# MISSOURI HIGHWAYS AND TRANSPORATION COMMISSION

EFFECTIVE: 01/01/2017

## MISSOURI STANDARD PLANS FOR HIGHWAY CONSTRUCTION

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* REVISED OR ADDED SINCE OCTOBER 2016

EFFECTIVE: 01/01/2017

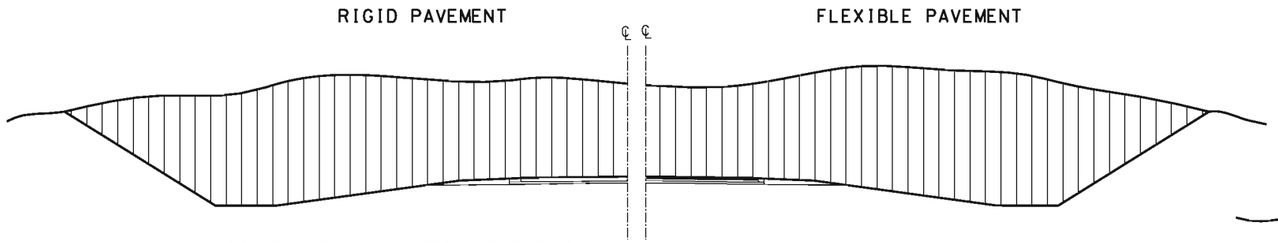
# MISSOURI HIGHWAYS AND TRANSPORATION COMMISSION

## MISSOURI STANDARD PLANS FOR HIGHWAY CONSTRUCTION

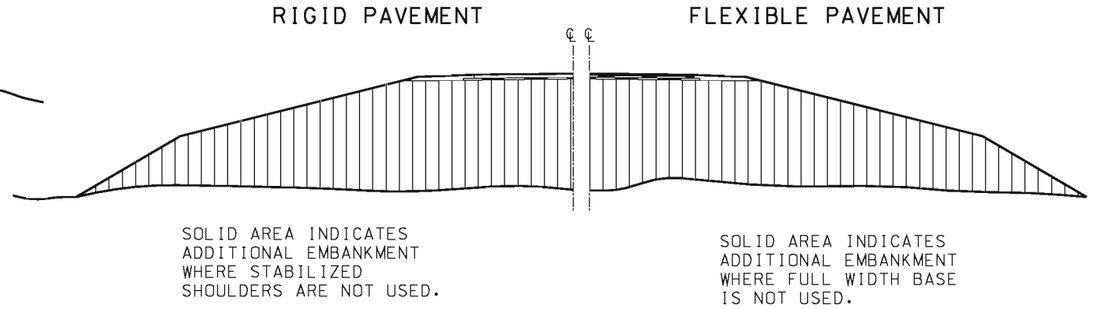
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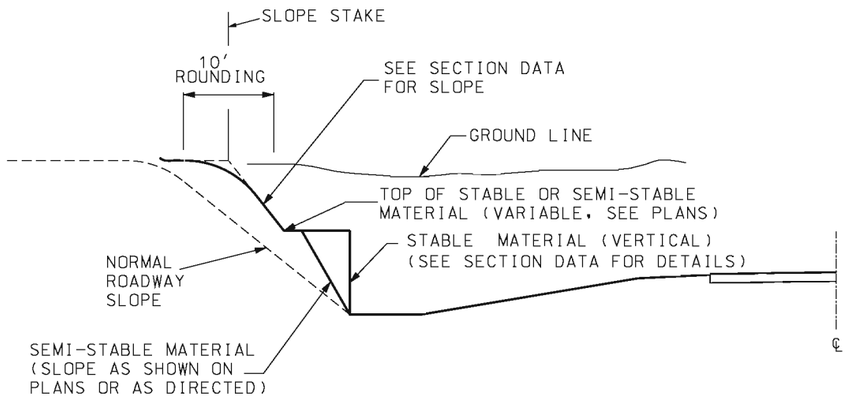

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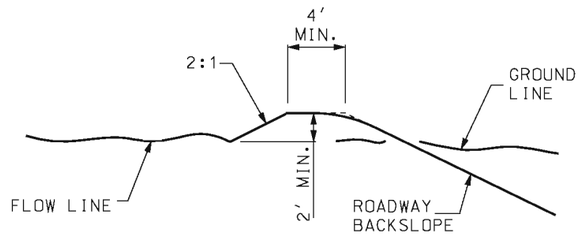

## EXCAVATION PAY LIMITS



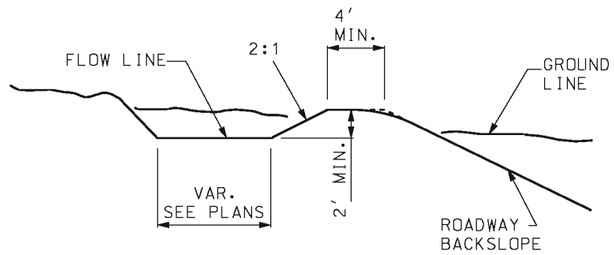

## EMBANKMENT LIMITS




## BACKSLOPES IN STABLE AND SEMI-STABLE MATERIAL



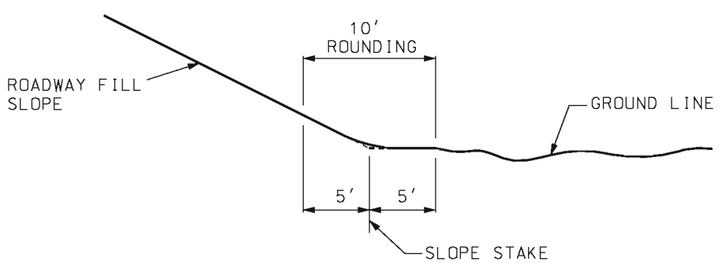

LEVEE



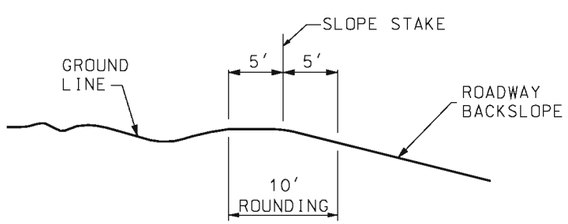

LEVEE AND DITCH

LEVEE AND/OR DITCH MAY BE LOCATED BACK OF BACKSLOPE WHEN CONDITIONS REQUIRE. USE DITCH ONLY WHERE INDICATED OR WHERE REQUIRED FOR DRAINAGE.

## INTERCEPTION DITCH AND/OR LEVEE




AT TOE OF ROADWAY FILL SLOPE




AT TOP OF ROADWAY BACKSLOPES

## PARABOLIC ROUNDING

GENERAL NOTES:

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

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

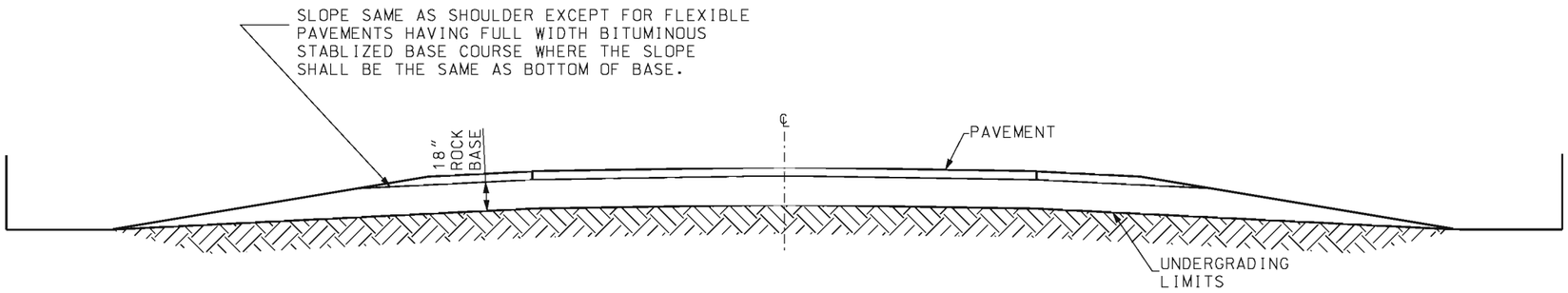
# EXCAVATION AND EMBANKMENT
TYPICAL DETAILS

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DATE PREPARED: 8/21/2009

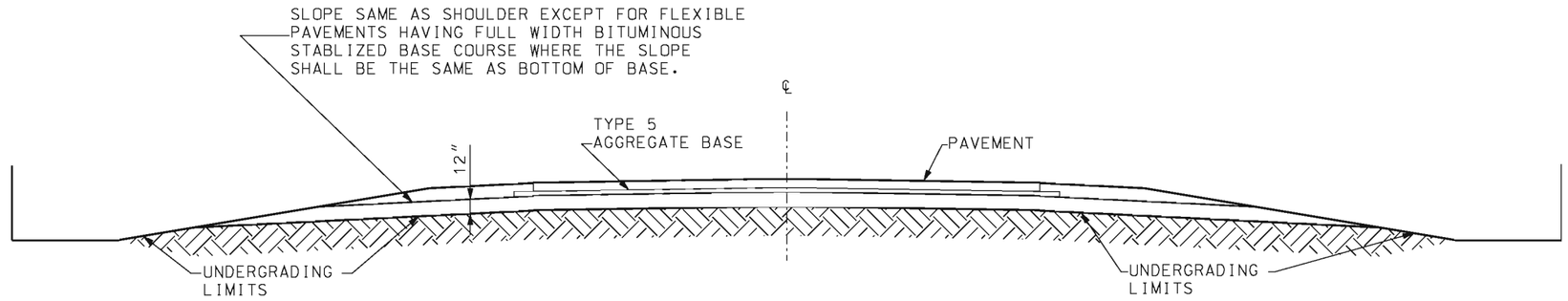
203.00E

SHEET NO. 1 OF 1

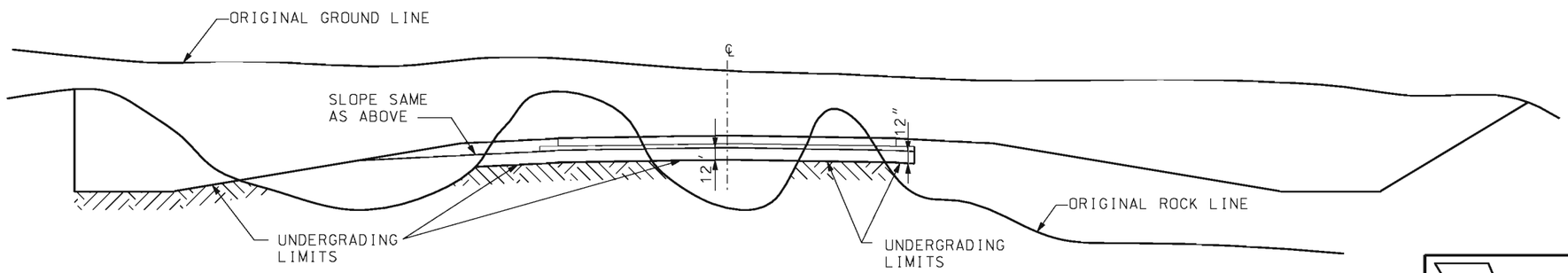
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## IN ROCK OVER ENTIRE WIDTH OF ROADBED WITH 18" ROCK BASE




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




## IN ROCK OVER PARTIAL WIDTH OF ROADBED

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

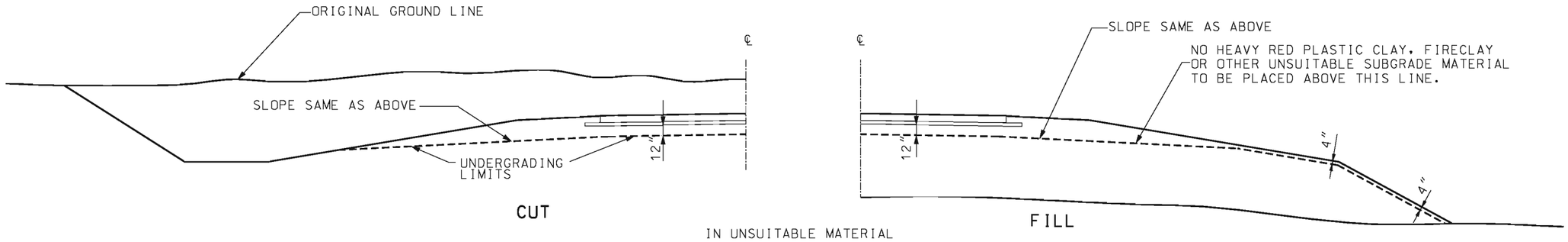
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# UNDERGRADING
TYPICAL DETAILS

DATE EFFECTIVE: 01/01/2004
DATE PREPARED: 8/21/2009

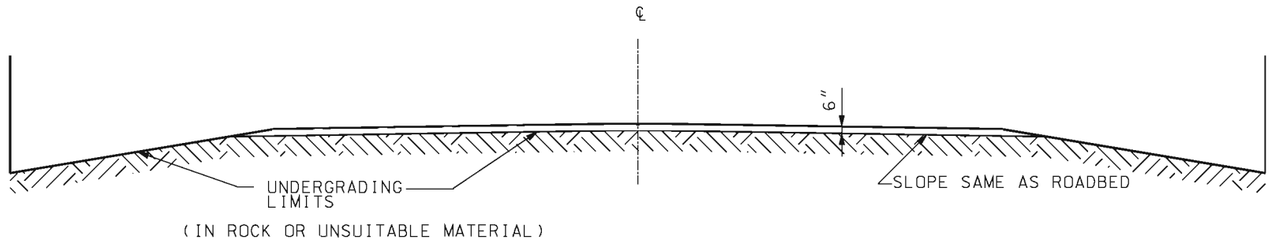
203.02F

SHEET NO. 1 OF 2




IN UNSUITABLE MATERIAL

## UNDERGRADING LIMITS
(FLEXIBLE OR RIGID PAVEMENTS)




(IN ROCK OR UNSUITABLE MATERIAL)

## UNDERGRADING LIMITS
(EARTH OR AGGREGATE TYPE SURFACE)

GENERAL NOTES:

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# UNDERGRADING
TYPICAL DETAILS

DATE EFFECTIVE: 01/01/2004
DATE PREPARED: 8/21/2009

203.02F

SHEET NO.
2 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

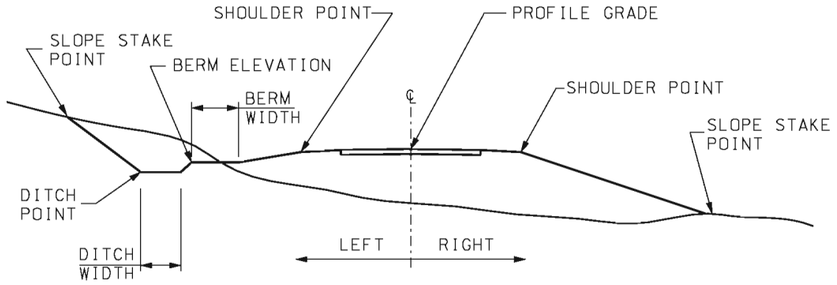



FIGURE A

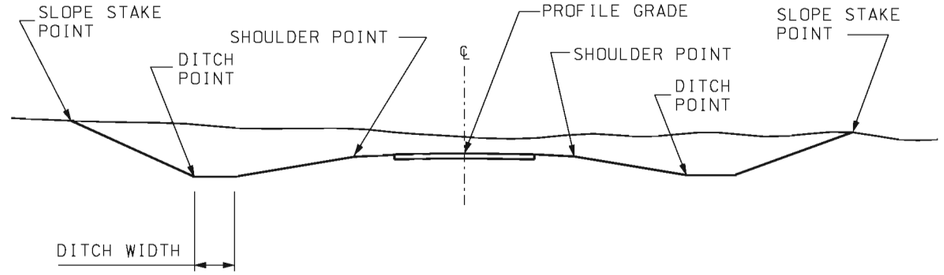



FIGURE B

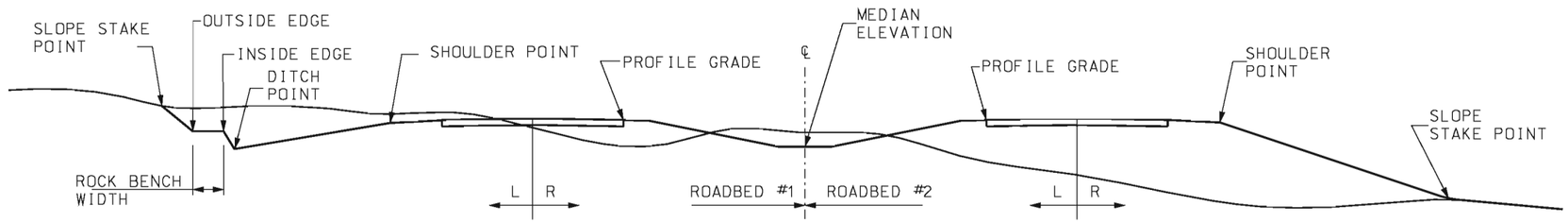



FIGURE C

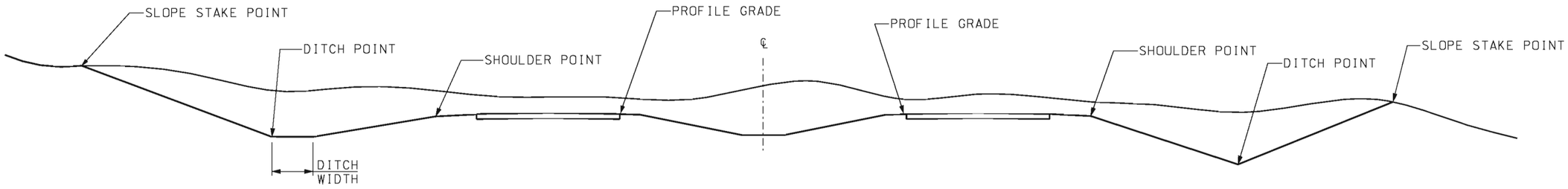
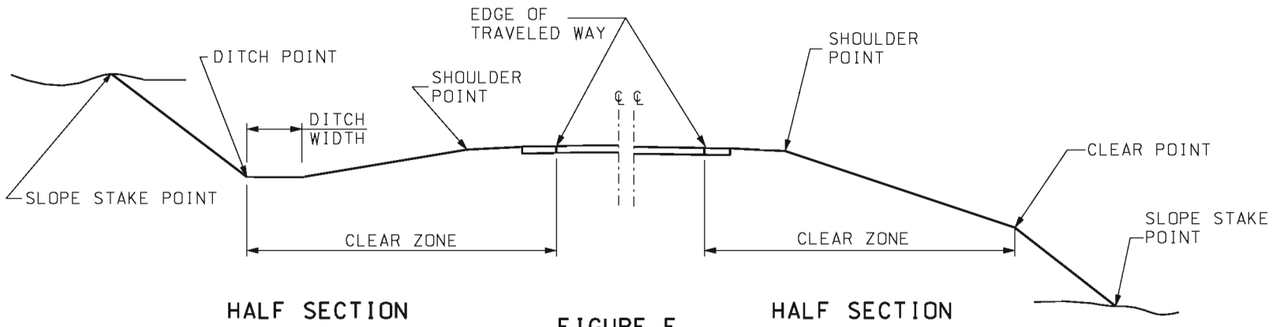



FIGURE D




HALF SECTION CUT

FIGURE E

HALF SECTION CUT

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

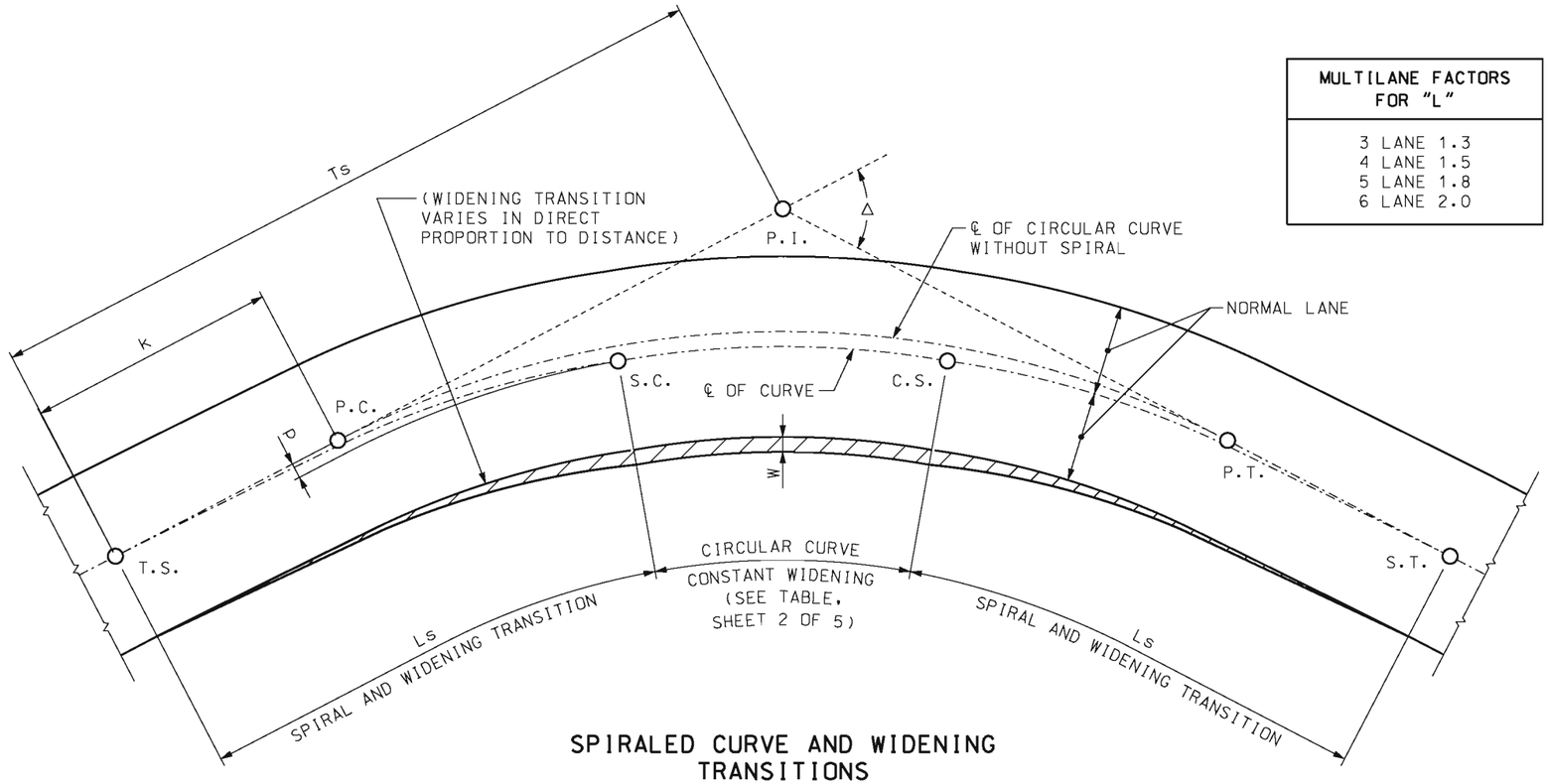
# TABULATED EARTHWORK AND SECTION DATA

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DATE PREPARED: 12/18/2008

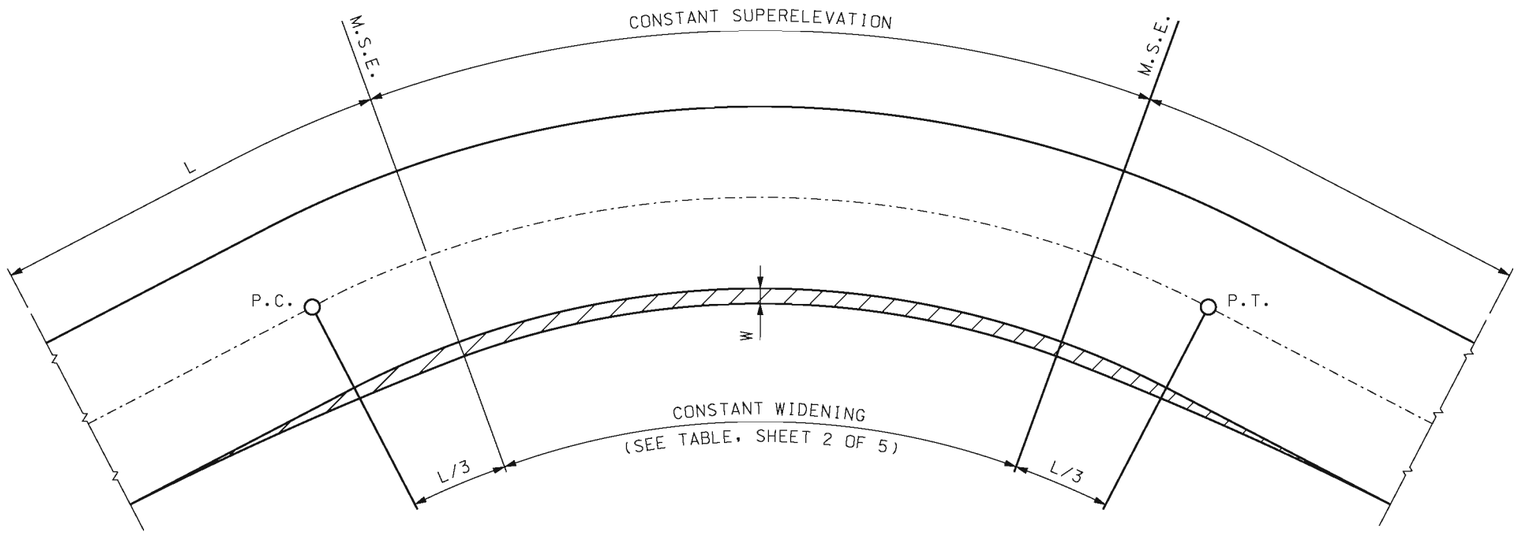
203.10D

SHEET NO. 1 OF 1

| MULTILANE FACTORS FOR "L" |
|---|
| 3 LANE 1.3 |
| 4 LANE 1.5 |
| 5 LANE 1.8 |
| 6 LANE 2.0 |




SPIRALED CURVE AND WIDENING TRANSITIONS




SUPERELEVATION RUNOUT AND WIDENING TRANSITIONS WITHOUT SPIRALS

GENERAL NOTES:

CURVES WITH A LARGER RADIUS THAN 3000' ARE NOT TO BE SPIRALED.

CURVES OF ROADS WITH DESIGN TRAFFIC LESS THAN 400 ADT ARE NOT TO BE SPIRALED.

A PRACTICAL CONTROL FOR THE LENGTH OF SPIRAL "Ls" IS CONSIDERED TO BE THE SUPERELEVATION RUNOFF "L".

SPIRAL TRANSITION CURVES MAY BE STAKED BY DEFLECTION ANGLES AND CHORDS OR BY OFFSETS FROM TANGENT. THE ARC DEFINITION SHALL BE USED FOR THE CIRCULAR CURVE.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
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NUMBER PE-23751
PROFESSIONAL ENGINEER
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# SUPERELEVATION SPIRALS AND WIDENING
## UNDIVIDED HIGHWAYS

| DATE EFFECTIVE: 04/01/2002 | 203.20F | SHEET NO. |
|---|---|---|
| DATE PREPARED: 8/21/2009 | | 1 OF 5 |


IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SUPERELEVATION AND WIDENING TABLE, $e_{max}$= 8%

| DESIGN SPEED | 30 M.P.H. OR LESS | | | | | 40 M.P.H. | | | | | 50 M.P.H. | | | | | 60 M.P.H. | | | | 70 M.P.H. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NORMAL SURFACE WIDTH | | | 20′ | 22′ | 24′ | | | 20′ | 22′ | 24′ | | | 20′ | 22′ | 24′ | | | 22′ | 24′ | | | 24′ |
| RADIUS (FEET) | e% | L | W | | | e% | L | W | | | e% | L | W | | | e% | L | W | | e% | L | W |
| 17000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | NC | 0 | 0 |
| 14000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | RC | 60 | 0 |
| 12000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | RC | 60 | 0 |
| 10000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | RC | 53 | 0 | 0 | 2.1 | 63 | 0 |
| 8000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | 2.1 | 56 | 0 | 0 | 2.6 | 78 | 0 |
| 6000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | RC | 48 | 0 | 0 | 0 | 2.7 | 72 | 0 | 0 | 3.4 | 102 | 0 |
| 5000 | NC | 0 | 0 | 0 | 0 | RC | 41 | 0 | 0 | 0 | 2.4 | 58 | 2.0 | 0 | 0 | 3.2 | 85 | 0 | 0 | 4.1 | 123 | 0 |
| 4000 | NC | 0 | 0 | 0 | 0 | RC | 41 | 2.0 | 0 | 0 | 2.9 | 70 | 2.0 | 0 | 0 | 3.9 | 104 | 0 | 0 | 4.9 | 147 | 0 |
| 3500 | NC | 0 | 0 | 0 | 0 | 2.3 | 48 | 2.0 | 0 | 0 | 3.2 | 77 | 2.0 | 0 | 0 | 4.4 | 117 | 0 | 0 | 5.5 | 165 | 0 |
| 3000 | RC | 36 | 2.0 | 0 | 0 | 2.6 | 54 | 2.0 | 0 | 0 | 3.7 | 89 | 2.5 | 0 | 0 | 5.0 | 133 | 0 | 0 | 6.3 | 189 | 0 |
| 2500 | RC | 36 | 2.0 | 0 | 0 | 3.0 | 62 | 2.5 | 0 | 0 | 4.3 | 103 | 2.5 | 0 | 0 | 5.7 | 152 | 0 | 0 | 7.2 | 216 | 0 |
| 2000 | 2.4 | 44 | 2.5 | 0 | 0 | 3.7 | 77 | 2.5 | 0 | 0 | 5.1 | 122 | 2.5 | 0 | 0 | 6.6 | 176 | 2.0 | 0 | 7.9 | 237 | 0 |
| 1800 | 2.6 | 47 | 2.5 | 0 | 0 | 4.0 | 83 | 3.0 | 0 | 0 | 5.5 | 132 | 3.0 | 2.0 | 0 | 7.1 | 189 | 2.0 | 0 | MIN. RADIUS = 1820′ | | |
| 1600 | 2.9 | 53 | 2.5 | 0 | 0 | 4.4 | 91 | 3.0 | 0 | 0 | 5.9 | 142 | 3.0 | 2.0 | 0 | 7.5 | 200 | 2.0 | 0 | | | |
| 1400 | 3.2 | 58 | 3.0 | 0 | 0 | 4.8 | 99 | 3.0 | 2.0 | 0 | 6.4 | 154 | 3.0 | 2.5 | 0 | 7.8 | 208 | 2.5 | 0 | | | |
| 1200 | 3.6 | 65 | 3.0 | 2.0 | 0 | 5.4 | 112 | 3.5 | 2.5 | 0 | 7.0 | 168 | 3.5 | 2.5 | 0 | MIN. RADIUS = 1205′ | | | | | | |
| 1000 | 4.2 | 76 | 3.5 | 2.5 | 0 | 6.0 | 124 | 3.5 | 2.5 | 0 | 7.6 | 182 | 3.5 | 3.0 | 2.0 | | | | | | | |
| 900 | 4.5 | 82 | 3.5 | 2.5 | 0 | 6.4 | 132 | 4.0 | 3.0 | 2.0 | 7.8 | 187 | 4.0 | 3.5 | 2.5 | | | | | | | |
| 800 | 4.9 | 89 | 4.0 | 3.0 | 2.0 | 6.8 | 141 | 4.0 | 3.0 | 2.0 | 8.0 | 192 | 4.5 | 3.5 | 2.5 | | | | | | | |
| 700 | 5.3 | 96 | 4.0 | 3.0 | 2.0 | 7.2 | 149 | 4.5 | 3.5 | 2.5 | MIN. RADIUS = 750′ | | | | | | | | | | | |
| 600 | 5.8 | 105 | 4.5 | 3.5 | 2.5 | 7.6 | 157 | 5.0 | 4.0 | 3.0 | | | | | | | | | | | | |
| 500 | 6.4 | 116 | 5.5 | 4.5 | 3.5 | 8.0 | 165 | 5.5 | 4.5 | 3.5 | | | | | | | | | | | | |
| 450 | 6.7 | 122 | 5.5 | 4.5 | 3.5 | MIN. RADIUS = 465′ | | | | | | | | | | | | | | | | |
| 400 | 7.1 | 129 | 6.0 | 5.0 | 4.0 | | | | | | | | | | | | | | | | | |
| 350 | 7.5 | 136 | 7.0 | 6.0 | 5.0 | | | | | | | | | | | | | | | | | |
| 300 | 7.8 | 142 | 7.5 | 6.5 | 5.5 | | | | | | | | | | | | | | | | | |
| 250 | 8.0 | 145 | 9.0 | 8.0 | 7.0 | | | | | | | | | | | | | | | | | |
| MIN. RADIUS = 250′ | | | | | | | | | | | | | | | | | | | | | | |

## SUPERELEVATION AND WIDENING TABLE, $e_{max}$= 4%

| DESIGN SPEED | 30 M.P.H. OR LESS | | | | | 40 M.P.H. | | | | | 50 M.P.H. | | | | | 60 M.P.H. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NORMAL SURFACE WIDTH | | | 20′ | 22′ | 24′ | | | 20′ | 22′ | 24′ | | | 20′ | 22′ | 24′ | | | 22′ | 24′ |
| RADIUS (FEET) | e% | L | W | | | e% | L | W | | | e% | L | W | | | e% | L | W | |
| 10000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 |
| 8000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | RC | 53 | 0 | 0 |
| 6000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | RC | 48 | 0 | 0 | 0 | 2.3 | 61 | 0 | 0 |
| 5000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | 0 | RC | 48 | 2.0 | 0 | 0 | 2.5 | 67 | 0 | 0 |
| 4000 | NC | 0 | 0 | 0 | 0 | RC | 41 | 2.0 | 0 | 0 | 2.3 | 55 | 2.0 | 0 | 0 | 2.8 | 75 | 0 | 0 |
| 3500 | NC | 0 | 0 | 0 | 0 | RC | 41 | 2.0 | 0 | 0 | 2.5 | 60 | 2.0 | 0 | 0 | 3.0 | 80 | 0 | 0 |
| 3000 | NC | 0 | 2.0 | 0 | 0 | 2.1 | 43 | 2.0 | 0 | 0 | 2.7 | 65 | 2.5 | 0 | 0 | 3.3 | 88 | 0 | 0 |
| 2500 | RC | 36 | 2.0 | 0 | 0 | 2.4 | 50 | 2.5 | 0 | 0 | 2.9 | 70 | 2.5 | 0 | 0 | 3.5 | 93 | 0 | 0 |
| 2000 | RC | 36 | 2.0 | 0 | 0 | 2.6 | 54 | 2.5 | 0 | 0 | 3.2 | 77 | 2.5 | 0 | 0 | 3.8 | 101 | 2.0 | 0 |
| 1800 | 2.1 | 38 | 2.5 | 0 | 0 | 2.7 | 56 | 3.0 | 0 | 0 | 2.3 | 79 | 3.0 | 2.0 | 0 | 3.9 | 104 | 2.0 | 0 |
| 1600 | 2.2 | 40 | 2.5 | 0 | 0 | 2.9 | 60 | 3.0 | 0 | 0 | 3.5 | 84 | 3.0 | 2.0 | 0 | 4.0 | 107 | 2.5 | 0 |
| 1400 | 2.4 | 44 | 2.5 | 0 | 0 | 3.0 | 62 | 3.0 | 2.0 | 0 | 3.7 | 89 | 3.0 | 2.5 | 0 | MIN. RADIUS = 1505′ | | | |
| 1200 | 2.5 | 45 | 3.0 | 2.0 | 0 | 3.2 | 66 | 3.5 | 2.5 | 0 | 3.9 | 94 | 3.5 | 2.5 | 0 | | | | |
| 1000 | 2.7 | 49 | 3.5 | 2.5 | 0 | 3.5 | 72 | 3.5 | 2.5 | 0 | 4.0 | 96 | 3.5 | 3.0 | 2.0 | | | | |
| 900 | 2.9 | 53 | 3.5 | 2.5 | 0 | 3.6 | 74 | 4.0 | 3.0 | 2.0 | MIN. RADIUS = 930′ | | | | | | | | |
| 800 | 3.0 | 55 | 4.0 | 3.0 | 0 | 3.8 | 79 | 4.0 | 3.0 | 2.0 | | | | | | | | | |
| 700 | 3.2 | 58 | 4.0 | 3.0 | 2.0 | 3.9 | 81 | 4.5 | 3.5 | 2.5 | | | | | | | | | |
| 600 | 3.4 | 62 | 4.5 | 3.5 | 2.5 | 4.0 | 83 | 5.0 | 4.0 | 3.0 | | | | | | | | | |
| 500 | 3.6 | 65 | 5.5 | 4.5 | 3.5 | MIN. RADIUS = 565′ | | | | | | | | | | | | | |
| 450 | 3.7 | 67 | 5.5 | 4.5 | 3.5 | | | | | | | | | | | | | | |
| 400 | 3.8 | 69 | 6.0 | 5.0 | 4.0 | | | | | | | | | | | | | | |
| 350 | 3.9 | 71 | 7.0 | 6.0 | 5.0 | | | | | | | | | | | | | | |
| 300 | 4.0 | 73 | 7.5 | 6.5 | 5.5 | | | | | | | | | | | | | | |
| MIN. RADIUS = 300′ | | | | | | | | | | | | | | | | | | | |

TABLE NOTES:

"NC" DENOTES NORMAL CROSS SLOPE.

"RC" DENOTES REMOVE ADVERSE CROSS SLOPE. SUPERELEVATE AT NORMAL CROSS SLOPE.

"e" DENOTES THE SUPERELEVATION IN PERCENT (%).

"L" THE LENGTH OF SUPERELEVATION RUNOFF AND WIDENING TRANSITION IN FEET FOR A 2 LANE ROADWAY.

"W" THE WIDENING IN FEET FOR SURFACING AT INSIDE SHOULDERS.

VALUE FOR A RADIUS NOT SHOWN IN ABOVE TABLE SHALL BE IDENTICAL TO THOSE FOR THE NEAREST TABULATED RADIUS. IN CASE OF TIE, USE VALUES OF NEXT LARGER RADIUS.

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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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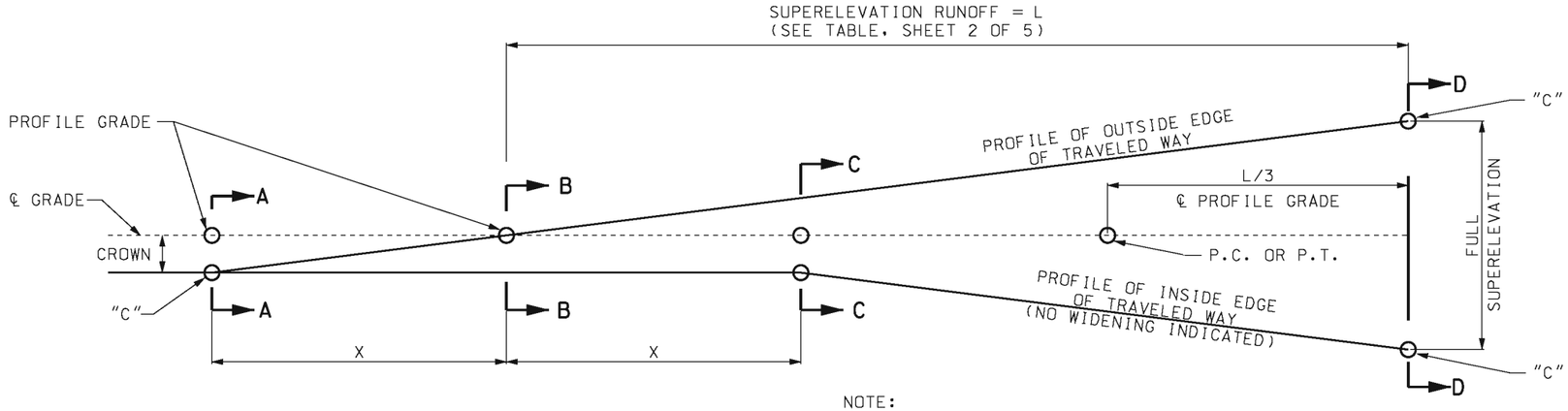
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# SUPERELEVATION SPIRALS AND WIDENING

UNDIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009

203.20F

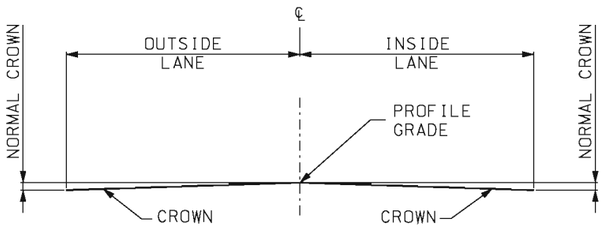



A-A TO B-B IS THE TANGENT RUNOUT.

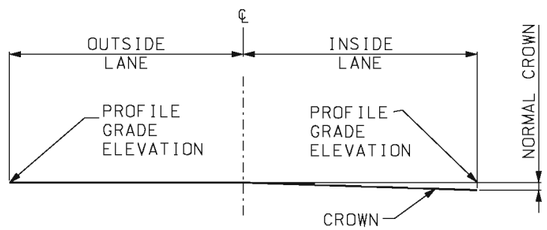
$$X = \frac{L \times NC(\%)}{e(\%)}$$

NOTE:

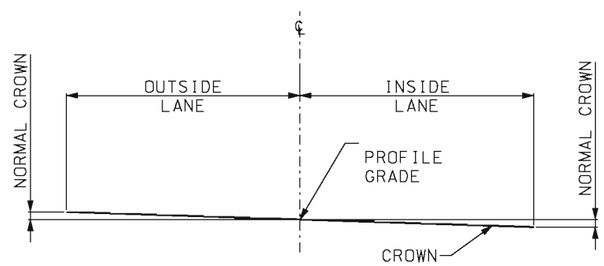
SHORT VERTICAL CURVES MAY BE INSERTED AT POINTS "C" BY EYE ADJUSTMENTS OF STAKES OR FORMS IN THE FIELD.



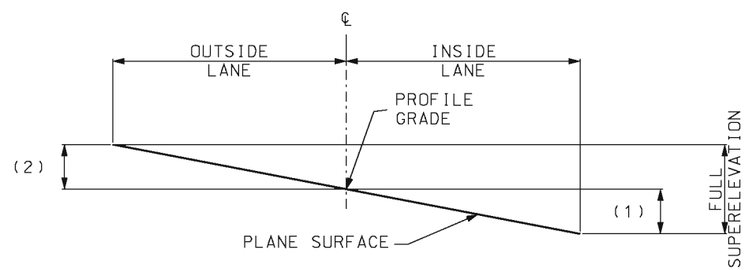

SECTION A-A




SECTION B-B




SECTION C-C




(1) FULL S.E. FOR ½ PAVEMENT WIDTH IF GREATER THAN CROWN SLOPE.

(2) FULL S.E. FOR ½ PAVEMENT WIDTH.

SECTION D-D

## CASE NUMBER 1

(WHERE HIGH POINT OF TRAVELED WAY IS AT CENTERLINE ON TANGENT SECTION)
NOTE: USE FOR 2 LANE TRAFFIC ROADS ONLY. PAVEMENT REVOLVED ABOUT ITS ℄.


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STATE OF MISSOURI
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NUMBER PE-23751
PROFESSIONAL ENGINEER
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# SUPERELEVATION SPIRALS AND WIDENING

UNDIVIDED HIGHWAYS

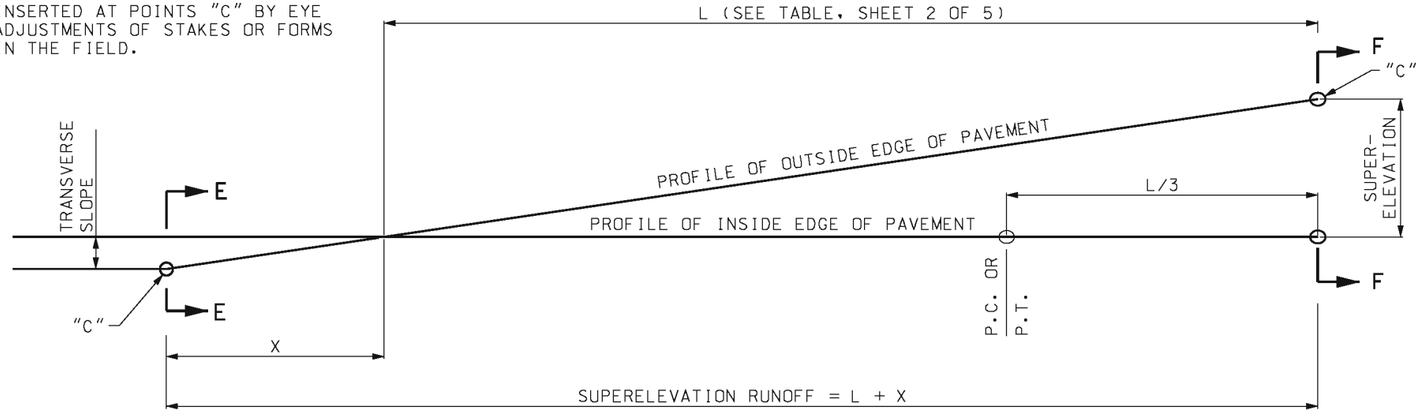
DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009

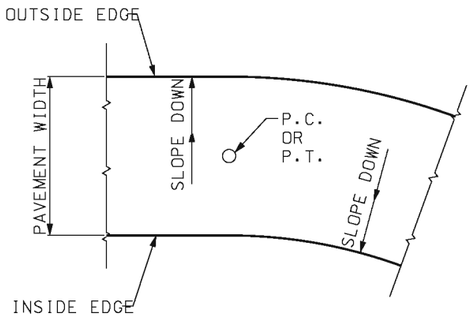
203.20F

SHEET NO. 3 OF 5

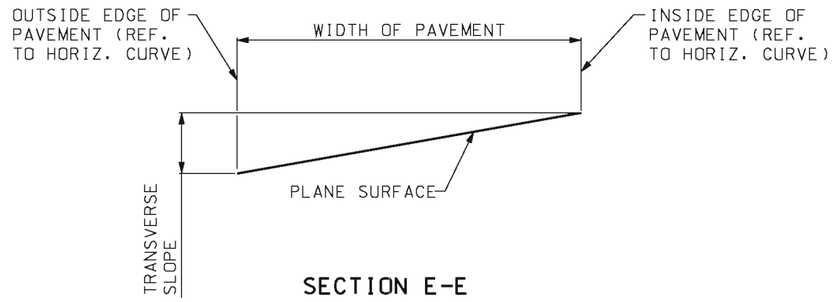

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

NOTE:
SHORT VERTICAL CURVES MAY BE INSERTED AT POINTS "C" BY EYE ADJUSTMENTS OF STAKES OR FORMS IN THE FIELD.

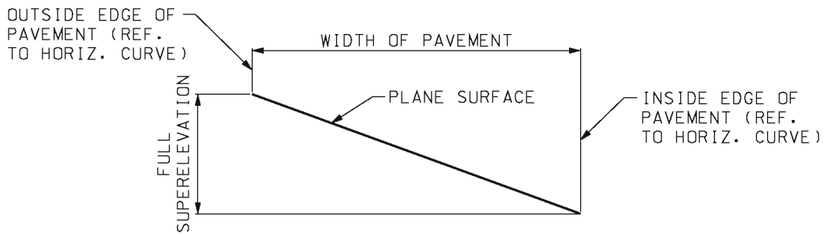



PLAN OF ALIGNMENT
FOR CASE NUMBER 2




SECTION E-E




SECTION F-F

CASE NUMBER 2

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

## STRAIGHT LINE METHODS OF ATTAINING SUPERELEVATION

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

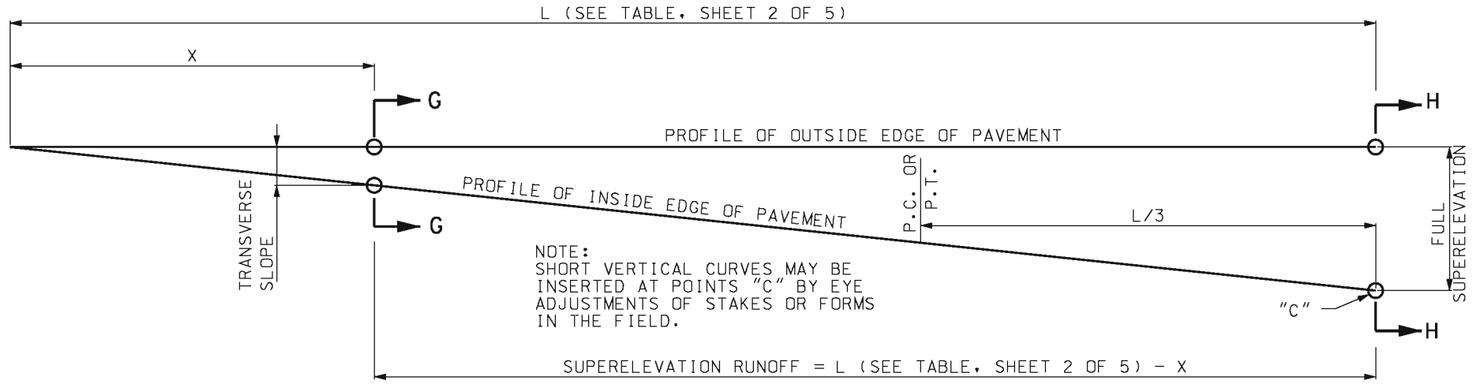

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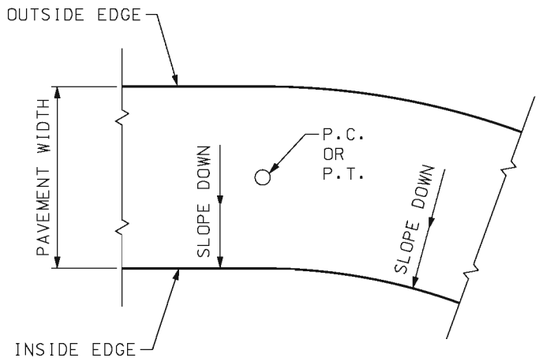

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# SUPERELEVATION SPIRALS AND WIDENING
UNDIVIDED HIGHWAYS

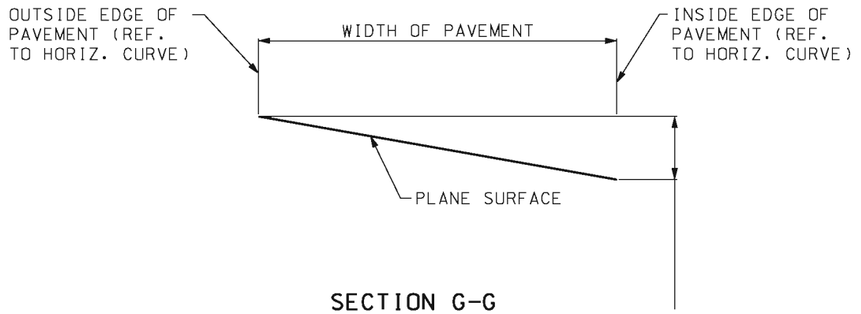
DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009

203.20F

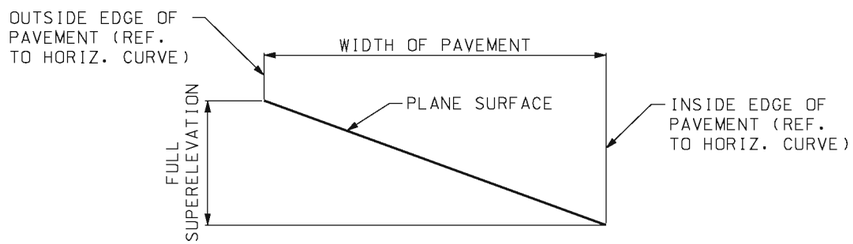



PLAN OF ALIGNMENT
FOR CASE NUMBER 3




SECTION G-G




SECTION H-H

CASE NUMBER 3

(WHERE TRANSVERSE SLOPE ON TANGENT SECTION IS SAME DIRECTION AS SLOPE OF SUPERELEVATION)
NOTE: PAVEMENT REVOLVED ABOUT ITS OUTSIDE EDGE WITH REFERENCE TO THE HORIZONTAL CURVE WHICH IS BEING APPROACHED.

## STRAIGHT LINE METHOD OF ATTAINING SUPERELEVATION

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

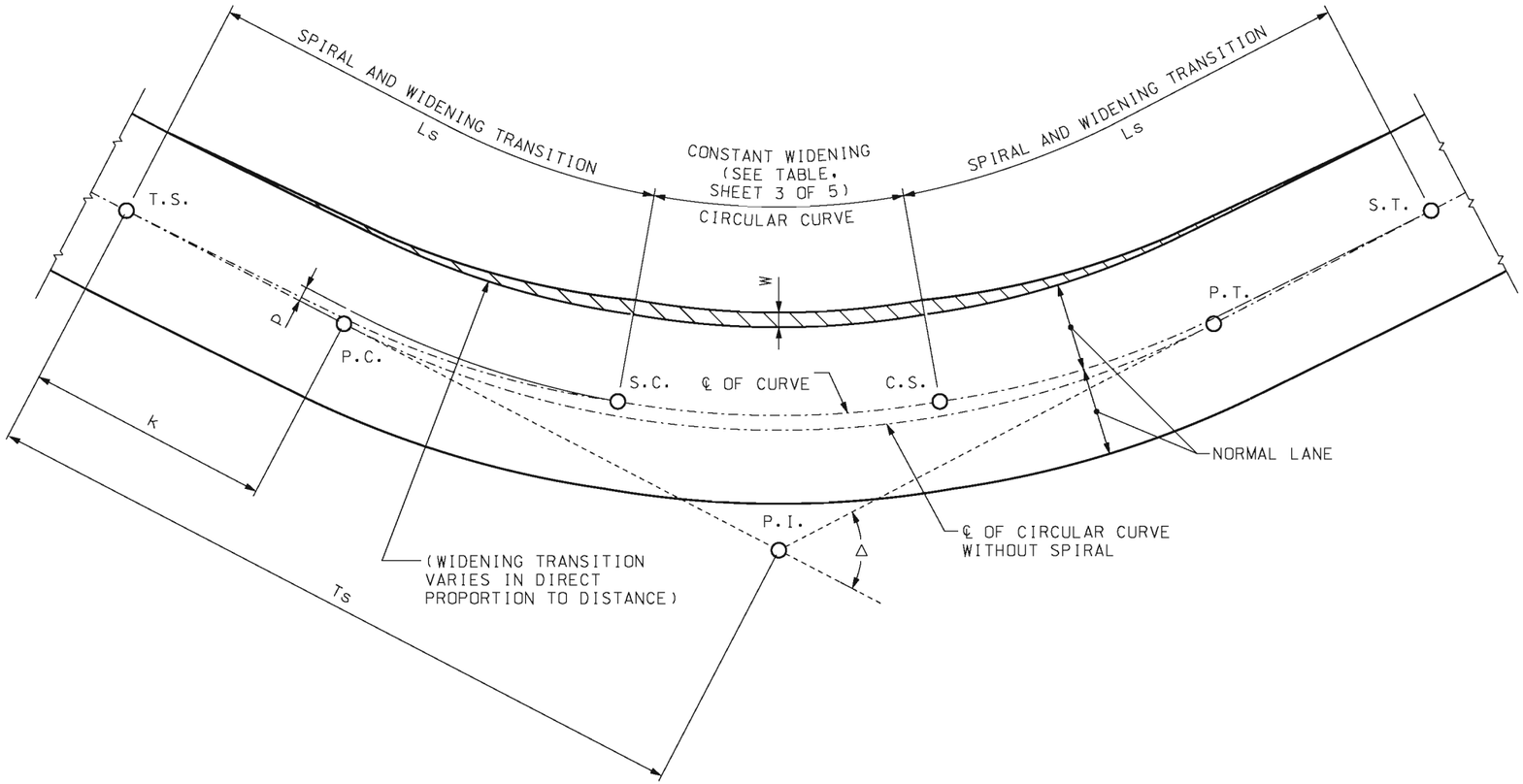
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
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# SUPERELEVATION SPIRALS AND WIDENING
UNDIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009
203.20F
SHEET NO. 5 OF 5

| MULTILANE FACTORS FOR "L" IN ONE DIRECTION |
|---|
| 3 LANE 1.3 |
| 4 LANE 1.7 |
| 5 LANE 2.0 |
| 6 LANE 2.3 |




## SPIRALED CURVE AND WIDENING TRANSITIONS

GENERAL NOTES:

CURVES WITH RADIUS OF 3000' OR MORE ARE NOT TO BE SPIRALED.

CURVES OF ROADS WITH DESIGN TRAFFIC LESS THAN 400 ADT ARE NOT TO BE SPIRALED.

A PRACTICAL CONTROL FOR THE LENGTH OF SPIRAL "Ls" IS CONSIDERED TO BE THE SUPERELEVATION RUNOFF "L".

SPIRAL TRANSITION CURVES MAY BE STAKED BY DEFLECTION ANGLES AND CHORDS OR BY OFFSETS FROM TANGENT. THE ARC DEFINITION SHALL BE USED FOR THE CIRCULAR CURVES.


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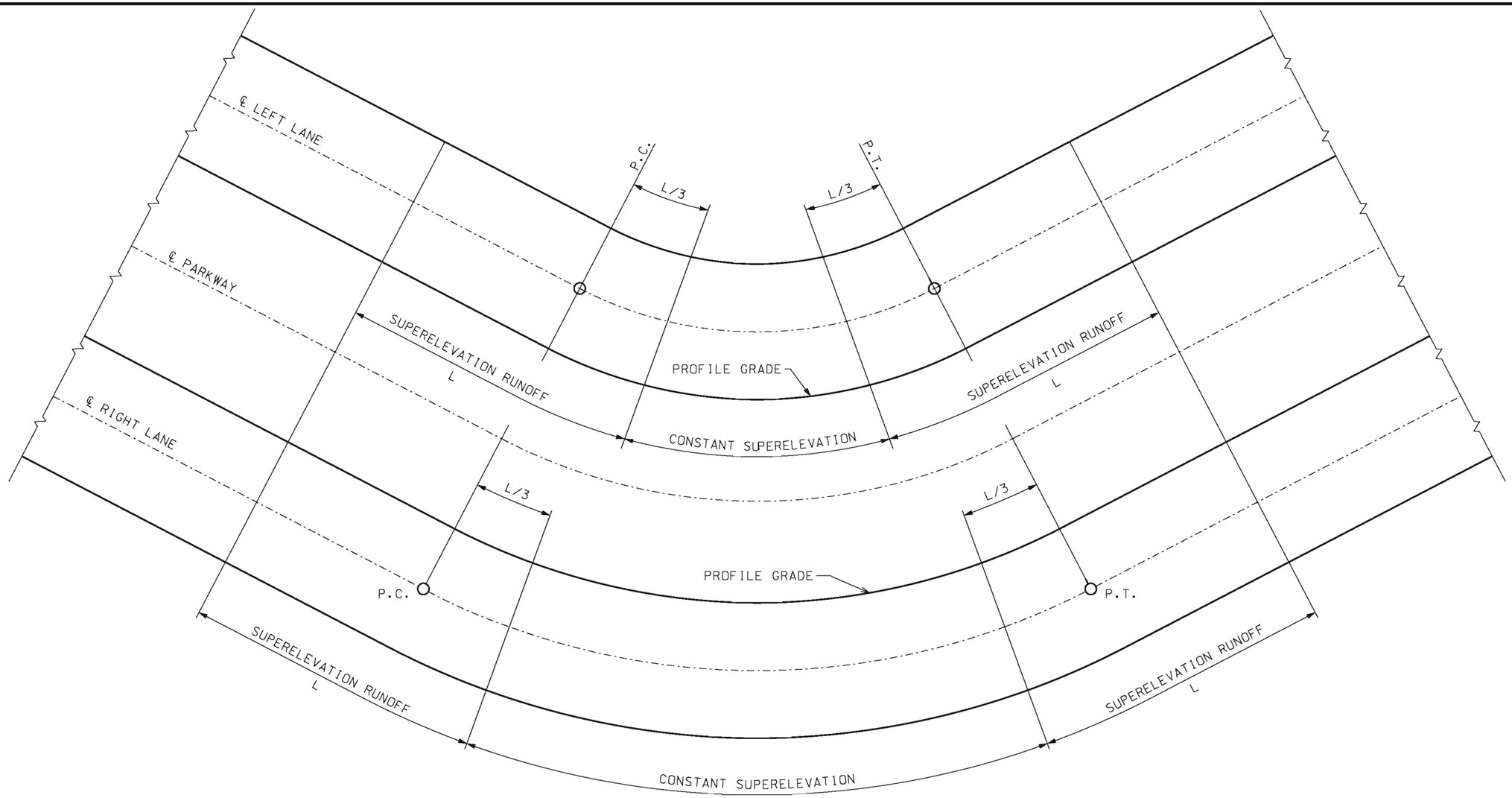

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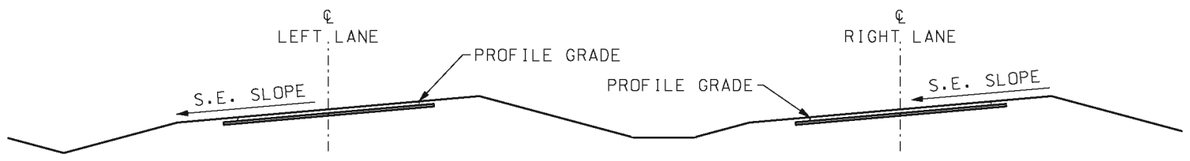
# SUPERELEVATION, SPIRALS AND WIDENING

DIVIDED HIGHWAYS

| DATE EFFECTIVE: 04/01/2002 | 203.21J | SHEET NO. |
|---|---|---|
| DATE PREPARED: 8/21/2009 | | 1 OF 5 |


IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




**SECTION ON SUPERELEVATED CURVE**
CURVE TO LEFT (ILLUSTRATED)

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# SUPERELEVATION, SPIRALS AND WIDENING
DIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009

203.21J

SHEET NO. 2 OF 5

## SUPERELEVATION AND WIDENING TABLE, $e_{max}$= 8%

| DESIGN SPEED | 50 M.P.H. | | | | | 60 M.P.H. | | | | 70 M.P.H. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NORMAL SURFACE WIDTH | | | 20′ | 22′ | 24′ | | | 22′ | 24′ | | | 24′ |
| RADIUS (FEET) | e% | L | W | | | e% | L | W | | e% | L | W |
| 17000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | NC | 0 | 0 |
| 14000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | RC | 90 | 0 |
| 12000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 | RC | 90 | 0 |
| 10000 | NC | 0 | 0 | 0 | 0 | RC | 80 | 0 | 0 | 2.1 | 95 | 0 |
| 8000 | NC | 0 | 0 | 0 | 0 | 2.1 | 84 | 0 | 0 | 2.6 | 117 | 0 |
| 6000 | RC | 72 | 0 | 0 | 0 | 2.7 | 108 | 0 | 0 | 3.4 | 153 | 0 |
| 5000 | 2.4 | 86 | 2.0 | 0 | 0 | 3.2 | 126 | 0 | 0 | 4.1 | 184 | 0 |
| 4000 | 2.9 | 104 | 2.0 | 0 | 0 | 3.9 | 156 | 2.0 | 0 | 4.9 | 221 | 0 |
| 3500 | 3.2 | 115 | 2.0 | 0 | 0 | 4.4 | 176 | 2.0 | 0 | 5.5 | 248 | 0 |
| 3000 | 3.7 | 133 | 2.5 | 0 | 0 | 5.0 | 200 | 2.0 | 0 | 6.3 | 283 | 0 |
| 2500 | 4.3 | 155 | 2.5 | 0 | 0 | 5.7 | 228 | 2.0 | 0 | 7.2 | 324 | 0 |
| 2000 | 5.1 | 184 | 2.5 | 0 | 0 | 6.6 | 264 | 2.0 | 0 | 7.9 | 356 | 0 |
| 1800 | 5.5 | 196 | 3.0 | 2.0 | 0 | 7.1 | 284 | 2.0 | 0 | | | |
| 1600 | 5.9 | 212 | 3.0 | 2.0 | 0 | 7.5 | 300 | 2.5 | 0 | | | |
| 1400 | 6.4 | 230 | 3.0 | 2.5 | 0 | 7.8 | 312 | 2.5 | 0 | | | |
| 1200 | 7.0 | 252 | 3.5 | 2.5 | 0 | | | | | | | |
| 1000 | 7.6 | 274 | 3.5 | 3.0 | 2.0 | | | | | | | |
| 900 | 7.8 | 281 | 4.0 | 3.5 | 2.5 | | | | | | | |
| 800 | 8.0 | 288 | 4.5 | 3.5 | 2.5 | | | | | | | |

MIN RADIUS = 1820′

MIN RADIUS = 1205′

MIN RADIUS = 750′

## SUPERELEVATION AND WIDENING TABLE, $e_{max}$= 4%

| DESIGN SPEED | 50 M.P.H. | | | | | 60 M.P.H. | | | |
|---|---|---|---|---|---|---|---|---|---|
| NORMAL SURFACE WIDTH | | | 20′ | 22′ | 24′ | | | 22′ | 24′ |
| RADIUS (FEET) | e% | L | W | | | e% | L | W | |
| 10000 | NC | 0 | 0 | 0 | 0 | NC | 0 | 0 | 0 |
| 8000 | NC | 0 | 0 | 0 | 0 | RC | 80 | 0 | 0 |
| 6000 | RC | 72 | 0 | 0 | 0 | 2.3 | 92 | 0 | 0 |
| 5000 | RC | 72 | 2.0 | 0 | 0 | 2.5 | 100 | 0 | 0 |
| 4000 | 2.3 | 83 | 2.0 | 0 | 0 | 2.8 | 112 | 0 | 0 |
| 3500 | 2.5 | 90 | 2.0 | 0 | 0 | 3.0 | 120 | 0 | 0 |
| 3000 | 2.7 | 97 | 2.5 | 0 | 0 | 3.3 | 132 | 0 | 0 |
| 2500 | 2.9 | 104 | 2.5 | 0 | 0 | 3.5 | 140 | 0 | 0 |
| 2000 | 3.2 | 115 | 2.5 | 0 | 0 | 3.8 | 152 | 0 | 0 |
| 1800 | 3.3 | 119 | 3.0 | 2.0 | 0 | 3.9 | 156 | 2.0 | 0 |
| 1600 | 3.5 | 126 | 3.0 | 2.0 | 0 | 4.0 | 160 | 2.5 | 0 |
| 1400 | 3.7 | 133 | 3.0 | 2.5 | 0 | | | | |
| 1200 | 3.9 | 140 | 3.5 | 2.5 | 0 | | | | |
| 1000 | 4.0 | 144 | 3.5 | 3.0 | 2.0 | | | | |

MIN RADIUS = 930′

RADIUS = 1505′

TABLE NOTES:

"NC" DENOTES NORMAL CROSS SLOPE.

"RC" DENOTES REMOVE ADVERSE CROSS SLOPE, SUPERELEVATE AT NORMAL CROSS SLOPE.

"e" DENOTES THE SUPERELEVATION IN PERCENT (%).

"L" THE LENGTH OF SUPERELEVATION RUNOFF AND WIDENING TRANSITION IN FEET FOR A 4 LANE DIVIDED HIGHWAY.

"W" THE WIDENING IN FEET FOR SURFACING AT INSIDE SHOULDERS.

VALUE FOR A RADIUS NOT SHOWN IN ABOVE TABLE SHALL BE IDENTICAL TO THOSE FOR THE NEAREST TABULATED RADIUS. IN CASE OF TIE, USE VALUES OF NEXT LARGER RADIUS.

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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# SUPERELEVATION, SPIRALS AND WIDENING

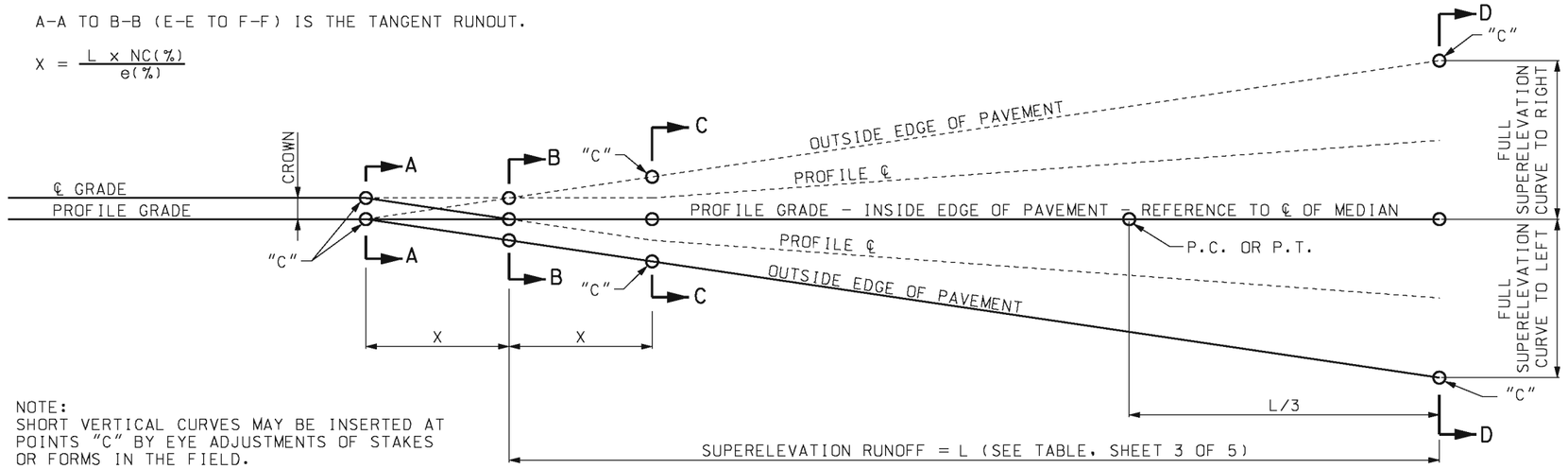
DIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009

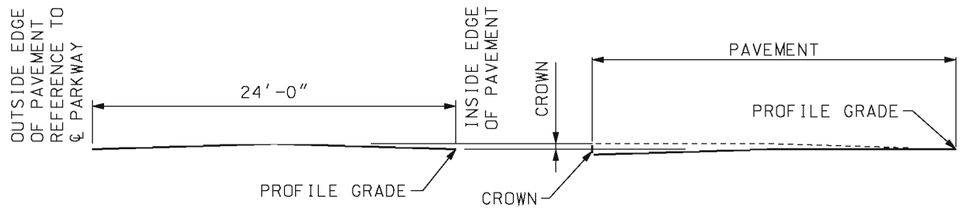
203.21J

A-A TO B-B (E-E TO F-F) IS THE TANGENT RUNOUT.

$$X = \frac{L \times NC(\%)}{e(\%)}$$



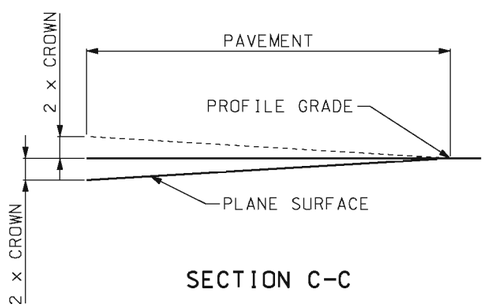

NOTE:
SHORT VERTICAL CURVES MAY BE INSERTED AT POINTS "C" BY EYE ADJUSTMENTS OF STAKES OR FORMS IN THE FIELD.



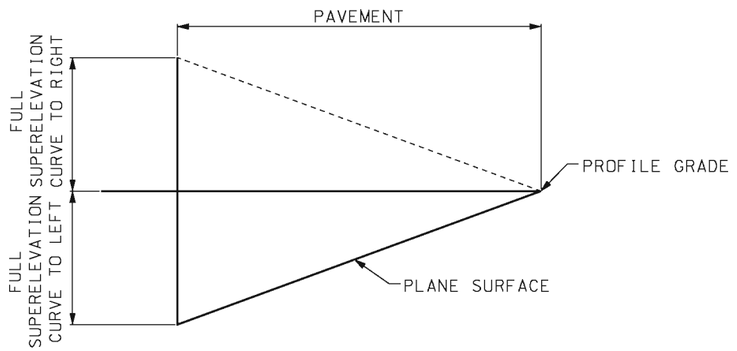

SECTION A-A

SECTION B-B

SOLID LINES ARE FOR CURVES TO LEFT
DASHED LINES ARE FOR CURVES TO RIGHT




SECTION C-C




SECTION D-D

## METHOD OF ATTAINING SUPERELEVATION
(LEFT LANE)

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
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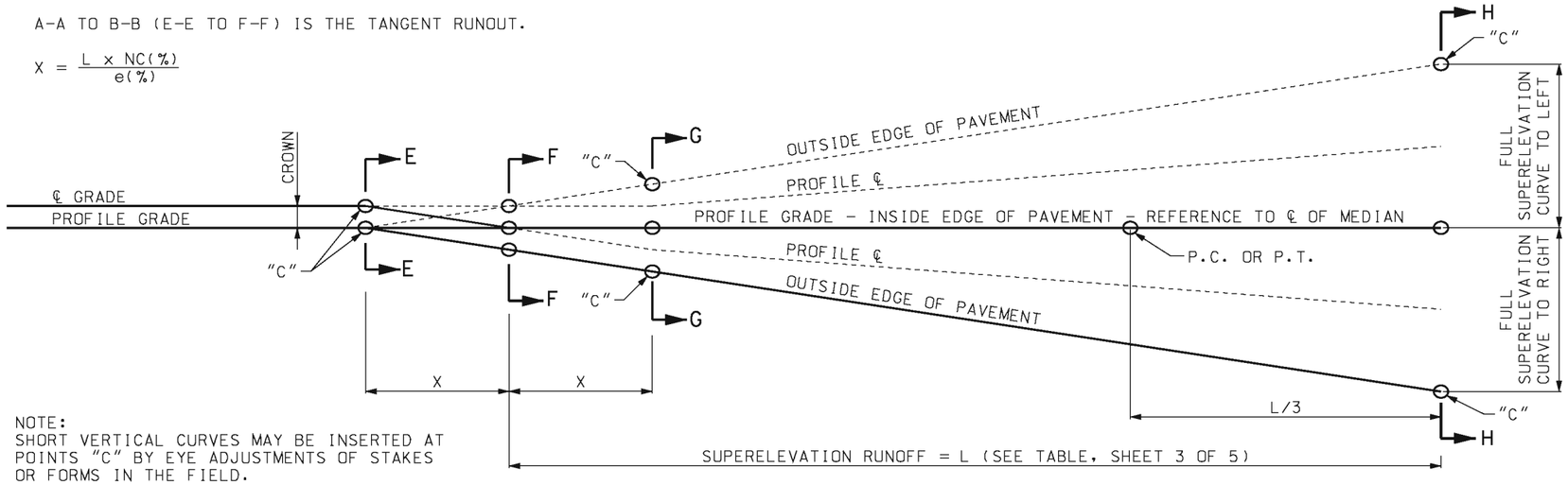
# SUPERELEVATION, SPIRALS AND WIDENING
DIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009

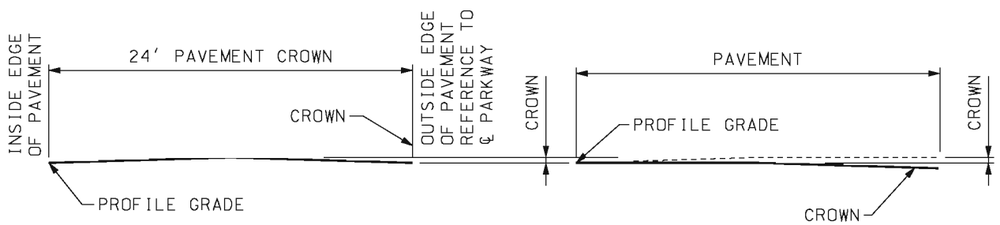
203.21J

A-A TO B-B (E-E TO F-F) IS THE TANGENT RUNOUT.

$$X = \frac{L \times NC(\%)}{e(\%)}$$



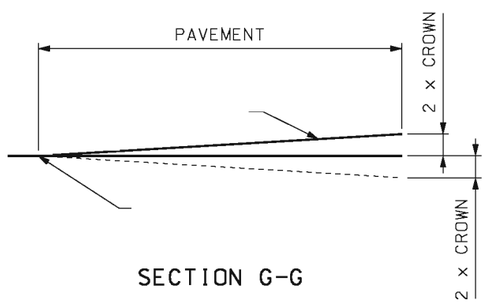

NOTE:
SHORT VERTICAL CURVES MAY BE INSERTED AT POINTS "C" BY EYE ADJUSTMENTS OF STAKES OR FORMS IN THE FIELD.



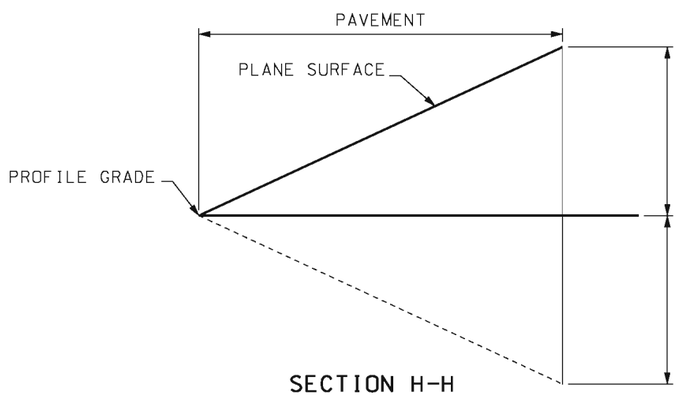

SECTION E-E

SECTION F-F

SOLID LINES ARE FOR CURVES TO LEFT
DASHED LINES ARE FOR CURVES TO RIGHT




SECTION G-G




SECTION H-H

## METHOD OF ATTAINING SUPERELEVATION
(RIGHT LANE)

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

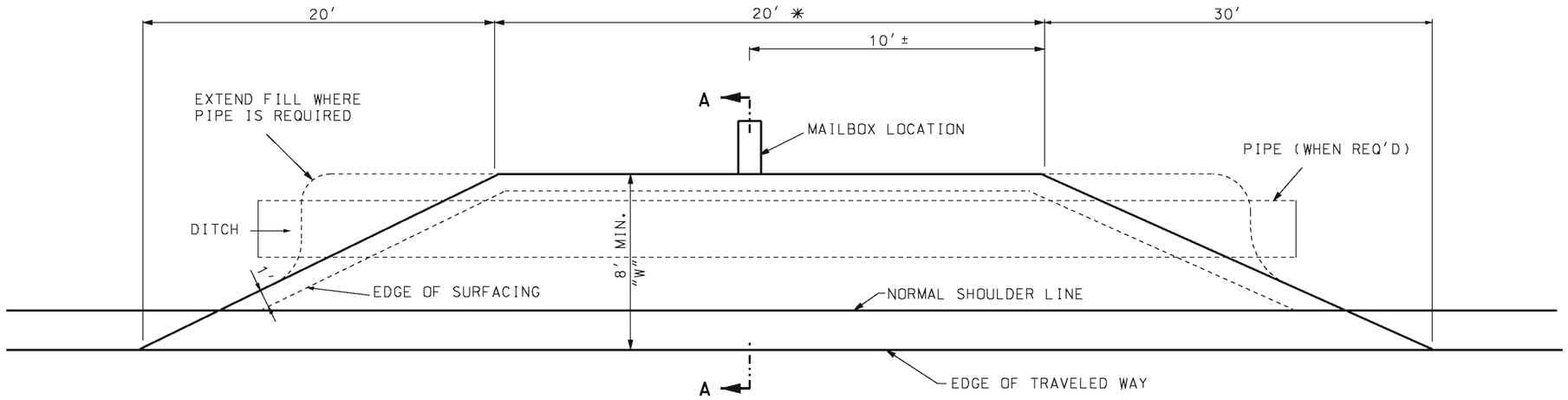
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-2375I
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# SUPERELEVATION, SPIRALS AND WIDENING
DIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 8/21/2009

203.21J

SHEET NO. 5 OF 5

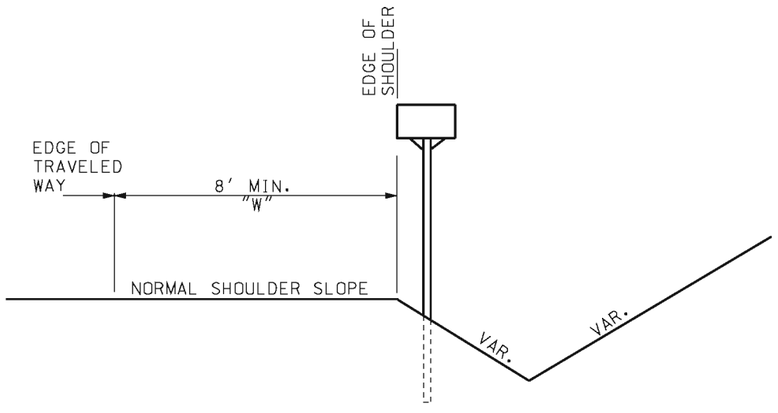



✳ ADD 2′ FOR EACH
ADDITIONAL MAILBOX

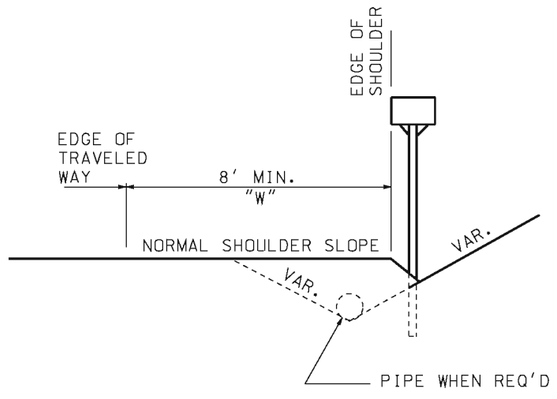
℄ PAVEMENT

℄ PAVEMENT

PLAN




SECTION A-A
(WITHOUT PIPE)




SECTION A-A
(WITH PIPE)

GENERAL NOTES:

IN NO CASE WILL "W" BE LESS THAN SHOULDER WIDTH.
"W" WILL BE 8′ UNLESS OTHERWISE NOTED ON THE PLANS.

WHEN ENTRANCES ARE ADJACENT TO MAILBOX TURNOUTS,
THE AREA AND SURFACING OF THE ENTRANCE MAY BE USED
FOR A PORTION OF THE MAILBOX TURNOUT.

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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
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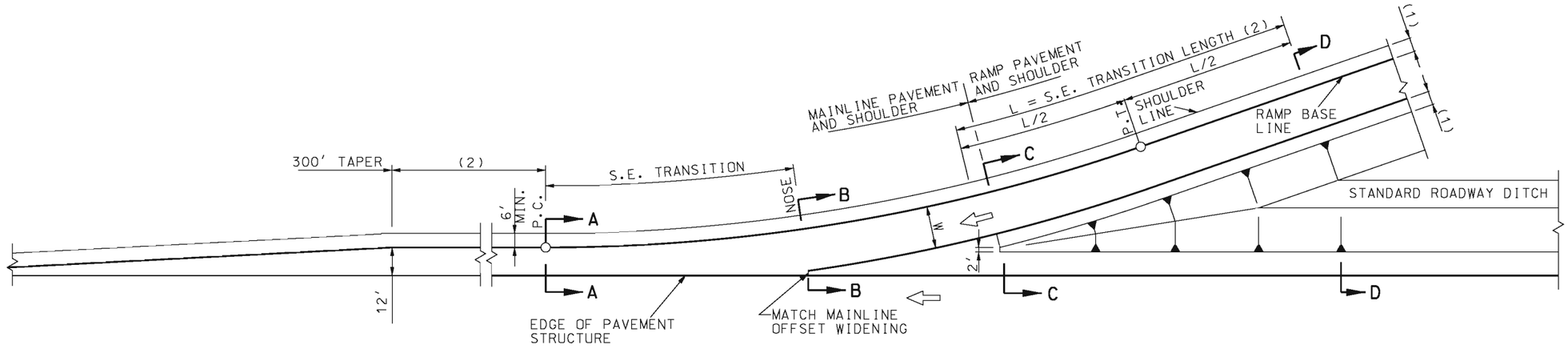
# MAILBOX TURNOUTS

DATE EFFECTIVE: 08/01/1981
DATE PREPARED: 8/21/2009

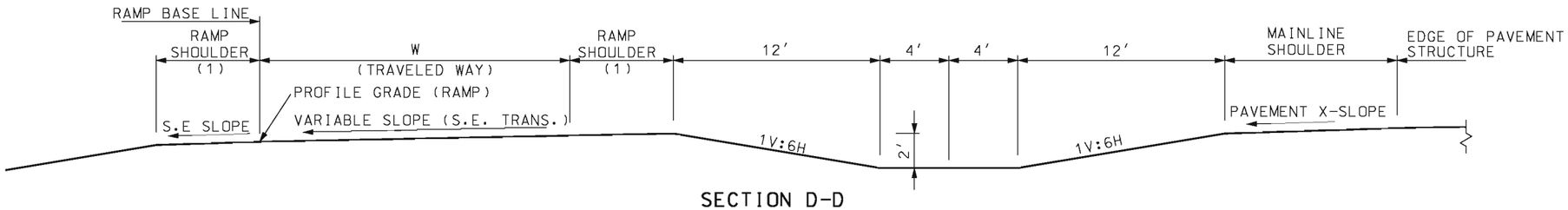
203.35A

SHEET NO.
1 OF 1

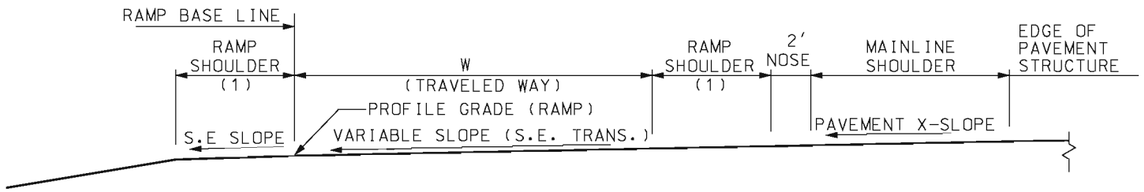
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



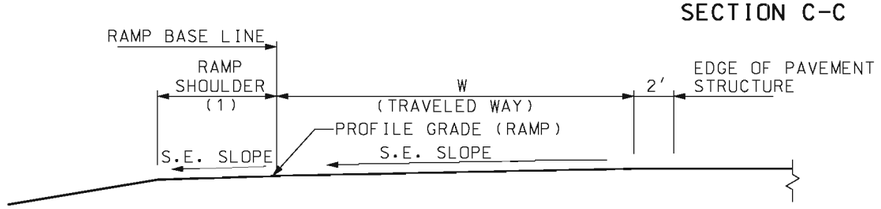

## PLAN VIEW "ON" RAMPS



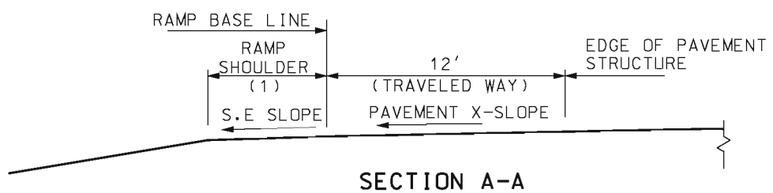

## SECTION D-D




## SECTION C-C




## SECTION B-B




## SECTION A-A

| W | RAMP WIDTH |
|---|---|
| 14' | ONE LANE, ONE WAY OPERATION WITH NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES > 5% |
| 12' | ONE LANE, ONE WAY OPERATION WITH NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES ≤ 5% |

NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

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.

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STATE OF MISSOURI
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# TYPICAL DETAILS ON AND OFF RAMPS

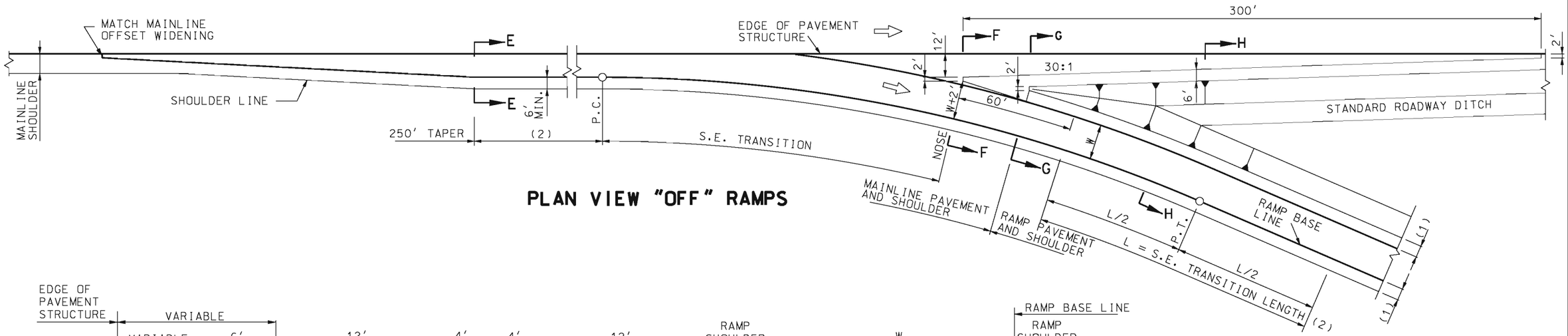
DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES

DATE EFFECTIVE: 10/01/2007
DATE PREPARED: 8/21/2009

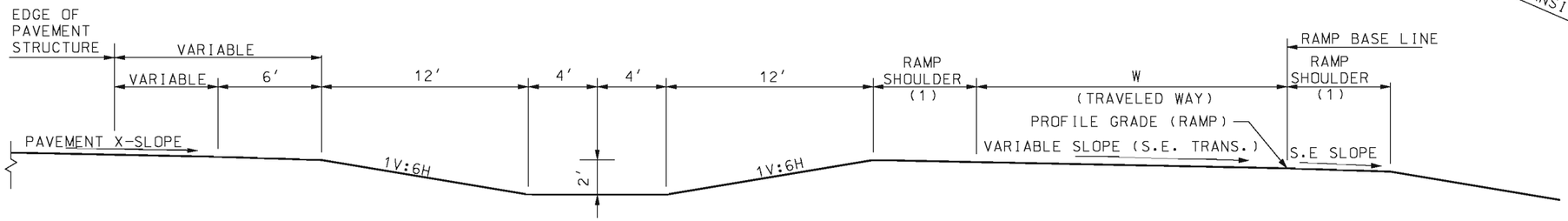
203.40G

SHEET NO. 1 OF 2

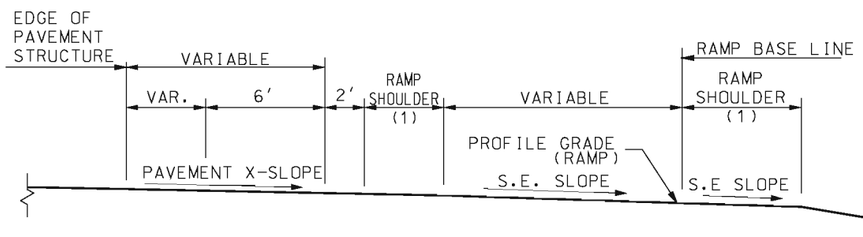
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



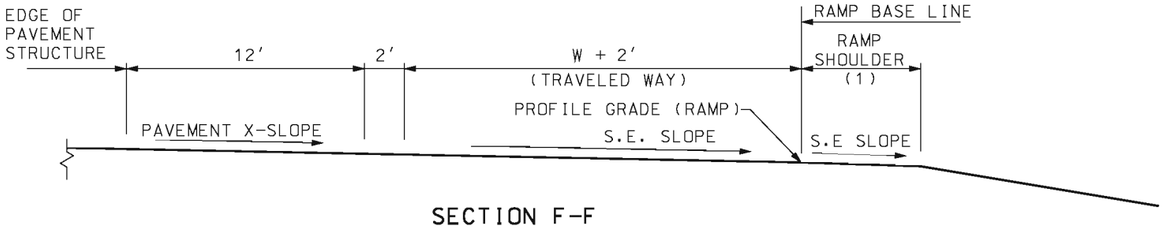

## PLAN VIEW "OFF" RAMPS



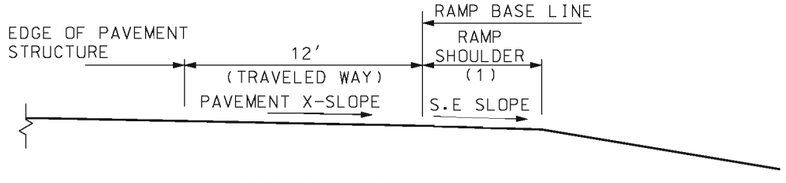

## SECTION H-H




## SECTION G-G




## SECTION F-F




## SECTION E-E

| W | RAMP WIDTH |
|---|---|
| 14' | ONE LANE, ONE WAY OPERATION WITH NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES > 5% |
| 12' | ONE LANE, ONE WAY OPERATION WITH NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES ≤ 5% |

NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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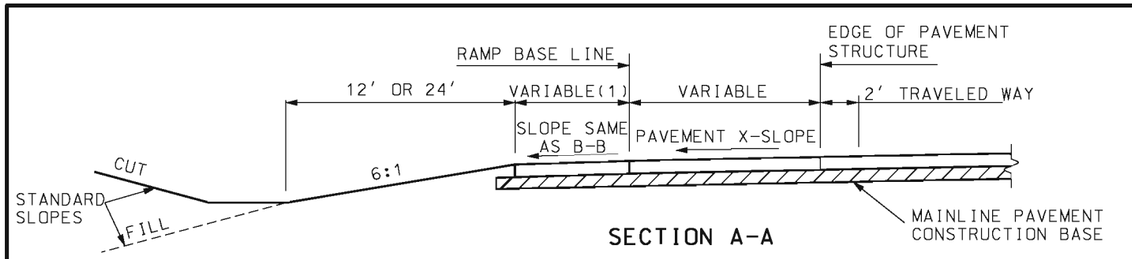
# TYPICAL DETAILS ON AND OFF RAMPS

DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES

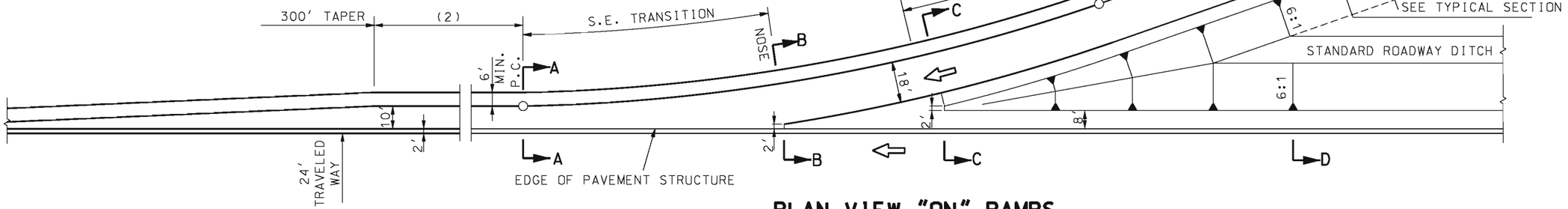
DATE EFFECTIVE: 10/01/2007
DATE PREPARED: 8/21/2009

203.40G

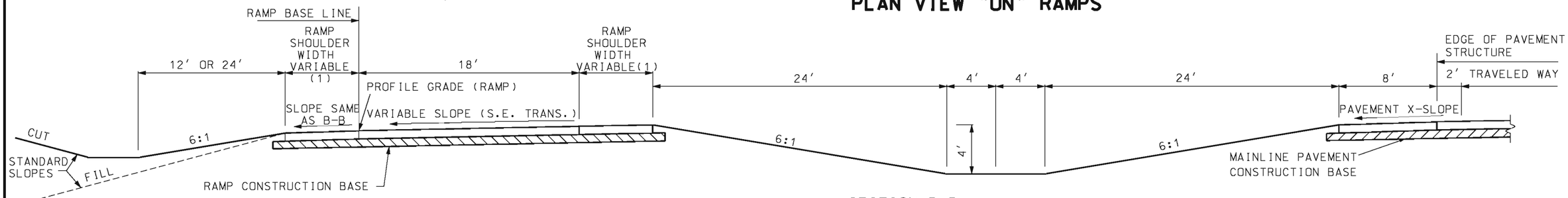
SHEET NO. 2 OF 2



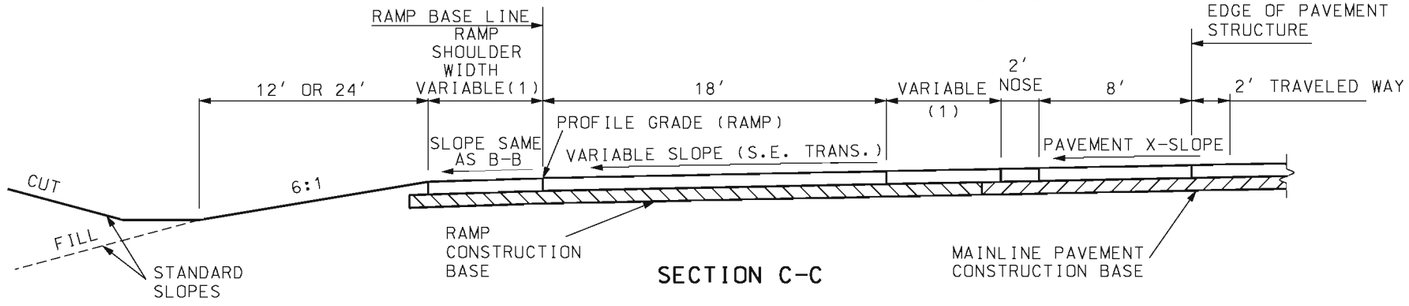

## SECTION A-A



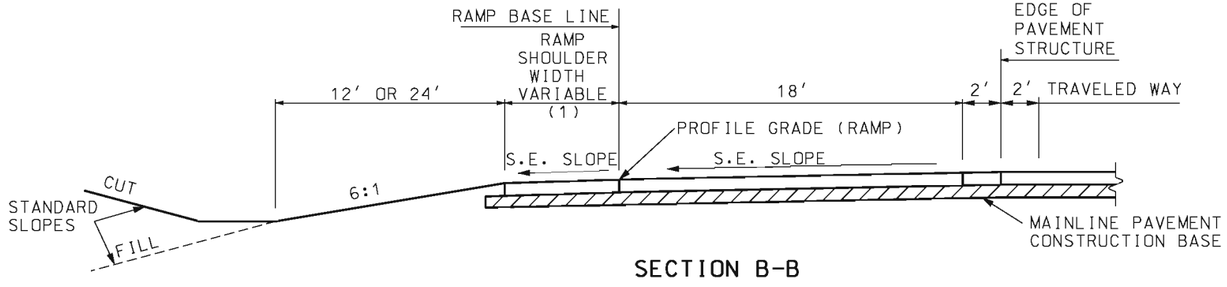

## PLAN VIEW "ON" RAMPS




## SECTION D-D




## SECTION C-C




## SECTION B-B

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.

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STATE OF MISSOURI
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# TYPICAL DETAILS ON AND OFF RAMPS

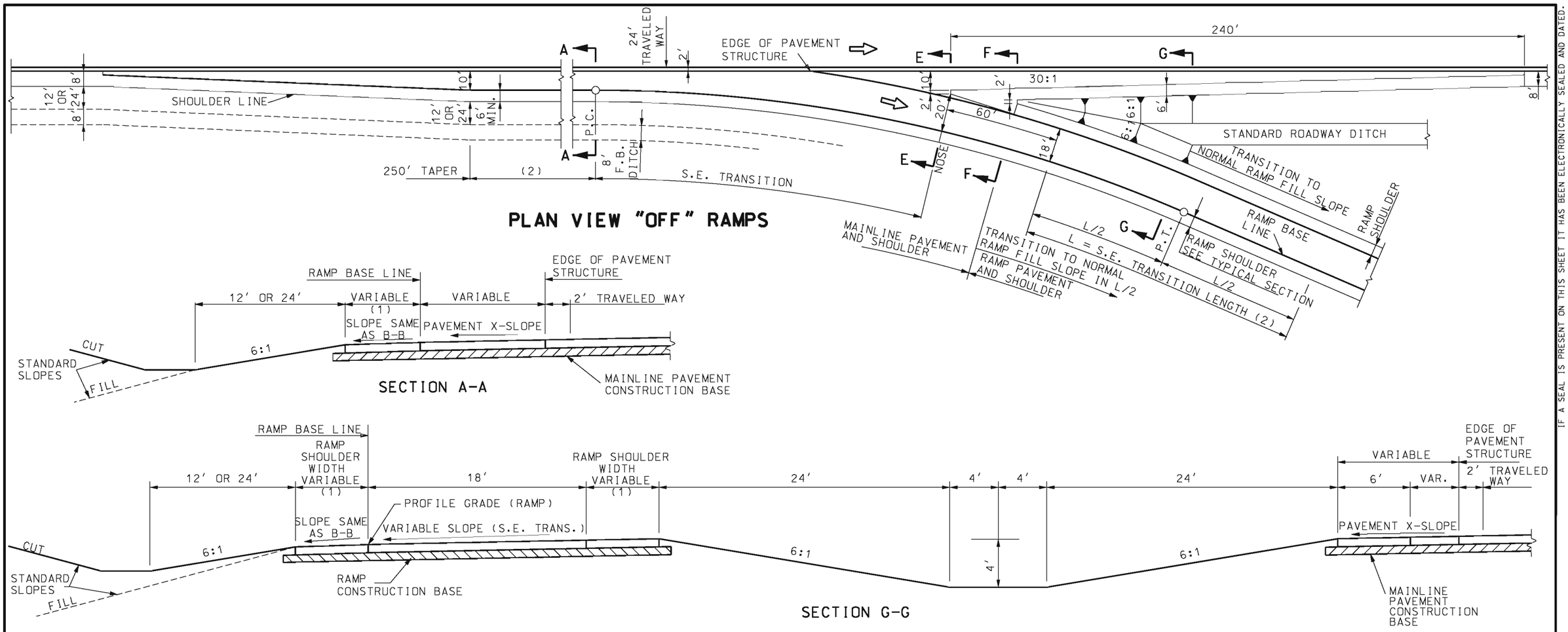
DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES
(ROADWAYS WITH 6:1 FORESLOPES)
28 FOOT PAVEMENT STRUCTURE

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

203.41F

SHEET NO. 1 OF 2

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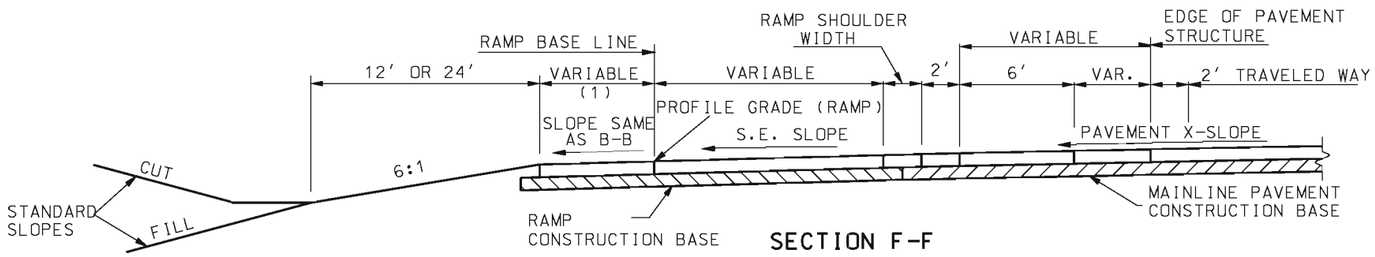

## PLAN VIEW "OFF" RAMPS



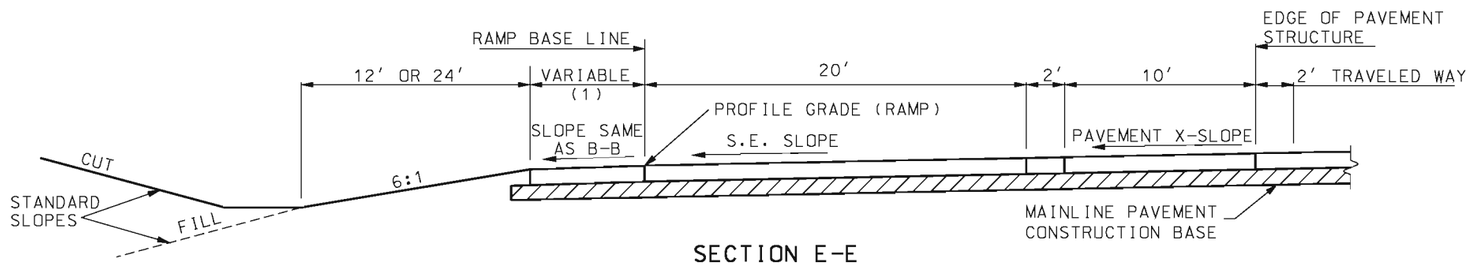

## SECTION A-A




## SECTION G-G




## SECTION F-F




## SECTION E-E

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

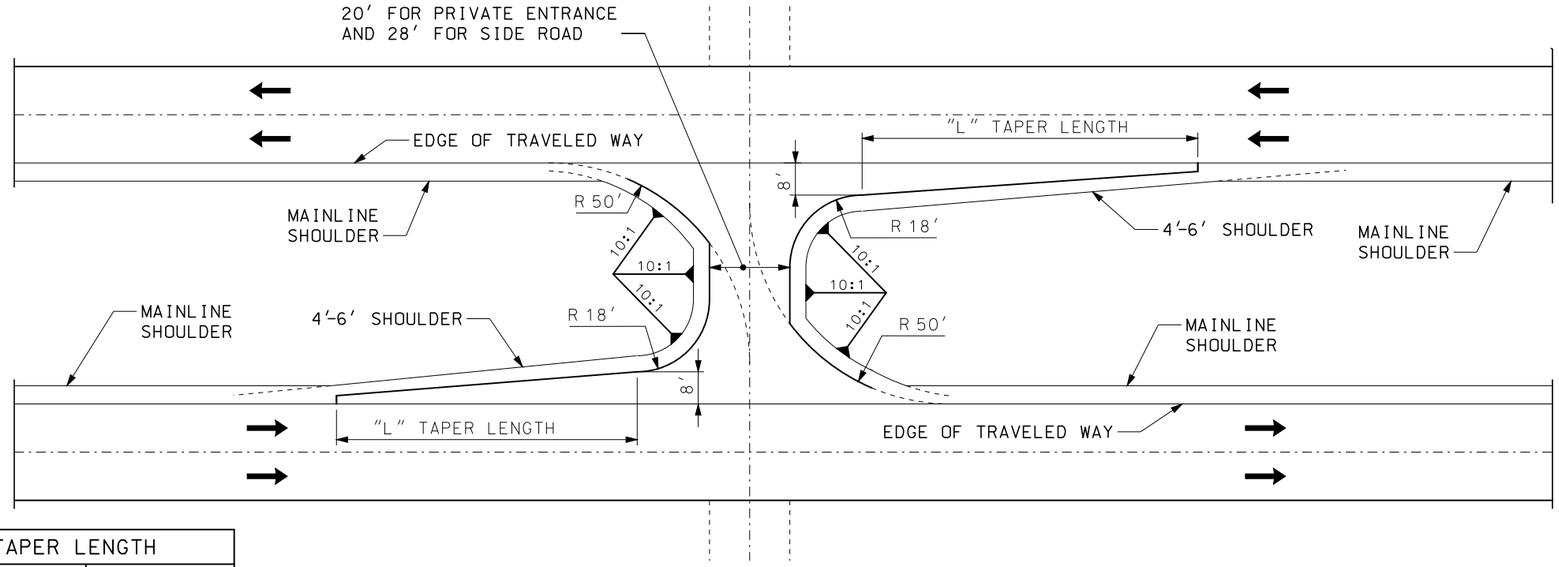
# TYPICAL DETAILS ON AND OFF RAMPS

DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES (ROADWAYS WITH 6:1 FORESLOPES) 28 FOOT PAVEMENT STRUCTURE

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

203.41F

SHEET NO. 2 OF 2




| TAPER LENGTH | |
|---|---|
| DESIGN SPEED | "L" |
| ≤ 40 MPH | 112.5′ |
| > 40 MPH | 225′ |

FOR PRIVATE ENTRANCES, MINOR SIDE ROADS OR FIELD ENTRANCES

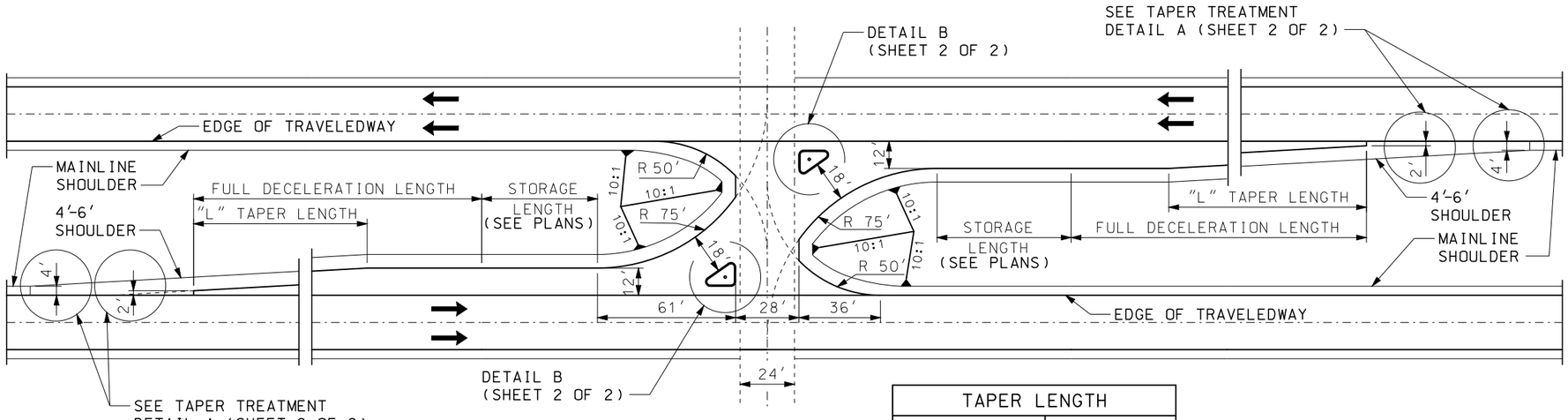
TYPE I MEDIAN OPENING

NOTES FOR TYPE I MEDIAN OPENINGS:

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

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 5.5:1.




| FULL DECELERATION LENGTH | |
|---|---|
| DESIGN SPEED | MINIMUM LENGTH |
| 45 MPH | 385 FT. |
| 50 MPH | 435 FT. |
| 55 MPH | 480 FT. |
| 60 MPH | 530 FT. |
| 65 MPH | 570 FT. |
| 70 MPH | 615 FT. |

| TAPER LENGTH | |
|---|---|
| DESIGN SPEED | "L" |
| ≤ 40 MPH | 125′ |
| > 40 MPH | 250′ |

FOR MAJOR SIDE ROADS, STATE ROUTES AND MAJOR COMMERCIAL ENTRANCES

TYPE II MEDIAN OPENING

NOTES FOR TYPE II MEDIAN OPENINGS:

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

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 5.5:1.

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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
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# TYPICAL MEDIAN OPENING

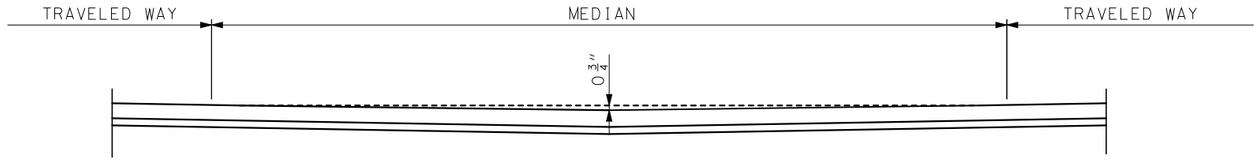
DIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2016
DATE PREPARED: 2/11/2016

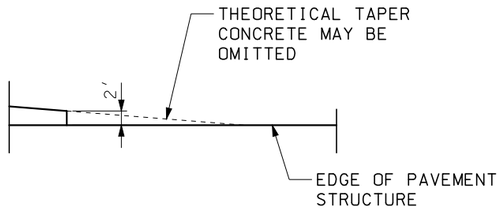
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SHEET NO. 1 OF 2

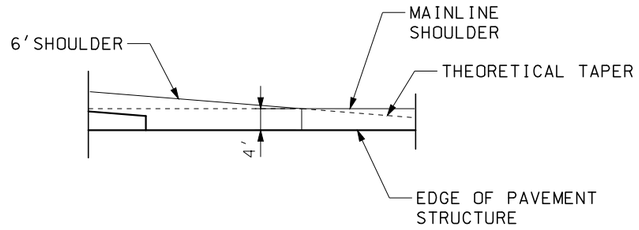
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




SECTION ALONG MEDIAN OPENING ℄

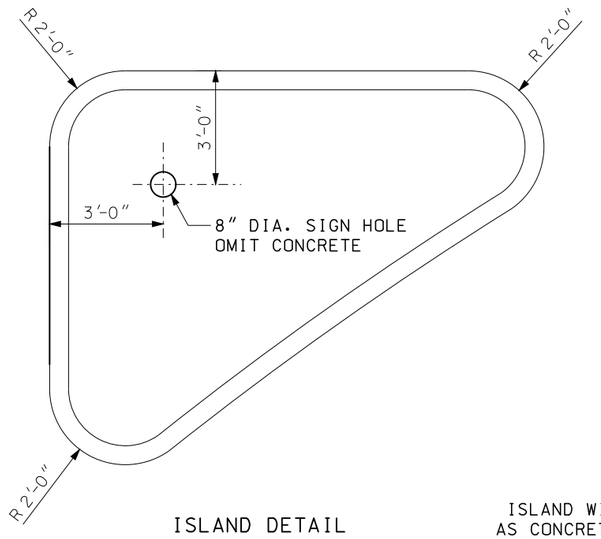



TAPER TREATMENT



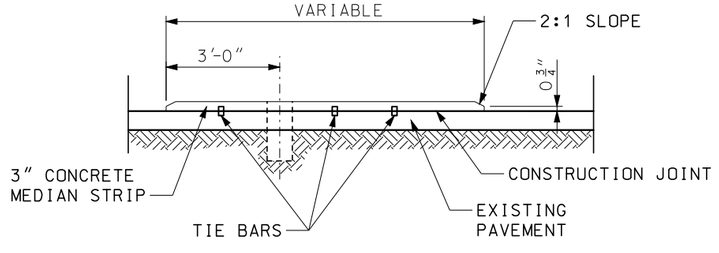

SHOULDER TAPER
TREATMENT

DETAIL A




ISLAND DETAIL

ISLAND WILL BE PAID FOR
AS CONCRETE MEDIAN STRIP.




LOW PROFILE ISLAND DETAIL

DETAIL B

GENERAL NOTES:
FOR DETAILS ON CONCRETE MEDIAN STRIP CONSTRUCTION, SEE STANDARD PLAN 608.30.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
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NUMBER PE-28411
PROFESSIONAL ENGINEER
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# TYPICAL MEDIAN OPENING

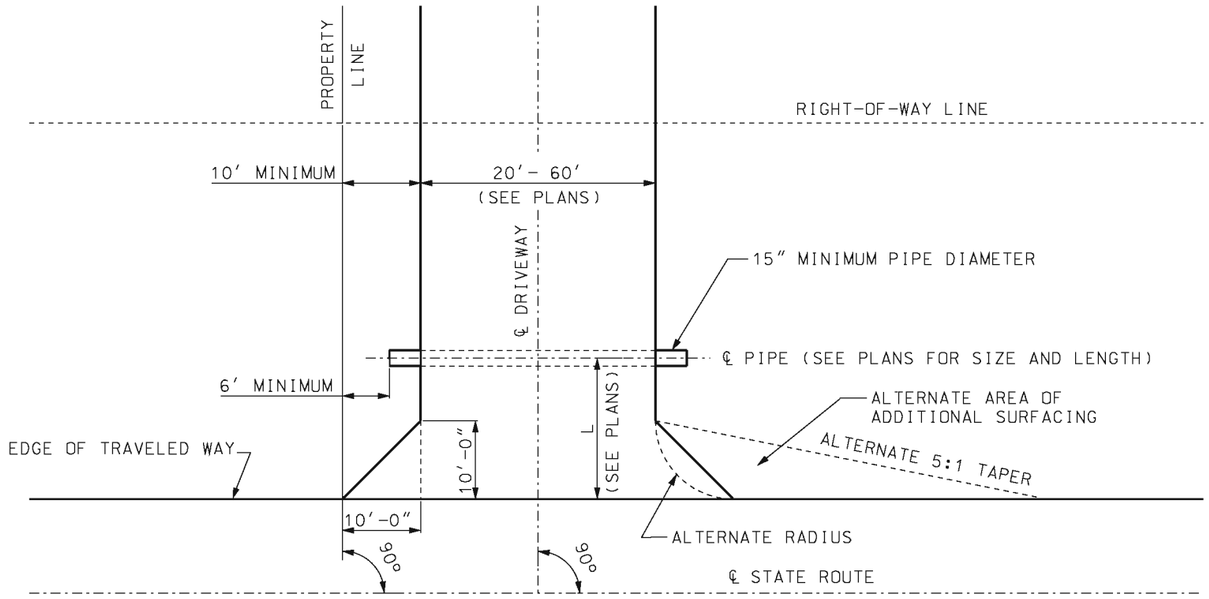
DIVIDED HIGHWAYS

DATE EFFECTIVE: 04/01/2016
DATE PREPARED: 2/11/2016

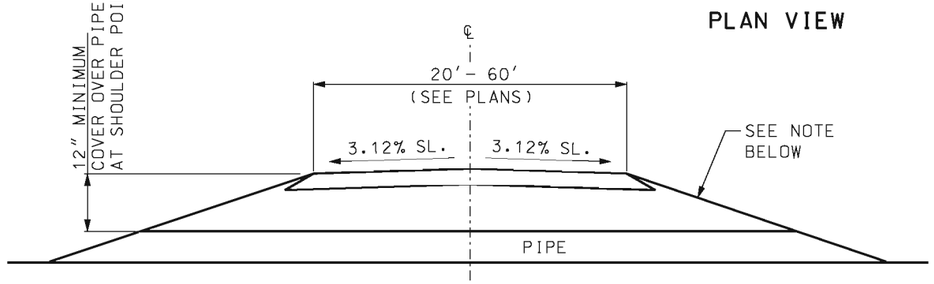
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SHEET NO. 2 OF 2

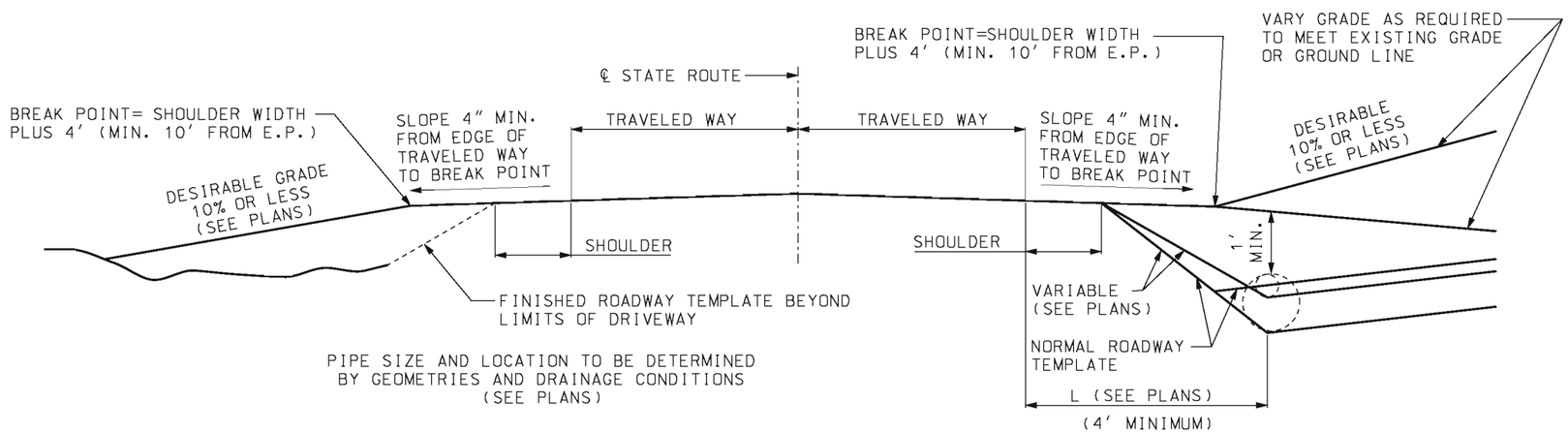
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




**PLAN VIEW**




**DRIVEWAY TYPICAL SECTION**




IN FILLS

IN CUTS

**PROFILE VIEW**

DRIVEWAY SIDE SLOPES: ✳

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

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

NOTE: RECOMMENDED WIDTH OF DRIVEWAY – 20′

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

GENERAL NOTES:

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

SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.

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

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


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# DRIVEWAY

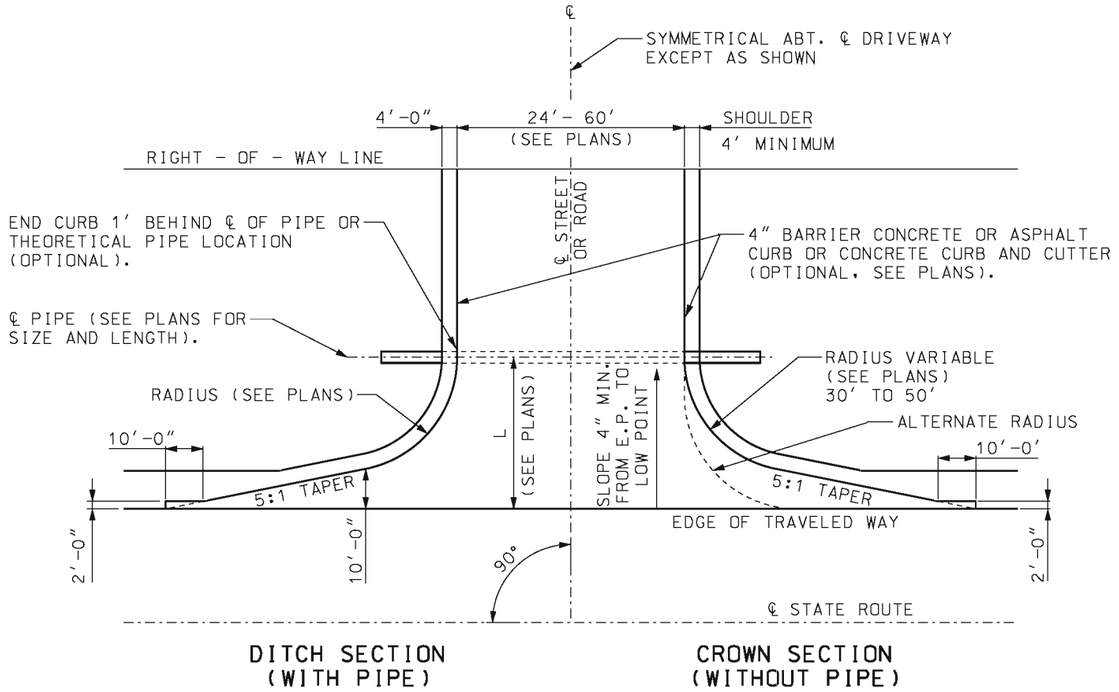
TYPE I

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

203.61A

SHEET NO. 1 OF 1

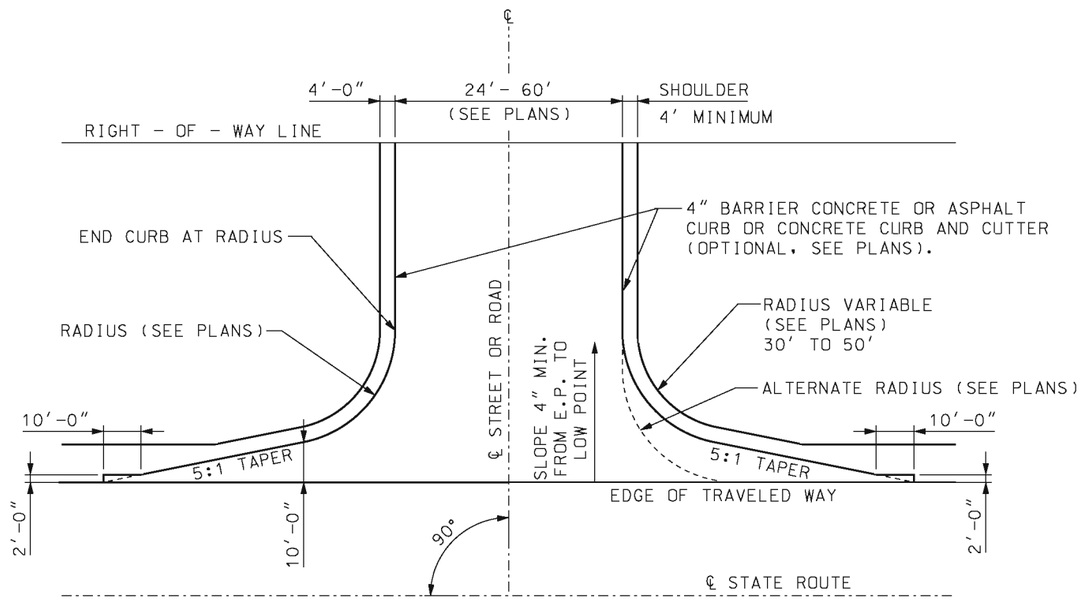
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




DITCH SECTION
(WITH PIPE)

CROWN SECTION
(WITHOUT PIPE)

## PLAN VIEW




FILL SECTION OR CROWN SECTION
(WITHOUT PIPE)

## PLAN VIEW

GENERAL NOTES:

RECOMMENDED WIDTH OF ROADWAY - 24′ WITHOUT PARKING ON ROAD AND 32′ WITH PARKING ON ROAD.

SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.

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

IF A PAVED APPROACH IS REQUIRED, REFER TO STANDARD PLANS 608.00 FOR CONSTRUCTION DETAILS AND CONSTRUCT CURB (IF REQUIRED) TO MEET CURB ON PAVED APPROACH, TRANSITION REQUIRED FROM 4″ CURB TO 6″ CURB.

CURB OR CURB AND GUTTER BETWEEN RIGHT-OF-WAY LINE AND PIPE MAY MEET LOCAL AGENCY STANDARDS.

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

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

A MINIMUM 100-FOOT SIGHT DISTANCE TRIANGLE, MEASURED ALONG THE CENTERLINE OF THE INTERSECTING ROADWAYS, SHOULD BE PROVIDED.

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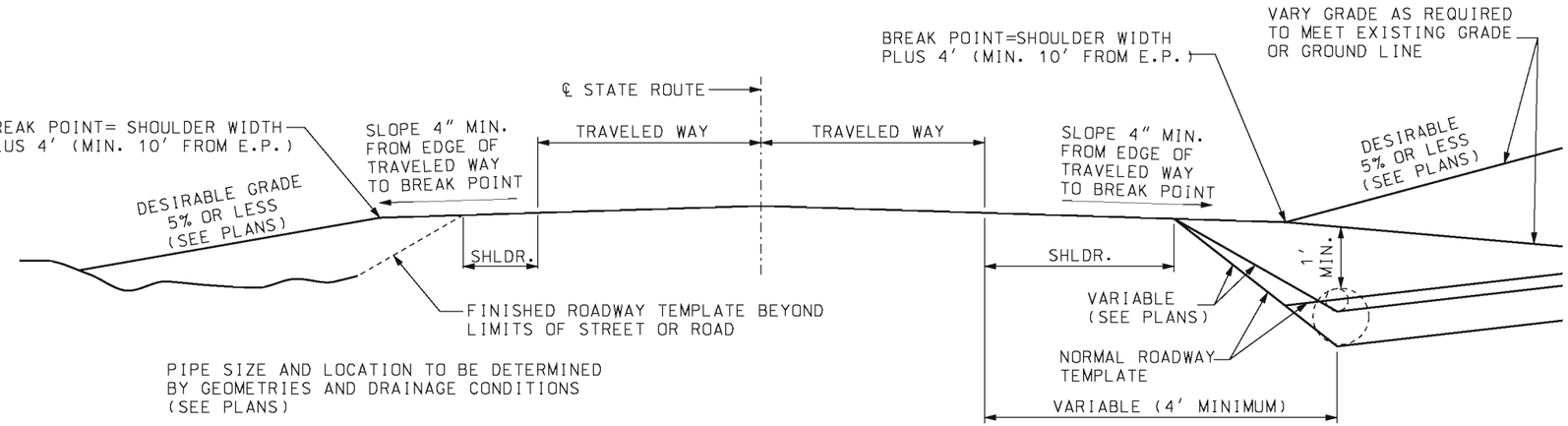
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# DRIVEWAY
TYPE II

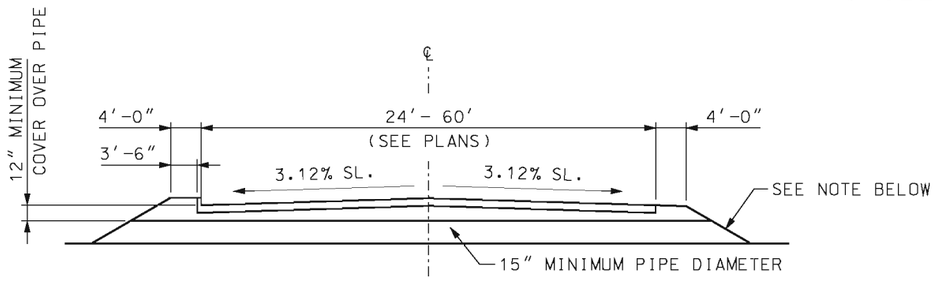
DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

203.62C

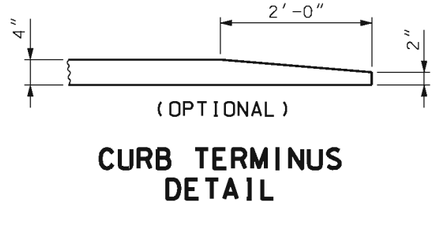
SHEET NO.
1 OF 2



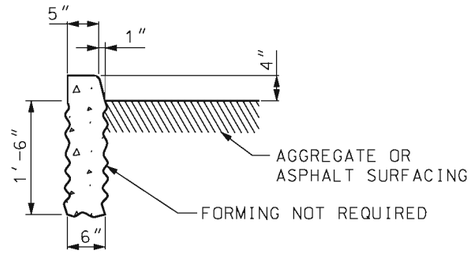

## PROFILE



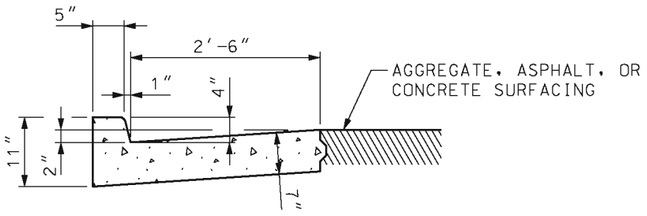

## DRIVEWAY TYPICAL SECTION




## CURB TERMINUS DETAIL




## SECTION THRU 4" BARRIER CURB



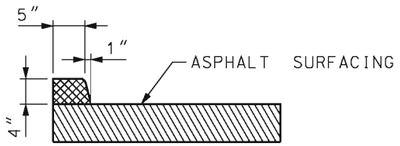

## SECTION THRU CONCRETE CURB AND GUTTER

DRIVEWAY SIDE SLOPES: ✳

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

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

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




## SECTION THRU 4" ASPHALT CURB

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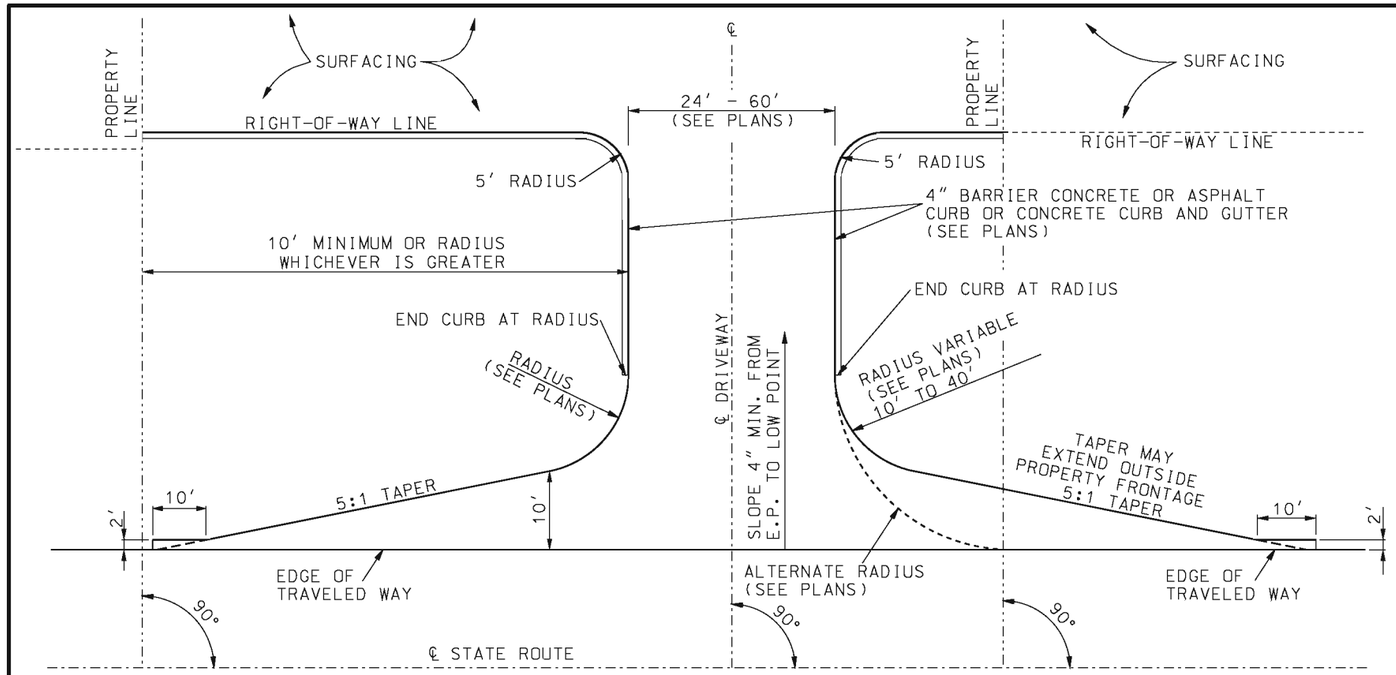
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
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PROFESSIONAL ENGINEER
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# DRIVEWAY
TYPE II

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

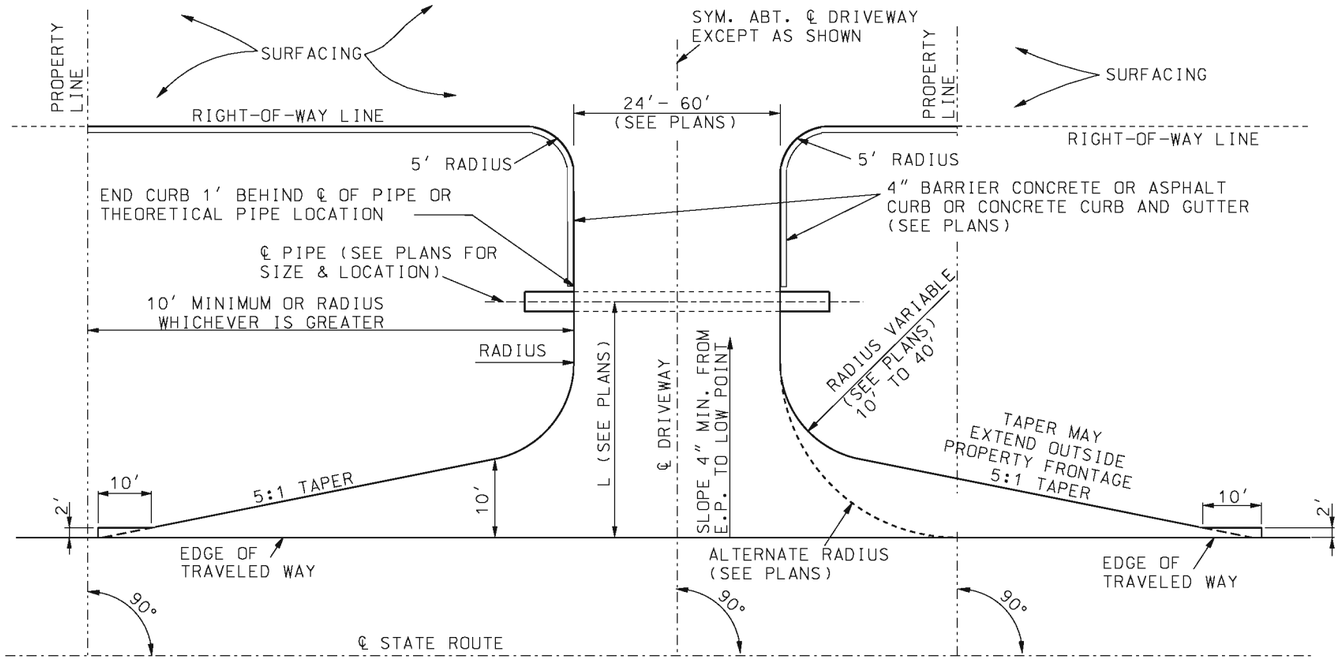
203.62C

SHEET NO. 2 OF 2




FILL SECTION OR CROWN SECTION
(WITHOUT PIPE)

**PLAN VIEW**




DITCH SECTION
(WITH PIPE)

**PLAN VIEW**

GENERAL NOTES:

FOR LIGHT DUTY PAVEMENT (<3500 ADT) DRIVEWAY BEGINS AT EDGE OF PAVEMENT.

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

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

SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.

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

IF A PAVED APPROACH IS REQUIRED, REFER TO STANDARD PLAN 608.00 FOR CONSTRUCTION DETAILS AND CONSTRUCT CURB (IF REQUIRED) TO MEET CURB ON PAVED APPROACH. TRANSITION REQUIRED FROM 4″ CURB TO 6″ CURB.

CURB OR CURB AND GUTTER BETWEEN RIGHT-OF-WAY LINE AND PIPE MAY MEET LOCAL AGENCY STANDARDS.

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

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

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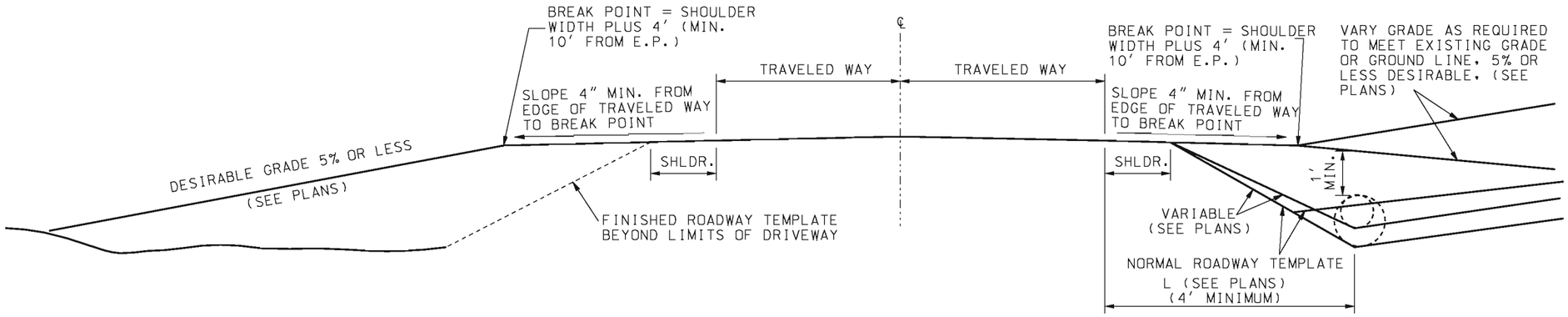
# DRIVEWAY
TYPE III

DATE EFFECTIVE: 01/01/1992
DATE PREPARED: 8/21/2009

203.63A

SHEET NO.
1 OF 2

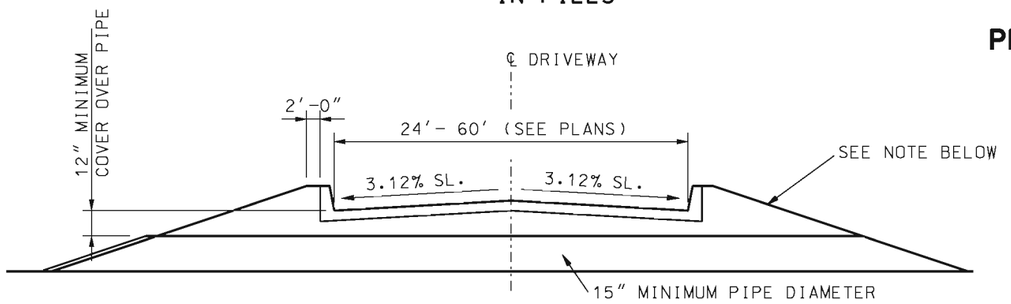
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




IN FILLS

## PROFILE VIEW

IN CUTS

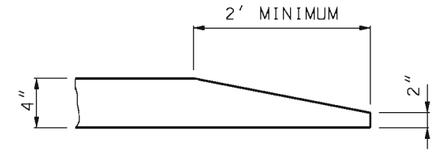



## DRIVEWAY TYPICAL SECTION

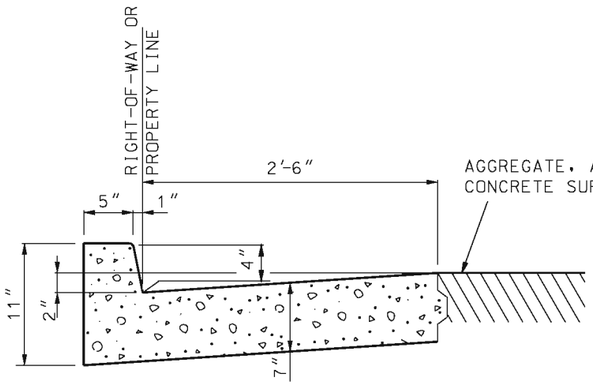
DRIVEWAY SIDE SLOPES: ✳

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

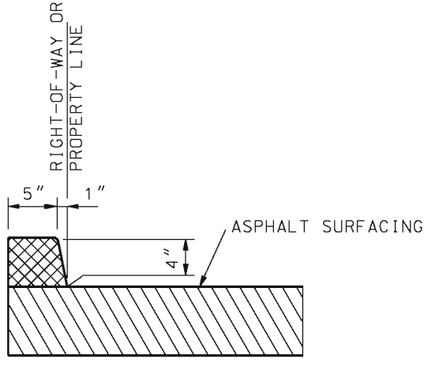
✳ IN ORDER TO MINIMIZE THE USE OF 6:1 SLOPED END PIPE SECTIONS ON NEW CONSTRUCTION AND WHERE POSSIBLE ON EXISTING ROUTES, THE LOCATION OF THE DRAINAGE PIPE SHOULD BE BEYOND THE CLEAR ZONE DISTANCE AS SHOWN IN TABLE 3.1 OF THE 1988 EDITION OF "ROADSIDE DESIGN GUIDE".



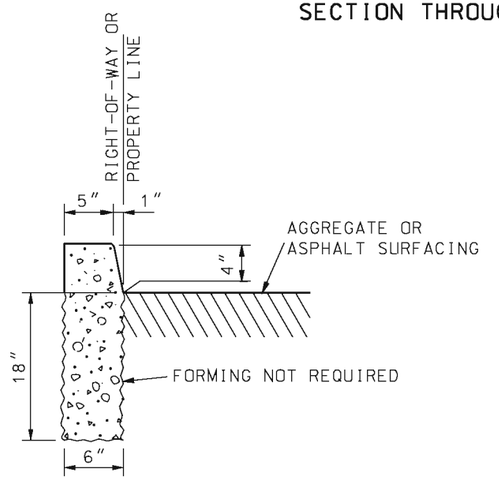

## CURB TEMINUS DETAIL




## SECTION THROUGHCONCRETE CURB AND GUTTER




## SECTION THRU 4" ASPHALT CURB




## SECTION THROUGH 4" BARRIER CURB

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JEFFERSON CITY, MO 65102
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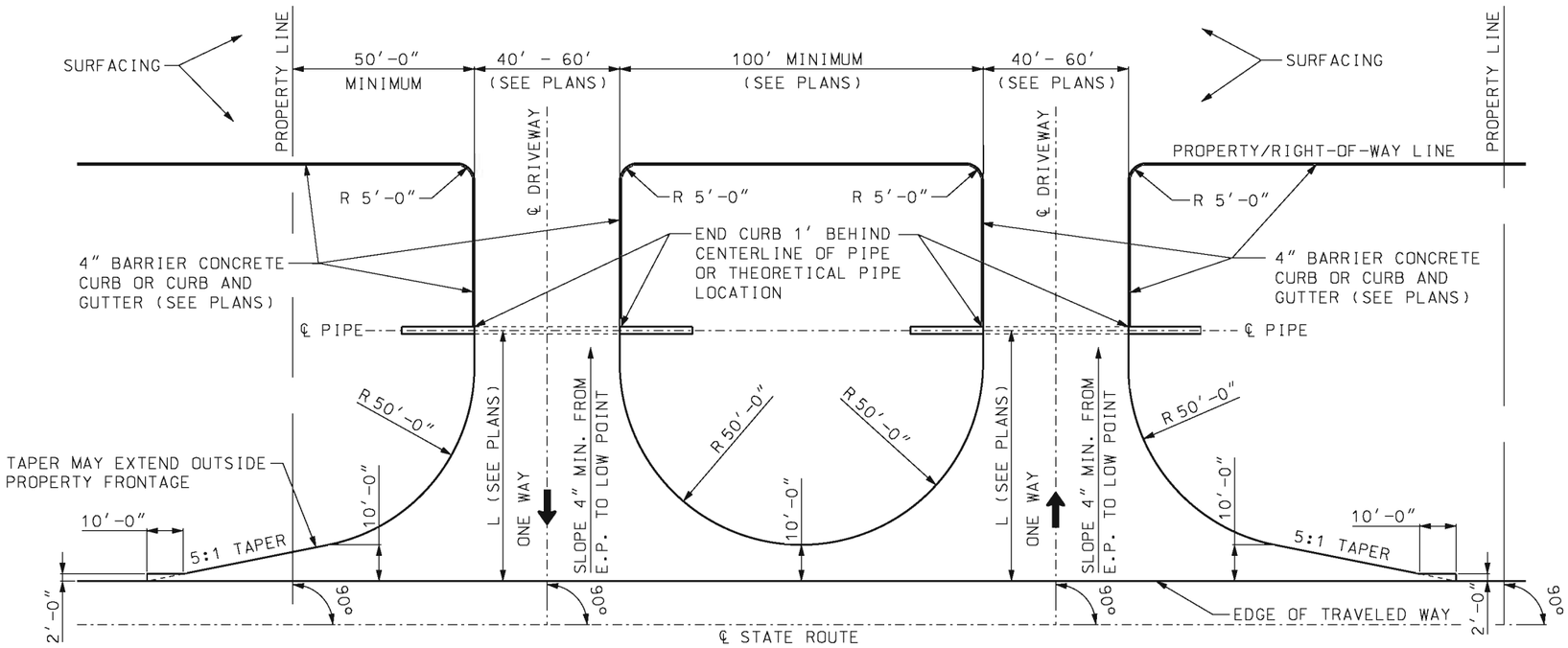
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# DRIVEWAY
TYPE III

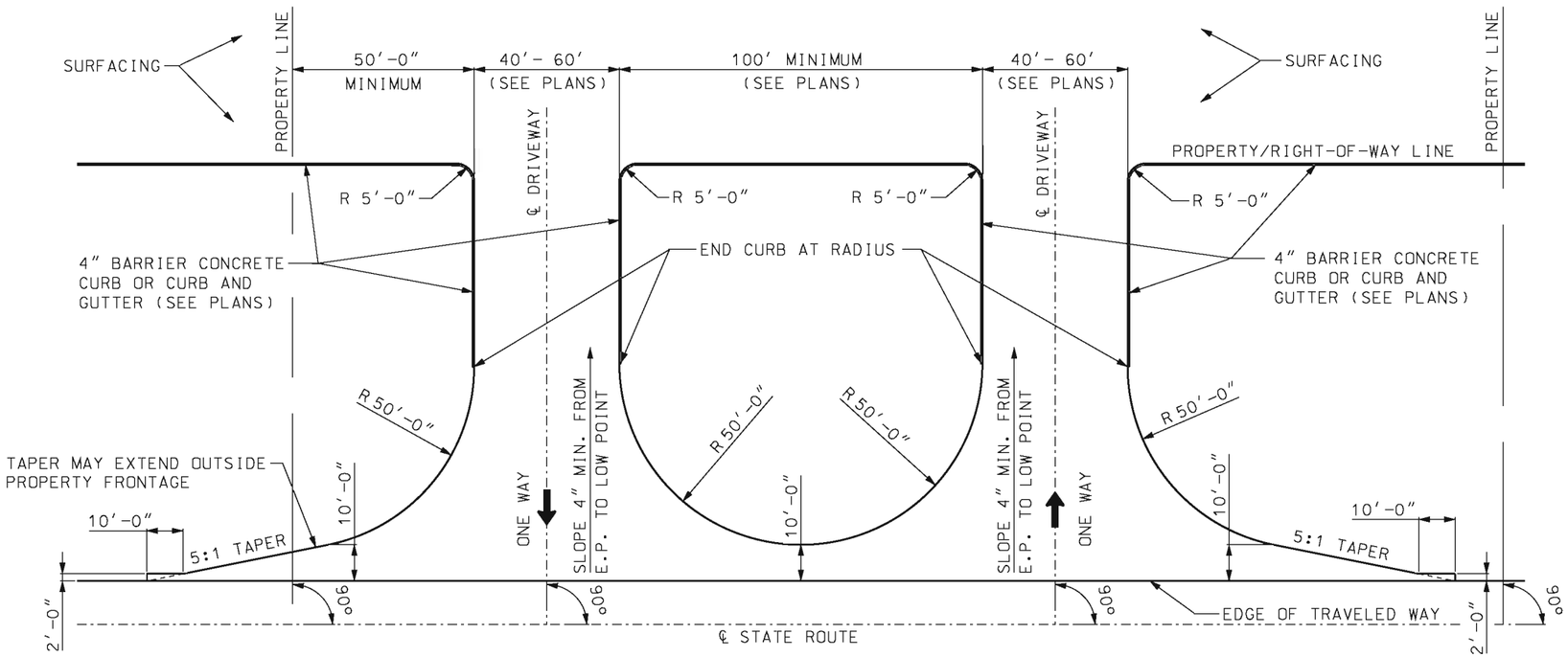
DATE EFFECTIVE: 01/01/1992
DATE PREPARED: 8/21/2009

203.63A

SHEET NO.
2 OF 2




DITCH SECTION (WITH PIPE)
PLAN VIEW




FILL SECTION OR CROWN SECTION
(WITHOUT PIPE)
PLAN VIEW

GENERAL NOTES:

RECOMMENDED WIDTH OF ROADWAY - 40'.

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

SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.

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

IF A PAVED APPROACH IS REQUIRED, REFER TO STANDARD PLAN 608.00 FOR CONSTRUCTION DETAILS AND CONSTRUCT CURB (IF REQUIRED) TO MEET CURB ON PAVED APPROACH. TRANSITION REQUIRED FROM 4" CURB TO 6" CURB.

CURB OR CURB AND GUTTER BETWEEN RIGHT-OF-WAY LINE AND PIPE MAY MEET LOCAL AGENCY STANDARDS.

THE DRIVEWAY WIDTH SHALL BE DETERMINED AT THE TANGENT POINT OF THE RADIUS AND SIDE OF DRIVEWAY.

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

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

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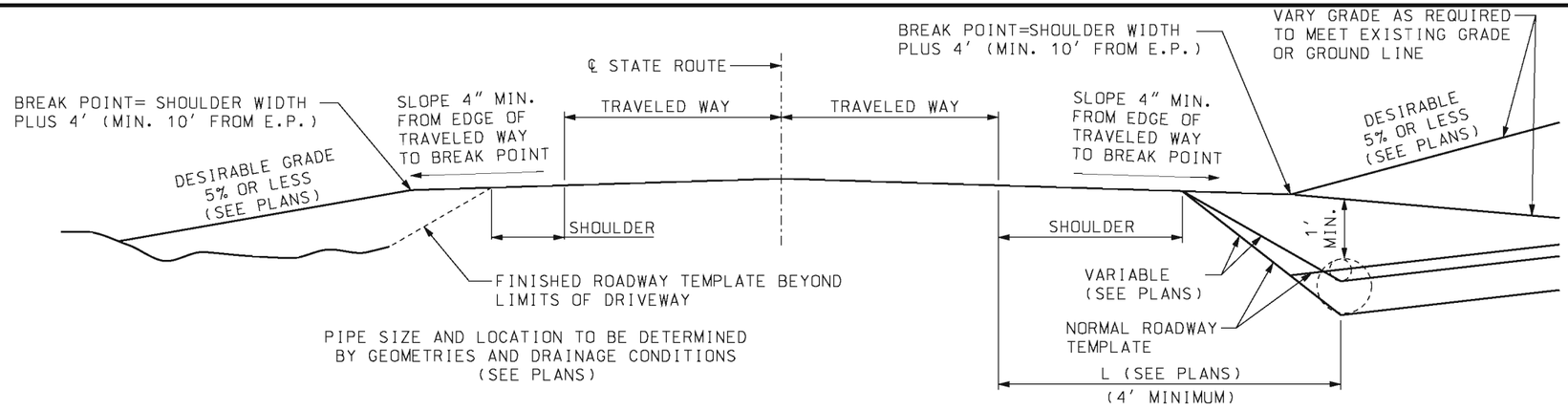
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KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# DRIVEWAY
## TYPE IV

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

203.64C

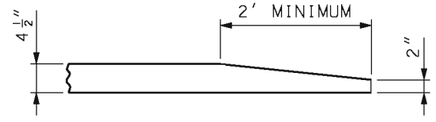
SHEET NO. 1 OF 2



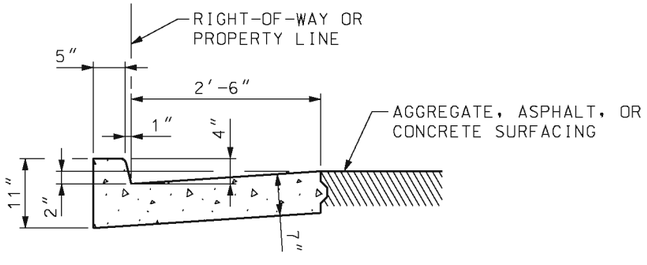

## PROFILE



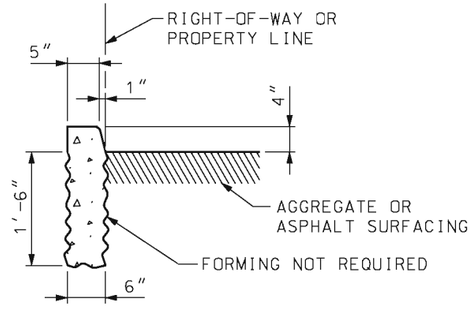

## DRIVEWAY TYPICAL SECTION




CURB TERMINUS DETAIL




SECTION THRU CONCRETE CURB AND GUTTER




SECTION THRU 4" BARRIER CURB

DRIVEWAY SIDE SLOPES: ✳

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

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

✳ IN ORDER TO MINIMIZE THE USE OF 6:1 SLOPE AND PIPE SECTIONS ON NEW CONSTRUCTION OF DRAINAGE PIPE SHOULD BE BEYOND THE CLEAR ZONE DISTANCE AS SHOWN IN TABLE 3.1 OF THE 1988 EDITION OF "ROADSIDE DESIGN GUIDE".

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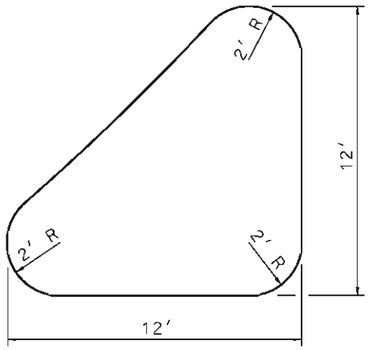
# DRIVEWAY
TYPE IV

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

203.64C

SHEET NO. 2 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

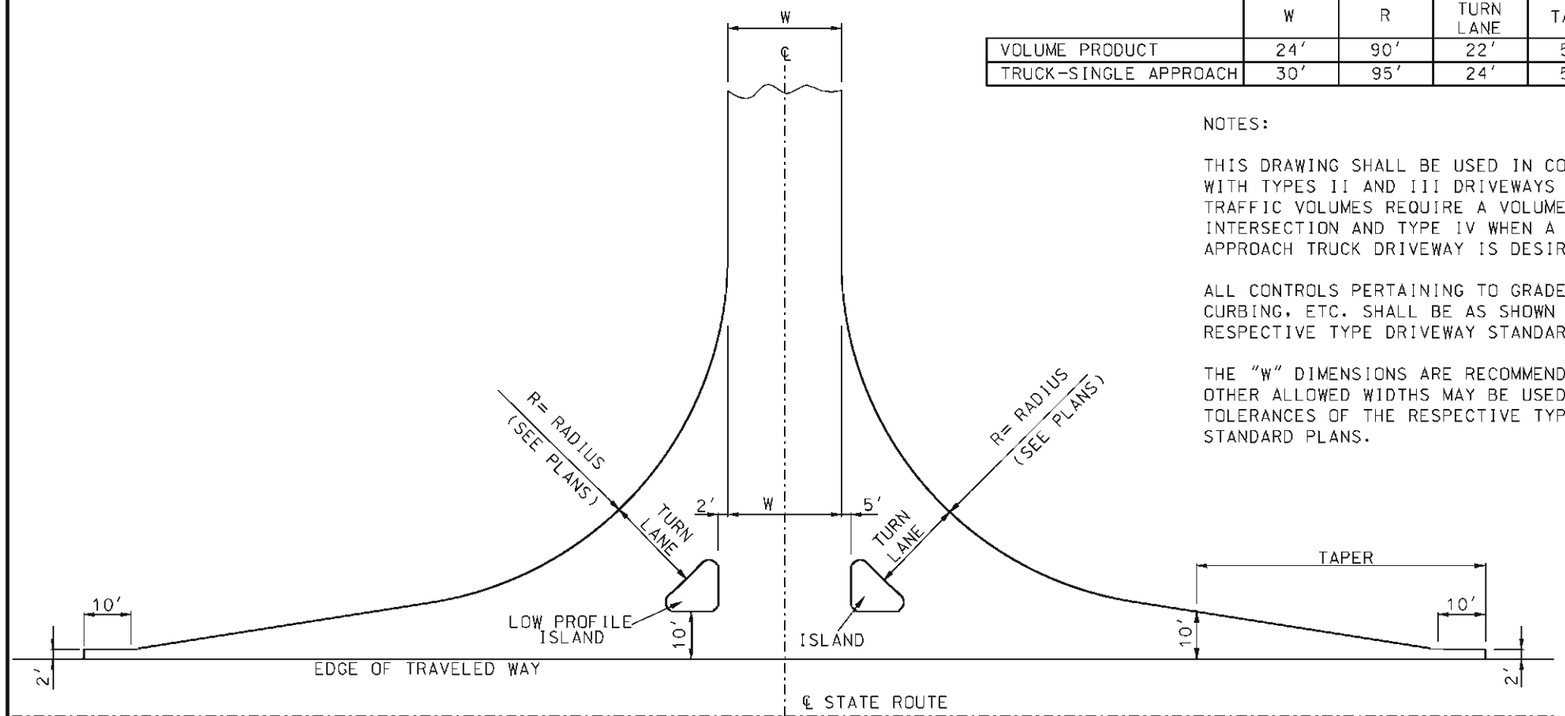



NOTE:

SEE STANDARD PLAN 203.50 FOR DETAILS OF LOW PROFILE ISLAND.

WHERE MINIMUM ISLAND CANNOT BE OBTAINED, OMIT ISLAND.

## MINIMUM ISLAND DETAILS




PLAN VIEW

| | W | R | MIN. TURN LANE | TAPER |
|---|---|---|---|---|
| VOLUME PRODUCT | 24' | 90' | 22' | 5:1 |
| TRUCK-SINGLE APPROACH | 30' | 95' | 24' | 5:1 |

NOTES:

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

ALL CONTROLS PERTAINING TO GRADES, DRAINAGE, CURBING, ETC. SHALL BE AS SHOWN ON OTHER RESPECTIVE TYPE DRIVEWAY STANDARD PLANS.

THE "W" DIMENSIONS ARE RECOMMENDED WIDTH. OTHER ALLOWED WIDTHS MAY BE USED WITHIN TOLERANCES OF THE RESPECTIVE TYPE DRIVEWAY STANDARD PLANS.

GENERAL NOTES:

DETAILS SHOWN ON THIS SHEET ARE FOR RIGHT ANGLE APPROACHES.

TAPER LENGTHS ARE NOT APPLICABLE WHEN DECELERATION LANES ARE PROVIDED.

SIGNALIZED INTERSECTIONS AND INTERSECTIONS IN DEVELOPED AREAS MAY BE MODIFIED TO MEET EXISTING CONDITIONS.

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

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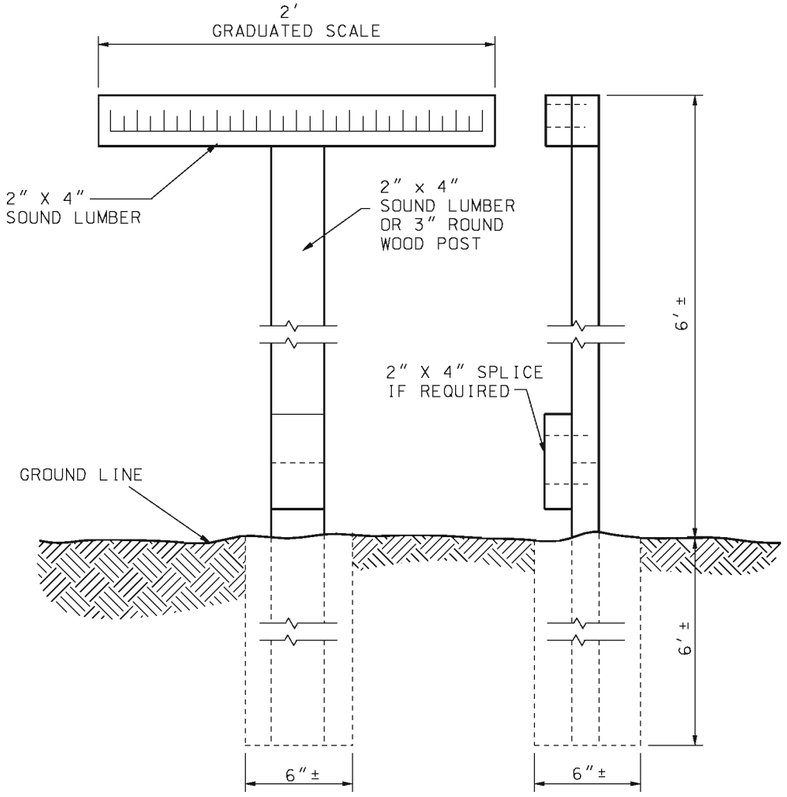
# DRIVEWAY
TYPE V

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

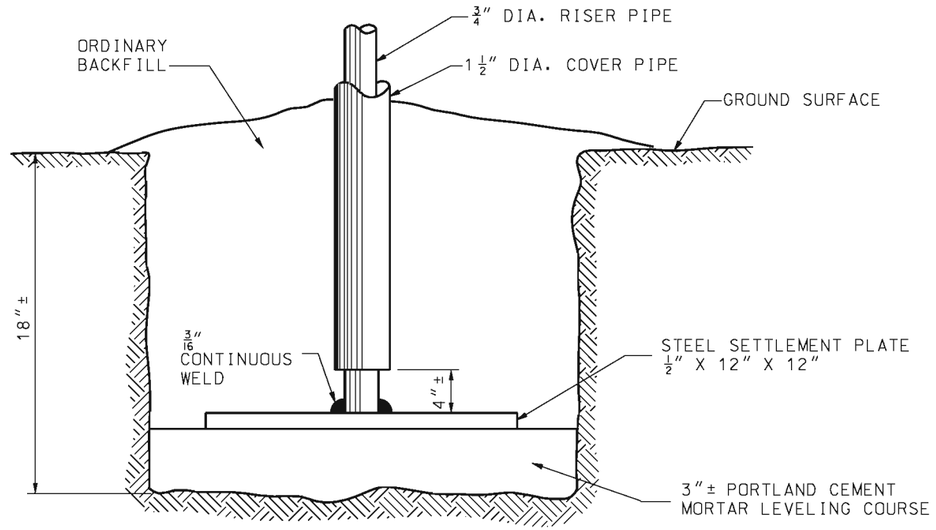
203.65A

SHEET NO. 1 OF 1

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EMBANKMENT CONTROL STAKE




SETTLEMENT GAUGE

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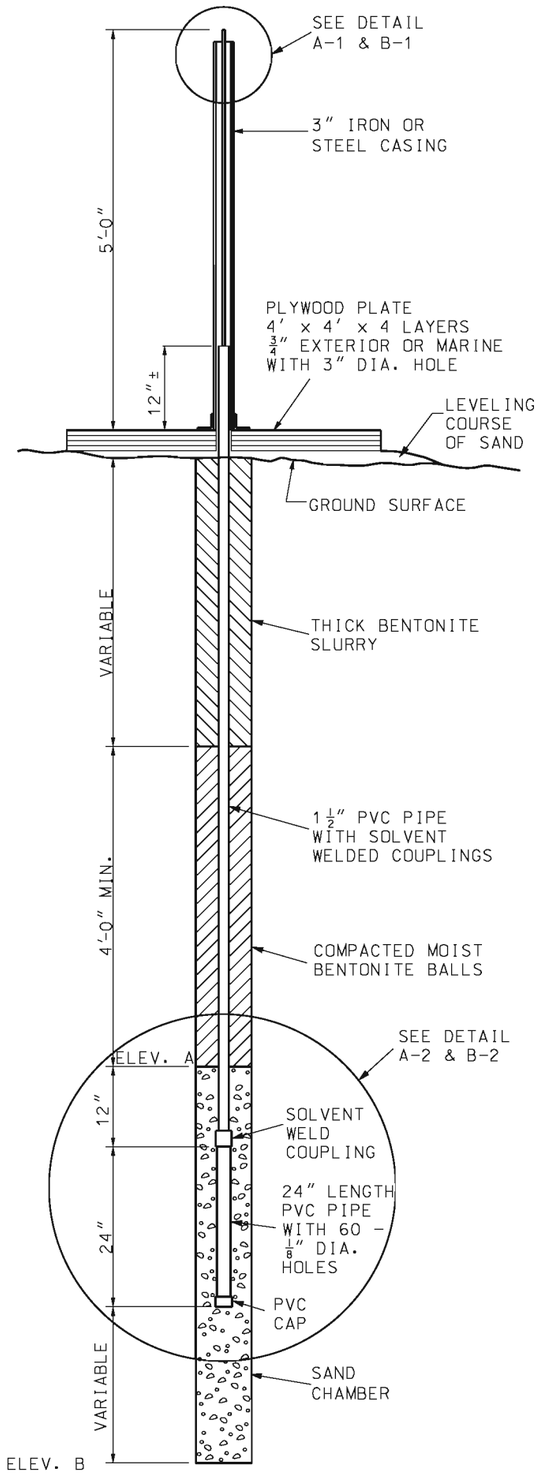
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# EMBANKMENT CONTROL
MEASURING DEVICES

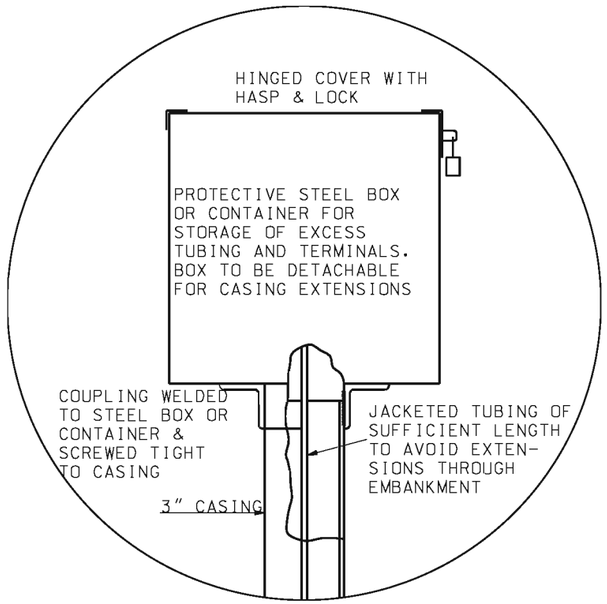
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DATE PREPARED: 8/21/2009

204.00D

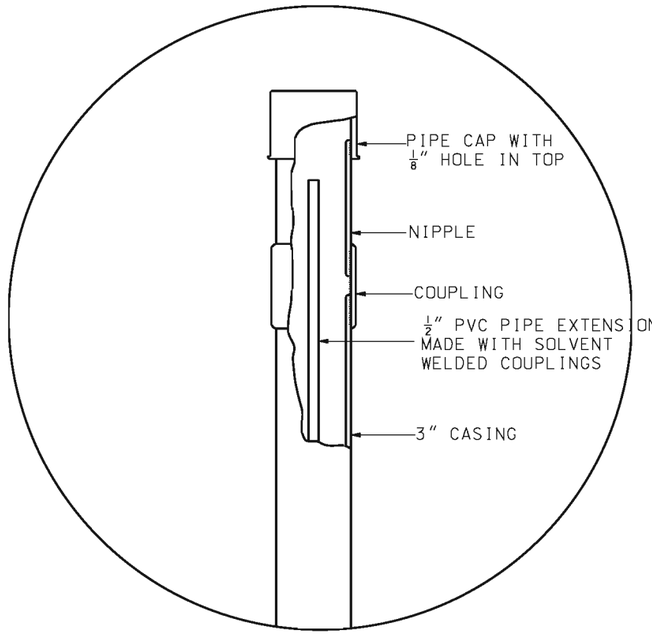
SHEET NO.
1 OF 1



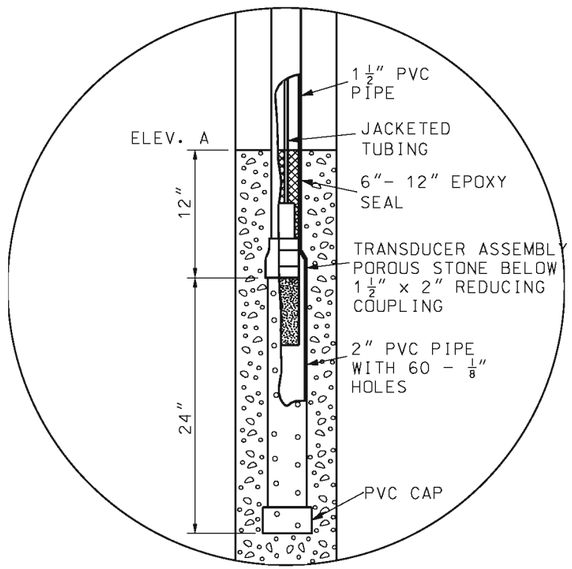

GENERAL



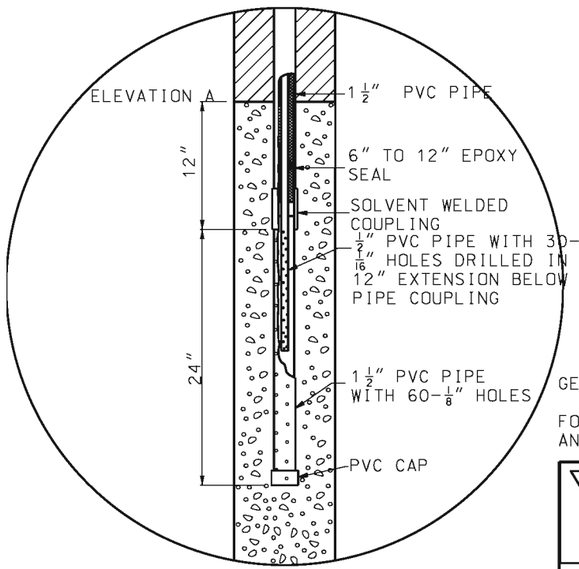

DETAIL A-1




DETAIL B-1




DETAIL A-2
TYPE A




DETAIL B-2
TYPE B

GENERAL NOTES:

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

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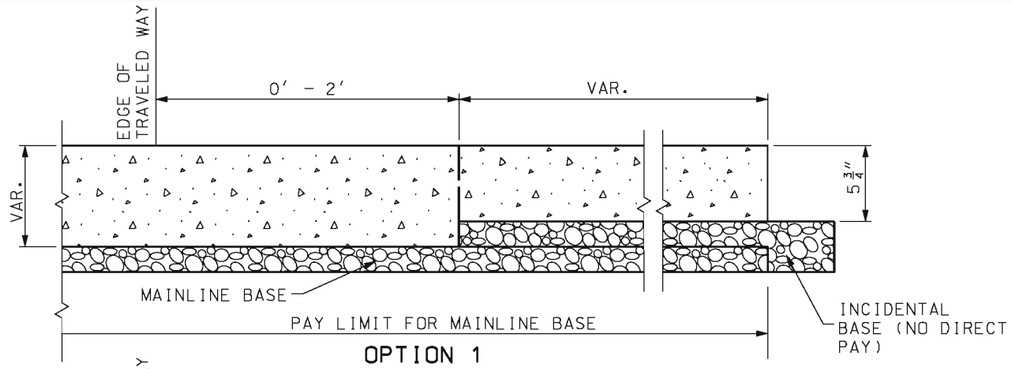

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# PORE PRESSURE MEASUREMENT DEVICES

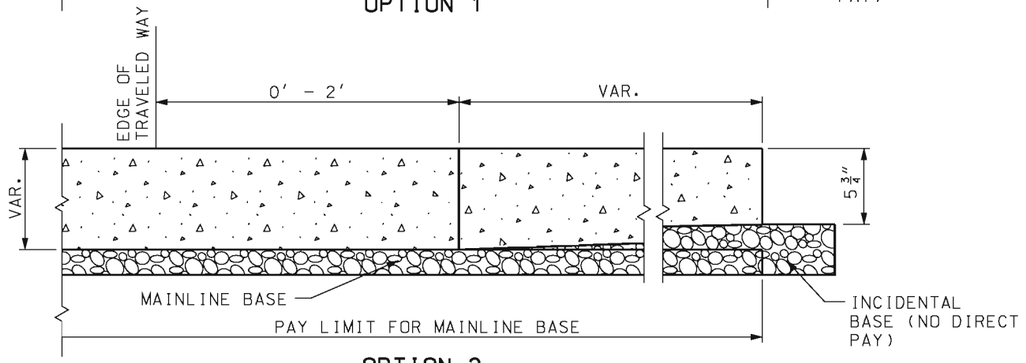
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DATE PREPARED: 8/21/2009

204.30

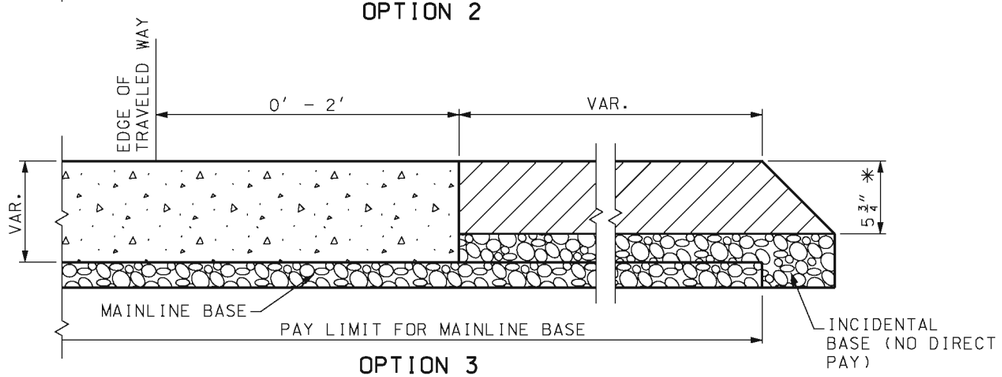
SHEET NO. 1 OF 1




OPTION 1

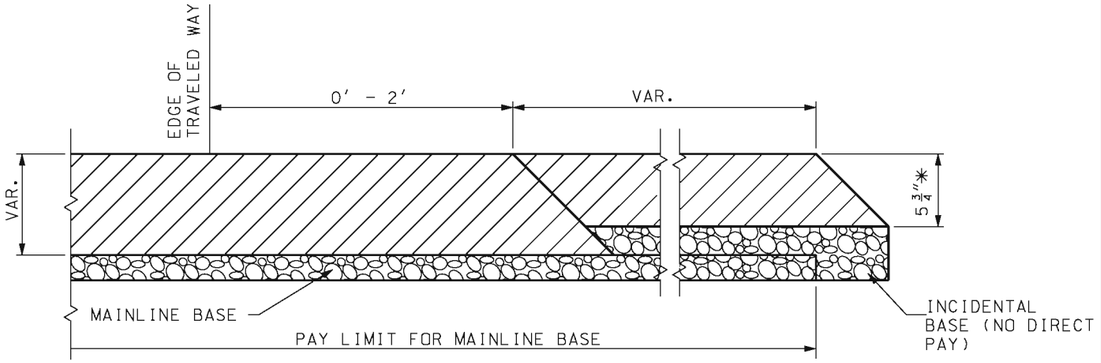



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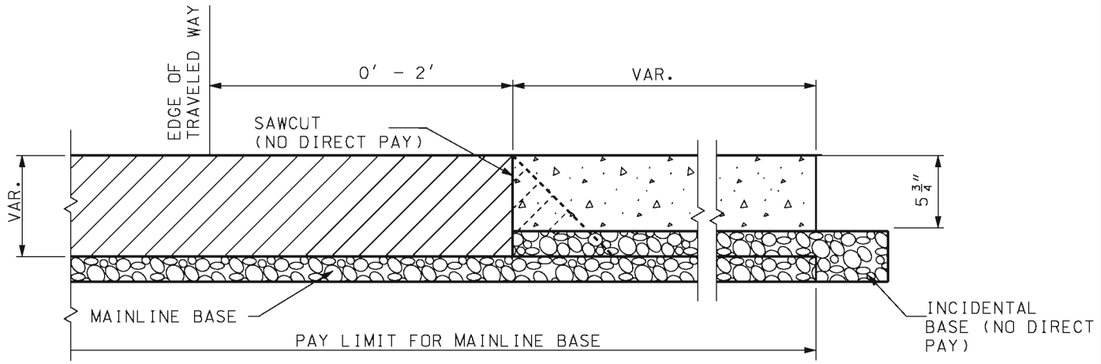



OPTION 3

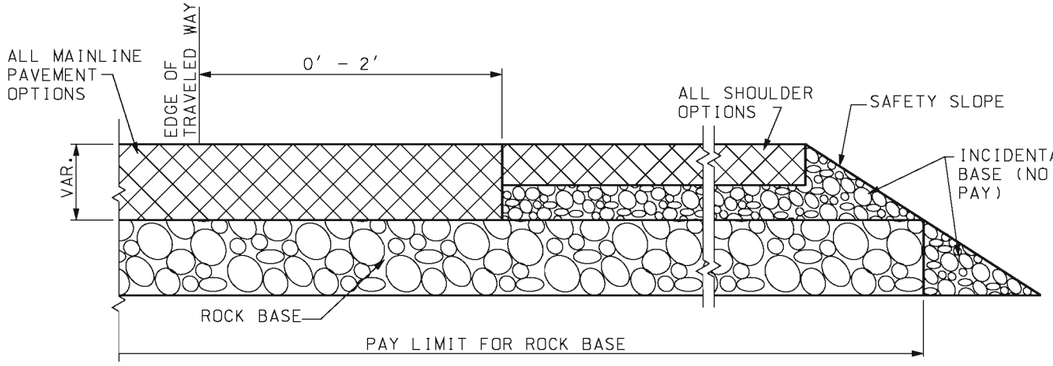
## PCC PAVEMENT




## HMA PAVEMENT




## HMA PAVEMENT




## PAVEMENT ON ROCK BASE

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

BASE

* USE 1 3/4″ BP-1 OVER 4″ PMBB UNLESS OTHERWISE SPECIFIED ON THE PLANS.

GENERAL NOTE:

THE FINAL FINISH ON CONCRETE SHOULDERS MAY BE OBTAINED BY THE USE OF A DRAG CONSISTING OF A SEAMLESS STRIP OF DAMP BURLAP, COTTON FABRIC, PLASTIC TURF, OR OTHER SUITABLE MATERIAL CAPABLE OF PRODUCING A UNIFORM SURFACE OF GRITTY TEXTURE.

THE QUANTITY FOR ADDITIONAL BASE MATERIAL RESULTING FROM THE VARIABLE THICKNESS MATERIAL OR CONSTRUCTION METHOD OF TYPE A2 SHOULDER WILL BE CONSIDERED INCIDENTAL.

INCIDENTAL BASE SHALL CONSIST OF TYPE 1 OR 5 AGGREGATE FOR BASE, OR AN ALTERNATE MATERIAL THAT MEETS THE APPROVAL OF THE ENGINEER.

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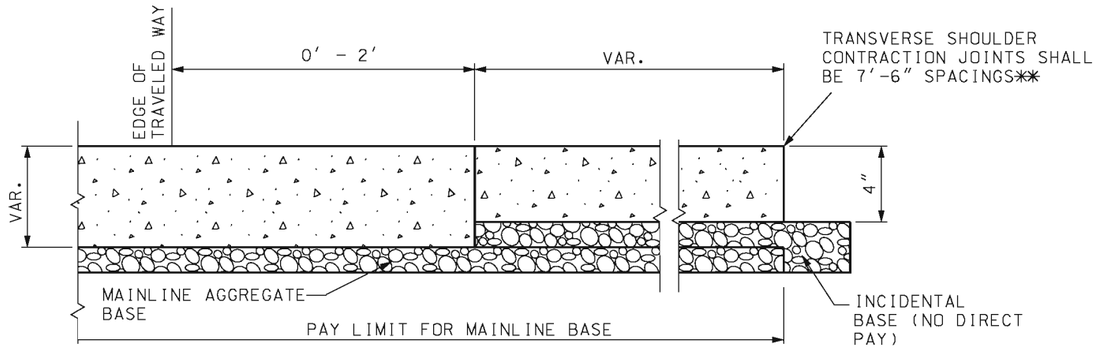
# TYPE A2 SHOULDERS

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DATE PREPARED: 2/20/2009

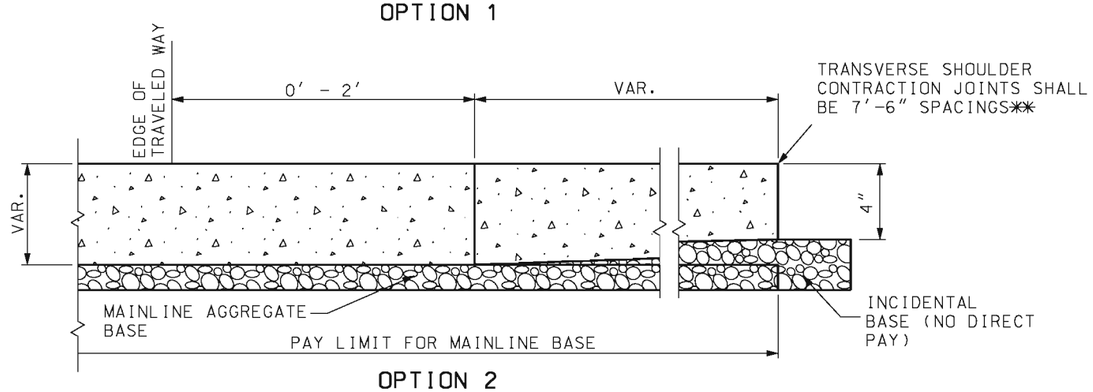
401.00A

SHEET NO. 1 OF 2

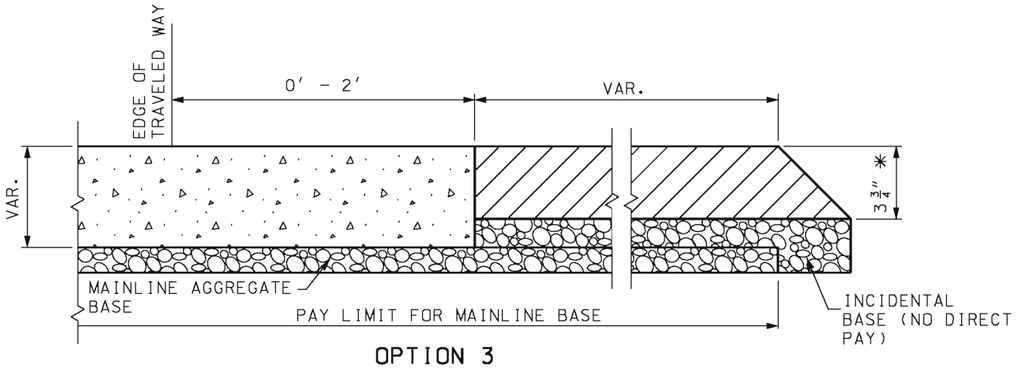
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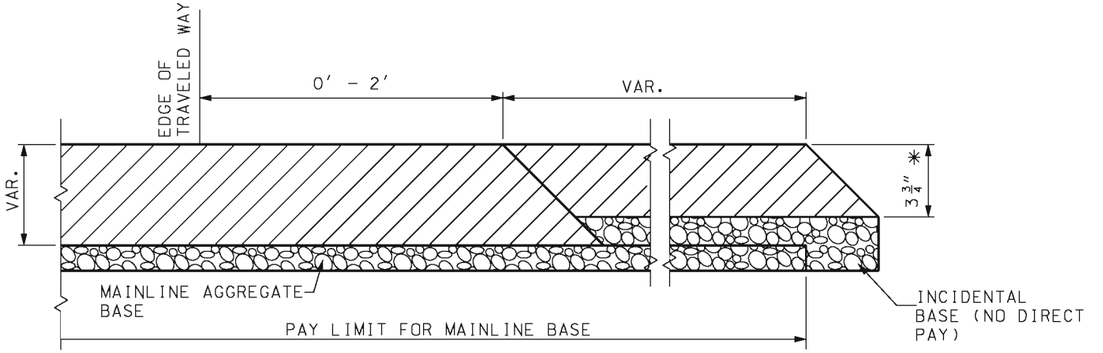



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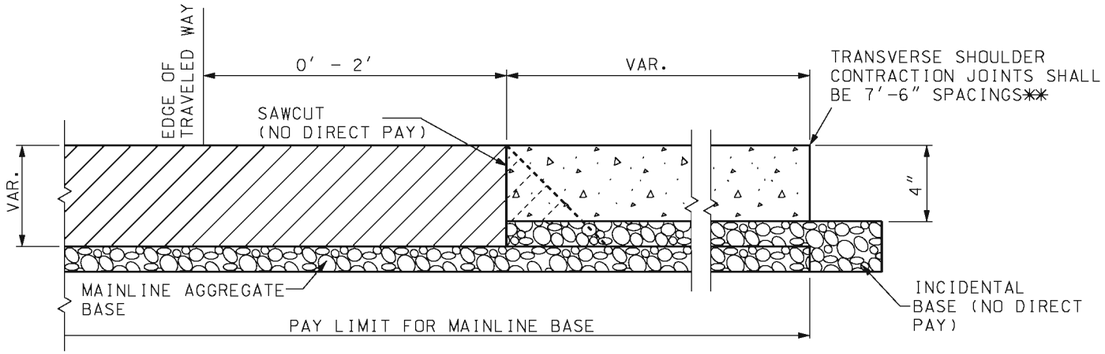



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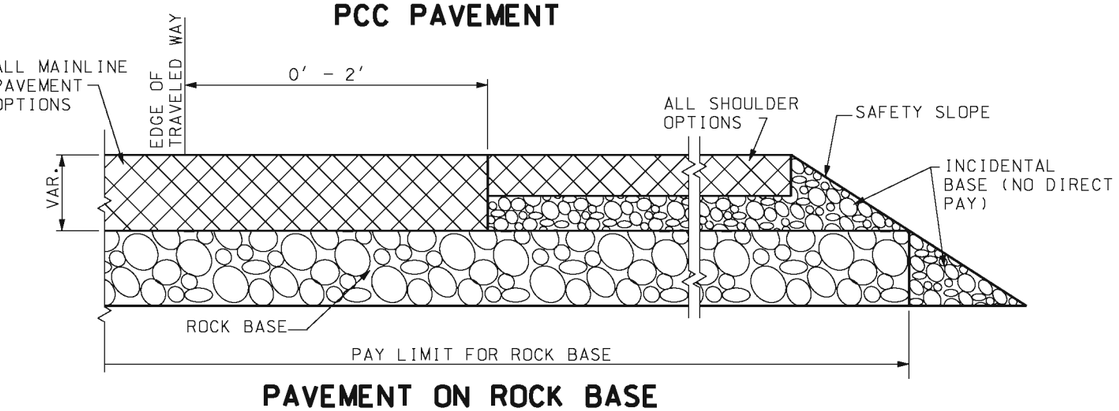
## PCC PAVEMENT



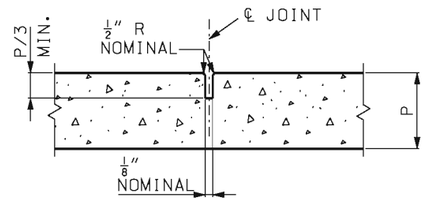

## HMA PAVEMENT




## HMA PAVEMENT




## PAVEMENT ON ROCK BASE




## TOOL JOINT

P = SHOULDER THICKNESS

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

BASE

* USE 3¾″ BP-1 UNLESS OTHERWISE SPECIFIED ON THE PLANS.

** JOINT DEPTH SHALL BE P/3 AND MAY BE SAWED OR TOOLED.

GENERAL NOTE:

THE FINAL FINISH ON CONCRETE SHOULDERS MAY BE OBTAINED BY THE USE OF A DRAG CONSISTING OF A SEAMLESS STRIP OF DAMP BURLAP, COTTON FABRIC, PLASTIC TURF OR OTHER SUITABLE MATERIAL CAPABLE OF PRODUCING A UNIFORM SURFACE OF GRITTY TEXTURE.

THE QUANTITY FOR ADDITIONAL BASE MATERIAL RESULTING FROM THE VARIABLE THICKNESS MATERIAL OR CONSTRUCTION METHOD OF TYPE A3 SHOULDER WILL BE CONSIDERED INCIDENTAL.

INCIDENTAL BASE SHALL CONSIST OF TYPE 1 OR 5 AGGREGATE FOR BASE, OR AN ALTERNATE MATERIAL THAT MEETS THE APPROVAL OF THE ENGINEER.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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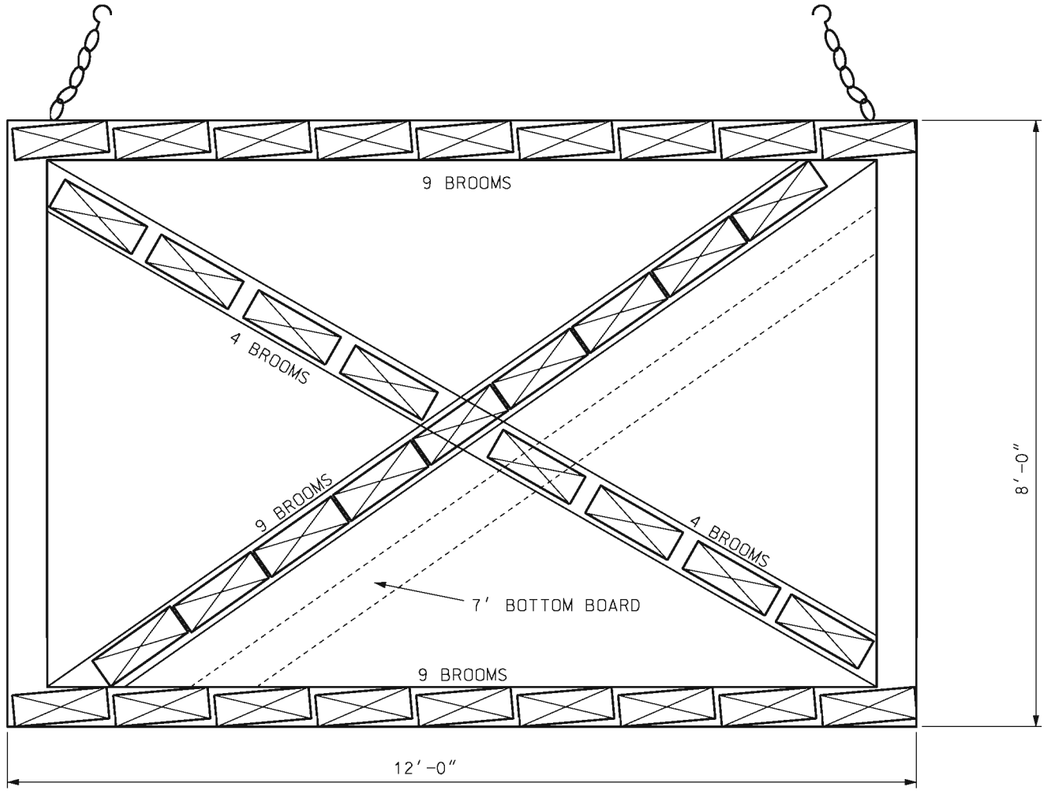
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PROFESSIONAL ENGINEER
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# TYPE A3 SHOULDERS

DATE EFFECTIVE: 04/01/2009
DATE PREPARED: 2/20/2009

401.00A

SHEET NO.
2 OF 2




STREET BROOMS WITH NYLON BRISTLES

$\frac{3}{8}$" CHAIN WITH HOOKS

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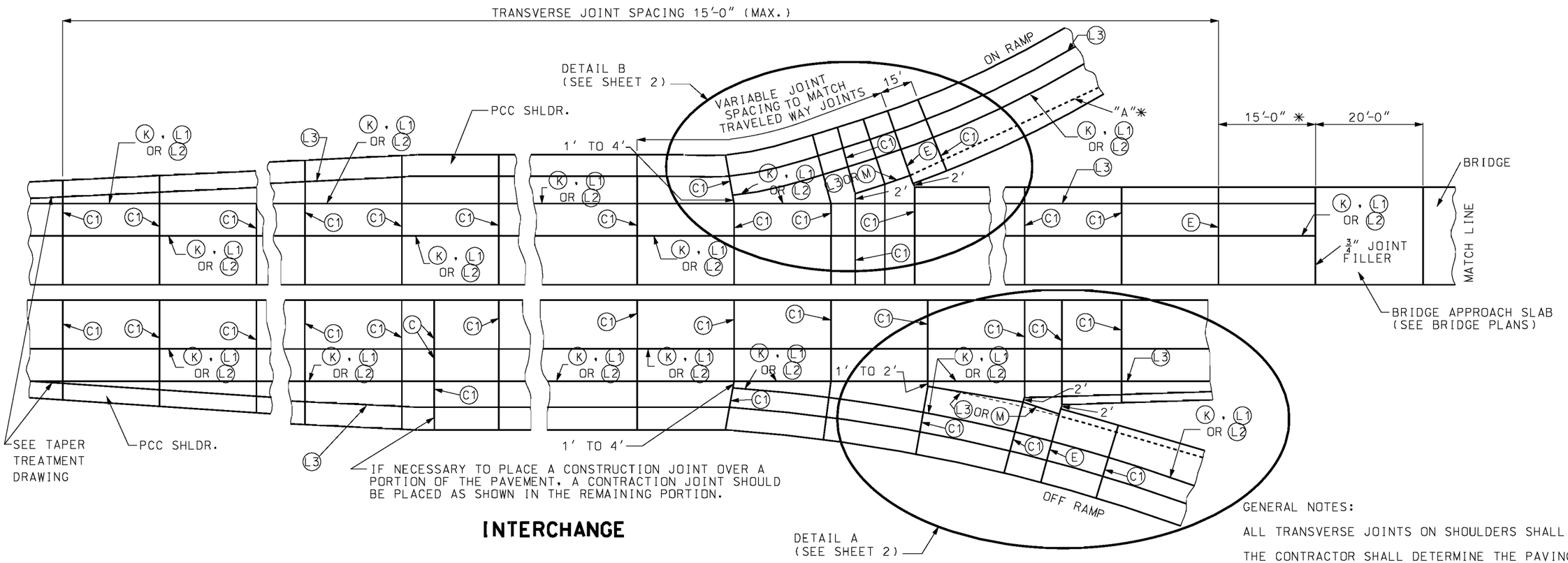
# SCRUB SEAL BROOM CONFIGURATION

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DATE PREPARED: 8/21/2009

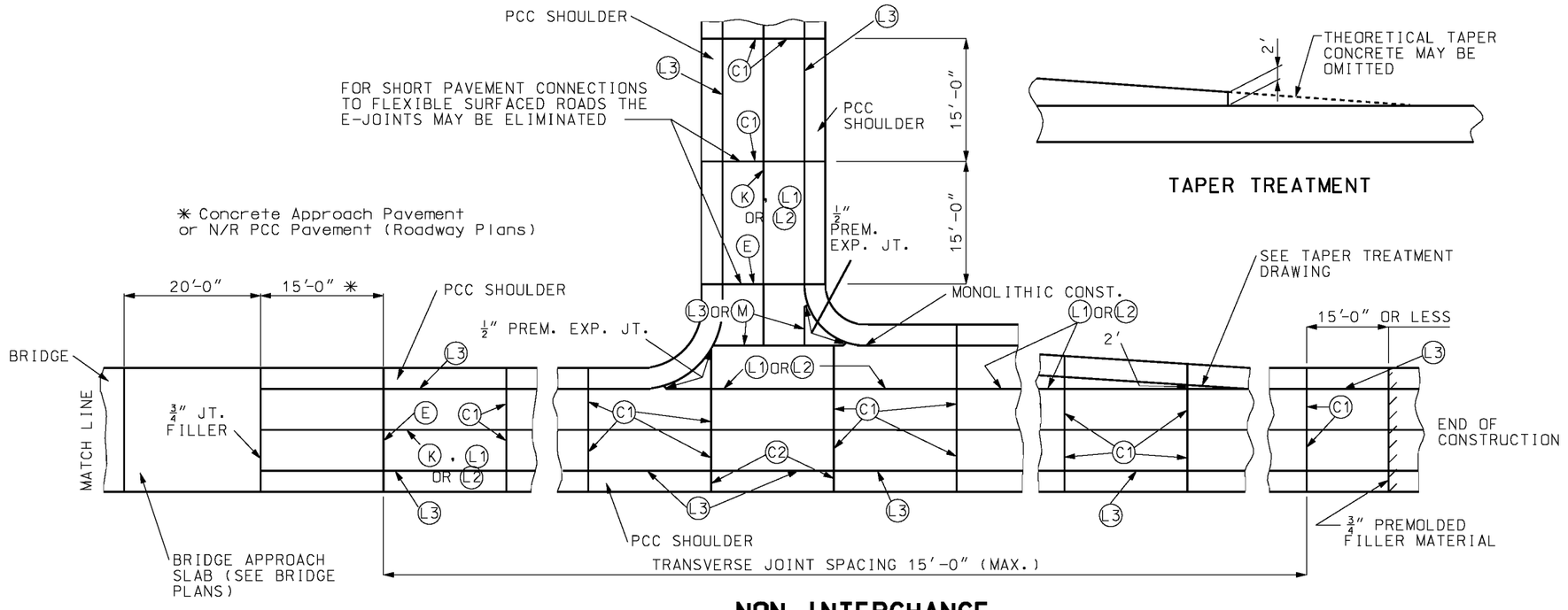
413.20

SHEET NO. 1 OF 1

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## INTERCHANGE




## NON-INTERCHANGE




## TAPER TREATMENT

GENERAL NOTES:

ALL TRANSVERSE JOINTS ON SHOULDERS SHALL BE (C2).

THE CONTRACTOR SHALL DETERMINE THE PAVING WIDTH.

(L3) SHALL BE USED BETWEEN PAVEMENT AND SHOULDER GREATER THAN 4'. THE INTERCHANGE WILL EXTEND FROM THE BEGINNING OF THE ACCELERATION/DECELERATION LANE TO THE GORE RETURN TAPER ON THE MAINLINE. THE INTERCHANGE WILL ALSO INCLUDE THE RAMPS UP TO THE BEGINNING OF THE RADIUS WITH THE ROAD INTERSECTING THE RAMP.

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

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

JOINT SPACING SHOWN IS MAXIMUM AND IS TO BE REDUCED TO AVOID CONFLICT WITH ABUTTING STRUCTURES. JOINTS IN MULTI-LANE PAVEMENT ARE TO BE CONTINUOUS.

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

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105 WEST CAPITOL
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STATE OF MISSOURI
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NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

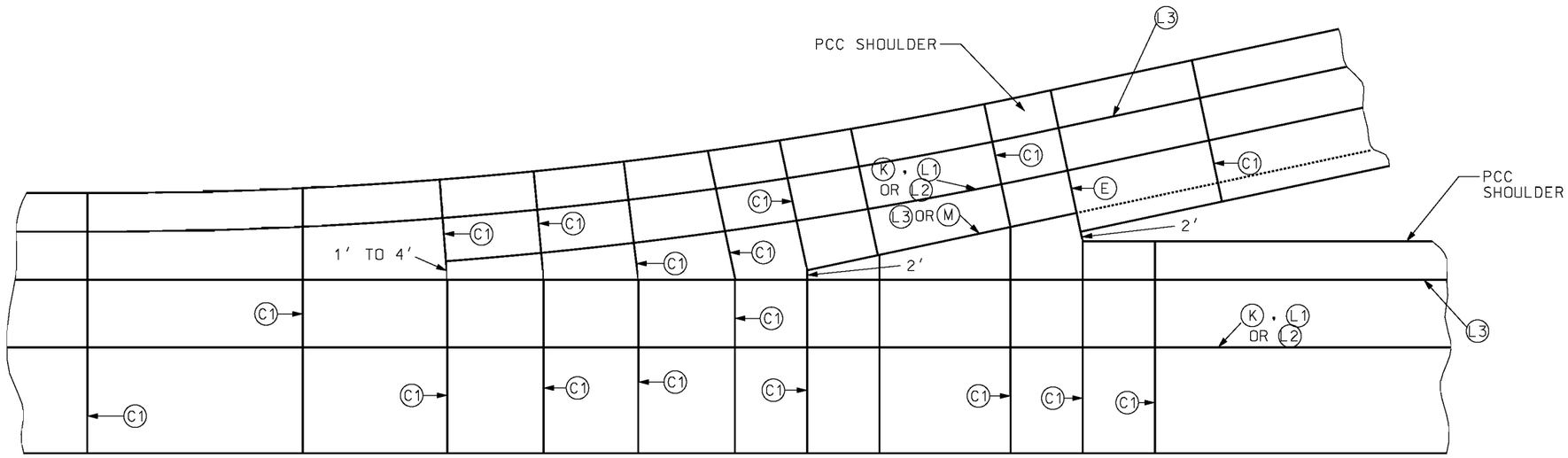
# CONCRETE PAVEMENT AND BASE APPURTENANCES FOR 15' JOINT SPACING

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

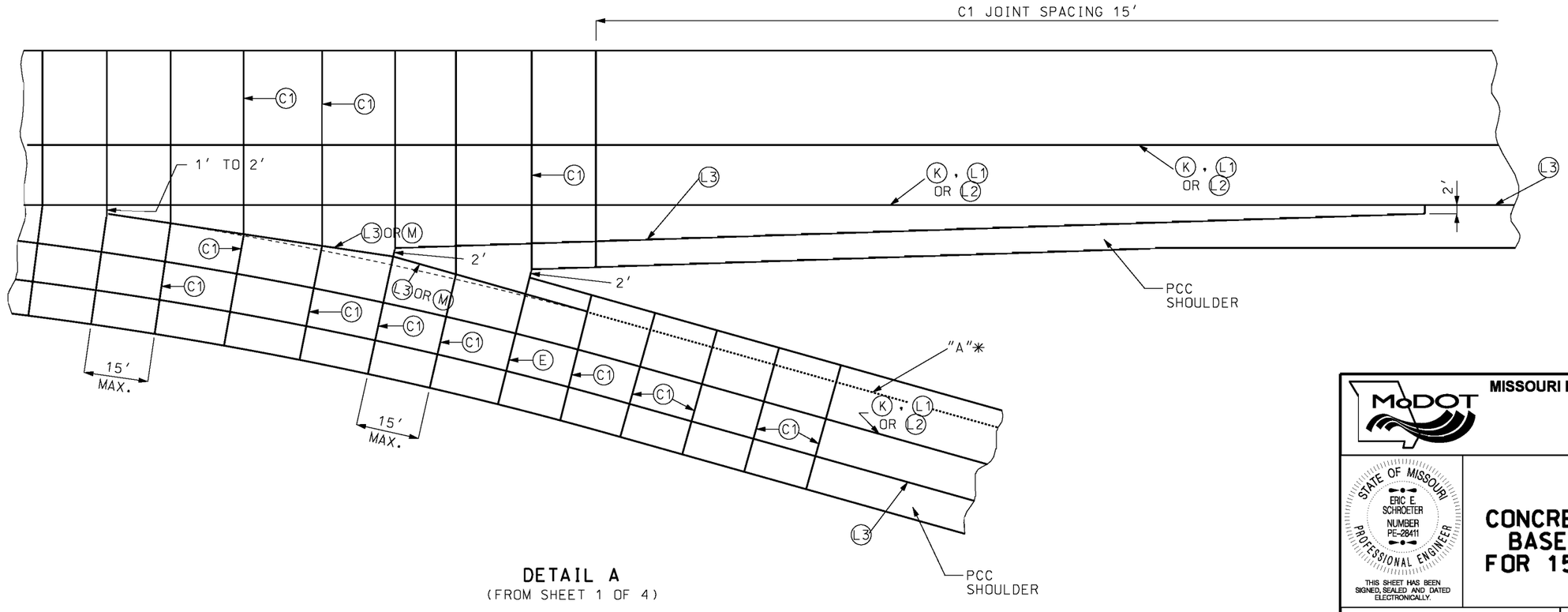
502.05N

SHEET NO. 1 OF 4

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




DETAIL B
(FROM SHEET 1 OF 4)




DETAIL A
(FROM SHEET 1 OF 4)

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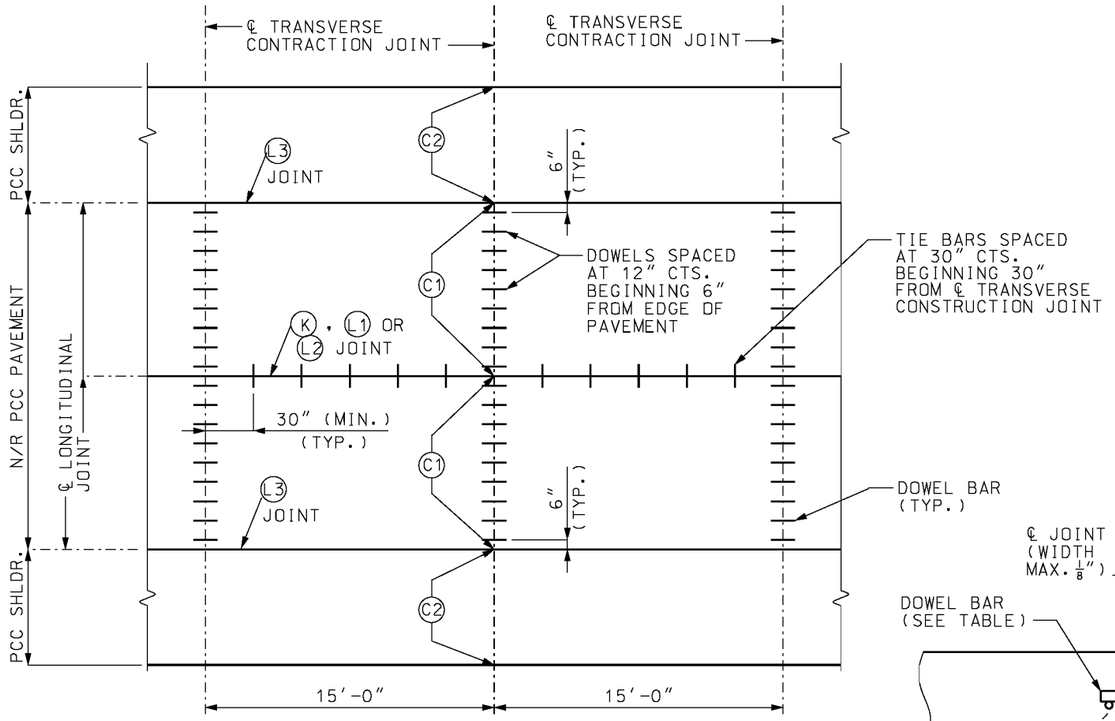
# CONCRETE PAVEMENT AND BASE APPURTENANCES FOR 15' JOINT SPACING

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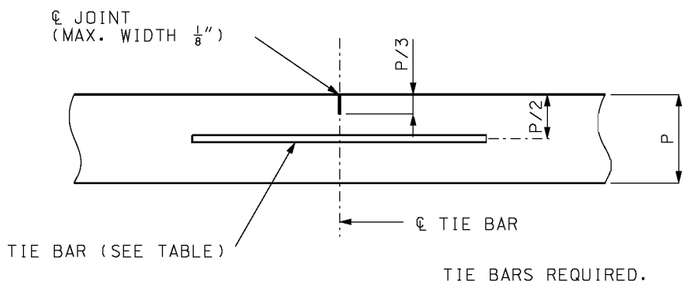
SHEET NO. 2 OF 4

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## JOINT PLAN AND SPACING FOR CONTRACTION JOINTS (1)

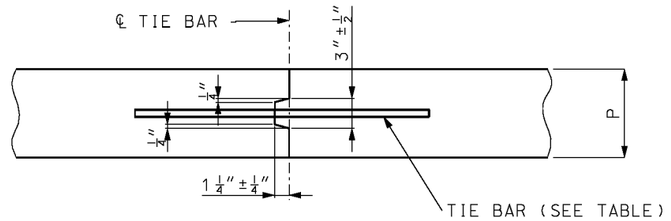
(1) LONGITUDINAL JOINT NOT REQUIRED AT INSIDE SHOULDER ON DIVIDED HIGHWAYS OR AT INSIDE SHOULDER OF RAMPS . FOR 4' OR LESS INSIDE SHOULDERS, DOWELS ARE REQUIRED FOR THE FIRST TWO FEET ADJACENT TO THE TRAVEL LANE.




TIE BARS REQUIRED.

## LONGITUDINAL JOINT (L1)

| TIE BAR AND DOWEL TABLE | | | | |
|---|---|---|---|---|
| PCCP THICKNESS (P) | DOWEL SIZE | TIE BAR SIZE | DOWEL SPACING | TIE BAR SPACING |
| LESS THAN 7" | NONE | #5X30" | NONE | 30" CTR.-CTR. |
| 7" TO 10" | 1 1/4"X18" | #5X30" | 12" CTR.-CTR. | 30" CTR.-CTR. |
| GREATER THAN 10" | 1 1/2"X18" | #6X40" | 12" CTR.-CTR. | 30" CTR.-CTR. |



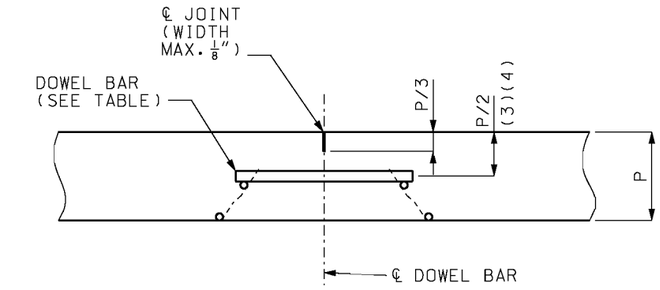

IF METAL IS USED TO FORM KEY DISCONTINUE STRIP FOR DISTANCE OF APPROXIMATELY 3" EACH SIDE OF TRANSVERSE JOINT.

TYPE (K) REQUIRES TIE BAR.

TYPE (M) CONSTRUCTED WITHOUT TIE BARS.

(K) AND (M) JOINTS SHALL NOT BE SAWED.

## TONGUE AND GROOVE JOINTS (K) AND (M)

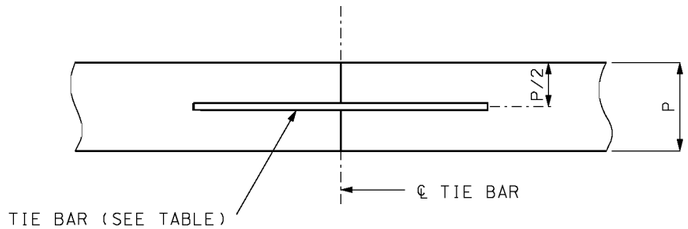



DOWELS REQUIRED. FOR PERMISSIBLE TYPES OF DOWELS SUPPORTING UNITS, SEE OTHER DRAWINGS.

TRANSVERSE CONTRACTION JOINTS FOR CONCRETE PAVEMENT OR BASE WIDENING SHALL MATCH EXISTING JOINTS.

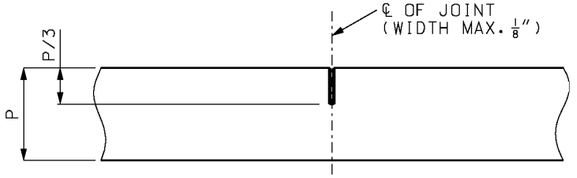
## TRANSVERSE CONTRACTION JOINT (C1) (2)

(2) DOWEL BARS ARE REQUIRED FOR ALL PAVEMENTS HAVING THE SAME THICKNESS AS THE TRAVELED WAY.
(3) FOR PAVEMENTS HAVING THICKNESS IN 1/2" INCREMENTS, DOWEL BASKETS SHALL BE P/2- 1/2".
(4) DOWEL BARS MAY BE PLACED BY MECHANICAL MEANS AT THE OPTION OF THE CONTRACTOR.

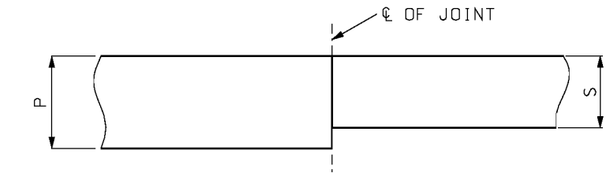



TIE BARS REQUIRED.

## LONGITUDINAL CONSTRUCTION JOINT (L2)




## TRANSVERSE CONTRACTION JOINT (C2)




## LONGITUDINAL CONSTRUCTION JOINT FOR SHOULDER (L3)

S = SHOULDER THICKNESS

GENERAL NOTES:

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

(L3) JOINT FOR FULL DEPTH OR PARTIAL DEPTH SHOULDERS.


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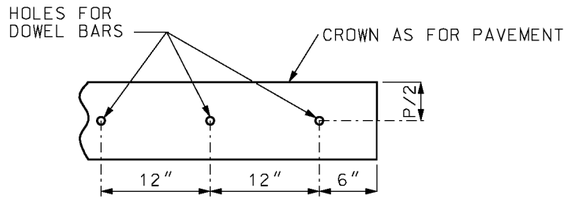
# CONCRETE PAVEMENT AND BASE APPURTENANCES FOR 15' JOINT SPACING

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

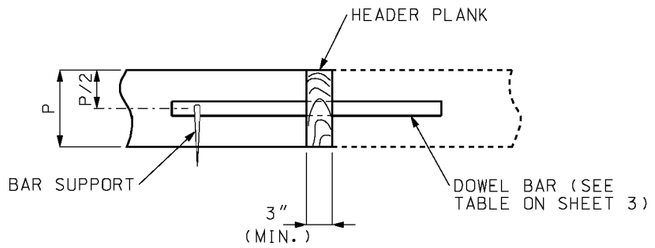
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SHEET NO. 3 OF 4

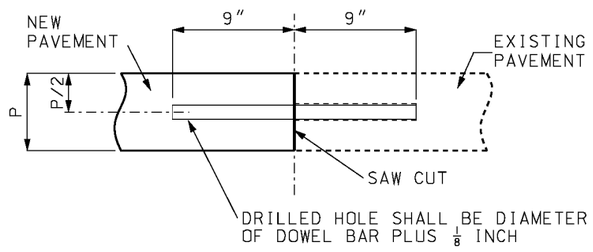
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PART ELEVATION OF
HEADER PLANK




HEADER SECTION




SAWED SECTION

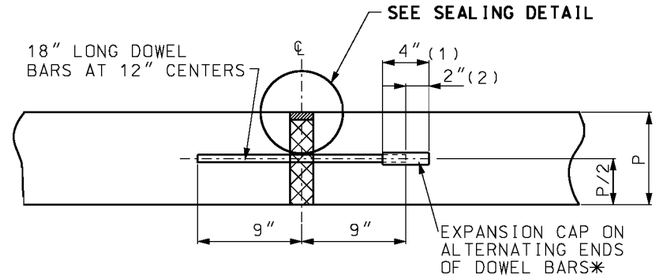
THE HEADER BOARD SHALL BE SUFFICIENTLY RIGID TO PREVENT DISTORTION FROM THE TYPICAL SECTION AND MAINTAIN A STRAIGHT LINE FROM PAVEMENT EDGE TO PAVEMENT EDGE.

THE CONSTRUCTION JOINT MAY BE SAWED FULL DEPTH. HOLES FOR DOWEL BARS SHALL BE DRILLED AFTER THE CONCRETE HAS SUFFICIENT SET TO PREVENT DAMAGE. DOWEL BARS SHALL BE BONDED INTO THE HOLES.

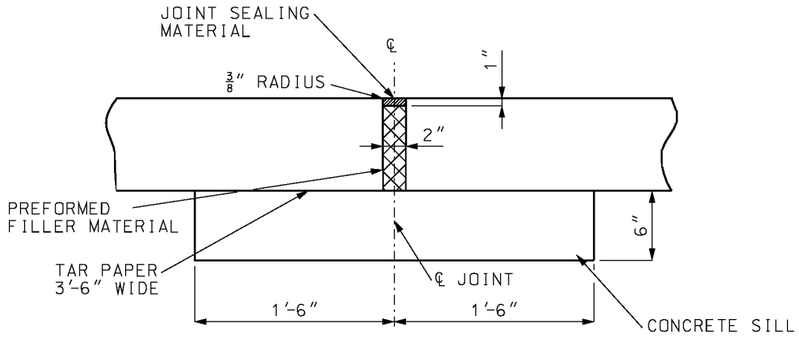
BONDING FOR DOWEL BARS SHALL BE EPOXY OR POLYESTER BONDING AGENTS AS SPECIFIED IN SECTION 1039.

THE PORTION OF THE DOWEL OUTSIDE THE HOLE SHALL BE COATED WITH AN APPROVED LUBRICANT.

## CONSTRUCTION JOINT (C)



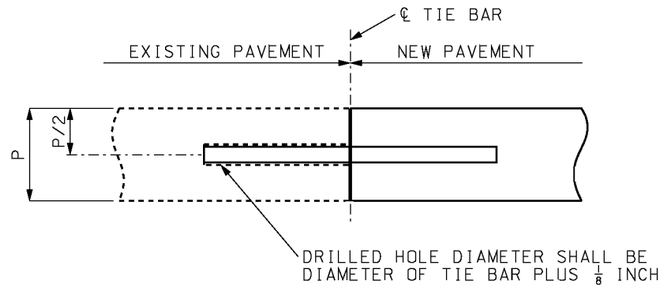

## EXPANSION JOINTS (E)




SILL SHALL EXTEND 18" BEYOND EACH EDGE OF THE PAVEMENT AND SHALL BE CONSTRUCTED OF CONCRETE REGARDLESS OF ADJACENT BASE MATERIAL.

## ALTERNATE EXPANSION JOINTS (E)

(CONTRACTOR MAY SELECT EITHER EXPANSION JOINT (E))




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

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

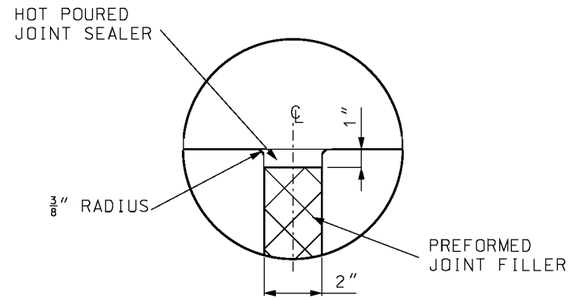
TIE BAR SIZE AND LENGTH SHALL BE BASED ON THE THICKNESS OF THE THINNER PAVEMENT OR SHOULDER TO BE TIED TOGETHER.

## LONGITUDINAL CONSTRUCTION JOINT (EXISTING PAVEMENT) (L)

(1) LENGTH OF CAP

(2) GAP BETWEEN END OF CAP AND DOWEL.

* FOR EXPANSION JOINTS FORMED USING A CONSTRUCTION HEADER, THE EXPANSION CAPS SHALL BE INSTALLED ON THE EXPOSED END OF EACH BAR ONCE THE HEADER HAS BEEN REMOVED AND THE JOINT FILLER MATERIAL HAS BEEN INSTALLED.




## SEALING DETAIL

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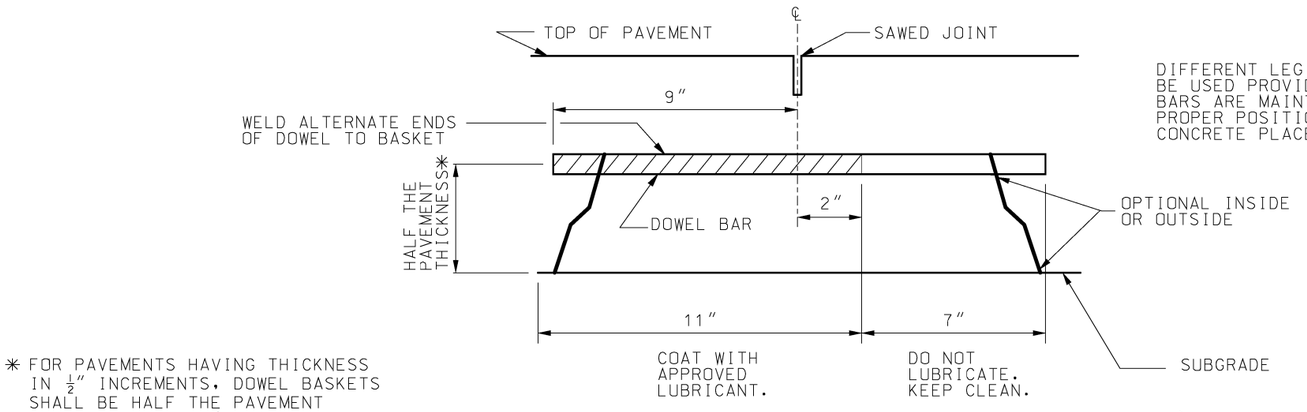
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PROFESSIONAL ENGINEER
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# CONCRETE PAVEMENT AND BASE APPURTENANCES FOR 15' JOINT SPACING

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

502.05N

SHEET NO.
4 OF 4

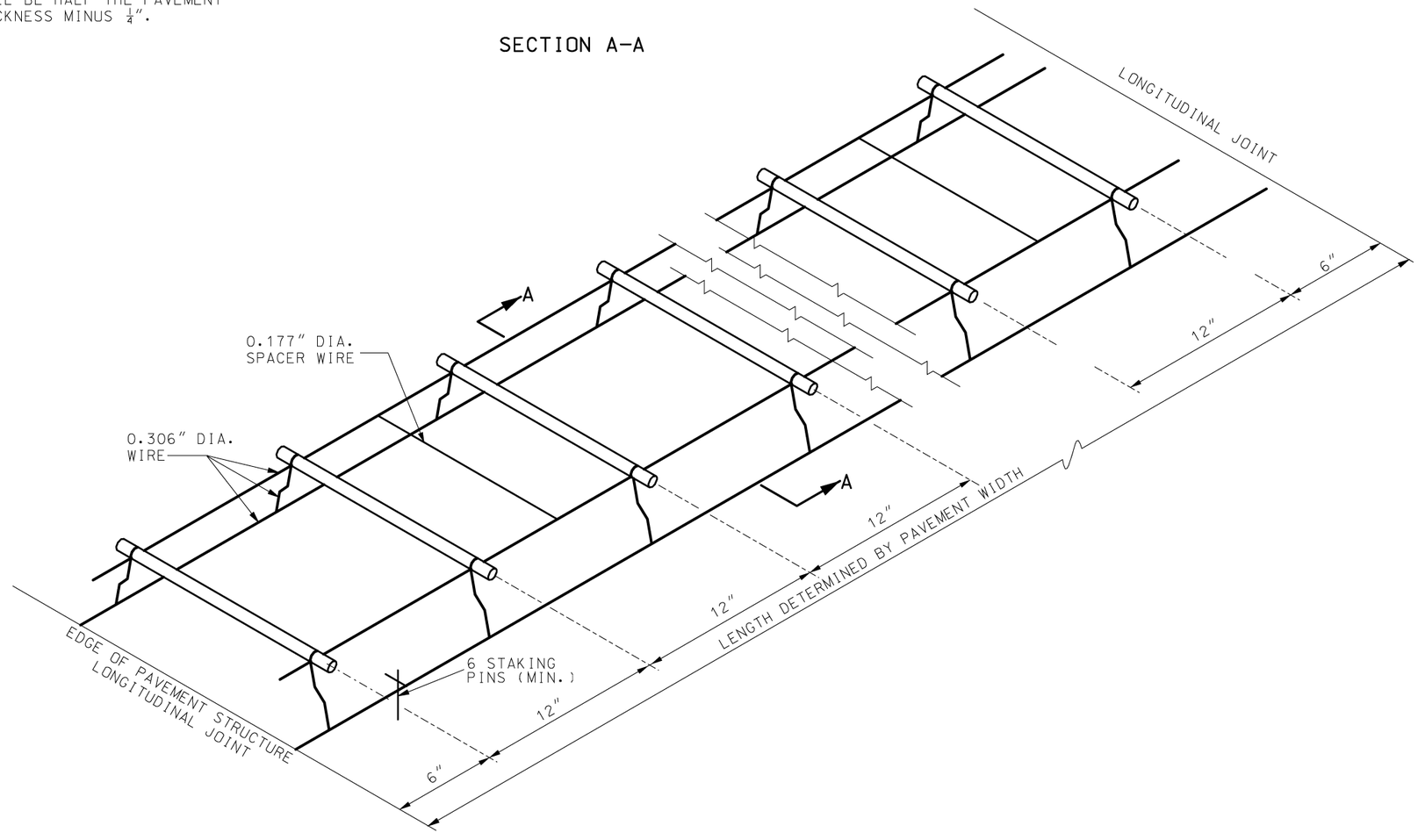



DIFFERENT LEG SHAPES MAY BE USED PROVIDED THE DOWEL BARS ARE MAINTAINED AT THE PROPER POSITION DURING CONCRETE PLACEMENT

* FOR PAVEMENTS HAVING THICKNESS IN $\frac{1}{2}$″ INCREMENTS, DOWEL BASKETS SHALL BE HALF THE PAVEMENT THICKNESS MINUS $\frac{1}{4}$″.

SECTION A-A

| DOWEL BARS | | |
|---|---|---|
| PAVEMENT THICKNESS | BAR SIZE | |
| | DIAMETER | LENGTH |
| 10″ AND LESS | $1\frac{1}{4}$″ | 18″ |
| GREATER THAN 10″ | $1\frac{1}{2}$″ | 18″ |




GENERAL NOTES:

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

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

WIRE SIZES SHOWN ARE MINIMUM REQUIRED.

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

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

SPACER WIRE MAY BE CUT OR LEFT INTACT.

STAKING PINS SHALL BE FABRICATED FROM 0.306″ DIAMETER WIRE MINIMUM WITH A SUITABLE HOOK. STAKING PINS SHALL HAVE A MINIMUM LENGTH OF 12″ FOR DOWEL ASSEMBLIES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

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

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# DOWEL SUPPORTING UNITS

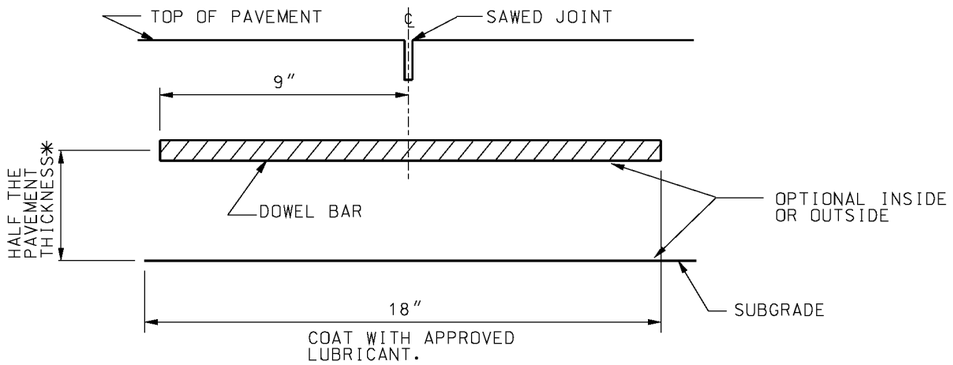
APPROVED FOR USE
WITH TRANSVERSE JOINTS

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

502.10K

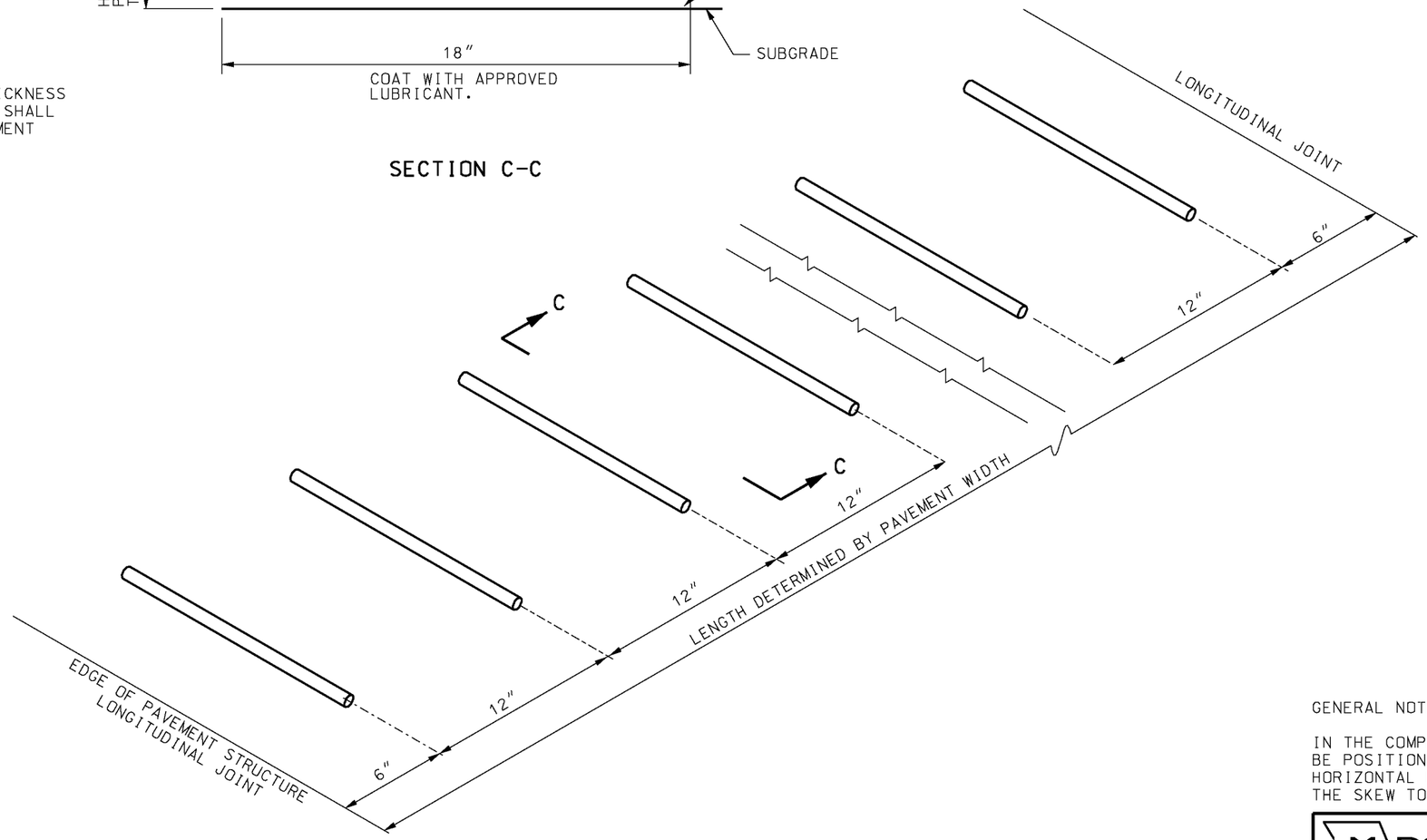
SHEET NO. 1 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




* FOR PAVEMENTS HAVING THICKNESS IN ½″ INCREMENTS, DOWEL SHALL BE PLACED HALF THE PAVEMENT THICKNESS MINUS ¼″.

SECTION C-C




GENERAL NOTES:

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

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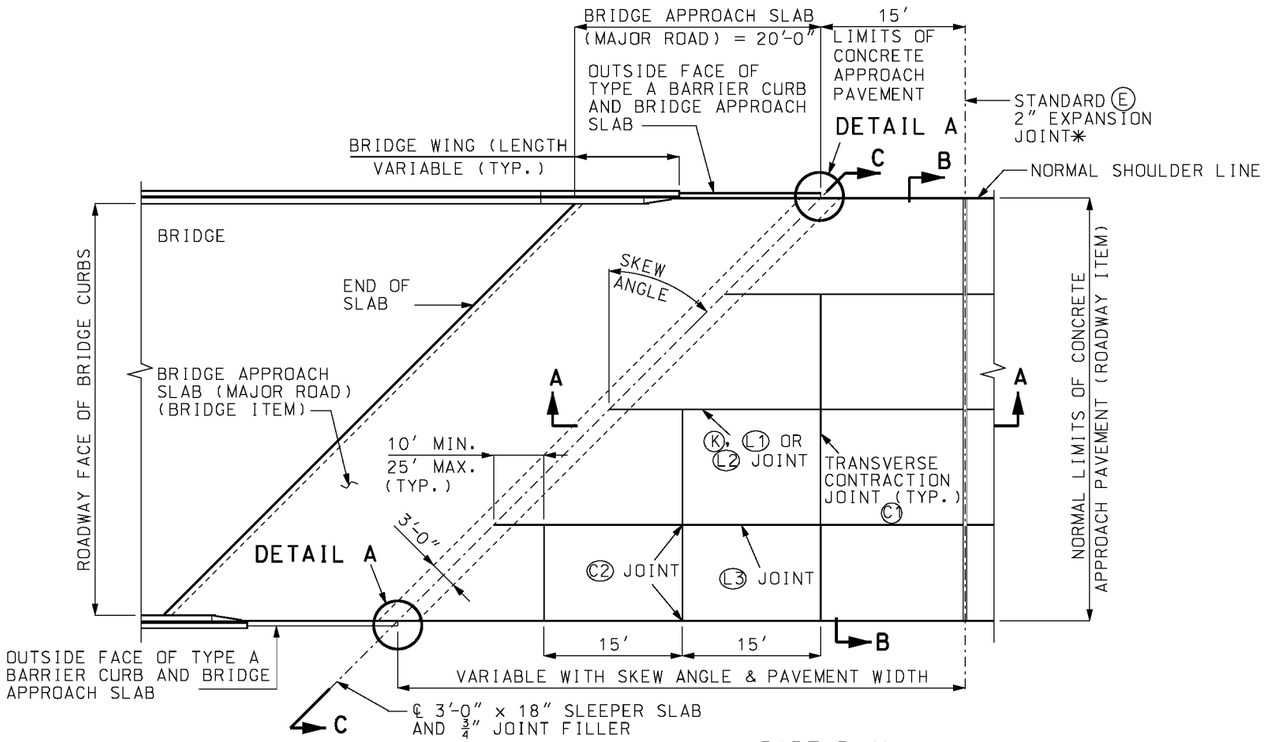
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# DOWEL SUPPORTING UNITS

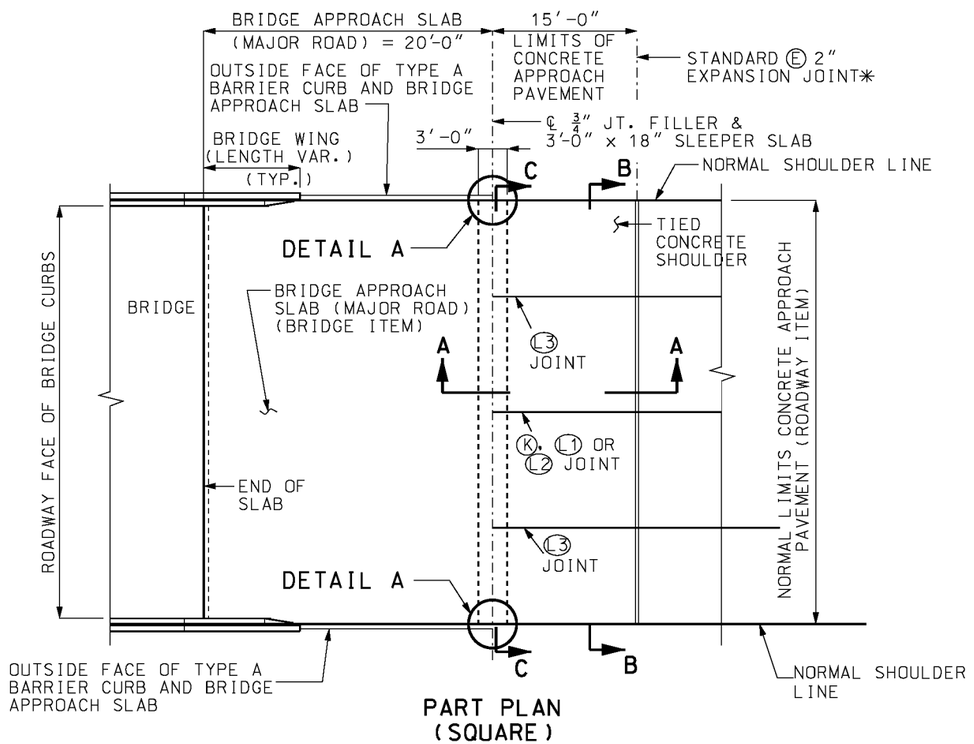
## MECHANICAL PLACEMENT

| DATE EFFECTIVE: | 06/01/2010 | 502.10K | SHEET NO. |
|---|---|---|---|
| DATE PREPARED: | 5/29/2015 | | 2 OF 2 |

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PART PLAN
(SKEWED)




PART PLAN
(SQUARE)

SEE SHEET 2 OF 3 FOR DETAIL A.

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

* NOT REQUIRED WHEN ADJACENT PAVEMENT IS ASPHALT.

GENERAL NOTES:

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

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

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

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

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

COST OF FURNISHING AND PLACEMENT OF 4" TYPE 5 AGGREGATE BASE AND ¾" JOINT FILLER IS INCLUDED IN CONTRACT UNIT BID PRICE FOR CONCRETE APPROACH PAVEMENT.

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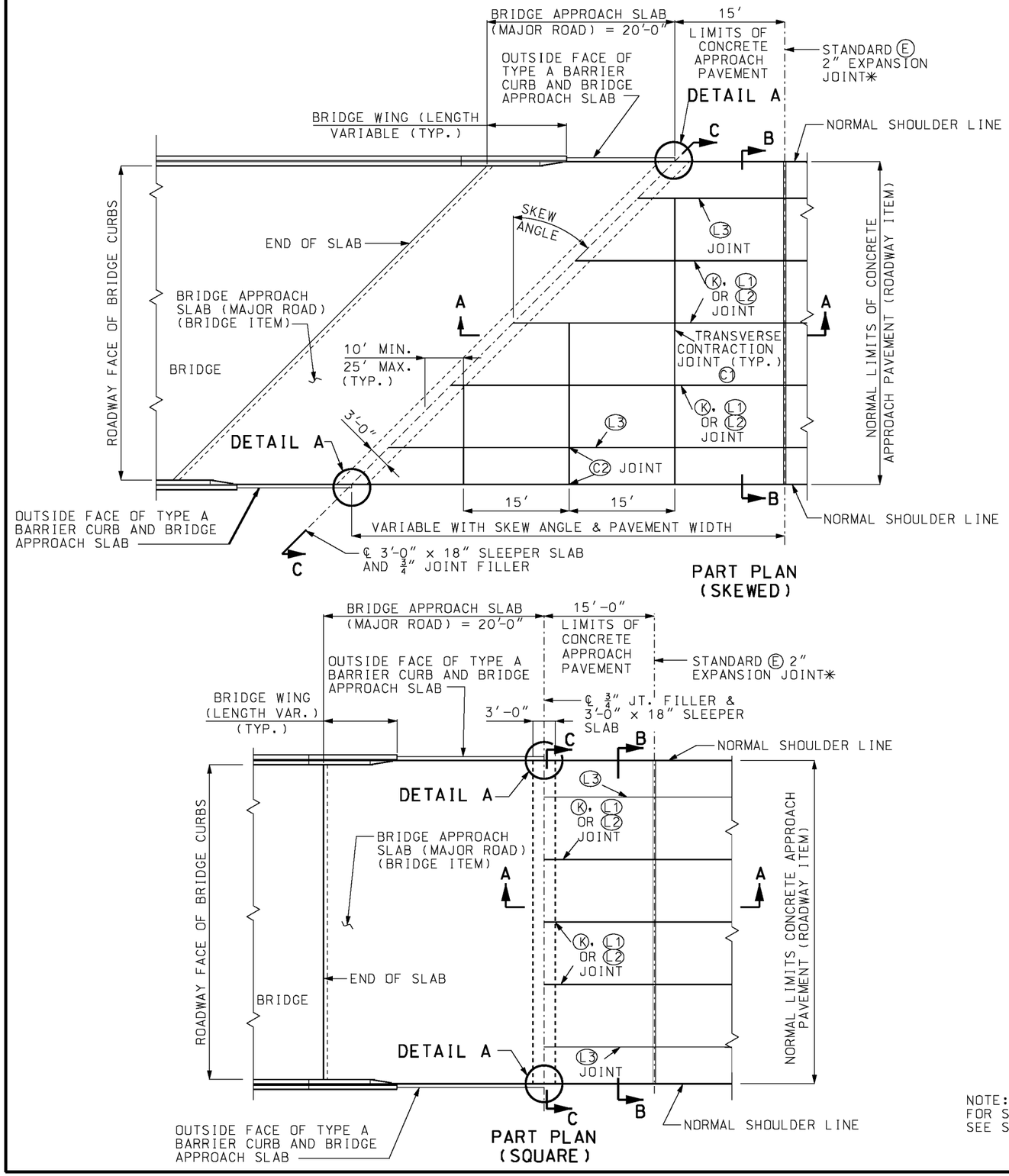
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# CONCRETE APPROACH PAVEMENT

## FOR TWO-LANE PAVEMENTS (MAJOR ROAD)

| DATE EFFECTIVE: | 07/01/2015 | 504.00J | SHEET NO. 1 OF 3 |
|---|---|---|---|
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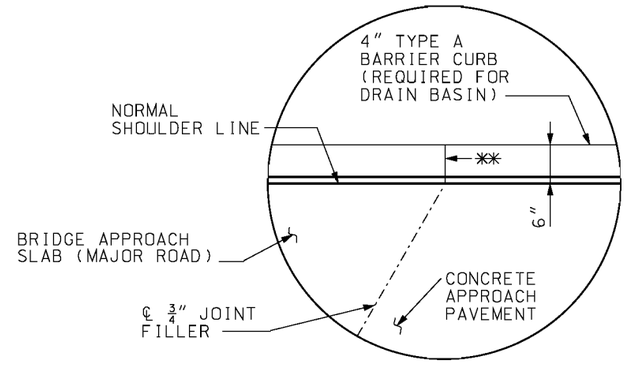



PART PLAN (SKEWED)




PART PLAN (SQUARE)

* NOT REQUIRED WHEN ADJACENT PAVEMENT IS ASPHALT.




DETAIL A

** USE ¾" JOINT FILLER BETWEEN TYPE A CURBS

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

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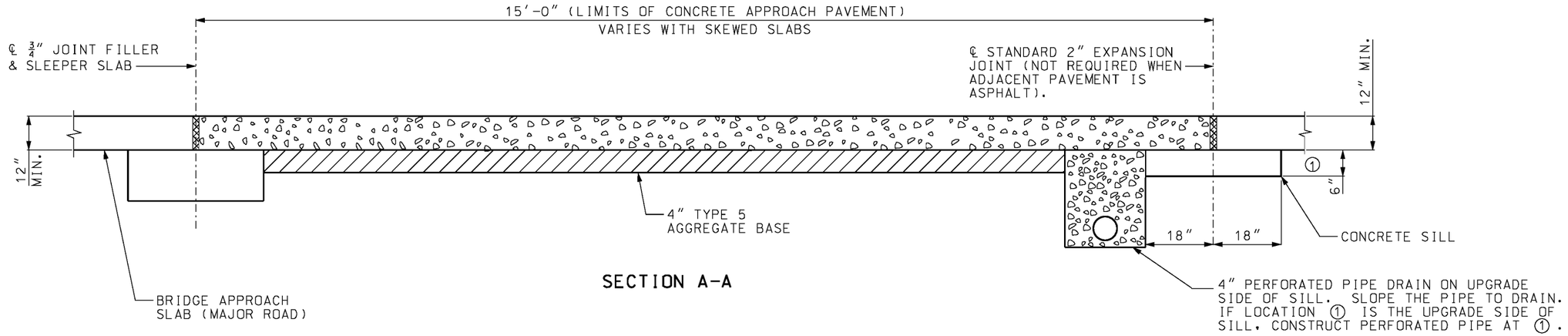
# CONCRETE APPROACH PAVEMENT
## FOR MULTI-LANE PAVEMENTS (MAJOR ROAD)

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

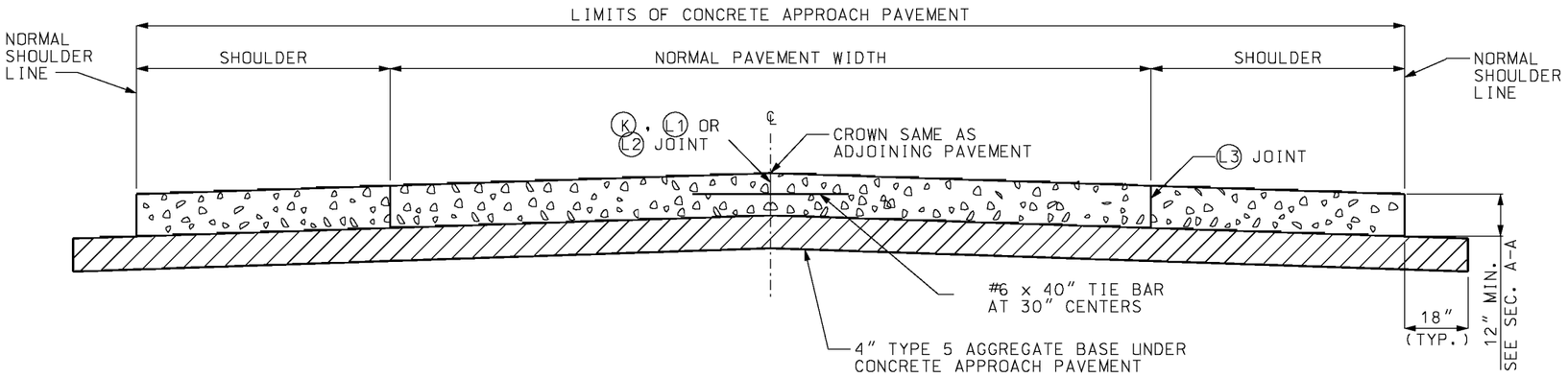
504.00J

SHEET NO. 2 OF 3

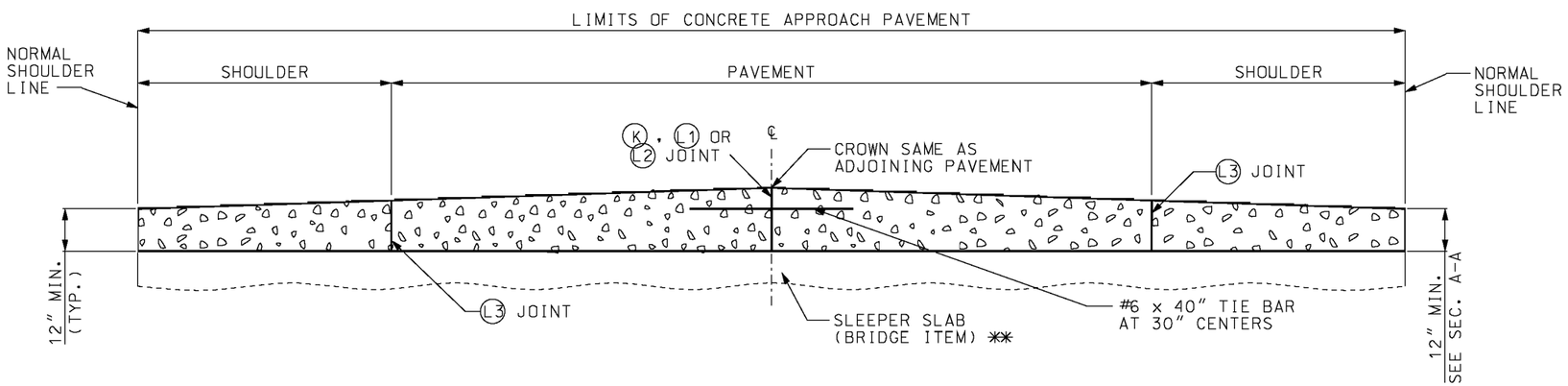
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




SECTION A-A




SECTION B-B




SECTION C-C

** TOP OF SLEEPER SLAB MAY BE FLAT OR CROWNED. SEE BRIDGE PLANS.

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

GENERAL NOTES:

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

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

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

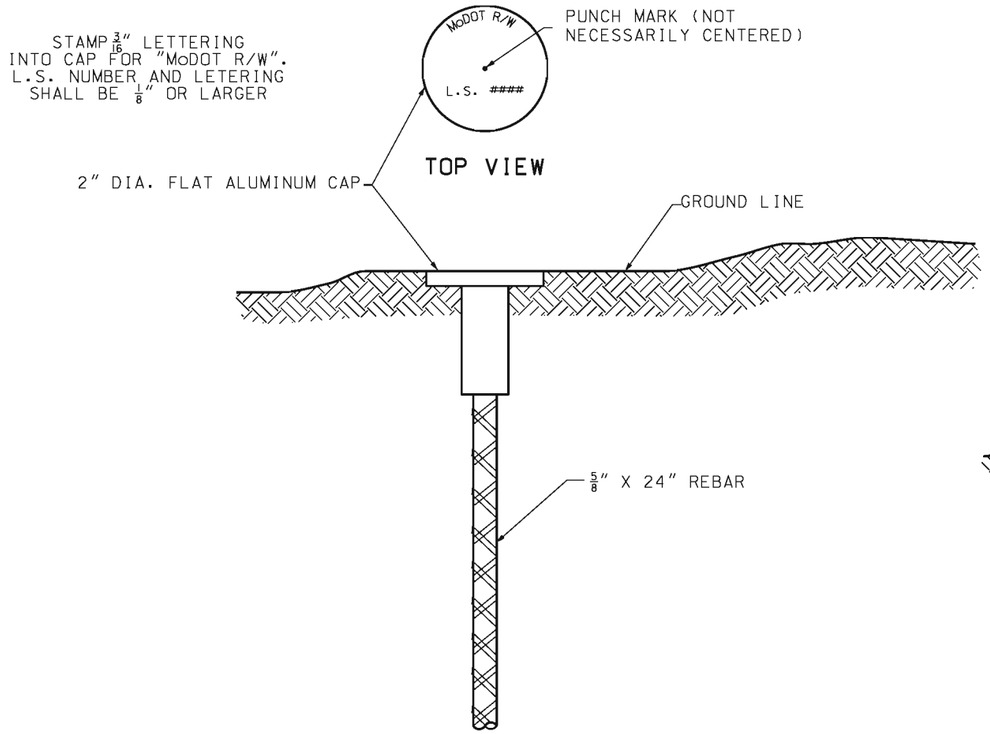
# CONCRETE APPROACH PAVEMENT (MAJOR ROAD)

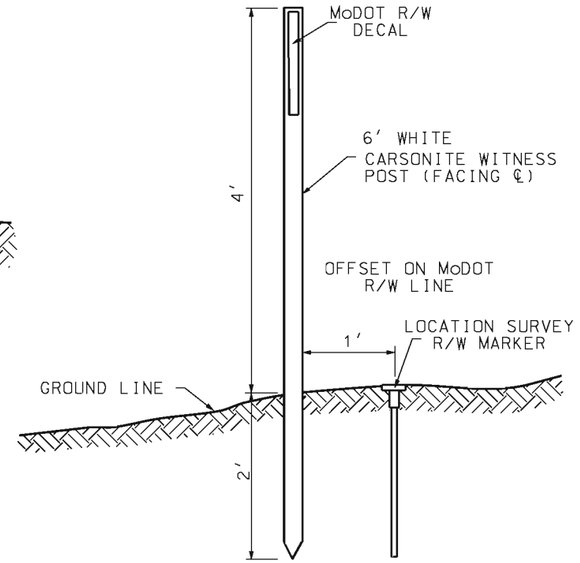
DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

504.00J

SHEET NO. 3 OF 3

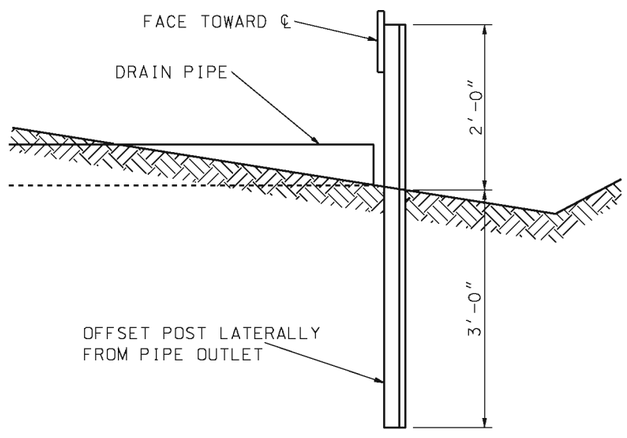
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



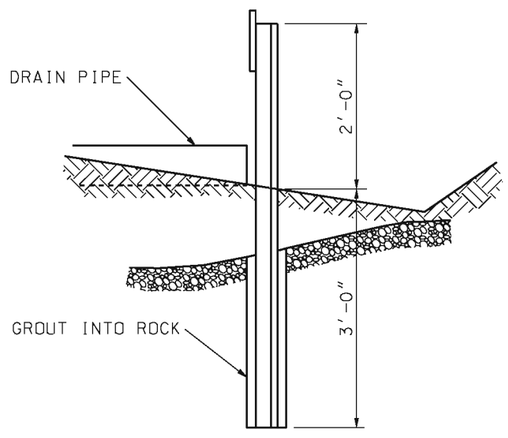




WITNESS POST

## LOCATION SURVEY RIGHT-OF-WAY MARKER




IN EARTH




IN ROCK

## DRAIN MARKER

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.

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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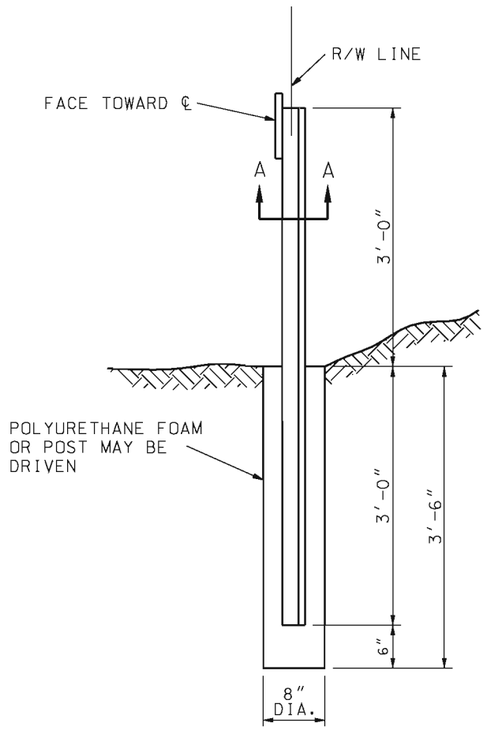
# RIGHT-OF-WAY AND DRAIN MARKERS

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/21/2009

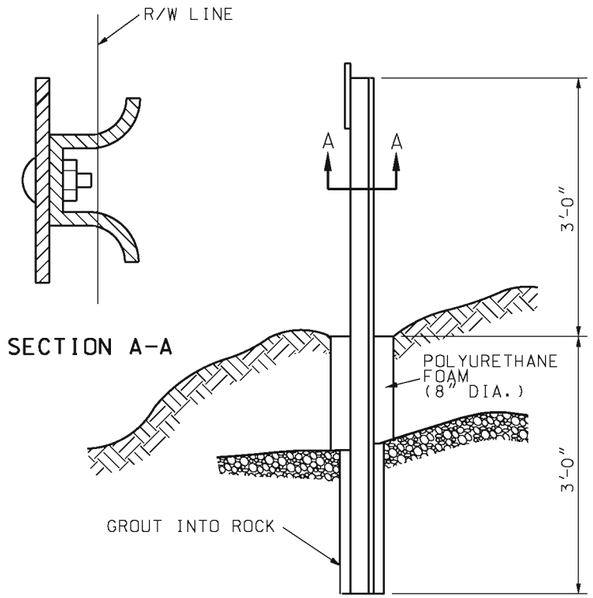
602.00D

SHEET NO. 1 OF 2

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IN EARTH

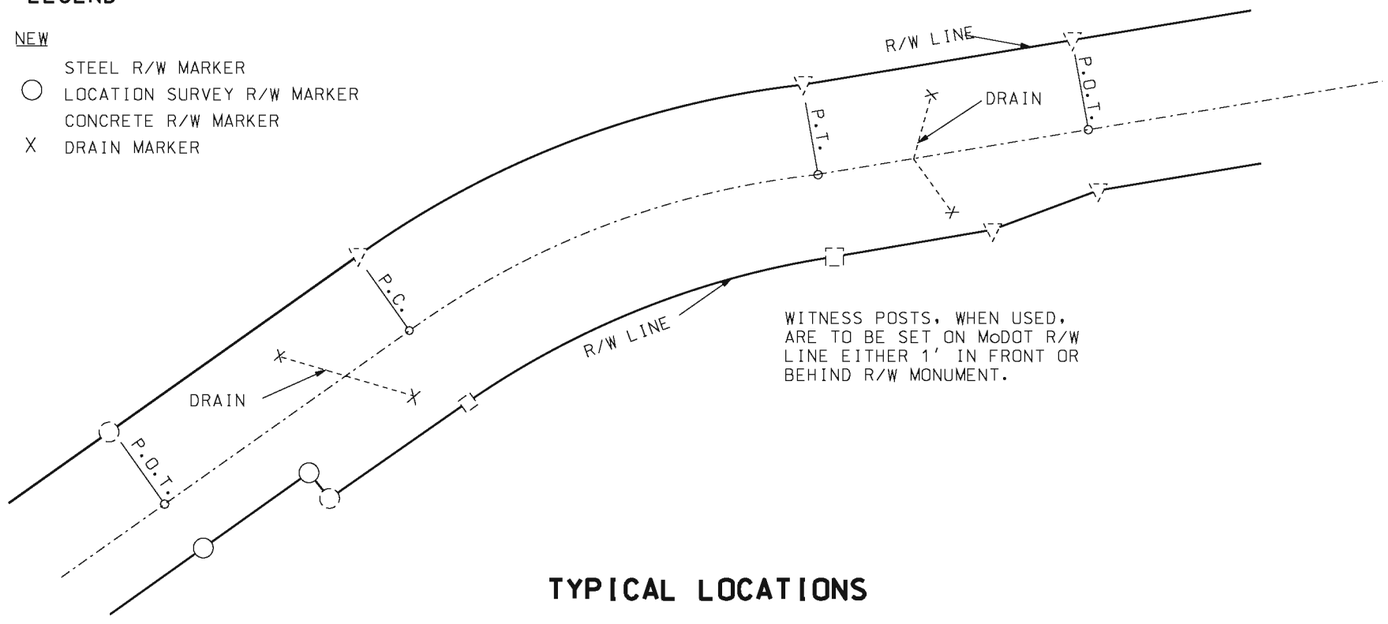



IN ROCK

## STEEL RIGHT-OF-WAY MARKER

LEGEND

| EXISTING | NEW | |
|---|---|---|
| ▽ | | STEEL R/W MARKER |
| ○ | ○ | LOCATION SURVEY R/W MARKER |
| ▭ | ▭ | CONCRETE R/W MARKER |
| | X | DRAIN MARKER |




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

TYPICAL LOCATIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

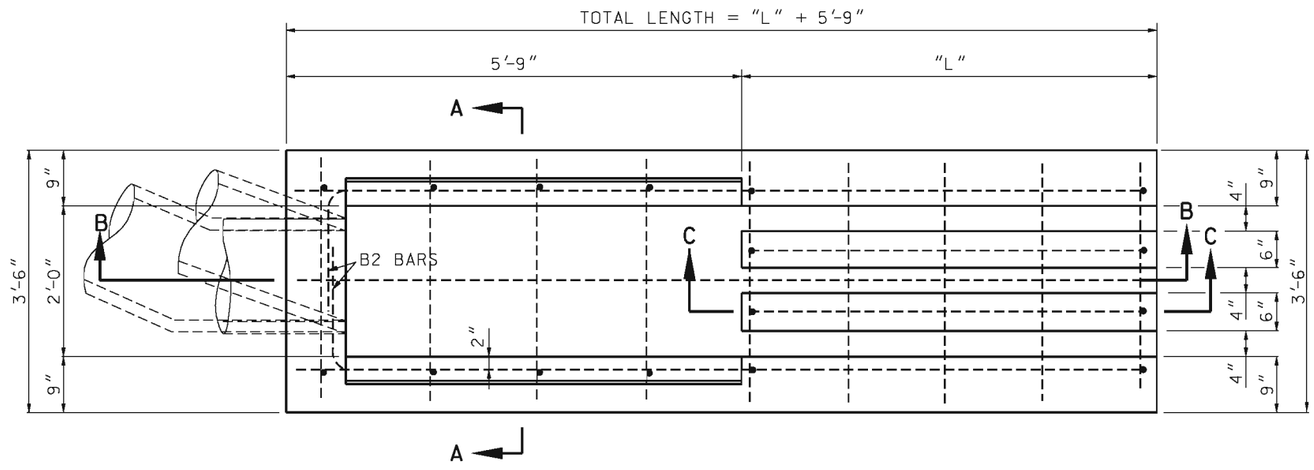
# RIGHT-OF-WAY AND DRAIN MARKERS

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/21/2009

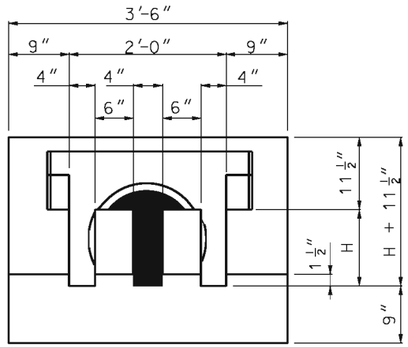
602.00D

SHEET NO. 2 OF 2

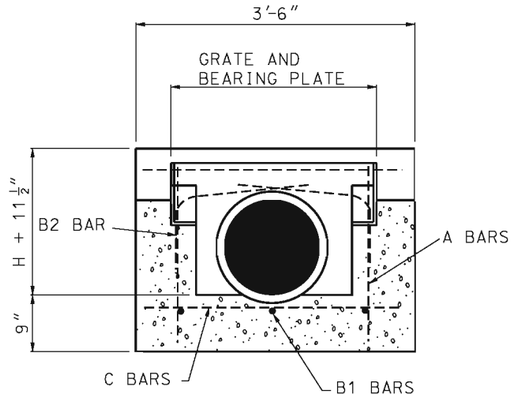
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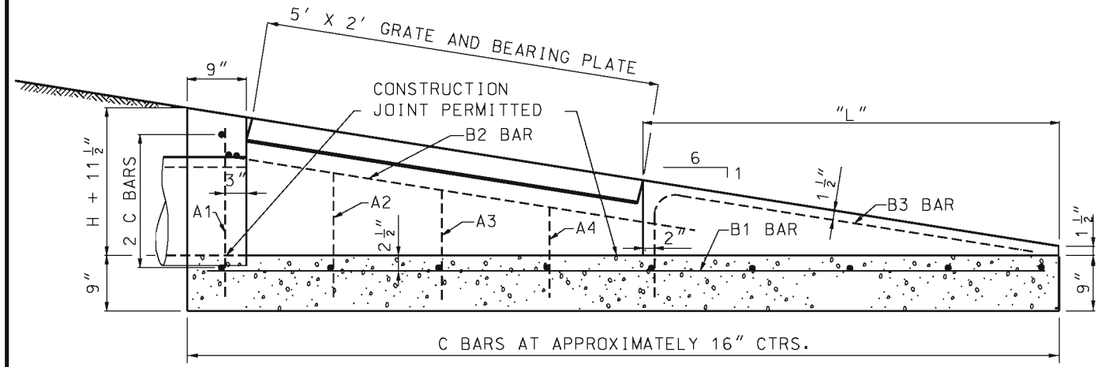

PLAN VIEW



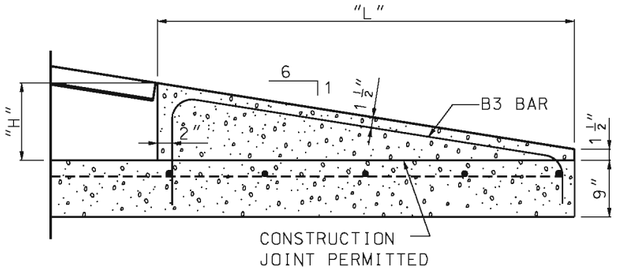

END SECTION




SECTION A-A

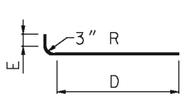



SECTION B-B

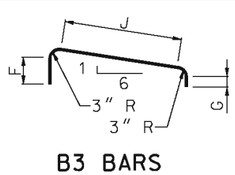



SECTION C-C

| PIPE SIZE | DIMENSIONS | | | QUANTITIES | | REINFORCING | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | #4 A1 BARS | | #4 A2 BARS | | #4 A3 BARS | | #4 A4 BARS | | #4 B1 BARS | | #4 B2 BARS | | | | #4 B3 BARS | | | | | | #4 C BARS | |
| | "H" | "L" | TOTAL LENGTH | CONC. C. Y. | STEEL LBS. | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | E | D | LENGTH | NO. | F | G | J | LENGTH | NO. | LENGTH |
| 12" | 9" | 3'-9" | 9'-6" | 1.5 | 70 | 2 | 2'-0" | 2 | 1'-6" | 2 | 1'-3" | 2 | 1'-0" | 3 | 9'-3" | 2 | 1'-5" | 5'-8" | 7'-6" | 4 | 11" | 5" | 2'-11" | 5'-0" | 8 | 3'-3" |
| 15" | 1'-0" | 5'-3" | 11'-0" | 1.8 | 80 | 2 | 2'-3" | 2 | 1'-9" | 2 | 1'-6" | 2 | 1'-3" | 3 | 10'-9" | 2 | 1'-5" | 5'-8" | 7'-6" | 4 | 1'-2" | 5" | 4'-5" | 6'-9" | 9 | 3'-3" |
| 18" | 1'-3" | 6'-9" | 12'-6" | 2.2 | 90 | 2 | 2'-6" | 2 | 2'-0" | 2 | 1'-9" | 2 | 1'-6" | 3 | 12'-3" | 2 | 1'-5" | 5'-8" | 7'-6" | 4 | 1'-5" | 5" | 5'-11" | 8'-6" | 10 | 3'-3" |
| 21" | 1'-6" | 8'-3" | 14'-0" | 2.6 | 100 | 2 | 2'-9" | 2 | 2'-3" | 2 | 2'-0" | 2 | 1'-9" | 3 | 13'-9" | 2 | 1'-5" | 5'-8" | 7'-6" | 4 | 1'-8" | 5" | 7'-5" | 10'-3" | 11 | 3'-3" |
| 24" | 1'-9" | 9'-9" | 15'-6" | 3.0 | 110 | 2 | 3'-0" | 2 | 2'-6" | 2 | 2'-3" | 2 | 2'-0" | 3 | 15'-3" | 2 | 1'-5" | 5'-8" | 7'-6" | 4 | 1'-11" | 5" | 8'-11" | 12'-0" | 12 | 3'-3" |




B2 BARS




B3 BARS

## BENDING DETAILS

GENERAL NOTES:

USE RIGHT ANGLE HEADWALL FOR ALL INSTALLATIONS. SKEW PIPE BY USING A BEVELED END OR ELBOW ON PIPE. IN SPECIAL CASES, HEADWALL MAY BE TURNED TO FIT PIPE SKEW AND 1V TO 6H SLOPE WARPED TO FIT HEADWALL.

ALL CONCRETE SHALL BE CLASS "B".

THIS DRAWING AND THE CONCRETE QUANTITIES SHOWN ARE BASED ON THE USE OF CONCRETE PIPE. QUANTITIES OF CONCRETE SHOWN WILL BE USED FOR PAYMENT REGARDLESS OF ANY QUANTITY CHANGES NECESSARY DUE TO THE USE OF ANY OTHER TYPE PIPE SPECIFIED OR PERMITTED.

FLOW LINE OF HEADWALL IS TO BE PLACED HORIZONTALLY.

PRECAST NOTES:

THE CONTRACTOR MAY, SUBJECT TO APPROVAL OF THE ENGINEER, FURNISH PRECAST UNITS IN LIEU OF CAST-IN-PLACE. IF A PRECAST UNIT IS FURNISHED, IT SHALL CONFORM IN ALL RESPECTS TO THE 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 PRECASTING FORMS.

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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
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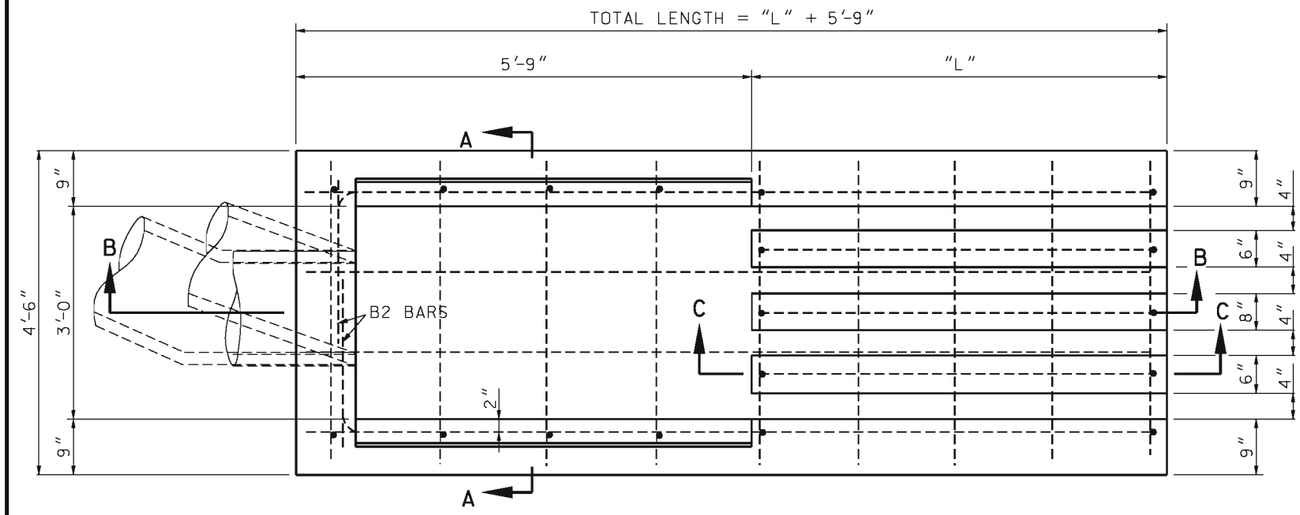
STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

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

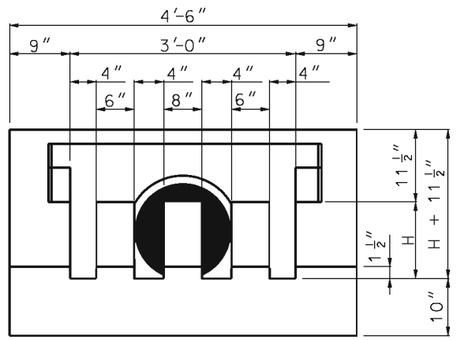
DATE EFFECTIVE: 08/01/2006
DATE PREPARED: 9/3/2009

604.05D

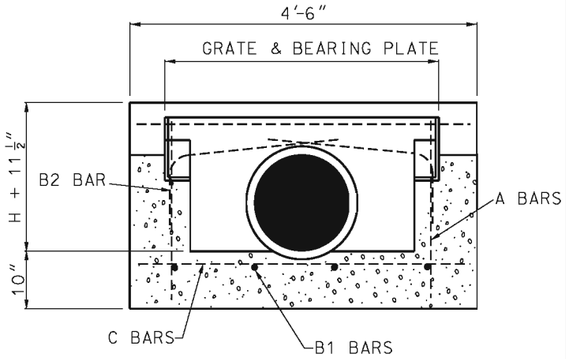
SHEET NO. 1 OF 2



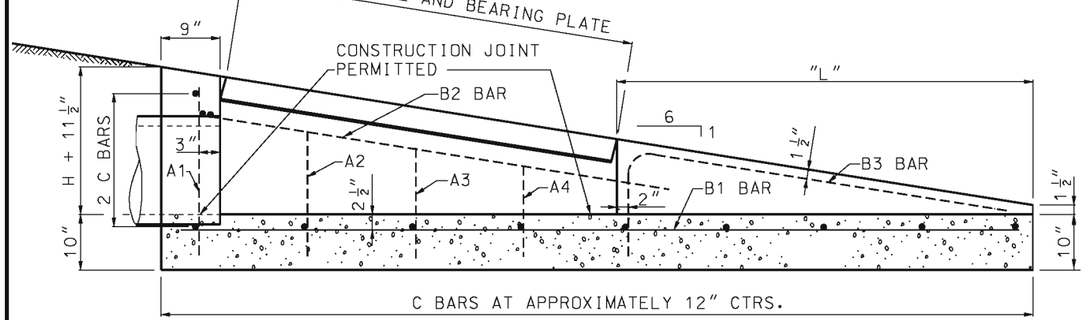

PLAN VIEW



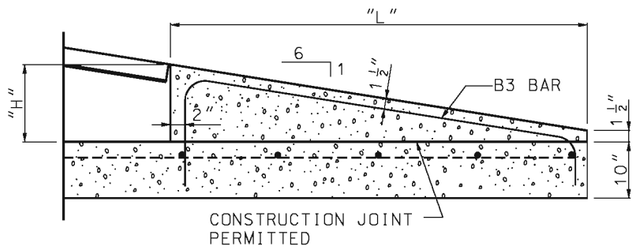

END SECTION




SECTION A-A

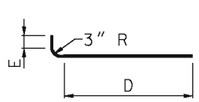



SECTION B-B

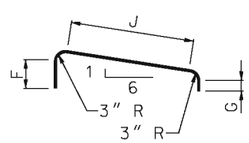



SECTION C-C

| PIPE SIZE | DIMENSIONS | | | QUANTITIES | | REINFORCING | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | "H" | "L" | TOTAL LENGTH | CONC. C. Y. | STEEL LBS. | #4 A1 BARS | | #4 A2 BARS | | #4 A3 BARS | | #4 A4 BARS | | #4 B1 BARS | | #4 B2 BARS | | | | #4 B3 BARS | | | | | | #4 C BARS | |
| | | | | | | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | E | D | LENGTH | NO. | F | G | J | LENGTH | NO. | LENGTH |
| 27" | 2'-0" | 11'-3" | 17'-0" | 4.5 | 160 | 2 | 3'-3" | 2 | 2'-9" | 2 | 2'-6" | 2 | 2'-3" | 4 | 16'-9" | 2 | 1'-11" | 5'-8" | 8'-0" | 5 | 2'-2" | 5" | 10'-5" | 13'-9" | 18 | 4'-3" |
| 30" | 2'-3" | 12'-9" | 18'-6" | 5.0 | 170 | 2 | 3'-6" | 2 | 3'-0" | 2 | 2'-9" | 2 | 2'-6" | 4 | 18'-3" | 2 | 1'-11" | 5'-8" | 8'-0" | 5 | 2'-5" | 5" | 11'-11" | 15'-6" | 19 | 4'-3" |
| 36" | 2'-9" | 15'-9" | 21'-6" | 6.1 | 200 | 2 | 4'-0" | 2 | 3'-6" | 2 | 3'-3" | 2 | 3'-0" | 4 | 21'-3" | 2 | 1'-11" | 5'-8" | 8'-0" | 5 | 2'-11" | 5" | 14'-11" | 19'-0" | 21 | 4'-3" |




B2 BARS




B3 BARS

## BENDING DETAILS

GENERAL NOTES:

SEE GENERAL NOTES ON SHEET 1.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# PIPE CULVERT HEADWALLS

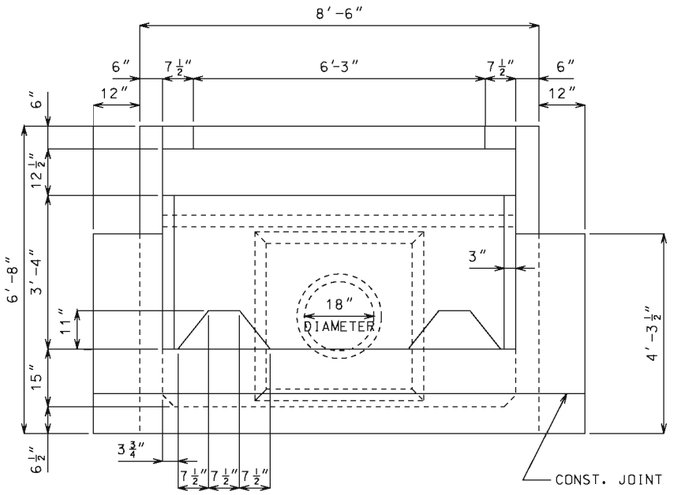
TYPE S
27" TO 36" DIAMETERS
- 1V:6H SLOPES

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

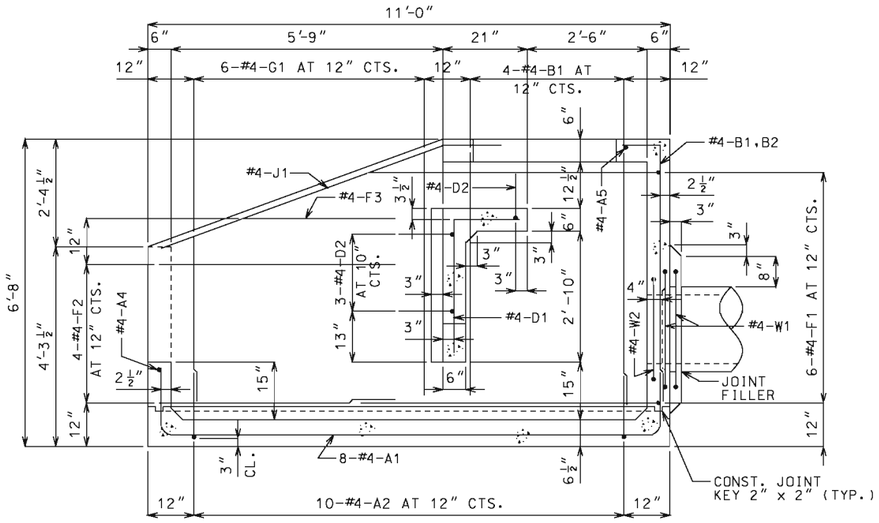
604.05D

SHEET NO. 2 OF 2

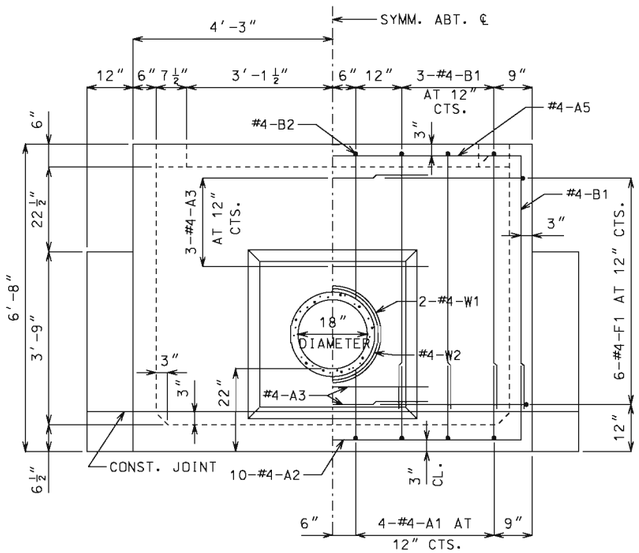

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DOWNSTREAM ELEVATION

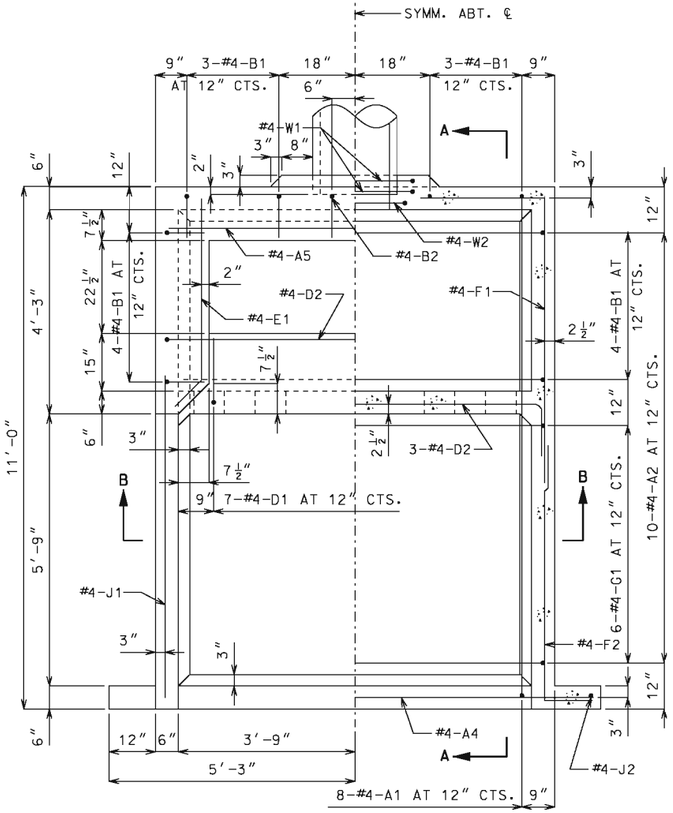



SECTION A – A




UPSTREAM ELEVATION

NOTE: BEND OR CUT A1 BARS IN FIELD TO CLEAR PIPE.




HALF PLAN HALF HORIZONTAL SECTION

**GENERAL NOTES:**

**DESIGN UNIT STRESSES**

CLASS B CONCRETE f′c = 3,000 psi
REINFORCING STEEL (GRADE 60) fy = 60,000 psi

**REINFORCING STEEL**

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

**DIMENSIONS**

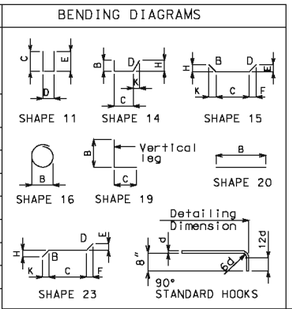
DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

| ESTIMATED QUANTITIES | | |
|---|---|---|
| ITEM | | TOTAL |
| CLASS B CONCRETE | CU. YD. | 6.1 |
| REINFORCING STEEL | LBS. | 490 |

COMPLETE BILL OF REINFORCING STEEL

| NO. REQ'D | MARK NO. SIZE | MARK | SHAPE NO. | NO. VARIES (V) | NO. EACH | DIMENSIONS B | C | D | E | F | H | K | NOMINAL LENGTH | ACTUAL LENGTH | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | LBS. |
| 8 | 4 | A1 | 11 | | | | 0-16¼ | 10-7 | 0-17¾ | | | | 13-5 | 13-3 | 71 |
| 10 | 4 | A2 | 11 | | | | 0-18¼ | 8-0 | 0-18¼ | | | | 11-1 | 10-10 | 72 |
| 5 | 4 | A3 | 20 | | | 4-6 | | | | | | | 4-6 | 4-6 | 15 |
| 1 | 4 | A4 | 20 | | | 10-3 | | | | | | | 10-3 | 10-3 | 7 |
| 1 | 4 | A5 | 20 | | | 8-3 | | | | | | | 8-3 | 8-3 | 6 |
| 14 | 4 | B1 | 19 | | | 5-9 | 0-9 | | | | | | 6-6 | 6-4 | 59 |
| 2 | 4 | B2 | 19 | | | 2-11 | 0-9 | | | | | | 3-8 | 3-6 | 5 |
| 7 | 4 | D1 | 19 | | | 2-11 | 0-16 | | | | | | 4-3 | 4-2 | 19 |
| 4 | 4 | D2 | 11 | | | | 0-20½ | 8-0 | 0-20½ | | | | 11-5 | 11-3 | 30 |
| 1 | 4 | D3 | 15 | | | 2-1½ | 2-11½ | 2-1½ | 0-21⅜ | 0-13½ | 0-21⅜ | 0-13½ | 7-3 | 7-2 | 5 |
| 2 | 4 | D4 | 14 | | | 0-12 | 0-6 | 2-1½ | | | 0-21⅜ | 0-13½ | 3-8 | 3-6 | 5 |
| 2 | 4 | E1 | 23 | | | 0-13 | 4-0⅜ | | | | 0-9⅜ | 0-9 | 5-1 | 5-1 | 7 |
| 12 | 4 | F1 | 19 | | | 2-10½ | 6-4⅛ | | | | | | 9-3 | 9-1 | 73 |
| 8 | 4 | F2 | 19 | | | 0-13 | 5-9 | | | | | | 6-10 | 6-9 | 36 |
| 2 | 4 | F3 | 20 | | | 4-0 | | | | | | | 4-0 | 4-0 | 5 |
| 12 | 4 | G1 | 20 | V | 2 | 5-8 | | | | | | | 5-8 | 5-8 | |
| | | | | | | 3-9 | (INCREMENT = 4⅜ INCHES) | | | | | | 3-9 | 3-9 | 38 |
| 2 | 4 | J1 | 20 | | | 7-5 | | | | | | | 7-5 | 7-5 | 10 |
| 2 | 4 | J2 | 19 | | | 3-10¾ | 2-1½ | | | | | | 6-0 | 5-11 | 8 |
| 2 | 4 | W1 | 16 | | | 2-4 | | | | | | | 8-2 | 8-2 | 11 |
| 1 | 4 | W2 | 16 | | | 0-23 | | | | | | | 6-11 | 6-11 | 5 |

BENDING DIAGRAMS




ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEG. STANDARD HOOKS.

HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.

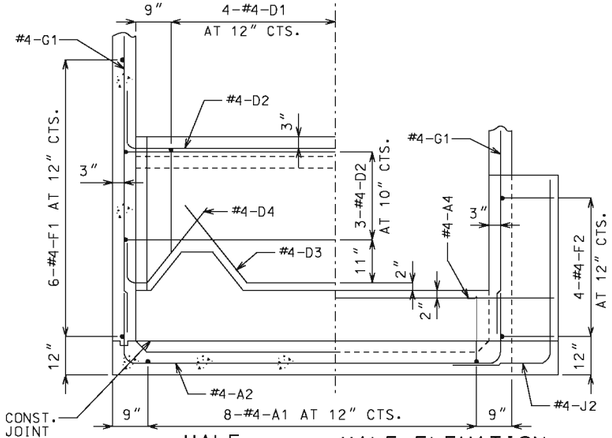
NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED FOR FABRICATORS USE.

PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

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

V – BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE AND THE FOLLOWING LINE.

NO.EA. = NUMBER OF BARS OF EACH LENGTH.




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

NOTE: BEND OR CUT D1 BARS IN FIELD TO CLEAR NOTCH IN BAFFLE WALL.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

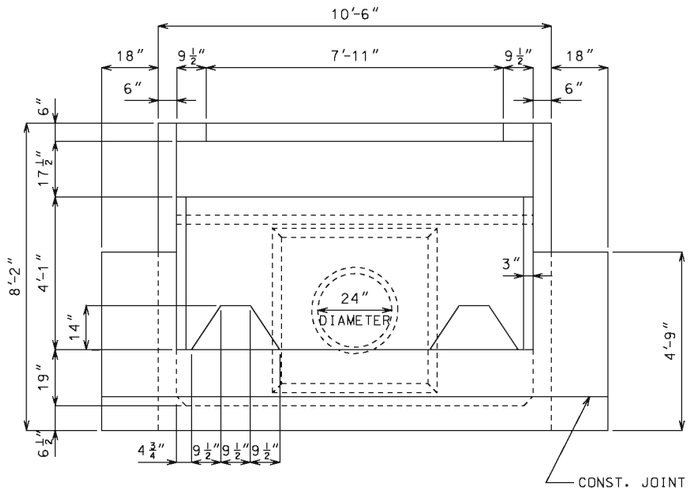
# PIPE CULVERT HEADWALL

## ENERGY DISSIPATOR (IMPACT TYPE) FOR 18″ CONCRETE PIPE

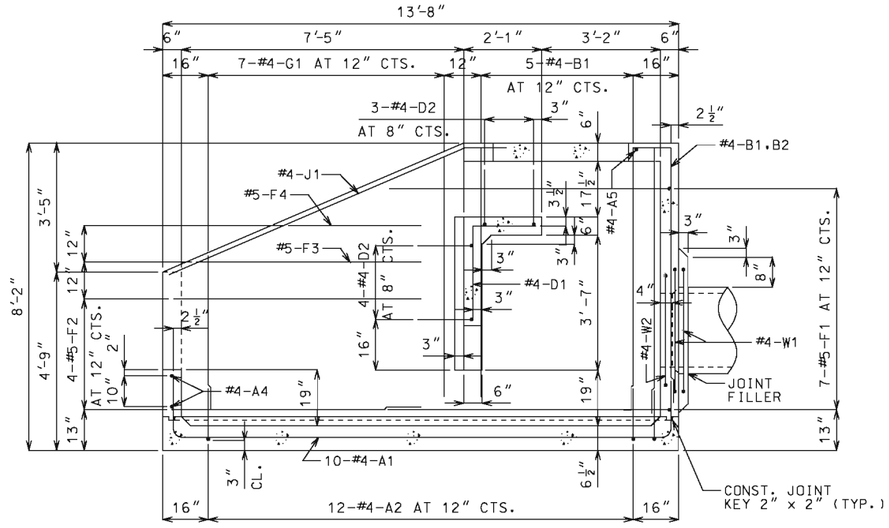
DATE EFFECTIVE: 07/01/2001
DATE PREPARED: 9/3/2009

604.10E

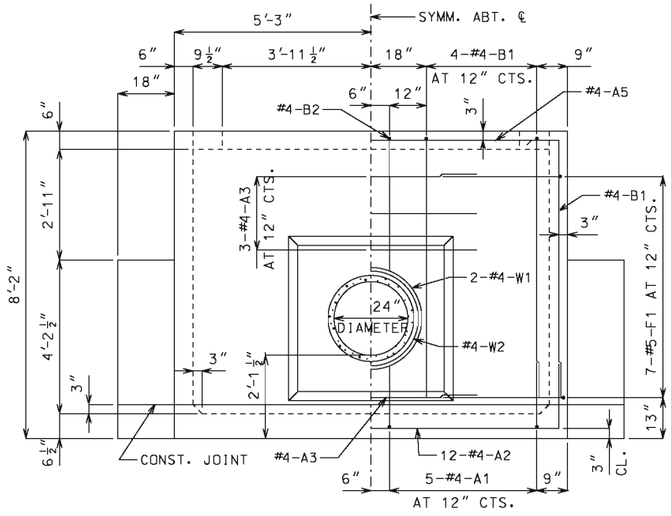
SHEET NO. 1 OF 1




DOWNSTREAM ELEVATION

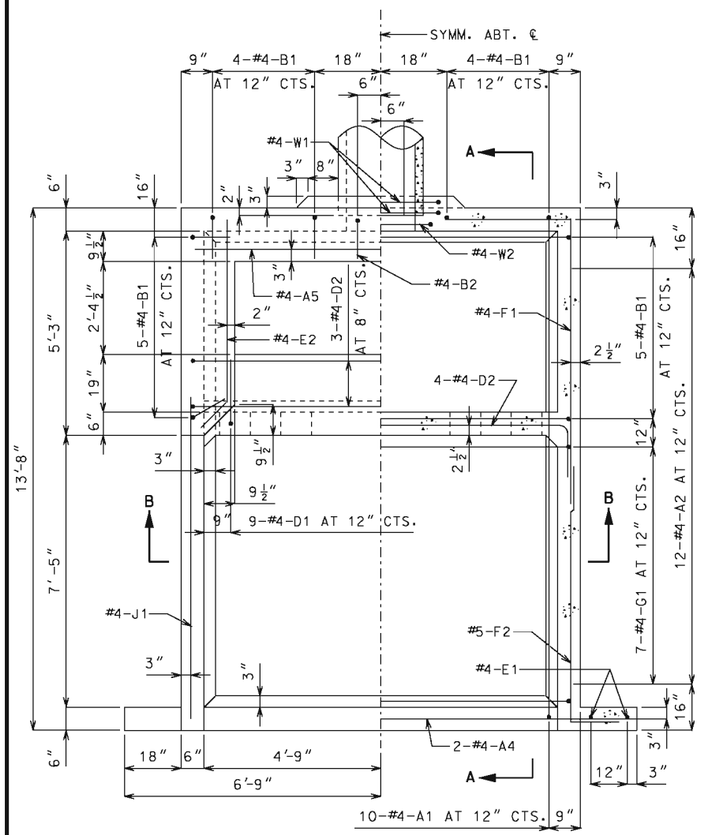



SECTION A – A




UPSTREAM ELEVATION

NOTE: BEND OR CUT A1 BARS IN FIELD TO CLEAR PIPE.




HALF PLAN HALF HORIZONTAL SECTION

**GENERAL NOTES:**

**DESIGN UNIT STRESSES**

CLASS B CONCRETE f'c = 3,000 psi
REINFORCING STEEL (GRADE 60) fy = 60,000 psi

**REINFORCING STEEL**

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

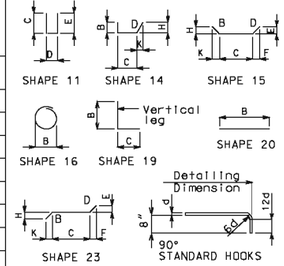
**DIMENSIONS**

DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

| ESTIMATED QUANTITIES | | |
|---|---|---|
| ITEM | | TOTAL |
| CLASS B CONCRETE | CU. YD. | 9.5 |
| REINFORCING STEEL | LBS. | 820 |

| COMPLETE BILL OF REINFORCING STEEL | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NO. REQ'D | MARK NO. SIZE | MARK NO. MARK | SHAPE NO. | VARIES (V) | NO. EACH | DIMENSIONS B | C | D | E | F | H | K | NOMINAL LENGTH | ACTUAL LENGTH | WEIGHT |
| | | | | | | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | LBS. |
| 10 | 4 | A1 | 11 | | | | 0-20¼ | 13-2½ | 0-17¾ | | | | 16-5 | 16-2 | 108 |
| 12 | 4 | A2 | 11 | | | | 0-18¾ | 10-0 | 0-18¾ | | | | 13-2 | 12-11 | 104 |
| 4 | 4 | A3 | 20 | | | 5-0 | | | | | | | 5-0 | 5-0 | 13 |
| 2 | 4 | A4 | 20 | | | 13-3 | | | | | | | 13-3 | 13-3 | 18 |
| 1 | 4 | A5 | 20 | | | 10-3 | | | | | | | 10-3 | 10-3 | 7 |
| 18 | 4 | B1 | 19 | | | 7-1½ | 0-12 | | | | | | 8-2 | 8-0 | 96 |
| 2 | 4 | B2 | 19 | | | 3-8 | 0-10 | | | | | | 4-6 | 4-5 | 6 |
| 9 | 4 | D1 | 19 | | | 3-8 | 0-20½ | | | | | | 5-5 | 5-3 | 32 |
| 7 | 4 | D2 | 11 | | | | 0-19 | 10-1 | 0-19 | | | | 13-3 | 13-1 | 61 |
| 1 | 4 | D3 | 15 | | | 2-9⅛ | 3-10 | 2-9⅛ | 2-3½ | 0-18½ | 2-3½ | 0-18½ | 9-4 | 9-3 | 6 |
| 2 | 4 | D4 | 14 | | | 0-12 | 0-7 | 2-9⅛ | | | 2-3½ | 0-18½ | 4-4 | 4-2 | 6 |
| 4 | 4 | E1 | 20 | | | 4-6 | | | | | | | 4-6 | 4-6 | 12 |
| 2 | 4 | E2 | 23 | | | 0-17 | 5-0½ | | | | 0-12 | 0-12 | 6-6 | 6-5 | 9 |
| 2 | 4 | E3 | 20 | | | 2-8 | | | | | | | 2-8 | 2-8 | 4 |
| 14 | 5 | F1 | 19 | | | 3-8 | 7-11 | | | | | | 11-7 | 11-6 | 168 |
| 8 | 5 | F2 | 19 | | | 0-19 | 7-0 | | | | | | 8-7 | 8-6 | 71 |
| 2 | 5 | F3 | 20 | | | 6-0 | | | | | | | 6-0 | 6-0 | 13 |
| 2 | 5 | F4 | 20 | | | 3-9 | | | | | | | 3-9 | 3-9 | 8 |
| 14 | 4 | G1 | 20 | V | 2 | 6-8 | | | | | | | 6-8 | 6-8 | |
| | | | | | | 4-1 | (INCREMENT = 5⅛ INCHES) | | | | | | 4-1 | 4-1 | 50 |
| 2 | 4 | J1 | 20 | | | 9-6 | | | | | | | 9-6 | 9-6 | 13 |
| 2 | 4 | W1 | 16 | | | 2-9 | | | | | | | 9-6 | 9-6 | 13 |
| 1 | 4 | W2 | 16 | | | 2-5 | | | | | | | 8-6 | 8-6 | 6 |

BENDING DIAGRAMS




ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEG. STANDARD HOOKS.

HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.

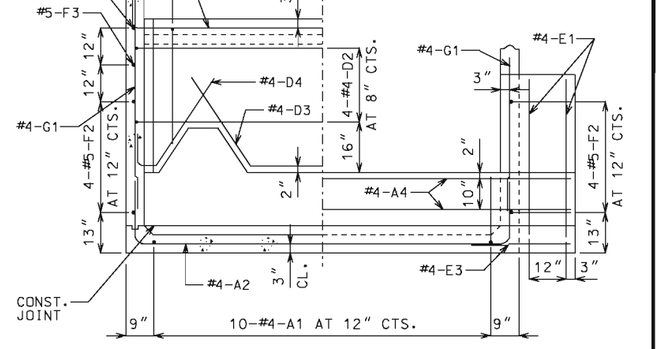
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PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

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

V – BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE AND THE FOLLOWING LINE.

NO.EA. = NUMBER OF BARS OF EACH LENGTH.




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

NOTE: BEND OR CUT D1 BARS IN FIELD TO CLEAR NOTCH IN BAFFLE WALL.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
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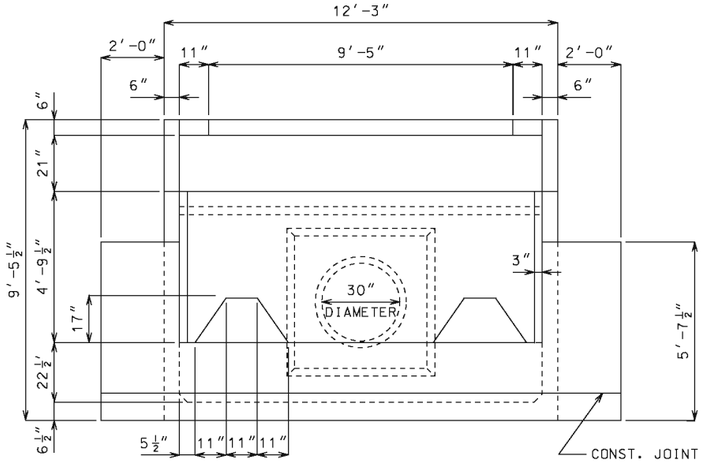
# PIPE CULVERT HEADWALL
## ENERGY DISSIPATOR (IMPACT TYPE) FOR 24" CONCRETE PIPE

DATE EFFECTIVE: 07/01/2001
DATE PREPARED: 9/3/2009

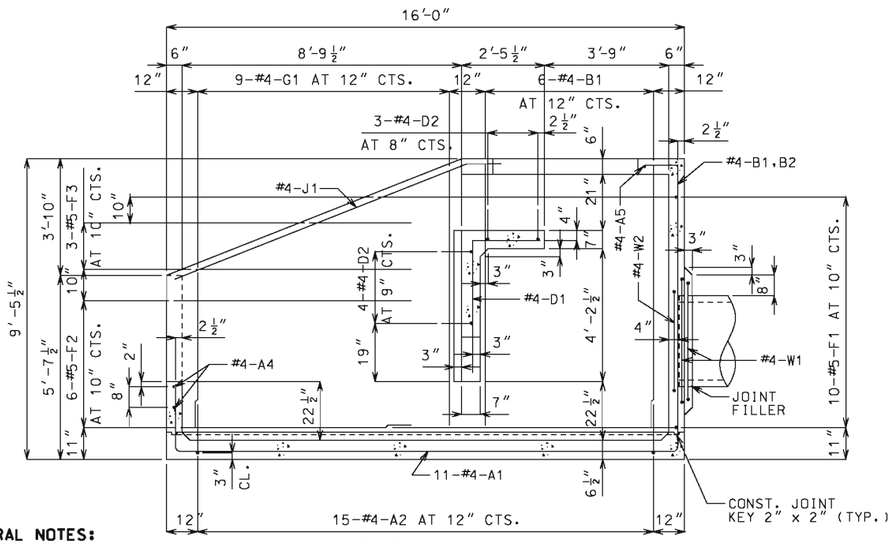
604.11E

SHEET NO. 1 OF 1

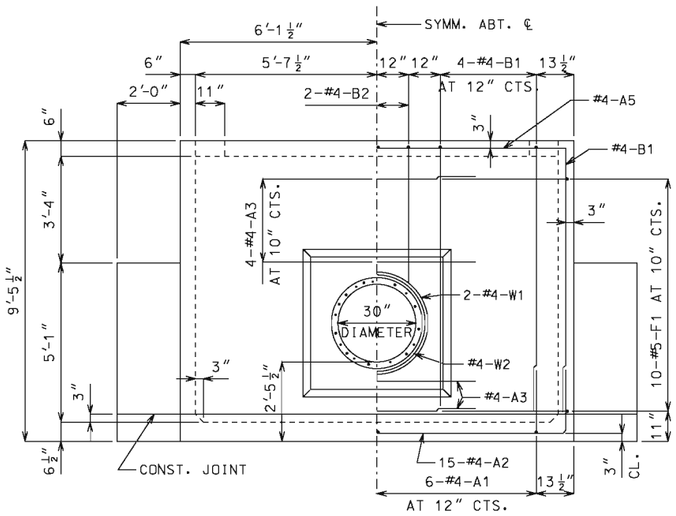
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




DOWNSTREAM ELEVATION

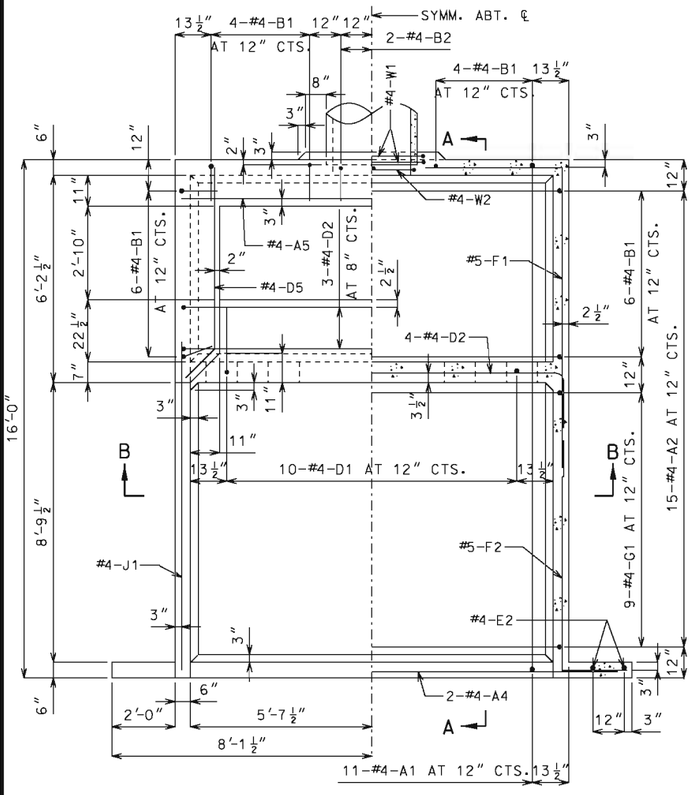



SECTION A – A




UPSTREAM ELEVATION

NOTE: BEND OR CUT A1 BARS IN FIELD TO CLEAR PIPE.




HALF PLAN HALF HORIZONTAL SECTION

**GENERAL NOTES:**

**DESIGN UNIT STRESSES**

CLASS B CONCRETE f′c = 3,000 psi
REINFORCING STEEL (GRADE 60) fy = 60,000 psi

**REINFORCING STEEL**

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

**DIMENSIONS**

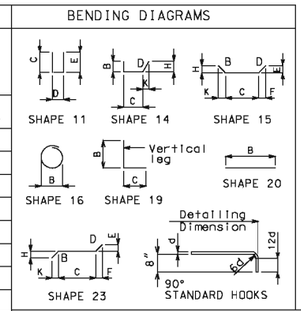
DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

| ESTIMATED QUANTITIES | | |
|---|---|---|
| ITEM | | TOTAL |
| CLASS B CONCRETE | CU. YD. | 13.2 |
| REINFORCING STEEL | LBS. | 1,170 |

COMPLETE BILL OF REINFORCING STEEL

| NO. REQ'D | MARK NO. SIZE | MARK | SHAPE NO. | VARIES (V) | NO. EACH | DIMENSIONS B | C | D | E | F | H | K | NOMINAL LENGTH | ACTUAL LENGTH | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | LBS. |
| 11 | 4 | A1 | 11 | | | | 2-0½ | 15-6 | 0-20½ | | | | 19-3 | 19-1 | 140 |
| 15 | 4 | A2 | 11 | | | | 0-20½ | 11-10 | 0-20½ | | | | 15-3 | 15-1 | 151 |
| 6 | 4 | A3 | 20 | | | 5-4 | | | | | | | 5-4 | 5-4 | 21 |
| 2 | 4 | A4 | 20 | | | 13-3 | | | | | | | 13-3 | 13-3 | 18 |
| 1 | 4 | A5 | 20 | | | 11-9 | | | | | | | 11-9 | 11-9 | 8 |
| 20 | 4 | B1 | 19 | | | 8-5½ | 0-13 | | | | | | 9-7 | 9-5 | 126 |
| 3 | 4 | B2 | 19 | | | 4-0 | 0-13 | | | | | | 5-1 | 5-0 | 10 |
| 10 | 4 | D1 | 19 | | | 4-4 | 2-0½ | | | | | | 6-5 | 6-3 | 42 |
| 7 | 4 | D2 | 11 | | | | 0-12 | 11-10 | 0-12 | | | | 13-10 | 13-8 | 64 |
| 1 | 4 | D3 | 15 | | | 2-11 | 4-7 | 2-11 | 2-6 | 0-18 | 2-6 | 0-18 | 10-5 | 10-4 | 7 |
| 2 | 4 | D4 | 14 | | | 0-12 | 0-7 | 3-0 | | | 2-6 | 0-20 | 4-7 | 4-5 | 6 |
| 2 | 4 | D5 | 23 | | | 0-18⅜ | 5-7 | | | | 0-13 | 0-13 | 7-1 | 7-1 | 9 |
| 2 | 4 | E1 | 20 | | | 3-0 | | | | | | | 3-0 | 3-0 | 4 |
| 4 | 4 | E2 | 20 | | | 5-3 | | | | | | | 5-3 | 5-3 | 14 |
| 20 | 5 | F1 | 19 | | | 8-8⅜ | 4-2½ | | | | | | 12-11 | 12-9 | 266 |
| 12 | 5 | F2 | 19 | | | 2-1 | 8-1 | | | | | | 10-2 | 10-1 | 126 |
| 6 | 5 | F3 | 20 | V | 2 | 3-0⅞ | | | | | | | 3-1 | 3-1 | |
| | | | | | | 7-0⅞ | (INCREMENT = 24 INCHES) | | | | | | 7-1 | 7-1 | 32 |
| 18 | 4 | G1 | 20 | V | 2 | 5-1⅜ | | | | | | | 5-1 | 5-1 | |
| | | | | | | 8-5⅜ | (INCREMENT = 5 INCHES) | | | | | | 8-5 | 8-5 | 81 |
| 2 | 4 | J1 | 20 | | | 10-11 | | | | | | | 10-11 | 10-11 | 15 |
| 2 | 4 | W1 | 16 | | | 3-6 | | | | | | | 11-10 | 11-10 | 16 |
| 1 | 4 | W2 | 16 | | | 2-11 | | | | | | | 10-0 | 10-0 | 7 |

BENDING DIAGRAMS




ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEG. STANDARD HOOKS.

HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.

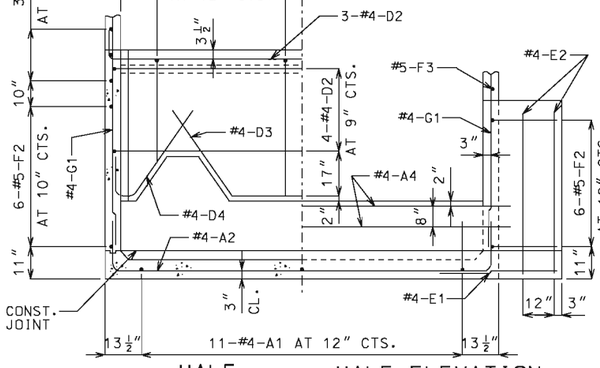
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PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

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

V – BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE AND THE FOLLOWING LINE.

NO.EA. = NUMBER OF BARS OF EACH LENGTH.




HALF SECTION B-B

HALF ELEVATION OF LOWER BAFFLE AND WING

NOTE: BEND OR CUT D1 BARS IN FIELD TO CLEAR NOTCH IN BAFFLE WALL.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# PIPE CULVERT HEADWALL

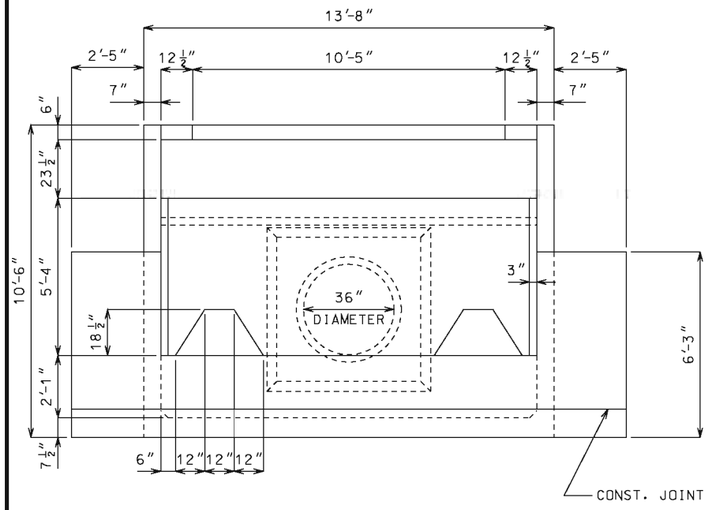
## ENERGY DISSIPATOR (IMPACT TYPE) FOR 30″ CONCRETE PIPE

DATE EFFECTIVE: 07/01/2001
DATE PREPARED: 9/3/2009

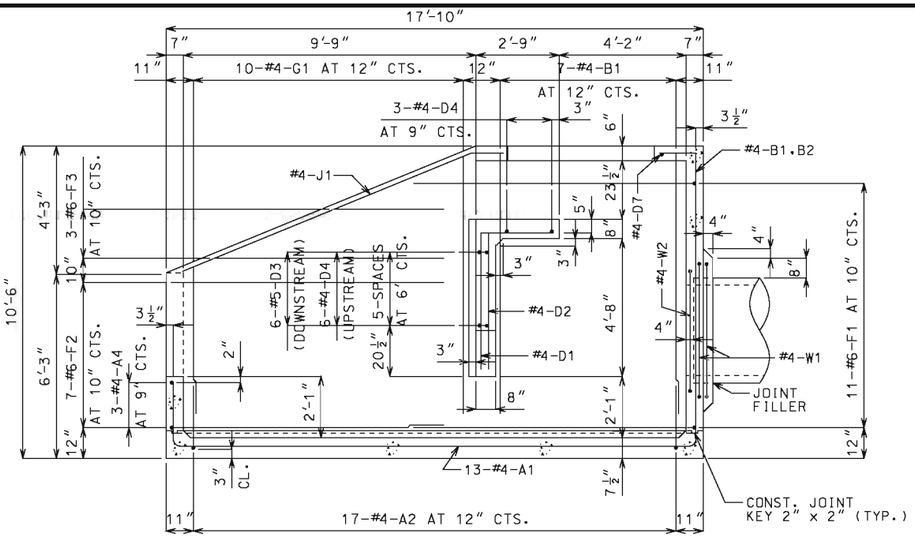
604.12E

SHEET NO. 1 OF 1

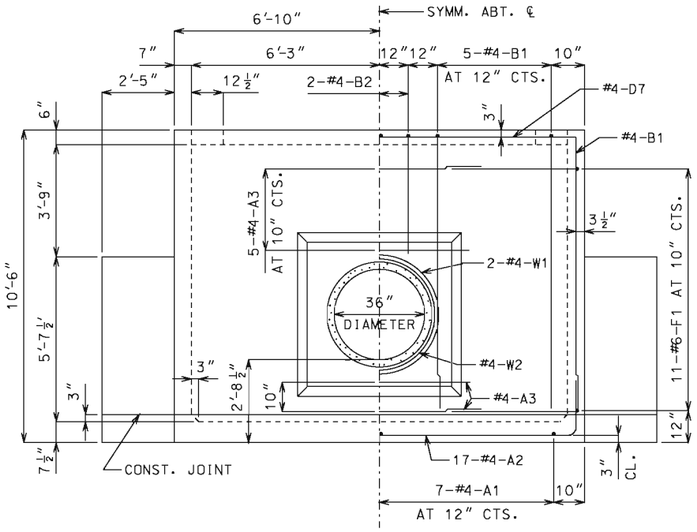
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




DOWNSTREAM ELEVATION

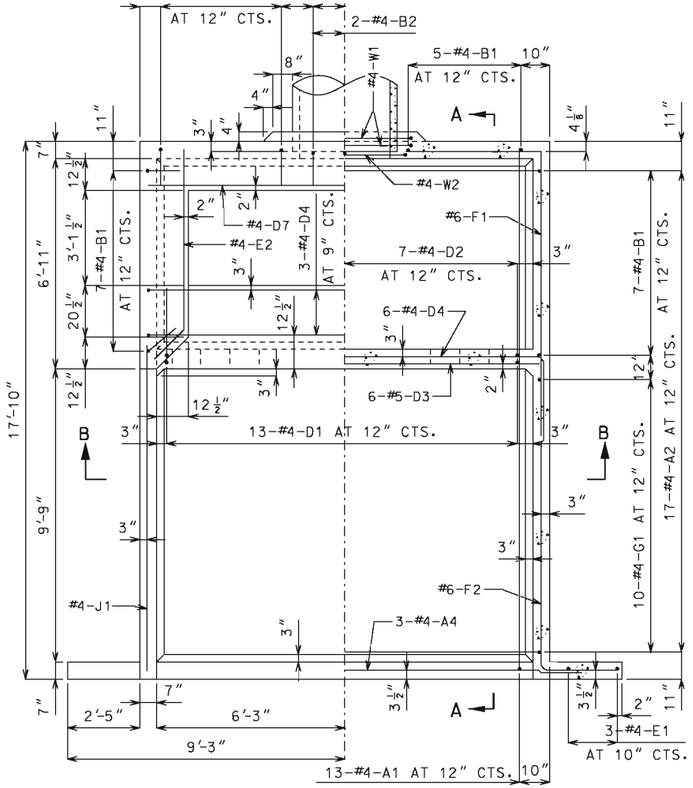



SECTION A - A




UPSTREAM ELEVATION

NOTE: BEND OR CUT A1 BARS IN FIELD TO CLEAR PIPE.




HALF PLAN HALF HORIZONTAL SECTION

**GENERAL NOTES:**

**DESIGN UNIT STRESSES**

CLASS B CONCRETE f'c = 3,000 psi
REINFORCING STEEL (GRADE 60) fy = 60,000 psi

**REINFORCING STEEL**

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

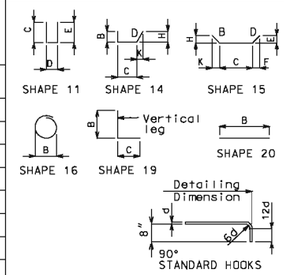
**DIMENSIONS**

DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

| ESTIMATED QUANTITIES | | |
|---|---|---|
| ITEM | | TOTAL |
| CLASS B CONCRETE | CU. YD. | 19.0 |
| REINFORCING STEEL | LBS. | 1,870 |

| COMPLETE BILL OF REINFORCING STEEL | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NO. REQ'D | MARK NO. SIZE | MARK | SHAPE NO. | VARIES (V) | NO. EACH | DIMENSIONS B | C | D | E | F | H | K | NOMINAL LENGTH | ACTUAL LENGTH | WEIGHT |
| | | | | | | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | LBS. |
| 13 | 4 | A1 | 11 | | | | 2-2½ | 17-5½ | 2-4 | | | | 22-0 | 21-10 | 190 |
| 17 | 4 | A2 | 11 | | | | 2-4 | 13-1 | 2-4 | | | | 17-9 | 17-7 | 200 |
| 7 | 4 | A3 | 20 | | | 5-11 | | | | | | | 5-11 | 5-11 | 28 |
| 3 | 4 | A4 | 20 | | | 15-2 | | | | | | | 15-2 | 15-2 | 30 |
| 24 | 4 | B1 | 19 | | | 8-7½ | 0-15 | | | | | | 9-11 | 9-9 | 156 |
| 3 | 4 | B2 | 19 | | | 4-2½ | 0-15 | | | | | | 5-6 | 5-4 | 11 |
| 13 | 4 | D1 | 19 | | | 4-11 | 2-5½ | | | | | | 7-5 | 7-3 | 63 |
| 13 | 4 | D2 | 20 | | | 4-11 | | | | | | | 4-11 | 4-11 | 43 |
| 6 | 5 | D3 | 20 | | | 13-5 | | | | | | | 13-5 | 13-5 | 84 |
| 9 | 4 | D4 | 11 | | | | 0-12 | 13-2 | 0-12 | | | | 15-2 | 15-0 | 90 |
| 4 | 4 | D5 | 14 | | | 0-12 | 0-8¾ | 3-0 | | | 2-6 | 0-20 | 4-9 | 4-7 | 12 |
| 2 | 4 | D6 | 15 | | | 3-0 | 5-4½ | 3-0 | 2-6 | 0-20 | 2-6 | 0-20 | 11-5 | 11-4 | 15 |
| 1 | 4 | D7 | 20 | | | 13-5 | | | | | | | 13-5 | 13-5 | 9 |
| 6 | 4 | E1 | 20 | | | 6-0 | | | | | | | 6-0 | 6-0 | 24 |
| 2 | 4 | E2 | 15 | | | 0-22⅝ | 6-0 | | | | 0-16 | 0-16 | 7-11 | 7-10 | 10 |
| 2 | 4 | E3 | 20 | | | 3-7 | | | | | | | 3-7 | 3-7 | 5 |
| 22 | 6 | F1 | 19 | | | 9-10½ | 4-7½ | | | | | | 14-6 | 14-4 | 474 |
| 14 | 6 | F2 | 19 | | | 9-2½ | 2-6½ | | | | | | 11-9 | 11-7 | 244 |
| 6 | 6 | F3 | 20 | V | 2 | 3-6 | | | | | | | 3-6 | 3-6 | |
| | | | | | | 7-6 | (INCREMENT = 24 INCHES) | | | | | | 7-6 | 7-6 | 50 |
| 20 | 4 | G1 | 20 | V | 2 | 4-9 | | | | | | | 4-9 | 4-9 | |
| | | | | | | 8-5½ | (INCREMENT = 5 INCHES) | | | | | | 8-6 | 8-6 | 89 |
| 2 | 4 | J1 | 20 | | | 12-0 | | | | | | | 12-0 | 12-0 | 16 |
| 2 | 4 | W1 | 16 | | | 4-0½ | | | | | | | 13-7 | 13-7 | 18 |
| 1 | 4 | W2 | 16 | | | 3-4½ | | | | | | | 11-6 | 11-6 | 8 |

BENDING DIAGRAMS




ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEG. STANDARD HOOKS.

HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.

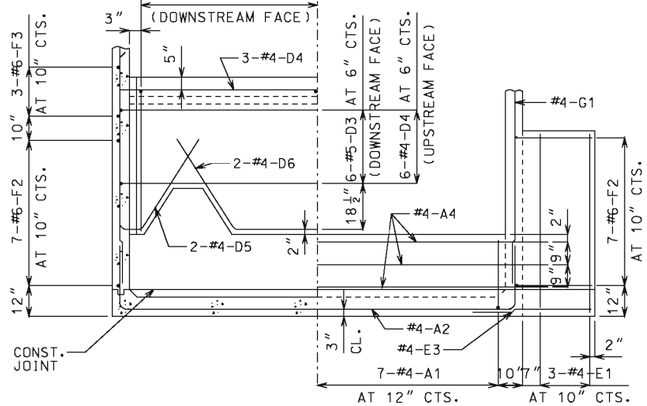
NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED FOR FABRICATORS USE.

PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

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

V - BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE AND THE FOLLOWING LINE.

NO.EA. = NUMBER OF BARS OF EACH LENGTH.




HALF SECTION B-B

HALF ELEVATION OF LOWER BAFFLE AND WING

NOTE: BEND OR CUT D1 AND D2 BARS IN FIELD TO CLEAR NOTCH IN BAFFLE WALL.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# PIPE CULVERT HEADWALL

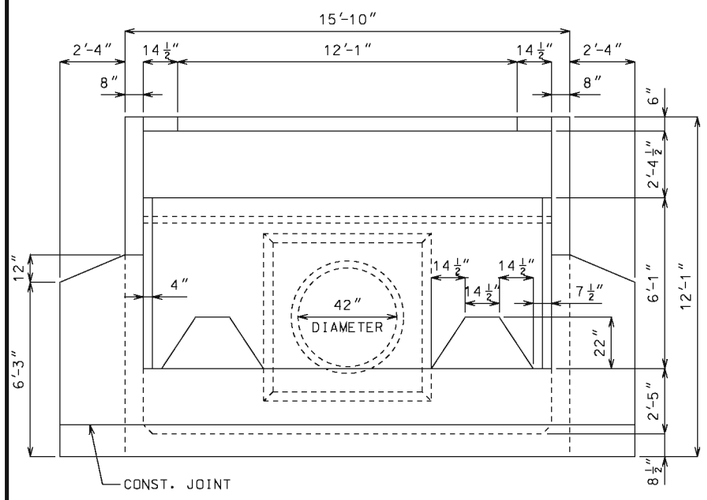
## ENERGY DISSIPATOR (IMPACT TYPE) FOR 36" CONCRETE PIPE

DATE EFFECTIVE: 07/01/2001
DATE PREPARED: 9/3/2009

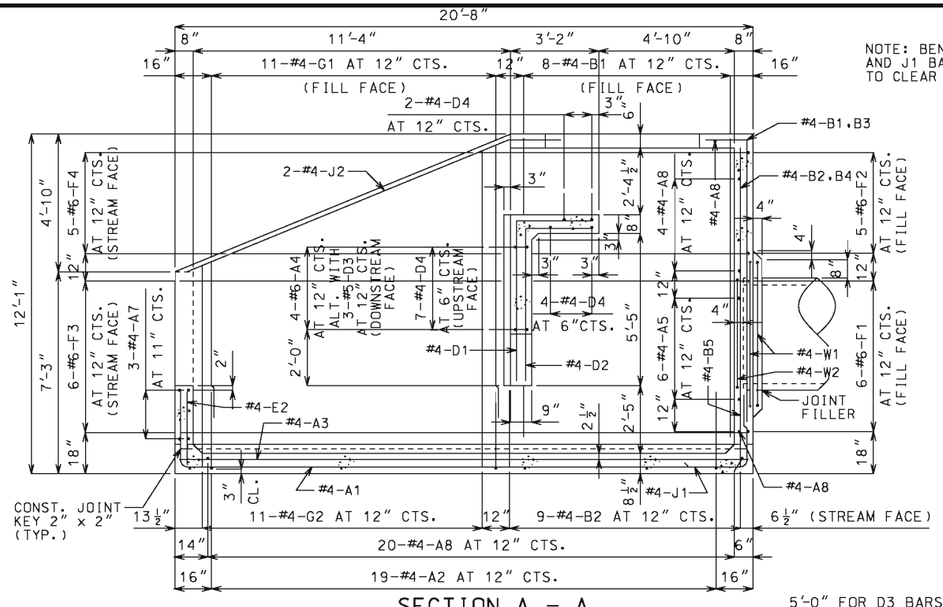
604.13E

SHEET NO. 1 OF 1

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

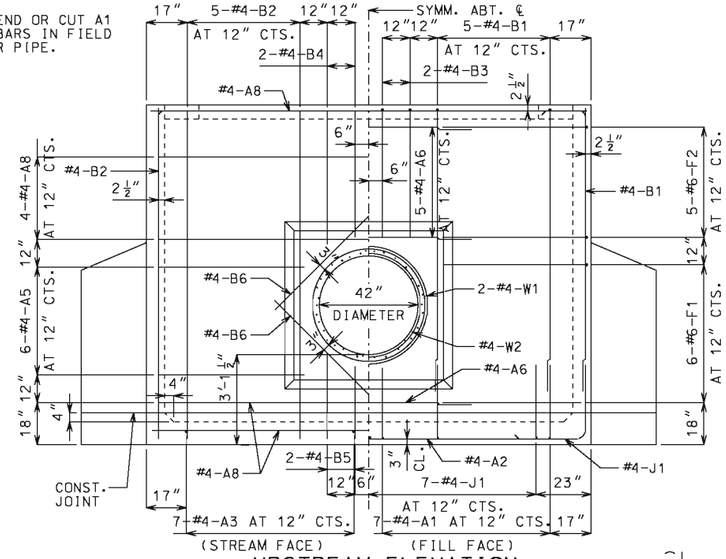



DOWNSTREAM ELEVATION

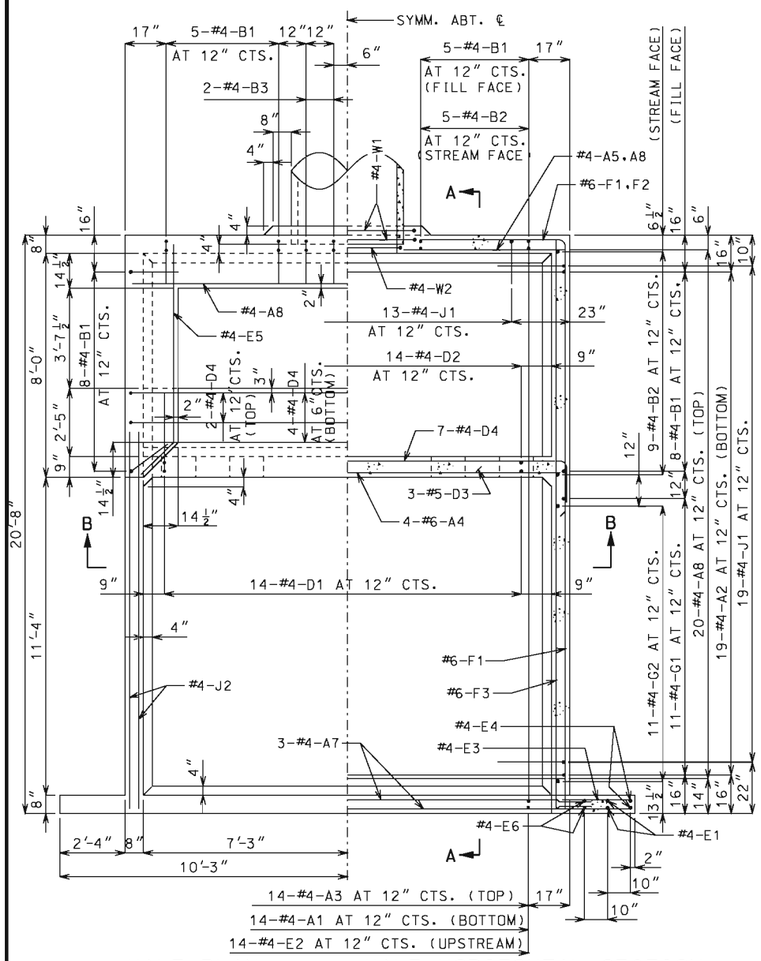



SECTION A – A

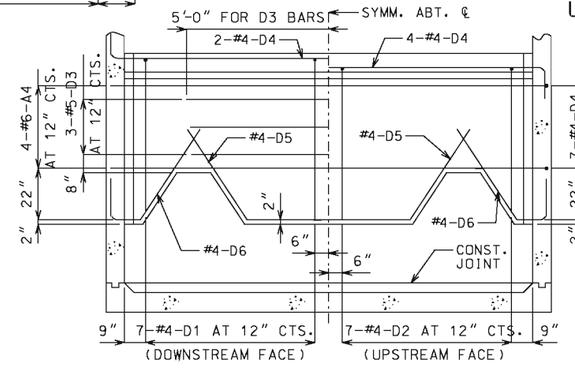
NOTE: BEND OR CUT A1 AND J1 BARS IN FIELD TO CLEAR PIPE.




UPSTREAM ELEVATION

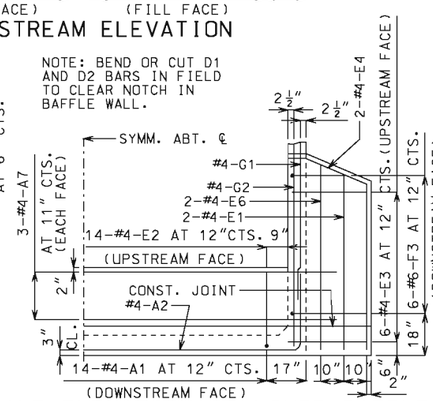



HALF PLAN HALF HORIZONTAL SECTION




SECTION B-B

NOTE: BEND OR CUT D1 AND D2 BARS IN FIELD TO CLEAR NOTCH IN BAFFLE WALL.




HALF ELEVATION OF LOWER BAFFLE AND WING

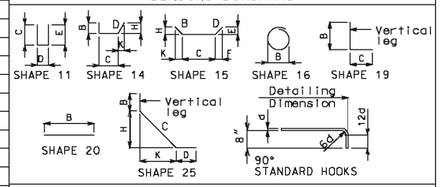
COMPLETE BILL OF REINFORCING STEEL

| NO. REQ'D | MARK NO. SIZE | MARK | SHAPE NO. | NO. VARIES (V) | NO. EACH | DIMENSIONS B | C | D | E | F | H | K | NOMINAL LENGTH | ACTUAL LENGTH | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | LBS. |
| 14 | 4 | A1 | 11 | | | | 2-9 | 20-4 | 2-9 | | | | 25-10 | 25-8 | 240 |
| 19 | 4 | A2 | 11 | | | | 2-10 | 15-7 | 2-10 | | | | 21-3 | 21-1 | 268 |
| 14 | 4 | A3 | 20 | | | 20-4 | | | | | | | 20-4 | 20-4 | 190 |
| 4 | 6 | A4 | 20 | | | 15-7 | | | | | | | 15-7 | 15-7 | 94 |
| 12 | 4 | A5 | 20 | | | 5-7 | | | | | | | 5-7 | 5-7 | 45 |
| 6 | 4 | A6 | 20 | | | 6-5 | | | | | | | 6-5 | 6-5 | 26 |
| 6 | 4 | A7 | 20 | | | 16-9 | | | | | | | 16-9 | 16-9 | 67 |
| 26 | 4 | A8 | 20 | | | 15-7 | | | | | | | 15-7 | 15-7 | 271 |
| 26 | 4 | B1 | 19 | | | 9-11½ | 0-19 | | | | | | 11-7 | 11-5 | 198 |
| 28 | 4 | B2 | 20 | | | 11-10 | | | | | | | 11-10 | 11-10 | 221 |
| 4 | 4 | B3 | 19 | | | 4-10 | 0-19 | | | | | | 6-5 | 6-4 | 17 |
| 4 | 4 | B4 | 20 | | | 4-10 | | | | | | | 4-10 | 4-10 | 13 |
| 4 | 4 | B5 | 20 | | | 2-6 | | | | | | | 2-6 | 2-6 | 7 |
| 4 | 4 | B6 | 20 | | | 5-0 | | | | | | | 5-0 | 5-0 | 13 |
| 14 | 4 | D1 | 19 | | | 5-9½ | 2-10½ | | | | | | 8-8 | 8-7 | 80 |
| 14 | 4 | D2 | 19 | | | 5-5½ | 2-6 | | | | | | 8-0 | 7-10 | 73 |
| 3 | 5 | D3 | 20 | | | 10-0 | | | | | | | 10-0 | 10-0 | 31 |
| 13 | 4 | D4 | 11 | | | | 0-12 | 15-7 | 0-12 | | | | 17-7 | 17-5 | 151 |
| 2 | 4 | D5 | 15 | | | 3-7⅜ | 5-10 | 3-7⅜ | 3-0½ | 2-0 | 3-0½ | 2-0 | 13-1 | 13-0 | 17 |
| 4 | 4 | D6 | 14 | | | 0-12 | 0-13½ | 3-7⅜ | | | 3-0½ | 2-0 | 5-9 | 5-7 | 15 |
| 4 | 4 | E1 | 20 | | | 6-5 | | | | | | | 6-5 | 6-5 | 17 |
| 14 | 4 | E2 | 20 | | | 2-10 | | | | | | | 2-10 | 2-10 | 26 |
| 12 | 4 | E3 | 20 | | | 2-9 | | | | | | | 2-9 | 2-9 | 22 |
| 4 | 4 | E4 | 25 | | | 6-0 | 2-5 | 0-6½ | | | 0-11½ | 2-2½ | 8-11 | 8-10 | 24 |
| 2 | 4 | E5 | 15 | | | 2-2⅞ | 7-3½ | | | | 0-19 | 0-19 | 9-6 | 9-6 | 13 |
| 4 | 4 | E6 | 20 | | | 6-9 | | | | | | | 6-9 | 6-9 | 18 |
| 12 | 6 | F1 | 19 | | | 20-5 | 5-5½ | | | | | | 25-11 | 25-9 | 464 |
| 10 | 6 | F2 | 19 | V | 2 | 9-8 | 5-5½ | | | | | | 15-2 | 15-0 | |
| | | | | | | 19-6 | 5-5½ | | (INCREMENT = 29½) | | | | 25-0 | 24-10 | 299 |
| 12 | 6 | F3 | 19 | | | 20-5 | 2-9 | | | | | | 23-2 | 23-0 | 415 |
| 10 | 6 | F4 | 20 | V | 2 | 9-8 | | | | | | | 9-8 | 9-8 | |
| | | | | | | 19-6 | | | (INCREMENT = 29½) | | | | 19-6 | 19-6 | 219 |
| 22 | 4 | G1 | 20 | V | 2 | 5-7 | | | | | | | 5-7 | 5-7 | |
| | | | | | | 9-6 | | | (INCREMENT = 4⅜) | | | | 9-6 | 9-6 | 111 |
| 22 | 4 | G2 | 20 | V | 2 | 7-7 | | | | | | | 7-7 | 7-7 | |
| | | | | | | 11-6 | | | (INCREMENT = 4⅜) | | | | 11-6 | 11-6 | 140 |
| 51 | 4 | J1 | 19 | | | 3-3 | 3-3 | | | | | | 6-6 | 6-5 | 219 |
| 4 | 4 | J2 | 20 | | | 13-10 | | | | | | | 13-10 | 13-10 | 37 |
| 2 | 4 | W1 | 16 | | | 4-7½ | | | | | | | 15-5 | 15-5 | 21 |
| 1 | 4 | W2 | 16 | | | 3-10½ | | | | | | | 13-1 | 13-1 | 9 |

ESTIMATED QUANTITIES

| ITEM | | TOTAL |
|---|---|---|
| CLASS B CONCRETE | CU. YD. | 28.2 |
| REINFORCING STEEL | LBS. | 4,090 |

BENDING DIAGRAMS




ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEG. STANDARD HOOKS.

HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.

NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED FOR FABRICATORS USE.

PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

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

V - BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE AND THE FOLLOWING LINE.

NO.EA. = NUMBER OF BARS OF EACH LENGTH.

**GENERAL NOTES:**

**DESIGN UNIT STRESSES**

CLASS B CONCRETE f'c = 3,000 psi
REINFORCING STEEL (GRADE 60) fy = 60,000 psi

**REINFORCING STEEL**

MINIMUM CLEARANCE TO REINFORCING STEEL

**DIMENSIONS**

DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

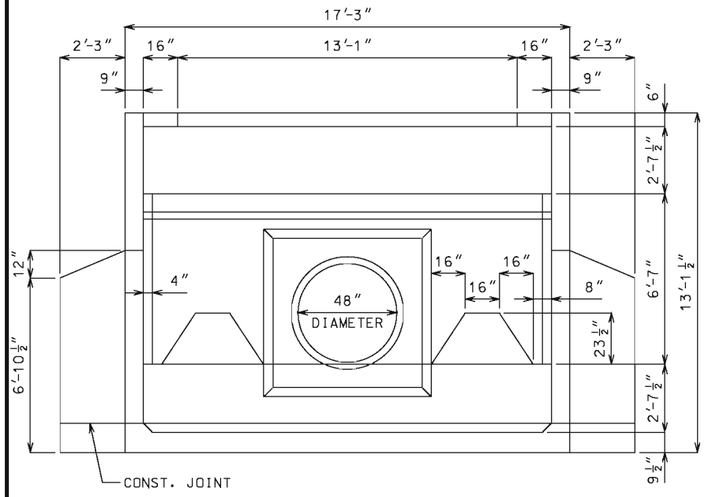
# PIPE CULVERT HEADWALL

## ENERGY DISSIPATOR (IMPACT TYPE) FOR 42" CONCRETE PIPE

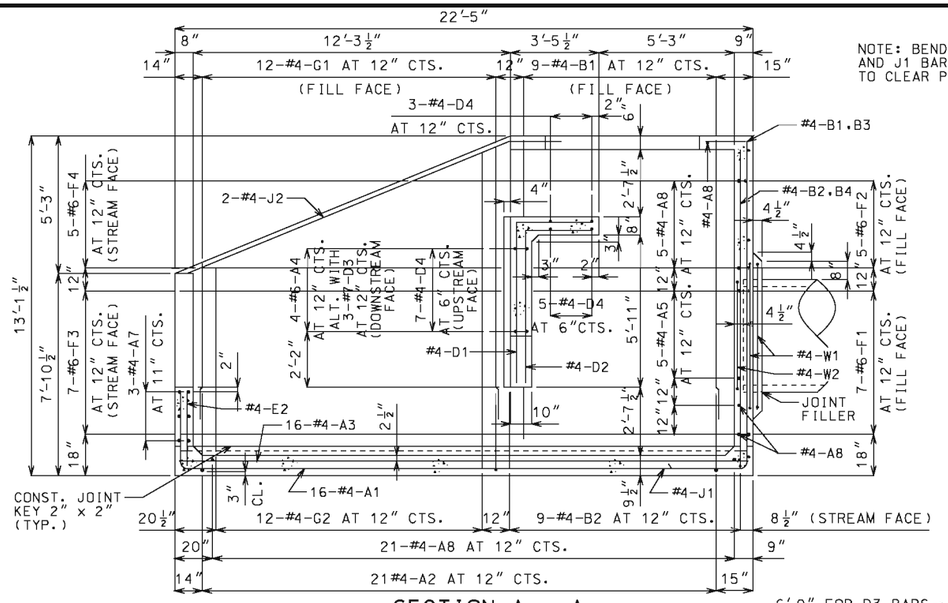
DATE EFFECTIVE: 07/01/2001
DATE PREPARED: 9/3/2009

604.14E

SHEET NO. 1 OF 1

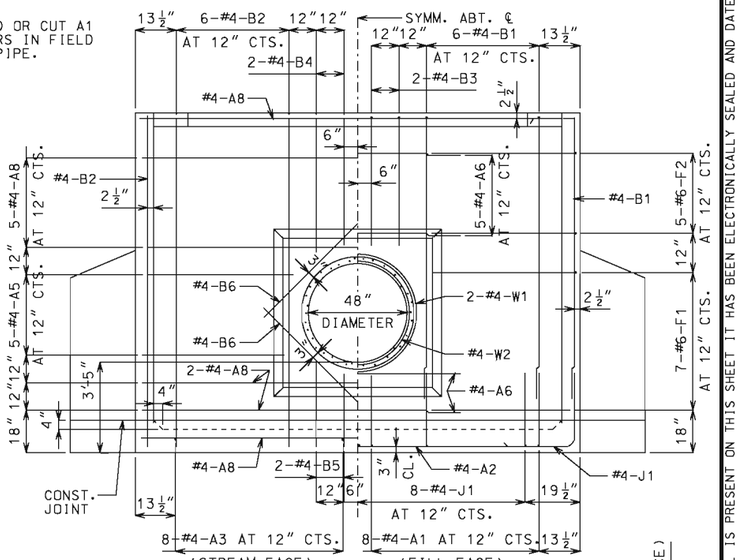



## DOWNSTREAM ELEVATION

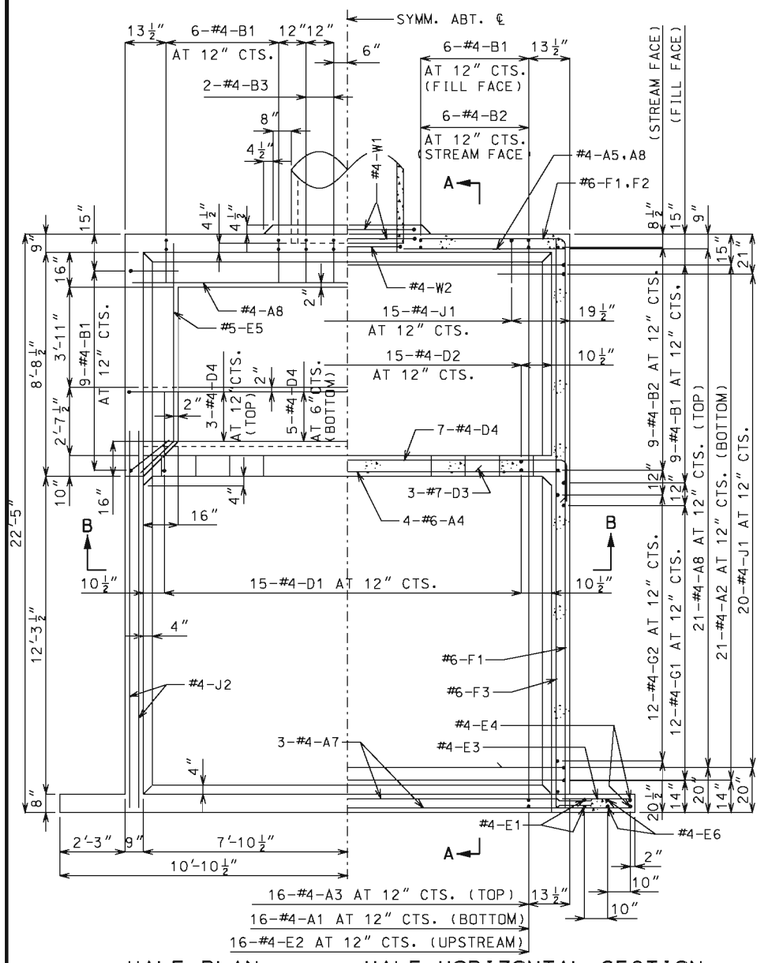



## SECTION A - A

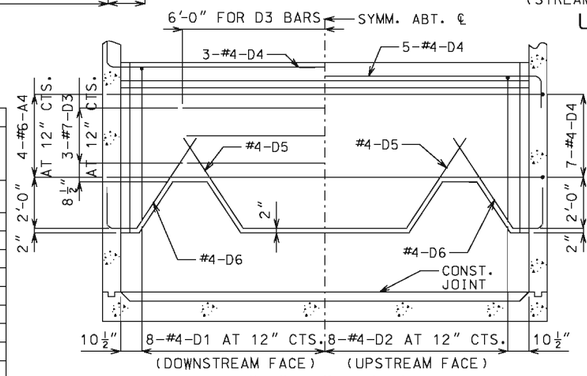
NOTE: BEND OR CUT A1 AND J1 BARS IN FIELD TO CLEAR PIPE.



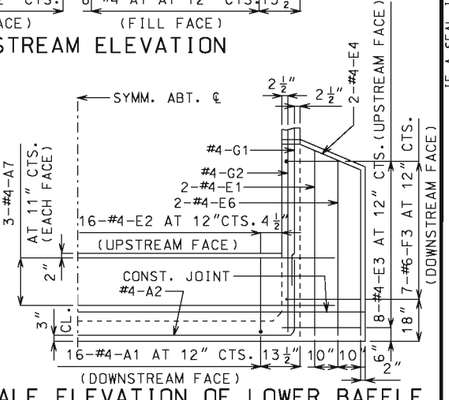

## UPSTREAM ELEVATION




## HALF PLAN HALF HORIZONTAL SECTION




## SECTION B-B




## HALF ELEVATION OF LOWER BAFFLE AND WING

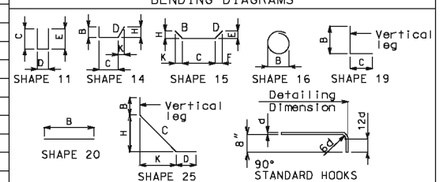
### COMPLETE BILL OF REINFORCING STEEL

| NO. REQ'D | MARK NO. SIZE | MARK | SHAPE NO. | VARIES (V) NO. EACH | DIMENSIONS B | C | D | E | F | H | K | NOMINAL LENGTH | ACTUAL LENGTH | WEIGHT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | FT. IN. | LBS. |
| 16 | 4 | A1 | 11 | | | 3-0½ | 22-1 | 3-0½ | | | | 28-2 | 28-0 | 299 |
| 21 | 4 | A2 | 11 | | | 3-1 | 16-11 | 3-1 | | | | 23-1 | 22-11 | 321 |
| 16 | 4 | A3 | 20 | | 22-2 | | | | | | | 22-2 | 22-2 | 237 |
| 4 | 6 | A4 | 20 | | 17-0 | | | | | | | 17-0 | 17-0 | 102 |
| 10 | 4 | A5 | 20 | | 6-0 | | | | | | | 6-0 | 6-0 | 40 |
| 7 | 4 | A6 | 20 | | 7-1 | | | | | | | 7-1 | 7-1 | 33 |
| 6 | 4 | A7 | 20 | | 18-0 | | | | | | | 18-0 | 18-0 | 72 |
| 29 | 4 | A8 | 20 | | 17-0 | | | | | | | 17-0 | 17-0 | 329 |
| 30 | 4 | B1 | 19 | | 10-8½ | 0-21½ | | | | | | 12-6 | 12-5 | 249 |
| 30 | 4 | B2 | 20 | | 12-10½ | | | | | | | 12-11 | 12-11 | 259 |
| 4 | 4 | B3 | 19 | | 5-0½ | 0-21½ | | | | | | 6-10 | 6-9 | 18 |
| 4 | 4 | B4 | 20 | | 5-1 | | | | | | | 5-1 | 5-1 | 14 |
| 4 | 4 | B5 | 20 | | 2-10 | | | | | | | 2-10 | 2-10 | 8 |
| 4 | 4 | B6 | 20 | | 5-1 | | | | | | | 5-1 | 5-1 | 14 |
| 15 | 4 | D1 | 19 | | 6-3½ | 3-2½ | | | | | | 9-6 | 9-5 | 94 |
| 15 | 4 | D2 | 19 | | 5-11 | 2-8 | | | | | | 8-7 | 8-6 | 85 |
| 3 | 7 | D3 | 20 | | 12-0 | | | | | | | 12-0 | 12-0 | 74 |
| 15 | 4 | D4 | 11 | | | 0-12 | 17-0 | 0-12 | | | | 19-0 | 18-10 | 189 |
| 2 | 4 | D5 | 15 | | 3-9⅞ | 6-4 | 3-9⅞ | 3-1¾ | 2-2 | 3-1¾ | 2-2 | 14-0 | 13-11 | 19 |
| 4 | 4 | D6 | 14 | | 0-12 | 0-15 | 3-9⅞ | | | 3-1¾ | 2-2 | 6-1 | 5-11 | 16 |
| 4 | 4 | E1 | 20 | | 7-5 | | | | | | | 7-5 | 7-5 | 20 |
| 16 | 4 | E2 | 20 | | 3-2 | | | | | | | 3-2 | 3-2 | 34 |
| 16 | 4 | E3 | 20 | | 2-9 | | | | | | | 2-9 | 2-9 | 29 |
| 4 | 4 | E4 | 25 | | 6-8 | 2-2⅞ | 0-7½ | | | 0-10 | 2-1 | 9-6 | 9-6 | 25 |
| 2 | 5 | E5 | 15 | | 2-7⅛ | 7-11½ | | | | 0-22 | 0-22 | 10-7 | 10-6 | 22 |
| 4 | 4 | E6 | 20 | | 7-1 | | | | | | | 7-1 | 7-1 | 19 |
| 14 | 6 | F1 | 19 | V 2 | 22-3 | 6-0 | | | | | | 28-3 | 28-1 | 591 |
| 10 | 6 | F2 | 19 | V 2 | 10-8½ | 6-0 | | | | | | 16-9 | 16-7 | |
| | | | | | 20-6½ | 6-0 | (INCREMENT = 29½) | | | | | 26-7 | 26-5 | 323 |
| 14 | 6 | F3 | 19 | | 22-3 | 2-9 | | | | | | 25-0 | 24-10 | 522 |
| 10 | 6 | F4 | 20 | V 2 | 10-8½ | | | | | | | 10-9 | 10-7 | |
| | | | | | 20-6½ | | (INCREMENT = 29½) | | | | | 20-7 | 20-7 | 233 |
| 24 | 4 | G1 | 20 | V 2 | 8-1 | | | | | | | 8-1 | 8-1 | |
| | | | | | 12-6½ | | (INCREMENT = 4⅞) | | | | | 12-7 | 12-7 | 166 |
| 24 | 4 | G2 | 20 | V 2 | 8-4 | | | | | | | 8-4 | 8-4 | |
| | | | | | 12-9½ | | (INCREMENT = 4⅞) | | | | | 12-10 | 12-10 | 170 |
| 55 | 4 | J1 | 19 | | 3-3 | 3-3 | | | | | | 6-6 | 6-5 | 236 |
| 4 | 4 | J2 | 20 | | 14-10 | | | | | | | 14-10 | 14-10 | 40 |
| 2 | 4 | W1 | 16 | | 5-2½ | | | | | | | 17-3 | 17-3 | 23 |
| 1 | 4 | W2 | 16 | | 4-4½ | | | | | | | 14-7 | 14-7 | 10 |

### ESTIMATED QUANTITIES

| ITEM | | TOTAL |
|---|---|---|
| CLASS B CONCRETE | CU. YD. | 36.7 |
| REINFORCING STEEL | LBS. | 4,940 |

### BENDING DIAGRAMS




ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEG. STANDARD HOOKS.

HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.

NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED FOR FABRICATORS USE.

PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.

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

V - BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE AND THE FOLLOWING LINE.

NO.EA. = NUMBER OF BARS OF EACH LENGTH.

### GENERAL NOTES:

**DESIGN UNIT STRESSES**

CLASS B CONCRETE f'c = 3,000 psi
REINFORCING STEEL (GRADE 60) fy = 60,000 psi

**REINFORCING STEEL**

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

**DIMENSIONS**

DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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

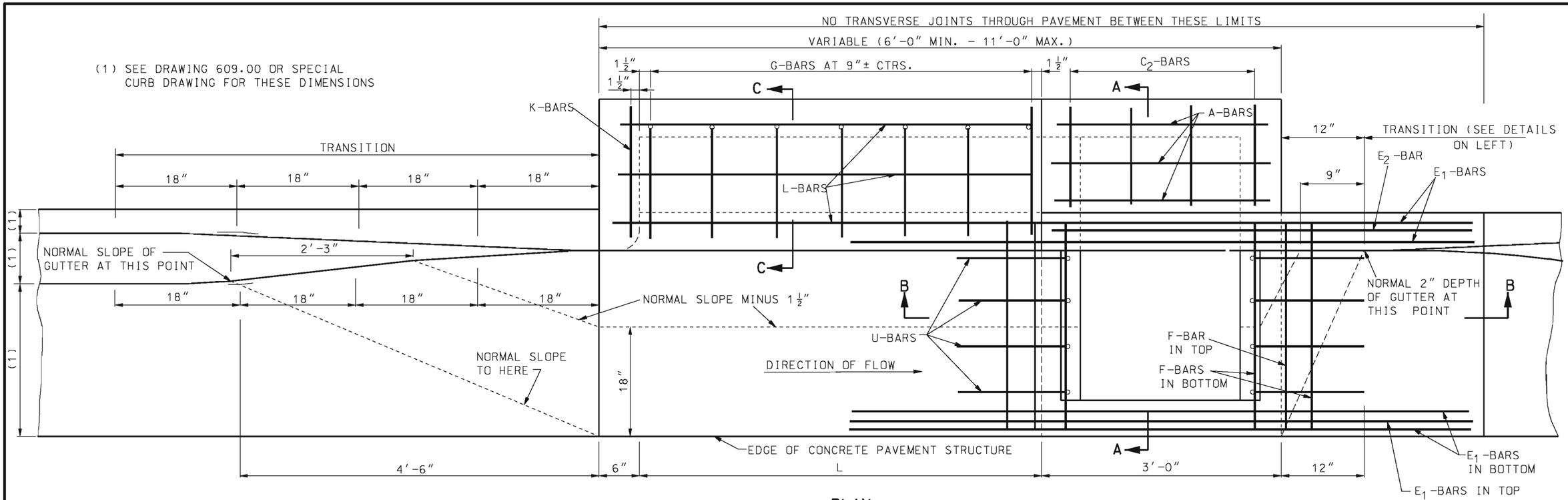

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

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

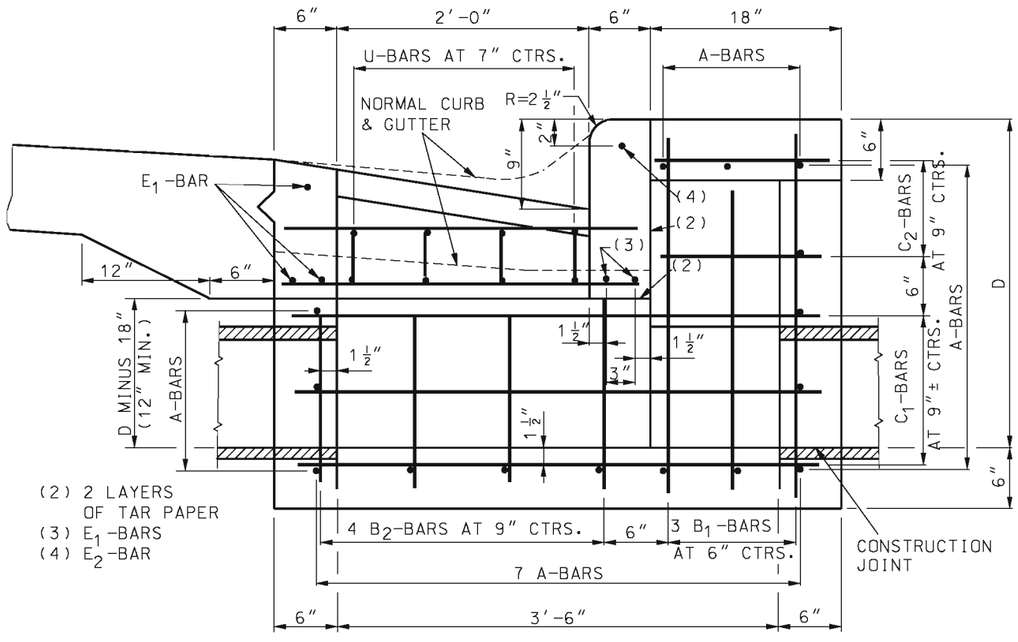
DATE EFFECTIVE: 07/01/2001
DATE PREPARED: 9/3/2009

604.15E

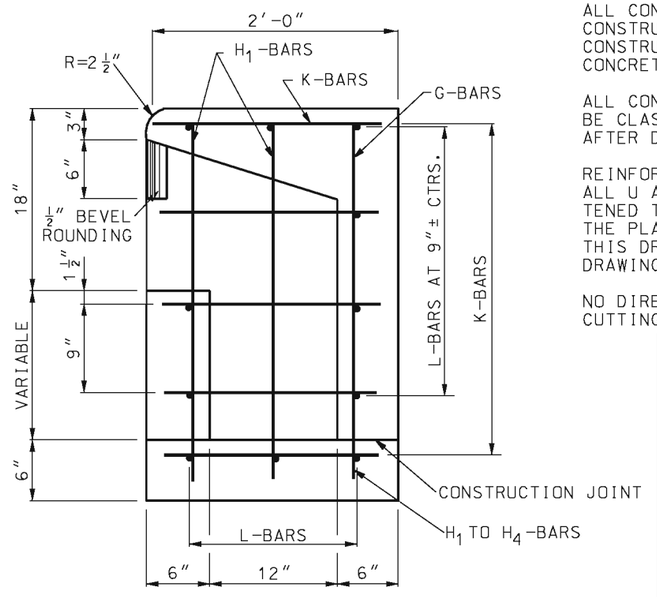
SHEET NO. 1 OF 1




PLAN




SECTION A-A
(INTAKE BOX)




SECTION C-C
(EXTENSION)

GENERAL NOTES:

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

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

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

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# DROP INLET
TYPE X

DATE EFFECTIVE: 04/01/1983
DATE PREPARED: 8/21/2009

604.29C

SHEET NO.
1 OF 2

## BAR BILL - EXTENSION

| LENGTH OF EXT. L | | 2′-6″ | | 5′-0″ | | 7′-6″ | |
|---|---|---|---|---|---|---|---|
| MARK | SIZE | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH |
| G | #5 | 4 | 3′-3″ | 7 | 3′-3″ | 10 | 3′-3″ |
| $H_1$ | #4 | 4 | 2′-6″ | 4 | 2′-6″ | 4 | 2′-6″ |
| $H_2$ | #4 | 2 | 2′-9″ | 3 | 2′-9″ | 3 | 2′-9″ |
| $H_3$ | #4 | | | 2 | 3′-0″ | 3 | 3′-0″ |
| $H_4$ | #4 | | | | | 2 | 3′-3″ |
| $H_5$ | #4 | 1 | 1′-0″ | 1 | 1′-0″ | 1 | 1′-0″ |
| $H_6$ | #4 | 2 | 1′-3″ | 3 | 1′-3″ | 3 | 1′-3″ |
| $H_7$ | #4 | | | 2 | 1′-6″ | 3 | 1′-6″ |
| $H_8$ | #4 | | | | | 2 | 1′-9″ |
| K | #4 | 7 | 1′-9″ | 10 | 1′-9″ | 13 | 1′-9″ |
| L | #4 | 11 | 2′-9″ | 11 | 5′-3″ | 11 | 7′-9″ |
| DOWEL BAR | #4 | 8 | 1′-0″ | 9 | 1′-0″ | 10 | 1′-0″ |

## CU. YDS. & LBS. ADDITIONS TO BE MADE FOR EACH EXTENSION

| LENGTH | CU.YDS. | LBS. |
|---|---|---|
| 2′-6″ | 0.39 | 60.0 |
| 5′-0″ | 0.70 | 101.4 |
| 7′-6″ | 1.04 | 143.8 |

## CU. YDS. DEDUCTION TO BE MADE FOR PIPE OPENING

| 12″ | 15″ | 18″ | 24″ |
|---|---|---|---|
| 0.03 | 0.04 | 0.05 | 0.09 |

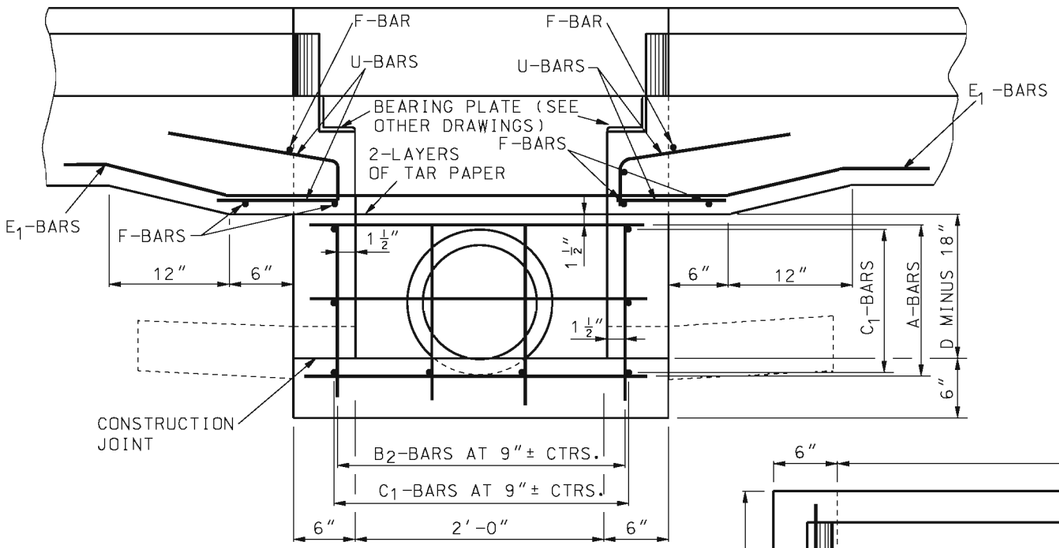
## CONCRETE AND STEEL DEDUCTIONS TO BE MADE FOR EACH EXTENSION OPENING

| 9″ X 12″ | 12″ X 12″ | 15″ X 12″ |
|---|---|---|
| 0.01 C.Y. | 0.02 C.Y. | 0.02 C.Y. |
| 2.5 LBS. | 3.7 LBS. | 4.0 LBS. |

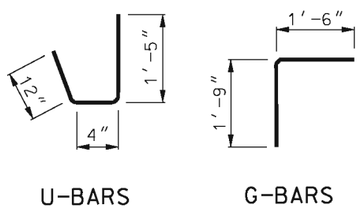
## BAR BILL - INTAKE BOX

| D | CONC. CU. YDS. | STEEL LBS. | A-BARS | | $B_1$-BARS | | $B_2$-BARS | | $C_1$-BARS | | $C_2$-BARS | | $E_1$-BARS | | $E_2$-BARS | | F-BARS | | U-BARS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TRANSVERSE IN BOTTOM WALLS & TOP | | VERTICAL IN WALLS | | VERTICAL IN WALLS | | LONGITUDINAL IN BOTTOM AND SIDE | | LONGITUDINAL IN SIDE AND TOP | | LONGITUDINAL IN GUTTER | | LONGITUDINAL IN GUTTER | | TRANSVERSE IN GUTTER | | IN GUTTER | |
| | | | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH | NO. | LENGTH |
| 2′-6″ | 0.82 | 131 | 15 | 2′-9″ | 8 | 2′-9″ | 10 | 1′-3″ | 8 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 2′-9″ | 0.88 | 134 | 15 | 2′-9″ | 8 | 3′-0″ | 10 | 1′-6″ | 8 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 3′-0″ | 0.94 | 137 | 15 | 2′-9″ | 8 | 3′-3″ | 10 | 1′-9″ | 8 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 3′-3″ | 1.00 | 140 | 15 | 2′-9″ | 8 | 3′-6″ | 10 | 2′-0″ | 8 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 3′-6″ | 1.06 | 152 | 17 | 2′-9″ | 8 | 3′-9″ | 10 | 2′-3″ | 10 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 3′-9″ | 1.12 | 155 | 17 | 2′-9″ | 8 | 4′-0″ | 10 | 2′-6″ | 10 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 4′-0″ | 1.18 | 158 | 17 | 2′-9″ | 8 | 4′-3″ | 10 | 2′-9″ | 10 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 4′-3″ | 1.24 | 170 | 19 | 2′-9″ | 8 | 4′-6″ | 10 | 3′-0″ | 12 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 4′-6″ | 1.30 | 173 | 19 | 2′-9″ | 8 | 4′-9″ | 10 | 3′-3″ | 12 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 4′-9″ | 1.36 | 176 | 19 | 2′-9″ | 8 | 5′-0″ | 10 | 3′-6″ | 12 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |
| 5′-0″ | 1.42 | 189 | 21 | 2′-9″ | 8 | 5′-3″ | 10 | 3′-9″ | 14 | 4′-3″ | 6 | 1′-3″ | 5 | 7′-0″ | 1 | 4′-9″ | 6 | 2′-9″ | 8 | 2′-9″ |

CONCRETE QUANTITIES INCLUDE 0.15 CU.YDS. FOR INVERT | ALL BARS #4

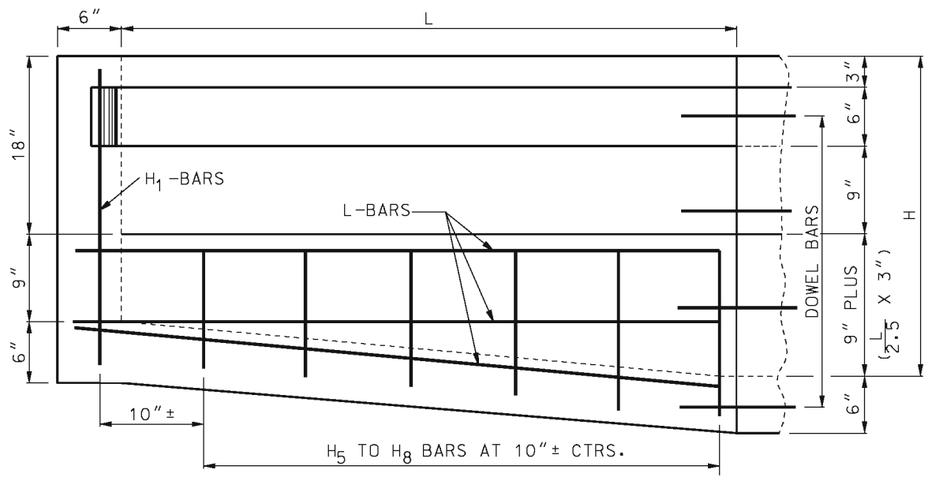



SECTION B-B

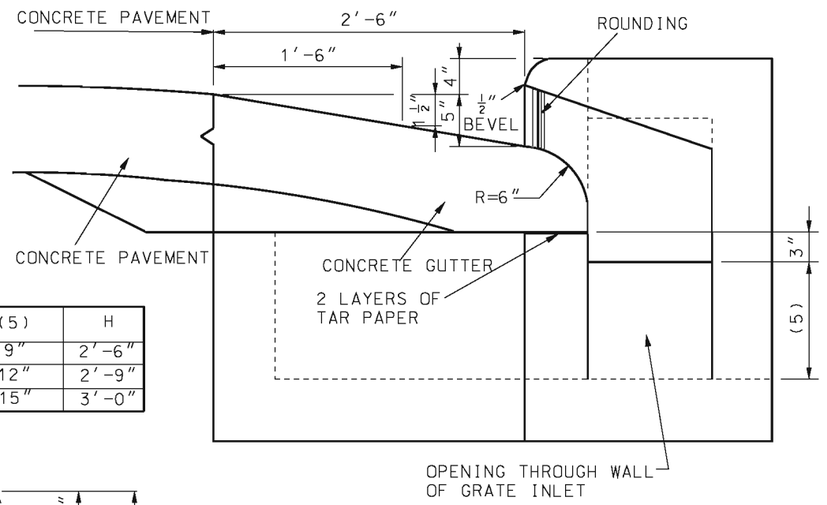



U-BARS G-BARS

BENDING DIAGRAMS




LONGITUDINAL SECTION
(EXTENSION)




| L | (5) | H |
|---|---|---|
| 2′-6″ | 9″ | 2′-6″ |
| 5′-0″ | 12″ | 2′-9″ |
| 7′-6″ | 15″ | 3′-0″ |

SECTION SHOWING DETAILS OF OPENING AND DEPRESSION IN PAVEMENT OR GUTTER


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


STATE OF MISSOURI
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NUMBER PE-23751
PROFESSIONAL ENGINEER
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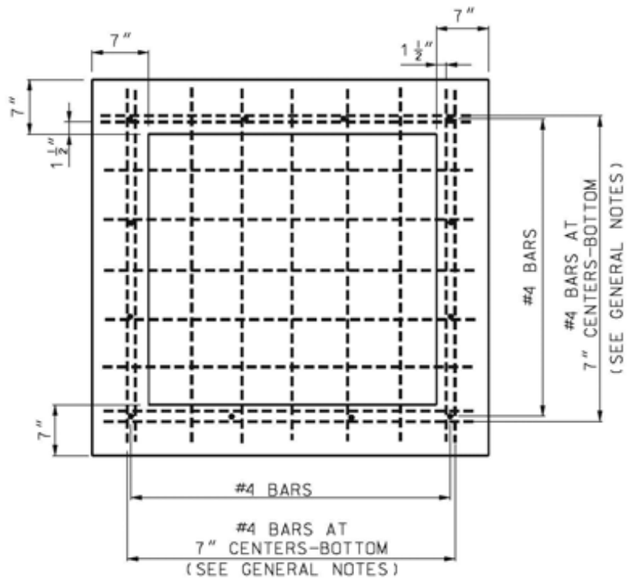
# DROP INLET

TYPE X

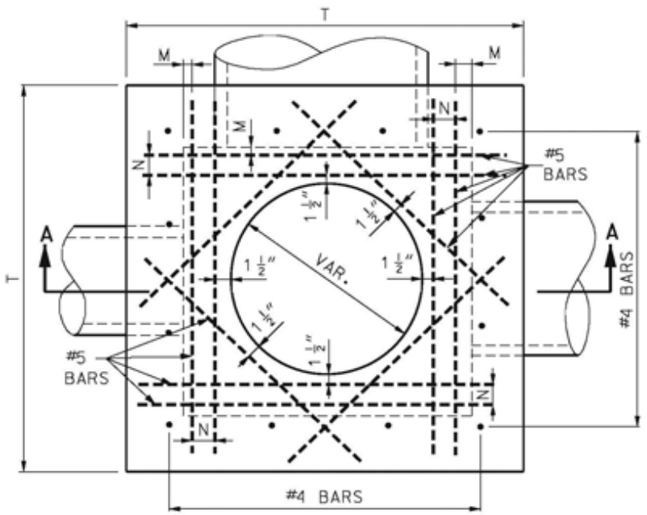
DATE EFFECTIVE: 04/01/1983
DATE PREPARED: 8/21/2009

SHEET NO. 2 OF 2

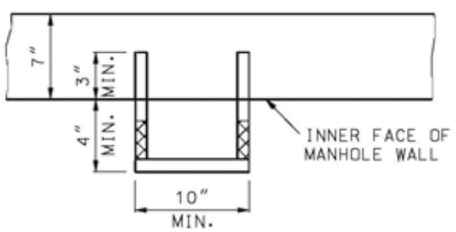
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## BASE PLAN




## PLAN VIEW

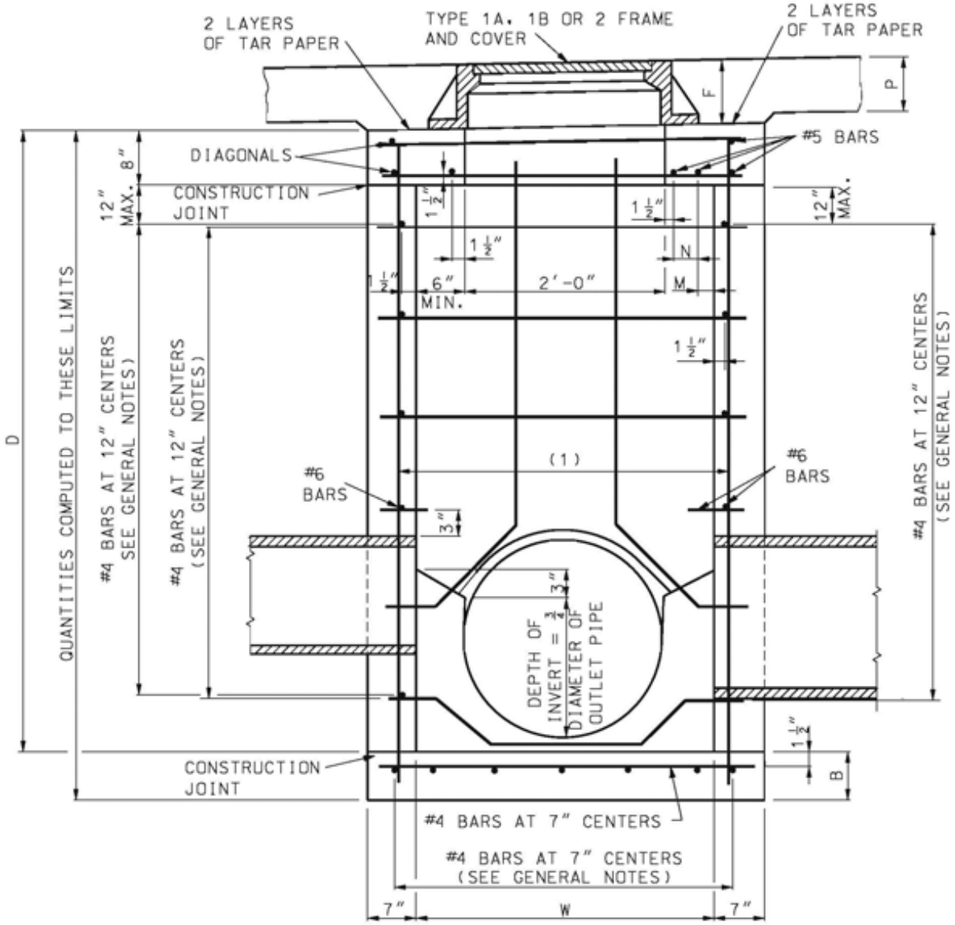



## STEP INSTALLATION

STEPS SHALL BE PLACED AT VERTICAL INTERVALS OF 16" MAXIMUM IN ALL MANHOLES HAVING A DEPTH OF MORE THAN 4'-0". STEPS SHALL BEGIN AT AN ELEVATION 6" ABOVE THE TOP OF THE OUTLET PIPE.

STEPS SHALL BE SET LEVEL AND IN VERTICAL ALIGNMENT.

NO DIRECT PAYMENT WILL BE MADE FOR MANHOLE STEPS.




## SECTION A-A

MANHOLE FRAME AND COVER IN PAVED AREAS USE TYPE 1. IN UNPAVED AREAS USED TYPE 1A OR 1B. NO CHANGE IN QUANTITIES REQUIRED FOR FRAME AND COVER DETAILS. SEE OTHER DRAWINGS.

(1) 4-#4 FOR 3'-0" OPENING
5-#4 FOR 3'-6" & 4'-0"
6-#4 FOR 4'-6" & 5'-0"

| VARIABLE DIMENSIONS | | | | | |
|---|---|---|---|---|---|
| SIZE OF PIPE | W | T | B | M | N |
| ≤ 24" | 3'-0" | 4'-2" | 7" | VARIABLE | 2½" |
| 30" | 3'-6" | 4'-8" | 7" | | 5½" |
| 36" | 4'-0" | 5'-2" | 7" | | 8" |
| 42" | 4'-6" | 5'-8" | 8" | | 5½"* |
| 48" | 5'-0" | 6'-2" | 8" | | 7"* |
| * 4-#5 BARS ADDED | | | | | |

NOTES:
MINIMUM "D "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.

GENERAL NOTES:

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

OVER 20' DEPTH. HORIZONTAL BARS SHALL BE INCREASED TO A #5 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.

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# CONCRETE MANHOLES

DATE EFFECTIVE: 02-01-2009
DATE PREPARED: 8/26/2009

604.30G

SHEET NO. 1 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## FOR PIPE OPENINGS

| | PIPE SIZES | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 12" | 15" | 18" | 24" | 30" | 36" | 42" | 48" |
| CUBIC YARDS CONCRETE TO DEDUCT | 0.03 | 0.04 | 0.06 | 0.11 | 0.16 | 0.23 | 0.31 | 0.40 |
| ADDITIONAL STEEL REQUIRED FOR PIPE OPENING | | | | | | | | |
| WIDTH OF WALL REQUIRED FOR PIPE | | | | 3'-0" | 3'-6" | 4'-0" | 4'-6" | 5'-0" |
| LENGTH OF #6 BAR REQUIRED | | | | 4'-0" | 4'-6" | 5'-0" | 5'-6" | 6'-0" |
| WEIGHT OF BAR LBS. | | | | 6.0 | 6.8 | 7.5 | 8.3 | 9.0 |

NOTE:
CONCRETE QUANTITIES IN TABLE INCLUDE INVERT. THE QUANTITY OF STEEL FOR 3" OF "D" IS NOT $\frac{1}{4}$ OF THAT FOR 1 FOOT OF "D", NEITHER IS THE QUANTITY FOR 6" OF "D" EQUAL TO $\frac{1}{2}$ THAT FOR 1 FOOT OF "D". SO USE QUANTITY IN 1 FOOT COLUMN FOR FULL FEET AND IN 3" COLUMN FOR FRACTIONAL FEET.

## QUANTITIES

| SIZE (W) | | TO AND INCLUDING 20' DEPTH | | | | 20' TO AND INCLUDING 30' DEPTH | | |
|---|---|---|---|---|---|---|---|---|
| | | D= 3'-3" | D= 4'-3" | ADD OR SUBTRACT FOR EACH | | ADD OR SUBTRACT FOR EACH | | ADDITIONAL STEEL IN BOTTOM DIFFERENCE IN #4 AND #6 BARS |
| | | | | 1 FT. | 3 IN. | 1 FT. | 3 IN. | |
| 3'-0" X 3'-0" | C | 1.62 | 1.93 | 0.31 | 0.08 | 0.31 | 0.08 | |
| | S | 157.90 | 176.80 | 18.60 | 2.00 | 20.64 | 5.16 | 30.14 |
| 3'-0" X 3'-6" | C | 1.77 | 2.11 | 0.33 | 0.08 | 0.33 | 0.08 | |
| | S | 173.80 | 194.60 | 20.60 | 2.30 | 23.12 | 5.78 | 34.85 |
| 3'-0" X 4'-0" | C | 1.93 | 2.28 | 0.35 | 0.09 | 0.35 | 0.09 | |
| | S | 187.10 | 208.60 | 21.30 | 2.30 | 24.27 | 6.07 | 39.56 |
| 3'-0" X 4'-6" | C | 2.16 | 2.53 | 0.38 | 0.09 | 0.38 | 0.09 | |
| | S | 211.20 | 234.70 | 23.30 | 2.70 | 26.75 | 6.69 | 44.26 |
| 3'-0" X 5'-0" | C | 2.32 | 2.71 | 0.40 | 0.10 | 0.40 | 0.10 | |
| | S | 219.60 | 243.80 | 24.00 | 2.70 | 27.90 | 6.97 | 48.97 |
| 3'-6" X 3'-6" | C | 1.94 | 2.29 | 0.35 | 0.09 | 0.35 | 0.09 | |
| | S | 192.40 | 215.10 | 22.70 | 2.70 | 25.60 | 6.40 | 40.27 |
| 3'-6" X 4'-0" | C | 2.10 | 2.48 | 0.38 | 0.09 | 0.38 | 0.09 | |
| | S | 204.30 | 227.70 | 23.40 | 2.70 | 26.75 | 6.69 | 45.69 |
| 3'-6" X 4'-6" | C | 2.35 | 2.75 | 0.40 | 0.10 | 0.40 | 0.10 | |
| | S | 230.00 | 255.50 | 25.30 | 3.00 | 29.23 | 7.31 | 51.11 |
| 3'-6" X 5'-0" | C | 2.53 | 2.95 | 0.42 | 0.10 | 0.42 | 0.10 | |
| | S | 240.90 | 267.10 | 26.00 | 3.00 | 30.38 | 7.60 | 56.53 |
| 4'-0" X 4'-0" | C | 2.28 | 2.68 | 0.40 | 0.10 | 0.40 | 0.10 | |
| | S | 216.70 | 240.80 | 24.10 | 2.70 | 27.90 | 6.97 | 51.83 |
| 4'-0" X 4'-6" | C | 2.55 | 2.97 | 0.42 | 0.10 | 0.42 | 0.10 | |
| | S | 246.40 | 272.60 | 26.00 | 3.00 | 30.38 | 7.60 | 57.96 |
| 4'-0" X 5'-0" | C | 2.74 | 3.18 | 0.44 | 0.11 | 0.44 | 0.11 | |
| | S | 255.60 | 282.50 | 26.70 | 3.00 | 31.53 | 7.88 | 64.10 |
| 4'-6" X 4'-6" | C | 2.75 | 3.19 | 0.44 | 0.11 | 0.44 | 0.11 | |
| | S | 276.80 | 304.90 | 28.00 | 3.30 | 32.86 | 8.22 | 64.81 |
| 4'-6" X 5'-0" | C | 2.94 | 3.41 | 0.46 | 0.12 | 0.46 | 0.12 | |
| | S | 289.40 | 318.20 | 28.70 | 3.30 | 34.01 | 8.50 | 71.66 |
| 5'-0" X 5'-0" | C | 3.15 | 3.64 | 0.48 | 0.12 | 0.48 | 0.12 | |
| | S | 299.80 | 329.30 | 29.40 | 3.30 | 35.16 | 8.79 | 79.23 |

TO AND INCLUDING 20-FOOT DEPTH

NOTE:
TO COMPUTE THE QUANTITIES FOR DEPTHS ("D") NOT SHOWN, REFER TO TABLE FOR THE SIZE OF MANHOLE REQUIRED. SUBTRACT THE "D" VALUE FROM THE TABLE AND THE "D" VALUE FROM THE PLANS. MULTIPLY THE VALUES SHOWN IN THE 1-FOOT COLUMN FROM THE TABLE WITH THE FULL ONE FOOT INCREMENTS FROM THE DIFFERENCE BETWEEN THE "D" FROM THE PLANS AND THE "D" FROM THE TABLE. MULTIPLY THE VALUES SHOWN IN THE 3" COLUMN FROM THE TABLE WITH THE REMAINING FRACTIONAL FOOT VALUES PER 3" INCREMENTS. FOLLOW THIS SAME PROCESS FOR THE STEEL CALCULATIONS. SEE THE EXPAMPLE BELOW:

FOR EXAMPLE: QUANTITIES FOR 3'-0" X 4'-0" MANHOLE WITH 6'-9" "D" HAVING ONE 18", ONE 24" AND ONE 36" PIPE OPENINGS ARE DETERMINED AS FOLLOWS:
"D" REQUIRED = 6'-9"
"D" GIVEN IN TABLE = 4'-3"
"D" ADDITIONAL = 2'-6"

| 2.76 | CONCRETE | STEEL |
|---|---|---|
| FROM TABLE FOR 4'-3" "D" | 2,28 | 208.6 |
| ADD (2 X QUANTITIES FOR 1-FOOT) | 0.70 | 42.6 |
| ADD (6" = 2 X 3") (2 X QUANTITIES FOR 3") | 0.18 | 255.8 |
| SUBTOTAL | 3.16 | 255.8 |
| ADJUST QUANTITIES FOR THE PIPE OPENINGS (DEDUCT CONCRETE AND ADD STEEL FOR TWO 3' AND ONE 4' WALL) | -0.40 | +19.5 |
| TOTAL | 2.76 | 275.3 |
| USE | 2.80 | 280.0 |

MORE THAN 20-FOOT TO AND INCLUDING 30-FOOT DEPTH

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

FOR EXAMPLE: QUANTITIES FOR 3'-0" X 4'-0" MANHOLE WITH 20'-0", "D" HAVING ONE 18", ONE 24" AND ONE 36" PIPE OPENINGS ARE DETERMINED AS FOLLOWS:

"D" REQUIRED = 20'-0"
"D" GIVEN IN TABLE = 4'-3"
"D" ADDITIONAL = 15'-9"

| | CONCRETE | STEEL |
|---|---|---|
| FROM TABLE FOR 4'-3" "D" | 2.28 | 208.6 |
| ADD (15 X QUANTITIES FOR 1-FOOT) | 5.25 | 319.9 |
| ADD (9" = 3 X 3") (3 X QUANTITIES FOR 3") | 0.27 | 6.9 |
| SUBTOTAL | 7.80 | 535.0 |
| ADJUST QUANTITIES FOR THE PIPE OPENINGS (DEDUCT CONCRETE AND ADD STEEL FOR TWO 3' AND ONE 4' WALL) | -0.40 | +19.5 |
| TOTAL | 7.40 | 554.5 |

SECOND, COMPUTE QUANTITIES FOR THE DEPTHS BEYOND 20 FEET TO A MAXIMUM OF 30 FEET, USING THE TABLE "20-FOOT TO AND INCLUDING 30-FOOT DEPTH", AND ADD TO THE QUANTITIES FOR 20-FOOT DEPTH. ALSO, ADD THE DIFFERENCE IN STEEL IN THE BOTTOM DUE TO THE INCREASE IN SIZE OF BARS FROM #4 TO #6 BARS ON 7-INCH CENTERS.

FOR EXAMPLE:
"D" REQUIRED = 30'-0"
"D" COMPUTED = 20'-0"
"D" ADDITIONAL = 10'-0"

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

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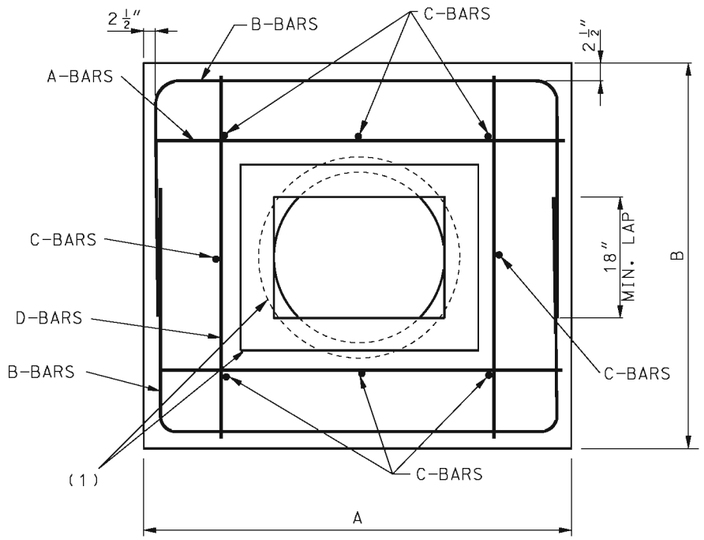
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
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# CONCRETE MANHOLES

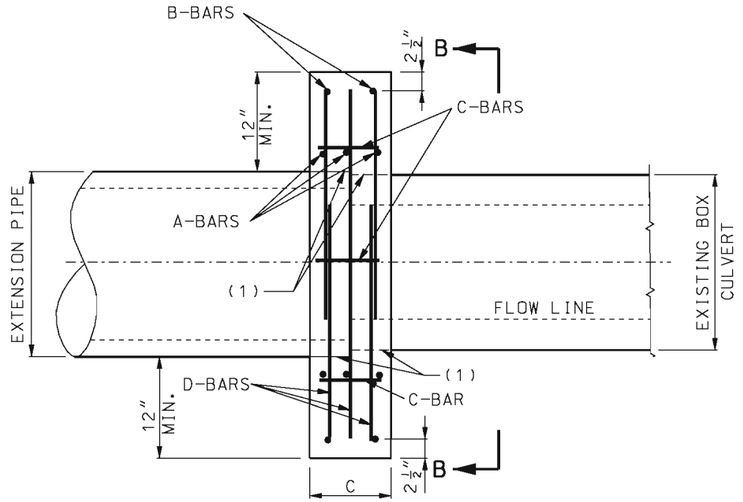
DATE EFFECTIVE: 02-01-2009
DATE PREPARED: 8/26/2009

604.30G

SHEET NO. 2 OF 2

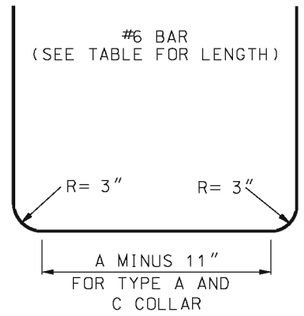



SECTION B-B

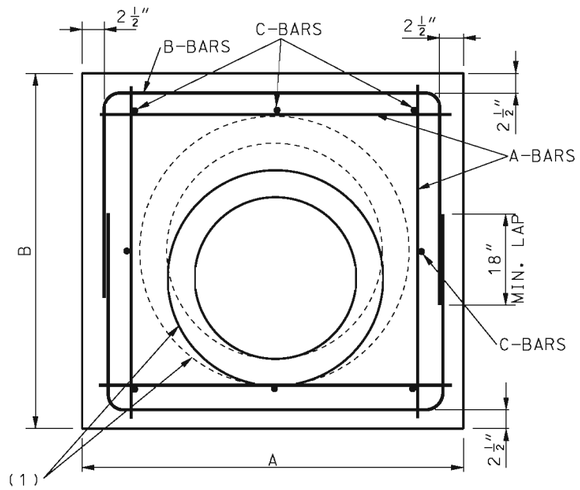



ELEVATION
(FOR BOX CULVERT TO PIPE)

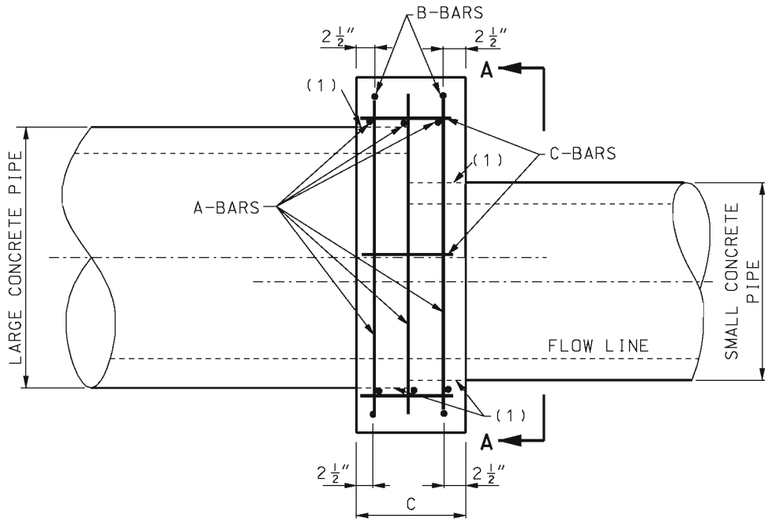
## TYPE C COLLAR




BENDING DIAGRAM FOR B-BARS




SECTION A-A




ELEVATION
(FOR CONCRETE PIPE
TO CONCRETE PIPE)

## TYPE A COLLAR

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


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# PIPE COLLARS

DATE EFFECTIVE: 10/01/2000
DATE PREPARED: 8/21/2009

604.40F

SHEET NO. 1 OF 2

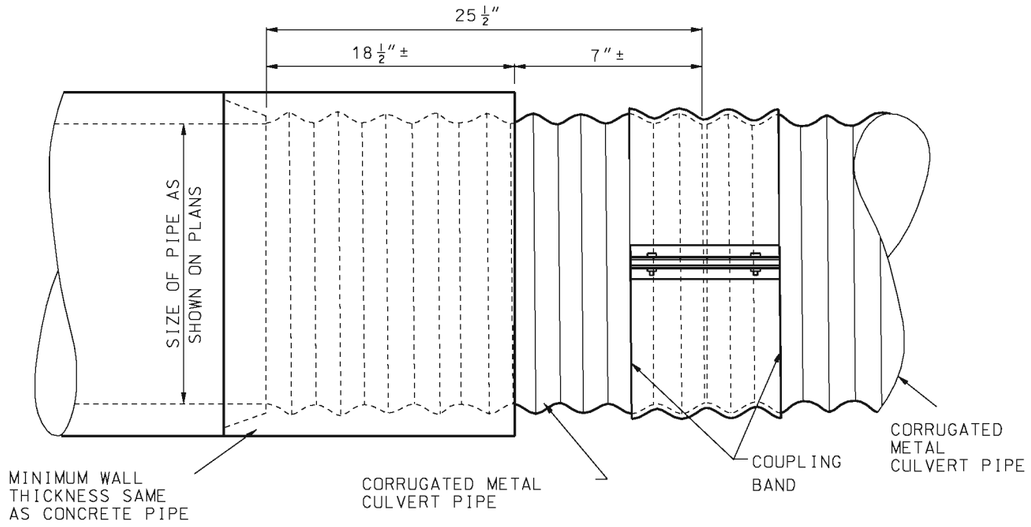

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## TABLE OF DIMENSIONS

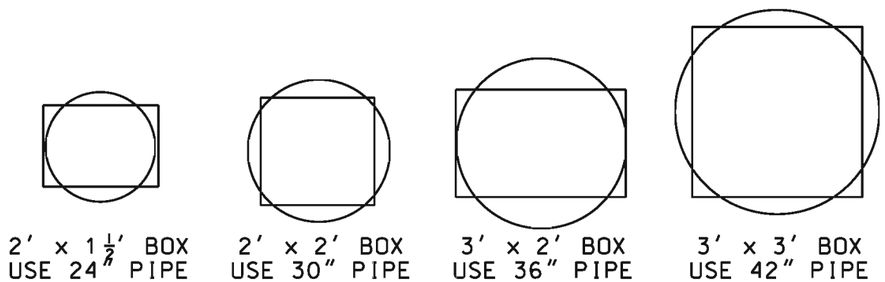
| SIZE OF PIPE | | DIMENSIONS | | LENGTH OF BARS | | | QUANTITIES | |
|---|---|---|---|---|---|---|---|---|
| LARGE (IN.) | SMALL (IN.) | A & B (FT.-IN.) | C (FT.-IN.) | A(#5) 12 REQUIRED (FT.-IN.) | B(#6) 4 REQUIRED (FT.-IN.) | C(#4) 8 REQUIRED (FT.-IN.) | CONCRETE (CU. YD.) | STEEL (LBS.) |
| 12 | 12 | 2-8 | 1-0 | 2-5 | 5-10 | 0-9 | 0.21 | 70 |
| 15 | 12<br>15 | 3-0 | 1-0 | 2-9 | 6-6 | 0-9 | 0.27<br>0.25 | 77 |
| 18 | 12<br>15<br>18 | 3-3 | 1-0 | 3-0 | 7-0 | 0-9 | 0.33<br>0.32<br>0.30 | 84 |
| 21 | 12<br>15<br>18 | 3-6 | 1-0 | 3-3 | 7-6 | 0-9 | 0.36<br>0.34<br>0.33 | 90 |
| 24 | 15<br>18<br>24 | 3-10 | 1-0 | 3-6 | 8-2 | 0-9 | 0.44<br>0.40<br>0.36 | 97 |
| 30 | 18<br>24<br>30 | 4-5 | 1-4 | 4-2 | 9-4 | 1-0 | 0.71<br>0.66<br>0.60 | 114 |
| 36 | 24<br>30<br>36 | 5-0 | 1-4 | 4-9 | 10-6 | 1-0 | 0.88<br>0.79<br>0.76 | 128 |
| 42 | 30<br>36<br>42 | 5-7 | 1-4 | 5-4 | 11-8 | 1-0 | 1.05<br>0.98<br>0.89 | 142 |
| 48 | 36<br>42<br>48 | 6-2 | 1-4 | 6-0 | 12-10 | 1-0 | 1.22<br>1.13<br>1.03 | 158 |
| 54 | 42<br>48<br>54 | 7-1 | 1-8 | 6-9 | 14-8 | 1-6 | 2.02<br>1.90<br>1.76 | 181 |
| 60 | 48<br>54<br>60 | 7-8 | 1-8 | 7-5 | 15-10 | 1-6 | 2.27<br>2.13<br>1.97 | 196 |
| 66 | 54<br>60<br>66 | 8-3 | 2-0 | 8-0 | 17-0 | 1-9 | 3.04<br>2.85<br>2.65 | 210 |
| 72 | 60<br>66<br>72 | 8-10 | 2-0 | 7-7 | 18-2 | 1-9 | 3.36<br>3.16<br>2.93 | 225 |

## TABLE OF DIMENSIONS

| BOX SIZE (FT.) | PIPE SIZE (IN.) | DIMENSIONS | | | LENGTH OF BARS | | | | QUANTITIES | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | A (FT.-IN.) | B (FT.-IN.) | C (FT.-IN.) | A(#5) 6 REQUIRED (FT.-IN.) | B(#6) 4 REQUIRED (FT.-IN.) | C(#4) 8 REQUIRED (FT.-IN.) | D(#5) 6 REQUIRED (FT.-IN.) | CONCRETE (CU.YD.) | STEEL (LBS.) |
| 2 x 1½ | 24 | 5-1 | 4-9 | 1-0 | 4-10 | 10-4 | 0-9 | 4-6 | 0.65 | 124 |
| 2 x 2 | 30 | 5-3 | 5-3 | 1-4 | 5-0 | 11-0 | 1-0 | 5-0 | 0.93 | 134 |
| 3 x 2 | 36 | 6-1 | 5-10 | 1-4 | 5-10 | 12-5 | 1-0 | 5-7 | 1.16 | 151 |
| 3 x 3 | 42 | 6-5 | 6-5 | 1-4 | 6-0 | 13-4 | 1-0 | 6-0 | 1.29 | 162 |




### TYPE B COLLAR
(FOR CONCRETE PIPE TO CORRUGATED METAL PIPE)




### PIPE PLACEMENT

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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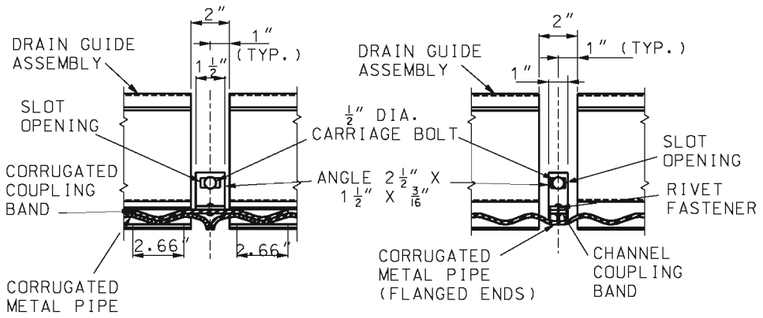

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KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# PIPE COLLARS

DATE EFFECTIVE: 10/01/2000
DATE PREPARED: 8/21/2009

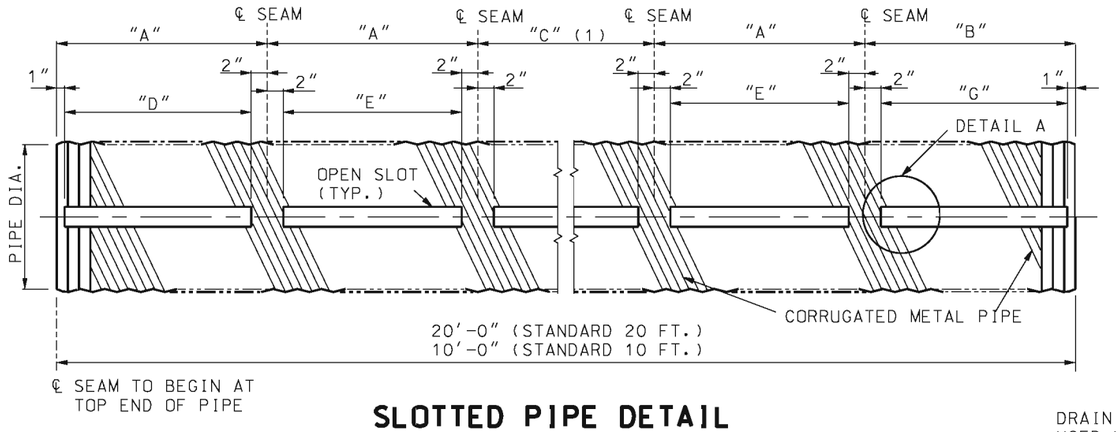
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SHEET NO. 2 OF 2

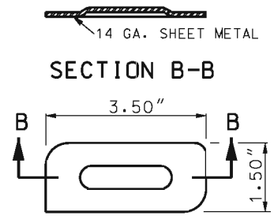



TYPE "A" TYPE "B"

**JOINT CONNECTION SECTION**

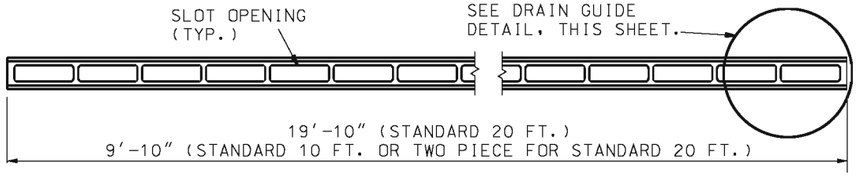



**SLOTTED PIPE DETAIL**



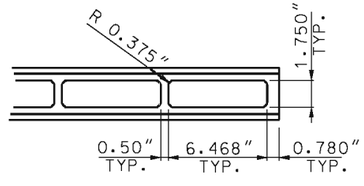

PLAN

**LOCKING PLATE DETAIL**




DRAIN GUIDE PLAN

| DIMENSION SCHEDULE | | | | | | | | LOCKING PLATES REQUIRED (3) | |
|---|---|---|---|---|---|---|---|---|---|
| PIPE DIAMETER | A | $B_{10}$ | $G_{10}$ | $B_{20}$ | $G_{20}$ | D | E | 10 FT. | 20 FT. |
| 12" | 31½" | 25½" | 22½" | 19½" | 16½" | 28½" | 27½" | 9 | 17 |
| 15" | 27½" | 10" | 7" | 20" | 17" | 24½" | 23½" | 10 | 19 |
| 18" | 26¼" | 15" | 12" | 33 | ¾" | 23¼" | 22¼" | 10 | 19 |
| 24" | 25" | 20" | 17" | 15" | 12" | 22" | 21" | 11 | 21 |
| 30" | 24¾" | 21" | 18" | 17¼" | 14¼" | 21¾" | 20¾" | 11 | 21 |
| 36" | 24⅝" | 21½" | 18½" | 18⅜" | 15⅜" | 21⅜" | 20⅝" | 11 | 21 |

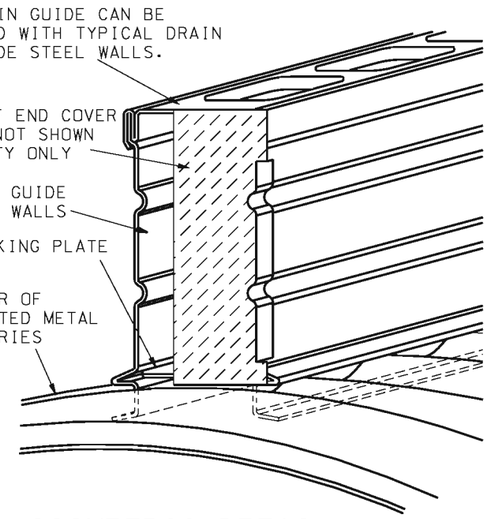



**DRAIN GUIDE DETAIL**



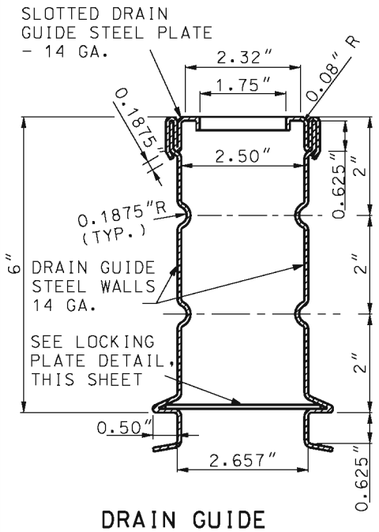

**JOINT CONNECTION SECTION**

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

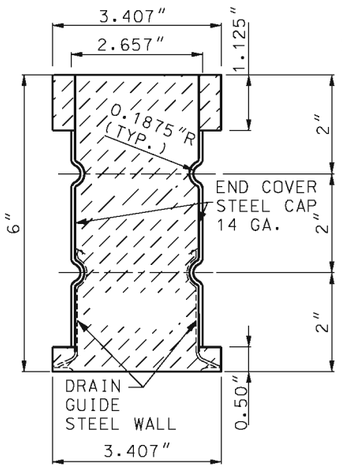



**ISOMETRIC DETAIL**

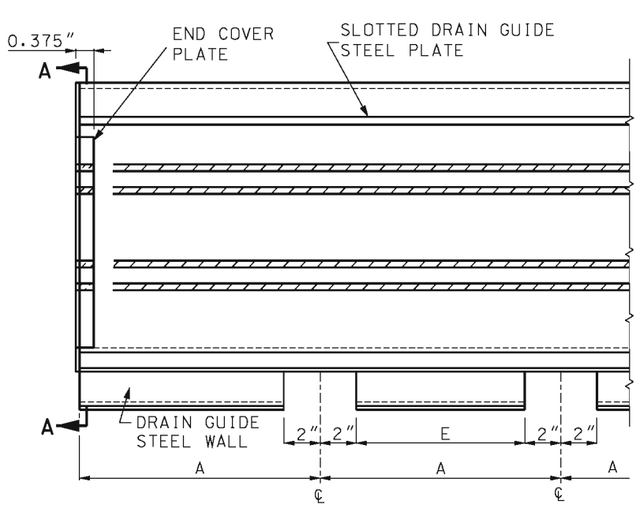
(1) FOR STANDARD 10 FT., 12" DIA. PIPE, "C" = 0. FOR ALL OTHER PIPE SIZES "C" IS IN MULTIPLES OF "A".
(2) LOCKING PLATE TO BE INSTALLED AT:
  A. EACH END OF DRAIN GUIDE.
  B. EACH SEAM.
  C. EACH MID-POINT OF OPEN SLOT.
(3) IN 20 FT. SECTION FOR TWO PIECE DRAIN GUIDE, INCREASE NUMBER OF LOCKING PLATES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




DRAIN GUIDE SECTION (TYP.)
DRAIN DETAILS




SECTION A-A
END COVER PLATE DETAIL




SIDE ELEVATION

**TYPE A SLOTTED DRAIN**
(FORMED SHEET)

CUT OUT SLOT FOR DRAIN GUIDE WALLS TO FIT OVER CORRUGATED METAL PIPE SEAMS (TYPICAL).


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STATE OF MISSOURI
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NUMBER PE-23751
PROFESSIONAL ENGINEER
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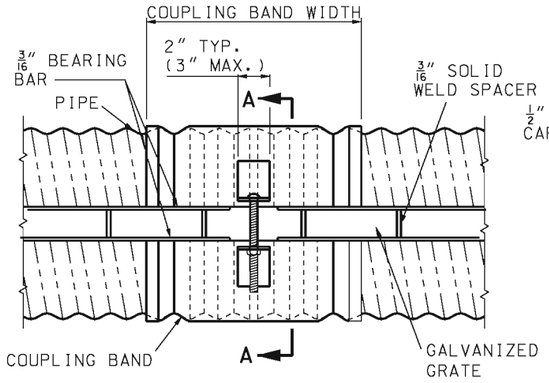
# SLOTTED DRAIN
TYPE A

DATE EFFECTIVE: 03/01/1994
DATE PREPARED: 8/21/2009

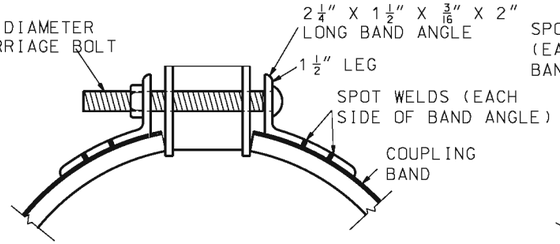
604.70

SHEET NO. 1 OF 2

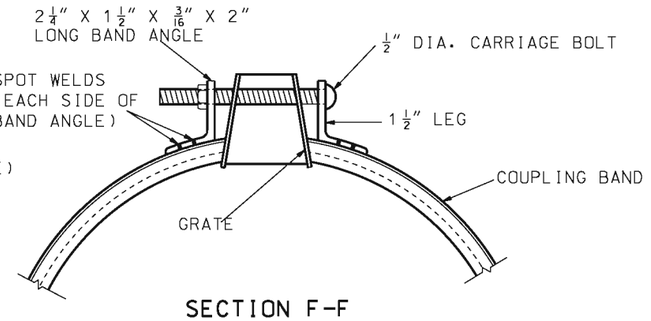

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




TOP VIEW

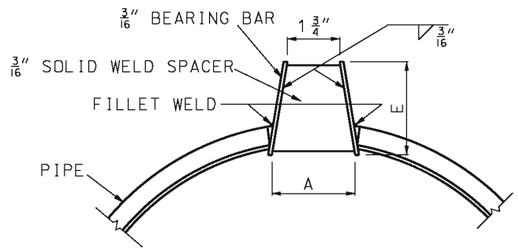



SECTION A-A

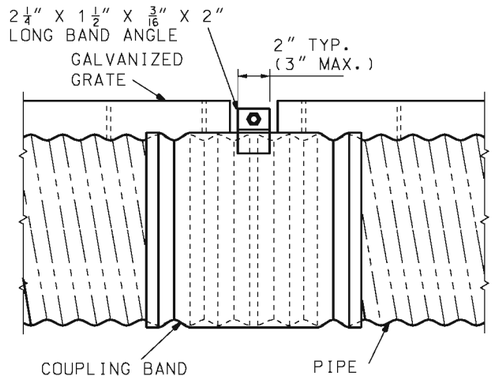



SECTION F-F

| GRATE TYPE | "E" | "A" |
|---|---|---|
| C | 2 1/2" | 2 1/4" |
| C | 6" | 3" |

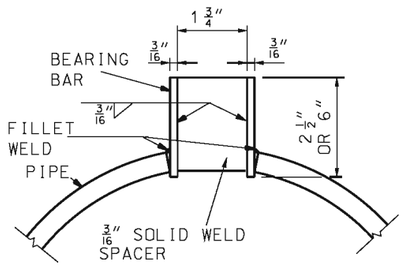



SECTION G-G

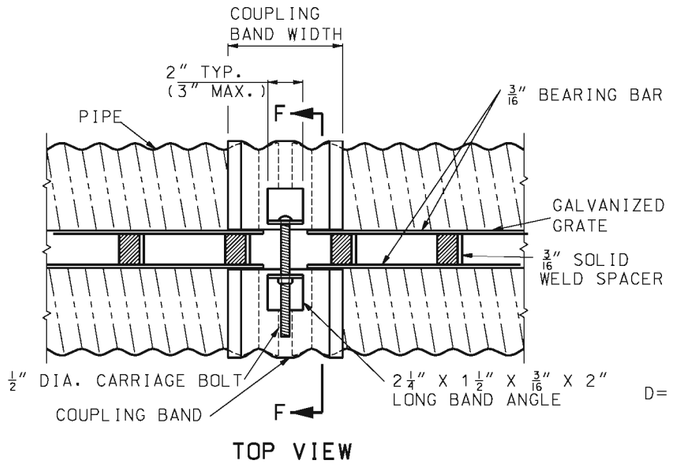



SIDE VIEW

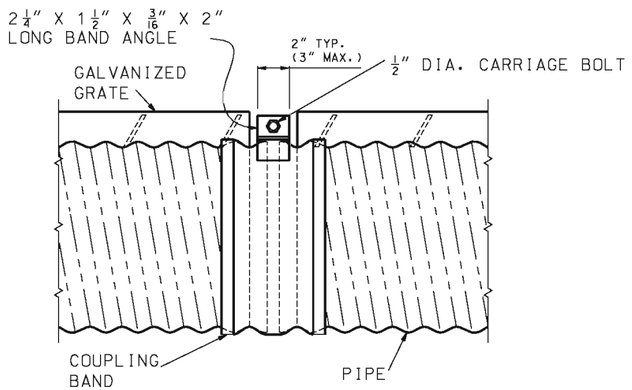
**TYPICAL COUPLING BAND**



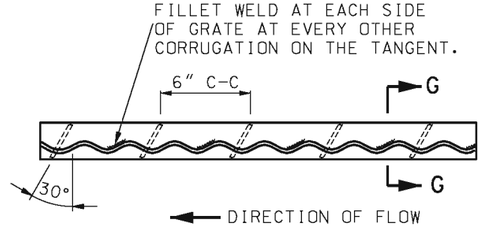

SECTION D-D




TOP VIEW

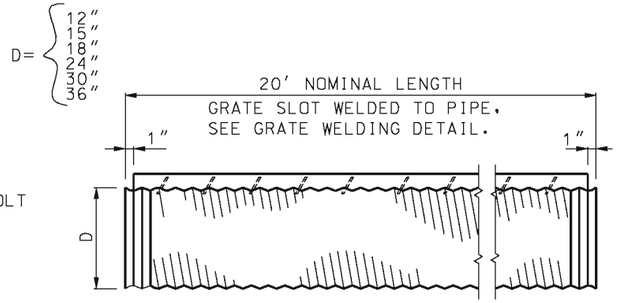



SIDE VIEW
TYPICAL COUPLING BAND

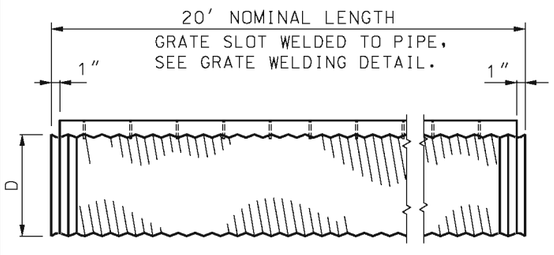



**GRATE WELDING DETAIL**

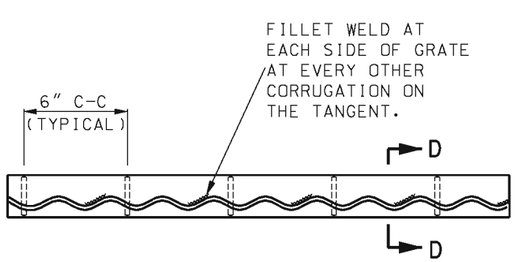
D= 12" 15" 18" 24" 30" 36"




TYPICAL PIPE SECTION




TYPICAL PIPE SECTION




GRATE WELDING DETAIL

D= 12" 15" 18" 24" 30" 36"

## STRUCTURAL STEEL SLOTTED DRAIN
(TYPE B)

## STRUCTURAL STEEL SLOTTED DRAIN
(TYPE C)

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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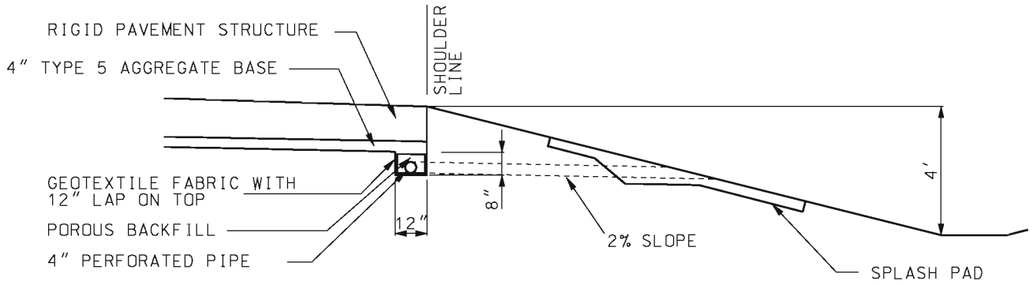

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
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PROFESSIONAL ENGINEER
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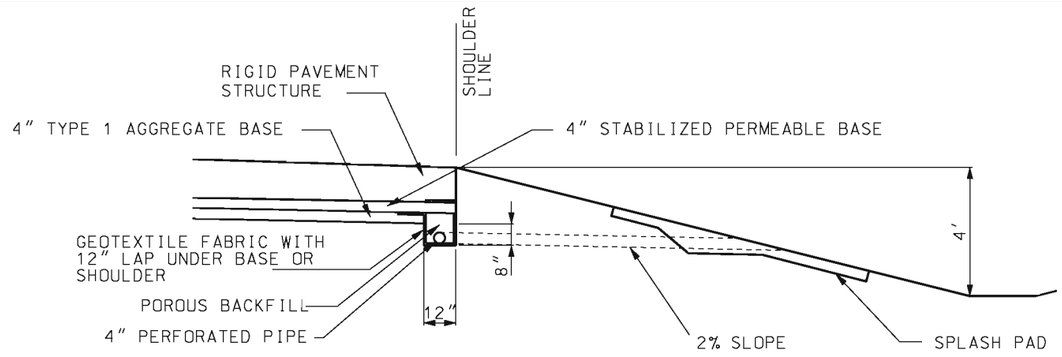
# SLOTTED DRAIN
TYPE B AND TYPE C

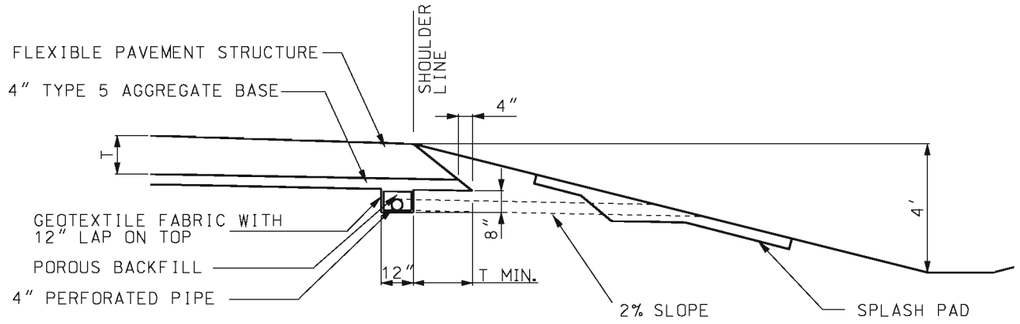
DATE EFFECTIVE: 03/01/1994
DATE PREPARED: 8/21/2009

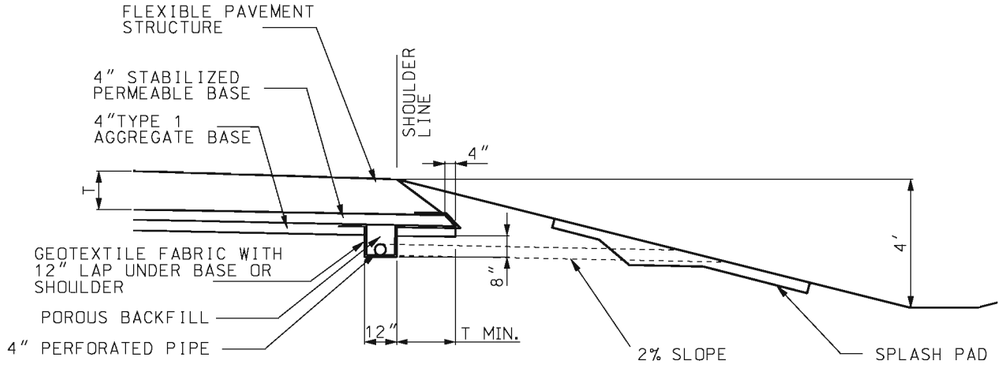
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SHEET NO. 2 OF 2



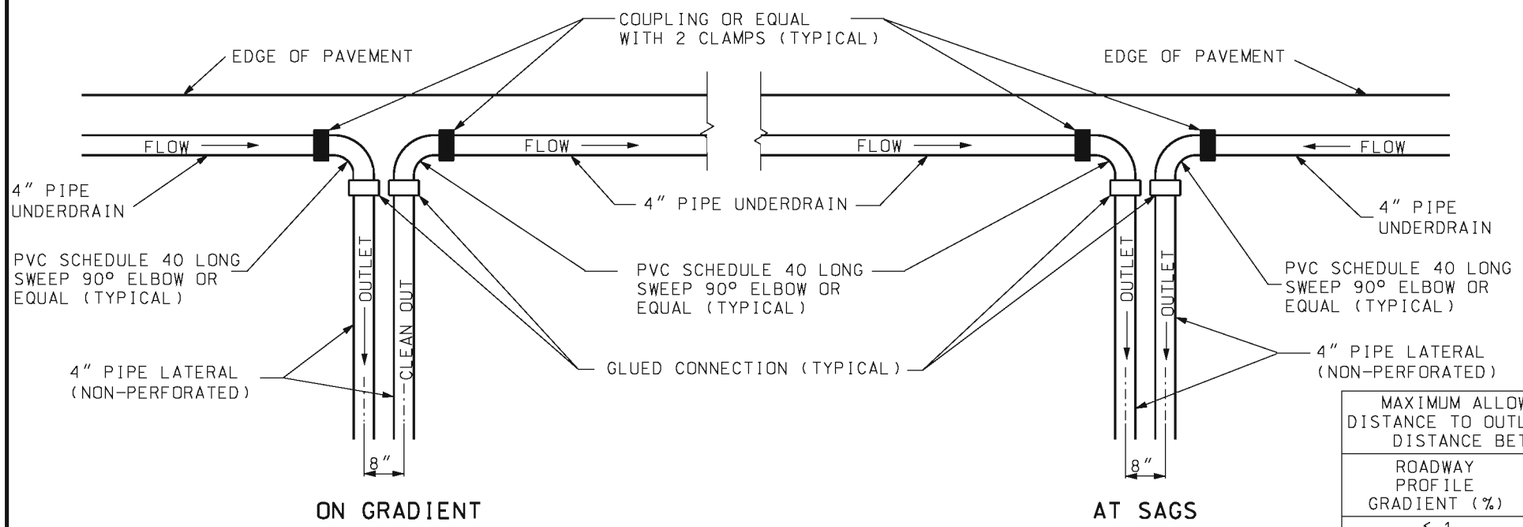




MEDIUM DUTY

HEAVY DUTY




## DETAIL OF PIPE AGGREGATE DRAIN OUTLETS

| MAXIMUM ALLOWABLE DRAINAGE DISTANCE TO OUTLET OR SEPARATION DISTANCE BETWEEN OUTLETS | |
|---|---|
| ROADWAY PROFILE GRADIENT (%) | DISTANCE |
| ≤ 1 | 250 FT. |
| > 1 AND ≤ 2 | 375 FT. |
| > 2 | 500 FT. |

GENERAL NOTES:

ON SUPERELEVATED CURVES PLACE LONGITUDINAL UNDERDRAIN ON LOW SIDE ONLY.

CONSTRUCT OUTLETS AT LOW POINT OF SAG CURVE.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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105 WEST CAPITOL
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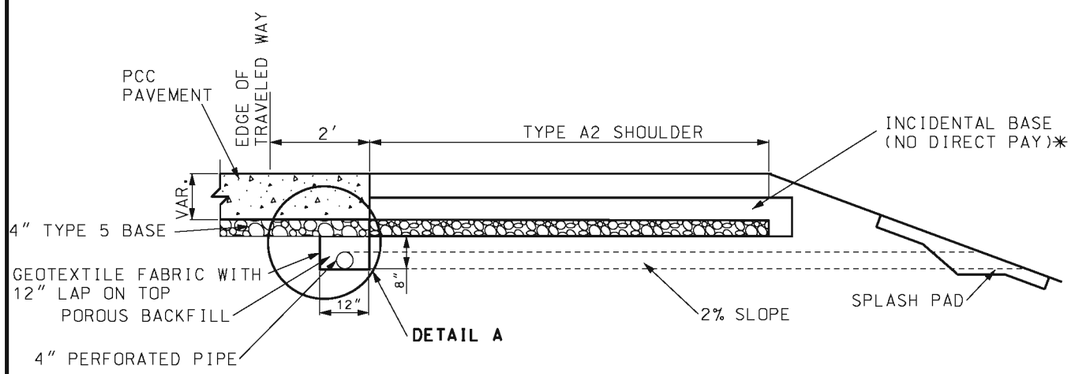
# PAVEMENT UNDERDRAINAGE

PIPE AGGREGATE PAVEMENT EDGE DRAINS FOR FULL DEPTH SHOULDERS

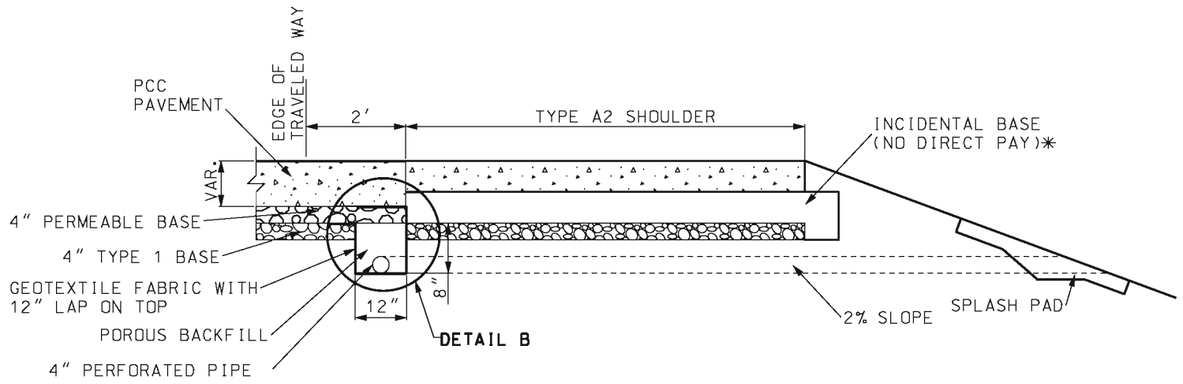
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DATE PREPARED: 4/1/2013

605.101

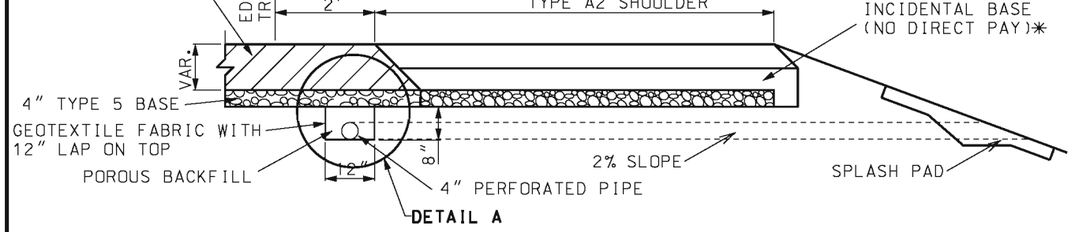
SHEET NO. 1 OF 4



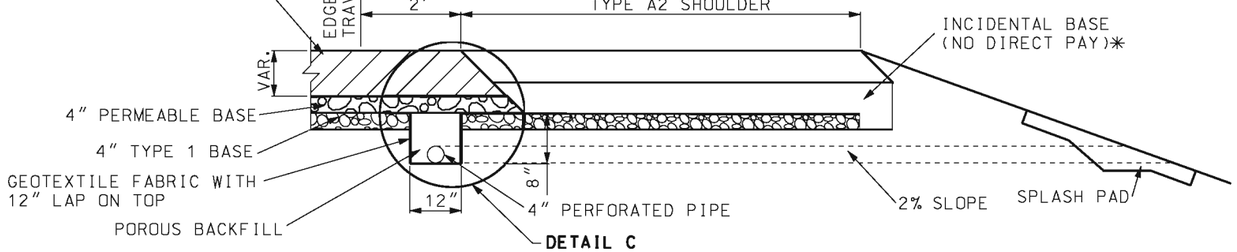

## RIGID PAVEMENT WITH TYPE 5 BASE




## RIGID PAVEMENT WITH PERMEABLE BASE




## FLEXIBLE PAVEMENT WITH TYPE 5 BASE



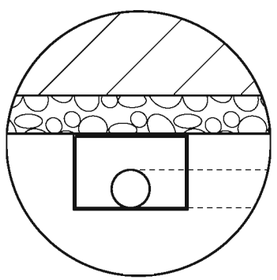

## FLEXIBLE PAVEMENT WITH PERMEABLE BASE

PCC (PORTLAND CEMENT CONCRETE)

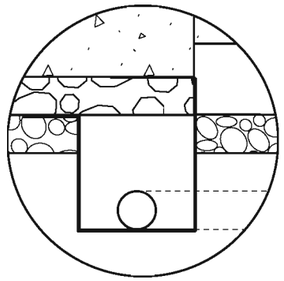
HMA (HOT MIX ASPHALT)

BASE

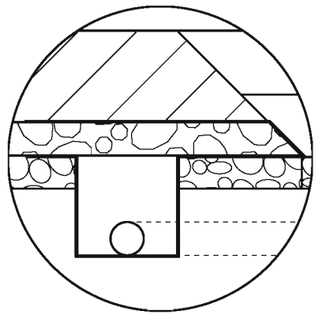
* BASE MATERIAL (ASPHALT MILLINGS, RECYCLED CONCRETE, TYPE 1 BASE, ETC.) APPROVED BY THE ENGINEER.



DETAIL A



DETAIL B



DETAIL C

GENERAL NOTES:

SEE DETAIL OF PIPE AGGREGATE DRAIN OUTLETS ON SHEET 1.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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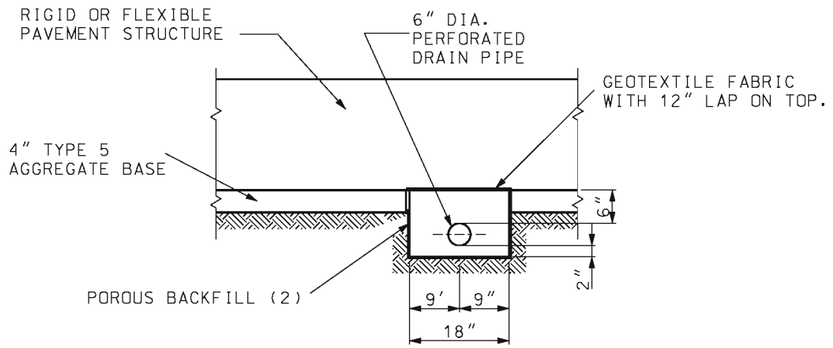
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED, AND DATED ELECTRONICALLY.

# PAVEMENT UNDERDRAINAGE

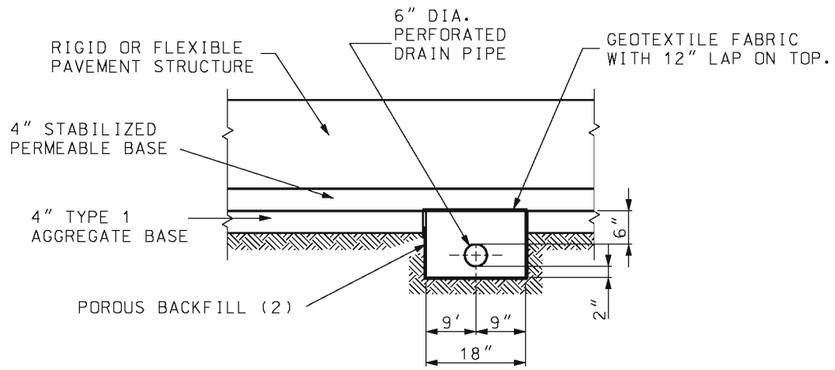
PIPE AGGREGATE PAVEMENT EDGE DRAINS FOR TYPE A2 SHOULDERS

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

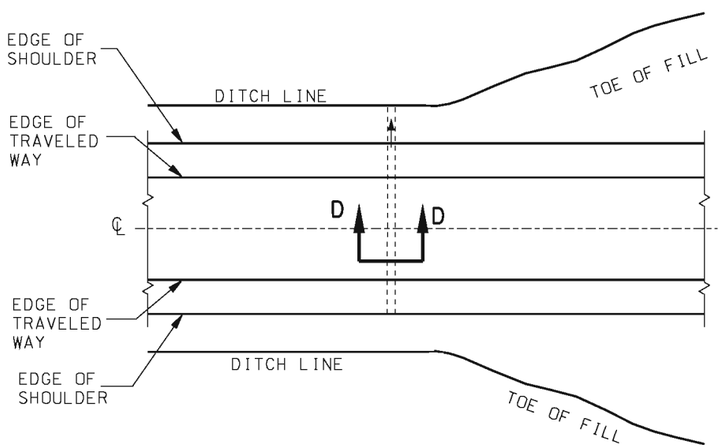
605.101



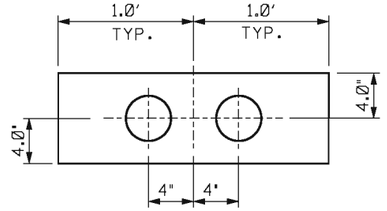

SECTION D-D
WITHOUT PERMEABLE BASE



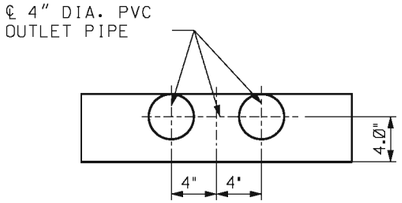

SECTION D-D
WITH PERMEABLE BASE



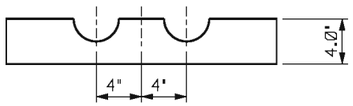

CROSS DRAIN



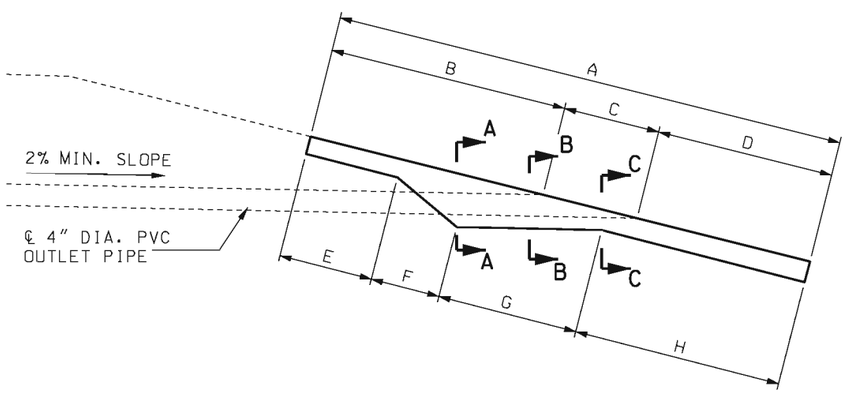

SECTION A-A




SECTION B-B




SECTION C-C




CONCRETE SPLASH PADS

| ITEM | 2:1 | 3:1 | 4:1 | 6:1 |
|---|---|---|---|---|
| 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. |

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.

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JEFFERSON CITY, MO 65102
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KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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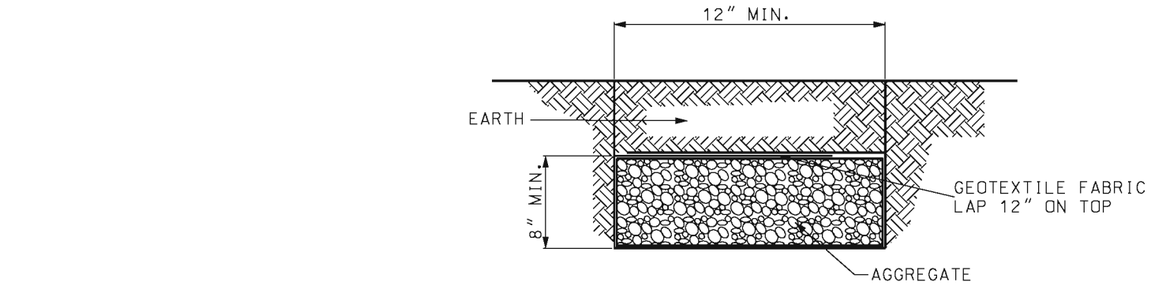
# PAVEMENT UNDERDRAINAGE
## CROSS DRAINS

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

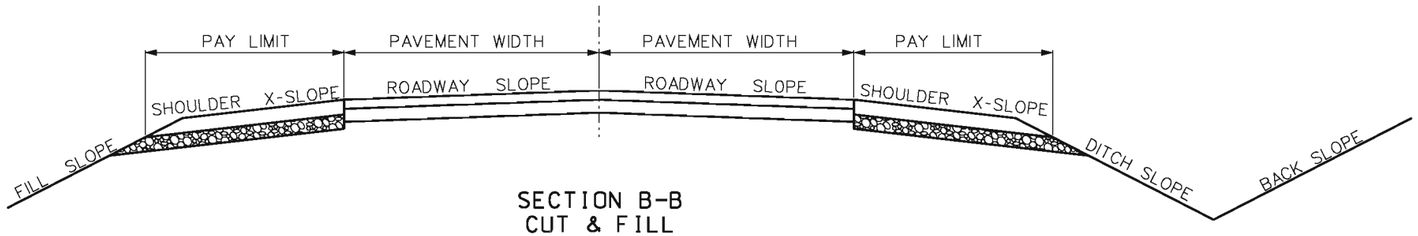
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SHEET NO. 3 OF 4

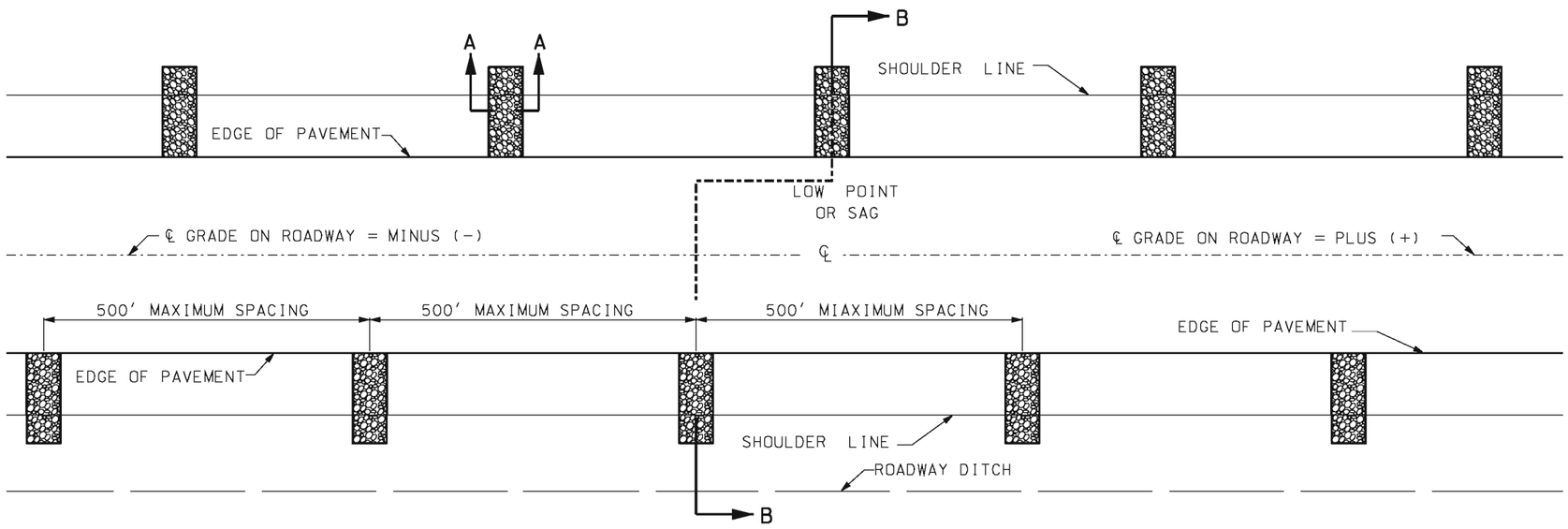
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




SECTION A-A




SECTION B-B
CUT & FILL
ELEVATION




PLAN

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.

THE BOTTOM OF THE AGGREGATE DRAINS SHALL BE AT OR BELOW THE BOTTOM OF THE PAVEMENT'S AGGREGATE SUBBASE AT THE POINT OF CONTACT. THE TOP OF THE AGGREGATE DRAINS SHALL BE NO HIGHER THAN THE BOTTOM OF THE SHOULDER'S AGGREGATE BASE.

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KATHRYN PHILLIPS HARVEY
NUMBER PE-2575I
PROFESSIONAL ENGINEER
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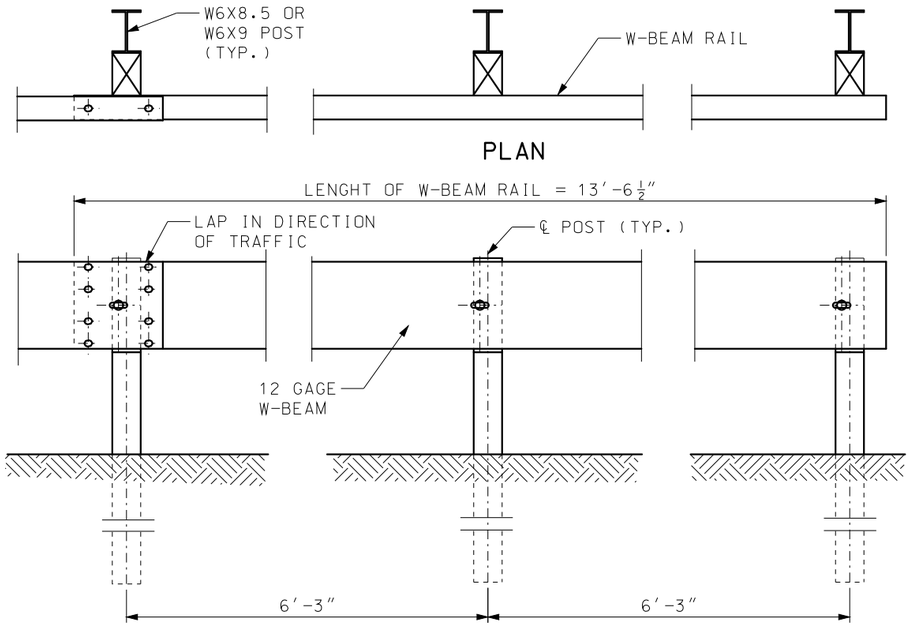
# PAVEMENT UNDERDRAINAGE
## AGGREGATE UNDERDRAINS

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

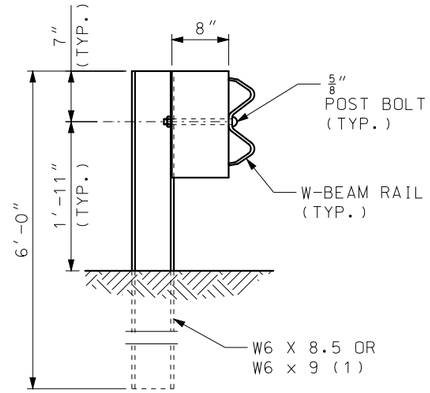
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SHEET NO. 4 OF 4

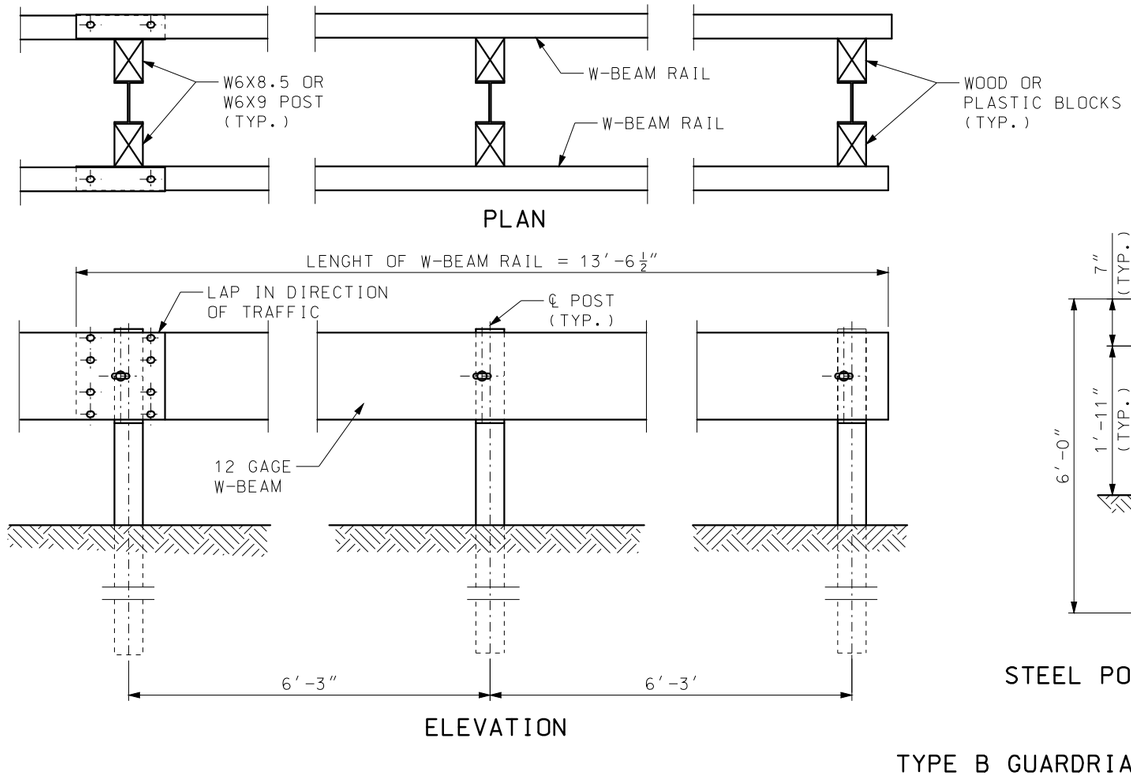
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



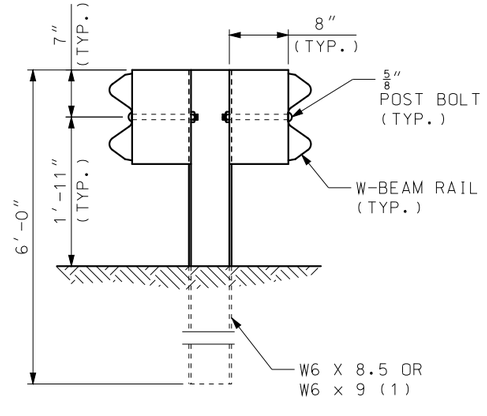

TYPE A GUARDRAIL




STEEL POST & WOOD OR
PLASTIC BLOCK




TYPE B GUARDRIAL




STEEL POST & WOOD OR PLASTIC
BLOCKS

(1) THE CONTRACTOR MAY FURNISH EQUIVALENT SECTIONS FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH SECTION 1040.

GENERAL NOTES:
SEE SHEET NO. 5 OF 7 FOR POST AND BLOCK DETAILS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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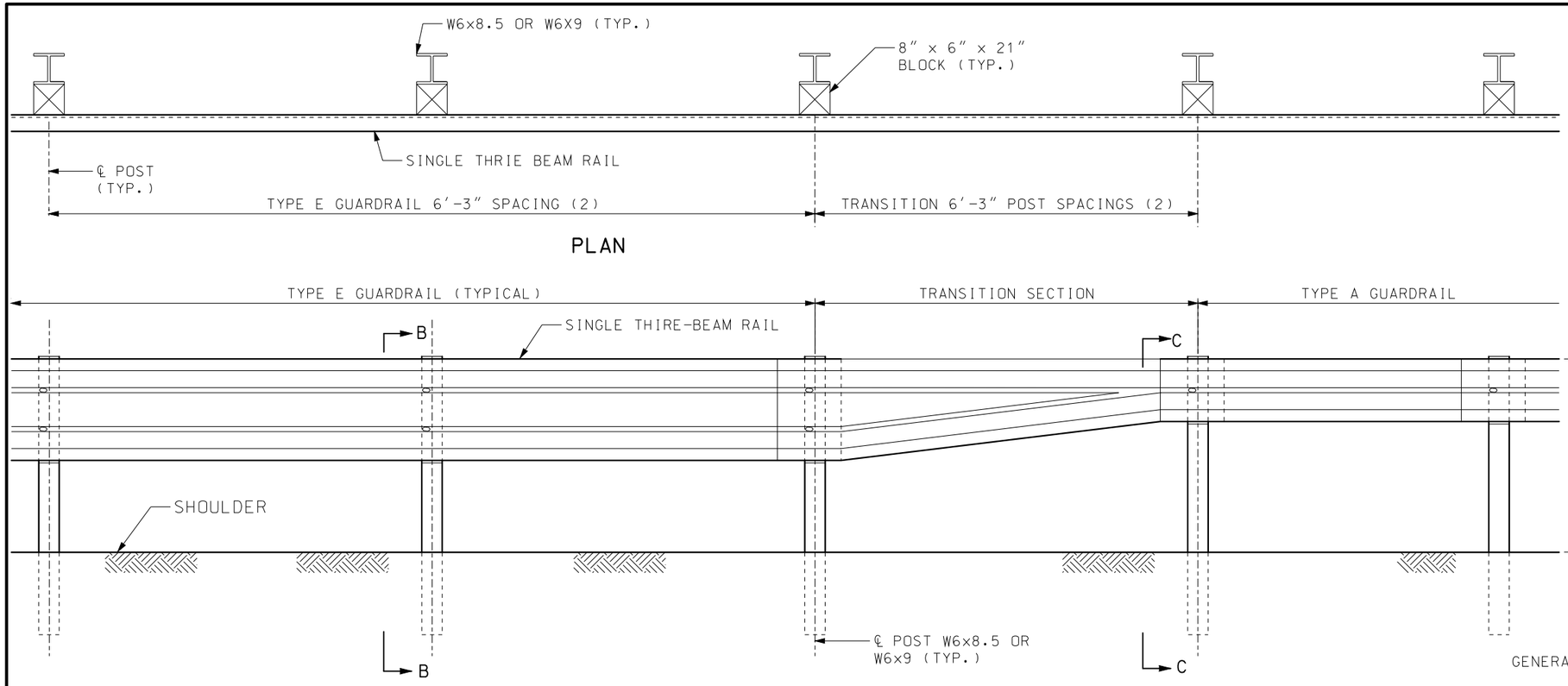
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# GUARDRAIL
# TYPE A AND TYPE B

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.00AY

SHEET NO.
1 OF 7




PLAN



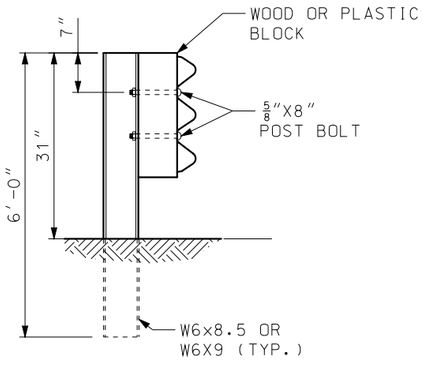

(1) THE CONTRACTOR MAY FURNISH EQUIVALENT SECTIONS FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH SEC 1040.

(2) IF THE TRANSITION IS CONNECTED TO A BRIDGE ANCHOR SECTION, POST SPACING FOR TYPE E GUARDRAIL AND THE TRANSITION SECTION SHALL BE 3'-1½" . FOR ALL OTHER CASES, POST SPACING SHALL BE 6'-3".

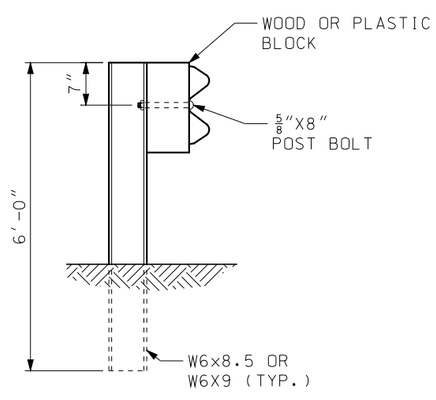
(3) TRANSITION FROM 31" TO 29" HEIGHT OVER 2-12.5' W-BEAMS OR 25'.

## PART SECTION SHOWING TYPE E TO TYPE A GUARDRAIL TRANSITION

THE OVERALL NOMINAL DIMENSIONS SHOWN SHALL BE MET, ALTHOUGH THE SHAPE OF THE PLASTIC BLOCKS MAY VARY FROM THE SHAPE SHOWN, EXCEPT THE $\frac{7}{8}" \pm \frac{1}{4}"$ FLANGE AND THE OVERALL WIDTH DIMENSIONS MAY BE WAIVED IF APPROVED BY PROJECT OPERATIONS.




SECTION B–B




SECTION C–C

GENERAL NOTES:

TYPE E GUARDRAIL SHALL USE 6'-3" POST SPACING UNLESS 3'-1½" POST IS SPECIFIED.

THE THRIE BEAM RAIL FOR THE TYPE E GUARDRAIL AND THE TRANSITION SECTION SHALL BE MADE OF STEEL AND SHALL BE 12 GAGE.

FOR PROTECTIVE COATING AND MATERAL REQUIREMENTS, SEE SEC 1040 OF THE STANDARD SPECIFICATIONS.

SEE SHEET 7 OF 7 FOR REQUIREMENTS FOR SPECIAL INSTALLATIONS.

ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES EXCEPT WHERE ALLOWABLE TOLERANCES ARE SHOWN.

FOR DETAILS NOT SHOWN, SEE OTHER SHEETS OF THIS DRAWING.

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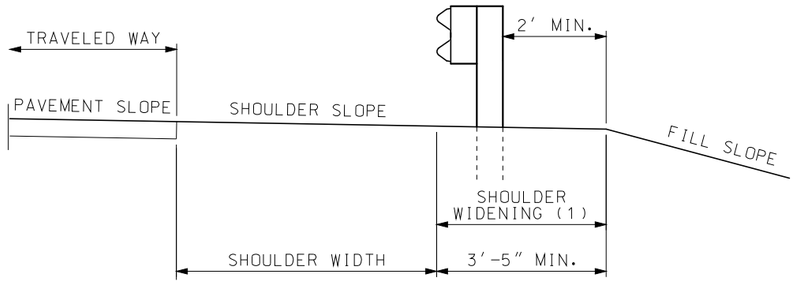
# GUARDRAIL TYPE E

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

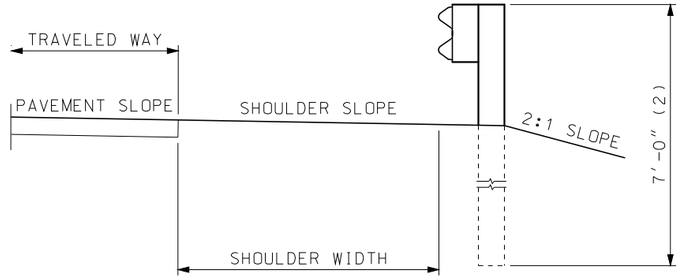
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SHEET NO. 2 OF 7

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




TYPCIAL SECTION

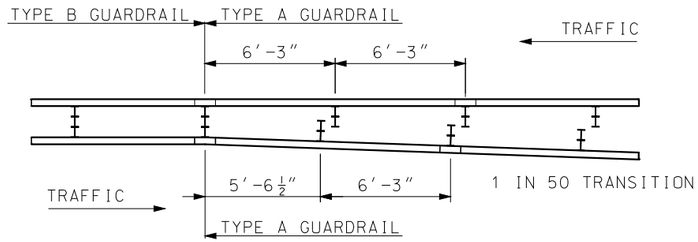



ALTERNATE TYPICAL SECTION AT SLOPE BREAKPOINT

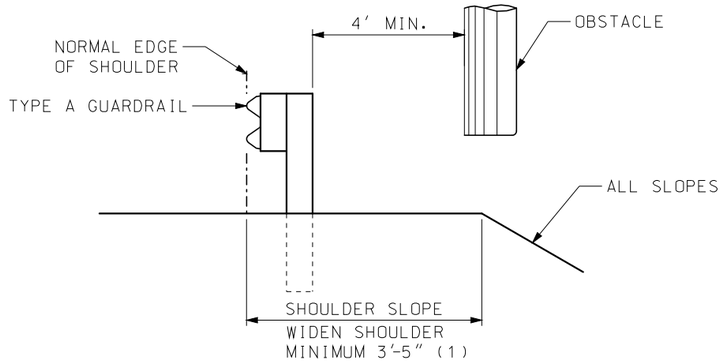
(1) SHOULDER WIDENING SHALL CONSIST OF EMBANKMENT MATERIAL COMPACETED IN ACCORDANCE WITH SEC 203.4 OF THE STANDARD SPECIFICATIONS.

(2) POST SHALL BE SPACED AT 3'-1½" ON CENTER.

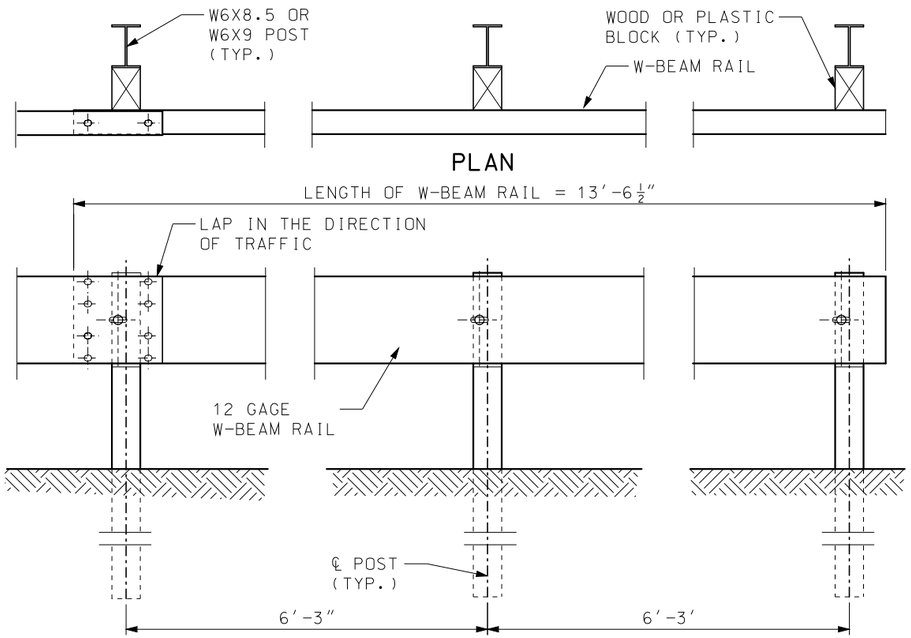
(3) WHEN GUARDRAIL IS CONSTRUCTED OVER CURBS, THE CURBS SHALL BE CONSTRUCTED AS SHOWN.

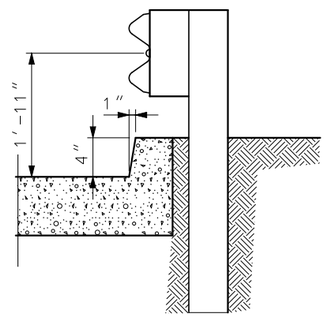



DETAIL FOR TRANSITIONING
BETWEEN TYPE A AND TYPE B GUARDRAIL




LOCATION OTHER THAN ℄ MEDIAN
LATERAL PLACEMENT OF GUARDRAIL
FOR SHOULDER INSTALLATION




GUARDRIAL AT CURBS (3)

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STATE OF MISSOURI
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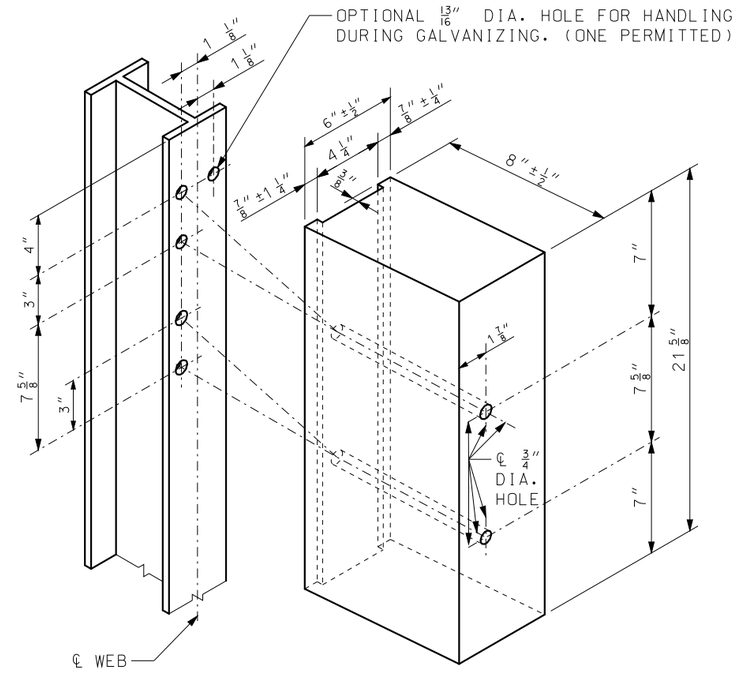
GUARDARIL LAYOUT

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

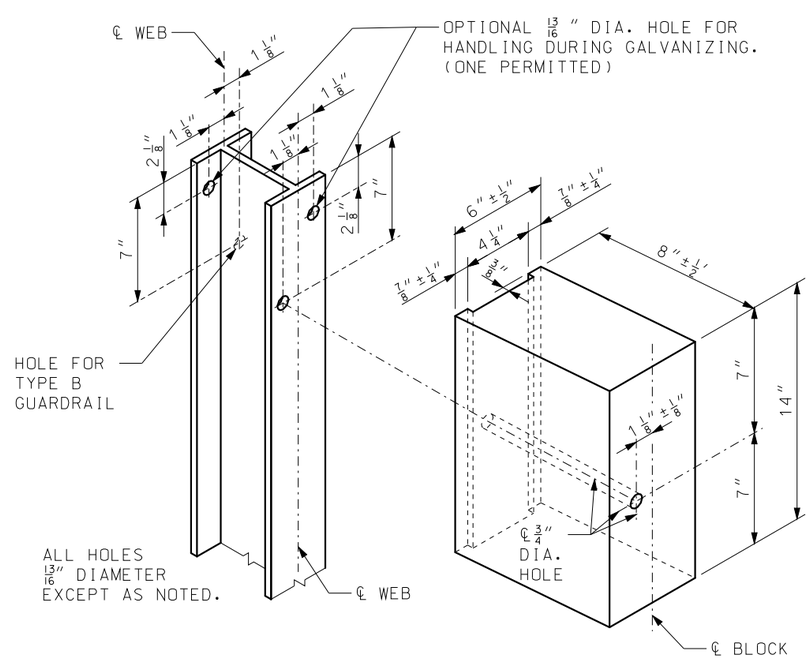
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SHEET NO. 3 OF 7

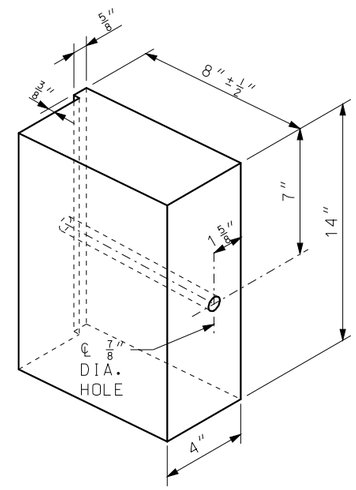
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




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

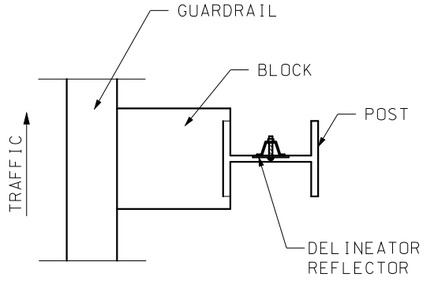


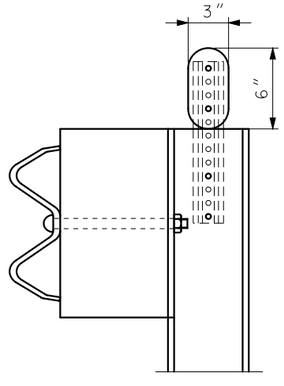

TYPE A AND TYPE B
FOR STEEL POST AND WOOD OR PLASTIC BLOCKS (1)

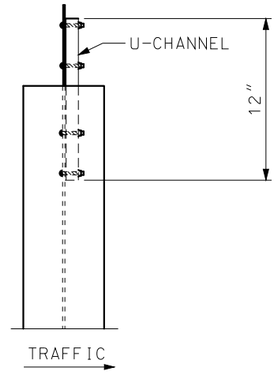



ALTERNATE DESIGN
FOR WOOD BLOCK

(1) THE OVERALL NOMINAL DIMENSIONS SHOWN SHALL BE MET, ALTHOUGH THE SHAPE OF THE PLASTIC BLOCKS MAY VARY FROM THE SHAPE SHOWN, EXCEPT THE 7/8" ±1/4" FLANGE AND THE OVERALL WIDTH DIMENSIONS MAY BE WAIVED IF APPROVED BY PROJECT OPERATIONS.




DELINEATORS ON NEW GUARDRAIL

GENERAL NOTES:

FOR GUARDRAIL DELINEATION DETAILS SEE STD PLAN 903.03.

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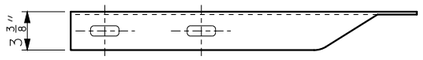
# GUARDRAIL POST AND BLOCK

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

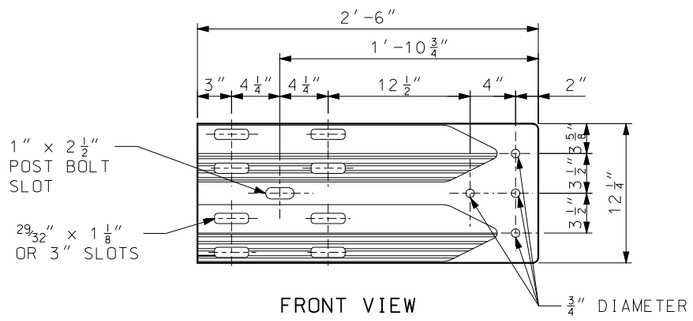
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SHEET NO. 4 OF 7

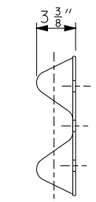
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



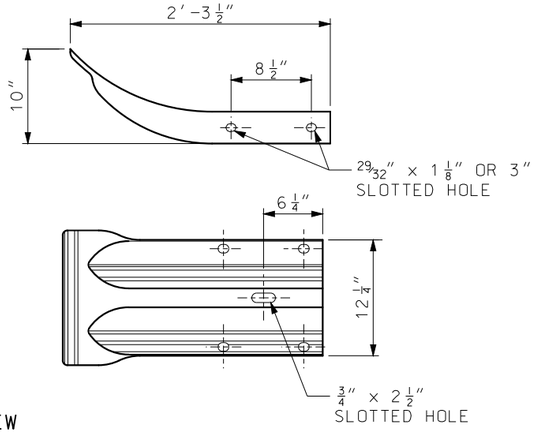
TOP VIEW



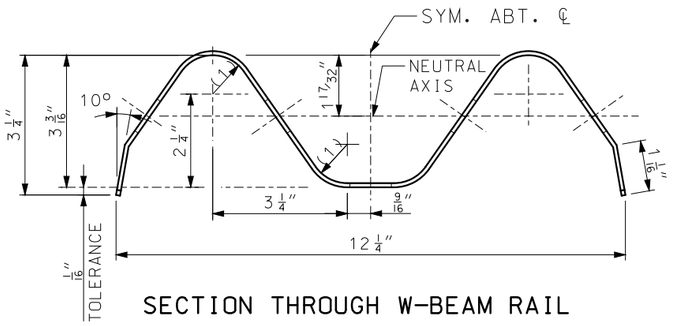

FRONT VIEW



END VIEW



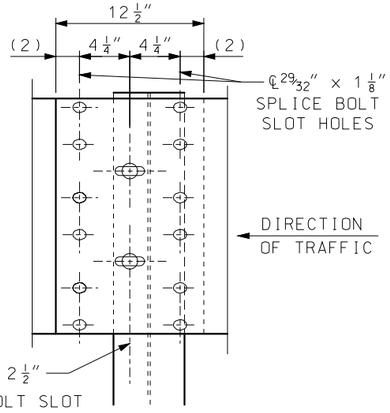

## TERMIANL CONNECTOR



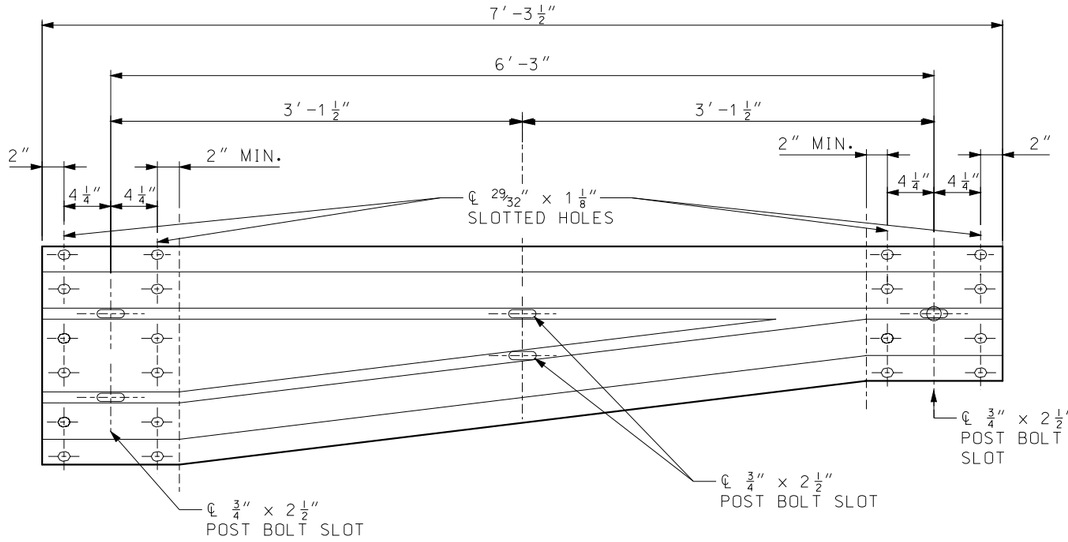

SECTION THROUGH W-BEAM RAIL

(1) 15/16″ RADIUS

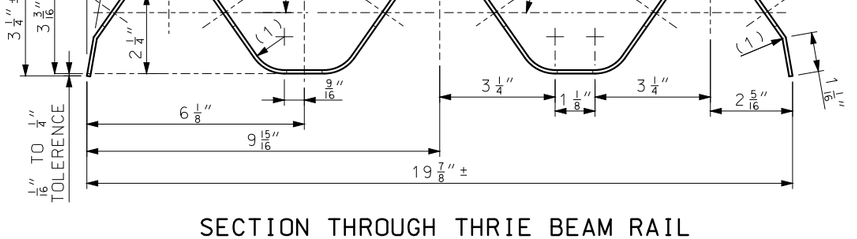
(2) 2″ (TOLERANCE +1 1/4″, −1/4″)



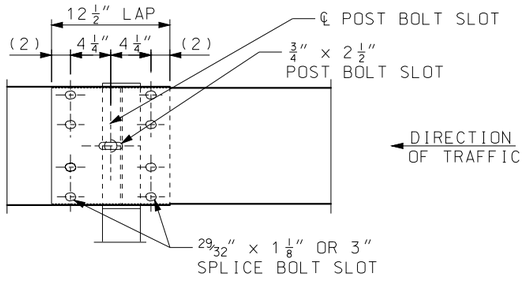

THRIE-BEAM SPLICE AT POST



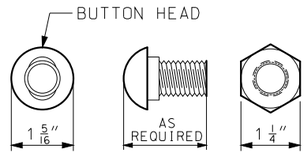

ELEVATION OF ASYMMETRICAL TRANSITION SECTION




SECTION THROUGH THRIE BEAM RAIL

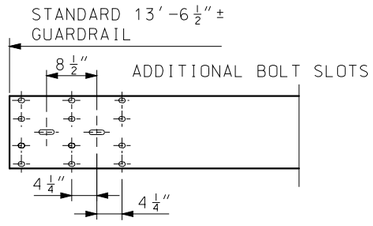



W-BEAM RAIL SPLICE AT POST




OVAL SHOULDER SHALL BE OF ADEQUATE HEIGHT, LENGTH & SHAPE TO PREVENT TURNING DURING INSTALLATION OR REMOVAL OF BOLT.

5/8″ POST OR SPLICE BOLT




NOTE: PORTIONS OF BEAM WITH UNUSED BOLT SLOTS TO BE LAPPED BEHIND.

BEAM DETAILS SHOWING LOCATION OF ADDITIONAL BOLT SLOTS NECESSARY TO OBTAIN GUARDRAIL OFFSET.


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NUMBER PE-28411
PROFESSIONAL ENGINEER
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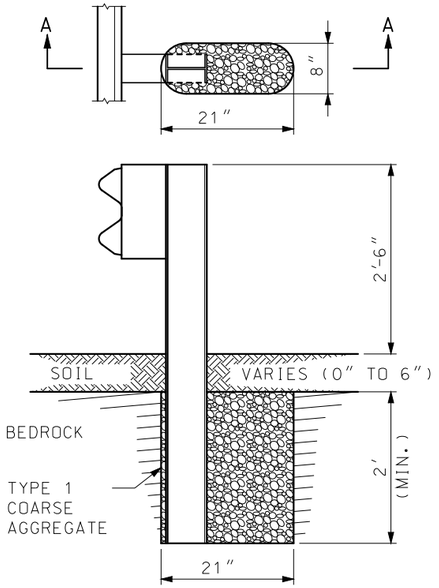
# GUARDRAIL
# RAIL ELEMENTS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

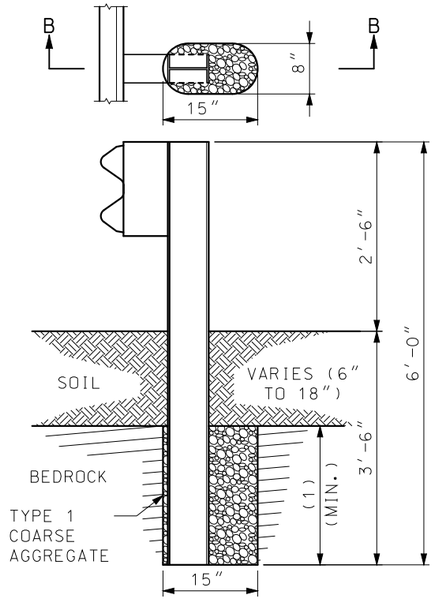
606.00AY

SHEET NO. 5 OF 7

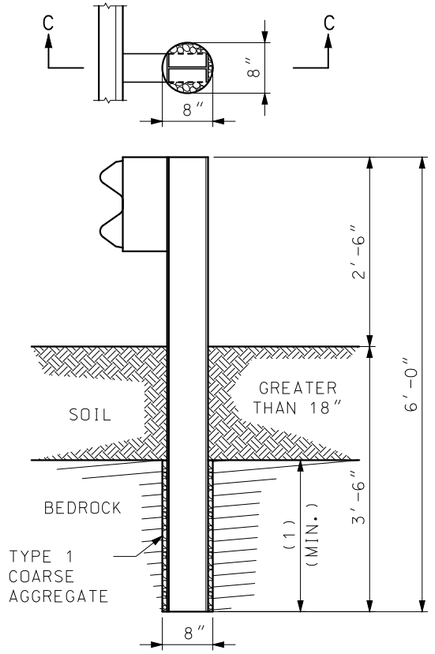

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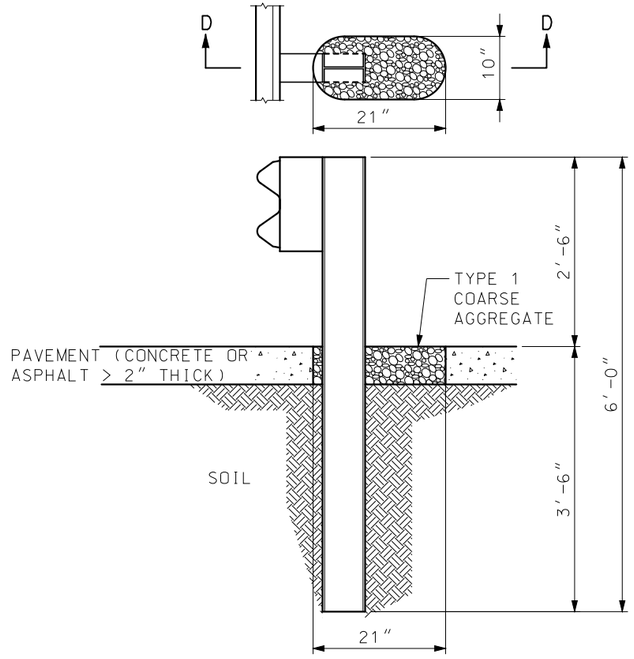

SECTION A–A
ROCK ENCOUNTERED
UP TO 6″ BENEATH SURFACE




SECTION B–B
ROCK ENCOUNTERED
6″ TO 18″ BENEATH SURFACE

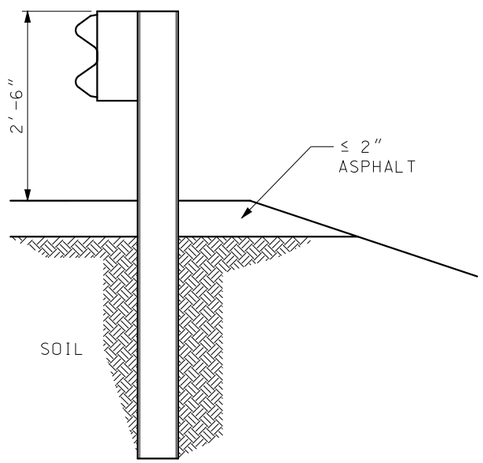



SECTION C–C
ROCK ENCOUNTERED MORE
THAN 18″ BENEATH SURFACE




SECTION D–D
SETTING POST THROUGH PAVEMENT
(CONCRETE OR ASPHALT > 2″ THICK)

## SETTING POST IN SOLID ROCK




SETTING POST THROUGH ASPHALT ≤ 2″ THICK

(1) MINIMUM ROCK EMBEDMENT IS EQUAL TO FULL DEPTH POST EMBEDMENT MINUS SOIL DEPTH.

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 A MINIMUM 2 FEET OF SOLID ROCK. STEEL POSTS MAY BE FLAME OR SAW CUT. REPAIR OF CUT SHALL BE IN ACCORDANCE WITH SEC 712 OF THE STANDARD SPECIFICATIONS.


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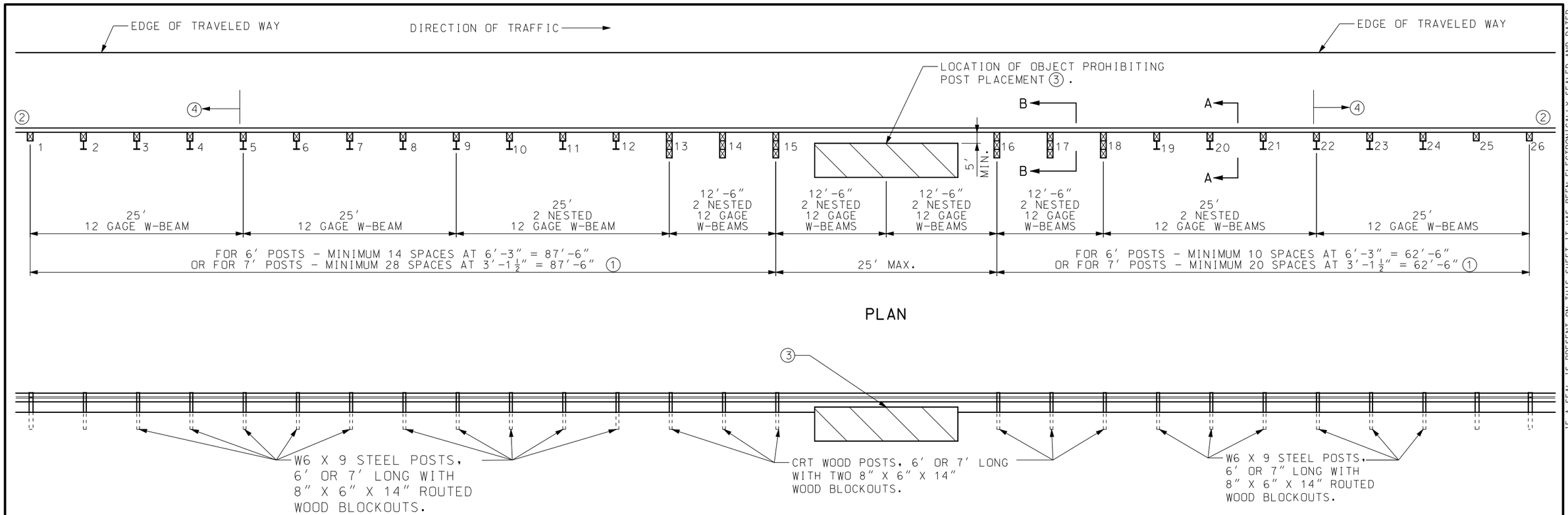
# GUARDRAIL
# SPECIAL INSTALLATIONS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.00AY

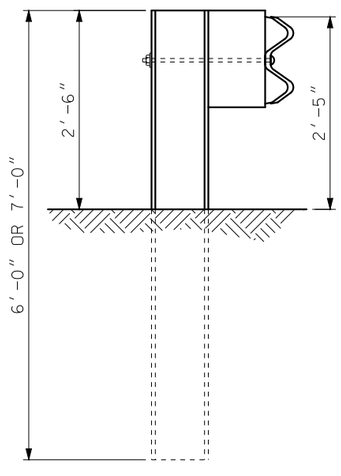
SHEET NO.
6 OF 7

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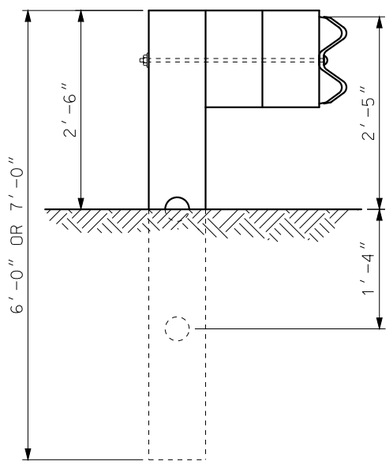

PLAN

ELEVATION




SECTION A-A

W6 X 9 STEEL POSTS, 6' OR 7' LONG WITH 8" X 6" X 14" ROUTED WOOD BLOCKOUTS POSTS 3 THROUGH 12 AND 19 THROUGH 24.




SECTION B-B

CRT WOOD POSTS, 6' OR 7' LONG WITH TWO 8" X 6" X 14" WOOD BLOCKOUTS POSTS 13 THROUGH 18.

(1) IF LOCATED WITHIN THE CLEAR ZONE OF A TWO-WAY ROADWAY, THE MINIMUM LENGTH IS 87'-6".

(2) ADDITIONAL GUARDRAIL AS REQUIRED, INCLUDING END TREATMENT.

(3) THE POST MAY BE SKIPPED DUE TO THE PRESENCE OF AN OBSTACLE SUCH AS A CULVERT.

(4) PLACE END TREATMENT NO CLOSER TO THE SKIPPED POST THAN POSTS 5 AND 22.

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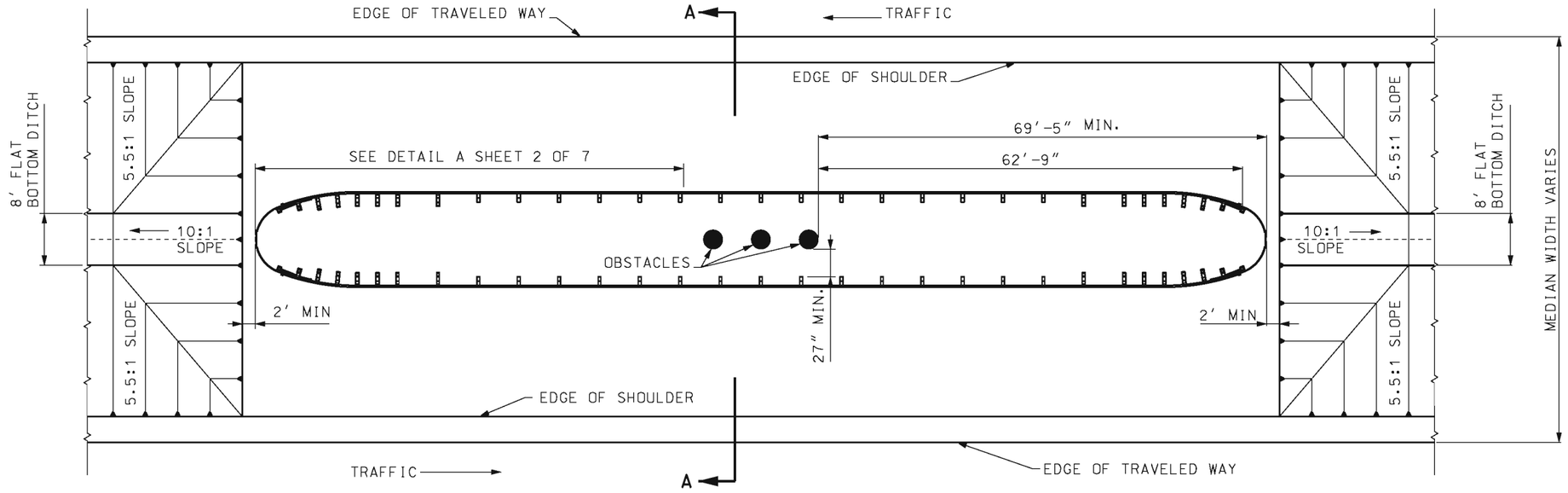
# GUARDRAIL
# LONG-SPAN NESTED W-BEAM

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

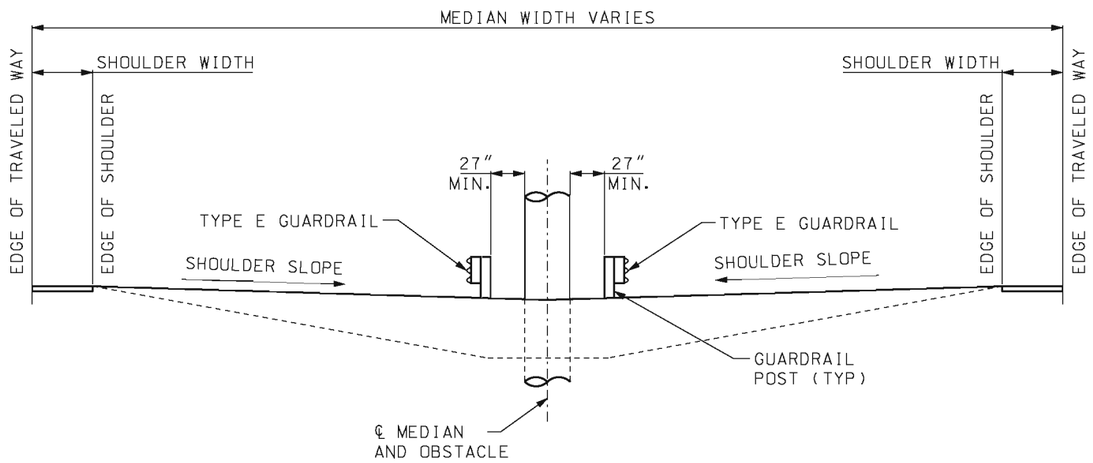
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SHEET NO. 7 OF 7

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## PIER AT ℄ OF MEDIAN
## PLAN VIEW




SECTION A-A

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.

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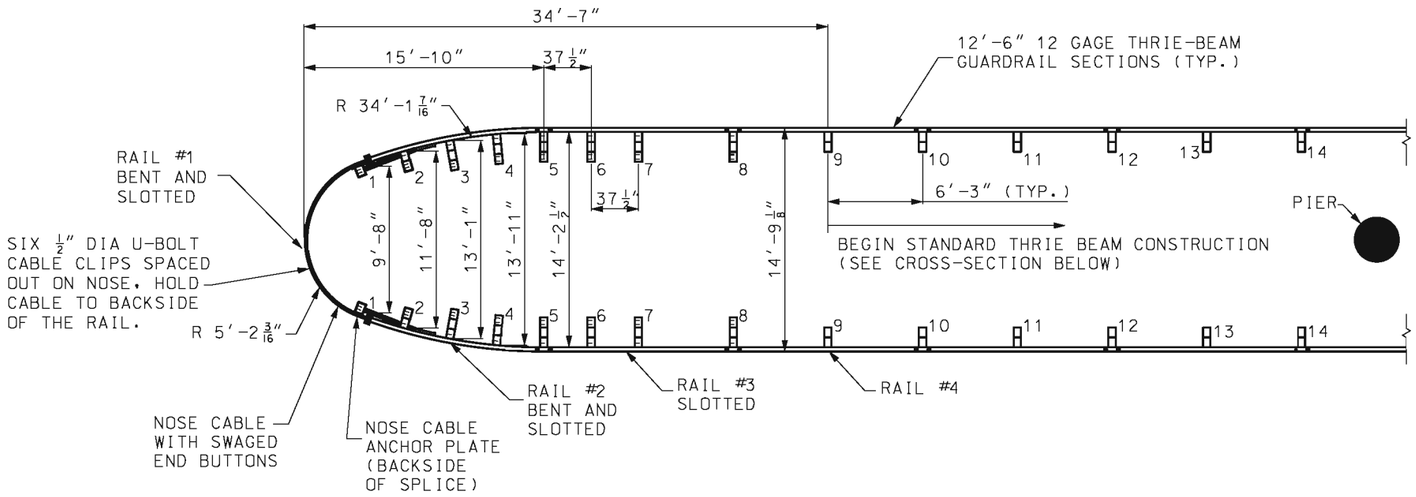
# MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM

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

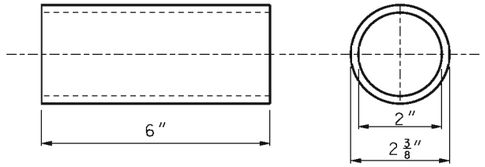
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SHEET NO. 1 OF 9

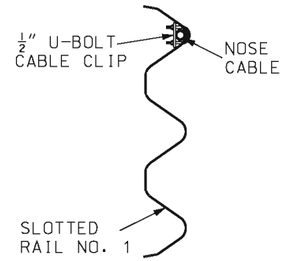
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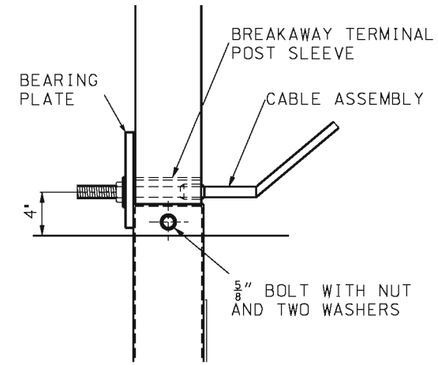

DETAIL A



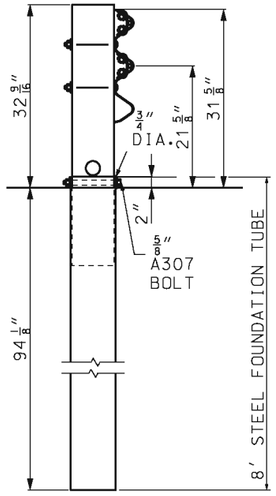

BREAKAWAY TERMINAL POST SLEEVE



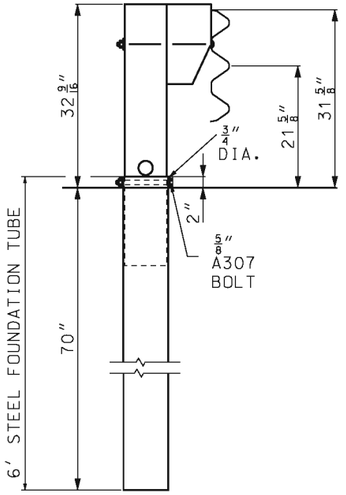

U-BOLT CABLE CLIP DETAIL



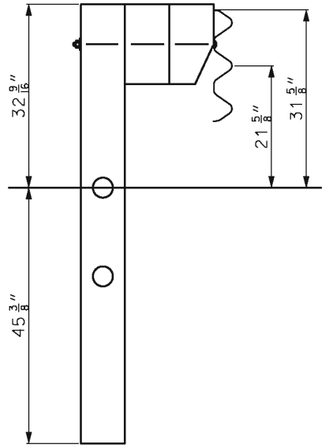

POST 1 DETAIL



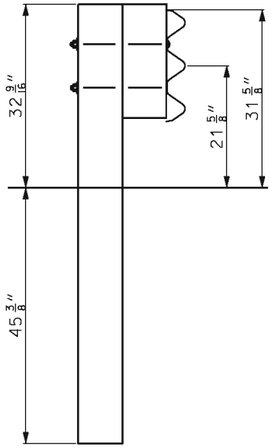

THRIE BEAM BCT POST WITH 96 1/16″ FOUNDATION TUBE POST 1




THRIE BEAM BCT POST WITH 72″ FOUNDATION TUBE AND 14″ TAPERED BLOCK POST 2




THRIE BEAM CRT POST 78″ LONG WITH 14″ BLOCK AND 14″ TAPERED BLOCK POSTS 3, 4, 5, 6, 7, 8




THRIE BEAM POST 78″ LONG WITH 14″ BLOCK POSTS 9 AND 10

## POST DETAILS

GENERAL NOTE:

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

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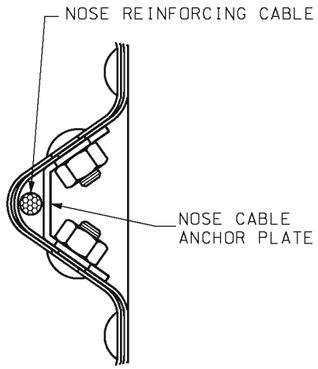
# MEDIAN PIER PROTECTION
## BULLNOSE GUARDRAIL SYSTEM

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

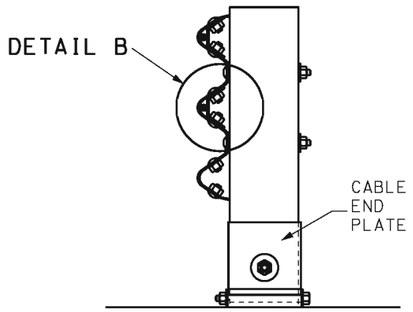
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SHEET NO. 2 OF 9

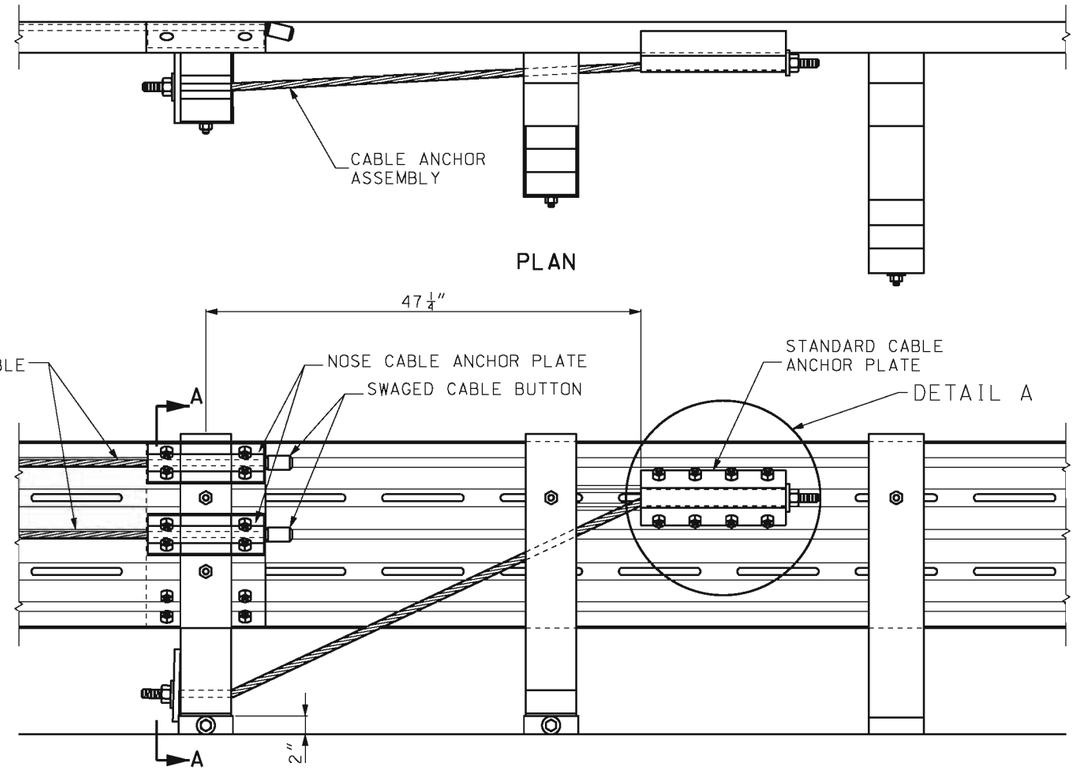
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DETAIL B

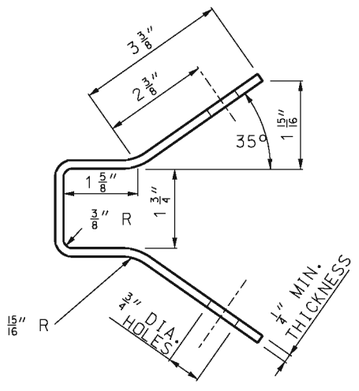



SECTION A-A

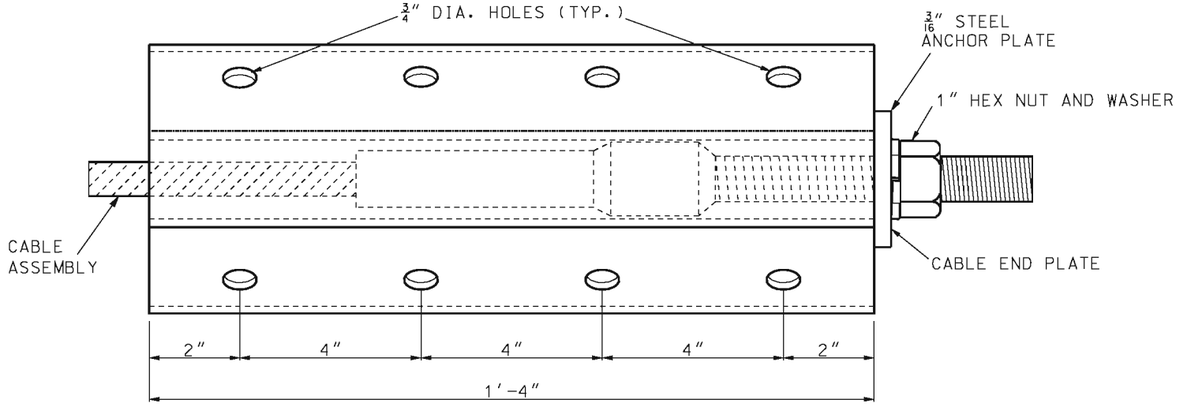



ELEVATION

## CABLE ANCHOR ASSEMBLY




END VIEW




DETAIL A

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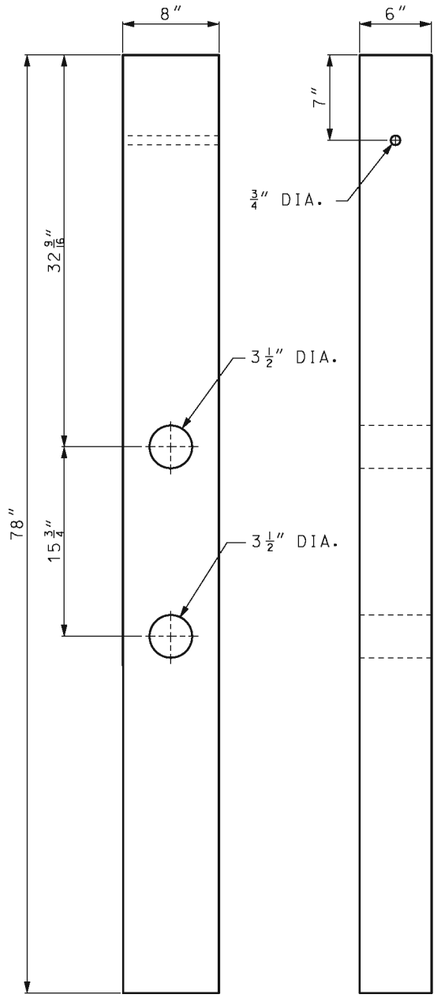
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# MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM
CABLE ANCHOR

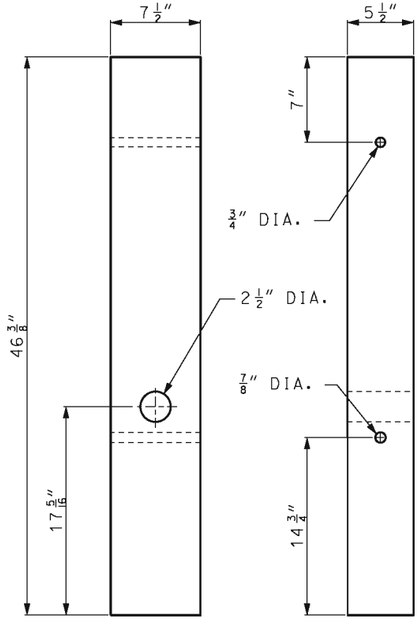
DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 7/27/2012

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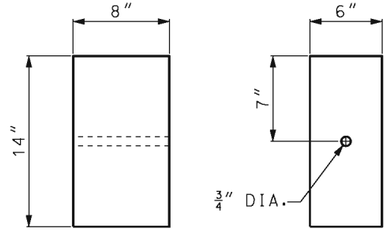
SHEET NO.
3 OF 9



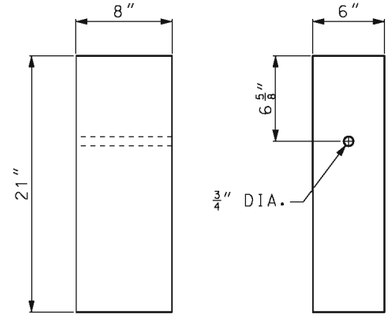

THRIE BEAM CRT POSTS



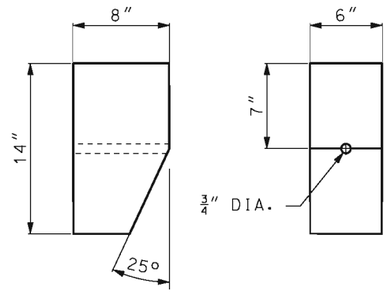

THRIE BEAM ANCHOR POSTS




POSTS 2 THROUGH 8
STANDARD BLOCKS




BLOCKS FOR POSTS 9 AND 10
STANDARD BLOCKS




TAPERED BLOCK

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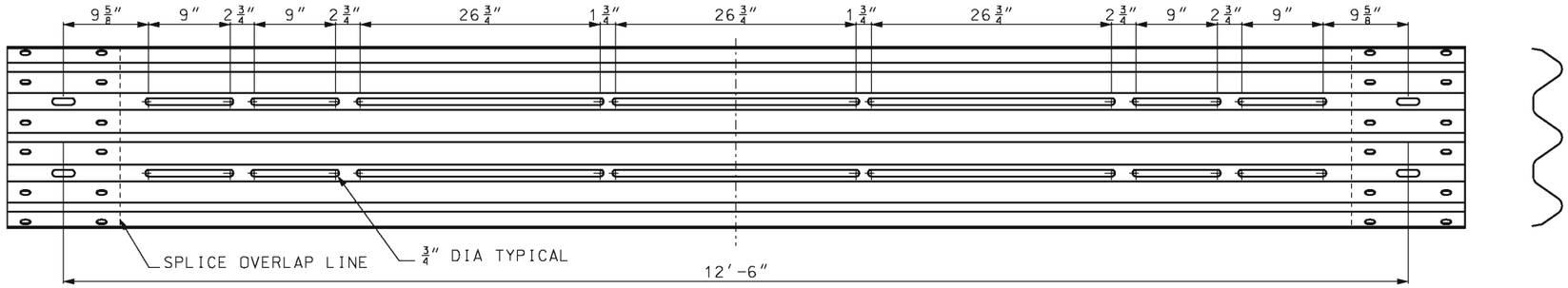
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# MEDIAN PIER PROTECTION
## BULLNOSE GUARDRAIL SYSTEM
## POST AND BLOCKS

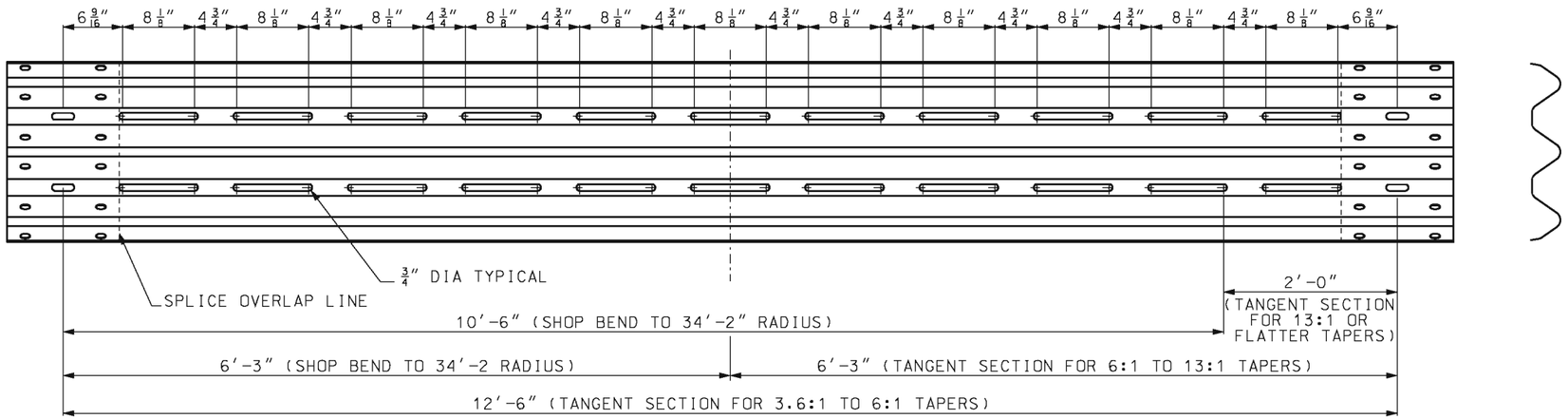
DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 7/27/2012

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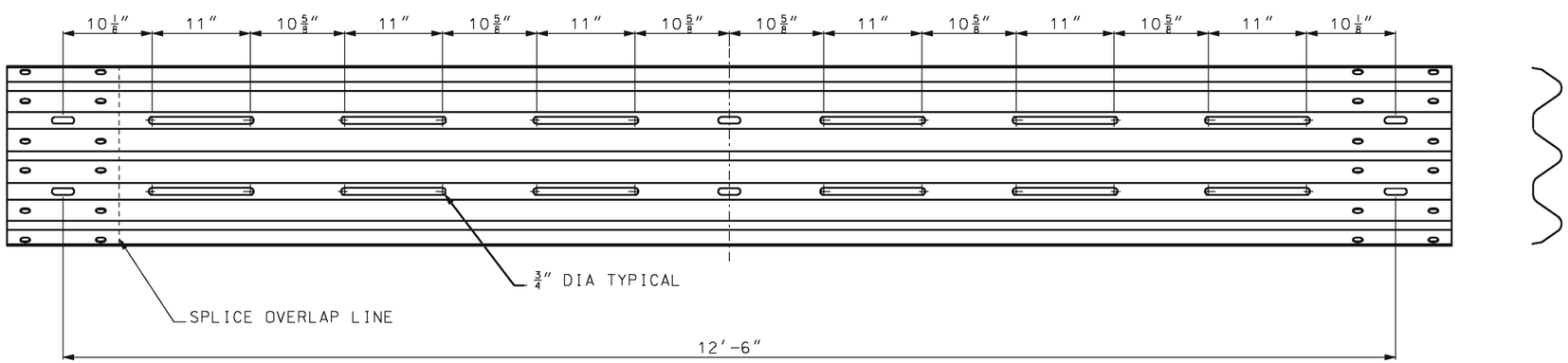
SHEET NO. 4 OF 9




## RAIL SECTION 1 (NOSE SECTION)




## RAIL SECTION 2




## RAIL SECTION 3

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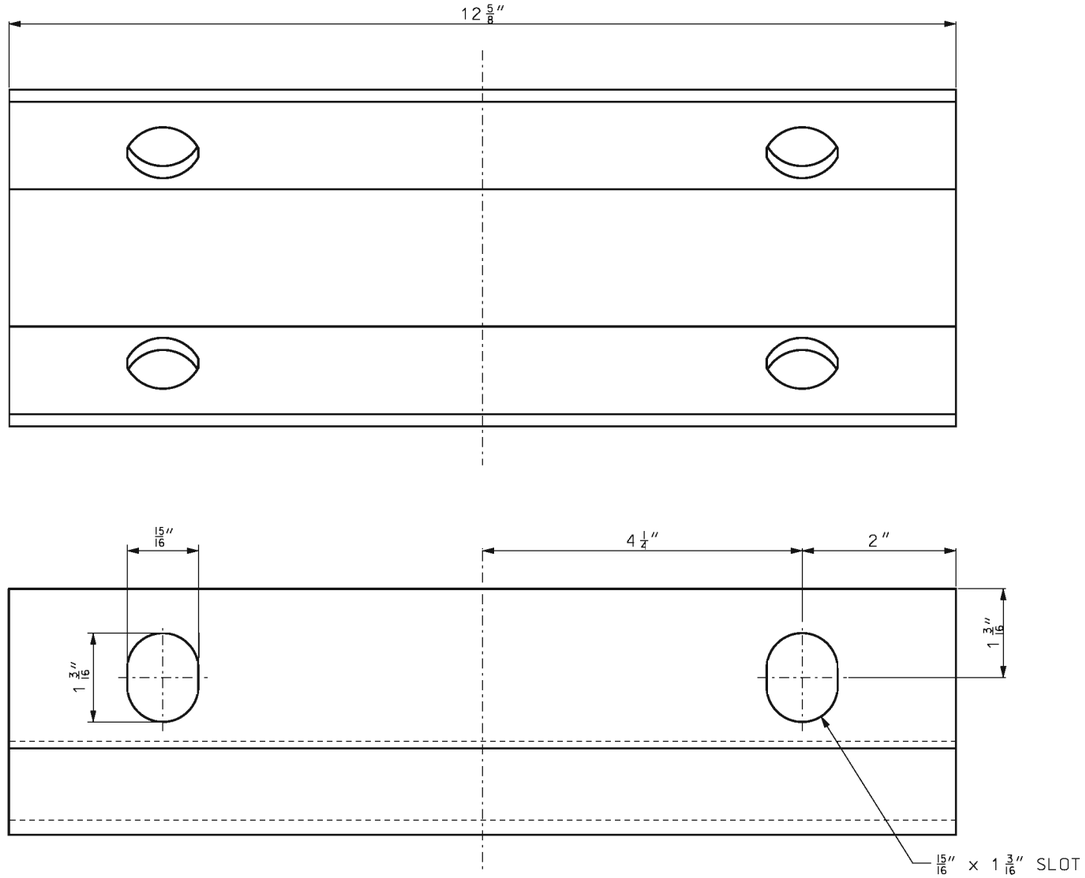
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# MEDIAN PIER PROTECTION

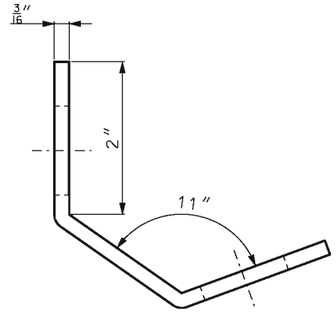
BULLNOSE GUARDRAIL SYSTEM
RAIL SECTION 1, 2 AND 3

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

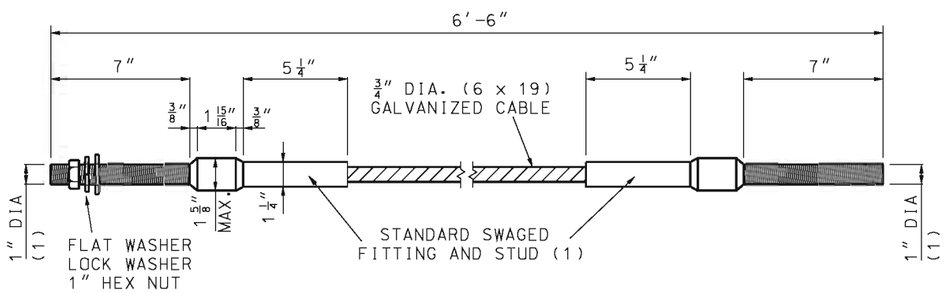
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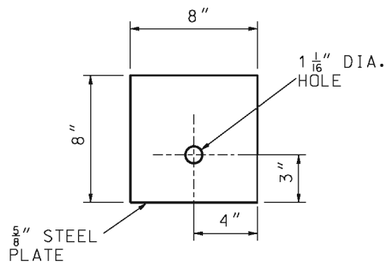

## STEEL PLATE, A306
## 12 5/8" x 5 7/8" x 3/16"




(1) STUD, THREADED ENTIRE LENGTH.




## DETAIL OF CABLE ASSEMBLY




## DETAIL OF STEEL BEARING PLATE

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

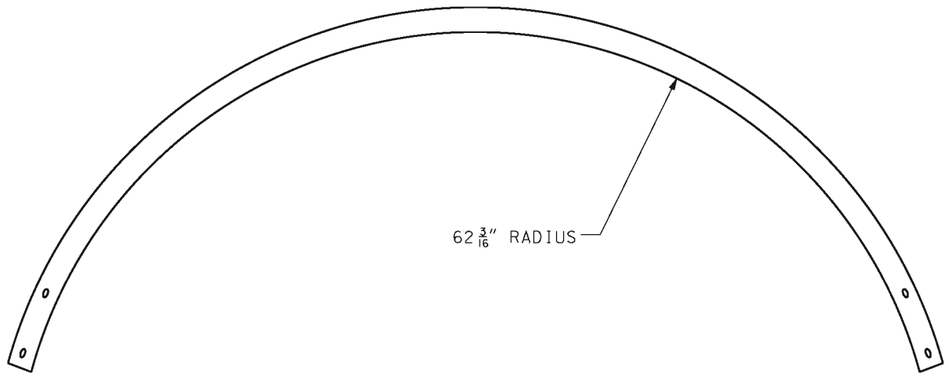
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JEFFERSON CITY, MO 65102
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PROFESSIONAL ENGINEER
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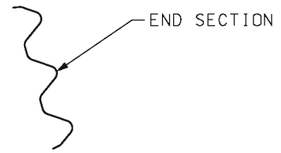
# MEDIAN PIER PROTECTION
## BULLNOSE GUARDRAILS SYSTEM PLATES AND CABLE ASSEMBLY

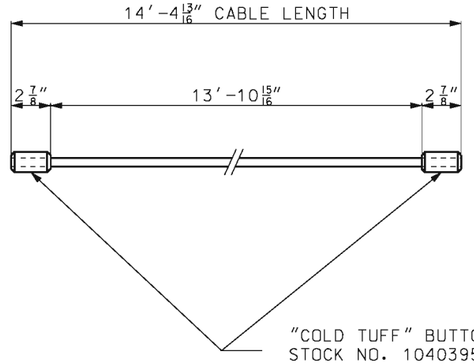
DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 7/27/2012

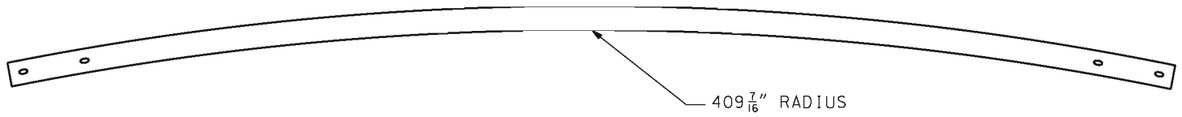
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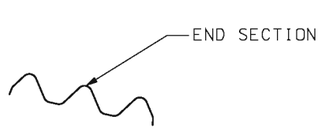

TOP VIEW, RAIL #1

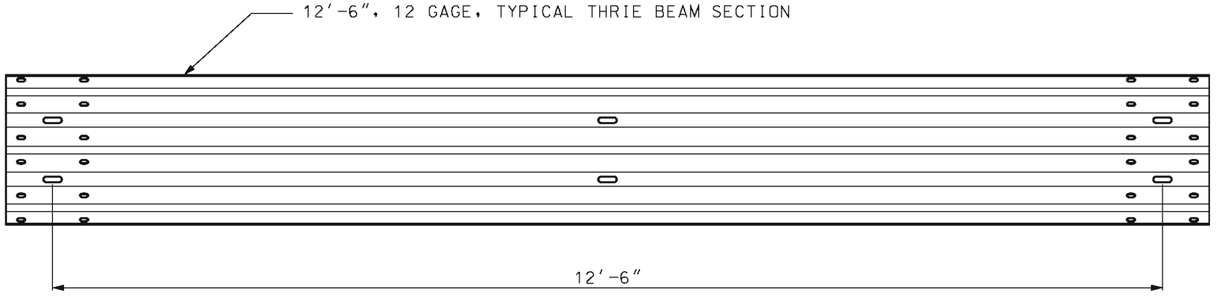


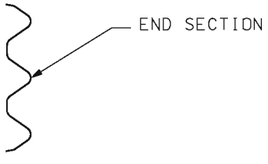




TOP VIEW, RAIL #2




FRONT VIEW (UNBENT)




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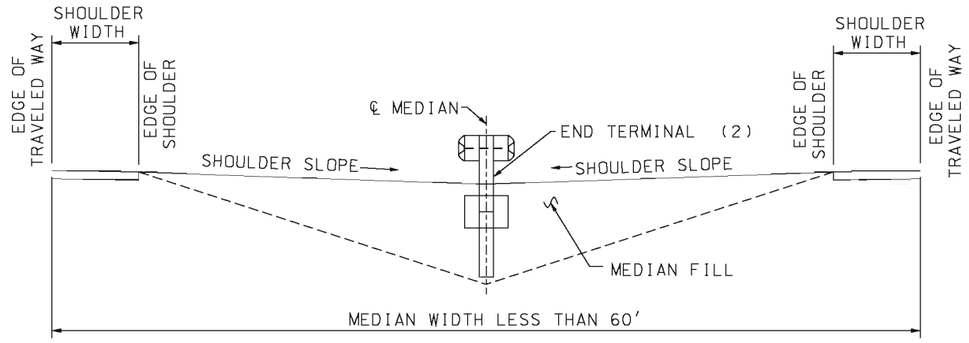
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# MEDIAN PIER PROTECTION
## BULLNOSE GUARDRAIL SYSTEM
## THRIE BEAM AND CABLE LENGTH

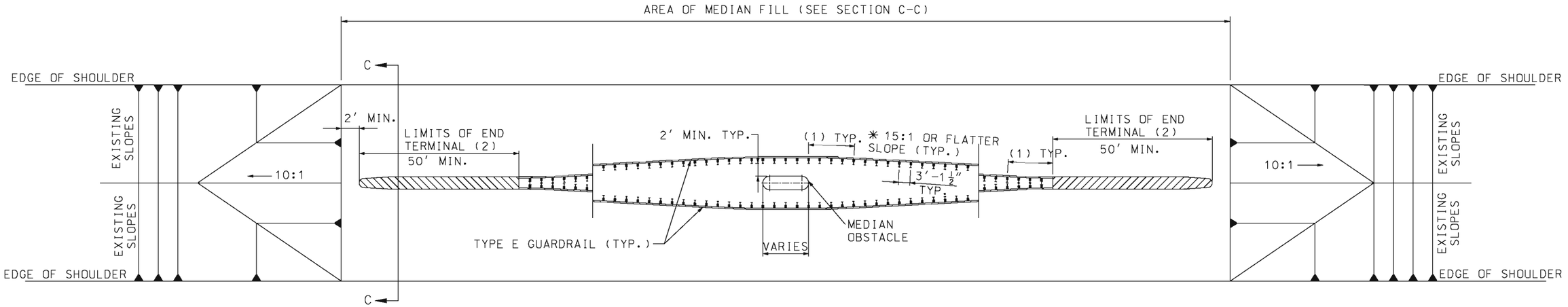
DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 7/27/2012

606.01F

SHEET NO. 7 OF 9




SECTION C-C




(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 CRASHWORTHY END TERMINAL.

GENERAL NOTES:

TYPE B CRASHWORTHY END TERMINAL SHALL BE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMENDATIONS.

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# TYPE E MEDIAN PIER PROTECTION

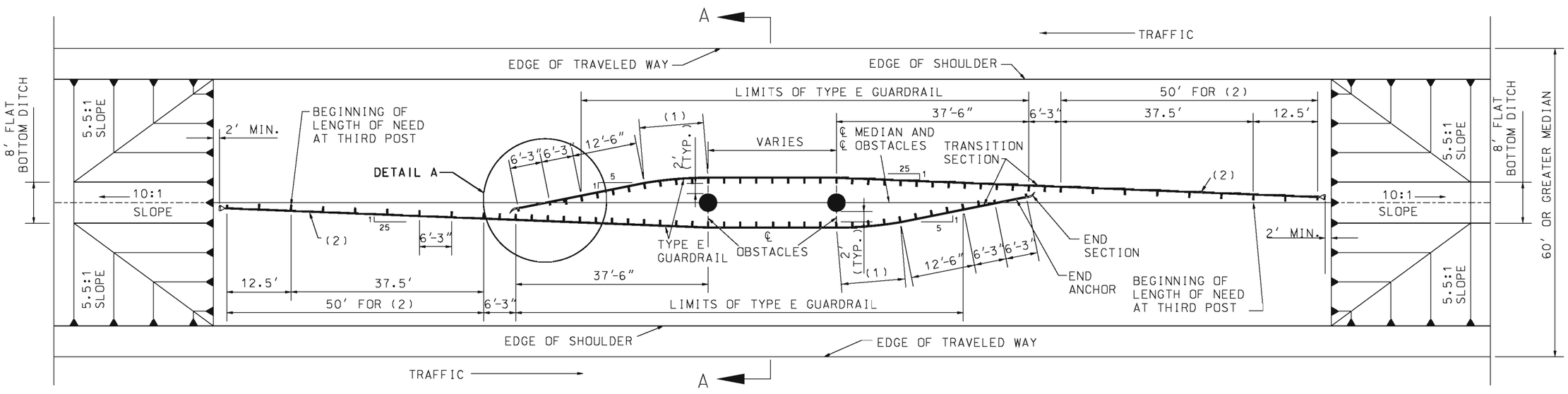
MEDIAN LESS THAN 60'

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

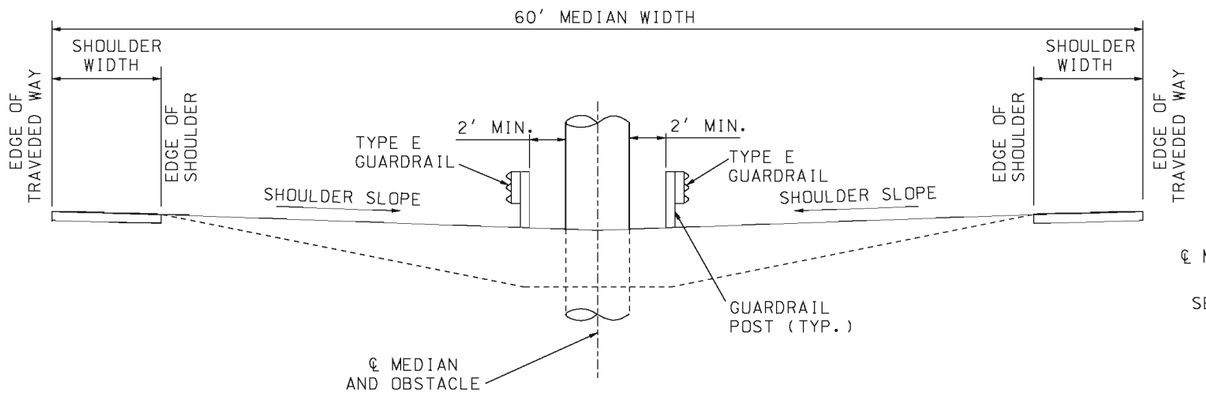
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SHEET NO. 8 OF 9

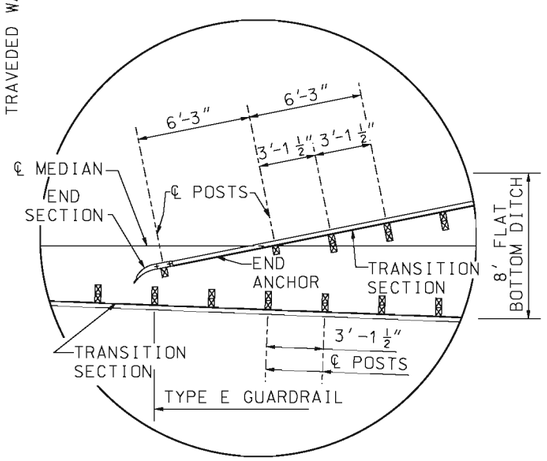
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PIER AT ℄ OF MEDIAN




SECTION A-A




DETAIL A

(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 EYOND 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.


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# TYPE E MEDIAN PIER PROTECTION

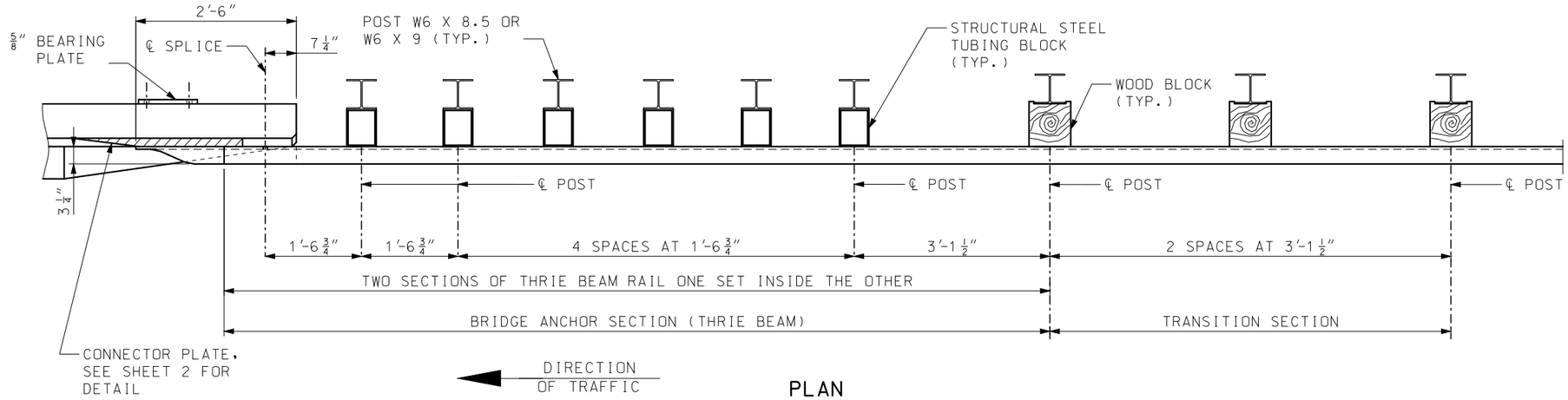
60' MEDIAN OR GREATER

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

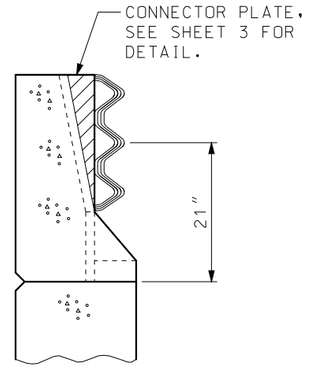
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SHEET NO. 9 OF 9

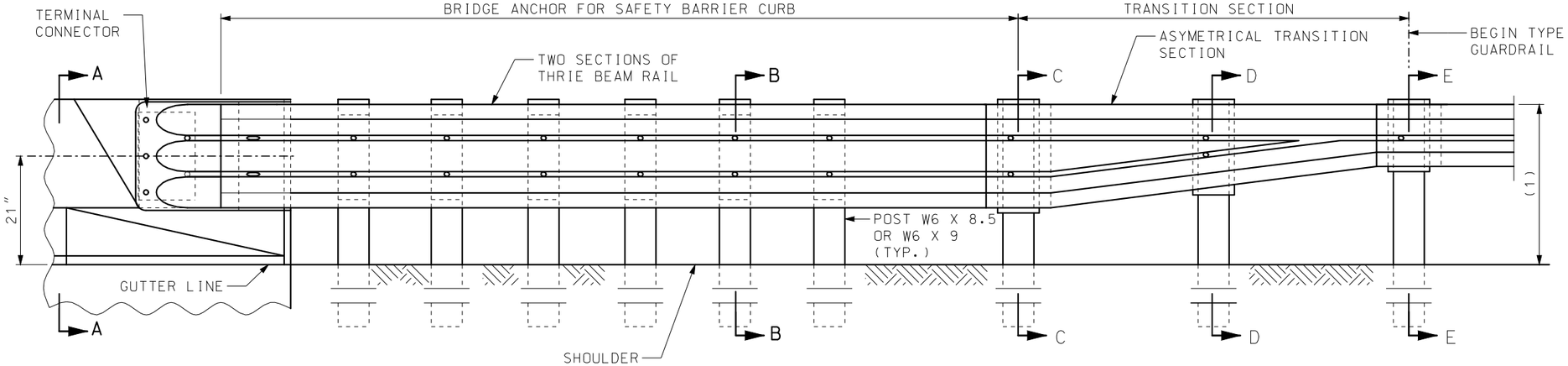
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PLAN

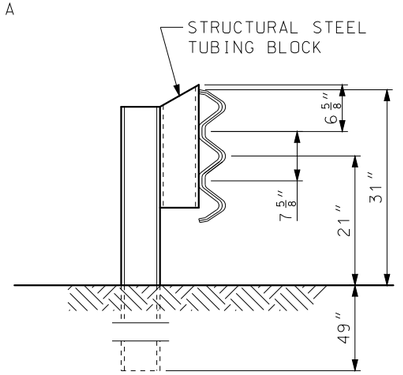



SECTION A-A

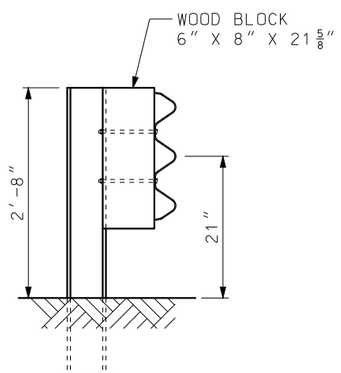



PART SECTION THRU SLAB AT END OF WING

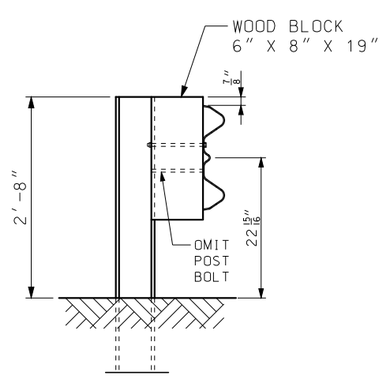
(1) TRANSITION FROM 31" TO 29" HEIGHT OVER NEXT TWO UPSTREAM 12'-6" W-BEAM RAILS.



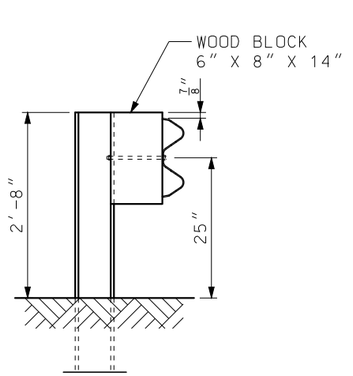

SECTION B-B




SECTION C-C




SECTION D-D




SECTION E-E

NOTES:

FOR GENERAL NOTES, SEE SHEET 3 OF 6

FOR DETAILS OF BLOCK ON STEEL POSTS, SEE SHEET 2 OF 6.

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NUMBER PE-28411
PROFESSIONAL ENGINEER
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# BRIDGE ANCHOR SECTION

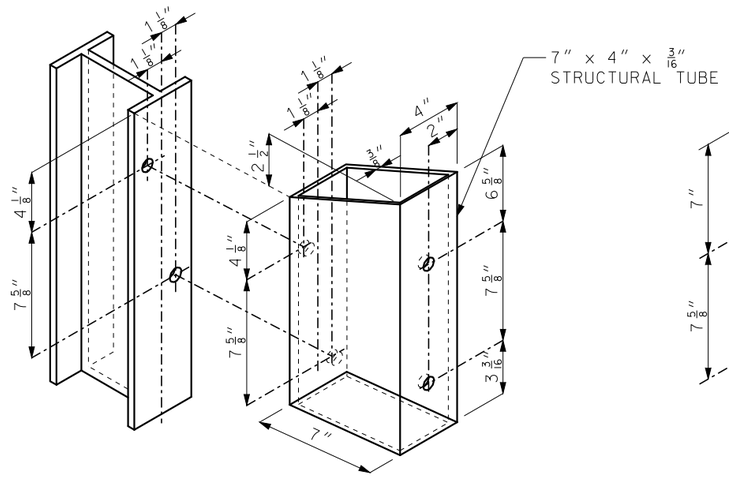
## SAFETY BARRIER CURB ON BRIDGE

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

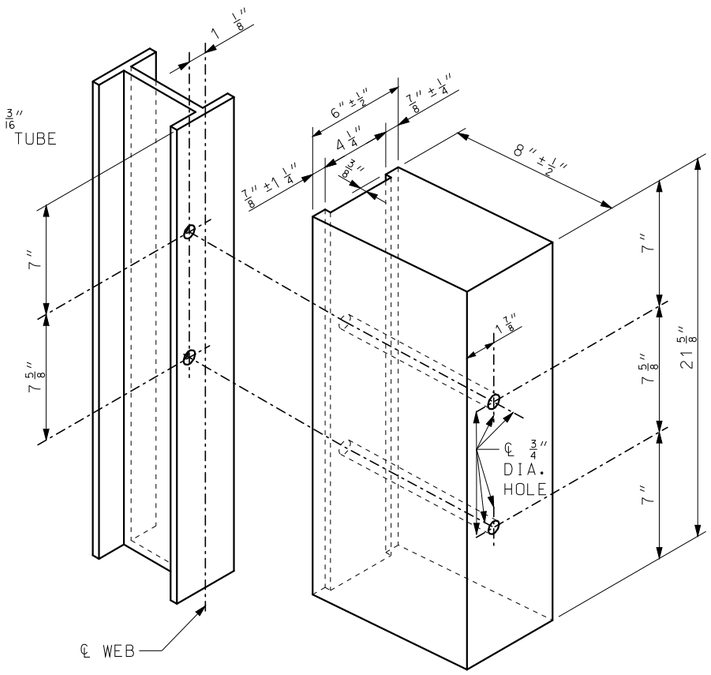
606.22U

SHEET NO. 1 OF 6

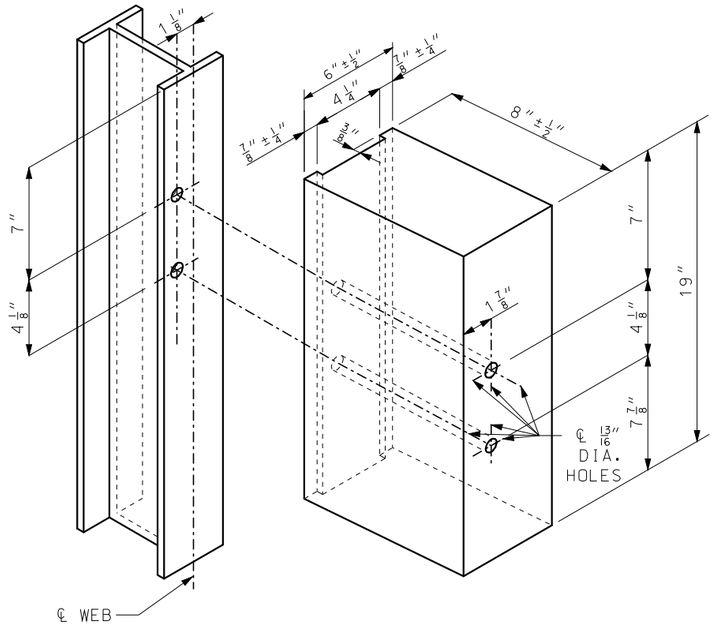
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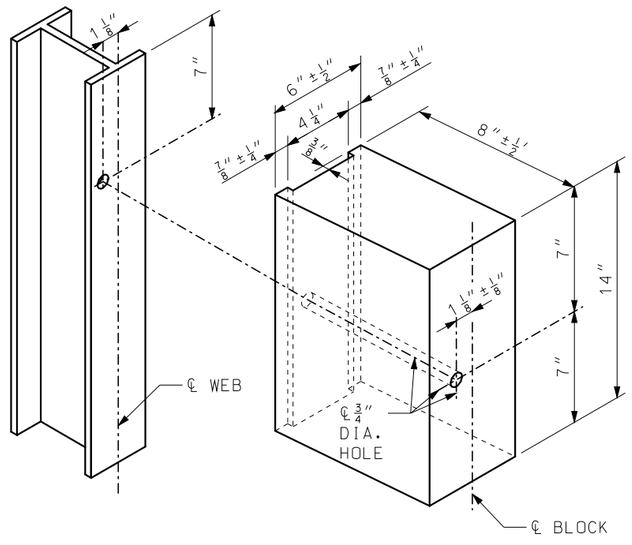

STRUCTURAL STEEL TUBING BLOCK DETAIL




21 5/8" WOOD BLOCK DETAIL




19" WOOD BLOCK DETAIL




14" WOOD BLOCK DETAIL

ALL HOLES DRILLED OR PUNCHED 13/16" DIA.

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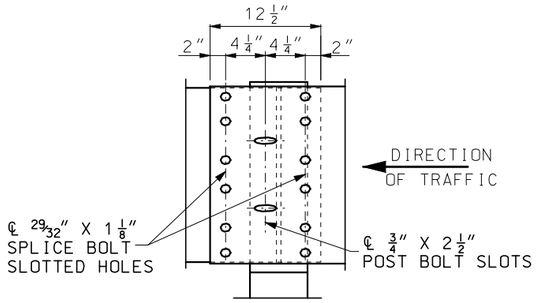
# BRIDGE ANCHOR SECTION

## SAFETY BARRIER CURB ON BRIDGE

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

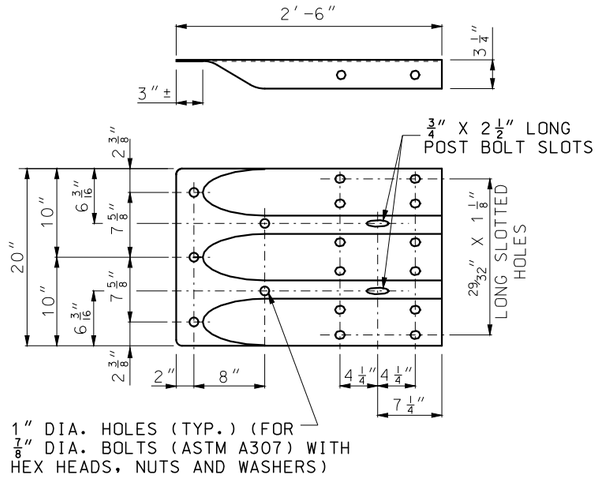
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SHEET NO. 2 OF 6

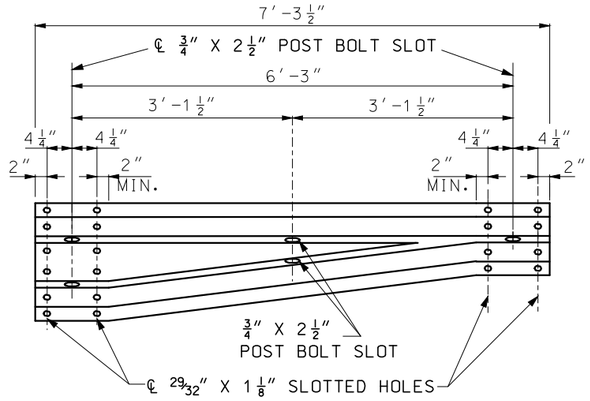



## THRIE BEAM RAIL SPLICE AT POST

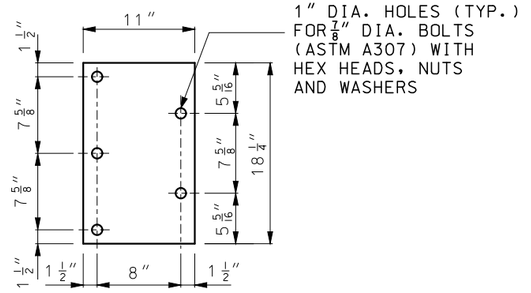
(1) THE CONTRACTOR MAY, AT HIS OPTION, FURNISH EQUIVALENT SECTIONS FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A769 GRADE 36 OR 40. THE SECTIONS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH REQUIREMENTS OF AASHTO M 111.



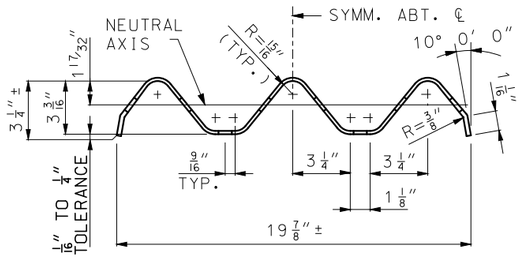

## TERMINAL CONNECTOR




## ASYMMETRICAL TRANSITION SECTION




## 5/8" BEARING PLATE




## SECTION THROUGH THRIE BEAM RAIL

GENERAL NOTES:

DESIGN BASED ON NCHRP REPORT 350 TEST LEVEL 3.

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

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 TUBING BLOCK SHALL BE FABRICATED FROM ASTM A500 BRADE B STEEL AND GALVANIZED.

USE 5/8" BUTTON-HEAD OVAL SHOULDER BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUTS = 3/8" 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, COPLETE 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.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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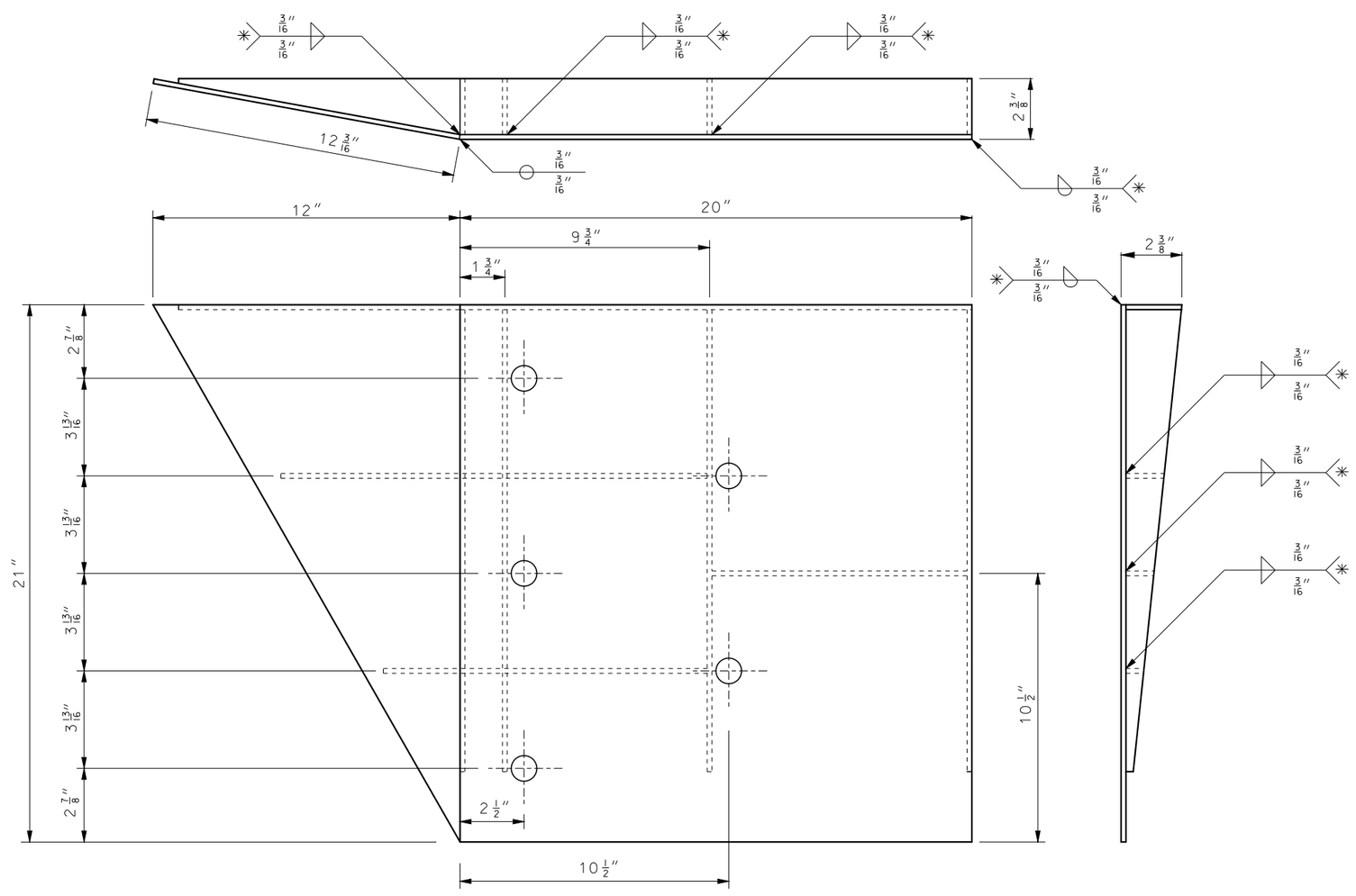
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NUMBER PE-2841
PROFESSIONAL ENGINEER
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# BRIDGE ANCHOR SECTION

SAFETY BARRIER CURB ON BRIDGE

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

606.22U




## WELDING INSTRUCTION

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

GENERAL NOTES:

COVER PLATE PANELS ARE 4. 3/16" THICK.

ALL STIFFENERS ARE 1/4" THICK.

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

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

ALL HOLE DIAMETERS SHALL BE 1".

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PROFESSIONAL ENGINEER
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# BRIDGE ANCHOR SECTION
## SAFETY BARRIER CURB ON BRIDGE (CONNECTOR PLATE DETAIL)

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

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SHEET NO. 4 OF 6

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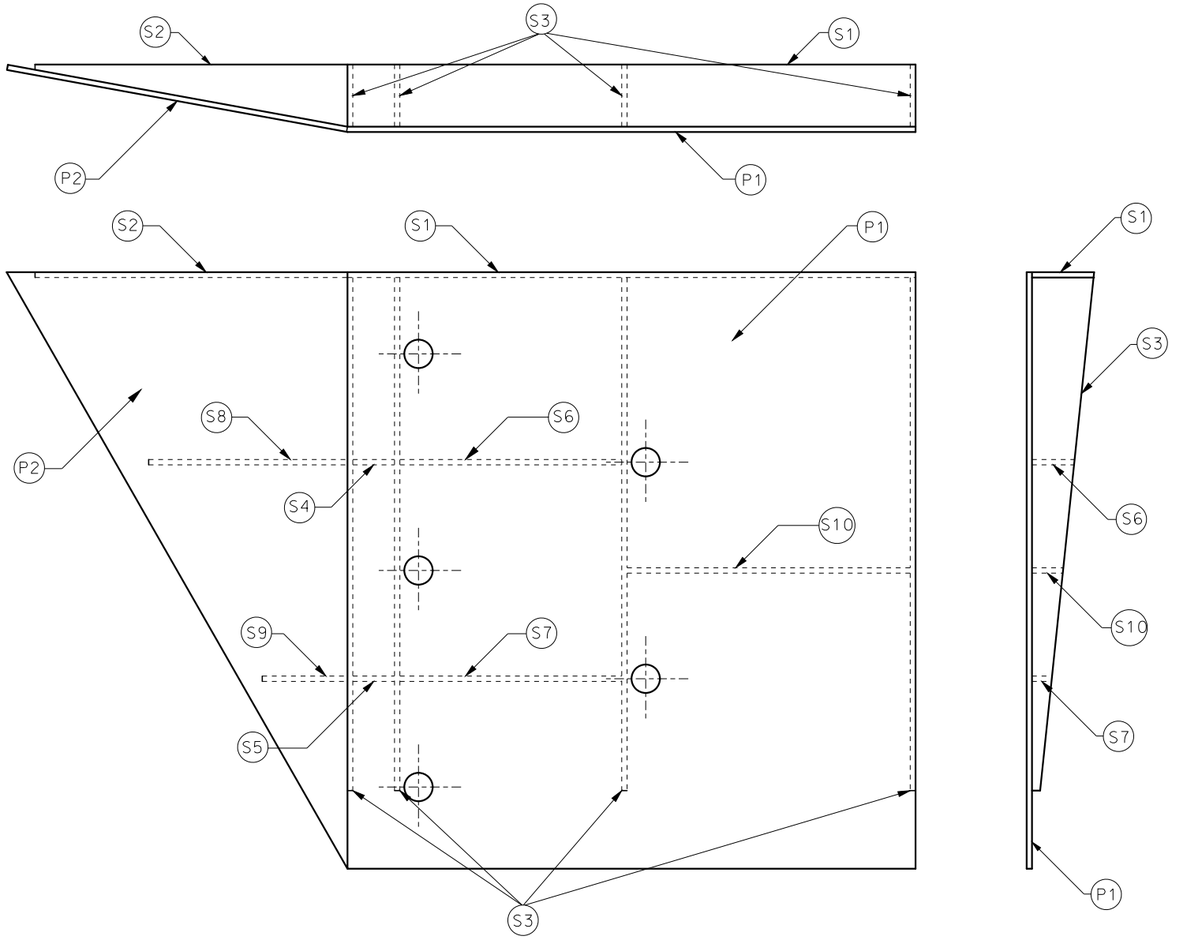
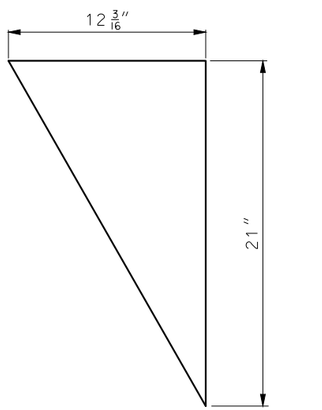
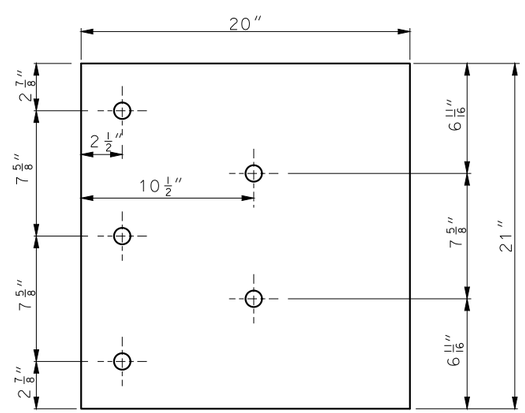


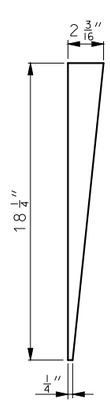

PLATE AND STIFFENER IDENTIFICATION



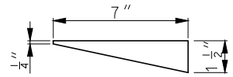

(P2) COVER PLATE #2



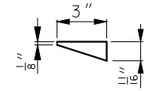

(P1) COVER PLATE #1



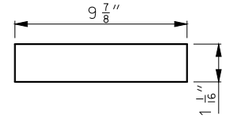

(S3) STIFFENER #3: 4 EACH



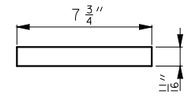

(S8) STIFFENER #8: 1 EACH



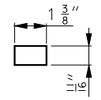

(S9) STIFFENER #9: 1 EACH



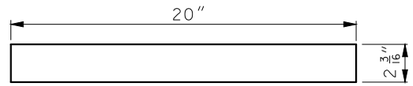

(S10) STIFFENER #10: 1 EACH



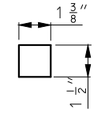

(S7) STIFFENER #7: 1 EACH



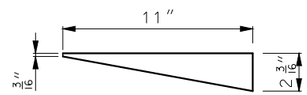

(S5) STIFFENER #5: 1 EACH



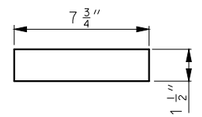

(S1) STIFFENER #1: 1 EACH




(S4) STIFFENER #4: 1 EACH




(S2) STIFFENER #2: 1 EACH




(S6) STIFFENER #6: 1 EACH

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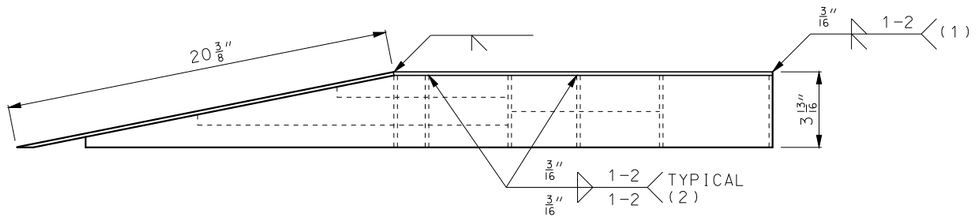
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PROFESSIONAL ENGINEER
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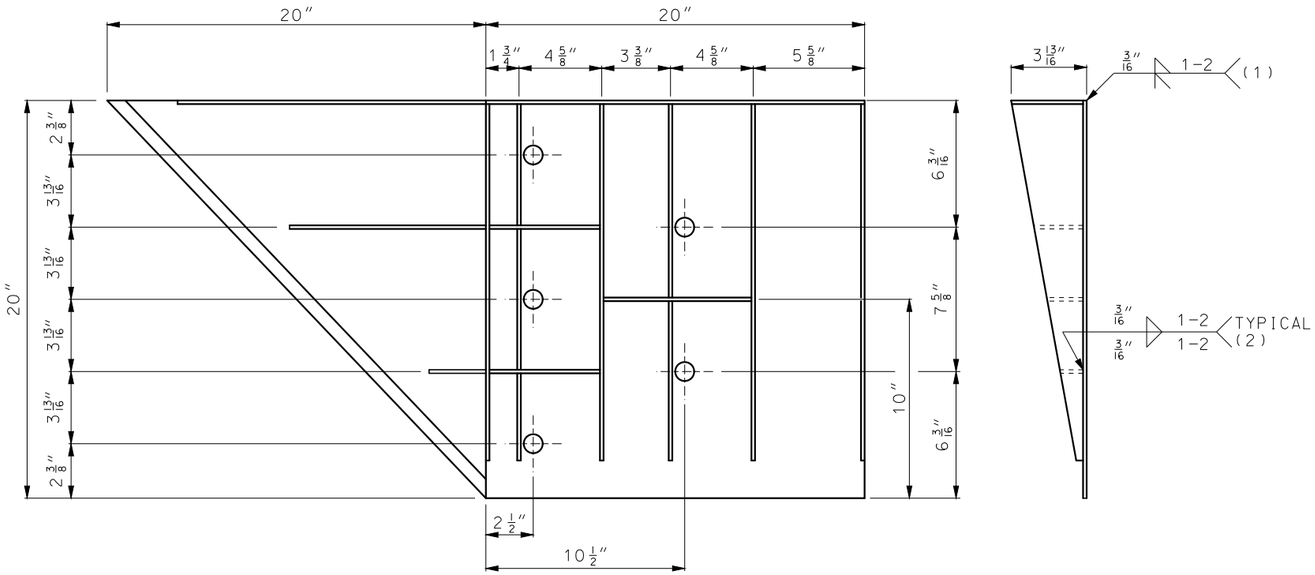
# BRIDGE ANCHOR SECTION

## SAFETY BARRIER CURB ON BRIDGE (CONNECTOR PLATE DETAIL)

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

606.22U



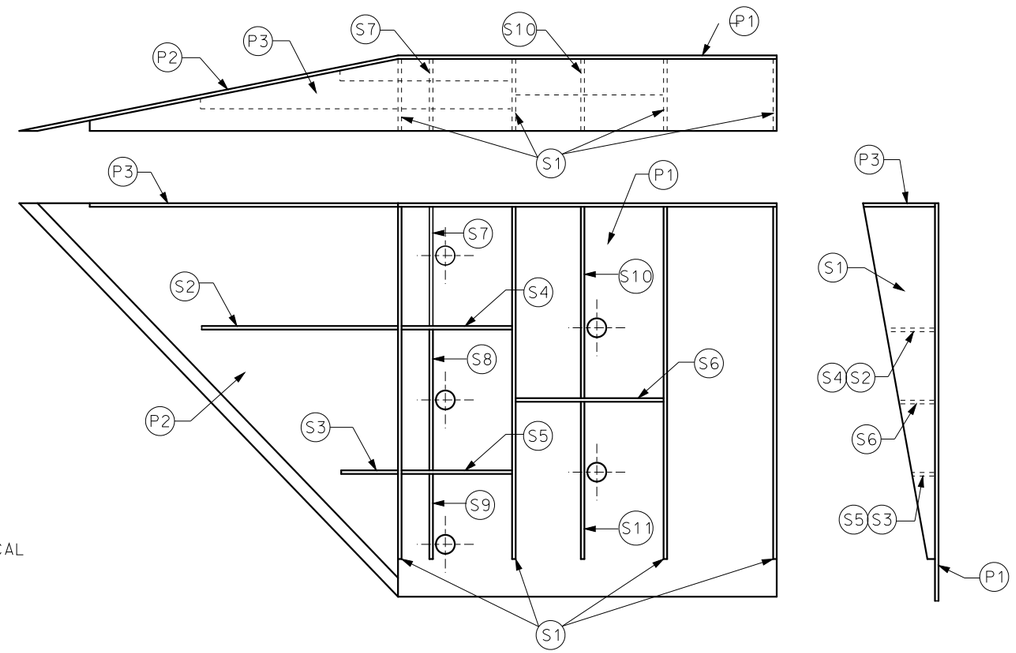




PLATE AND STIFFENER IDENTIFICATION

## WELDING INSTRUCTION

(1) STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATES SHALL BE WELDED AS FOLLOWS:
SINGLE BEVEL GROOVE WELD ON EXTERNAL SIDES AND $\frac{3}{16}$" FILLET WELD BY 1" LONG SPACED AT 2" ON INTERNAL SIDES.

(2) STEFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
$\frac{3}{16}$" FILLET WELD BY 1" LONG SPACED AT 2".

## CONNECTOR PLATE DIMENSION (PER ASSEMBLY)

| PLATE | QUANTITY | SHAPE | SIZE (A x B x C x D) | THICKNESS |
|---|---|---|---|---|
| P1 | 1 | | 20" x 20" | $\frac{3}{16}$" |
| P2 | 1 | | 20" x 20" x $28\frac{9}{16}$" | $\frac{3}{16}$" |
| P3 | 1 | | 39" x $3\frac{5}{8}$" x 20" x $19\frac{5}{16}$" | $\frac{3}{16}$" |
| S1 | 4 | | $18\frac{7}{16}$" x $3\frac{5}{8}$" x $18\frac{3}{4}$" | $\frac{1}{4}$" |
| S2 | 1 | | $10\frac{1}{4}$" x $2\frac{7}{16}$" x $10\frac{3}{8}$" x $\frac{1}{2}$" | $\frac{1}{4}$" |
| S3 | 1 | | 3" x $1\frac{1}{16}$" x $3\frac{1}{8}$" x $\frac{1}{2}$" | $\frac{1}{4}$" |
| S4 | 1 | | $6\frac{1}{8}$" x $2\frac{7}{16}$" | $\frac{1}{4}$" |
| S5 | 1 | | $6\frac{1}{8}$" x $1\frac{1}{16}$" | $\frac{1}{4}$" |
| S6 | 1 | | $7\frac{3}{4}$" x $1\frac{3}{4}$" | $\frac{1}{4}$" |
| S7 | 1 | | $2\frac{9}{16}$" x 6" x $3\frac{5}{8}$" x $5\frac{7}{8}$" | $\frac{1}{4}$" |
| S8 | 1 | | $1\frac{5}{32}$" x $7\frac{1}{2}$" x $2\frac{1}{2}$" x $7\frac{3}{8}$" | $\frac{1}{4}$" |
| S9 | 1 | | $6\frac{1}{16}$" x $6\frac{3}{16}$" x $1\frac{3}{32}$" | $\frac{1}{4}$" |
| S10 | 1 | | $1\frac{7}{8}$" x $9\frac{7}{8}$" x $3\frac{5}{8}$" x $9\frac{11}{16}$" | $\frac{1}{4}$" |
| S11 | 1 | | $8\frac{1}{2}$" x $8\frac{3}{4}$" x $1\frac{13}{16}$" | $\frac{1}{4}$" |

GENERAL NOTES:

COVER PLATE PANELS ARE $\frac{3}{16}$" THICK.

ALL STIFFENERS ARE $\frac{1}{4}$" THICK.

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

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

ALL HOLE DIAMETERS SHALL BE 1".


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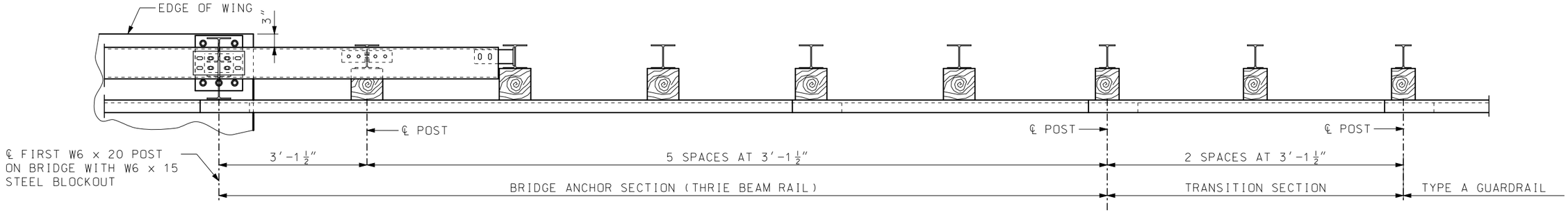
# BRIDGE ANCHOR SECTION
## SAFETY BARRIER CURB ON BRIDGE (CONNECTOR PLATE DETAIL) SINGLE SLOPE BARRIERS

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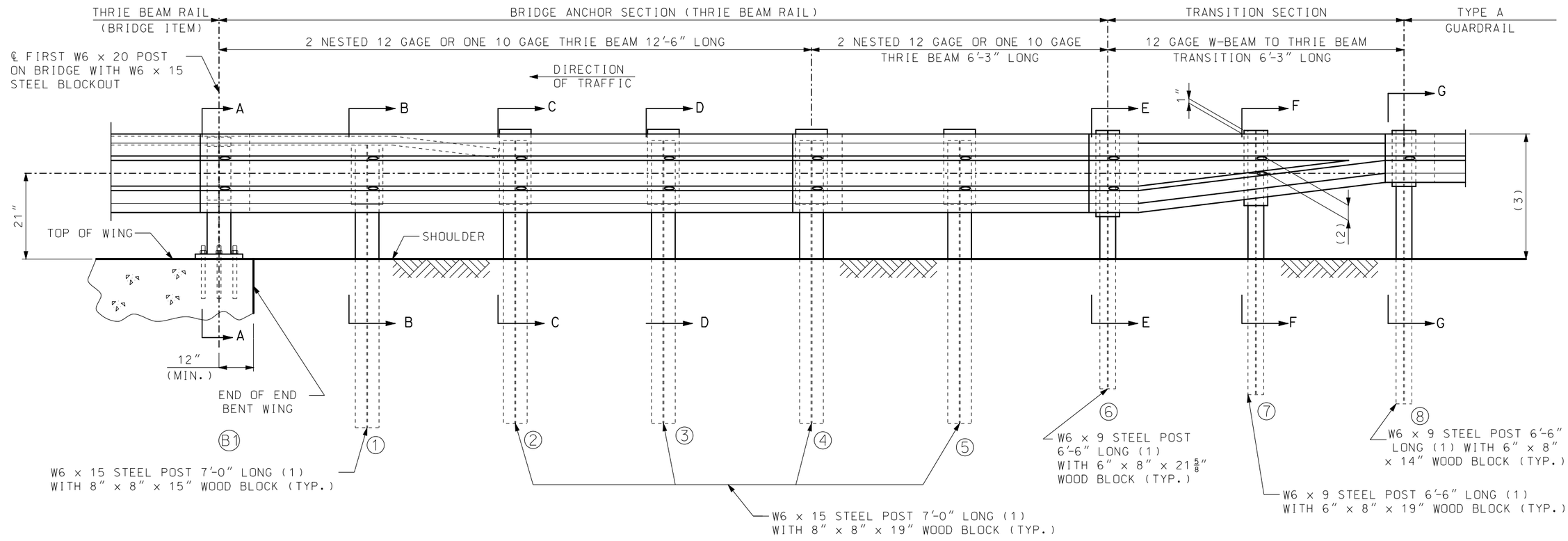
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SHEET NO. 6 OF 6

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PLAN




## PART SECTION THROUGH SLAB AT END OF WING

NOTES:

FOR GENERAL NOTES, SEE SHEET 2 OF 5.

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

(1) AT CONTRACTOR'S OPTION, EQUIVALENT SECTIONS MAY BE FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A769 GRADE 36 OR 40. THE SECTIONS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE REQUIREMENTS OF AASHTO 111.

(2) VERIFY BY RAIL TRANSITION PRODUCER.

(3) TRANSITION FROM 31" TO 29" HEIGHT OVER NEXT TWO UPSTREAM 12′-6" W-BEAM RAILS.

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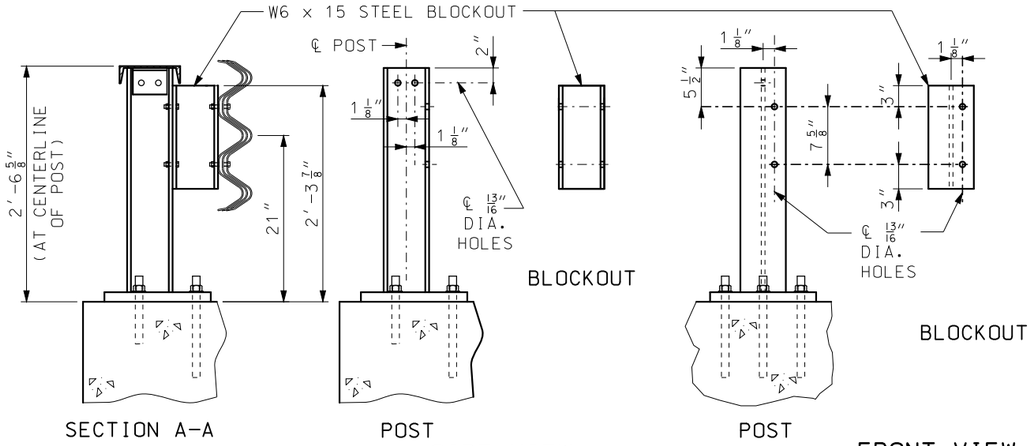
# BRIDGE ANCHOR SECTION
(THRIE BEAM RAIL ON BRIDGE)

DATE EFFECTIVE: 7/01/016
DATE PREPARED: 5/13/2016

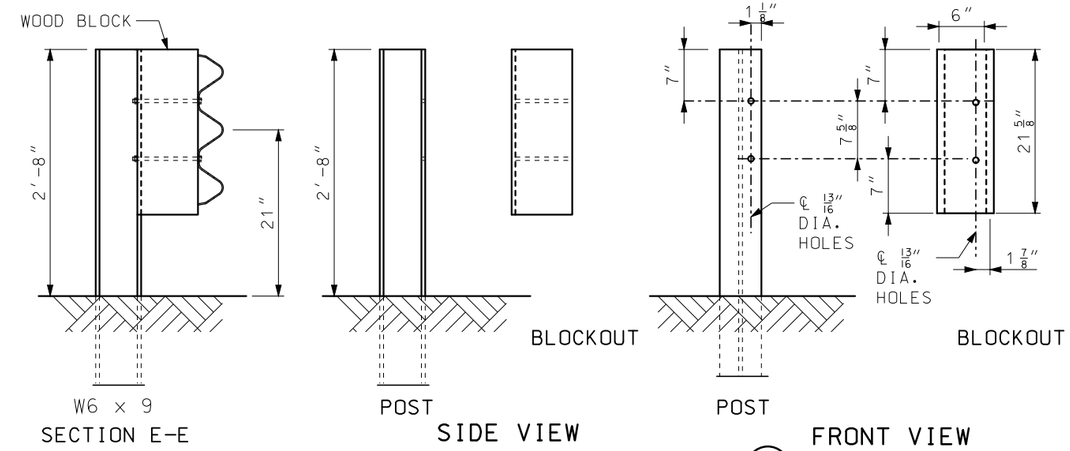
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SHEET NO. 1 OF 5

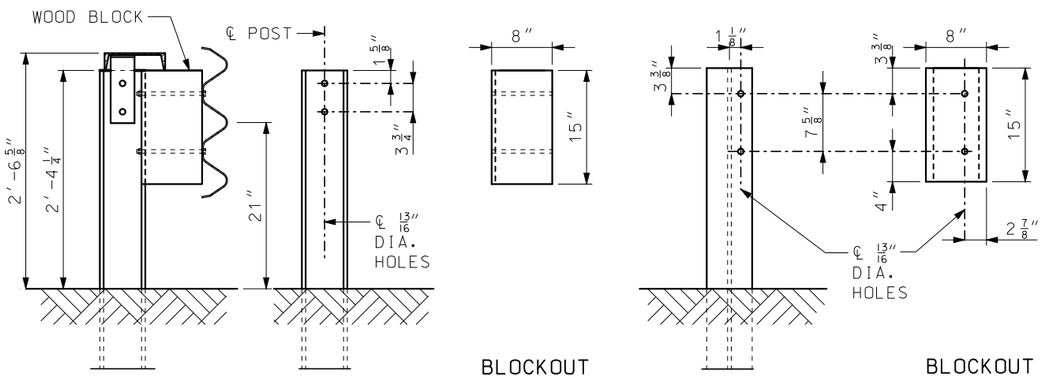
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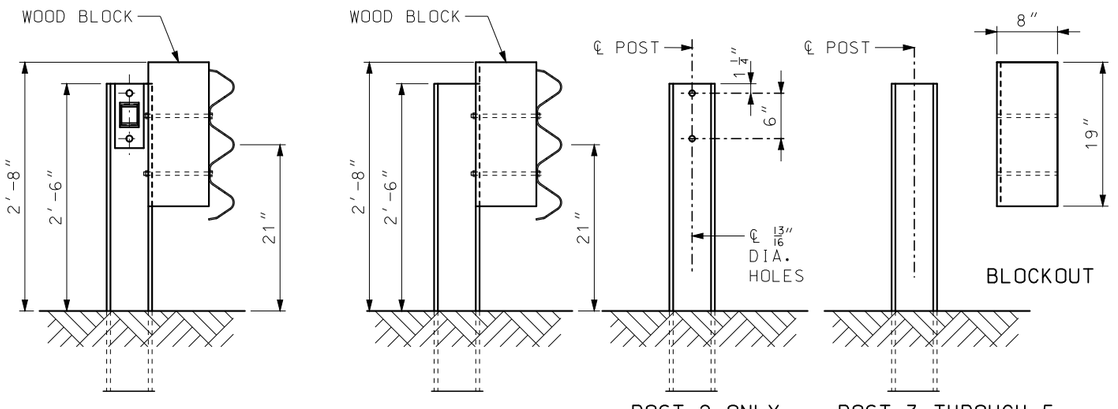

STEEL POST AND STEEL BLOCKOUT (B1)



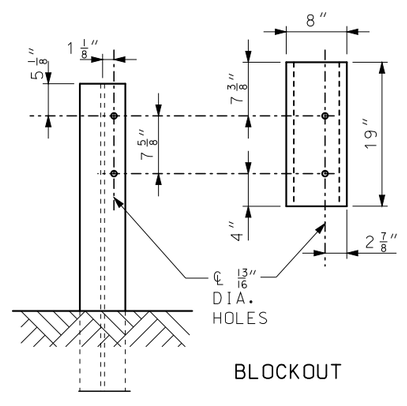

STEEL POST AND WOOD BLOCKOUT (6)




STEEL POST AND WOOD BLOCKOUT (1)




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




(2) VERIFY BY RAIL TRANSITION PRODUCER.

GENERAL NOTES:

DESIGN BASED UPON NCHRP REPORT 350 TEST LEVEL 3 (TL-3).

THE THRIE BEAM RAIL FOR THE BRIDGE ANCHOR SECTION SHALL BE 12 GAGE OR 10 GAGE AT THE CONTRACTOR'S OPTION, AND THE TRANSITION SECTION SHALL BE 12 GAGE.

FABRICATED STRUCTURAL STEEL SHALL BE ASTM A709 GRADE 36.

FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SEC 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.

USE 5/8″ BUTTON-HEAD, OVAL SHOULDER BOLTS WITH HEX NUTS (THICKNESS OF HEX NUTS = 3/4″ MIN.) AT ALL SLOTS.

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

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

THE COST OF FURNISHING, FABRICATING AND INSTALLING BRIDGE ANCHOR SECTION (THRIE BEAM), COMPLETE-IN-PLACE, SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EACH.

FOR DETAILS NOT SHOWN, SEE BRIDGE THRIE BEAM RAIL SHEET.

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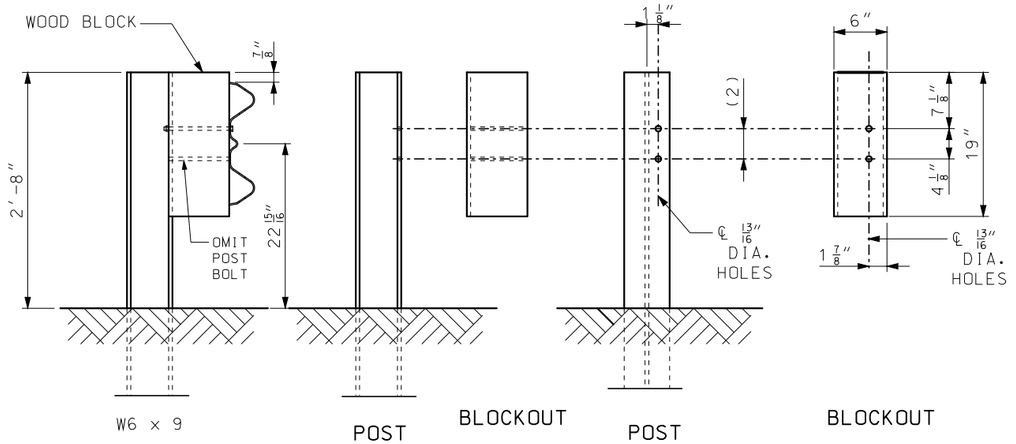
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# BRIDGE ANCHOR SECTION
## (THRIE BEAM RAIL ON BRIDGE)

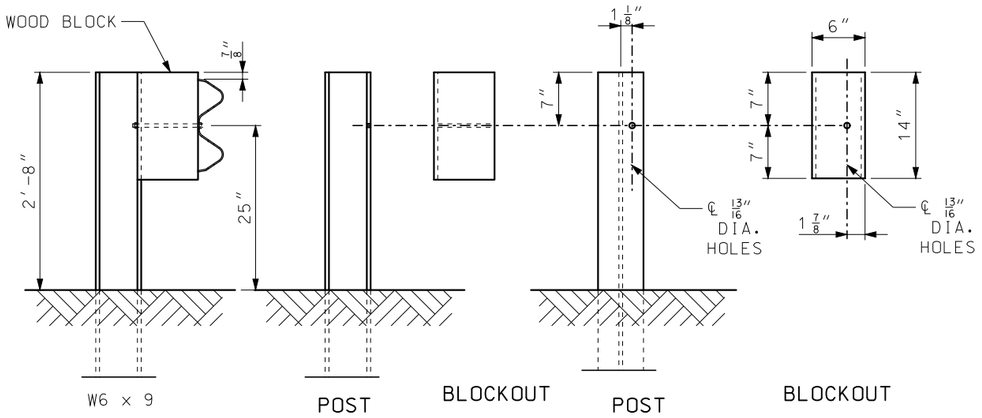
DATE EFFECTIVE: 07/01/2016
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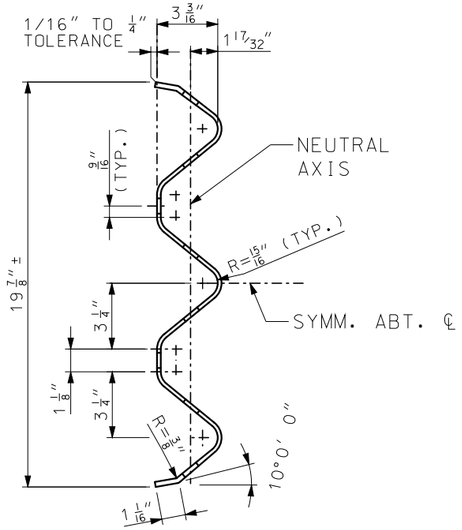
SHEET NO. 2 OF 5




STEEL POST AND WOOD BLOCKOUT (7)

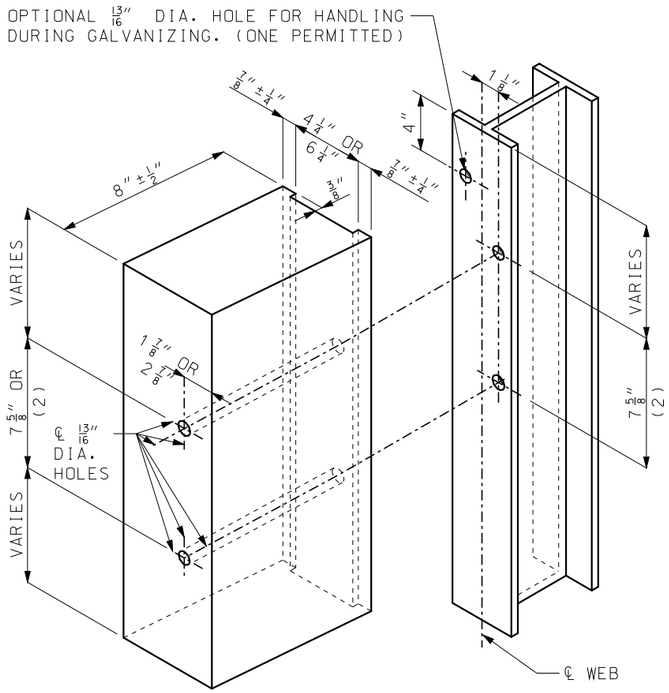



STEEL POST AND WOOD BLOCKOUT (8)



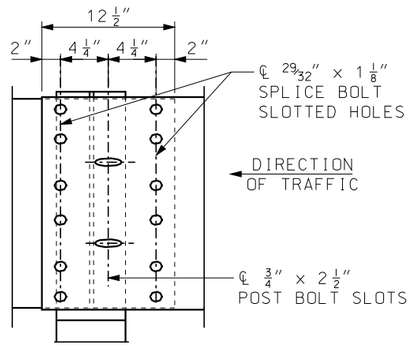

SECTION H–H

THROUGH THRIE BEAM RAIL

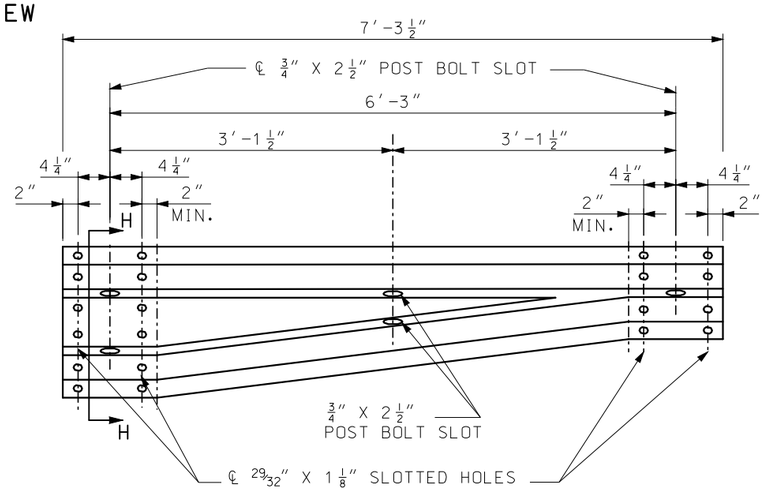



POST (7) – (2) VERIFY BY RAIL TRANSITION PRODUCER (SEE FRONT SHEET)
POST (8) – ONLY 1 HOLE REQUIRED
ALL HOLES 13/16″ DIAMETER EXCEPT AS NOTED

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




THRIE BEAM RAIL SPLICE AT POST




ASYMMETRICAL TRANSITION SECTION

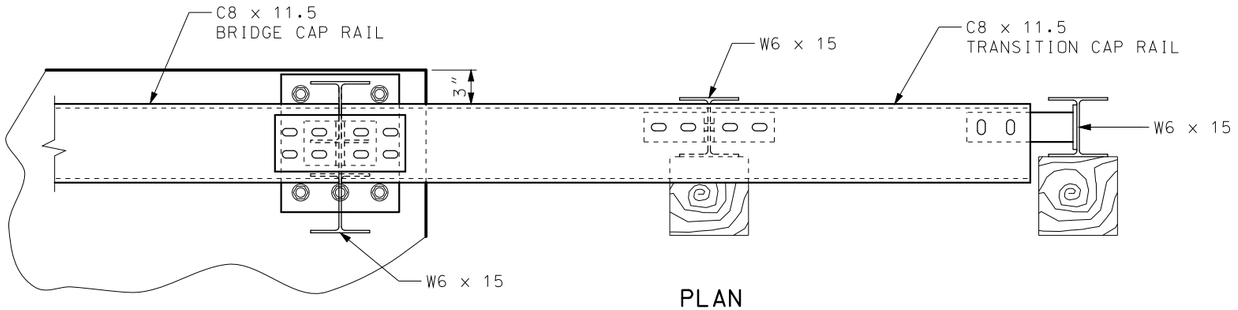
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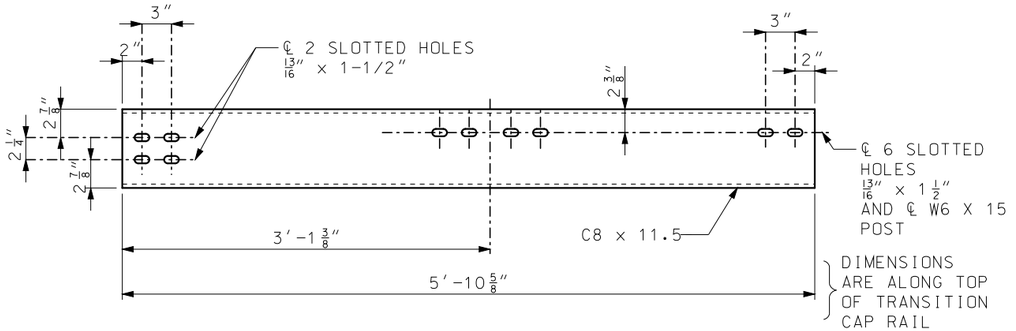

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# BRIDGE ANCHOR SECTION
(THRIE BEAM RAIL ON BRIDGE)

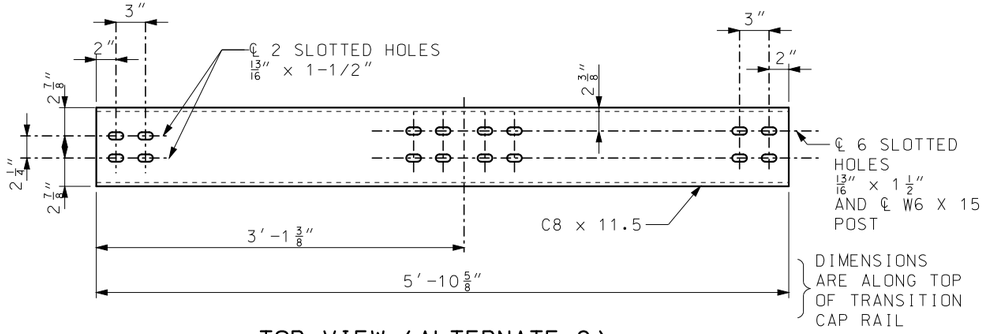
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|---|---|---|



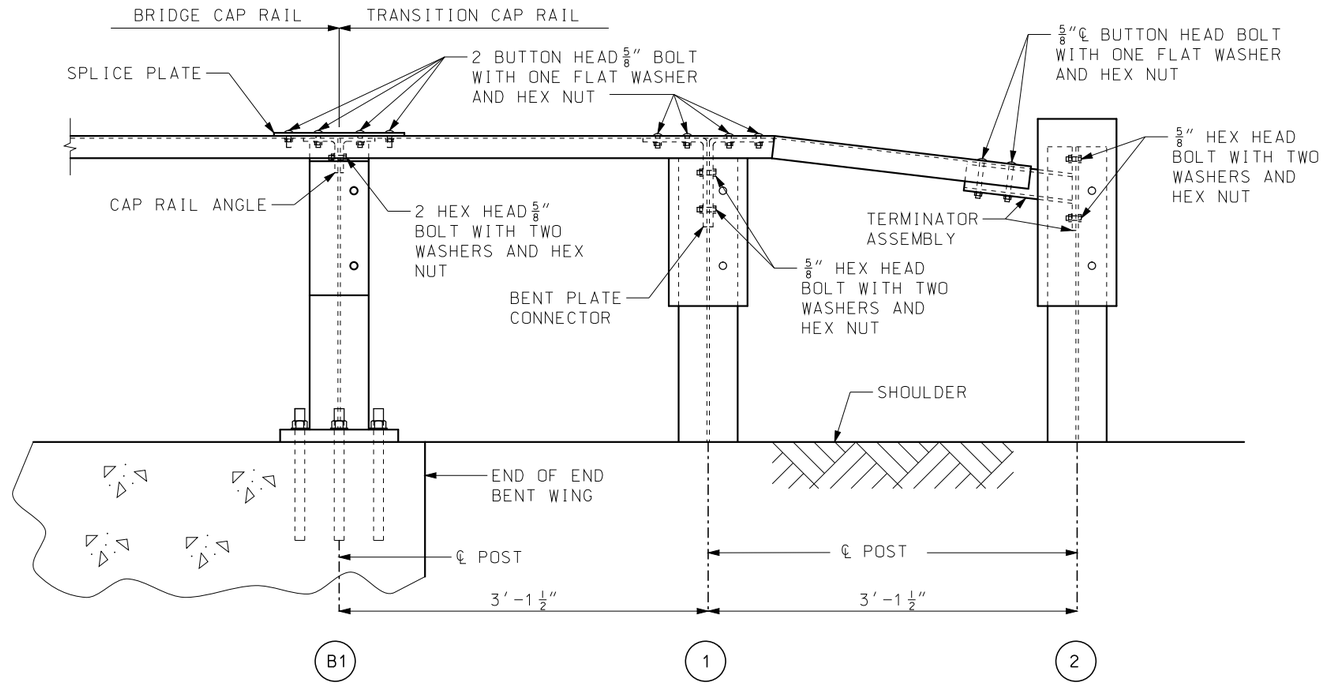

PLAN



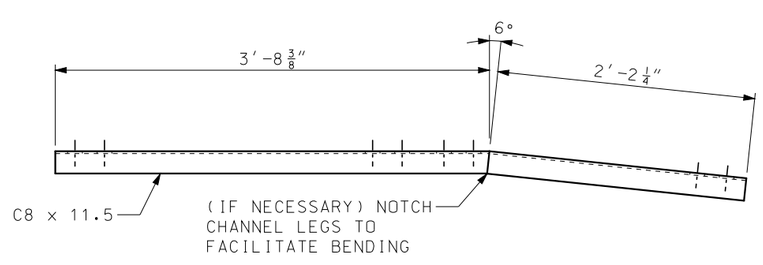

TOP VIEW (ALTERNATE 1)




TOP VIEW (ALTERNATE 2)




ELEVATION
(THRIE BEAM RAIL NOT SHOWN)




ELEVATION
TRANSITION CAP RAIL

GENERAL NOTES:

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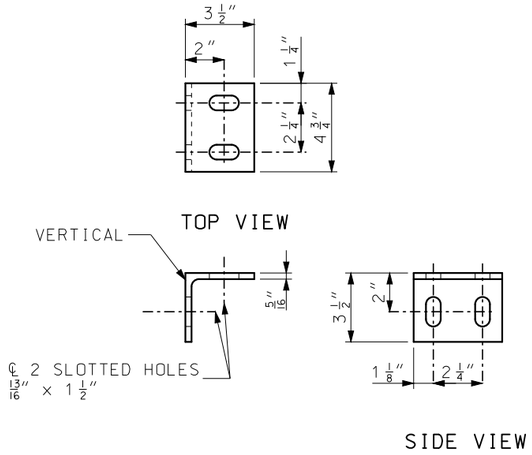
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# BRIDGE ANCHOR SECTION
(THRIE BEAM RAIL ON BRIDGE)

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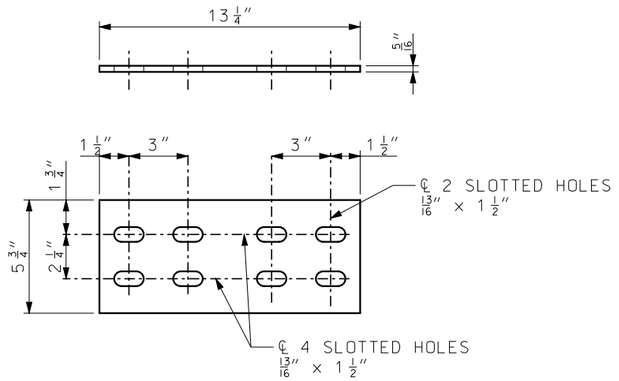
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SHEET NO.
4 OF 5

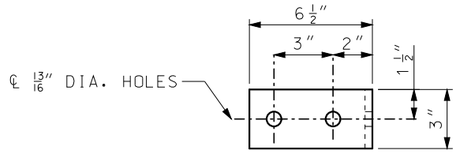



CAP RAIL ANGLE

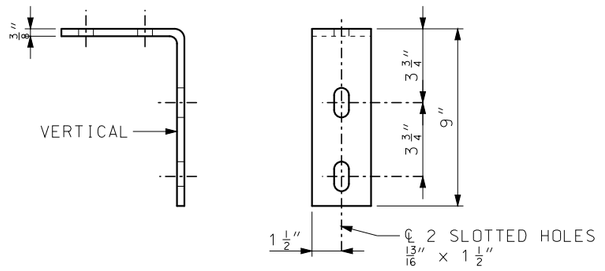
∠ 3 1/2" × 3 1/2" × 5/16"




SPLICE PLATE



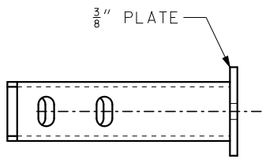

TOP VIEW



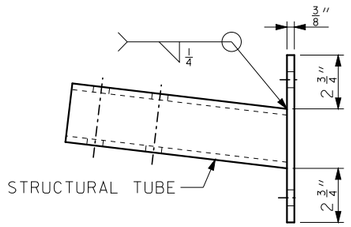

FRONT VIEW

SIDE VIEW

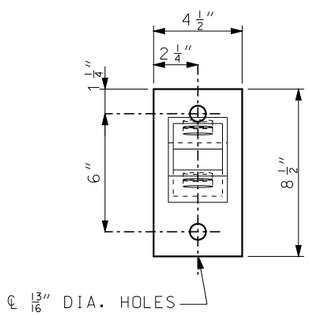
BENT PLATE CONNECTOR



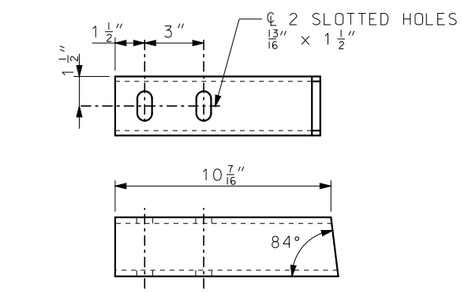

TOP VIEW




FRONT VIEW




SIDE VIEW




3/8" PLATE




STRUCTURAL TUBE

TS 3" × 3" × 5/16"

TERMINATOR ASSEMBLY

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NUMBER PE-28411
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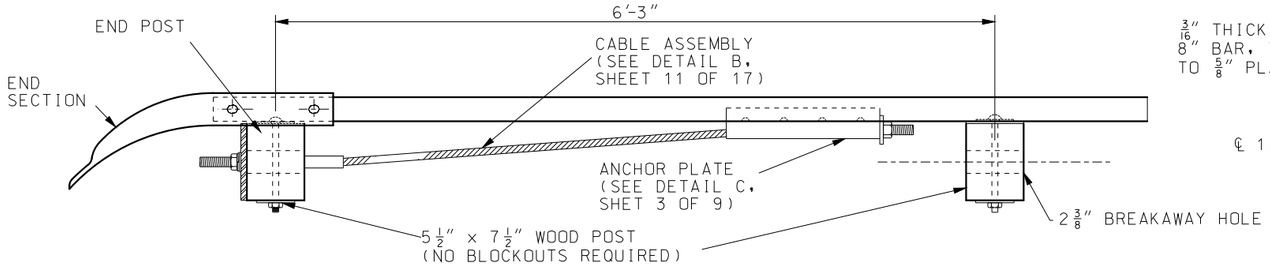
# BRIDGE ANCHOR SECTION

(THRIE BEAM RAIL ON BRIDGE)

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DATE PREPARED: 5/13/2016

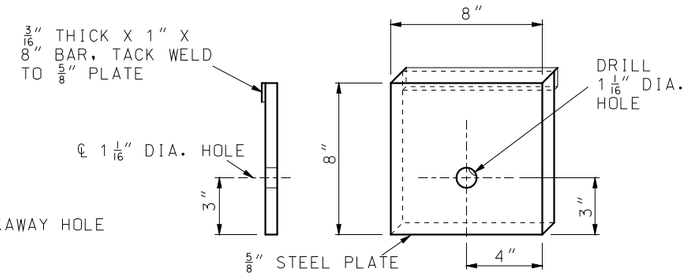
606.23J

SHEET NO.
5 OF 5

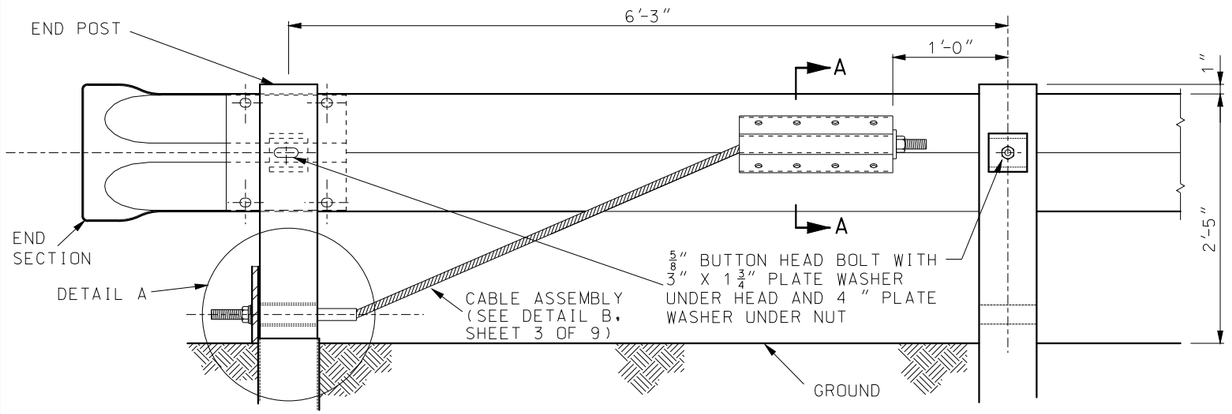



NOTE: SEE SHEET 7 OF 17 FOR DETAILS OF END SECTION.

PLAN

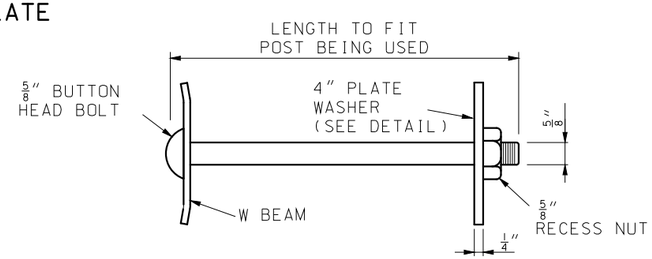



DETAIL OF
STEEL BEARING PLATE

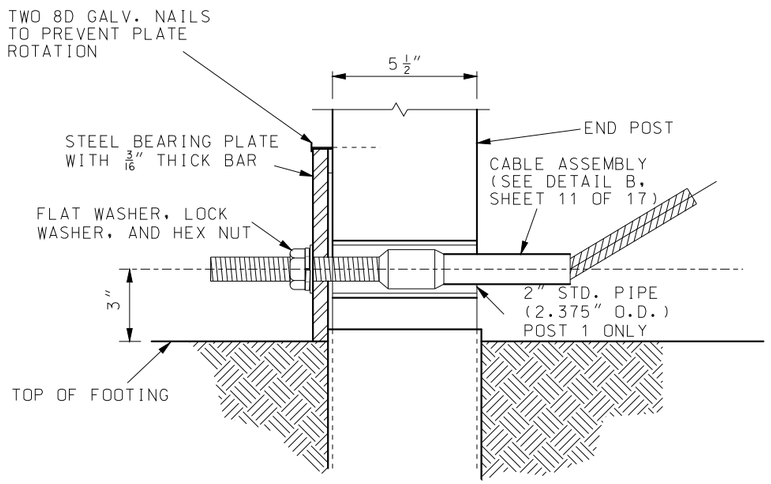



POST 1 ELEVATION (BACK SIDE) POST 2

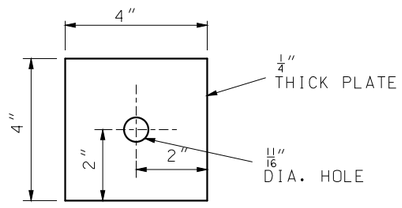
END ANCHOR DETAILS



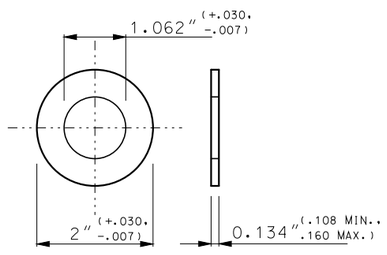

POST BOLT ASSEMBLY



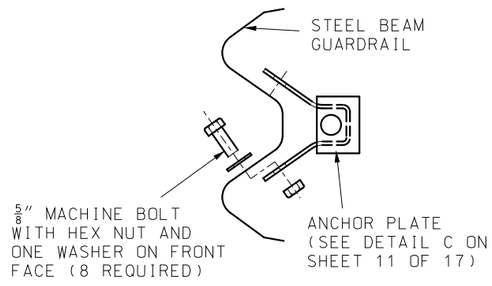

DETAIL A
(END POST DETAIL)




4" PLATE WASHER




TYPE A WASHER




SECTION A-A

GENERAL NOTES:

END ANCHOR DETAILS SHOWN SHALL BE USED ONLY ON DOWN STREAM ENDS OF GUARDRAIL WHEN AN END ANCHOR IS REQUIRED.

THE DETAILS SHOWN ARE FOR AN END ANCHORAGE SYSTEM FOR GUARDRAIL. GUARDRAIL AND POSTS ARE PAID FOR SEPARATELY.

CABLE ASSEMBLY AND ANCHOR PLATE SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER AND SHALL HAVE A MINIMUM BREAKING STRENGTH OF 20 TONS.

ALL FITTINGS AND HARDWARE REQUIRED SHALL BE GALVANIZED AFTER FABRICATION, SEE SECTION 1040 STANDARD SPECIFICATION.

WOOD POSTS 1 AND 2 SHALL BE 5 1/2" X 7 1/2".

SEE SHEET 4 FOR WOOD POST DETAILS.

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# GUARDRAIL

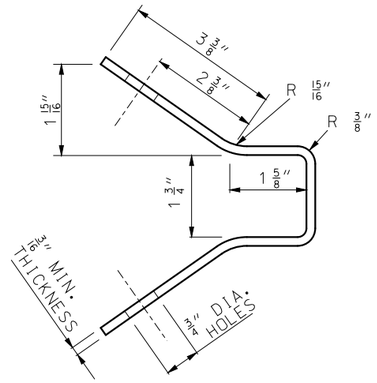
## TERMINAL ANCHOR ENDS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

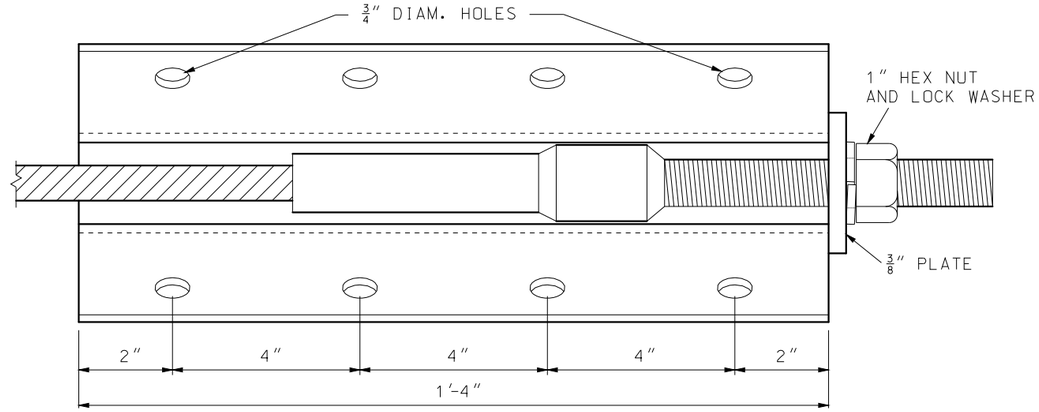
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SHEET NO. 1 OF 7

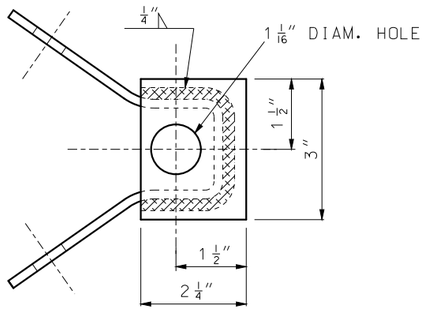
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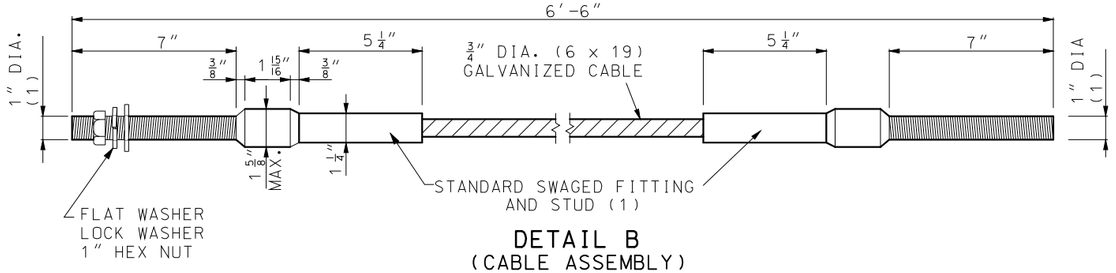

FABRICATION DETAIL




DETAIL C
ASSEMBLED VIEW
(ANCHOR PLATE)

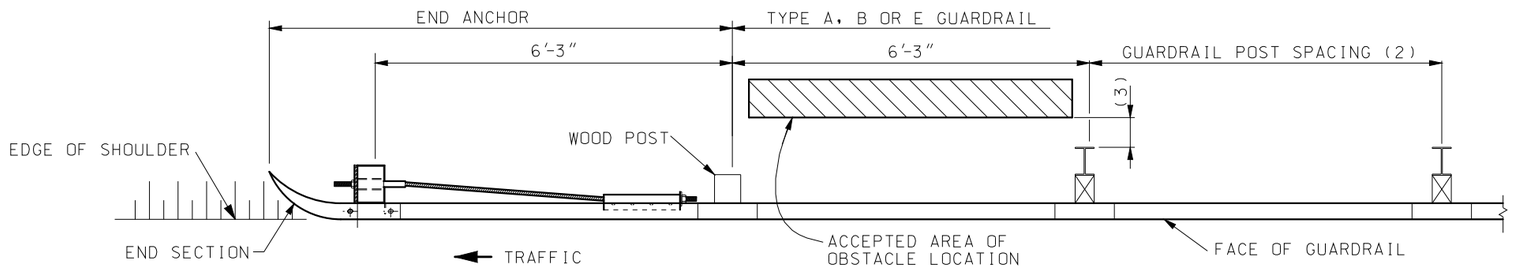



END VIEW

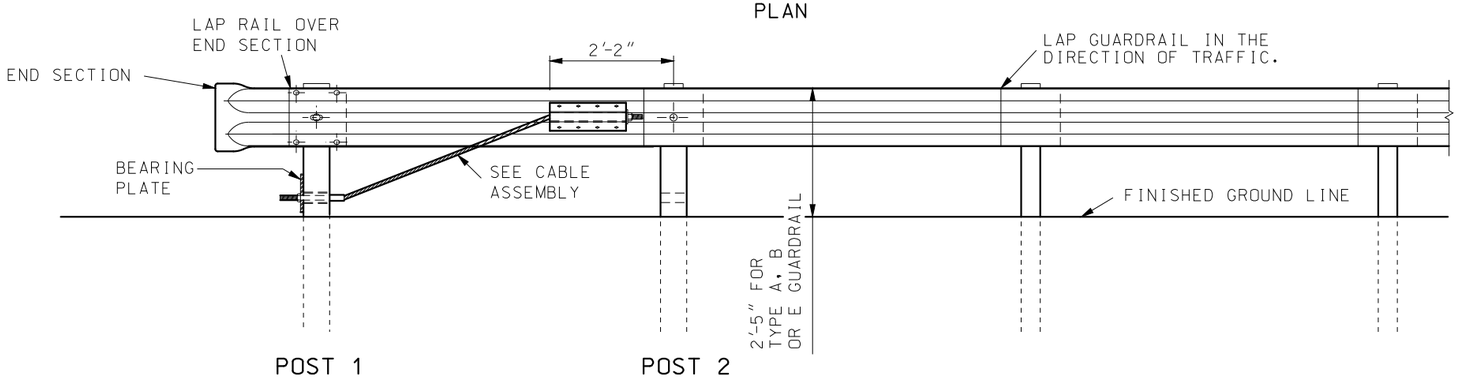



DETAIL B
(CABLE ASSEMBLY)

(1) STUD, THREADED ENTIRE LENGTH.
(2) 6'-3" SPACING FOR TYPE A OR B GUARDRAIL; 3'-1 1/2" SPACING FOR TYPE E GUARDRAIL.
(3) 27" MINIMUM BUT LESS THAN 4' FOR TYPE E GUARDRAIL; 4' MINIMUM FOR TYPE A GUARDRAIL.




PLAN




ELEVATION
END ANCHOR

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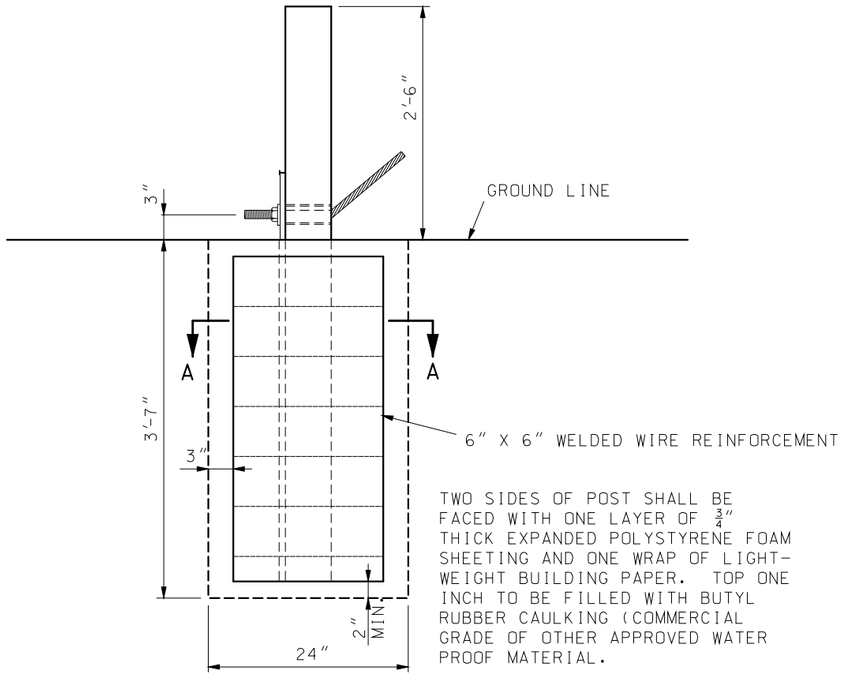

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# GUARDRAIL

## TERMINAL ANCHOR ENDS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

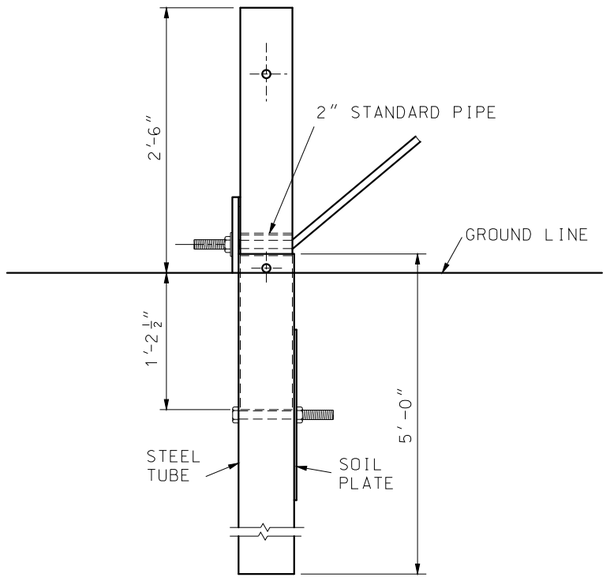
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TWO SIDES OF POST SHALL BE FACED WITH ONE LAYER OF $\frac{3}{4}$" THICK EXPANDED POLYSTYRENE FOAM SHEETING AND ONE WRAP OF LIGHT-WEIGHT BUILDING PAPER. TOP ONE INCH TO BE FILLED WITH BUTYL RUBBER CAULKING (COMMERCIAL GRADE OF OTHER APPROVED WATER PROOF MATERIAL.

POST 1

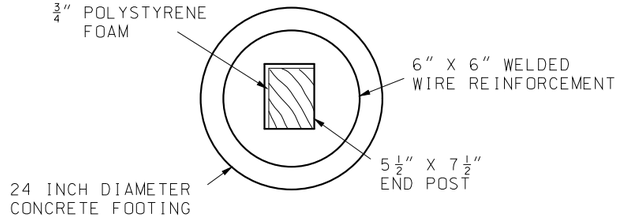
## CONCRETE FOUNDATION FOR END ANCHORS



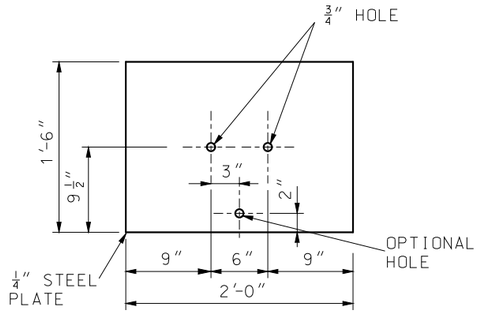

POST 1

## STEEL TUBE FOUNDATION FOR END ANCHORS

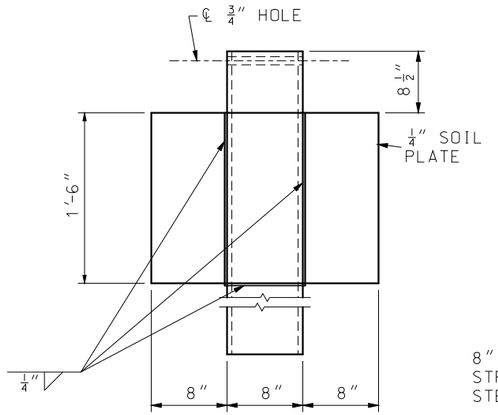
BOLTS AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH THE REQUIREMENTS OF AASHTO M232, OR THEY MAY BE MECHANICALLY GALVANIZED IN ACCORDANCE WITH AASHTO M232 CLASS C.



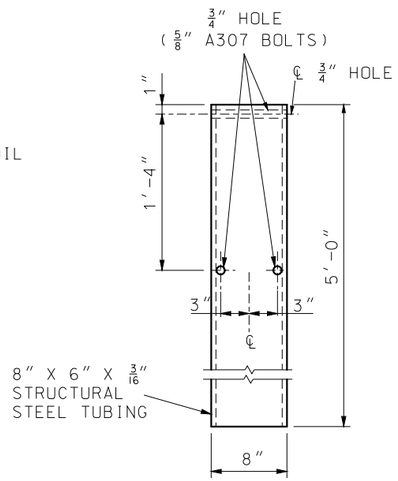

## SECTION A–A
## EXPANDED POLYSTYRENE FOAM INSTALLATION DETAIL



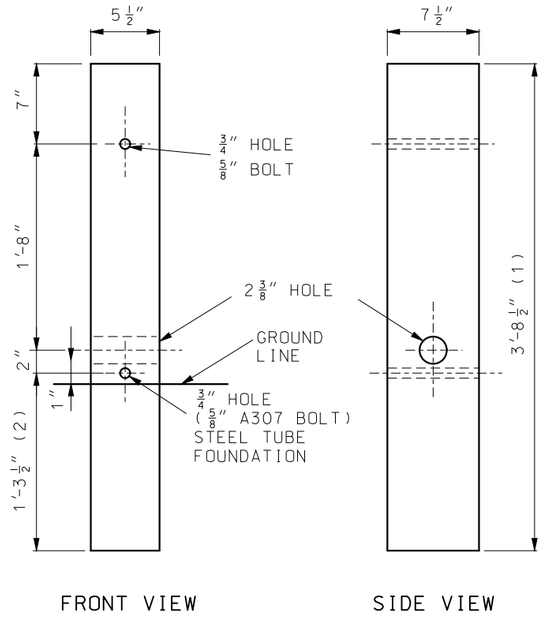

## SOIL PLATE




## SHOP WELDED
## SOIL PLATE CONNECTION




## STEEL TUBE




FRONT VIEW SIDE VIEW

## WOOD BREAKAWAY POST
SEE SECTION 1050

(1) 5'-11 $\frac{1}{2}$" FOR CONCRETE FOUNDATION ALTERNATE.

(2) 3'-8 $\frac{1}{2}$" 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 DRILLED AND BACK-FILLED WITH A SUITABLE MATERIAL WHEN THE SOIL PLATE IS BOLTED, AS SHOWN, TO THE STEEL TUBE. STEEL TUBE FOUNDATION MAY BE DRIVEN WHEN THE SOIL PLATE IS WELDED, AS SHOWN, TO THE STEEL TUBE.

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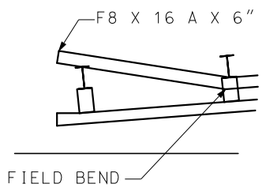
# GUARDRAIL
## TERMINAL ANCHOR ENDS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

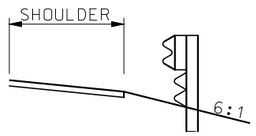
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SHEET NO. 3 OF 7

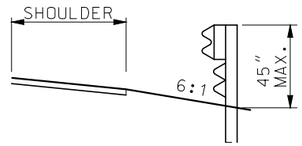
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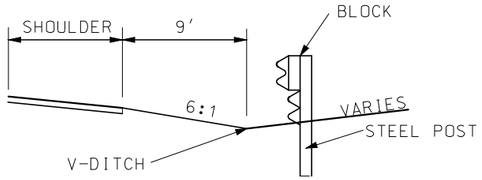

DETAIL A



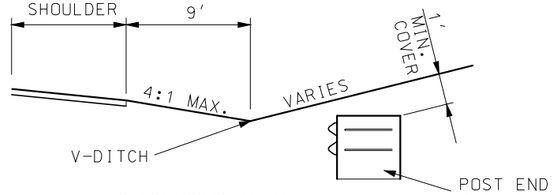

SECTION A-A



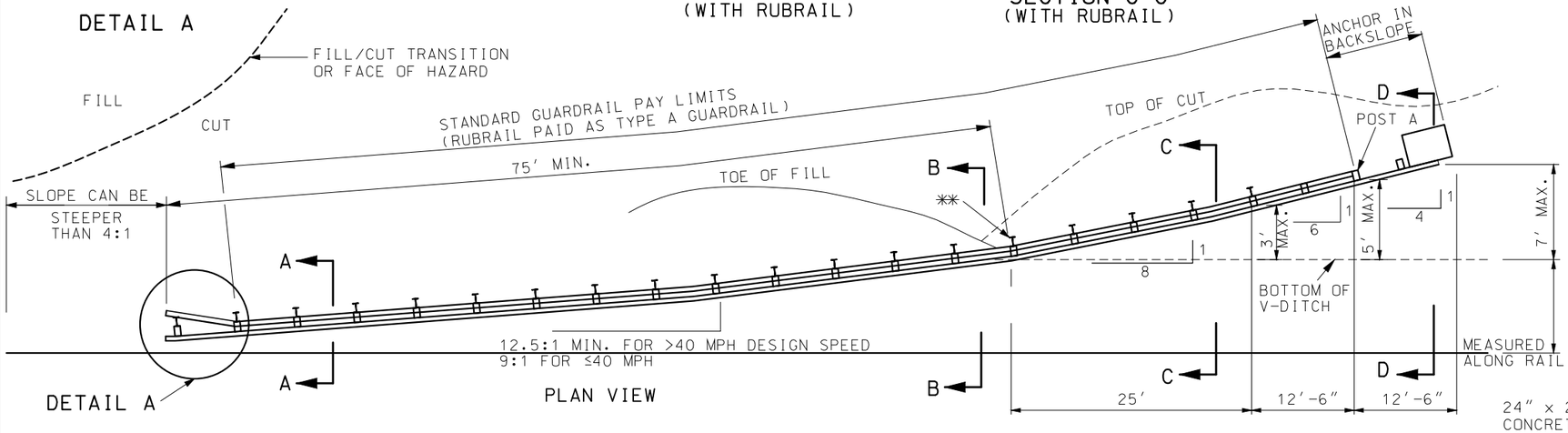

SECTION B-B
(WITH RUBRAIL)




SECTION C-C
(WITH RUBRAIL)

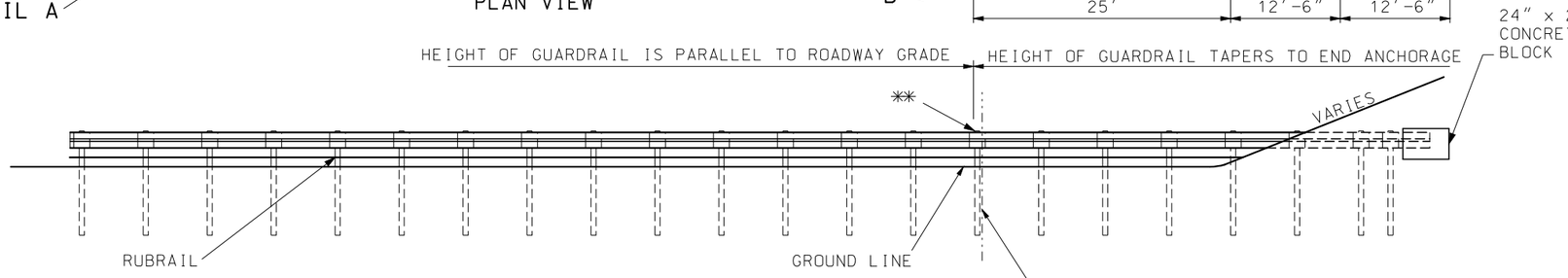



SECTION D-D




DETAIL A

PLAN VIEW

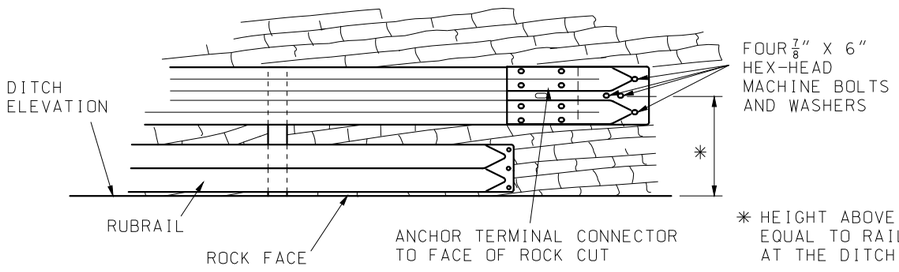



ELEVATION

ANCHORED IN BACKSLOPE GUARDRAIL

** THE POST BEHIND THE DITCHLINE MAY BE SHORTENED TO PROVIDE 48" MIN. EMBEDMENT.

COST OF SHAPING ROCK FACE FOR PLACING OF TERMINAL CONNECTOR, DRILLING HOLES, FURNISHING AND PLACING BOLTS, WASHERS, CAULKING, ANCHORS AND END SHOE TO BE INCLUDED IN THE PRICE OF GUARDRAIL ANCHOR, ROCK FACE.




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

ROCK FACE GUARDRAIL ANCHOR

24" x 24" x 36" CONCRETE ANCHOR BLOCK

GENERAL NOTES:

FOR END ANCHOR DETAILS, SEE SHEET 1-3 OF 7.

EIGHT FOOT POST IS REQUIRED WITH RUBRAIL.

RUBRAIL BEGINS WHEN THE DISTANCE BETWEEN THE GUARD-RAIL AND THE GROUND IS 18" AND INCREASING.

END ANCHOR POSTS 1 AND 2 SHALL HAVE FOUNDATION TYPE AS SHOWN ON SHEET 3 OF 7.

THE CONTRACT UNIT PRICE FOR EMBEDDED GUARDRAIL ANCHOR SHALL INCLUDE THE CONCRETE ANCHOR. EXCAVATION AND BACKFILLING, OR TERMINAL CONNECTOR, AND ALL INCIDENTIAL HARDWARE AND WORK NECESSARY TO COMPLETE THE INSTALLATION.

THE GUARDRAIL SHALL EXTEND 50'± BEYOND THE DITCH LINE AND TERMINATE A MINIMUM OF 12 INCHES BELOW GROUND ELEVATION OF THE BACKSLOPE.

BLOCKOUTS WILL NOT BE REQUIRED FOR ANY POST WHICH WILL BE COMPLETELY BELOW GROUND. THE ALIGNMENT OF SUCH POSTS SHALL BE APPROVED BY THE ENGINEER.

SEE OTHER DRAWINGS AND STANDARD SPECIFICATIONS FOR MATERIAL AND CONSTRUCTION REQUIREMENTS NOT SHOWN.

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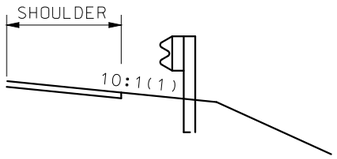
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# GUARDRAIL
## TERMINAL ENDS EMBEDDED AND ROCK FACE (V-DITCH STEEPER THAN 10:1, 4:1 MAX. FORESLOPE)

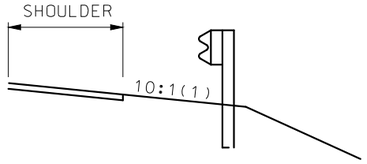
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

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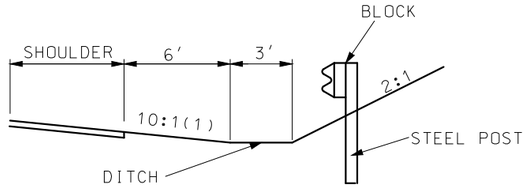
SHEET NO. 4 OF 7



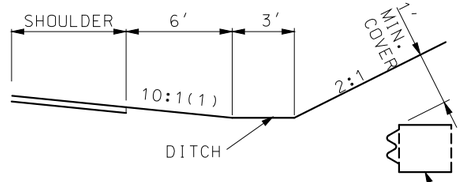

SECTION A-A




SECTION B-B



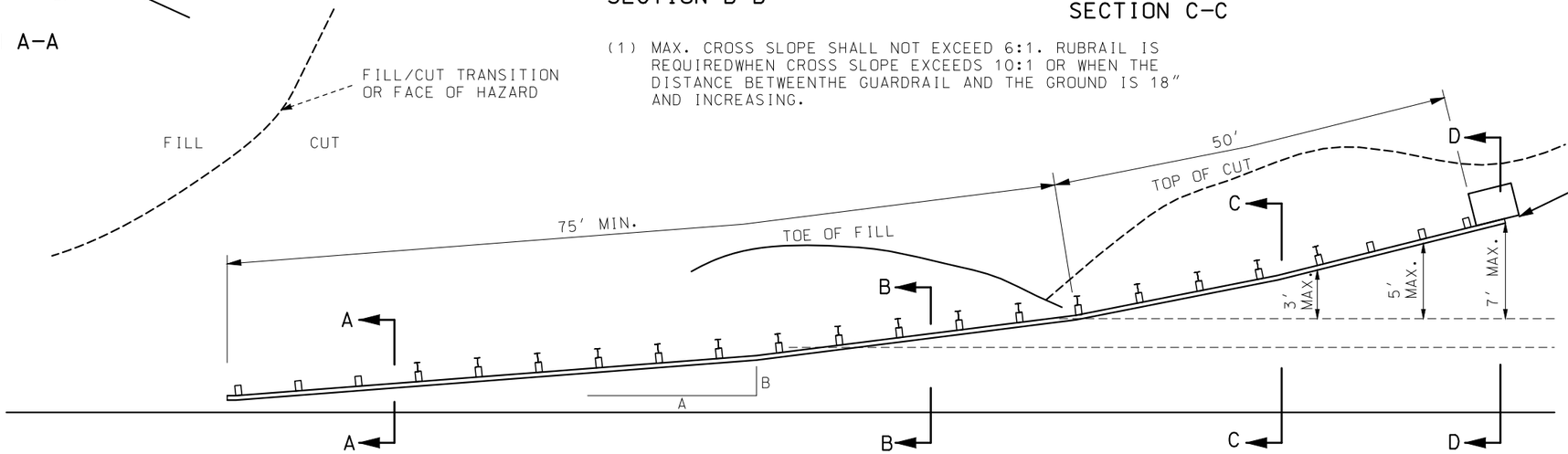

SECTION C-C




SECTION D-D

CONCRETE BLOCK ANCHOR
OR EMBEDDED STEEL POST

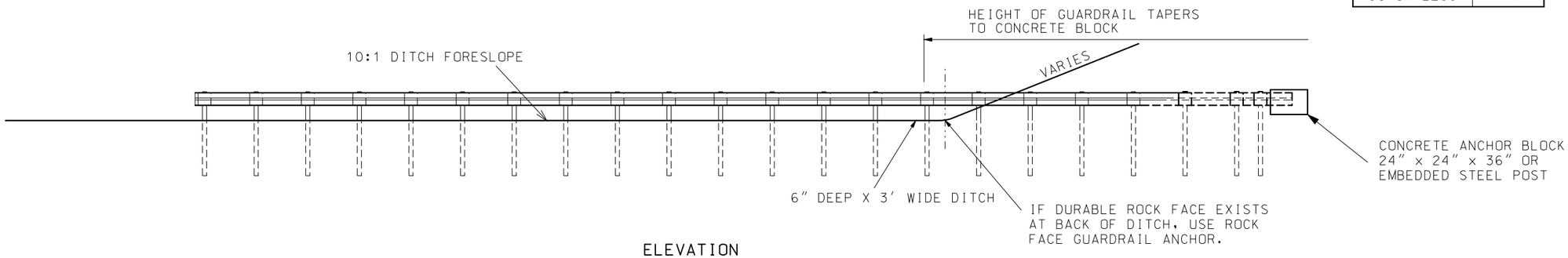
(1) MAX. CROSS SLOPE SHALL NOT EXCEED 6:1. RUBRAIL IS REQUIREDWHEN CROSS SLOPE EXCEEDS 10:1 OR WHEN THE DISTANCE BETWEENTHE GUARDRAIL AND THE GROUND IS 18" AND INCREASING.




| 10:1 CROSS SLOPE | |
|---|---|
| DESIGN SPEED mph | A:B |
| 70 | 15:1 |
| 60 | 13:1 |
| 55 | 12:1 |
| 50 | 11:1 |
| 45 | 10:1 |
| 40 | 9:1 |
| 30 OR LESS | 7:1 |

| STEEPER THAN 10:1 CROSS SLOPE (1) | |
|---|---|
| DESIGN SPEED mph | A:B |
| 45-70 | 12.5:1 |
| 40 | 9:1 |
| 30 OR LESS | 7:1 |

PLAN VIEW




ELEVATION

ANCHORED IN BACKSLOPE GUARDRAIL

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

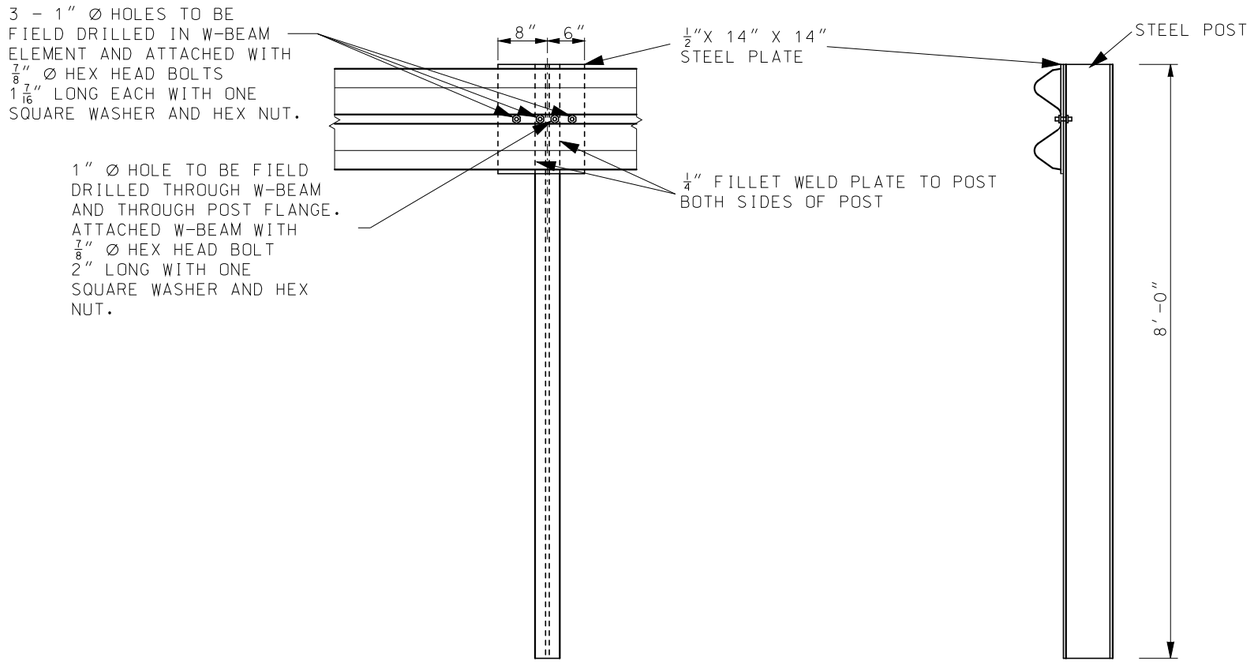

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ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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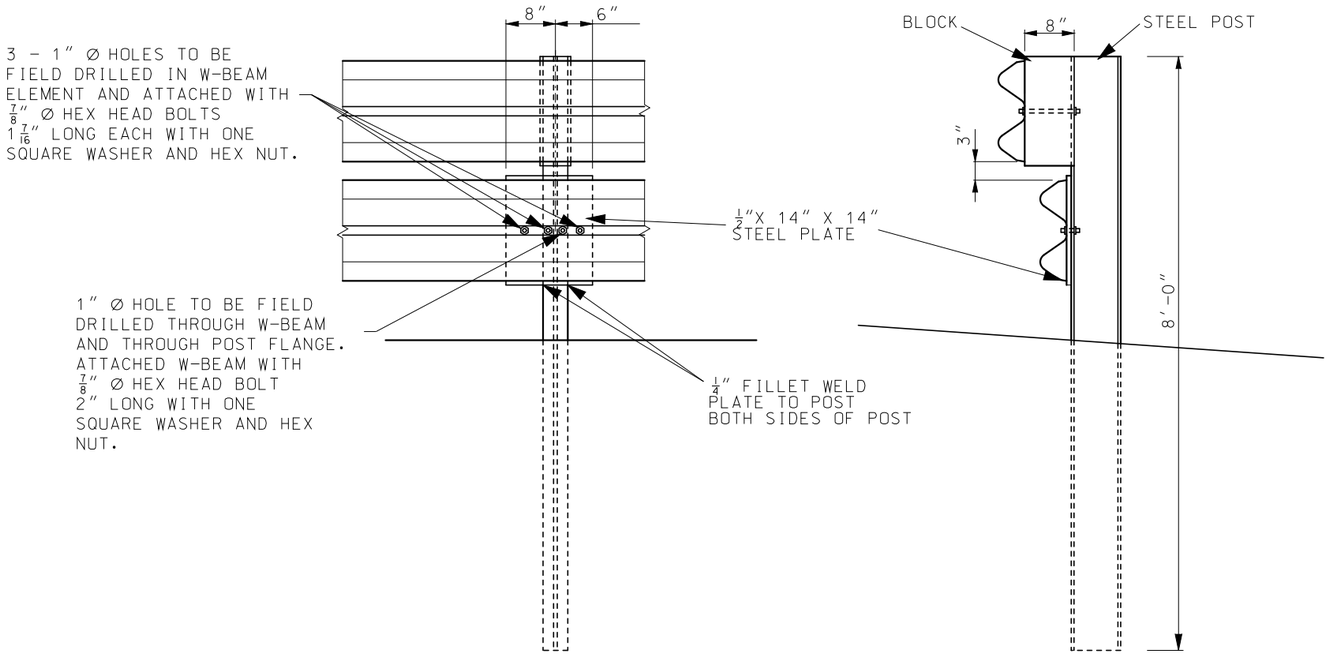
# GUARDRAIL
## EMBEDDED TERMINAL ENDS (FLAT DITCH)

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.30J




EMBEDDED STEEL POST




SPECIAL RUBRAIL TO POST CONNECTION AT POST A

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

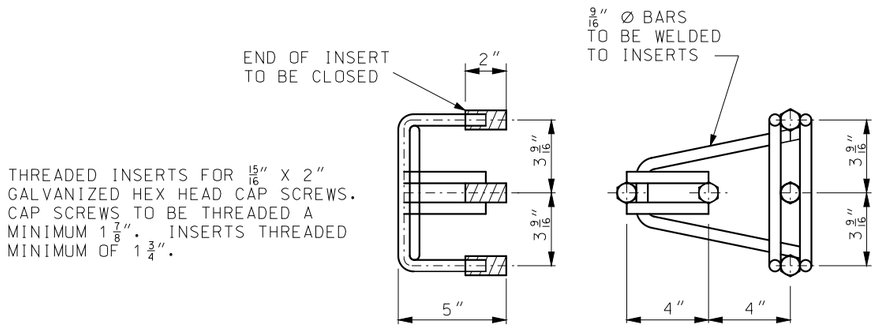
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# GUARDRAIL
## EMBEDDED ANCHOR TERMINAL ENDS (STEEL POST OPTION)

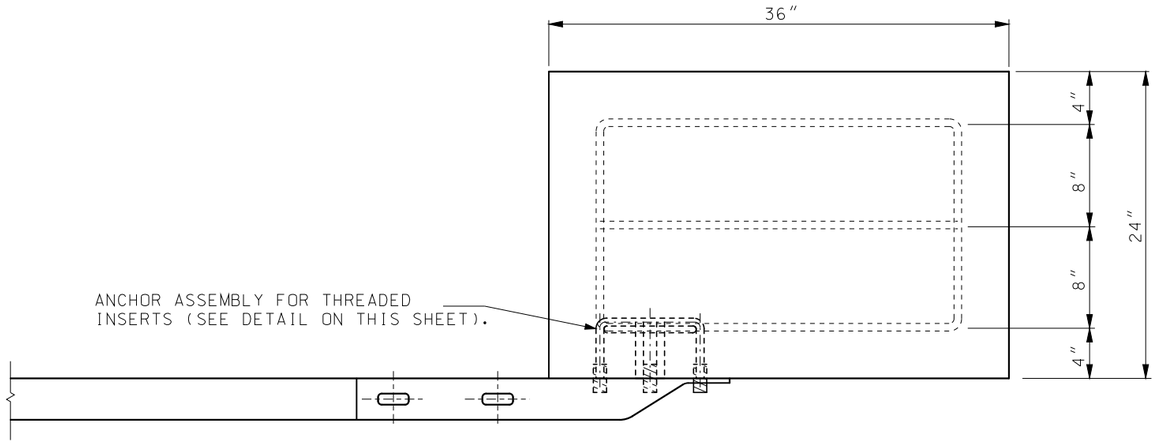
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.30J

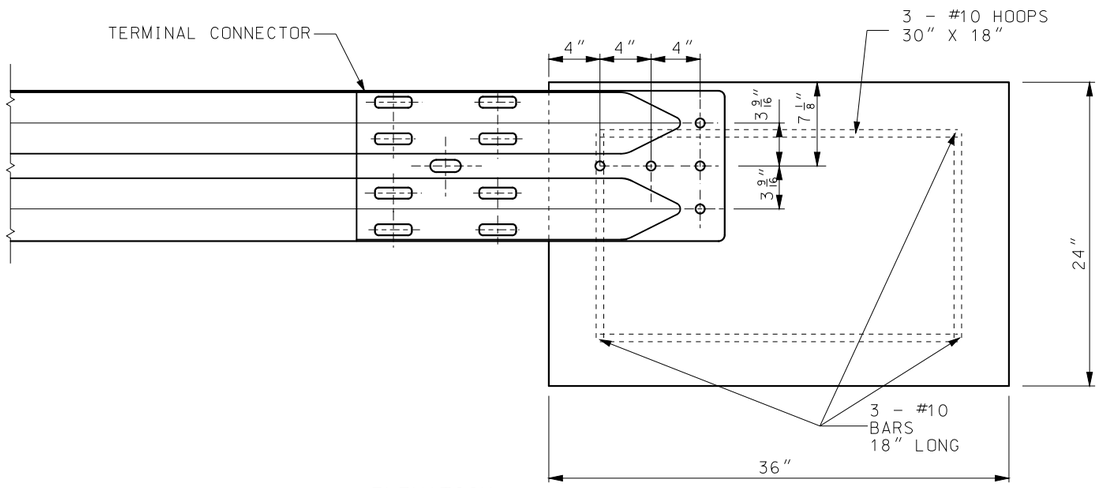



THREADED INSERTS FOR $\frac{15}{16}$″ X 2″ GALVANIZED HEX HEAD CAP SCREWS. CAP SCREWS TO BE THREADED A MINIMUM $1\frac{7}{8}$″. INSERTS THREADED MINIMUM OF $1\frac{3}{4}$″.

## CONCRETE BLOCK ANCHOR ANCHOR ASSEMBLY

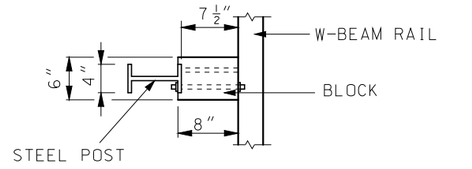



TOP VIEW

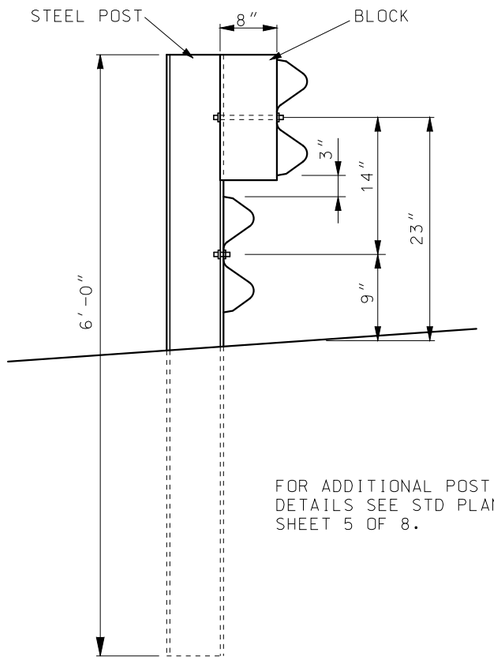



ELEVATION

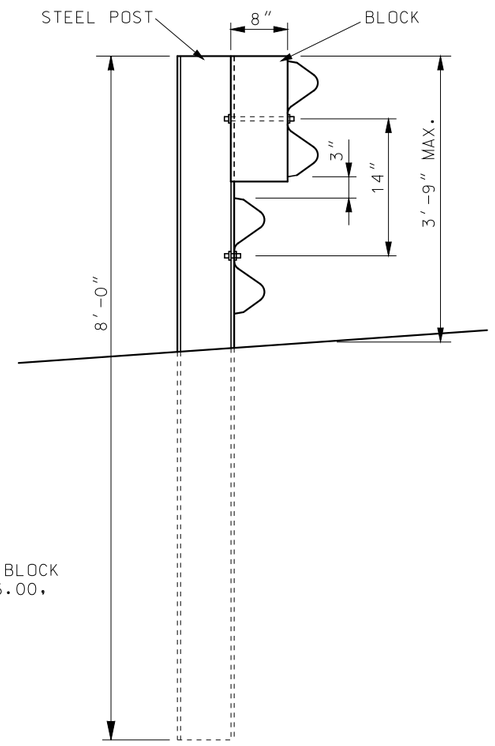
CONCRETE BLOCK ANCHOR
(24″ X 24″ X 36″)




PLAN




FOR ADDITIONAL POST AND BLOCK DETAILS SEE STD PLAN 606.00, SHEET 5 OF 8.




ELEVATION OF 6′ POST

ELEVATION 8′ POST

STEEL POST AND BLOCK DETAIL

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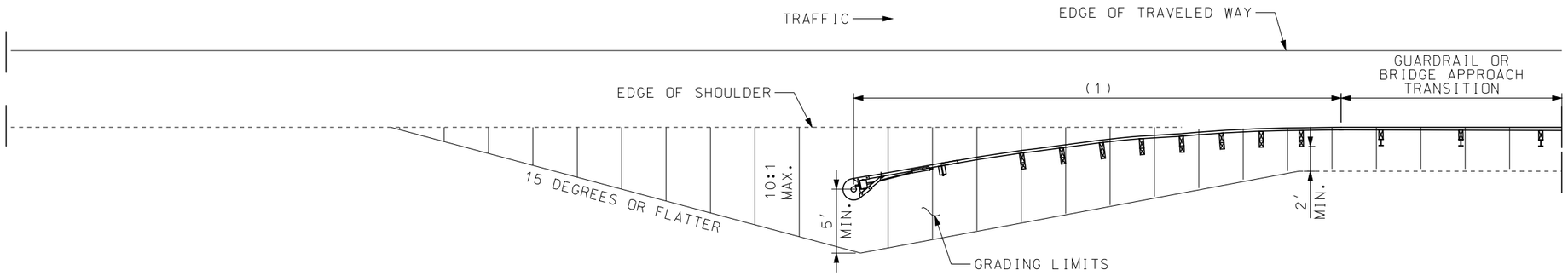

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# GUARDRAIL
## EMBEDDED TERMINAL ENDS
## GENERAL DETAILS

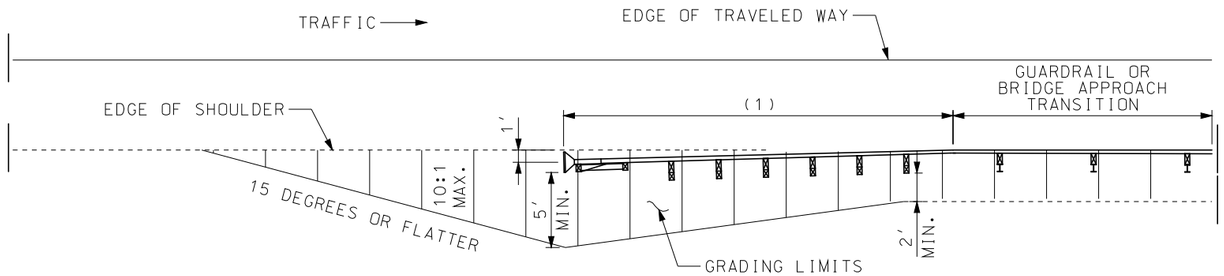
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.30J

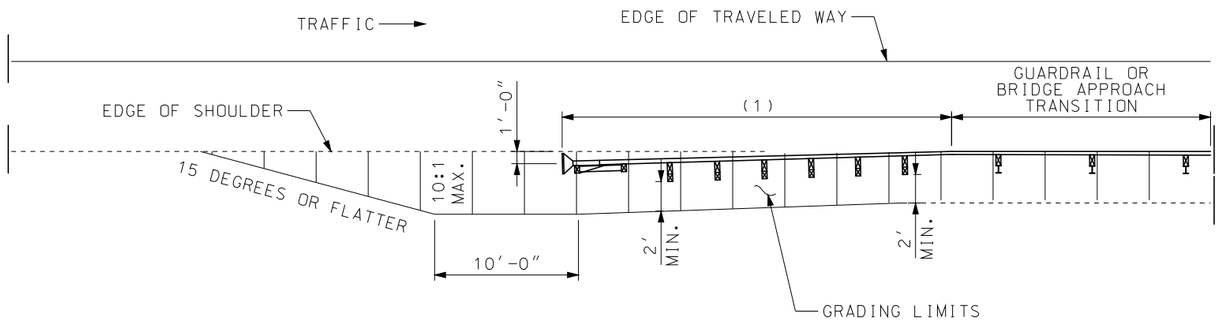
SHEET NO. 7 OF 7




## GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS




## PREFERRED GRADING LIMITS FOR CRASHWORTHY END TERMINALS




## ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS

(1) APPROVED CRASHWORTHY END TERMINAL

GENERAL NOTES:

THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH APPROVED SHOP DRAWINGS OF THE APPROVED CRASH-WORTHY END TERMINAL.

END ANCHORS SHALL BE INSTALLED ON ENDS OF GUARDRAIL RUNS WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.

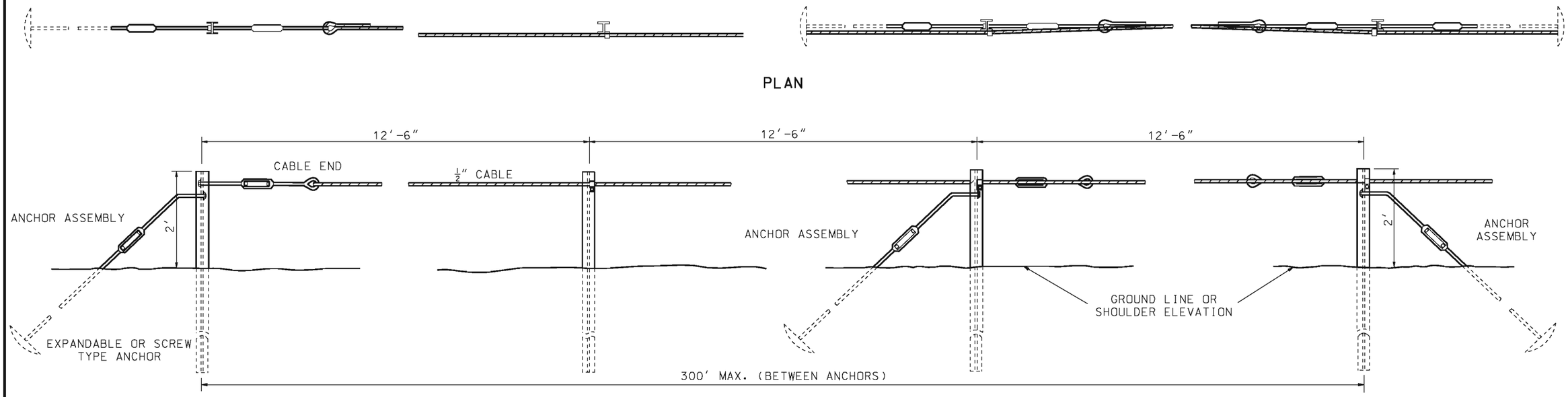
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# CRASHWORTHY END TERMINALS TYPE A GRADING LIMITS

| DATE EFFECTIVE: 01/01/2017<br>DATE PREPARED: 10/28/2016 | 606.31 | SHEET NO.<br>1 OF 1 |
|---|---|---|

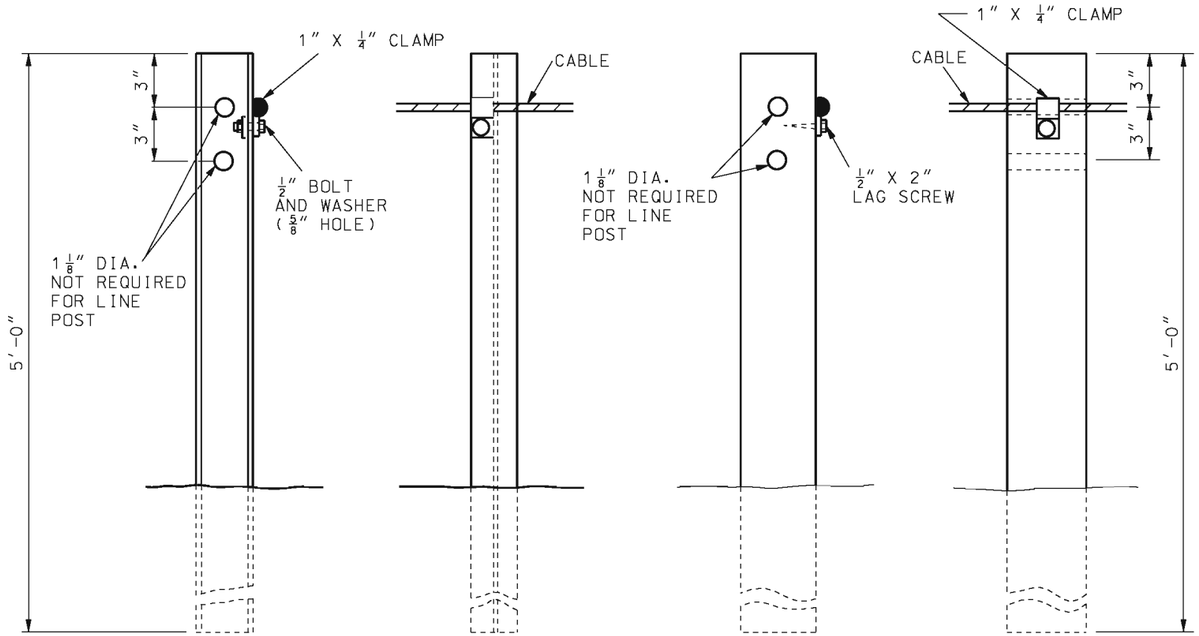
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PLAN

END ANCHOR | LINE POST | INTERMEDIATE ANCHOR

ELEVATION




STEEL POST
(S3 X 5.7 STD. BEAM)

WOOD POST
(4″ X 4″ SQUARE OR 4″ ROUND)

## POST DETAILS

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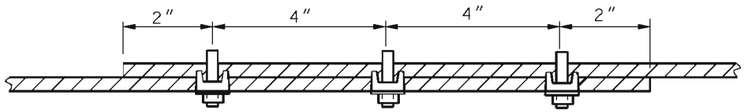
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# ONE-STRAND ACCESS RESTRAINT CABLE

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

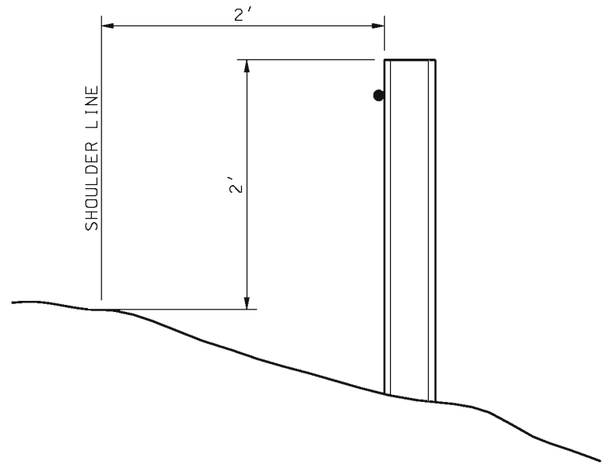
606.40D

SHEET NO. 1 OF 2

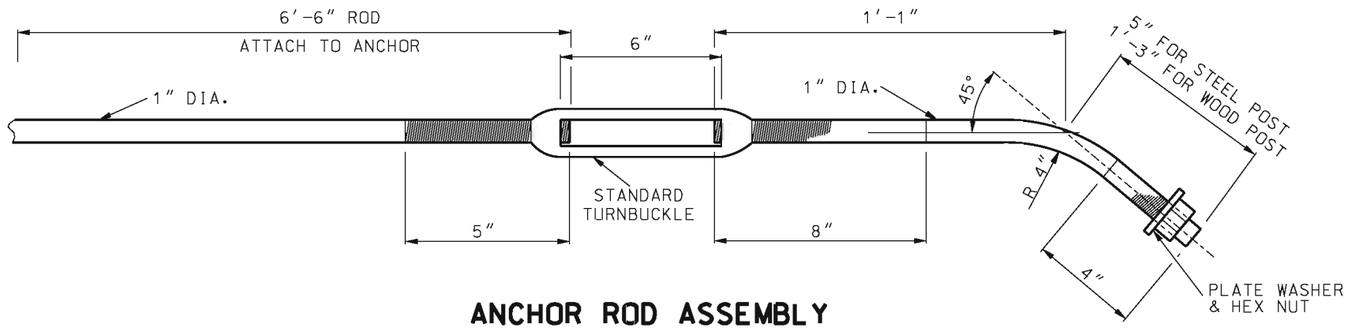



ACCESS-RESTRAINT CABLE GREATER THAN 300 FEET IN LENGTH REQUIRES AN INTERMEDIATE ANCHOR AS SHOWN.

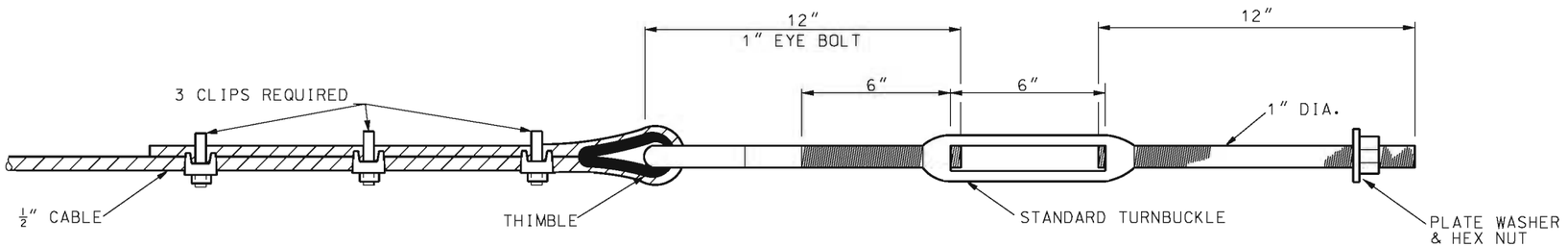
## SPLICE DETAIL




## TYPICAL LOCATION SHOULDER INSTALLATION




## ANCHOR ROD ASSEMBLY




## CABLE END

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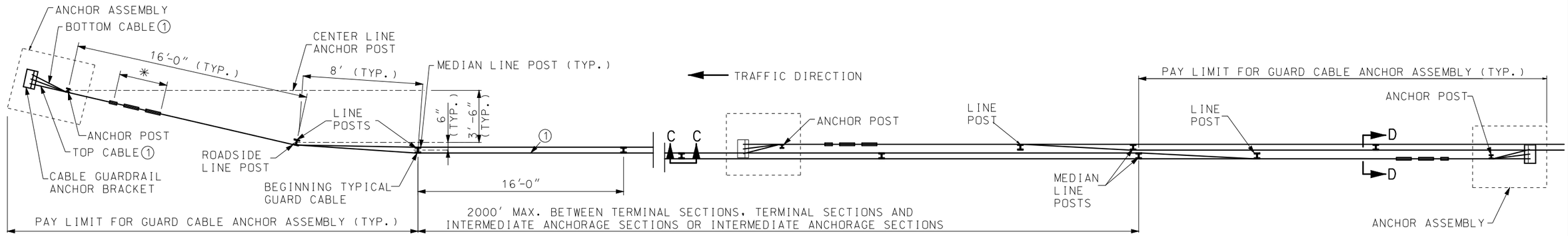
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# ONE-STRAND ACCESS RESTRAINT CABLE

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

606.40D

SHEET NO. 2 OF 2

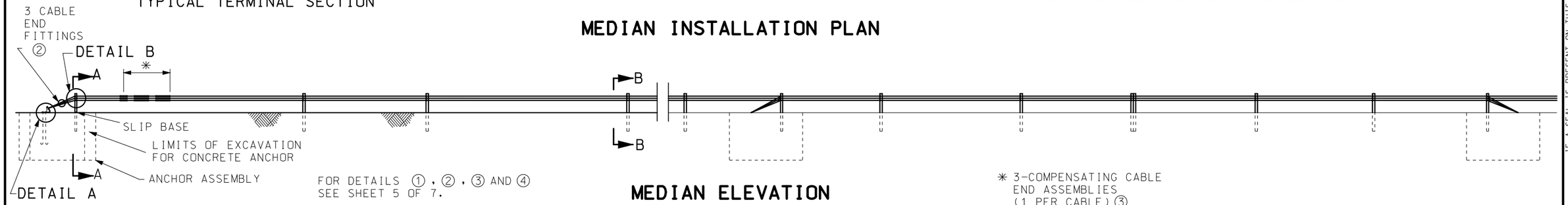



TYPICAL TERMINAL SECTION

TRAFFIC DIRECTION

TYPICAL INTERMEDIATE TERMINAL SECTIONS

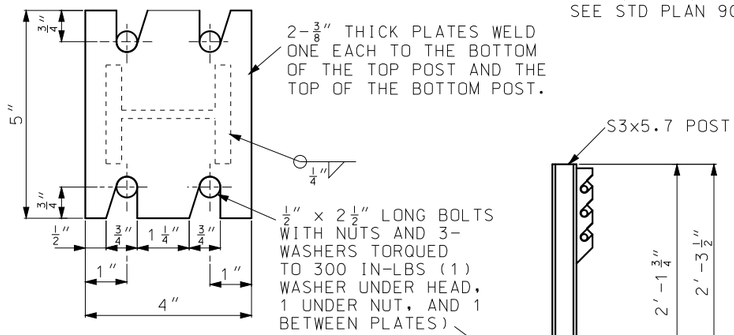
## MEDIAN INSTALLATION PLAN



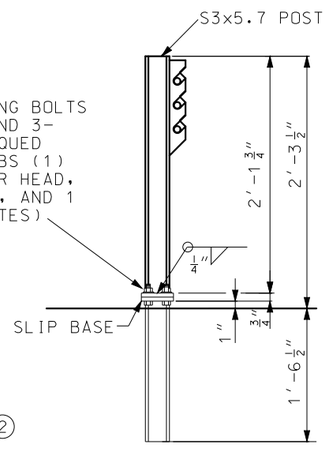

FOR DETAILS ①, ②, ③ AND ④ SEE SHEET 5 OF 7.

## MEDIAN ELEVATION

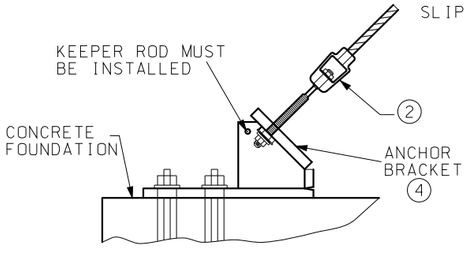
✳ 3-COMPENSATING CABLE END ASSEMBLIES (1 PER CABLE) ③




SLIP BASE PLATE

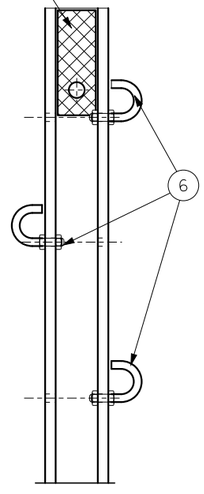



SECTION A-A



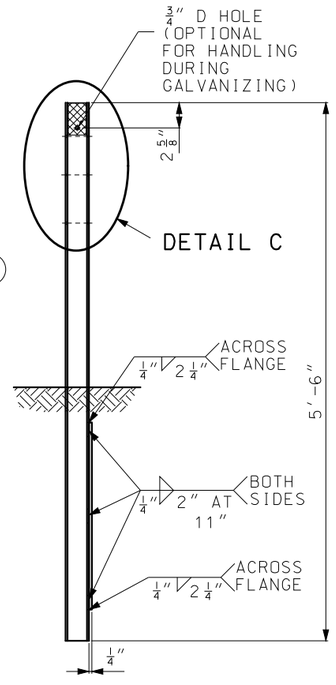

DETAIL A
ANCHOR BRACKET

FOR GUARD CABLE DELINEATION DETAILS SEE STD PLAN 903.03

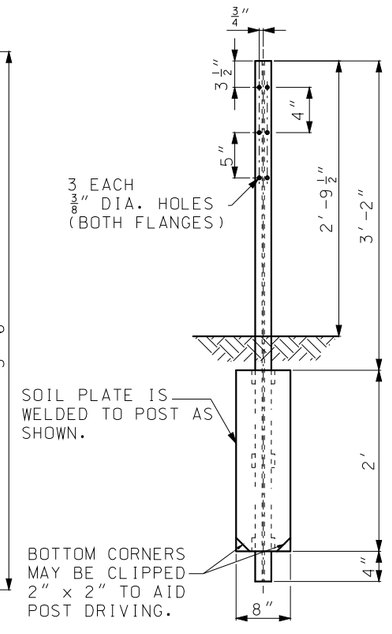



DETAIL C

FOR DETAIL ⑥, SEE SHEET 6 OF 7.




SECTION B-B




SECTION C-C

## LINE POST AND WELDED SOIL PLATE

GENERAL NOTES:

IN THE EVENT THE NORMAL 16' POST SPACING WOULD PLACE A POST ON A DROP INLET, THE SPACING OF THE TWO POSTS IMMEDIATELY PRECEDING THE INLET SHALL BE REDUCED SUCH THAT THE FOLLOWING POST CLEARS THE INLET. EACH SUBSEQUENT POST SHALL BE SPACED AT 16'. IN NO CASE SHALL THE SPACING EXCEED 16'.

IN THE EVENT A LONGITUDINAL MEDIAN PIPE IS ENCOUNTERED THE CABLE SHALL BE PLACED PARALLEL TO THE PIPE AT A MINIMUM OFFSET OF 12". THE OFFSET SHALL BE ACHIEVED BY A MINIMUM 16:1 TAPER ON THE UPSTREAM AND DOWNSTREAM END OF THE PIPE.

FOR SECTION D-D AND DETAIL B, SEE SHEET 4 OF 7.

FOR GUARD CABLE DELINEATION DETAILS SEE STD PLAN 903.03.

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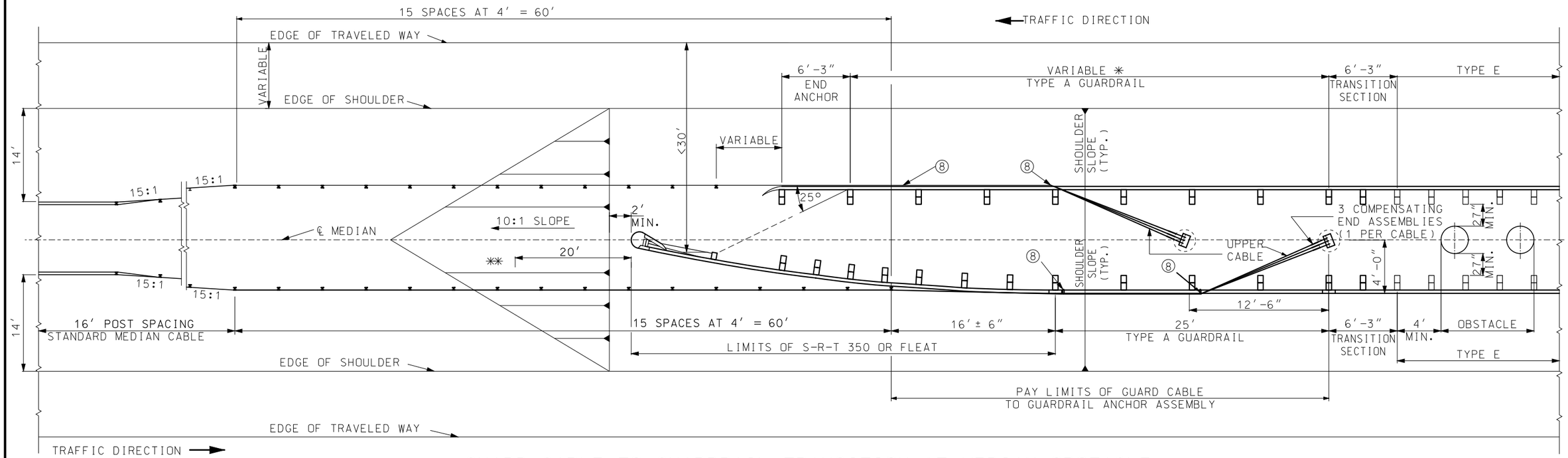
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# THREE-STRAND GUARD CABLE
MEDIAN APPLICATION

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

606.41K

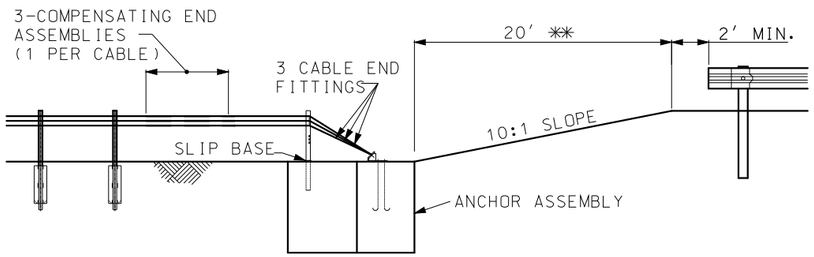
SHEET NO. 1 OF 7



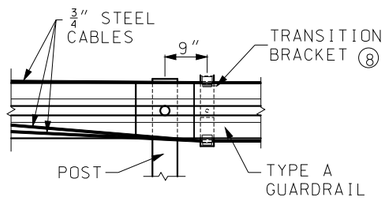

# GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN OBSTACLE

✳ VARY LENGTH TO ACHIEVE 25° DEFLECTION TO SECOND POST OF S-R-T 350 OR FLEAT.

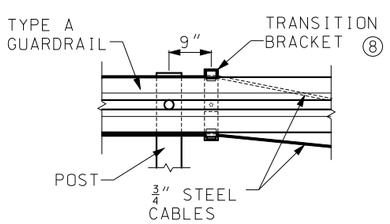
✳✳ IF GUARD CABLE IS USED WITH BULLNOSE GUARDRAIL SYSTEM, OR A CRASHWORTHY END TERMINAL ON A MEDIAN LESS THAN 60′ IN WIDTH, THE CABLE ANCHORAGE SHALL BE PLACED ON THE MEDIAN CENTERLINE 20′ FROM THE NOSE OF THE CRASHWORTHY END TERMINAL OR BULLNOSE GUARDRAIL SYSTEM.




## PROFILE OF TRANSITION AT MEDIAN OBSTACLE WITH BULLNOSE OR IN A MEDIAN NARROWER THAN 60′✳✳

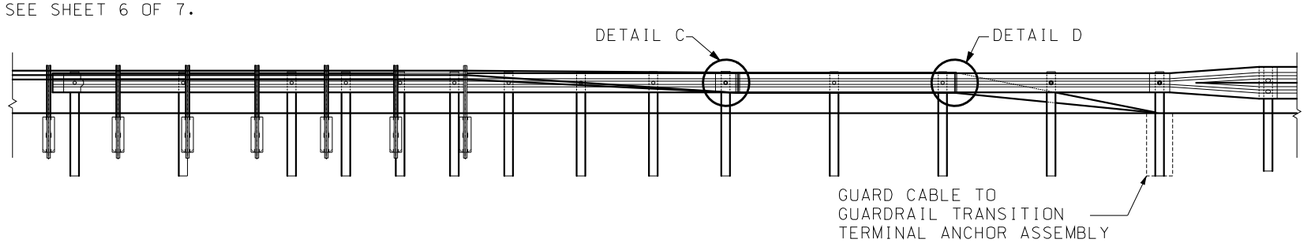



DETAIL C




DETAIL D

FOR DETAIL ⑧ SEE SHEET 6 OF 7.




## TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION

GENERAL NOTES:

WHEN GUARD CABLE IS LOCATED ALONG THE MEDIAN CENTERLINE NEAR A BRIDGE END OR CONCRETE BARRIER, IT SHALL BE ANCHORED BEHIND THE GUARDRAIL ASSEMBLY WITH THE GUARD CABLE ANCHOR ASSEMBLY. THE GUARD CABLE ANCHOR SHALL BE CONSTRUCTED SO THAT IT IS PROTECTED BY THE GUARDRAIL.

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

SUITABLE DRAINAGE MUST BE PROVIDED WHEN MEDIAN GRADING IMPEDES NORMAL FLOW.

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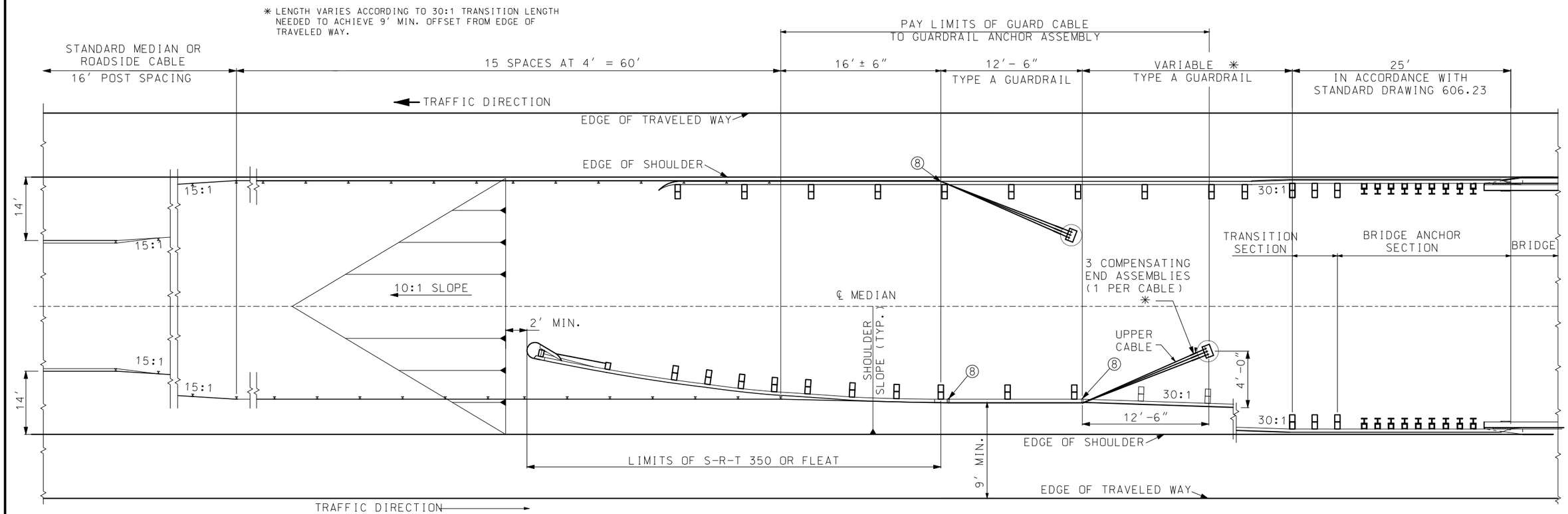
# THREE-STRAND GUARD CABLE

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

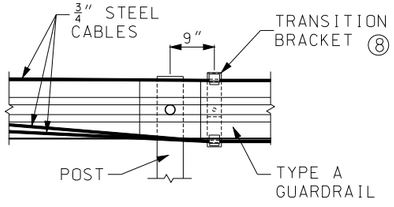
606.41K

SHEET NO. 2 OF 7

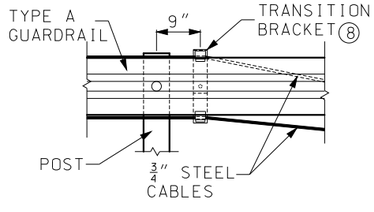
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# GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN BRIDGE END

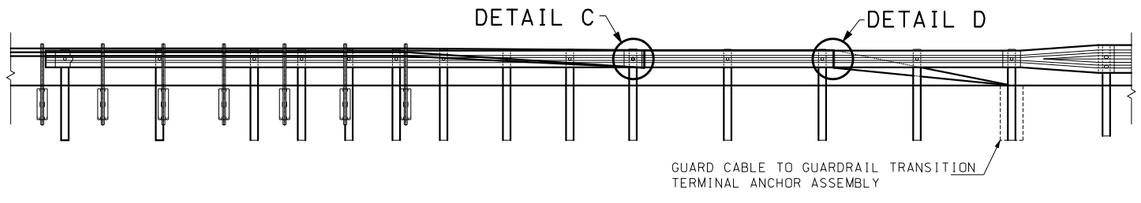



DETAIL C




DETAIL D

FOR DETAIL ⑧
SEE SHEET 6 OF 7.




## TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION

GENERAL NOTES:

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

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

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ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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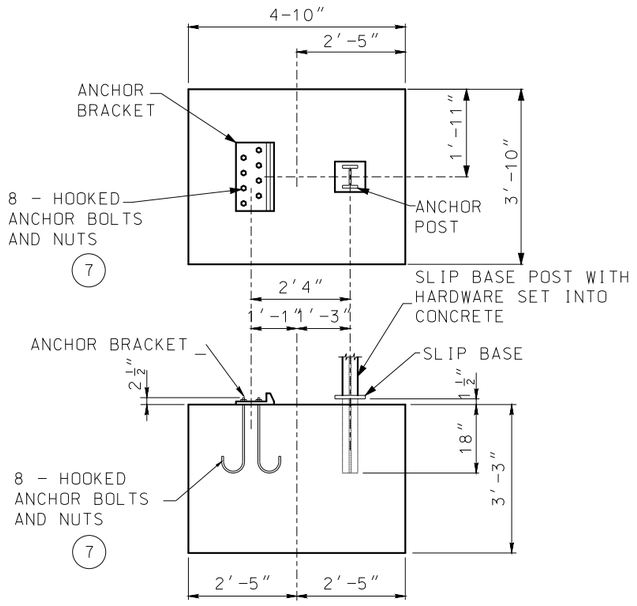
## THREE-STRAND GUARD CABLE

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

606.41K

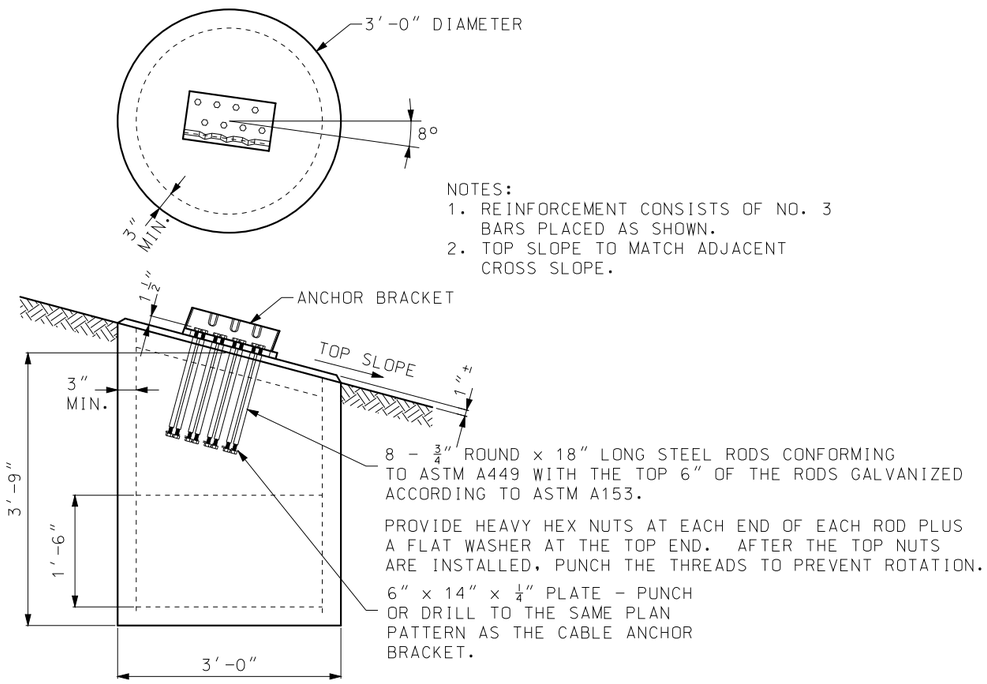
SHEET NO. 3 OF 7

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MEDIAN AND ROADSIDE CABLE

NOTES:
1. PLACE ANCHORS SO THE TOPS ARE LEVEL; WARP SLOPE TO FIT.
2. THE CONCRETE ANCHOR BLOCK DOES NOT REQUIRE REINFORCEMENT.




NOTES:
1. REINFORCEMENT CONSISTS OF NO. 3 BARS PLACED AS SHOWN.
2. TOP SLOPE TO MATCH ADJACENT CROSS SLOPE.

8 - ¾" ROUND x 18" LONG STEEL RODS CONFORMING TO ASTM A449 WITH THE TOP 6" OF THE RODS GALVANIZED ACCORDING TO ASTM A153.

PROVIDE HEAVY HEX NUTS AT EACH END OF EACH ROD PLUS A FLAT WASHER AT THE TOP END. AFTER THE TOP NUTS ARE INSTALLED, PUNCH THE THREADS TO PREVENT ROTATION.

6" x 14" x ¼" PLATE - PUNCH OR DRILL TO THE SAME PLAN PATTERN AS THE CABLE ANCHOR BRACKET.

GUARD CABLE TO GUARDRAIL TRANSITION

| STANDARDIZED HARDWARE | |
|---|---|
| (1) | WIRE ROPE |
| (2) | CABLE END FITTING |
| (3) | COMPENSATING CABLE END ASSEMBLY |
| (4) | ANCHOR BRACKET |
| (5) | U-BOLT CABLE CLIPS |
| (6) | CABLE HOOK BOLT AND NUT |
| (7) | HOOKED ANCHOR BOLT AND NUTS |
| (8) | CABLE TRANSITION BRACKET |

GENERAL NOTES:

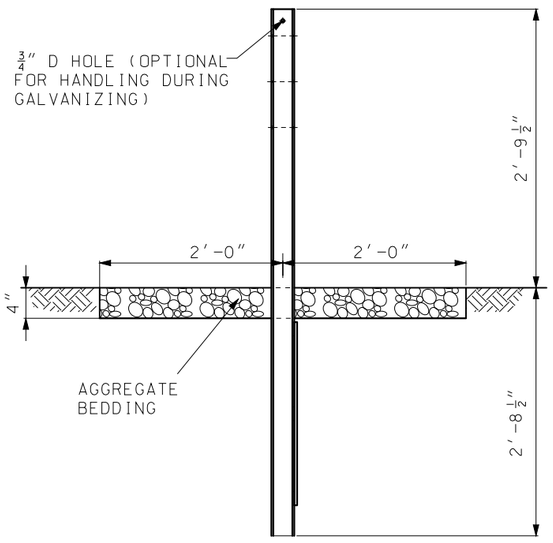
FOR ARRANGEMENT OF SPRING AND COMPENSATING CABLE END ASSEMBLIES AND TURNBUCKLE CABLE END ASSEMBLIES, THE FOLLOWING CRITERIA SHALL APPLY: LENGTH OF CABLE RUNS TO 1000' - USE COMPENSATING CABLE END ASSEMBLY ON ONE END AND THE TURNBUCKLE CABLE END ASSEMBLY ON THE OTHER END OF EACH INDIVIDUAL CABLE. FOR LENGTHS LONGER THAN 1000' AND UP TO AND INCLUDING 2000' - USE COMPENSATING CABLE END ASSEMBLY ON EACH END OF THE INDIVIDUAL CABLE.

PRIOR TO FINAL ACCEPTANCE BY THE ENGINEER, THE FOLLOWING PROCEDURES SHALL BE USED TO TIGHTEN THE TURNBUCKLES. DEPENDING ON THE TEMPERATURE AT THE TIME OF THE ADJUSTMENT IN ACCORDANCE WITH THE FOLLOWING TABLE:

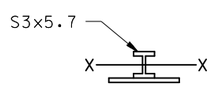
| TEMPERATURE (°F) | SPRING COMPRESSION FROM UNLOADED POSITION IN EACH SPRING |
|---|---|
| 120 TO 100 | 1" |
| 99 TO 80 | 1½" |
| 79 TO 60 | 2" |
| 59 TO 40 | 2½" |
| 39 TO 20 | 3" |
| 19 TO 0 | 3½" |
| -1 TO -20 | 4" |

THE SPECIFICATIONS AND DIMENSIONS OF ALL HARDWARE AND FITTINGS SHALL COMPLY WITH AASHTO-AGC-ARTBA JOINT COMMITTEE TASK FORCE 13 REPORT, A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE.

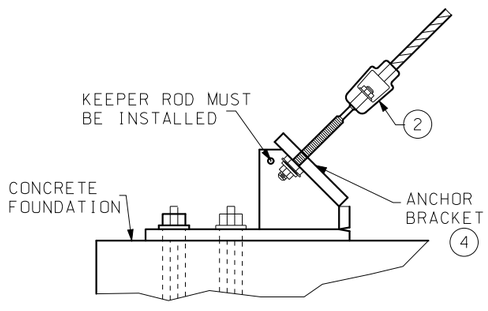
## TERMINAL ANCHOR ASSEMBLY
DETAIL FROM SHEET 1.



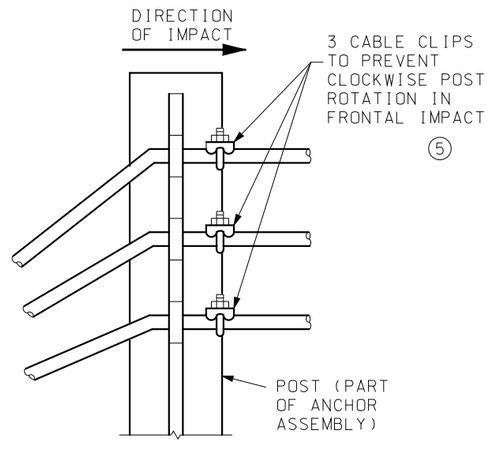

SECTION D-D




PLAN




DETAIL A
ANCHOR BRACKET
DETAIL FROM SHEET 1.




DETAIL B
CABLE CLIPS
DETAIL FROM SHEET 1.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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# THREE-STRAND GUARD CABLE

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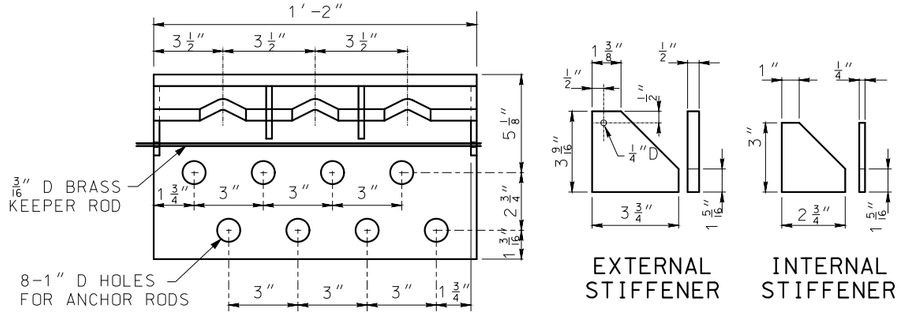
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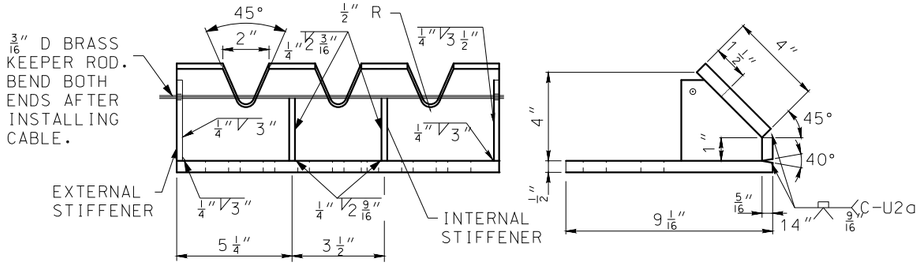
SHEET NO. 4 OF 7

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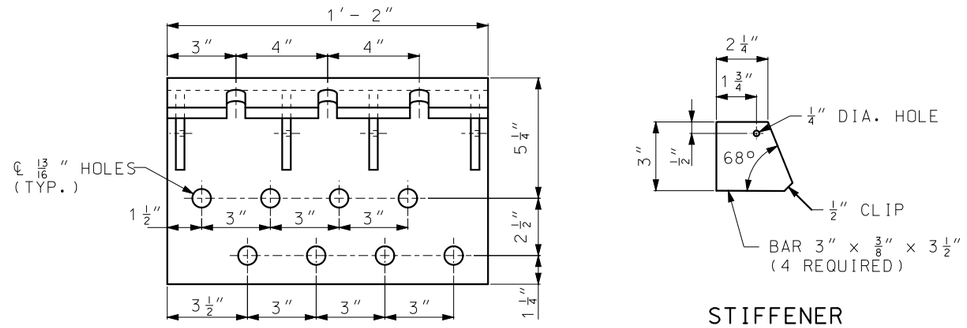



① WIRE ROPE

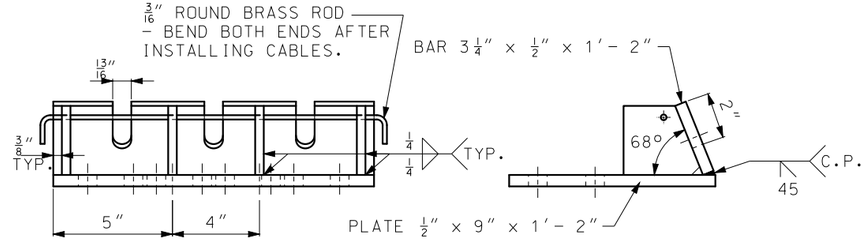


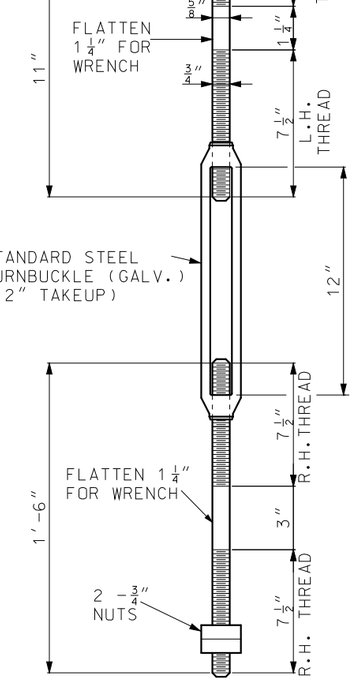

MEDIAN AND ROADSIDE CABLE



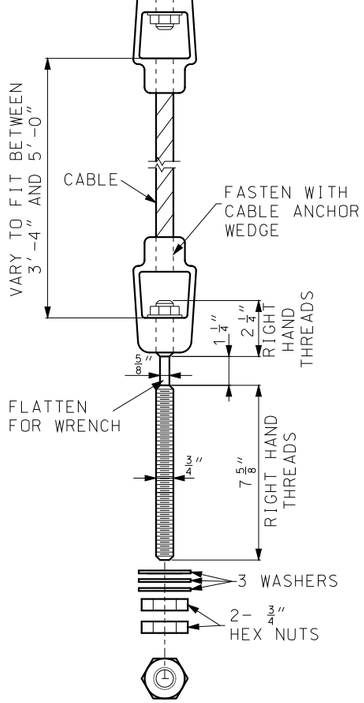

STIFFENER




GUARD CABLE TO GUARDRAIL TRANSITION



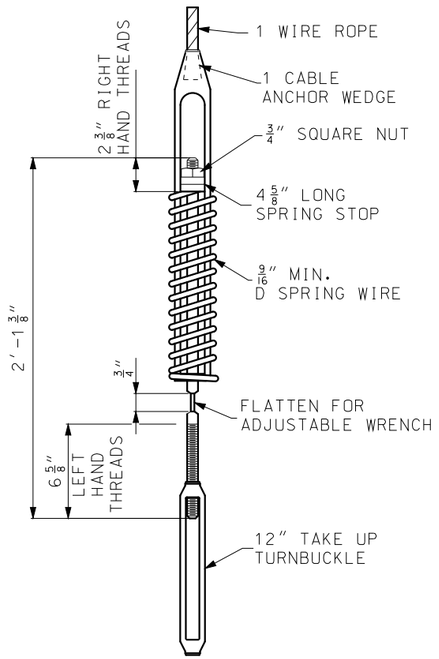

TURNBUCKLE CABLE END ASSEMBLY




CABLE END FITTING

② CABLE END FITTINGS

④ ANCHOR BRACKET




③ COMPENSATING CABLE END ASSEMBLY

GENERAL NOTES:

AT ALL LOCATIONS WHERE THE CABLE IS CONNECTED TO A CABLE SOCKET WITH A WEDGE TYPE CONNECTION, ONE WIRE OF THE WIRE ROPE SHALL BE CRIMPED OVER THE BASE OF THE WEDGE TO HOLD IT FIRMLY IN PLACE.

THE SPECIFICATIONS AND DIMENSIONS OF ALL HARDWARE AND FITTINGS SHALL COMPLY WITH AASHTO-AGC-ARTBA JOINT TASK FORCE 13 REPORT, A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE.

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105 WEST CAPITOL
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STATE OF MISSOURI
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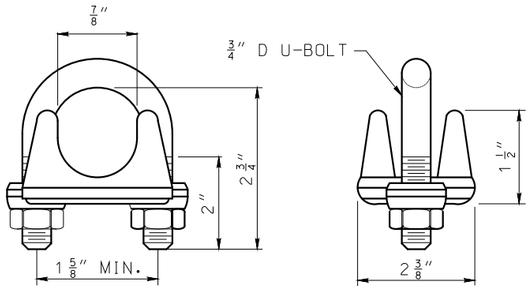
# THREE-STRAND GUARD CABLE

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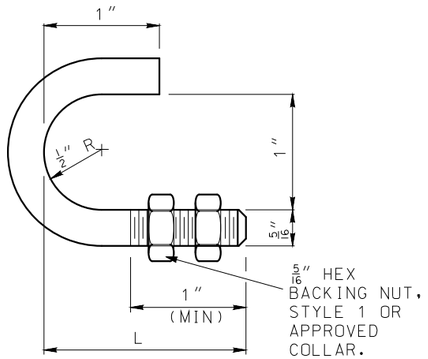
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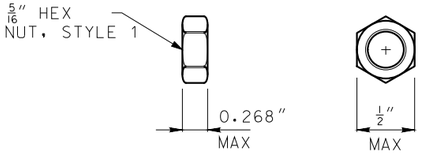
SHEET NO. 5 OF 7

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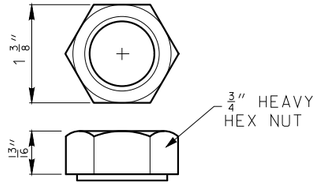


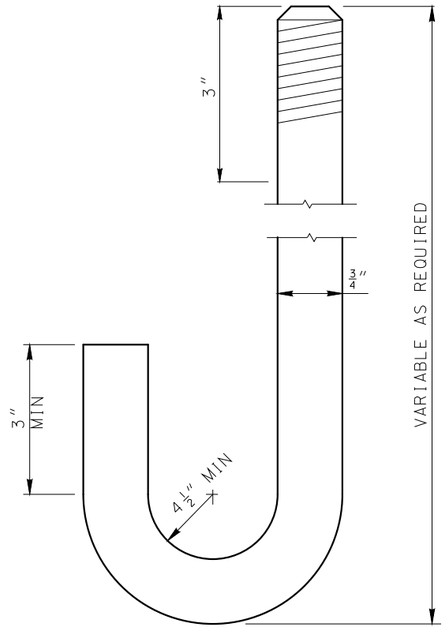

⑤ U-BOLT CABLE CLIPS



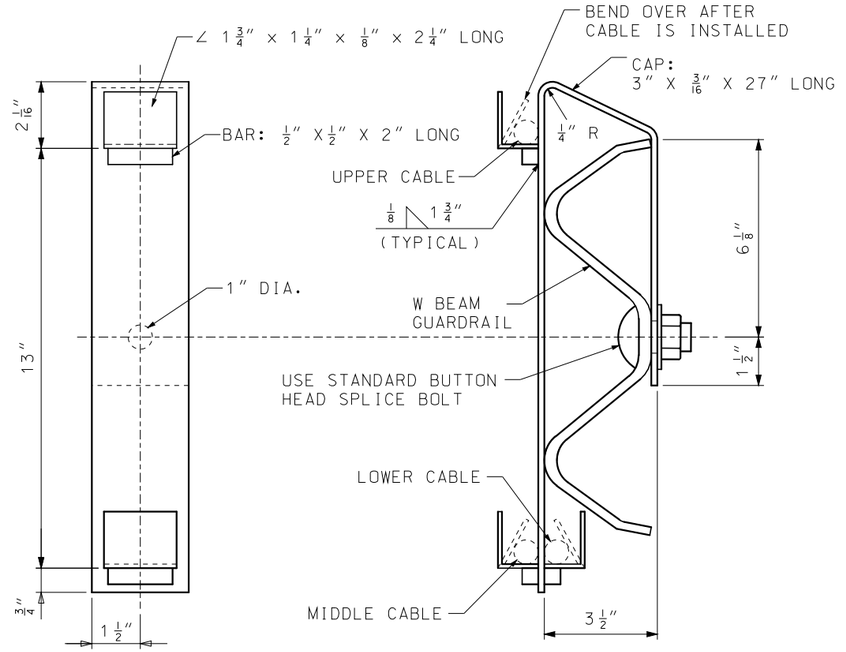




⑥ CABLE HOOK BOLT AND NUT

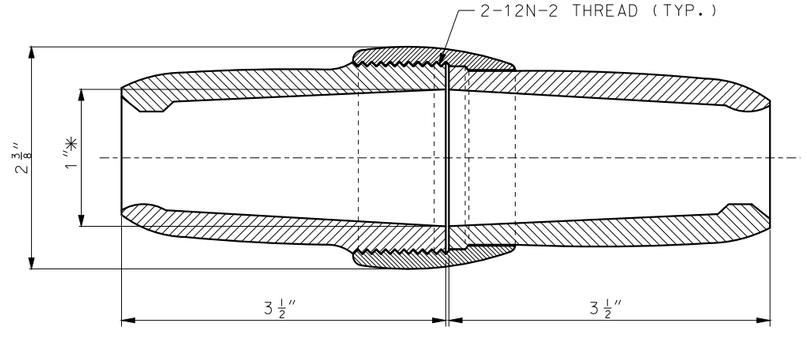



⑦ 25" HOOKED ANCHOR BOLT AND NUT

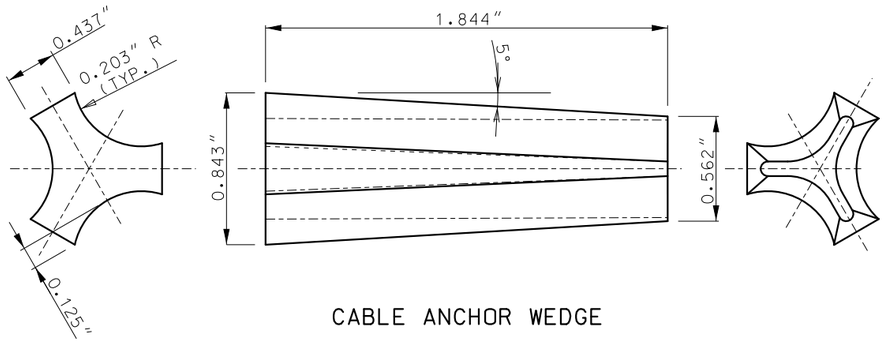



⑧ CABLE TRANSITION BRACKET




NOTE:
FITTING SPLICE SHALLDEVELOP THE FULL STRENGTH OF THE CABLE (25,000 LB.).

CABLE SPLICE




CABLE ANCHOR WEDGE

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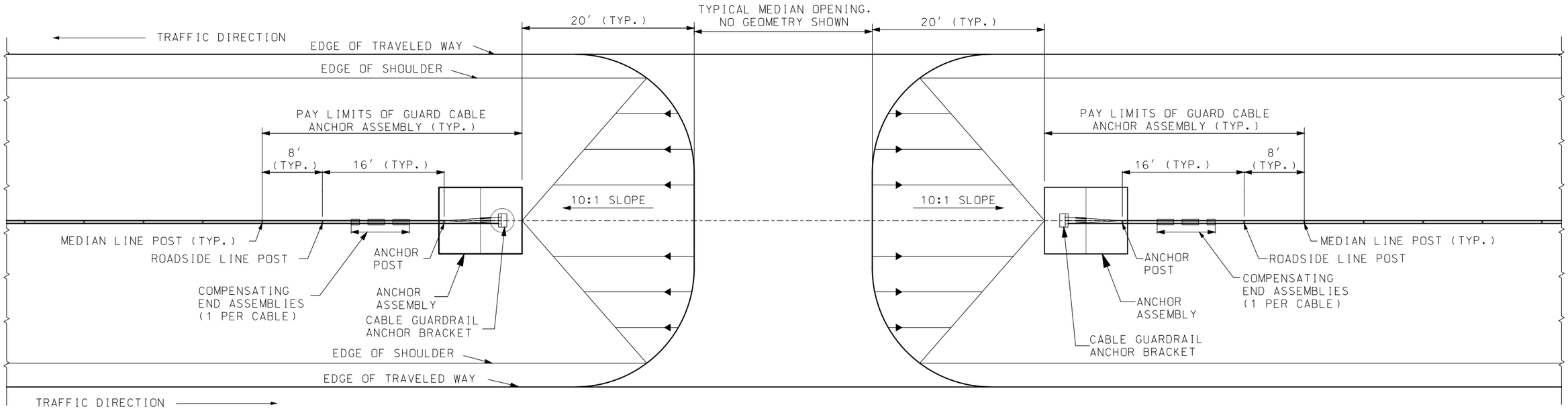
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# THREE-STRAND GUARD CABLE

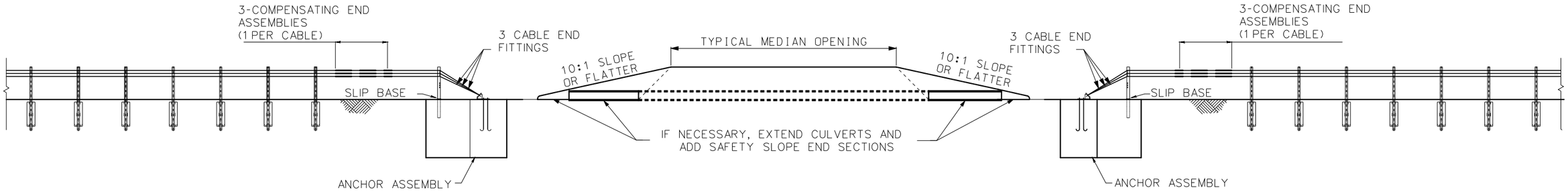
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SHEET NO. 6 OF 7




**PLAN**




**PROFILE**

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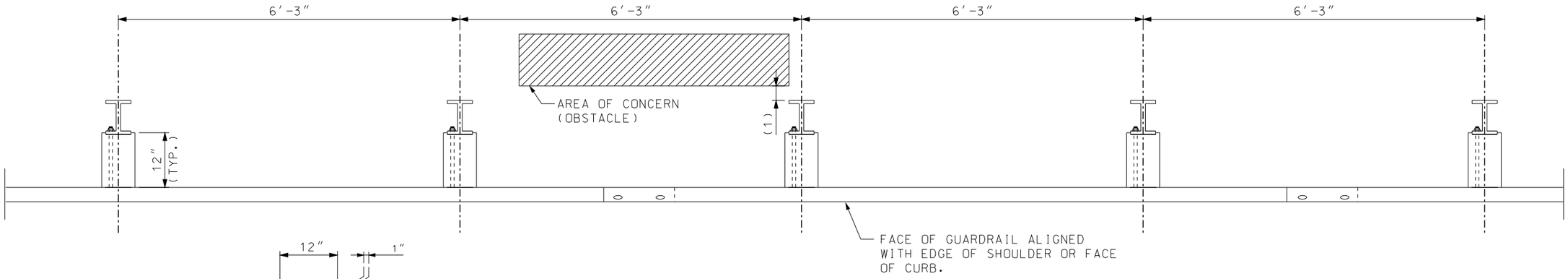
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# THREE-STRAND GUARD CABLE
## TRANSITION AT MEDIAN OPENING

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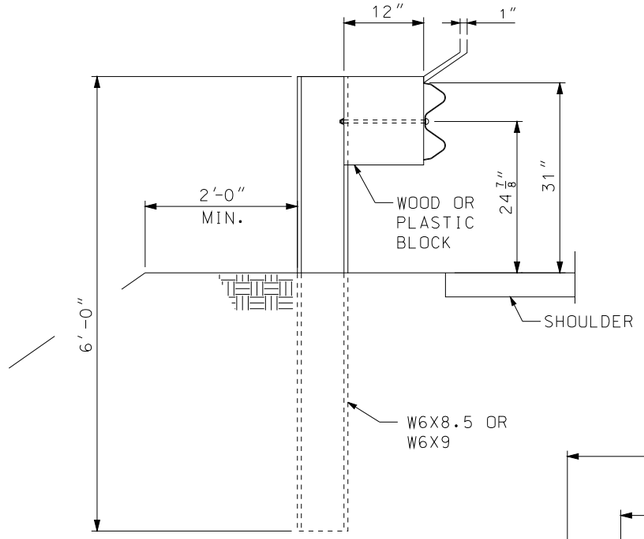
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SHEET NO.
7 OF 7



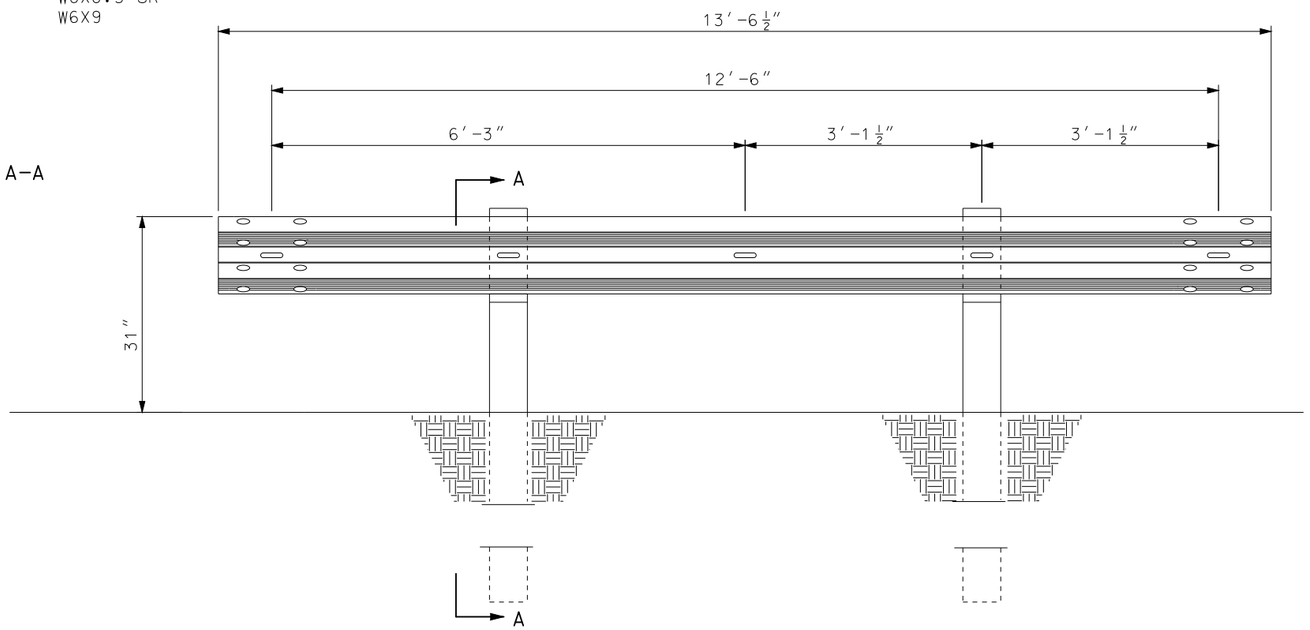

PLAN VIEW

MGS GUARDRAIL




SECTION A-A

(1) 2′-6″ MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 6′-3″ POST SPACINGS, 2′-0″ MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 3′-1 1/2″ POST SPACINGS, OR 1′-6″ MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 1′-6 3/4″ POST SPACINGS. SEE SHEET 4 OF 8 FOR POST SPACING DETAILS.




ELEVATION VIEW

GENERAL NOTES:
FOR INITIAL INSTALLATION, CONSTRUCT THE GUARDRAIL WITHIN 1″ OF THE STANDARD 31″ HEIGHT TO THE TOP OF W-BEAM RAIL. WHEN SUBSEQUENT PROJECTS, SUCH AS RESURFACINGS, AFFECT THE HEIGHT OF EXISTING GUARDRAIL ADJUSTMENT IS NOT REQUIRED IF THE FINISHED HEIGHT IS WITHIN 3″ OF THE STANDARD HEIGHT.

THE STANDARD POST LENGTH IS 6′-0″ (+3″,-0″ TOLERANCE).

WHERE SITE CONSTRAINTS PROHIBIT THE POST FROM BEING PLACED AT LEAST TWO FEET IN FRONT OF THE SLOPE BREAK POINT, USE LONGER POSTS AS SHOWN ON SHEET 6 OF 11.

REFER TO AASHTO M 180 FOR DIMENSIONAL DETAILS OF W-BEAM, RELATED BUFFER AND END SECTIONS, BEAM SPLICES, POST AND SPLICE BOLTS, NUTS, AND TYPE 1 W-BEAM TO THRIE BEAM TRANSITION SECTIONS.

BEAM WASHERS ARE NOT TO BE USED. BOLT GRADE SHALL BE ASTM A307.

UNLESS OTHERWISE SPECIFIED, W-BEAM RAIL IS 12 GAUGE STEEL WITH AN EFFECTIVE LENGTH OF 12′-6″ OR 25′-0″, WITH 29/32″ X 1 1/8″ SPLICE BOLT SLOTS, AND 3/4″ X 2 1/2″ POST BOLT SLOTS ON 3′-1 1/2″ CENTERS REGARDLESS OF POST SPACING.

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

LAP SPLICES BETWEEN TWO RAILS OR BETWEEN A RAIL AND TERMINAL CONNECTOR IN THE DIRECTION OF TRAFFIC. LAP THE FLARED END SECTIONS IN THE DIRECTION OF TRAFFIC.

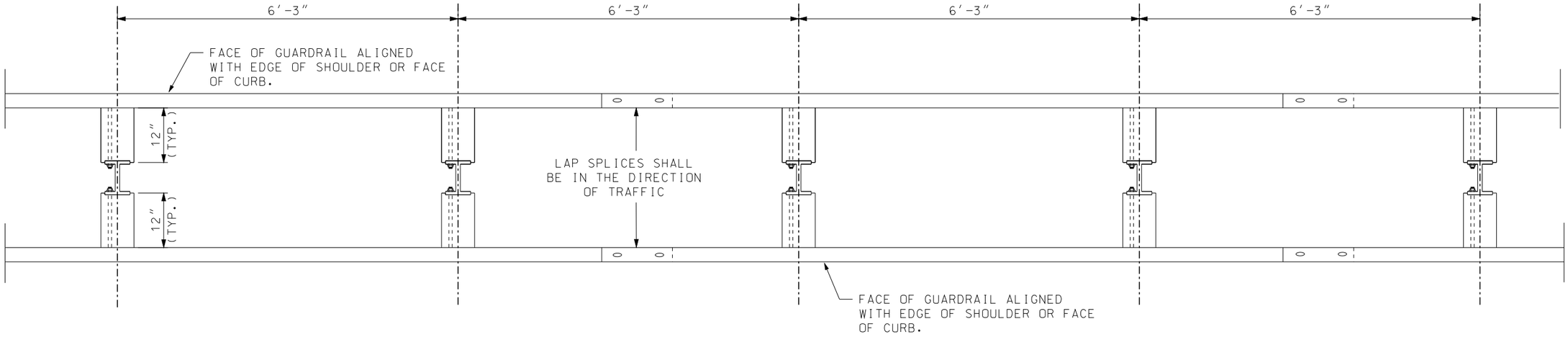
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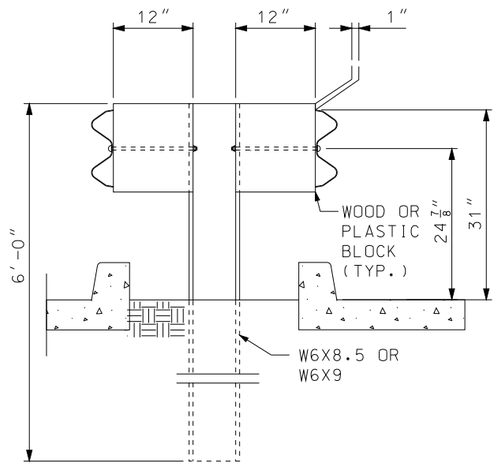
# MIDWEST GUARDRAIL SYSTEM (MGS) GUARDRAIL

| DATE EFFECTIVE: | 01/01/2017 | 606.50B | SHEET NO. 1 OF 8 |
|---|---|---|---|
| DATE PREPARED: | 10/28/2016 | | |



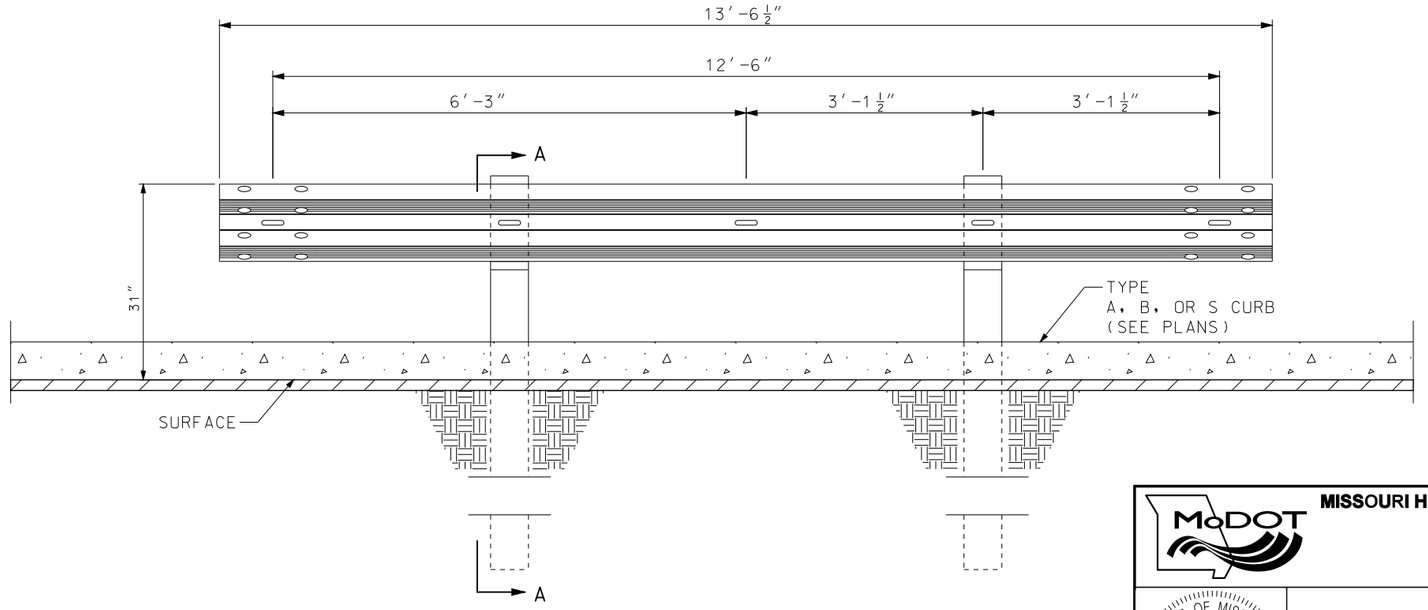

PLAN VIEW

DOUBLE FACED
MGS GUARDRAIL




SECTION A-A

DOUBLE FACED
MGS GUARDRAIL




ELEVATION VIEW

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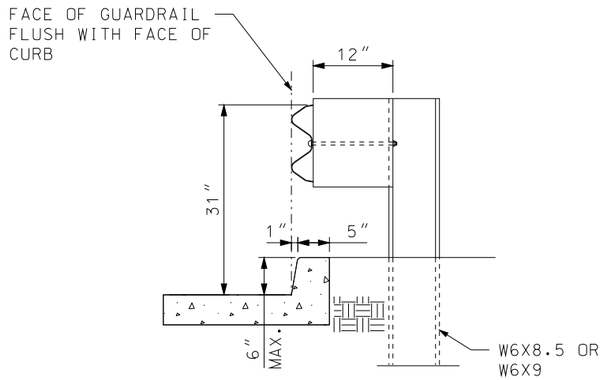
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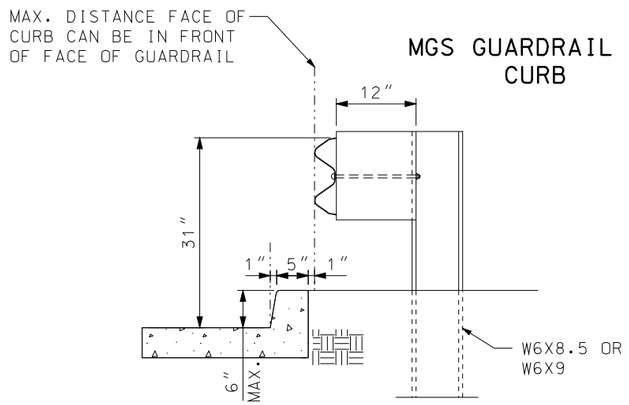
# MIDWEST GUARDRAIL SYSTEM (MGS) DOUBLE FACED GUARDRAIL

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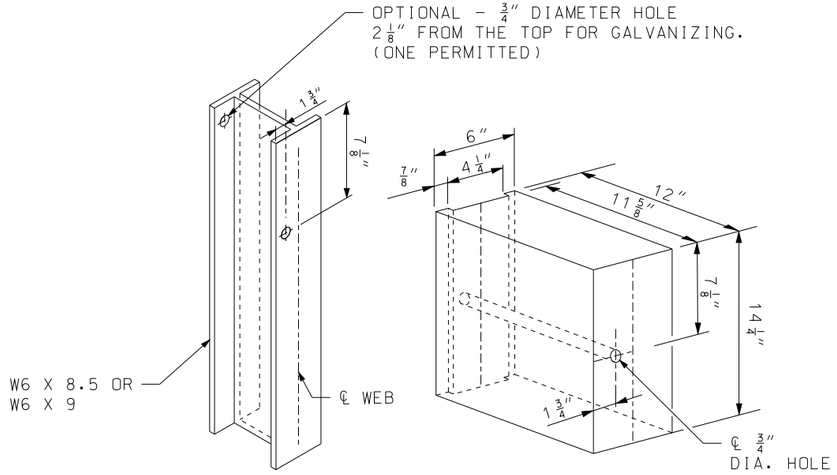
606.50B




MGS GUARDRAIL AT CURB

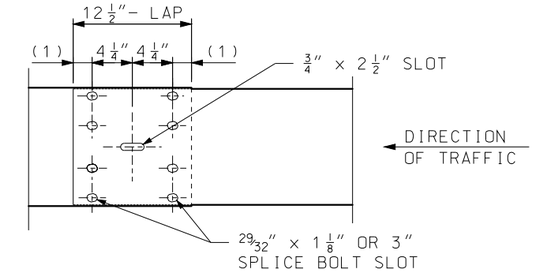



ALTERNATE MGS AT CURB

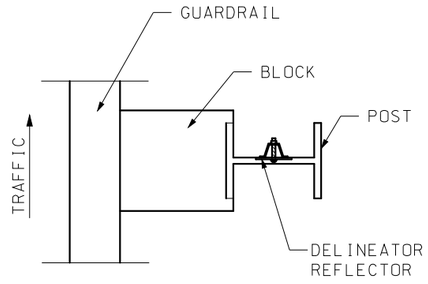


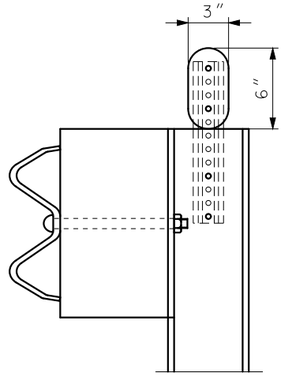

FOR STEEL POST AND NOTCHED WOOD OR PLASTIC BLOCK

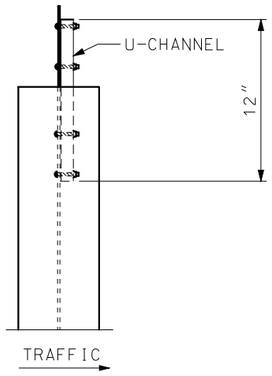
HOLE PUNCHING DETAIL




RAIL ELEMENT SPLICE DETAIL




DELINEATORS ON NEW GUARDRAIL

GENERAL NOTES:

FOR GUARDRAIL DELINEATION DETAILS SEE STD PLAN 903.03.

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NUMBER PE-28411
PROFESSIONAL ENGINEER
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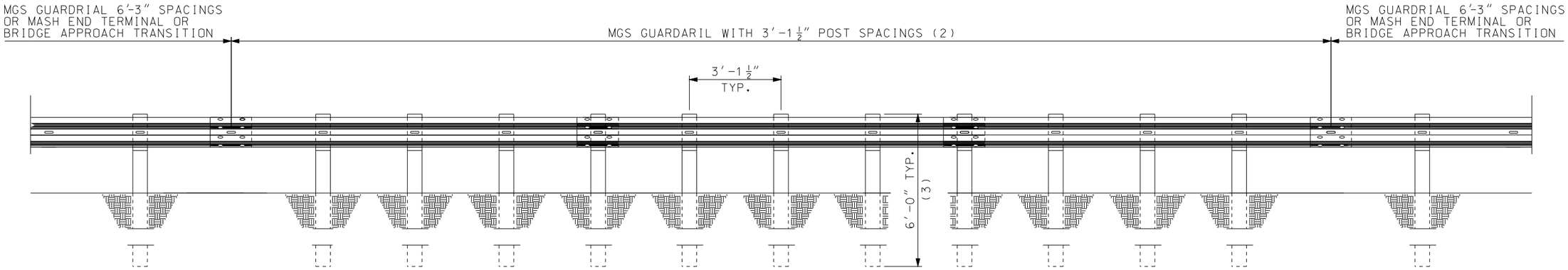
# MIDWEST GUARDRAIL SYSTEM (MGS) POST AND BLOCK

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DATE PREPARED: 10/28/2016

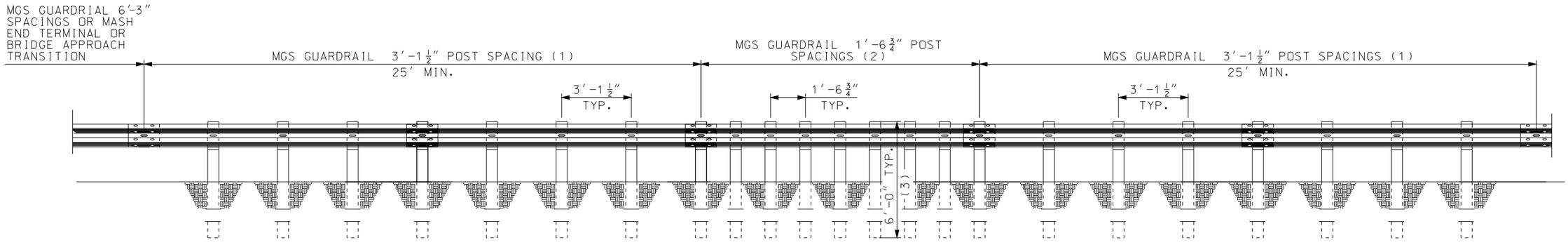
606.50B

SHEET NO. 3 OF 8

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## MGS GUARDRAIL WITH 3'-1½" POST SPACING




(1) 25 FEET OF MGS 3'-1½" POST SPACING GUARDRAIL IS REQIRED ON APPROACH AND DEPARTURE ENDS OF 1'-6¾" POST SPACING MGS GUARDRAIL.

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

(3) REDUCED POST SPACING SHALL USE 6'-0" POSTS MAX. ANY DEVIATION OF 6'-0" POSTS WILL ONLY BE ALLOWED IN ACCORDANCE WITH SPECIAL INSTALLATIONS AS SHOWN ON SHEET 5 OF 8.

## MGS GUARDRAIL WITH 1'-6¾" POST SPACING

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

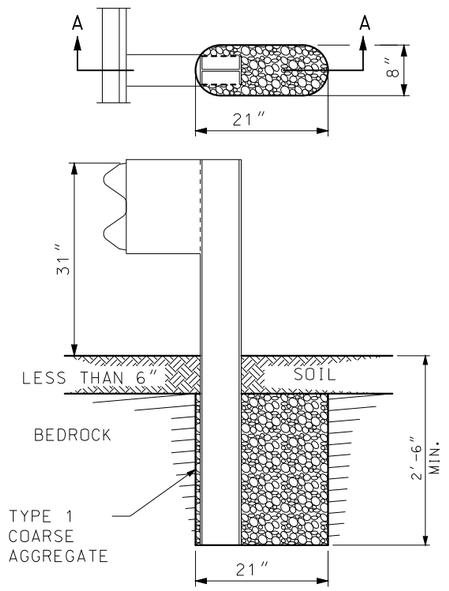
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# MIDWEST GUARDRAIL SYSTEM (MGS) REDUCED POST SPACINGS

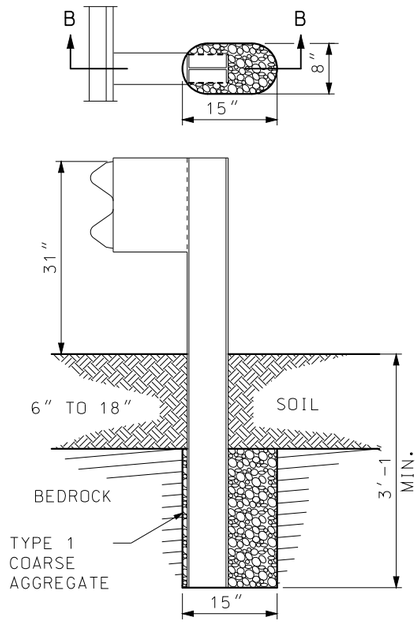
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.50B



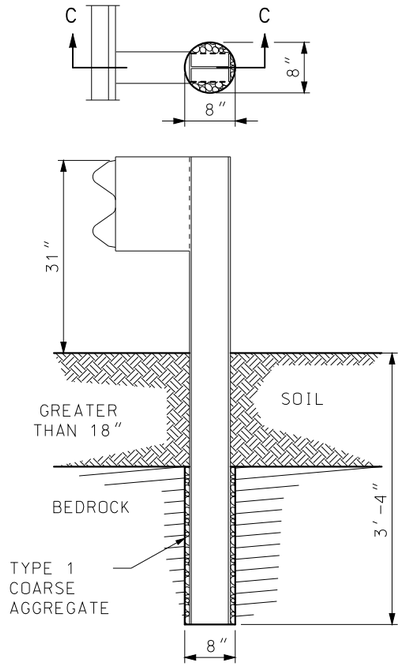

SECTION A-A

ROCK ENCOUNTERED
UP TO 6″ BENEATH SURFACE



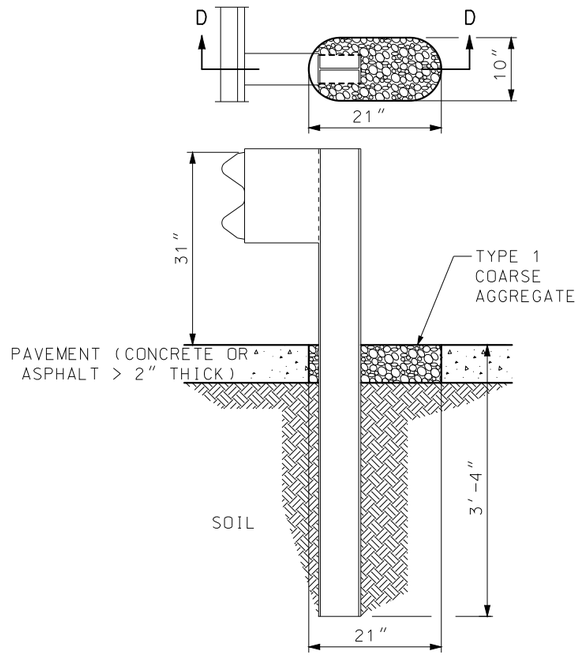

SECTION B-B

ROCK ENCOUNTERED
6″ TO 18″ BENEATH SURFACE




SECTION C-C

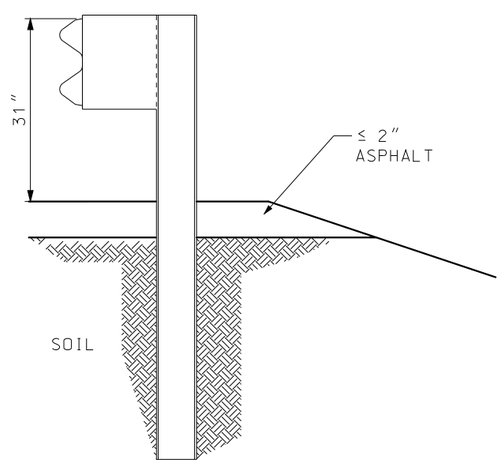
ROCK ENCOUNTERED MORE
THAN 18″ BENEATH SURFACE




SECTION D-D

SETTING POST THROUGH PAVEMENT
(CONCRETE OR ASPHALT > 2″ THICK)

## SETTING POST IN SOLID ROCK




SETTING POST THROUGH ASPHALT ≤ 2″ THICK

GENERAL NOTES:

HOLES IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT LESS THAN 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 FLAME OR SAW CUT. REPAIR OF CUT SHALL BE IN ACCORDANCE WITH SEC 712 OF THE STANDARD SPECIFICATIONS.


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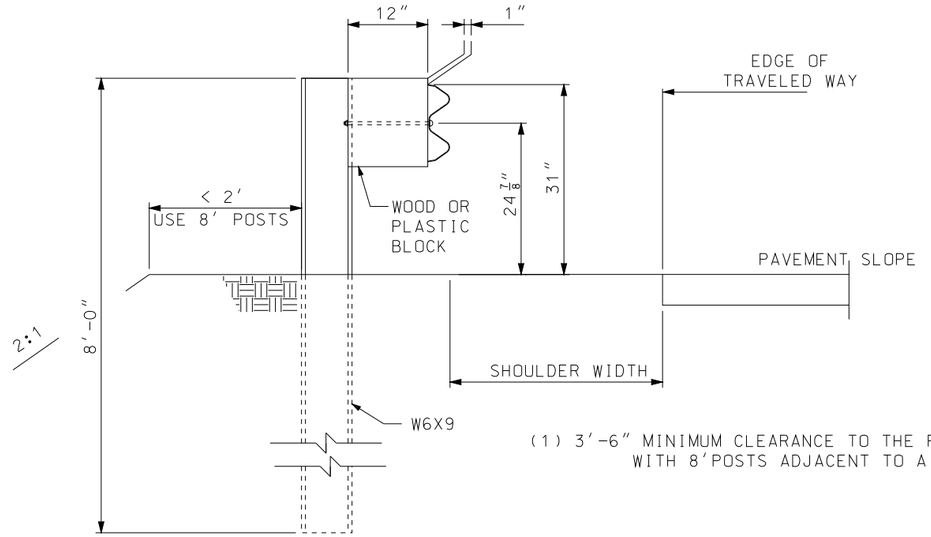
# MGS GUARDRAIL SYSTEM (MGS) SPECIAL INSTALLATIONS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

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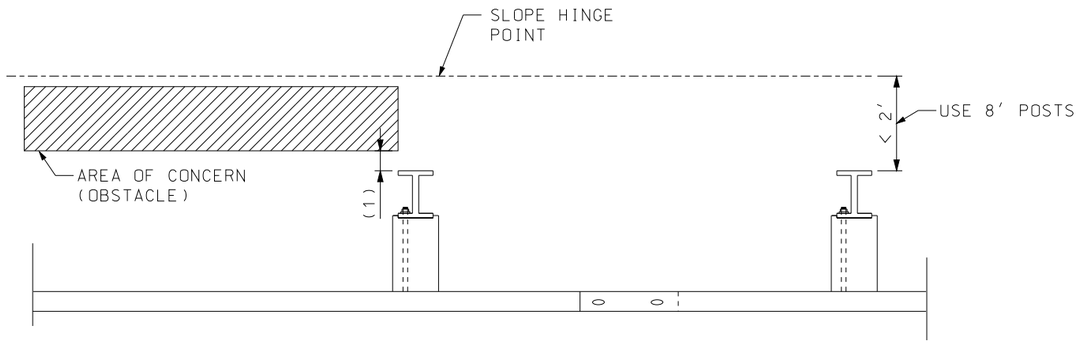
SHEET NO. 5 OF 8

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

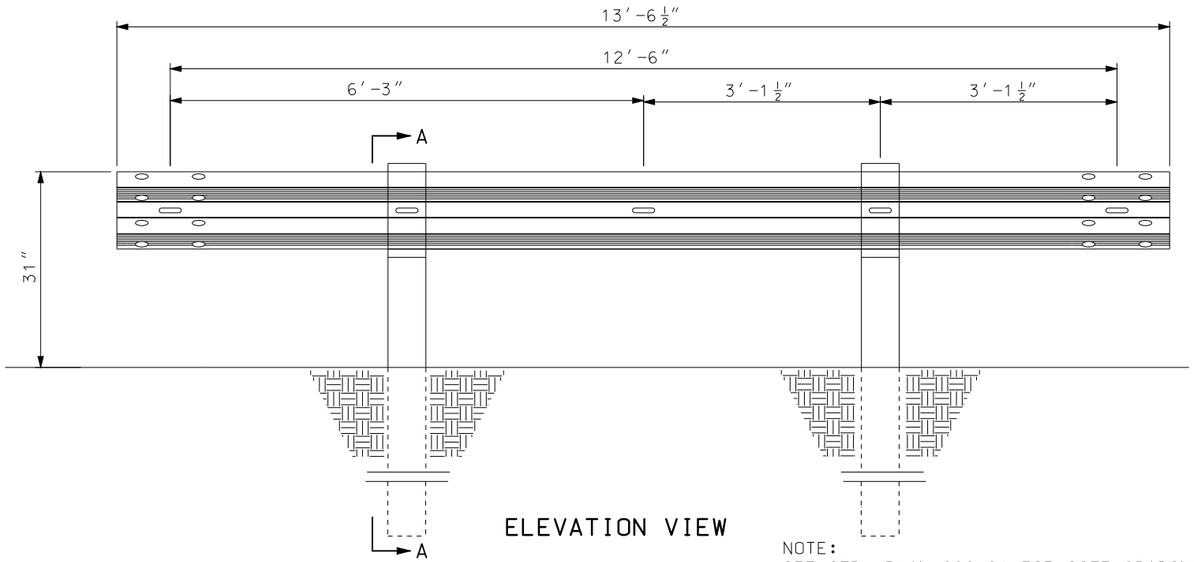



(1) 3′-6″ MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 8′POSTS ADJACENT TO A 2:1 SLOPE.

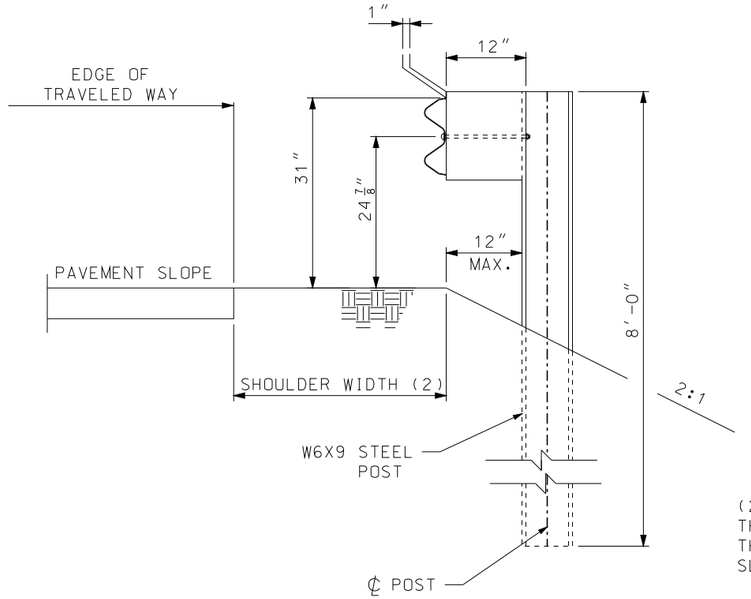
SECTION A–A
8′ STEEL POST




PLAN VIEW




ELEVATION VIEW




(2) WHEN THERE IS NOT SUFFICIENT GRADING BEYOND THE SHOULDER TO PLACE THE GUARDRAIL AND POSTS, THE POSTS MAY BE PLACED A MAXIMUM OF 12″ BEYOND THE SLOPE BREAK POINT OF A 2:1 MAXUMUM SLOPE.

ALTERNATE SECTION A–A
MAXIMUM LATERAL PLACEMENT OF
8′ STEEL POSTS ADJACENT TO
SLOPES

NOTE:
SEE STD. PLAN 606.81 FOR SITE GRADING REQUIREMENTS FOR CRASHWORTHY END TERMINALS.

8 FOOT POSTS SHALL BE USED WHEN LESS THAN 2 FEET OF EMBANKMENT IS PRESENT BEHIND THE GUARDRAIL POSTS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

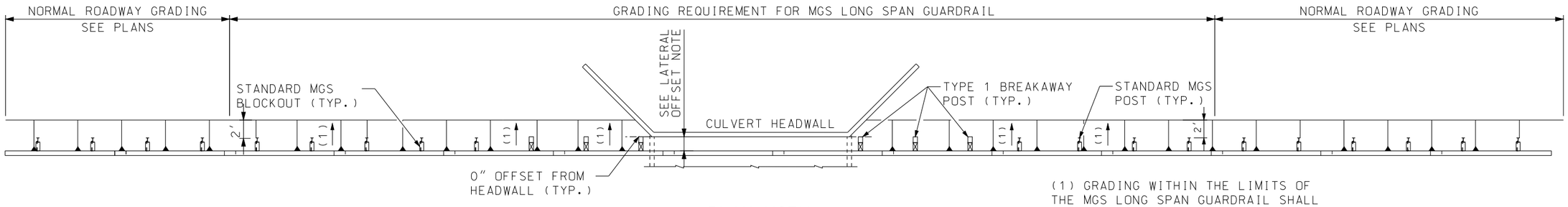
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# MIDWEST GUARDRAIL SYSTEM (MGS) 8 FT. POST

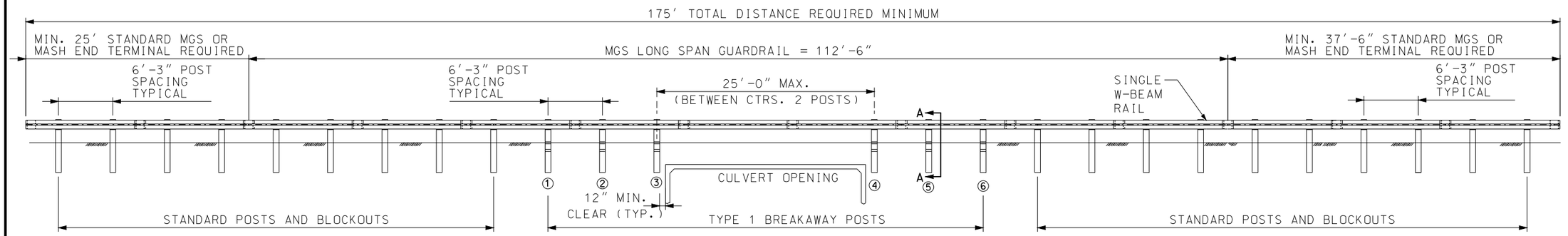
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

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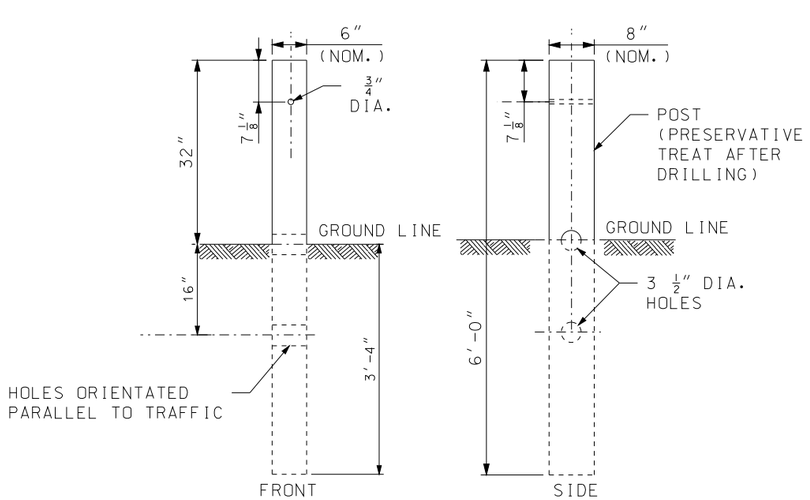



PLAN VIEW

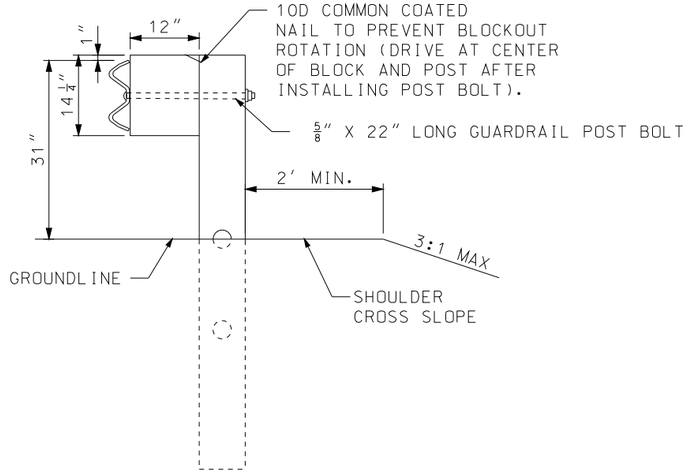
(1) GRADING WITHIN THE LIMITS OF THE MGS LONG SPAN GUARDRAIL SHALL BE THE SAME CROSS SLOPE AS SHOULDER.




ELEVATION VIEW




TYPE 1 BREAKAWAY WOOD POST




SECTION A-A

NOTES:
A MINIMUM LENGTH OF STANDARD MGS GUARDRAIL OR AN END TERMINAL IS REQUIRED BEFORE THE 112'-6" OF MGS LONG SPAN AND AFTER TO MAINTAIN STABILITY IN THE SYSTEM. 8'POSTS MAY BE USED OUTSIDE THE GRADING LIMITS SHOWN.

USE TYPE 1 BREAKAWAY WOOD POST FOR POSTS NO. 1-6. ALL OTHER POSTS SHALL BE W6X8.5 OR W6X9 STEEL POSTS.

WHEN THE HEADWALL IS FLUSH WITH THE GRADE, THE BACK OF THE POST CAN BE ALIGNED WITH THE NEAR SIDE OF THE HEADWALL. BUT IF THE HEADWALL CONTINUES ABOVE GRADE, THE SYSTEM SHOULD BE OFFSET 8' FROM THE FIXED OBJECT.

FOR LOCATIONS WHERE A GUARDRAIL FLARE IS DESIRED, THE SYSTEM SHOULD REMAIN TANGENT FOR 50'-0" BEFORE POST 1 OR AFTER POST 6, AT WHICH POINT THE GUARDRAIL MAY FLARE AT A MAXIMUM TAPER RATE OF 7:1.

ALL POSTS, BLOCK, RAILS, AND HARDWARE SHALL COMPLY WITH SEC 606, MGS GUARDRAIL AND AS DETAILED ON THIS STANDARD.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

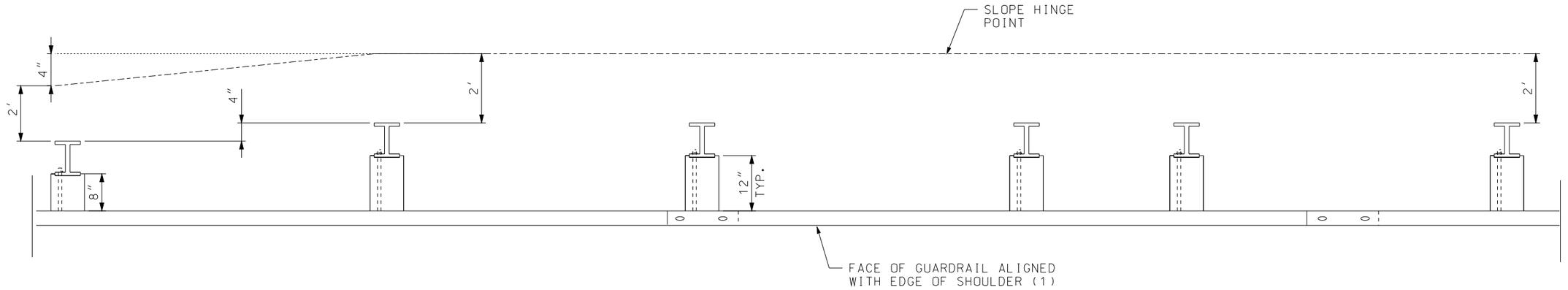
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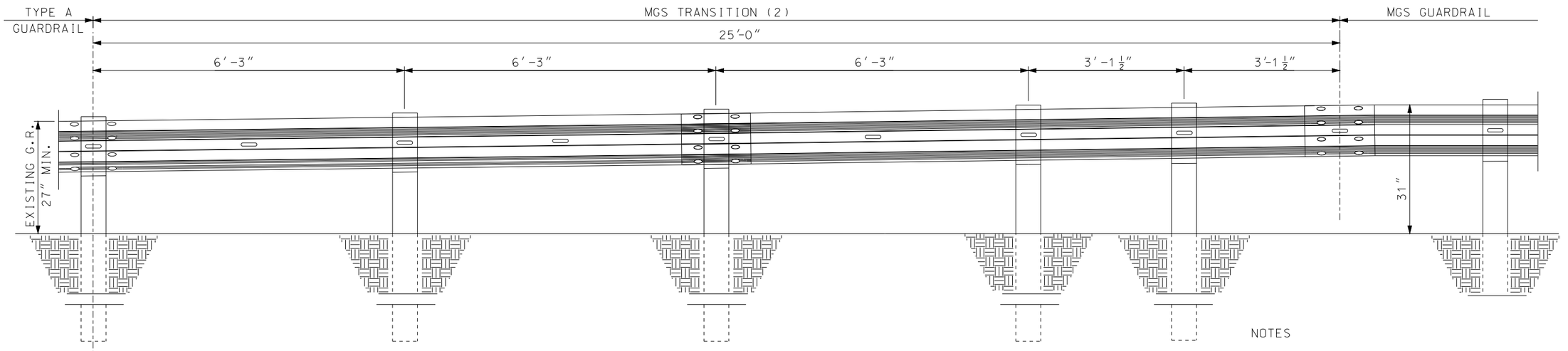
# MIDWEST GUARDRAIL SYSTEM (MGS) LONG SPAN GUARDRAIL

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

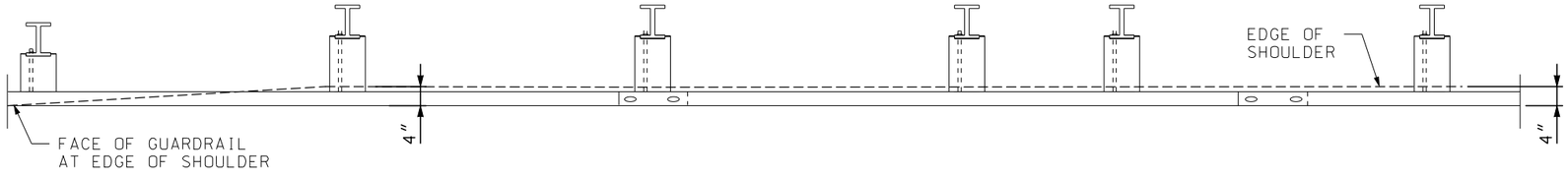
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PLAN VIEW




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




ALTERNATE PLAN VIEW – ALIGNMENT TAPER

SEE NOTE (1)

NOTES

(1) WHERE POST OFFSET IS CONSTRAINED, AND WHEN THE EXISTING SHOULDER IS WIDER THAN 4 FEET, THE EXISTING SHOULDER MAY BE REDUCED UP TO 4 INCHES TO ACCOMMODATE THE 12 INCH BLOCKS OF THE MGS GUARDRAIL OR 9 FOOT POSTS SHALL BE USED. (SEE PLAN VIEW - ALIGNMENT TAPER)

(2) MGS TRANSITION FROM TYPE A GUARDRAIL SHALL BE COMPLETED OUTSIDE THE 50′ MGS END TERMINAL LIMITS.

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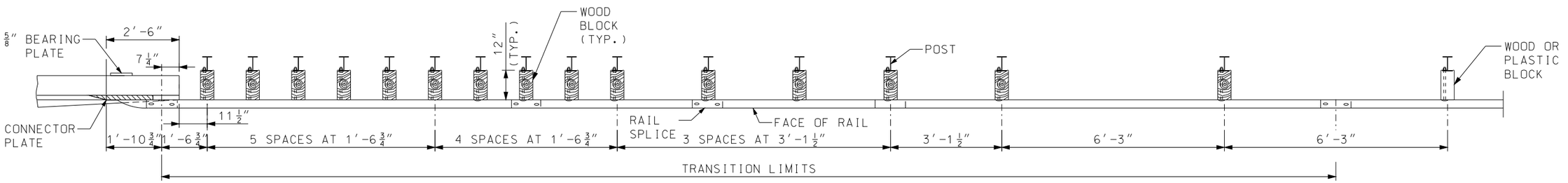
# MIDWEST GUARDRAIL SYSTEM (MGS) BLOCK AND HEIGHT TRANSITION

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

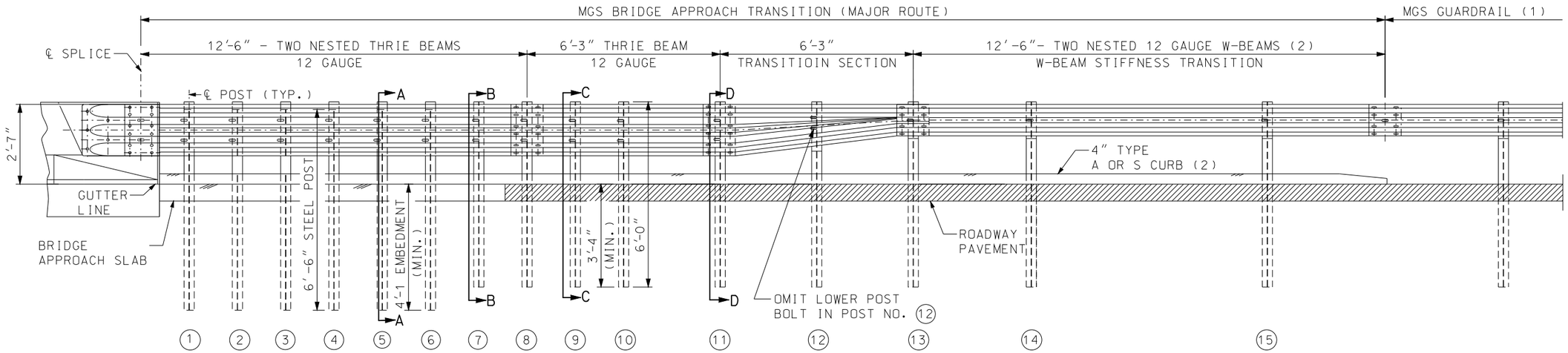
606.50B

SHEET NO. 8 OF 8

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PLAN VIEW




# BRIDGE APPROACH TRANSITION (MAJOR ROUTE)

GENERAL NOTES:
MGS GUARDRAIL SHALL BE TANGENTIAL WITHIN 12'-6" OF THE BRIDGE APPROACH TRANSITION.

AT THE CONTRACTORS OPTION, A SINGLE 18'-9" PIECE OF THRIE BEAM MAY BE SUBSTITUTED FOR ONE OF THE 12'-6" PANELS AND THE 6'-3" SECTION AS SHOWN.

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

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

USE 5/8" BUTTON-HEAD OVAL SHOULDER BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUTS = 3/8" 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.

THE COST OF FURNISHING, FABRICATING AND INSTALLING BRIDGE APPROACH TRANSITION (MAJOR ROUTE), COMPLETE IN PLACE, WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EACH.

THE CONTRACTOR MAY, AT THEIR OPTION, FURNISH EQUIVALENT SECTIONS FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A769 GRADE 36 OR 40. THE SECTIONS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH REQUIREMENTS OF AASHTO M 111.

(1) PLACE THE FIRST POST OF THE MGS 6'-3" PAST THE LAST POST OF THE BRIDGE APPROACH TRANSITION TO KEEP POSTS OFFSET FROM THE RAIL SPLICES.

(2) WHERE CURB EXTENDS UPSTREAM OF POST NO. (11) FOR DRAINAGE PURPOSES, A STIFFNESS TRANSITION CONSISTING OF AN EXTRA 12'-6" BEAM OF 12 GAUGE W-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" 12 GAUGE W-BEAM STIFFNESS TRANSITION SEE STD. PLAN 609.40 FOR DETAILS. WHEN CURBS DO NOT EXTEND UPSTREAM OF POST NO. (11), PAY FOR A BRIDGE APPROACH TRANSITION (MINOR ROUTE).

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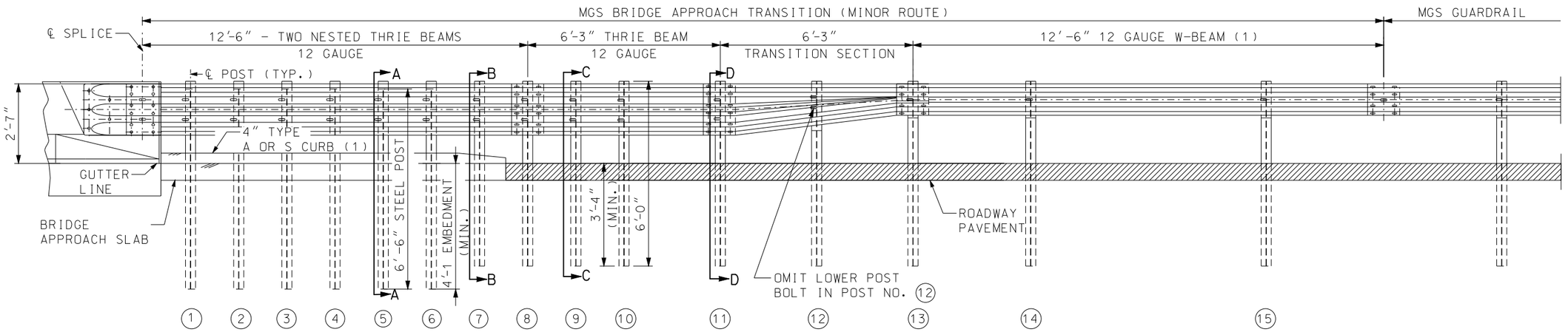
# MIDWEST GUARDRAIL SYSTEM (MGS) VERTICAL BARRIER TRANSITIONS

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

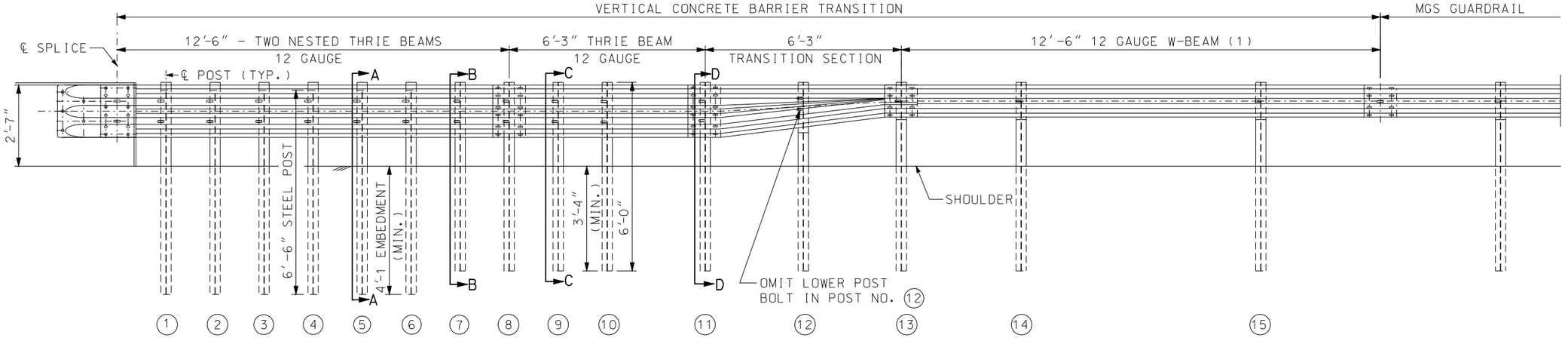
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SHEET NO. 1 OF 5

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## BRIDGE APPROACH TRANSITION (MINOR ROUTE)




## VERTICAL CONCRETE BARRIER TRANSITION

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

(1) WHERE CURB EXTENDS UPSTREAM OF POST NO. (11) FOR DRAINAGE PURPOSES, A STIFFNESS TRANSITION CONSISTING OF AN EXTRA 12'-6" BEAM OF 12 GAUGE W-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" 12 GAUGE W-BEAM STIFFNESS TRANSITION SEE STD. PLAN 609.40 FOR DETAILS. IF CURB EXTENDS BEYOND POST NO. (11), PAY FOR A BRIDGE APPROACH TRANSITION (MAJOR ROAD).


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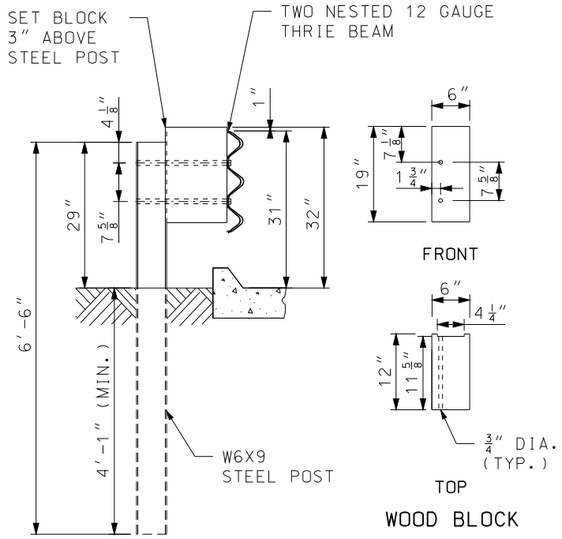
# MIDWEST GUARDRAIL SYSTEM (MGS) VERTICAL BARRIER TRANSITIONS

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 8/11/2016

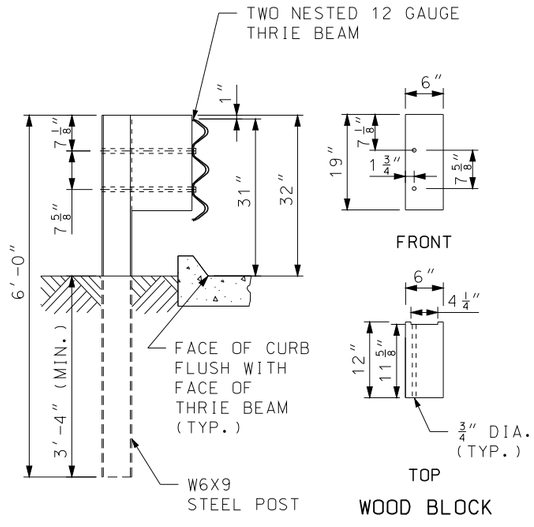
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SHEET NO. 2 OF 5

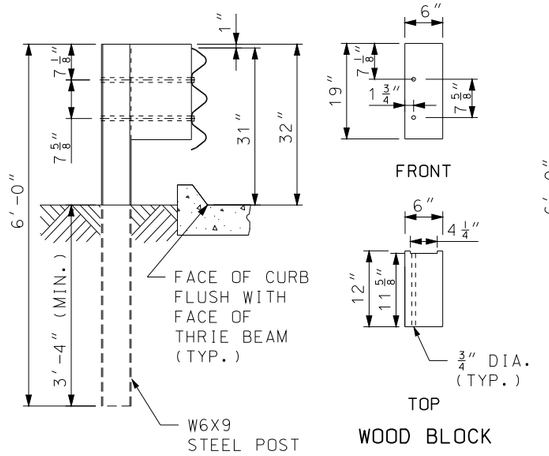

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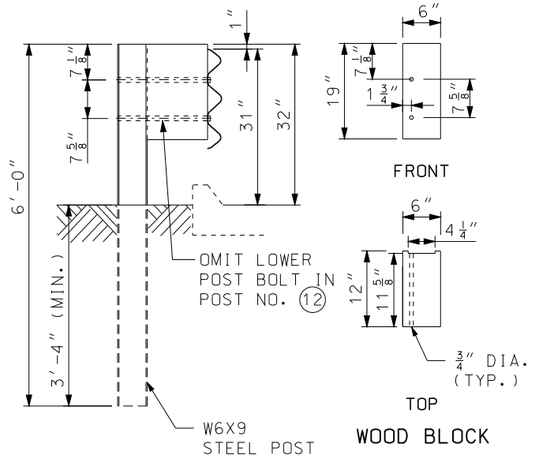

SECTION A-A



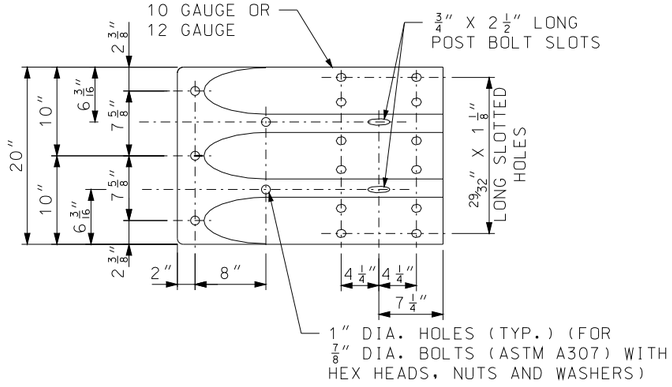

SECTION B-B



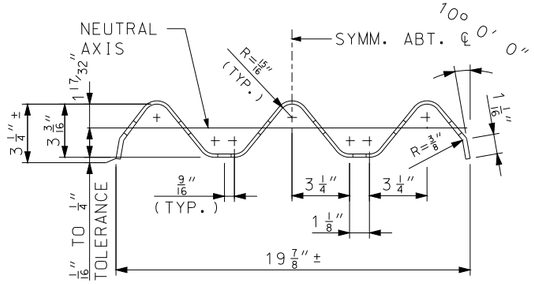

SECTION C-C



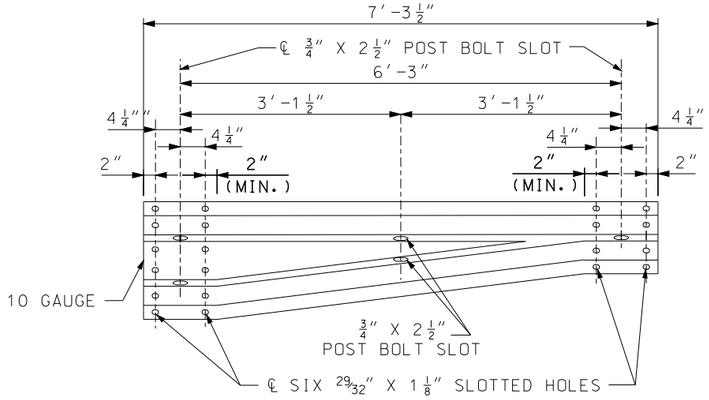

SECTION D-D



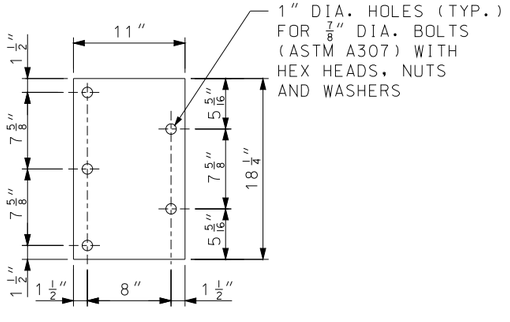

TERMINAL CONNECTOR



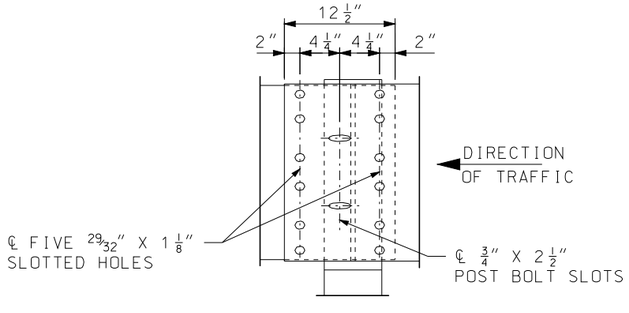

SECTION THROUGH THRIE BEAM RAIL




TRANSITION SECTION




⅝" BEARING PLATE




THRIE BEAM RAIL SPLICE AT POST

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

STATE OF MISSOURI — ERIC E. SCHROETER — NUMBER PE-28411 — PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

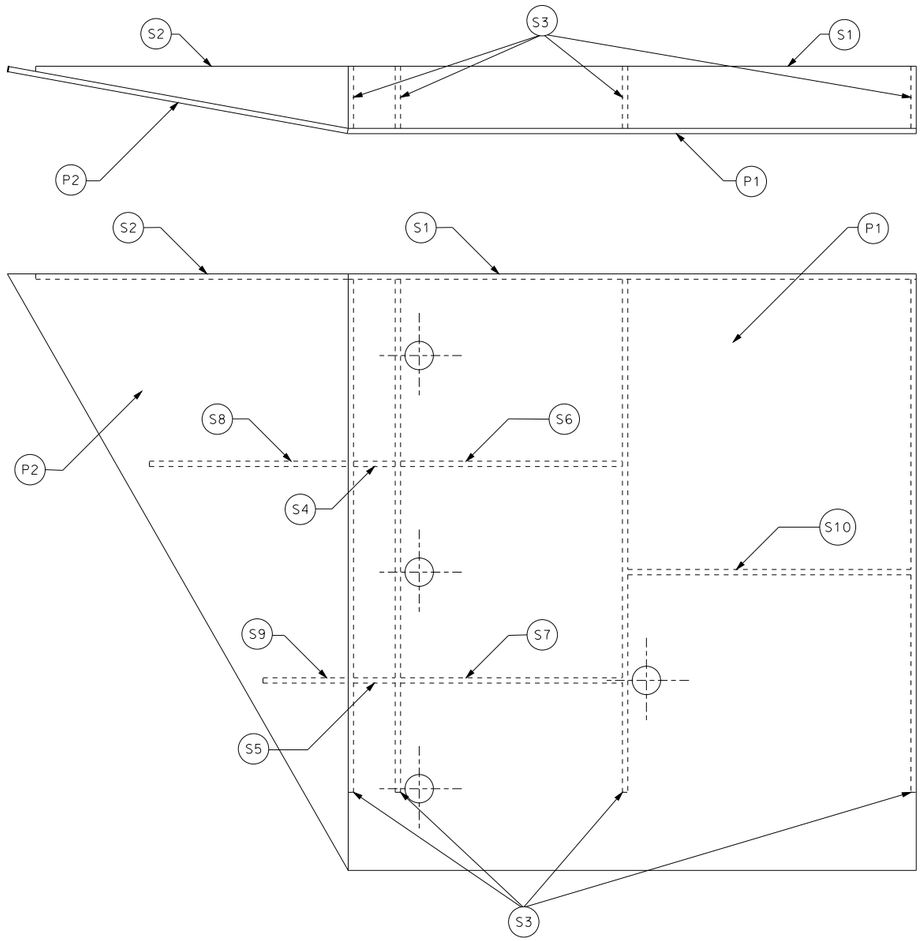
# MIDWEST GUARDRAIL SYSTEM (MGS)

## VERTICAL BARRIER TRANSITIONS

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

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SHEET NO. 3 OF 5



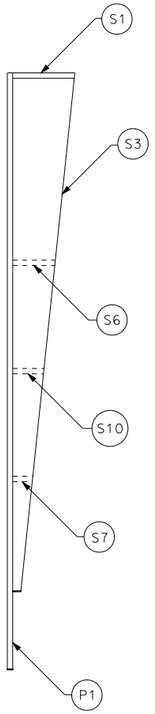
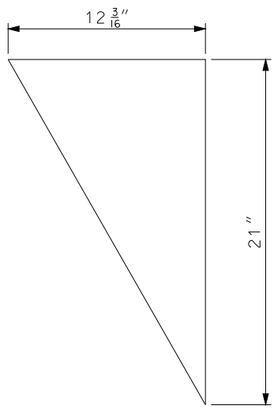
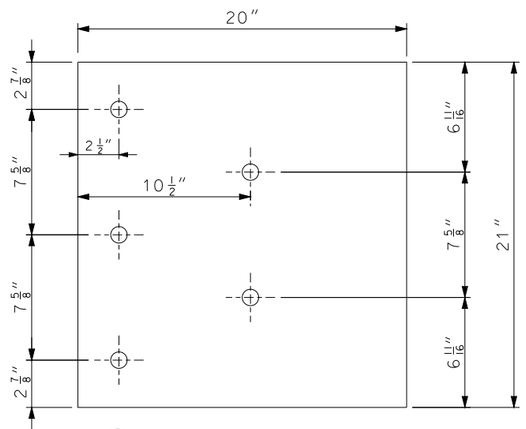



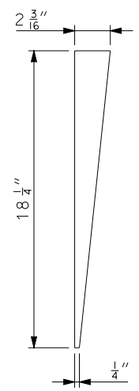

PLATE AND STIFFENER IDENTIFICATION



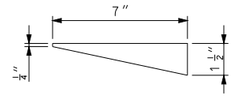

(P2) COVER PLATE #2



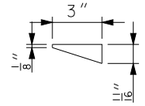

(P1) COVER PLATE #1



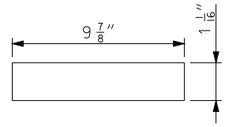

(S3) STIFFENER #3: 4 EACH



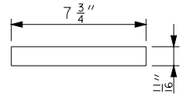

(S8) STIFFENER #8: 1 EACH



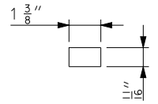

(S9) STIFFENER #9: 1 EACH



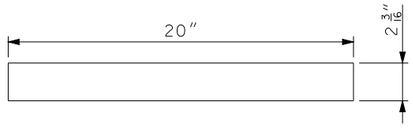

(S10) STIFFENER #10: 1 EACH



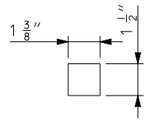

(S7) STIFFENER #7: 1 EACH



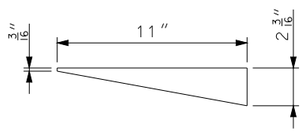

(S5) STIFFENER #5: 1 EACH



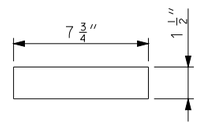

(S1) STIFFENER #1: 1 EACH




(S4) STIFFENER #4: 1 EACH




(S2) STIFFENER #2: 1 EACH




(S6) STIFFENER #6: 1 EACH

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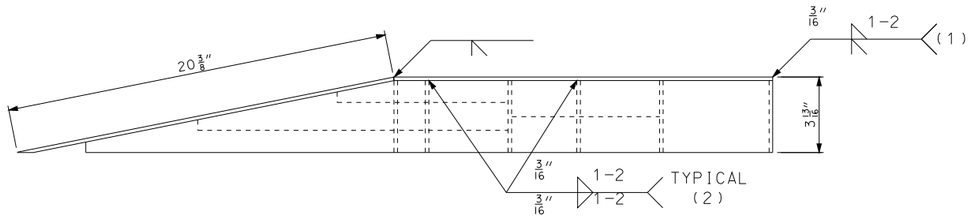
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

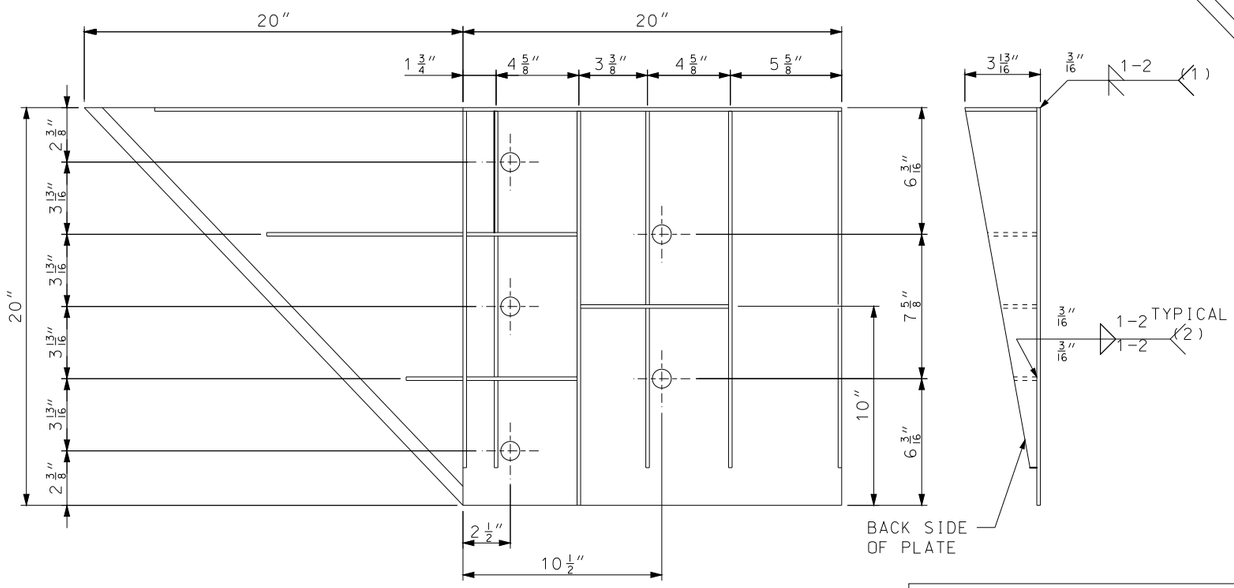
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# MIDWEST GUARDRAIL SYSTEM (MGS) VERTICAL BARRIER TRANSITIONS (CONNECTOR PLATE DETAIL)

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/18/2016

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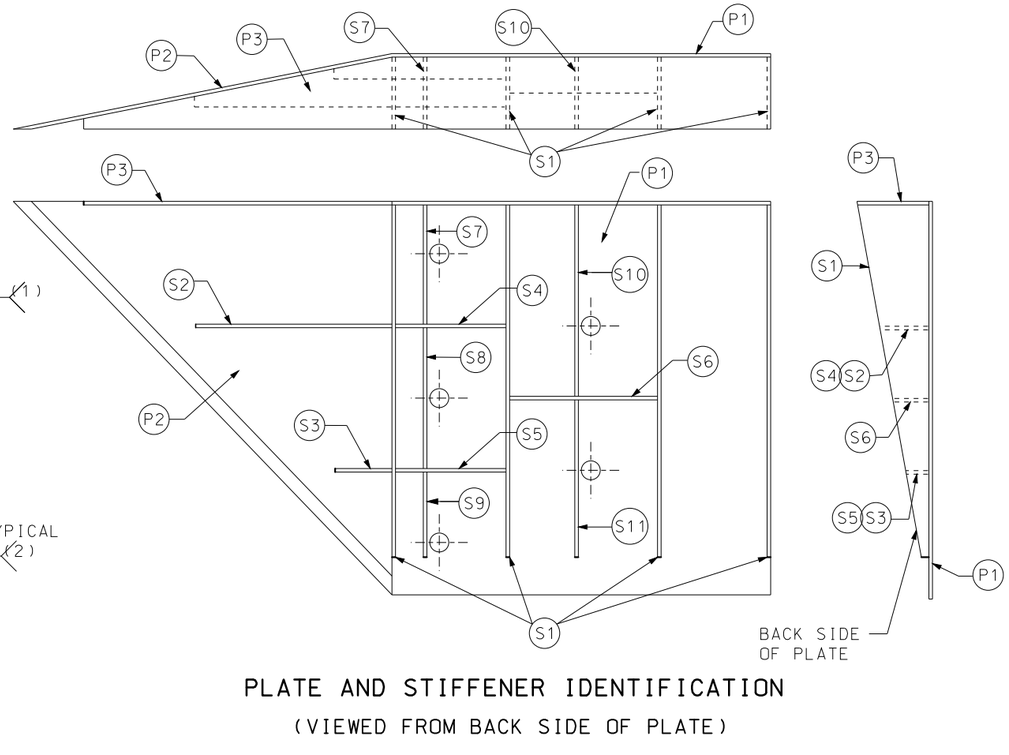


## WELDING INSTRUCTION

(VIEWED FROM BACK SIDE OF PLATE)

(1) STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATES SHALL BE WELDED AS FOLLOWS:
SINGLE BEVEL GROOVE WELD ON EXTERNAL SIDES AND $\frac{3}{16}$" FILLET WELD BY 1" LONG SPACED AT 2" ON INTERNAL SIDES.

(2) STEFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
$\frac{3}{16}$" FILLET WELD BY 1" LONG SPACED AT 2".




## PLATE AND STIFFENER IDENTIFICATION

(VIEWED FROM BACK SIDE OF PLATE)

| CONNECTOR PLATE DIMENSION (PER ASSEMBLY) | | | | |
|---|---|---|---|---|
| PLATE | QUANTITY | SHAPE | SIZE (A x B x C x D) | THICKNESS |
| P1 | 1 | A, B | 20" x 20" | $\frac{3}{16}$" |
| P2 | 1 | A, B, C | 20" x 20" x 28 9/16" | $\frac{3}{16}$" |
| P3 | 1 | A, B, C, D | 39" x 3 5/8" x 20" x 19 5/16" | $\frac{3}{16}$" |
| S1 | 4 | A, B, C, D | 18 7/16" x 3 5/8" x 18 3/4" | $\frac{1}{4}$" |
| S2 | 1 | A, B, C, D | 10 1/4" x 2 7/16" x 10 3/8" x 1/2" | $\frac{1}{4}$" |
| S3 | 1 | A, B, C, D | 3" x 1 1/16" x 3 1/8" x 1/2" | $\frac{1}{4}$" |
| S4 | 1 | A, B | 6 1/8" x 2 7/16" | $\frac{1}{4}$" |
| S5 | 1 | A, B | 6 1/8" x 1 1/16" | $\frac{1}{4}$" |
| S6 | 1 | A, B | 7 3/4" x 1 3/4" | $\frac{1}{4}$" |
| S7 | 1 | A, B, C, D | 2 9/16" x 6" x 3 5/8" x 5 7/8" | $\frac{1}{4}$" |
| S8 | 1 | A, B, C, D | 1 5/32" x 7 1/2" x 2 1/2" x 7 3/8" | $\frac{1}{4}$" |
| S9 | 1 | A, B, C | 6 1/16" x 6 3/16" x 1 3/32" | $\frac{1}{4}$" |
| S10 | 1 | A, B, C, D | 1 7/8" x 9 7/8" x 3 5/8" x 9 11/16" | $\frac{1}{4}$" |
| S11 | 1 | A, B, C, D | 8 1/2" x 8 3/4" x 1 13/16" | $\frac{1}{4}$" |

GENERAL NOTES:

COVER PLATE PANELS ARE $\frac{3}{16}$" THICK.

ALL STIFFENERS ARE $\frac{1}{4}$" THICK.

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

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

ALL HOLE DIAMETERS SHALL BE 1".

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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NUMBER PE-28411
PROFESSIONAL ENGINEER
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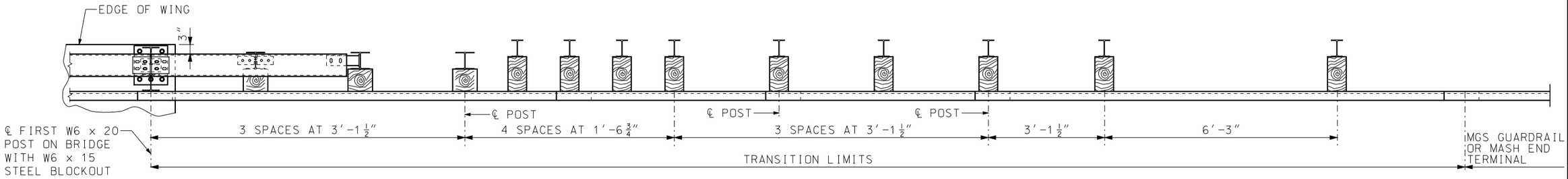
# MIDWEST GUARDRAIL SYSTEM (MGS)

## VERTICAL BARRIER TRANSITIONS (CONNECTOR PLATE DETAIL) SINGLE SLOPE BARRIERS

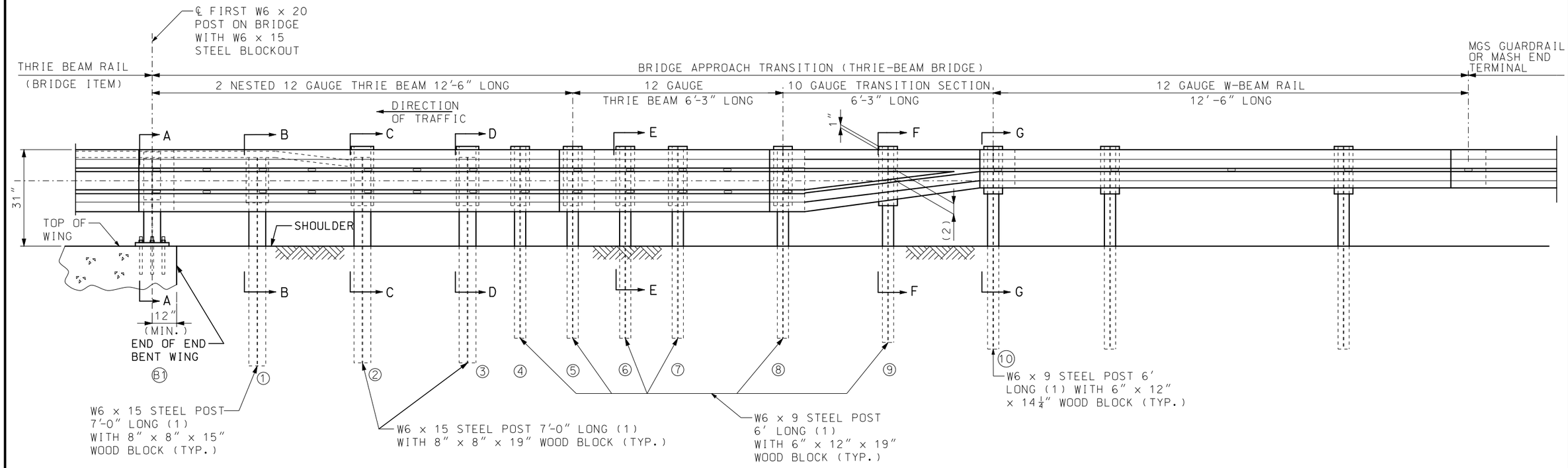
DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

606.60

SHEET NO. 5 OF 5




PLAN




PART SECTION THROUGH SLAB AT END OF WING

NOTES:

FOR GENERAL NOTES, SEE SHEET 2 OF 5.

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

(1) AT CONTRACTOR'S OPTION, EQUIVALENT SECTIONS MAY BE FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A769 GRADE 36 OR 40. THE SECTIONS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE REQUIREMENTS OF AASHTO 111.

(2) VERIFY BY RAIL TRANSITION PRODUCER.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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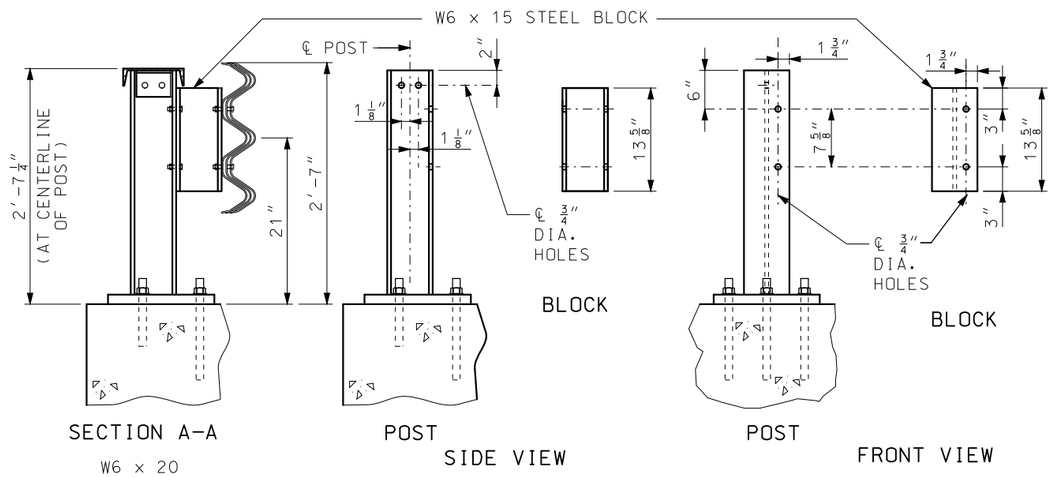
STATE OF MISSOURI
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# MIDWEST GUARDRAIL SYSTEM (MGS) BRIDGE APPROACH TRANSITION (THRIE BEAM ON BRIDGE)

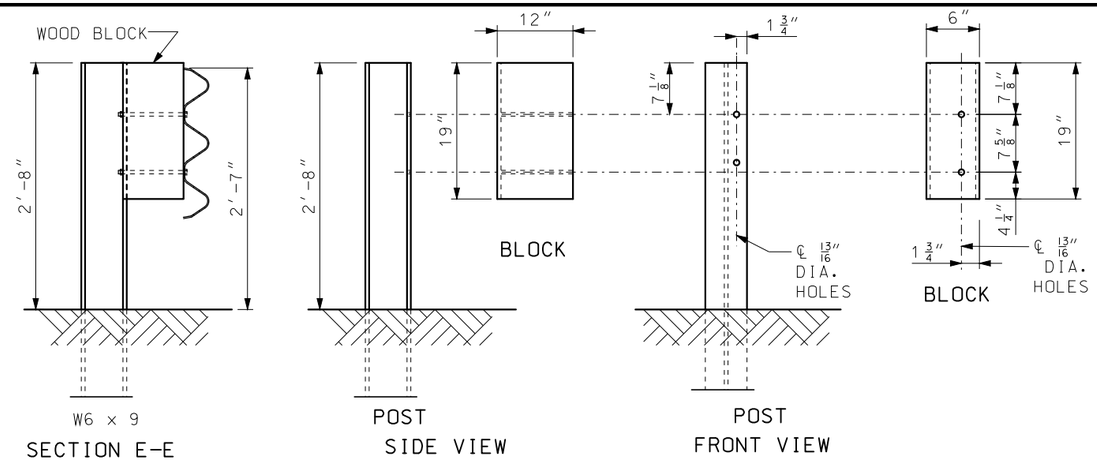
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

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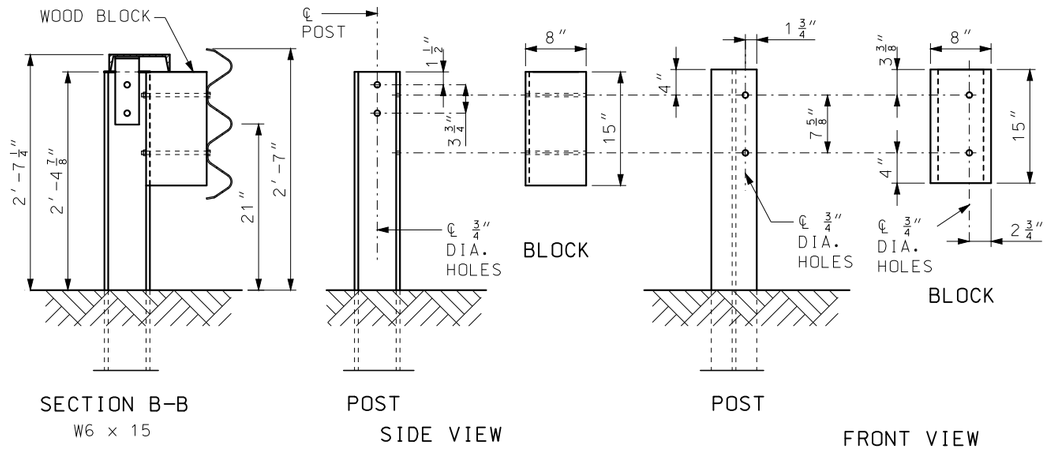
SHEET NO. 1 OF 5



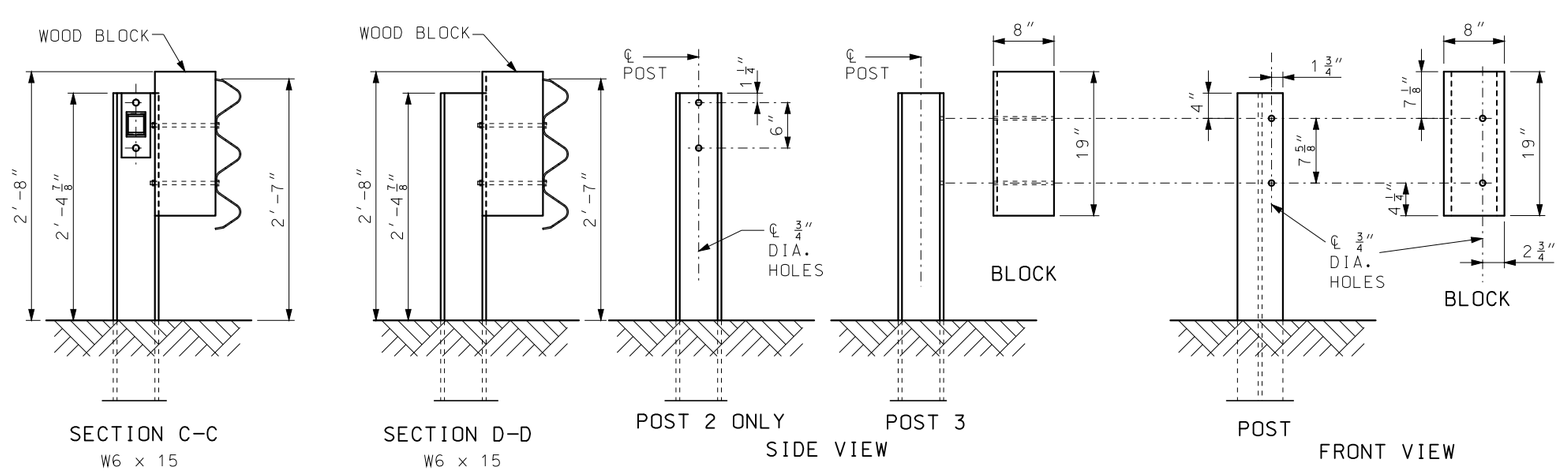

## STEEL POST AND STEEL BLOCK (B1)




## STEEL POST AND WOOD BLOCK (4) THROUGH (8)




## STEEL POST AND WOOD BLOCK (1)




## STEEL POST AND WOOD BLOCK (2) and (3)

GENERAL NOTES:

DESIGN BASED UPON MASH TEST LEVEL 3 (TL-3).

FABRICATED STRUCTURAL STEEL SHALL BE ASTM A709 GRADE 36.

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

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

USE 5/8″ BUTTON-HEAD, OVAL SHOULDER BOLTS WITH HEX NUTS (THICKNESS OF HEX NUTS = 3/8″ MIN.) AT ALL SLOTS.

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

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

THE COST OF FURNISHING, FABRICATING AND INSTALLING BRIDGE ANCHOR SECTION (THRIE BEAM), COMPLETE-IN-PLACE, SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EACH.

FOR DETAILS NOT SHOWN, SEE BRIDGE THRIE BEAM RAIL SHEET.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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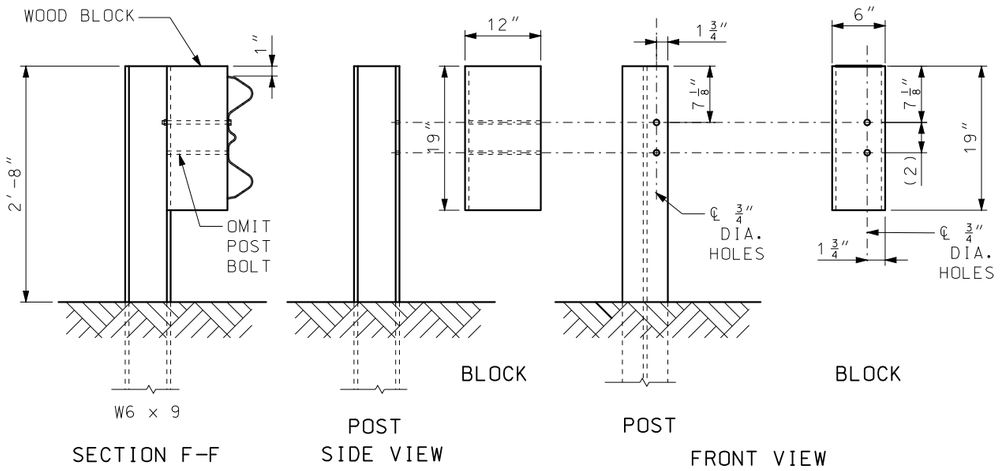

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# MIDWEST GUARDRAIL SYSTEM (MGS) BRIDGE APPROACH TRANSITION (THRIE BEAM ON BRIDGE)

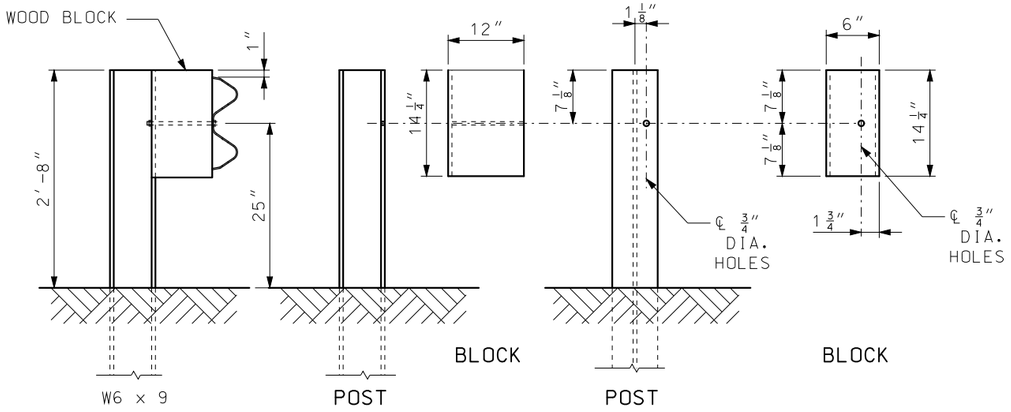
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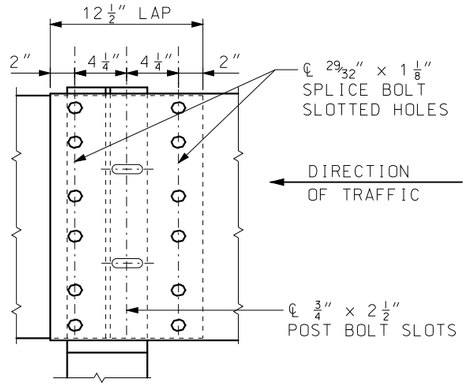
SHEET NO. 2 OF 5




## STEEL POST AND WOOD BLOCK (9)

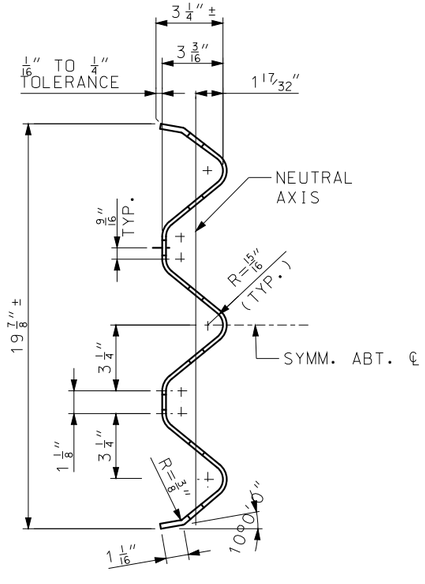



## STEEL POST AND WOOD BLOCK (10)



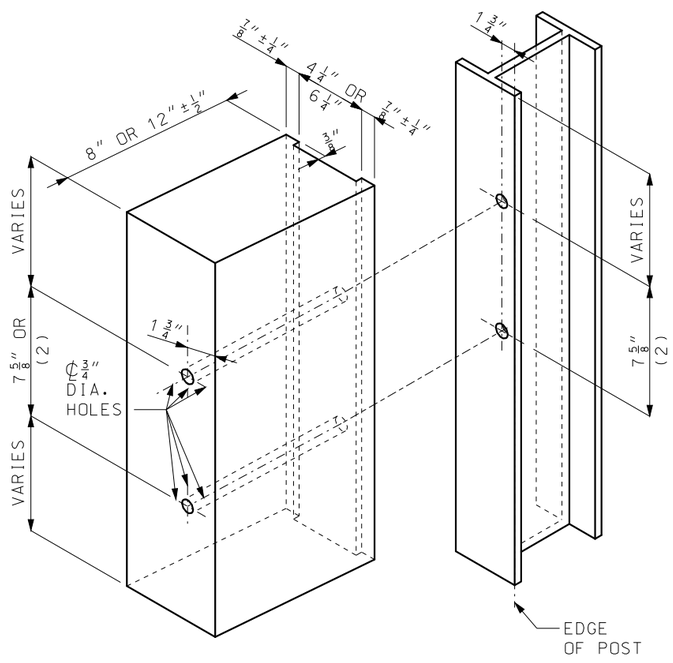

THRIE BEAM RAIL SPLICE AT POST

(2) VERIFY BY RAIL TRANSITION PRODUCER.




SECTION H-H

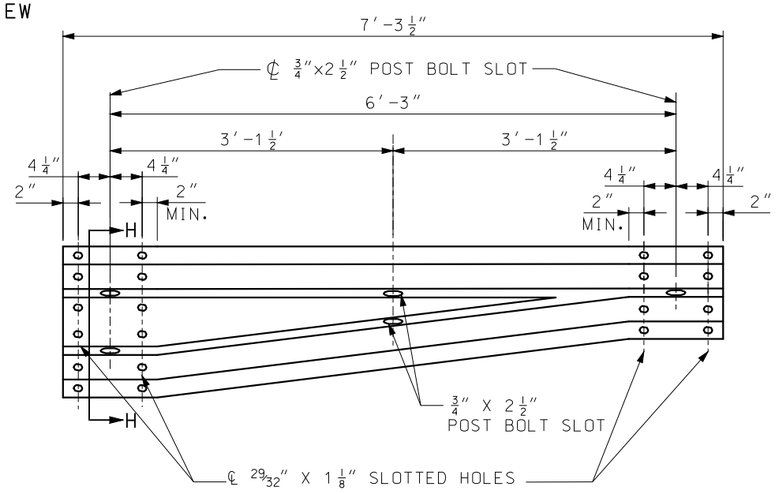
THROUGH THRIE BEAM RAIL




POST (9) - (2) VERIFY BY RAIL TRANSITION PRODUCER (SEE FRONT SHEET)
POST (10) - ONLY 1 HOLE REQUIRED
ALL HOLES 3/4" DIAMETER EXCEPT AS NOTED

## HOLE PUNCHING DETAIL

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




ASYMMETRICAL TRANSITION SECTION

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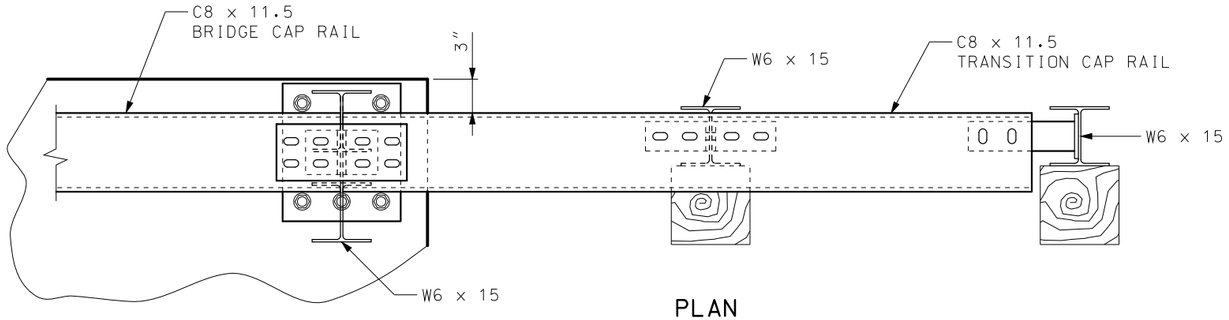
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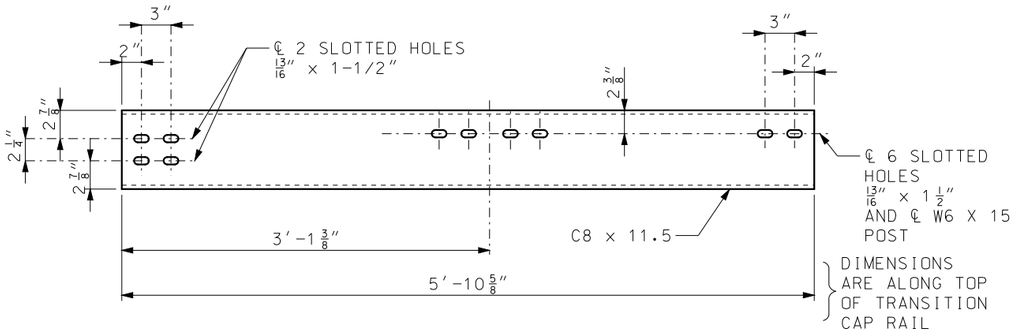
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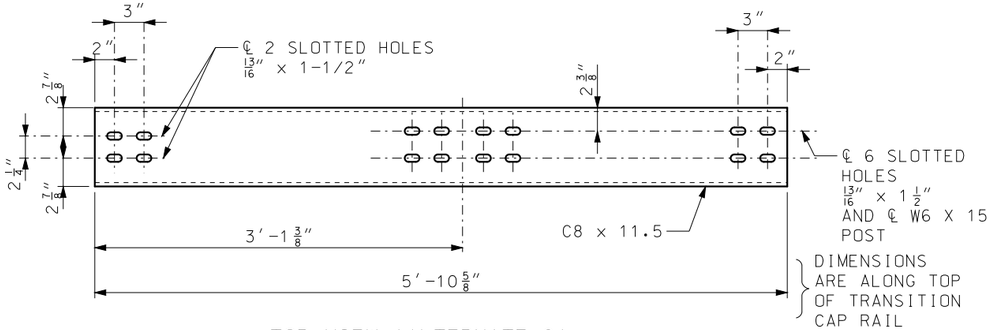
SHEET NO. 3 OF 5



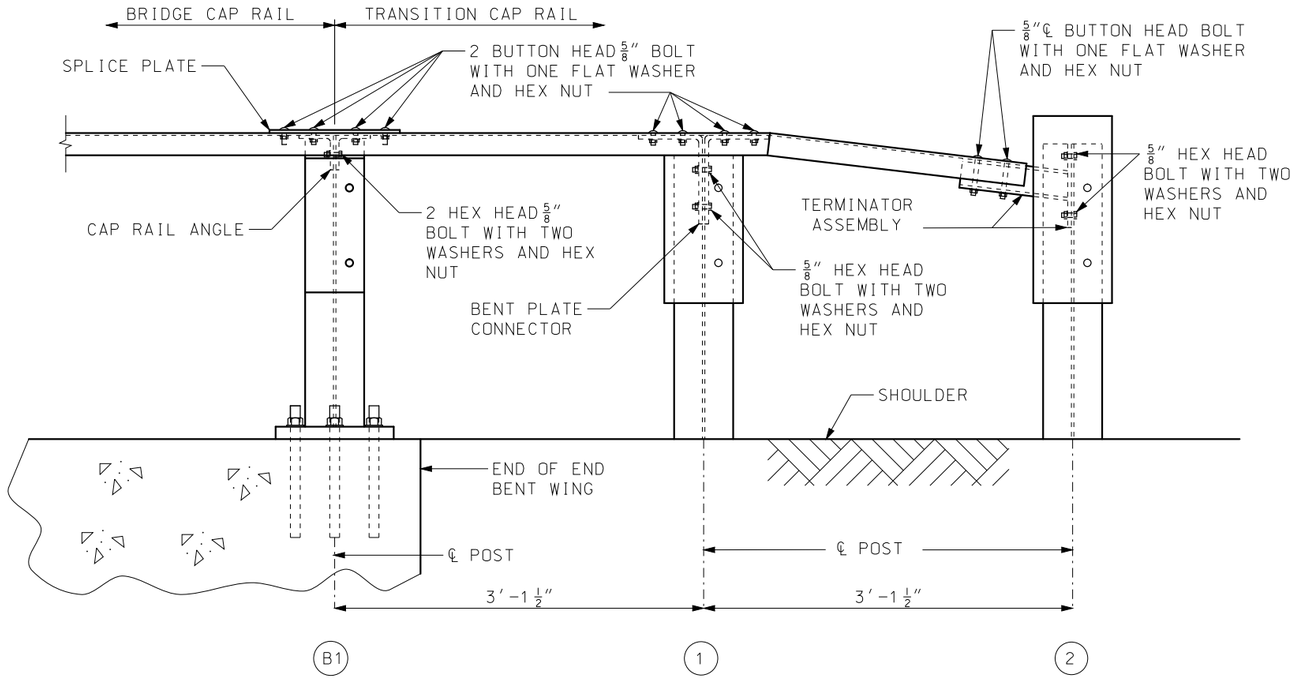

PLAN



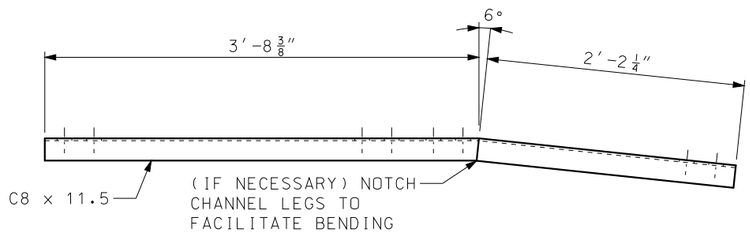

TOP VIEW (ALTERNATE 1)




TOP VIEW (ALTERNATE 2)




ELEVATION
(THRIE BEAM RAIL NOT SHOWN)




ELEVATION
TRANSITION CAP RAIL

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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JEFFERSON CITY, MO 65102
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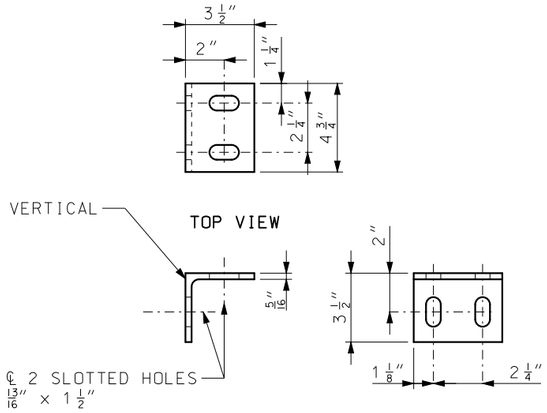
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# MIDWEST GUARDRAIL SYSTEM (MGS) BRIDGE APPROACH TRANSITION (THRIE BEAM ON BRIDGE)

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

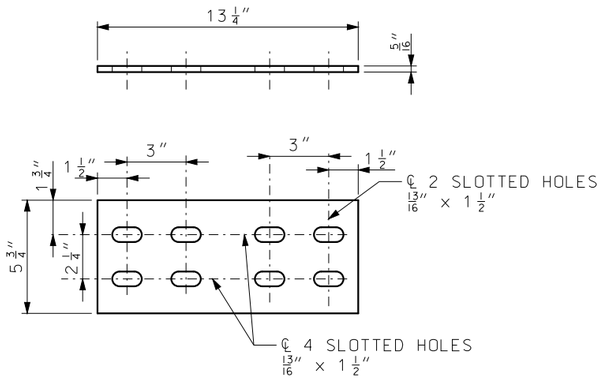
606.70A

SHEET NO. 4 OF 5

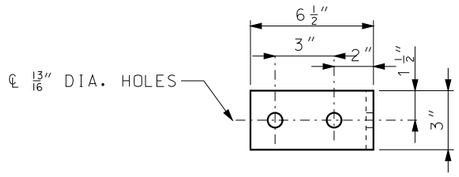


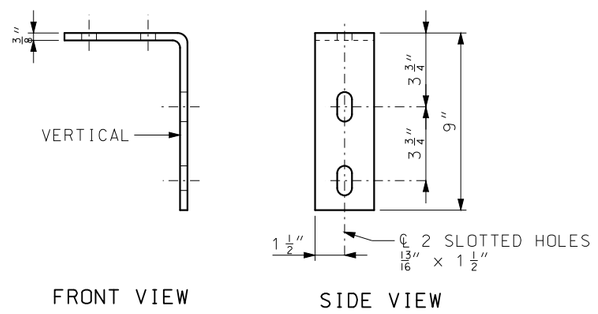

## CAP RAIL ANGLE

∠ 3 1/2" × 3 1/2" × 5/16"

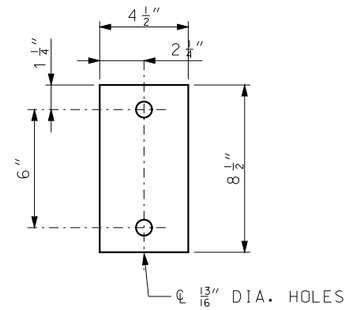



## SPLICE PLATE

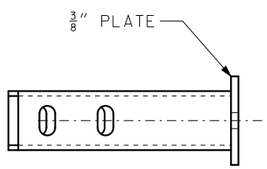


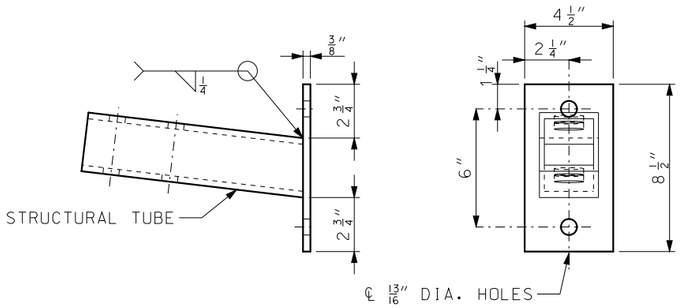



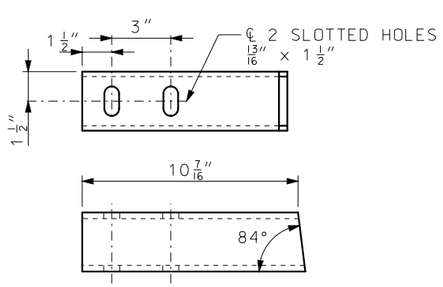

## BENT PLATE CONNECTOR




## 3/8" PLATE




## TERMINATOR ASSEMBLY

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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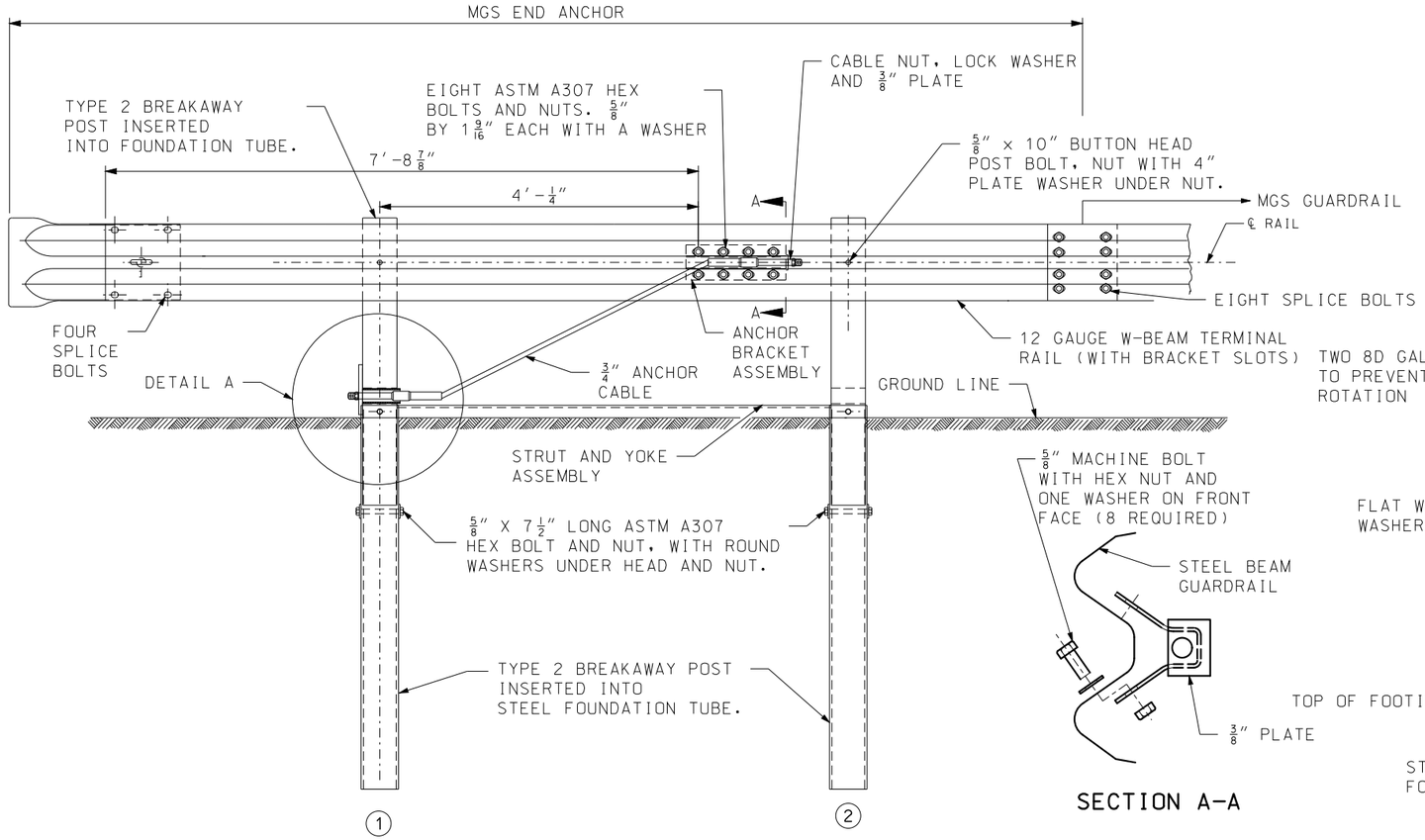
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# MIDWEST GUARDRAIL SYSTEM (MGS)
# BRIDGE APPROACH TRANSITION (THRIE BEAM ON BRIDGE)

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

606.70A

SHEET NO.
5 OF 5







SECTION A-A

GENERAL NOTES:

END ANCHOR DETAILS SHOWN SHALL BE USED ONLY ON DOWNSTREAM ENDS OF GUARDRAIL WHEN AN END ANCHOR IS REQUIRED.

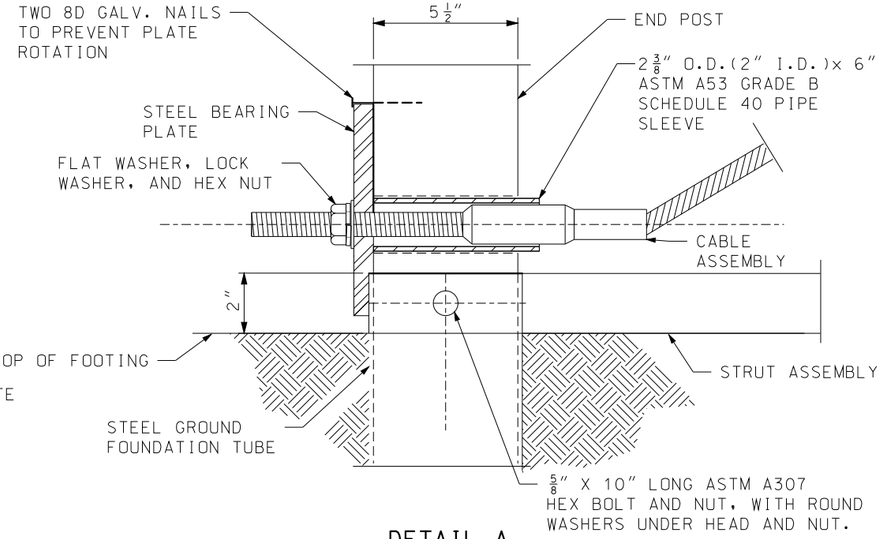
THE DETAILS SHOWN ARE FOR AN END ANCHORAGE SYSTEM FOR GUARDRAIL.

CABLE ASSEMBLY AND ANCHOR PLATE SHALL HAVE A MINIMUM BREAKING STRENGTH OF 20 TONS.

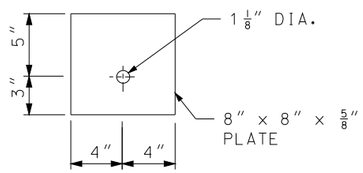
ALL FITTINGS AND HARDWARE REQUIRED SHALL BE GALVANIZED IN ACCORDANCE WITH SECTION 1040.

WOOD POSTS 1 AND 2 SHALL BE 5 1/2" X 7 1/2".

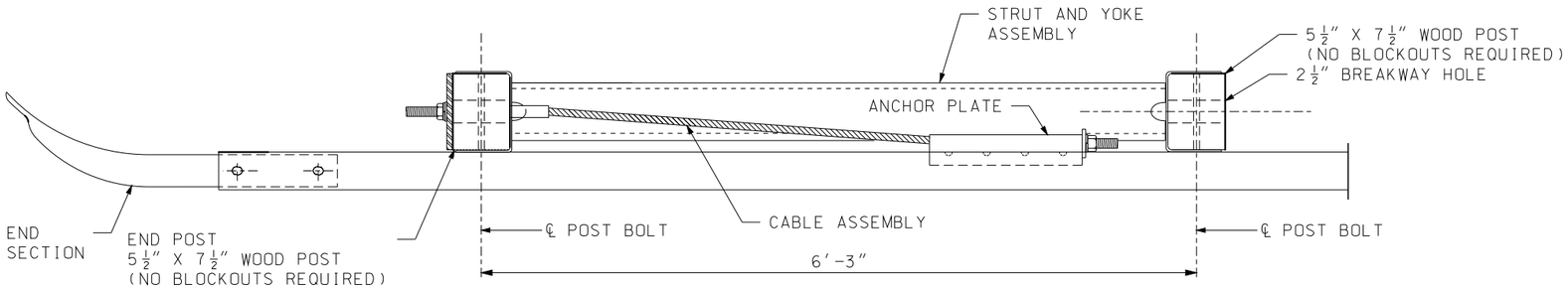
SEE SHEET NO. 9 OF 11 FOR WOOD POST DETAILS.



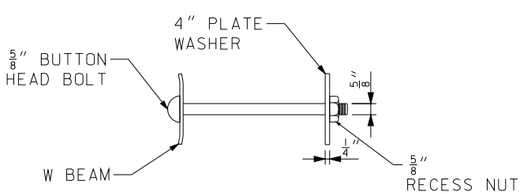

DETAIL A
(END POST DETAIL)



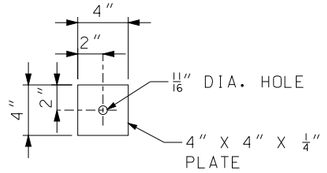

STEEL BEARING PLATE



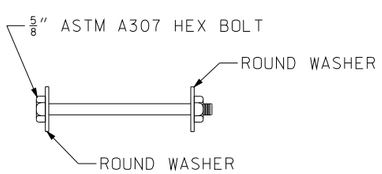

PLAN VIEW




POST BOLT AT W-BEAM




4" PLATE WASHER




POST BOLT AT YOKE

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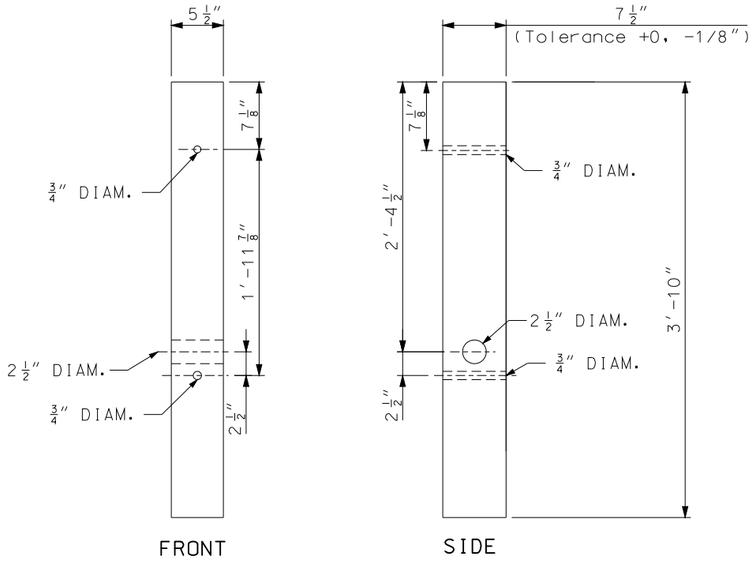
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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
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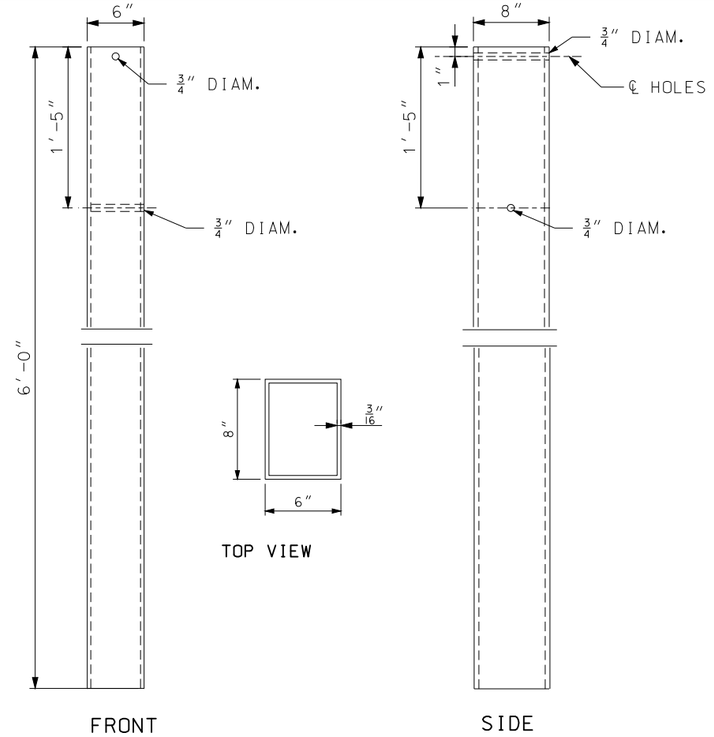
# MIDWEST GUARDRAIL SYSTEM (MGS) TERMINAL ANCHOR END

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

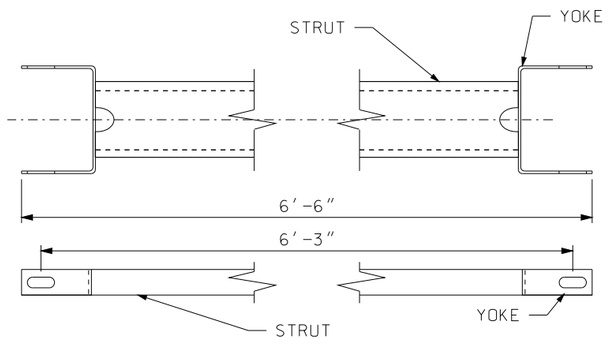
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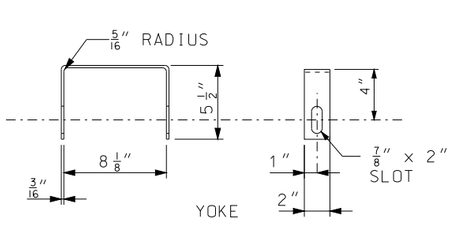



TYPE 2 BREAKAWAY
WOOD POST

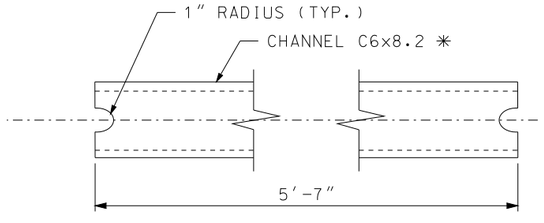



STEEL GROUND
FOUNDATION TUBE

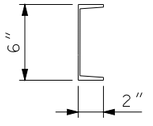



TWO REQUIRED IN ASSEMBLY




STRUT




✳ A 6"X3" 10 GAUGE BENT PLATE STRUT
MAY BE SUBSTITUTED FOR THE C-CHANNEL

STRUT AND YOKE ASSEMBLY

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

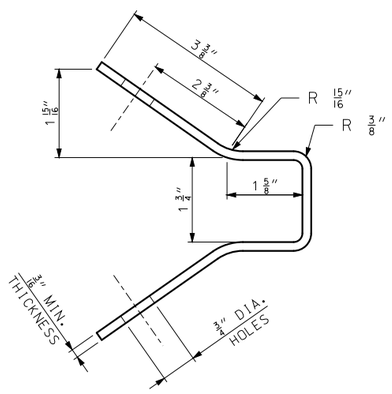
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
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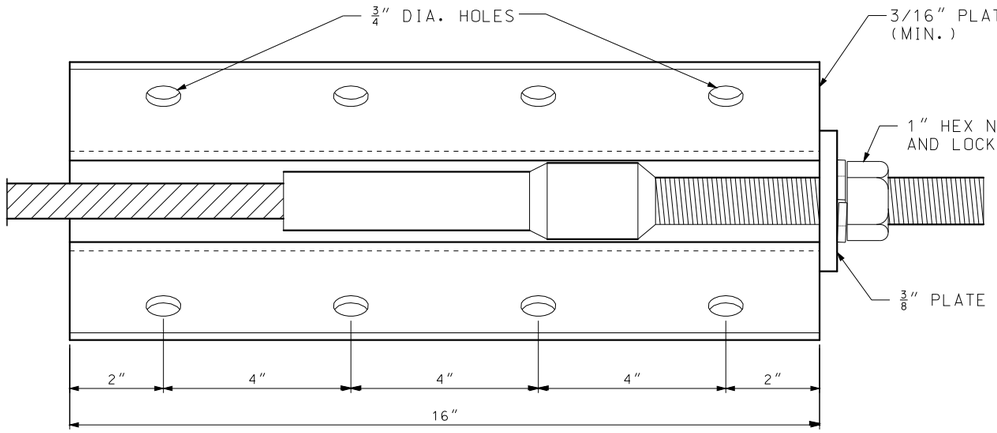
# MIDWEST GUARDRAIL SYSTEM (MGS) TERMINAL ANCHOR END

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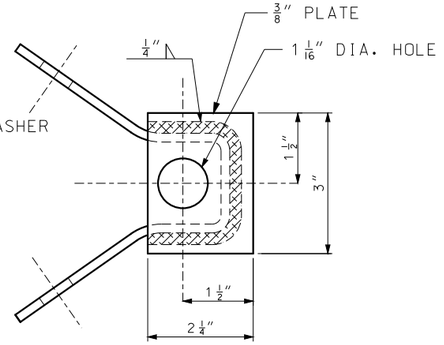
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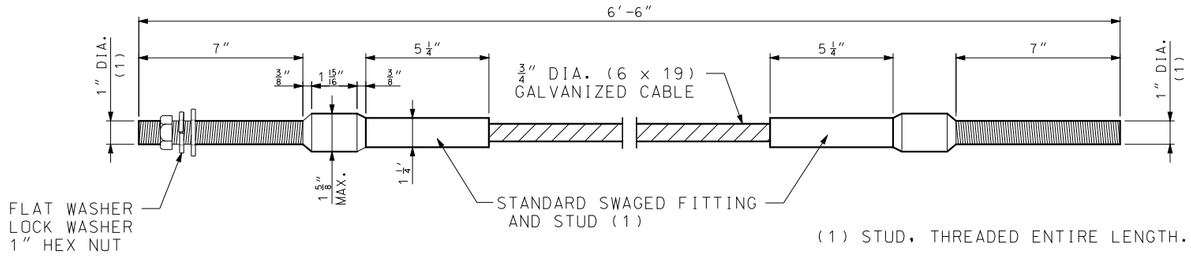

FABRICATION DETAIL




ASSEMBLED VIEW
ANCHOR BRACKET




END VIEW




CABLE ASSEMBLY

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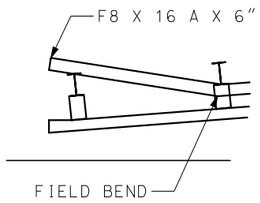
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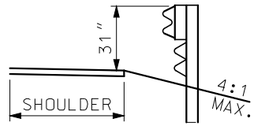
# MIDWEST GUARDRAIL SYSTEM (MGS) TERMINAL ANCHOR END

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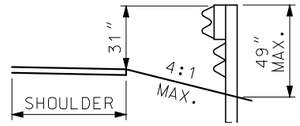
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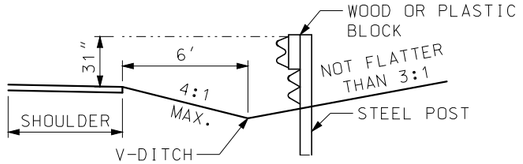

DETAIL A



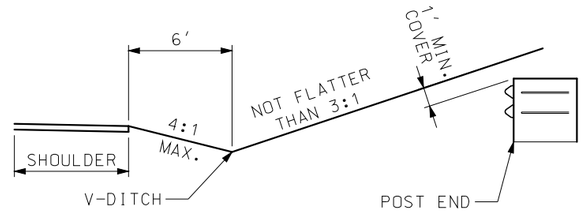

SECTION A-A



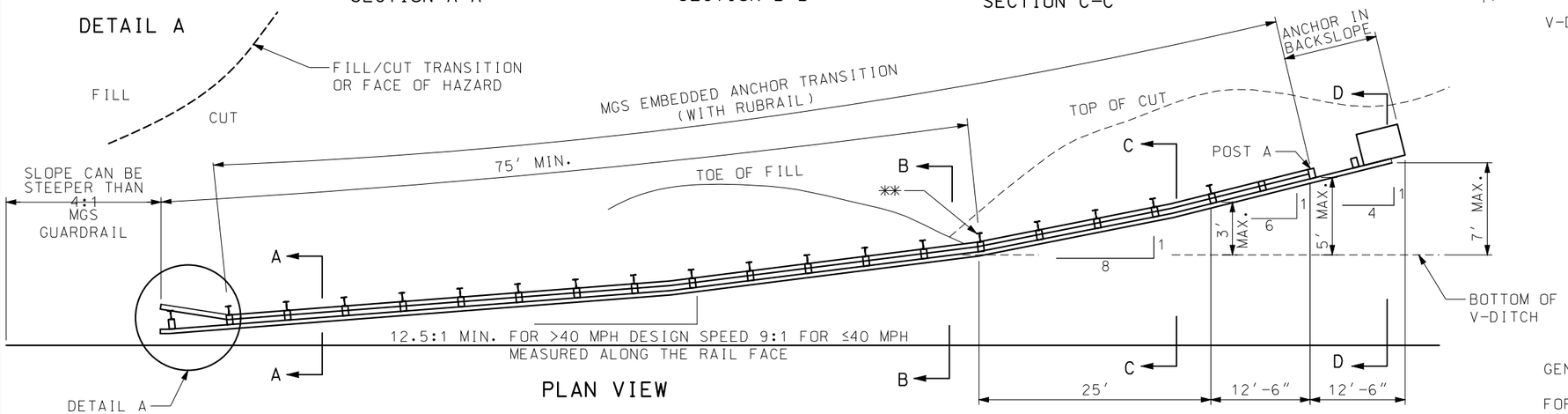

SECTION B-B



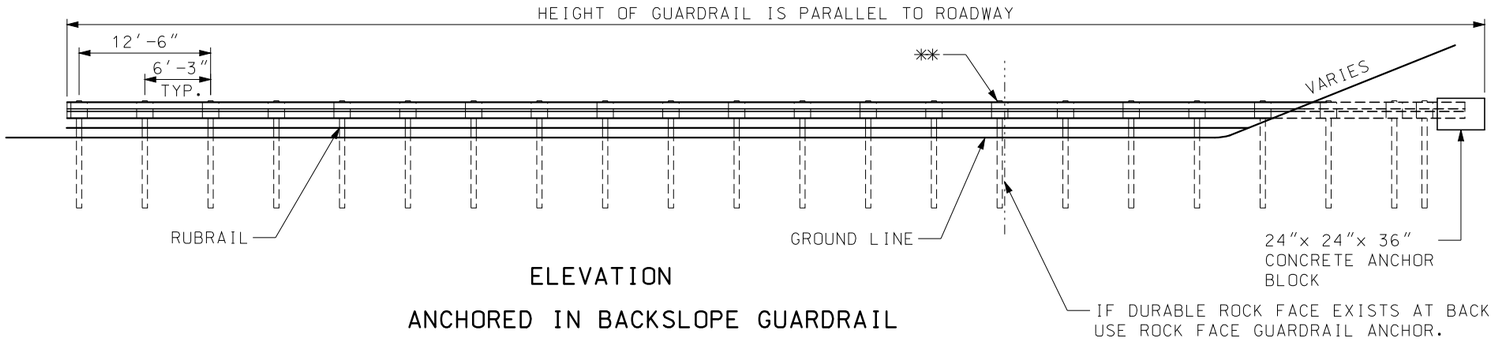

SECTION C-C




SECTION D-D




PLAN VIEW

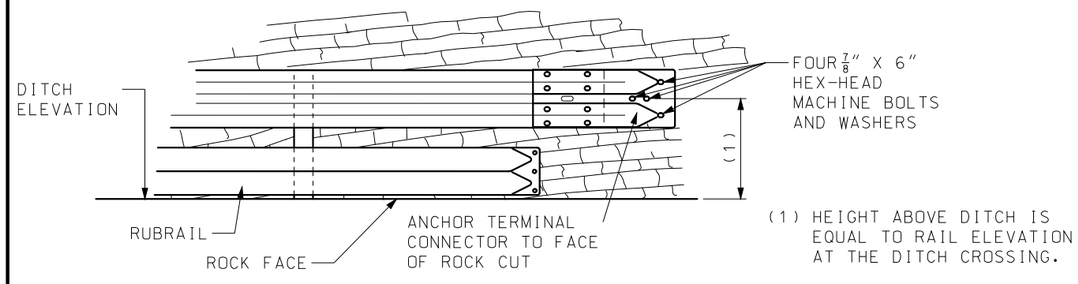



ELEVATION

ANCHORED IN BACKSLOPE GUARDRAIL

✻✻ THE POST BEHIND THE DITCHLINE MAY BE SHORTENED TO PROVIDE 48" MIN. EMBEDMENT.

COST OF SHAPING ROCK FACE FOR PLACING OF TERMINAL CONNECTOR, DRILLING HOLES, FURNISHING AND PLACING BOLTS, WASHERS, CAULKING, ANCHORS AND END SHOE TO BE INCLUDED IN THE PRICE OF GUARDRAIL ANCHOR, ROCK FACE.




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

ROCK FACE GUARDRAIL ANCHOR

GENERAL NOTES:

FOR END ANCHOR DETAILS, SEE SHEET 1-3 OF 7.

RUBRAIL BEGINS WHEN THE DISTANCE BETWEEN THE GUARD-RAIL AND THE GROUND IS 18" AND INCREASING.

END ANCHOR POSTS 1 AND 2 SHALL HAVE FOUNDATION TYPE AS SHOWN ON SHEET 3 OF 7.

THE CONTRACT UNIT PRICE FOR EMBEDDED GUARDRAIL ANCHOR SHALL INCLUDE THE CONCRETE ANCHOR. EXCAVATION AND BACKFILLING, OR TERMINAL CONNECTOR, AND ALL INCIDENTIAL HARDWARE AND WORK NECESSARY TO COMPLETE THE INSTALLATION.

THE EMBEDED ANCHOR TRANSITION SHALL EXTEND 50'± BEYOND THE DITCH LINE AND TERMINATE A MINIMUM OF 12 INCHES BELOW GROUND ELEVATION OF THE BACKSLOPE.

BLOCKOUTS WILL NOT BE REQUIRED FOR ANY POST WHICH WILL BE COMPLETELY BELOW GROUND. THE ALIGNMENT OF SUCH POSTS SHALL BE APPROVED BY THE ENGINEER.

SEE OTHER DRAWINGS AND STANDARD SPECIFICATIONS FOR MATERIAL AND CONSTRUCTION REQUIREMENTS NOT SHOWN.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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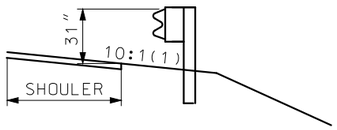
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
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# MIDWEST GUARDRAIL SYSTEM (MGS) TERMINAL ENDS EMBEDDED AND ROCK FACE (V-DITCH STEEPER THAN 10:1, 4:1 MAX. FORESLOPE)

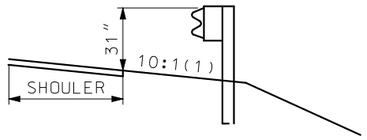
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.80B

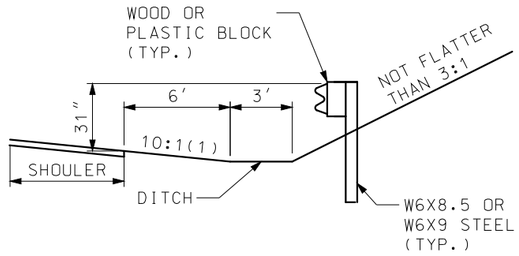
SHEET NO. 4 OF 7



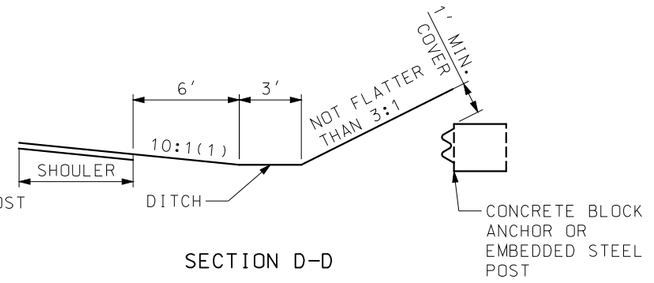

SECTION A-A




SECTION B-B

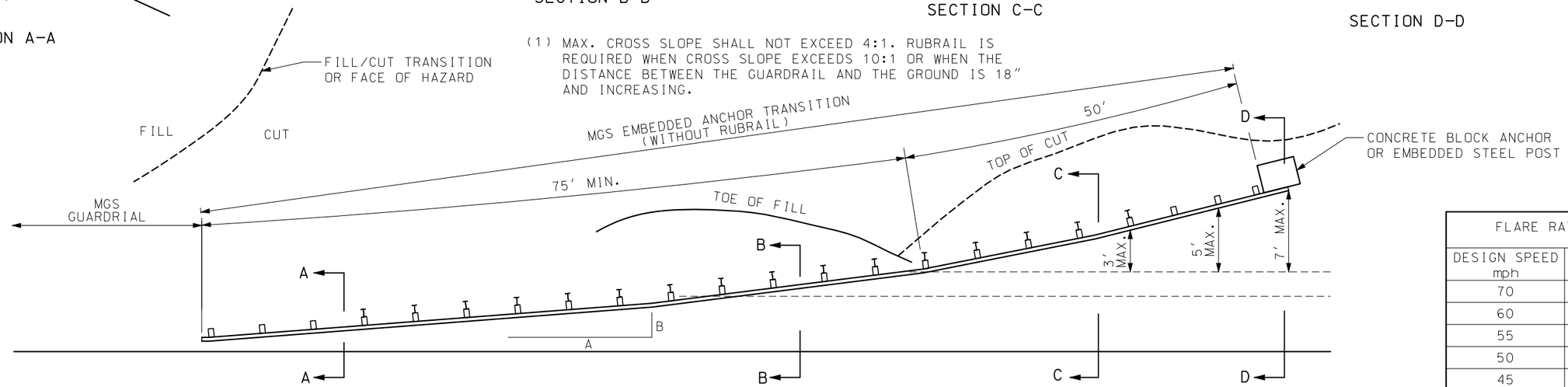



SECTION C-C



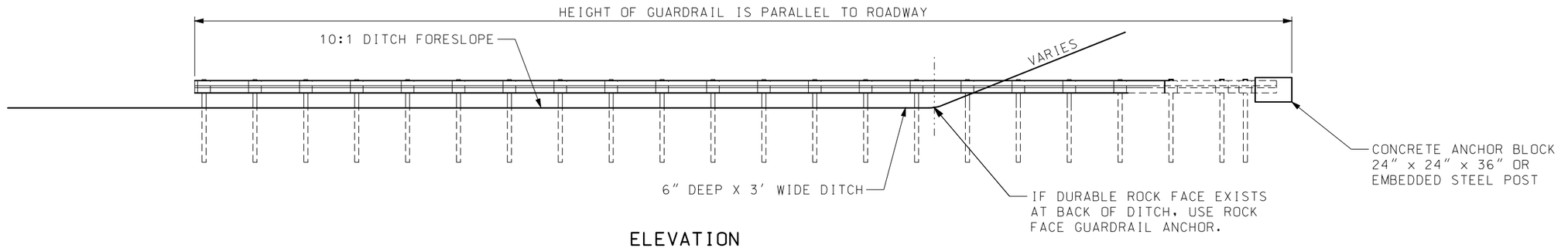

SECTION D-D

(1) MAX. CROSS SLOPE SHALL NOT EXCEED 4:1. RUBRAIL IS REQUIRED WHEN CROSS SLOPE EXCEEDS 10:1 OR WHEN THE DISTANCE BETWEEN THE GUARDRAIL AND THE GROUND IS 18" AND INCREASING.




PLAN VIEW

| FLARE RATE | |
|---|---|
| DESIGN SPEED mph | A:B |
| 70 | 15:1 |
| 60 | 13:1 |
| 55 | 12:1 |
| 50 | 11:1 |
| 45 | 10:1 |
| 40 | 9:1 |
| 30 OR LESS | 7:1 |




ELEVATION
ANCHORED IN BACKSLOPE GUARDRAIL

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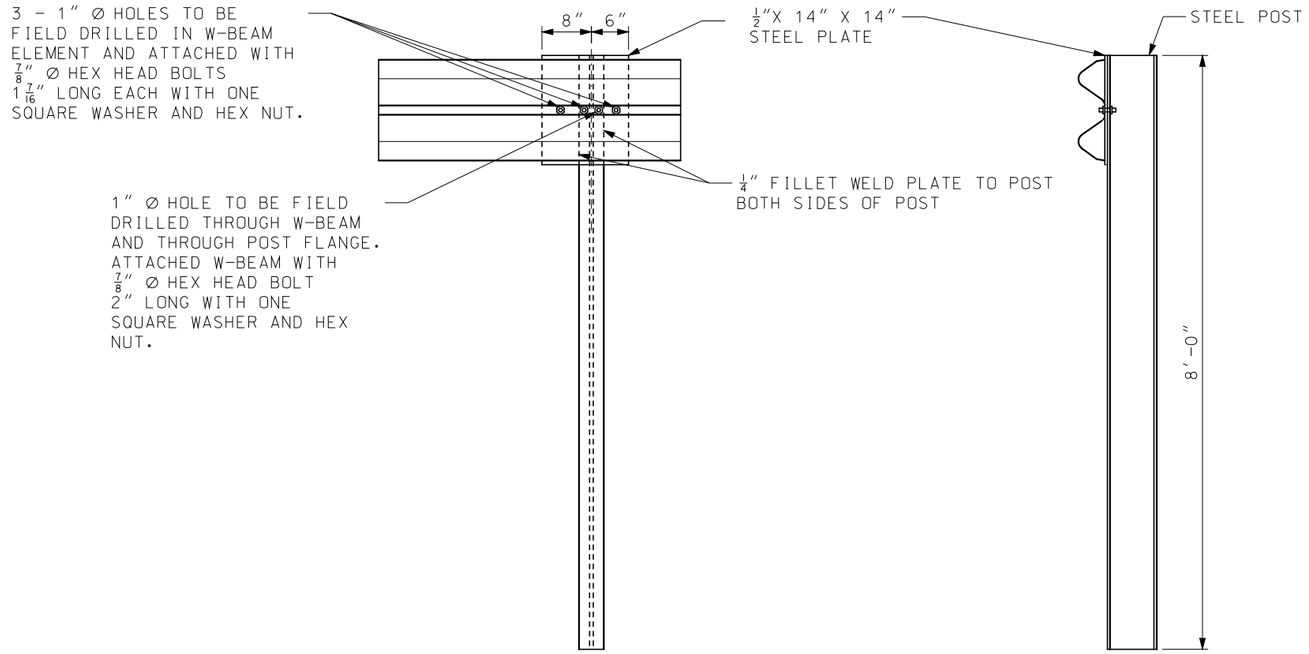
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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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NUMBER PE-28411
PROFESSIONAL ENGINEER
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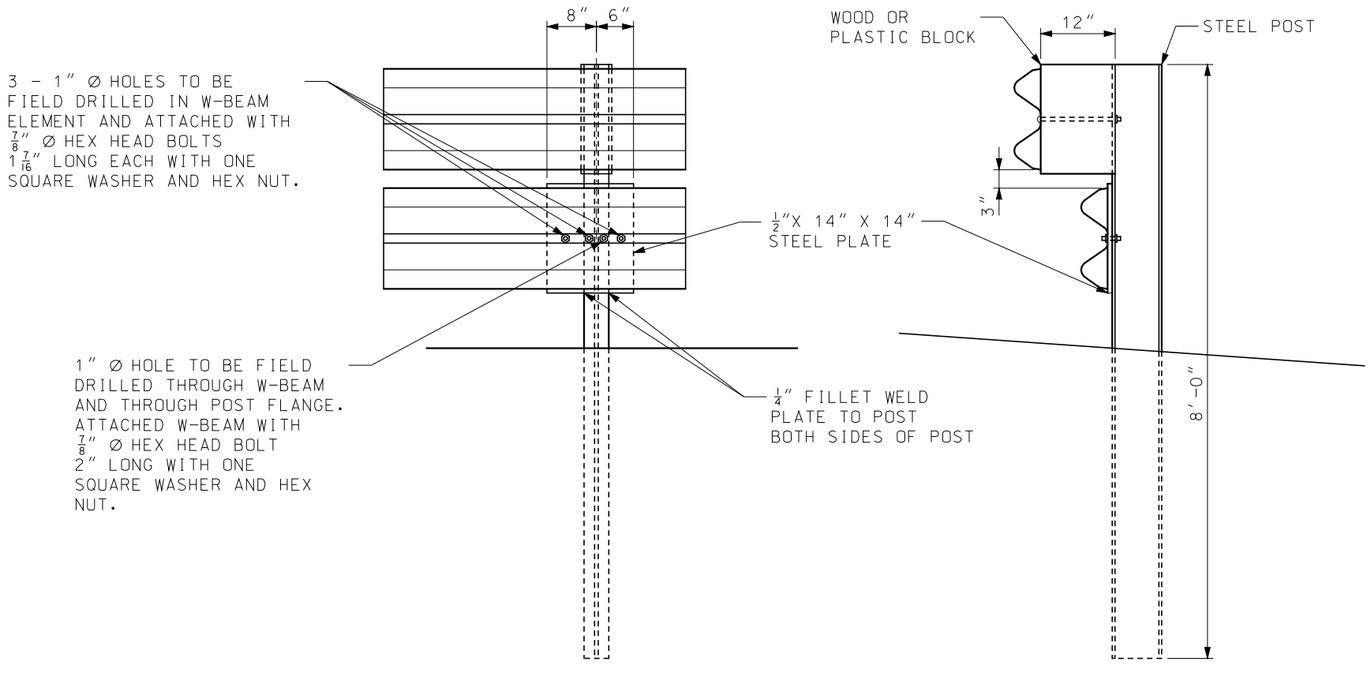
# MIDWEST GUARDRAIL SYSTEM (MGS) EMBEDED ANCHOR TRANSITION EMBEDDED TERMINAL ENDS (FLAT DITCH)

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.80B




EMBEDDED STEEL POST




SPECIAL RUBRAIL TO POST CONNECTION AT POST A

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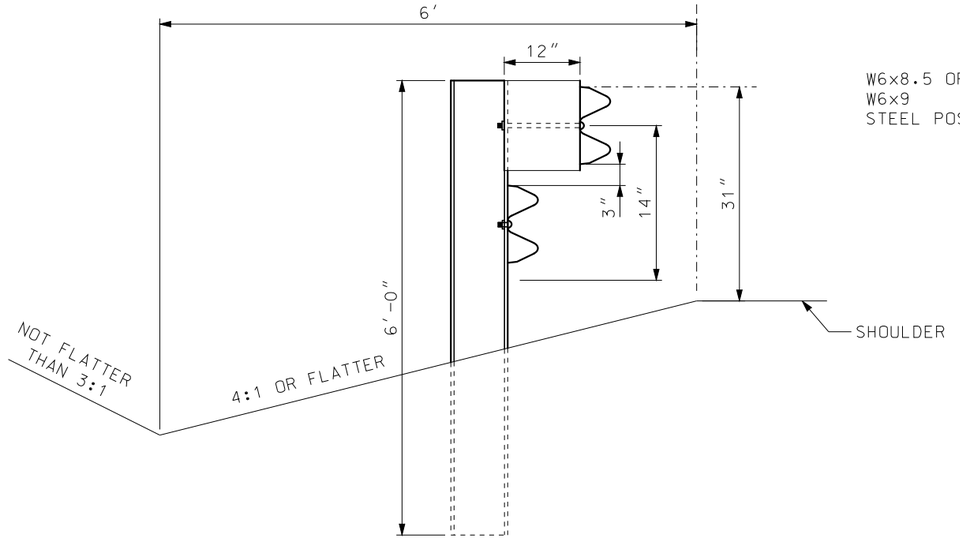
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# MIDWEST GUARDRAIL SYSTEM (MGS)

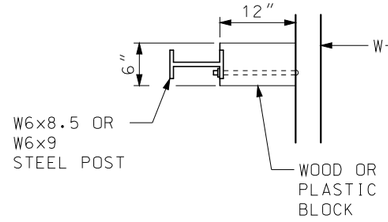
## EMBEDDED ANCHOR TERMINAL ENDS (STEEL POST OPTION)

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

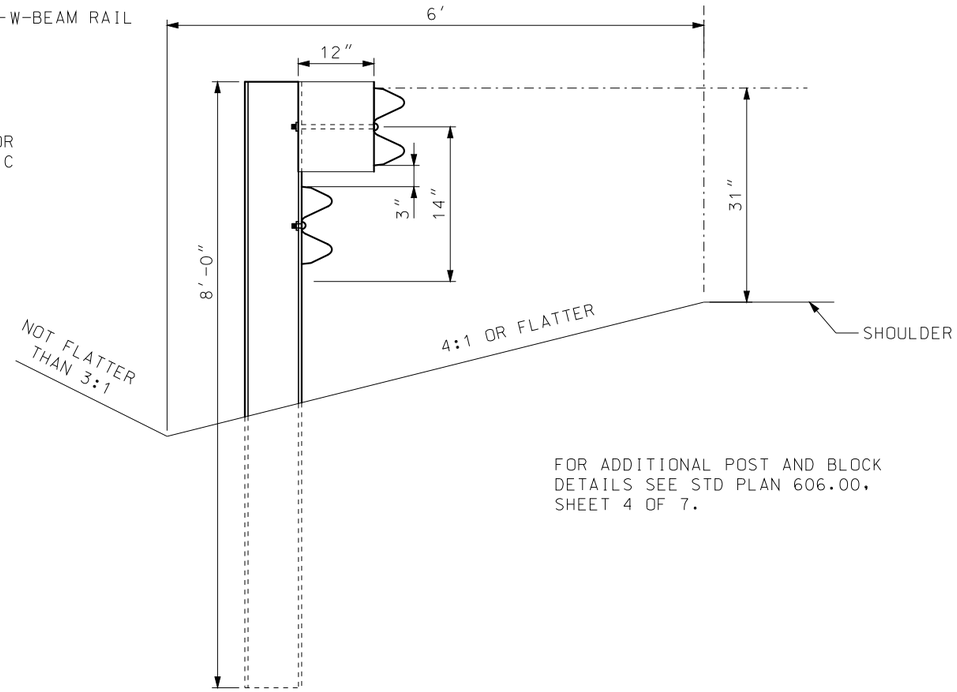
606.80B




ELEVATION OF 6′ STEEL POST AND BLOCK

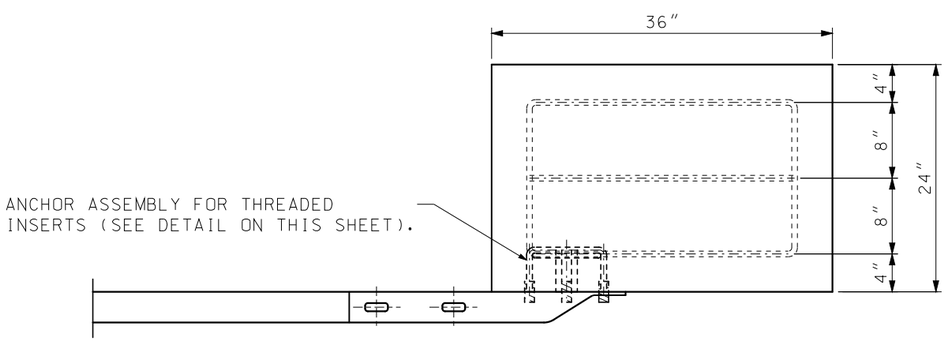



PLAN VIEW

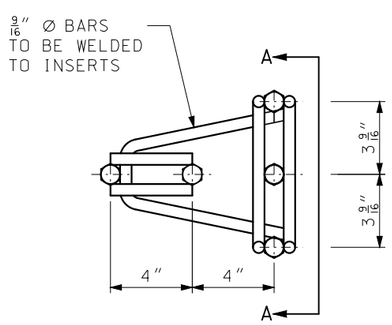



FOR ADDITIONAL POST AND BLOCK DETAILS SEE STD PLAN 606.00, SHEET 4 OF 7.

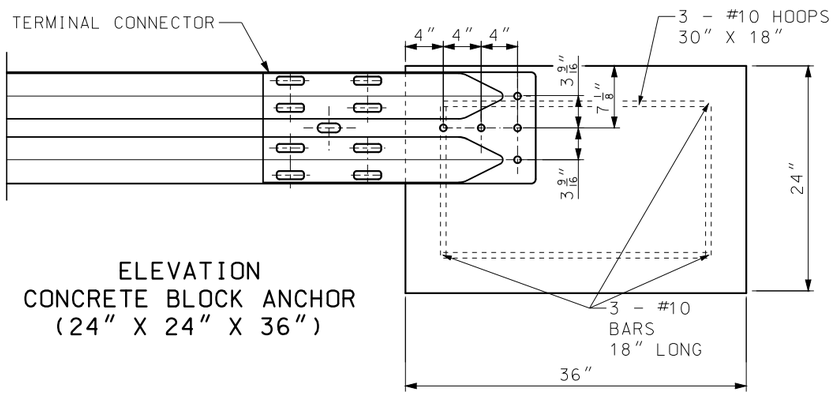
ELEVATION 8′ STEEL POST AND BLOCK



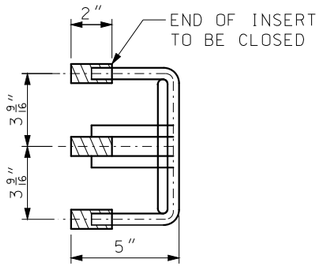

TOP VIEW




CONCRETE BLOCK ANCHOR ANCHOR ASSEMBLY




ELEVATION CONCRETE BLOCK ANCHOR (24″ X 24″ X 36″)




SECTION A–A

THREADED INSERTS FOR 15/16″ X 2″ GALVANIZED HEX HEAD CAP SCREWS. CAP SCREWS TO BE THREADED A MINIMUM 1 7/8″. INSERTS THREADED MINIMUM OF 1 3/4″.

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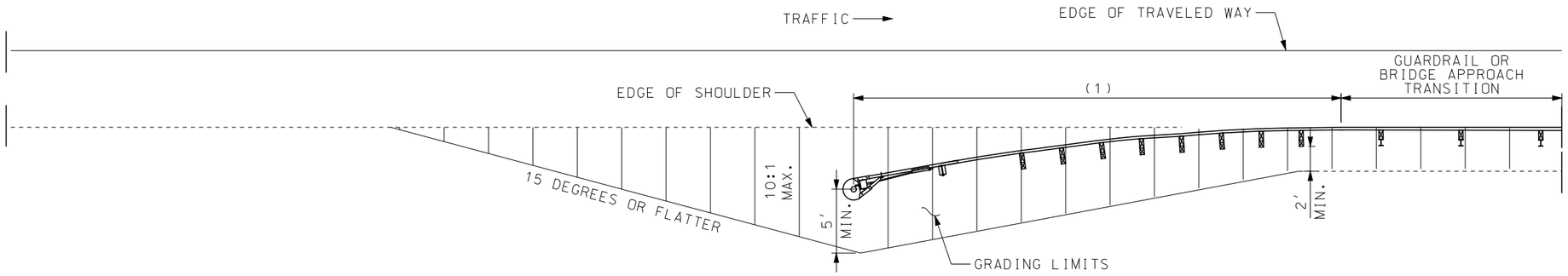
# MIDWEST GUARDRAIL SYSTEM (MGS)

## EMBEDDED TERMINAL ENDS GENERAL DETAILS

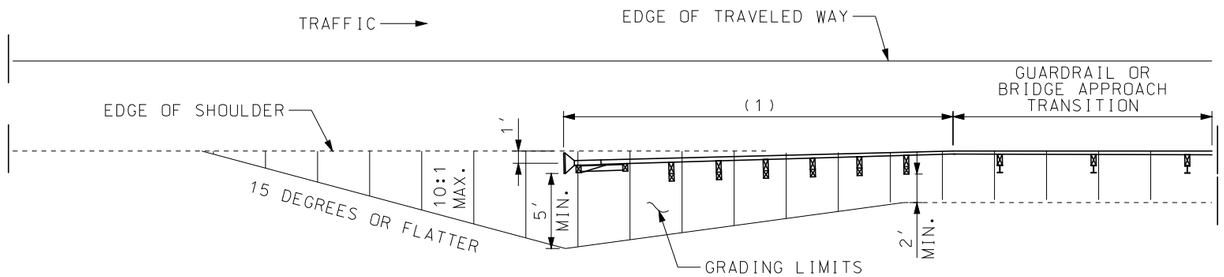
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.80B

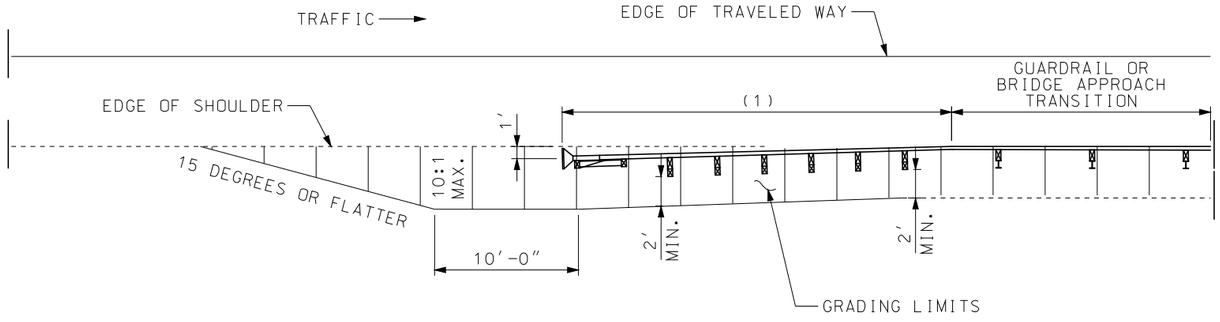
SHEET NO. 7 OF 7




GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS




**PREFERRED GRADING LIMITS FOR CRASHWORTHY END TERMINALS**




ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS

(1) APPROVED CRASHWORTHY END TERMINAL

GENERAL NOTES:

THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH APPROVED SHOP DRAWINGS OF THE APPROVED CRASH-WORTHY END TERMINAL.

END ANCHORS SHALL BE INSTALLED ON ENDS OF GUARDRAIL RUNS WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.

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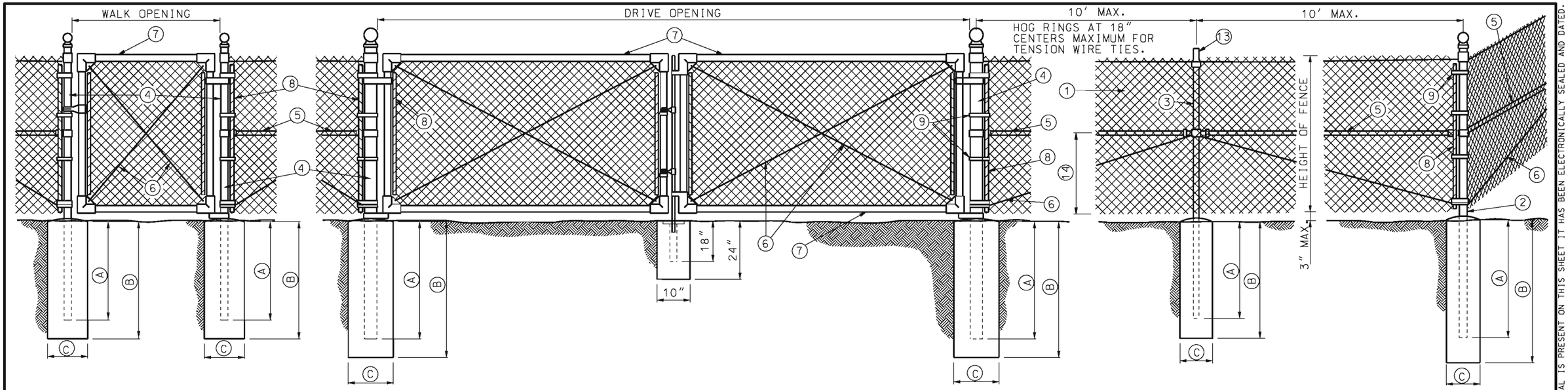
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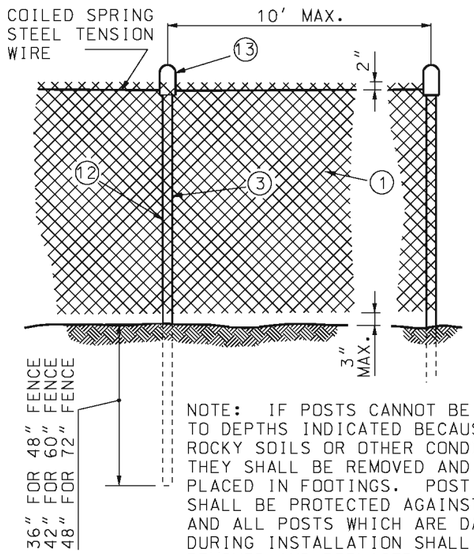
# MASH
# CRASHWORTHY END TERMINALS
# TYPE A
# GRADING LIMITS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

606.81

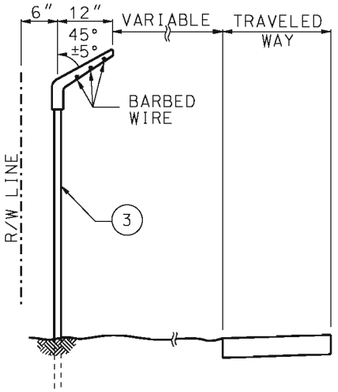
SHEET NO.
1 OF 1



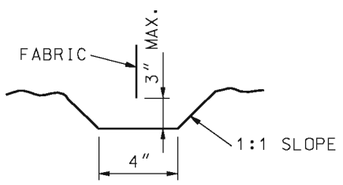




NOTE: IF POSTS CANNOT BE DRIVEN TO DEPTHS INDICATED BECAUSE OF ROCKY SOILS OR OTHER CONDITIONS, THEY SHALL BE REMOVED AND RE-PLACED IN FOOTINGS. POST TOPS SHALL BE PROTECTED AGAINST DAMAGE AND ALL POSTS WHICH ARE DAMAGED DURING INSTALLATION SHALL BE REMOVED AND REPLACED.

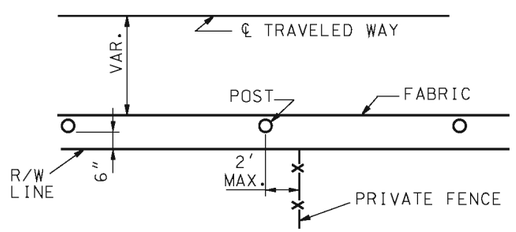
ALTERNATE LINE POST ANCHORAGE (DRIVEN)




BARBED WIRE EXTENSION BRACKET




TYPICAL TRENCH DETAILS




TYPICAL LOCATION

LEGEND

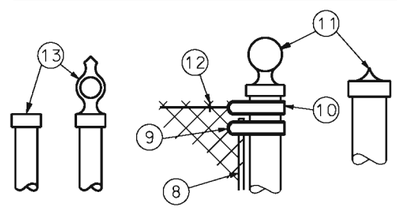
1. FABRIC
2. END, CORNER OR PULL POST
3. LINE POST
4. GATE POST
5. BRACE
6. TRUSS ROD
7. GATE FRAME
8. STRETCHER BAR $\frac{1}{4}$" X $\frac{3}{4}$" PLATE
9. STRETCHER BAR BAND
10. END OR CORNER CLAMP
11. POST TOPS (OTHER THAN LINE POSTS)
12. FABRIC TIES
13. LINE POST TOPS WITH OR WITHOUT TOP RAILS
14. ONE-HALF FABRIC HEIGHT OR AS RECOMMENDED BY MANUFACTURER

MINIMUM DEPTH FOR SETTING POSTS

| DESCRIPTION | | HEIGHT OF FENCE 48" SIZE (IN.) | 60" SIZE (IN.) | 72" SIZE (IN.) |
|---|---|---|---|---|
| ② END CORNER & PULL POST | (A) | 30" | 36" | 36" |
| | (B) | 36" | 42" | 42" |
| | (C) | 10" | 12" | 12" |
| ③ LINE POST | (A) | 24" | 27" | 36" |
| | (B) | 30" | 36" | 42" |
| | (C) | 10" | 12" | 12" |
| ④ GATE POST | (A) | 30" | 36" | 36" |
| | (B) | 36" | 42" | 42" |
| | (C) | 10" | 12" | 12" |

MINIMUM SIZE FOR FENCE HARDWARE

| | WIDTH | SIZE (IN.) | LBS/FT. |
|---|---|---|---|
| ② END CORNER OR PULL POST | N/A | $2\frac{1}{2}$ DIA. | 5.79 |
| ③ LINE POST | N/A | 2" DIA. | 3.65 |
| ④ GATE POST (SINGLE GATE OR 1 LEAF OF DOUBLE) | ≤ 6' | $2\frac{1}{2}$ DIA. | 5.79 |
| | ≤ 13' | $3\frac{1}{2}$ DIA. | 9.10 |
| | ≤ 18' | 6 DIA. | 18.97 |
| | > 18' | 8 DIA. | 24.70 |
| ⑤ BRACE | N/A | $1\frac{1}{4}$ DIA. | 2.27 |
| ⑥ TRUSS ROD | N/A | $\frac{3}{8}$ | – |
| ⑦ GATE FRAME | N/A | $1\frac{1}{2}$ DIA. | 2.72 |




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

POST TOPS

| WIRE SIZE AND HEIGHT OF FABRIC | | | |
|---|---|---|---|
| SPECIFIED DIAMETER | | | HEIGHT OF FABRIC INCHES |
| INCHES | GAGE | MESH INCHES | |
| 0.120 | 11 | 2 | 36, 42 |
| 0.148 | 9 | 2 | 48, 60 |
| 0.192 | 6 | 2 | 72, 84 |

GENERAL NOTES:

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

PULL POSTS SHALL BE USED AT SHARP BREAKS IN VERTICAL GRADE OR AT APPROXIMATE 500' CENTERS ON STRAIGHT RUNS OR AS DIRECTED BY THE ENGINEER.

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

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

THE MESH SIZE SHALL BE 2 INCHES $\pm\frac{1}{8}$ IN. MEASURED IN EITHER DIRECTION AS THE MINIMUM CLEAR DISTANCE BETWEEN THE WIRES FORMING THE PARALLEL SIDES OF THE MESH.

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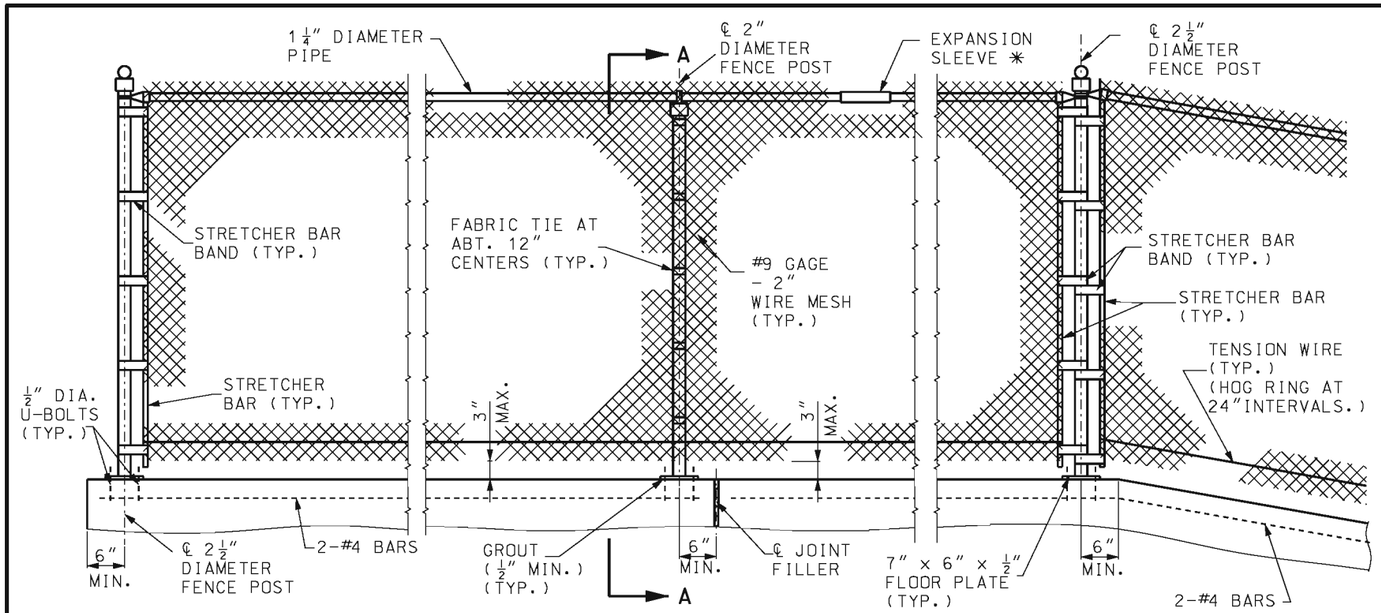
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# CHAIN-LINK FENCE

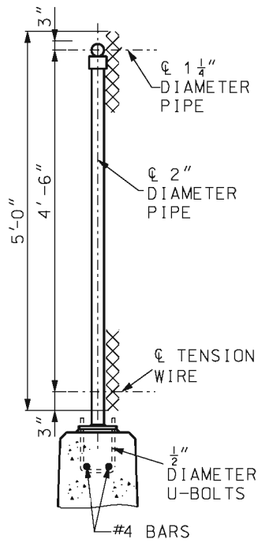
DATE EFFECTIVE: 02/01/2007
DATE PREPARED: 8/21/2009

607.10V

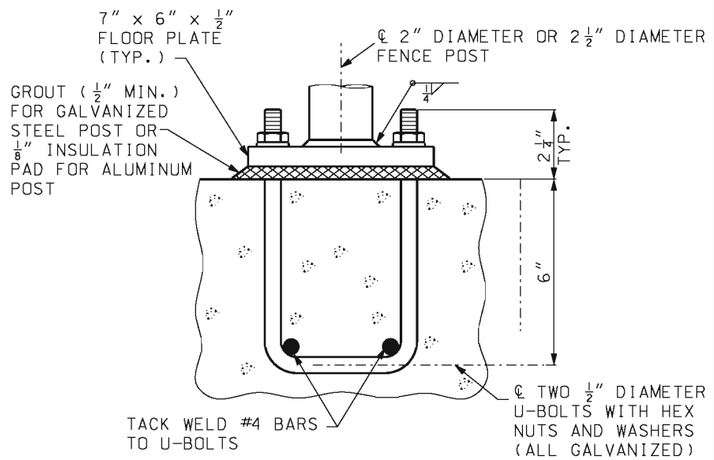
SHEET NO. 1 OF 1




TERMINAL POST LINE POST PULL POST



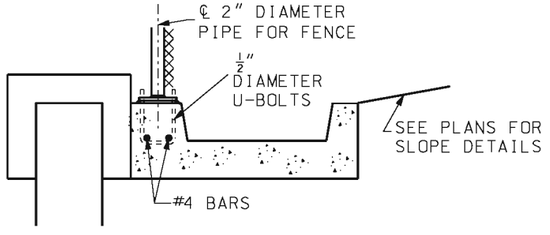

SECTION A-A



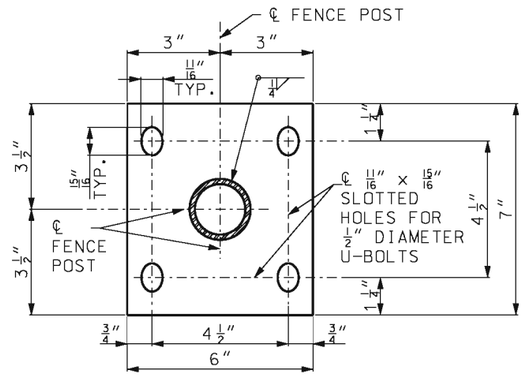

TYPICAL FENCE POST CONNECTION

* PLACE EXPANSION SLEEVE AT ABOUT 30'-0" CENTERS WITH AT LEAST ONE EXPANSION SLEEVE BETWEEN PULL POSTS.

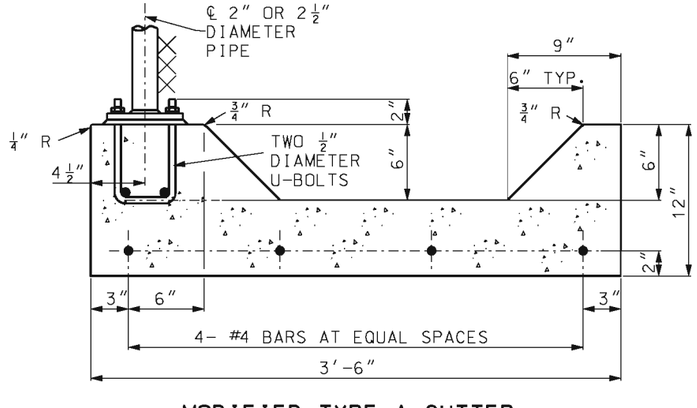
## PART ELEVATION (TYPICAL)



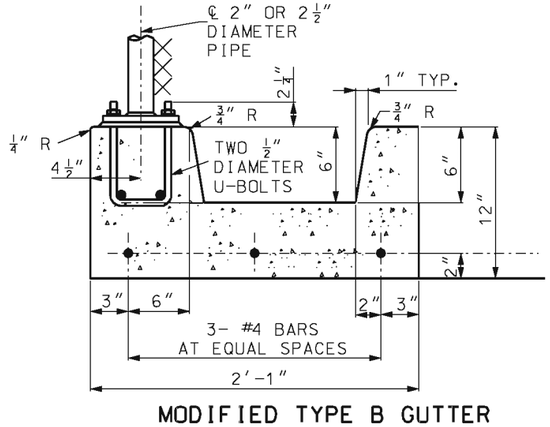

ALTERNATE SECTION A-A FOR MSE WALLS




PLAN OF FLOOR PLATE




MODIFIED TYPE A GUTTER




MODIFIED TYPE B GUTTER

## FENCE CONNECTION FOR MSE WALLS

GENERAL NOTES:

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

PULL POST SHALL BE USED AT SHARP BREAKS IN VERTICAL GRADE OR AT APPROXIMATE 100'-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".


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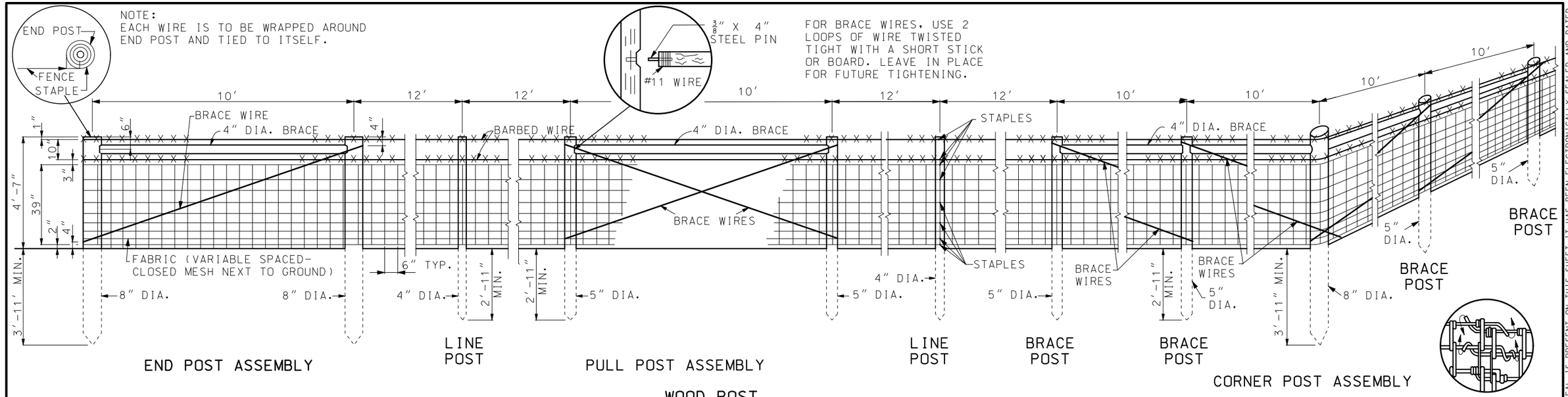
# CHAIN-LINK FENCE FOR RETAINING WALLS

DATE EFFECTIVE: 06/01/2009
DATE PREPARED: 4/30/2009

607.11H

SHEET NO. 1 OF 1


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TYPICAL FENCE LOCATION

| GATE OPENING | GATE POST SIZE | #/FT. |
|---|---|---|
| ≤ 6' | 2" DIA. | 3.65 |
| ≤13' | 2½" DIA. | 5.79 |
| ≤18' | 3½" DIA. | 9.10 |
| >18' | 6" DIA. | 18.97 |
| GATE FRAME | 1½" DIA. | 2.72 |




1. BRACES
2. WIRE TIES
3. 3.8" ADJUSTABLE TRUSS RODS.

GENERAL NOTES:

STEEL LINE POSTS SHALL BE OF AN APPROVED "U", "Y", "T" OR CHANNEL SECTION, NOTCHED OR STUDDED WITH AN ANCHOR PLATE. POST PUNCHED WITH HOLES OR SELF FASTENING LUGS WILL NOT BE PERMITTED.

STAPLES SHALL BE SCREW SHANK TYPE OR EQUIVALENT (1¼" MINIMUM LENGTH).

STRETCHED FABRIC AND BARBED WIRE ON OUTSIDE OF POST ON CORNERS AND CURVES.

ATTACHMENT OF FABRIC TO STEEL LINE POSTS IN ACCORDANCE WITH MANUFACTURE'S RECOMMENDATION.

GATES FOR WOVEN WIRE FENCE SHALL BE IN ACCORDANCE WITH SEC 607.20 AND 1043.3.6 OF THE STANDARD SPECIFICATIONS. EXCEPT THE FILLER SHALL BE WOVEN WIRE FABRIC OF THE SAME KIND AS USED FOR THE FENCE.

SINGLE LEAF GATES REQUIRE UP TO 12" OPENING. DOUBLE LEAF GATES REQUIRE OVER 12" OPENING. DIRECTION OF SWING OF GATES SHALL BE AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.


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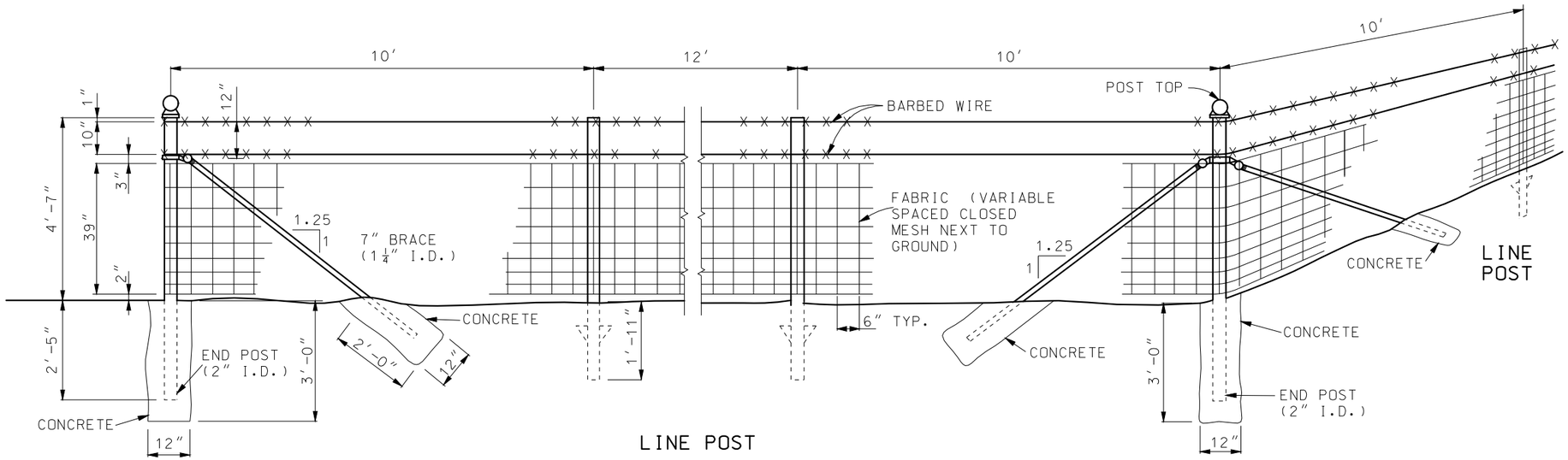
# WOVEN WIRE FENCE

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

607.20G

SHEET NO. 1 OF 2

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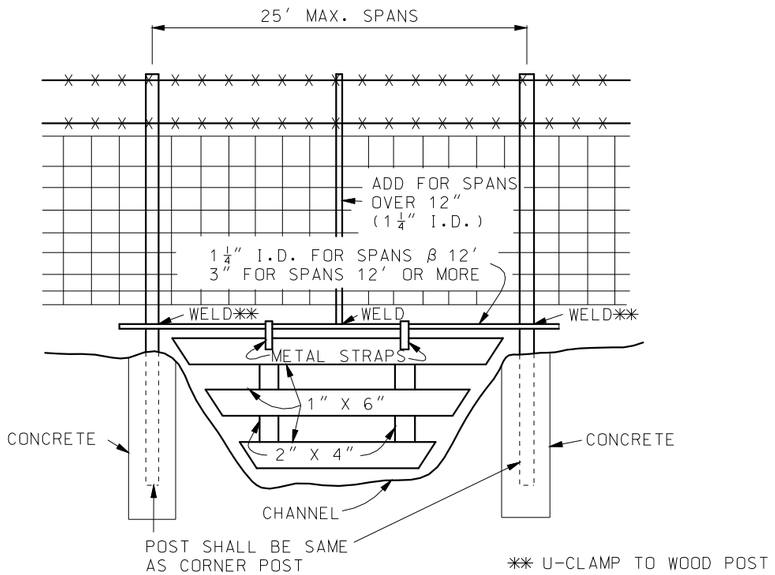



END POST ASSEMBLY

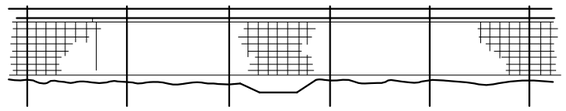
LINE POST

STEEL POST

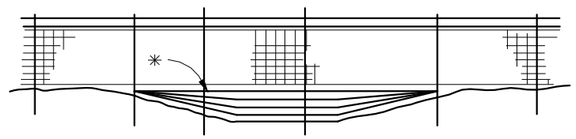
CORNER OR PULL POST ASSEMBLY



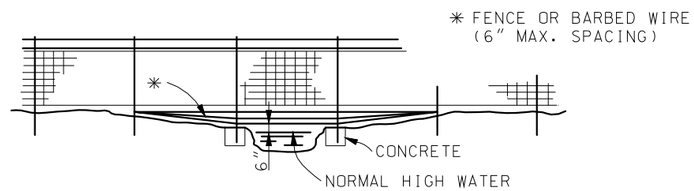

TYPICAL
WATER CROSSING GATE



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



POORLY DEFINED CHANNELS (SMALL DRAINAGE AREAS)




WELL DEFINED CHANNELS (LARGE DRAINAGE AREAS)

TYPICAL FENCING AT
CHANNEL CROSSING

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

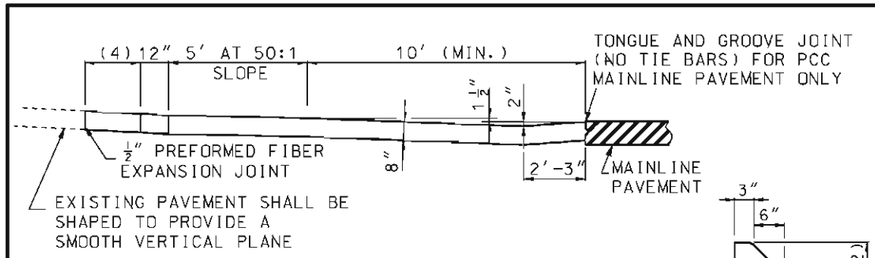
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# WOVEN WIRE FENCE

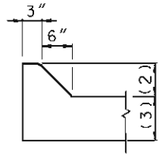
DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

607.20G

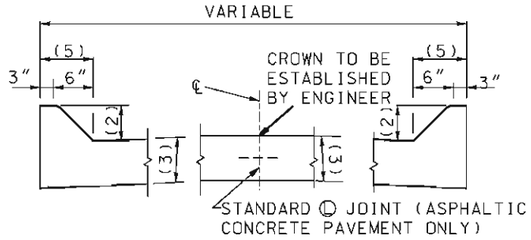
SHEET NO.
2 OF 2



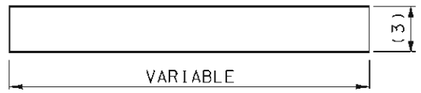

SECTION A-A



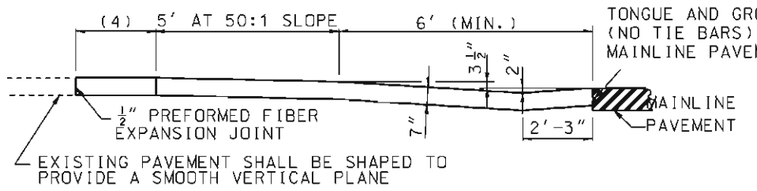

SECTION B-B




SECTION C-C

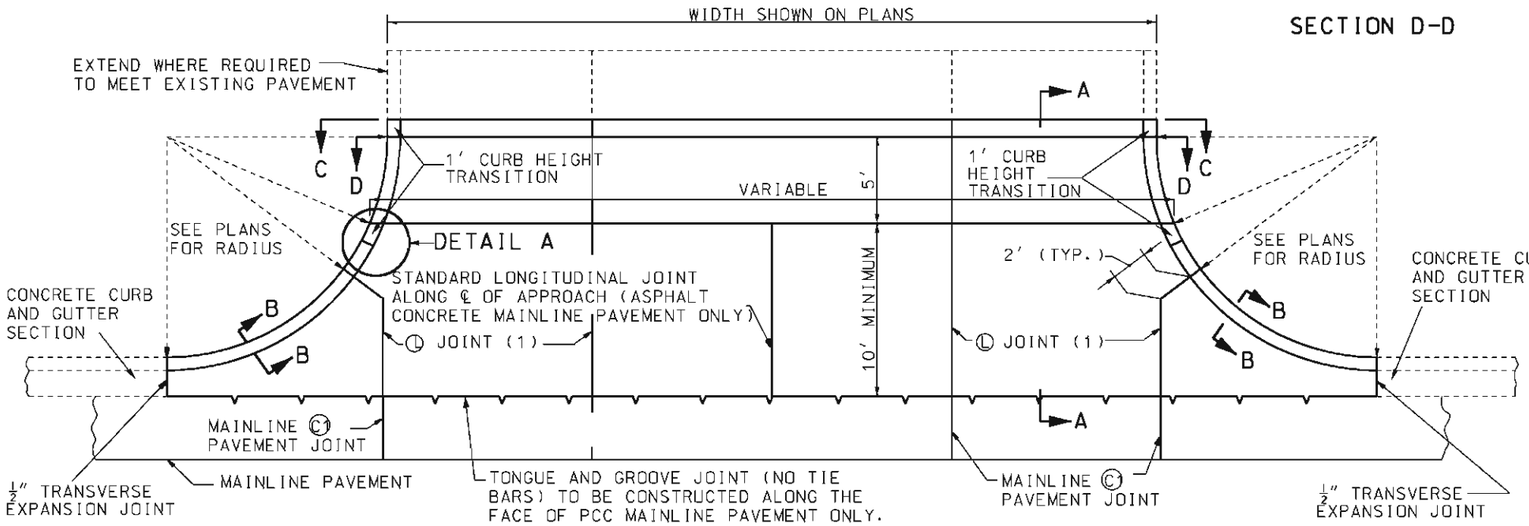



SECTION D-D

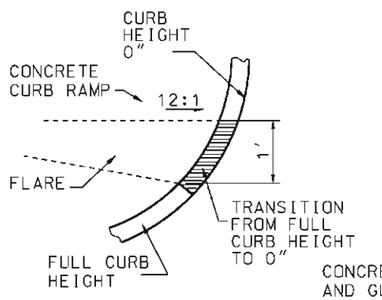



SECTION E-E

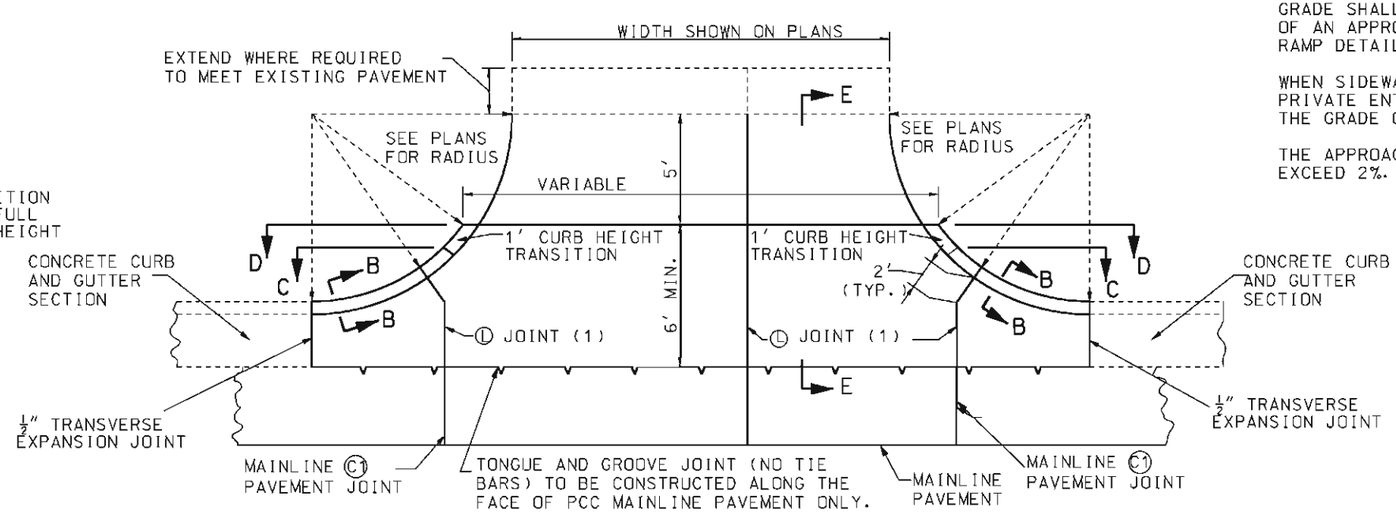
(1) THE NUMBER OF Ⓛ JOINTS SHOWN IN PAVED APPROACH ARE FOR ILLUSTRATIVE PURPOSES ONLY. JOINTS PLACED IN PAVED APPROACHES SHALL MATCH THE Ⓒ1 PAVEMENT TRANSVERSE MAINLINE PAVEMENT JOINT LOCATION.
(2) 6" – EXCEPT WHERE VARIED TO MEET EXISTING IMPROVEMENTS.
(3) 8" NRCCP – FOR STREET, SIDEROAD, ALLEY OR COMMERCIAL APPROACHES. 7" NRPCCP – FOR PRIVATE APPROACHES.
(4) EXTEND WHERE REQUIRED TO MEET EXISTING PAVEMENT.
(5) VARY TO MEET EXISTING IMPROVEMENTS.




PLAN OF STREET, SIDEROAD, ALLEY OR COMMERCIAL APPROACHES




DETAIL A




PLAN OF PRIVATE APPROACHES

GENERAL NOTES:

WHERE PAVED APPROACH MEETS EXISTING CONCRETE PAVEMENT OR SIDEWALK, PLACE ½" PREFORMED FIBER EXPANSION JOINT, CUT TO TEMPLATE, THROUGH NEW CONCRETE AND 1' FROM JUNCTION WITH EXISTING CONCRETE, OR ALONG INSIDE EDGE OF SIDEWALK. WHERE PAVED APPROACH MEETS EXISTING BITUMINOUS CONSTRUCTION, OMIT JOINT.

SEE STANDARD PLAN 608.10 FOR CONCRETE CURB RAMPS.

SEE STANDARD PLAN 502.05 FOR JOINT DETAILS.

SEE STANDARD PLAN 609.00 FOR TRANSVERSE EXPANSION JOINT DETAILS.

WHERE DRAINAGE IS NOT TO BE CARRIED ACROSS THE PAVED APPROACH, SECTION A-A SHALL BE MODIFIED TO ELIMINATE THE "DIP" AND SHALL BE CROWNED AS DIRECTED BY THE ENGINEER.

IF SIDEWALKS ARE NOT INCLUDED IN CONSTRUCTION OF PAVED APPROACH, PLACE GROUND COVER, AS SHOWN ON PLANS, BEHIND CURB THROUGH RADIUS. GROUND COVER SHALL CONFORM TO FINISHED GRADING FOR CURB RAMP.

HAND FINISHING PERMITTED ON PAVED APPROACH.

WHEN SIDEWALKS ARE PRESENT ADJACENT TO THE PAVED APPROACHES OF STREETS, SIDEROADS, ALLEYS OR COMMERCIAL ENTRANCES, THE SIDEWALK GRADE SHALL BE TRANSITIONED TO THE GRADE OF THE APPROACH BY WAY OF AN APPROPRIATE RAMP AS SHOWN ON THE PLANS. SEE 608.10 FOR RAMP DETAILS.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

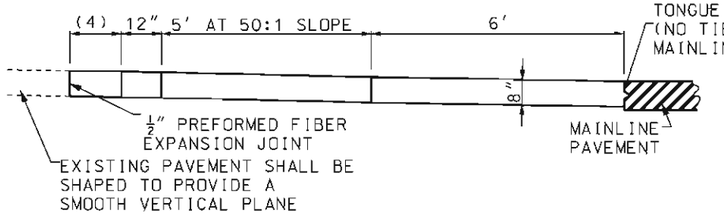
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY

# PAVED APPROACHES
## ADJOINING CURB AND GUTTER SECTIONS

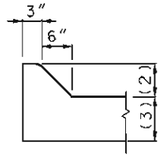
DATE EFFECTIVE: 10/01/2009
DATE PREPARED: 8/26/2009

608.00H

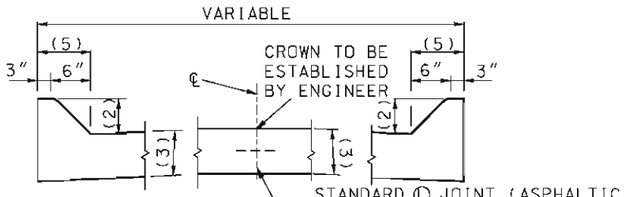
SHEET NO. 1 OF 2



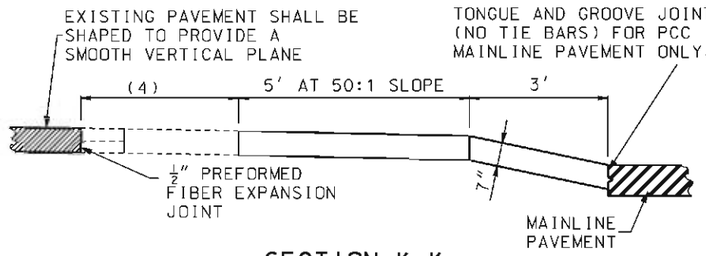

SECTION F-F



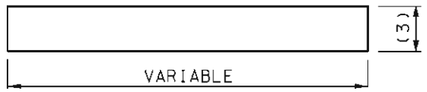

SECTION G-G



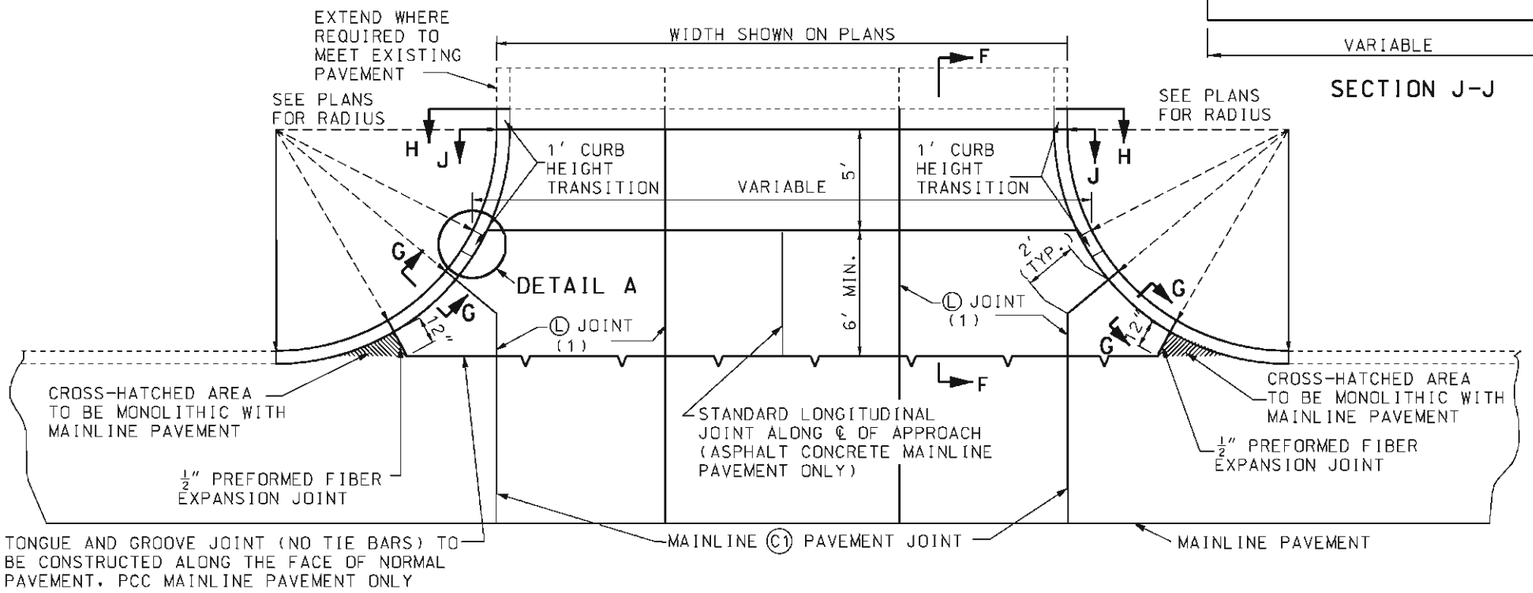

SECTION H-H



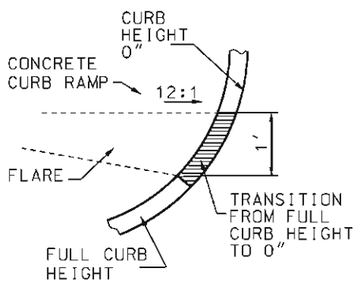

SECTION K-K




SECTION J-J




## PLAN OF STREET, SIDEROAD, ALLEY OR COMMERCIAL APPROACHES




DETAIL A




## PLAN OF PRIVATE APPROACHES

(1) THE NUMBER OF Ⓛ JOINTS SHOWN IN PAVED APPROACH ARE FOR ILLUSTRATIVE PURPOSES ONLY. JOINTS PLACED IN PAVED APPROACHES SHALL MATCH THE Ⓒ1 PAVEMENT TRANSVERSE MAINLINE PAVEMENT JOINT LOCATION.
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(3) 8" NRCCP - FOR STREET, SIDEROAD, ALLEY OR COMMERCIAL APPROACHES. 7" NRPCCP - FOR PRIVATE APPROACHES.
(4) EXTEND WHERE REQUIRED TO MEET EXISTING PAVEMENT.
(5) VARY TO MEET EXISTING IMPROVEMENTS.

GENERAL NOTES:

WHERE PAVED APPROACH MEETS EXISTING PCC PAVEMENT OR SIDEWALK, PLACE ½" PREFORMED FIBER EXPANSION JOINT, CUT TO TEMPLATE, THROUGH NEW CONCRETE AND 1' FROM JUNCTION WITH EXISTING CONCRETE, OR ALONG INSIDE EDGE OF SIDEWALK. WHERE PAVED APPROACH MEETS EXISTING BITUMINOUS CONSTRUCTION, OMIT JOINT.

SEE STANDARD PLAN 608.10 FOR CONCRETE CURB RAMPS.

SEE STANDARD PLAN 502.05 FOR JOINT DETAILS.

(SECTION F-F) ELEVATION OF CENTER OF PAVED APPROACH, AT A POINT 6' FROM EDGE OF NORMAL PAVEMENT SHALL NOT VARY MORE THAN 2" FROM ELEVATION OF MAINLINE PAVEMENT AT CENTERLINE OF PAVED APPROACH.

IF SIDEWALKS ARE NOT INCLUDED IN CONSTRUCTION OR PAVED APPROACH, PLACE GROUND COVER, AS SHOWN ON PLANS, BEHIND CURB THROUGH RADIUS. GROUND COVER SHALL CONFORM TO FINISHED GRADING FOR CURB RAMP.

HAND FINISHING PERMITTED ON PAVED APPROACH.

WHEN SIDEWALKS ARE PRESENT ADJACENT TO THE PAVED APPROACHES OF STREETS, SIDEROADS, ALLEYS OR COMMERCIAL ENTRANCES, THE SIDEWALK GRADE SHALL BE TRANSITIONED TO THE GRADE OF THE APPROACH BY WAY OF AN APPROPRIATE RAMP AS SHOWN ON THE PLANS. SEE 608.10 FOR RAMP DETAILS.

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

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

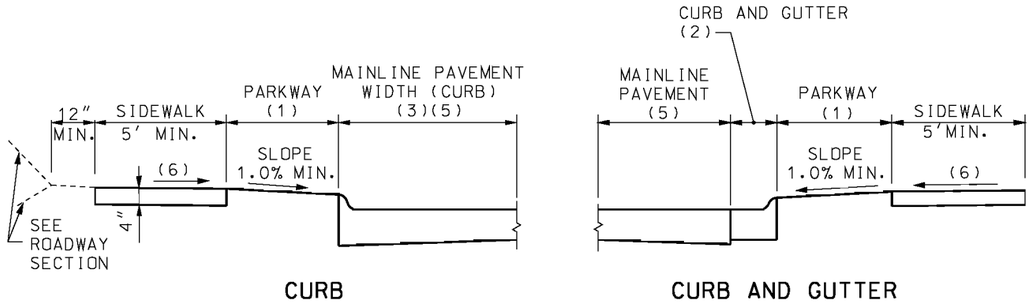
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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY

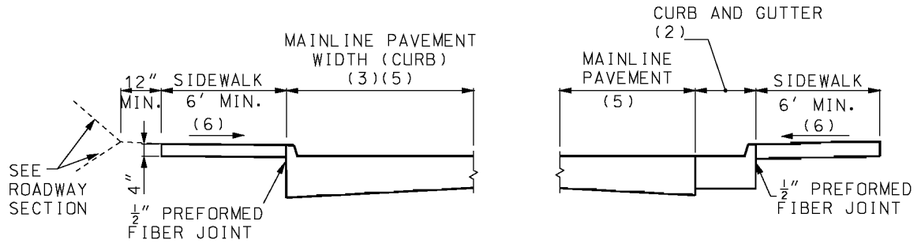
# PAVED APPROACHES
## NOT ADJOINING CURB AND GUTTER SECTIONS

| DATE EFFECTIVE: | 10/01/2009 | 608.00H | SHEET NO. |
|---|---|---|---|
| DATE PREPARED: | 8/26/2009 | | 2 OF 2 |



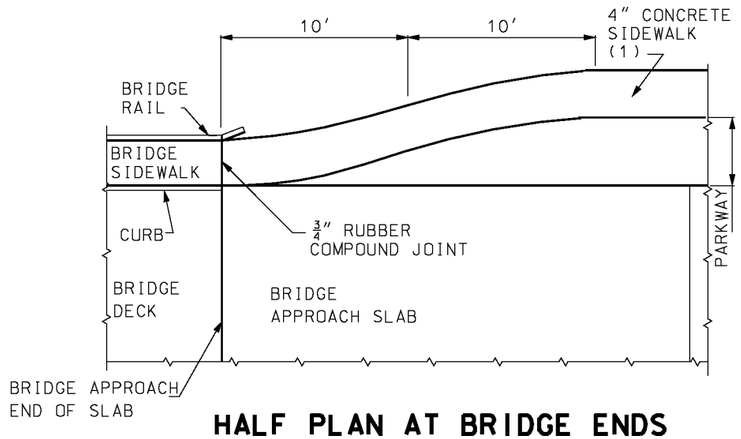

CURB CURB AND GUTTER

## TYPICAL SIDEWALK WITH PARKWAY 2' OR MORE

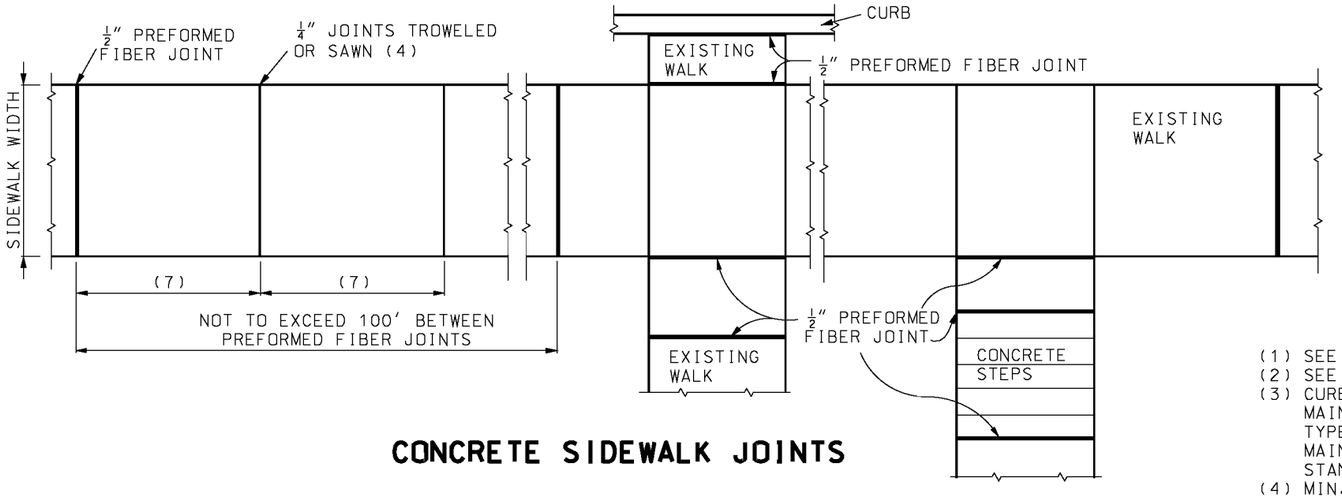



CURB CURB AND GUTTER

## TYPICAL SIDEWALK WITH NO PARKWAY




## HALF PLAN AT BRIDGE ENDS




## 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. ½" DEPTH JOINT.
(5) SEE TYPICAL PAVEMENT SECTION
(6) SLOPE 1.0% (2.0% MAX.)
(7) SPACING EQUAL TO WIDTH OF WALK

GENERAL NOTES:

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

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

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

THE CROSS SLOPE OF THE CONTINUOUS PEDESTRIAN ACCESS ROUTE THROUGH ENTRANCES, ALLEYS, AND SIDEROAD CONNECTIONS WITH STOP OR YIELD CONTROL SHALL BE 1.00% 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 SIDEROAD CONNECTIONS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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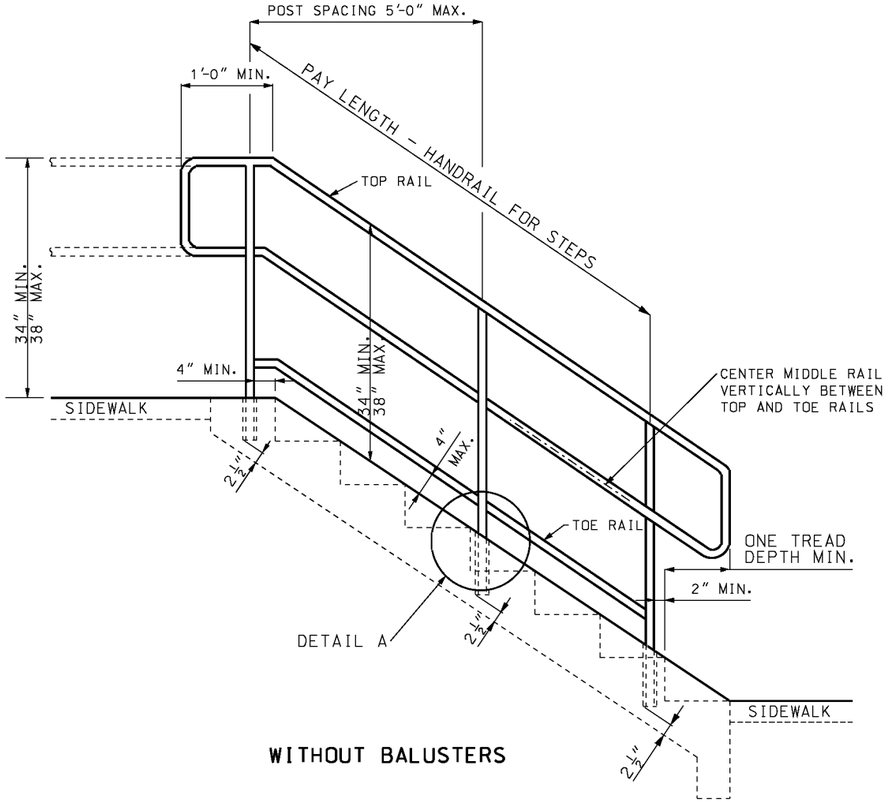
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SIDEWALK

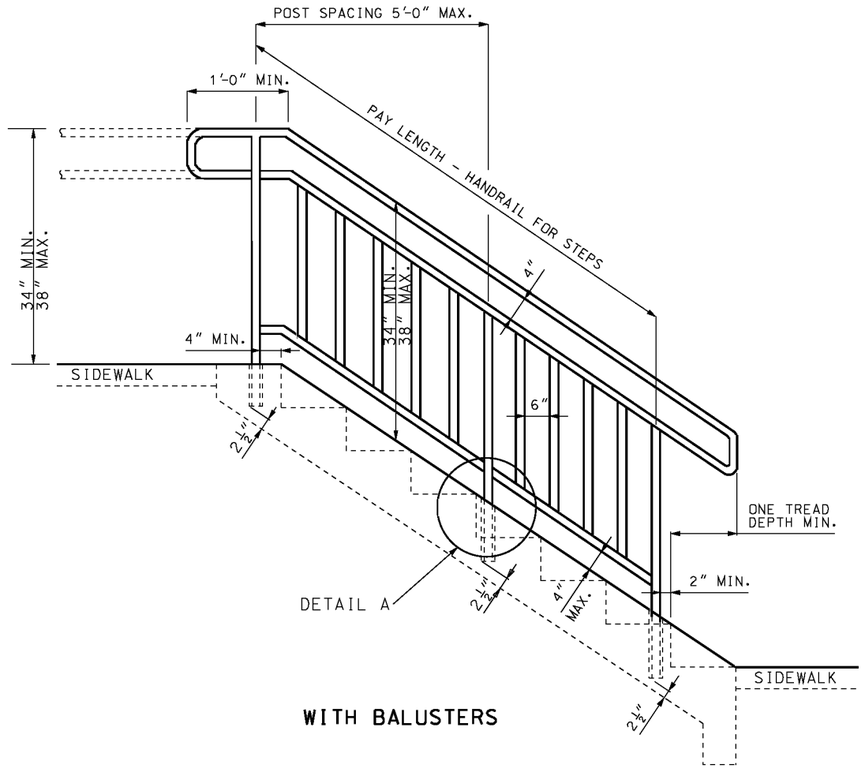
DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

608.10P

SHEET NO. 1 OF 1



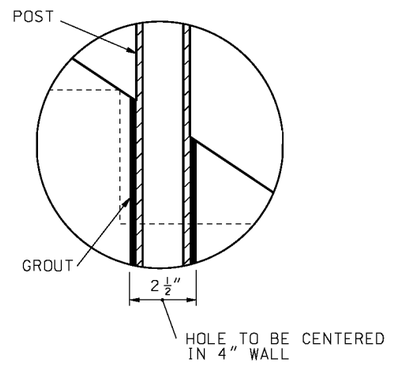

WITHOUT BALUSTERS




WITH BALUSTERS

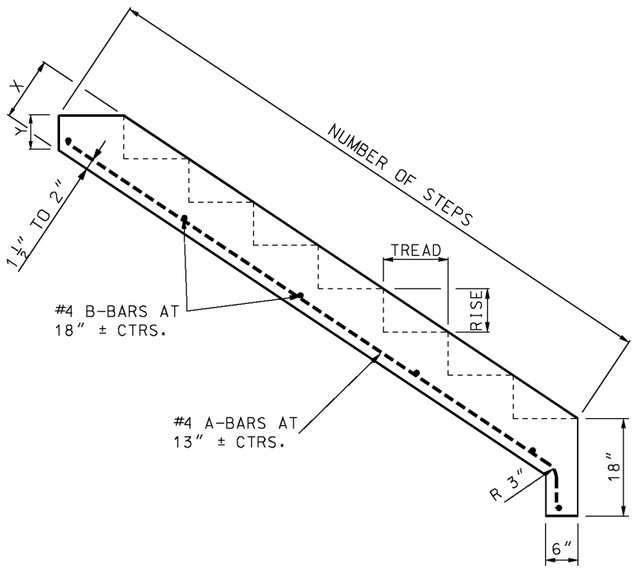
| RAILING & POST SPECIFICATIONS | | | |
|---|---|---|---|
| TYPE | SIZE (DIA.) | WEIGHT (LBS./FT.) | |
| | | ALUM. | STEEL |
| ROUND | 1½" | 0.940 | 2.72 |
| SQUARE | 2" X 2" | 1.3094 | 4.31 |

| STEP DIMENSIONS | | | | |
|---|---|---|---|---|
| SLOPE | TREAD | RISE | X | Y |
| 1:1.5 | 10½" | 7" | 10 3/16" | 5¼" |
| 1:2 | 12" | 6" | 10⅜" | 5 9/16" |
| 1:3 | 14¼" | 4¾" | 9½" | 5¼" |

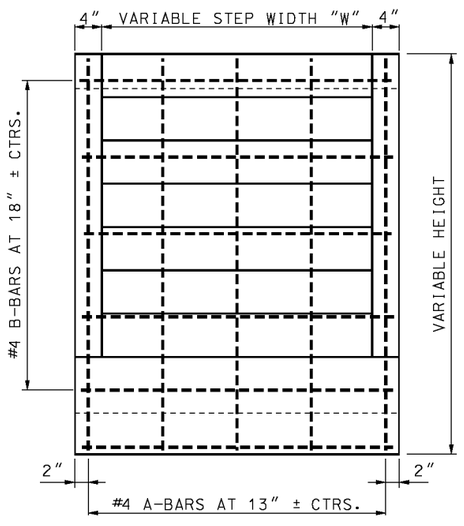



DETAIL A

## SAFETY RAIL DETAILS




SIDE ELEVATION




FRONT ELEVATION

## STAIRWAY STEP DETAILS

GENERAL NOTES:

STAIRWAY SHALL HAVE SAFETY RAILS AT BOTH SIDES OF ALL STEPS.

RAILINGS AND POSTS MAY BE EITHER ROUND OR SQUARE STEEL OF GOOD COMMERCIAL WELDABLE QUALITY OR ALUMINUM ALLOY 6061-T6 OR 6063-T6.

STEEL RAILINGS AND POSTS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AASHTO M111.

ALL JOINTS SHALL BE CONTINUOUS WELDED AND GROUND SMOOTH.

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

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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE STAIRS

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

608.20E

SHEET NO. 1 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

# QUANTITIES FOR CONCRETE STEPS

CONCRETE C.Y. STEEL LB.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10½" TREAD | | | | | 1:1.5 SLOPE | | | 7" RISE | | | | |
| W | NO. STEPS | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 2' | CONC. | 0.20 | 0.29 | 0.38 | 0.47 | 0.56 | 0.65 | 0.74 | 0.83 | 0.92 | 1.01 | 1.10 | 1.19 | 1.28 |
| | STEEL | 10 | 13 | 16 | 20 | 24 | 28 | 30 | 34 | 38 | 42 | 46 | 48 | 52 |
| 3' | CONC. | 0.27 | 0.39 | 0.51 | 0.63 | 0.75 | 0.88 | 1.00 | 1.12 | 1.24 | 1.36 | 1.48 | 1.60 | 1.73 |
| | STEEL | 13 | 18 | 21 | 27 | 32 | 38 | 41 | 46 | 52 | 57 | 63 | 65 | 71 |
| 4' | CONC. | 0.34 | 0.49 | 0.64 | 0.80 | 0.95 | 1.10 | 1.25 | 1.40 | 1.56 | 1.71 | 1.86 | 2.01 | 2.17 |
| | STEEL | 17 | 23 | 27 | 34 | 41 | 48 | 52 | 59 | 66 | 73 | 80 | 83 | 90 |
| 5' | CONC. | 0.41 | 0.59 | 0.78 | 0.96 | 1.14 | 1.33 | 1.51 | 1.69 | 1.88 | 2.06 | 2.24 | 2.42 | 2.61 |
| | STEEL | 21 | 28 | 33 | 42 | 50 | 59 | 63 | 71 | 80 | 88 | 97 | 101 | 109 |
| 6' | CONC. | 0.48 | 0.70 | 0.91 | 1.12 | 1.34 | 1.55 | 1.77 | 1.98 | 2.19 | 2.41 | 2.62 | 2.84 | 3.05 |
| | STEEL | 24 | 33 | 39 | 49 | 59 | 69 | 74 | 84 | 94 | 104 | 114 | 118 | 128 |
| | | 12" TREAD | | | | | 1:2 SLOPE | | | 6" RISE | | | | |
| W | NO. STEPS | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 2' | CONC. | 0.18 | 0.26 | 0.33 | 0.41 | 0.49 | 0.56 | 0.64 | 0.72 | 0.80 | 0.87 | 0.95 | 1.03 | 1.10 |
| | STEEL | 10 | 12 | 16 | 19 | 23 | 25 | 29 | 33 | 36 | 39 | 42 | 46 | 50 |
| 3' | 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 |
| 4' | CONC. | 0.31 | 0.44 | 0.57 | 0.70 | 0.83 | 0.96 | 1.09 | 1.22 | 1.35 | 1.48 | 1.61 | 1.74 | 1.87 |
| | STEEL | 17 | 20 | 27 | 33 | 40 | 44 | 50 | 57 | 63 | 67 | 73 | 81 | 87 |
| 5' | 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 | 53 | 61 | 69 | 77 | 82 | 89 | 98 | 105 |
| 6' | CONC. | 0.44 | 0.62 | 0.81 | 0.99 | 1.17 | 1.36 | 1.54 | 1.72 | 1.90 | 2.09 | 2.27 | 2.45 | 2.64 |
| | STEEL | 24 | 29 | 39 | 48 | 58 | 62 | 71 | 81 | 90 | 96 | 105 | 115 | 124 |
| | | 14¼" TREAD | | | | | 1:3 SLOPE | | | 4¾" RISE | | | | |
| W | NO. STEPS | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 2' | CONC. | 0.19 | 0.27 | 0.35 | 0.43 | 0.51 | 0.59 | 0.68 | 0.76 | 0.84 | 0.92 | 1.00 | 1.08 | 1.16 |
| | STEEL | 10 | 14 | 18 | 21 | 25 | 29 | 33 | 37 | 41 | 43 | 47 | 51 | 55 |
| 3' | 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 |
| 4' | CONC. | 0.33 | 0.47 | 0.61 | 0.74 | 0.88 | 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 |
| 5' | 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 |
| 6' | 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 |

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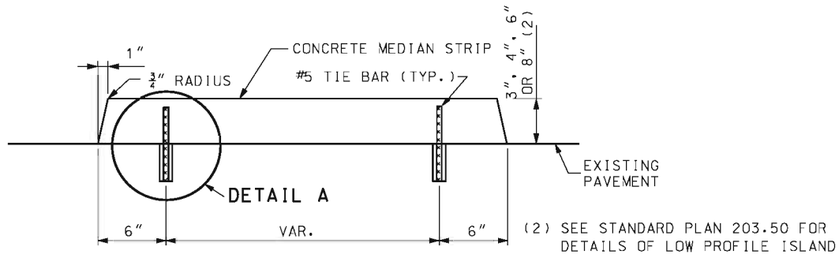
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ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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## CONCRETE STAIRS

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DATE PREPARED: 2/20/2015

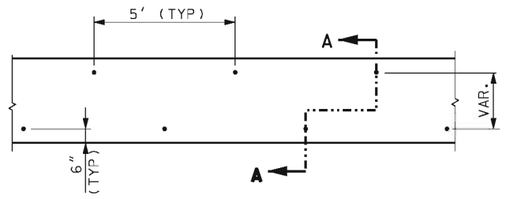
608.20E

SHEET NO.
2 OF 2

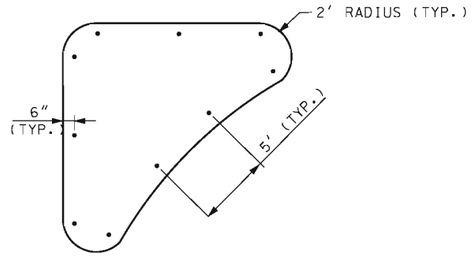



(2) SEE STANDARD PLAN 203.50 FOR DETAILS OF LOW PROFILE ISLAND

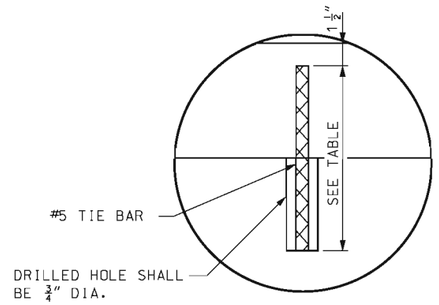
## SECTION A-A CONCRETE MEDIAN STRIP




## TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP

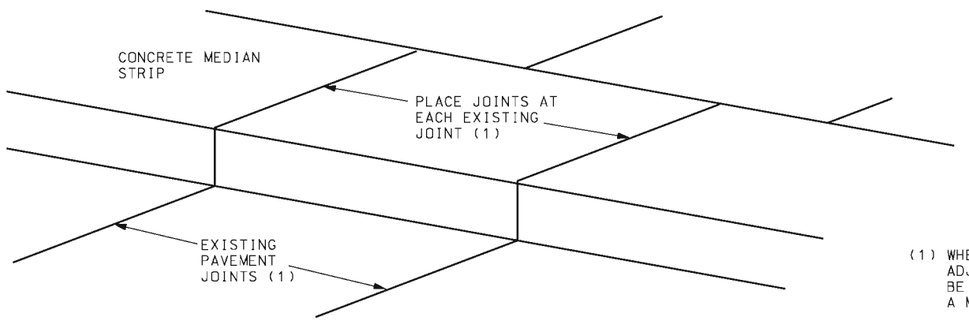



## TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP (ISLAND)




## DETAIL A

| MEDIAN HEIGTH | BAR LENGTH |
|---|---|
| 3″ | 8″ |
| 4″ | 9″ |
| 6″ | 11″ |
| 8″ | 13″ |




## CONCRETE MEDIAN STRIP JOINT LOCATION

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

GENERAL NOTES:

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

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

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

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

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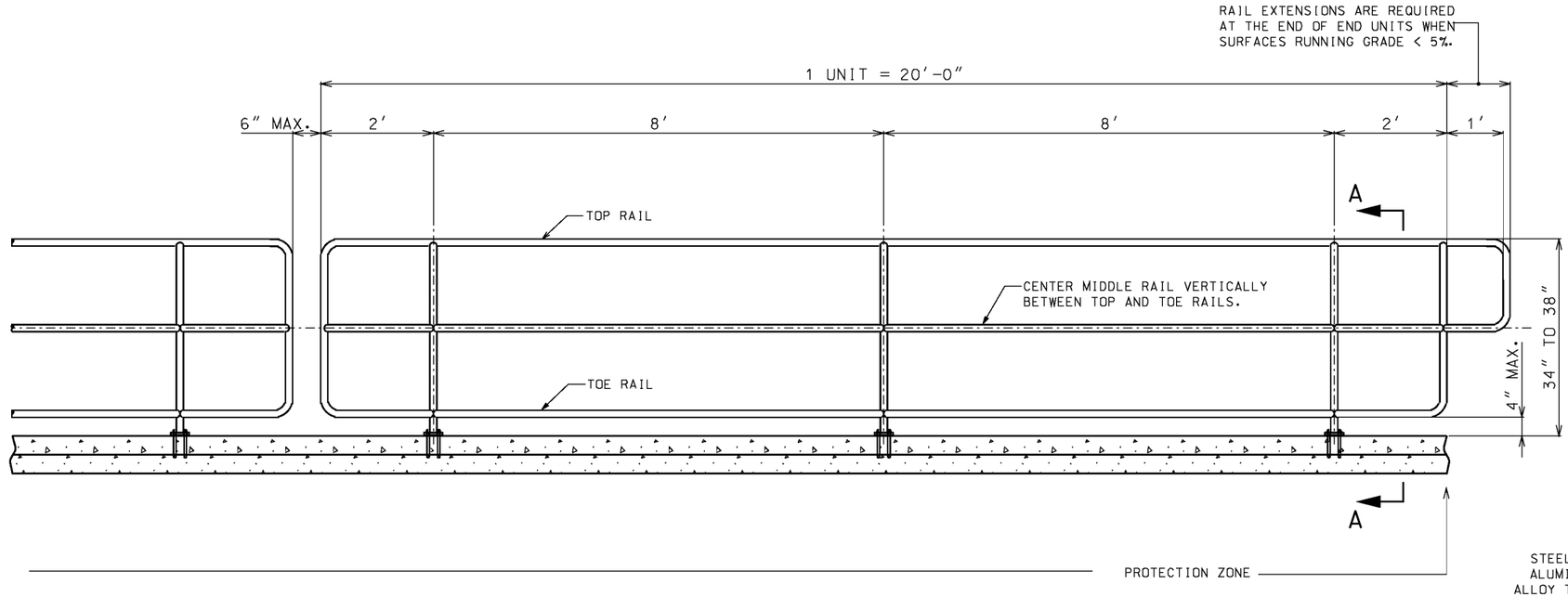
# CONCRETE MEDIAN STRIP

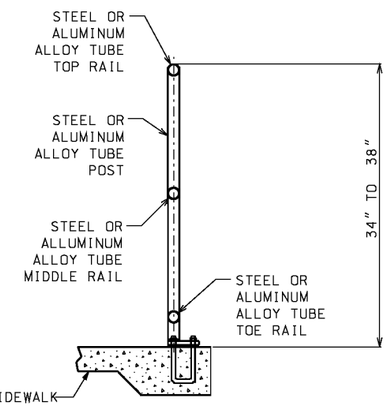
DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 3/9/2011

608.30A

SHEET NO. 1 OF 1

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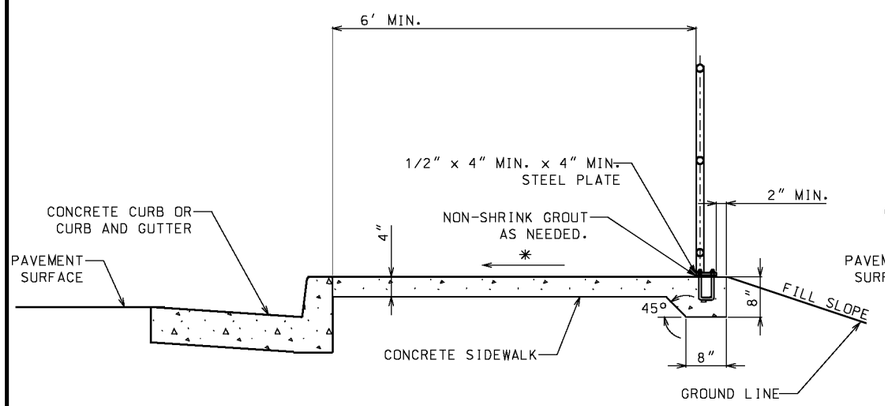


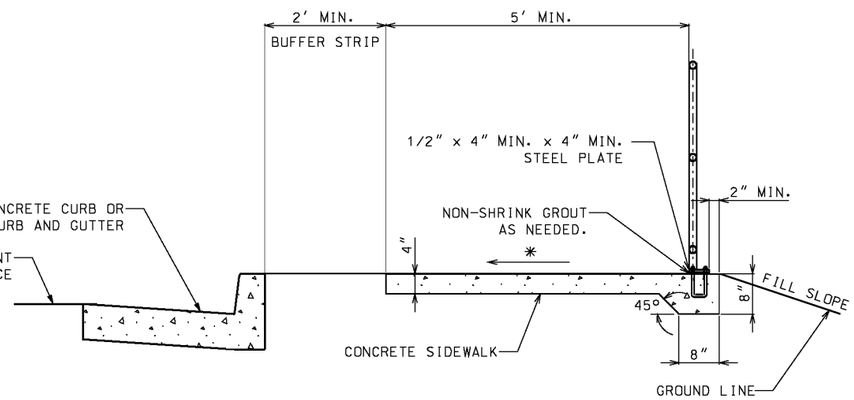

HANDRAILING

# SIDEWALK HANDRAILING WITHOUT BALUSTERS

✳ CROSS SLOPE: 1.0 % MIN. - 2.0 % MAX.




SIDEWALK WITHOUT BUFFER STRIP
(SECTION A-A)




SIDEWALK WITH BUFFER STRIP
(SECTION A-A)

FOR GENERAL NOTES AND HANDRAILING REQUIREMENTS ON FILL SLOPES SEE SHEET 3 OF 4

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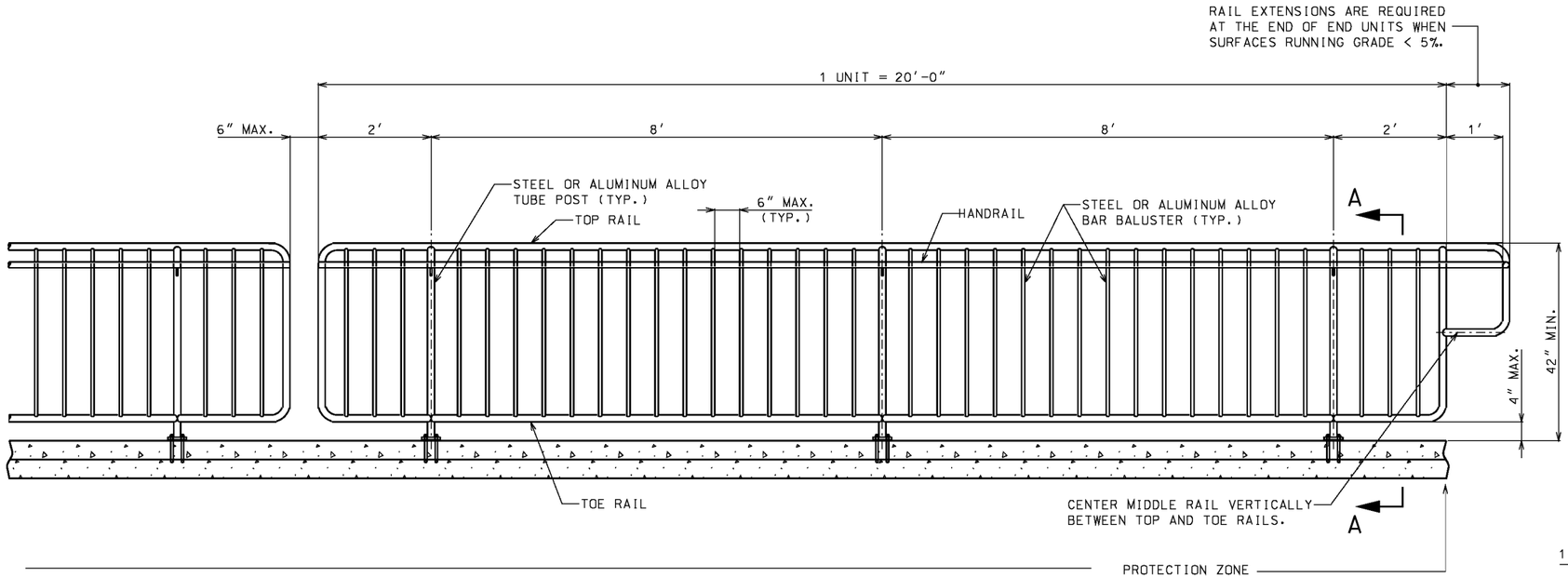
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NUMBER PE-28411
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# HANDRAILING

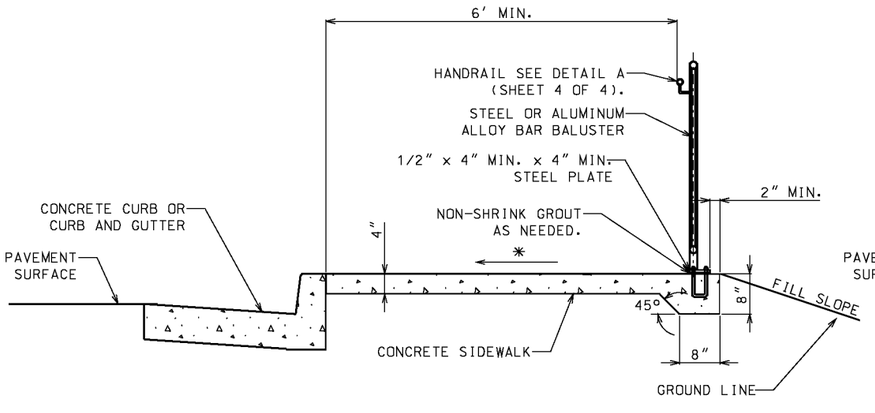
DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

608.40

SHEET NO.
1 OF 4

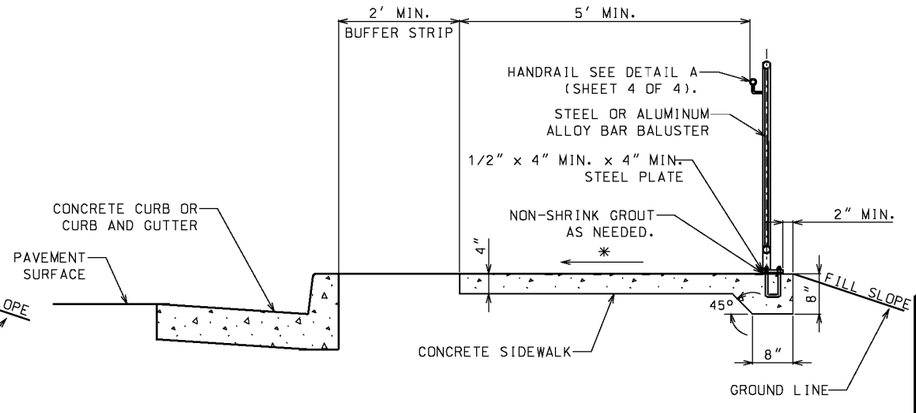



## SIDEWALK SAFETY RAIL WITH BALUSTERS AND HANDRAIL

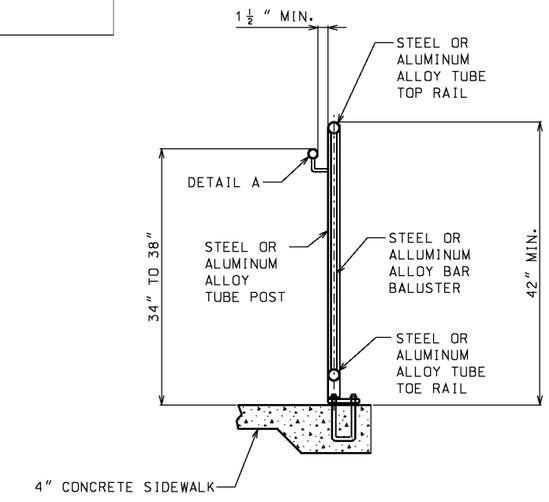



### SIDEWALK WITHOUT BUFFER STRIP (SECTION A-A)

✳ CROSS SLOPE: 1.0 % MIN. - 2.0 % MAX.




### SIDEWALK WITH BUFFER STRIP (SECTION A-A)




### SAFETY RAIL WITH HANDRAIL

FOR GENERAL NOTES AND HANDRAIL REQUIREMENTS ON FILL SLOPES SEE SHEET 3 OF 4.

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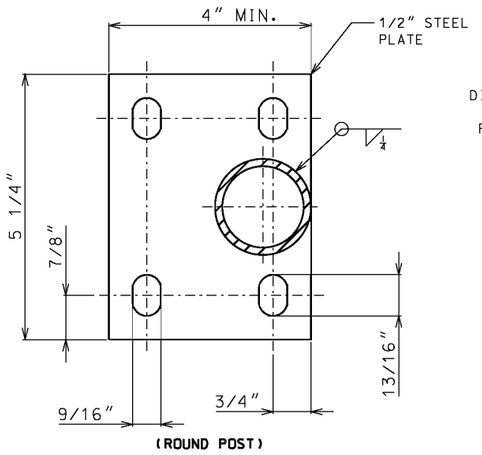
# HANDRAILING

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DATE PREPARED: 2/20/2015

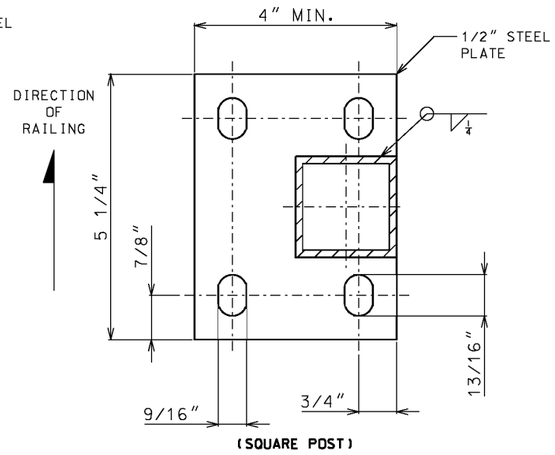
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SHEET NO. 2 OF 4

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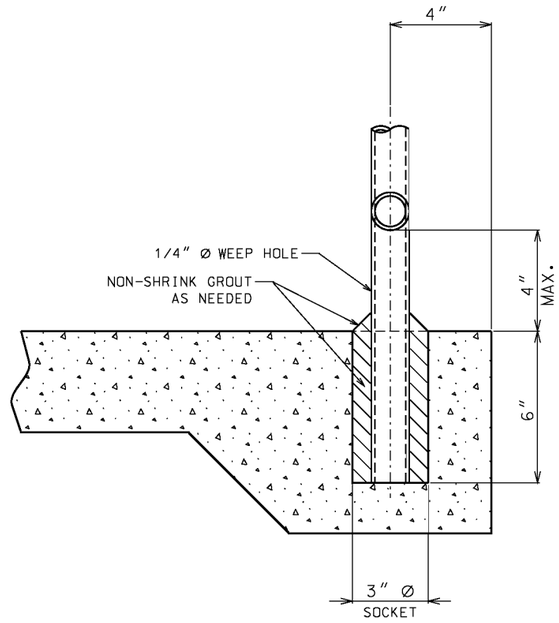



(ROUND POST)




(SQUARE POST)

**MOUNTING PLATE DETAIL (PLAN VIEW)**




**SOCKET MOUNTING DETAIL**

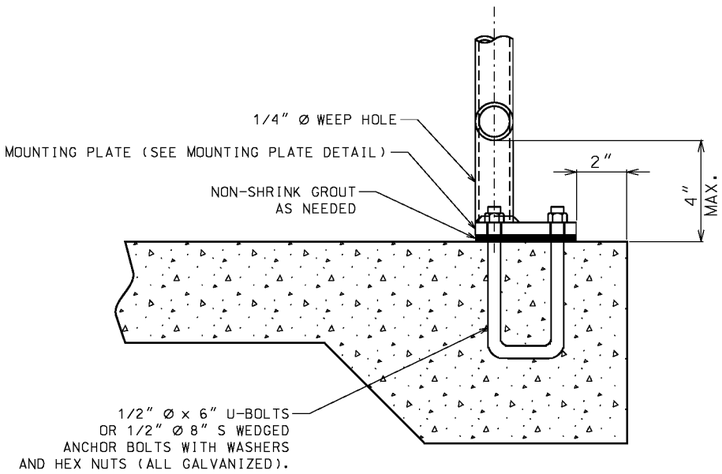



**PLATE MOUNTING DETAIL**

| HANDRAIL REQUIREMENTS | | |
|---|---|---|
| FILL SLOPE | FILL HEIGHT | HANDRAIL |
| (1V:3H) OR FLATTER | ——— | NOT REQUIRED |
| (1V:3H) OR STEEPER | $\geq$ 6 FT. | REQUIRED |
| (1V:2H) OR STEEPER | $\geq$ 4 FT. | REQUIRED |
| (1V:1H) OR STEEPER | $\geq$ 1 FT. | REQUIRED |

**GENERAL NOTES:**

RAILINGS AND POSTS MAY BE EITHER ROUND OR SQUARE STEEL OF GOOD COMMERCIAL WELDABLE QUALITY OR ALUMINUM ALLOY 6061-T6 OR 6063-T6.

STEEL RAILINGS AND POSTS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AASHTO M111.

ALL JOINTS SHALL BE CONTINUOUS WELDED AND GROUND SMOOTH.

METAL SAFETY RAIL MUST BE COMPLIANT WITH THE "AMERICAN'S WITH DISABLILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG)". EXCEPTIONS MUST BE APPROVED BY THE ENGINEER. ALL OTHER AREAS OF NON-COMPLIANCE SHALL BE REMOVED AND CORRECTED AT THE CONTRACTOR'S EXPENSE.

ALL POSTS SHALL HAVE A 1/4" WEEP HOLE IMMEDIATELY ABOVE THE MOUNTING PLATE.

WHEN INSTALLED THE POSTS SHALL BE PLUMB AND RAILINGS SHALL MATCH THE SLOPE OF THE SIDEWALK.

| RAILING AND POST SPECIFICATION | | | | |
|---|---|---|---|---|
| DESCRIPTION | TYPE | SIZE ( DIA.) | WEIGHT (LBS. / FT.) | |
| | | | ALUM. | STEEL |
| RAILING & POST | ROUND | 1 1/2" | 0.940 | 2.720 |
| | SQUARE | 2" X 2" | 1.3094 | 4.310 |
| BALUSTER | ROUND | 1/2" | 0.2312 | 0.668 |
| | RECT. | 3/8" X 1/2" STL. | ——— | 0.6375 |
| | SQUARE | 1/2" X 1/2" ALUM. | 0.2944 | ——— |


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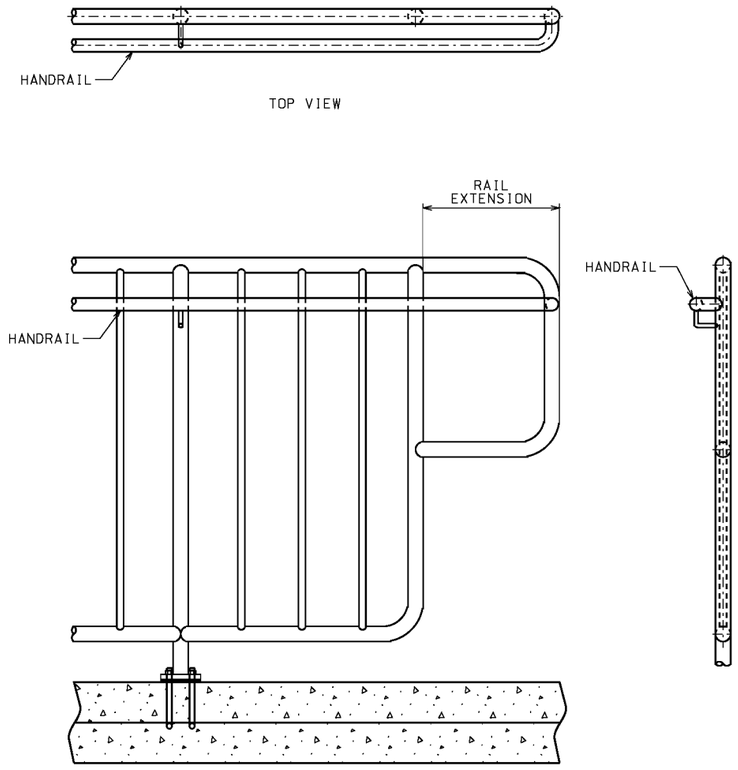
# HANDRAILING

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

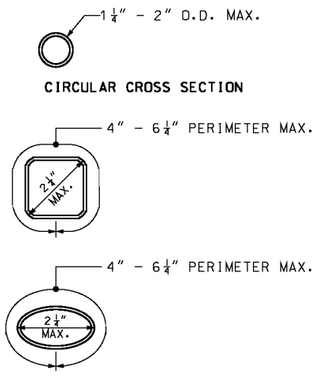
608.40

SHEET NO. 3 OF 4

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




HANDRAIL AND EXTENSION CONNECTION




HANDRAIL GRIPPING SURFACES

HANDRAIL NOTES:

HANDRAILS SHALL BE STEEL OF GOOD COMMERCIAL WELDABLE QUALITY OR ALUMINUM ALLOY 6061-T6 OR 6063-T6.

HANDRAILS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AASHTO M111.

HANDRAILS SHALL BE AT A CONSISTENT HEIGHT ABOVE WALKING SURFACES.

HANDRAIL GRIPPING SURFACES SHALL BE CONTINUOUS ALONG THEIR LENGTH AND SHALL NOT BE OBSTRUCTED ALONG THEIR TOPS OR SIDES.

THE BOTTOMS OF HANDRAIL GRIPPING SURFACES SHALL NOT BE OBSTRUCTED FOR MORE THAN 20 PERCENT OF THEIR LENGTH.

WHERE HANDRAILS ARE PROVIDED ALONG WALKING SURFACES WITH SLOPES NOT STEEPER THAN 1:20, THE BOTTOMS OF HANDRAIL GRIPPING SURFACES SHALL BE PERMITTED TO BE OBSTRUCTED ALONG THEIR ENTIRE LENGTH WHERE THEY ARE INTEGRAL TO CRASH RAILS OR BUMPER GUARDS.

THE DISTANCE BETWEEN HORIZONTAL PROJECTIONS AND THE BOTTOM OF THE GRIPPING SURFACE SHALL BE PERMITTED TO BE REDUCED BY $\frac{1}{8}$" FOR EACH $\frac{1}{2}$" OF ADDITIONAL HANDRAIL PERIMETER DIMENSION THAT EXCEEDS 4".

HANDRAIL SURFACES AND ANY SURFACES ADJACENT TO THEM SHALL BE FREE OF SHARP OR ABRASIVE ELEMENTS AND SHALL HAVE ROUNDED EDGES.

HANDRAILS SHALL NOT ROTATE WITHIN THEIR FITTINGS.

# DETAIL A - HANDRAIL

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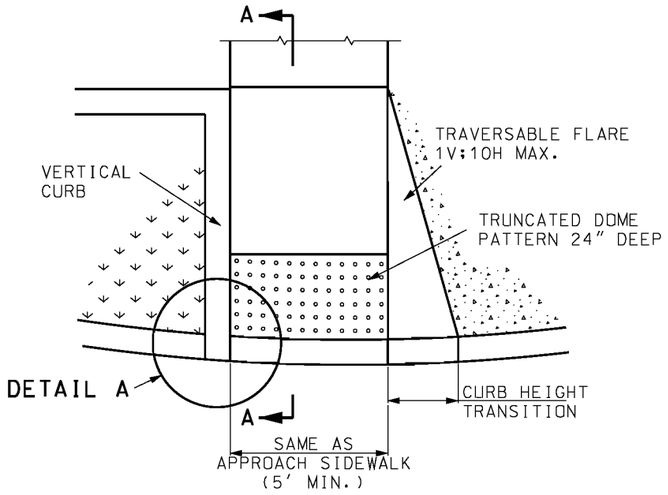
## HANDRAILING

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

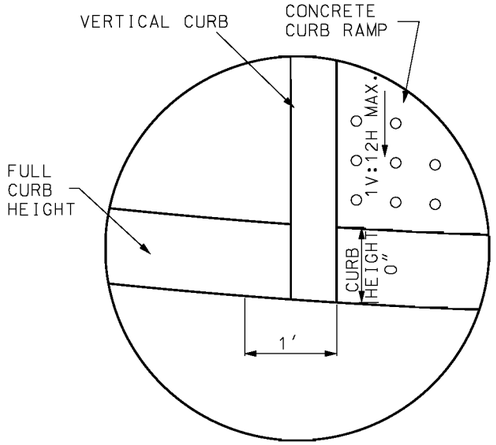
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SHEET NO. 4 OF 4

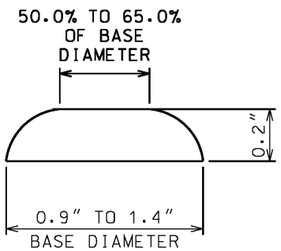
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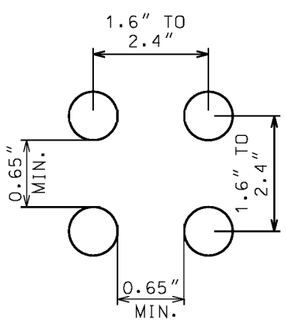

CURB RAMP DETAIL



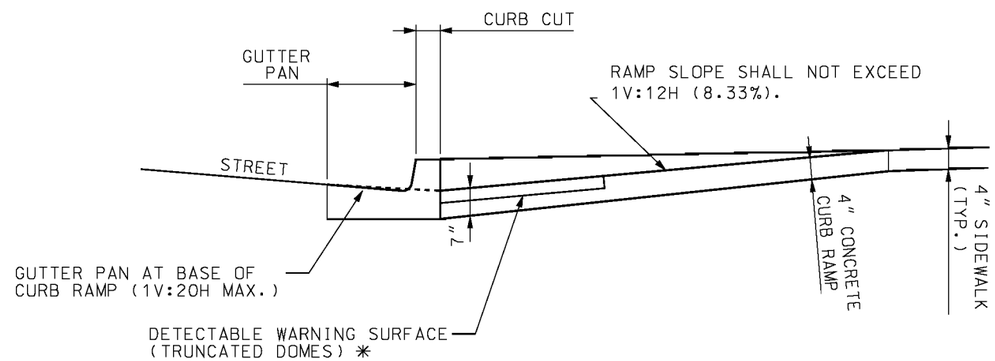

DETAIL A




TRUNCATED DOMES
CROSS SECTION




TRUNCATED DOMES
SPACING




SECTION A-A

* SOME DETECTABLE WARNING PRODUCTS REQUIRE A CONCRETE BORDER FOR PROPER INSTALLATION. THE CONCRETE BORDER SHALL NOT EXCEED 2 INCH PER SIDE.

GENERAL NOTES:

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

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

SIDEWALK, RAMP AND LANDING CROSS SLOPES SHALL BE 1.00% TO FACILITATE DRAINAGE (2.00% MAX.).

THE CROSS SLOPE OF THE CONTINUOUS PEDESTRIAN ACCESS ROUTE THROUGH ENTRANCES, ALLEYS, AND SIDEROAD CONNECTIONS WITH STOP OR YIELD CONTROL SHALL BE 1.00% TO FACILITATE DRAINAGE (2.00% MAX.).

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

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

30"x 48" CLEAR SPACE SHALL BE PROVIDED CENTERED ON THE PEDESTRIAN PUSH BUTTON.

BEYOND THE BOTTOM GRADE BREAK OF A CURB RAMP, A CLEAR SPACE 4'MINIMUM BY 4'MINIMUM SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND WHOLLY OUTSIDE THE PARALLEL VEHICLE TRAVEL LANE.

SIDE FLARES OF CURB RAMPS, IN THE PATH OF PEDESTRIAN TRAVEL (TRAVERSABLE), SHALL NOT EXCEED A SLOPE OF 1V:10H. SIDE FLARES OUTSIDE THE PEDESTRIAN PATH (NONTRAVERSABLE) MAY BE VERTICAL.

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

DETECTABLE WARNING SURFACES (TRUNCATED DOMES) SHALL BE PREFORMED AND INSTALLED AS PER MANUFACTURER'S RECOMENDATIONS. STAMPED CONCRETE WILL NOT BE ACCEPTED.

THE DETECTABLE WARNING SURFACE SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES, EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT. TRUNCATED DOMES SHALL SPAN THE FULL WIDTH OF THE RAMP OR LANDING 24" DEEP.

DETECTABLE WARNING SURFACES SHALL BE ALIGNED PERPENDICULAR OR RADIAL TO THE BREAK BETWEEN THE RAMP, LANDING OR BLENDED TRANSITION, AND THE STREET.

WHERE THE BOTTOM GRADE BREAK OF A CURB RAMP IS LESS THAN 5' FROM THE BACK OF CURB, DETECTABLE WARNINGS SHALL BE LOCATED ON THE RAMP SURFACE AT THE BACK OF THE CURB. WHERE THE GRADE BREAK IS GREATER THAN 5' FROM THE BACK OF CURB, THE DETECTABLE WARNING SHALL BE LOCATED ON THE LOWER LANDING.

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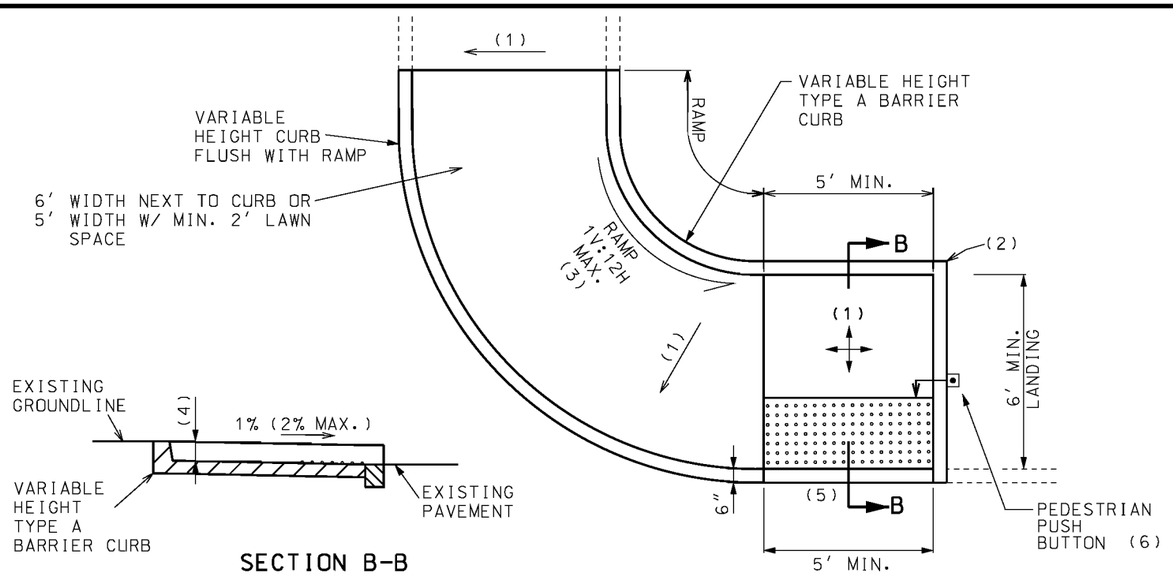
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CURB RAMPS

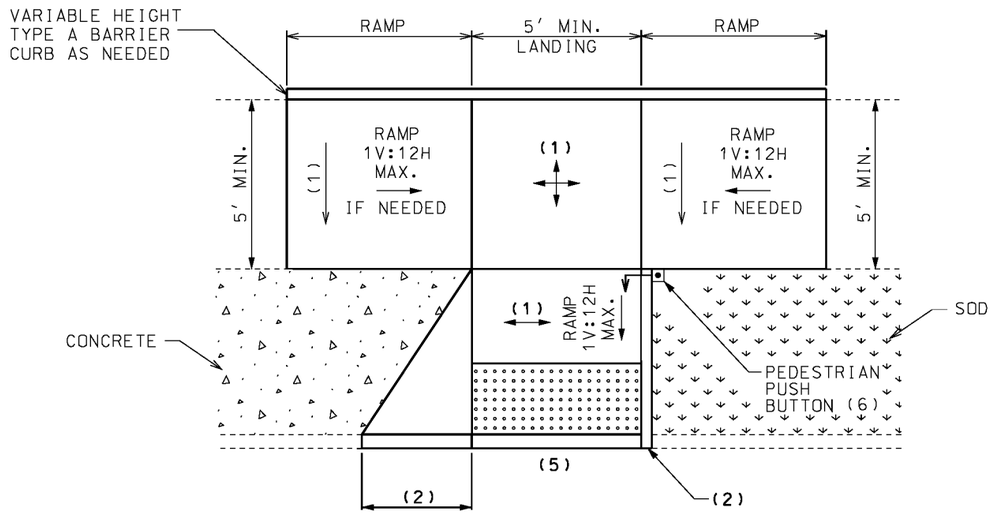
DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 5/29/2015

608.50

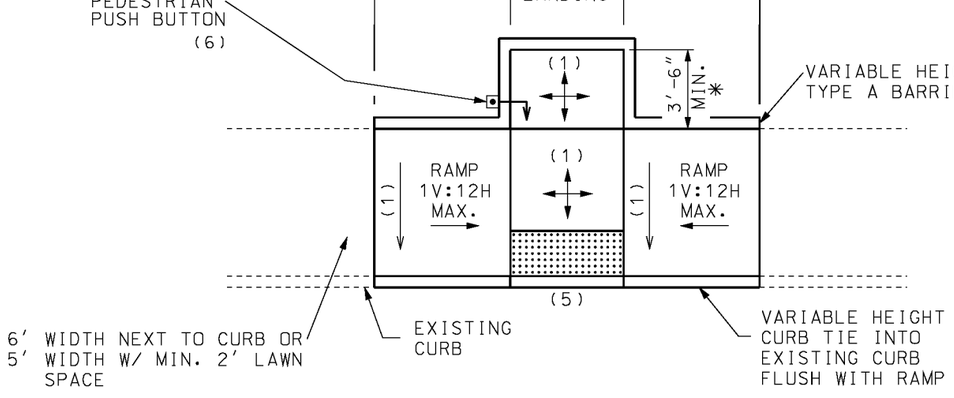



SECTION B-B

TYPE 1 PARALLEL

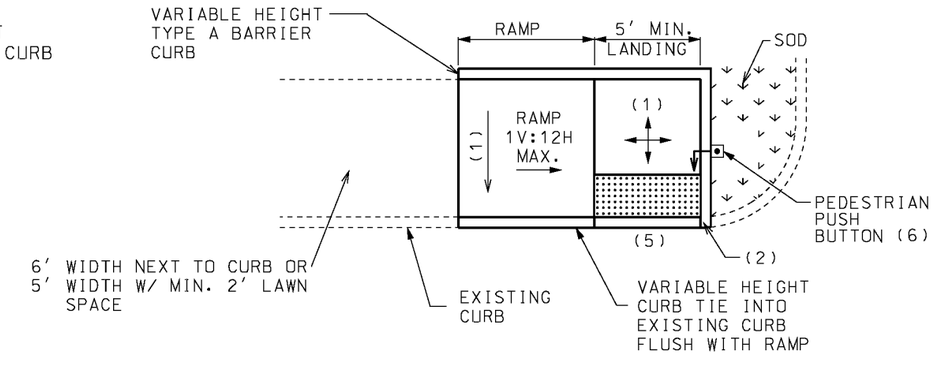



COMPOUND PERPENDICULAR

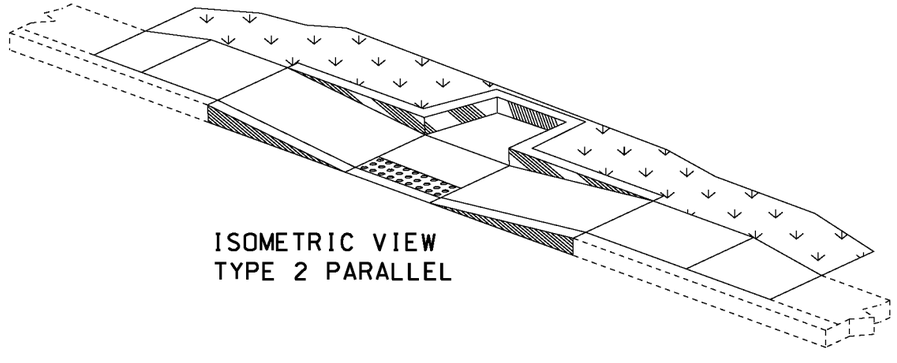



* - OMIT 3'-6" X 5' LANDING IF NO PEDESTRIAN PUSH BUTTON

TYPE 2 PARALLEL




TYPE 3 PARALLEL



ISOMETRIC VIEW
TYPE 2 PARALLEL

GENERAL NOTES:

(1) 1.0% (2.0% MAX.) OR ROAD GRADE EXCEPTION
(2) VARIABLE HEIGHT VERTICAL CURB . IF TRAVERSABLE USE A MAX. 1V:10H FLARE MEASURED PARALLEL TO THE CURB LINE.
(3) ENSURE THAT THE INSIDE EDGE OF CURVED RAMPS MAINTAIN AN 8.3% (1V:12H) MAXIMUM SLOPE.
(4) HEIGHT VARIES TO MEET EXISTING GROUND.
(5) THE COUNTER SLOPE OF THE GUTTER OR STREET AT THE FOOT OF CURB RAMP RUNS, BLENDED TRANSITIONS, AND TURNING SPACES SHALL BE 5% MAXIMUM.
(6) THE FACE OF PEDESTRIAN PUSH BUTTONS SHALL BE 0" OFFSET FOR FRONT APPROACH AND 10" MAX. FOR SIDE APPROACH TO THE CURB FACE.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

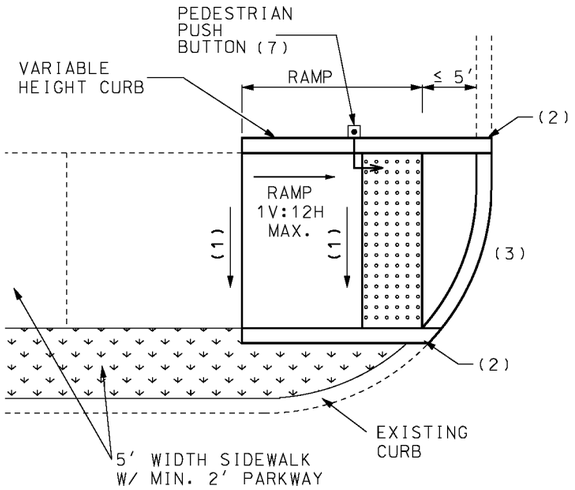
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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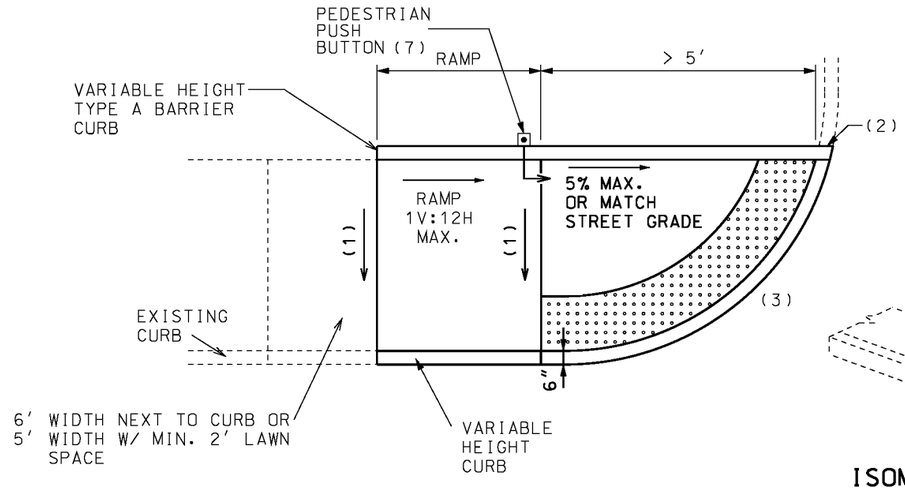
# CURB RAMPS

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

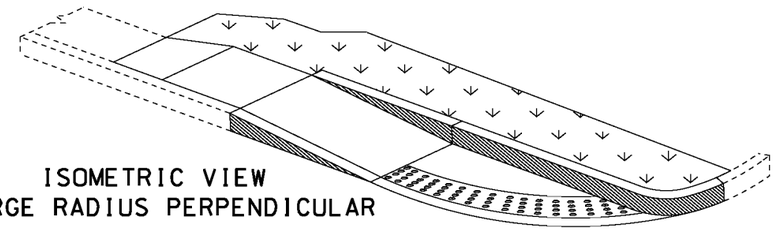
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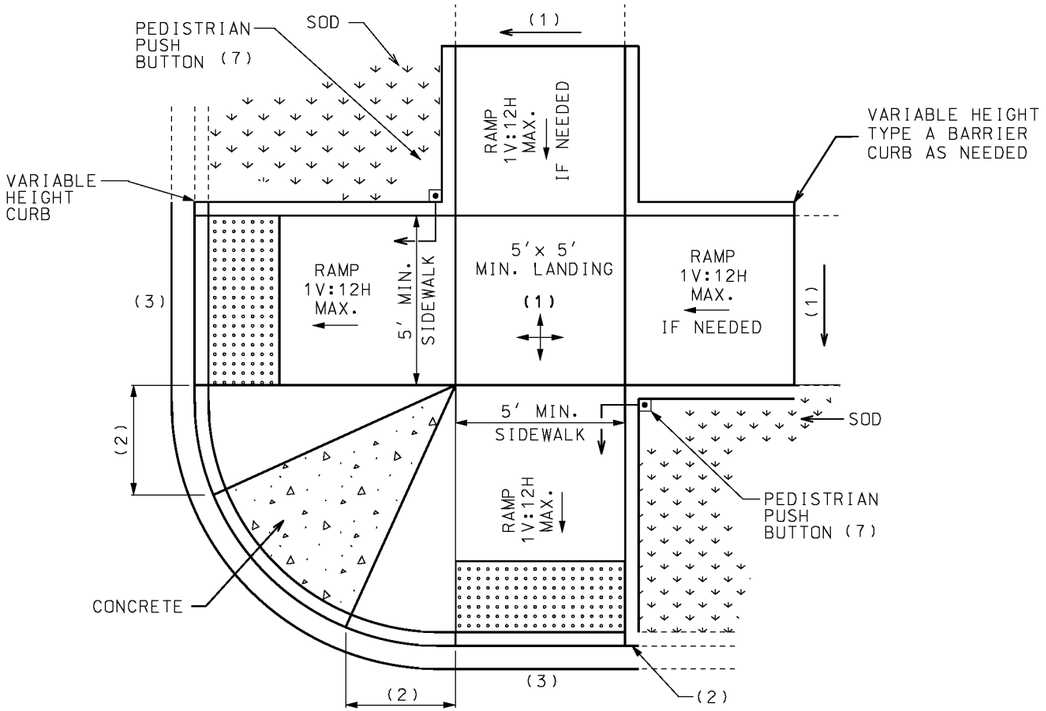

SMALL RADIUS PERPENDICULAR



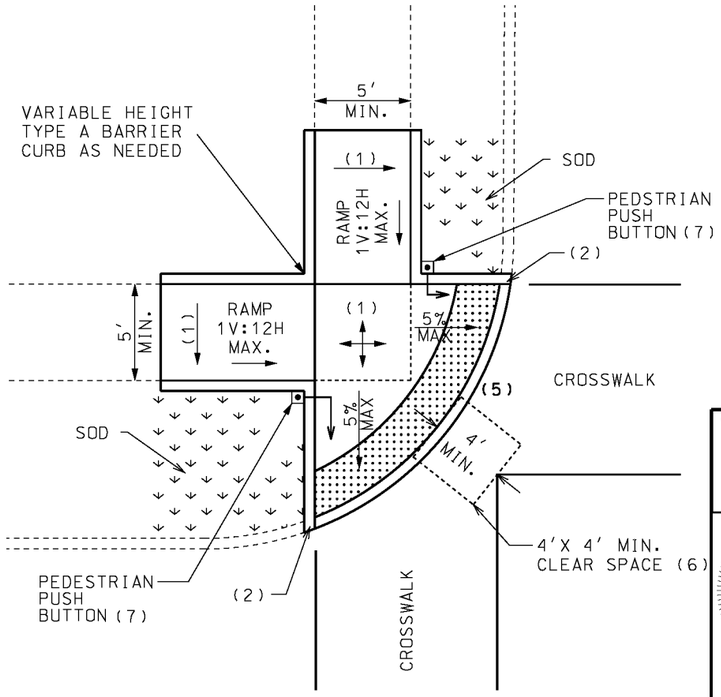

LARGE RADIUS PERPENDICULAR



ISOMETRIC VIEW
LARGE RADIUS PERPENDICULAR




DUAL PERPENDICULAR




BLENDED TRANSITION

GENERAL NOTES:

(1) 1.0% MINIMUM, 2.0% MAXIMUM.
(2) VERTICAL OR 1' FLARE. IF TRAVERSABLE USE A MAX. 1V:10H FLARE MEASURED PARALLEL TO THE CURB LINE.
(3) ENSURE THAT THE INSIDE EDGE OF CURVED RAMPS MAINTAIN AN 8.3% (1V:12H) MAXIMUM SLOPE.
(4) HEIGHT VARIES TO MEET EXISTING GROUND.
(5) THE COUNTER SLOPE OF THE GUTTER OR STREET AT THE FOOT OF CURB RAMP RUNS,BLENDED TRANSITIONS, AND TURNING SPACES SHALL BE 5% MAXIMUM.
(6) BEYOND THE BOTTOM GRADE BREAK, A CLEAR SPACE 4'X 4' MINIMUM SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND WHOLLY OUTSIDE THE PARALLEL VEHICLE TRAVEL LANE.
(7) THE FACE OF PEDESTRIAN PUSH BUTTONS SHALL BE 0" OFFSET FOR FRONT APPROACH AND 10" MAX. FOR SIDE APPROACH TO THE CURB FACE.

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

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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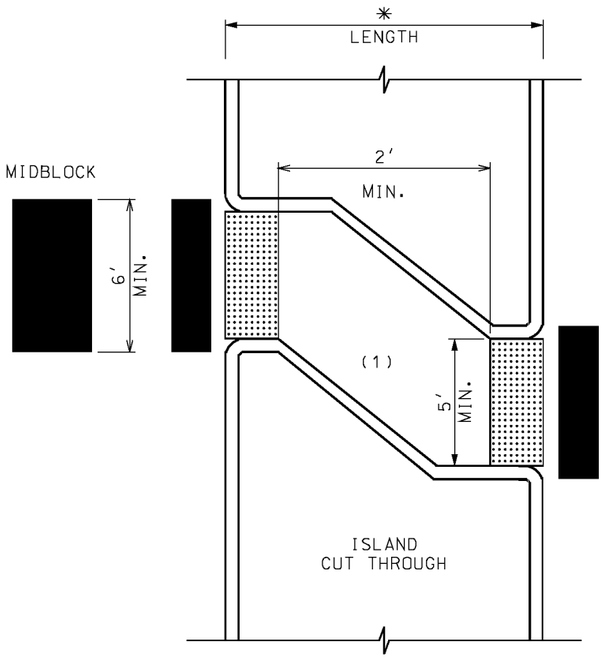
# CURB RAMPS

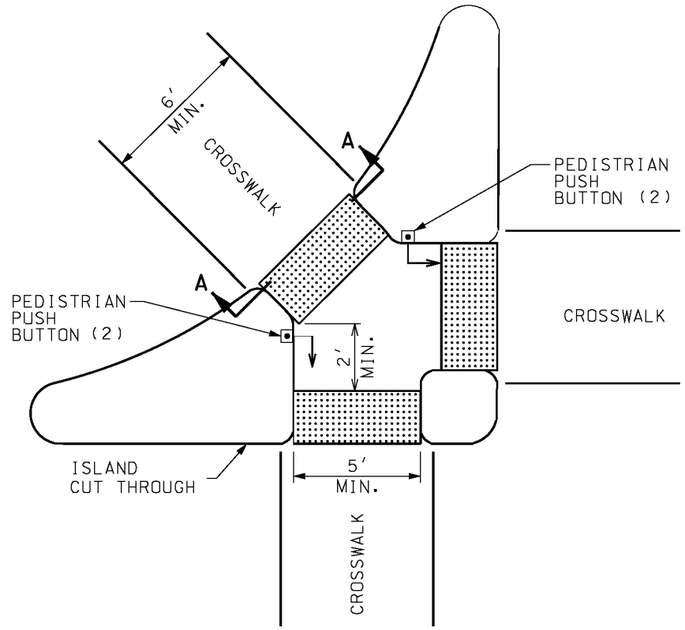
DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

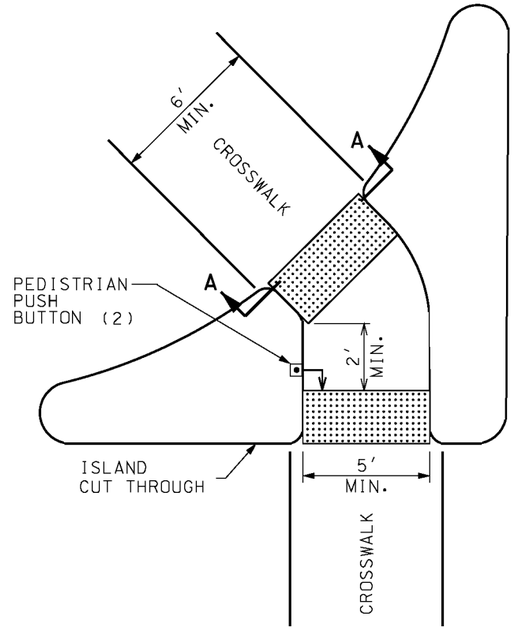
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SHEET NO. 3 of 4

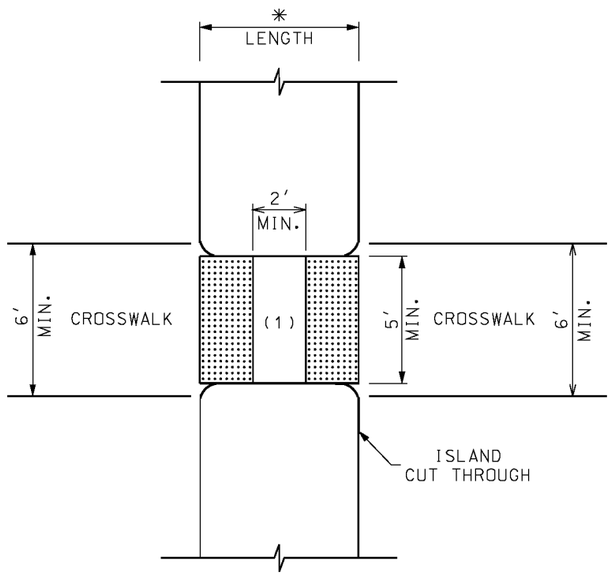
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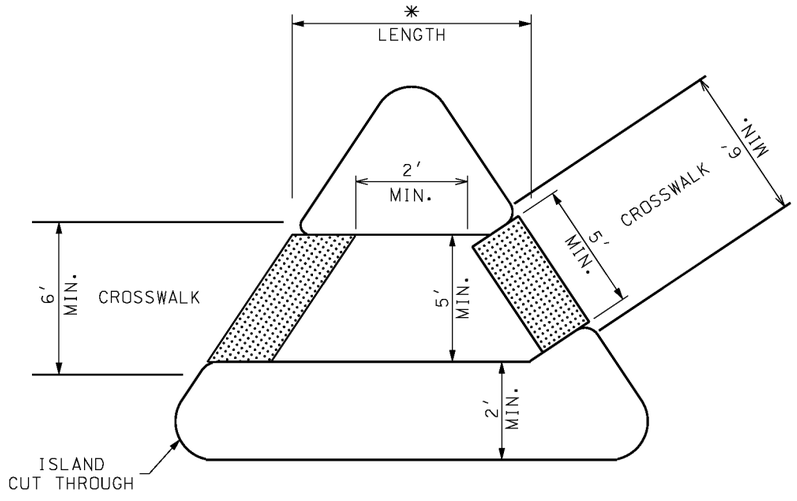


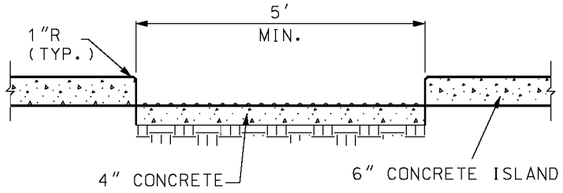




(2) PEDESTRIAN PUSH BUTTONS SHALL BE 0" OFFSET FOR FRONT APPROACH AND 10" MAX. FOR SIDE APPROACH TO THE CURB FACE.




SECTION A-A
ISLAND CUT THROUGH TYPICAL

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

RAMP MUST BE CONSTRUCTED TO DRAIN TO THE OUTSIDE.

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

(1) DETECTABLE WARNING SURFACES SHALL BE PLACED AT THE EDGES OF THE PEDESTRIAN ISLAND AND SHALL BE SEPARATED BY 2′ MIN. LENGTH OF SURFACE WITHOUT DETECTABLE WARNINGS.

ISLAND CUT THROUGHS

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

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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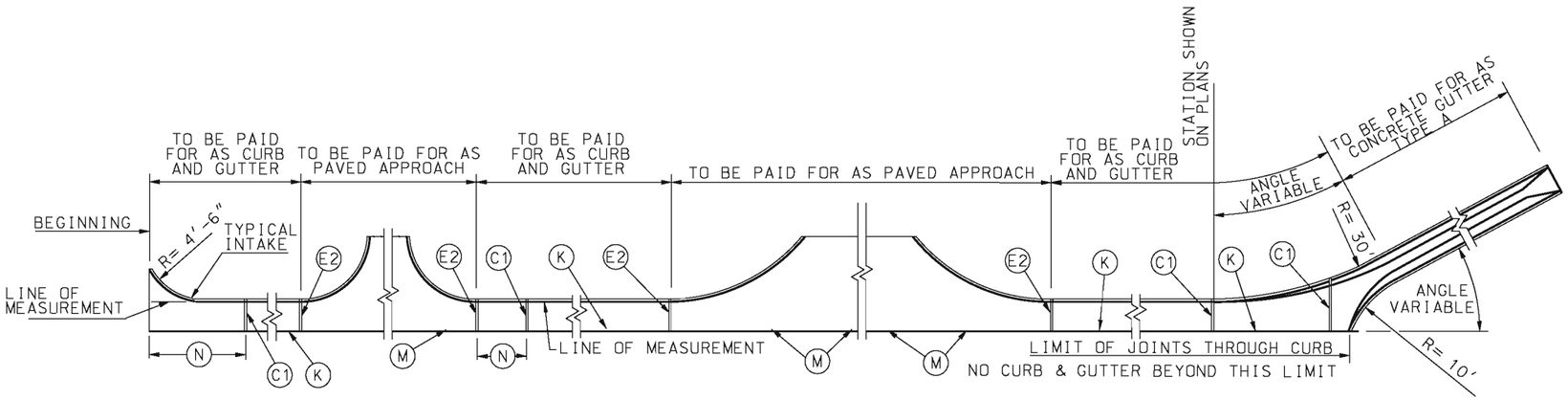
# CURB RAMPS

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DATE PREPARED: 2/20/2015

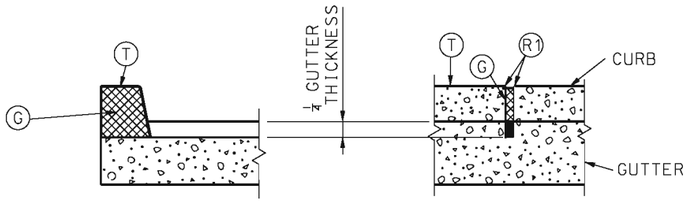
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SHEET NO. 4 of 4

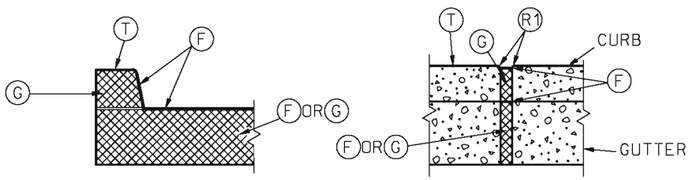
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



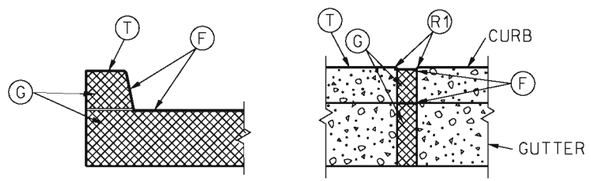

## PLAN OF MEASUREMENT OF CURB & GUTTER AND JOINT PLAN




C1 JOINT




E2 JOINT




E1 JOINT

LEGEND

- (C1) 1/8" MAXIMUM WIDTH TRANSVERSE CONTRACTION JOINT (PREFORMED OR SAWED).
- (E1) 2" TRANSVERSE EXPANSION JOINT. (PREFORMED OR SAWED)
- (E2) 1/2" TRANSVERSE EXPANSION JOINT. (PREFORMED OR SAWED)
- (F) FILLER FOR JOINTS - HOT POURED.
- (G) PREFORMED JOINT FILLER MATERIAL.
- (K) TONGUE & GROOVE JOINT WITH TIE BAR - SEE DETAIL.
- (M) TONGUE & GROOVE JOINT WITHOUT TIE BARS - SEE DETAIL.
- (N) NOT LESS THAN 10' OR MORE THAN 30'.
- (T) TOP OF CURB.
- (R1) ROUND TO 1/4" RADIUS. (EXCEPT FOR SAWED JOINTS)

GNERAL NOTES:

A MINIMUM 4" TYPE 1 OR 5 AGGREGATE BASE SHALL BE PLACED BENEATH ALL CURB AND GUTTER SECTIONS AND INCLUDED WITHIN THE MAINLINE BASE PAY LIMITS.

WHEN CURBS ARE CONSTRUCTED DIRECTLY BENEATH GUARDRAIL, CURB HEIGHT SHALL BE 4 INCH BARRIER CURB, AS SHOWN ON STANDARD PLAN 606.00.

CURB, GUTTER AND CURB AND CUTTER CONSTRUCTED ALONG AND ATTACHED TO CONCRETE PAVEMENT OR BASE SHALL HAVE:

1. JOINT (C1) ONE-QUARTER DEPTH OF CURB AND GUTTER THICKNESS AS A CONTINUATION OF EACH CONTRACTION JOINT IN THE BASE OR PAVEMENT.
2. JOINT (E1) AS CONTINUATION OF 2" EXPANSION JOINT (E) IN THE CONCRETE BASE OR PAVEMENT SHALL EXTEND AND CONTINUE THROUGH THE CURB, CUTTER AND CURB AND GUTTER.
3. JOINT (E2) THROUGH CURB AND CURB AND CUTTER AT THE BEGINNING AND END OF EACH PAVED APPROACH.

CURB, CURB AND GUTTER AND GUTTER CONSTRUCTED APART OR SEPARATED FROM CONCRETE BASE OR PAVEMENT OR AS A FORM FOR ASPHALTIC CONCRETE PAVEMENT SHALL HAVE A JOINT (E2) ENTIRELY THROUGH THE CURB, CURB AND GUTTER AND GUTTER, AT THE BEGINNING AND END OF EACH "PAVED APPROACH" AND A JOINT (C1) TO 1/4 DEPTH OF CURB AND GUTTER THICKNESS AT INTERVALS OF 30 FEET BETWEEN APPROACHES.

JOINTS (E1) AND (E2) THROUGH CURB SHALL BE FILLED WITH PREFORMED FILLER MATERIAL AND SEALED WITH HOT POURED FILLER FOR JOINTS.

JOINT (E1) IN GUTTER SHALL BE FILLED WITH PREFORMED FILLER AND SEALED WITH HOT FILLER MATERIAL.

JOINT (E2) IN GUTTER SHALL BE FILLED WITH PREFORMED FILLER AND SEALED WITH FILLER OR FILLED WITH HOT POURED FILLER.

PREFORMED FILLER MATERIAL SHALL BE PLACED TO PROVIDE 1" HOT POURED FILLER FOR JOINTS.

THE BARRIER CLASS CURBS MAY BE CONSTRUCTED WITHOUT BATTER WHEN CONSTRUCTED ON A RADIUS OF 6 FEET OR LESS. THE (R2) WILL BE REQUIRED.

WHERE A SIDEWALK INTERSECTS A CURB. THE SIDEWALK SHALL BE RAMPED NO STEEPER THAN 12:1 SLOPE TO PROVIDED ACCESS FOR WHEELCHAIR ACROSS APPROACHES.

WHEN ALLOWED BY THE ENGINEER, TYPES A AND B GUTTER MAY BE PRECAST TO CONFORM TO THE DIMENSIONS SHOWN. THE PRECASTER SHALL SUBMIT SHOP DRAWINGS INDICATING THE SECTION LENGTH. SECTION CONNECTION, AND PROPOSED JOINT SEALING SYSTEM. WHEN PRECAST SECTIONS CANNOT CONFORM TO ANY VERTICAL OR HORIZONTAL CURVE DESIGNATED ON THE PLANS. THE GUTTER SHALL BE CAST-IN-PLACE. A COMBINATION OF CAST-IN-PLACE AND PRECAST GUTTER MAY BE PERMITTED.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

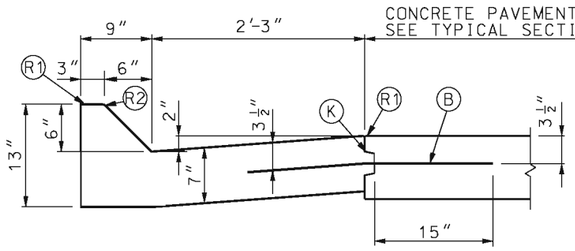
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# CONCRETE CURB, CURB AND GUTTER AND GUTTER

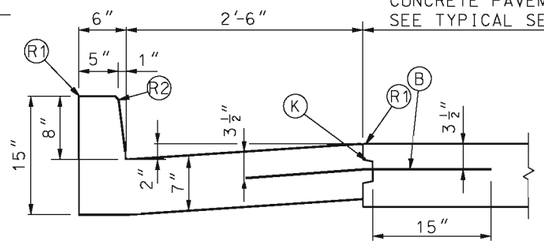
DATE EFFECTIVE: 08/01/2008
DATE PREPARED: 12/29/2011

609.00P

SHEET NO. 1 OF 2

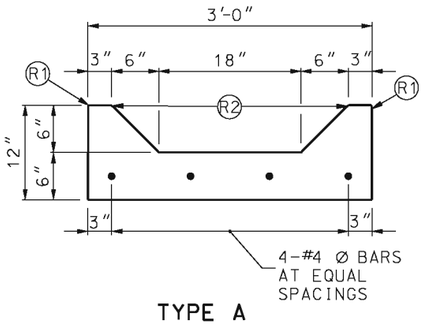



TYPE A
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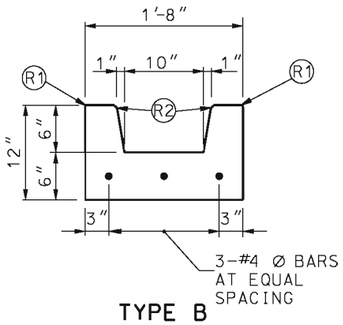



TYPE B
(BARRIER)

## CURB & GUTTER

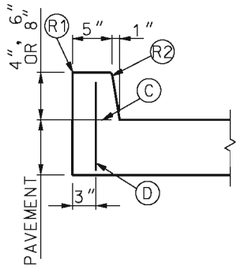



TYPE A

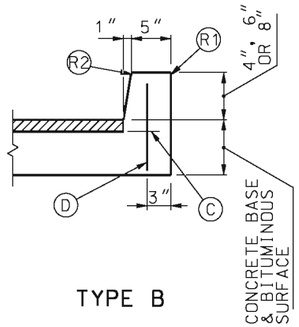



TYPE B

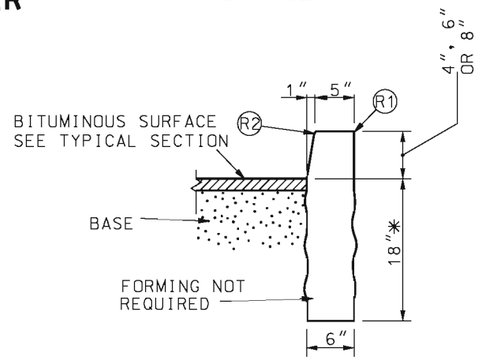
## GUTTERS




TYPE A
(INTEGRAL)



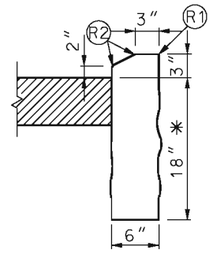

TYPE B



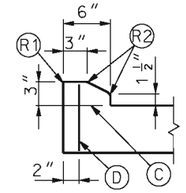

TYPE S
(SEPARATED)

✳ DEPTH MAY BE REDUCED IF KEYED 6" IN ROCK

## BARRIER CURBS




TYPE F
(SEPARATED)

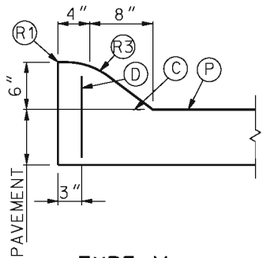



TYPE E
(INTEGRAL)

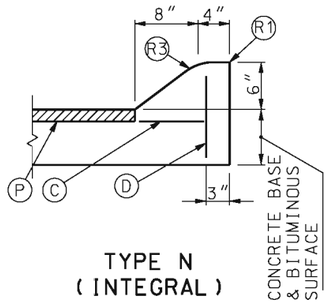
BEGINNING AND ENDINGS OF INTROCUCED LOW PROFILE CURBS SHALL UTILIZE CURB HEIGHT RUNOUT FORM 0 INCH TO 3 INCHES IN 5 FEET PAYMENT. LENGTH SHALL INCLUDE TAPERS.

✳ DEPTH MAY BE REDUCED IF KEYED 6" IN ROCK.

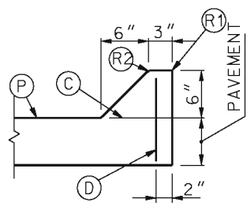
## LOW PROFILE CURB




TYPE M
(INTEGRAL)




TYPE N
(INTEGRAL)

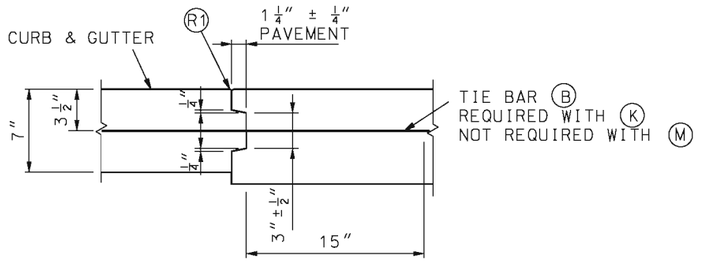



TYPE O
(INTEGRAL)

## MOUNTABLE CURBS

LEGEND

- (B) TIE BARS - 30" X #5 Ø AT 30" CTRS.
- (C) PERMISSIBLE CONSTRUCTION JOINT. IF CONSTRUCTED IN THIS MANNER TIE BARS MUST BE USED.
- (D) #4 Ø TIE BAR AT 24" CENTERS LENGTH OF THE TIE BARS EQUALS THICKNESS OF PAVEMENT PLUS HEIGHT OF CURB, LESS 3 INCHES.
- (K) TONGUE & GROOVE JOINT WITH TIE BAR - SEE DETAIL.
- (P) TOP OF PAVEMENT OR CONCRETE BASE.
- (R1) ROUND TO ¼" RADIUS. (EXCEPT FOR SAWED JOINTS)
- (R2) ROUND TO ¾" RADIUS.
- (R3) CONSTRUCT TO 9" RADIUS




## THRU TONGUE & GROOVE JOINT

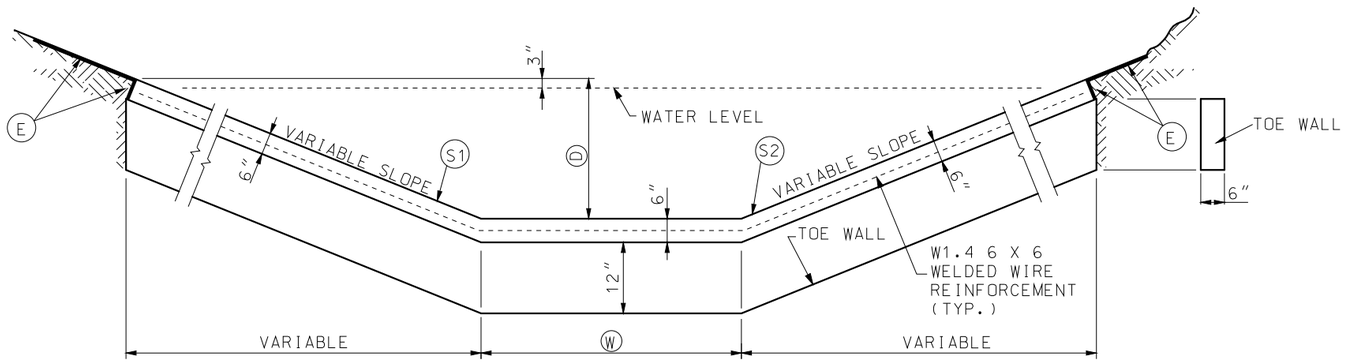
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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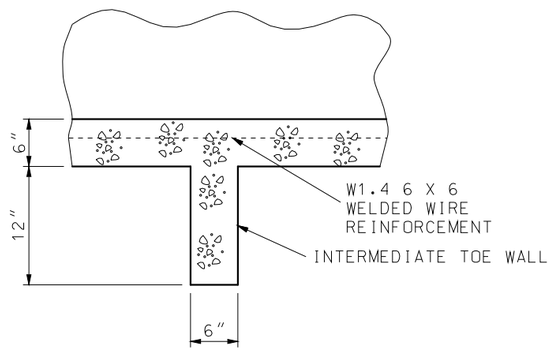
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# CONCRETE CURB, CURB AND GUTTER AND GUTTER

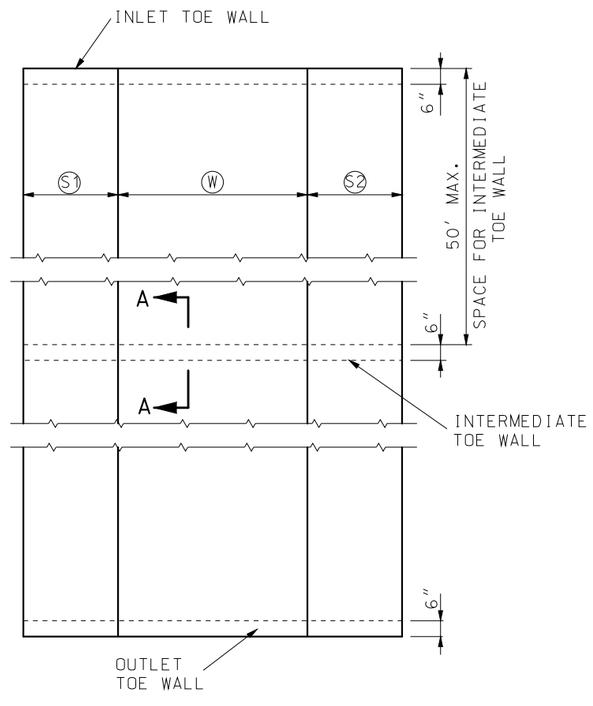
DATE EFFECTIVE: 08/01/2008
DATE PREPARED: 8/26/2009
609.00P
SHEET NO. 2 OF 2




## SECTION THROUGH DITCH
(SHOWING TOE WALL)




SECTION A-A




PLAN

LEGEND

(D) VERTICAL PAVED DITCH HEIGHT.

(E) SOD, GEOTEXTILE FABRIC, OR EROSION CONTROL MAT, IF REQUIRED.

(S1) THE WIDTH OF THE STEEPER SIDEWALL OF ALL DITCHES.

(S2) THE WIDTH OF THE FLATTER SIDEWALL OF ALL DITCHES.

(W) THE WIDTH OF THE BOTTOM OF A FLAT BOTTOM DITCH

GENERAL NOTES:

STEEL WELDED WIRE REINFORCEMENT SHALL BE IN ACCORDANCE WITH SEC 1036.3.3.

SOD, GEOTEXTILE FABRIC, OR EROSION CONTROL MATS SHALL BE USED ALONG THE SIDES IF SHOWN ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.

TOE WALLS SHALL BE CONSTRUCTED AT INLET AND OUTLET ENDS OF PAVED DITCHES AND AT 50' MAXIMUM SPACING FOR INTERMEDIATE TOE WALLS.

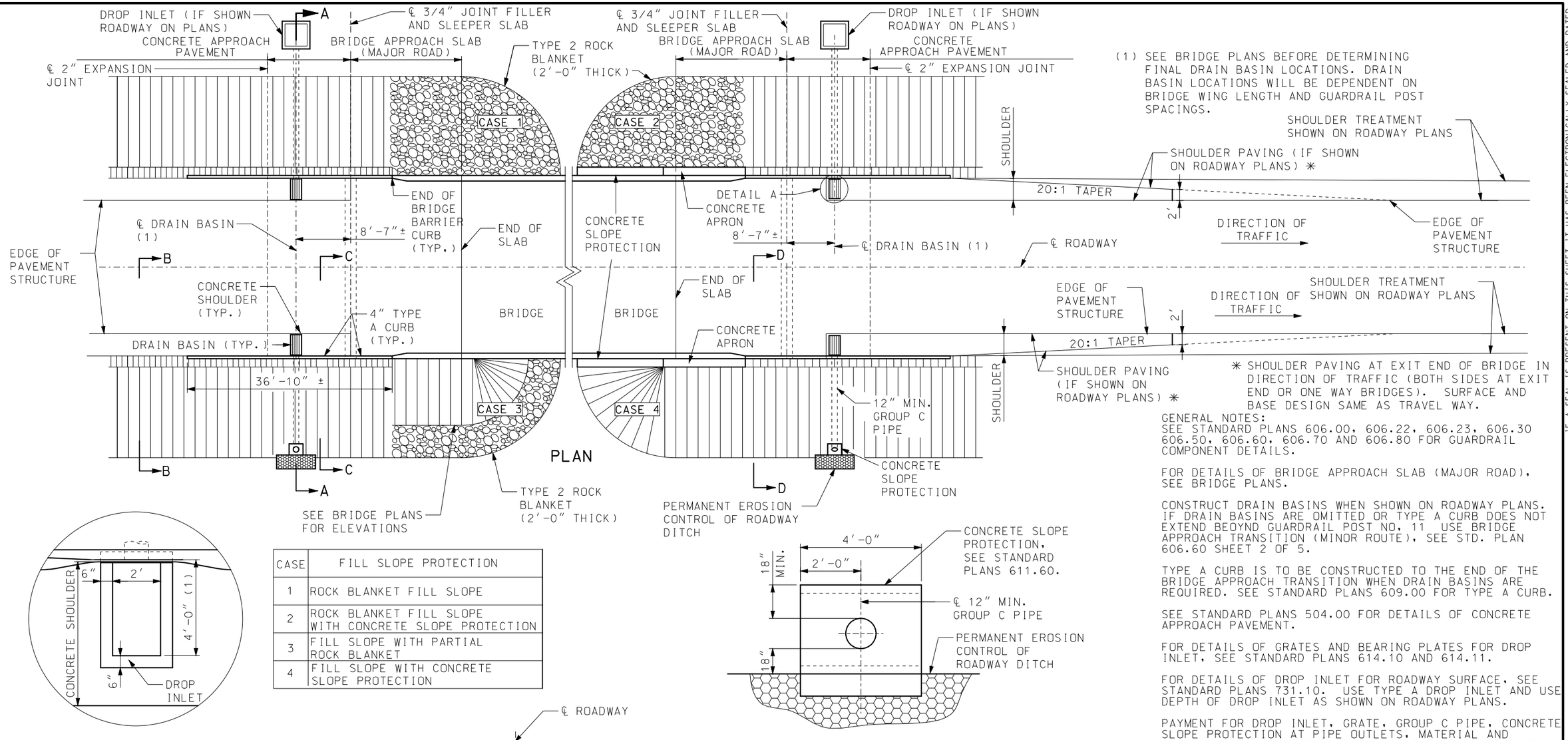

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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PAVED DITCHES

| DATE EFFECTIVE: 07/01/2016 | 609.15D | SHEET NO. |
|---|---|---|
| DATE PREPARED: 5/13/2016 | | 1 OF 1 |


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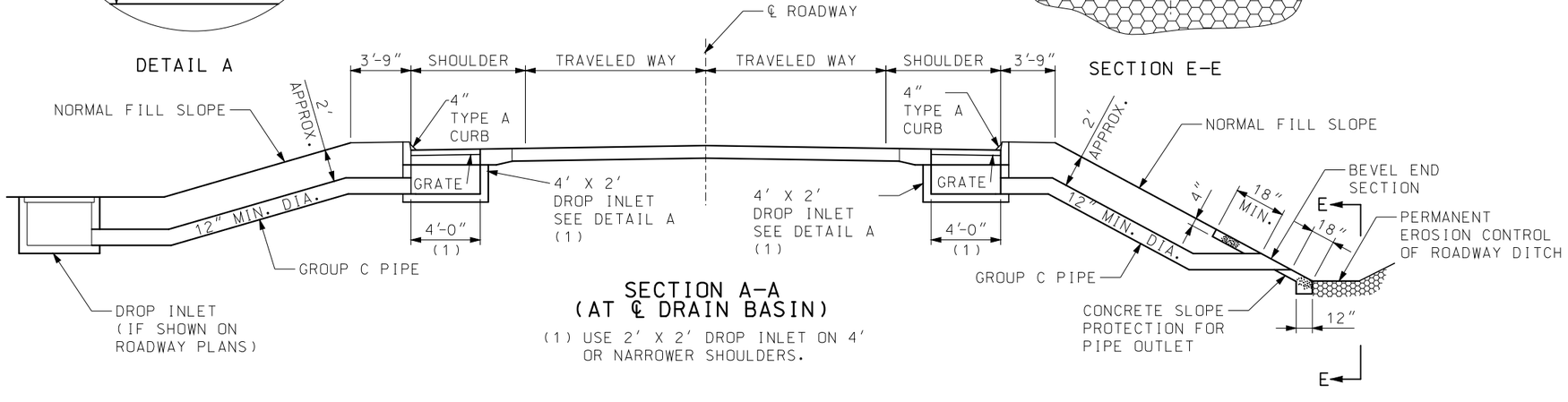



| CASE | FILL SLOPE PROTECTION |
|---|---|
| 1 | ROCK BLANKET FILL SLOPE |
| 2 | ROCK BLANKET FILL SLOPE WITH CONCRETE SLOPE PROTECTION |
| 3 | FILL SLOPE WITH PARTIAL ROCK BLANKET |
| 4 | FILL SLOPE WITH CONCRETE SLOPE PROTECTION |




DETAIL A




SECTION E-E

SECTION A-A
(AT ℄ DRAIN BASIN)

(1) USE 2' X 2' DROP INLET ON 4' OR NARROWER SHOULDERS.

GENERAL NOTES:
SEE STANDARD PLANS 606.00, 606.22, 606.23, 606.30 606.50, 606.60, 606.70 AND 606.80 FOR GUARDRAIL COMPONENT DETAILS.

FOR DETAILS OF BRIDGE APPROACH SLAB (MAJOR ROAD), SEE BRIDGE PLANS.

CONSTRUCT DRAIN BASINS WHEN SHOWN ON ROADWAY PLANS. IF DRAIN BASINS ARE OMITTED OR TYPE A CURB DOES NOT EXTEND BEOYND GUARDRAIL POST NO. 11 USE BRIDGE APPROACH TRANSITION (MINOR ROUTE), SEE STD. PLAN 606.60 SHEET 2 OF 5.

TYPE A CURB IS TO BE CONSTRUCTED TO THE END OF THE BRIDGE APPROACH TRANSITION WHEN DRAIN BASINS ARE REQUIRED. SEE STANDARD PLANS 609.00 FOR TYPE A CURB.

SEE STANDARD PLANS 504.00 FOR DETAILS OF CONCRETE APPROACH PAVEMENT.

FOR DETAILS OF GRATES AND BEARING PLATES FOR DROP INLET, SEE STANDARD PLANS 614.10 AND 614.11.

FOR DETAILS OF DROP INLET FOR ROADWAY SURFACE, SEE STANDARD PLANS 731.10. USE TYPE A DROP INLET AND USE DEPTH OF DROP INLET AS SHOWN ON ROADWAY PLANS.

PAYMENT FOR DROP INLET, GRATE, GROUP C PIPE, CONCRETE SLOPE PROTECTION AT PIPE OUTLETS, MATERIAL AND INSTALLATION WILL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR DRAIN BASIN PER EACH.

FOR DETAILS OF SECTION B-B, C-C AND D-D, SEE SHEET 2 OF 3.

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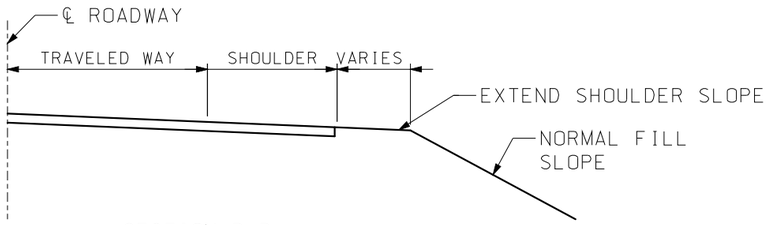
# DRAIN BASIN, SHOULDER PAVING AND FILL SLOPES AT BRIDGE ENDS (MAJOR ROAD)

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 11/2/2016

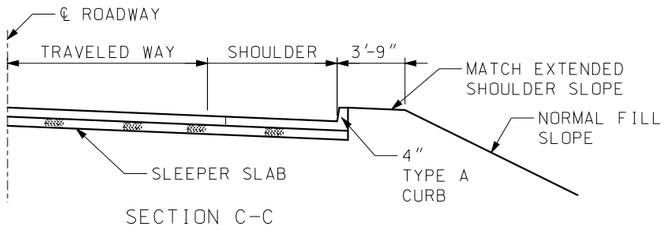
609.40S

SHEET NO. 1 OF 3

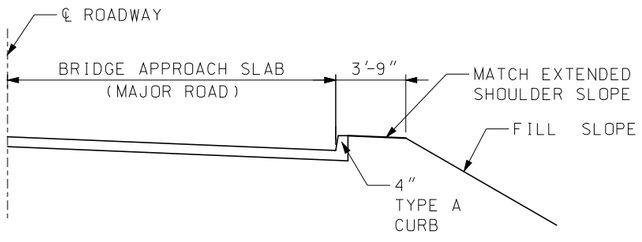
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




SECTION B-B

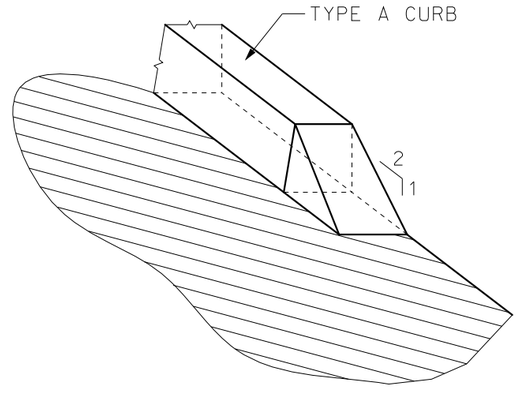



SECTION C-C




SECTION D-D

NOTE: FOR DETAILS NOT SHOWN, SEE OTHER SECTIONS.




TYPE A CURB
TRANSITION DETAIL

GENERAL NOTE:

FOR LOCATION OF SEC. B-B, C-C AND D-D, SEE SHEET 1 OF 3.

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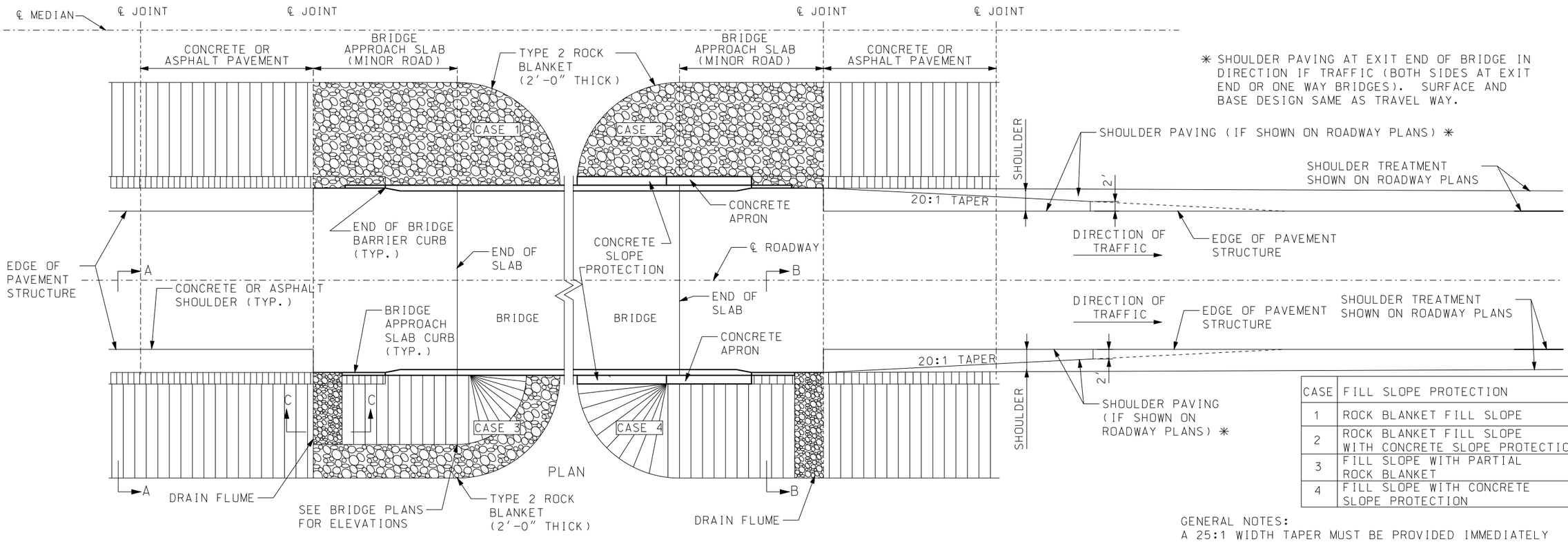
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# DRAIN BASIN, SHOULDER PAVING AND FILL SLOPE AT BRIDGE ENDS (MAJOR ROAD)

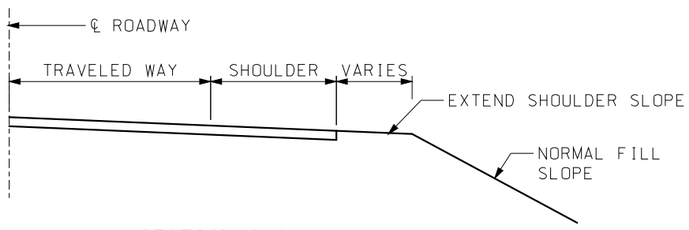
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 11/2/2016

609.40S

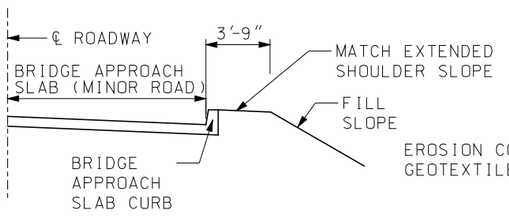
SHEET NO. 2 OF 3



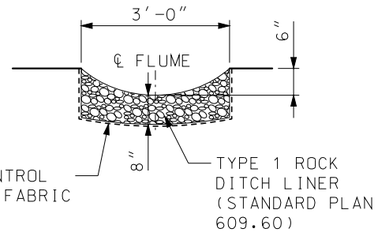

| CASE | FILL SLOPE PROTECTION |
|---|---|
| 1 | ROCK BLANKET FILL SLOPE |
| 2 | ROCK BLANKET FILL SLOPE WITH CONCRETE SLOPE PROTECTION |
| 3 | FILL SLOPE WITH PARTIAL ROCK BLANKET |
| 4 | FILL SLOPE WITH CONCRETE SLOPE PROTECTION |



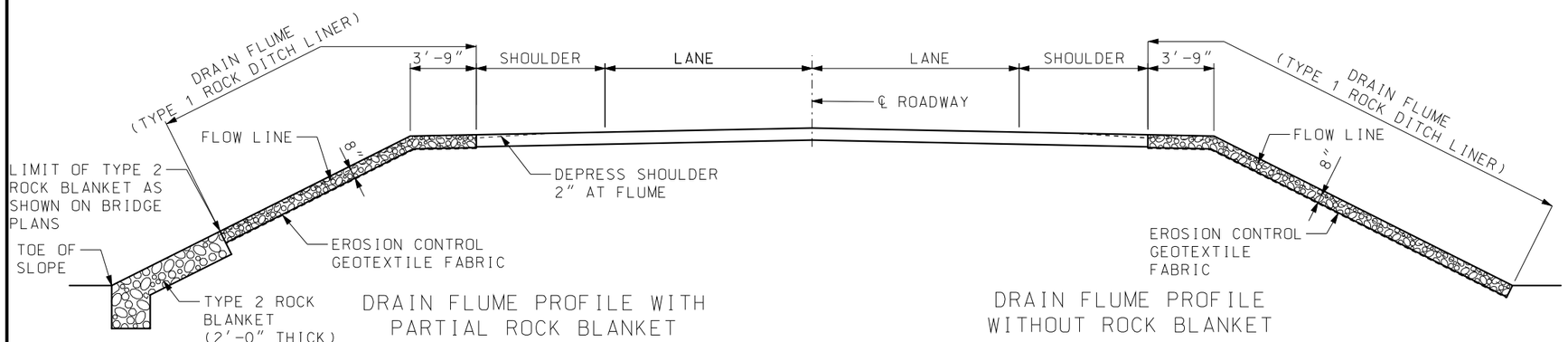

SECTION A-A




SECTION B-B




SECTION C-C




DRAIN FLUME PROFILE WITH PARTIAL ROCK BLANKET

DRAIN FLUME PROFILE WITHOUT ROCK BLANKET

GENERAL NOTES:
A 25:1 WIDTH TAPER MUST BE PROVIDED IMMEDIATELY BEYOND THE LIMITS OF CURB AS SHOWN IN ORDER TO TRANSITION ROADWAY WIDTH TO WIDTH BETWEEN GUARDRAIL FACES ON PAVEMENT.

SEE STANDARD PLANS 606.00, 606.22, 606.23, 606.30, 606.50, 606.60, 606.70 AND 606.80 FOR DETAILS OF GUARDRAILS AND BRIDGE ANCHOR SECTIONS.

FOR DETAILS OF BRIDGE APPROACH SLAB (MINOR ROAD), SEE BRIDGE PLANS.

CONSTRUCT DRAIN FLUMES AND OR FILL SLOPE PROTECTION WHEN SHOWN ON ROADWAY PLANS.

PAYMENT FOR FURNISHING ALL MATERIALS, LABOR AND EXCAVATION NECESSARY TO CONSTRUCT THE DRAIN FLUMES, INCLUDING THE PERMANENT EROSION CONTROL GEOTEXTILE, COMPLETE-IN-PLACE, WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR TYPE 1 ROCK DITCH LINER.

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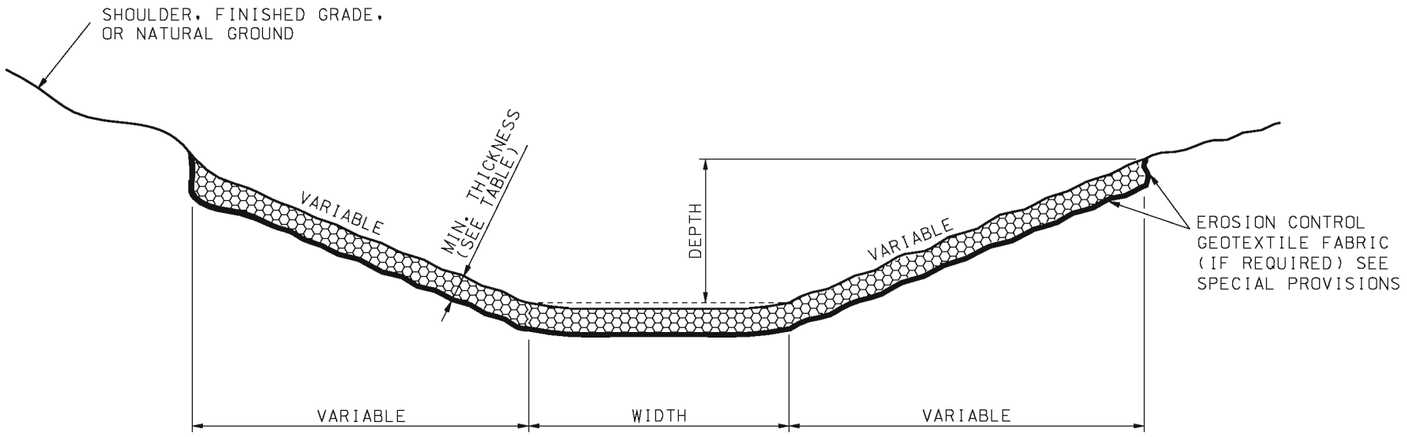
# DRAIN FLUME, SHOULDER PAVING AND FILL SLOPES AT BRIDGE ENDS (MINOR ROAD)

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 11/2/2016

609.40S

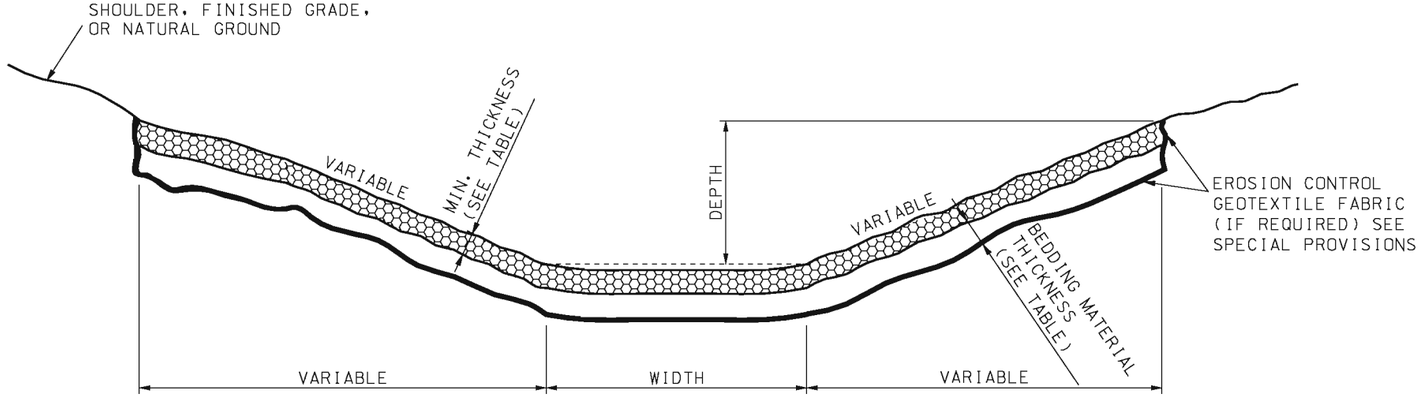
SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




FLAT BOTTOM DITCH
WITHOUT BEDDING MATERIAL

| TYPE | ROCK DITCH LINER MIN. THICKNESS | BEDDING MATERIAL MIN. THICKNESS |
|---|---|---|
| 1 | 8″ | -- |
| 2 | 12″ | -- |
| 3 | 22″ | 8″ |
| 4 | 30″ | 12″ |




FLAT BOTTOM DITCH
WITH BEDDING MATERIAL

## TYPICAL DITCH LINER DETAILS

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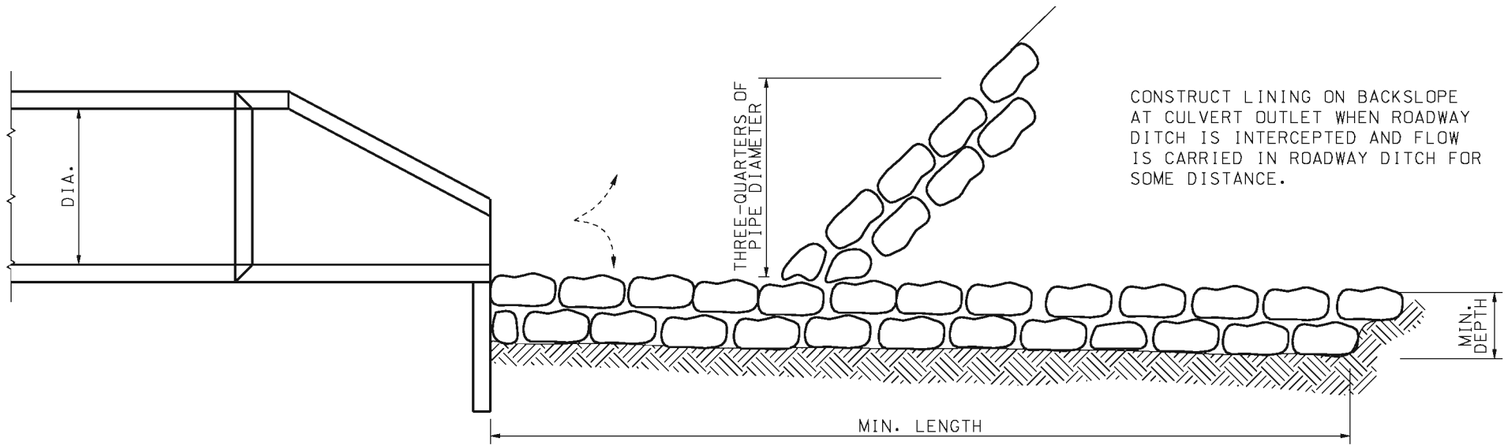
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# ROCK DITCH LINER

DATE EFFECTIVE: 03/01/1993
DATE PREPARED: 8/21/2009

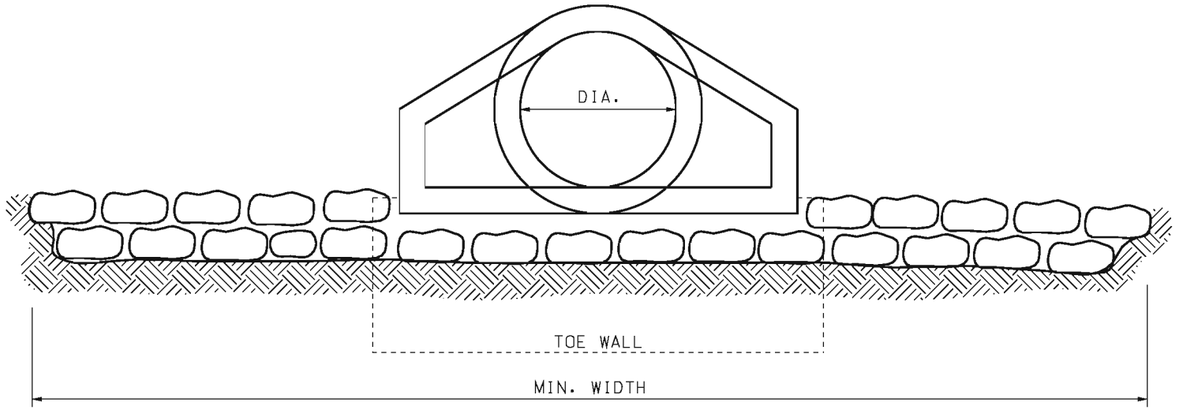
609.60C

SHEET NO. 1 OF 1

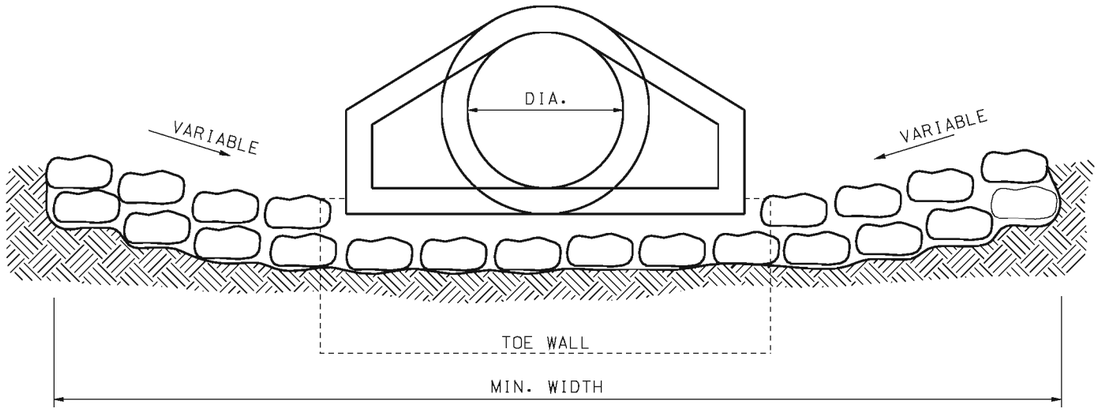



CONSTRUCT LINING ON BACKSLOPE AT CULVERT OUTLET WHEN ROADWAY DITCH IS INTERCEPTED AND FLOW IS CARRIED IN ROADWAY DITCH FOR SOME DISTANCE.

**SIDE VIEW**




**END VIEW**




**END VIEW**
**(ALTERNATE METHOD)**

## ROCK LINING FOR CULVERT OUTLETS

| CULVERT SIZE, DIA (IN.) | MINIMUN DEPTH AND WIDTH (FT.) | MINIMUM LENGHT (FT.) | ROCK LINING (CU.YD.) | EQUIVALENT PIPE ARCH CULVERT (APPROX.) | EQUIVALENT CONCRETE BOX CULVERT (APPROX.) |
|---|---|---|---|---|---|
| 18 | 1 X 4 | 12 | 2 | | |
| 24 | 1 X 6 | 14 | 3 | | 2′ X 1½′ |
| 30 | 1 X 7 | 16 | 4 | B-5 | 2′ X 2′ |
| 36 | 1.5 X 9 | 18 | 9 | B-6 | 3′ X 2′ |
| 42 | 2 X 10 | 20 | 15 | B-7 | 3′ X 3′ |
| 48 | 2 X 12 | 20 | 18 | B-8 | 4′ X 3′ |
| 54 | 2 X 13.5 | 22 | 22 | B-9 | 4′ X 4′ |
| 60 | 2 X 15 | 25 | 28 | B-10 | 5′ X 4′ |
| 66 | 2 X 18 | 25 | 33 | B-11 | 5′ X 5′ |
| 72 | 2 X 20 | 30 | 44 | B-12 | 5′ X 6′ |
| 84 | 2.5 X 25 | 35 | 81 | | 6′ X 6′ |
| 96 | 2.5 X 30 | 40 | 111 | | 7′ X 7′ |
| 108 | 3 X 32 | 40 | 142 | | 8′ X 8′ |

GENERAL NOTES:

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

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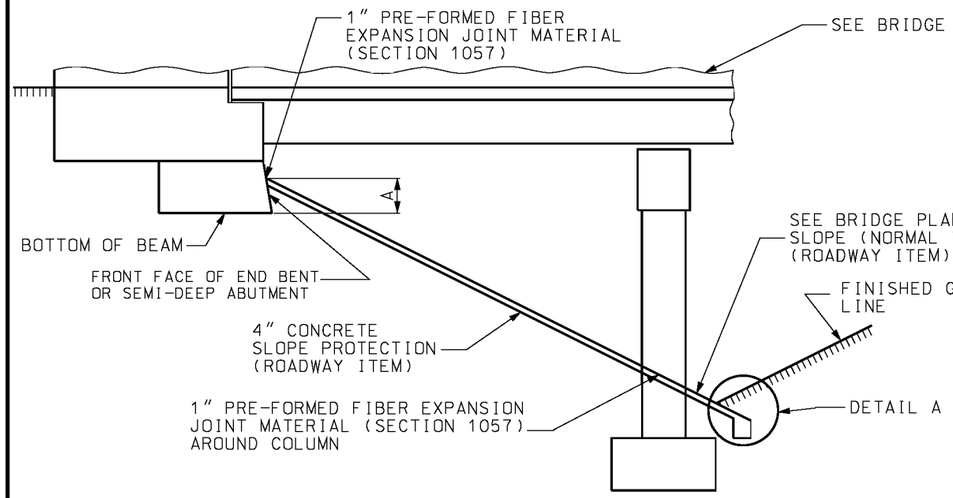
# ROCK LINING FOR CULVERT OUTLET

DATE EFFECTIVE: 10/01/1981
DATE PREPARED: 8/21/2009

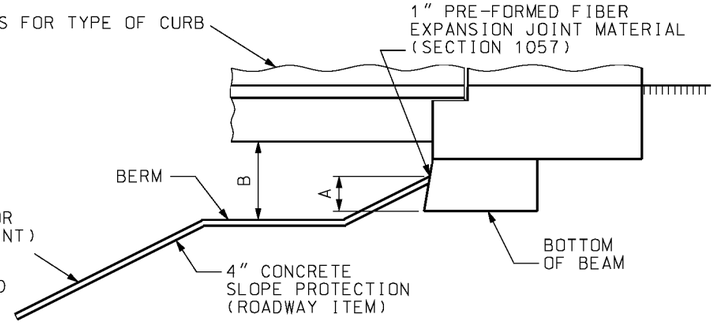
609.70C

SHEET NO. 1 OF 1

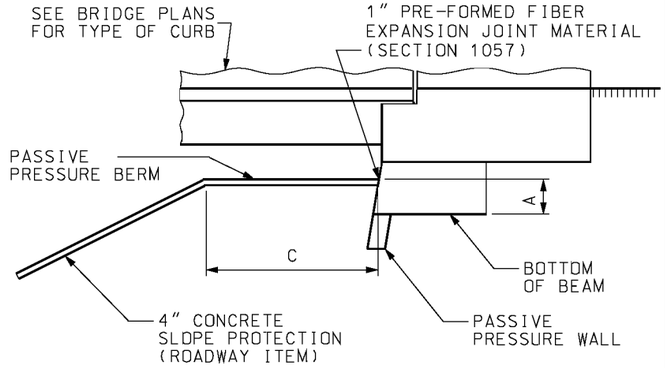
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## ELEVATION
**(STRAIGHT SLOPE TYPE)**




## ELEVATION
**(USE ON STRUCTURES WITHOUT PASSIVE PRESSURE BERM)**



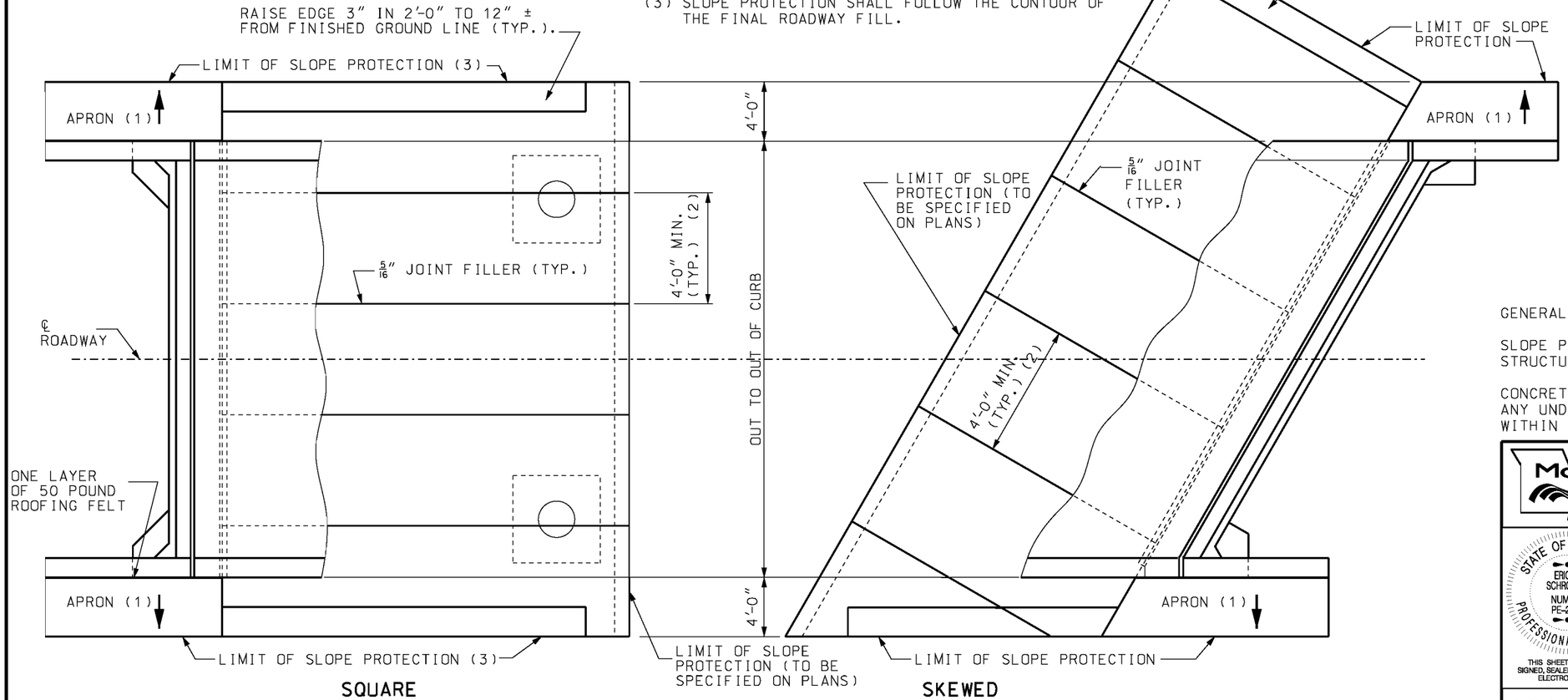

## ELEVATION
**(USE ON STRUCTURES WITH PASSIVE PRESSURE BERM)**

A – SEE BRIDGE PLANS

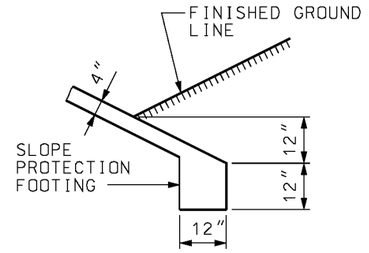
B – BERM SHALL BE CONSTRUCTED TO ELEVATION SHOWN ON PLANS WITH A MINIMUM OF 4'-0" BELOW BOTTOM OF SUPERSTRUCTURE.

C – DIMENSION OF BERM (SEE BRIDGE PLANS).

(1) SLOPE $\frac{1}{4}$" PER FOOT MINIMUM.
(2) PROTECTION SHALL BE PLACED IN CONTINUOUS PANELS FROM TOE OF THE SLOPE TO THE TOP OF THE SLOPE.
(3) SLOPE PROTECTION SHALL FOLLOW THE CONTOUR OF THE FINAL ROADWAY FILL.




## PART PLAN




## DETAIL A

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

GENERAL NOTES:

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

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


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ERIC E. SCHROETER
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# CONCRETE SLOPE PROTECTION

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

**611.60R**

SHEET NO. 1 OF 1

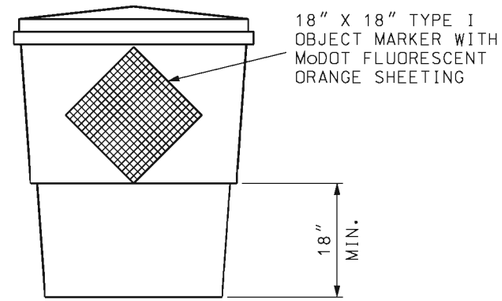
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

| DESIGN SPEED | 70 MPH | 65 MPH | 60 MPH | 55 MPH | 50 MPH | 45 MPH | 40 MPH | 35 MPH |
|---|---|---|---|---|---|---|---|---|
| TOTAL LENGTH | 41'-6" | 38'-0" | 31'-0" | 27'-5" | 24'-0" | 20'-6" | 20'-6" | 17'-0" |
| TOTAL WIDTH | 8'-6" | 8'-6" | 8' | 8' | 7'-6" | 7'-6" | 7'-6" | 7'-6" |
| ROW 12 | 1 @ 200# | | | | | | | |
| 11 | 1 @ 200# | 1 @ 200# | | | | | | |
| 10 | 1 @ 200# | 1 @ 200# | | | | | | |
| 9 | 1 @ 200# | 1 @ 200# | 1 @ 200# | | | | | |
| 8 | 1 @ 400# | 1 @ 200# | 1 @ 200# | 1 @ 200# | | | | |
| 7 | 2 @ 200# | 1 @ 400# | 1 @ 200# | 1 @ 200# | 1 @ 200# | | | |
| 6 | 2 @ 400# | 2 @ 200# | 1 @ 400# | 1 @ 400# | 1 @ 400# | 1 @ 400# | 1 @ 400# | |
| 5 | 2 @ 400# | 2 @ 400# | 2 @ 400# | 1 @ 700# | 1 @ 700# | 1 @ 700# | 1 @ 700# | 1 @ 700# |
| 4 | 2 @ 700# | 2 @ 700# | 2 @ 700# | 2 @ 700# | 1 @ 1400# | 1 @ 1400# | 1 @ 1400# | 1 @ 1400# |
| 3 | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# |
| 2 | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# |
| 1 | 2 @ 2100# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# | 2 @ 1400# |
| TOTAL WEIGHT | 14400# | 12200# | 11600# | 11300# | 11100# | 10900# | 10900# | 10500# |
| TOTAL NO. OF ATTEN. | 19 | 17 | 14 | 12 | 10 | 9 | 9 | 8 |

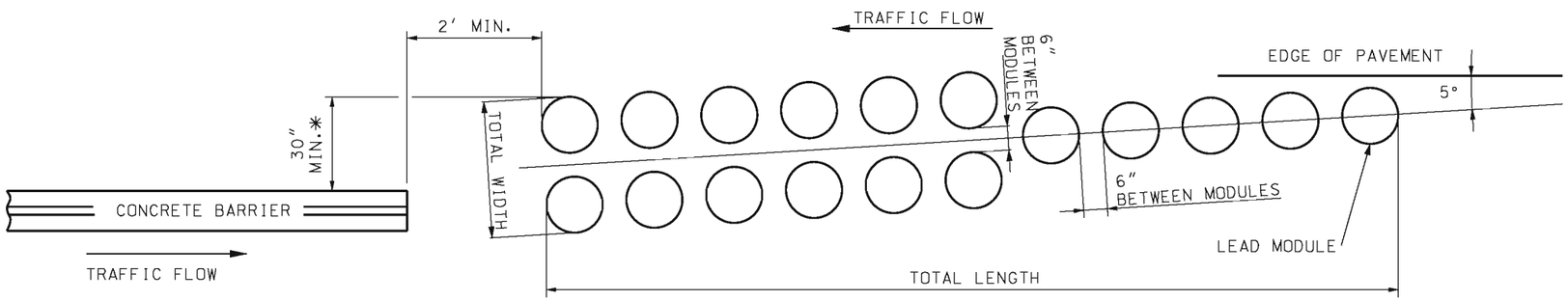
NOTE:
DESIGN SPEED IN CONSTRUCTION AREAS SHOULD BE BASED ON POSTED SPEED PRIOR TO CONSTRUCTION.




## TYPE 3 OBJECT MARKER PLACEMENT FOR PERMANENT INSTALLATIONS




## TYPE I OBJECT MARKER PLACEMENT FOR TEMPORARY INSTALLATIONS




* OFFSET ARRAY FOR BIDIRECTIONAL TRAFFIC

## ATTENUATOR LAYOUT

GENERAL NOTES:

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


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


STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

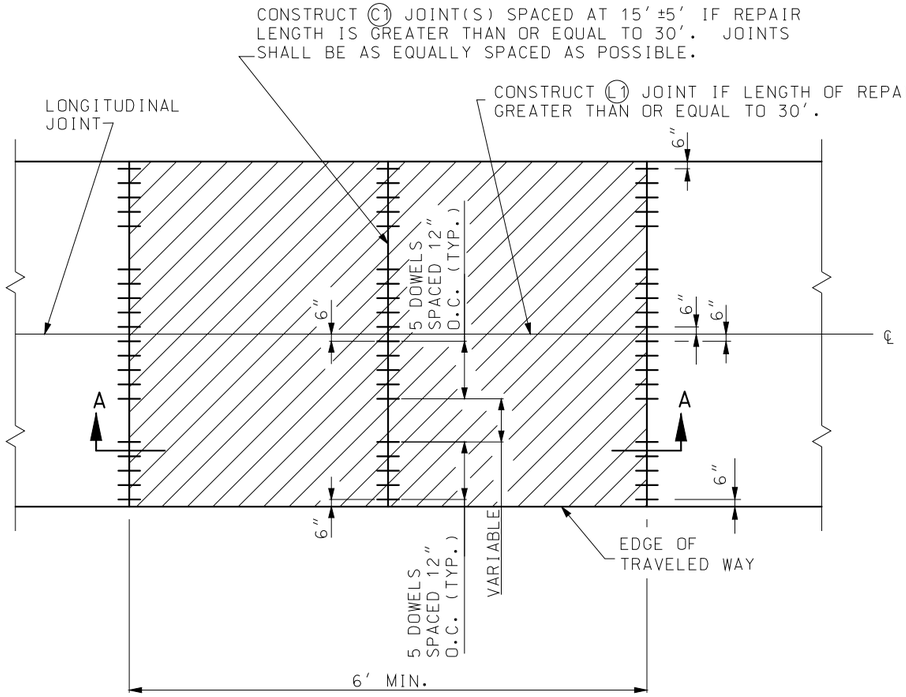
# SAND FILLED IMPACT ATTENUATORS

DATE EFFECTIVE: 08/01/2008
DATE PREPARED: 8/21/2009

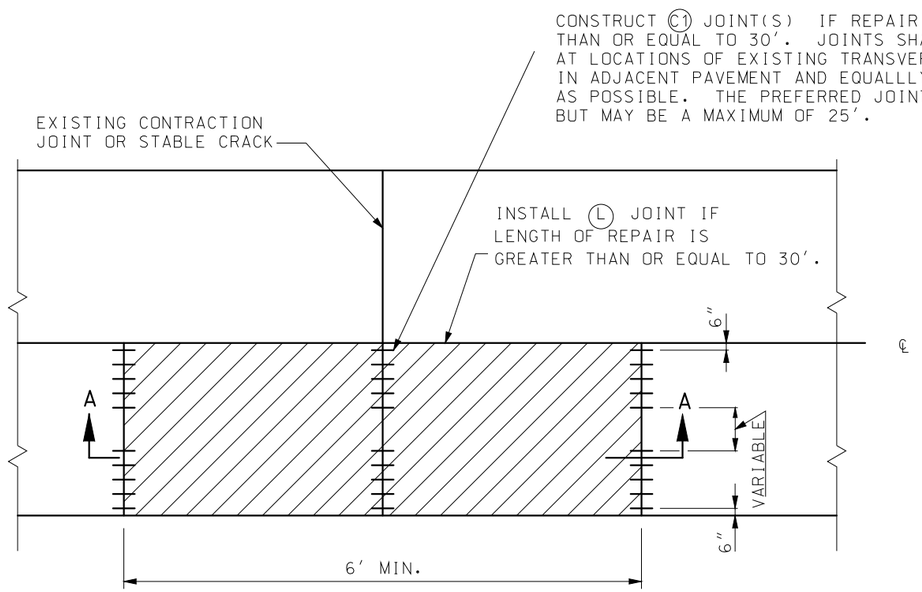
612.20D

SHEET NO. 1 OF 1

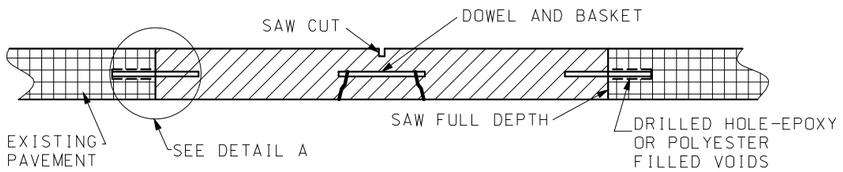
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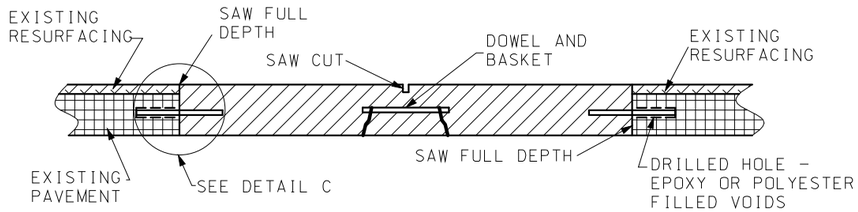

TWO OR MORE LANES



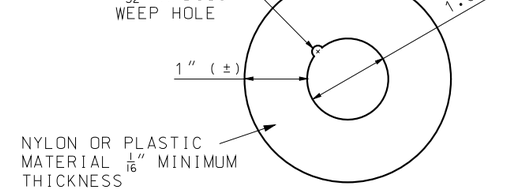

ONE LANE



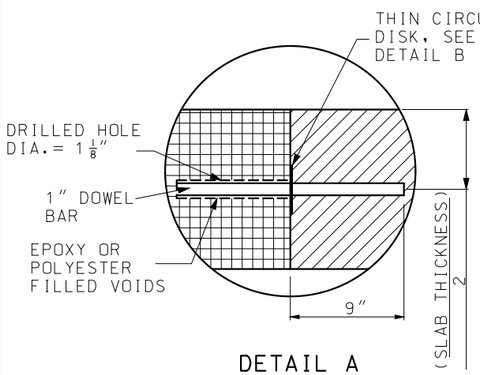

SECTION A–A




SECTION A–A ALTERNATE
WITH ASPHALT OVERLAY

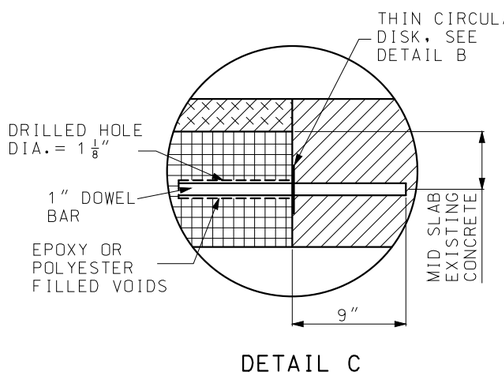



DETAIL B
THIN CIRCULAR DISK




DETAIL A

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 BACK OF THE PREDRILLED HOLE BEFORE INSERTING THE DOWEL BAR.
3. THE DOWEL IS INSERTED INTO THE HOLE WITH A TWISTING MOTION SO THAT THE MATERIAL IN THE BACK OF THE HOLE IS FORCED UP AND AROUND THE BAR.
4. EXPOSED END OF DOWEL SHALL BE COATED WITH A THIN UNIFORM COAT OF GRAPHITE GREASE. DOWEL BASKET ASSEMBLIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD PLAN 502.10. IN LIEU OF GRAPHITE GREASE, THE DOWEL BAR BASKET SUPPLIER MAY PROVIDE COMPLETED BASKET UNITS PRE-DIPPED IN AN APPROVED BONDBREAKER.
5. REPAIR ONLY ONE LANE AT A TIME.




DETAIL C

GENERAL NOTES:

ALL SAW CUTS SHALL BE MADE WITH A DIAMOND SAW EXCEPT THE CENTER RELIEF CUT.

FOR DETAILS OF TYPE C, L AND L1 JOINTS. SEE STANDARD PLAN 502.05.

## NON-REINFORCED AND REINFORCED PORTLAND CEMENT CONCRETE

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

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

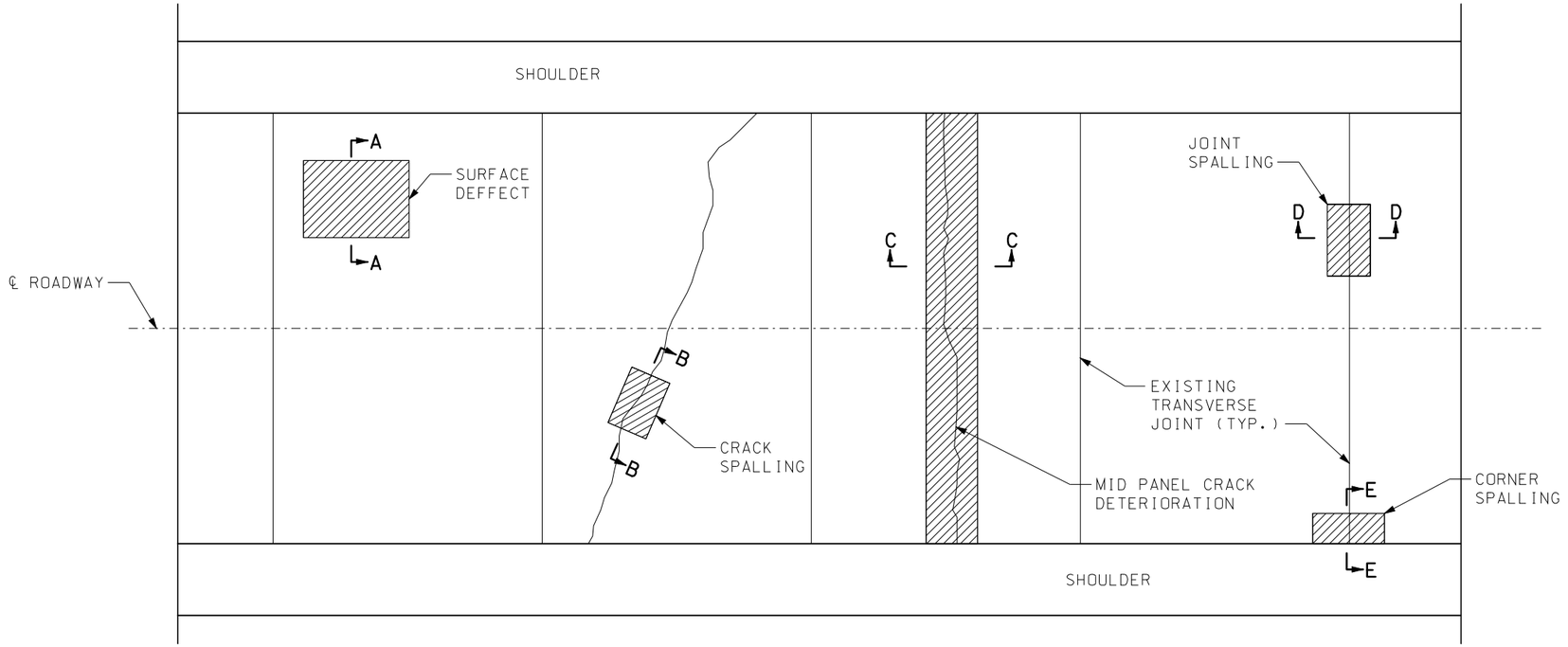
# PAVEMENT REPAIR
FULL DEPTH

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

613.00R

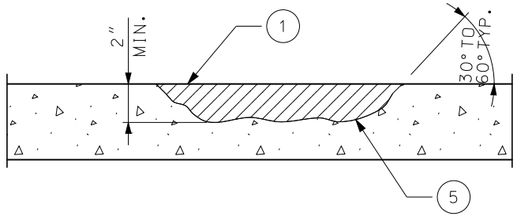
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

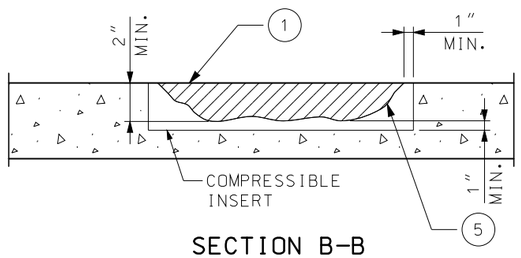



PLAN VIEW

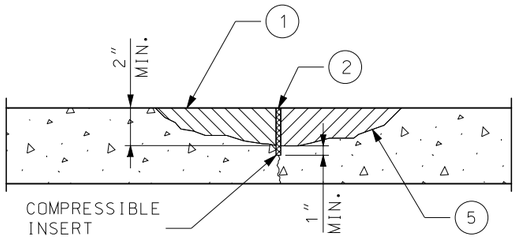
1. REMOVE ALL CONCRETE, TO LIMITS SHOWN, TO MAX. OF $\frac{1}{2}$ THE PAVEMENT DEPTH OR TOP OF DOWELS BY MILLING.
2. PLACE COMPRESSIBLE INSERT IN JOINT OR CRACK. INSERT SHALL BE THICKNESS OF JOINT OR CRACK WIDTH, BUT NOT LESS THAN $\frac{1}{4}$".
3. CHIP VERTICAL REPAIR EDGES AT APPROXIMATE 1:1 SLOPE.
4. PLACE $\frac{1}{8}$" MIN. COMPRESSIBLE INSERT ADJACENT TO LONGITUDINAL LANE OR SHOULDER JOINT.
5. EXPOSED SURFACE SHALL BE CLEANED BY SANDBLASTING, SHOTBLASTING, OR HIGH PRESSURE WATER BLASTING.
6. EXPOSED SURFACE OF DOWEL BARS SHALL BE COATED WITH AN APPROVED BONDBREAKER.



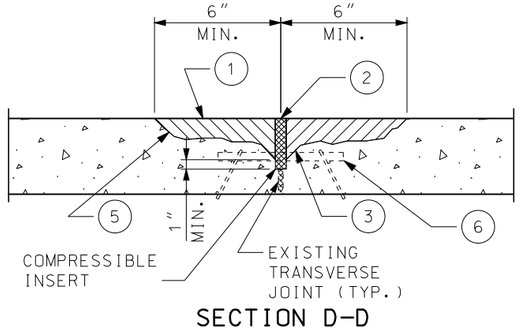

SECTION A-A



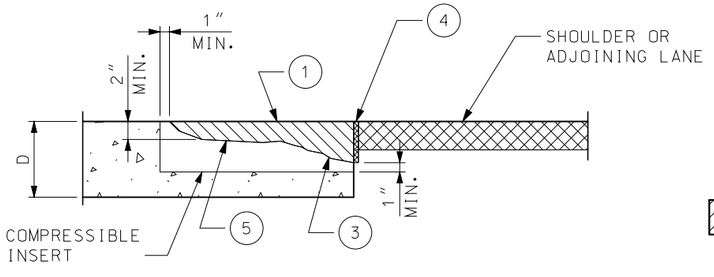

SECTION B-B




SECTION C-C




SECTION D-D




SECTION E-E

AREA TO BE REMOVED

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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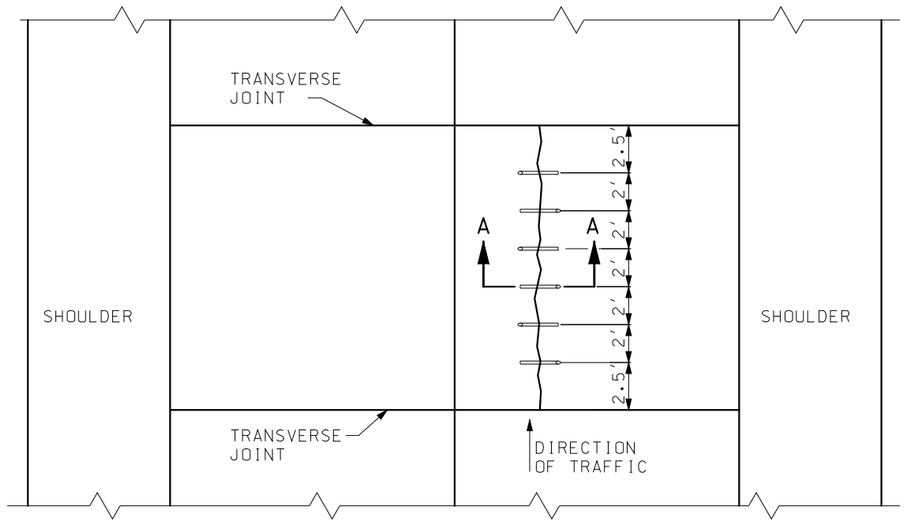
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# PAVEMENT REPAIR

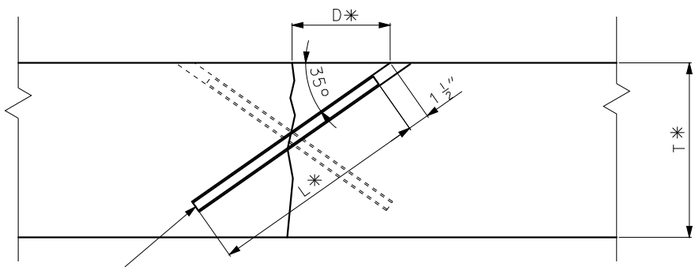
PARTIAL DEPTH
CLASS A

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

613.00R




## CROSS STITCHING PLAN




* SEE TABLE

| | | | | | | |
|---|---|---|---|---|---|---|
| T | SLAB THICKNESS (IN) | 8 | 9 | 10 | 11 | 12 |
| D | DISTANCE TO HOLE (IN) | 5 3/4 | 6 1/2 | 7 1/4 | 8 1/2 | 8 1/2 |
| L | LENGTH OF BAR (IN) | 8 1/2 | 11 | 12 1/2 | 14 | 16 |

SECTION A-A

GENERAL NOTES:

AT EACH REPAIR LOCATION, HOLES SHALL BE DRILLED AT 35° ANGLES TO THE PAVEMENT SURFACE, PERPENDICULAR TO THE CRACK. THE DRILL BIT DIAMETER SHALL NOT EXCEED 1 1/8".

DRILLING SHALL ALTERNATE BACK AND FORTH ON EITHER SIDE OF THE LONGITUDINAL JOINT FROM HOLE TO HOLE.

DRILLED HOLES SHALL NOT PENETRATE THROUGH THE SLAB BOTTOM.

DRILLED HOLES SHALL BE CLEANED OF LOOSE DEBRIS AND DUST. EPOXY OR POLYESTER BONDING AGENTS FOR DOWELS, MEETING THE MATERIAL REQUIREMENTS OF SECTION 1039, SHALL BE INJECTED OR POURED INTO EACH HOLE. A CROSS-STITCH BAR SHALL BE INSERTED IN EACH HOLE SUCH THAT THE EPOXY MATERIAL IS EVENLY DISTRIBUTED AROUND THE BAR AND EXTRUDING FROM THE SURFACE OPENING. EACH BAR SHALL BE INSERTED FAR ENOUGH TO ALLOW 1 1/2" OF COVER AS SHOWN IN THE PROFILE DETAIL.

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

GENERAL NOTES:

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

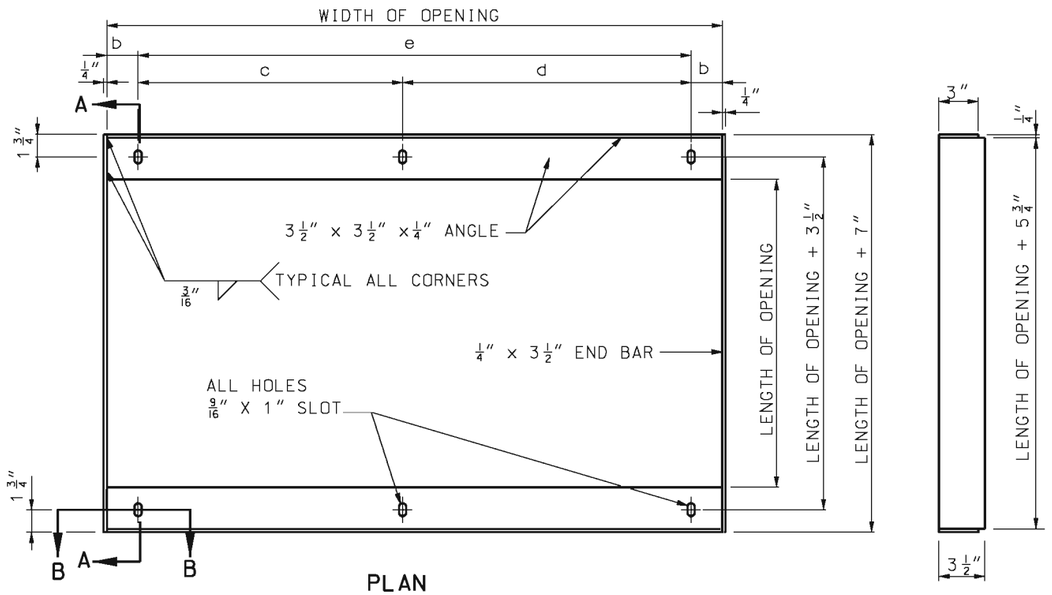
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# PAVEMENT REPAIR
## CROSS STITCHING

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

613.00R

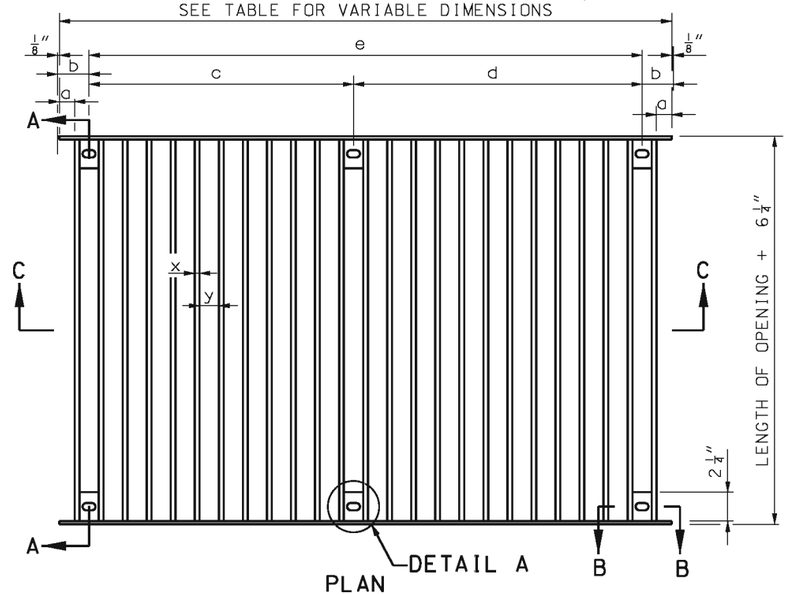



PLAN

## BEARING PLATE




END VIEW OF BEARING BAR



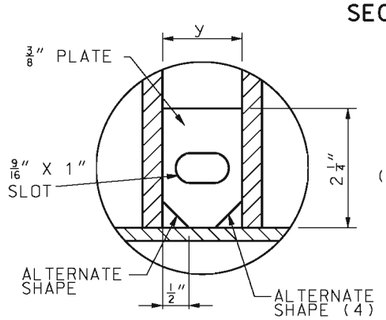

PLAN

SECTION C-C

## GRATE




SECTION B-B



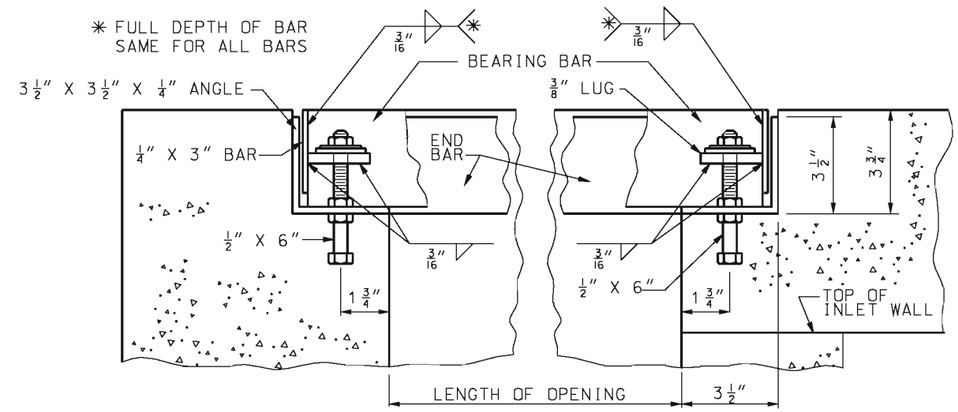

DETAIL A

(4) OTHER ALTERNATE SHAPES ARE ALLOWED, UPON APPROVAL, PROVIDED 4 LINEAR INCHES WELD IS MAINTAINED SYMETRICALLY AROUND THE PLATE AND THE NOMINAL DIMENSIONS OF THE PLATE AND SLOT ARE MAINTAINED.

## WEIGHT AND DIMENSIONS DATA

| OPENING | | WEIGHT (1) LBS. | BEARING BARS | | | | DIMENSIONS | | | | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WIDTH | LENGTH | | x | y | LENGTH | NUMBER | a | b | c | d | e | |
| 3'-0" | 2'-0" | 190 | 3/8" | 3" | 2'-5 3/4" | 11 | 13/16" | 2 13/16" | | | 2'-6 3/8" | USE WITH TYPE S-1 INLETS AND TYPE S HEADWALLS |
| 3'-0" | 3'-0" | 330 | 5/8" | 3" | 3'-5 3/4" | 10 | 1 1/4" | 3 1/2" | | | 2'-5" | |
| 5'-0" | 2'-0" | 300 | 3/8" | 3" | 2'-5 3/4" | 18 | 1" | 3" | 2'-3" | 2'-3" | | |
| 5'-0" | 3'-0" | 550 | 5/8" | 3" | 3'-5 3/4" | 17 | 9/16" | 2 13/16" | 2'-1 3/8" | 2'-5" | | |
| 3'-1" | 2'-1" | 200 | 3/8" | 3" | 2'-6 3/4" | 11 | 1 5/16" | 3 5/16" | | | 2'-6 3/8" | USE WITH TYPE S-2 AND TYPE S-3 INLETS ONLY |
| 3'-1" | 3'-1" | 340 | 5/8" | 3" | 3'-6 3/4" | 10 | 1 3/4" | 4" | | | 2'-5" | |
| 5'-1" | 2'-1" | 310 | 3/8" | 3" | 2'-6 3/4" | 18 | 1 1/2" | 3 1/2" | 2'-3" | 2'-3" | | |
| 5'-1" | 3'-1" | 560 | 5/8" | 3" | 3'-6 3/4" | 17 | 1 1/16" | 3 5/16" | 2'-1 3/8" | 2'-5" | | |

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




SECTION A-A

GENERAL NOTES:

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

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

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

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

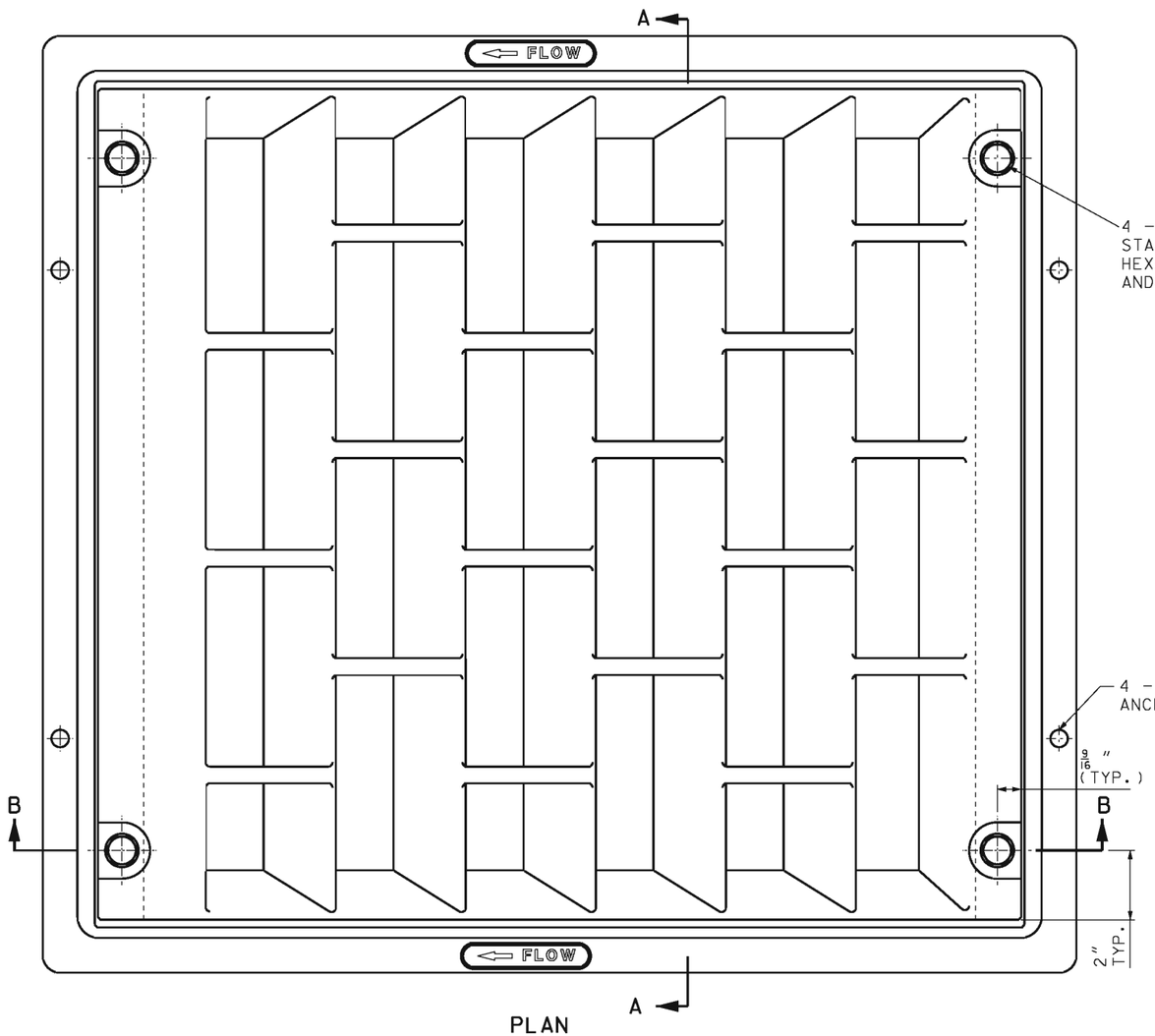
# GRATES AND BEARING PLATES

DATE EFFECTIVE: 12/01/2005
DATE PREPARED: 8/21/2009

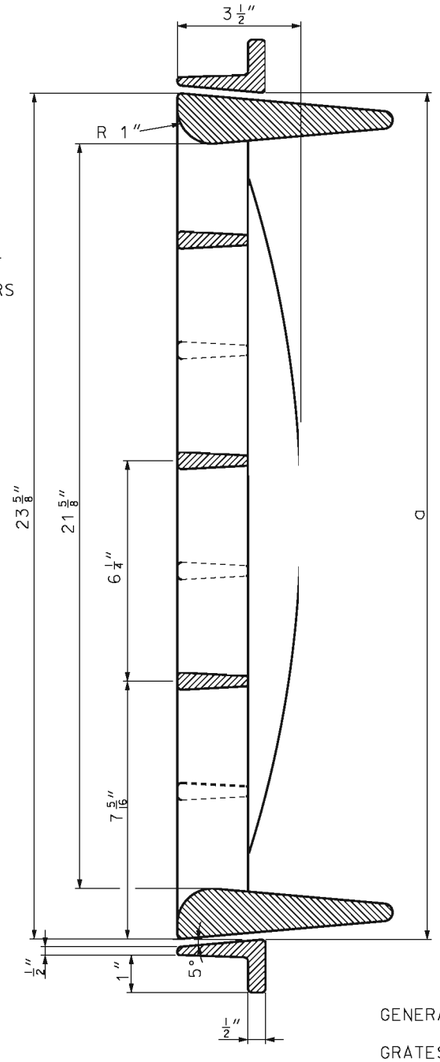
614.10T

SHEET NO.
1 OF 1

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN




SECTION A-A

| NOMINAL DIMENSIONS AND WEIGHTS | | | | | |
|---|---|---|---|---|---|
| OPENING | | | | NUMBER OF | |
| WIDTH | LENGTH | d | WEIGHT (LB.) | ANCHOR BOLTS | STAINLESS STEEL BOLTS |
| 2'-0" | 2'-0" | 24" | 200 | 4 | 4 |
| 4'-0" | 2'-0" | 48" | 348 | 8 | 8 |

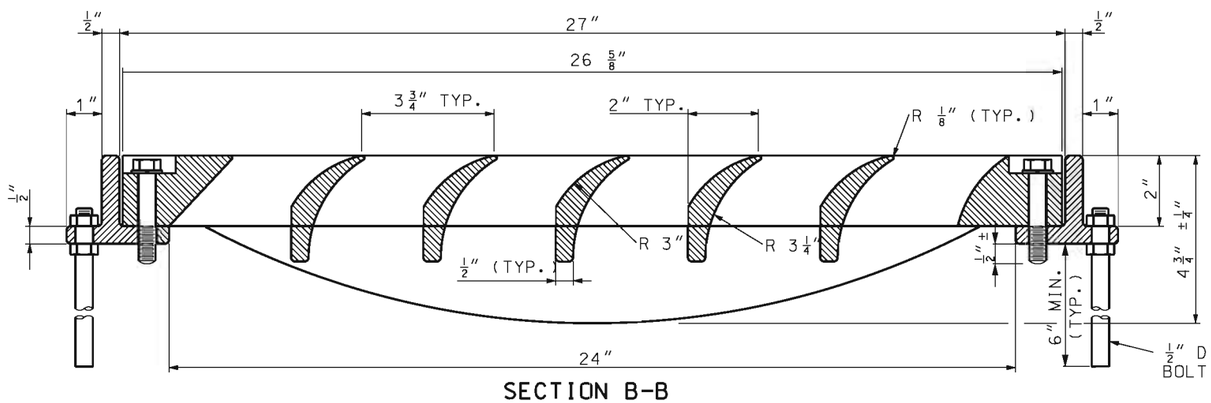
NOTE: TWO 2' X 2' GRATES MAY BE USED IN LIEU OF SINGLE 4' X 2' GRATES.

INSTALLATION INSTRUCTIONS:

DRILL AND TAP FRAME.

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

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




SECTION B-B

(*) ½" DIA. ANCHOR BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M 232 OR SHALL BE MECHANICALLY GALVANIZED. IF MECHANICALLY GALVANIZED, THE COATING THICKNESS, ADHERENCE AND QUALITY REQUIREMENTS SHALL BE IN ACCORDANCE WITH AASHTO M 232, CLASS C. DAMAGED SPELTER COATING SHALL BE REPAIRED IN ACCORDANCE WITH SEC 1081.

GENERAL NOTES:

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

MINIMUM CLEAR OPEN AREA: 2.10 SQUARE FEET.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

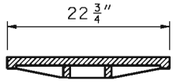
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED, AND DATED ELECTRONICALLY.

# CURVED VANE GRATE AND FRAME

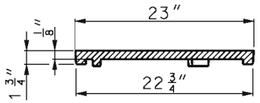
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DATE PREPARED: 7/3/2013

614.11C

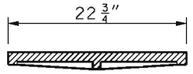
SHEET NO. 1 OF 1



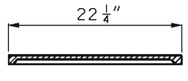

SECTION A-A



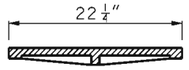

SECTION C-C



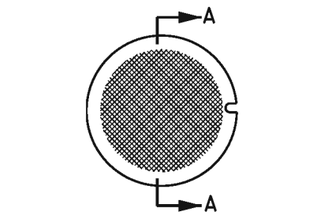

SECTION E-E



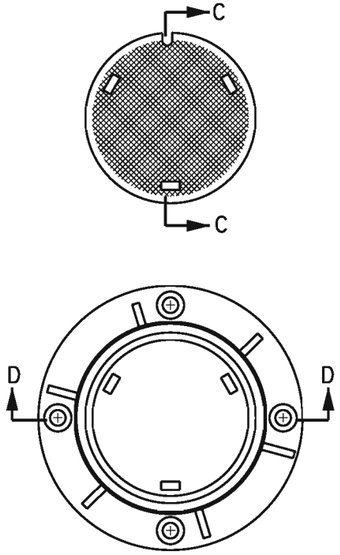

SECTION G-G



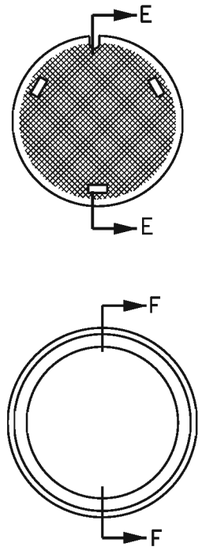

SECTION I-I



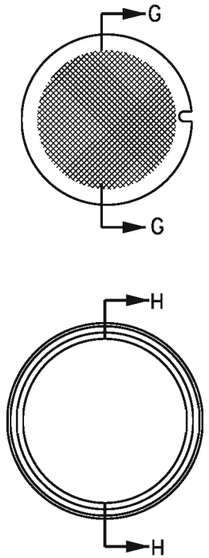

PLAN



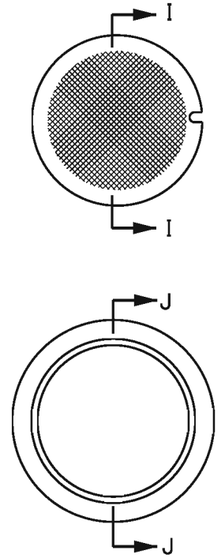

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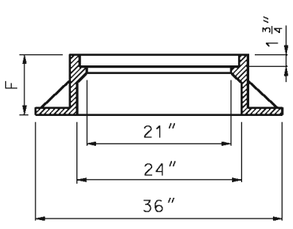

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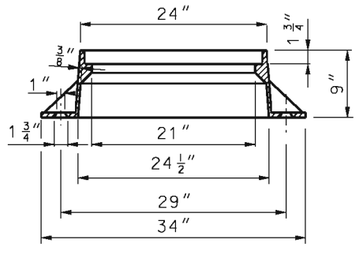

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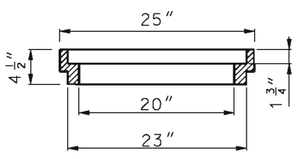

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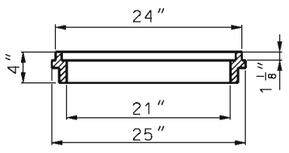

SECTION B-B



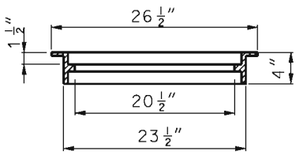

SECTION D-D



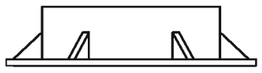

SECTION F-F




SECTION H-H



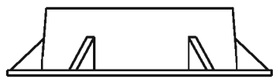

SECTION J-J



ELEVATION

**TYPE 1A AND 1B**

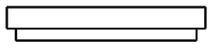
APPROXIMATE WEIGHT OF
FRAME AND COVER
TYPE 1A 540 LBS.
TYPE 1B 570 LBS.



ELEVATION

**TYPE 1C**

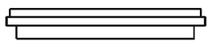
APPROXIMATE WEIGHT OF
FRAME AND COVER 290 LBS.



ELEVATION

**TYPE 2**

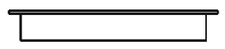
APPROXIMATE WEIGHT OF
FRAME AND COVER 250 LBS.



ELEVATION

**TYPE 3**

APPROXIMATE WEIGHT OF
FRAME AND COVER 115 LBS.



ELEVATION

**TYPE 4**

APPROXIMATE WEIGHT OF
FRAME AND COVER 160 LBS.

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.

TYPE1C:
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.


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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

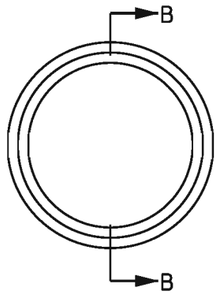
# MANHOLE FRAMES AND COVERS

DATE EFFECTIVE: 03/01/1996
DATE PREPARED: 8/21/2009

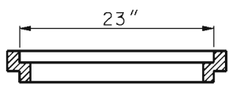
614.30E

SHEET NO. 1 OF 2

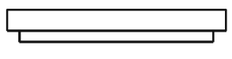

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN

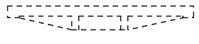



SECTION B-B

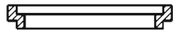


ELEVATION

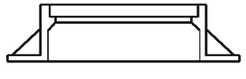
ADJUSTING RING
SOLID OR ADJUSTABLE



COVER

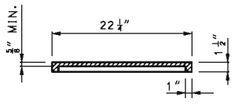


ADJUSTING RING

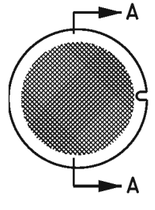


FRAME

**INSTALLATION DETAILS**




SECTION A-A




APPROXIMATE WEIGHT OF
FRAME AND COVER 150 LBS.

ALTERNATE
TYPE 4 COVER

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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# MANHOLE FRAMES AND COVERS

DATE EFFECTIVE: 03/01/1996
DATE PREPARED: 8/21/2009

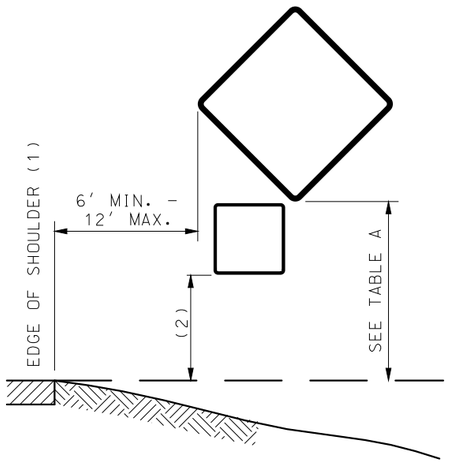
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SHEET NO. 2 OF 2

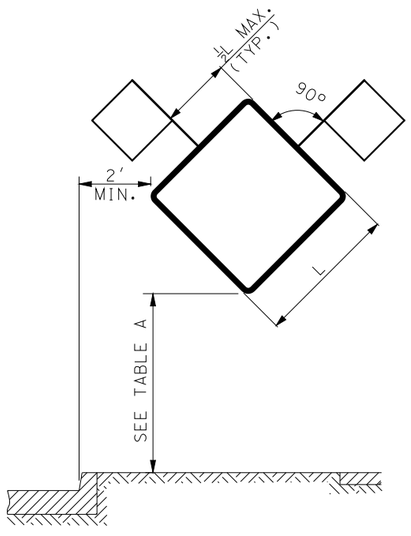
# TABLE A
## WORK ZONE SIGN MOUNTING REQUIREMENTS

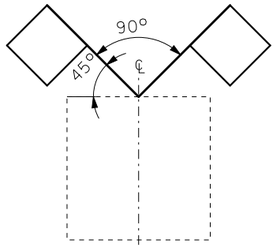
| TYPE | SIGN SUPPORT | SIGN SUBSTRATE | MINIMUM MOUNTING HEIGHT(3) | USAGE LIMITATIONS | COMMENTS |
|---|---|---|---|---|---|
| POST | PERFORATED SQUARE STEEL TUBE<br>U-CHANNEL<br>WOOD | RIGID | 5′ RURAL UNDIVIDED HIGHWAYS<br>7′ RURAL DIVIDED HIGHWAYS<br>7′ URBAN HIGHWAYS | NONE | POSTS SHALL BE FREE OF ANY BRACING AND EXTEND NO FURTHER ABOVE THE SIGN EXCEPT AS NEEDED FOR WARNING LIGHT ATTACHMENT. FOR DETAILS OF POST INSTALLATION DETAILS SEE SHEET NO. 2 OF 9. GALVANIZATION OF POSTS WILL NOT BE REQUIRED. |
| TYPE 1 PORTABLE | SKID<br>FOLD-UP STAND | RIGID | 5′ RURAL UNDIVIDED HIGHWAYS<br>7′ RURAL DIVIDED HIGHWAYS<br>7′ URBAN HIGHWAYS | PERMITTED ONLY WHERE POST MOUNTING IS NOT FEASIBLE. | SYSTEMS SHALL COMPLY WITH CRASH TEST REQUIREMENTS OF NCHRP 350 TEST LEVEL 3 AND MAY BE PLACED ADJACENT TO OR WITHIN THE ROADWAY PROVIDED A MINIMUM LATERAL CLEARANCE OF 3 FEET, MEASURED HORIZONTALLY FROM THE EDGE OF THE SIGN TO THE EDGE OF DESIGNATED TRAVELED WAY, IS MAINTAINED. |
| TYPE 2 PORTABLE | EASEL<br>FOLD-UP STAND<br>SELF-DRIVING POST<br>TYPE III MOVABLE BARRICADE<br>SKID | FLEXIBLE<br>RIGID | 12″(4) | PERMITTED ONLY FOR INSTALLATION UP TO 3 DAYS(5). WHERE SIGNS ARE OBSCURED BY OTHER OBJECTS (I.E., TRAFFIC CONTROL DEVICES, PARKED VEHICLES, BARRIER, VEGETATION, ETC.) OR INSTALLED ON MULTI-LANE UNDIVIDED FACILITIES OR MULTI-LANE DIVIDED FACILITIES WITH 3 OR MORE LANES IN ONE DIRECTION, MOUNTING HEIGHTS SHALL BE AS SPECIFIED FOR POST-MOUNTED SIGNS. | SYSTEMS SHALL COMPLY WITH CRASH TEST REQUIREMENTS OF NCHRP 350 TEST LEVEL 3 AND MAY BE PLACE ADJACENT TO OR WITHIN ROADWAY PROVIDED A MINIMUM LATERAL CLEARANCE OF 3 FEET, MEASURED HORIZONTALLY FROM THE EDGE OF THE SIGN TO THE EDGE OF THE DESIGNATED TRAVELED WAY, IS MAINTAINED. |
| BARRIER | CONCRETE TRAFFIC BARRIER<br>GUARDRAIL | FLEXIBLE<br>RIGID | 5′ RURAL UNDIVIDED HIGHWAYS<br>7′ RURAL DIVIDED HIGHWAYS<br>7′ URBAN HIGHWAYS | PERMITTED ONLY WHERE LONGITUDINAL BARRIER IS PRESENT. | SYSTEMS SHALL PROVIDE POSITIVE CONNECTION TO THE BARRIER AND MINIMIZE POTENTIAL FOR VEHICLE SNAGGING. |
| VEHICLE | PAVEMENT MARKING EQUIPMENT<br>PILOT CAR<br>PROTECTIVE VEHICLE | FLEXIBLE<br>RIGID | 48″ (6) | PERMITTED ONLY IN PILOT CAR OR MOVING OPERATIONS. | |

(3) MEASURED FROM THE BOTTOM OF THE SIGN TO THE NEAR EDGE OF THE PAVEMENT.
(4) MOUNTING HEIGHTS FOR REGULATORY AND GUIDE SIGNS SHALL BE AS SPECIFIED FOR POST-MOUNTED SIGNS.
(5) SIGNS MOUNTED ON TYPE III BARRICADES, GORE EXIT SIGN, AND SIGNS FOR CROSWALK/SIDEWALKCLOSURES MAY BE LEFT IN PLACE FOR MORE THAN 3 DAYS.
(6) DEVIATIONS AS APPROVED BY THE ENGINEER.




(1) EDGE OF TRAVELED WAY WHERE THERE IS NO PAVED OR STABILIZED SHOULDER.
(2) ONE-FOOT LESS THAN MOUNTING HEIGHT NOTED IN TABLE A.




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

GENERAL NOTES:

LONGITUDINAL SPACING OF SIGNS SHOWN IN THE PLANS ARE PREFERRED MINIMUMS, BUT MAY BE ADJUSTED TO MEET EXISTING FIELD CONDITIONS WITH APPROVAL FROM THE ENGINEER.

SIGNS SHALL NOT BE MOUNTED IN OR ON CHANNELIZERS.

ALL POSTS AND SIGNS SHALL BE INSTALLED AND MAINTAINED IN A PLUMB POSITION.

CONSTRUCTION SIGNS SHALL NOT BE LOCATED ON SIDEWALKS, BICYCLE LANES, OR AREAS DESIGNATED FOR PEDESTRIAN OR BICYCLE TRAFFIC.


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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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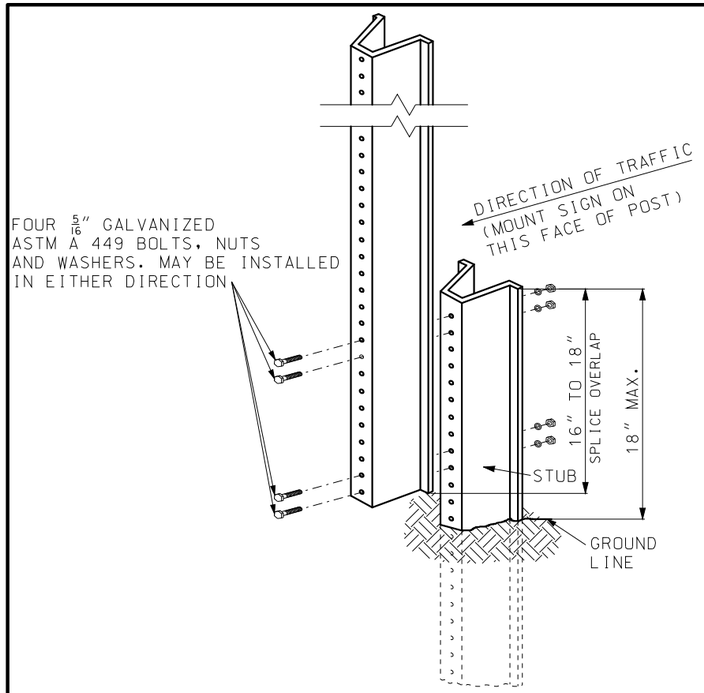
# TEMPORARY TRAFFIC CONTROL DEVICES
## SIGN MOUNTING REQUIREMENTS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

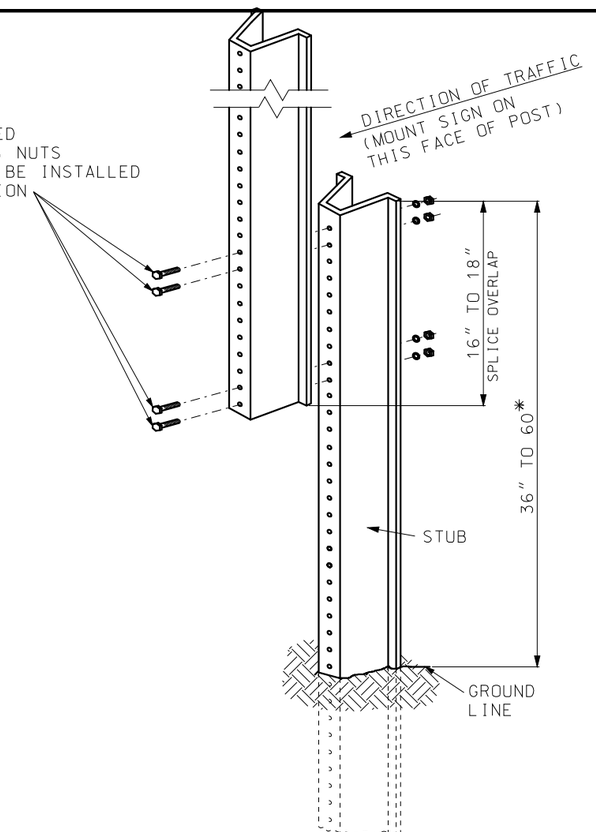
616.10AT

SHEET NO.
1 OF 9

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## U-CHANNEL POST DETAIL




## OPTIONAL U-CHANNEL POST DETAIL

## POST TYPE

| SIGN AREA (SQ.FT.) | U-CHANNEL | WOOD | PERFORATED SQUARE STEEL TUBING |
|---|---|---|---|
| ≤ 10 | 1 - 3.0 LB./FT.* | 1 - 4" X 4"* | 1 - 2" 12 GA.* |
| > 10 ≤ 16 | 2 - 3.0 LB./FT. | 2 - 4" X 4"<br>1 - 4" X 6"* | 2 - 2" 12 GA.<br>1 - 2½" 12 GA. |
| > 16 ≤ 24 | 2 - 3.0 LB./FT. | 2 - 4" X 6" | 3 - 2" 12 GA.** |
| > 24 ≤ 30 | 3 - 3.0 LB./FT. | 2 - 4" X 6" | N/A |
| > 30 ≤ 50 | N/A | 2 - 6" X 6" | N/A |

* SIGNS GREATER THAN 4 FEET IN WIDTH, EXCEPT DIAMOND SHAPE SIGNS, REQUIRE TWO POSTS.

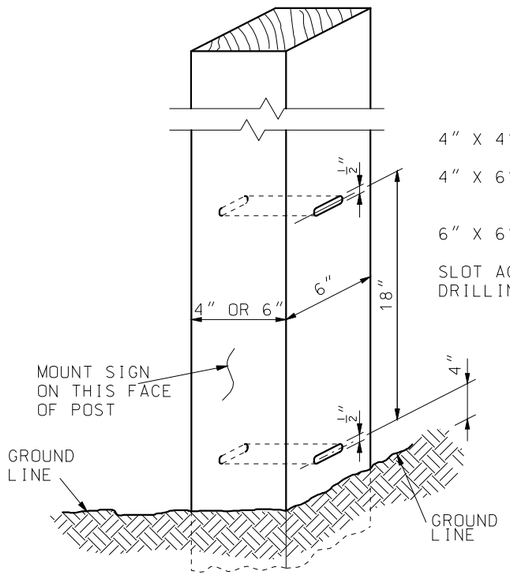
** REQUIRES SLIP BASE PER MANUFACTURER'S RECOMMENDATION.

USE OF SPLICE IS OPTIONAL.

SPLICE OVERLAP SHALL BE POSITION ENTIRELY BETWEEN GROUND LINE AND 18" ABOVE GROUND LINE OR BETWEEN 18" AND 60" ABOVE GROUND LINE.

* IF A PLAQUE IS USED, NEITHER THE SIGN NOR PLAQUE SHALL BE POSITIONED WITHIN THE SPLICE OVERLAP AREA.

ONLY ONE SPLICE WILL BE ALLOWED PER POST.



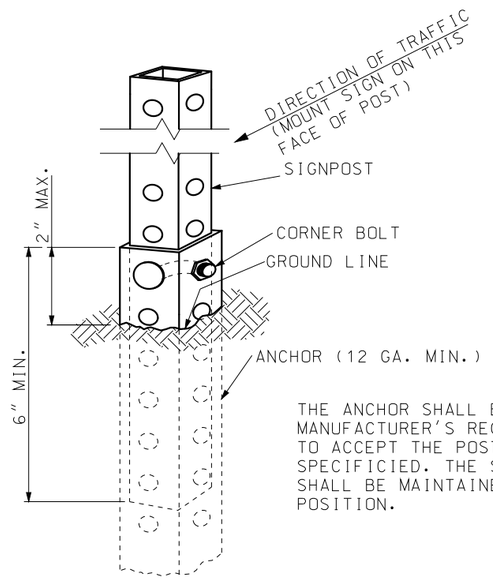

4" X 4" WOOD POST - NO SLOTS OR HOLES REQUIRED

4" X 6" WOOD POST - 1½" X ½" SLOT ON 6" SIDE OR 1½" DIA. HOLE ON 6" SIDE

6" X 6" WOOD POST - 2" X ½" SLOT OR 2" DIA. HOLE

SLOT ACROSS NEUTRAL AXIS FORMED BY SUCCESSIVE DRILLING WITH ½" BIT.

## WOOD POST DETAIL




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

THE ANCHOR SHALL BE SIZED AS PER MANUFACTURER'S RECOMMENDATIONS TO ACCEPT THE POST SIZE SPECIFICIED. THE SIGN ASSEMBLY SHALL BE MAINTAINED IN A PLUMB POSITION.

## PERFORATED SQUARE STEEL TUBE POST DETAIL

GENERAL NOTES:

ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 3 FEET.

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


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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
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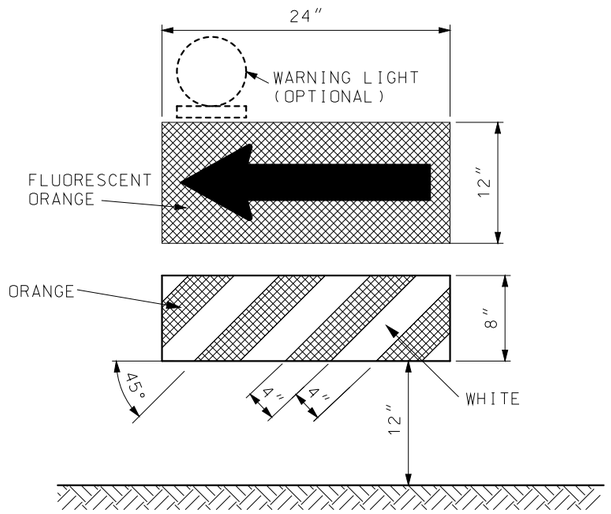
# TEMPORARY TRAFFIC CONTROL DEVICES POST INSTALLATION DETAILS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

616.10AT

SHEET NO. 2 OF 9

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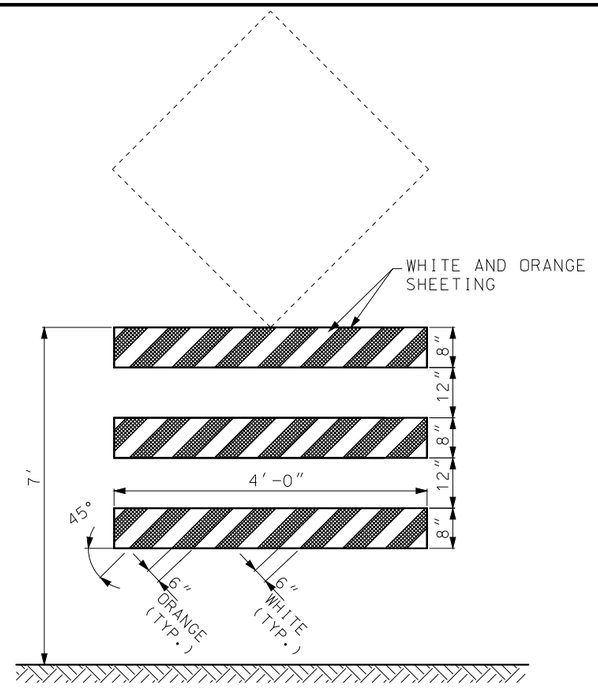



## DIRECTION INDICATOR BARRICADE

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

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

THE PANELS SHALL BE SECURELY ATTACHED TO A SUPPORT THAT IS PORTABLE, 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 7 TO 10 FEET SEPARATING THE TWO DEVICES.

WHERE MARKING IS NOT PROVIDED ON THE BACKSIDE, STRIPS OF 3″ WIDE MODOT TYPE 7 ORANGE 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 1042.2.7.3.

GENERAL NOTES:

FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.2.7.3.

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

WHITE AND ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.2.7.2.

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

WARNING LIGHTS SHALL BE IN ACCORDANCE WITH SEC 1063.5.

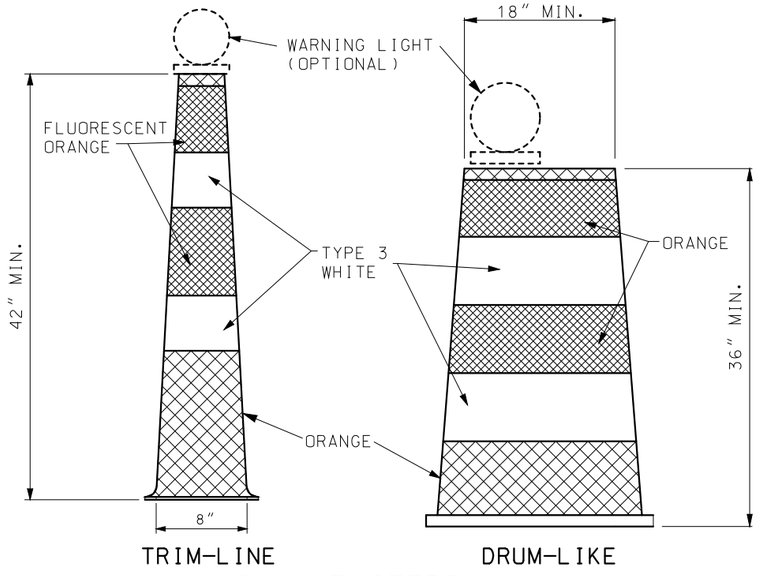
UPON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE DRUM-LIKE CHANNELIZERS IN LIEU OF TRIM-LINE CHANNELIZERS TO PROVIDE LONGITUDINAL CHANNELIZATION WITHIN THE ACTIVITY AREA WHERE NO RAMPS, INTERSECTIONS OR LIMITED LATERAL CLEARANCE EXISTS.

UPON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE DIRECTION INDICATOR BARRICADES IN LIEU OF TRIM-LINE CHANNELIZERS IN MERGING TAPERS.

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

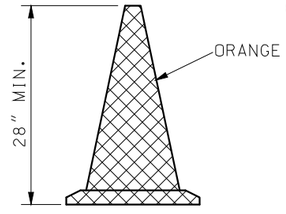
UPON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE CONES IN LIEU OF TRIM-LINE CHANNELIZERS DURING DAYTIME OPERATIONS ON MINOR ROUTES.

PANEL AND RAIL MARKINGS FOR TRAFFIC DELINEATION SHALL SLOPE DOWNWARD TOWARD THE INTENDED DIRECTION OF TRAVEL. ILLUSTRATIONS SHOWN ARE FOR INSTANCES WHERE TRAFFIC MOVES TO THE LEFT, REVERSE CONFIGURATIONS SHALL BE USED FOR TRAFFIC MOVEMENTS TO THE RIGHT. MARKINGS SHALL ONLY BE APPLIED TO THE FRONT OF EACH RAIL OR PANEL, OR MAY BE APPLIED TO BOTH THE FRONT AND BACK PROVIDING THE MARKING ON THE BACK DOES NOT CONFLICT WITH INTENDED OPPOSING TRAFFIC MOVEMENT.




## CHANNELIZERS

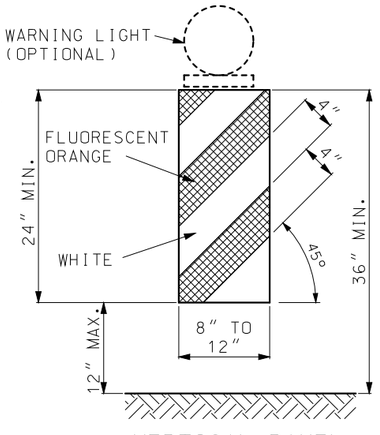
REFLECTIVE SHEETING APPLIED TO CHANNELIZERS SHALL BE REBOUNDABLE MEETING ASTM D 4956.




CONE

CONES SHALL MAINTAIN THEIR SHAPE UPON EXPOSURE TO NORMAL WORK CONDITIONS.

CONES SHALL BE USED DURING DAYLIGHT HOURS ONLY.




VERTICAL PANEL

VERTICAL PANELS SHALL BE SECURELY ATTACHED TO A SUPPORT THAT IS PORTABLE, CAPABLE OF REMAINING UPRIGHT AND ENTIRELY FREE STANDING.

STRIPES ON TRIM-LINE CHANNELIZERS SHALL BE 6″ TO 8″.
STRIPES ON DRUM-LIKE CHANNELIZERS SHALL BE 4″ TO 6″.

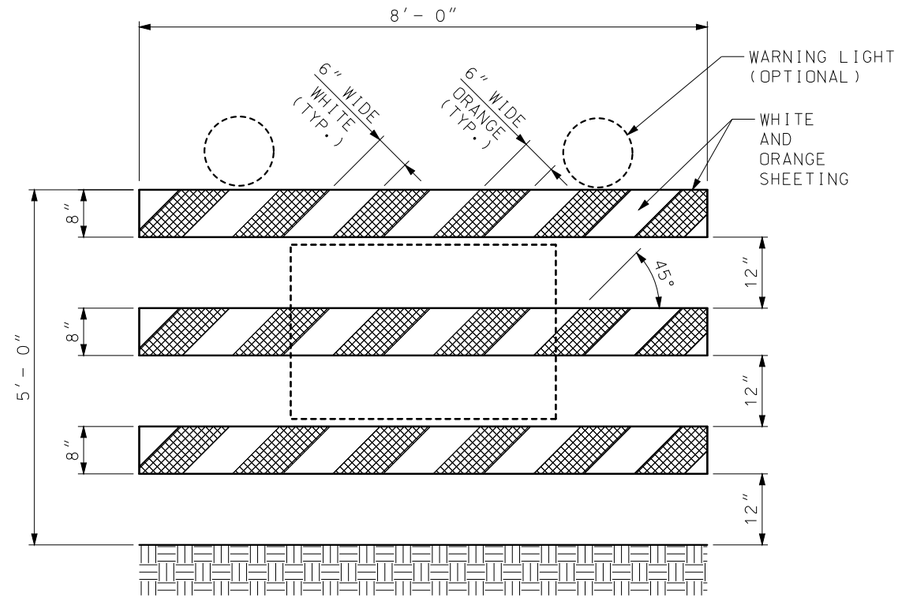
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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

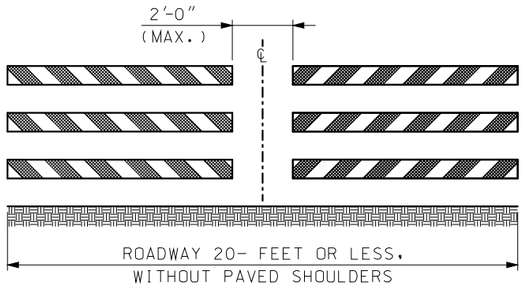

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TEMPORARY TRAFFIC CONTROL DEVICES
## CHANNELIZERS AND DIRECTION INDICATOR BARRICADE

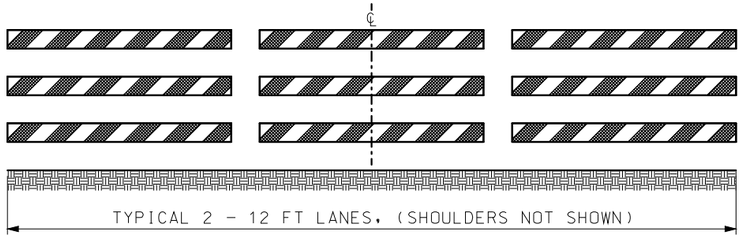
| DATE EFFECTIVE: 01/01/2017 | 616.10AT | SHEET NO. 3 OF 9 |
|---|---|---|
| DATE PREPARED: 10/28/2016 | | |




EXAMPLE 1

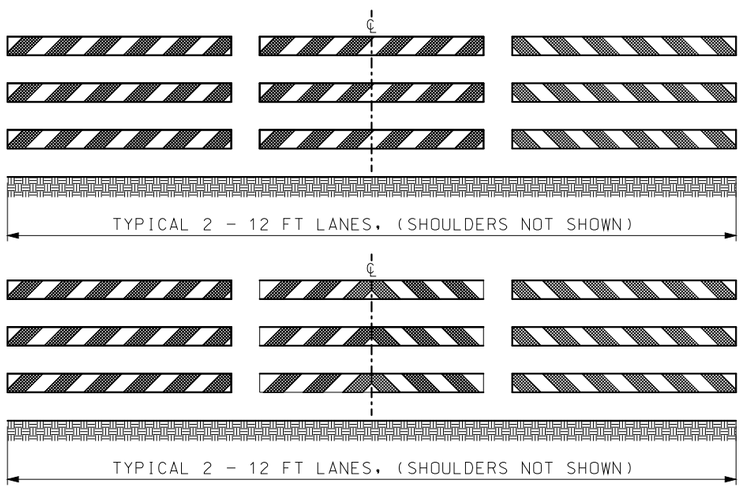



EXAMPLE 2

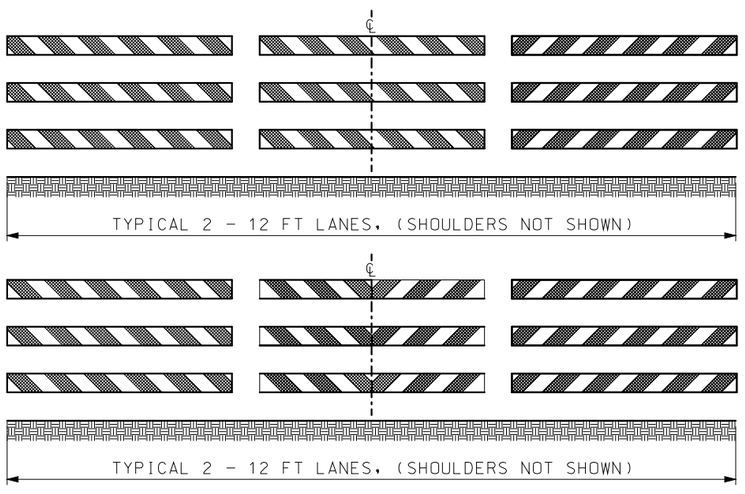



EXAMPLE SHOWS STRIPES SLOPING TO DIRECT VEHICULAR MOVEMENT TOWARD THE LEFT

EXAMPLE 3




EXAMPLE 4




EXAMPLE 5

EXAMPLE 1 - ONE TYPE 3 MOVABLE BARRICADE WILL BE REQUIRED TO COMPLETELY CLOSE EACH 8′ OF PAVEMENT. PAVED SHOULDERS SHALL BE INCLUDED IN THE AREA TO BE CLOSED.

SIGNS SHALL BE LIGHT WEIGHT (ROLL-UP OR PLASTIC) AND SHOULD NOT OBSCURE MORE THAN 50 PERCENT OF THE TOP 2 RAILS OR 33 PERCENT OF ALL THREE RAILS.

WARNING LIGHTS SHALL BE LIGHT WEIGHT (3.3 LBS. OR LESS) OR HAVE BATTERY PACK MOUNTED NO HIGHER THAN 18-INCH AND SHALL NOT COVER ANY PORTION OF THE BARRICADE FACE.

IF WARNING LIGHTS ARE USED,THE LIGHT SHOULD BE INSTALLED ON THE BARRICADES IN THE DIRECTION OF TRAFFIC.

IF SIGNS OR LIGHTS CANNOT MEET THE ABOVE REQUIREMENTS, THEY SHALL BE MOUNTED ON SEPARATE CRASHWORTHY DEVICES AT HEIGHTS SPECIFIED FOR POST MOUNTED SIGNS, LOCATED IN TABLE A ON SHEET 1. THE BARRICADE SHALL BE LOCATED IN FRONT OF THE SIGNS OR LIGHTS WITH 7 TO 10 FEET SEPARATING THE DEVICES.

TYPE 3 MOVABLE BARRICADES SHALL BE ENTIRELY FREE STANDING AND PORTABLE. MARKING SHALL ONLY BE APPLIED TO THE FRONT OF EACH RAIL OR MAY BE APPLIED TO BOTH THE FRONT AND THE BACK OF EACH RAIL PROVIDED THE MARKING ON THE BACK DOES NOT CONFLICT WITH INTENDED OPPOSING TRAFFIC MOVEMENT. WHERE MARKING IS NOT PROVIDED ON THE BACKSIDE, STRIPS OF 3″ WIDE ORANGE 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 104.2.7.3.

EXAMPLE 2 - FOR PAVED ROADWAYS WITH A WIDTH OF 20-FEET OR LESS AND WITHOUT PAVED SHOULDERS, TWO BARRICADES ARE ACCEPTABLE.

EXAMPLE 3 - WHERE BARRICADES EXTEND ENTIRELY ACROSS A ROADWAY, STRIPES SLOPE DOWNWARD IN THE DIRECTION TOWARD WHICH ROAD USERS MUST TURN.

EXAMPLE 4 - WHERE BOTH RIGHT AND LEFT TURNS ARE PROVIDED, STRIPES SLOPE DOWNWARD IN BOTH DIRECTIONS FROM THE CENTER OF THE BARRICADE OR BARRICADES.

EXAMPLE 5 - WHERE NO TURNS ARE INTENDED, STRIPES POSITIONED TO SLOPE DOWNARD TOWARD THE CENTER OF THE BARRICADE OR BARRICADES.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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

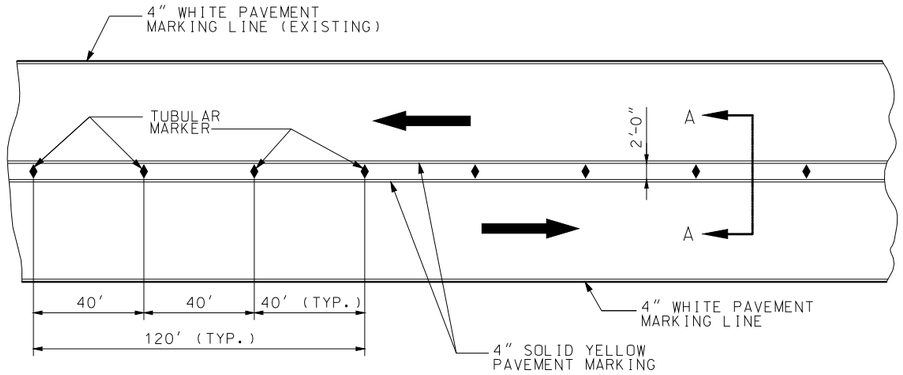

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# TEMPORARY TRAFFIC CONTROL DEVICES

## TYPE 3 MOVABLE BARRICADE

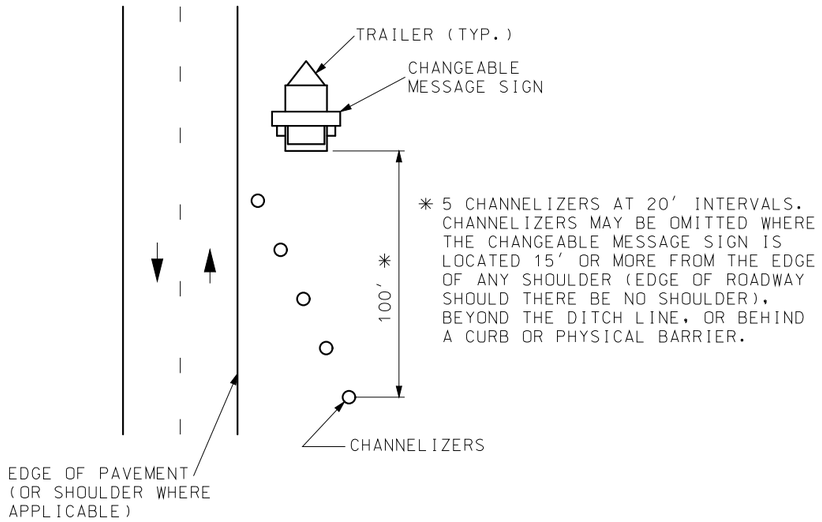
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

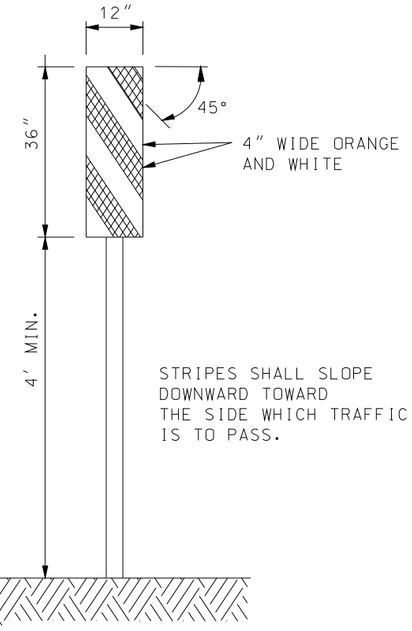
616.10AT




## TWO LANE / TWO WAY TRAFFIC DELINEATION PLAN FOR DIVIDED HIGHWAY

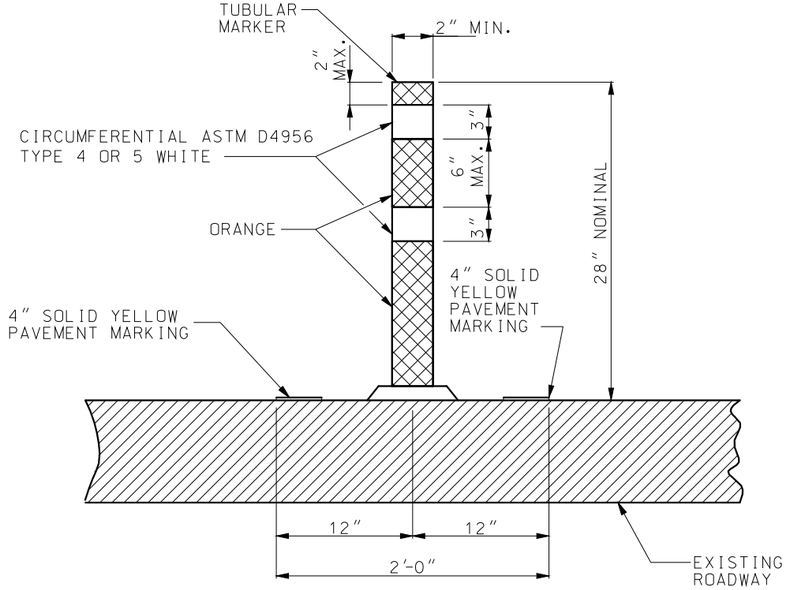
IF RAISED PAVEMENT MARKERS ARE PRESENT, THE LENSES SHALL BE REMOVED OR COVERED TO THE SATISFACTION OF THE ENGINEER.




## TYPE 3 OBJECT MARKERS

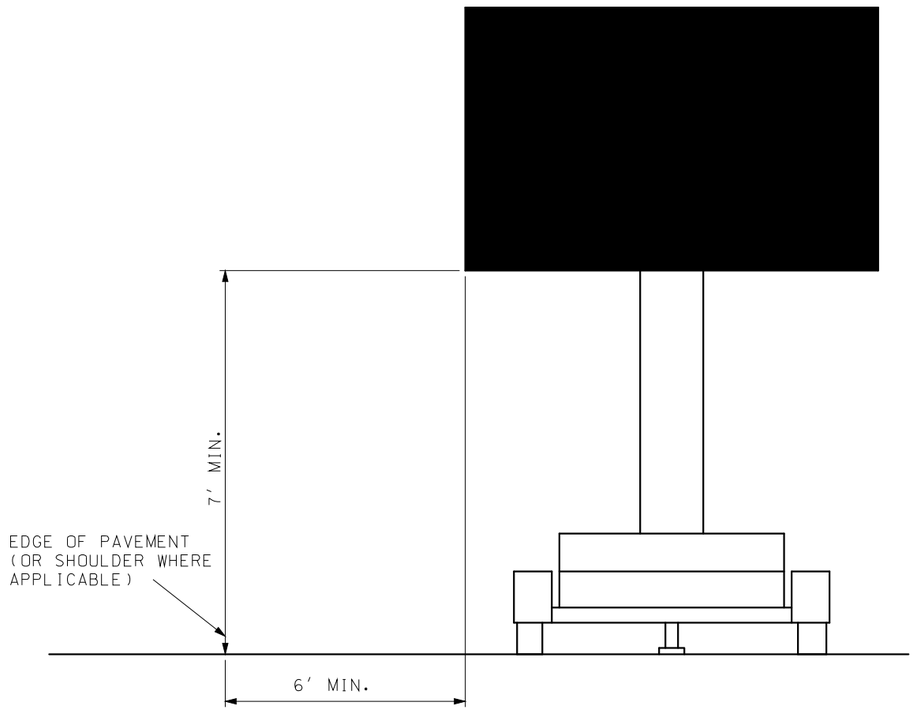
WHITE AND ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.2.7.3.




## SECTION A-A
## TUBULAR MARKER DETAIL

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

REFLECTIVE SHEETING APPLIED TO TUBULAR MARKERS SHALL BE REBOUNDABLE MEETING ASTM D4956.




## CHANGEABLE MESSAGE SIGN

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

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TEMPORARY TRAFFIC CONTROL DEVICES

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

616.10AT

SHEET NO. 5 OF 9

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## WARNING SIGNS

| SIGN | SIZE (IN.) | AREA (SQ. FT.) | COLOR SYM. LEG. BRD. | COLOR BACK GROUND | SHEETING | DESCRIPTION |
|---|---|---|---|---|---|---|
| SPECIAL | 36X36 | 9.00 | BK | FL. OR | R4 | FRESH OIL/LOOSE GRAVEL (3) |
| EO5-2 | 48X36 | 12.00 | BK | FL. OR | R4 | EXIT OPEN |
| EO5-2a | 48X36 | 12.00 | BK | FL. OR | R4 | EXIT CLOSED |
| WO1-1L | 48X48 | 16.00 | BK | FL. OR | R4 | TURN (SYMBOL LEFT ARROW) |
| WO1-1R | 48X48 | 16.00 | BK | FL. OR | R4 | TURN (SYMBOL RIGHT ARROW) |
| WO1-2L | 48X48 | 16.00 | BK | FL. OR | R4 | CURVE (SYMBOL LEFT ARROW) |
| WO1-2R | 48X48 | 16.00 | BK | FL. OR | R4 | CURVE (SYMBOL RIGHT ARROW) |
| WO1-3L | 48X48 | 16.00 | BK | FL. OR | R4 | REVERSE TURN (SYMBOL LEFT ARROW) |
| WO1-3R | 48X48 | 16.00 | BK | FL. OR | R4 | REVERSE TURN (SYMBOL RIGHT ARROW) |
| WO1-4L | 48X48 | 16.00 | BK | FL. OR | R4 | REVERSE CURVE (SYMBOL LEFT ARROW) |
| WO1-4R | 48X48 | 16.00 | BK | FL. OR | R4 | REVERSE CURVE (SYMBOL RIGHT ARROW) |
| WO1-4bL | 48X48 | 16.00 | BK | FL. OR | R4 | DOUBLE ARROW REVERSE CURVE (SYMBOL LEFT ARROWS) (2) |
| WO1-4bR | 48X48 | 16.00 | BK | FL. OR | R4 | DOUBLE ARROW REVERSE CURVE (SYMBOL RIGHT ARROWS) (2) |
| WO1-4cL | 48X48 | 16.00 | BK | FL. OR | R4 | TRIPLE ARROW REVERSE CURVE (SYMBOL LEFT ARROWS) (2) |
| WO1-4cR | 48X48 | 16.00 | BK | FL. OR | R4 | TRIPLE ARROW REVERSE CURVE (SYMBOL RIGHT ARROWS) (2) |
| WO1-6 | 60X30 | 12.50 | BK | FL. OR | R4 | HORIZONTAL ARROW (SYMBOL) |
| WO1-6a | 72X36 | 18.00 | BK | FL. OR | R4 | HORIZONTAL ARROW (SYMBOL ON PERMANENT BARRICADE) (1) |
| WO1-7 | 60X30 | 12.50 | BK | FL. OR | R4 | DOUBLE HEAD HORIZONTAL ARROW (SYMBOL) |
| WO1-7a | 72X36 | 18.00 | BK | FL. OR | R4 | DOUBLE HEAD HORIZONTAL ARROW (SYMBOL ON PERMANENT BARRICADE)(1) |
| WO1-8 | 18X24 | 3.00 | BK | FL. OR | R4 | CHEVRON (SYMBOL) |
| WO1-8a | 30X36 | 7.50 | BK | FL. OR | R4 | CHEVRON (SYMBOL FOR DIVIDED HIGHWAYS) |
| WO3-1 | 48X48 | 16.00 | BK | FL. OR | R4 | STOP AHEAD (SYMBOL) |
| WO3-2 | 48X48 | 16.00 | BK | FL. OR | R4 | YIELD AHEAD (SYMBOL) |
| WO3-3 | 48X48 | 16.00 | BK | FL. OR | R4 | SIGNAL AHEAD (SYMBOL) |
| WO3-4 | 48X48 | 16.00 | BK | FL. OR | R4 | BE PREPARED TO STOP |
| WO3-5 | 48X48 | 16.00 | BK | FL. OR | R4 | SPEED LIMIT AHEAD |
| WO4-1L | 48X48 | 16.00 | BK | FL. OR | R4 | MERGE (SYMBOL FROM LEFT) |
| WO4-1R | 48X48 | 16.00 | BK | FL. OR | R4 | MERGE (SYMBOL FROM RIGHT) |
| WO4-1a(L) | 48X48 | 16.00 | BK | FL. OR | R4 | MERGE (ARROW SYMBOL) (3) |
| WO4-1a(R) | 48X48 | 16.00 | BK | FL. OR | R4 | MERGE (ARROW SYMBOL) (3) |
| WO5-1 | 48X48 | 16.00 | BK | FL. OR | R4 | ROAD/BRIDGE/RAMP NARROWS (4) |
| WO5-3 | 48X48 | 16.00 | BK | FL. OR | R4 | ONE LANE BRIDGE |
| WO5-5 | 48X48 | 16.00 | BK | FL. OR | R4 | NARROW LANES (3) |
| WO6-1 | 48X48 | 16.00 | BK | FL. OR | R4 | DIVIDED HIGHWAY (SYMBOL) |
| WO6-2 | 48X48 | 16.00 | BK | FL. OR | R4 | DIVIDED HIGHWAY END (SYMBOL) |
| WO6-3 | 48X48 | 16.00 | BK | FL. OR | R4 | TWO WAY TRAFFIC (SYMBOL) |
| WO7-3a | 30X24 | 5.00 | BK | FL. OR | R4 | NEXT XX MILES (PLAQUE) |
| WO8-1 | 48X48 | 16.00 | BK | FL. OR | R4 | BUMP |
| WO8-2 | 48X48 | 16.00 | BK | FL. OR | R4 | DIP |
| WO8-3 | 48X48 | 16.00 | BK | FL. OR | R4 | PAVEMENT ENDS |
| WO8-4 | 48X48 | 16.00 | BK | FL. OR | R4 | SOFT SHOULDER |
| WO8-5 | 48X48 | 16.00 | BK | FL. OR | R4 | SLIPPERY WHEN WET (SYMBOL) |
| WO8-6 | 48X48 | 16.00 | BK | FL. OR | R4 | TRUCK CROSSING WITH FLAGS |
| WO8-6c | 48X48 | 16.00 | BK | FL. OR | R4 | TRUCK ENTRANCE (3) |
| WO8-7 | 36X36 | 9.00 | BK | FL. OR | R4 | LOOSE GRAVEL |
| WO8-9 | 48X48 | 16.00 | BK | FL. OR | R4 | LOW SHOULDER |
| WO8-11 | 48X48 | 16.00 | BK | FL. OR | R4 | UNEVEN LANES |
| WO8-12 | 48X48 | 16.00 | BK | FL. OR | R4 | NO CENTER LINE |
| WO8-15 | 48X48 | 16.00 | BK | FL. OR | R4 | GROOVED PAVEMENT |
| WO8-15p | 30X24 | 5.00 | BK | FL. OR | R4 | MOTORCYCLE (PLAQUE) |
| WO8-17(L) | 48X48 | 16.00 | BK | FL. OR | R4 | SHOULDER DROP-OFF (SYMBOL LEFT) |
| WO8-17(R) | 48X48 | 16.00 | BK | FL. OR | R4 | SHOULDER DROP OFF (SYMBOL RIGHT) (4) |
| WO8-17p | 30X24 | 5.00 | BK | FL. OR | R4 | SHOULDER DROP-OFF (PLAQUE) |
| W10-1 | 42 RND. | 9.62 | BK | FL. YL | R4 | RAILROAD CROSSING |
| WO12-1 | 24X24 | 4.00 | BK | FL. OR | R4 | DOUBLE DOWN ARROW (SYMBOL) |
| WO12-2 | 48X48 | 16.00 | BK | FL. OR | R4 | LOW CLEARANCE (SYMBOL) |
| WO12-2x | 24X18 | 3.00 | BK | FL. OR | R4 | LOW CLEARANCE (PLAQUE) (3) |
| WO12-2a | 84X24 | 14.00 | BK | FL. OR | R4 | OVERHEAD LOW CLEARANCE (FEET AND INCHES) (3) |
| SPECIAL | 120X60 | 50.00 | BK | FL. OR | R4 | LOW CLEARANCE XX FT XX IN XX MILES AHEAD (3) |
| SPECIAL | 120X60 | 50.00 | BK | FL. OR | R4 | WIDTH RESTRICTION XX FT XX IN XX MILES AHEAD (3) |
| WO13-1 | 30X30 | 6.25 | BK | FL. OR | R4 | ADVISORY SPEED (PLAQUE) |
| WO16-2 | 30X24 | 5.00 | BK | FL. OR | R4 | XXX FEET (PLAQUE) |
| WO16-3 | 30X24 | 5.00 | BK | FL. OR | R4 | X MILE (PLAQUE) |
| WO20-1 | 48X48 | 16.00 | BK | FL. OR | R4 | ROAD/BRIDGE/RAMP WORK AHEAD (4) |
| WO20-2 | 48X48 | 16.00 | BK | FL. OR | R4 | DETOUR AHEAD |
| WO20-3 | 48X48 | 16.00 | BK | FL. OR | R4 | ROAD CLOSED AHEAD |

(1) SIGN DEPICTION, ARROW, BORDERS AND SPACING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

(2) REFER TO THE LATEST EDITION OF MUTCD PART VI BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA FOR SIGN DEPICTION. ARROW, BORDERS AND SPACING SHALL CONFORM TO THE GUIDELINES SET FORTH IN THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

(3) ARROW, BORDERS AND SPACING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

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

(5) PLAQUE AND APPLICABLE REGULATORY SIGN MAY BE MANUFACTURED AS ONE SIGN.

(6) R4 REFER TO SEC 1042.2.7.3.

GENERAL NOTES:

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

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

NO ADDITIONAL PAYMENT WILL BE MADE FOR PLATES.

ALL PLAQUES SHALL HAVE A BORDER. PLATES SHALL NOT HAVE A BORDER.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TEMPORARY TRAFFIC CONTROL DEVICES
## WARNING SIGNS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

616.10AT



IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

| SIGN | SIZE (IN.) | AREA (SQ. FT.) | COLOR SYM. LEG. BRD. | COLOR BACK GROUND | SHEETING | DESCRIPTION | |
|---|---|---|---|---|---|---|---|
| **WARNING SIGNS** | | | | | | | |
| W020-3 | 48X48 | 16.00 | BK | FL. OR | R4 | ROAD CLOSED AHEAD | |
| W020-4 | 48X48 | 16.00 | BK | FL. OR | R4 | ONE LANE ROAD AHEAD | |
| W020-5 | 48X48 | 16.00 | BK | FL. OR | R4 | RIGHT/CENTER/LEFT LANE CLOSED AHEAD | (4) |
| W020-5a | 48X48 | 16.00 | BK | FL. OR | R4 | 2 RIGHT/CENTER/LEFT LANES CLOSED AHEAD | (4) |
| SPECIAL W020-6a | 48X48 | 16.00 | BK | FL. OR | R4 | RIGHT/CENTER/LEFT LANE CLOSED | (3)(4) |
| W020-7 | 48X48 | 16.00 | BK | FL. OR | R4 | FLAGGER (SYMBOL) WITH FLAGS | |
| W021-2 | 36X36 | 9.00 | BK | FL. OR | R4 | FRESH OIL | |
| SPECIAL W021-5 | 48X48 | 16.00 | BK | FL. OR | R4 | SHOULDER WORK AHEAD | (3) |
| W021-5a | 48X48 | 16.00 | BK | FL. OR | R4 | RIGHT/LEFT SHOULDER CLOSED | |
| W021-5b | 48X48 | 16.00 | BK | FL. OR | R4 | RIGHT/LEFT SHOULDER CLOSED AHEAD | |
| W022-1 | 48X48 | 16.00 | BK | FL. OR | R4 | BLASTING ZONE AHEAD | |
| W022-2 | 42X36 | 10.50 | BK | FL. OR | R4 | TURN OFF 2-WAY RADIO AND PHONE | |
| W022-3 | 42X36 | 10.50 | BK | FL. OR | R4 | END BLASTING ZONE | |
| SPECIAL W022-6e | 21X15 | 2.19 | BK | FL. OR | R4 | WET PAINT (ARROW PIVOTS) | (3) |
| **GUIDE SIGNS** | | | | | | | |
| E05-1 | 36X48 | 12.00 | BK | FL. OR | R4 | GORE EXIT | (3) |
| G020-1 | 60X24 | 10.00 | BK | FL. OR | R4 | ROAD WORK NEXT XX MILES | |
| G020-2 | 48X24 | 8.00 | BK | FL. OR | R4 | END ROAD WORK | |
| G020-4 | 36X18 | 4.50 | BK | FL. OR | R4 | PILOT CAR FOLLOW ME | |
| SPECIAL | 42X30 | 8.75 | BK | FL. OR | R4 | PLEASE WAIT FOR PILOT CAR | (3) |
| G020-5aP | 36X24 | 6.00 | BK | FL. OR | R4 | WORK ZONE (PLAQUE) | (3) (5) |
| M04-8a | 24X18 | 3.00 | BK | FL. OR | R4 | END DETOUR | |
| M04-9L | 48X36 | 12.00 | BK | FL. OR | R4 | DETOUR (LEFT ARROW) | |
| M04-9R | 48X36 | 12.00 | BK | FL. OR | R4 | DETOUR (RIGHT ARROW) | |
| M04-10L | 48X18 | 6.00 | BK | FL. OR | R4 | DETOUR (ARROW LEFT) | |
| M04-10R | 48X18 | 6.00 | BK | FL. OR | R4 | DETOUR (ARROW RIGHT) | |
| **REGULATORY SIGNS** | | | | | | | |
| R1-1 | 48X48 | 13.25 | WH | RD | R2 | STOP | |
| R1-2 | 48 TRI. | 6.93 | RD | WH | R2 | YIELD | |
| R1-2a | 36X36 | 9.00 | BK | WH | R2 | TO ONCOMING TRAFFIC (PLAQUE) | |
| R1-3p | 20X9 | 1.25 | WH | RD | R2 | ALL WAY (PLAQUE) | |
| R2-1 | 36X48 | 12.00 | BK | WH | R2 | SPEED LIMIT XX | |
| R3-1 | 48X48 | 16.00 | BK/RD | WH | R2 | NO RIGHT TURN (SYMBOL) | |
| R3-2 | 48X48 | 16.00 | BK/RD | WH | R2 | NO LEFT TURN (SYMBOL) | |
| R3-3 | 36X36 | 9.00 | BK | WH | R2 | NO TURNS | |
| R3-4 | 48X48 | 16.00 | BK/RD | WH | R2 | NO U-TURN (SYMBOL) | |
| R3-7L | 30X30 | 6.25 | BK | WH | R2 | LEFT LANE MUST TURN LEFT | |
| R3-7R | 30X30 | 6.25 | BK | WH | R2 | RIGHT LANE MUST TURN RIGHT | |
| R4-1 | 36X48 | 12.00 | BK | WH | R2 | DO NOT PASS | |
| R4-2 | 36X48 | 12.00 | BK | WH | R2 | PASS WITH CARE | |
| R4-7a | 36X48 | 12.00 | BK | WH | R2 | KEEP RIGHT (HORIZONTAL ARROW) | |
| R4-8a | 36X48 | 12.00 | BK | WH | R2 | KEEP LEFT (HORIZONTAL ARROW) | |
| R5-1 | 30X30 | 6.25 | RD | WH | R2 | DO NOT ENTER | |
| R5-1a | 36X24 | 6.00 | WH | RD | R2 | WRONG WAY | |
| R6-1L | 48X18 | 6.00 | BK | WH | R2 | ONE WAY ARROW (LEFT) | |
| R6-1R | 48X18 | 6.00 | BK | WH | R2 | ONE WAY ARROW (RIGHT) | |
| R6-2L | 24X30 | 5.00 | BK | WH | R2 | ONE WAY (LEFT) | |
| R6-2R | 24X30 | 5.00 | BK | WH | R2 | ONE WAY (RIGHT) | |
| R10-6 | 24X36 | 6.00 | BK | WH | R2 | STOP HERE ON RED (45° ARROW) | |
| R11-2 | 48X30 | 10.00 | BK | WH | R2 | ROAD CLOSED | |
| R11-3a | 60X30 | 12.50 | BK | WH | R2 | ROAD CLOSED XX MILES AHEAD LOCAL TRAFFIC ONLY | |
| R11-4 | 60X30 | 12.50 | BK | WH | R2 | ROAD CLOSED TO THRU TRAFFIC | |
| CONST-3A | 60X48 | 20.00 | BK | WH/FL. OR | R2 | FINE SIGN | (3) |
| CONST-3X | 56X12 | 4.67 | BK | WH | R2 | SPEEDING/PASSING (PLATE) | (3) |
| | | | | | | | |
| **SPECIAL SIGNS** | | | | | | | |
| CONST-7-72 | 72X36 | 18.00 | WH/BL | BK/FL.OR | R2 | RATE OUR WORK ZONE | |
| CONST-7-48 | 48X24 | 8.00 | WH/BL | BK/FL.OR | R2 | RATE OUR WORK ZONE | |
| | | | | | | | |

(1) SIGN DEPICTION, ARROW, BORDERS AND SPACING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

(2) REFER TO THE LATEST EDITION OF MUTCD PART VI BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA FOR SIGN DEPICTION. ARROW, BORDERS AND SPACING SHALL CONFORM TO THE GUIDELINES SET FORTH IN THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

(3) ARROW, BORDERS AND SPACING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

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

(5) PLAQUE AND APPLICABLE REGULATORY SIGN MAY BE MANUFACTURED AS ONE SIGN.

(6) R2 REFER TO SEC 1042.2.7.2.

(7) R4 REFER TO SEC 1042.2.7.3.

GENERAL NOTES:

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

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

NO ADDITIONAL PAYMENT WILL BE MADE FOR PLATES.

ALL PLAQUES SHALL HAVE A BORDER. PLATES SHALL NOT HAVE A BORDER.


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


STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TEMPORARY TRAFFIC CONTROL DEVICES

## WARNING, GUIDE AND REGULATORY SIGNS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

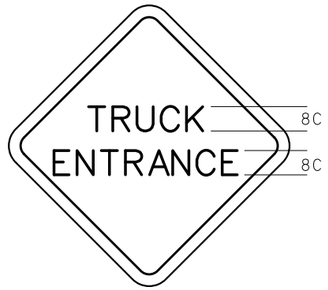
616.10AT




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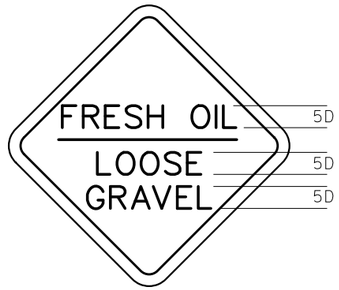

W05-5 (3)




W08-6c (3)




W012-2x (3)




SPECIAL (3)

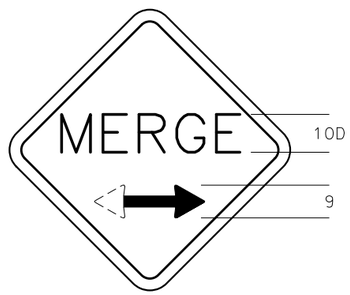
(1) SIGN DEPICTION, ARROW, BORDERS AND SPACING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

(2) REFER TO THE LATEST EDITION OF MUTCD PART VI BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA FOR SIGN DEPICTION. ARROW, BORDERS AND SPACING SHALL CONFORM TO THE GUIDELINES SET FORTH IN THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

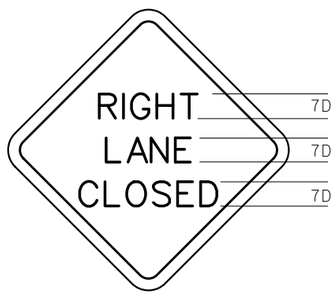
(3) ARROW, BORDERS AND SPACING SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FHWA.

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

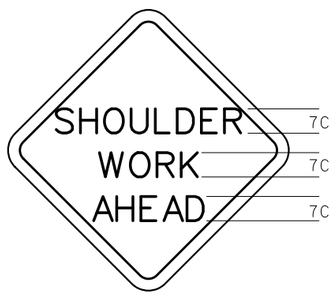
(5) PLAQUE AND APPLICABLE REGULATORY SIGN MAY BE MANUFACTURED AS ONE SIGN.



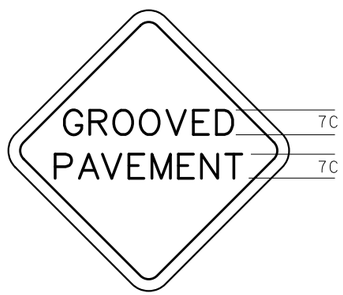

W04-1a

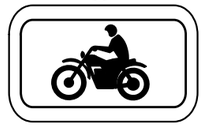



W020-6a (3)(4)

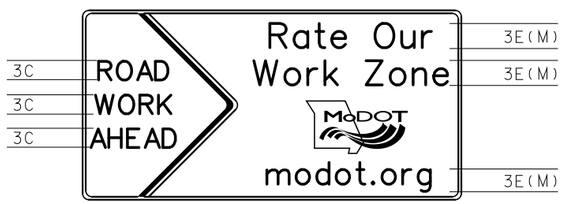



W021-5 (3)

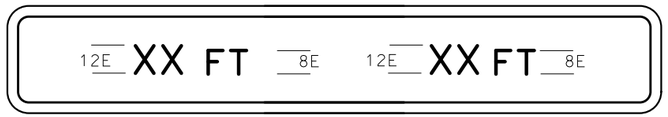


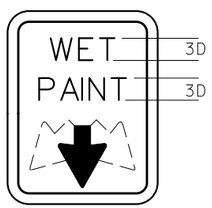
W08-15(3)
W08-15p



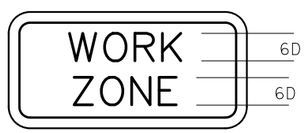

CONST-7-72
CONST-7-48



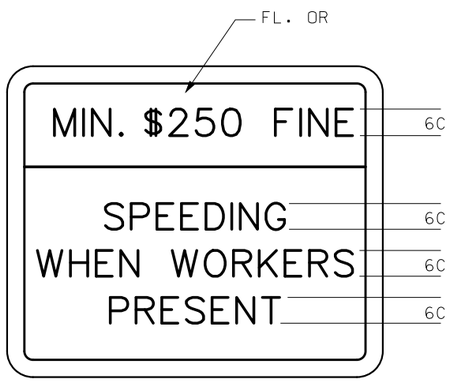

W012-2a (3)



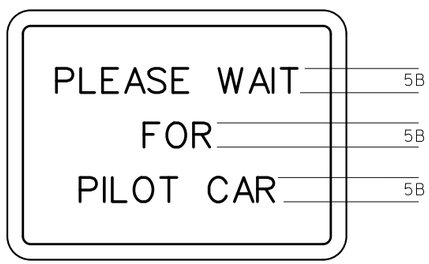

W022-6e (3)




G020-5aP (3)




CONST-3A (3)




SPECIAL (3)




SPECIAL (3)




SPECIAL (3)




CONST-3X (3)

GENERAL NOTES:

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NO ADDITIONAL PAYMENT WILL BE MADE FOR PLATES.

ALL PLAQUES SHALL HAVE A BORDER. PLATES SHALL NOT HAVE A BORDER.

LETTER DIMENSIONS SHALL BE AS SHOWN.

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

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TEMPORARY TRAFFIC CONTROL DEVICES

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

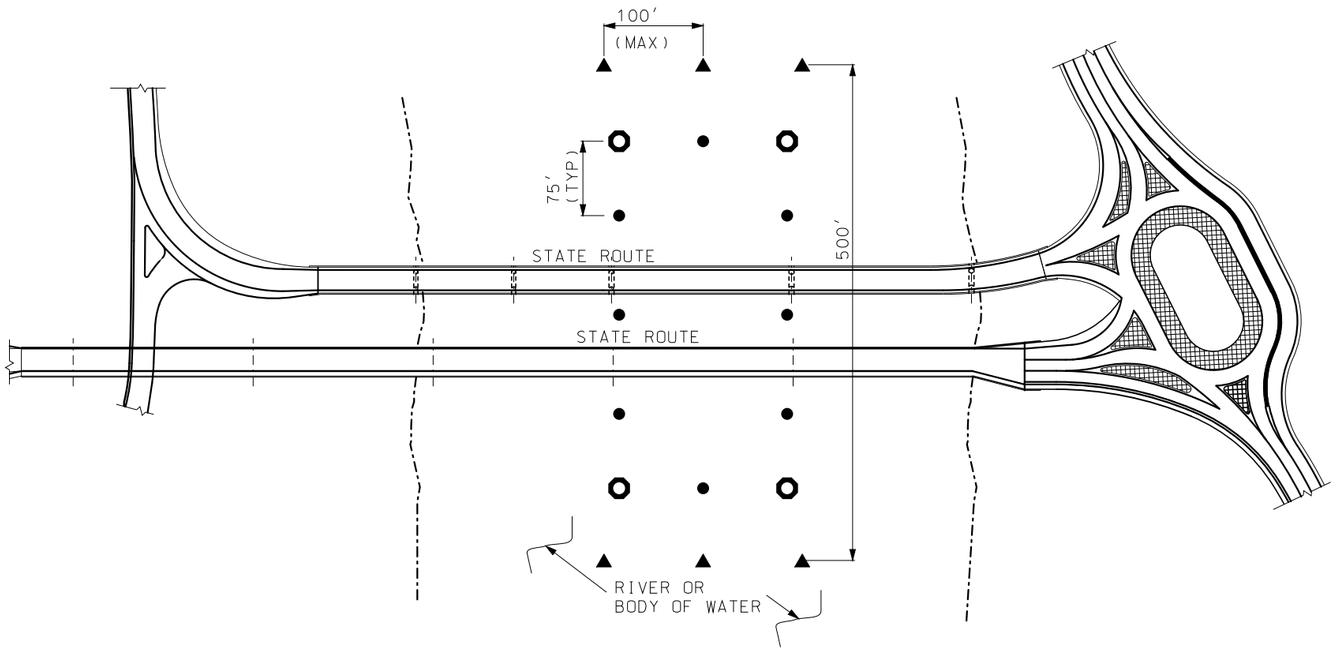
616.10AT

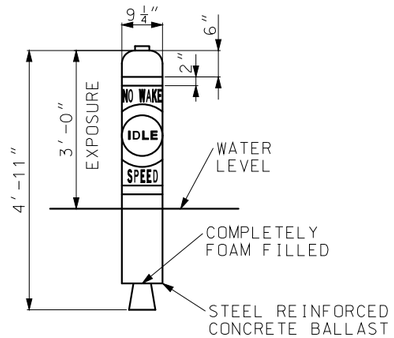
SHEET NO. 8 OF 9

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LEGEND

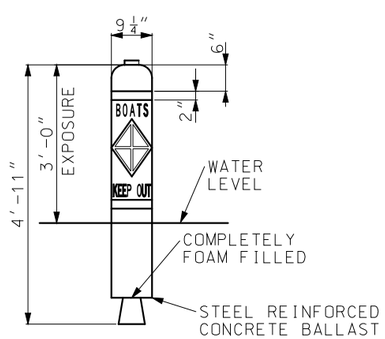
- ○ – BOATS KEEP OUT (SIGN)
- ● – BOATS KEEP OUT (BUOY)
- ▲ – NO WAKE (BUOY)



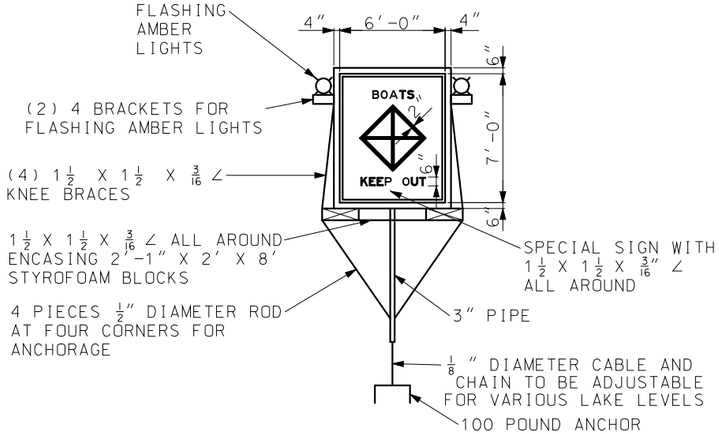

51 POUND ANCHOR
TACKLE PERMITTED

RESTRICTED AREA BUOY
("NO WAKE")
(6 REQUIRED – ROADWAY ITEM)




51 POUND ANCHOR
TACKLE PERMITTED

CONTROLLED AREA BUOY
("BOATS KEEP OUT")
(8 REQUIRED – ROADWAY ITEM)




SPECIAL SIGN ASSEMBLY
("BOATS KEEP OUT")
(4 REQUIRED – ROADWAY ITEM)

GENERAL NOTES:

INFORMATION SHOWN IS SCHEMATIC ONLY. FINAL LOCATION AND NUMBER OF SIGNS AND BUOYS IS SUBJECT TO APPROVAL OF MISSOURI STATE WATER PATROL

THE DETAILS SHOWN ARE FOR BIDDING PURPOSES ONLY. ALL MATERIALS AND LABOR NECESSARY TO INSTALL AND REMOVE

SIGNS SHALL BE INCIDENTAL TO OTHER ITEMS

THE CONTRACTOR IS RESPONSIBLE FOR BUOY MAINTENANCE THROUGHOUT CONSTRUCTION AND FOR DETERMINING ANTICIPATED WATER LEVELS DURING CONSTRUCTION. EACH SIGN AND BUOY SHALL BE ANCHORED TO BOTTOM OF LAKE.

SIGNS SHALL BE DOUBLE FACED

EACH SIGN SHALL BE EQUIPPED WITH TWO (2) FLASHING LIGHT UNITS WITH AMBER LENS. FLASHING LIGHT UNITS SHALL BE FURNISHED AND MAINTAINED BY THE CONTRACTOR

ALL LETTERING TO BE BLACK IN COLOR IN BLOCK FORM.

FOR OTHER INFORMATION AND LOCATION OF SIGNS AND BUOYS SEE SPECIAL PROVISIONS.

SCHEMATIC SHOWN IS FOR ONE NAVIGATIONAL SPAN. FOR WORK ON OTHER SPANS MOVE APPROPRIATE SIGNS WITH NO DIRECT PAY

COLOR:
- BACKGROUND – WHITE
- LEGEND – BLACK
- 2″ REFLECTIVE BAND AND SYMBOL – INTERNATIONAL ORANGE

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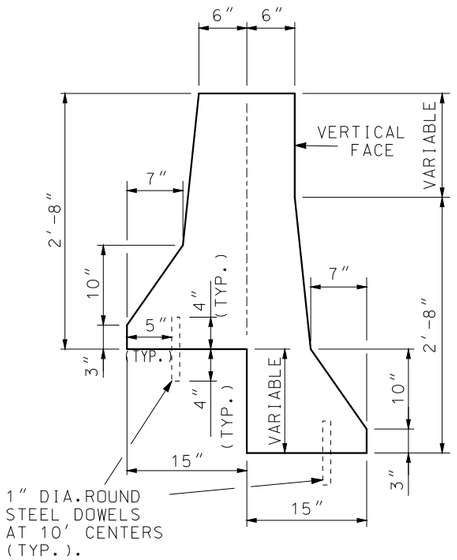

STATE OF MISSOURI
ERIC E. SCHROETER
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PROFESSIONAL ENGINEER
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# TEMPORARY TRAFFIC CONTROL DEVICES

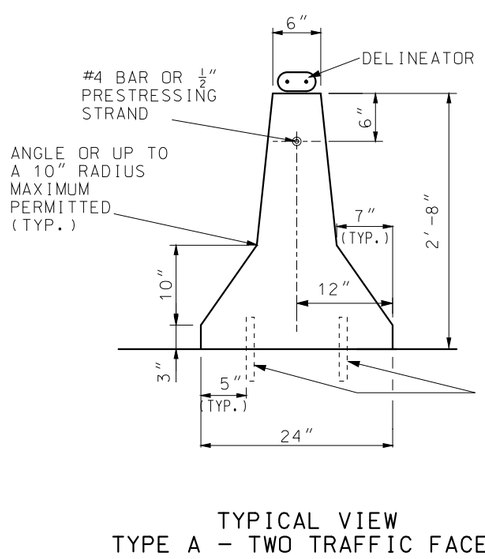
## TRAFFIC CONTROL FOR WATERWAYS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

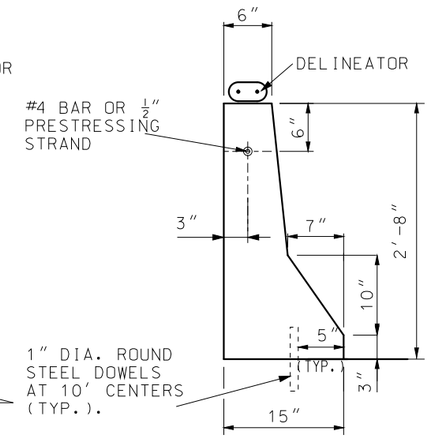
616.10AT



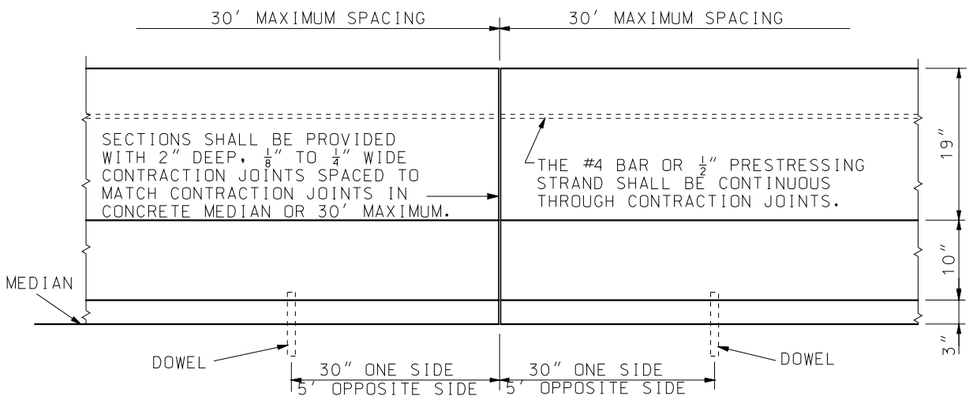

TYPICAL VIEW
BARRIER FOR
STEPPED PAVEMENT

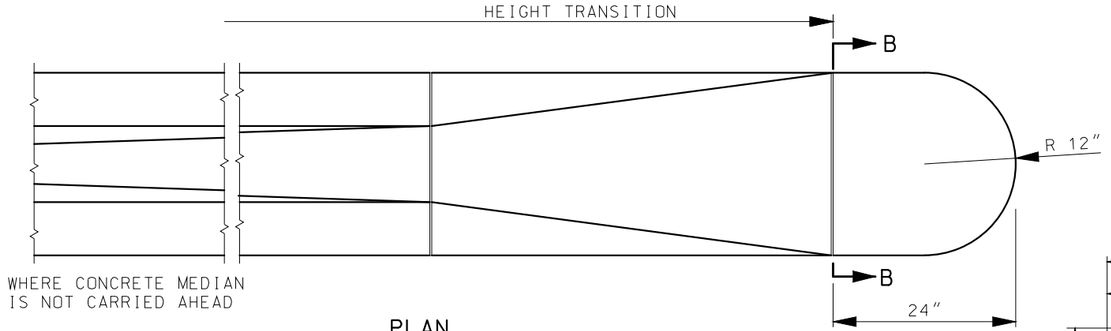



TYPICAL VIEW
TYPE A – TWO TRAFFIC FACES

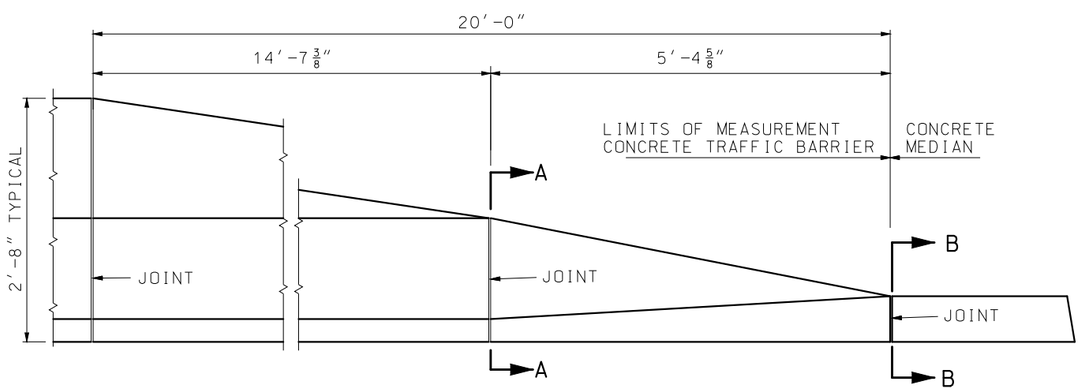



TYPICAL VIEW
TYPE B – ONE TRAFFIC FACE

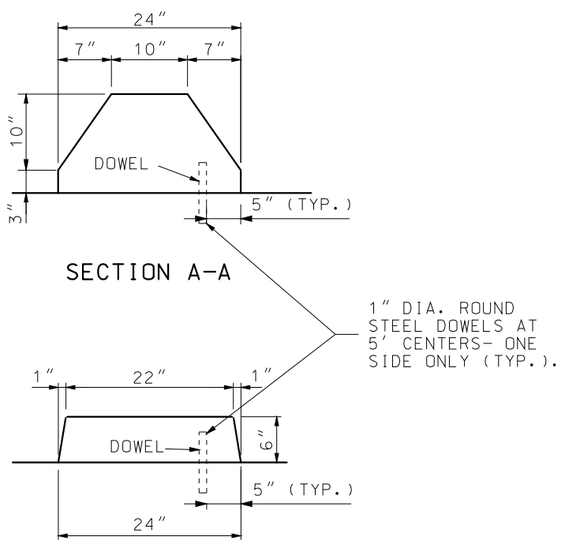



PLAN




ELEVATION
**BARRIER HEIGHT TRANSITION**




SECTION A–A




SECTION B–B

GENERAL NOTES:

HEIGHT TRANSITIONS SHALL NOT BE USED IN LOCATIONS WHERE THE POSTED SPEED IS GREATER THAN 35 MPH.

ALL TOP AND END EDGES SHALL BE CHAMFERED ¾ INCH.

EXPANSION JOINTS SHALL BE PROVIDED IN THE BARRIER TO MATCH EXPANSION JOINTS IN PAVEMENT.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.


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# PERMANENT CONCRETE TRAFFIC BARRIER

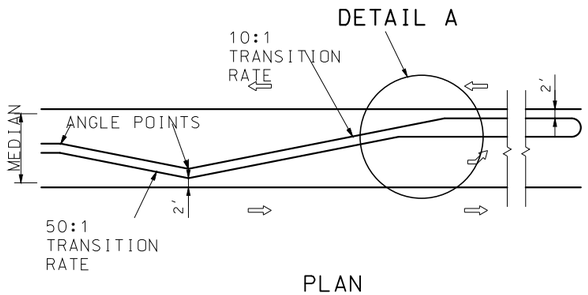
TYPE A AND B

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

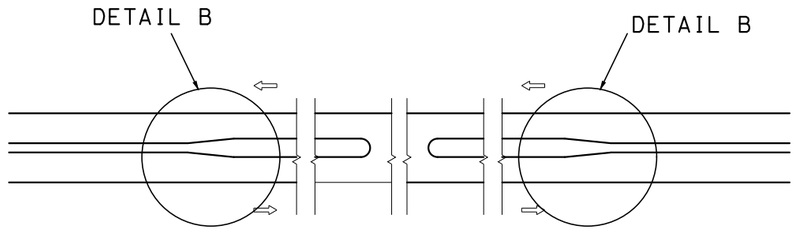
617.10J

SHEET NO. 1 OF 12

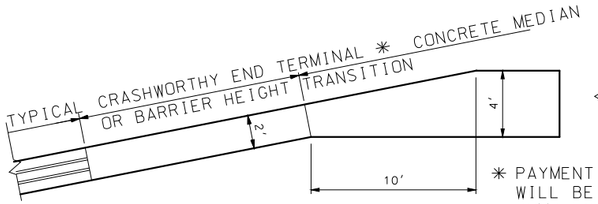
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PLAN

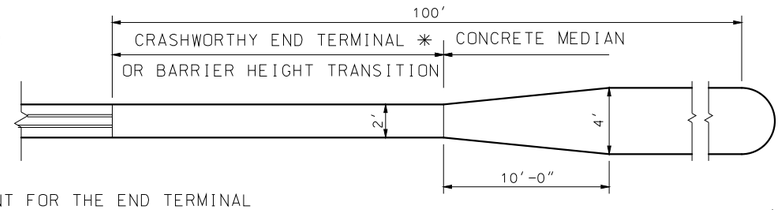



PLAN




DETAIL A

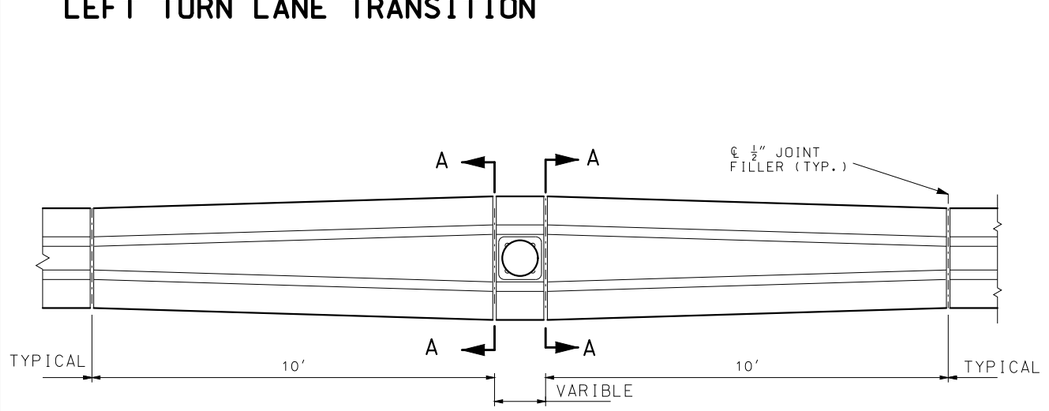
## LEFT TURN LANE TRANSITION



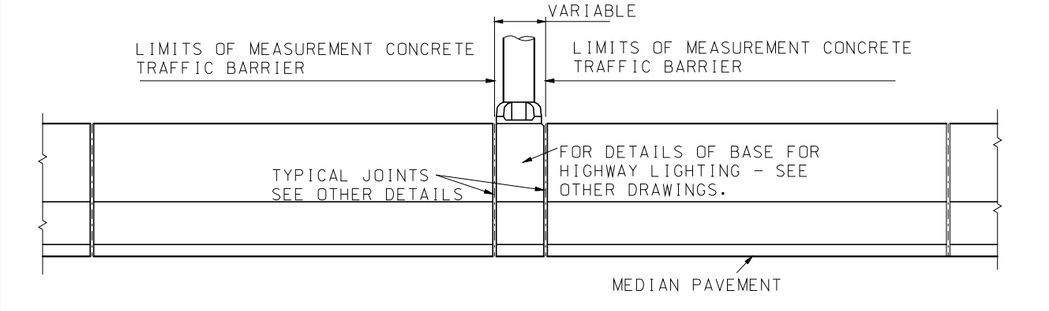

✳ PAYMENT FOR THE END TERMINAL WILL BE CONSIDERED FULL COMPENSATION FOR END TERMINAL, BACKUP ASSEMBLIES, AND OTHER ITEMS NECESSARY FOR PROPER INSTALLATION AS REQUIRED BY THE MANUFACTURER.

DETAIL B

## MEDIAN OPENING TRANSITION

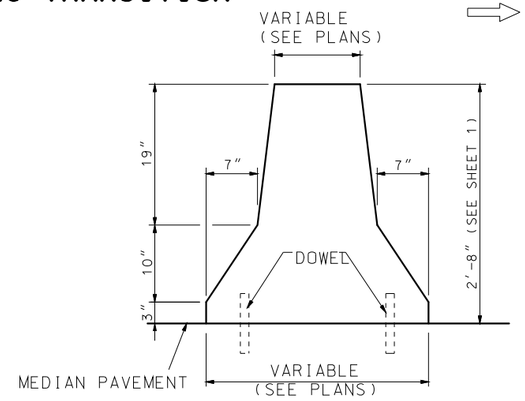



PLAN

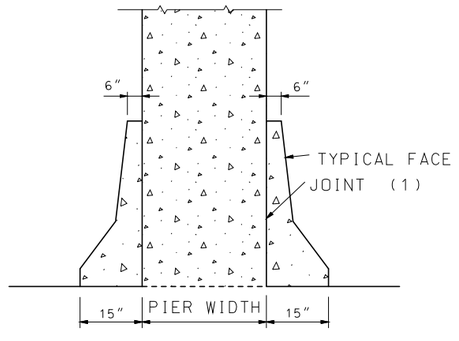



ELEVATION

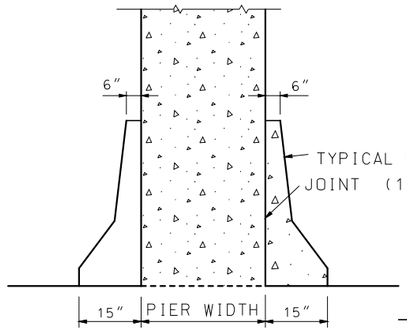
## TRANSITION DETAILS FOR MEDIAN LIGHTING



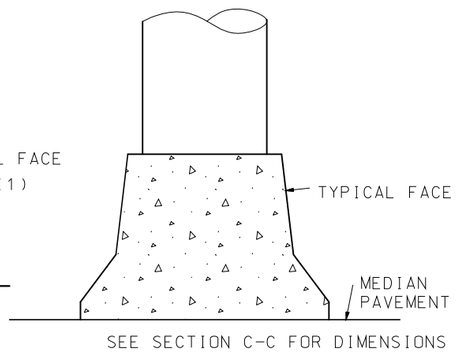

SECTION A-A




SECTION D-D

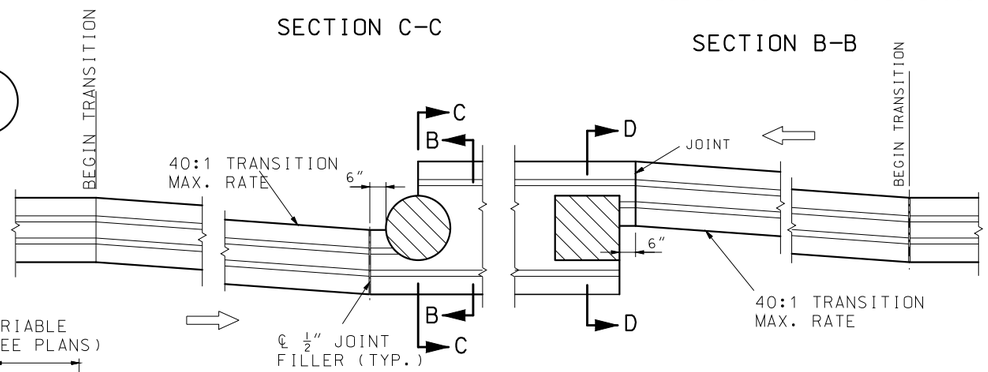



SECTION C-C




SEE SECTION C-C FOR DIMENSIONS

SECTION B-B




PLAN

## TRANSITION DETAILS FOR PIER PROTECTION

(1) 1 IN. JOINT WITH JOINT FILLER AND SEALER

GENERAL NOTES:

FOR DETAILS AND LOCATION OF DOWELS, SEE SHEET 1.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

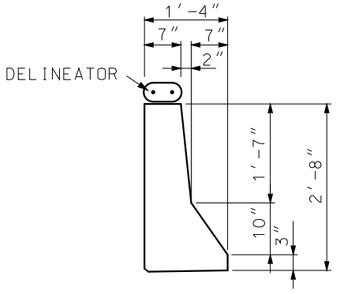

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

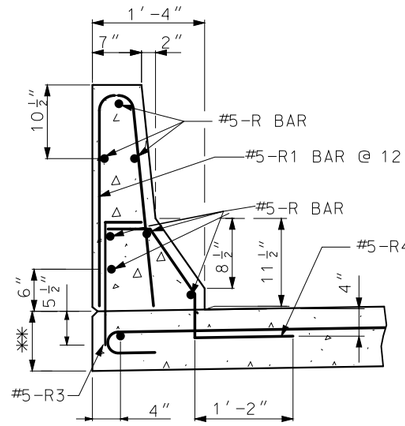
# PERMANENT CONCRETE TRAFFIC BARRIER
TYPE A AND B

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

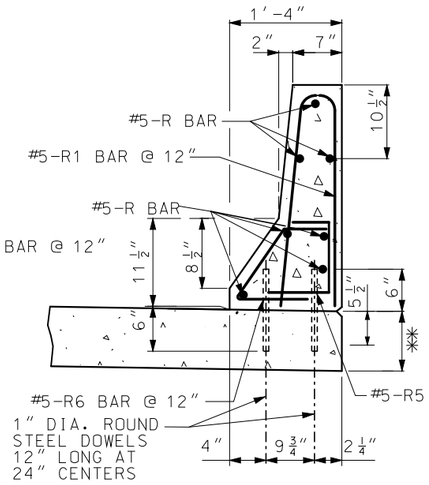
617.10J



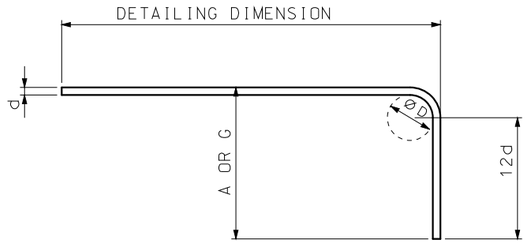

TYPE B (MODIFIED)
TYPICAL SECTION



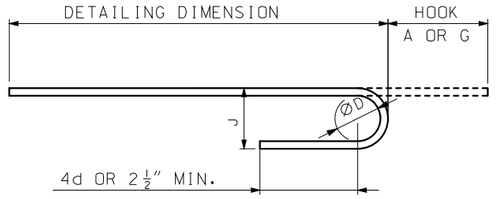

PART SECTION THROUGH
UPPER BARRIER




PART SECTION THROUGH
LOWER BARRIER




90° HOOKS




180° HOOKS

| END HOOK DIMENSIONS | | | | |
|---|---|---|---|---|
| BAR SIZE | D (IN.) | ALL GRADES | | |
| | | 180° HOOKS | | 90° HOOKS |
| | | A OR G | J | A OR G |
| #5 | 3¾″ | 7″ | 5″ | 10″ |
| #6 | 4½″ | 8″ | 6″ | 12″ |

ALL STANDARD HOOKS AND BENDS OTHER THAN 180° TO BE BENT WITH THE SAME PROCEDURE AS FOR 90° STANDARD HOOKS.

| TABLE A<br>TRANSVERSE PAVEMENT REINFORCEMENT | |
|---|---|
| PAVEMENT THICKNESS ✳✳ | BAR SIZE & SPACING |
| 8″ | #5 @ 5″ |
| 9″ | #5 @ 6″ |
| 10″ | #5 @ 8″ |
| 11″ | #5 @ 9″ |
| ≥ 12″ | #6 @ 12″ |

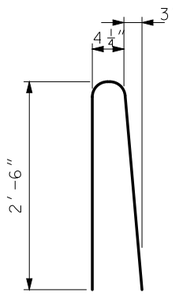
NOTES:

ALL REINFORCING STEEL SHALL BE EPOXY COATED.

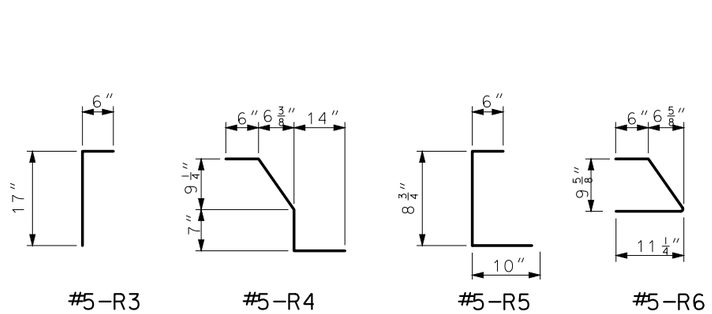
NO DIRECT PAYMENT WILL BE MADE FOR REINFORCING STEEL.

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

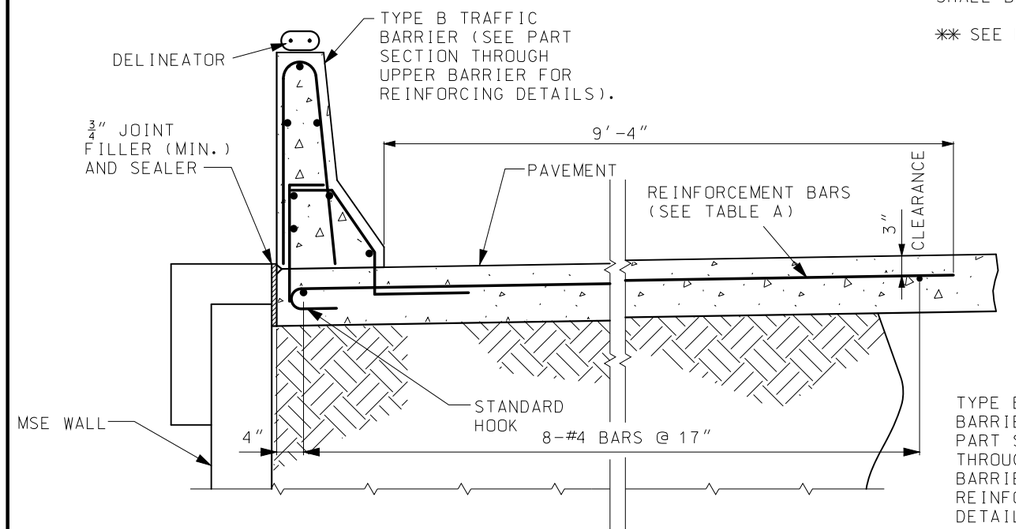
✳✳ SEE ROADWAY PAVEMENT DESIGN.



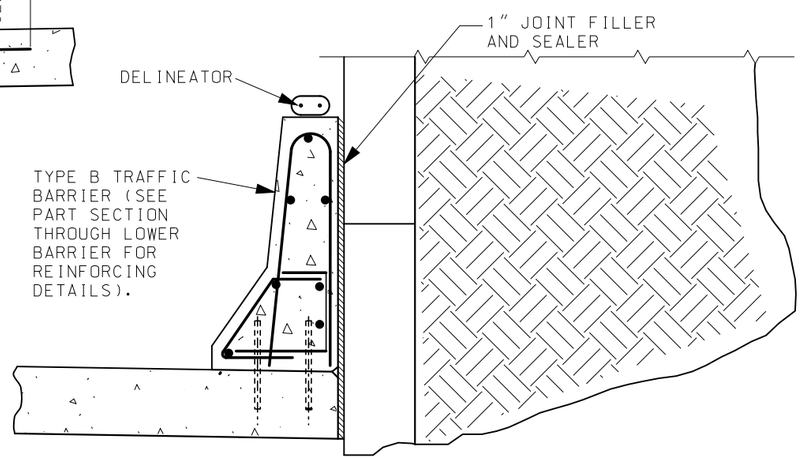

#5-R1




#5-R3 #5-R4 #5-R5 #5-R6




TYPE B TRAFFIC BARRIER ON TOP OF MSE WALL




TYPE B TRAFFIC BARRIER AT THE SIDE OF MSE WALL

NOTES:

TYPE B (MODIFIED) SHALL BE USED ONLY AT LOCATIONS SHOWN IN PLANS.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.


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STATE OF MISSOURI
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NUMBER PE-28411
PROFESSIONAL ENGINEER
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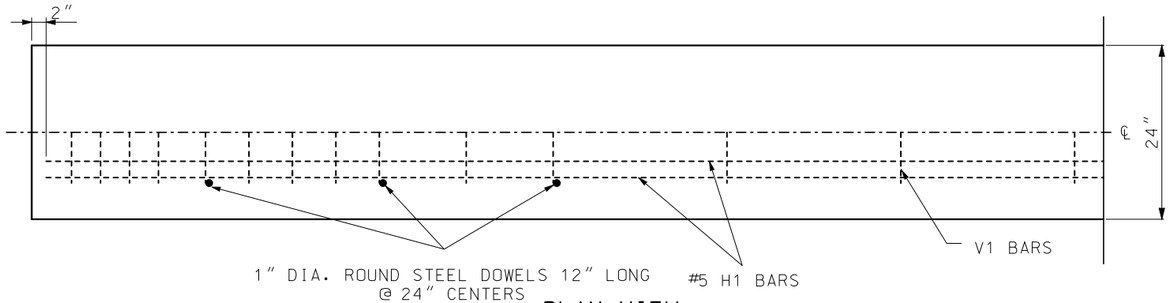
# PERMANENT CONCRETE TRAFFIC BARRIER
AT MSE WALL
TYPE B MODIFIED

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

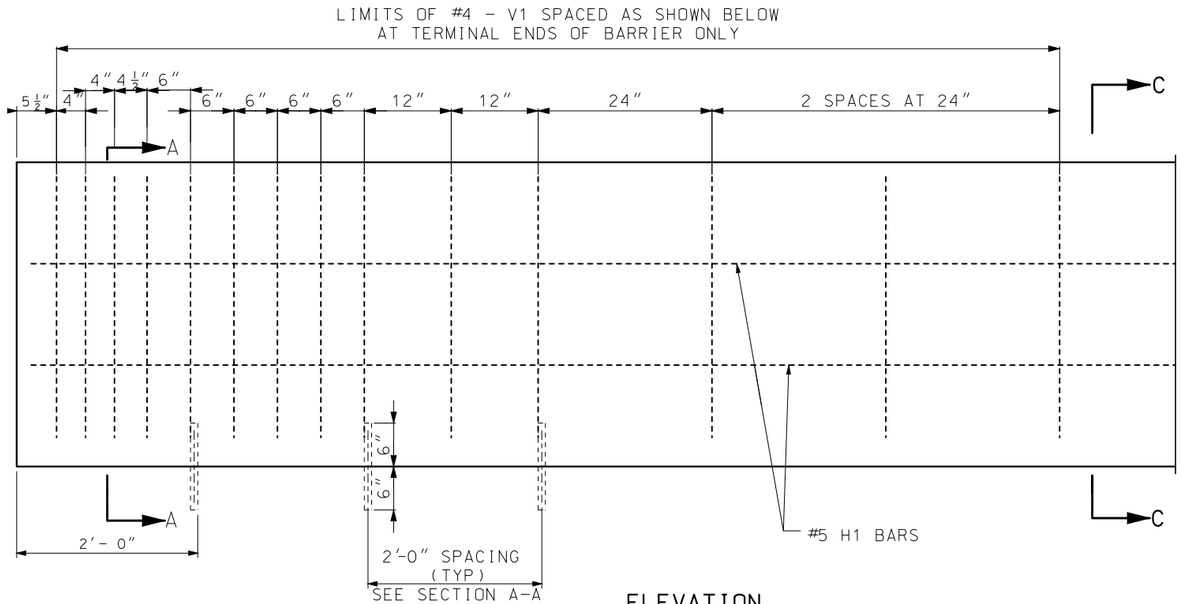
617.10J

SHEET NO. 3 OF 12

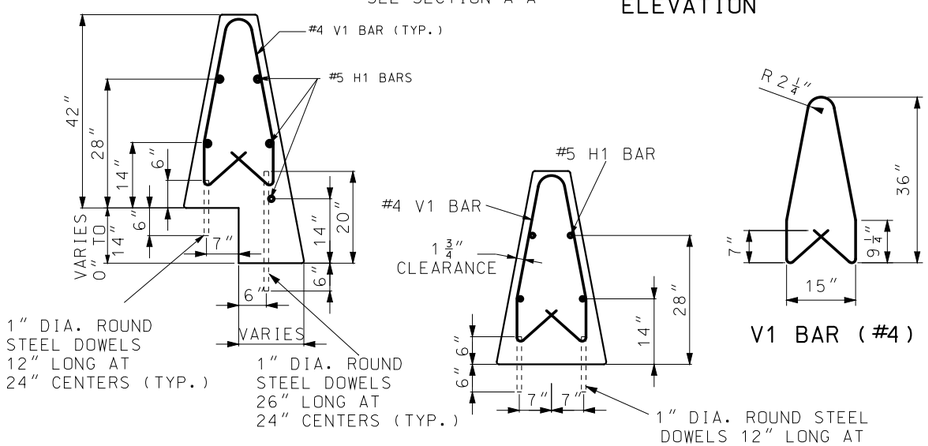
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN VIEW
(SYMMETRICAL ABOUT CENTERLINE)




ELEVATION




SECTION A–A
(STEPPED PAVEMENT)

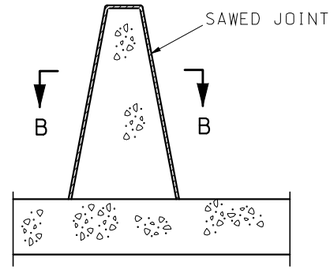


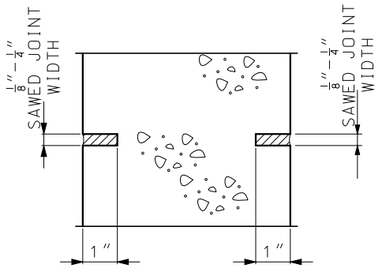

SECTION A–A
(NORMAL PAVEMENT)




V1 BAR (#4)

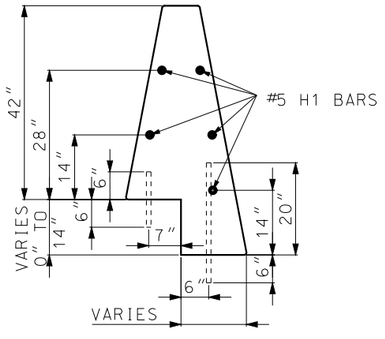
REINFORCING DETAILS



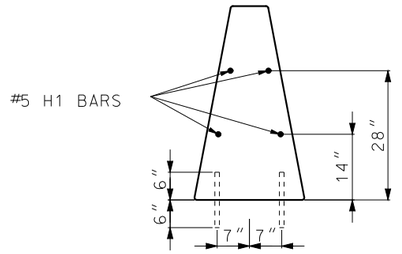




SECTION B–B

## SECTION THROUGH SAWED JOINT




SECTION C–C
(STEPPED PAVEMENT)




SECTION C–C
(NORMAL PAVEMENT)

NOTES:

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

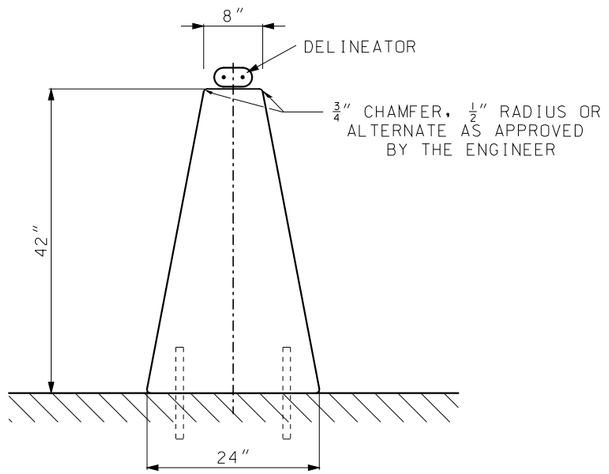
ANY REINFORCING BAR INSTALLATION METHOD DEVISED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REINFORCING STEEL WILL BE POSITIONED ±½ INCH AS DIMENSIONED WILL BE SATISFACTORY.

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

ANCHORING DOWELS MAY BE OMITTED WHEN THE PLANS SPECIFY A MINIMUM 1¾″ PAVEMENT SURFACE TO BE PLACED ABUTTING BOTH BARRIER FACES.

SAWED JOINTS SHALL BE LOCATED AT PAVEMENT TRANSVERSE JOINTS.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.




TYPE C
TYPICAL SECTION

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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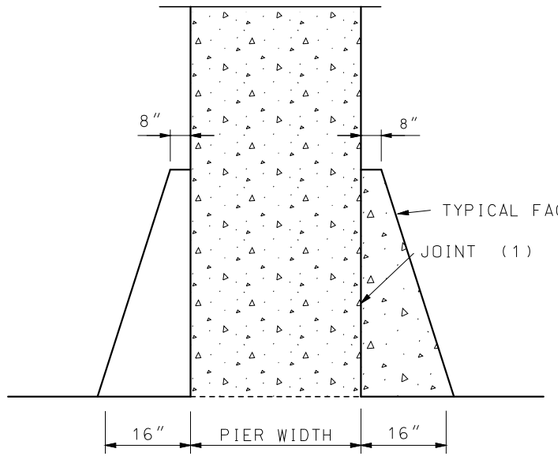
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# PERMANENT CONCRETE TRAFFIC BARRIER

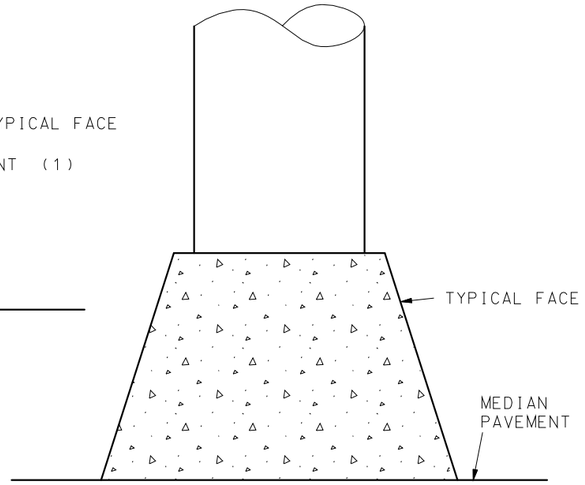
TYPE C

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

617.10J

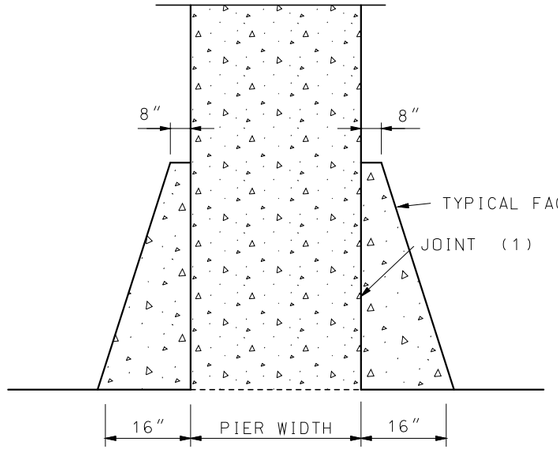



SECTION A–A

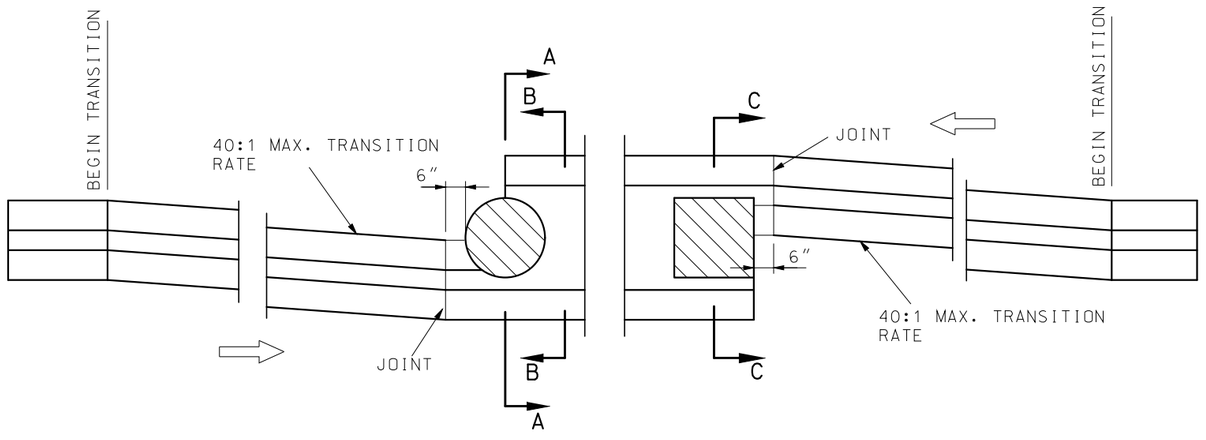



SEE SECTION C–C FOR DIMENSIONS

SECTION B–B




SECTION C–C




PLAN

# TRANSITION DETAILS FOR PIER PROTECTION

(1) 1 IN. JOINT WITH JOINT FILLER AND SEALER

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
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NUMBER PE-28411
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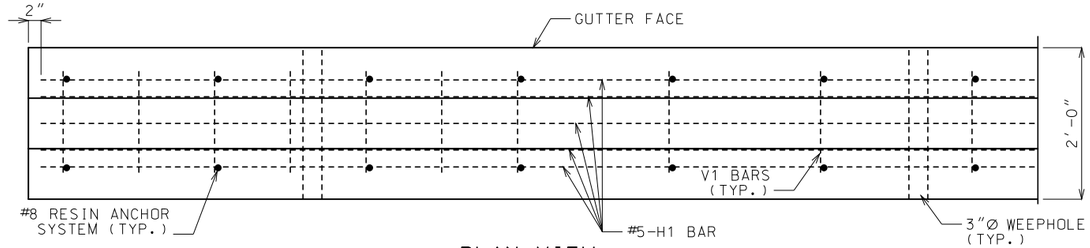
## PERMANENT CONCRETE TRAFFIC BARRIER
TYPE C

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

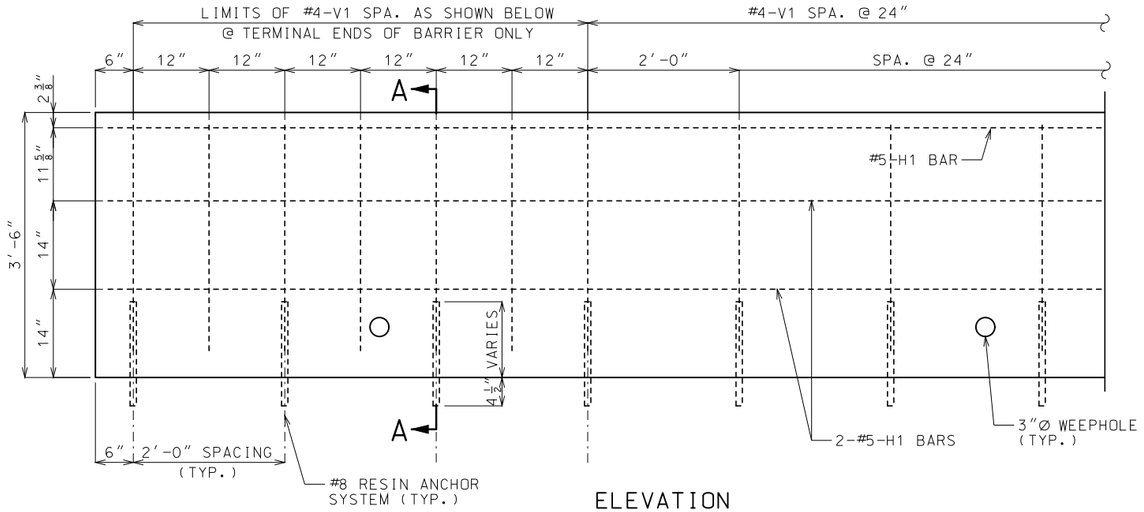
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SHEET NO. 5 OF 12

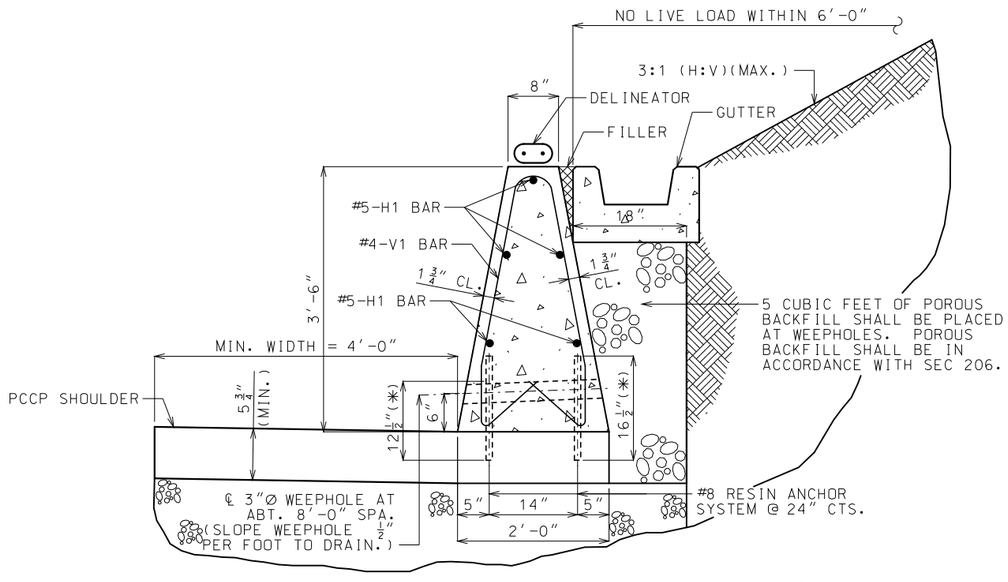
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN VIEW
NOTE: GUTTER NOT SHOWN FOR CLARITY.

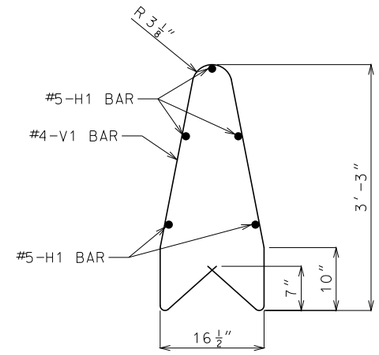



ELEVATION
REINFORCING DETAILS




(*) EMBED ANCHOR 4 1/2" BELOW PCCP SHOULDER.

SECTION A-A
(FOR SLOPING AND NONSLOPING BACKSLOPE)




PART SECTION OF
#4-V1 BAR

GENERAL NOTES:

CONCRETE SHALL BE CLASS B F'C = 4,000 PSI.

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.

ANGLE OF INTERNAL FRICTION, ΦF ≥ 27° FOR BACKFILL MATERIAL.

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

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

ANY METHOD DEVISED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REINFORCING STEEL WILL BE POSITIONED ±1/2 INCH AS DIMENSIONED WILL BE SATISFACTORY.

THE CONTRACTOR HAS THE OPTION TO SLIP-FORM THE BARRIER. IN WHICH CASE, ADDITIONAL REINFORCEMENT MAY BE TIED TO THE UPPER TWO-THIRDS FO THE REINFORCING CAGE TO PROVIDE BRACING.

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

THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY APPLICATIONS.

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

TYPE C BARRIER MODIFIED RETAINING WALL WITH NONMOMENT SLAB SHALL BE USED ONLY AT LOCATIONS SHOWN ON PLANS.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.

RESIN ANCHOR SYSTEM SHALL BE DRILLED IN THE PAVEMENT.

WHEN CURB HEIGHT EXCEEDS 42" OR SLOPE EXCEEDS 3:1 (H:V) OR LIVE LOAD IS WITHIN 6'-0", CONTACT BRIDGE DIVISION FOR SPECIAL DESIGN.

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NUMBER PE-28411
PROFESSIONAL ENGINEER
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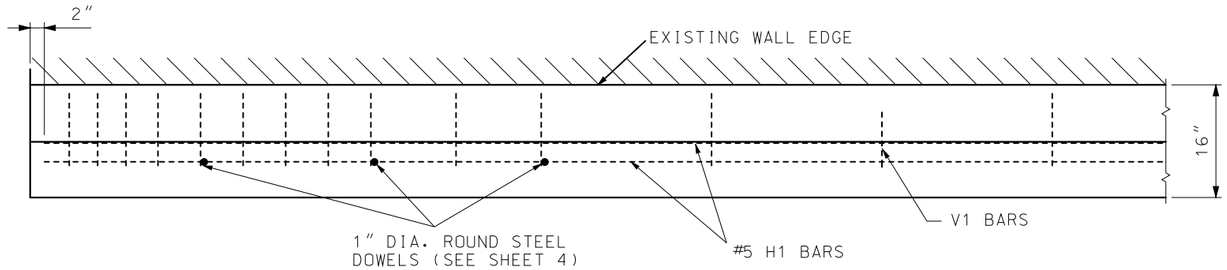
# PERMANENT CONCRETE TRAFFIC BARRIER

TYPE C AS RETAINING WALL

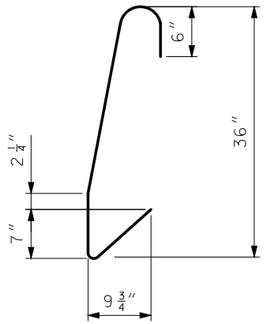
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

617.10J

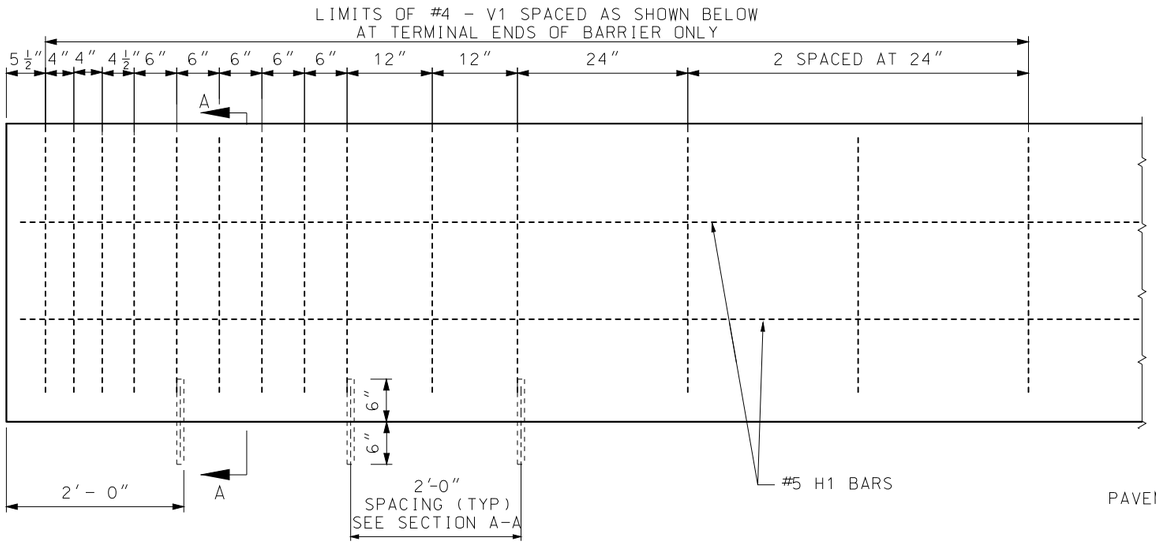
SHEET NO. 6 OF 12



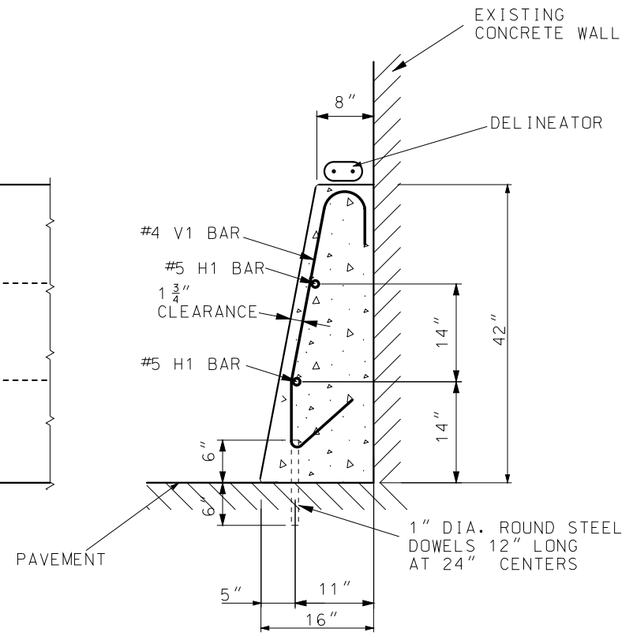

PLAN VIEW




V1 BAR (#4)




ELEVATION




SECTION A–A

## REINFORCING DETAILS

NOTES:

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

ANY METHOD DEVISED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REINFORCING STEEL WILL BE POSITIONED ± 1/2 INCH AS DIMENSIONED WILL BE SATISFACTORY.

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

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

THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY APPLICATIONS.

SAWED JOINTS SHALL BE LOCATED AT PAVEMENT TRANSVERSE JOINTS.

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

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.

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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PERMANENT CONCRETE TRAFFIC BARRIER

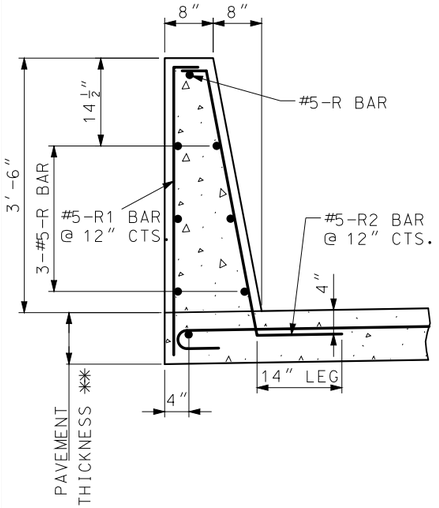
TYPE D

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

617.10J

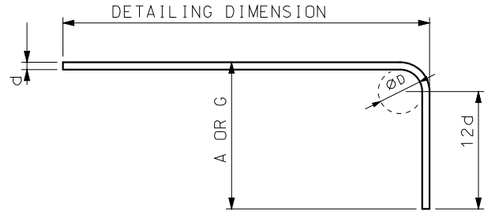
SHEET NO. 7 OF 12

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



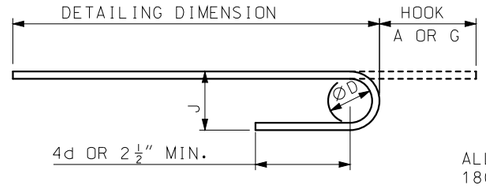

PART SECTION THROUGH BARRIER

| TABLE A TRANSVERSE PAVEMENT REINFORCEMENT | |
|---|---|
| PAVEMENT THICKNESS ** | BAR SIZE & SPACING |
| 8″ | #5 @ 4″ |
| 9″ | #5 @ 5″ |
| 10″ | #5 @ 6″ |
| 11″ | #5 @ 7″ |
| 12″ | #6 @ 12″ |
| ≥ 13″ | #6 @ 12″ |



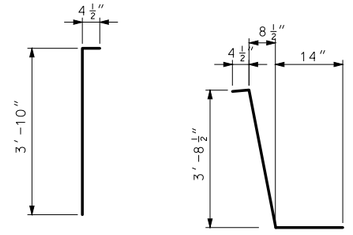

90° HOOKS

| END HOOK DIMENSIONS | | | | |
|---|---|---|---|---|
| BAR SIZE | D (IN.) | ALL GRADES | | |
| | | 180° HOOKS | | 90° HOOKS |
| | | A OR G | J | A OR G |
| #5 | 3¾″ | 7″ | 5″ | 10″ |
| #6 | 4½″ | 8″ | 6″ | 12″ |

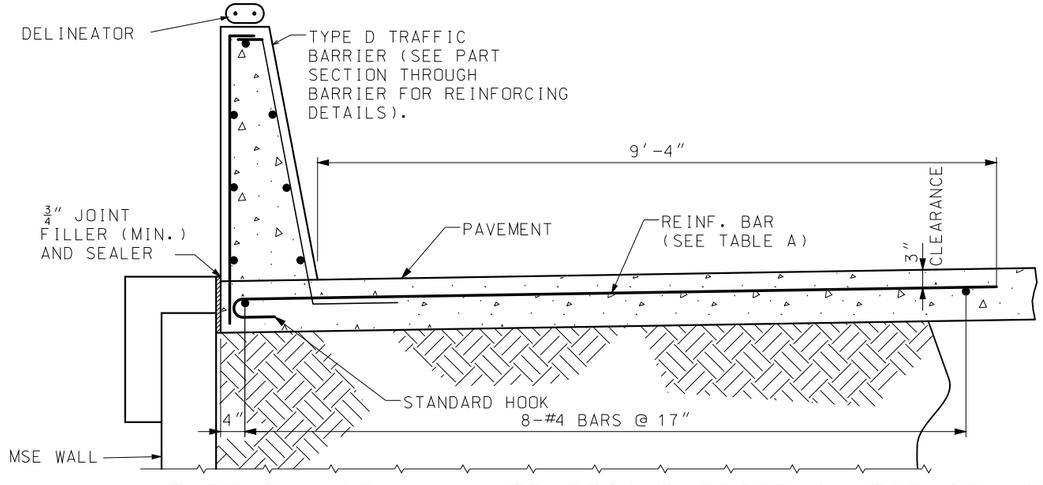



180° HOOKS

ALL STANDARD HOOKS AND BENDS OTHER THAN 180° TO BE BENT WITH THE SAME PROCEDURE AS FOR 90° STANDARD HOOKS.




#5 R1 #5 R2




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

| TABLE B TRANSVERSE PAVEMENT REINFORCEMENT | |
|---|---|
| PAVEMENT THICKNESS ** | BAR SIZE & SPACING |
| 8″ | #6 @ 5″ |
| 9″ | #6 @ 6″ |
| 10″ | #5 @ 6″ |
| 11″ | #6 @ 8″ |
| 12″ | #6 @ 9″ |
| ≥ 13″ | #6 @ 9″ |

NOTES:

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

** SEE ROADWAY PAVEMENT DESIGN.

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

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

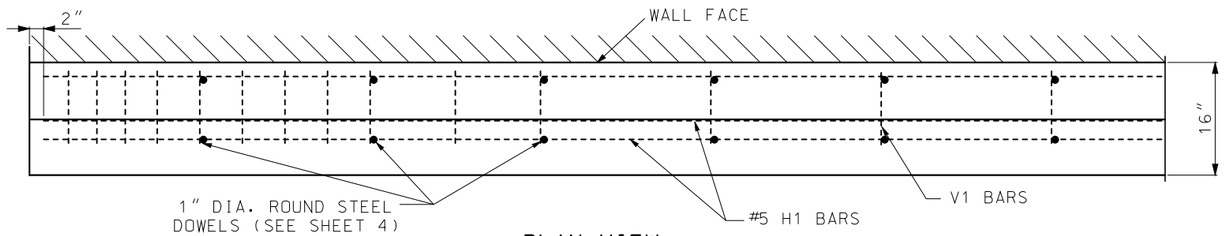
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PERMANENT CONCRETE TRAFFIC BARRIER

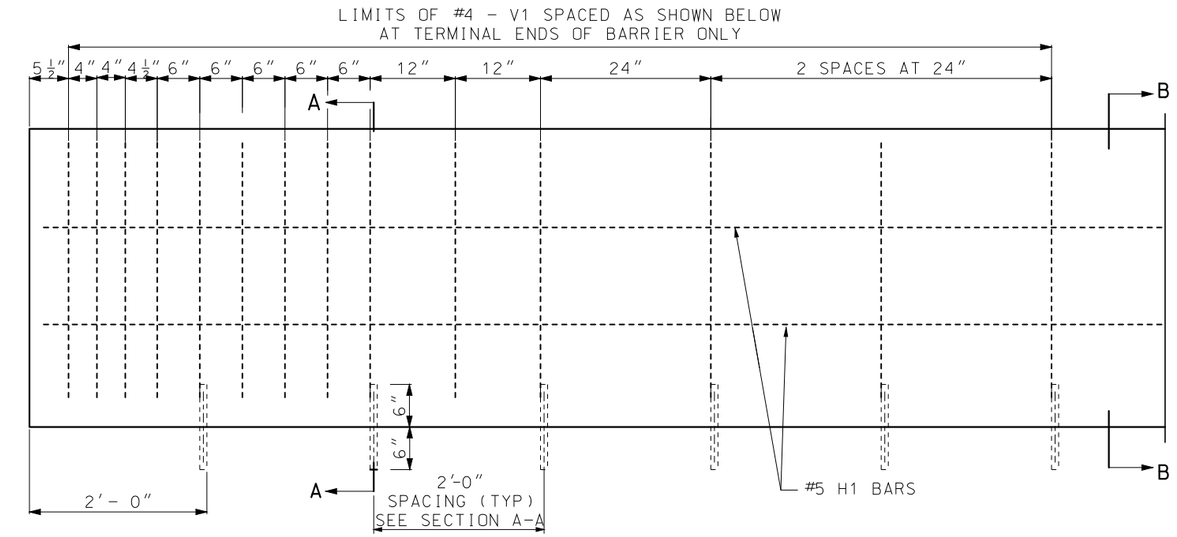
## TYPE D ATOP MSE WALL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

617.10J

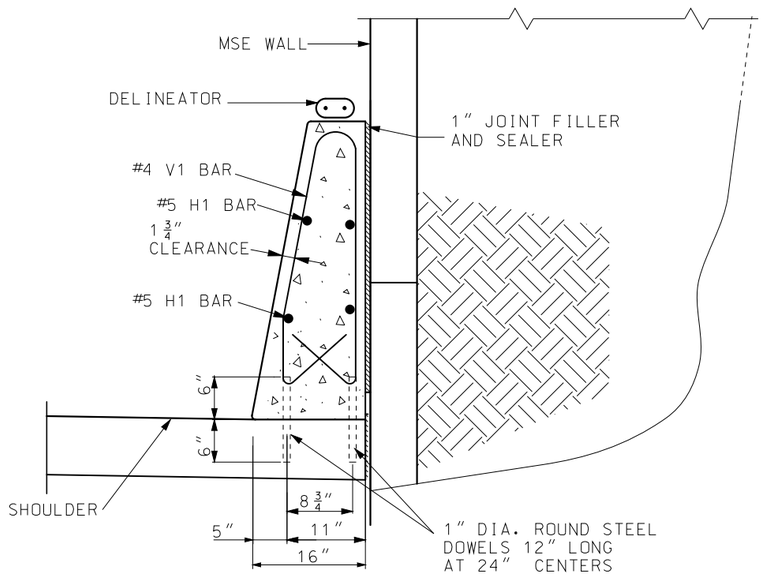



PLAN VIEW

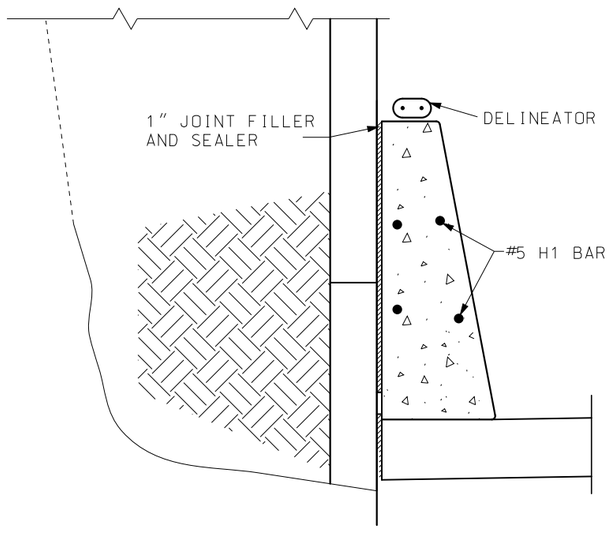



ELEVATION

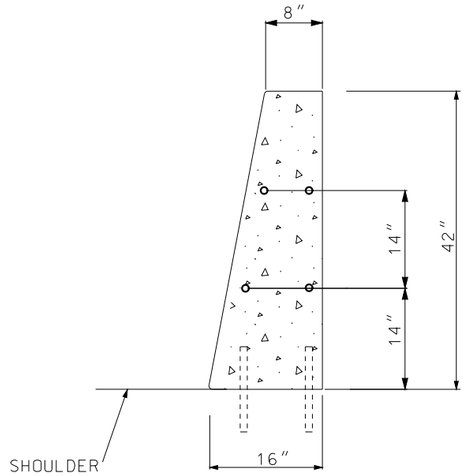
## REINFORCING DETAILS



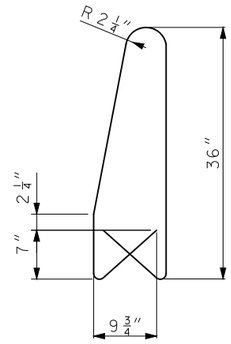

SECTION A–A




SECTION B–B




TYPE D TYPICAL SECTION




V1 BAR (#4)

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

NOTES:

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

ANY METHOD DEVISED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REINFORCING STEEL WILL BE POSITIONED ± ½ INCH AS DIMENSIONED WILL BE SATISFACTORY.

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

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

THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY APPLICATIONS.

SAWED JOINTS SHALL BE SPACED AT 15′-0″. SEE STANDARD PLANS FOR SAWED JOINT DETAIL

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

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.

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

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PERMANENT CONCRETE TRAFFIC BARRIER

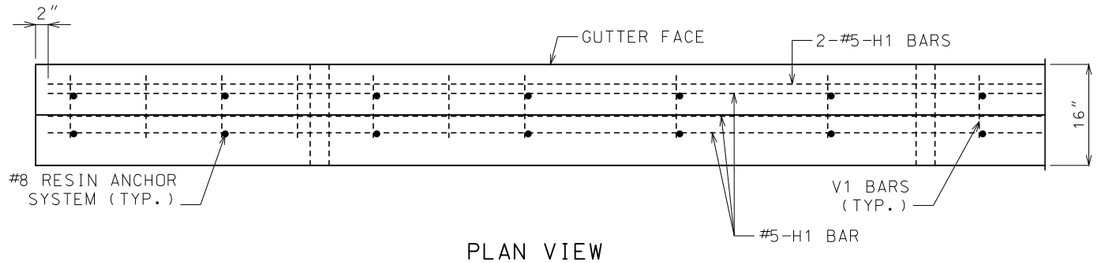
TYPE D BESIDE MSE WALL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

617.10J

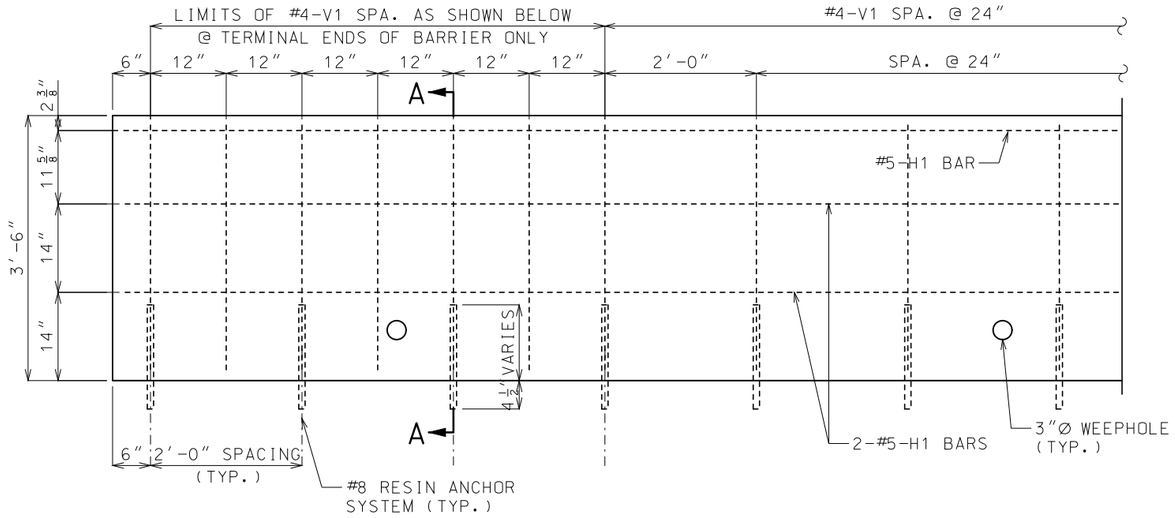
SHEET NO. 9 OF 12

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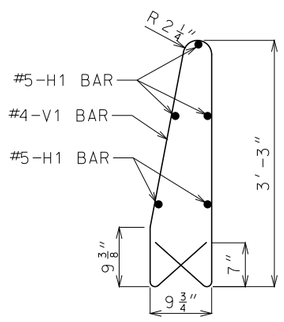



PLAN VIEW

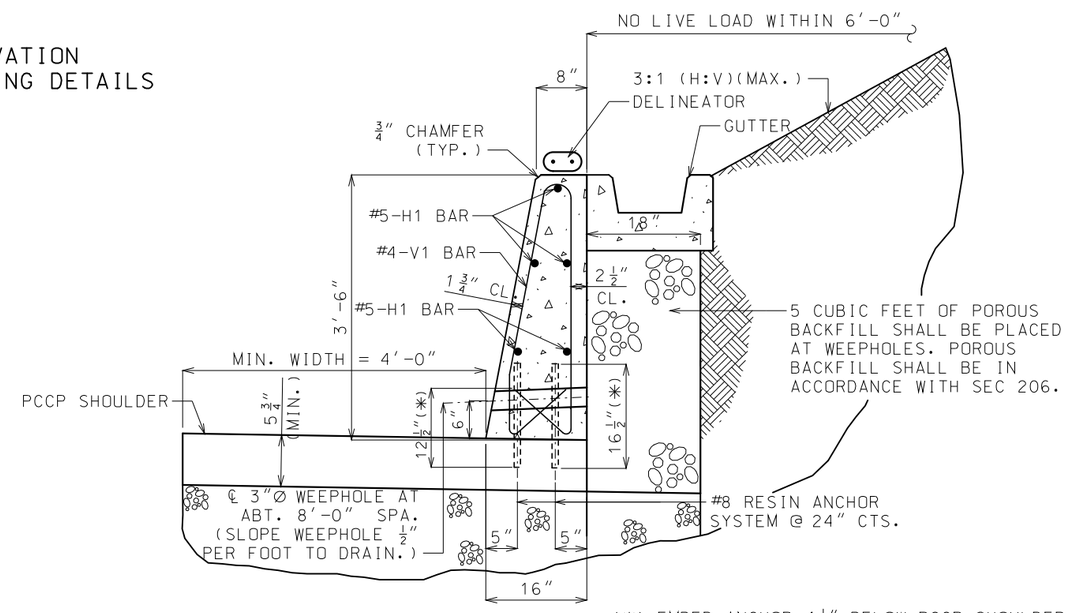
NOTE: GUTTER NOT SHOWN FOR CLARITY.




ELEVATION
REINFORCING DETAILS




PART SECTION OF
#4-V1 BAR




SECTION A-A
(FOR SLOPING AND NONSLOPING BACKSLOPE)

(*) EMBED ANCHOR 4½″ BELOW PCCP SHOULDER.

GENERAL NOTES:

CONCRETE SHALL BE CLASS B f′c = 4,000 PSI.

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.

ANGLE OF INTERNAL FRICTION, ϕf ≥ 30° FOR BACKFILL MATERIAL.

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

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

ANY METHOD DEVISED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REFORCING STEEL WILL BE POSITIONED ±1/2 INCH AS DIMENSIONED WILL BE SATISFACTORY.

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

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

THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY APPLICATION.

SAWED JOINTS SHALL BE SPACED AT 15′-0″. SEE MISSOURI STANDARD PLANS FOR SAWED JOINT DETAIL.

TYPE D A BARRIER MODIFIED RETAINING WALL WITH NONMOMENT SLAB SHALL BE USED ONLY AT LOCATIONS SHOWN ON PLANS.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.

RESIN ANCHOR SYSTEM SHALL BE DRILLED IN THE PAVEMENT.

WHEN CURB HEIGHT EXCEEDS 42″ OR SLOPE EXCEEDS 3:1 (H:V) OR LIVE LOAD IS WITHIN 6′-0″, CONTACT BRIDGE DIVISION FOR SPECIAL DESIGN.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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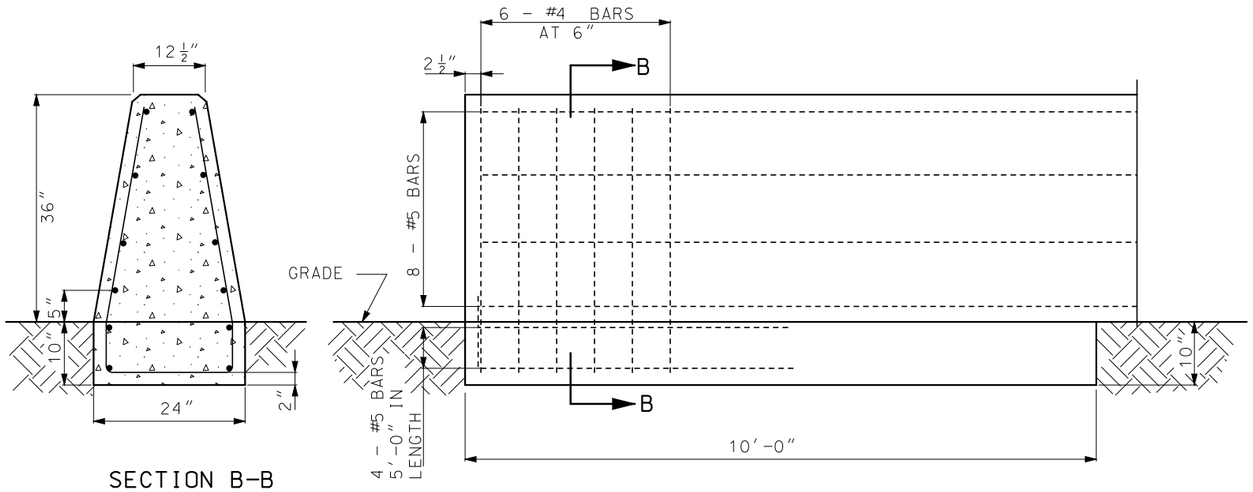
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
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# PERMANENT CONCRETE TRAFFIC BARRIER

## TYPE D AS RETAINING WALL

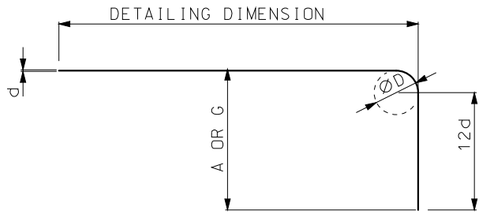
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

617.10J



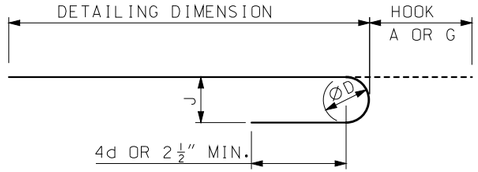

SECTION B–B

## CONCRETE BARRIER END ANCHORAGE ON GRADE



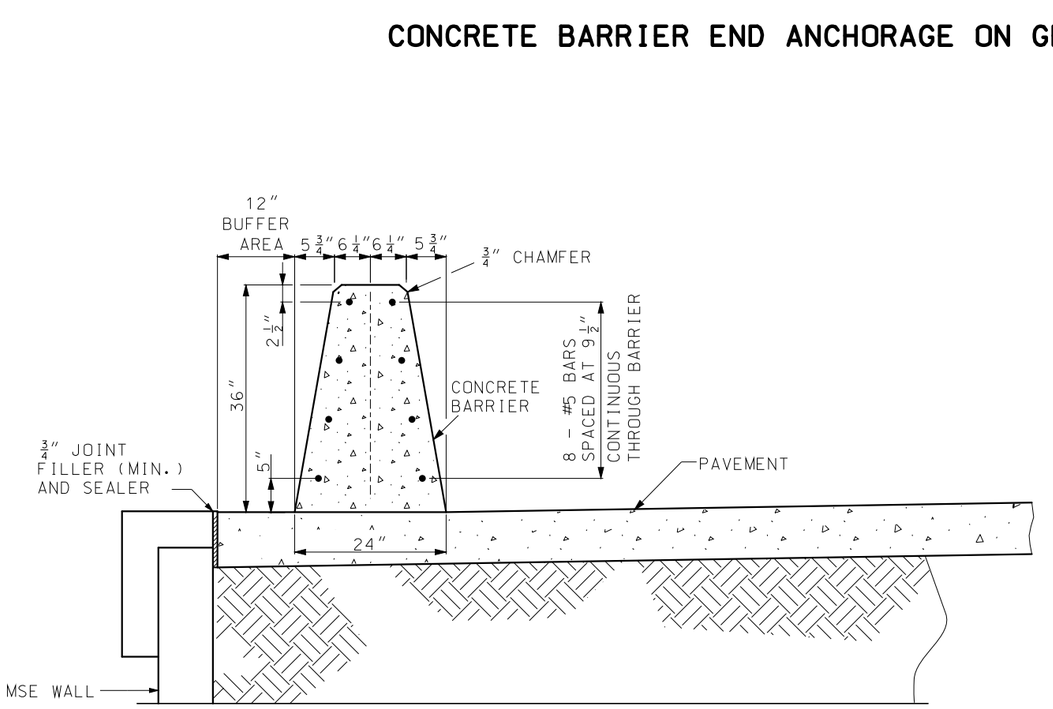

90° HOOKS

| END HOOK DIMENSIONS | | | | |
|---|---|---|---|---|
| BAR SIZE | D (IN.) | ALL GRADES | | |
| | | 180° HOOKS | | 90° HOOKS |
| | | A OR G | J | A OR G |
| #5 | 3 ¾″ | 7″ | 5″ | 10″ |
| #6 | 4 ½″ | 8″ | 6″ | 12″ |

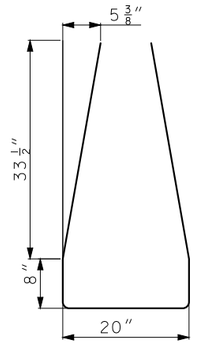



180° HOOKS

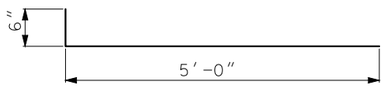
ALL STANDARD HOOKS AND BENDS OTHER THAN 180° TO BE BENT WITH THE SAME PROCEDURE AS FOR 90° STANDARD HOOKS.




## TRAFFIC BARRIER ON TOP OF MSE WALL




#4 BARS




#5 BARS

GENERAL NOTES:

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 ½″, UNLESS OTHERWISE SHOWN.

A 12″ BUFFER REQUIRED WITHIN THE LIMITS OF THE TRAFFIC BARRIER EXCLUDING THE END ANCHORAGE SECTIONS.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STD PLAN 903.03.

PAVEMENT SURFACE DIFFERENTIAL SHALL NOT EXCEED 1 ½″.

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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JEFFERSON CITY, MO 65102
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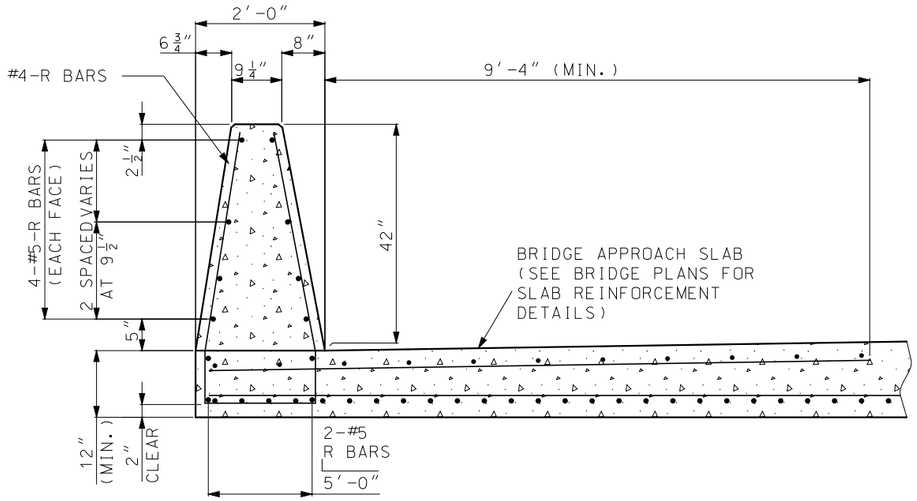
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-2841
PROFESSIONAL ENGINEER
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# PERMANENT CONCRETE TRAFFIC BARRIER

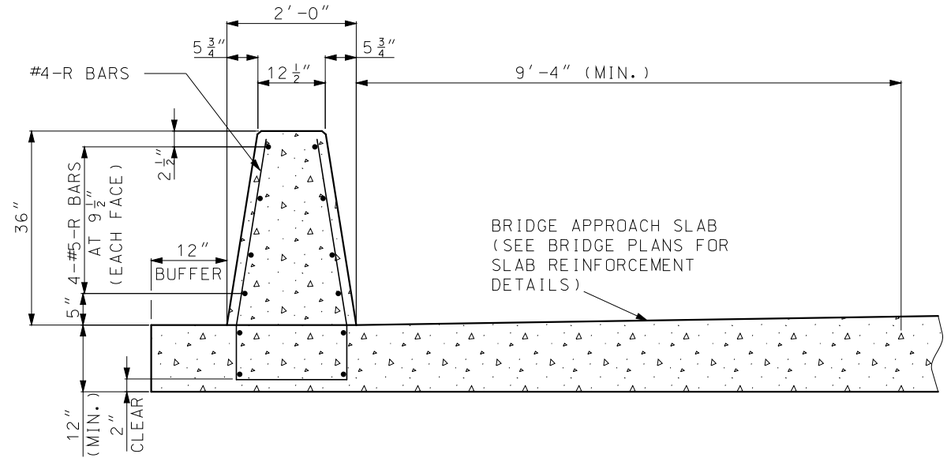
TYPE E ATOP MSE WALL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

617.10J

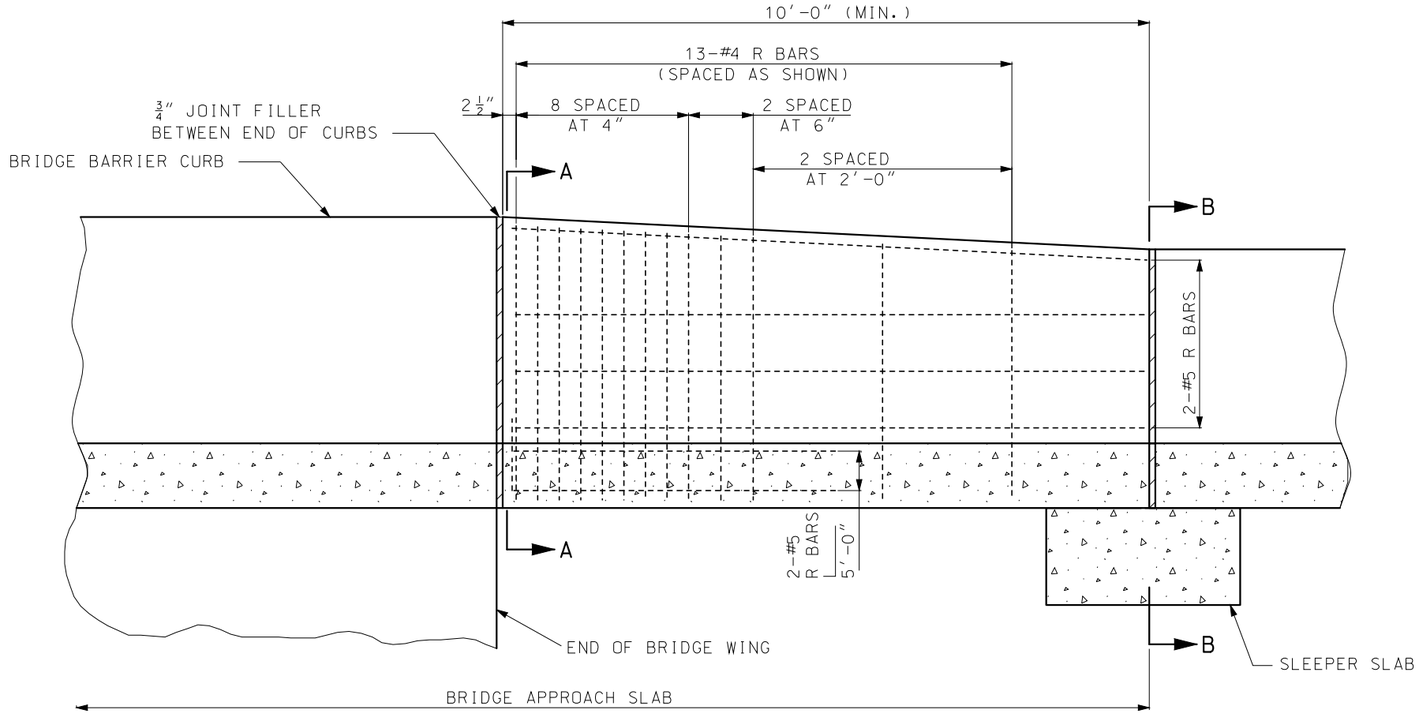



SECTION A–A




SECTION B–B

NOTE: SEE 'CONCRETE BARRIER END ANCHORAGE ON GRADE', SHEET 11 OF 12, FOR REINFORCMENT DETAILS.




## CONCRETE BARRIER END ANCHORAGE AT BRIDGE

GENERAL NOTES:

ANCHORAGE SHALL BE 10′ LONG. IF 10′ OF BRIDGE APPROACH SLAB IS NOT AVAILABLE BEYOND THE WINGS, THE SLAB LENGTH SHALL BE ADJUSTED ACCORDINGLY. SEE BRIDGE PLANS.

A 12″ BUFFER REQUIRED WITHIN THE LIMITS OF THE TRAFFIC BARRIER EXCLUDING THE END ANCHORAGE SECTIONS.


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NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PERMANENT CONCRETE TRAFFIC BARRIER

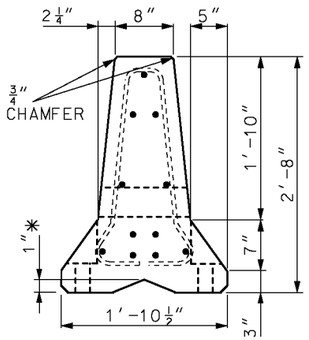
TYPE E ATOP MSE WALL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

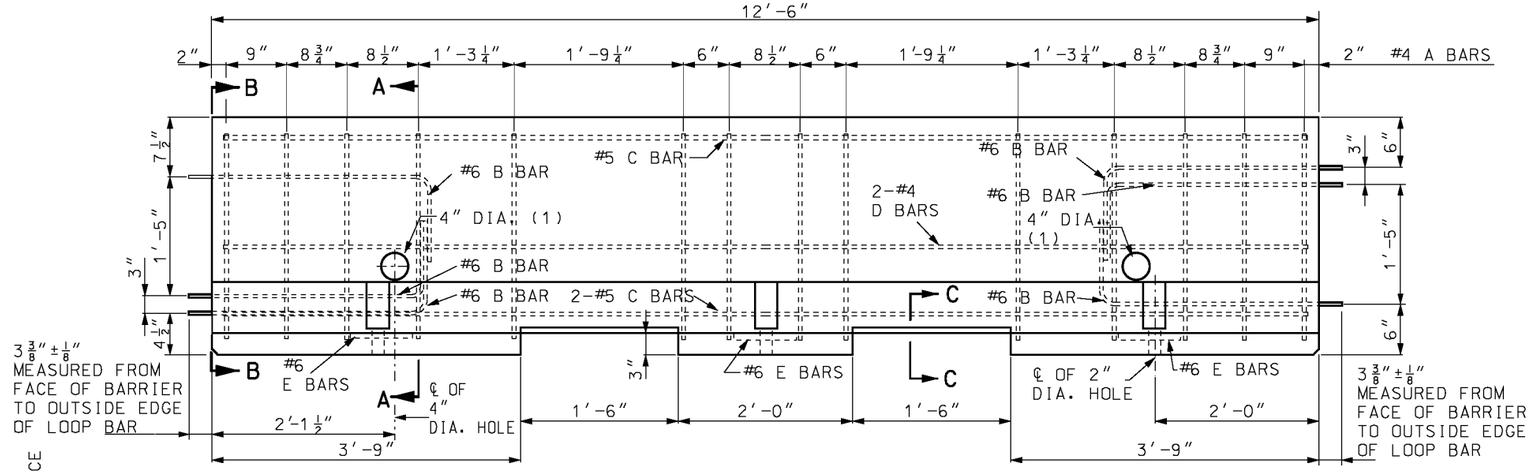
617.10J

SHEET NO. 12 OF 12

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

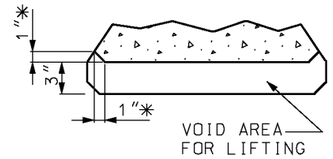



SECTION B-B
* V-NOTCH OPTIONAL

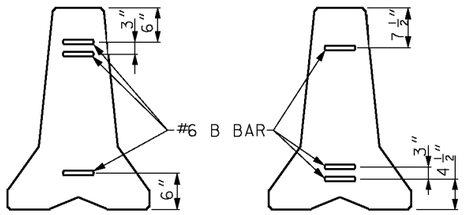



ELEVATION VIEW

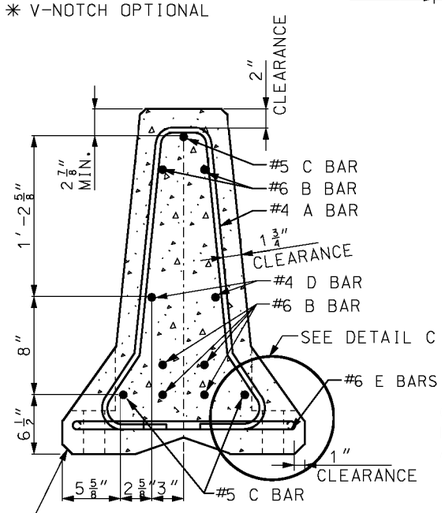
(1) 4 INCH DIAMETER - 11 GAUGE STEEL ROUND MECHANICAL TUBING SLEEVE. THESE HOLES ARE OPTIONAL.



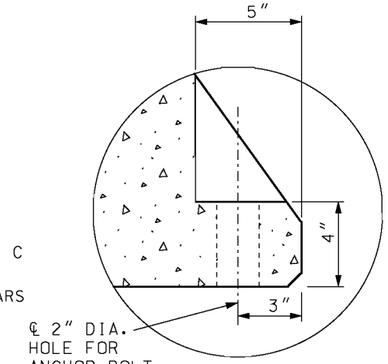

PART SECTION C-C
LIFTING SLOT DETAIL
* RADIUS EDGER TO PREVENT SPALLING



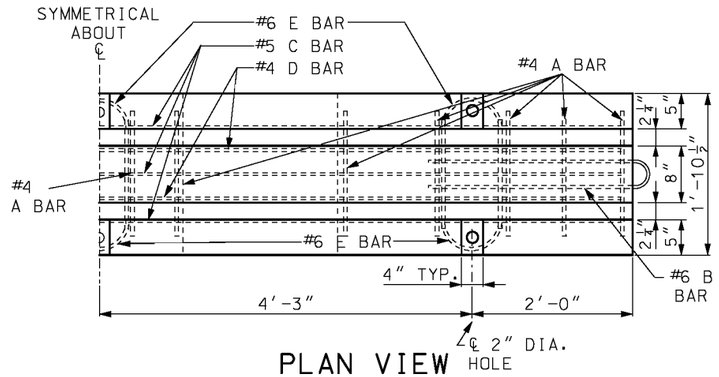

ALTERNATING END VIEWS FOR BARRIER LOOP CONNECTION



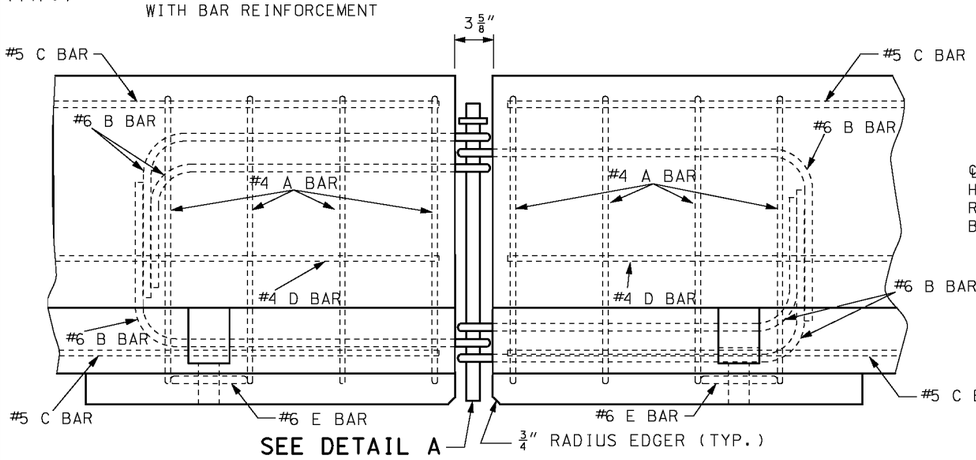

SECTION A-A
STIRRUP PLACEMENT
WITH BAR REINFORCEMENT



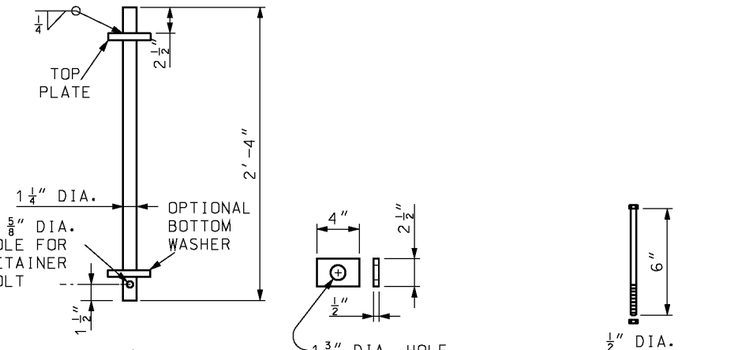

DETAIL C




PLAN VIEW




DETAILS OF BARRIER CONNECTION




ROD 1¼" DIA.
CONNECTION ROD (A36)

TOP PLATE & BOTTOM WASHER (A36)

RETAINER BOLT AND NUT (SAE GRADE 8)

NOTE: RETAINER BOLT AND BOTTOM WASHER AT CONTRACTOR'S OPTION.

DETAIL A
CONNECTION ROD ASSEMBLY

GENERAL NOTES:

ALL REINFORCING SHALL MEET REQUIREMENTS OF CRSI EXCEPT WHERE SHOWN ON PLANS.

REINFORCING STEEL CLEARANCE TO EDGE OF CONCRETE SHALL BE 1¾" UNLESS OTHERWISE SHOWN.

AT NO TIME SHALL THE BARRIERS BE LIFTED OR MOVED BY USE OF THE LOOP BARS.

THE SECTION FURNISHED SHALL COMPLY WITH DIMENSIONS SHOWN, AS APPROVED BY THE ENGINEER.

SEE SHEET 3 FOR DELINEATOR DETAILS.

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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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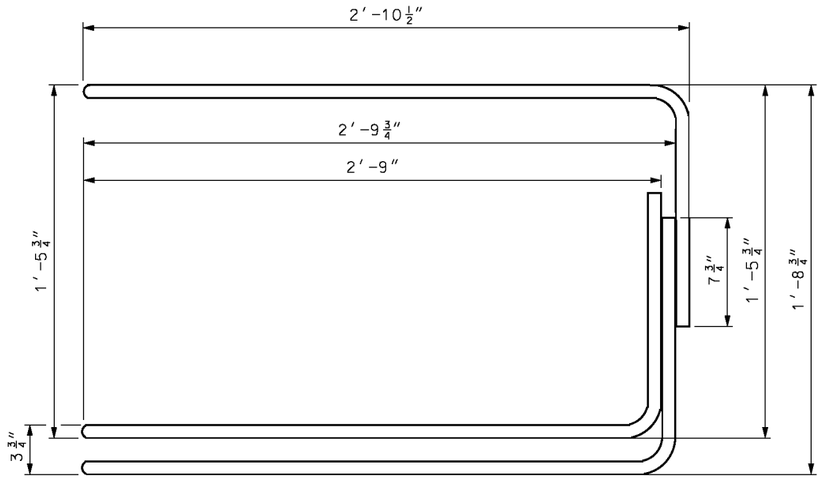
# TEMPORARY CONCRETE TRAFFIC BARRIER
TYPE F

DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 8/24/2015

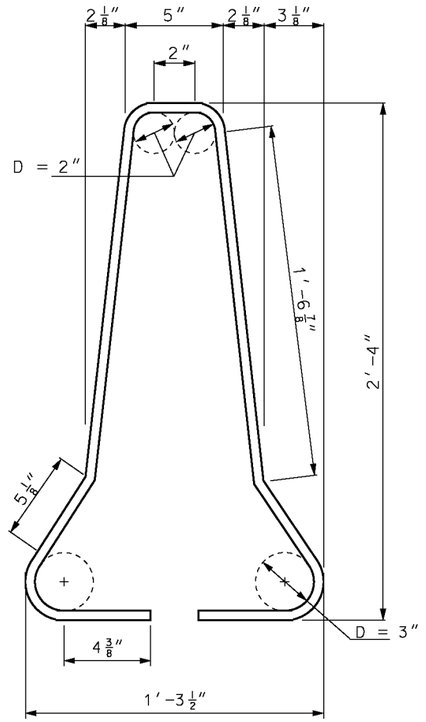
617.20D

SHEET NO. 1 OF 8

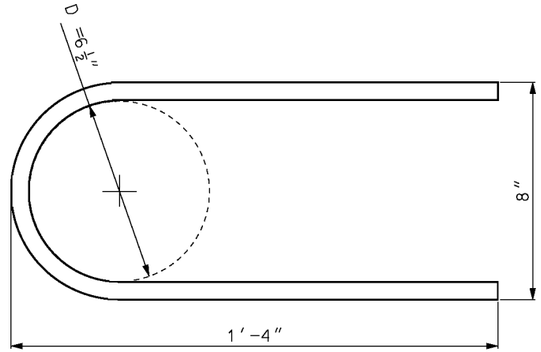
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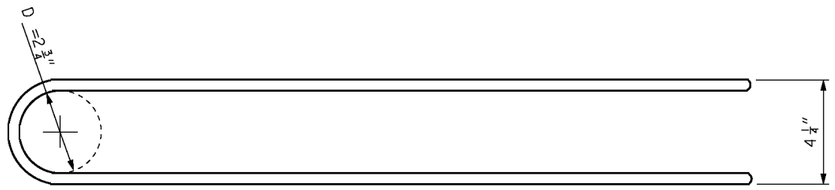

#6 B BAR ELEVATION




#4 A BARS




#6 E BAR




#6 B BAR PLAN

## REINFORCING BARS
PER 12′- 6″ BARRIER SECTION

| MARK | BAR SIZE | NO. OF BARS | SHAPE OF EACH | LENGTH EACH (NOM.) | WEIGHT |
|---|---|---|---|---|---|
| A | 4 | 14 | | 6′-5″ | 60.8 lbs |
| C | 5 | 3 | | 12′-2″ | 38.1 lbs |
| D | 4 | 2 | | 12′-2″ | 16.3 lbs |
| E | 6 | 6 | | 2′-11″ | 26.3 lbs |
| LOOP ASSEMBLY | | | | | |
| B | 6 | 6 | | 7′-10″ | 70.5 lbs |

CONCRETE VOLUME 1.3 CU YDS APPROXIMATE WEIGHT 5601 LBS.

GENERAL NOTE:

DIMENSIONS ARE OUT TO OUT OF BARS UNLESS OTHERWISE NOTED.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

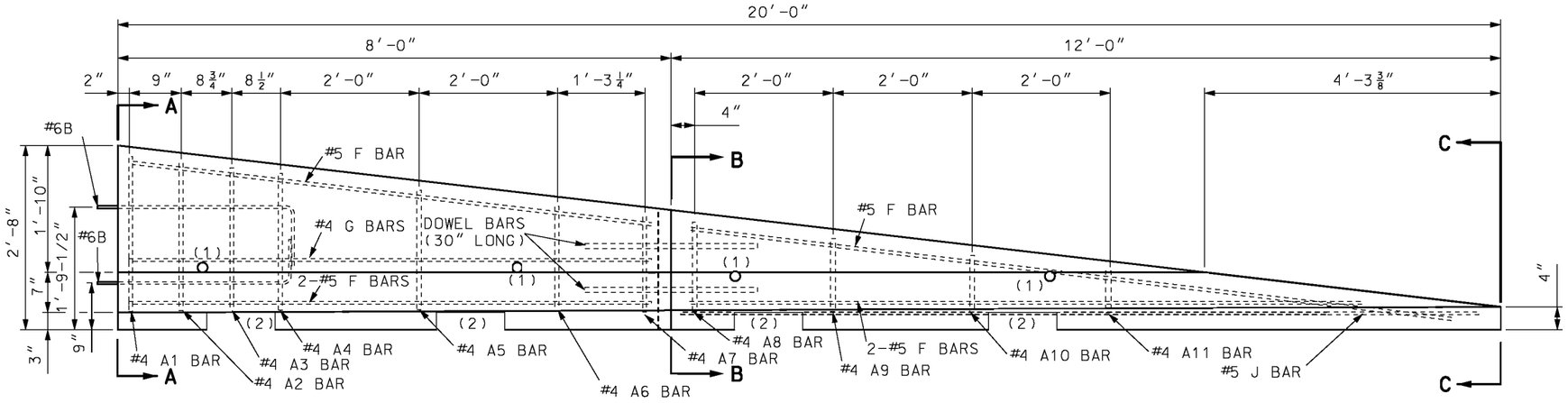
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

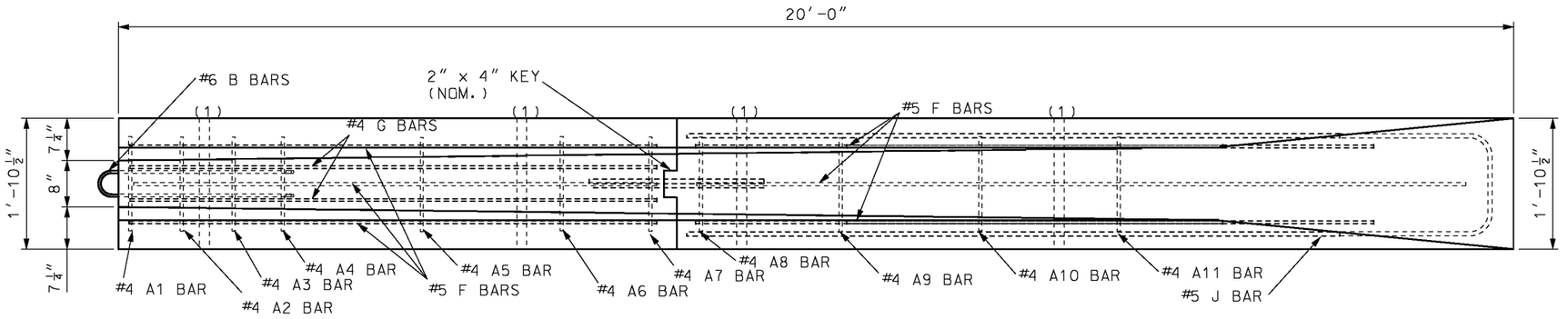
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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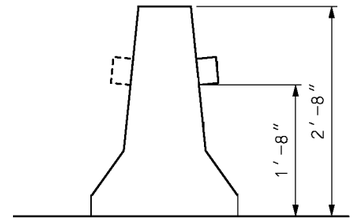
# TEMPORARY CONCRETE TRAFFIC BARRIER
TYPE F

DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 8/24/2015

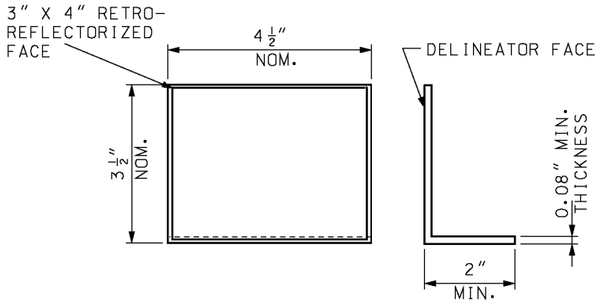
617.20D




**TRAFFIC BARRIER DELINEATORS**




**DELINEATOR**

GENERAL NOTES:

REINFORCING STEEL CLEARANCE TO EDGE OF CONCRETE SHALL BE 1¾″ UNLESS OTHERWISE SHOWN.

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

AT NO TIME SHALL THE BARRIERS BE LIFTED OR MOVED BY USE OF THE LOOP BARS.

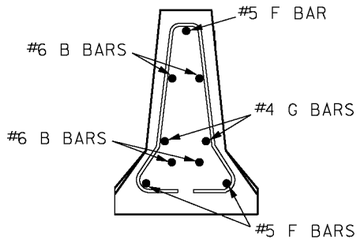
RETAINER BOLT AND NUT MUST BE USED WITH TRANSITION BARRIER.

AT THE OPTION OF THE CONTRACTOR, HEIGHT TRANSITIONS MAY BE MANUFACTURED IN ONE SECTION. THE PLANS FOR REINFORCEMENT ACROSS JOINT SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURE.

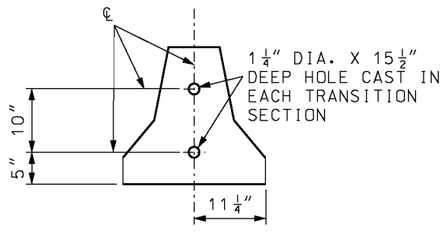
# PRECAST BARRIER HEIGHT TRANSITION
## (TEMPORARY INSTALLATIONS ONLY)

(1) OPTIONAL 4 INCH DIAMETER, 11 GUAGE STEEL ROUND MECHANICAL TUBING SLEEVE FOR LIFT HOLE ALLOWED. THE LOCATION OF THE HOLE MAY VARY TO ACCOMMODATE THE DIFFERING WEIGHT DISTRIBUTIONS OF TRANSITION SECTIONS.

(2) 3″ X 1′-0″ SLOTS FOR LIFTING - TWO PER SECTION. LOCATION TO BE DETERMINED BY CONTRACTOR.

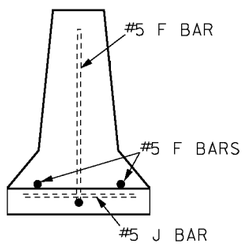



**SECTION A-A**




**SECTION B-B**

NOTE: SECTIONS TO BE CONNECTED WITH TWO- 1″ DIA. BARS OR #8 REINFORCING BARS 30″ LONG IN 1¼″ DIA. HOLES AS SHOWN.




**SECTION C-C**

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

STATE OF MISSOURI — ERIC E. SCHROETER — NUMBER PE-2841 — PROFESSIONAL ENGINEER
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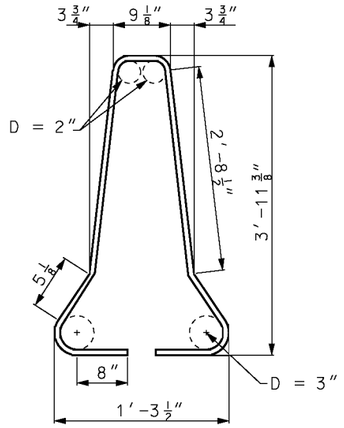
**TEMPORARY CONCRETE TRAFFIC BARRIER**
TYPE F HEIGHT TRANSITIONS

DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 8/24/2015

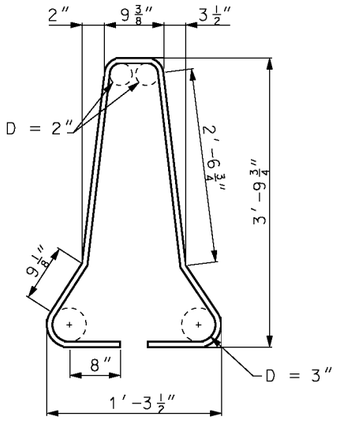
617.20D

SHEET NO. 3 OF 8

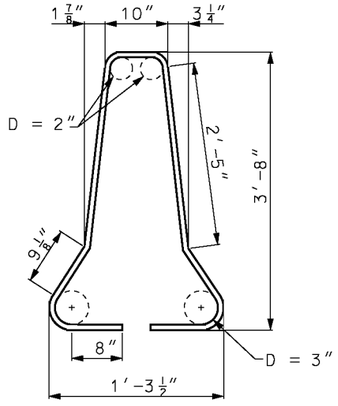
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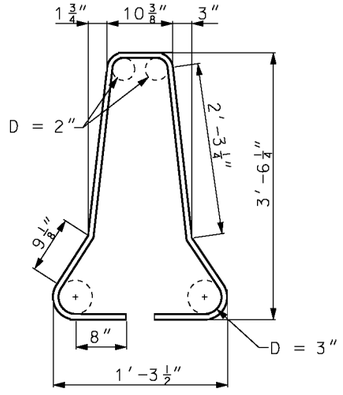

#4 A1 BAR



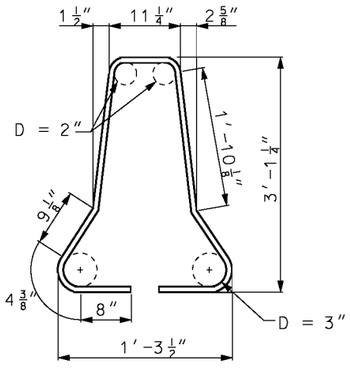

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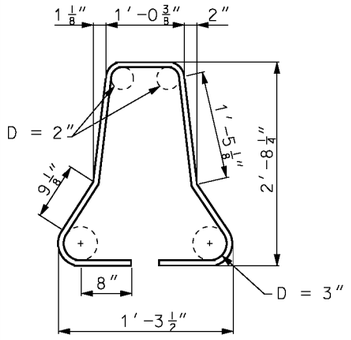

#4 A3 BAR



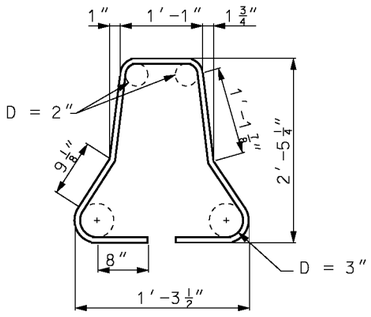

#4 A4 BAR



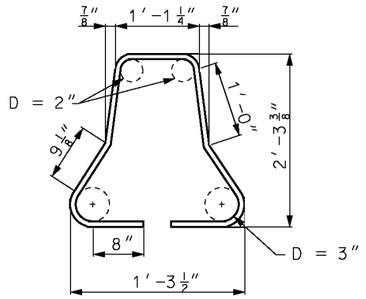

#4 A5 BAR



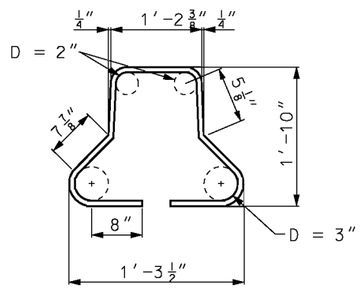

#4 A6 BAR



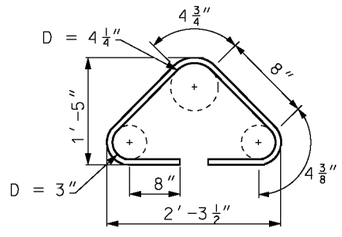

#4 A7 BAR



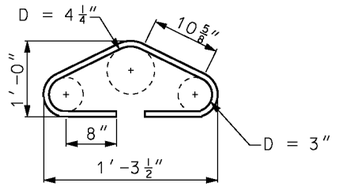

#4 A8 BAR



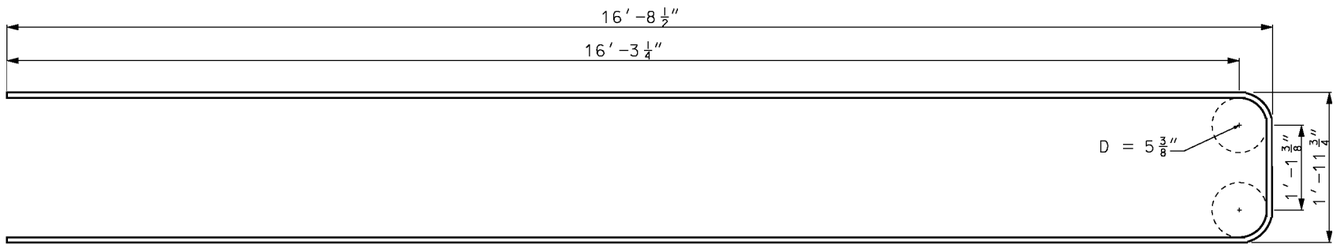

#4 A9 BAR




#4 A10 BAR




#4 A11 BAR




#5 J BAR

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

GENERAL NOTES:

DIMENSIONS ARE OUT TO OUT OF BARS UNLESS OTHERWISE NOTED.


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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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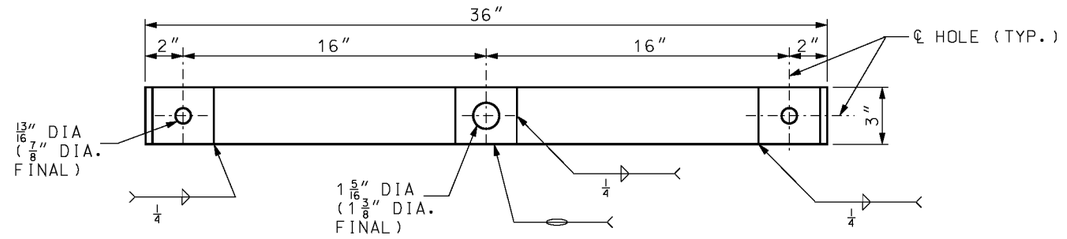
# TEMPORARY CONCRETE TRAFFIC BARRIER
## TYPE F HEIGHT TRANSITIONS

DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 8/24/2015

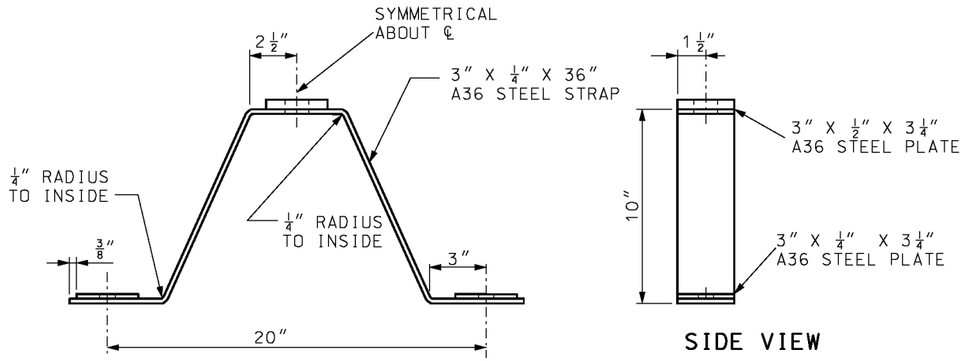
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PLAN OF TIE-DOWN STRAP




SIDE VIEW

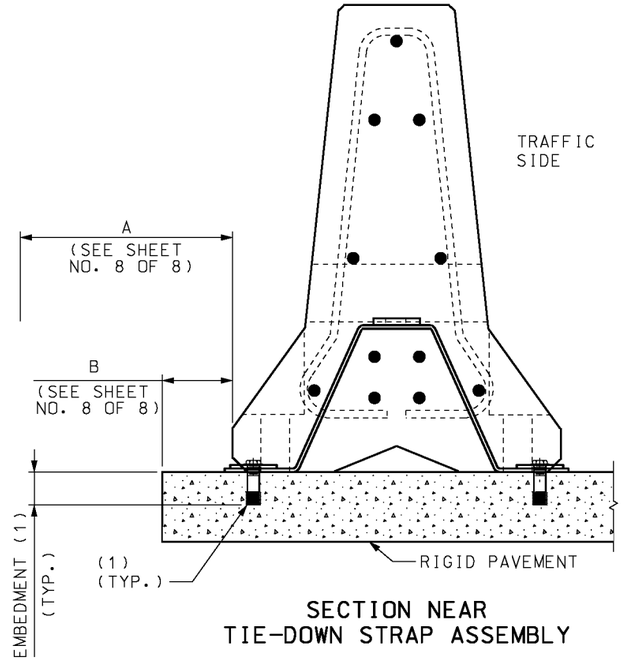
DETAILS OF TYPE F TEMPORARY BARRIER TIE-DOWN STRAP

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

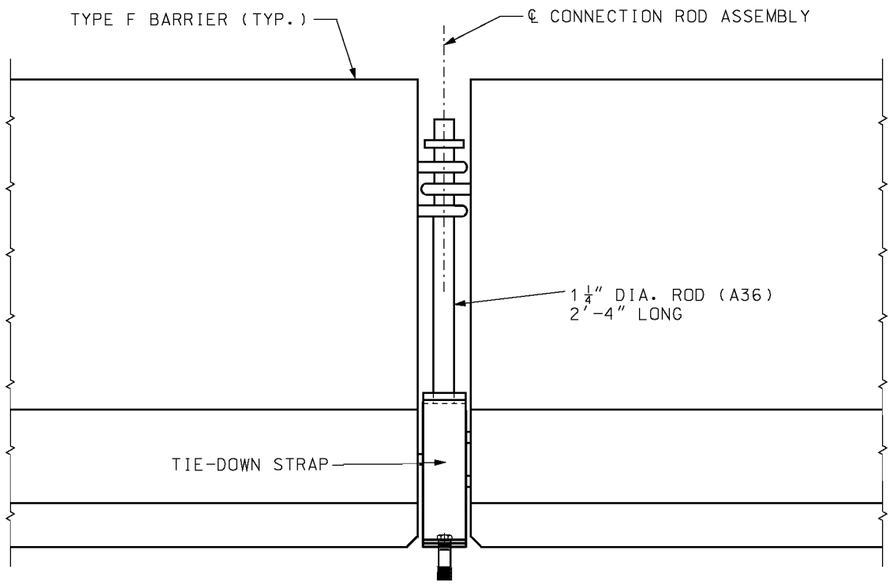
$\frac{3}{4}$″ DROP IN ANCHOR WITH A 3 $\frac{1}{4}$″ EMBEDMENT AND $\frac{3}{4}$″ DIA. X 1 $\frac{3}{4}$″ LONG GRADE 5 BOLT.

RED HEAD LARGE DIAMETER TAPCON (LDT) $\frac{3}{4}$″ X 4 $\frac{1}{2}$″ LONG WITH A 4″ EMBEDMENT.

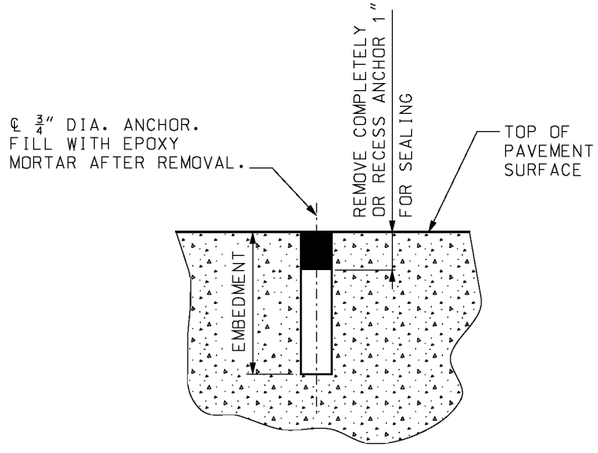
SIMPSON TITEN HD $\frac{3}{4}$″ DIA. X 5″ LONG WITH A 4 $\frac{1}{2}$″ EMBEDMENT.




SECTION NEAR
TIE-DOWN STRAP ASSEMBLY




PART ELEVATION OF BARRIER




DETAIL SHOWING SEALING OF HOLES
AFTER REMOVAL OF TIE-DOWN BOLTS

GENERAL NOTES:

TIE-DOWN STRAP SYSTEMS ARE ONLY APPLICABLE ON RIGID PAVEMENTS.

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

SEE OTHER SHEETS FOR DETAILS NOT SHOWN.

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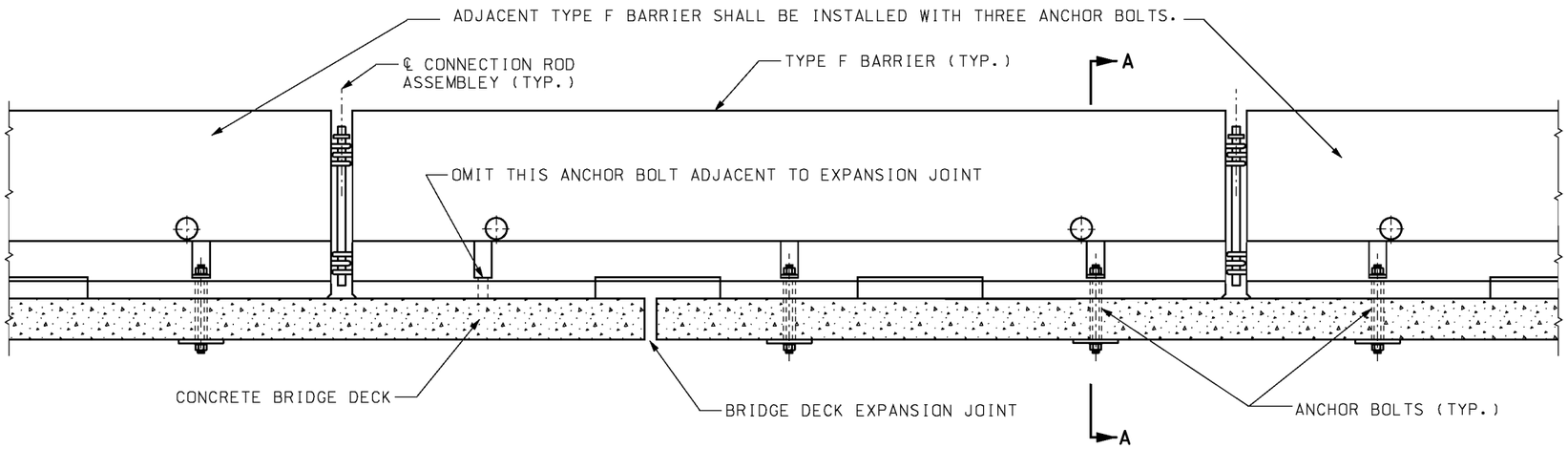
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# TEMPORARY CONCRETE TRAFFIC BARRIER
## ANCHORED
## (TIE-DOWN STRAP SYSTEM)

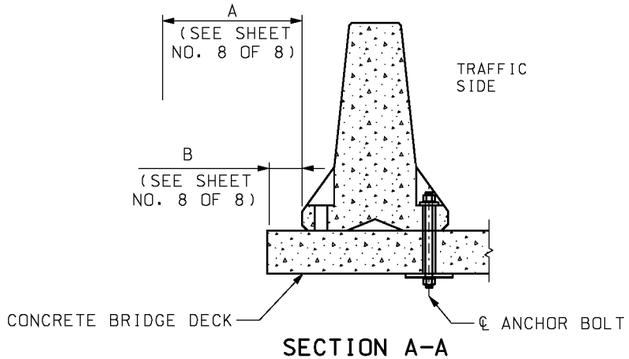
DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 9/3/2015

617.20D

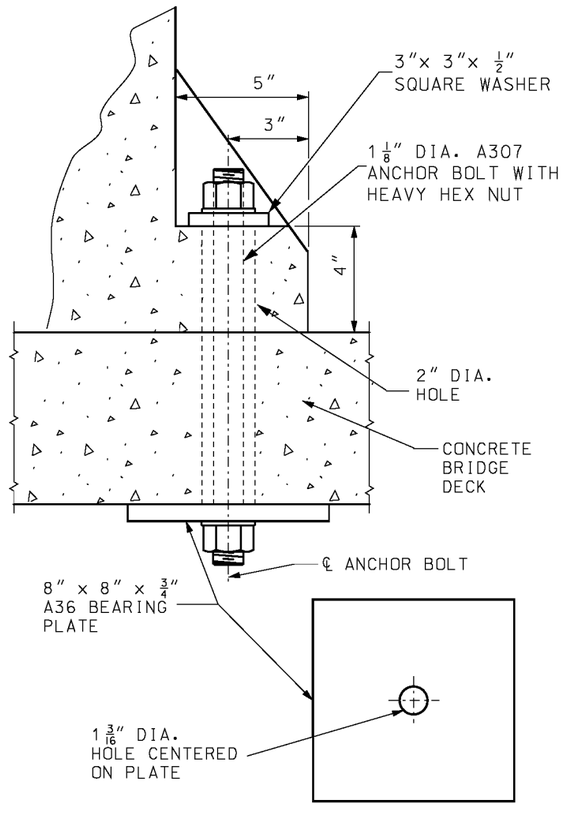
SHEET NO. 5 OF 8




BOLT THROUGH DECK AT THERMAL EXPANSION JOINTS




SECTION A-A




BOLT THROUGH DECK DETAIL

GENERAL NOTES:

ANCHOR BOLT SYSTEMS ARE ONLY APPLICABLE ON BRIDGE DECKS AND RIGID PAVEMENTS.

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

SEE OTHER SHEETS FOR DETAILS NOT SHOWN.

AFTER REMOVAL OF ANCHOR BOLTS HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL MORTAR IN ACCORDANCE WITH SEC 704.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

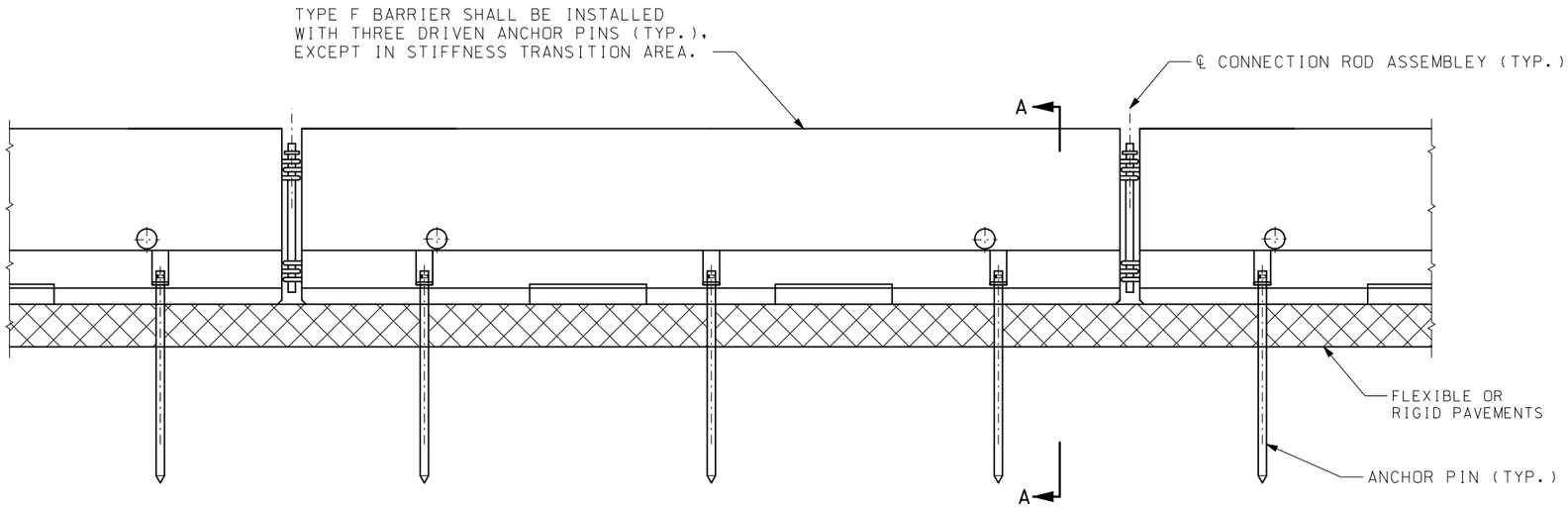
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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
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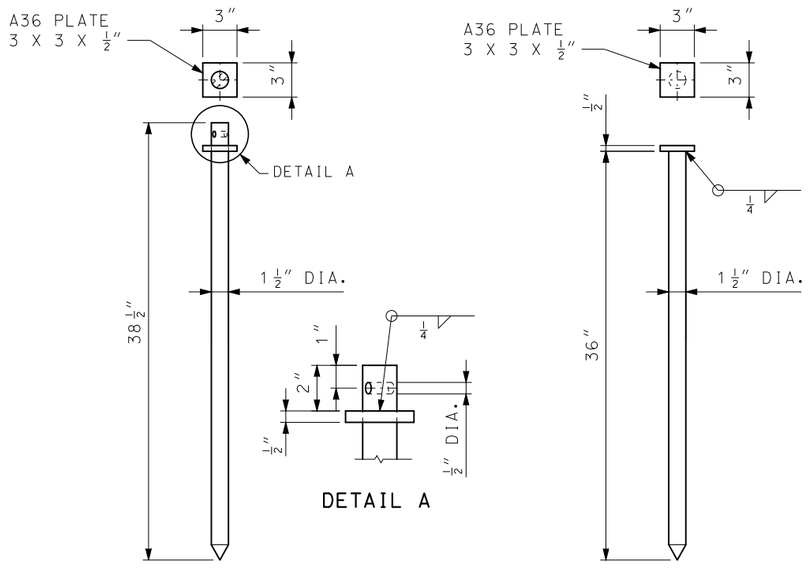
# TEMPORARY CONCRETE TRAFFIC BARRIER
## ANCHORED (BOLT SYSTEM)

DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 9/3/2015

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ELEVATION OF BARRIER WITH ANCHOR PINS

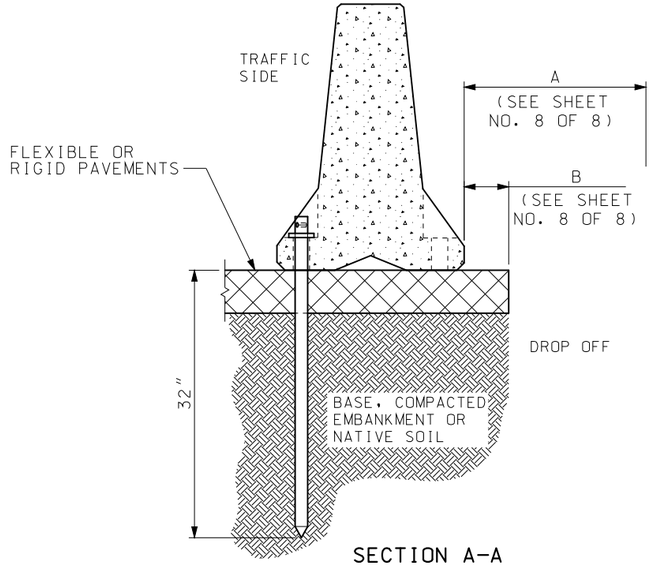



DETAIL A




(OPTIONAL)

DRIVEN ANCHOR PIN (A36)




SECTION A-A

GENERAL NOTES:

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

WHERE EXISTING FLEXIBLE PAVEMENT **OR RIGID** PAVEMENT IS NOT PRESENT A 2" THICK X 30" WIDE MINIMUM ASPHALT PAD SHALL BE CONSTRUCTED.

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

SEE OTHER SHEETS FOR DETAILS NOT SHOWN.

AFTER REMOVAL OF ANCHOR PINS HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL MORTAR IN ACCORDANCE WITH SEC 704.

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STATE OF MISSOURI
ERIC E. SCHROETER
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# TEMPORARY CONCRETE TRAFFIC BARRIER

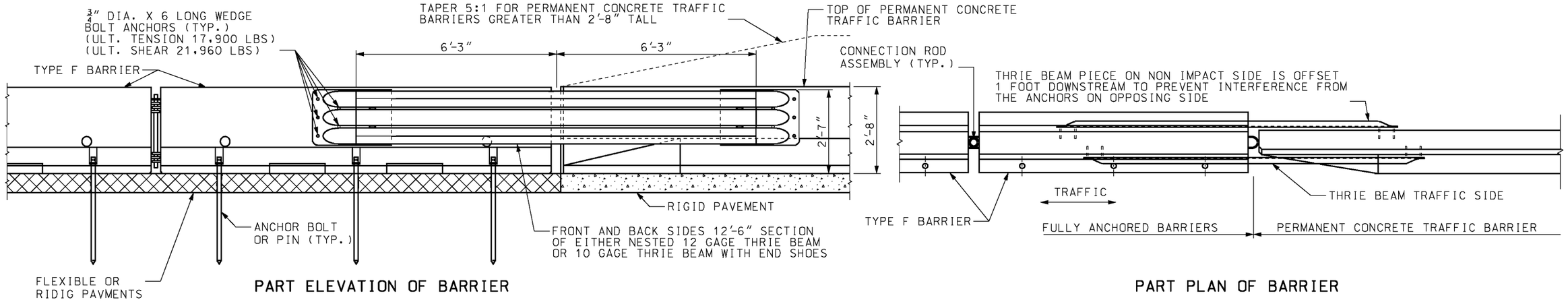
## ANCHORED (PIN SYSTEM)

DATE EFFECTIVE: 10/01/2015
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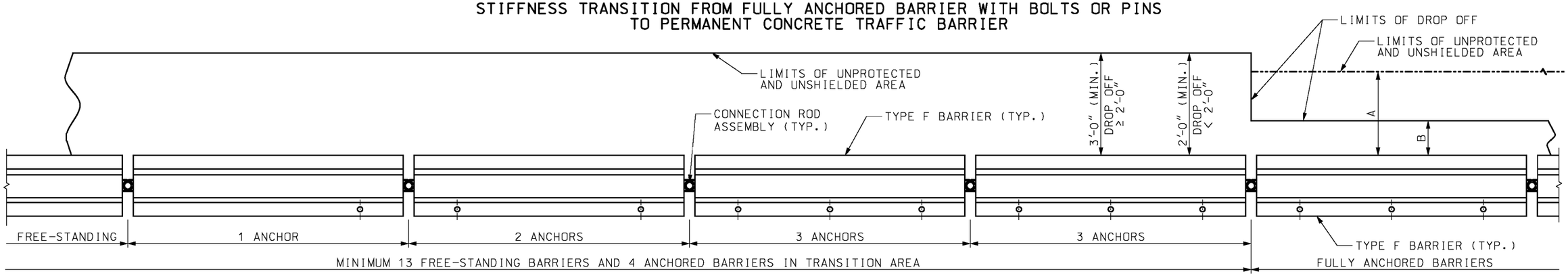
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SHEET NO. 7 OF 8

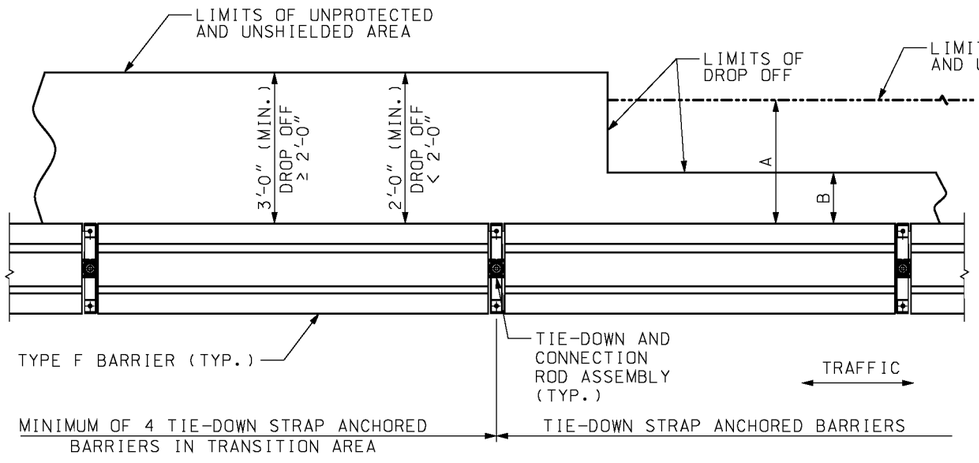
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## STIFFNESS TRANSITION FROM FULLY ANCHORED BARRIER WITH BOLTS OR PINS TO PERMANENT CONCRETE TRAFFIC BARRIER




## PLAN OF STIFFNESS TRANSITION FROM FREE-STANDING BARRIERS TO FULLY ANCHORED BARRIER WITH BOLTS OR PINS




## STIFFNESS TRANSITION FOR BARRIER ANCHORED WITH TIE-DOWN STRAPS

(13 FREE-STANDING BARRIERS NOT REQUIRED)

TRAFFIC

| LIMITS OF UNPROTECTED AND UNSHIELDED AREA | |
|---|---|
| 6" ≤ A < 2' | ANCHOR EACH BARRIER WITH 3 ANCHOR BOLTS OR PINS |
| 2' ≤ A < 3' | ANCHOR WITH TIE-DOWN STRAP |
| A ≥ 3' | NO ANCHORAGE REQUIRED UNLESS SHOWN ON PLANS |

| EDGE OF DROP OFF | |
|---|---|
| 1" ≤ B < 6" | ANCHOR EACH BARRIER WITH 3 ANCHOR BOLTS OR PINS |
| 6" ≤ B < 2' | ANCHOR WITH TIE-DOWN STRAP |
| B ≥ 2' | NO ANCHORAGE REQUIRED UNLESS SHOWN ON PLANS |

NOTE: TEMPORARY CONCRETE TRAFFIC BARRIER MUST MEET BOTH A AND B DIMENSIONS, UNLESS OTHERWISE SHOWN ON PLANS.

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

COST OF FURNISHING AND INSTALLING THE ANCHOR BOLT SYSTEM, ANCHOR PINS SYSTEM, TIE-DOWN STRAP SYSTEM AND THRIE BEAM COMPLETE-IN-PLACE WILL BE CONSIDERED INCIDENTAL TO OTHER PAY ITEMS.

ALL TYPE F BARRIERS SHALL BE CONNECTED TO ADJACENT TYPE F BARRIERS WITH CONNECTION ROD ASSEMBLY. PULL TIGHT DURING INSTALLATION TO REMOVE SLACK TO PROVIDE LONGITUDINAL TENSION DURING IMPACT.

AFTER REMOVAL OF ANCHORS HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL MORTAR IN ACCORDANCE WITH SEC 704.

SEE OTHER SHEETS FOR DETAILS NOT SHOWN.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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ERIC F. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

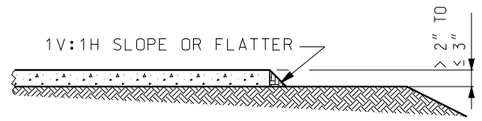
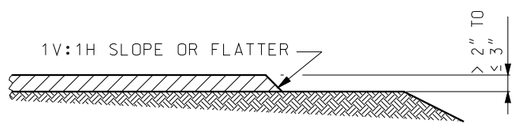
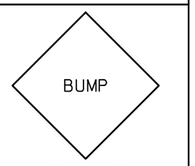
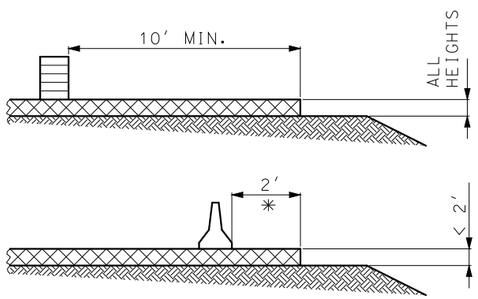
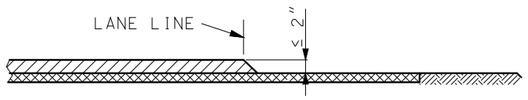
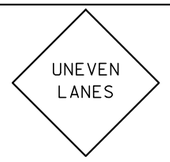
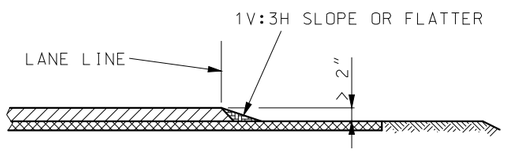
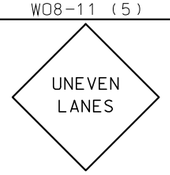
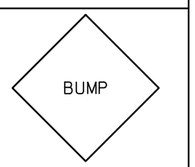
# TEMPORARY CONCRETE TRAFFIC BARRIER
## STIFFNESS TRANSITION

DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 9/3/2015

617.20D

SHEET NO. 8 OF 8

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

| | CROSS SECTION | CONDITION | | TREATMENT | SIGN | |
|---|---|---|---|---|---|---|
| | | DIFFERENTIAL | TIME | | MAINLINE (1) | SIDE ROAD (2) |
| EDGE DROP-OFF |  | PAVEMENT EDGE DIFFERENTIAL > 2" TO ≤ 3" | NON-WORKING HOURS | WEDGE SLOPE TO 1V:1H OR FLATTER |  W08-17 (3)(4) W08-17p (6) | NO SIGNS REQUIRED |
| | | | WORKING HOURS | NO EDGE TREATMENT REQUIRED | | |
| |  | PAVEMENT EDGE DIFFERENTIAL > 2" TO ≤ 3" | NON-WORKING HOURS | WEDGE SLOPE TO 1V:1H OR FLATTER |  W08-17 (3)(4) W08-17p (6) | NO SIGNS REQUIRED |
| | | | WORKING HOURS | NO EDGE TREATMENT REQUIRED | | |
| |  | PAVEMENT EDGE DIFFERENTIAL > 3" | NON-WORKING HOURS | WEDGE SLOPE TO 1V:3H OR FLATTER |  W08-17 (3)(4) W08-17p (6) |  W08-1 (3) |
| | | | WORKING HOURS | DELINEATE DIFFERENTIAL WITH CHANNELIZERS | | |
| |  * FOR DISTANCES LESS THAN 2', SEE STANDARD PLAN 617.20. ** FOR DISTANCES LESS THAN 3', SEE STANDARD PLAN 617.20. | ANY PAVEMENT EDGE OR LANE LINE DIFFERENTIAL | NON-WORKING AND WORKING HOURS WHERE PLANS REQUIRE ADJACENT LANE CLOSURE WITH CHANNELIZATION OR PARTIAL LANE CLOSURE WITH BARRIER. | NO EDGE TREATMENT REQUIRED | NO SIGNS REQUIRED | NO SIGNS REQUIRED |
| LANE DIFFERENTIAL |  | LANE LINE DIFFERENTIAL ≤ 2" | NON-WORKING AND WORKING HOURS | NO EDGE TREATMENT REQUIRED |  W08-11 (5) | NO SIGNS REQUIRED |
| |  | LANE LINE DIFFERENTIAL > 2" | NON-WORKING AND WORKING HOURS WHERE LANES OPEN TO TRAFFIC | WEDGE SLOPE TO 1V:3H OR FLATTER |  W08-11 (5) |  W08-1 |
| | | | NON-WORKING AND WORKING HOURS WHERE LANE CLOSED TO TRAFFIC | DELINEATE DIFFERENTIAL WITH CHANNELIZERS | | |

(1) SIGNS SHALL BE SPACED AT APPROXIMATELY ONE MILE INTERVALS AND LOCATED WITHIN 150 FT. BEYOND ANY STATE ROADS. WHEN A SIGN PLACED AT THE ONE MILE INTERVAL FALLS WITHIN 1/2 MILE OF A SIGN PLACED AFTER AN INTERSECTION, THE SIGN PLACED AT THE 1/2 MILE INTERVAL MAY BE OMITTED. WHEN SHOULDER DROP-OFF SIGNS WITH UNEVEN LANES ARE BOTH SPECIFIED, ALTERNATING SIGN MESSAGES SHALL BE USED AT 1 MILE SPACINGS.

(2) ON SIDE ROADS WITH POSTED SPEED OF 45 MPH OR GREATER, SIGNS SHALL BE PLACED 150 FT. IN ADVANCE OF INTERSECTION WITH MAINLINE.

(3) SIGNS SHALL BE LOCATED ON THE SIDE OF THE ROADWAY WHERE THE PAVEMENT EDGE DIFFERENTIAL EXISTS, ON TWO-LANE UNDIVIDED HIGHWAYS, BACK-TO-BACK SIGNS SHALL BE PROVIDED ON THE SIDE OF THE ROADWAY, WHERE THE PAVEMENT EDGE DIFFERENTIAL EXISTS. "BACK TO BACK" SIGNS SHALL BE SEPARATED BY 7-10 FEET.

(4) SIGNS TO REMAIN VISIBLE UNTIL SHOULDER SHAPING IS COMPLETE.

(5) SIGNS SHALL BE LOCATED ON RIGHT SIDE OF NON-DIVIDED HIGHWAYS AND ON BOTH SIDES OF DIVIDED HIGHWAYS WHERE A LANE LINE DIFFERENTIAL EXISTS.

(6) WHEN THE SHOULDER DROP-OFF SIGNS ARE IN PLACE FOR GREATER THAN THREE DAYS, THE SHOULDER DROP-OFF PLAQUE SHOULD BE USED IN ADDITION WITH THE SHOULDER DROP-OFF SIGN.

LEGEND

- RIGID PAVEMENT
- FLEXIBLE PAVEMENT
- ALL PAVEMENT TYPES

GENERAL NOTES:

SIGNS SHALL BE VISIBLE TO TRAFFIC ONLY WHEN AND WHERE CONDITIONS EXIST.

FOR ADDITIONAL SIGN SPACING AND DETAILS SEE STANDARD PLAN 620.10.

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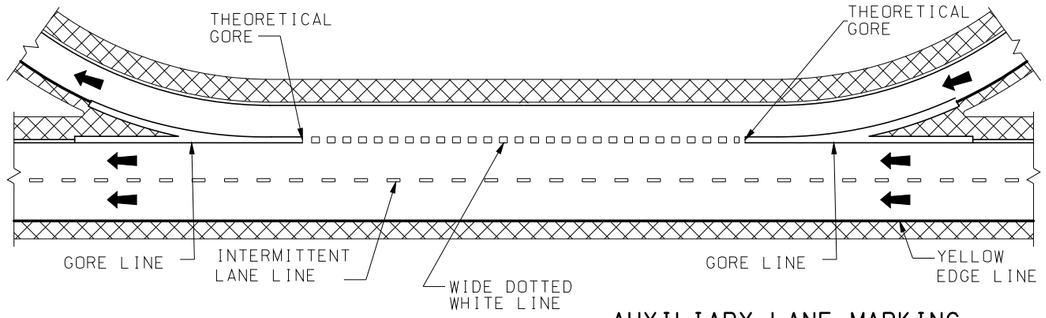

STATE OF MISSOURI
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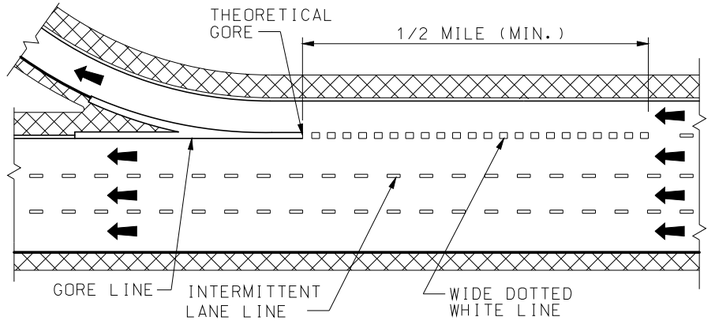
# PAVEMENT EDGE TREATMENT

DATE EFFECTIVE: 10/01/2015
DATE PREPARED: 10/28/2016

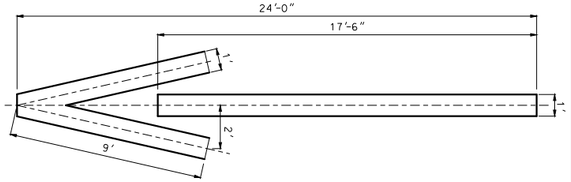
619.10H

SHEET NO. 1 OF 1




## AUXILIARY LANE MARKING



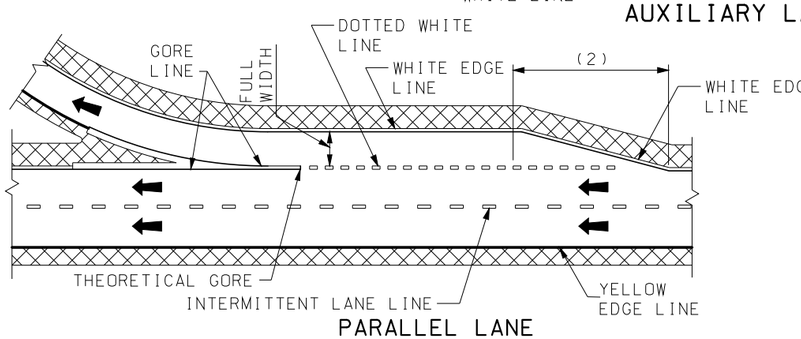

FIRST ARROW 25' FROM CROSSROAD OR STOP LINE.

MAXIMUM 3 ARROWS AT 100' INTERVALS.

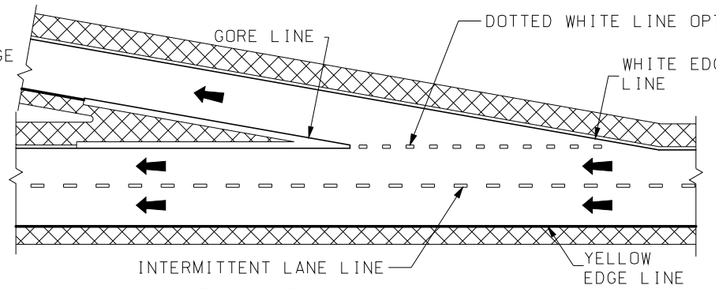
ON MULTI-LANE RAMP USE ARROW IN EACH LANE.

WRONG WAY ARROWS ARE NOT USED WHEN RAMP HAS LANE USE CONTROL ARROWS.

## OFF RAMP WRONG WAY ARROW



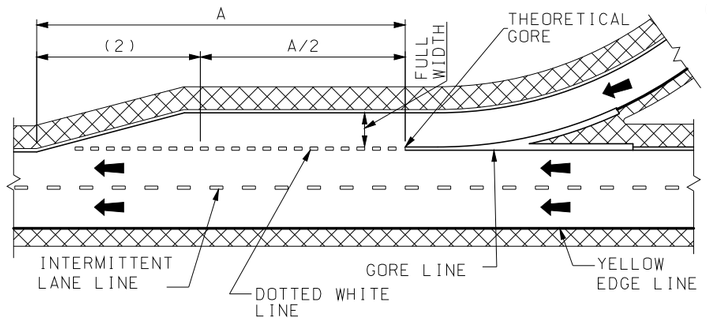

## PARALLEL LANE



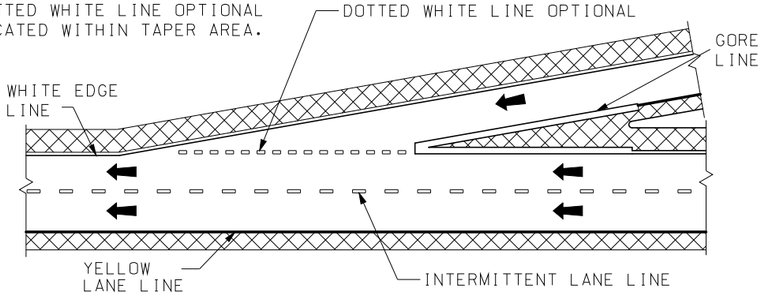

## TAPERED LANE

## EXIT RAMP MARKING

A = LENGTH OF ACCERLERATION LANE PLUS TAPER.



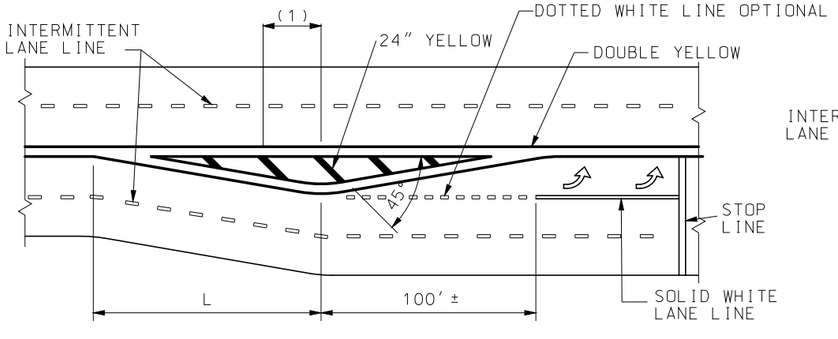

## PARALLEL LANE




## TAPERED LANE

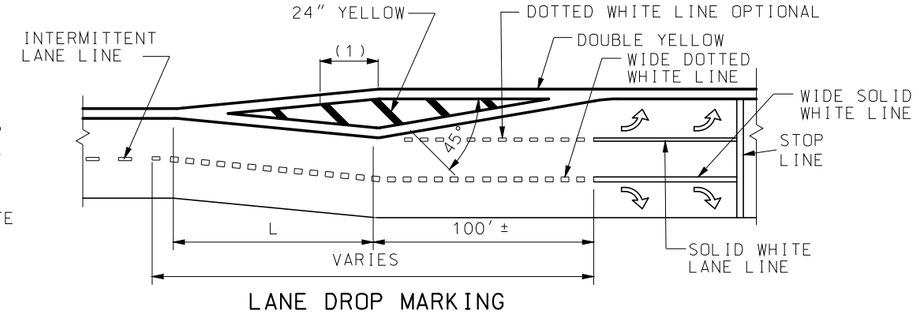
## ENTRANCE RAMP MARKING

L = LENGTH OF TAPER IN FEET.




## MEDIAN ISLAND MARKING

(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 3 BARS.




## LANE DROP MARKING

GENERAL NOTES:

DOTTED LINES SHALL BE 3 FEET IN LENGTH SEPARATED BY 9 FOOT GAPS.

REFER TO THE STANDARD PLAN 626.00 WHEN INSTALLING PAVEMENT MARKINGS OVER RUMBLE STRIPS.

WIDE LINES ARE TWICE THE WIDTH OF NORMAL LINES.

LANE LINES SHALL BE AN INTERMITTENT OR SOLID WHITE.

INTERMITTENT LINES SHALL BE 10 FEET IN LENGTH SEPARATED BY 30 FOOT GAPS.

EDGELINES SHALL BE CONTINUOUS SOLID WHITE OR YELLOW LINES. RIGHT SIDE EDGELINES SHALL BE SOLID WHITE. MEDIAN OR LEFT SIDE EDGELINES ON DIVIDED HIGHWAYS AND ON THE LEFT SIDE OF RAMPS SHALL BE SOLID YELLOW. EDGELINES SHALL BE CONTINUOUS ACROSS DRIVEWAYS AND MINOR INTERSECTING ROADS.

"NO PASSING" LINES SHALL BE CONTINUOUS SOLID YELLOW.

"NO PASSING" LINES SHALL BE PLACED AS SHOWN IN "LINE DETAIL". "NO PASSING" LINES ON A TWO-LANE, TWO-WAY HIGHWAY WHEN PASSING IS PROHIBITED IN EACH DIRECTION SHALL BE PLACED 4 INCHES APART AND THE INTERMITTENT CENTERLINE SHALL BE OMITTED.

STOP LINES SHALL BE A SOLID WHITE TRANSVERSE LINE 24 INCHES WIDE, LOCATED AT LEAST 4 FEET FROM THE NEAREST EDGE OF THE INTERSECTING ROADWAY.

CROSSWALK LINES SHALL BE SOLID WHITE TRANSVERSE LINES 6 INCHES WIDE AT LEAST 6 FEET APART. CROSSWALK LINES ON THE INTERSECTION SIDE OF THE CROSSWALK SHALL MEET AT THE CURB.

GORE LINES SHALL BE A SOLID WHITE LINE WITH A WIDTH TWICE THAT OF THE EDGELINE.

ARROWS AND WORD SYMBOLS SHALL BE SOLID WHITE.

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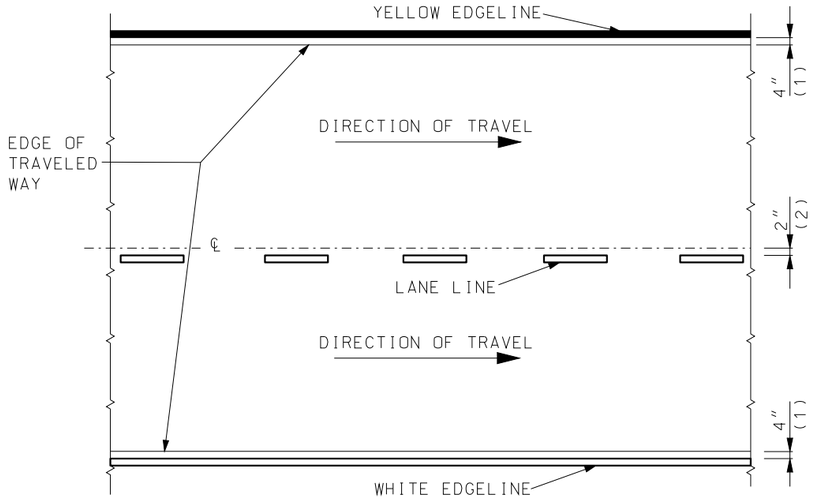
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# PAVEMENT MARKING

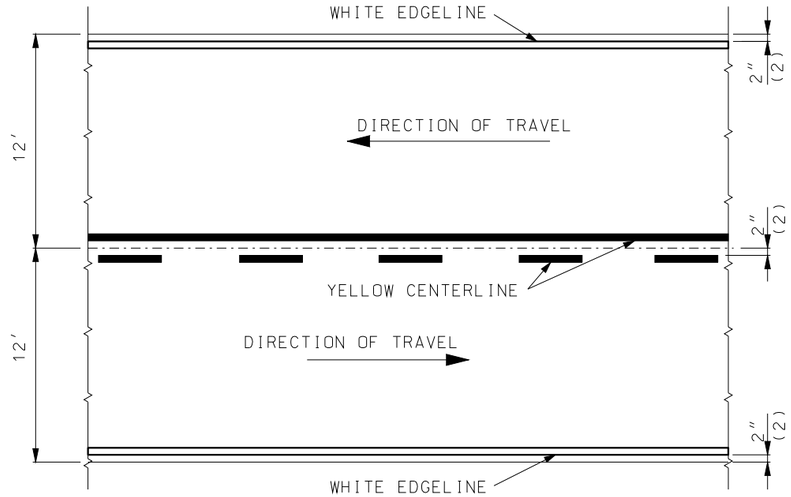
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/17/2016

620.00L

SHEET NO. 1 OF 5

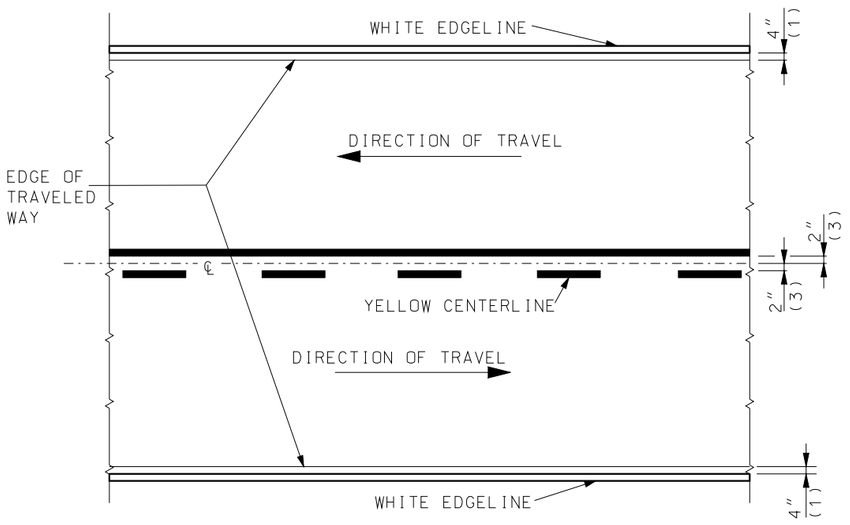



DIVIDED PAVEMENT



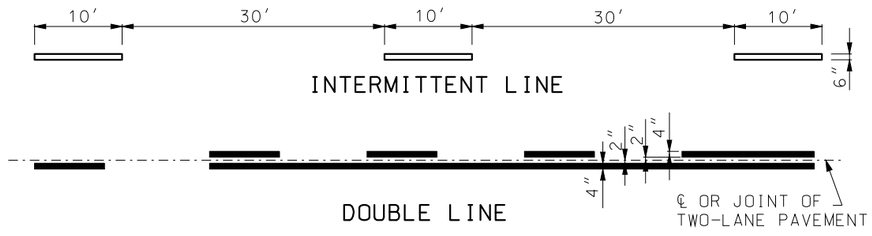

TWO-LANE TWO-WAY

## TYPICAL STRIPING OFFSETS WITHOUT RUMBLE STRIPES




TWO-LANE TWO-WAY

## TYPICAL STRIPING OFFSETS FOR RUMBLE STRIPES




DOUBLE LINE
LINE DETAIL

LEGEND
WHITE LINE
YELLOW LINE

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

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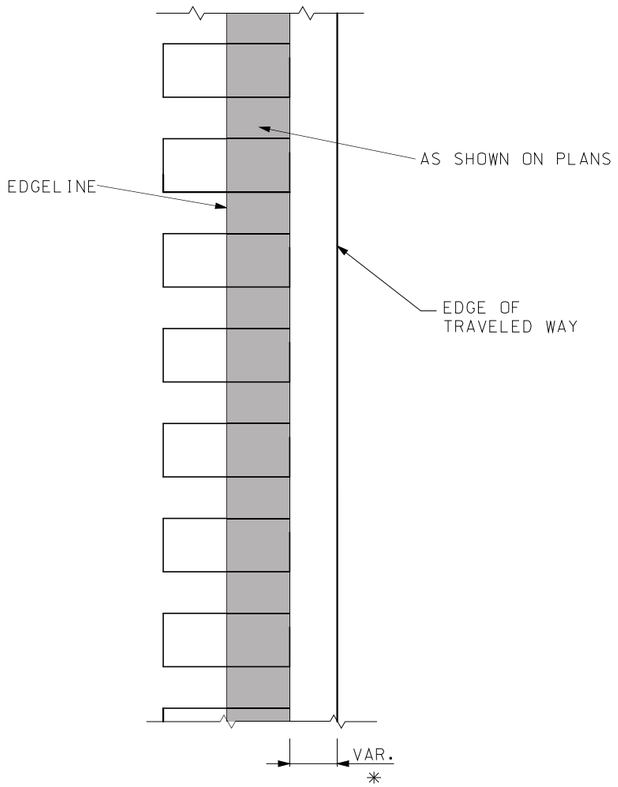

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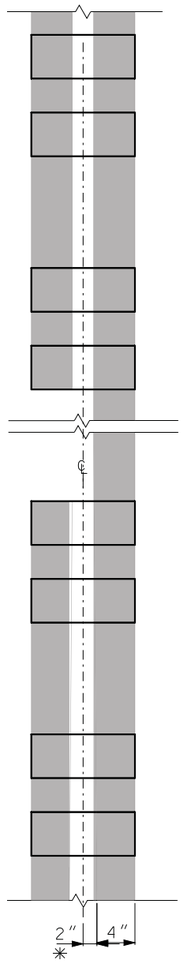
# PAVEMENT MARKING

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/17/2016

620.00L




FOR SHOULDERS




2 WAY 2 LANE
(SEE TYPICAL STRIPING
FOR RUMBLESTRIPS)

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

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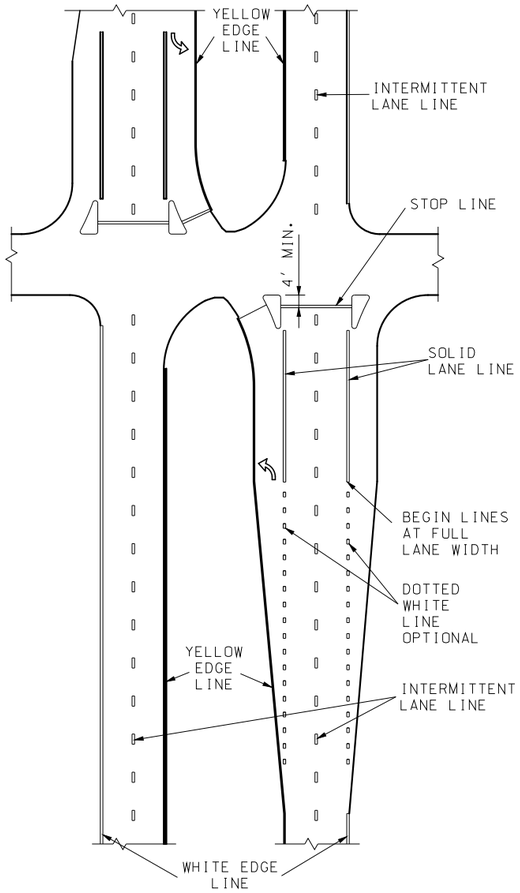
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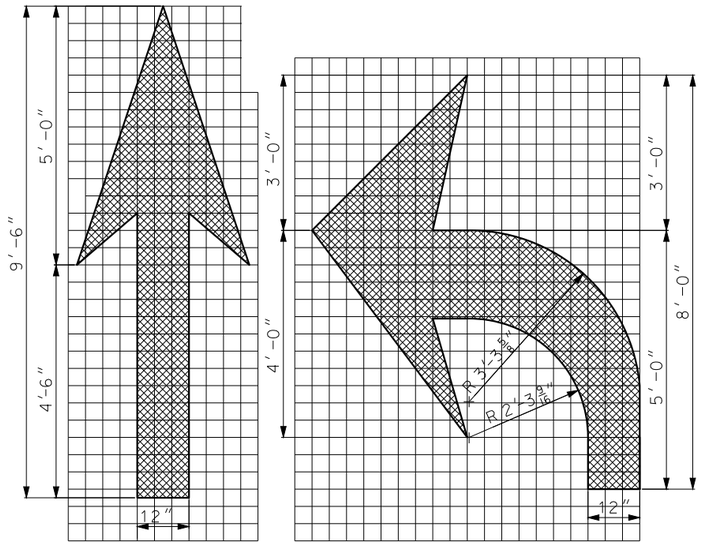
# PAVEMENT MARKING STRIPING THROUGH RUMBLE STRIPS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/17/2016

620.00L

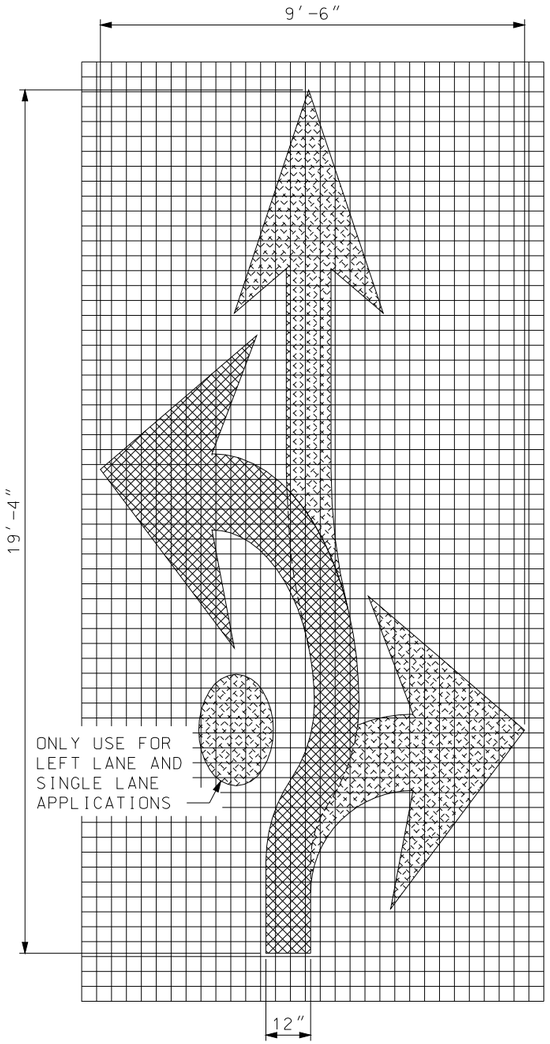



SIGNALIZED GRADE
INTERSECTION MARKING

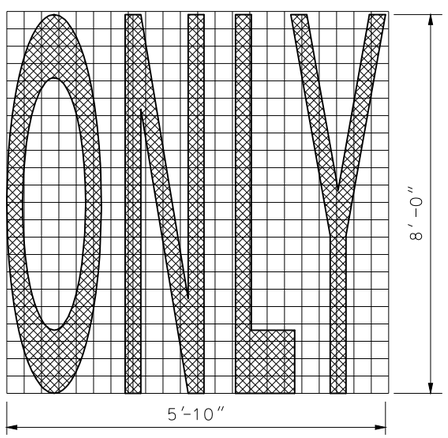



## ARROW MARKINGS

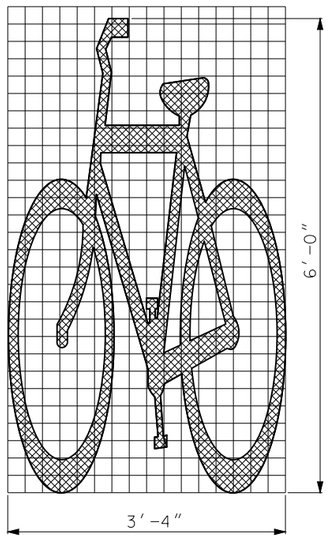
TWO LANE USE CONTROL ARROWS FOR FIRST 200 FEET WITH ONE ADDITIONAL ARROW EVERY 400 FEET OF MANDATORY MOVEMENT LANE. FIRST ARROW 75 FEET FROM STOP LINE.



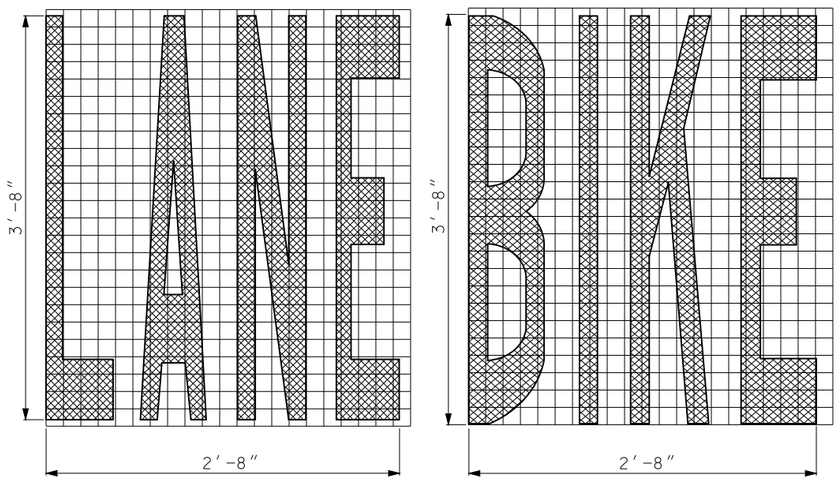

FISH-HOOK ARROW
ROUNDABOUT APPROACH
MARKINGS




WORD MARKING
ELONGATED WORD & SYMBOL




BICYCLE SYMBOL




WORD MARKING
ELONGATED WORD & SYMBOL

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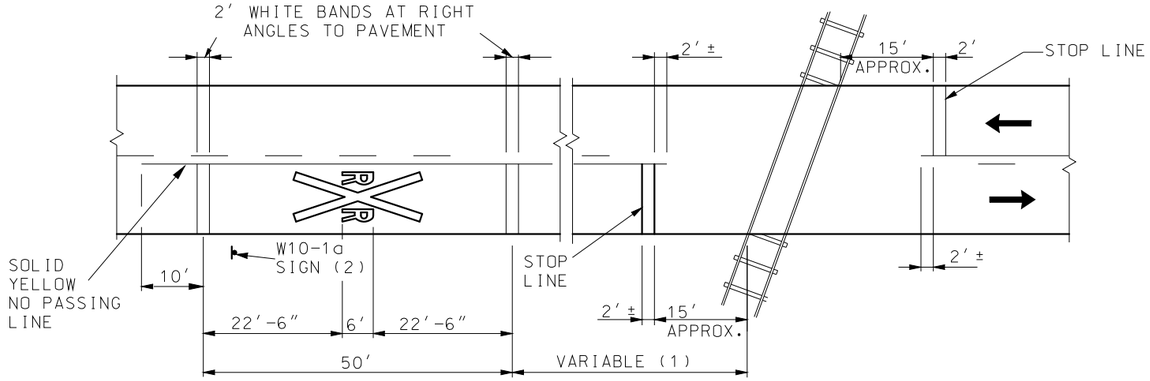
PAVEMENT MARKING

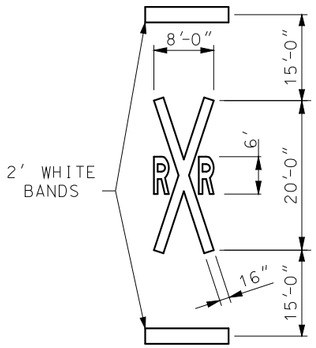
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/17/2016

620.00L

SHEET NO.
4 OF 5

1. STOP LINES SHALL BE PLACED 90° TO THE ROADWAY.
2. IF RAILROAD GATE IS PRESENT THE STOP LINE SHALL BE 8′ FROM GATE.



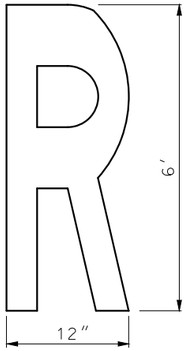




SYMBOL DETAIL

## PAVEMENT DETAIL

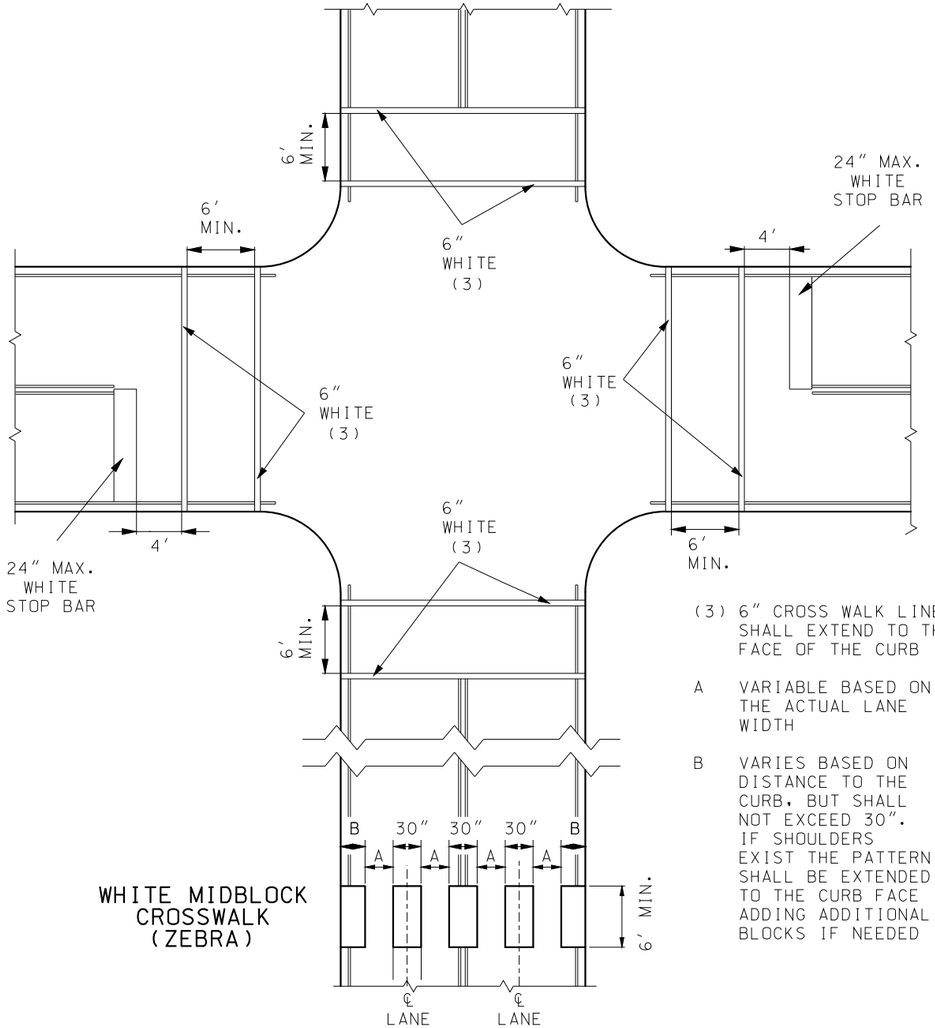
(1) THE DISTANCE FROM THE RAILROAD CROSSING MARKING TO THE NEAREST TRACK WILL VARY ACCORDING TO THE APPROACH SPEED AND THE SIGHT DISTANCE OF THE VEHICULAR TRAFFIC APPROACHING, BUT SHALL BE NO LESS THAN 50 FEET.
A THREE-LANE ROADWAY SHALL BE MARKED WITH A CENTERLINE FOR TWO-LANE APPROACH OPERATION ON THE APPROACH TO A CROSSING. ON MULTI-LANE ROADWAYS THE TRANSVERSE BANDS SHALL EXTEND ACROSS ALL APPROACH LANES, AND INDIVIDUAL "R X R" SYMBOLS SHALL BE USED IN EACH APPROACH LANE.

(2) PLACEMENT OF W10-1a SIGN BY OTHERS.




LETTER DETAIL

RAILROAD GRADE CROSSING



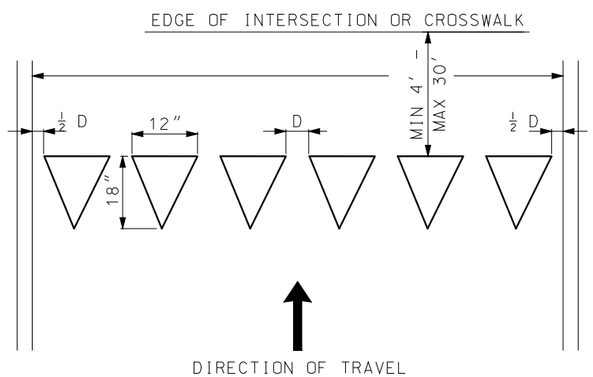

WHITE MIDBLOCK CROSSWALK (ZEBRA)

(3) 6″ CROSS WALK LINE SHALL EXTEND TO THE FACE OF THE CURB

A VARIABLE BASED ON THE ACTUAL LANE WIDTH

B VARIES BASED ON DISTANCE TO THE CURB, BUT SHALL NOT EXCEED 30″. IF SHOULDERS EXIST THE PATTERN SHALL BE EXTENDED TO THE CURB FACE ADDING ADDITIONAL BLOCKS IF NEEDED

PEDESTRIAN CROSSWALKS




WHITE YIELD LINE TRIANGLES

D = 3″ TO 12″

TRIANGLES SHALL BE UNIFORMLY SPACED AND COVER THE COMPLETE WIDTH OF THE TRAVEL LANE. SPACING SHALL BE ADJUSTED SO THERE ARE NO PARTIAL TRIANGLES WITHIN THE YIELD MARKING.


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NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

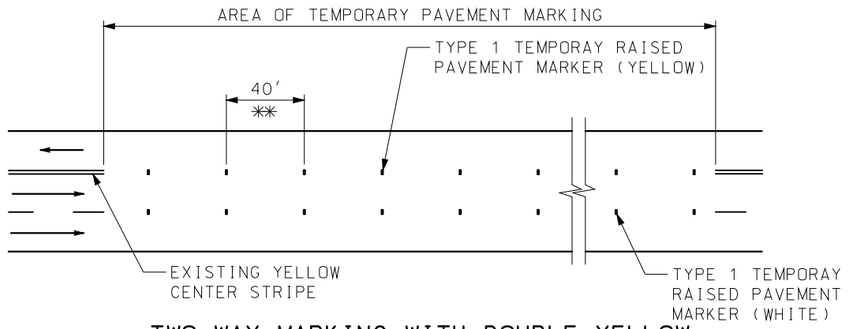
# PAVEMENT MARKING

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/17/2016

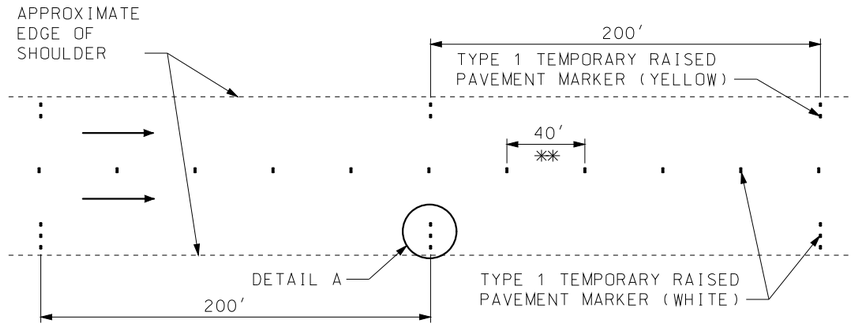
620.00L

SHEET NO. 5 OF 5

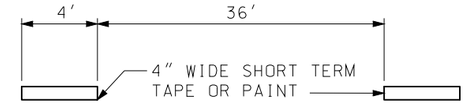

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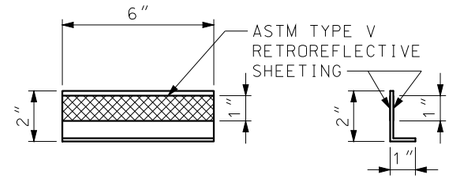

TWO-WAY MARKING WITH DOUBLE YELLOW PROHIBITTED PASSING MARKING SECTION



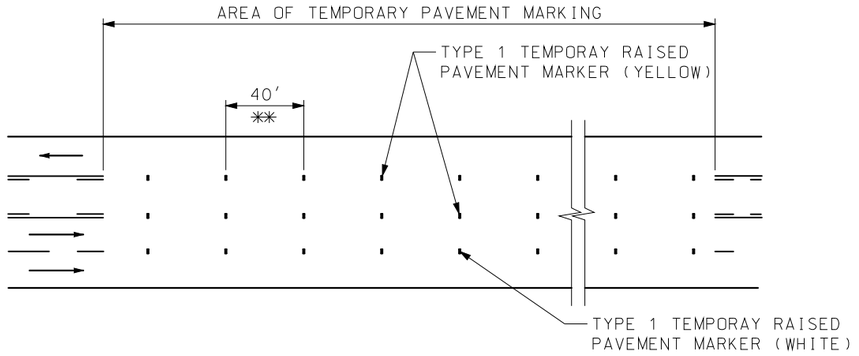

EDGE LINES AND LANE LINES ON MULTILANE DIVIDED SECTIONS



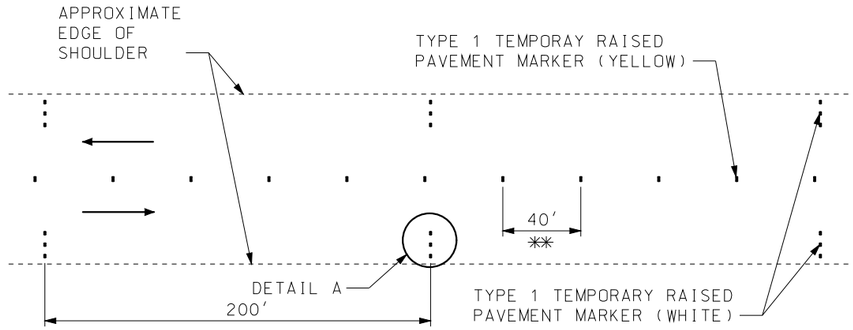

** OPTIONAL TEMPORARY PAVEMENT MARKING DETAIL FOR INTERMEDIATE LIFTS



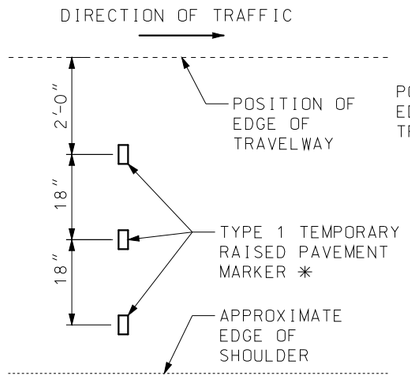

TYPICAL TYPE 1 TEMPORARY RAISED PAVEMENT MARKER DETAIL




TWO-WAY WITH LEFT-TURN LANE MARKING SECTION

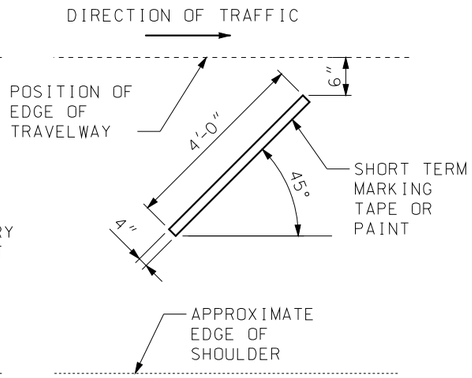



EDGE LINES AND CENTERLINE ON TWO-WAY SECTIONS WITH PAVED SHOULDERS GREATER THAN 4 FEET WIDE

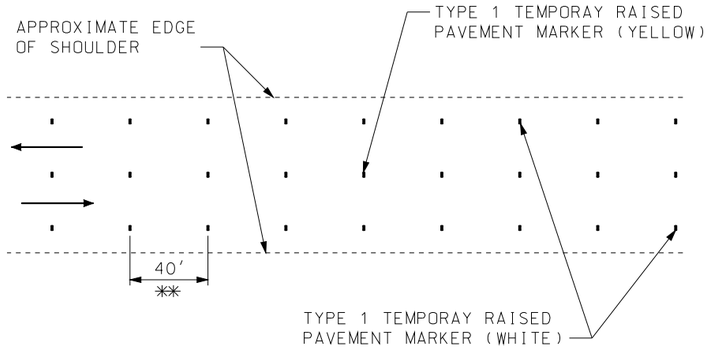



DETAIL A

✳ THREE TYPE 1 TEMPORARY RAISED PAVEMENT MARKERS SHALL BE USED IF SHOULDER IS 6′OR WIDER. OTHERWISE, USE TWO TYPE 1 TEMPORARY RAISED PAVEMENT MARKERS.




OPTIONAL DETAIL A FOR INTERMEDIATE LIFT




EDGE LINES AND CENTERLINE ON TWO-WAY SECTIONS WITH PAVED SHOULDERS 4 FEET WIDE OR LESS, AGGREGATE OR EARTH SHOULDERS OR NO SHOULDERS

GENERAL NOTES:

TEMPORARY PAVEMENT MARKING IS REQUIRED WHEN 200 CONSECUTIVE LINEAR FEET OR MORE OF PERMANENT PAVEMENT MARKING HAS BEEN OBLITERATED, OR AS DIRECTED BY THE ENGINEER.

TEMPORARY RAISED PAVEMENT MARKERS (TRPMS), OR THE OPTIONAL 4″X 4′ SHORT TERM TAPE OR PAINT, WHEN ALLOWED, SHALL BE MAINTAINED IN PLACE AND RETROREFLECTIVE UNTIL THE PERMANENT PAVEMENT MARKINGS ARE INSTALLED. MISSING OR NON-REFLECTIVE MARKINGS SHALL BE REPLACED AT NO ADDITIONAL COST TO THE COMMISSION WHEN 10% OR MORE ARE DEFICIENT WITHIN ONE MILE OR WHEN 4 OR MORE CONSECUTIVE MARKINGS ARE DEFICIENT.

FOR INTERMEDIATE LIFTS, 4″X 4′ SHORT TERM TAPE OR TEMPORARY PAINT MAY BE USED IN LIEU OF TRPMS.

TRPMS USED ON INTERMEDIATE LIFTS SHALL BE REMOVED PRIOR TO PLACEMENT OF THE NEXT LIFT.

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

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

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STATE OF MISSOURI
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NUMBER PE-28411
PROFESSIONAL ENGINEER
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# TEMPORARY PAVEMENT MARKING

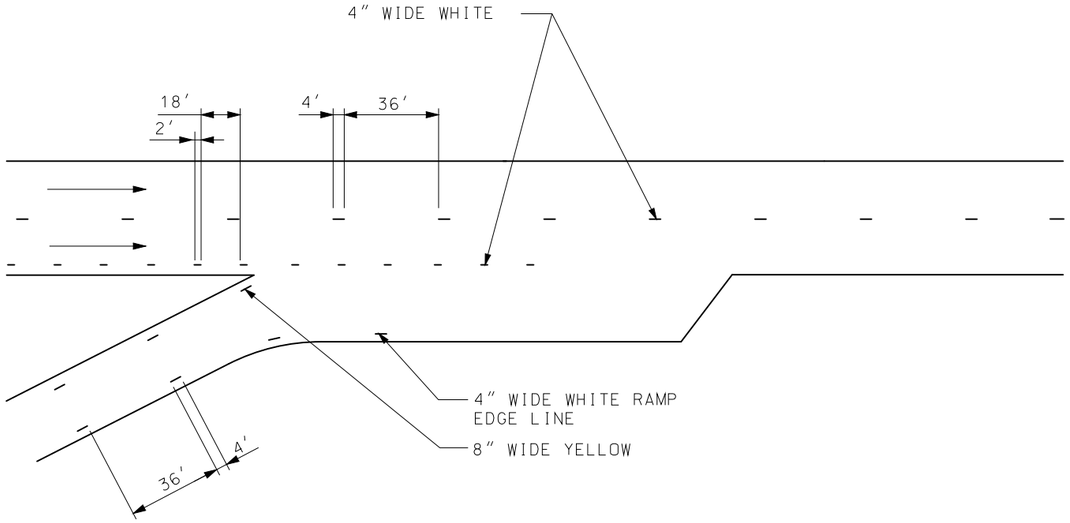
TEMPORARY PAVEMENT MARKING

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

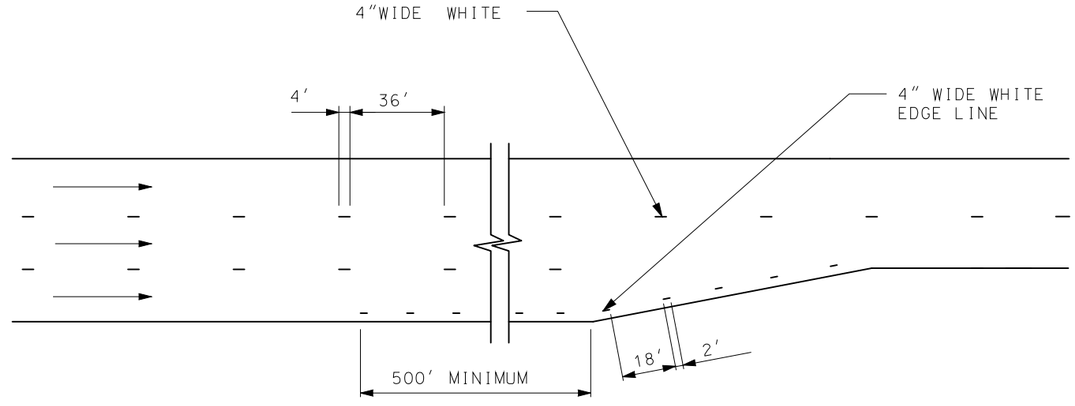
620.10E

SHEET NO. 1 OF 5

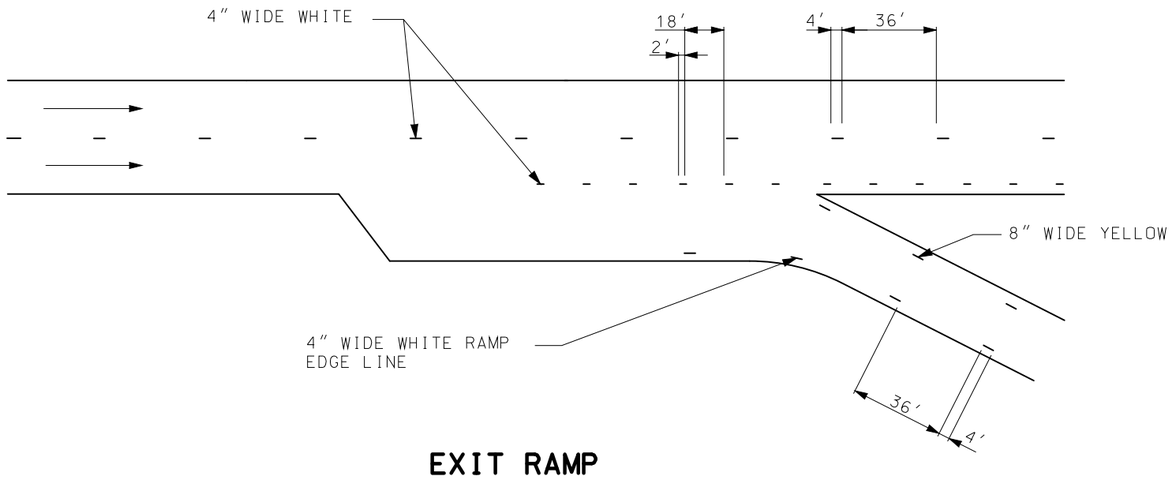
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## ENTRANCE RAMP




## LANE TRANSITION




## EXIT RAMP

GENERAL NOTES:

TEMPORARY PAVEMENT MARKING IN INTERSECTIONS, RAMPS GORES AND OTHER TRANSITION AREAS USE AN INTERMITTENT MARKING OF 2 FEET LONG AT A CYCLE OF 20 FEET.

LIMITS OF TEPORARY GORE MARKING ARE THE SAME AS THE EXISTING GORE LINES.


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# TEMPORARY PAVEMENT MARKING

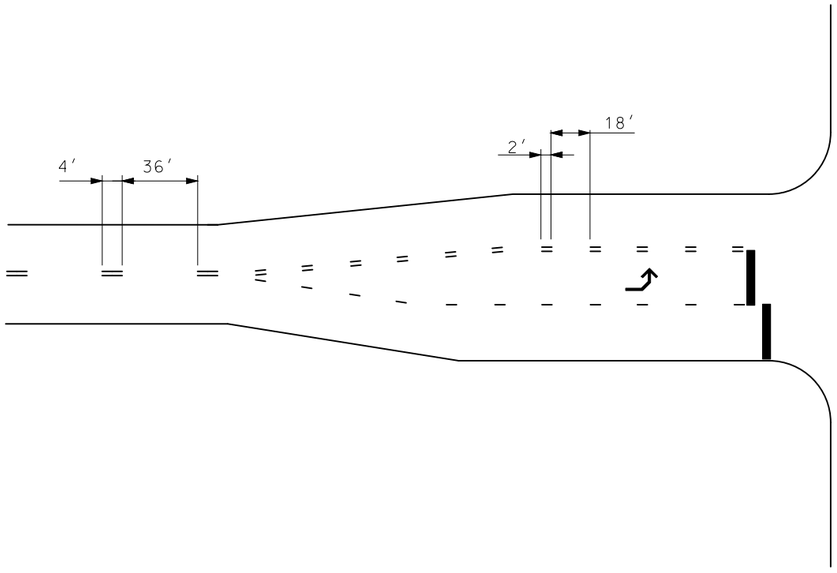
LANE TRANSITION AND RAMP AREAS

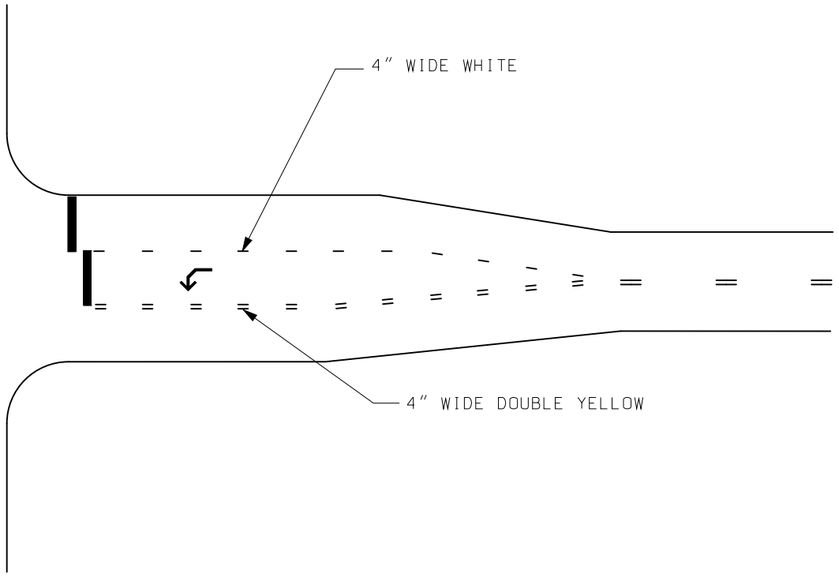
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

620.10E

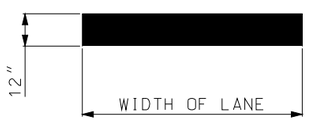
SHEET NO. 2 OF 5

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

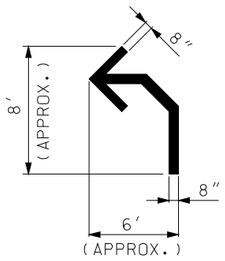


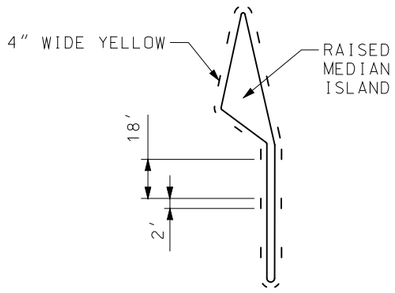

PLAN VIEW



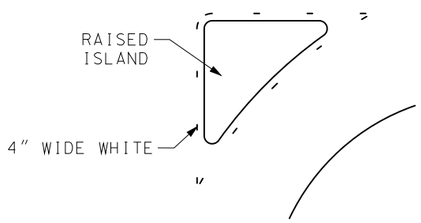

TEMPORARY STOP BAR DETAIL (WHITE)




TEMPORARY ARROW DETAIL (WHITE)




RAISED DIVISIONAL ISLAND




RAISED CHANNELIZING ISLAND

GENERAL NOTES:

TEMPORARY ARROWS AND STOP BARS ARE REQUIRED WHEN GOEMETRIC MODIFICATIONS DURING CONSTRUCTION CREATE LANE CONFIGURATIONS DIFFERENT THAN EXISTING, OR THE EXISTING PAVEMENT MARKING INCLUDES THEM.

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

TEMPORARY PAVEMENT MARKING IN INTERSECTIONS, RAMP GORES AND OTHER TRANSITION AREAS USE AN INTERMITTENT MARKING 2′ LONG AT A CYCLE OF 20′.

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# TEMPORARY PAVEMENT MARKING

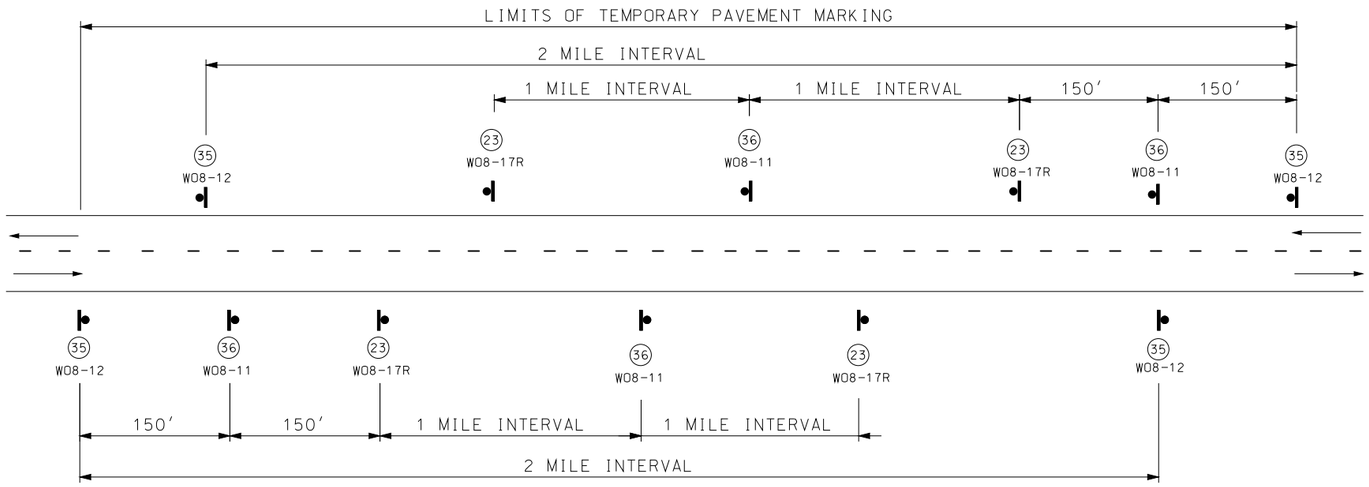
INTERSECTIONS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

620.10E

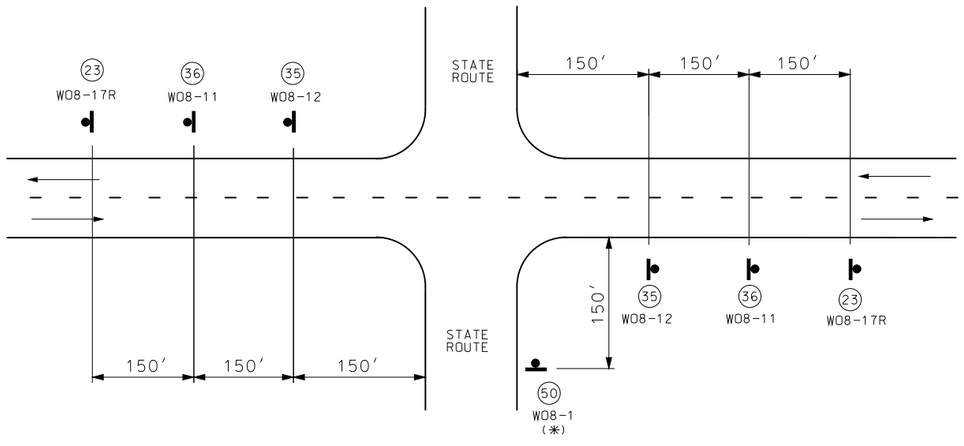
SHEET NO. 3 OF 5

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## SIGN SPACING FOR MAINLINE

(DETAIL SHOWN IS BASED ON A PROJECT MEETING ALL CONDITIONS: NO CENTER STRIPE, UNEVEN LANES, SHOULDER DROP-OFF AND BUMP.)
WHEN BOTH UNEVEN LANES AND SHOULDER DROP-OFF SIGNS ARE USED, BOTH SIGHS SHALL STAY IN PLACE UNTIL BOTH CONDITIONS NO LONGER EXIST.
IF ONLY ONE CONDITIOIN EXISTS (UNEVEN LANES OR SHOULDER DROP-OFF), THE SIGN SPACING SHALL BE AT 1 MILE INTERVALS.




## SIGN SPACING AT STATE ROUTE INTERSECTIONS

(*) BUMP SIGN SHOULD BE IN ACCORDANCE WITH STANDARD PLAN 619.10.




W08-17R
W08-17p
23




W08-1
50
(*)




W08-11
36




W08-12
35

GENERAL NOTES:

FOR DETAILS OF TEMPORARY PAVEMENT MARKING SEE STANDARD PLAN 620.10.

SIGN (35) AND TEMPORARY PAVEMENT MARKING INSTALLED WHERE CENTERLINE STRIPING HAS BEEN COVERED OR REMOVED. SIGNS ARE TO REMAIN IN PLACE UNTIL THE PERMANENT CENTERLINE PAVEMENT MARKINGS ARE IN PLACE. SIGNS SHALL BE COVERED OR REMOVED WHEN PAVEMENT CENTERLINE MARKING HAS BEEN INSTALLED.

SIGN (35) IS PLACED AT APPROXIMATELY TWO-MILE INTERVALS AND AT STATE ROUTE JUNCTIONS. WHEN THE INSTALLATION AT A JUNCTION IS WITHIN ONE-EIGHTH MILE OF THE NORMAL MAINLINE SIGN (35) , THE LATTER MAY BE ELIMINATED.

ALL SIGNS SHALL BE POST MOUNTED AND IN ACCORDANCE WITH STANDARD PLAN 616.10 AND 903.03.

WHEN SHOULDER DROP-OFF SIGNS ARE IN PLACE FOR GREATER THAN THREE DAYS, THE SHOULDER DROP-OFF PLAQUE SHOULD BE USED IN ADDITION WITH THE SHOULDER DROP-OFF SIGN.

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# TEMPORARY PAVEMENT MARKING

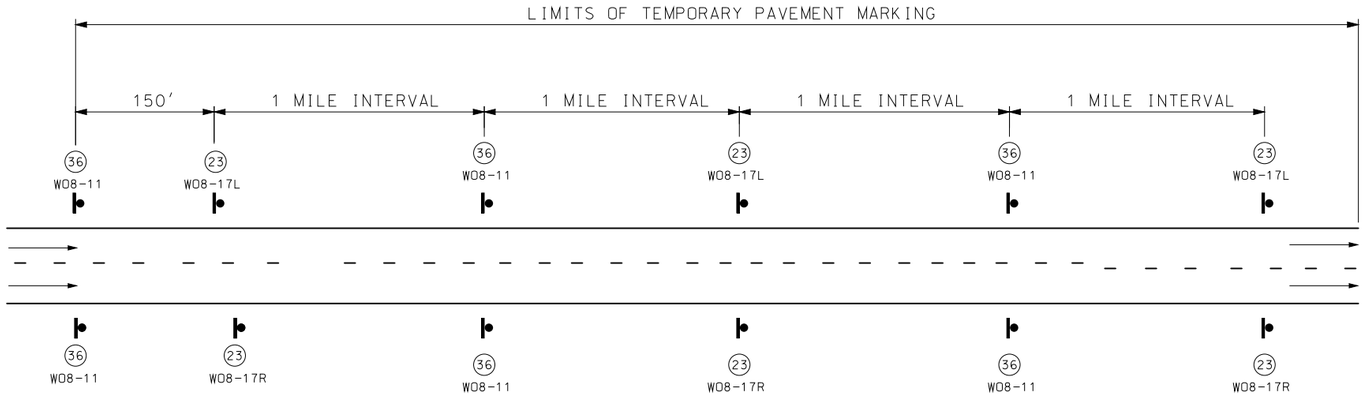
TWO-LANE TWO-WAY HIGHWAY

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

620.10E

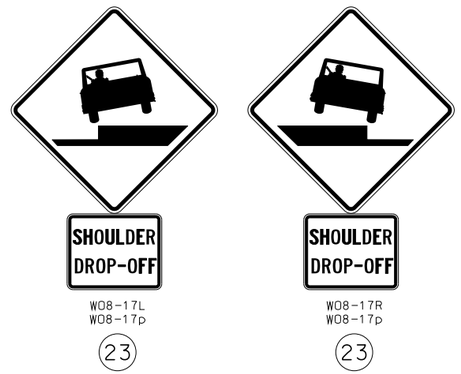
SHEET NO. 4 OF 5

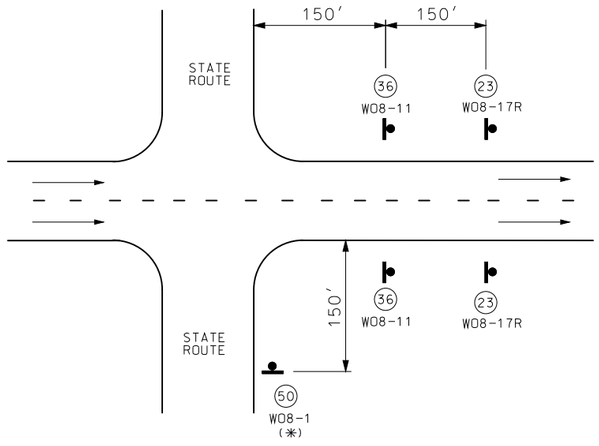
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## SIGN SPACING FOR DIVIDED OR MULTI-LANE HIGHWAY

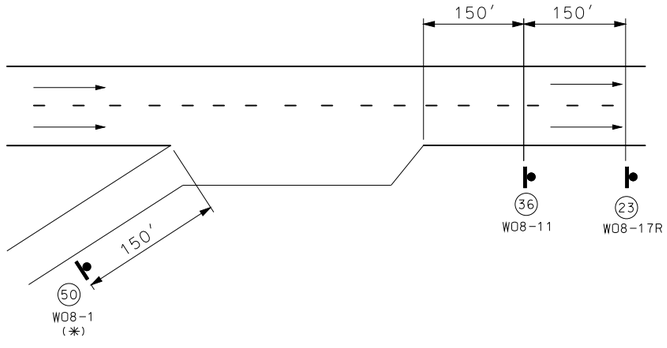
(DETAIL SHOWN IS BASED ON A PROJECT MEETING CONDITIONS OF UNEVEN LANES AND SHOULDER DROP-OFF.)
WHEN BOTH UNEVEN LANES AND SHOULDER DROP-OFF SIGNS ARE USED, BOTH SIGNS SHALL STAY IN PLACE UNTIL BOTH CONDITIONS NO LONGER EXISTS.
WHEN ONLY ONE CONDITION EXISTS (UNEVEN LANES OR SHOULDER DROP-OFF), SIGN SPACING SHALL BE AT 1 MILE INTERVALS




## SIGN SPACING AT STATE ROUTE INTERSECTIONS

(*) BUMP SIGN SHOULD BE IN ACCORDANCE WITH STANDARD PLAN 619.10.




## SIGN SPACING AT RAMPS

(*) BUMP SIGN SHOULD BE IN ACCORDANCE WITH STANDARD PLAN 619.10.

GENERAL NOTES:

FOR DETAILS OF TEMPORARY PAVEMENT MARKING, SEE SHEET 1 OF 5.

ALL SIGNS SHALL BE POST MOUNTED AND IN ACCORDANCE WITH STANDARD PLAN 616.10 AND 903.03.

WHEN SHOULDER DROP-OFF SIGNS ARE IN PLACE FOR GREATER THAN THREE DAYS, THE SHOULDER DROP-OFF PLAQUE SHOULD BE USED IN ADDITION WITH THE SHOULDER DROP-OFF SIGN.

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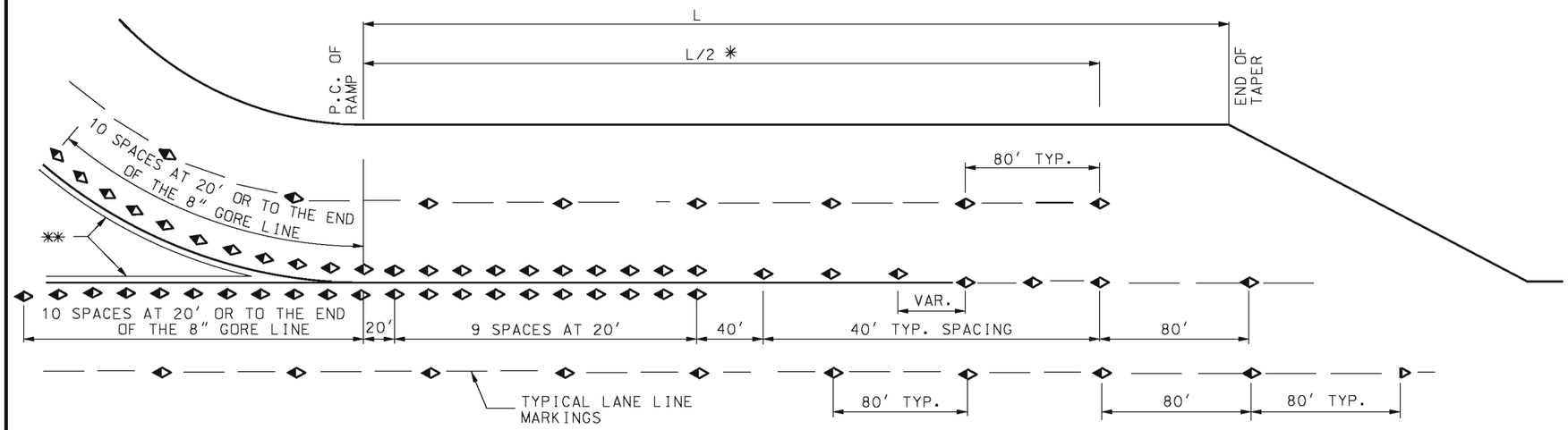
# TEMPORARY PAVEMENT MARKING
DIVIDED AND MULTI-LANE HIGHWAYS

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

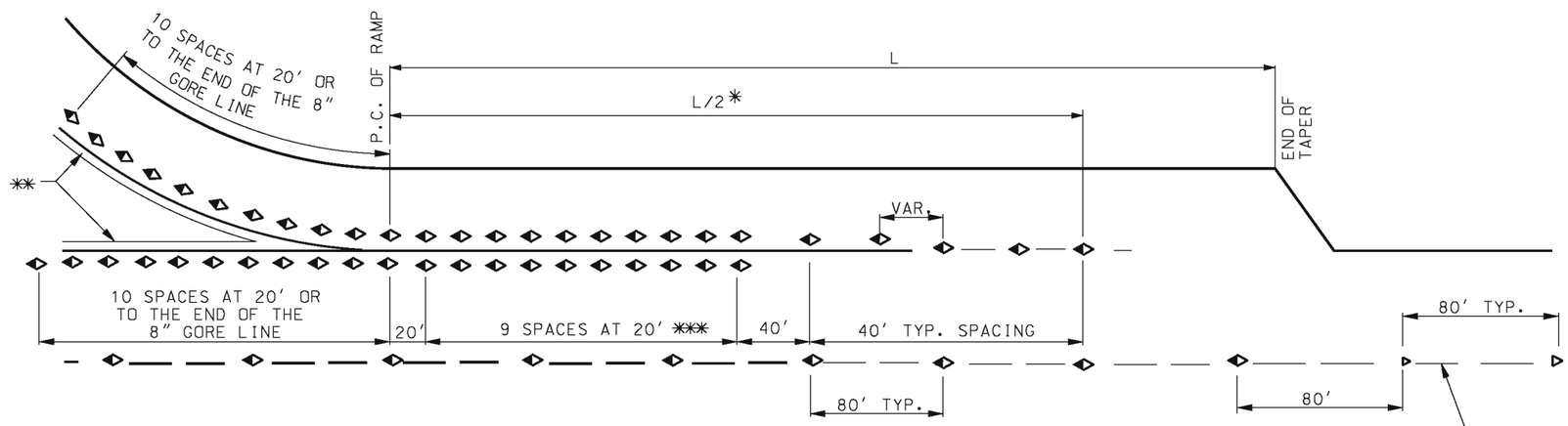
620.10E

SHEET NO. 5 OF 5

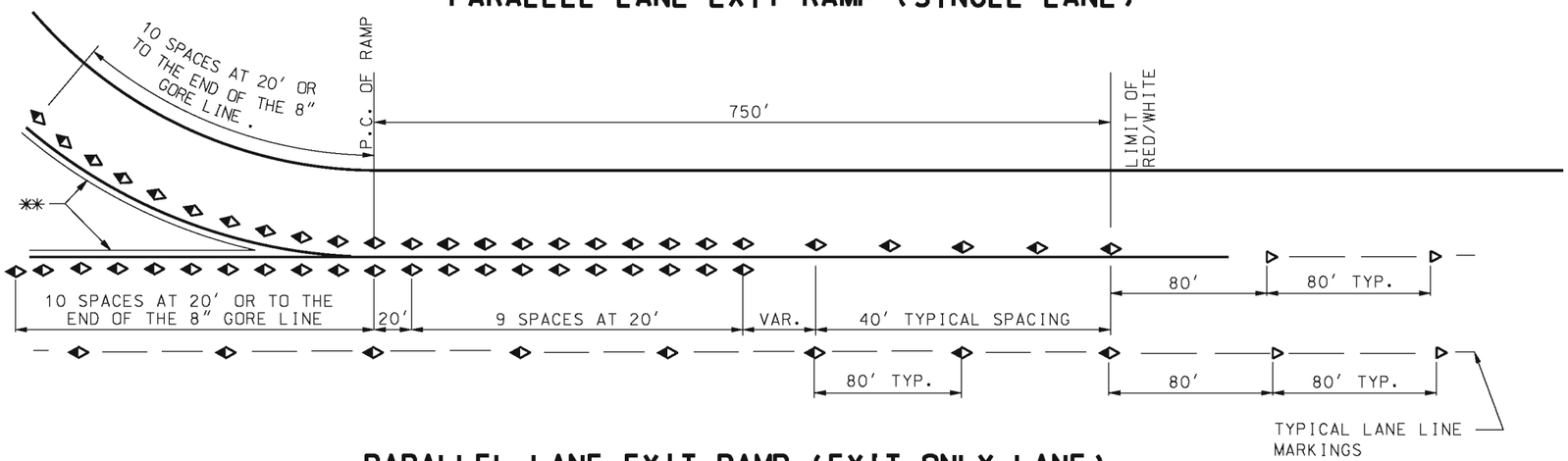
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## PARALLEL LANE EXIT RAMP (MULTI-LANE)




## PARALLEL LANE EXIT RAMP (SINGLE LANE)




## PARALLEL LANE EXIT RAMP (EXIT ONLY LANE)

◆ RED/WHITE SRPM
▷ WHITE SRPM
* LIMIT OF SRPM'S
** 8" GORE LINE
*** IF L/2 IS LESS THAN 200' THEN USE 20' SPACING TO END OF SOLID WHITE LINE.

SRPM SNOWPLOWABLE RAISED PAVEMENT MARKER

GENERAL NOTES:

ALL SRPM'S ON DIAMOND INTERCHANGES SHALL BE RED/WHITE SPACED FROM 750 FEET UPSTREAM OF THE P.C. OF THE EXIT RAMP TO THE P.C. OF THE ENTRANCE RAMP, EXCEPT AS OTHERWISE SHOWN.

FOR HALF DIAMOND INTERCHANGE ENTRANCE RAMPS, PLACE THE RED'WHITE SRPM'S ON ADJACENT LANES FROM THE GORE POINT TO 750 FEET UPSTREAM.

DIRECTIONAL INTERCHANGES DO NOT REQUIRE RED/WHITE SRPM'S, HOWEVER, THE ENGINEER MAY ELECT TO INSTALL RED/WHITE MARKERS INSTEAD OF ONE-WAY WHITE SRPM'S.

SRPM'S INSTALLED NEXT TO A SOLID LINE SHALL BE PLACED A MINIMUM OF 2" AND A MAXIMUM OF 4" OFF THE LINE.

SRPM'S INSTALLED FOR LANE LINE DELINEATION SHALL BE INSTALLED IN LINE WITH THE PAVEMENT MARKINGS AND PLACED IN THE CENTER OF THE GAP. LONGITUDINAL AND TRANSVERSE DEVIATIONS SHALL BE KEPT TO A MINIMUM. THE SRPM'S SHALL BE INSTALLED SO THAT THEY ARE ALIGNED TRANSVERSELY.

SRPM'S INSTALLED FOR LANE LINE MARKINGS ON MULTILANE EXIT RAMPS ARE TO BE TERMINATED APPROXIMATELY ADJACENT TO THE LAST MARKER INSTALLED IN THE GORE. INTERSTATE-INTERSTATE INTERCHANGES AND COLLECTOR DISTRIBUTORS ARE THE ONLY EXCEPTIONS. FOR INSTALLATION DIAGRAM SEE COLLECTOR DISTRIBUTOR EXIT RAMP ON SHEET 2 OF 4.

SRPM'S SHALL BE PLACED IN THE FIRST GAP AFTER TRANSITIONING FROM A SOLID TO AN INTERMITTENT LANE LINE.

ENTRANCE AND EXIT RAMP SRPM'S SHALL BE ALIGNED TRANSVERSELY WITH LANE LINE SRPM'S WHEN MARKING THE TRANSITION TO THE 80 FOOT SPACING.

A LONGITUDINAL ADJUSTMENT TO THE LOCATION OF THE MARKER SHALL BE MADE IN ORDER TO AVOID DAMAGE TO DETERIORATED PAVEMENTS OR TRANSVERSE JOINTS

IN LOCATIONS WHERE CONCRETE AND BITUMINOUS SURFACES ABUT, THE SRPM SHALL BE INSTALLED IN THE CONCRETE SURFACE.

MARKERS SHALL BE OFFSET A MINIMUM OF 2" FROM LONGITUDINAL JOINT AND MINIMUM OF 6" FROM TRANSVERSE JOINT.

DRAWINGS ARE NOT TO SCALE.

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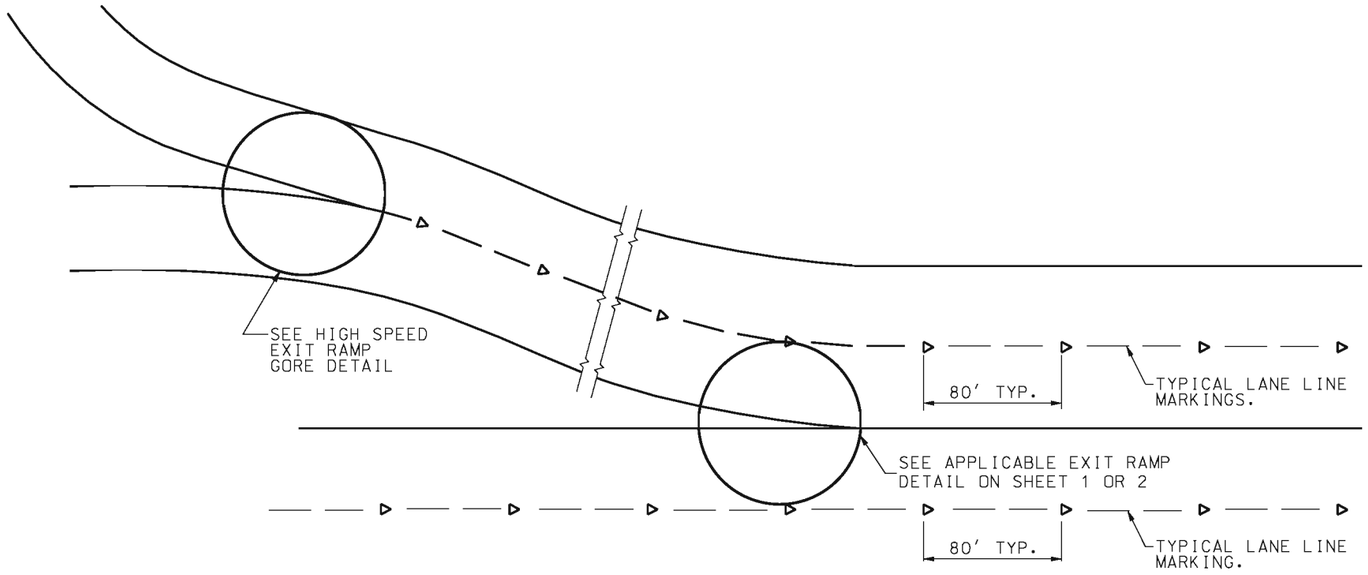
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# SNOWPLOWABLE RAISED PAVEMENT MARKERS
## EXIT AND ENTRANCE RAMPS

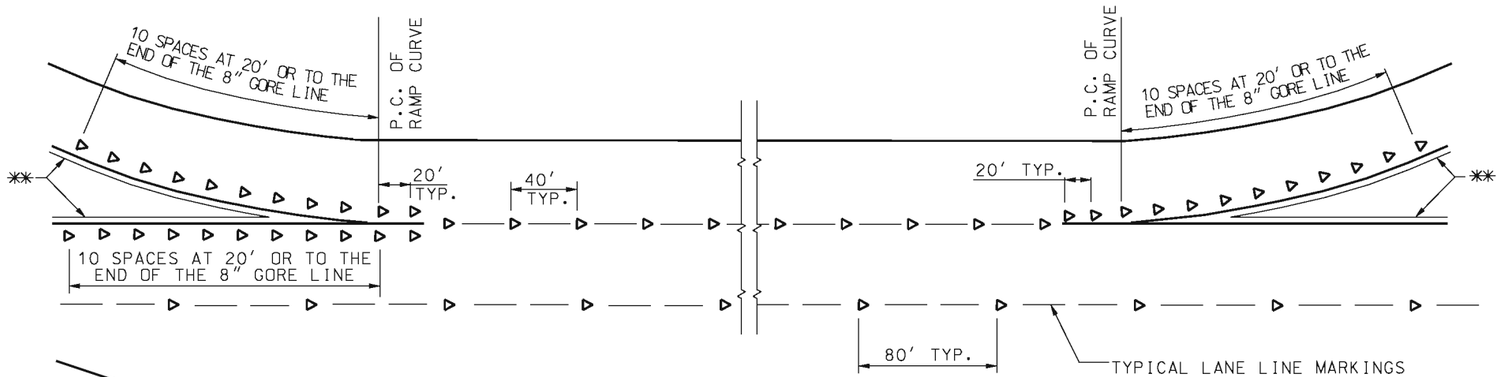
DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/21/2009

620.20

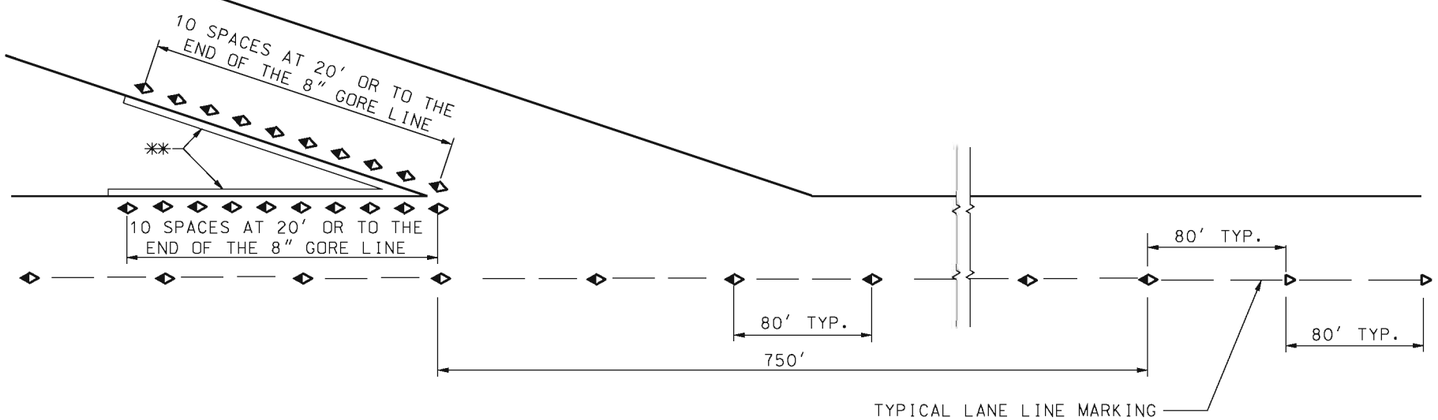
SHEET NO. 1 OF 4




## COLLECTOR DISTRIBUTOR EXIT RAMP




## CLOVER LEAF



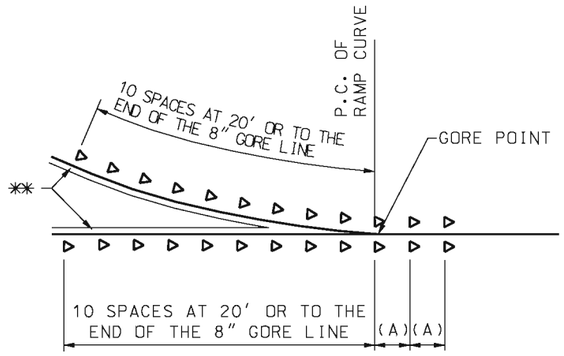

## TAPERED LANE EXIT RAMP

RED/WHITE SRPM

WHITE SRPM

8" GORE LINE

SRPM SNOWPLOWABLE RAISED PAVEMENT MARKER




## HIGH SPEED EXIT RAMP GORE DETAIL

(A) 20' (TYP.) SPACING FOR THE FIRST 200' FROM THE GORE POINT THEN 40' SPACING TO THE END OF THE SOLID WHITE LINE.

NOTES:

FOR HIGH SPEED MULTI-LANE EXIT RAMPS, CONTINUE LANE LINE SRPM'S THROUGH THE LENGTH OF THE MULTI-LANE SECTION.

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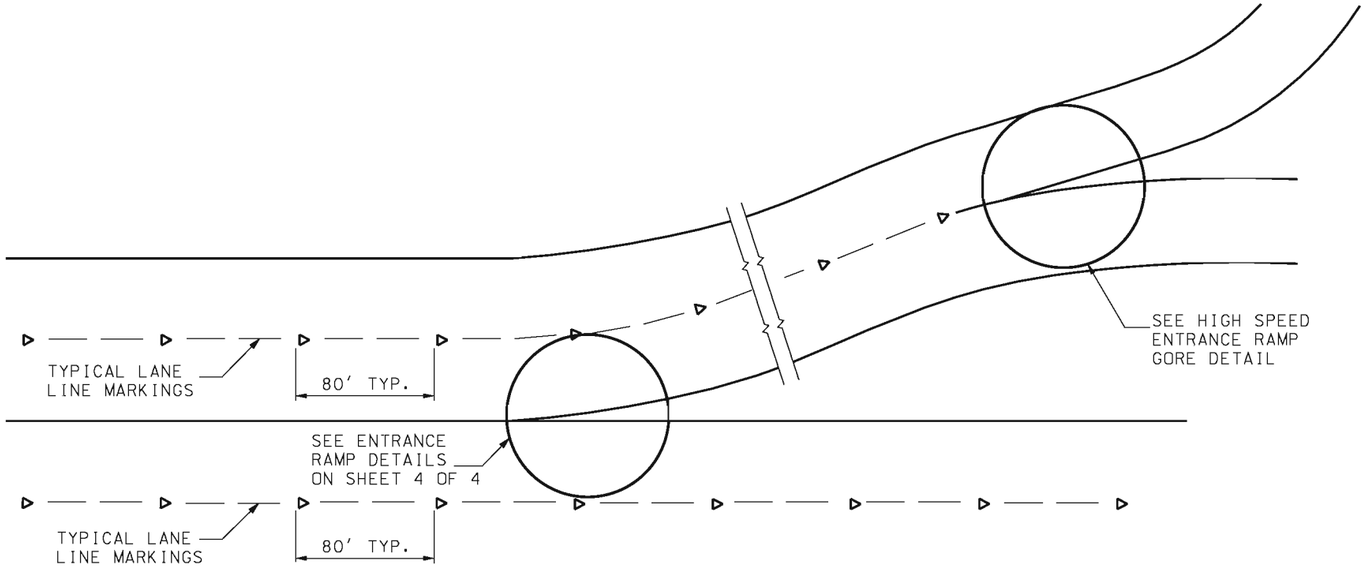
# SNOWPLOWABLE RAISED PAVEMENT MARKERS
EXIT AND ENTRANCE RAMPS

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/21/2009

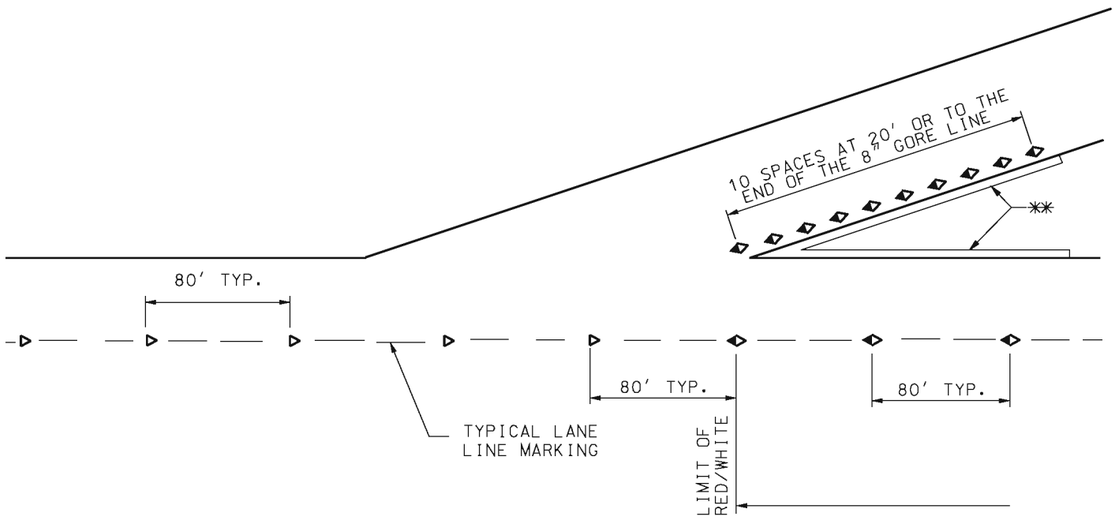
620.20



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## COLLECTOR DISTRIBUTOR ENTRANCE RAMP



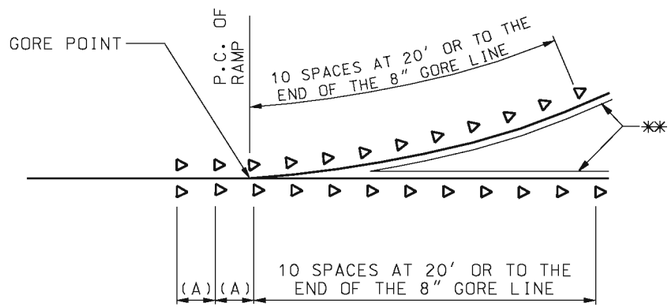

## TAPERED LANE ENTRANCE RAMP

RED/WHITE SRPM

WHITE SRPM

8" GORE LINE

SRPM SNOWPLOWABLE RAISED PAVEMENT MARKER




## HIGH SPEED ENTRANCE RAMP GORE DETAIL

(A) 20' (TYP.) SPACING FOR THE FIRST 200' FROM THE GORE POINT THEN 40' SPACING TO THE END OF THE SOLID WHITE LINE.

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# SNOWPLOWABLE RAISED PAVEMENT MARKERS
EXIT AND ENTRANCE RAMPS

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/21/2009

620.20

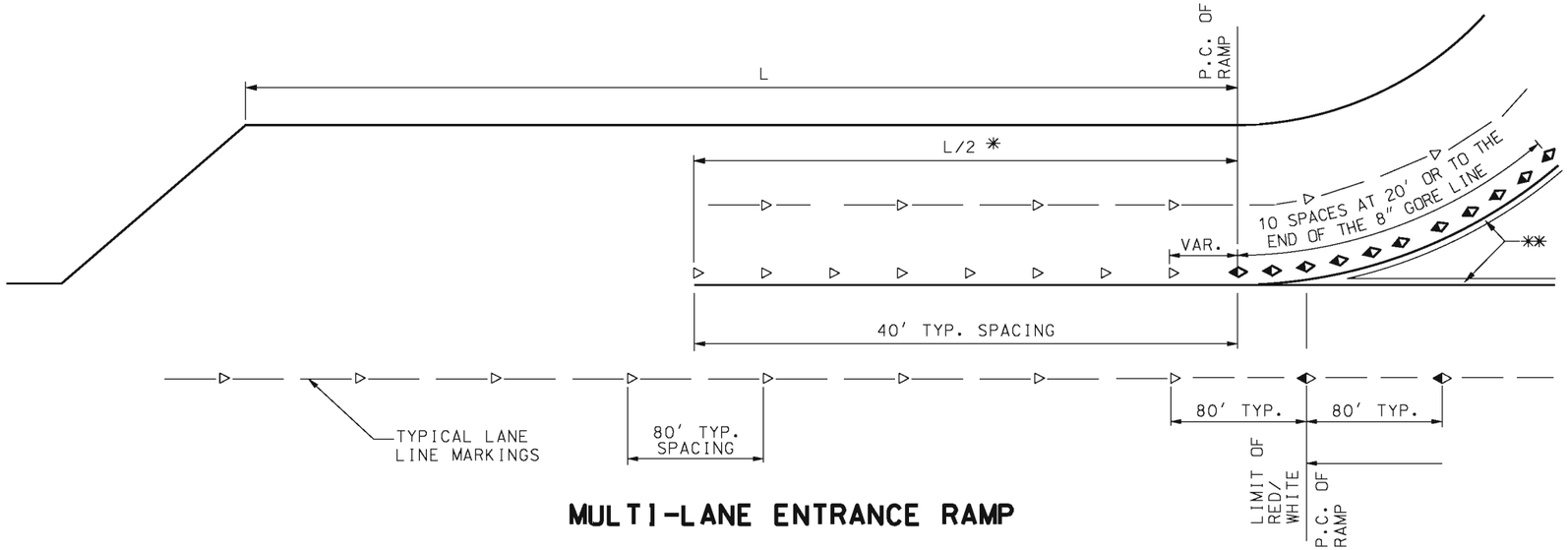
◆▷ RED/WHITE SRPM

▷ WHITE SRPM

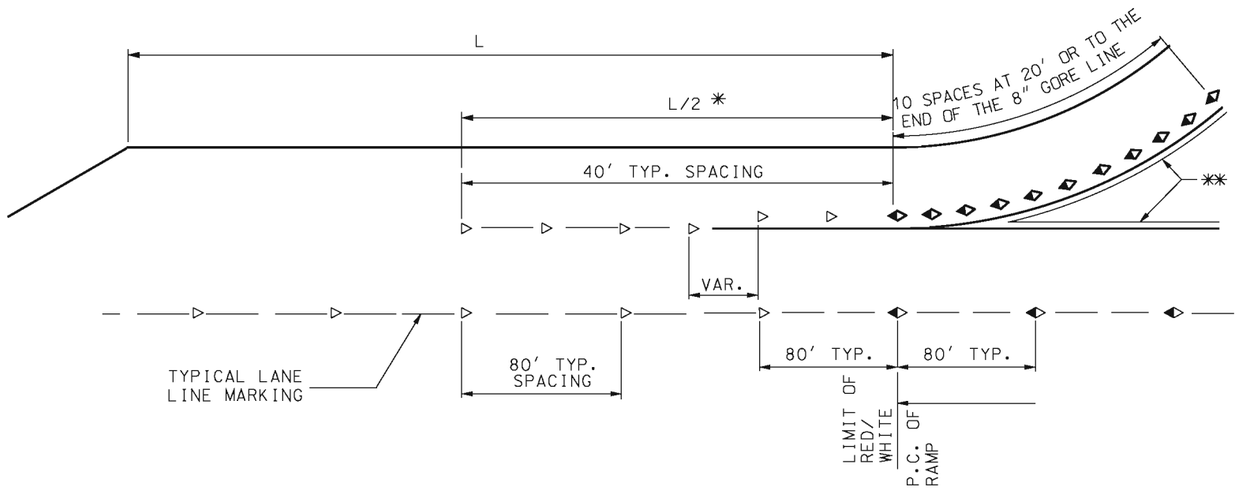
✳ LIMIT OF RED/WHITE SRPM'S

✳✳ 8" GORE LINE

SRPM SNOWPLOWABLE RAISED PAVEMENT MARKER




## MULTI-LANE ENTRANCE RAMP




## SINGLE LANE ENTRANCE RAMP

GENERAL NOTES:

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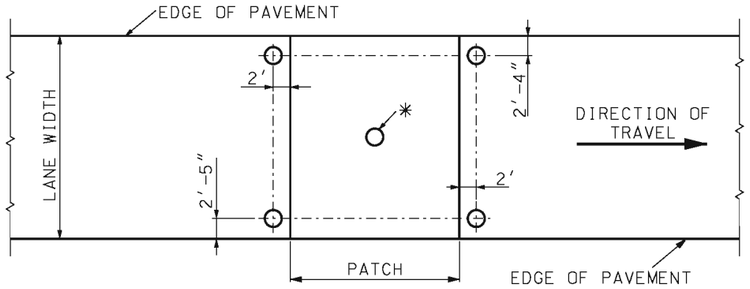

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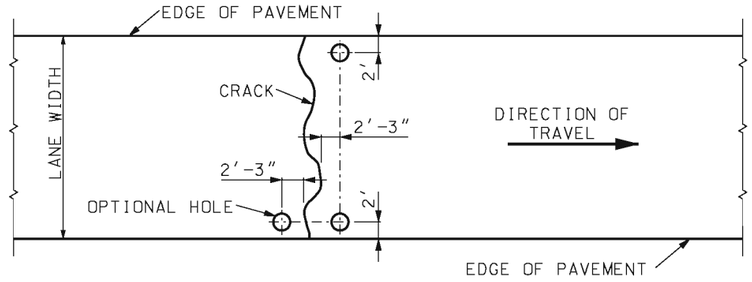
# SNOWPLOWABLE RAISED PAVEMENT MARKERS
EXIT AND ENTRANCE RAMPS

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/21/2009

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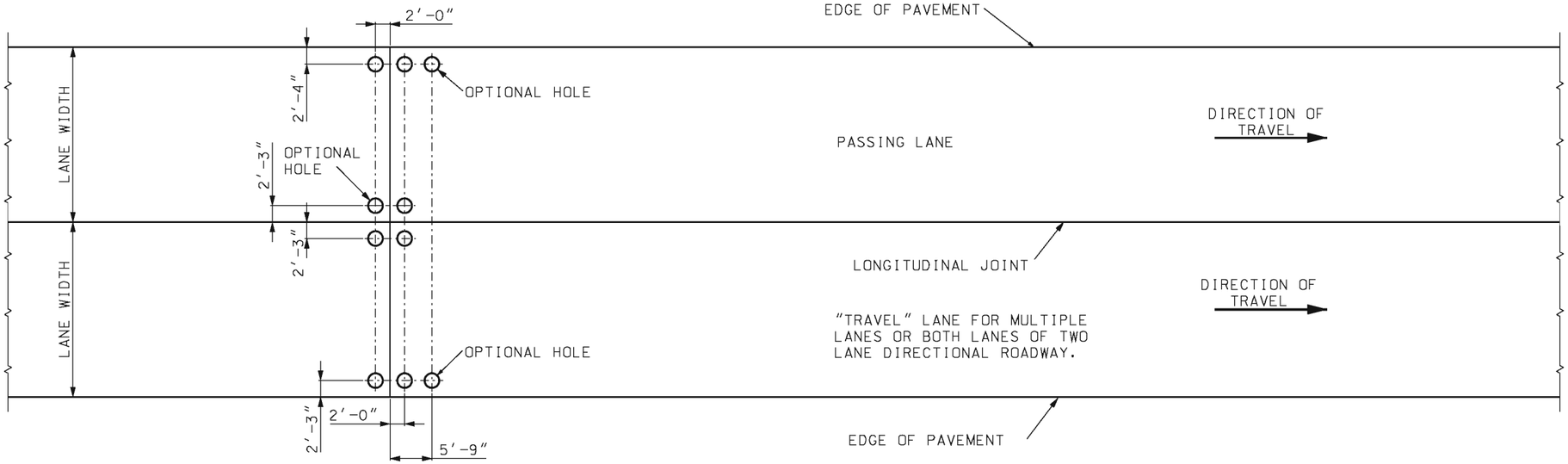



**PATCH**




**CRACK**

✳ 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.




**JOINT**

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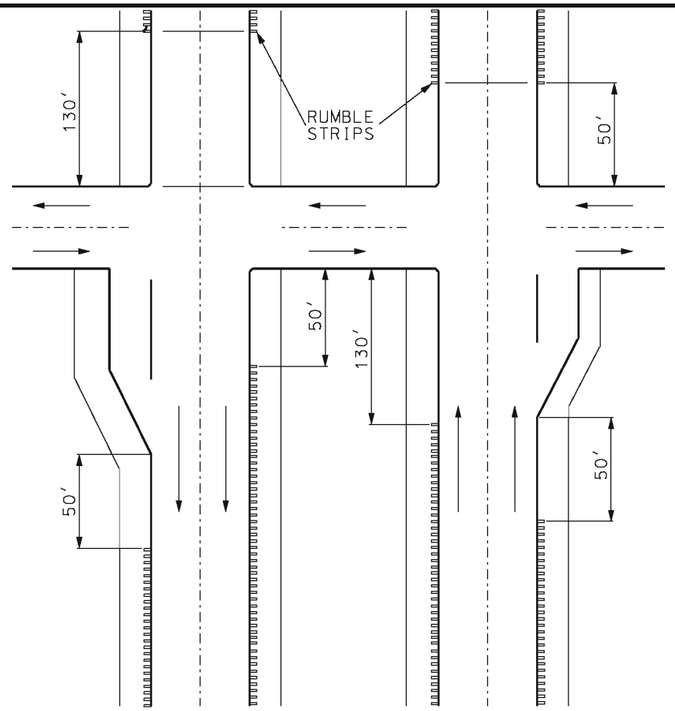
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KATHRYN PHILLIPS HARVEY
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# HOLE PATTERN FOR PAVEMENT SLAB STABILIZATION

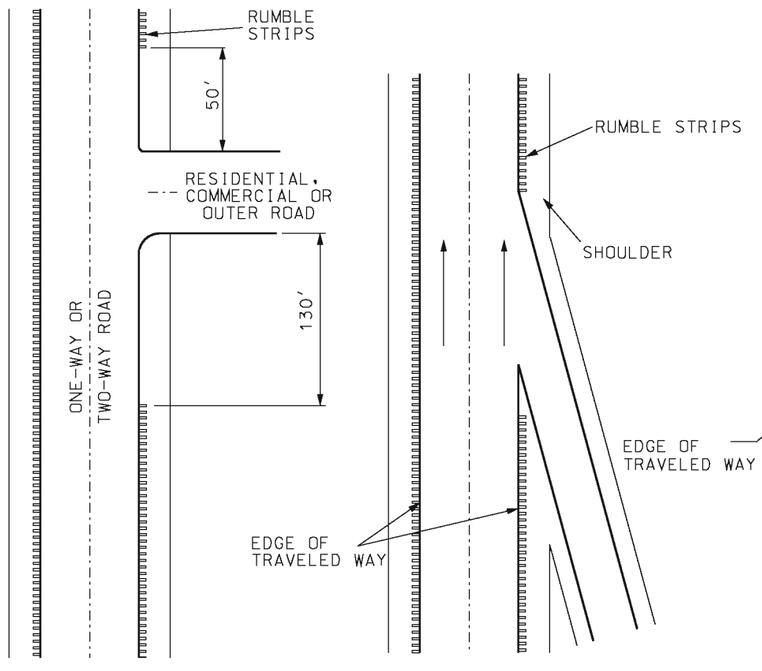
DATE EFFECTIVE: 10/01/1998
DATE PREPARED: 8/21/2009

625.00

SHEET NO. 1 OF 1



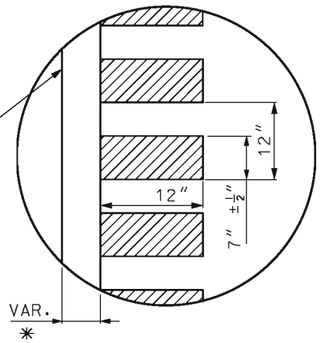

EXPRESSWAY DIVIDED



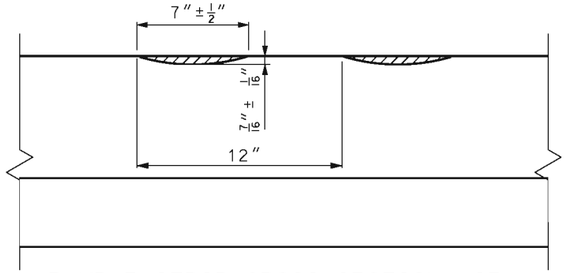

INTERSECTIONS

ACCELERATION LANE SHOWN

ACCELERATION OR DECELERATION LANE

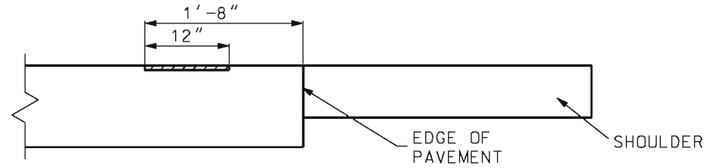
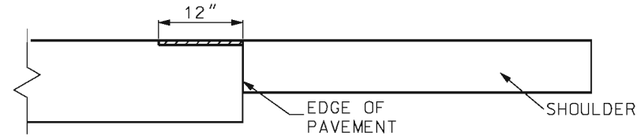
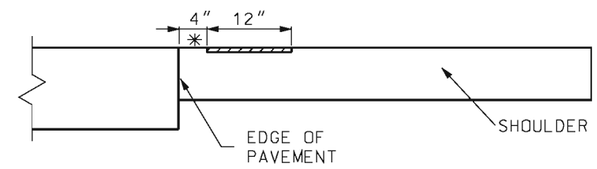
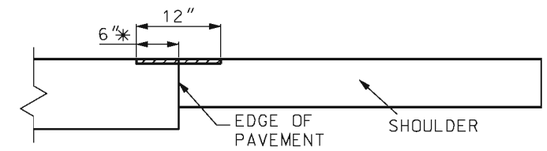
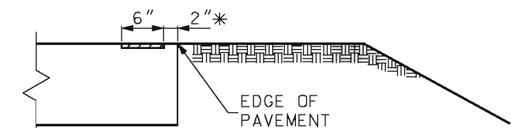



RUMBLE STRIP PLAN VIEW




RUMBLE STRIP CROSS SECTION VIEW

## RUMBLE STRIP LAYOUTS

| | |
|---|---|
| 14′ PAVEMENT STRUCTURES, ALL SHOULDER TYPES |   |
| 13′ PAVEMENT STRUCTURES, ALL SHOULDER TYPES |   |
| PAVEMENT STRUCTURES ≤ 12′ WITH A2 SHOULDER |   |
| PAVEMENT STRUCTURES ≤ 12′ WITH A3 SHOULDER |   |
| PAVEMENT STRUCTURES ≤ 12′ WITH EARTH OR AGGREGATE SHOULDERS |   |

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

GENERAL NOTES:

SEE STAMDARD PLAN 620.00 FOR PAVEMENT MARKING.

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

ALL RUMBLE STRIPS SHALL BE MILLED.

RUMBLE STRIPS SHALL NOT BE MILLED ONTO TRANSVERSE JOINTS.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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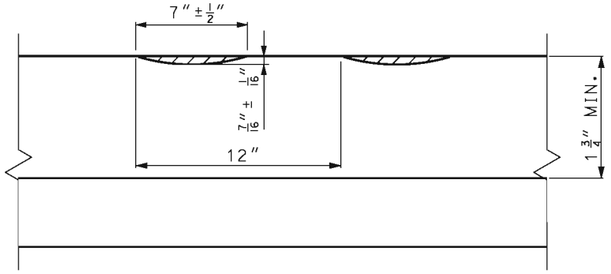
# RUMBLE STRIPS

SHOULDER

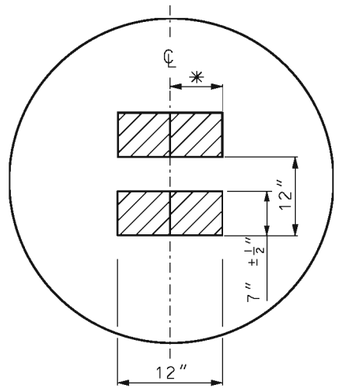
DATE EFFECTIVE: 04/01/2009
DATE PREPARED: 2/20/2009

626.00H

SHEET NO. 1 OF 2

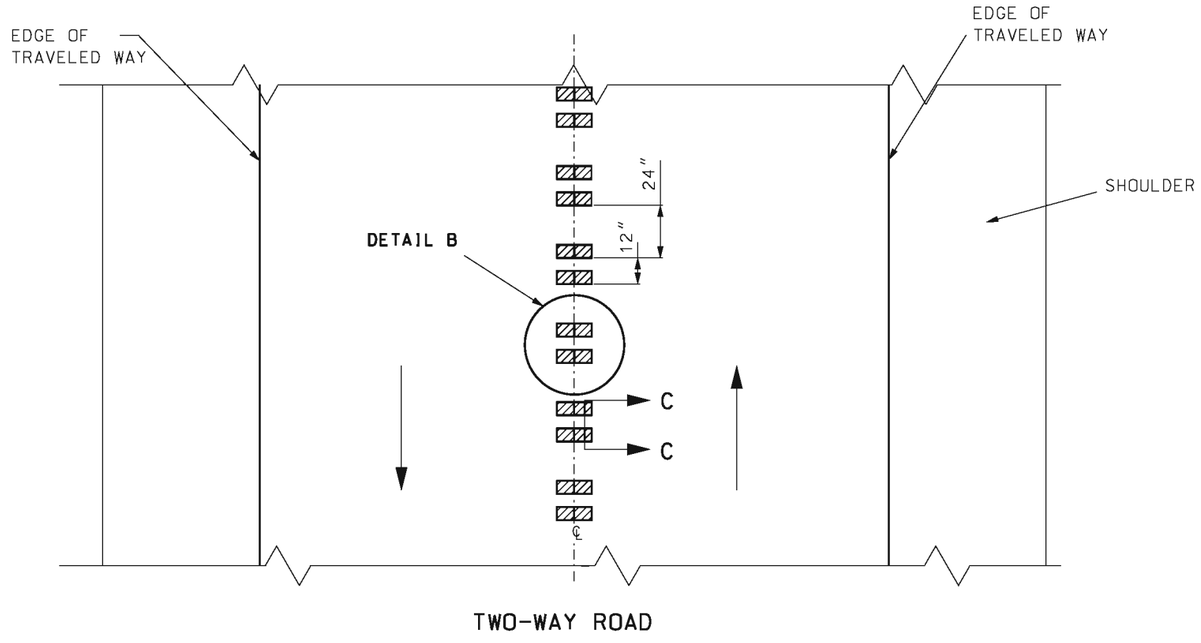



SECTION C-C




DETAIL B

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




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.

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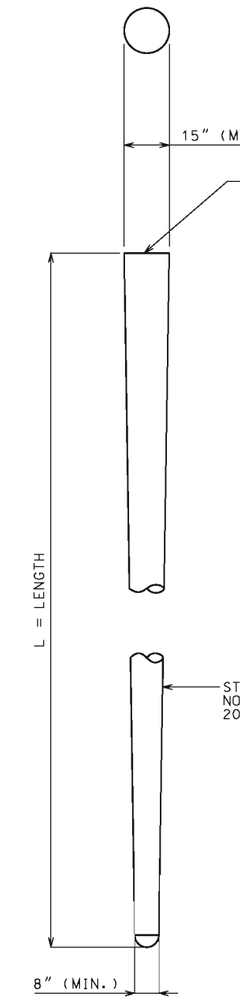
# RUMBLE STRIPS
## CENTERLINE

DATE EFFECTIVE: 04/01/2009
DATE PREPARED: 2/20/2009

626.00H

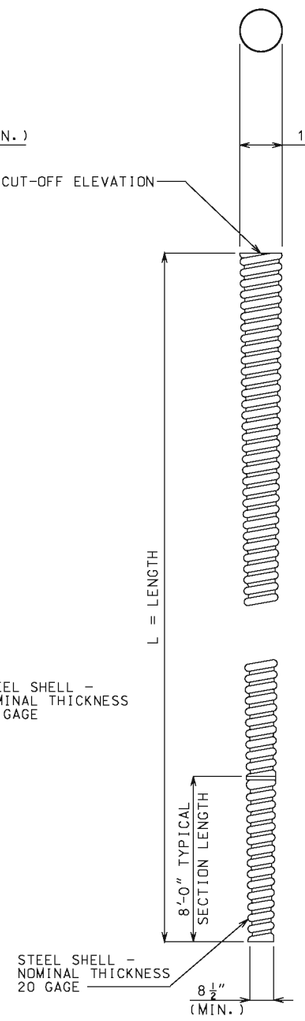
SHEET NO. 2 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



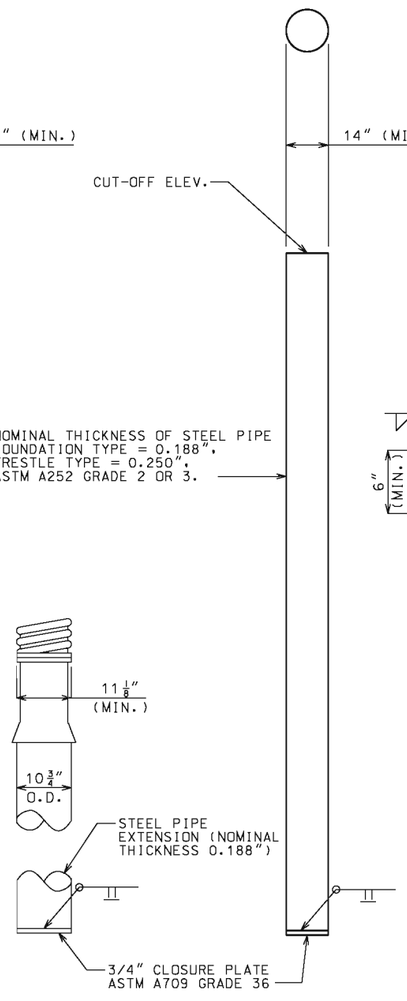

THIN UNIFORM TAPERED
CAST-IN-PLACE PILE

(FOUNDATIONS ONLY)



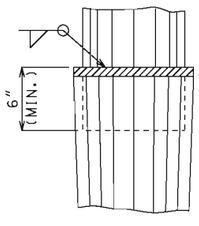

THIN STEP-TAPERED
OR UNIFORM DIAMETER
CAST-IN-PLACE

(FOUNDATIONS ONLY)

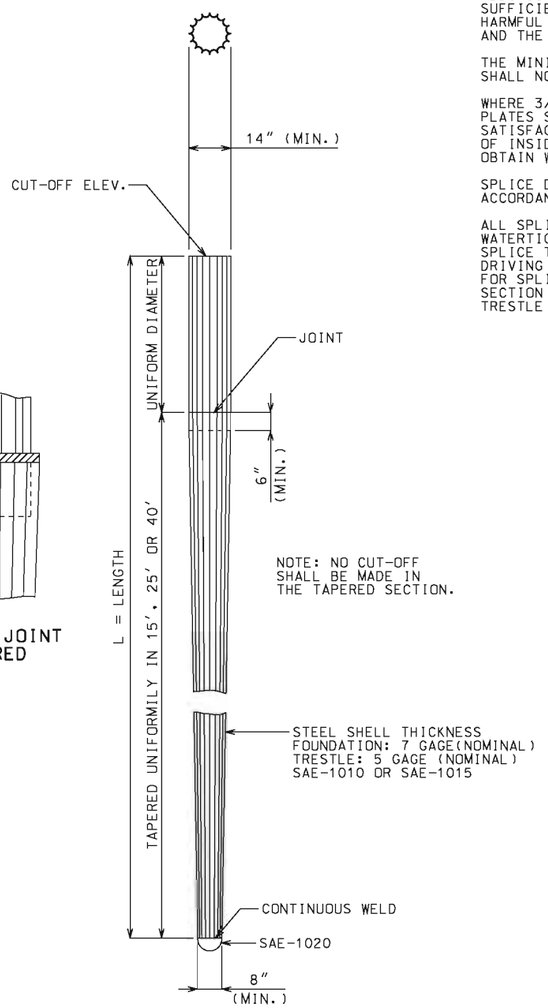



WELDED OR SEAMLESS STEEL PIPE
CAST-IN-PLACE

(FOUNDATIONS OR
TRESTLES AS SPECIFIED)




TYPE OF JOINT
REQUIRED




FLUTED TYPES
CAST-IN-PLACE PILE

(FOUNDATIONS OR
TRESTLES AS SPECIFIED)

## THIN SHELLED TYPES
(DRIVEN WITH CORES OR MANDRELS)

## THICK SHELLED TYPES
(DRIVEN WITHOUT CORES OR MANDRELS)

### GENERAL NOTES:

ALL CONCRETE FOR CAST-IN-PLACE PILES SHALL BE CLASS B-1.

ADDITIONAL THICKNESS MAY BE REQUIRED FOR THIN SHELLED TYPES TO PROVIDE SUFFICIENT STRENGTH TO WITHSTAND DRIVING WITHOUT INJURY AND TO RESIST HARMFUL DISTORTION OR BUCKLING DUE TO SOIL PRESSURE AFTER BEING DRIVEN AND THE MANDEL REMOVED.

THE MINIMUM WALL THICKNESS OF ANY SPOT OR LOCAL AREA OF ANY TYPE SHALL NOT BE MORE THAN 12.5% UNDER THE SPECIFIED NOMIMAL WALL THICKNESS.

WHERE 3/4" CLOSURE PLATES ARE REQUIRED FOR TIPS OF PIPE PILES. THE CLOSURE PLATES SHALLNOT PROJECT BEYOND THE OUTSIDE DIAMETER OF THE PIPE PILES. SATISFACTORY WELDMENTS MAY BE MADE BY BEVELING TIP ENDS OF PIPE OR BY USE OF INSIDE BACKING RINGS. IN EITHER CASE, PROPER GAPS SHALL BE USED TO OBTAIN WELD PENETRATION FULL THICKNESS OF PIPE.

SPLICE DETAILS FOR CAST-IN-PLACE CONCRETE PILES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

ALL SPLICES OF SHELLS FOR CAST-IN-PLACE CONCRETE PILES SHALL BE MADE WATERTIGHT AND TO THE FULL STRENGTH OF THE SHELL ABOVE AND BELOW THE SPLICE TO PERMIT HARD DRIVING WITHOUT DAMAGE. ALL SHELLS DAMAGED DURING DRIVING SHALL BE REPLACED WITHOUT COST TO THE STATE. SHELL SECTIONS USED FOR SPLICING SHALL BE AT LEAST 5'-0" IN LENGTH. THE SPLICE AT THE TAPERED SECTION SHALL BE AT LEAST 3'-0" BELOW THE STREAMBED FOR INTERMEDIATE TRESTLE TYPE BENTS.

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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CAST-IN-PLACE CONCRETE PILES
(APPROVED TYPES)

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 9/3/2009

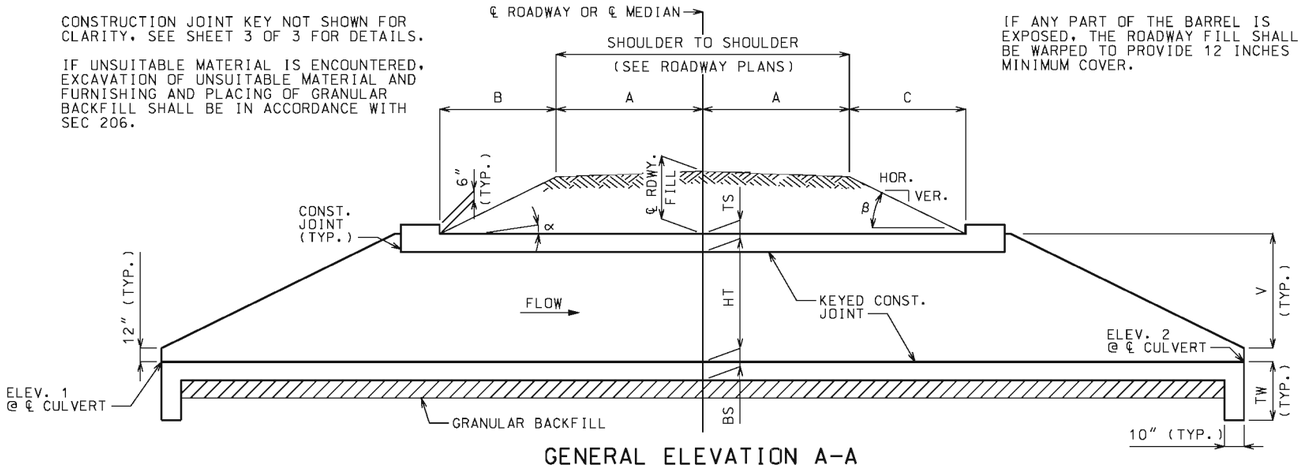
702.02F

SHEET NO.
1 OF 1

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.

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




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 ∝, β, B AND C

∝ = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\text{ARCTAN}\left(\frac{\text{ELEV. 1} - \text{ELEV. 2}}{W}\right)$

β = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\text{ARCTAN}\left(\frac{\text{VER.}}{\text{HOR.}}\right)$

B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO UPSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) - A(\text{TAN}\alpha)}{\text{TAN}\beta + \text{TAN}\alpha}$

C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO DOWNSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) + A(\text{TAN}\alpha)}{\text{TAN}\beta - \text{TAN}\alpha}$

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

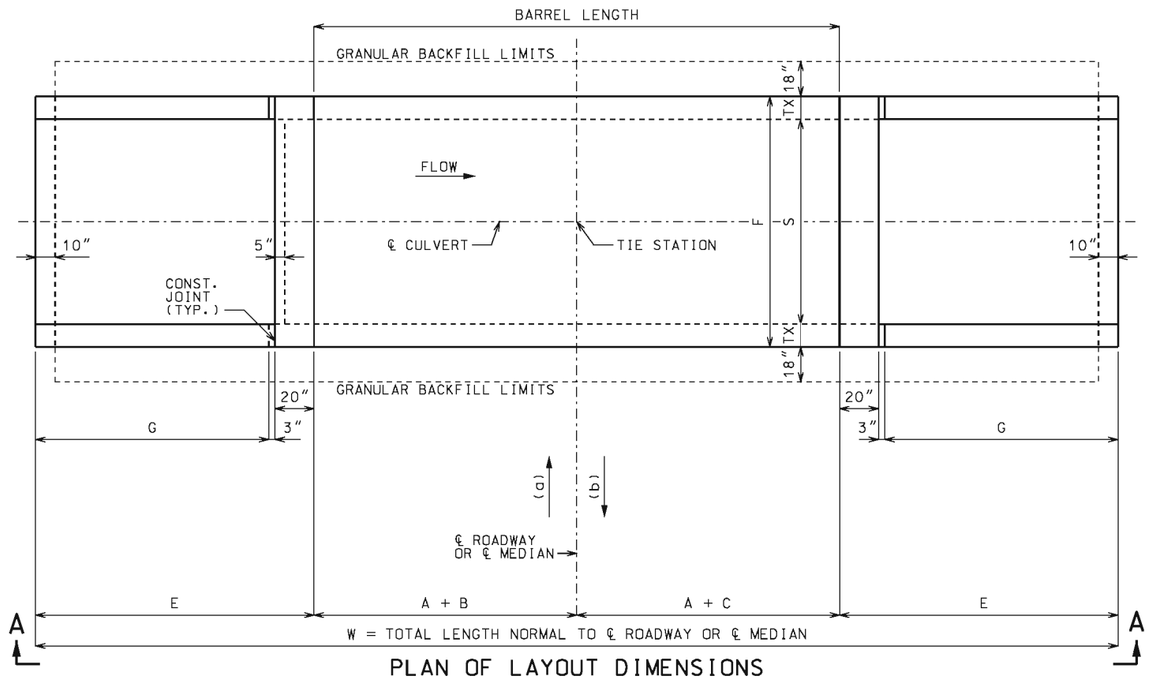
THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN ℄ ROADWAY OR ℄ MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO ℄ ROADWAY OR ℄ MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.

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

SEE ROADWAY PLANS FOR SLOPES, ℄ ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

## LAYOUT DIMENSIONS

| VARIABLE | DIMENSION |
|---|---|
| ∝ | SEE EQUATIONS |
| β | SEE EQUATIONS |
| B | SEE EQUATIONS |
| C | SEE EQUATIONS |
| E | G + 23" |
| F | S + 2TX |
| G | 2V |
| V | HT + TS - 12" |
| W | 2A + B + C + 2E |
| TW | MAX{3'-4" OR (BS + 12")} |




PLAN OF LAYOUT DIMENSIONS

(a) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (b) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

## GENERAL NOTES:

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3. 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 SECTIONS MEASURED ALONG THE SHORTEST WALL SHALL BE 3 FEET. REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

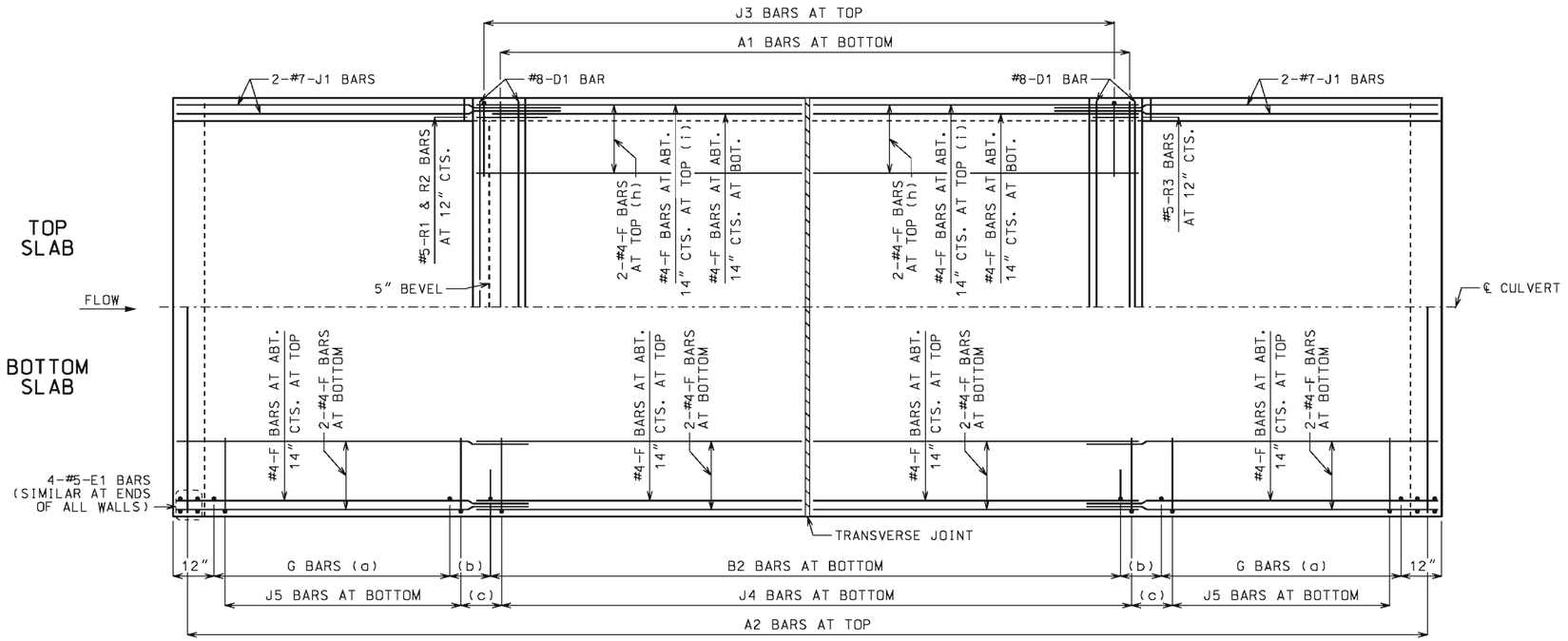
LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.10J

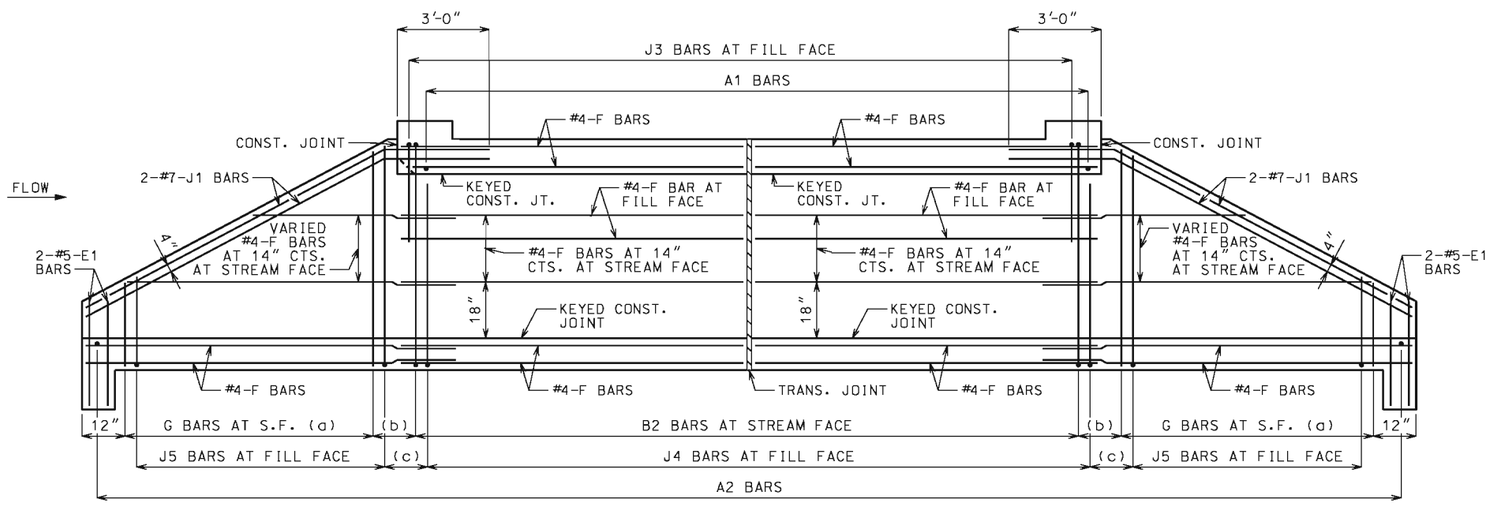
SHEET NO. 1 OF 3


IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## HALF PLANS

HALF PLANS ARE SYMMETRICAL ABOUT ℄ CULVERT.




## ELEVATION

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) 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

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# CONCRETE SINGLE BOX CULVERT

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WINGS: STRAIGHT

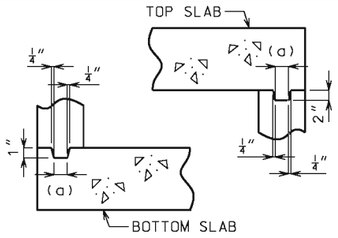
REINFORCEMENT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.10J

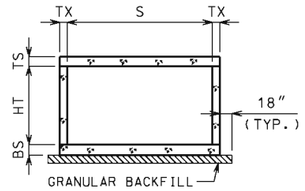
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

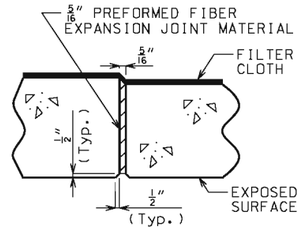



KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



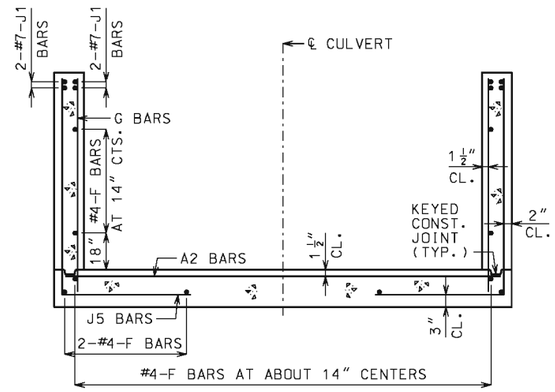

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



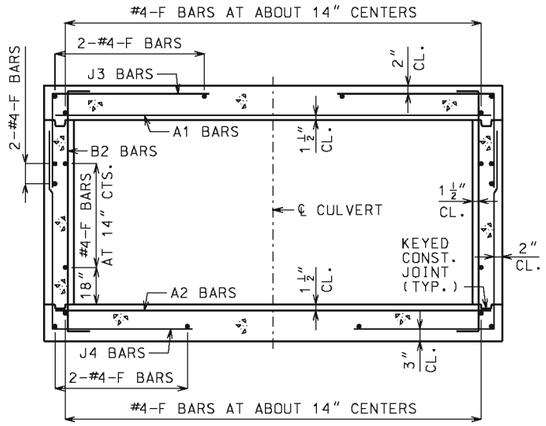

TRANSVERSE JOINT THRU BARREL

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

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

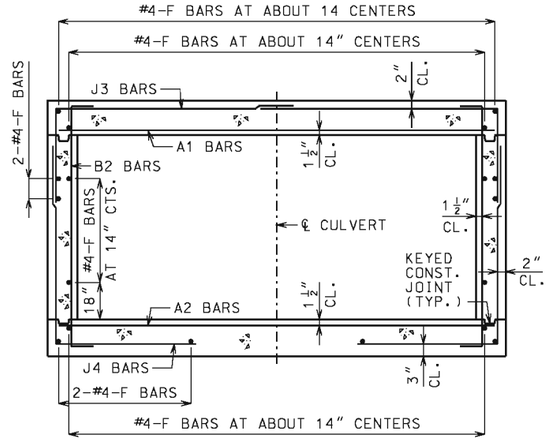



UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT



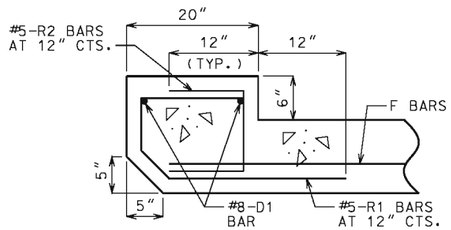

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"

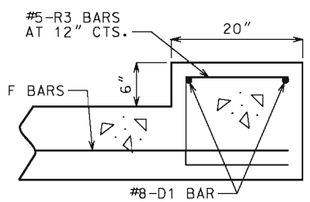



BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS




UPSTREAM HEADWALL REINFORCEMENT




DOWNSTREAM HEADWALL REINFORCEMENT

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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NUMBER PE-27141
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# CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

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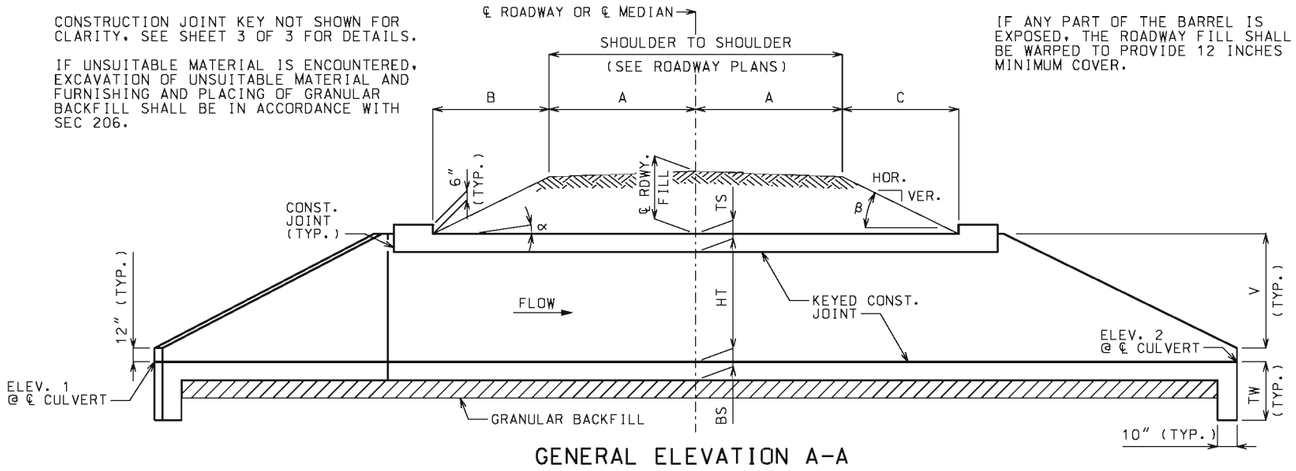
SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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.

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




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 ∝, β, B AND C

∝ = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\text{ARCTAN}\left(\frac{\text{ELEV. 1} - \text{ELEV. 2}}{W}\right)$

β = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\text{ARCTAN}\left(\frac{\text{VER.}}{\text{HOR.}}\right)$

B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO UPSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) - A(\tan\alpha)}{\tan\beta + \tan\alpha}$

C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO DOWNSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) + A(\tan\alpha)}{\tan\beta - \tan\alpha}$

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

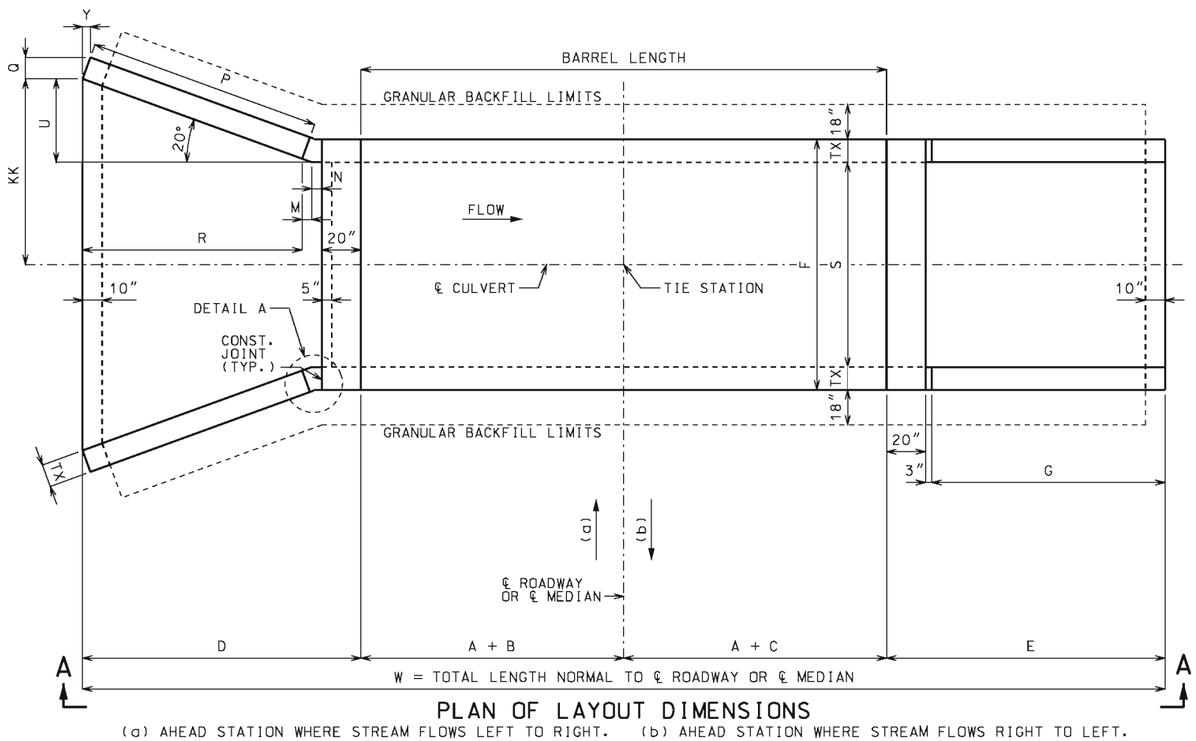
THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN ℄ ROADWAY OR ℄ MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO ℄ ROADWAY OR ℄ MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.

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

SEE ROADWAY PLANS FOR SLOPES, ℄ ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

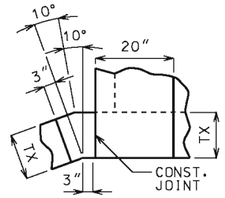
## LAYOUT DIMENSIONS

| VARIABLE | DIMENSION | VARIABLE | DIMENSION |
|---|---|---|---|
| ∝ | SEE EQUATIONS | P | 2V(SEC 20°) |
| β | SEE EQUATIONS | Q | TX(COS 20°) |
| B | SEE EQUATIONS | R | P(COS 20°) |
| C | SEE EQUATIONS | U | (R + M)(TAN 20°) |
| D | R + M + N + 20" | V | HT + TS - 12" |
| E | G + 23" | W | 2A + B + C + D + E |
| F | S + 2TX | Y | TX(SIN 20°) |
| G | 2V | KK | S/2 + U |
| M | N(COS 20°) | TW | MAX{3'-4" OR (BS + 12")} |
| N | 3" + TX(TAN 10°) | | |




PLAN OF LAYOUT DIMENSIONS

(a) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (b) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.




DETAIL A

## GENERAL NOTES:

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3. 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 SECTIONS MEASURED ALONG THE SHORTEST WALL SHALL BE 3 FEET. REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.


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# CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

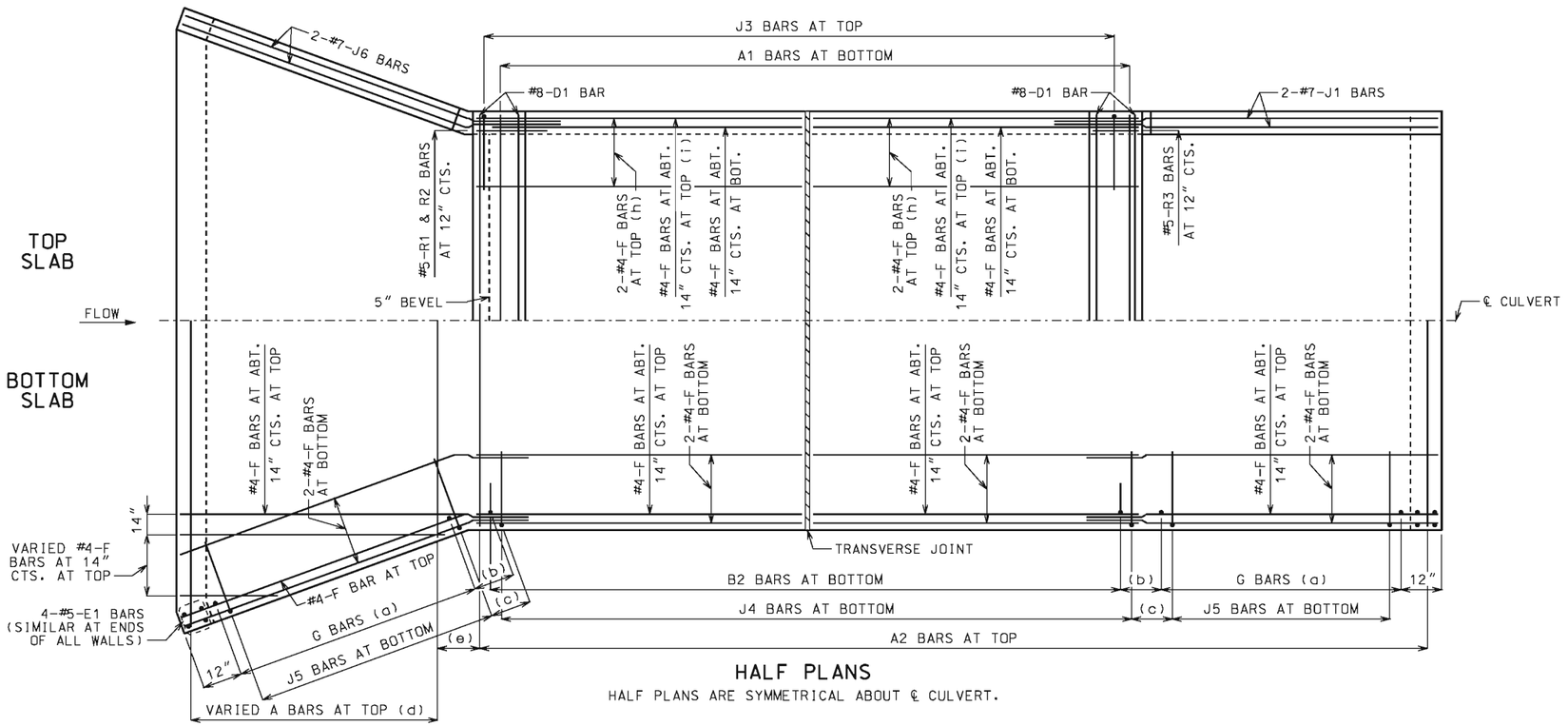
LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.11J

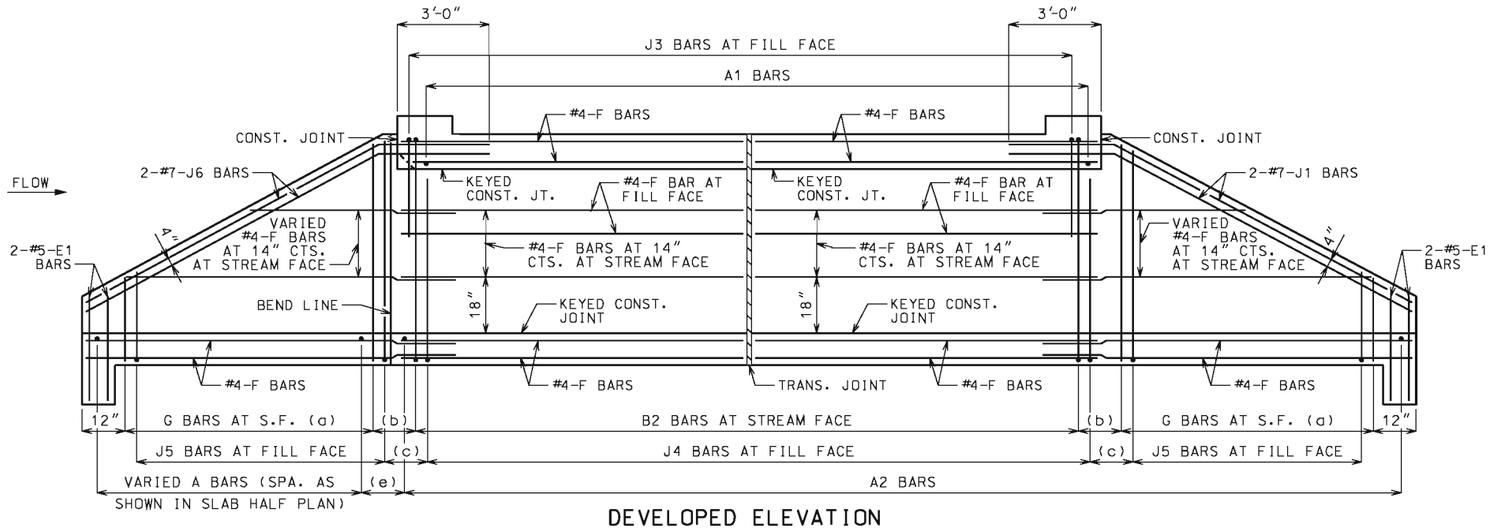
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## HALF PLANS

HALF PLANS ARE SYMMETRICAL ABOUT ℄ CULVERT.




## DEVELOPED ELEVATION

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS B2 BARS

(e) A2 BAR SPACING

(f) NOT SPECIFIED ON THIS SHEET

(g) NOT SPECIFIED ON THIS SHEET

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

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

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SKEW: SQUARED
WINGS: FLARED

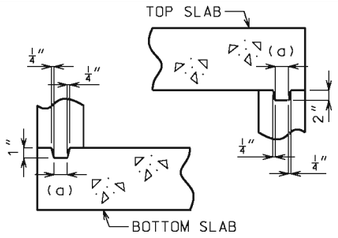
REINFORCEMENT

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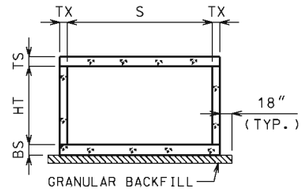
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

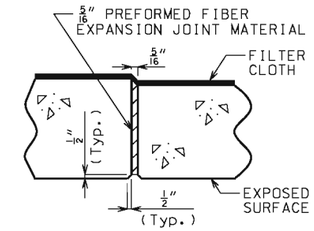



## KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



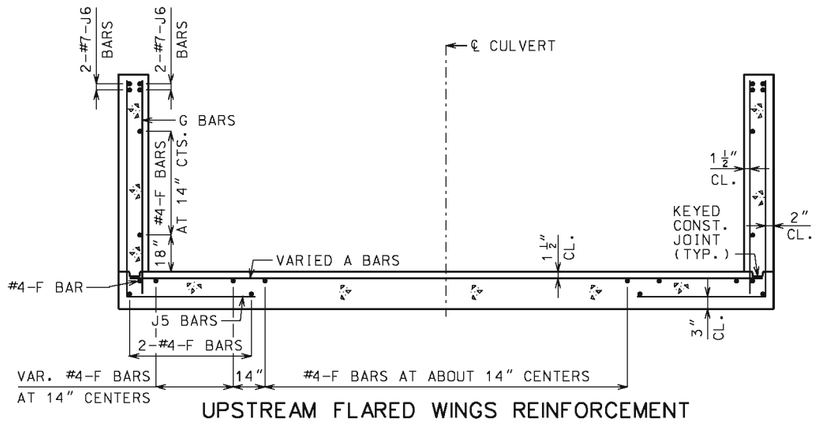

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



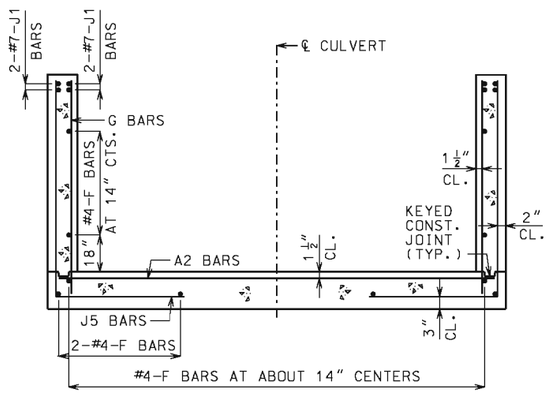

## TRANSVERSE JOINT THRU BARREL

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

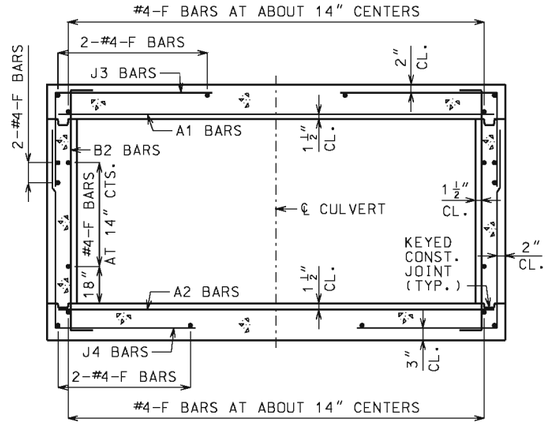
FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.




## UPSTREAM FLARED WINGS REINFORCEMENT

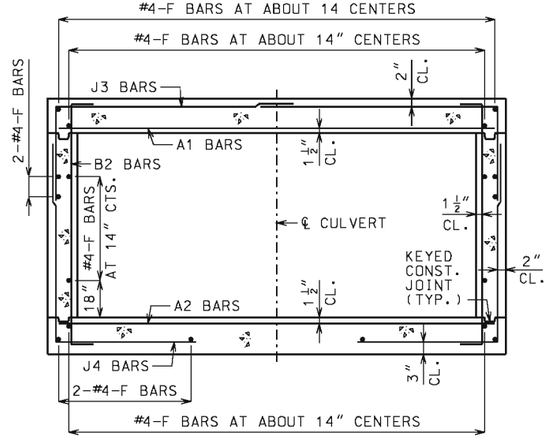



## DOWNSTREAM WINGS REINFORCEMENT



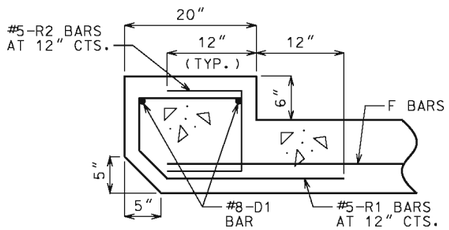

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"

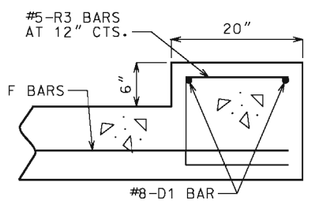



## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS




## UPSTREAM HEADWALL REINFORCEMENT




## DOWNSTREAM HEADWALL REINFORCEMENT

### GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

SECTIONS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.11J

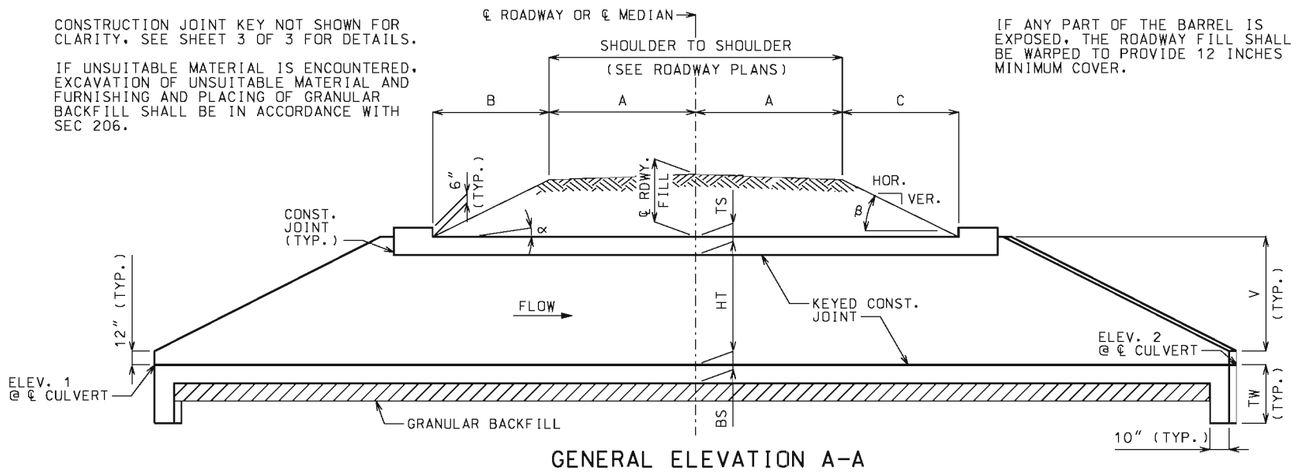
SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

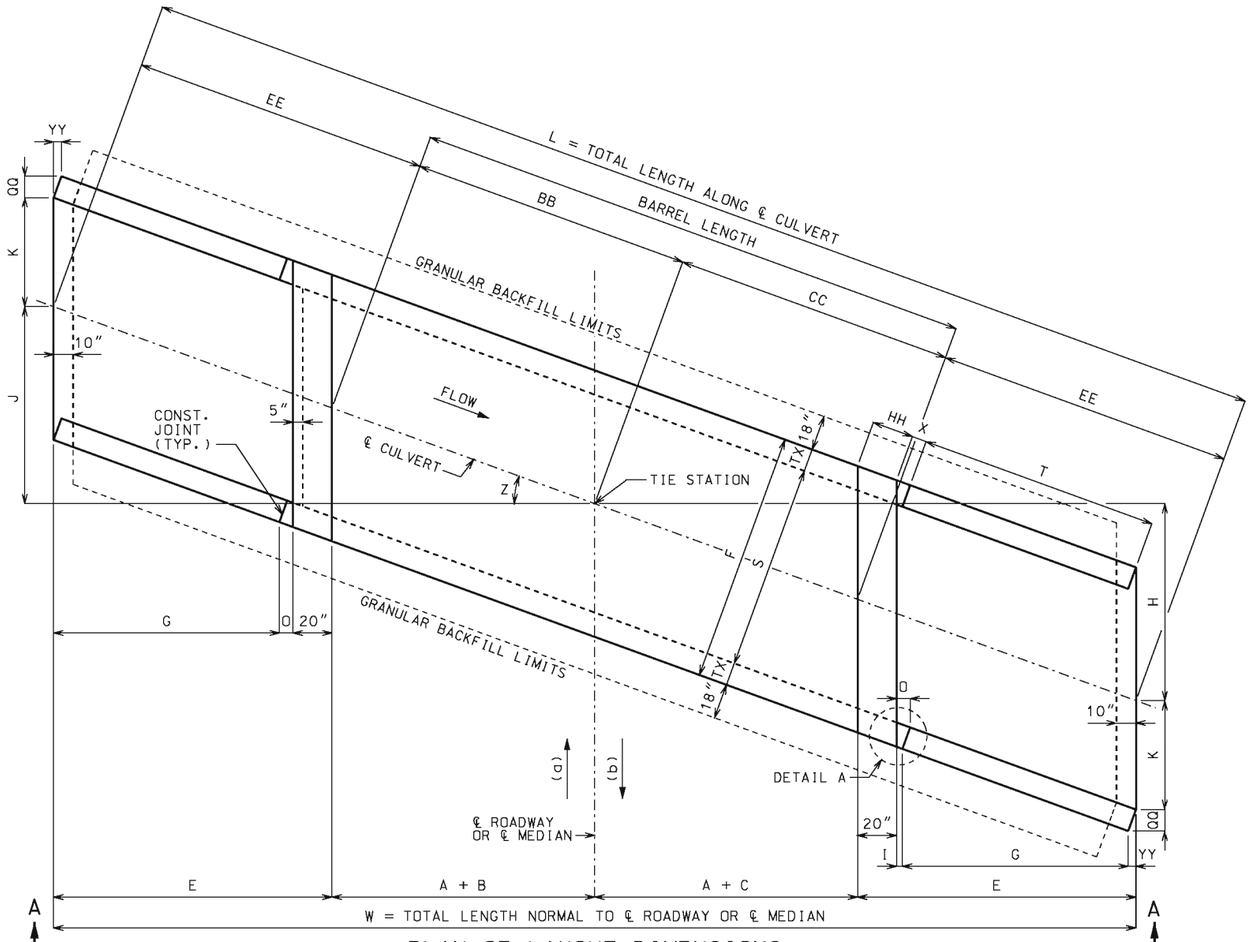
IF UNSUITABLE MATERIAL IS ENCOUNTERED, EXCAVATION OF UNSUITABLE MATERIAL AND FURNISHING AND PLACING OF GRANULAR BACKFILL SHALL BE IN ACCORDANCE WITH SEC 206.

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



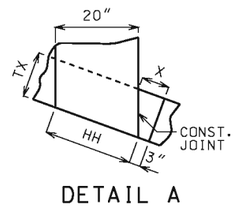

## GENERAL ELEVATION A-A

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




## PLAN OF LAYOUT DIMENSIONS

(a) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (b) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.




DETAIL A

## EQUATIONS FOR COMPUTING ∝, β, B AND C

∝ = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\arctan\left(\frac{\text{ELEV. 1} - \text{ELEV. 2}}{W}\right)$

β = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\arctan\left(\frac{\text{VER.}}{\text{HOR.}}\right)$

B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO UPSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) - A(\tan\alpha)}{\tan\beta + \tan\alpha}$

C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO DOWNSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) + A(\tan\alpha)}{\tan\beta - \tan\alpha}$

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

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

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

SEE ROADWAY PLANS FOR SLOPES, ℄ ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

## LAYOUT DIMENSIONS

| VARIABLE | DIMENSION | VARIABLE | DIMENSION |
|---|---|---|---|
| ∝ | SEE EQUATIONS | T | G(SEC Z) |
| β | SEE EQUATIONS | V | HT + TS - 12" |
| B | SEE EQUATIONS | W | 2A + B + C + 2E |
| C | SEE EQUATIONS | X | 3" + TX(TAN Z) |
| E | G + O + 20" | Z | SKEW ANGLE |
| F | S + 2TX | BB | (A + B)(SEC Z) |
| G | 2V | CC | (A + C)(SEC Z) |
| H | (A + C + E)(TAN Z) | EE | E(SEC Z) |
| I | 3"(COS Z) | HH | 20"(SEC Z) |
| J | (A + B + E)(TAN Z) | QQ | TX(COS Z) |
| K | S(SEC Z)/2 | YY | TX(SIN Z) |
| L | 2EE + BB + CC | TW | MAX{3'-4" OR (BS + 12")} |
| O | I + YY | | |

## GENERAL NOTES:

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3. 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 SECTIONS MEASURED ALONG THE SHORTEST WALL SHALL BE 3 FEET. REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.


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STATE OF MISSOURI
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NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

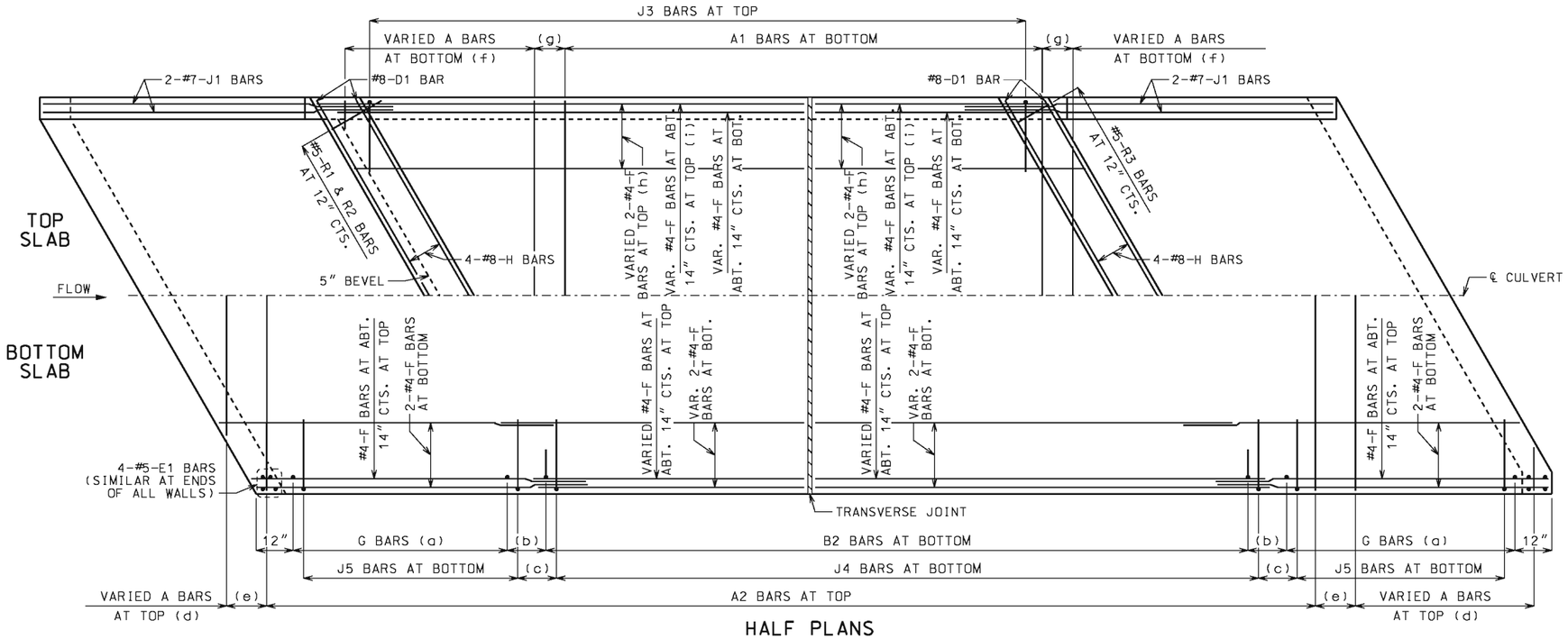
LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.12J

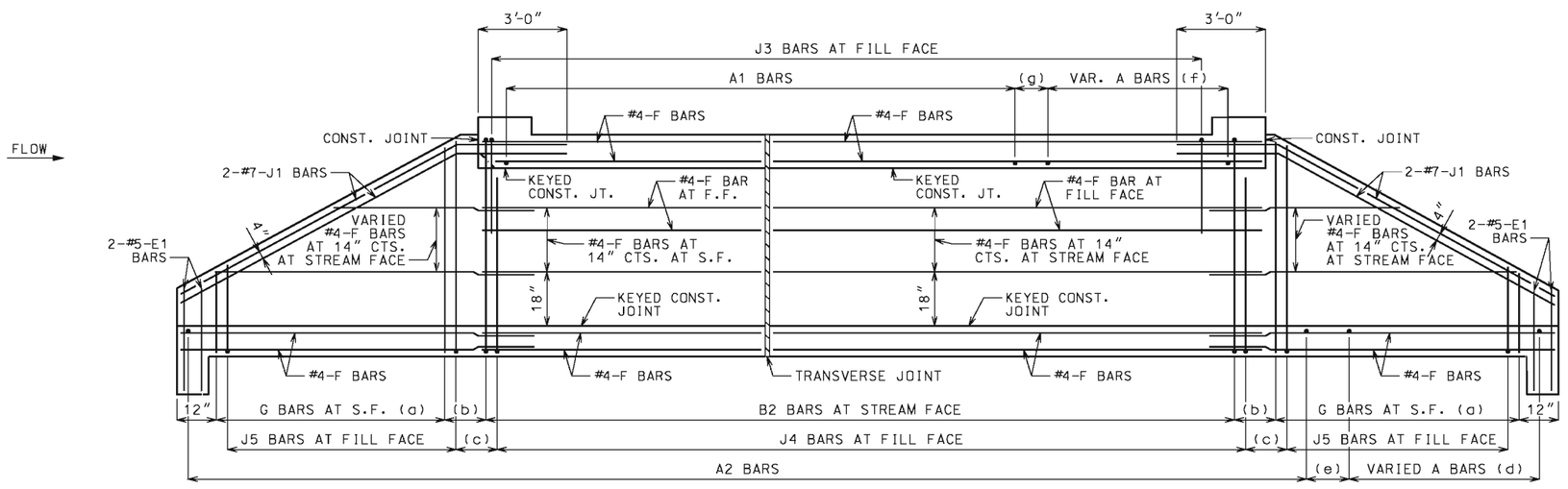
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## HALF PLANS

HALF PLANS ARE SYMMETRICAL ABOUT ℄ CULVERT.




## ELEVATION

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

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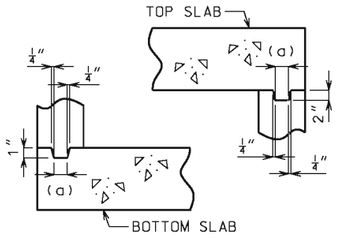
# CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

REINFORCEMENT

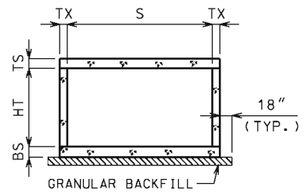
DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.12J

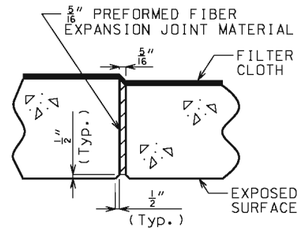



KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



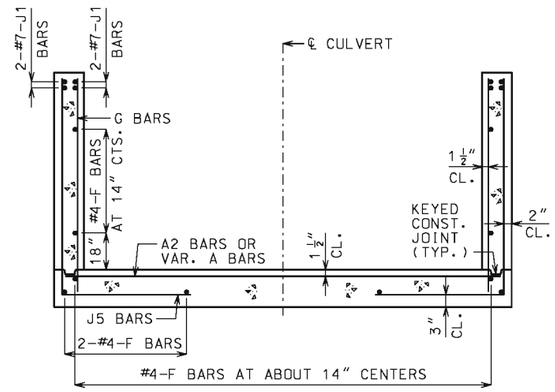

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



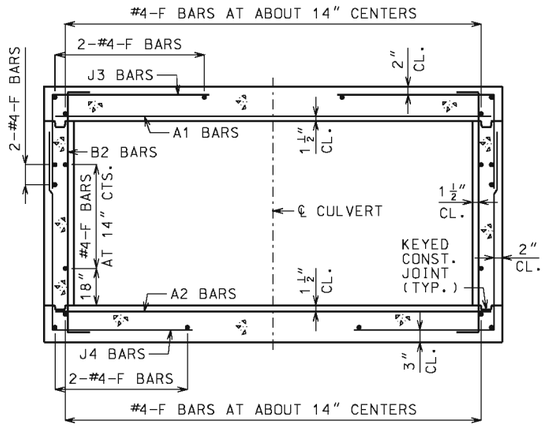

TRANSVERSE JOINT THRU BARREL

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

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

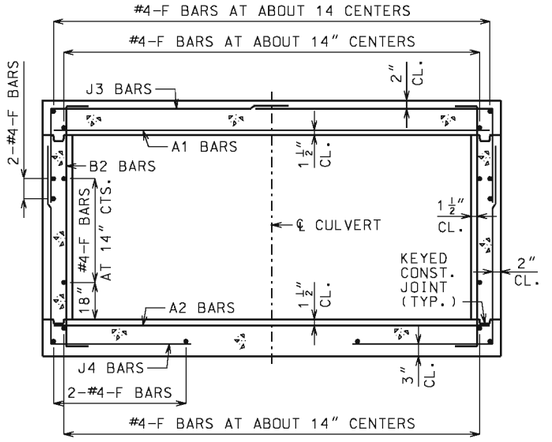



UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT



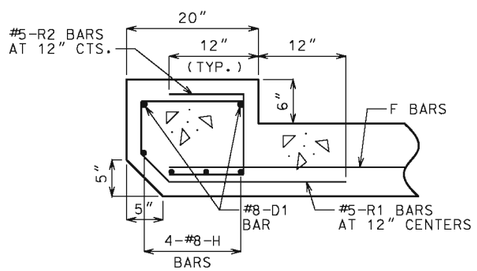

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"

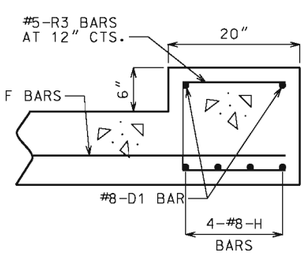



BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS




UPSTREAM HEADWALL REINFORCEMENT




DOWNSTREAM HEADWALL REINFORCEMENT

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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# CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.12J

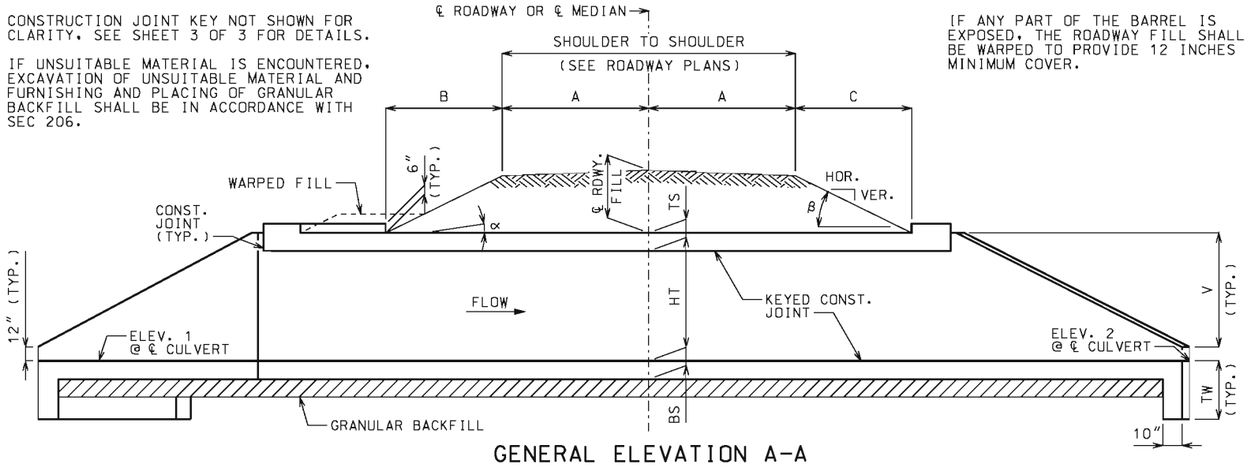
SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

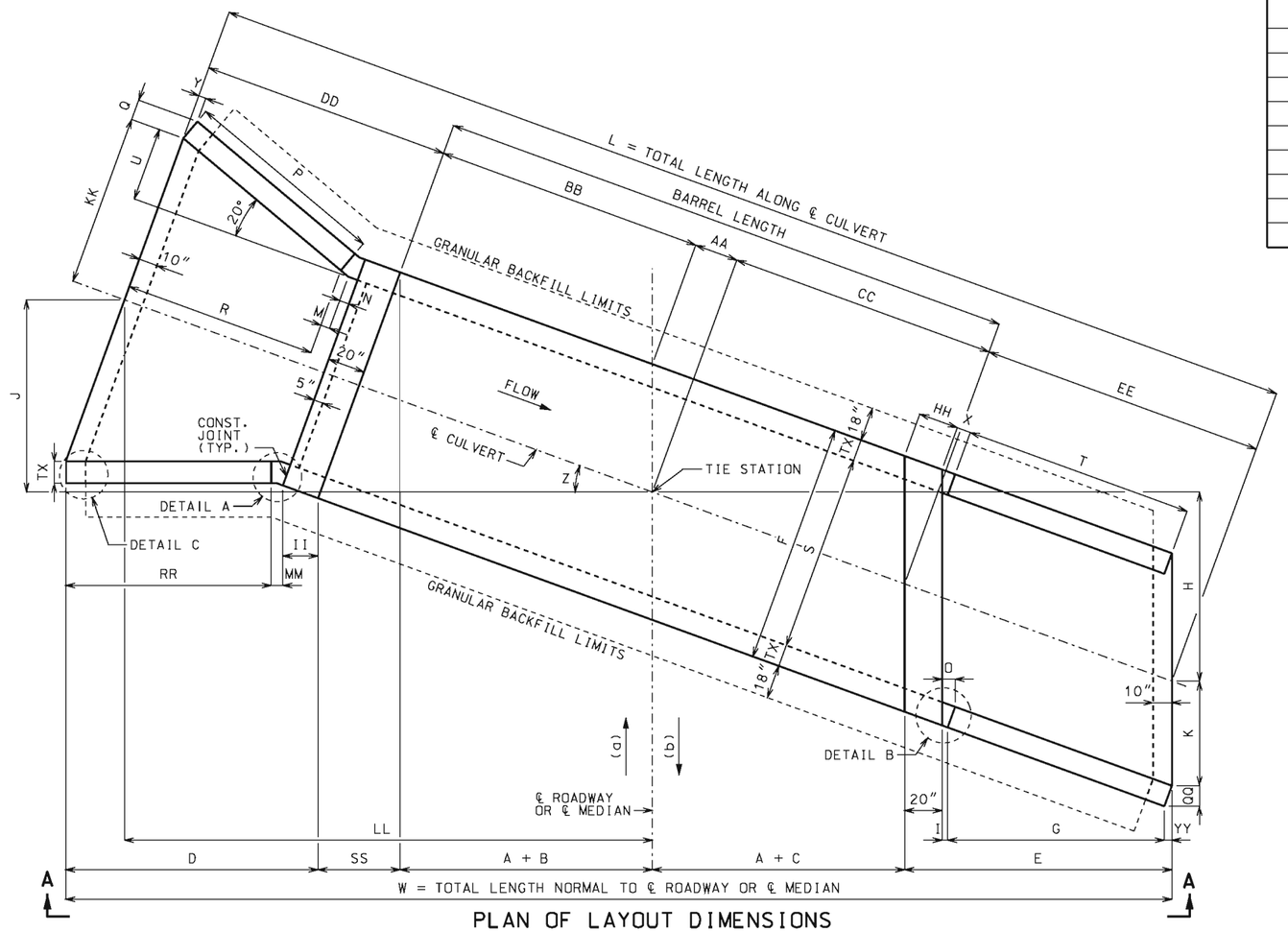
IF UNSUITABLE MATERIAL IS ENCOUNTERED, EXCAVATION OF UNSUITABLE MATERIAL AND FURNISHING AND PLACING OF GRANULAR BACKFILL SHALL BE IN ACCORDANCE WITH SEC 206.

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




## GENERAL ELEVATION A-A

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




## PLAN OF LAYOUT DIMENSIONS

(a) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (b) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

## EQUATIONS FOR COMPUTING ∝, β, B AND C

∝ = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\text{ARCTAN}\left(\frac{\text{ELEV. 1} - \text{ELEV. 2}}{\text{LL+A+C+E}}\right)$

β = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\text{ARCTAN}\left(\frac{\text{VER.}}{\text{HOR.}}\right)$

B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO UPSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + \text{A(CS)} - \text{A(TAN}\alpha)}{\text{TAN}\beta + \text{TAN}\alpha}$

C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO DOWNSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + \text{A(CS)} + \text{A(TAN}\alpha)}{\text{TAN}\beta - \text{TAN}\alpha}$

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

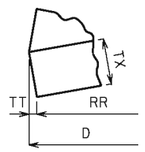
THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN ℄ ROADWAY OR ℄ MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO ℄ ROADWAY OR ℄ MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.

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

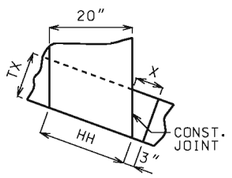
SEE ROADWAY PLANS FOR SLOPES, ℄ ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

## LAYOUT DIMENSIONS

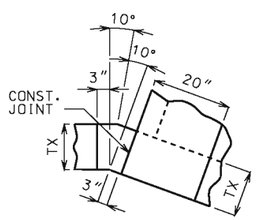
| VARIABLE | DIMENSION | VARIABLE | DIMENSION | VARIABLE | DIMENSION |
|---|---|---|---|---|---|
| ∝ | SEE EQUATIONS | N | 3" + TX(TAN 10°) | CC | (A + C)(SEC Z) |
| β | SEE EQUATIONS | O | I + YY | DD | R + M + N + 20" |
| B | SEE EQUATIONS | P | 2V[SEC(Z + 20°)] | EE | E(SEC Z) |
| C | SEE EQUATIONS | Q | TX(COS 20°) | HH | 20"(SEC Z) |
| D | Z ≥ 20°: II + MM + RR | R | P(COS 20°) | II | 20"(COS Z) |
| | Z < 20°: II + MM + RR + TT | T | G(SEC Z) | KK | S/2 + U |
| E | G + O + 20" | U | (R + M)(TAN 20°) | LL | (AA + BB + DD)(COS Z) |
| F | S + 2TX | V | HT + TS − 12" | MM | 3"[COS Z + COS(Z − 20°)] |
| G | 2V | W | 2A + B + C + D + E + SS | QQ | TX(COS Z) |
| H | (A + C + E)(TAN Z) | X | 3" + TX(TAN Z) | RR | P[COS (Z − 20°)] |
| I | 3"(COS Z) | Y | TX(SIN 20°) | SS | F(SIN Z) |
| J | (AA + BB + DD)(SIN Z) | Z | SKEW ANGLE | TT | TX[SIN(20° − Z)] |
| K | S(SEC Z)/2 | AA | F(TAN Z)/2 | YY | TX(SIN Z) |
| L | AA + BB + CC + DD + EE | BB | (A + B)(SEC Z) | TW | MAX{3'-4" OR (BS + 12")} |
| M | N(COS 20°) | | | | |




DETAIL C
For Z < 20°




DETAIL B




DETAIL A

## GENERAL NOTES:

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3. 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 SECTIONS MEASURED ALONG THE SHORTEST WALL SHALL BE 3 FEET. REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

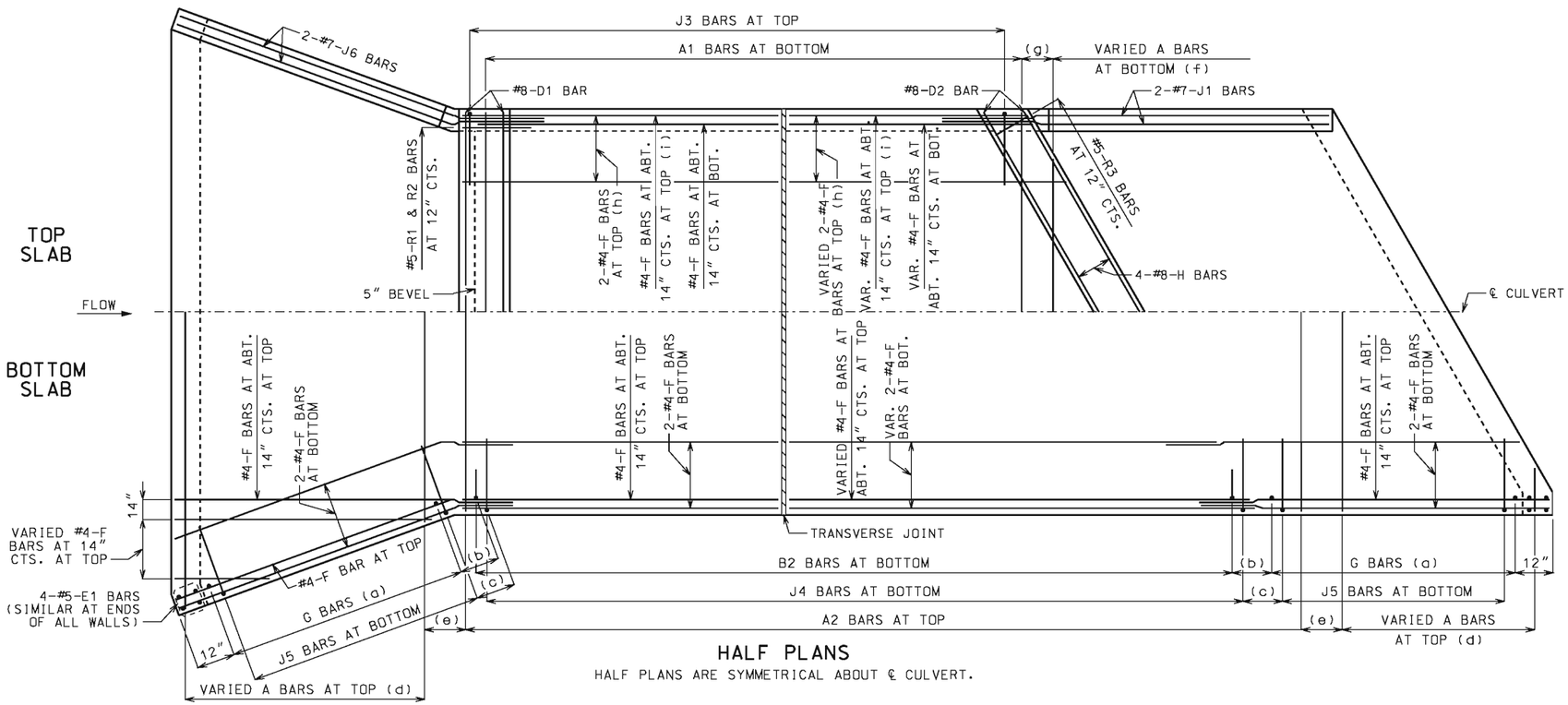
LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.13J

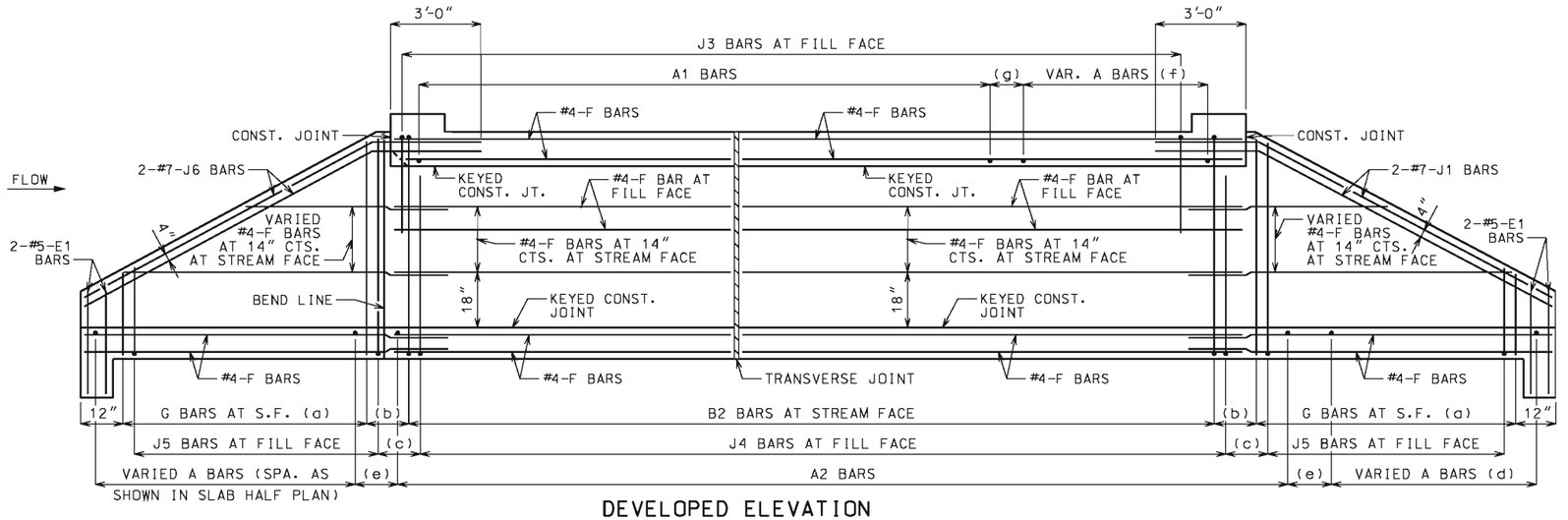
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## HALF PLANS

HALF PLANS ARE SYMMETRICAL ABOUT ℄ CULVERT.




## DEVELOPED ELEVATION

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

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# CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

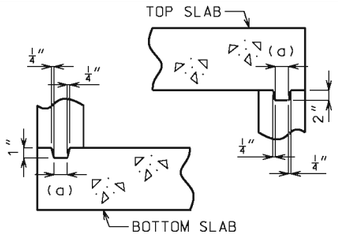
REINFORCEMENT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.13J

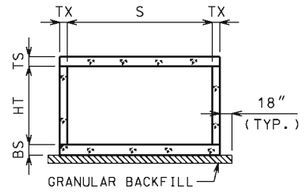
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

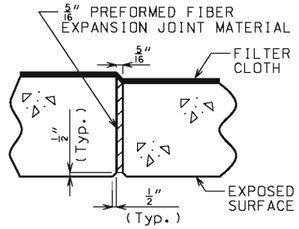



## KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



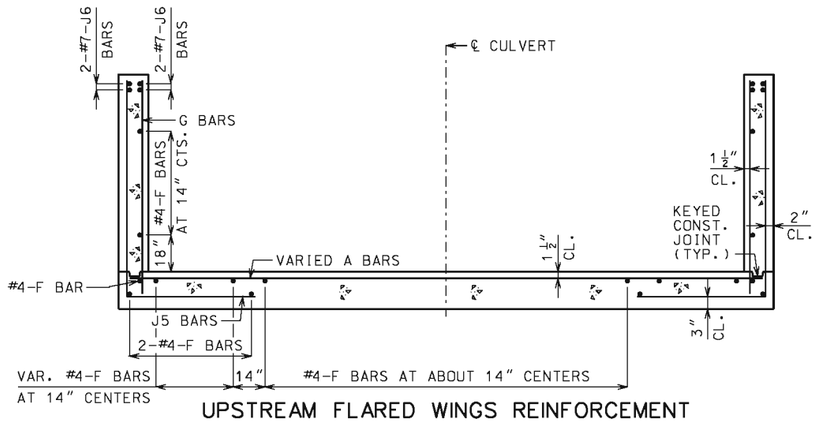

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



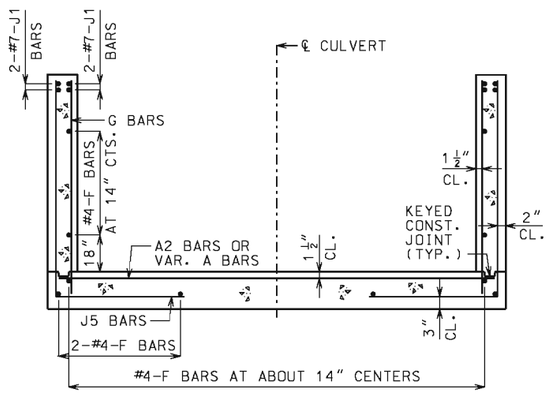

## TRANSVERSE JOINT THRU BARREL

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

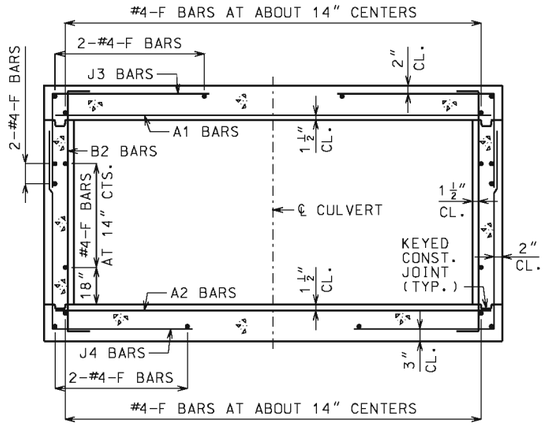
FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.




## UPSTREAM FLARED WINGS REINFORCEMENT

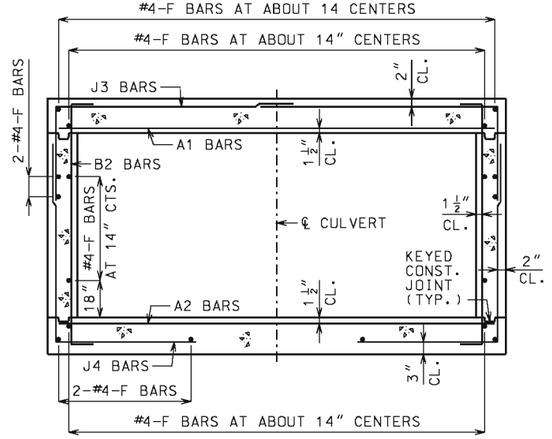



## DOWNSTREAM WINGS REINFORCEMENT



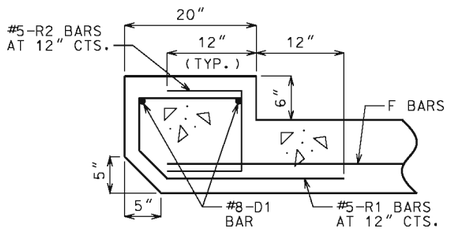

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"

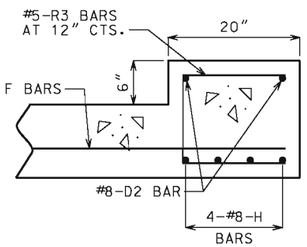



## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS




## UPSTREAM HEADWALL REINFORCEMENT




## DOWNSTREAM HEADWALL REINFORCEMENT

### GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

SECTIONS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

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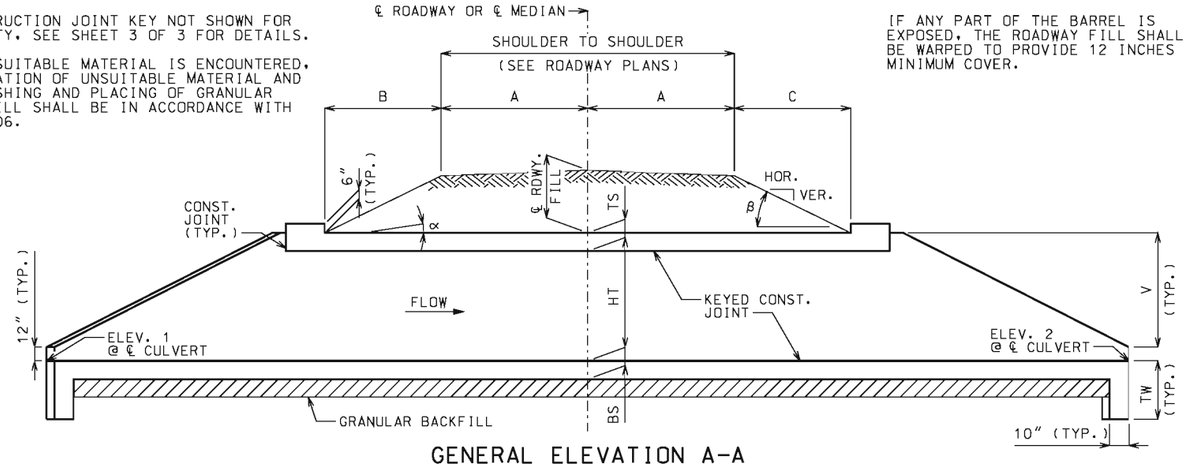
SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

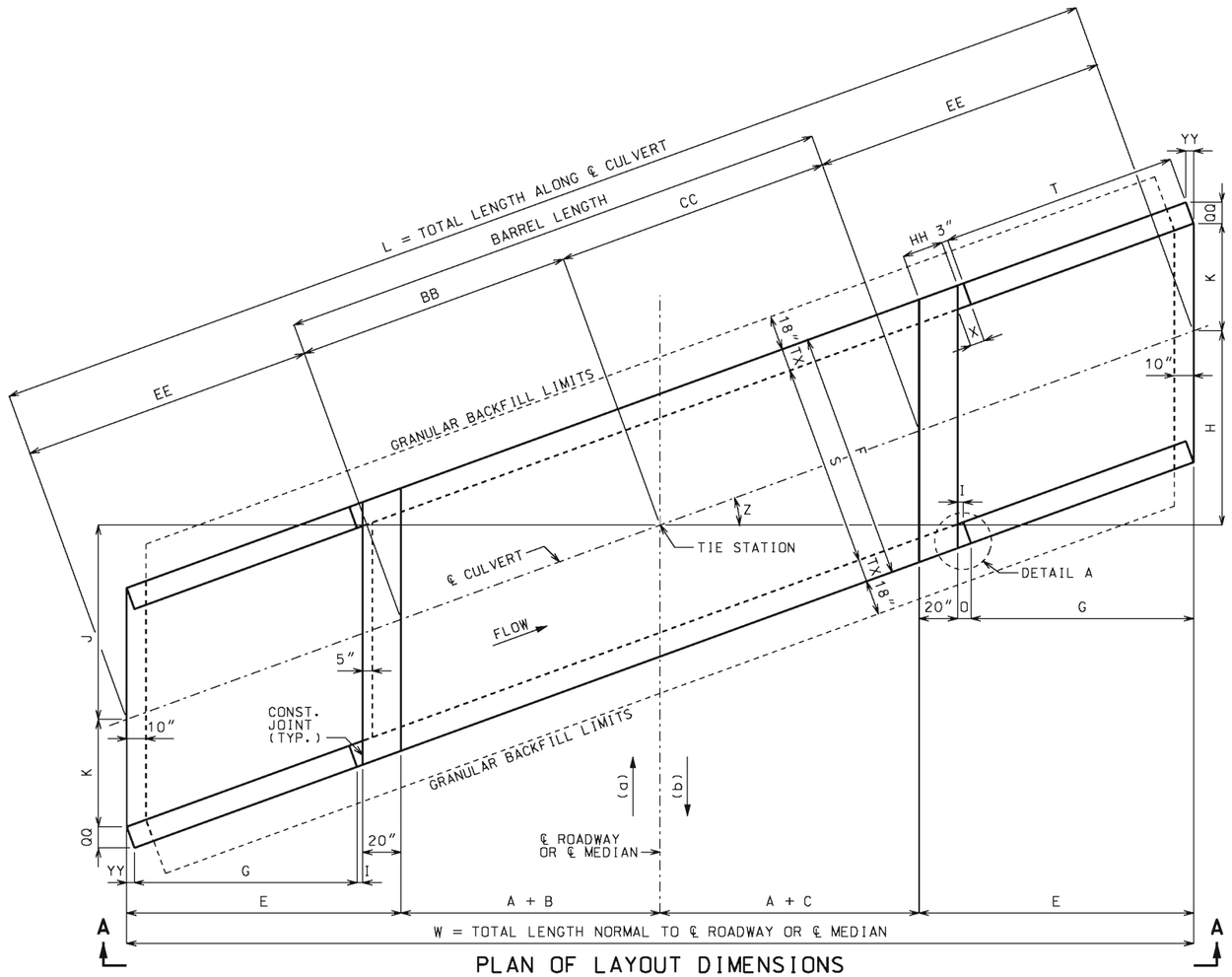
IF UNSUITABLE MATERIAL IS ENCOUNTERED, EXCAVATION OF UNSUITABLE MATERIAL AND FURNISHING AND PLACING OF GRANULAR BACKFILL SHALL BE IN ACCORDANCE WITH SEC 206.

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




GENERAL ELEVATION A-A

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




PLAN OF LAYOUT DIMENSIONS

(a) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (b) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

## EQUATIONS FOR COMPUTING ∝, β, B AND C

∝ = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\arctan\left(\frac{\text{ELEV. 1} - \text{ELEV. 2}}{W}\right)$

β = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\arctan\left(\frac{\text{VER.}}{\text{HOR.}}\right)$

B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO UPSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) - A(TAN\propto)}{TAN\beta + TAN\propto}$

C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO DOWNSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL} + A(CS) + A(TAN\propto)}{TAN\beta - TAN\propto}$

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

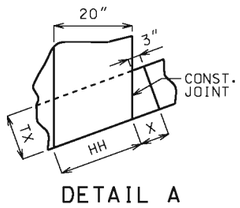
THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN ℄ ROADWAY OR ℄ MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO ℄ ROADWAY OR ℄ MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.

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

SEE ROADWAY PLANS FOR SLOPES, ℄ ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

## LAYOUT DIMENSIONS

| VARIABLE | DIMENSION | VARIABLE | DIMENSION |
|---|---|---|---|
| ∝ | SEE EQUATIONS | T | G(SEC Z) |
| β | SEE EQUATIONS | V | HT + TS - 12" |
| B | SEE EQUATIONS | W | 2A + B + C + 2E |
| C | SEE EQUATIONS | X | 3" + TX(TAN Z) |
| E | G + O + 20" | Z | SKEW ANGLE |
| F | S + 2TX | BB | (A + B)(SEC Z) |
| G | 2V | CC | (A + C)(SEC Z) |
| H | (A + C + E)(TAN Z) | EE | E(SEC Z) |
| I | 3"(COS Z) | HH | 20"(SEC Z) |
| J | (A + B + E)(TAN Z) | QQ | TX(COS Z) |
| K | S(SEC Z)/2 | YY | TX(SIN Z) |
| L | 2EE + BB + CC | TW | MAX{3'-4" OR (BS + 12")} |
| O | I + YY | | |




DETAIL A

## GENERAL NOTES:

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3. 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 SECTIONS MEASURED ALONG THE SHORTEST WALL SHALL BE 3 FEET. REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.


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# CONCRETE SINGLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

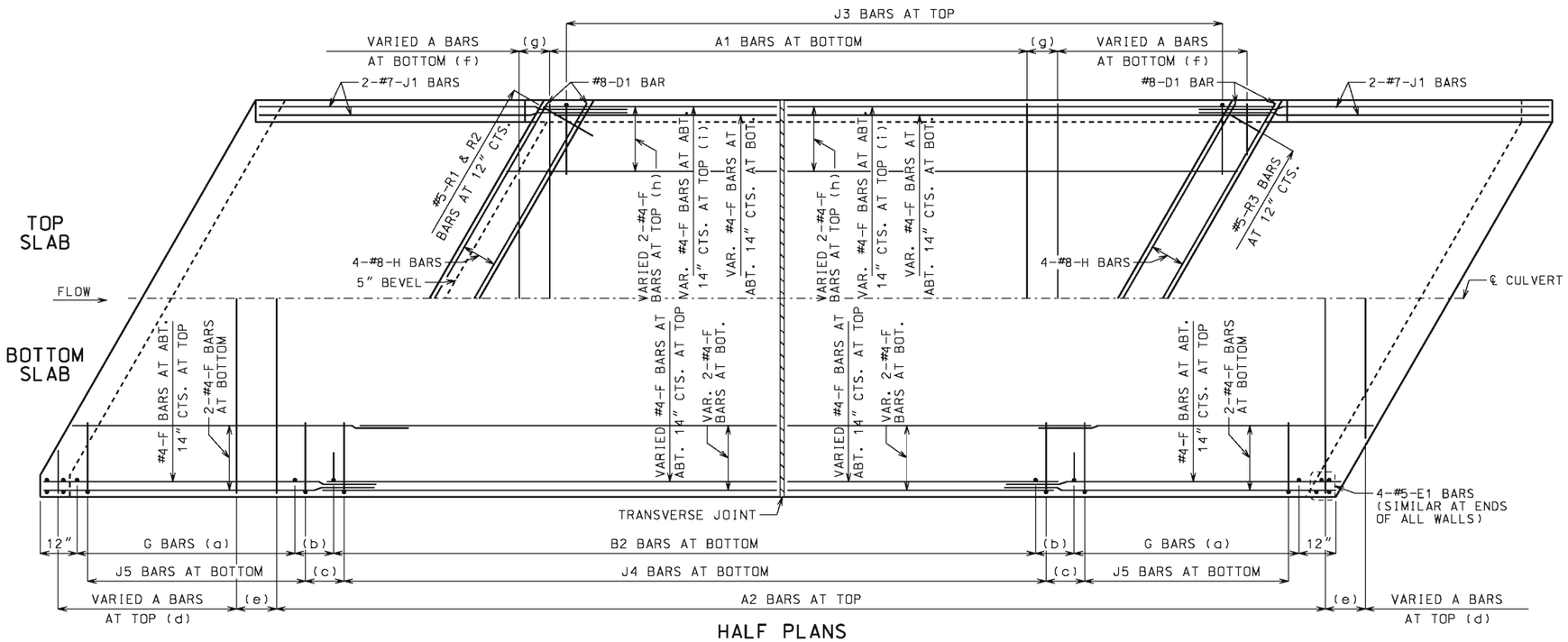
LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

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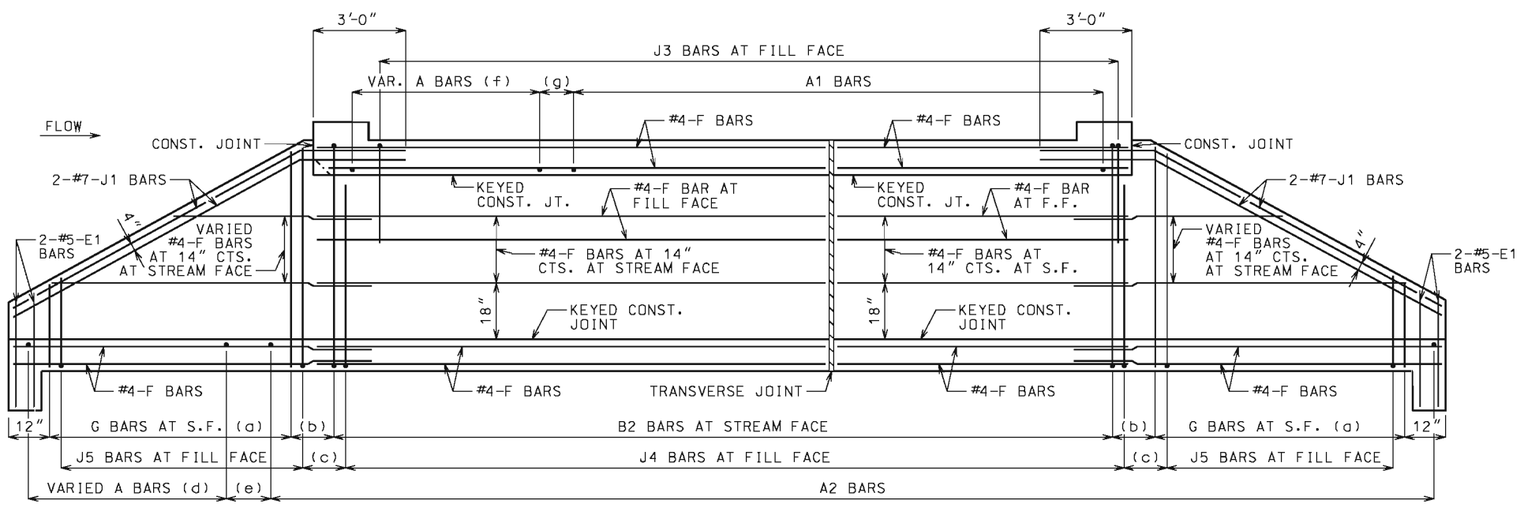
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## HALF PLANS

HALF PLANS ARE SYMMETRICAL ABOUT ℄ CULVERT.




## ELEVATION

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

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SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

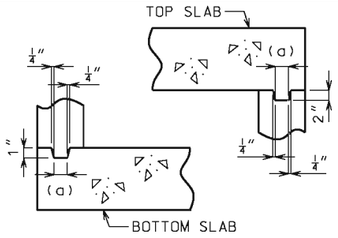
REINFORCEMENT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.14J

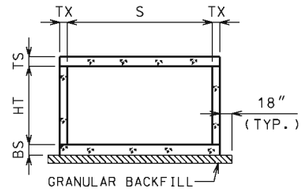
SHEET NO. 2 OF 3

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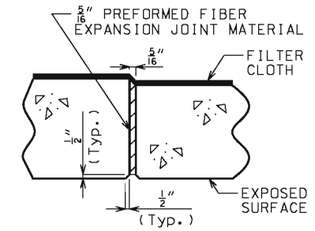



KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



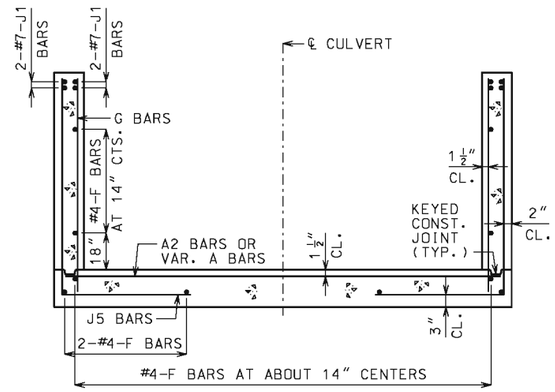

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



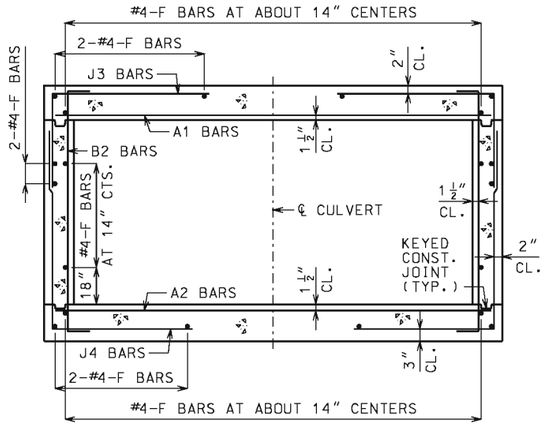

TRANSVERSE JOINT THRU BARREL

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

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

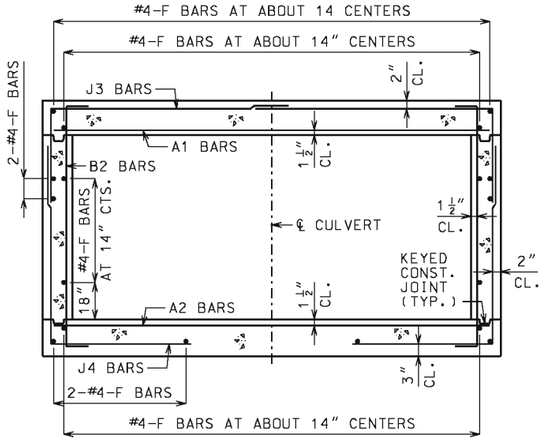



UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT



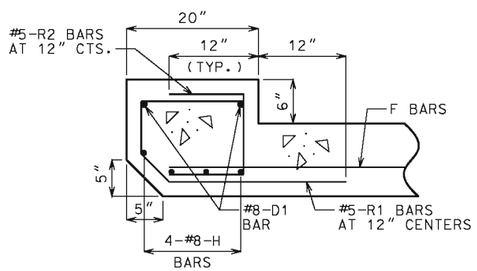

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"

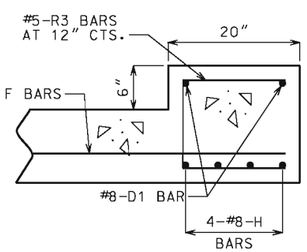



BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS




UPSTREAM HEADWALL REINFORCEMENT




DOWNSTREAM HEADWALL REINFORCEMENT

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.14J

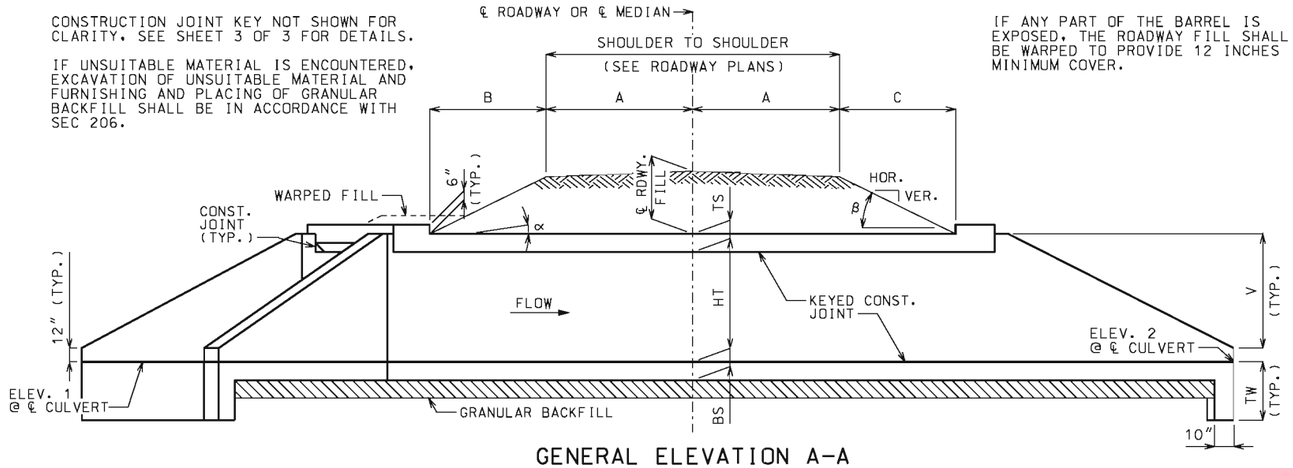
SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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

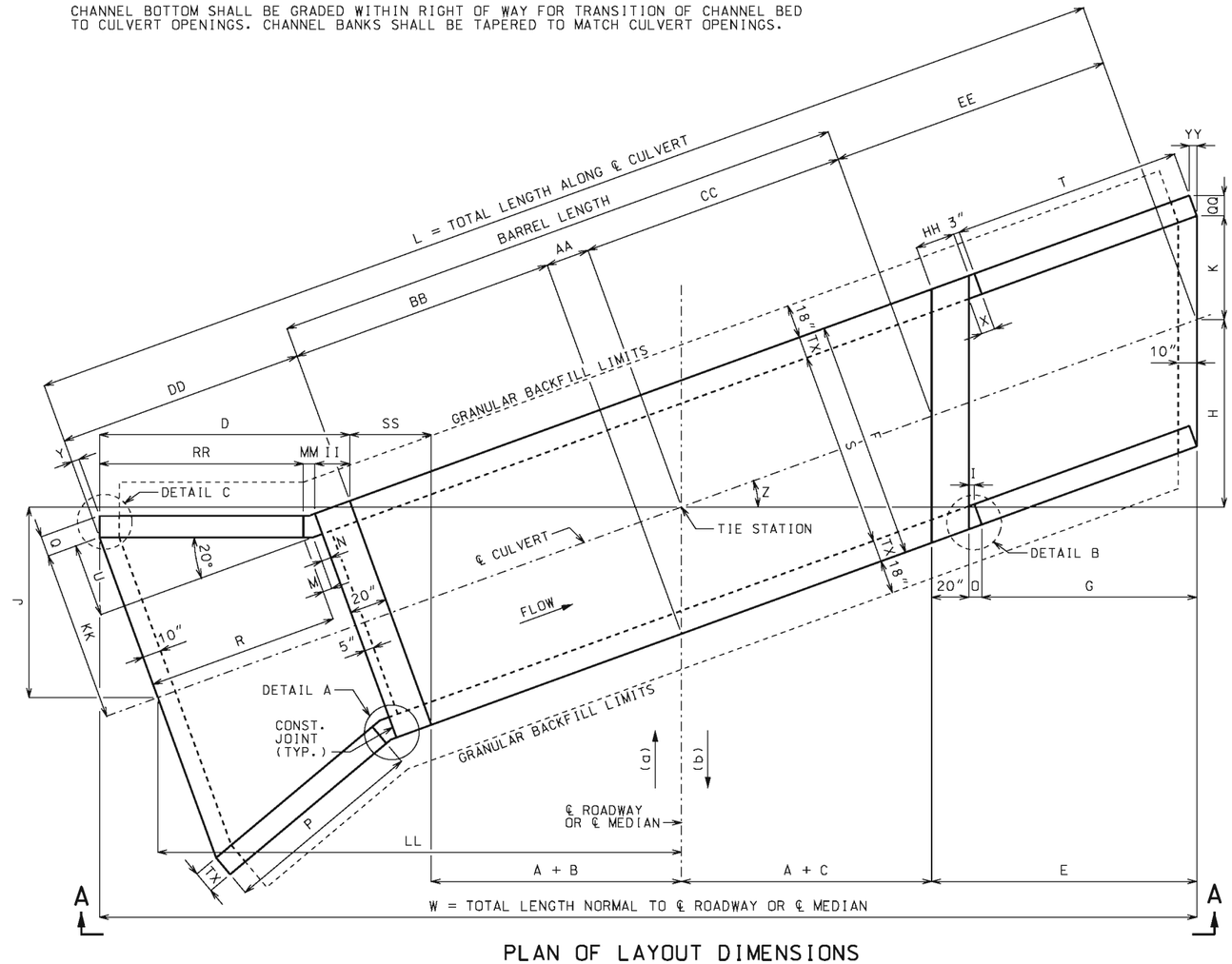
IF UNSUITABLE MATERIAL IS ENCOUNTERED, EXCAVATION OF UNSUITABLE MATERIAL AND FURNISHING AND PLACING OF GRANULAR BACKFILL SHALL BE IN ACCORDANCE WITH SEC 206.

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




GENERAL ELEVATION A-A

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




PLAN OF LAYOUT DIMENSIONS

(a) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (b) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

## EQUATIONS FOR COMPUTING ∝, β, B AND C

∝ = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\arctan\left(\frac{\text{ELEV. 1 - ELEV. 2}}{\text{A + C + E + LL}}\right)$

β = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\arctan\left(\frac{\text{VER.}}{\text{HOR.}}\right)$

B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO UPSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL + A(CS) - A(TAN}\propto)}{\text{TAN}\beta + \text{TAN}\propto}$

C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO DOWNSTREAM HEADWALL NORMAL TO ℄ ROADWAY OR ℄ MEDIAN = $\frac{\text{℄ RDWY. FILL + A(CS) + A(TAN}\propto)}{\text{TAN}\beta - \text{TAN}\propto}$

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

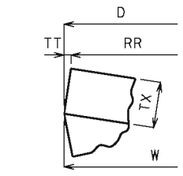
THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN ℄ ROADWAY OR ℄ MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO ℄ ROADWAY OR ℄ MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.

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

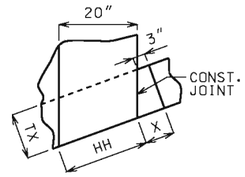
SEE ROADWAY PLANS FOR SLOPES, ℄ ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

## LAYOUT DIMENSIONS

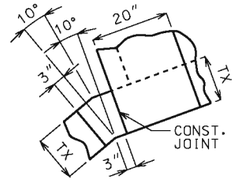
| VARIABLE | DIMENSION | VARIABLE | DIMENSION | VARIABLE | DIMENSION |
|---|---|---|---|---|---|
| ∝ | SEE EQUATIONS | N | 3" + TX(TAN 10°) | CC | (A + C)(SEC Z) |
| β | SEE EQUATIONS | O | I + YY | DD | R + M + N + 20" |
| B | SEE EQUATIONS | P | 2V[SEC(Z + 20°)] | EE | E(SEC Z) |
| C | SEE EQUATIONS | Q | TX(COS 20°) | HH | 20"(SEC Z) |
| D | Z ≥ 20°: II + MM + RR | R | P(COS 20°) | II | 20"(COS Z) |
| | Z < 20°: II + MM + RR + TT | T | G(SEC Z) | KK | S/2 + U |
| E | G + O + 20" | U | (R + M)(TAN 20°) | LL | (AA + BB + DD)(COS Z) |
| F | S + 2TX | V | HT + TS - 12" | MM | 3"[COS Z + COS(Z - 20°)] |
| G | 2V | W | 2A + B + C + D + E + SS | QQ | TX(COS Z) |
| H | (A + C + E)(TAN Z) | X | 3" + TX(TAN Z) | RR | P[COS (Z - 20°)] |
| I | 3"(COS Z) | Y | TX(SIN 20°) | SS | F(SIN Z) |
| J | (AA + BB + DD)(SIN Z) | Z | SKEW ANGLE | TT | TX[SIN(20°- Z)] |
| K | S(SEC Z)/2 | AA | F(TAN Z)/2 | YY | TX(SIN Z) |
| L | AA + BB + CC + DD + EE | BB | (A + B)(SEC Z) | TW | MAX{3'-4" OR (BS + 12")} |
| M | N(COS 20°) | | | | |




DETAIL C
For Z < 20°




DETAIL B




DETAIL A

## GENERAL NOTES:

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3. 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 SECTIONS MEASURED ALONG THE SHORTEST WALL SHALL BE 3 FEET. REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.


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NUMBER PE-27141
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# CONCRETE SINGLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED

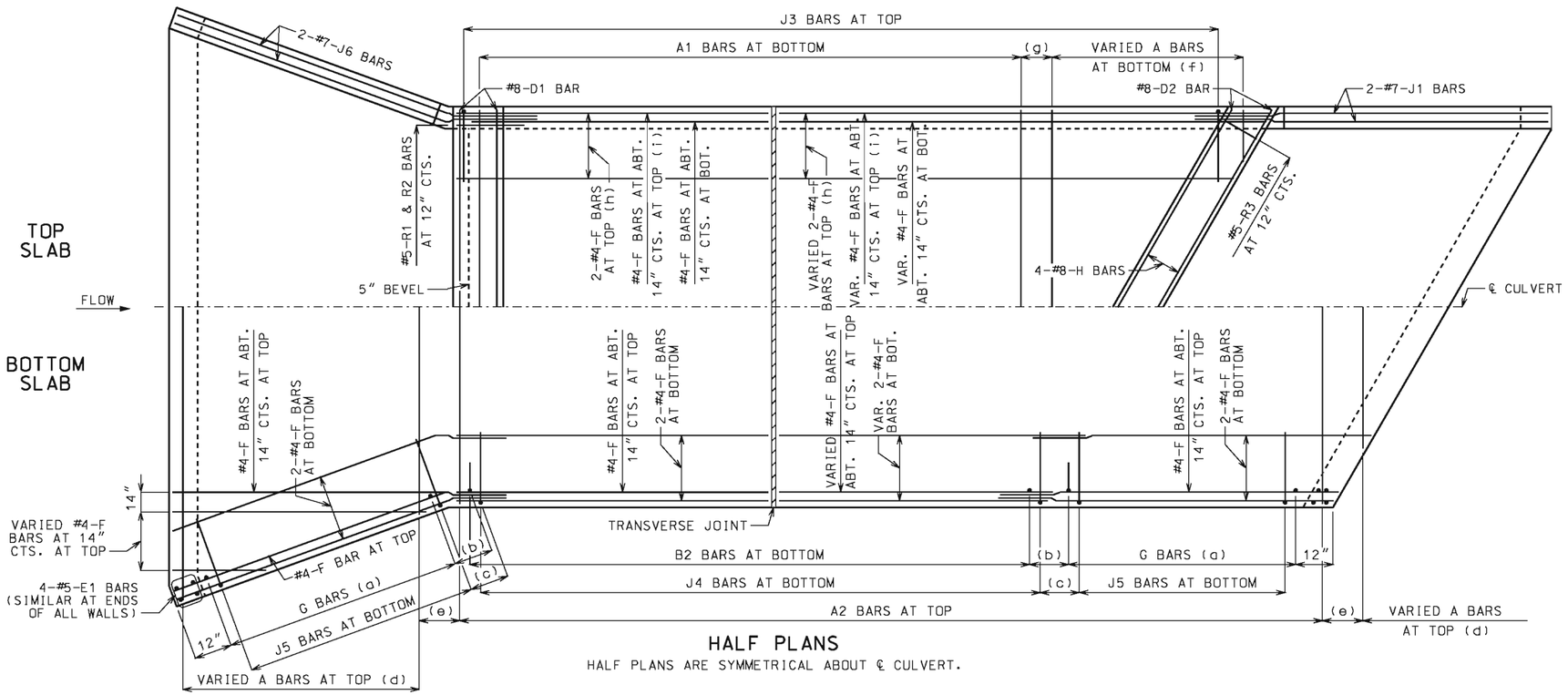
LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 6/4/2015

703.15E

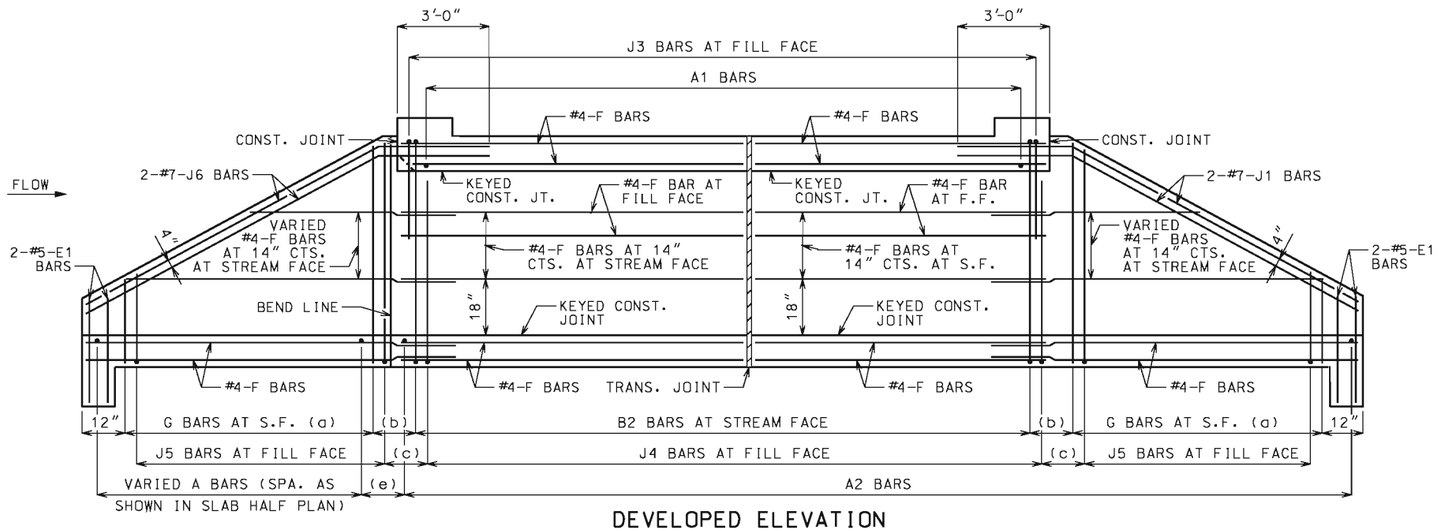
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## HALF PLANS

HALF PLANS ARE SYMMETRICAL ABOUT ℄ CULVERT.




## DEVELOPED ELEVATION

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

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# CONCRETE SINGLE BOX CULVERT

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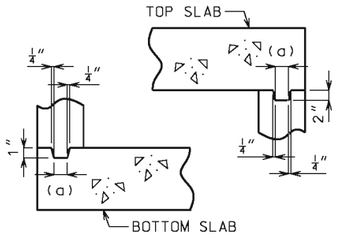
REINFORCEMENT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.15E

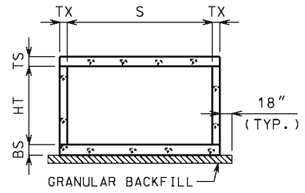
SHEET NO. 2 OF 3

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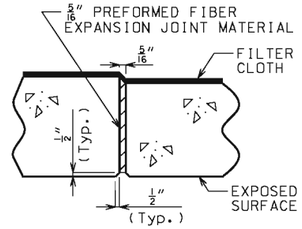



## KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



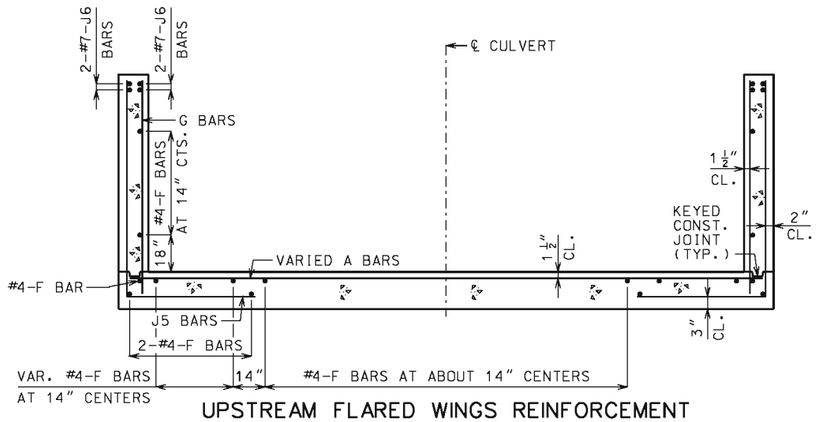

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



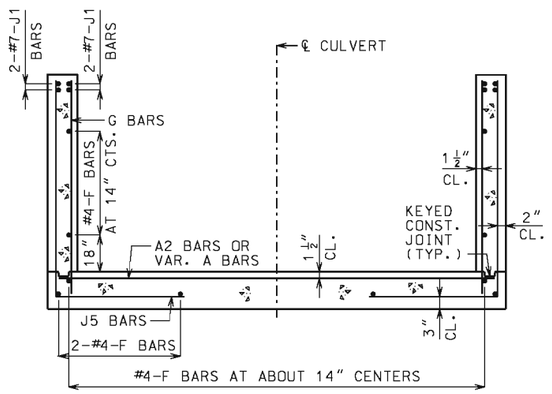

## TRANSVERSE JOINT THRU BARREL

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

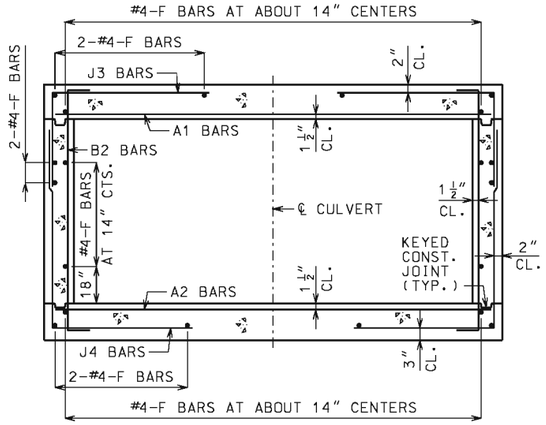
FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.




## UPSTREAM FLARED WINGS REINFORCEMENT

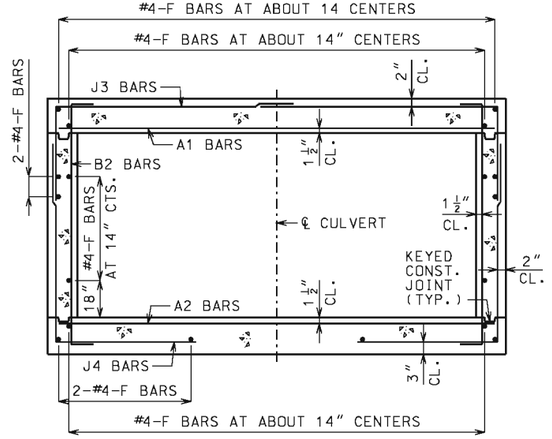



## DOWNSTREAM WINGS REINFORCEMENT



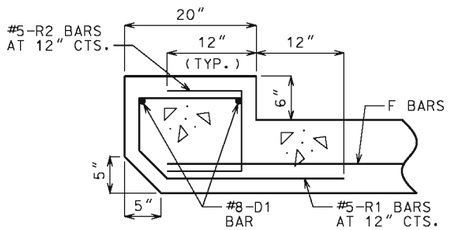

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"

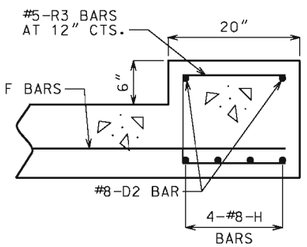



## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS




## UPSTREAM HEADWALL REINFORCEMENT




## DOWNSTREAM HEADWALL REINFORCEMENT

## GENERAL NOTES:

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

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

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MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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# CONCRETE SINGLE BOX CULVERT

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WINGS: FLARED

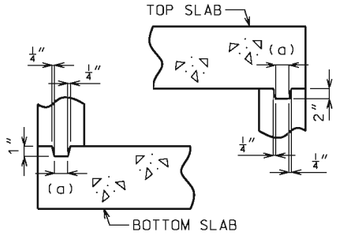
SECTIONS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/13/2015

703.15E

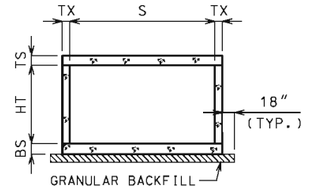
SHEET NO. 3 OF 3

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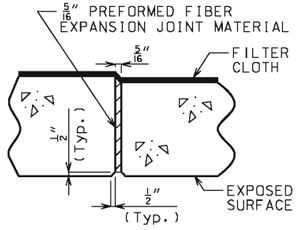



## KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



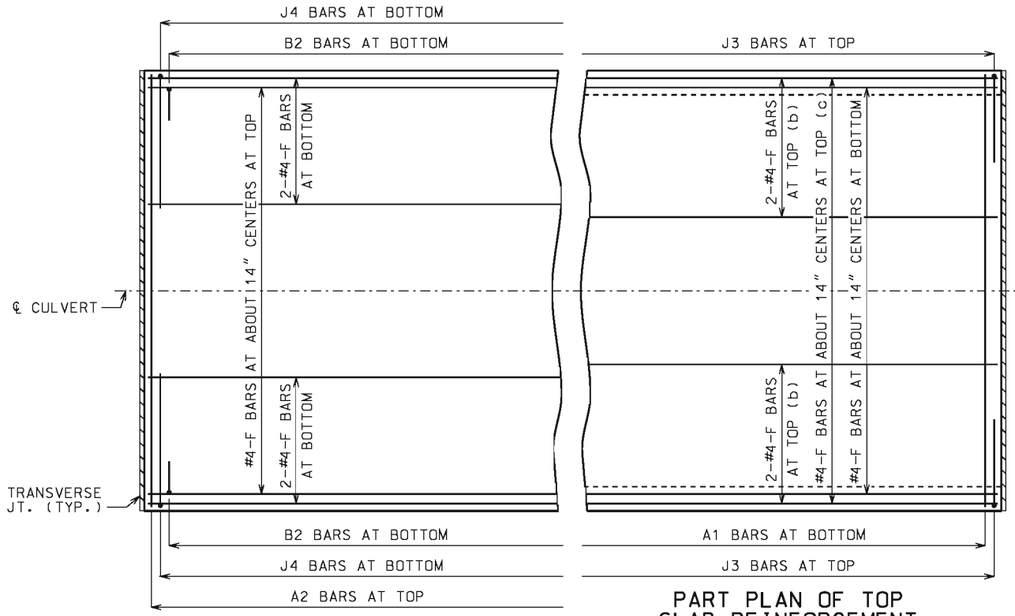

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## TRANSVERSE JOINT THRU BARREL

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

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.




## PART PLAN OF BOTTOM SLAB REINFORCEMENT

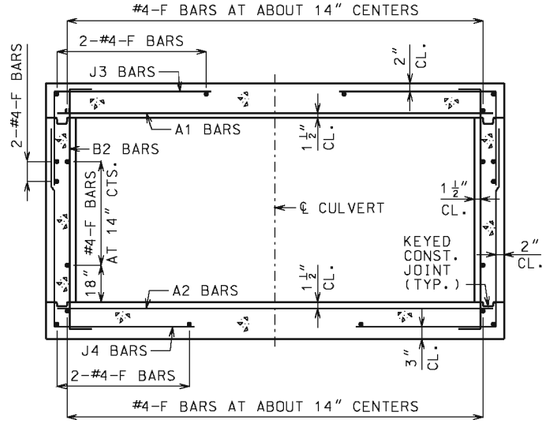



## PART PLAN OF TOP SLAB REINFORCEMENT

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

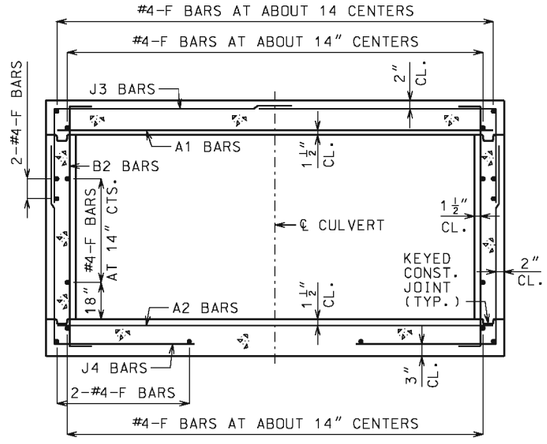



## ELEVATION OF WALL REINFORCEMENT




## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"
SYMMETRICAL ABOUT AND NORMAL TO ℄ CULVERT.




## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS
SYMMETRICAL ABOUT AND NORMAL TO ℄ CULVERT.

## GENERAL NOTES

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS, SEE 703.17.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PART PLANS AND ELEVATION.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

CUT SECTION

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 5/13/2015

703.16

SHEET NO. 1 OF 1

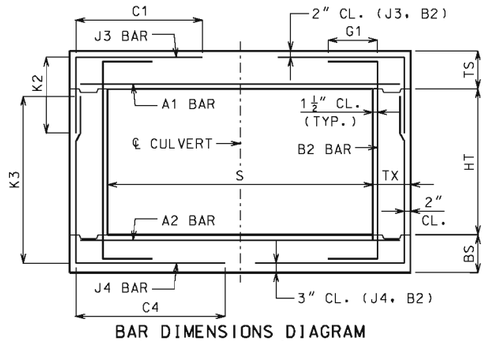
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 3 FT  HEIGHT (HT) = 2 FT OR 3 FT

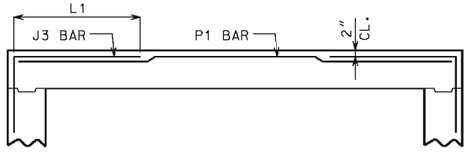
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=2′ | K2 HT=3′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=2′ | K3 HT=3′ | SIZE | SPA. | G1 |
| 1 FT | 9 | 8 | 8 | 4 | 7 | 4 | 12 | 32.5 | 25.3 | 33.6 | 4 | 11.5 | 4 | 12 | 32.5 | 28 | 40 | 5 | 12 | 12 |
| 2 FT | 9 | 8 | 8 | 4 | 7 | 4 | 12 | 32.5 | 25.3 | 33.6 | 4 | 11.5 | 4 | 12 | 30.8 | 28 | 40 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.4 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 26.0 | 28 | 40 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.6 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 24.6 | 28 | 40 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 23.8 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 23.8 | 28 | 40 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 11 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 4 | 11.5 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 10 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 4 | 10.5 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 9 | 4 | 12 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 4 | 9.5 | 4 | 12 | 22.0 | 24.1 | 32.4 | 4 | 8.5 | 4 | 11.5 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 28 FT | 8 | 8 | 8 | 4 | 9 | 4 | 11.5 | 22.0 | 24.1 | 32.4 | 4 | 8 | 4 | 10.5 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 30 FT | 8 | 8 | 8 | 4 | 8.5 | 4 | 11 | 22.0 | 24.1 | 32.4 | 4 | 7.5 | 4 | 10 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 32 FT | 8 | 8 | 8 | 4 | 8 | 4 | 10 | 22.0 | 24.1 | 32.4 | 4 | 7 | 4 | 9.5 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 34 FT | 8 | 8 | 8 | 4 | 7.5 | 4 | 9.5 | 22.0 | 24.1 | 32.4 | 4 | 6.5 | 4 | 8.5 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 36 FT | 8 | 8 | 8 | 4 | 7 | 4 | 9 | 22.0 | 24.1 | 32.4 | 4 | 6 | 4 | 8 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 38 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 8.5 | 22.0 | 24.1 | 32.4 | 5 | 9 | 4 | 8 | 22.0 | 28 | 40 | 5 | 12 | 0 |
| 40 FT | 8 | 9 | 8 | 4 | 6.5 | 4 | 8 | 22.0 | 24.1 | 32.1 | 4 | 6 | 4 | 11 | 21.5 | 29 | 41 | 5 | 12 | 0 |
| 42 FT | 8 | 9 | 8 | 4 | 6 | 4 | 8 | 22.0 | 24.1 | 32.1 | 5 | 9 | 4 | 10 | 21.5 | 29 | 41 | 5 | 12 | 0 |
| 44 FT | 8 | 9 | 8 | 4 | 6 | 4 | 7.5 | 22.0 | 24.1 | 32.1 | 5 | 8.5 | 4 | 10 | 21.5 | 29 | 41 | 5 | 12 | 0 |
| 46 FT | 8 | 9 | 8 | 4 | 6 | 4 | 7 | 22.0 | 24.1 | 32.1 | 5 | 8 | 4 | 9.5 | 21.5 | 29 | 41 | 5 | 12 | 0 |
| 48 FT | 8 | 10 | 8 | 4 | 6 | 4 | 7 | 22.0 | 24.0 | 31.9 | 5 | 8.5 | 4 | 12 | 21.5 | 30 | 42 | 5 | 12 | 0 |
| 50 FT | 8 | 10 | 8 | 4 | 6 | 4 | 6.5 | 22.0 | 24.0 | 31.9 | 5 | 8 | 4 | 12 | 21.5 | 30 | 42 | 5 | 12 | 0 |

## SPAN (S) = 3 FT  HEIGHT (HT) = 4 FT OR 5 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=4′ | K2 HT=5′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=4′ | K3 HT=5′ | SIZE | SPA. | G1 |
| 1 FT | 9 | 8 | 8 | 4 | 6.5 | 4 | 12 | 32.5 | 25.3 | 30.3 | 4 | 10.5 | 4 | 12 | 32.5 | 52 | 64 | 5 | 12 | 12 |
| 2 FT | 9 | 8 | 8 | 4 | 6.5 | 4 | 12 | 32.5 | 25.3 | 30.3 | 4 | 10 | 4 | 12 | 32.5 | 52 | 64 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 32.5 | 24.3 | 29.1 | 4 | 12 | 4 | 12 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 36.1 | 24.3 | 29.1 | 4 | 12 | 4 | 12 | 33.5 | 52 | 64 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 32.5 | 24.3 | 29.1 | 4 | 12 | 4 | 12 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 32.5 | 24.3 | 29.1 | 4 | 12 | 4 | 12 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 35.6 | 24.3 | 29.1 | 4 | 12 | 4 | 12 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 34.4 | 24.3 | 29.1 | 4 | 12 | 4 | 11.5 | 36.1 | 52 | 64 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 33.5 | 24.3 | 29.1 | 4 | 12 | 4 | 11 | 35.3 | 52 | 64 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 32.5 | 24.3 | 29.1 | 4 | 12 | 4 | 10.5 | 34.8 | 52 | 64 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 31.6 | 24.3 | 29.1 | 4 | 10.5 | 4 | 10 | 34.4 | 52 | 64 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 4 | 11.5 | 4 | 11 | 31.6 | 24.3 | 29.1 | 4 | 9.5 | 4 | 9.5 | 33.9 | 52 | 64 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 4 | 10.5 | 4 | 10 | 31.6 | 24.3 | 29.1 | 4 | 9 | 4 | 9 | 33.9 | 52 | 64 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 4 | 9.5 | 4 | 9.5 | 31.3 | 24.3 | 29.1 | 4 | 8.5 | 4 | 8 | 33.5 | 52 | 64 | 5 | 12 | 0 |
| 28 FT | 8 | 8 | 8 | 4 | 9 | 4 | 8.5 | 31.3 | 24.3 | 29.1 | 4 | 7.5 | 4 | 7.5 | 33.0 | 52 | 64 | 5 | 12 | 0 |
| 30 FT | 8 | 8 | 8 | 4 | 8.5 | 4 | 8 | 31.3 | 24.3 | 29.1 | 4 | 7 | 4 | 7 | 33.0 | 52 | 64 | 5 | 12 | 0 |
| 32 FT | 8 | 8 | 8 | 4 | 8 | 4 | 7.5 | 30.8 | 24.3 | 29.1 | 4 | 7 | 4 | 6.5 | 33.0 | 52 | 64 | 5 | 12 | 0 |
| 34 FT | 8 | 8 | 8 | 4 | 7.5 | 4 | 7 | 30.8 | 24.3 | 29.1 | 4 | 6.5 | 4 | 6.5 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 36 FT | 8 | 8 | 8 | 4 | 7 | 4 | 7 | 30.8 | 24.3 | 29.1 | 4 | 6 | 4 | 6 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 38 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 6.5 | 30.8 | 24.3 | 29.1 | 5 | 9 | 5 | 7 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 40 FT | 8 | 9 | 8 | 4 | 6.5 | 4 | 6 | 30.8 | 24.0 | 28.8 | 4 | 6 | 4 | 6.5 | 32.5 | 53 | 65 | 5 | 12 | 0 |
| 42 FT | 8 | 9 | 8 | 4 | 6 | 4 | 6 | 30.8 | 24.0 | 28.8 | 5 | 9 | 4 | 6 | 32.5 | 53 | 65 | 5 | 11.5 | 0 |
| 44 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 30.8 | 24.0 | 28.8 | 5 | 8.5 | 4 | 6 | 32.5 | 53 | 65 | 5 | 11 | 0 |
| 46 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 30.4 | 24.0 | 28.8 | 5 | 8 | 5 | 6.5 | 34.8 | 53 | 65 | 5 | 10.5 | 0 |
| 48 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6 | 30.4 | 24.0 | 28.8 | 5 | 8 | 5 | 6.5 | 34.8 | 53 | 65 | 5 | 10 | 0 |
| 50 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6 | 30.4 | 24.0 | 28.8 | 5 | 7.5 | 5 | 6 | 34.8 | 53 | 65 | 5 | 9.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS. WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

## SPAN (S): 3 FEET HEIGHT (HT): 2 THRU 5 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 1 OF 14

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 4 FT  HEIGHT (HT) = 2 FT OR 3 FT

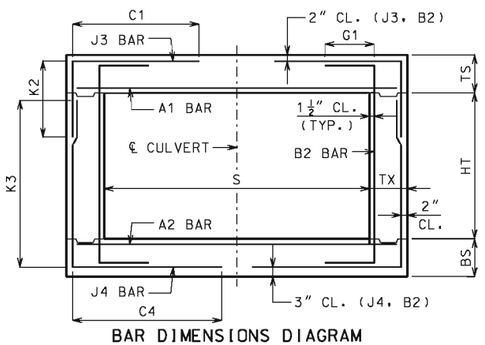
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=2′ | HT=3′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=2′ | HT=3′ | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 4 | 6 | 4 | 10.5 | 38.6 | 26.3 | 34.8 | 4 | 7 | 4 | 7 | 30.3 | 28 | 40 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 4 | 6 | 4 | 10.5 | 38.6 | 26.3 | 34.8 | 4 | 7 | 4 | 7 | 28.0 | 28 | 40 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 25.3 | 24.1 | 32.4 | 4 | 11 | 4 | 12 | 25.3 | 28 | 40 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.6 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 24.6 | 28 | 40 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.1 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 24.1 | 28 | 40 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 23.0 | 24.1 | 32.4 | 4 | 12 | 4 | 12 | 23.0 | 28 | 40 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 23.0 | 24.1 | 32.4 | 4 | 11 | 4 | 12 | 23.0 | 28 | 40 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 11 | 4 | 12 | 23.0 | 24.1 | 32.4 | 4 | 9.5 | 4 | 11.5 | 23.0 | 28 | 40 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 4 | 10 | 4 | 11 | 23.0 | 24.1 | 32.4 | 4 | 8.5 | 4 | 10 | 23.0 | 28 | 40 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 4 | 8.5 | 4 | 10 | 23.0 | 24.1 | 32.4 | 4 | 7.5 | 4 | 9 | 22.4 | 28 | 40 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 4 | 8 | 4 | 9 | 23.0 | 24.1 | 32.4 | 4 | 6.5 | 4 | 8 | 22.4 | 28 | 40 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 4 | 7 | 4 | 8 | 23.0 | 24.1 | 32.4 | 4 | 6 | 4 | 7.5 | 22.4 | 28 | 40 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 7.5 | 23.0 | 24.1 | 32.4 | 5 | 8.5 | 4 | 6.5 | 22.4 | 28 | 40 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 4 | 6 | 4 | 7 | 23.0 | 24.1 | 32.4 | 5 | 8 | 4 | 6 | 22.4 | 28 | 40 | 5 | 12 | 0 |
| 28 FT | 8 | 9 | 8 | 4 | 6 | 4 | 6.5 | 23.0 | 24.1 | 32.1 | 5 | 8 | 4 | 8 | 21.9 | 29 | 41 | 5 | 12 | 0 |
| 30 FT | 8 | 9 | 8 | 4 | 6 | 4 | 6 | 23.0 | 24.1 | 32.1 | 5 | 7.5 | 4 | 7.5 | 21.9 | 29 | 41 | 5 | 12 | 0 |
| 32 FT | 8 | 10 | 8 | 4 | 6 | 5 | 6.5 | 23.0 | 24.0 | 31.9 | 5 | 7.5 | 4 | 10 | 21.3 | 30 | 42 | 5 | 12 | 0 |
| 34 FT | 9 | 10 | 8 | 5 | 8.5 | 4 | 7 | 22.4 | 25.1 | 33.0 | 5 | 7.5 | 4 | 9.5 | 21.3 | 30 | 42 | 5 | 12 | 0 |
| 36 FT | 9 | 10 | 8 | 5 | 8.5 | 4 | 7 | 22.4 | 25.1 | 33.0 | 5 | 7 | 4 | 9 | 21.3 | 30 | 42 | 5 | 12 | 0 |
| 38 FT | 9 | 11 | 8 | 5 | 8.5 | 4 | 6.5 | 22.4 | 25.4 | 33.1 | 5 | 7 | 4 | 10 | 20.8 | 31 | 43 | 5 | 12 | 0 |
| 40 FT | 9 | 11 | 8 | 5 | 8.5 | 4 | 6 | 22.4 | 25.4 | 33.1 | 5 | 6.5 | 4 | 9.5 | 20.8 | 31 | 43 | 5 | 12 | 0 |
| 42 FT | 10 | 11 | 8 | 5 | 8 | 4 | 7 | 21.9 | 26.0 | 33.8 | 5 | 6.5 | 4 | 9 | 21.3 | 31 | 43 | 5 | 12 | 0 |
| 44 FT | 10 | 11 | 8 | 5 | 8 | 4 | 6.5 | 21.9 | 26.0 | 33.8 | 5 | 6.5 | 4 | 8.5 | 21.3 | 31 | 43 | 5 | 12 | 0 |
| 46 FT | 10 | 12 | 8 | 5 | 8 | 4 | 6.5 | 21.9 | 26.3 | 33.9 | 5 | 6 | 4 | 9.5 | 20.8 | 32 | 44 | 5 | 12 | 0 |
| 48 FT | 10 | 12 | 8 | 5 | 8 | 4 | 6 | 21.9 | 26.3 | 33.9 | 5 | 6 | 4 | 9.5 | 20.8 | 32 | 44 | 5 | 12 | 0 |
| 50 FT | 11 | 12 | 8 | 5 | 7.5 | 4 | 7 | 21.3 | 27.3 | 35.1 | 5 | 6 | 4 | 9.5 | 21.3 | 32 | 44 | 5 | 12 | 0 |

## SPAN (S) = 4 FT  HEIGHT (HT) = 4 FT OR 5 FT

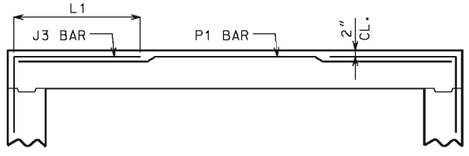
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=4′ | HT=5′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=4′ | HT=5′ | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 5 | 9 | 4 | 10.5 | 38.6 | 26.3 | 31.4 | 4 | 6 | 4 | 8 | 38.6 | 52 | 64 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 5 | 9 | 4 | 10.5 | 38.6 | 26.3 | 31.4 | 4 | 6 | 4 | 7.5 | 38.6 | 52 | 64 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 11.5 | 4 | 12 | 38.6 | 24.3 | 29.1 | 4 | 9.5 | 4 | 11.5 | 38.6 | 52 | 64 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 35.9 | 24.3 | 29.1 | 4 | 11 | 4 | 11.5 | 35.3 | 52 | 64 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 32.5 | 24.3 | 29.1 | 4 | 11 | 4 | 11 | 32.5 | 52 | 64 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 28.0 | 24.3 | 29.1 | 4 | 11.5 | 4 | 11.5 | 28.0 | 52 | 64 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.5 | 24.3 | 29.1 | 4 | 10 | 4 | 10.5 | 28.0 | 52 | 64 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 10.5 | 4 | 12 | 27.5 | 24.3 | 29.1 | 4 | 9 | 4 | 10 | 27.5 | 52 | 64 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 4 | 9.5 | 4 | 11 | 26.9 | 24.3 | 29.1 | 4 | 8 | 4 | 9.5 | 27.5 | 52 | 64 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 4 | 8.5 | 4 | 9.5 | 26.9 | 24.3 | 29.1 | 4 | 7 | 4 | 8.5 | 27.5 | 52 | 64 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 4 | 7.5 | 4 | 9 | 26.9 | 24.3 | 29.1 | 4 | 6.5 | 4 | 7.5 | 27.5 | 52 | 64 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 4 | 7 | 4 | 8 | 26.9 | 24.3 | 29.1 | 4 | 6 | 4 | 7 | 27.5 | 52 | 64 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 4 | 6 | 4 | 7.5 | 26.9 | 24.3 | 29.1 | 5 | 8.5 | 4 | 6.5 | 26.9 | 52 | 64 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 4 | 6 | 4 | 6.5 | 26.9 | 24.3 | 29.1 | 5 | 8 | 4 | 6 | 26.9 | 52 | 64 | 5 | 12 | 0 |
| 28 FT | 8 | 9 | 8 | 4 | 6 | 4 | 6 | 26.9 | 24.0 | 28.8 | 5 | 8 | 4 | 7.5 | 27.5 | 53 | 65 | 5 | 12 | 0 |
| 30 FT | 8 | 9 | 8 | 4 | 6 | 4 | 6 | 26.9 | 24.0 | 28.8 | 5 | 7.5 | 4 | 7 | 27.5 | 53 | 65 | 5 | 12 | 0 |
| 32 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 26.9 | 24.0 | 28.8 | 5 | 7.5 | 4 | 6.5 | 27.5 | 53 | 65 | 5 | 12 | 0 |
| 34 FT | 9 | 10 | 8 | 5 | 8.5 | 4 | 6.5 | 26.9 | 25.4 | 30.4 | 5 | 7 | 4 | 7.5 | 28.0 | 54 | 66 | 5 | 12 | 0 |
| 36 FT | 9 | 10 | 8 | 5 | 8.5 | 4 | 6 | 26.9 | 25.4 | 30.4 | 5 | 7 | 4 | 7 | 28.0 | 54 | 66 | 5 | 12 | 0 |
| 38 FT | 9 | 10 | 8 | 5 | 8.5 | 5 | 7 | 26.9 | 25.4 | 30.4 | 5 | 7 | 4 | 7 | 28.0 | 54 | 66 | 5 | 12 | 0 |
| 40 FT | 9 | 11 | 8 | 5 | 8.5 | 5 | 6.5 | 26.9 | 25.3 | 30.0 | 5 | 6.5 | 4 | 7 | 28.5 | 55 | 67 | 5 | 12 | 0 |
| 42 FT | 10 | 11 | 8 | 5 | 8 | 5 | 7.5 | 27.5 | 26.3 | 31.1 | 5 | 6.5 | 4 | 6.5 | 28.5 | 55 | 67 | 5 | 12 | 0 |
| 44 FT | 10 | 11 | 8 | 5 | 8 | 5 | 7.5 | 27.5 | 26.3 | 31.1 | 5 | 6.5 | 4 | 6 | 28.5 | 55 | 67 | 5 | 12 | 0 |
| 46 FT | 10 | 11 | 8 | 5 | 8 | 5 | 7.5 | 27.5 | 26.3 | 31.1 | 5 | 6.5 | 4 | 6 | 28.5 | 55 | 67 | 5 | 12 | 0 |
| 48 FT | 10 | 12 | 8 | 5 | 8 | 5 | 7.5 | 27.5 | 26.0 | 30.8 | 5 | 6 | 4 | 6 | 29.1 | 56 | 68 | 5 | 11.5 | 0 |
| 50 FT | 11 | 12 | 8 | 5 | 7.5 | 5 | 8 | 28.0 | 27.0 | 32.0 | 5 | 6 | 4 | 6 | 29.1 | 56 | 68 | 5 | 11 | 0 |

## SPAN (S) = 4 FT  HEIGHT (HT) = 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=6′ | HT=7′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=6′ | HT=7′ | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 5 | 8.5 | 4 | 10.5 | 38.6 | 26.4 | 30.1 | 5 | 9 | 4 | 7 | 38.6 | 76 | 88 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 5 | 8.5 | 4 | 10.5 | 38.6 | 26.4 | 30.1 | 5 | 8.5 | 4 | 6.5 | 38.6 | 76 | 88 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 11 | 4 | 11 | 38.6 | 24.1 | 27.5 | 4 | 9 | 4 | 8 | 38.6 | 76 | 88 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 38.6 | 24.1 | 27.5 | 4 | 10.5 | 4 | 7 | 38.6 | 76 | 88 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 38.6 | 24.1 | 27.5 | 4 | 10.5 | 4 | 7 | 38.6 | 76 | 88 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 38.6 | 24.1 | 27.5 | 4 | 11 | 4 | 7 | 38.6 | 76 | 88 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 12 | 4 | 9.5 | 38.6 | 24.1 | 27.5 | 4 | 10 | 4 | 6.5 | 38.6 | 76 | 88 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 10.5 | 4 | 8 | 38.6 | 24.1 | 27.5 | 4 | 8.5 | 4 | 6 | 38.6 | 76 | 88 | 5 | 12 | 0 |
| 16 FT | 8 | 9 | 8 | 4 | 9.5 | 4 | 7 | 38.6 | 24.4 | 27.9 | 4 | 8.5 | 4 | 6.5 | 38.6 | 77 | 89 | 5 | 12 | 0 |
| 18 FT | 8 | 9 | 8 | 4 | 8.5 | 4 | 6.5 | 38.6 | 24.4 | 27.9 | 4 | 7.5 | 4 | 6 | 38.6 | 77 | 89 | 5 | 12 | 0 |
| 20 FT | 8 | 10 | 8 | 4 | 8 | 4 | 6 | 38.6 | 24.6 | 28.1 | 4 | 7.5 | 4 | 6 | 40.9 | 78 | 90 | 5 | 11.5 | 0 |
| 22 FT | 8 | 10 | 9 | 4 | 7.5 | 4 | 6.5 | 40.5 | 24.6 | 28.1 | 4 | 7 | 4 | 7 | 39.9 | 78 | 90 | 5 | 11.5 | 0 |
| 24 FT | 8 | 10 | 9 | 4 | 7 | 4 | 6 | 39.9 | 24.6 | 28.1 | 4 | 6.5 | 4 | 6.5 | 39.9 | 78 | 90 | 5 | 11 | 0 |
| 26 FT | 8 | 10 | 9 | 4 | 6.5 | 5 | 6.5 | 39.4 | 24.6 | 28.1 | 4 | 6 | 4 | 6 | 39.9 | 78 | 90 | 5 | 10 | 0 |
| 28 FT | 8 | 10 | 9 | 4 | 6 | 5 | 6 | 38.8 | 24.6 | 28.1 | 5 | 9 | 5 | 7 | 41.6 | 78 | 90 | 5 | 9.5 | 0 |
| 30 FT | 8 | 10 | 9 | 4 | 6 | 6 | 7.5 | 41.0 | 24.6 | 28.1 | 5 | 8.5 | 5 | 6.5 | 41.6 | 78 | 90 | 5 | 9 | 0 |
| 32 FT | 8 | 10 | 9 | 4 | 6 | 6 | 7 | 40.5 | 24.6 | 28.1 | 5 | 8 | 5 | 6 | 41.6 | 78 | 90 | 5 | 8.5 | 0 |
| 34 FT | 9 | 11 | 9 | 5 | 8.5 | 5 | 6 | 41.6 | 26.1 | 29.8 | 5 | 8.5 | 5 | 6 | 41.6 | 79 | 91 | 5 | 8.5 | 0 |
| 36 FT | 9 | 11 | 9 | 5 | 8.5 | 5 | 6 | 41.6 | 26.1 | 29.8 | 5 | 8 | 5 | 6 | 41.6 | 79 | 91 | 5 | 8.5 | 0 |
| 38 FT | 9 | 11 | 9 | 5 | 8.5 | 5 | 6 | 41.6 | 26.1 | 29.8 | 5 | 7.5 | 6 | 7 | 43.9 | 79 | 91 | 5 | 8.5 | 0 |
| 40 FT | 9 | 11 | 9 | 5 | 8.5 | 5 | 6 | 41.6 | 26.1 | 29.8 | 5 | 7 | 6 | 7 | 43.9 | 79 | 91 | 5 | 8.5 | 0 |
| 42 FT | 10 | 11 | 9 | 5 | 8 | 5 | 6 | 41.6 | 30.8 | 35.0 | 5 | 7 | 6 | 6.5 | 43.9 | 79 | 91 | 5 | 8.5 | 0 |
| 44 FT | 10 | 11 | 9 | 5 | 8 | 5 | 6 | 41.6 | 30.8 | 35.0 | 5 | 6.5 | 6 | 6.5 | 43.9 | 79 | 91 | 5 | 8.5 | 0 |
| 46 FT | 10 | 11 | 10 | 5 | 8 | 5 | 6.5 | 42.9 | 26.4 | 30.0 | 5 | 6.5 | 5 | 6 | 42.9 | 79 | 91 | 5 | 8 | 0 |
| 48 FT | 10 | 11 | 10 | 5 | 8 | 5 | 6.5 | 42.9 | 30.8 | 35.0 | 5 | 6 | 6 | 7.5 | 44.6 | 79 | 91 | 5 | 8 | 0 |
| 50 FT | 11 | 12 | 11 | 5 | 7.5 | 5 | 7 | 44.3 | 27.9 | 31.6 | 5 | 6.5 | 5 | 7.5 | 43.6 | 80 | 92 | 5 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




### ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 4 FEET
HEIGHT (HT): 2 THRU 7 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 2 OF 14

## SPAN (S) = 5 FT  HEIGHT (HT) = 3 FT OR 4 FT

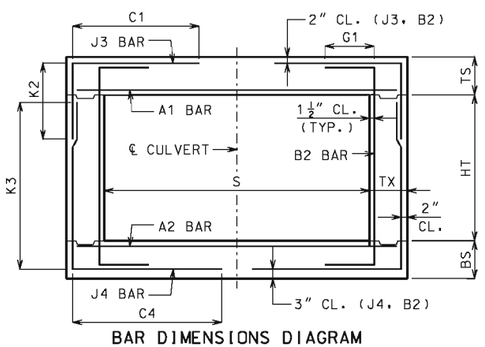
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=3′ | HT=4′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=3′ | HT=4′ | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 5 | 8 | 4 | 10.5 | 44.9 | 26.5 | 33.0 | 5 | 8.5 | 4 | 6 | 35.4 | 40 | 52 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 5 | 8 | 4 | 10.5 | 44.9 | 26.5 | 33.0 | 5 | 8 | 4 | 6 | 32.0 | 40 | 52 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 28.5 | 24.5 | 30.6 | 4 | 7.5 | 4 | 10 | 28.5 | 40 | 52 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 10 | 4 | 12 | 27.3 | 24.5 | 30.6 | 4 | 8 | 4 | 10 | 27.3 | 40 | 52 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 9.5 | 4 | 11 | 26.5 | 24.5 | 30.6 | 4 | 8 | 4 | 9.5 | 26.5 | 40 | 52 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 10 | 4 | 12 | 25.1 | 24.5 | 30.6 | 4 | 8.5 | 4 | 10.5 | 25.1 | 40 | 52 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 8.5 | 4 | 10 | 25.1 | 24.5 | 30.6 | 4 | 7 | 4 | 9 | 25.1 | 40 | 52 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 7.5 | 4 | 8.5 | 25.1 | 24.5 | 30.6 | 4 | 6 | 4 | 7.5 | 25.1 | 40 | 52 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 7.5 | 25.1 | 24.5 | 30.6 | 5 | 8.5 | 4 | 7 | 25.1 | 40 | 52 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 4 | 6 | 4 | 6.5 | 25.1 | 24.5 | 30.6 | 5 | 8 | 4 | 6 | 25.1 | 40 | 52 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 4 | 6 | 4 | 6 | 25.1 | 24.5 | 30.6 | 5 | 8 | 5 | 6.5 | 25.1 | 40 | 52 | 5 | 12 | 0 |
| 22 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 25.1 | 24.0 | 30.0 | 5 | 7.5 | 4 | 7 | 23.8 | 41 | 53 | 5 | 12 | 0 |
| 24 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6 | 25.1 | 24.0 | 30.0 | 5 | 7.5 | 4 | 6.5 | 23.8 | 41 | 53 | 5 | 12 | 0 |
| 26 FT | 9 | 10 | 8 | 5 | 8.5 | 4 | 6.5 | 24.5 | 25.0 | 31.0 | 5 | 7 | 4 | 8.5 | 23.8 | 42 | 54 | 5 | 12 | 0 |
| 28 FT | 9 | 10 | 8 | 5 | 8.5 | 4 | 6 | 24.5 | 25.0 | 31.0 | 5 | 7 | 4 | 8 | 23.8 | 42 | 54 | 5 | 12 | 0 |
| 30 FT | 9 | 11 | 8 | 5 | 8 | 5 | 6.5 | 24.5 | 25.5 | 31.5 | 5 | 6.5 | 4 | 9 | 23.1 | 43 | 55 | 5 | 12 | 0 |
| 32 FT | 10 | 11 | 8 | 5 | 8 | 4 | 6 | 23.8 | 26.0 | 32.0 | 5 | 6.5 | 4 | 8 | 23.1 | 43 | 55 | 5 | 12 | 0 |
| 34 FT | 10 | 12 | 8 | 5 | 7.5 | 5 | 7.5 | 23.8 | 26.5 | 32.5 | 5 | 6 | 4 | 9 | 22.5 | 44 | 56 | 5 | 12 | 0 |
| 36 FT | 10 | 12 | 8 | 5 | 7 | 5 | 7.5 | 23.8 | 26.5 | 32.5 | 5 | 6 | 4 | 8.5 | 22.5 | 44 | 56 | 5 | 12 | 0 |
| 38 FT | 11 | 12 | 8 | 5 | 7 | 4 | 6 | 23.8 | 27.0 | 33.0 | 5 | 6 | 4 | 8 | 23.1 | 44 | 56 | 5 | 12 | 0 |
| 40 FT | 11 | 13 | 8 | 5 | 6.5 | 5 | 8.5 | 23.8 | 27.5 | 33.5 | 5 | 6 | 4 | 8.5 | 22.5 | 45 | 57 | 5 | 12 | 0 |
| 42 FT | 12 | 13 | 8 | 5 | 6.5 | 4 | 6 | 23.1 | 28.0 | 34.0 | 5 | 6 | 4 | 8 | 23.1 | 45 | 57 | 5 | 12 | 0 |
| 44 FT | 12 | 13 | 8 | 5 | 6.5 | 5 | 9 | 23.1 | 28.0 | 34.0 | 5 | 6 | 4 | 7.5 | 23.1 | 45 | 57 | 5 | 12 | 0 |
| 46 FT | 12 | 14 | 8 | 5 | 6 | 5 | 8.5 | 23.8 | 28.5 | 34.5 | 6 | 8 | 4 | 7.5 | 22.5 | 46 | 58 | 5 | 12 | 0 |
| 48 FT | 13 | 14 | 8 | 5 | 6 | 4 | 6 | 23.1 | 29.0 | 35.0 | 6 | 8 | 4 | 7.5 | 23.1 | 46 | 58 | 5 | 12 | 0 |
| 50 FT | 13 | 14 | 8 | 5 | 6 | 5 | 8.5 | 23.1 | 29.0 | 35.0 | 6 | 8 | 4 | 7.5 | 23.1 | 46 | 58 | 5 | 12 | 0 |

## SPAN (S) = 5 FT  HEIGHT (HT) = 5 FT OR 6 FT

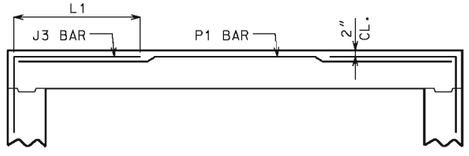
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=5′ | HT=6′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=5′ | HT=6′ | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 5 | 8 | 4 | 10.5 | 44.9 | 26.3 | 30.6 | 5 | 8 | 4 | 6 | 44.9 | 64 | 76 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 5 | 8 | 4 | 10.5 | 44.9 | 26.3 | 30.6 | 5 | 8 | 4 | 6 | 44.9 | 64 | 76 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 8 | 4 | 11 | 44.9 | 24.1 | 28.3 | 4 | 7 | 4 | 8.5 | 44.9 | 64 | 76 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 9 | 4 | 10.5 | 39.5 | 24.1 | 28.3 | 4 | 7.5 | 4 | 8 | 38.1 | 64 | 76 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 9 | 4 | 10 | 34.6 | 24.1 | 28.3 | 4 | 7 | 4 | 7.5 | 34.6 | 64 | 76 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 9.5 | 4 | 11 | 30.6 | 24.1 | 28.3 | 4 | 8 | 4 | 8 | 30.6 | 64 | 76 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 8 | 4 | 9 | 29.9 | 24.1 | 28.3 | 4 | 6.5 | 4 | 7.5 | 30.6 | 64 | 76 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 7 | 4 | 8 | 29.9 | 24.1 | 28.3 | 4 | 6 | 4 | 6.5 | 29.9 | 64 | 76 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 4 | 6 | 4 | 7 | 29.3 | 24.1 | 28.3 | 5 | 8 | 4 | 6 | 29.9 | 64 | 76 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 4 | 6 | 4 | 6 | 29.3 | 24.1 | 28.3 | 5 | 8 | 5 | 6.5 | 29.9 | 64 | 76 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 4 | 6 | 5 | 6.5 | 29.3 | 24.1 | 28.3 | 5 | 8 | 5 | 6 | 29.9 | 64 | 76 | 5 | 12 | 0 |
| 22 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6 | 29.3 | 24.5 | 28.5 | 5 | 7.5 | 4 | 6 | 29.9 | 65 | 77 | 5 | 12 | 0 |
| 24 FT | 8 | 9 | 8 | 5 | 9 | 6 | 7.5 | 32.0 | 28.1 | 32.8 | 5 | 7.5 | 5 | 6.5 | 29.9 | 65 | 77 | 5 | 12 | 0 |
| 26 FT | 9 | 10 | 8 | 5 | 8.5 | 5 | 6.5 | 29.3 | 25.1 | 29.3 | 5 | 7 | 4 | 6 | 30.6 | 66 | 78 | 5 | 12 | 0 |
| 28 FT | 9 | 10 | 8 | 5 | 8 | 5 | 6.5 | 29.3 | 25.1 | 29.3 | 5 | 7 | 5 | 7 | 29.9 | 66 | 78 | 5 | 12 | 0 |
| 30 FT | 9 | 10 | 8 | 5 | 7.5 | 5 | 6.5 | 29.3 | 29.6 | 34.4 | 5 | 6.5 | 5 | 6.5 | 29.9 | 66 | 78 | 5 | 12 | 0 |
| 32 FT | 10 | 11 | 8 | 5 | 7.5 | 5 | 7 | 29.3 | 26.6 | 30.8 | 5 | 6.5 | 5 | 7.5 | 30.6 | 67 | 79 | 5 | 12 | 0 |
| 34 FT | 10 | 11 | 8 | 5 | 7.5 | 5 | 6.5 | 29.3 | 26.6 | 30.8 | 5 | 6.5 | 5 | 7 | 30.6 | 67 | 79 | 5 | 11.5 | 0 |
| 36 FT | 10 | 11 | 8 | 5 | 7 | 5 | 6.5 | 29.3 | 30.4 | 35.3 | 5 | 6 | 5 | 6 | 30.6 | 67 | 79 | 5 | 11 | 0 |
| 38 FT | 11 | 12 | 8 | 5 | 7 | 5 | 7 | 29.9 | 27.3 | 31.5 | 5 | 6 | 5 | 7 | 31.3 | 68 | 80 | 5 | 10 | 0 |
| 40 FT | 11 | 12 | 8 | 5 | 6.5 | 5 | 6.5 | 29.9 | 31.3 | 36.0 | 5 | 6 | 5 | 6.5 | 31.3 | 68 | 80 | 5 | 10 | 0 |
| 42 FT | 11 | 13 | 8 | 5 | 6.5 | 5 | 6 | 29.9 | 27.6 | 31.9 | 5 | 6 | 5 | 7 | 31.3 | 69 | 81 | 5 | 9.5 | 0 |
| 44 FT | 12 | 13 | 8 | 5 | 6.5 | 5 | 6.5 | 29.9 | 28.0 | 32.3 | 5 | 6 | 5 | 6.5 | 32.0 | 69 | 81 | 5 | 9.5 | 0 |
| 46 FT | 12 | 13 | 8 | 5 | 6 | 5 | 6 | 29.9 | 32.0 | 36.8 | 5 | 6 | 5 | 6 | 31.3 | 69 | 81 | 5 | 9.5 | 0 |
| 48 FT | 12 | 14 | 9 | 5 | 6 | 5 | 7 | 30.4 | 28.4 | 32.5 | 6 | 8 | 5 | 8 | 31.8 | 70 | 82 | 5 | 9.5 | 0 |
| 50 FT | 13 | 14 | 9 | 5 | 6 | 5 | 7.5 | 30.4 | 29.5 | 33.9 | 6 | 8 | 5 | 7.5 | 32.4 | 70 | 82 | 5 | 9 | 0 |

## SPAN (S) = 5 FT  HEIGHT (HT) = 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=7′ | HT=8′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=7′ | HT=8′ | SIZE | SPA. | G1 |
| 1 FT | 10 | 9 | 8 | 5 | 8 | 4 | 9.5 | 44.9 | 26.5 | 29.8 | 5 | 7.5 | 4 | 7 | 44.9 | 89 | 101 | 5 | 12 | 12 |
| 2 FT | 10 | 9 | 8 | 5 | 8 | 4 | 8.5 | 44.9 | 26.5 | 29.8 | 5 | 7.5 | 4 | 6.5 | 44.9 | 89 | 101 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 7.5 | 4 | 7.5 | 44.9 | 24.8 | 27.9 | 4 | 6.5 | 4 | 6 | 44.9 | 88 | 100 | 5 | 12 | 0 |
| 6 FT | 8 | 9 | 8 | 4 | 9 | 4 | 7.5 | 44.9 | 24.0 | 27.0 | 4 | 7.5 | 4 | 6.5 | 44.9 | 89 | 101 | 5 | 12 | 0 |
| 8 FT | 8 | 9 | 8 | 4 | 9 | 4 | 7 | 44.9 | 24.0 | 27.0 | 4 | 7.5 | 4 | 6 | 44.9 | 89 | 101 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 8 | 4 | 10 | 4 | 7.5 | 44.9 | 24.0 | 27.0 | 4 | 8 | 4 | 6.5 | 44.9 | 89 | 101 | 5 | 12 | 0 |
| 12 FT | 8 | 10 | 8 | 4 | 8.5 | 4 | 6.5 | 44.9 | 24.3 | 27.3 | 4 | 8 | 4 | 6.5 | 44.9 | 90 | 102 | 5 | 12 | 0 |
| 14 FT | 8 | 10 | 9 | 4 | 7.5 | 4 | 6.5 | 41.4 | 24.3 | 27.3 | 4 | 7 | 4 | 7 | 45.5 | 90 | 102 | 5 | 12 | 0 |
| 16 FT | 8 | 10 | 9 | 4 | 6.5 | 4 | 6 | 40.8 | 24.3 | 27.3 | 4 | 6 | 4 | 6.5 | 45.5 | 90 | 102 | 5 | 11.5 | 0 |
| 18 FT | 8 | 10 | 9 | 4 | 6 | 5 | 6.5 | 40.0 | 24.3 | 27.3 | 5 | 9 | 4 | 6 | 45.5 | 90 | 102 | 5 | 10.5 | 0 |
| 20 FT | 8 | 10 | 9 | 4 | 6 | 5 | 6 | 39.4 | 25.3 | 28.4 | 5 | 8 | 5 | 6.5 | 47.6 | 90 | 102 | 5 | 10 | 0 |
| 22 FT | 8 | 10 | 9 | 4 | 6 | 6 | 7 | 42.1 | 25.3 | 28.4 | 5 | 7.5 | 5 | 6 | 47.6 | 90 | 102 | 5 | 9 | 0 |
| 24 FT | 9 | 11 | 9 | 5 | 8.5 | 5 | 6 | 41.4 | 26.8 | 30.0 | 5 | 7.5 | 5 | 6 | 47.6 | 91 | 103 | 5 | 8.5 | 0 |
| 26 FT | 9 | 11 | 9 | 5 | 8.5 | 5 | 6 | 41.4 | 26.8 | 30.0 | 5 | 7 | 6 | 7.5 | 49.6 | 91 | 103 | 5 | 8.5 | 0 |
| 28 FT | 9 | 11 | 9 | 5 | 8.5 | 5 | 6 | 41.4 | 29.8 | 33.3 | 5 | 6.5 | 6 | 7 | 49.6 | 91 | 103 | 5 | 8.5 | 0 |
| 30 FT | 9 | 11 | 9 | 5 | 8 | 5 | 6 | 40.8 | 29.8 | 33.3 | 5 | 6.5 | 6 | 6.5 | 49.6 | 91 | 103 | 5 | 8.5 | 0 |
| 32 FT | 10 | 11 | 9 | 5 | 8 | 5 | 6 | 46.3 | 30.0 | 33.6 | 5 | 6.5 | 6 | 6 | 49.6 | 91 | 103 | 5 | 8.5 | 0 |
| 34 FT | 10 | 11 | 9 | 5 | 7.5 | 5 | 6 | 45.5 | 30.0 | 33.6 | 5 | 6 | 6 | 6 | 49.6 | 91 | 103 | 5 | 8.5 | 0 |
| 36 FT | 10 | 12 | 10 | 5 | 7 | 5 | 6.5 | 40.6 | 30.3 | 33.9 | 5 | 6 | 5 | 6 | 49.0 | 92 | 104 | 5 | 8 | 0 |
| 38 FT | 11 | 12 | 10 | 5 | 7.5 | 5 | 6 | 43.4 | 31.6 | 35.4 | 5 | 6 | 6 | 7 | 51.1 | 92 | 104 | 5 | 8 | 0 |
| 40 FT | 11 | 12 | 11 | 5 | 7.5 | 5 | 7 | 41.1 | 31.6 | 35.4 | 5 | 6 | 5 | 6.5 | 49.8 | 92 | 104 | 5 | 7.5 | 0 |
| 42 FT | 11 | 13 | 11 | 5 | 7 | 5 | 7 | 41.1 | 31.9 | 35.6 | 5 | 6 | 5 | 6.5 | 49.8 | 93 | 105 | 5 | 7.5 | 0 |
| 44 FT | 12 | 13 | 11 | 5 | 7 | 5 | 6.5 | 43.3 | 32.3 | 36.0 | 5 | 6 | 5 | 6 | 49.8 | 93 | 105 | 5 | 7.5 | 0 |
| 46 FT | 12 | 13 | 11 | 5 | 7 | 5 | 6 | 43.3 | 32.3 | 36.0 | 5 | 6 | 5 | 6 | 49.8 | 93 | 105 | 5 | 7.5 | 0 |
| 48 FT | 12 | 14 | 12 | 5 | 6.5 | 5 | 6.5 | 41.0 | 32.5 | 36.3 | 6 | 8 | 5 | 6.5 | 51.1 | 94 | 106 | 5 | 7 | 0 |
| 50 FT | 13 | 14 | 12 | 5 | 6.5 | 5 | 6.5 | 43.3 | 33.9 | 37.8 | 6 | 8 | 5 | 6.5 | 51.1 | 94 | 106 | 5 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 5 FEET
HEIGHT (HT): 3 THRU 8 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 3 OF 14

## SPAN (S) = 6 FT  HEIGHT (HT) = 3 FT OR 4 FT OR 5 FT

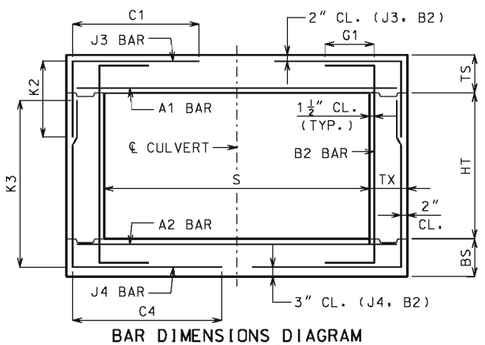
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | | | | C4 | K3 | | | | | |
| | | | | | | | | | HT=3′ | HT=4′ | HT=5′ | | | | | HT=3′ | HT=4′ | HT=5′ | | | |
| 1 FT | 10 | 8 | 8 | 5 | 8 | 4 | 9 | 51.3 | 26.5 | 33.0 | 39.4 | 5 | 8 | 5 | 6 | 41.6 | 40 | 52 | 64 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 5 | 7.5 | 4 | 9.5 | 51.3 | 27.0 | 33.5 | 40.0 | 5 | 8 | 6 | 7.5 | 36.0 | 40 | 52 | 64 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 7.5 | 32.8 | 24.5 | 30.6 | 36.9 | 5 | 8.5 | 4 | 6.5 | 32.0 | 40 | 52 | 64 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 7 | 4 | 8 | 30.4 | 24.5 | 30.6 | 36.9 | 5 | 9 | 4 | 7 | 30.4 | 40 | 52 | 64 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 7.5 | 29.6 | 24.5 | 30.6 | 36.9 | 5 | 8.5 | 4 | 6.5 | 29.6 | 40 | 52 | 64 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 4 | 7 | 4 | 8 | 27.3 | 24.5 | 30.6 | 36.9 | 4 | 6 | 4 | 7 | 27.3 | 40 | 52 | 64 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 4 | 6 | 4 | 7 | 27.3 | 24.5 | 30.6 | 36.9 | 5 | 8 | 4 | 6 | 27.3 | 40 | 52 | 64 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 4 | 6 | 4 | 6 | 27.3 | 24.5 | 30.6 | 36.9 | 5 | 8 | 5 | 6 | 27.3 | 40 | 52 | 64 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 4 | 6 | 5 | 6 | 27.3 | 28.3 | 35.4 | 42.6 | 5 | 8 | 6 | 7 | 30.4 | 40 | 52 | 64 | 5 | 12 | 0 |
| 18 FT | 8 | 9 | 8 | 5 | 8.5 | 6 | 7.5 | 30.4 | 24.0 | 30.0 | 36.0 | 5 | 7.5 | 4 | 6 | 26.4 | 41 | 53 | 65 | 5 | 12 | 0 |
| 20 FT | 8 | 9 | 8 | 5 | 7.5 | 6 | 7.5 | 30.4 | 28.4 | 35.4 | 42.5 | 5 | 7 | 5 | 6.5 | 26.4 | 41 | 53 | 65 | 5 | 12 | 0 |
| 22 FT | 9 | 10 | 8 | 5 | 7.5 | 5 | 6.5 | 26.4 | 25.0 | 31.0 | 37.0 | 5 | 7 | 4 | 6.5 | 25.6 | 42 | 54 | 66 | 5 | 12 | 0 |
| 24 FT | 9 | 11 | 8 | 5 | 7 | 5 | 6.5 | 26.4 | 25.5 | 31.5 | 37.5 | 5 | 6.5 | 4 | 7 | 24.8 | 43 | 55 | 67 | 5 | 12 | 0 |
| 26 FT | 10 | 11 | 8 | 5 | 7 | 5 | 7.5 | 26.4 | 26.0 | 32.0 | 38.0 | 5 | 6.5 | 4 | 6.5 | 25.6 | 43 | 55 | 67 | 5 | 12 | 0 |
| 28 FT | 10 | 12 | 8 | 5 | 6.5 | 5 | 7.5 | 26.4 | 26.5 | 32.5 | 38.5 | 5 | 6 | 4 | 7 | 24.8 | 44 | 56 | 68 | 5 | 12 | 0 |
| 30 FT | 11 | 12 | 8 | 5 | 6.5 | 5 | 8.5 | 25.6 | 27.0 | 33.0 | 39.0 | 5 | 6 | 4 | 6 | 24.8 | 44 | 56 | 68 | 5 | 12 | 0 |
| 32 FT | 11 | 13 | 8 | 5 | 6 | 5 | 8 | 25.6 | 27.5 | 33.5 | 39.5 | 5 | 6 | 4 | 7 | 24.8 | 45 | 57 | 69 | 5 | 12 | 0 |
| 34 FT | 12 | 13 | 8 | 5 | 6 | 5 | 8.5 | 25.6 | 28.0 | 34.0 | 40.0 | 5 | 6 | 4 | 6 | 24.8 | 45 | 57 | 69 | 5 | 12 | 0 |
| 36 FT | 12 | 14 | 8 | 6 | 8 | 5 | 8.5 | 25.6 | 28.5 | 34.5 | 40.5 | 6 | 8 | 4 | 6.5 | 24.8 | 46 | 58 | 70 | 5 | 12 | 0 |
| 38 FT | 13 | 14 | 8 | 6 | 8 | 5 | 8.5 | 24.8 | 29.0 | 35.0 | 41.0 | 6 | 8 | 4 | 6 | 24.8 | 46 | 58 | 70 | 5 | 12 | 0 |
| 40 FT | 13 | 14 | 8 | 6 | 7.5 | 5 | 8.5 | 24.8 | 29.0 | 35.0 | 41.0 | 6 | 7.5 | 5 | 9 | 24.8 | 46 | 58 | 70 | 5 | 12 | 0 |
| 42 FT | 14 | 15 | 8 | 6 | 8 | 5 | 8.5 | 24.8 | 30.0 | 36.0 | 42.0 | 6 | 7.5 | 4 | 6 | 24.8 | 47 | 59 | 71 | 5 | 12 | 0 |
| 44 FT | 14 | 15 | 8 | 6 | 7.5 | 5 | 8.5 | 24.8 | 30.0 | 36.0 | 42.0 | 6 | 7.5 | 5 | 8.5 | 24.8 | 47 | 59 | 71 | 5 | 12 | 0 |
| 46 FT | 14 | 16 | 8 | 6 | 7 | 5 | 8.5 | 24.8 | 30.5 | 36.5 | 42.5 | 6 | 7 | 4 | 6 | 24.8 | 48 | 60 | 72 | 5 | 12 | 0 |
| 48 FT | 15 | 16 | 8 | 6 | 7 | 5 | 8 | 29.6 | 31.0 | 37.0 | 43.0 | 6 | 7 | 5 | 8 | 25.6 | 48 | 60 | 72 | 5 | 12 | 0 |
| 50 FT | 15 | 16 | 8 | 6 | 7 | 5 | 8 | 29.6 | 31.0 | 37.0 | 43.0 | 6 | 7 | 5 | 8 | 24.8 | 48 | 60 | 72 | 5 | 12 | 0 |

## SPAN (S) = 6 FT  HEIGHT (HT) = 6 FT OR 7 FT

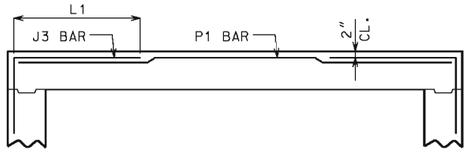
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | | | | C4 | K3 | | | | | |
| | | | | | | | | | HT=6′ | HT=7′ | | | | | | HT=6′ | HT=7′ | | | | |
| 1 FT | 10 | 8 | 8 | 5 | 8 | 4 | 9.5 | 51.3 | 26.4 | 30.1 | 5 | 8 | 5 | 6 | 52.8 | 76 | 88 | 5 | 12 | 12 | |
| 2 FT | 11 | 9 | 8 | 5 | 7.5 | 4 | 9.5 | 51.3 | 27.9 | 31.6 | 5 | 7.5 | 4 | 6.5 | 51.3 | 77 | 89 | 5 | 12 | 12 | |
| 4 FT | 8 | 8 | 8 | 4 | 6 | 4 | 7 | 51.3 | 24.1 | 27.5 | 5 | 8 | 4 | 6 | 51.3 | 76 | 88 | 5 | 12 | 0 | |
| 6 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 7.5 | 42.4 | 24.1 | 27.5 | 5 | 8 | 4 | 6 | 41.6 | 76 | 88 | 5 | 12 | 0 | |
| 8 FT | 8 | 8 | 8 | 4 | 6.5 | 4 | 7 | 38.4 | 24.1 | 27.5 | 5 | 8 | 5 | 6.5 | 38.4 | 76 | 88 | 5 | 12 | 0 | |
| 10 FT | 8 | 8 | 8 | 4 | 7 | 4 | 7.5 | 32.8 | 24.1 | 27.5 | 5 | 8.5 | 4 | 6 | 33.6 | 76 | 88 | 5 | 12 | 0 | |
| 12 FT | 8 | 9 | 8 | 4 | 6 | 4 | 6 | 32.8 | 24.4 | 27.9 | 5 | 8 | 4 | 7 | 33.6 | 77 | 89 | 5 | 12 | 0 | |
| 14 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 32.0 | 24.4 | 27.9 | 5 | 7.5 | 4 | 6 | 32.8 | 77 | 89 | 5 | 12 | 0 | |
| 16 FT | 8 | 9 | 8 | 4 | 6 | 6 | 7.5 | 35.3 | 28.5 | 32.6 | 5 | 7.5 | 5 | 6.5 | 32.8 | 77 | 89 | 5 | 12 | 0 | |
| 18 FT | 8 | 9 | 8 | 5 | 8.5 | 6 | 7.5 | 34.4 | 28.5 | 32.6 | 5 | 7.5 | 6 | 7.5 | 35.3 | 77 | 89 | 5 | 12 | 0 | |
| 20 FT | 8 | 9 | 8 | 5 | 7.5 | 6 | 7.5 | 34.4 | 28.5 | 32.6 | 5 | 6.5 | 6 | 7 | 35.3 | 77 | 89 | 5 | 12 | 0 | |
| 22 FT | 9 | 10 | 8 | 5 | 7.5 | 5 | 6 | 32.0 | 25.8 | 29.4 | 5 | 7 | 5 | 6 | 32.8 | 78 | 90 | 5 | 12 | 0 | |
| 24 FT | 9 | 11 | 8 | 5 | 7 | 6 | 7 | 34.4 | 29.6 | 33.6 | 5 | 6.5 | 5 | 6.5 | 32.8 | 79 | 91 | 5 | 12 | 0 | |
| 26 FT | 10 | 11 | 8 | 5 | 6.5 | 5 | 6 | 32.0 | 30.8 | 35.0 | 5 | 6.5 | 5 | 6 | 32.8 | 79 | 91 | 5 | 11 | 0 | |
| 28 FT | 10 | 12 | 8 | 5 | 6.5 | 6 | 7 | 34.4 | 30.3 | 34.4 | 5 | 6 | 5 | 6.5 | 33.6 | 80 | 92 | 5 | 10.5 | 0 | |
| 30 FT | 11 | 12 | 8 | 5 | 6.5 | 5 | 6 | 32.0 | 31.5 | 35.8 | 5 | 6 | 5 | 6 | 33.6 | 80 | 92 | 5 | 9.5 | 0 | |
| 32 FT | 11 | 13 | 8 | 5 | 6 | 6 | 7 | 35.3 | 31.9 | 36.0 | 5 | 6 | 5 | 6 | 33.6 | 81 | 93 | 5 | 9.5 | 0 | |
| 34 FT | 11 | 13 | 8 | 6 | 7.5 | 6 | 6.5 | 35.3 | 31.9 | 36.0 | 5 | 6 | 5 | 6 | 33.6 | 81 | 93 | 5 | 9.5 | 0 | |
| 36 FT | 12 | 13 | 8 | 6 | 8 | 6 | 7 | 35.3 | 32.3 | 36.4 | 6 | 8 | 6 | 7 | 36.8 | 81 | 93 | 5 | 9.5 | 0 | |
| 38 FT | 12 | 14 | 8 | 6 | 8 | 6 | 6.5 | 35.3 | 32.5 | 36.8 | 6 | 8 | 5 | 6 | 34.4 | 82 | 94 | 5 | 9.5 | 0 | |
| 40 FT | 13 | 14 | 9 | 6 | 8 | 5 | 6 | 32.4 | 33.9 | 38.1 | 6 | 8 | 5 | 6.5 | 34.0 | 82 | 94 | 5 | 8.5 | 0 | |
| 42 FT | 13 | 15 | 10 | 6 | 8 | 5 | 7 | 32.8 | 33.3 | 37.5 | 6 | 7.5 | 5 | 7.5 | 34.5 | 83 | 95 | 5 | 9 | 0 | |
| 44 FT | 14 | 15 | 10 | 6 | 8 | 5 | 7.5 | 32.8 | 34.5 | 38.9 | 6 | 7.5 | 5 | 7.5 | 34.5 | 83 | 95 | 5 | 8.5 | 0 | |
| 46 FT | 14 | 16 | 11 | 6 | 7.5 | 5 | 7 | 33.3 | 34.9 | 39.3 | 6 | 7 | 5 | 7 | 34.9 | 84 | 96 | 5 | 9 | 0 | |
| 48 FT | 14 | 16 | 11 | 6 | 7.5 | 5 | 6.5 | 33.3 | 34.9 | 39.3 | 6 | 7 | 5 | 7 | 34.9 | 84 | 96 | 5 | 9 | 0 | |
| 50 FT | 15 | 16 | 11 | 6 | 7.5 | 5 | 7 | 38.1 | 35.3 | 39.6 | 6 | 7 | 5 | 7 | 34.9 | 84 | 96 | 5 | 8.5 | 0 | |

## SPAN (S) = 6 FT  HEIGHT (HT) = 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | | | | C4 | K3 | | | | |
| | | | | | | | | | HT=8′ | HT=9′ | | | | | | HT=8′ | HT=9′ | | | |
| 1 FT | 10 | 10 | 8 | 5 | 8 | 4 | 7 | 51.3 | 26.6 | 29.5 | 5 | 7 | 4 | 6.5 | 51.3 | 102 | 114 | 5 | 12 | 12 |
| 2 FT | 11 | 10 | 8 | 5 | 7.5 | 4 | 7 | 51.3 | 28.0 | 31.0 | 5 | 7 | 4 | 6 | 51.3 | 102 | 114 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 9 | 4 | 6 | 4 | 6.5 | 51.9 | 24.9 | 27.6 | 5 | 8 | 4 | 6.5 | 51.9 | 101 | 113 | 5 | 12 | 0 |
| 6 FT | 8 | 9 | 9 | 4 | 6.5 | 4 | 6.5 | 51.9 | 24.9 | 27.6 | 5 | 8.5 | 4 | 6 | 51.9 | 101 | 113 | 5 | 12 | 0 |
| 8 FT | 8 | 10 | 9 | 4 | 6.5 | 4 | 6 | 51.9 | 25.1 | 27.9 | 4 | 6 | 4 | 6 | 51.9 | 102 | 114 | 5 | 11.5 | 0 |
| 10 FT | 8 | 10 | 9 | 4 | 7.5 | 4 | 6.5 | 45.4 | 25.1 | 27.9 | 4 | 6.5 | 4 | 6.5 | 51.9 | 102 | 114 | 5 | 12 | 0 |
| 12 FT | 8 | 10 | 9 | 4 | 6 | 5 | 6.5 | 43.8 | 25.1 | 27.9 | 5 | 8.5 | 4 | 6 | 51.9 | 102 | 114 | 5 | 11.5 | 0 |
| 14 FT | 8 | 10 | 9 | 4 | 6 | 5 | 6 | 42.1 | 26.1 | 29.0 | 5 | 7.5 | 5 | 6.5 | 54.3 | 102 | 114 | 5 | 10 | 0 |
| 16 FT | 8 | 10 | 9 | 4 | 6 | 6 | 7 | 44.5 | 28.4 | 31.5 | 5 | 7 | 5 | 6 | 54.3 | 102 | 114 | 5 | 9.5 | 0 |
| 18 FT | 8 | 10 | 9 | 5 | 9 | 6 | 7 | 43.8 | 29.4 | 32.6 | 5 | 7 | 6 | 7 | 55.9 | 102 | 114 | 5 | 8.5 | 0 |
| 20 FT | 9 | 10 | 9 | 5 | 8.5 | 5 | 6 | 43.8 | 29.8 | 33.0 | 5 | 7 | 6 | 6.5 | 56.8 | 102 | 114 | 5 | 8.5 | 0 |
| 22 FT | 9 | 11 | 9 | 5 | 8 | 5 | 6 | 42.9 | 30.0 | 33.3 | 5 | 6.5 | 6 | 6.5 | 55.9 | 103 | 115 | 5 | 8.5 | 0 |
| 24 FT | 10 | 11 | 9 | 5 | 7.5 | 5 | 6 | 45.4 | 30.3 | 33.5 | 5 | 6.5 | 6 | 6 | 55.9 | 103 | 115 | 5 | 8.5 | 0 |
| 26 FT | 10 | 11 | 9 | 5 | 7 | 5 | 6 | 44.5 | 30.3 | 33.5 | 5 | 6 | 6 | 6 | 55.9 | 103 | 115 | 5 | 8.5 | 0 |
| 28 FT | 10 | 12 | 9 | 5 | 6.5 | 6 | 7 | 47.0 | 31.6 | 35.0 | 5 | 6 | 6 | 6 | 55.9 | 104 | 116 | 5 | 8 | 0 |
| 30 FT | 11 | 12 | 9 | 5 | 6.5 | 6 | 6.5 | 49.4 | 35.4 | 39.0 | 5 | 6 | 6 | 6 | 55.9 | 104 | 116 | 5 | 8 | 0 |
| 32 FT | 11 | 13 | 10 | 5 | 6.5 | 6 | 8 | 46.8 | 32.3 | 35.5 | 5 | 6 | 6 | 6.5 | 56.6 | 105 | 117 | 5 | 8 | 0 |
| 34 FT | 12 | 13 | 11 | 5 | 6.5 | 5 | 6.5 | 44.0 | 32.5 | 35.9 | 5 | 6 | 5 | 6 | 49.8 | 105 | 117 | 5 | 7.5 | 0 |
| 36 FT | 12 | 13 | 11 | 5 | 6 | 5 | 6.5 | 44.0 | 32.5 | 35.9 | 6 | 8 | 6 | 7.5 | 52.3 | 105 | 117 | 5 | 7.5 | 0 |
| 38 FT | 12 | 14 | 12 | 5 | 6 | 5 | 6 | 42.0 | 32.8 | 36.1 | 6 | 8 | 5 | 6 | 48.8 | 106 | 118 | 5 | 7 | 0 |
| 40 FT | 13 | 14 | 12 | 5 | 6 | 5 | 6 | 44.5 | 33.0 | 36.4 | 6 | 8 | 5 | 6 | 48.8 | 106 | 118 | 5 | 7 | 0 |
| 42 FT | 13 | 15 | 12 | 5 | 6 | 5 | 6 | 43.6 | 33.4 | 36.6 | 6 | 7.5 | 5 | 6 | 52.1 | 107 | 119 | 5 | 7 | 0 |
| 44 FT | 14 | 15 | 13 | 5 | 6 | 5 | 6 | 44.3 | 34.8 | 38.3 | 6 | 7.5 | 5 | 6 | 48.5 | 107 | 119 | 5 | 6.5 | 0 |
| 46 FT | 14 | 15 | 13 | 6 | 8 | 5 | 6 | 44.3 | 34.8 | 38.3 | 6 | 7.5 | 6 | 8 | 51.0 | 107 | 119 | 5 | 6.5 | 0 |
| 48 FT | 14 | 16 | 13 | 6 | 8 | 5 | 6 | 44.3 | 35.1 | 38.6 | 6 | 7 | 5 | 6 | 50.1 | 108 | 120 | 5 | 6.5 | 0 |
| 50 FT | 15 | 16 | 13 | 6 | 8 | 5 | 6 | 51.0 | 35.4 | 38.9 | 6 | 7 | 6 | 8 | 53.5 | 108 | 120 | 5 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




### ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 6 FEET
HEIGHT (HT): 3 THRU 9 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 4 OF 14

## SPAN (S) = 7 FT  HEIGHT (HT) = 4 FT OR 5 FT OR 6 FT

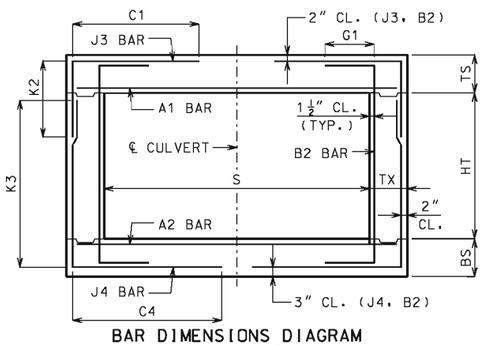
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | | | | C4 | K3 | | | | | |
| | | | | | | | | | HT=4′ | HT=5′ | HT=6′ | | | | | HT=4′ | HT=5′ | HT=6′ | | | |
| 1 FT | 11 | 9 | 8 | 5 | 7.5 | 4 | 9 | 57.0 | 27.1 | 32.3 | 37.4 | 5 | 7.5 | 4 | 6 | 54.3 | 53 | 65 | 77 | 5 | 12 | 12 |
| 2 FT | 11 | 9 | 8 | 5 | 7.5 | 4 | 9 | 57.0 | 27.1 | 32.3 | 37.4 | 5 | 7.5 | 5 | 7 | 43.3 | 53 | 65 | 77 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 4 | 6 | 4 | 6 | 36.8 | 24.3 | 29.1 | 34.0 | 5 | 8 | 5 | 6 | 35.9 | 52 | 64 | 76 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 4 | 6 | 4 | 6 | 33.1 | 24.3 | 29.1 | 34.0 | 5 | 8 | 5 | 6 | 33.1 | 52 | 64 | 76 | 5 | 12 | 0 |
| 8 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 32.3 | 24.0 | 28.8 | 33.6 | 5 | 7.5 | 4 | 6.5 | 32.3 | 53 | 65 | 77 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 8 | 4 | 6 | 4 | 6 | 30.4 | 24.0 | 28.8 | 33.6 | 5 | 7.5 | 4 | 7.5 | 29.5 | 53 | 65 | 77 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6 | 30.4 | 24.0 | 28.8 | 33.6 | 5 | 7.5 | 4 | 6 | 28.5 | 53 | 65 | 77 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 8 | 5 | 8 | 6 | 7.5 | 33.1 | 28.3 | 33.9 | 39.5 | 5 | 7 | 5 | 6.5 | 28.5 | 53 | 65 | 77 | 5 | 12 | 0 |
| 16 FT | 8 | 9 | 8 | 5 | 7 | 6 | 7 | 33.1 | 28.3 | 33.9 | 39.5 | 5 | 6.5 | 6 | 7.5 | 31.3 | 53 | 65 | 77 | 5 | 12 | 0 |
| 18 FT | 9 | 10 | 8 | 5 | 7 | 5 | 6.5 | 28.5 | 25.4 | 30.4 | 35.3 | 5 | 6 | 5 | 7 | 28.5 | 54 | 66 | 78 | 5 | 12 | 0 |
| 20 FT | 9 | 10 | 8 | 5 | 6 | 5 | 6 | 28.5 | 29.1 | 34.8 | 40.4 | 6 | 8 | 5 | 6 | 27.6 | 54 | 66 | 78 | 5 | 12 | 0 |
| 22 FT | 10 | 11 | 8 | 5 | 6 | 5 | 7 | 28.5 | 26.3 | 31.1 | 36.1 | 6 | 8 | 5 | 7.5 | 27.6 | 55 | 67 | 79 | 5 | 12 | 0 |
| 24 FT | 10 | 12 | 8 | 6 | 8 | 5 | 6 | 28.5 | 26.0 | 30.8 | 35.6 | 6 | 8 | 5 | 8.5 | 26.6 | 56 | 68 | 80 | 5 | 12 | 0 |
| 26 FT | 11 | 13 | 8 | 6 | 8 | 5 | 7 | 27.6 | 27.5 | 32.4 | 37.3 | 6 | 8 | 5 | 8.5 | 26.6 | 57 | 69 | 81 | 5 | 12 | 0 |
| 28 FT | 12 | 13 | 8 | 6 | 7.5 | 5 | 8 | 27.6 | 28.5 | 33.6 | 38.6 | 6 | 7.5 | 5 | 8.5 | 27.6 | 57 | 69 | 81 | 5 | 12 | 0 |
| 30 FT | 12 | 14 | 8 | 6 | 7.5 | 5 | 7 | 27.6 | 28.3 | 33.3 | 38.1 | 6 | 7.5 | 5 | 8.5 | 26.6 | 58 | 70 | 82 | 5 | 12 | 0 |
| 32 FT | 13 | 14 | 8 | 6 | 7 | 5 | 8 | 26.6 | 29.4 | 34.5 | 39.5 | 6 | 7 | 5 | 8.5 | 27.6 | 58 | 70 | 82 | 5 | 12 | 0 |
| 34 FT | 13 | 15 | 8 | 6 | 7 | 5 | 7 | 27.6 | 29.1 | 34.0 | 39.0 | 6 | 7 | 5 | 8.5 | 26.6 | 59 | 71 | 83 | 5 | 12 | 0 |
| 36 FT | 14 | 15 | 8 | 6 | 6.5 | 5 | 7.5 | 26.6 | 30.3 | 35.3 | 40.4 | 6 | 7 | 5 | 8.5 | 27.6 | 59 | 71 | 83 | 5 | 12 | 0 |
| 38 FT | 14 | 16 | 8 | 6 | 6.5 | 5 | 7 | 26.6 | 30.6 | 35.8 | 40.8 | 6 | 7 | 5 | 8 | 26.6 | 60 | 72 | 84 | 5 | 11.5 | 0 |
| 40 FT | 15 | 16 | 8 | 6 | 6.5 | 5 | 7.5 | 32.3 | 31.1 | 36.1 | 41.1 | 6 | 6.5 | 5 | 8 | 27.6 | 60 | 72 | 84 | 5 | 10.5 | 0 |
| 42 FT | 15 | 17 | 8 | 6 | 6 | 5 | 7 | 32.3 | 35.3 | 40.9 | 46.5 | 6 | 6.5 | 5 | 7 | 27.6 | 61 | 73 | 85 | 5 | 10 | 0 |
| 44 FT | 16 | 17 | 8 | 6 | 6 | 5 | 7 | 32.3 | 36.5 | 42.3 | 48.0 | 6 | 6.5 | 5 | 7 | 27.6 | 61 | 73 | 85 | 5 | 9.5 | 0 |
| 46 FT | 16 | 18 | 8 | 6 | 6 | 5 | 6 | 32.3 | 36.3 | 41.9 | 47.5 | 6 | 6.5 | 5 | 6.5 | 27.6 | 62 | 74 | 86 | 5 | 9.5 | 0 |
| 48 FT | 17 | 18 | 9 | 6 | 6 | 5 | 7.5 | 32.5 | 33.5 | 38.8 | 43.9 | 6 | 6.5 | 5 | 8 | 27.9 | 62 | 74 | 86 | 5 | 10 | 0 |
| 50 FT | 17 | 19 | 9 | 6 | 6 | 5 | 7 | 32.5 | 37.1 | 42.8 | 48.4 | 6 | 6 | 5 | 7.5 | 27.9 | 63 | 75 | 87 | 5 | 9 | 0 |

## SPAN (S) = 7 FT  HEIGHT (HT) = 7 FT OR 8 FT

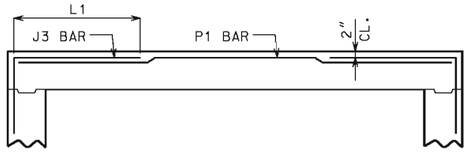
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | | | | C4 | K3 | | | | | |
| | | | | | | | | | HT=7′ | HT=8′ | | | | | | HT=7′ | HT=8′ | | | | |
| 1 FT | 11 | 9 | 8 | 5 | 7.5 | 4 | 8 | 57.0 | 27.8 | 31.1 | 5 | 7.5 | 5 | 6.5 | 58.9 | 89 | 101 | 5 | 12 | 12 | |
| 2 FT | 11 | 9 | 8 | 5 | 7.5 | 4 | 7.5 | 57.0 | 27.8 | 31.1 | 5 | 7.5 | 5 | 6 | 58.9 | 89 | 101 | 5 | 12 | 12 | |
| 4 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 58.9 | 24.0 | 27.0 | 5 | 7.5 | 4 | 6 | 57.0 | 89 | 101 | 5 | 12 | 0 | |
| 6 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 46.0 | 25.0 | 28.1 | 5 | 7.5 | 5 | 6.5 | 50.6 | 89 | 101 | 5 | 12 | 0 | |
| 8 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6 | 41.4 | 25.0 | 28.1 | 5 | 7.5 | 5 | 6.5 | 44.1 | 89 | 101 | 5 | 12 | 0 | |
| 10 FT | 8 | 9 | 8 | 4 | 6 | 5 | 6.5 | 35.9 | 25.0 | 28.1 | 5 | 7.5 | 5 | 6.5 | 36.8 | 89 | 101 | 5 | 12 | 0 | |
| 12 FT | 8 | 9 | 8 | 4 | 6 | 6 | 7.5 | 38.6 | 28.8 | 32.4 | 5 | 7.5 | 5 | 6 | 36.8 | 89 | 101 | 5 | 12 | 0 | |
| 14 FT | 8 | 9 | 8 | 5 | 8 | 6 | 7.5 | 37.8 | 28.8 | 32.4 | 5 | 7 | 6 | 6.5 | 38.6 | 89 | 101 | 5 | 12 | 0 | |
| 16 FT | 8 | 9 | 8 | 5 | 7 | 6 | 7 | 37.8 | 32.6 | 36.8 | 5 | 6 | 6 | 6 | 38.6 | 89 | 101 | 5 | 12 | 0 | |
| 18 FT | 9 | 10 | 8 | 5 | 6.5 | 6 | 7 | 37.8 | 29.4 | 33.0 | 5 | 6 | 6 | 6.5 | 38.6 | 90 | 102 | 5 | 12 | 0 | |
| 20 FT | 9 | 10 | 8 | 5 | 6 | 6 | 7 | 36.8 | 33.4 | 37.4 | 6 | 7.5 | 6 | 6 | 38.6 | 90 | 102 | 5 | 11 | 0 | |
| 22 FT | 10 | 11 | 9 | 5 | 6 | 5 | 6 | 34.4 | 30.0 | 33.6 | 6 | 8 | 5 | 6 | 35.4 | 91 | 103 | 5 | 12 | 0 | |
| 24 FT | 10 | 12 | 9 | 6 | 8.5 | 5 | 6 | 34.4 | 30.3 | 33.9 | 6 | 8 | 5 | 6.5 | 36.3 | 92 | 104 | 5 | 11 | 0 | |
| 26 FT | 11 | 13 | 9 | 6 | 8 | 6 | 7.5 | 38.1 | 31.9 | 35.6 | 6 | 8 | 5 | 6.5 | 36.3 | 93 | 105 | 5 | 10 | 0 | |
| 28 FT | 11 | 13 | 9 | 6 | 7 | 6 | 7 | 37.3 | 31.9 | 35.6 | 6 | 7.5 | 5 | 6 | 36.3 | 93 | 105 | 5 | 9.5 | 0 | |
| 30 FT | 12 | 13 | 9 | 6 | 7.5 | 6 | 7.5 | 37.3 | 33.3 | 37.1 | 6 | 7 | 6 | 7.5 | 39.0 | 93 | 105 | 5 | 8.5 | 0 | |
| 32 FT | 12 | 14 | 9 | 6 | 6.5 | 6 | 6.5 | 37.3 | 32.5 | 36.3 | 6 | 7 | 5 | 6 | 36.3 | 94 | 106 | 5 | 8.5 | 0 | |
| 34 FT | 13 | 14 | 9 | 6 | 7 | 6 | 7 | 38.1 | 33.9 | 37.8 | 6 | 7 | 6 | 7 | 39.0 | 94 | 106 | 5 | 8.5 | 0 | |
| 36 FT | 14 | 15 | 10 | 6 | 7 | 5 | 6.5 | 34.8 | 34.5 | 38.4 | 6 | 7 | 5 | 7 | 36.6 | 95 | 107 | 5 | 8 | 0 | |
| 38 FT | 14 | 16 | 11 | 6 | 7 | 5 | 6.5 | 36.1 | 34.9 | 38.8 | 6 | 7 | 5 | 7 | 37.0 | 96 | 108 | 5 | 8.5 | 0 | |
| 40 FT | 15 | 16 | 11 | 6 | 7 | 5 | 6.5 | 40.9 | 35.3 | 39.0 | 6 | 7 | 5 | 7 | 37.0 | 96 | 108 | 5 | 8 | 0 | |
| 42 FT | 15 | 17 | 11 | 6 | 6.5 | 5 | 6 | 40.9 | 35.5 | 39.4 | 6 | 7 | 5 | 7 | 37.0 | 97 | 109 | 5 | 7.5 | 0 | |
| 44 FT | 16 | 17 | 12 | 6 | 6.5 | 5 | 6.5 | 41.3 | 37.0 | 40.9 | 6 | 6.5 | 5 | 6.5 | 37.5 | 97 | 109 | 5 | 8 | 0 | |
| 46 FT | 16 | 18 | 12 | 6 | 6.5 | 5 | 6.5 | 41.3 | 36.1 | 40.0 | 6 | 6.5 | 5 | 6.5 | 37.5 | 98 | 110 | 5 | 8 | 0 | |
| 48 FT | 17 | 18 | 12 | 6 | 6.5 | 5 | 6.5 | 41.3 | 37.6 | 41.6 | 6 | 6.5 | 5 | 6.5 | 38.4 | 98 | 110 | 5 | 7.5 | 0 | |
| 50 FT | 17 | 18 | 12 | 6 | 6 | 5 | 6 | 41.3 | 37.6 | 41.6 | 6 | 6 | 5 | 6.5 | 38.4 | 98 | 110 | 5 | 7 | 0 | |

## SPAN (S) = 7 FT  HEIGHT (HT) = 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | | | | C4 | K3 | | | | |
| | | | | | | | | | HT=9′ | HT=10′ | | | | | | HT=9′ | HT=10′ | | | |
| 1 FT | 11 | 10 | 8 | 5 | 7.5 | 4 | 6 | 57.0 | 27.3 | 29.9 | 5 | 7 | 5 | 6.5 | 58.9 | 114 | 126 | 5 | 12 | 12 |
| 2 FT | 11 | 10 | 8 | 5 | 7.5 | 5 | 8.5 | 58.9 | 28.5 | 31.3 | 5 | 7 | 5 | 6 | 58.9 | 114 | 126 | 5 | 11 | 12 |
| 4 FT | 8 | 9 | 9 | 4 | 6 | 5 | 6 | 59.5 | 28.8 | 31.6 | 5 | 7.5 | 5 | 6 | 59.5 | 113 | 125 | 5 | 10.5 | 0 |
| 6 FT | 8 | 10 | 9 | 4 | 6 | 5 | 6 | 59.5 | 29.0 | 31.9 | 5 | 7 | 5 | 6.5 | 59.5 | 114 | 126 | 5 | 10 | 0 |
| 8 FT | 8 | 10 | 9 | 4 | 6 | 6 | 7 | 62.3 | 29.0 | 31.9 | 5 | 7 | 5 | 6 | 59.5 | 114 | 126 | 5 | 9 | 0 |
| 10 FT | 8 | 10 | 9 | 4 | 6 | 5 | 6 | 46.5 | 26.6 | 29.3 | 5 | 7.5 | 5 | 6 | 59.5 | 114 | 126 | 5 | 10 | 0 |
| 12 FT | 8 | 11 | 9 | 4 | 6 | 6 | 7 | 47.4 | 25.6 | 28.1 | 5 | 7 | 5 | 6 | 59.5 | 115 | 127 | 5 | 9 | 0 |
| 14 FT | 8 | 11 | 9 | 5 | 8.5 | 6 | 7 | 46.5 | 29.3 | 32.1 | 5 | 6.5 | 6 | 7 | 62.3 | 115 | 127 | 5 | 8.5 | 0 |
| 16 FT | 9 | 11 | 9 | 5 | 8 | 5 | 6 | 46.5 | 29.5 | 32.4 | 5 | 6.5 | 6 | 6.5 | 62.3 | 115 | 127 | 5 | 8.5 | 0 |
| 18 FT | 9 | 11 | 9 | 5 | 7 | 6 | 7 | 48.4 | 30.8 | 33.8 | 5 | 6.5 | 6 | 6 | 64.1 | 115 | 127 | 5 | 8.5 | 0 |
| 20 FT | 10 | 11 | 9 | 5 | 7 | 6 | 7.5 | 50.3 | 31.0 | 34.0 | 5 | 6 | 6 | 6 | 60.5 | 115 | 127 | 5 | 8.5 | 0 |
| 22 FT | 10 | 12 | 9 | 5 | 6.5 | 6 | 6.5 | 49.3 | 31.3 | 34.3 | 5 | 6 | 6 | 6 | 62.3 | 116 | 128 | 5 | 8 | 0 |
| 24 FT | 11 | 12 | 9 | 5 | 6 | 6 | 7 | 51.1 | 35.3 | 38.6 | 6 | 8.5 | 6 | 6 | 64.1 | 116 | 128 | 5 | 7.5 | 0 |
| 26 FT | 11 | 13 | 10 | 5 | 6 | 6 | 7.5 | 48.9 | 33.0 | 36.1 | 5 | 6 | 6 | 6.5 | 60.1 | 117 | 129 | 5 | 8 | 0 |
| 28 FT | 12 | 13 | 11 | 5 | 6 | 5 | 6.5 | 45.6 | 32.0 | 35.0 | 6 | 8 | 6 | 7 | 54.1 | 117 | 129 | 5 | 7.5 | 0 |
| 30 FT | 12 | 14 | 11 | 6 | 8 | 5 | 6 | 45.6 | 32.3 | 35.3 | 6 | 8 | 6 | 7 | 56.0 | 118 | 130 | 5 | 7.5 | 0 |
| 32 FT | 13 | 14 | 12 | 6 | 8 | 5 | 6 | 46.1 | 33.8 | 36.9 | 6 | 7.5 | 6 | 8 | 52.8 | 118 | 130 | 5 | 7 | 0 |
| 34 FT | 13 | 15 | 12 | 6 | 8 | 5 | 6 | 45.1 | 34.0 | 37.1 | 6 | 7.5 | 6 | 8 | 55.6 | 119 | 131 | 5 | 7 | 0 |
| 36 FT | 14 | 15 | 12 | 6 | 7.5 | 6 | 8 | 49.9 | 35.6 | 38.9 | 6 | 7.5 | 6 | 7.5 | 54.8 | 119 | 131 | 5 | 7 | 0 |
| 38 FT | 14 | 16 | 13 | 6 | 7.5 | 5 | 6 | 45.6 | 34.6 | 37.8 | 6 | 7 | 6 | 8 | 54.4 | 120 | 132 | 5 | 6.5 | 0 |
| 40 FT | 15 | 16 | 13 | 6 | 7.5 | 6 | 8 | 55.3 | 36.1 | 39.4 | 6 | 7 | 6 | 7.5 | 54.4 | 120 | 132 | 5 | 6.5 | 0 |
| 42 FT | 15 | 17 | 13 | 6 | 7 | 6 | 7.5 | 55.3 | 36.5 | 39.8 | 6 | 7 | 6 | 7.5 | 56.3 | 121 | 133 | 5 | 6.5 | 0 |
| 44 FT | 16 | 17 | 14 | 6 | 7 | 6 | 8 | 55.9 | 38.1 | 41.5 | 6 | 7 | 6 | 7.5 | 53.9 | 121 | 133 | 5 | 6 | 0 |
| 46 FT | 16 | 17 | 14 | 6 | 7 | 6 | 7.5 | 55.9 | 38.1 | 41.5 | 6 | 6.5 | 6 | 7 | 53.9 | 121 | 133 | 5 | 6 | 0 |
| 48 FT | 16 | 18 | 14 | 6 | 6.5 | 6 | 7 | 55.9 | 37.0 | 40.3 | 6 | 6.5 | 6 | 7.5 | 55.9 | 122 | 134 | 5 | 6 | 0 |
| 50 FT | 17 | 18 | 15 | 6 | 6.5 | 6 | 8 | 56.4 | 41.4 | 45.0 | 6 | 6.5 | 6 | 7.5 | 53.5 | 122 | 134 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 7 FEET
HEIGHT (HT): 4 THRU 10 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 5 OF 14

## SPAN (S) = 8 FT  HEIGHT (HT) = 4 FT OR 5 FT OR 6 FT

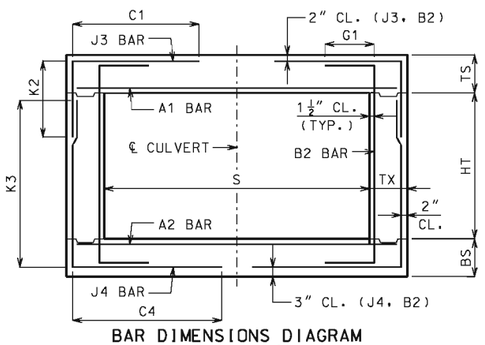
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | | A2 BARS | | J4 BARS | | | K3 | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=4′ | HT=5′ | HT=6′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=4′ | HT=5′ | HT=6′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 9 | 8 | 5 | 7 | 4 | 8.5 | 63.5 | 28.1 | 33.5 | 38.8 | 5 | 7.5 | 5 | 6 | 44.8 | 53 | 65 | 77 | 5 | 12 | 12 |
| 2 FT | 12 | 9 | 8 | 5 | 7 | 4 | 8 | 63.5 | 28.1 | 33.5 | 38.8 | 5 | 7 | 6 | 7.5 | 43.6 | 53 | 65 | 77 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 5 | 8 | 6 | 7.5 | 38.5 | 32.5 | 39.0 | 45.6 | 5 | 6.5 | 6 | 6 | 38.5 | 52 | 64 | 76 | 5 | 12 | 0 |
| 6 FT | 8 | 8 | 8 | 5 | 8.5 | 6 | 7.5 | 37.5 | 32.5 | 39.0 | 45.6 | 5 | 7 | 6 | 6 | 36.4 | 52 | 64 | 76 | 5 | 12 | 0 |
| 8 FT | 8 | 8 | 8 | 5 | 8 | 6 | 7.5 | 36.4 | 32.5 | 39.0 | 45.6 | 5 | 6.5 | 6 | 6 | 35.4 | 52 | 64 | 76 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 5 | 8.5 | 6 | 7.5 | 34.4 | 32.5 | 39.0 | 45.6 | 5 | 7 | 6 | 6 | 34.4 | 52 | 64 | 76 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 8 | 5 | 7.5 | 6 | 7.5 | 34.4 | 32.4 | 38.9 | 45.4 | 5 | 6.5 | 6 | 7.5 | 32.3 | 53 | 65 | 77 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 8 | 5 | 6.5 | 6 | 6.5 | 34.4 | 32.4 | 38.9 | 45.4 | 6 | 8 | 6 | 7 | 32.3 | 53 | 65 | 77 | 5 | 12 | 0 |
| 16 FT | 9 | 10 | 8 | 5 | 6 | 5 | 6 | 30.1 | 29.1 | 34.8 | 40.4 | 6 | 8 | 5 | 6.5 | 28.1 | 54 | 66 | 78 | 5 | 12 | 0 |
| 18 FT | 9 | 11 | 8 | 6 | 7.5 | 6 | 7 | 33.3 | 29.6 | 35.3 | 40.9 | 6 | 7.5 | 5 | 7.5 | 27.0 | 55 | 67 | 79 | 5 | 12 | 0 |
| 20 FT | 10 | 12 | 8 | 6 | 7.5 | 5 | 6 | 29.1 | 26.0 | 30.8 | 35.6 | 6 | 7.5 | 5 | 8.5 | 26.0 | 56 | 68 | 80 | 5 | 12 | 0 |
| 22 FT | 11 | 13 | 8 | 6 | 7 | 5 | 6.5 | 28.1 | 27.5 | 32.4 | 37.3 | 6 | 7 | 5 | 8.5 | 26.0 | 57 | 69 | 81 | 5 | 12 | 0 |
| 24 FT | 12 | 13 | 8 | 6 | 7 | 5 | 7.5 | 27.0 | 32.6 | 38.4 | 44.1 | 6 | 7 | 5 | 8 | 26.0 | 57 | 69 | 81 | 5 | 12 | 0 |
| 26 FT | 13 | 14 | 8 | 6 | 7 | 5 | 8 | 27.0 | 29.4 | 34.5 | 39.5 | 6 | 7 | 5 | 8.5 | 26.0 | 58 | 70 | 82 | 5 | 12 | 0 |
| 28 FT | 13 | 15 | 8 | 6 | 6.5 | 5 | 7 | 27.0 | 29.1 | 34.0 | 39.0 | 6 | 6.5 | 5 | 8.5 | 26.0 | 59 | 71 | 83 | 5 | 12 | 0 |
| 30 FT | 14 | 15 | 8 | 6 | 6 | 5 | 7.5 | 26.0 | 30.3 | 35.3 | 40.4 | 6 | 6.5 | 5 | 8.5 | 26.0 | 59 | 71 | 83 | 5 | 12 | 0 |
| 32 FT | 15 | 16 | 8 | 6 | 6 | 5 | 7.5 | 31.3 | 35.5 | 41.3 | 47.0 | 6 | 6.5 | 5 | 8 | 26.0 | 60 | 72 | 84 | 5 | 12 | 0 |
| 34 FT | 15 | 17 | 8 | 6 | 6 | 5 | 7 | 31.3 | 31.5 | 36.5 | 41.6 | 6 | 6.5 | 5 | 7 | 26.0 | 61 | 73 | 85 | 5 | 12 | 0 |
| 36 FT | 16 | 17 | 8 | 6 | 6 | 5 | 7 | 31.3 | 32.6 | 37.9 | 43.0 | 6 | 6 | 5 | 7 | 26.0 | 61 | 73 | 85 | 5 | 12 | 0 |
| 38 FT | 16 | 18 | 8 | 7 | 7.5 | 5 | 7 | 31.3 | 36.3 | 41.9 | 47.5 | 6 | 6 | 5 | 6.5 | 26.0 | 62 | 74 | 86 | 5 | 11.5 | 0 |
| 40 FT | 17 | 18 | 8 | 7 | 7.5 | 5 | 6.5 | 31.3 | 37.5 | 43.3 | 49.0 | 6 | 6 | 5 | 6.5 | 26.0 | 62 | 74 | 86 | 5 | 10.5 | 0 |
| 42 FT | 17 | 19 | 8 | 7 | 7 | 5 | 6.5 | 31.3 | 37.1 | 42.8 | 48.4 | 6 | 6 | 5 | 6.5 | 26.0 | 63 | 75 | 87 | 5 | 10 | 0 |
| 44 FT | 18 | 19 | 8 | 7 | 7 | 5 | 6.5 | 30.1 | 38.4 | 44.1 | 49.9 | 7 | 7.5 | 5 | 6.5 | 26.0 | 63 | 75 | 87 | 5 | 9.5 | 0 |
| 46 FT | 18 | 20 | 8 | 7 | 7 | 5 | 6 | 31.3 | 38.1 | 43.8 | 49.4 | 7 | 7.5 | 5 | 6 | 26.0 | 64 | 76 | 88 | 5 | 9.5 | 0 |
| 48 FT | 19 | 20 | 8 | 7 | 7 | 5 | 6 | 31.3 | 39.4 | 45.1 | 50.9 | 7 | 7.5 | 5 | 6 | 26.0 | 64 | 76 | 88 | 5 | 9.5 | 0 |
| 50 FT | 19 | 20 | 8 | 7 | 6.5 | 5 | 6 | 31.3 | 39.4 | 45.1 | 50.9 | 7 | 7 | 6 | 7.5 | 29.1 | 64 | 76 | 88 | 5 | 9.5 | 0 |

## SPAN (S) = 8 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

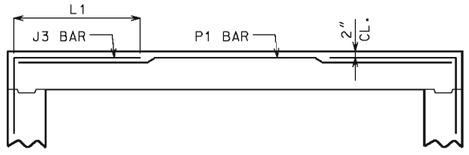
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | K2 | | | A2 BARS | | J4 BARS | | | K3 | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=7′ | HT=8′ | HT=9′ | | SIZE | SPA. | SIZE | SPA. | C4 | HT=7′ | HT=8′ | HT=9′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 10 | 8 | 5 | 7 | 4 | 6.5 | 63.5 | 28.3 | 31.6 | 35.0 | | 5 | 7 | 5 | 6.5 | 65.5 | 90 | 102 | 114 | 5 | 12 | 12 |
| 2 FT | 12 | 10 | 8 | 5 | 7 | 4 | 6 | 63.5 | 28.3 | 31.6 | 35.0 | | 5 | 7 | 5 | 6.5 | 65.5 | 90 | 102 | 114 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 8 | 5 | 7.5 | 6 | 7.5 | 66.5 | 28.8 | 32.4 | 36.0 | | 5 | 6.5 | 6 | 6.5 | 66.5 | 89 | 101 | 113 | 5 | 12 | 0 |
| 6 FT | 8 | 9 | 8 | 5 | 8 | 6 | 7.5 | 53.0 | 28.8 | 32.4 | 36.0 | | 5 | 7 | 6 | 6.5 | 58.3 | 89 | 101 | 113 | 5 | 12 | 0 |
| 8 FT | 8 | 9 | 8 | 5 | 7.5 | 6 | 7.5 | 47.9 | 28.8 | 32.4 | 36.0 | | 5 | 6.5 | 6 | 6 | 51.0 | 89 | 101 | 113 | 5 | 11.5 | 0 |
| 10 FT | 8 | 9 | 8 | 5 | 8 | 6 | 7.5 | 41.6 | 28.8 | 32.4 | 36.0 | | 5 | 7 | 6 | 6 | 43.6 | 89 | 101 | 113 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 9 | 5 | 7.5 | 6 | 7 | 41.0 | 32.6 | 36.8 | 40.8 | | 5 | 6.5 | 6 | 6.5 | 42.0 | 89 | 101 | 113 | 5 | 12 | 0 |
| 14 FT | 8 | 10 | 9 | 5 | 6.5 | 6 | 6.5 | 41.0 | 28.1 | 31.6 | 35.1 | | 5 | 6 | 6 | 7 | 42.0 | 90 | 102 | 114 | 5 | 12 | 0 |
| 16 FT | 9 | 10 | 9 | 5 | 6 | 6 | 7.5 | 41.0 | 29.4 | 33.0 | 36.6 | | 6 | 7.5 | 6 | 6.5 | 42.0 | 90 | 102 | 114 | 5 | 12 | 0 |
| 18 FT | 9 | 11 | 9 | 6 | 8 | 6 | 6.5 | 39.9 | 29.8 | 33.3 | 36.9 | | 6 | 7.5 | 6 | 7 | 42.0 | 91 | 103 | 115 | 5 | 11 | 0 |
| 20 FT | 10 | 11 | 9 | 6 | 7.5 | 6 | 7 | 39.9 | 30.0 | 33.6 | 37.3 | | 6 | 6.5 | 6 | 6 | 42.0 | 91 | 103 | 115 | 5 | 10 | 0 |
| 22 FT | 11 | 12 | 9 | 6 | 7.5 | 6 | 7 | 39.9 | 31.6 | 35.4 | 39.0 | | 6 | 7 | 6 | 6.5 | 42.0 | 92 | 104 | 116 | 5 | 9 | 0 |
| 24 FT | 11 | 13 | 9 | 6 | 6.5 | 6 | 6.5 | 39.9 | 31.9 | 35.6 | 39.4 | | 6 | 6.5 | 6 | 7 | 42.0 | 93 | 105 | 117 | 5 | 8.5 | 0 |
| 26 FT | 12 | 14 | 10 | 6 | 7 | 5 | 6 | 38.1 | 32.5 | 36.3 | 40.0 | | 6 | 7 | 5 | 6.5 | 39.3 | 94 | 106 | 118 | 5 | 9 | 0 |
| 28 FT | 13 | 15 | 10 | 6 | 7 | 6 | 7.5 | 40.3 | 33.1 | 36.9 | 40.6 | | 6 | 7 | 5 | 6.5 | 39.3 | 95 | 107 | 119 | 5 | 8 | 0 |
| 30 FT | 13 | 15 | 10 | 6 | 6.5 | 6 | 6.5 | 40.3 | 33.1 | 36.9 | 40.6 | | 6 | 6.5 | 5 | 6 | 39.3 | 95 | 107 | 119 | 5 | 8 | 0 |
| 32 FT | 14 | 16 | 11 | 6 | 6.5 | 6 | 8.5 | 40.6 | 34.9 | 38.8 | 42.5 | | 6 | 6.5 | 5 | 7 | 39.6 | 96 | 108 | 120 | 5 | 8 | 0 |
| 34 FT | 15 | 17 | 11 | 6 | 6.5 | 6 | 8 | 47.1 | 35.5 | 39.4 | 43.3 | | 6 | 6.5 | 5 | 7 | 39.6 | 97 | 109 | 121 | 5 | 7.5 | 0 |
| 36 FT | 15 | 17 | 11 | 6 | 6 | 6 | 7 | 47.1 | 35.5 | 39.4 | 43.3 | | 6 | 6 | 5 | 6.5 | 39.6 | 97 | 109 | 121 | 5 | 7.5 | 0 |
| 38 FT | 16 | 18 | 12 | 6 | 6 | 6 | 8 | 47.5 | 36.1 | 40.0 | 43.9 | | 6 | 6 | 5 | 6.5 | 40.0 | 98 | 110 | 122 | 5 | 7.5 | 0 |
| 40 FT | 17 | 18 | 12 | 6 | 6 | 6 | 8 | 47.5 | 37.6 | 41.6 | 45.5 | | 6 | 6 | 5 | 6.5 | 40.0 | 98 | 110 | 122 | 5 | 7 | 0 |
| 42 FT | 17 | 19 | 12 | 7 | 8 | 6 | 7.5 | 47.5 | 38.0 | 41.9 | 45.9 | | 6 | 6 | 5 | 6.5 | 41.0 | 99 | 111 | 123 | 5 | 7 | 0 |
| 44 FT | 18 | 19 | 13 | 7 | 8 | 5 | 6 | 44.8 | 38.3 | 42.3 | 46.3 | | 6 | 6 | 5 | 6 | 40.4 | 99 | 111 | 123 | 5 | 7 | 0 |
| 46 FT | 18 | 20 | 13 | 7 | 7.5 | 6 | 8 | 48.0 | 38.6 | 42.6 | 46.5 | | 7 | 8 | 5 | 6 | 41.4 | 100 | 112 | 124 | 5 | 6.5 | 0 |
| 48 FT | 19 | 20 | 13 | 7 | 7.5 | 6 | 8 | 48.0 | 40.1 | 44.3 | 48.3 | | 7 | 7.5 | 5 | 6 | 41.4 | 100 | 112 | 124 | 5 | 6.5 | 0 |
| 50 FT | 19 | 21 | 13 | 7 | 7 | 6 | 7 | 48.0 | 39.3 | 43.3 | 47.3 | | 7 | 7.5 | 5 | 6 | 41.4 | 101 | 113 | 125 | 5 | 6.5 | 0 |

## SPAN (S) = 8 FT  HEIGHT (HT) = 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=10′ | HT=11′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=10′ | HT=11′ | SIZE | SPA. | G1 |
| 1 FT | 11 | 10 | 8 | 5 | 6.5 | 5 | 7.5 | 65.5 | 31.3 | 34.0 | 5 | 6.5 | 6 | 6.5 | 66.5 | 126 | 138 | 5 | 9.5 | 12 |
| 2 FT | 11 | 10 | 8 | 5 | 6.5 | 5 | 7 | 65.5 | 31.3 | 34.0 | 5 | 6 | 6 | 6 | 66.5 | 126 | 138 | 5 | 9.5 | 12 |
| 4 FT | 8 | 9 | 9 | 5 | 7.5 | 6 | 7 | 68.3 | 33.0 | 36.0 | 5 | 6 | 6 | 6 | 68.3 | 125 | 137 | 5 | 8.5 | 0 |
| 6 FT | 8 | 10 | 9 | 5 | 8.5 | 6 | 7 | 68.3 | 30.6 | 33.4 | 5 | 7 | 6 | 6.5 | 68.3 | 126 | 138 | 5 | 8.5 | 0 |
| 8 FT | 8 | 10 | 9 | 5 | 8 | 6 | 7 | 68.3 | 33.3 | 36.3 | 5 | 7 | 6 | 6 | 68.3 | 126 | 138 | 5 | 8.5 | 0 |
| 10 FT | 8 | 10 | 9 | 5 | 8.5 | 6 | 7 | 52.5 | 30.6 | 33.4 | 5 | 7 | 6 | 6 | 68.3 | 126 | 138 | 5 | 8.5 | 0 |
| 12 FT | 8 | 10 | 9 | 5 | 7.5 | 6 | 6.5 | 50.4 | 33.3 | 36.3 | 5 | 6.5 | 6 | 6 | 65.1 | 126 | 138 | 5 | 8.5 | 0 |
| 14 FT | 9 | 11 | 9 | 5 | 7 | 6 | 7 | 52.5 | 31.0 | 33.8 | 5 | 6.5 | 6 | 6 | 69.3 | 127 | 139 | 5 | 8.5 | 0 |
| 16 FT | 9 | 11 | 9 | 5 | 6 | 6 | 6 | 50.4 | 33.8 | 36.8 | 6 | 8 | 6 | 6 | 64.0 | 127 | 139 | 5 | 8.5 | 0 |
| 18 FT | 10 | 12 | 9 | 5 | 6 | 6 | 6 | 52.5 | 34.3 | 37.3 | 6 | 8 | 6 | 6 | 68.3 | 128 | 140 | 5 | 8 | 0 |
| 20 FT | 11 | 12 | 10 | 5 | 6 | 5 | 6 | 48.8 | 31.8 | 34.5 | 6 | 7.5 | 6 | 6.5 | 58.3 | 128 | 140 | 5 | 8 | 0 |
| 22 FT | 11 | 13 | 10 | 6 | 8 | 6 | 7 | 50.9 | 33.4 | 36.3 | 6 | 7.5 | 6 | 6.5 | 60.4 | 129 | 141 | 5 | 7.5 | 0 |
| 24 FT | 12 | 13 | 11 | 6 | 7.5 | 6 | 8 | 51.4 | 33.6 | 36.5 | 6 | 7 | 6 | 7 | 56.8 | 129 | 141 | 5 | 7.5 | 0 |
| 26 FT | 12 | 14 | 11 | 6 | 7 | 6 | 7.5 | 50.3 | 33.9 | 36.8 | 6 | 7 | 6 | 7 | 57.8 | 130 | 142 | 5 | 7.5 | 0 |
| 28 FT | 13 | 15 | 12 | 6 | 7.5 | 6 | 8 | 50.8 | 34.4 | 37.3 | 6 | 7 | 6 | 7.5 | 57.3 | 131 | 143 | 5 | 7 | 0 |
| 30 FT | 14 | 15 | 12 | 6 | 7 | 6 | 7.5 | 51.9 | 36.0 | 39.0 | 6 | 6.5 | 6 | 7 | 57.3 | 131 | 143 | 5 | 7 | 0 |
| 32 FT | 14 | 16 | 13 | 6 | 7 | 6 | 8 | 51.3 | 36.3 | 39.3 | 6 | 6.5 | 6 | 7.5 | 56.6 | 132 | 144 | 5 | 6.5 | 0 |
| 34 FT | 15 | 16 | 13 | 6 | 6.5 | 6 | 7.5 | 57.8 | 36.5 | 39.5 | 6 | 6.5 | 6 | 7 | 55.6 | 132 | 144 | 5 | 6.5 | 0 |
| 36 FT | 15 | 17 | 13 | 6 | 6.5 | 6 | 6.5 | 57.8 | 36.8 | 39.8 | 6 | 6.5 | 6 | 7 | 57.8 | 133 | 145 | 5 | 6.5 | 0 |
| 38 FT | 16 | 18 | 14 | 6 | 6.5 | 6 | 7.5 | 58.3 | 37.3 | 40.3 | 6 | 6.5 | 6 | 7.5 | 57.3 | 134 | 146 | 5 | 6 | 0 |
| 40 FT | 16 | 18 | 14 | 6 | 6 | 6 | 7 | 58.3 | 37.3 | 40.3 | 6 | 6 | 6 | 7 | 57.3 | 134 | 146 | 5 | 6 | 0 |
| 42 FT | 17 | 19 | 15 | 6 | 6 | 6 | 7 | 58.9 | 42.3 | 45.6 | 6 | 6 | 6 | 7.5 | 56.6 | 135 | 147 | 6 | 8 | 0 |
| 44 FT | 17 | 19 | 15 | 6 | 6 | 6 | 6.5 | 57.8 | 42.3 | 45.6 | 6 | 6 | 6 | 7 | 56.6 | 135 | 147 | 6 | 8 | 0 |
| 46 FT | 18 | 19 | 15 | 6 | 6 | 6 | 7 | 58.9 | 42.5 | 45.9 | 7 | 8 | 6 | 6 | 56.6 | 135 | 147 | 6 | 8 | 0 |
| 48 FT | 18 | 20 | 16 | 7 | 8 | 6 | 7 | 58.3 | 42.9 | 46.3 | 7 | 8 | 6 | 7 | 56.0 | 136 | 148 | 6 | 8 | 0 |
| 50 FT | 19 | 21 | 16 | 7 | 7.5 | 6 | 7 | 59.4 | 43.4 | 46.8 | 7 | 8 | 6 | 7 | 58.3 | 137 | 149 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 8 FEET
HEIGHT (HT): 4 THRU 11 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 6 OF 14

## SPAN (S) = 9 FT  HEIGHT (HT) = 5 FT OR 6 FT OR 7 FT

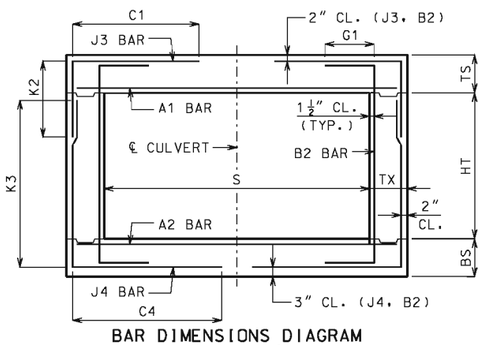
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | | A2 BARS | | J4 BARS | | | K3 | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=5′ | HT=6′ | HT=7′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=5′ | HT=6′ | HT=7′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 9 | 8 | 5 | 6.5 | 4 | 7 | 69.6 | 28.1 | 32.5 | 37.0 | 5 | 6.5 | 6 | 7.5 | 54.5 | 65 | 77 | 89 | 5 | 12 | 12 |
| 2 FT | 12 | 9 | 8 | 5 | 6.5 | 4 | 7 | 69.6 | 28.1 | 32.5 | 37.0 | 5 | 6 | 6 | 7 | 48.8 | 65 | 77 | 89 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 8 | 5 | 6.5 | 6 | 7 | 42.9 | 32.4 | 37.8 | 43.3 | 5 | 6 | 6 | 7.5 | 42.9 | 65 | 77 | 89 | 5 | 12 | 0 |
| 6 FT | 8 | 9 | 8 | 5 | 7 | 6 | 7.5 | 40.6 | 32.4 | 37.8 | 43.3 | 5 | 6 | 6 | 7 | 39.5 | 65 | 77 | 89 | 5 | 12 | 0 |
| 8 FT | 8 | 10 | 8 | 5 | 6.5 | 6 | 7 | 39.5 | 24.1 | 28.0 | 32.0 | 5 | 6 | 5 | 6.5 | 33.6 | 66 | 78 | 90 | 5 | 12 | 0 |
| 10 FT | 8 | 10 | 8 | 5 | 7 | 6 | 7.5 | 37.1 | 24.1 | 28.0 | 32.0 | 5 | 6.5 | 4 | 6 | 31.4 | 66 | 78 | 90 | 5 | 12 | 0 |
| 12 FT | 8 | 10 | 8 | 5 | 6 | 6 | 6 | 37.1 | 28.5 | 33.1 | 37.9 | 6 | 8 | 5 | 6.5 | 30.1 | 66 | 78 | 90 | 5 | 12 | 0 |
| 14 FT | 9 | 10 | 8 | 6 | 7.5 | 6 | 7 | 34.8 | 29.6 | 34.4 | 39.3 | 6 | 7 | 5 | 6 | 30.1 | 66 | 78 | 90 | 5 | 12 | 0 |
| 16 FT | 9 | 11 | 8 | 6 | 7 | 6 | 6 | 34.8 | 29.3 | 33.9 | 38.6 | 6 | 6.5 | 5 | 7 | 29.0 | 67 | 79 | 91 | 5 | 12 | 0 |
| 18 FT | 10 | 12 | 8 | 6 | 6.5 | 6 | 6.5 | 33.6 | 30.0 | 34.8 | 39.4 | 6 | 6.5 | 5 | 7.5 | 29.0 | 68 | 80 | 92 | 5 | 12 | 0 |
| 20 FT | 11 | 13 | 8 | 6 | 6 | 6 | 7 | 33.6 | 31.6 | 36.4 | 41.3 | 6 | 6 | 5 | 8 | 29.0 | 69 | 81 | 93 | 5 | 12 | 0 |
| 22 FT | 12 | 14 | 8 | 6 | 6 | 5 | 6 | 29.0 | 32.4 | 37.3 | 42.0 | 6 | 6 | 5 | 8.5 | 27.9 | 70 | 82 | 94 | 5 | 12 | 0 |
| 24 FT | 13 | 15 | 8 | 6 | 6 | 5 | 6 | 29.0 | 29.0 | 33.3 | 37.5 | 6 | 6 | 5 | 8.5 | 27.9 | 71 | 83 | 95 | 5 | 12 | 0 |
| 26 FT | 14 | 16 | 8 | 6 | 6 | 5 | 6 | 29.0 | 30.6 | 34.9 | 39.3 | 6 | 6 | 5 | 8 | 27.9 | 72 | 84 | 96 | 5 | 12 | 0 |
| 28 FT | 15 | 16 | 8 | 7 | 7.5 | 5 | 6.5 | 33.6 | 35.3 | 40.1 | 45.1 | 7 | 8 | 5 | 8 | 27.9 | 72 | 84 | 96 | 5 | 12 | 0 |
| 30 FT | 15 | 17 | 8 | 7 | 7 | 6 | 8 | 37.1 | 35.6 | 40.6 | 45.5 | 7 | 7.5 | 5 | 7 | 27.9 | 73 | 85 | 97 | 5 | 11.5 | 0 |
| 32 FT | 16 | 17 | 8 | 7 | 7 | 5 | 6 | 32.5 | 36.1 | 41.0 | 45.9 | 7 | 7.5 | 5 | 6.5 | 27.9 | 73 | 85 | 97 | 5 | 10 | 0 |
| 34 FT | 17 | 18 | 8 | 7 | 7 | 5 | 6 | 32.5 | 37.8 | 42.9 | 47.9 | 7 | 7.5 | 5 | 6.5 | 29.0 | 74 | 86 | 98 | 5 | 9.5 | 0 |
| 36 FT | 17 | 19 | 9 | 7 | 7 | 5 | 6 | 33.9 | 37.3 | 42.3 | 47.1 | 7 | 7.5 | 5 | 7.5 | 29.3 | 75 | 87 | 99 | 5 | 10.5 | 0 |
| 38 FT | 18 | 20 | 9 | 7 | 7 | 5 | 6 | 33.9 | 38.1 | 43.0 | 48.0 | 7 | 7.5 | 5 | 7 | 29.3 | 76 | 88 | 100 | 5 | 9.5 | 0 |
| 40 FT | 19 | 20 | 9 | 7 | 6.5 | 5 | 6.5 | 33.9 | 39.5 | 44.5 | 49.5 | 7 | 7 | 5 | 7 | 29.3 | 76 | 88 | 100 | 5 | 8.5 | 0 |
| 42 FT | 19 | 21 | 10 | 7 | 6.5 | 5 | 6.5 | 34.3 | 39.9 | 45.0 | 50.0 | 7 | 7 | 5 | 7.5 | 29.5 | 77 | 89 | 101 | 5 | 10 | 0 |
| 44 FT | 20 | 21 | 10 | 7 | 6.5 | 5 | 6.5 | 34.3 | 40.4 | 45.4 | 50.4 | 7 | 6.5 | 5 | 7.5 | 29.5 | 77 | 89 | 101 | 5 | 9.5 | 0 |
| 46 FT | 21 | 22 | 10 | 7 | 6.5 | 5 | 6.5 | 34.3 | 41.1 | 46.3 | 51.3 | 7 | 7 | 5 | 7 | 29.5 | 78 | 90 | 102 | 5 | 8.5 | 0 |
| 48 FT | 21 | 22 | 10 | 7 | 6 | 5 | 6.5 | 34.3 | 41.1 | 46.3 | 51.3 | 7 | 6.5 | 5 | 7 | 29.5 | 78 | 90 | 102 | 5 | 8 | 0 |
| 50 FT | 22 | 23 | 10 | 7 | 6 | 5 | 6.5 | 34.3 | 42.0 | 47.0 | 52.1 | 7 | 6.5 | 5 | 6.5 | 30.6 | 79 | 91 | 103 | 5 | 8 | 0 |

## SPAN (S) = 9 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

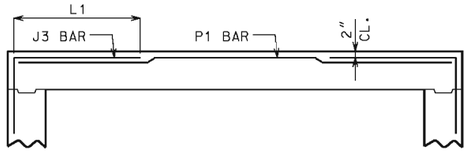
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | K2 | | | A2 BARS | | J4 BARS | | | K3 | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=8′ | HT=9′ | HT=10′ | | SIZE | SPA. | SIZE | SPA. | C4 | HT=8′ | HT=9′ | HT=10′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 11 | 8 | 5 | 6.5 | 5 | 8.5 | 70.8 | 29.6 | 32.8 | 35.9 | | 5 | 6.5 | 5 | 6.5 | 70.8 | 103 | 115 | 127 | 5 | 12 | 12 |
| 2 FT | 12 | 11 | 8 | 5 | 6.5 | 5 | 8.5 | 70.8 | 29.6 | 32.8 | 35.9 | | 5 | 6 | 5 | 6 | 70.8 | 103 | 115 | 127 | 5 | 11.5 | 12 |
| 4 FT | 8 | 10 | 9 | 5 | 6.5 | 6 | 7 | 67.9 | 26.1 | 29.0 | 31.9 | | 5 | 6 | 5 | 6 | 72.5 | 102 | 114 | 126 | 5 | 11.5 | 0 |
| 6 FT | 8 | 10 | 9 | 5 | 7 | 6 | 7 | 53.9 | 28.4 | 31.5 | 34.6 | | 5 | 6 | 6 | 7 | 64.4 | 102 | 114 | 126 | 5 | 11 | 0 |
| 8 FT | 8 | 10 | 9 | 5 | 6.5 | 6 | 6.5 | 49.1 | 28.4 | 31.5 | 34.6 | | 5 | 6 | 6 | 6.5 | 55.0 | 102 | 114 | 126 | 5 | 10.5 | 0 |
| 10 FT | 8 | 10 | 9 | 5 | 7 | 6 | 7 | 44.5 | 28.4 | 31.5 | 34.6 | | 5 | 6.5 | 6 | 7 | 46.8 | 102 | 114 | 126 | 5 | 12 | 0 |
| 12 FT | 9 | 10 | 9 | 5 | 6.5 | 5 | 6 | 41.0 | 29.8 | 33.0 | 36.1 | | 6 | 8 | 6 | 6 | 45.6 | 102 | 114 | 126 | 5 | 11.5 | 0 |
| 14 FT | 9 | 10 | 9 | 6 | 8 | 6 | 6.5 | 43.3 | 33.0 | 36.6 | 40.3 | | 6 | 6.5 | 6 | 6 | 45.6 | 102 | 114 | 126 | 5 | 10.5 | 0 |
| 16 FT | 10 | 11 | 9 | 6 | 7.5 | 6 | 7 | 43.3 | 30.3 | 33.5 | 36.8 | | 6 | 6.5 | 6 | 6 | 45.6 | 103 | 115 | 127 | 5 | 9.5 | 0 |
| 18 FT | 10 | 12 | 9 | 6 | 6.5 | 6 | 6 | 43.3 | 31.6 | 35.0 | 38.4 | | 6 | 6.5 | 6 | 6 | 45.6 | 104 | 116 | 128 | 5 | 8.5 | 0 |
| 20 FT | 11 | 13 | 9 | 6 | 6.5 | 6 | 6.5 | 43.3 | 31.0 | 34.3 | 37.5 | | 6 | 6.5 | 6 | 6 | 45.6 | 105 | 117 | 129 | 5 | 8.5 | 0 |
| 22 FT | 12 | 13 | 9 | 6 | 6 | 6 | 6.5 | 43.3 | 33.6 | 37.1 | 40.6 | | 6 | 6 | 7 | 6.5 | 48.0 | 105 | 117 | 129 | 5 | 8.5 | 0 |
| 24 FT | 13 | 14 | 10 | 6 | 6 | 6 | 7 | 43.6 | 33.0 | 36.4 | 39.8 | | 6 | 6 | 6 | 6.5 | 44.9 | 106 | 118 | 130 | 5 | 8 | 0 |
| 26 FT | 14 | 15 | 10 | 6 | 6 | 6 | 7 | 43.6 | 34.8 | 38.3 | 41.8 | | 6 | 6 | 6 | 7 | 44.9 | 107 | 119 | 131 | 5 | 8 | 0 |
| 28 FT | 14 | 16 | 11 | 7 | 8 | 6 | 7 | 44.0 | 35.1 | 38.6 | 42.0 | | 7 | 8 | 5 | 6 | 42.9 | 108 | 120 | 132 | 5 | 7.5 | 0 |
| 30 FT | 15 | 17 | 11 | 7 | 8 | 6 | 6.5 | 50.0 | 35.6 | 39.1 | 42.6 | | 6 | 6 | 5 | 6 | 42.9 | 109 | 121 | 133 | 5 | 7.5 | 0 |
| 32 FT | 16 | 18 | 12 | 6 | 6 | 6 | 7.5 | 50.4 | 36.3 | 39.8 | 43.3 | | 6 | 6 | 5 | 6 | 43.3 | 110 | 122 | 134 | 5 | 7 | 0 |
| 34 FT | 16 | 18 | 12 | 7 | 7.5 | 6 | 7 | 50.4 | 36.3 | 39.8 | 43.3 | | 7 | 7.5 | 5 | 6 | 43.3 | 110 | 122 | 134 | 5 | 7 | 0 |
| 36 FT | 17 | 19 | 13 | 7 | 7.5 | 6 | 7.5 | 50.9 | 38.1 | 41.8 | 45.3 | | 7 | 7.5 | 5 | 6 | 43.5 | 111 | 123 | 135 | 5 | 7 | 0 |
| 38 FT | 18 | 20 | 13 | 7 | 7.5 | 6 | 7.5 | 50.9 | 38.8 | 42.3 | 45.9 | | 7 | 7.5 | 5 | 6 | 43.5 | 112 | 124 | 136 | 5 | 6.5 | 0 |
| 40 FT | 18 | 20 | 13 | 7 | 7 | 6 | 7 | 50.9 | 38.8 | 42.3 | 45.9 | | 7 | 7 | 6 | 8.5 | 46.0 | 112 | 124 | 136 | 5 | 6.5 | 0 |
| 42 FT | 19 | 21 | 13 | 7 | 7 | 6 | 6.5 | 50.9 | 39.3 | 42.9 | 46.5 | | 7 | 7 | 6 | 8 | 47.3 | 113 | 125 | 137 | 5 | 6.5 | 0 |
| 44 FT | 19 | 21 | 14 | 7 | 6.5 | 6 | 6.5 | 51.3 | 39.3 | 42.9 | 46.5 | | 7 | 7 | 5 | 6 | 43.9 | 113 | 125 | 137 | 5 | 6 | 0 |
| 46 FT | 20 | 22 | 14 | 7 | 6.5 | 6 | 7 | 51.3 | 41.3 | 45.0 | 48.6 | | 7 | 7 | 6 | 8.5 | 47.6 | 114 | 126 | 138 | 5 | 6 | 0 |
| 48 FT | 20 | 22 | 14 | 7 | 6.5 | 6 | 6 | 51.3 | 45.3 | 49.3 | 53.4 | | 7 | 6.5 | 6 | 7.5 | 47.6 | 114 | 126 | 138 | 5 | 6 | 0 |
| 50 FT | 21 | 23 | 14 | 7 | 6.5 | 6 | 6 | 51.3 | 41.9 | 45.6 | 49.3 | | 7 | 6.5 | 6 | 8 | 47.6 | 115 | 127 | 139 | 5 | 6 | 0 |

## SPAN (S) = 9 FT  HEIGHT (HT) = 11 FT OR 12 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | A2 BARS | | J4 BARS | | | K3 | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=11′ | HT=12′ | SIZE | SPA. | SIZE | SPA. | C4 | HT=11′ | HT=12′ | SIZE | SPA. | G1 |
| 1 FT | 11 | 11 | 8 | 5 | 6 | 5 | 6 | 70.8 | 31.3 | 33.8 | 5 | 6 | 6 | 6 | 73.1 | 139 | 151 | 5 | 9.5 | 12 |
| 2 FT | 11 | 12 | 8 | 6 | 8.5 | 6 | 7 | 73.1 | 33.0 | 35.6 | 5 | 6 | 6 | 6 | 73.1 | 140 | 152 | 5 | 9.5 | 12 |
| 4 FT | 8 | 10 | 9 | 5 | 6 | 6 | 6.5 | 73.8 | 33.4 | 36.1 | 6 | 8 | 6 | 6 | 73.8 | 138 | 150 | 5 | 8.5 | 0 |
| 6 FT | 8 | 11 | 9 | 5 | 7 | 6 | 6.5 | 73.8 | 32.1 | 34.8 | 5 | 6 | 6 | 6 | 73.8 | 139 | 151 | 5 | 8.5 | 0 |
| 8 FT | 9 | 11 | 9 | 5 | 7 | 6 | 7 | 73.8 | 30.9 | 33.4 | 5 | 6 | 6 | 6 | 73.8 | 139 | 151 | 5 | 8.5 | 0 |
| 10 FT | 9 | 11 | 9 | 5 | 7.5 | 6 | 7 | 58.5 | 30.9 | 33.4 | 5 | 6.5 | 6 | 6 | 73.8 | 139 | 151 | 5 | 8.5 | 0 |
| 12 FT | 9 | 12 | 9 | 5 | 6.5 | 6 | 6 | 56.1 | 34.0 | 36.8 | 5 | 6 | 6 | 6 | 73.8 | 140 | 152 | 5 | 8.5 | 0 |
| 14 FT | 10 | 12 | 9 | 5 | 6 | 6 | 6 | 57.4 | 34.3 | 37.0 | 6 | 8 | 6 | 6 | 73.8 | 140 | 152 | 5 | 7.5 | 0 |
| 16 FT | 10 | 12 | 10 | 6 | 8 | 6 | 6.5 | 53.1 | 34.3 | 37.0 | 6 | 7 | 6 | 6 | 63.8 | 140 | 152 | 5 | 8 | 0 |
| 18 FT | 11 | 13 | 10 | 6 | 7.5 | 6 | 6.5 | 54.3 | 36.3 | 39.1 | 6 | 7 | 6 | 6 | 64.9 | 141 | 153 | 5 | 7.5 | 0 |
| 20 FT | 11 | 13 | 11 | 6 | 6.5 | 6 | 6.5 | 52.4 | 36.3 | 39.1 | 6 | 6.5 | 6 | 7 | 59.5 | 141 | 153 | 5 | 7.5 | 0 |
| 22 FT | 12 | 14 | 12 | 6 | 7 | 6 | 8 | 52.8 | 33.6 | 36.3 | 6 | 6.5 | 6 | 7.5 | 58.8 | 142 | 154 | 5 | 7 | 0 |
| 24 FT | 13 | 15 | 12 | 6 | 6.5 | 6 | 7.5 | 54.0 | 37.3 | 40.1 | 6 | 6.5 | 6 | 7 | 60.0 | 143 | 155 | 5 | 7 | 0 |
| 26 FT | 14 | 15 | 13 | 6 | 6.5 | 6 | 7.5 | 54.5 | 35.9 | 38.6 | 6 | 6 | 6 | 6.5 | 56.9 | 143 | 155 | 5 | 6.5 | 0 |
| 28 FT | 14 | 16 | 13 | 6 | 6 | 6 | 7 | 53.3 | 39.3 | 42.3 | 6 | 6 | 6 | 7 | 58.1 | 144 | 156 | 5 | 6.5 | 0 |
| 30 FT | 15 | 17 | 13 | 6 | 6 | 6 | 6.5 | 60.5 | 39.8 | 42.8 | 6 | 6 | 6 | 6.5 | 60.5 | 145 | 157 | 5 | 6.5 | 0 |
| 32 FT | 16 | 17 | 14 | 6 | 6 | 6 | 7 | 61.0 | 40.0 | 43.0 | 6 | 6 | 6 | 6 | 57.4 | 145 | 157 | 5 | 6 | 0 |
| 34 FT | 16 | 18 | 14 | 7 | 8 | 6 | 6.5 | 61.0 | 40.3 | 43.3 | 7 | 7.5 | 6 | 6.5 | 58.5 | 146 | 158 | 5 | 6 | 0 |
| 36 FT | 17 | 19 | 15 | 6 | 6 | 6 | 7 | 60.3 | 42.4 | 45.5 | 7 | 8 | 6 | 6.5 | 59.0 | 147 | 159 | 6 | 8 | 0 |
| 38 FT | 18 | 19 | 15 | 7 | 7.5 | 6 | 6.5 | 61.5 | 42.6 | 45.8 | 7 | 7.5 | 6 | 6.5 | 57.8 | 147 | 159 | 6 | 8 | 0 |
| 40 FT | 18 | 20 | 15 | 7 | 7.5 | 6 | 6 | 61.5 | 42.9 | 46.0 | 7 | 7.5 | 6 | 6.5 | 60.3 | 148 | 160 | 6 | 8 | 0 |
| 42 FT | 19 | 21 | 16 | 7 | 7.5 | 6 | 6.5 | 62.0 | 43.4 | 46.5 | 7 | 7.5 | 6 | 6.5 | 59.5 | 149 | 161 | 6 | 8 | 0 |
| 44 FT | 19 | 21 | 16 | 7 | 7 | 6 | 6 | 62.0 | 43.4 | 46.5 | 7 | 7 | 6 | 6.5 | 59.5 | 149 | 161 | 6 | 8 | 0 |
| 46 FT | 20 | 22 | 17 | 7 | 7 | 6 | 6.5 | 62.5 | 45.6 | 48.9 | 7 | 7 | 6 | 6.5 | 58.8 | 150 | 162 | 6 | 7.5 | 0 |
| 48 FT | 20 | 22 | 17 | 7 | 7 | 6 | 6 | 61.3 | 45.6 | 48.9 | 7 | 7 | 6 | 6.5 | 58.8 | 150 | 162 | 6 | 7.5 | 0 |
| 50 FT | 21 | 23 | 18 | 7 | 7 | 6 | 6.5 | 63.0 | 46.1 | 49.4 | 7 | 7 | 6 | 6.5 | 59.3 | 151 | 163 | 6 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




### ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 9 FEET
HEIGHT (HT): 5 THRU 12 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

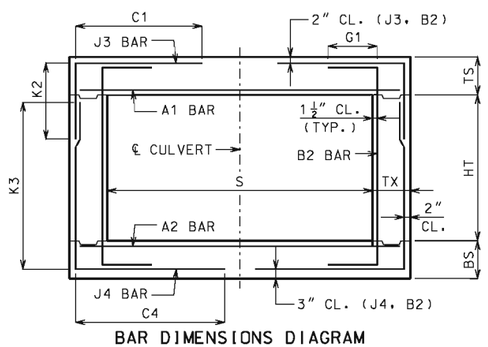
SHEET NO. 7 OF 14

## SPAN (S) = 10 FT  HEIGHT (HT) = 5 FT OR 6 FT OR 7 FT

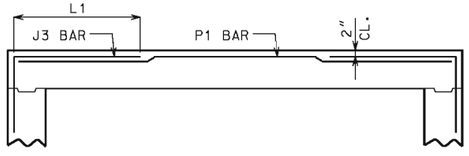
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=5′ | HT=6′ | HT=7′ | | | | | | HT=5′ | HT=6′ | HT=7′ | | | |
| 1 FT | 12 | 9 | 8 | 5 | 6 | 4 | 6 | 75.5 | 28.1 | 32.5 | 37.0 | 5 | 6 | 6 | 6.5 | 52.5 | 65 | 77 | 89 | 5 | 12 | 12 |
| 2 FT | 12 | 10 | 8 | 5 | 6 | 5 | 7.5 | 76.8 | 32.4 | 37.4 | 42.4 | 5 | 6 | 5 | 6.5 | 44.8 | 66 | 78 | 90 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 8 | 6 | 8 | 7 | 6.5 | 44.8 | 32.4 | 37.8 | 43.3 | 6 | 7.5 | 6 | 7 | 42.3 | 65 | 77 | 89 | 5 | 12 | 0 |
| 6 FT | 8 | 10 | 8 | 6 | 8.5 | 6 | 6 | 42.3 | 28.5 | 33.1 | 37.9 | 6 | 7.5 | 5 | 6.5 | 35.9 | 66 | 78 | 90 | 5 | 12 | 0 |
| 8 FT | 8 | 10 | 8 | 6 | 7.5 | 7 | 6 | 43.5 | 28.5 | 33.1 | 37.9 | 6 | 7 | 5 | 6.5 | 33.3 | 66 | 78 | 90 | 5 | 12 | 0 |
| 10 FT | 9 | 10 | 8 | 6 | 7 | 6 | 6.5 | 38.4 | 29.6 | 34.4 | 39.3 | 6 | 6.5 | 6 | 7 | 35.9 | 66 | 78 | 90 | 5 | 12 | 0 |
| 12 FT | 9 | 10 | 8 | 6 | 7.5 | 6 | 6.5 | 35.9 | 29.6 | 34.4 | 39.3 | 6 | 6.5 | 6 | 7 | 34.5 | 66 | 78 | 90 | 5 | 12 | 0 |
| 14 FT | 9 | 11 | 8 | 6 | 6.5 | 7 | 6 | 39.6 | 29.3 | 33.9 | 38.6 | 6 | 6 | 5 | 7 | 29.5 | 67 | 79 | 91 | 5 | 12 | 0 |
| 16 FT | 10 | 12 | 8 | 6 | 6 | 6 | 6 | 34.5 | 30.0 | 34.8 | 39.4 | 6 | 6 | 5 | 7.5 | 28.1 | 68 | 80 | 92 | 5 | 12 | 0 |
| 18 FT | 11 | 13 | 8 | 7 | 7.5 | 6 | 6.5 | 33.3 | 31.6 | 36.4 | 41.3 | 7 | 7.5 | 5 | 8 | 28.1 | 69 | 81 | 93 | 5 | 12 | 0 |
| 20 FT | 12 | 14 | 8 | 7 | 7.5 | 6 | 7 | 33.3 | 32.4 | 37.3 | 42.0 | 7 | 7.5 | 5 | 8.5 | 26.9 | 70 | 82 | 94 | 5 | 12 | 0 |
| 22 FT | 13 | 15 | 8 | 7 | 7 | 6 | 7.5 | 32.0 | 33.3 | 38.0 | 42.8 | 7 | 7.5 | 5 | 8.5 | 26.9 | 71 | 83 | 95 | 5 | 12 | 0 |
| 24 FT | 14 | 16 | 8 | 7 | 7 | 6 | 8 | 30.8 | 34.0 | 38.8 | 43.6 | 7 | 7.5 | 5 | 8 | 26.9 | 72 | 84 | 96 | 5 | 12 | 0 |
| 26 FT | 15 | 17 | 8 | 7 | 6.5 | 6 | 8 | 37.1 | 35.6 | 40.6 | 45.5 | 7 | 7 | 5 | 7 | 26.9 | 73 | 85 | 97 | 5 | 12 | 0 |
| 28 FT | 16 | 18 | 8 | 7 | 6.5 | 6 | 8.5 | 35.9 | 36.5 | 41.4 | 46.4 | 7 | 7 | 5 | 6.5 | 26.9 | 74 | 86 | 98 | 5 | 12 | 0 |
| 30 FT | 17 | 18 | 8 | 7 | 6.5 | 5 | 6 | 32.0 | 37.8 | 42.9 | 47.9 | 7 | 6.5 | 5 | 6.5 | 26.9 | 74 | 86 | 98 | 5 | 11.5 | 0 |
| 32 FT | 18 | 19 | 8 | 7 | 6.5 | 5 | 6 | 32.0 | 38.6 | 43.6 | 48.8 | 7 | 6.5 | 5 | 6.5 | 26.9 | 75 | 87 | 99 | 5 | 10 | 0 |
| 34 FT | 18 | 20 | 8 | 7 | 6 | 6 | 7.5 | 35.9 | 38.1 | 43.0 | 48.0 | 7 | 6.5 | 5 | 6 | 26.9 | 76 | 88 | 100 | 5 | 9.5 | 0 |
| 36 FT | 19 | 21 | 8 | 7 | 6 | 6 | 7.5 | 35.9 | 39.9 | 45.0 | 50.0 | 7 | 6.5 | 6 | 7.5 | 30.8 | 77 | 89 | 101 | 5 | 9.5 | 0 |
| 38 FT | 20 | 21 | 8 | 7 | 6 | 6 | 7.5 | 35.9 | 44.1 | 49.6 | 55.3 | 7 | 6.5 | 6 | 7.5 | 30.8 | 77 | 89 | 101 | 5 | 9.5 | 0 |
| 40 FT | 21 | 22 | 8 | 7 | 6 | 6 | 7 | 35.9 | 45.1 | 50.6 | 56.1 | 7 | 6.5 | 6 | 7 | 30.8 | 78 | 90 | 102 | 5 | 9 | 0 |
| 42 FT | 21 | 23 | 9 | 8 | 7.5 | 5 | 6 | 33.5 | 41.6 | 46.6 | 51.6 | 7 | 6 | 5 | 6 | 28.4 | 79 | 91 | 103 | 5 | 8.5 | 0 |
| 44 FT | 22 | 23 | 9 | 8 | 7.5 | 6 | 7.5 | 37.4 | 42.0 | 47.0 | 52.1 | 7 | 6 | 5 | 6 | 28.4 | 79 | 91 | 103 | 5 | 8.5 | 0 |
| 46 FT | 23 | 24 | 10 | 8 | 7.5 | 5 | 6.5 | 33.8 | 43.9 | 49.0 | 54.1 | 7 | 6 | 5 | 6.5 | 28.6 | 80 | 92 | 104 | 5 | 8.5 | 0 |
| 48 FT | 23 | 25 | 10 | 8 | 7 | 5 | 6 | 33.8 | 43.3 | 48.3 | 53.4 | 7 | 6 | 5 | 6 | 28.6 | 81 | 93 | 105 | 5 | 8 | 0 |
| 50 FT | 24 | 25 | 10 | 8 | 7 | 5 | 6 | 33.8 | 44.8 | 49.9 | 55.0 | 7 | 6 | 5 | 6 | 28.6 | 81 | 93 | 105 | 5 | 8 | 0 |

## SPAN (S) = 10 FT  HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=11′ | HT=12′ | HT=13′ | | | | | | HT=11′ | HT=12′ | HT=13′ | | | |
| 1 FT | 11 | 11 | 9 | 6 | 8 | 6 | 7.5 | 80.0 | 31.3 | 33.8 | 36.4 | 6 | 7.5 | 6 | 6 | 80.0 | 139 | 151 | 163 | 5 | 8.5 | 12 |
| 2 FT | 11 | 11 | 9 | 6 | 7.5 | 6 | 7 | 80.0 | 35.8 | 38.6 | 41.5 | 6 | 7.5 | 6 | 6 | 80.0 | 139 | 151 | 163 | 5 | 8.5 | 12 |
| 4 FT | 9 | 11 | 9 | 6 | 8 | 6 | 6.5 | 80.0 | 33.8 | 36.6 | 39.4 | 6 | 7.5 | 6 | 6 | 80.0 | 139 | 151 | 163 | 5 | 8 | 0 |
| 6 FT | 9 | 12 | 9 | 5 | 6 | 6 | 6 | 80.0 | 31.1 | 33.6 | 36.1 | 6 | 7.5 | 6 | 6 | 80.0 | 140 | 152 | 164 | 5 | 7.5 | 0 |
| 8 FT | 9 | 12 | 10 | 5 | 6 | 6 | 6.5 | 75.4 | 31.1 | 33.6 | 36.1 | 6 | 7.5 | 6 | 6.5 | 80.6 | 140 | 152 | 164 | 5 | 7.5 | 0 |
| 10 FT | 10 | 12 | 10 | 6 | 8 | 6 | 6.5 | 74.1 | 32.8 | 35.4 | 38.0 | 6 | 7 | 6 | 6 | 80.6 | 140 | 152 | 164 | 5 | 7 | 0 |
| 12 FT | 10 | 12 | 10 | 6 | 8.5 | 6 | 6.5 | 58.5 | 32.8 | 35.4 | 38.0 | 6 | 7.5 | 6 | 6 | 71.5 | 140 | 152 | 164 | 5 | 8 | 0 |
| 14 FT | 10 | 13 | 10 | 6 | 7.5 | 6 | 6 | 57.3 | 31.5 | 34.0 | 36.5 | 6 | 7 | 6 | 6 | 74.1 | 141 | 153 | 165 | 5 | 7 | 0 |
| 16 FT | 11 | 13 | 11 | 6 | 7 | 6 | 6.5 | 56.4 | 33.3 | 35.9 | 38.5 | 6 | 6.5 | 6 | 6.5 | 65.5 | 141 | 153 | 165 | 5 | 7.5 | 0 |
| 18 FT | 12 | 14 | 12 | 6 | 7 | 6 | 7.5 | 56.8 | 33.6 | 36.3 | 39.0 | 6 | 6.5 | 6 | 7.5 | 63.4 | 142 | 154 | 166 | 5 | 7 | 0 |
| 20 FT | 13 | 15 | 12 | 6 | 6.5 | 6 | 7 | 56.8 | 35.6 | 38.4 | 41.1 | 6 | 6 | 6 | 7 | 64.6 | 143 | 155 | 167 | 5 | 7 | 0 |
| 22 FT | 13 | 15 | 13 | 6 | 6 | 6 | 7 | 55.9 | 35.6 | 38.4 | 41.1 | 7 | 8 | 6 | 7 | 61.1 | 143 | 155 | 167 | 5 | 6.5 | 0 |
| 24 FT | 14 | 16 | 13 | 6 | 6 | 6 | 6.5 | 57.3 | 36.1 | 38.9 | 41.6 | 7 | 7.5 | 6 | 7 | 61.1 | 144 | 156 | 168 | 5 | 6.5 | 0 |
| 26 FT | 15 | 17 | 13 | 7 | 8 | 6 | 6 | 63.9 | 36.6 | 39.4 | 42.1 | 7 | 7.5 | 6 | 6 | 62.5 | 145 | 157 | 169 | 5 | 6.5 | 0 |
| 28 FT | 16 | 18 | 14 | 7 | 8 | 6 | 6.5 | 63.0 | 38.6 | 41.5 | 44.4 | 7 | 7.5 | 6 | 6.5 | 61.6 | 146 | 158 | 170 | 5 | 6 | 0 |
| 30 FT | 16 | 18 | 14 | 7 | 7 | 6 | 6 | 63.0 | 40.3 | 43.3 | 46.3 | 7 | 7 | 6 | 6 | 61.6 | 146 | 158 | 170 | 5 | 6 | 0 |
| 32 FT | 17 | 19 | 15 | 7 | 7 | 6 | 6 | 63.5 | 42.4 | 45.5 | 48.6 | 7 | 7 | 6 | 6 | 60.8 | 147 | 159 | 171 | 6 | 8 | 0 |
| 34 FT | 18 | 20 | 15 | 7 | 7 | 6 | 6 | 63.5 | 42.9 | 46.0 | 49.1 | 7 | 7 | 6 | 6 | 62.1 | 148 | 160 | 172 | 6 | 8 | 0 |
| 36 FT | 19 | 21 | 16 | 7 | 7 | 6 | 6 | 63.9 | 43.4 | 46.5 | 49.6 | 7 | 7 | 6 | 6 | 62.5 | 149 | 161 | 173 | 6 | 8 | 0 |
| 38 FT | 19 | 21 | 16 | 7 | 6.5 | 7 | 7.5 | 69.4 | 43.4 | 46.5 | 49.6 | 7 | 6.5 | 6 | 6 | 61.3 | 149 | 161 | 173 | 6 | 8 | 0 |
| 40 FT | 20 | 22 | 17 | 7 | 6.5 | 6 | 6 | 64.4 | 45.6 | 48.9 | 52.1 | 7 | 6.5 | 6 | 6 | 61.6 | 150 | 162 | 174 | 6 | 7.5 | 0 |
| 42 FT | 21 | 23 | 17 | 7 | 6.5 | 7 | 7.5 | 69.9 | 46.1 | 49.4 | 52.6 | 7 | 6.5 | 6 | 6 | 63.0 | 151 | 163 | 175 | 6 | 7.5 | 0 |
| 44 FT | 21 | 23 | 18 | 7 | 6.5 | 6 | 6 | 64.9 | 46.1 | 49.4 | 52.6 | 7 | 6.5 | 6 | 6 | 62.1 | 151 | 163 | 175 | 6 | 7 | 0 |
| 46 FT | 22 | 24 | 19 | 7 | 6.5 | 6 | 6 | 65.4 | 46.8 | 50.0 | 53.3 | 7 | 6.5 | 6 | 6 | 62.5 | 152 | 164 | 176 | 6 | 6.5 | 0 |
| 48 FT | 23 | 25 | 19 | 7 | 6 | 6 | 6 | 65.4 | 47.3 | 50.5 | 53.8 | 7 | 6 | 6 | 6 | 62.5 | 153 | 165 | 177 | 6 | 6.5 | 0 |
| 50 FT | 23 | 25 | 20 | 7 | 6 | 6 | 6 | 65.8 | 47.3 | 50.5 | 53.8 | 7 | 6 | 6 | 6 | 63.0 | 153 | 165 | 177 | 6 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




### ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

## SPAN (S) = 10 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=8′ | HT=9′ | HT=10′ | | | | | | HT=8′ | HT=9′ | HT=10′ | | | |
| 1 FT | 12 | 11 | 8 | 5 | 6 | 5 | 8 | 76.8 | 33.0 | 36.5 | 40.0 | 5 | 6 | 5 | 6 | 76.8 | 103 | 115 | 127 | 5 | 12 | 12 |
| 2 FT | 12 | 11 | 8 | 6 | 8 | 5 | 7 | 76.8 | 33.0 | 36.5 | 40.0 | 6 | 8 | 6 | 7.5 | 79.4 | 103 | 115 | 127 | 5 | 11.5 | 12 |
| 4 FT | 8 | 10 | 9 | 6 | 8 | 6 | 6 | 59.4 | 28.4 | 31.5 | 34.6 | 6 | 7.5 | 6 | 7 | 68.4 | 102 | 114 | 126 | 5 | 12 | 0 |
| 6 FT | 8 | 10 | 9 | 6 | 8 | 6 | 6 | 51.6 | 32.8 | 36.3 | 39.9 | 6 | 7.5 | 6 | 6.5 | 56.8 | 102 | 114 | 126 | 5 | 11.5 | 0 |
| 8 FT | 9 | 10 | 9 | 6 | 8 | 6 | 7 | 49.0 | 33.0 | 36.6 | 40.3 | 6 | 7 | 6 | 6 | 51.6 | 102 | 114 | 126 | 5 | 11.5 | 0 |
| 10 FT | 9 | 11 | 9 | 6 | 7.5 | 6 | 6 | 47.8 | 30.0 | 33.3 | 36.5 | 6 | 7 | 6 | 6.5 | 49.0 | 103 | 115 | 127 | 5 | 11 | 0 |
| 12 FT | 9 | 11 | 9 | 6 | 7.5 | 6 | 6.5 | 43.9 | 30.0 | 33.3 | 36.5 | 6 | 7 | 6 | 6.5 | 43.9 | 103 | 115 | 127 | 5 | 12 | 0 |
| 14 FT | 10 | 11 | 9 | 6 | 7 | 6 | 6.5 | 42.6 | 31.4 | 34.8 | 38.1 | 6 | 6 | 6 | 6 | 43.9 | 103 | 115 | 127 | 5 | 12 | 0 |
| 16 FT | 10 | 12 | 9 | 6 | 6 | 6 | 6 | 42.6 | 30.5 | 33.8 | 37.0 | 7 | 8 | 6 | 6.5 | 42.6 | 104 | 116 | 128 | 5 | 10.5 | 0 |
| 18 FT | 11 | 13 | 9 | 6 | 6 | 6 | 6 | 42.6 | 31.0 | 34.3 | 37.5 | 7 | 7.5 | 6 | 6.5 | 42.6 | 105 | 117 | 129 | 5 | 9.5 | 0 |
| 20 FT | 12 | 14 | 9 | 7 | 7.5 | 6 | 6.5 | 41.3 | 32.8 | 36.1 | 39.5 | 7 | 7.5 | 6 | 6.5 | 42.6 | 106 | 118 | 130 | 5 | 8.5 | 0 |
| 22 FT | 13 | 15 | 9 | 7 | 7.5 | 6 | 6 | 41.3 | 33.4 | 36.6 | 40.0 | 7 | 7.5 | 6 | 6.5 | 42.6 | 107 | 119 | 131 | 5 | 8.5 | 0 |
| 24 FT | 14 | 16 | 10 | 7 | 7.5 | 6 | 7 | 41.6 | 35.1 | 38.6 | 42.0 | 7 | 7.5 | 6 | 8 | 42.9 | 108 | 120 | 132 | 5 | 8 | 0 |
| 26 FT | 15 | 17 | 11 | 7 | 7.5 | 6 | 7 | 48.5 | 35.6 | 39.1 | 42.6 | 7 | 7.5 | 5 | 6 | 40.6 | 109 | 121 | 133 | 5 | 8.5 | 0 |
| 28 FT | 16 | 18 | 11 | 7 | 7 | 6 | 7 | 48.5 | 36.3 | 39.8 | 43.3 | 7 | 7.5 | 5 | 6 | 40.6 | 110 | 122 | 134 | 5 | 7.5 | 0 |
| 30 FT | 17 | 19 | 12 | 7 | 7 | 6 | 7.5 | 48.9 | 38.1 | 41.8 | 45.3 | 7 | 7 | 5 | 6 | 40.9 | 111 | 123 | 135 | 5 | 8 | 0 |
| 32 FT | 17 | 19 | 12 | 7 | 6.5 | 6 | 7 | 48.9 | 38.1 | 41.8 | 45.3 | 7 | 7 | 5 | 6 | 40.9 | 111 | 123 | 135 | 5 | 7.5 | 0 |
| 34 FT | 18 | 20 | 12 | 7 | 6.5 | 6 | 7 | 48.9 | 38.8 | 42.3 | 45.9 | 7 | 6.5 | 6 | 8.5 | 43.5 | 112 | 124 | 136 | 5 | 7 | 0 |
| 36 FT | 19 | 21 | 12 | 7 | 6.5 | 6 | 6 | 48.9 | 39.3 | 42.9 | 46.5 | 7 | 6.5 | 6 | 8 | 43.5 | 113 | 125 | 137 | 5 | 7 | 0 |
| 38 FT | 19 | 21 | 13 | 7 | 6 | 6 | 6 | 49.3 | 39.3 | 42.9 | 46.5 | 7 | 6.5 | 6 | 8 | 43.9 | 113 | 125 | 137 | 5 | 7 | 0 |
| 40 FT | 20 | 22 | 13 | 7 | 6 | 6 | 6.5 | 49.3 | 41.3 | 45.0 | 48.6 | 7 | 6.5 | 6 | 8 | 43.9 | 114 | 126 | 138 | 5 | 6.5 | 0 |
| 42 FT | 21 | 23 | 13 | 7 | 6 | 6 | 6 | 49.3 | 41.9 | 45.6 | 49.3 | 7 | 6.5 | 6 | 8 | 43.9 | 115 | 127 | 139 | 5 | 6.5 | 0 |
| 44 FT | 21 | 23 | 14 | 7 | 6 | 6 | 6 | 49.6 | 41.9 | 45.6 | 49.3 | 7 | 6 | 6 | 7.5 | 44.3 | 115 | 127 | 139 | 5 | 6.5 | 0 |
| 46 FT | 22 | 24 | 14 | 7 | 6 | 6 | 6.5 | 49.6 | 42.5 | 46.3 | 49.9 | 7 | 6 | 6 | 8 | 45.5 | 116 | 128 | 140 | 5 | 6 | 0 |
| 48 FT | 23 | 25 | 14 | 8 | 7.5 | 6 | 6.5 | 49.6 | 43.1 | 46.8 | 50.5 | 7 | 6 | 6 | 8 | 45.5 | 117 | 129 | 141 | 5 | 6 | 0 |
| 50 FT | 23 | 25 | 14 | 8 | 7 | 6 | 6 | 49.6 | 43.1 | 46.8 | 50.5 | 7 | 6 | 6 | 7.5 | 45.5 | 117 | 129 | 141 | 5 | 6 | 0 |

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 10 FEET
HEIGHT (HT): 5 THRU 13 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

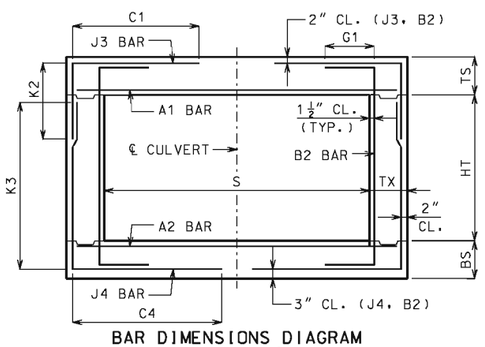
703.17

## SPAN (S) = 11 FT  HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT

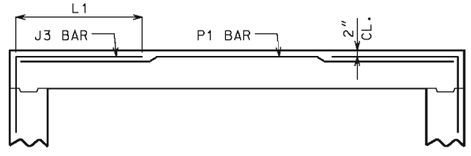
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | | | A2 BARS | | J4 BARS | | | K3 | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=6′ | HT=7′ | HT=8′ | | SIZE | SPA. | SIZE | SPA. | C4 | HT=6′ | HT=7′ | HT=8′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 10 | 8 | 6 | 7.5 | 5 | 7 | 82.6 | 32.0 | 36.4 | 40.6 | | 6 | 8 | 6 | 7.5 | 61.6 | 78 | 90 | 102 | 5 | 12 | 12 |
| 2 FT | 12 | 10 | 8 | 6 | 7.5 | 5 | 6.5 | 82.6 | 32.0 | 36.4 | 40.6 | | 6 | 7.5 | 6 | 7 | 53.3 | 78 | 90 | 102 | 5 | 12 | 12 |
| 4 FT | 9 | 10 | 8 | 6 | 7 | 6 | 6.5 | 46.3 | 29.3 | 33.4 | 37.4 | | 6 | 7 | 6 | 7.5 | 46.3 | 78 | 90 | 102 | 5 | 12 | 0 |
| 6 FT | 9 | 10 | 8 | 6 | 7 | 6 | 6.5 | 43.4 | 29.3 | 33.4 | 37.4 | | 6 | 6.5 | 6 | 6.5 | 42.0 | 78 | 90 | 102 | 5 | 12 | 0 |
| 8 FT | 9 | 10 | 8 | 6 | 6.5 | 6 | 6 | 42.0 | 33.5 | 38.3 | 42.9 | | 6 | 6 | 6 | 6 | 40.6 | 78 | 90 | 102 | 5 | 12 | 0 |
| 10 FT | 10 | 11 | 8 | 6 | 6.5 | 6 | 6.5 | 39.3 | 30.8 | 35.0 | 39.3 | | 7 | 8 | 6 | 7 | 37.8 | 79 | 91 | 103 | 5 | 12 | 0 |
| 12 FT | 10 | 11 | 8 | 6 | 6.5 | 6 | 6.5 | 37.8 | 30.8 | 35.0 | 39.3 | | 6 | 6 | 6 | 7 | 35.0 | 79 | 91 | 103 | 5 | 12 | 0 |
| 14 FT | 10 | 11 | 8 | 7 | 7.5 | 6 | 6 | 36.4 | 34.4 | 39.0 | 43.6 | | 7 | 7 | 6 | 6 | 35.0 | 79 | 91 | 103 | 5 | 12 | 0 |
| 16 FT | 11 | 13 | 8 | 7 | 7 | 6 | 6 | 36.4 | 31.9 | 36.0 | 40.3 | | 7 | 7 | 5 | 6.5 | 30.8 | 81 | 93 | 105 | 5 | 12 | 0 |
| 18 FT | 11 | 14 | 8 | 7 | 6 | 7 | 6 | 39.3 | 31.3 | 35.4 | 39.5 | | 7 | 6.5 | 5 | 7 | 29.4 | 82 | 94 | 106 | 5 | 12 | 0 |
| 20 FT | 13 | 15 | 8 | 7 | 6.5 | 6 | 6.5 | 33.6 | 33.3 | 37.5 | 41.6 | | 7 | 6.5 | 5 | 7 | 29.4 | 83 | 95 | 107 | 5 | 12 | 0 |
| 22 FT | 14 | 16 | 8 | 7 | 6 | 6 | 6.5 | 33.6 | 34.9 | 39.3 | 43.5 | | 7 | 6.5 | 5 | 7 | 29.4 | 84 | 96 | 108 | 5 | 12 | 0 |
| 24 FT | 15 | 17 | 8 | 7 | 6 | 6 | 6.5 | 39.3 | 35.6 | 40.0 | 44.3 | | 7 | 6.5 | 5 | 6.5 | 29.4 | 85 | 97 | 109 | 5 | 12 | 0 |
| 26 FT | 16 | 18 | 8 | 7 | 6 | 6 | 6.5 | 37.8 | 36.4 | 40.6 | 45.0 | | 7 | 6.5 | 5 | 6.5 | 29.4 | 86 | 98 | 110 | 5 | 10 | 0 |
| 28 FT | 17 | 19 | 8 | 8 | 7.5 | 6 | 6.5 | 37.8 | 37.1 | 41.4 | 45.8 | | 7 | 6 | 5 | 6.5 | 29.4 | 87 | 99 | 111 | 5 | 9.5 | 0 |
| 30 FT | 18 | 20 | 8 | 8 | 7.5 | 6 | 6 | 37.8 | 38.9 | 43.3 | 47.8 | | 7 | 6 | 5 | 6 | 29.4 | 88 | 100 | 112 | 5 | 9.5 | 0 |
| 32 FT | 19 | 21 | 9 | 8 | 7.5 | 6 | 7 | 39.5 | 39.6 | 44.0 | 48.5 | | 7 | 6 | 5 | 6.5 | 29.6 | 89 | 101 | 113 | 5 | 9 | 0 |
| 34 FT | 20 | 22 | 10 | 8 | 7.5 | 6 | 8 | 39.8 | 40.4 | 44.8 | 49.3 | | 7 | 6 | 5 | 7 | 31.3 | 90 | 102 | 114 | 5 | 10 | 0 |
| 36 FT | 21 | 23 | 10 | 8 | 7.5 | 6 | 8 | 39.8 | 41.1 | 45.5 | 50.0 | | 7 | 6 | 5 | 6.5 | 31.3 | 91 | 103 | 115 | 5 | 9 | 0 |
| 38 FT | 22 | 23 | 10 | 8 | 7 | 6 | 8 | 39.8 | 42.5 | 47.1 | 51.6 | | 8 | 7.5 | 5 | 6.5 | 31.3 | 91 | 103 | 115 | 5 | 8 | 0 |
| 40 FT | 22 | 24 | 11 | 8 | 7 | 6 | 7 | 40.0 | 43.0 | 47.5 | 52.0 | | 8 | 7.5 | 5 | 7 | 31.5 | 92 | 104 | 116 | 5 | 9 | 0 |
| 42 FT | 23 | 25 | 11 | 8 | 7 | 6 | 8 | 40.0 | 43.8 | 48.3 | 52.9 | | 8 | 7.5 | 5 | 7 | 31.5 | 93 | 105 | 117 | 5 | 8.5 | 0 |
| 44 FT | 24 | 26 | 11 | 8 | 7 | 6 | 8 | 40.0 | 44.5 | 49.0 | 53.6 | | 8 | 7.5 | 5 | 6.5 | 31.5 | 94 | 106 | 118 | 5 | 7.5 | 0 |
| 46 FT | 25 | 26 | 11 | 8 | 6.5 | 6 | 8 | 40.0 | 46.0 | 50.8 | 55.4 | | 8 | 7 | 5 | 6.5 | 31.5 | 94 | 106 | 118 | 5 | 7.5 | 0 |
| 48 FT | 25 | 27 | 11 | 8 | 6.5 | 6 | 7.5 | 40.0 | 45.3 | 49.8 | 54.4 | | 8 | 7 | 5 | 6 | 31.5 | 95 | 107 | 119 | 5 | 7.5 | 0 |
| 50 FT | 26 | 27 | 11 | 8 | 6.5 | 6 | 8 | 40.0 | 46.8 | 51.5 | 56.1 | | 8 | 7 | 5 | 6 | 31.5 | 95 | 107 | 119 | 5 | 7.5 | 0 |

## SPAN (S) = 11 FT  HEIGHT (HT) = 12 FT OR 13 FT OR 14 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | | | A2 BARS | | J4 BARS | | | K3 | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=12′ | HT=13′ | HT=14′ | | SIZE | SPA. | SIZE | SPA. | C4 | HT=12′ | HT=13′ | HT=14′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 12 | 9 | 6 | 7.5 | 6 | 7 | 86.0 | 32.6 | 35.0 | 37.4 | | 6 | 7.5 | 6 | 6 | 86.0 | 152 | 164 | 176 | 5 | 8.5 | 12 |
| 2 FT | 12 | 12 | 9 | 6 | 7 | 6 | 6.5 | 86.0 | 34.3 | 36.8 | 39.3 | | 6 | 7 | 6 | 6 | 86.0 | 152 | 164 | 176 | 5 | 8 | 12 |
| 4 FT | 9 | 11 | 10 | 6 | 7 | 6 | 6 | 86.6 | 33.4 | 35.9 | 38.4 | | 6 | 6.5 | 6 | 6 | 86.6 | 151 | 163 | 175 | 5 | 7.5 | 0 |
| 6 FT | 9 | 12 | 10 | 6 | 7.5 | 6 | 6 | 86.6 | 33.6 | 36.1 | 38.6 | | 6 | 6.5 | 6 | 6 | 88.0 | 152 | 164 | 176 | 5 | 7 | 0 |
| 8 FT | 10 | 13 | 10 | 6 | 7.5 | 6 | 6 | 86.6 | 34.0 | 36.5 | 39.0 | | 6 | 7 | 6 | 6 | 86.6 | 153 | 165 | 177 | 5 | 6.5 | 0 |
| 10 FT | 10 | 13 | 11 | 6 | 7 | 6 | 6 | 70.1 | 34.0 | 36.5 | 39.0 | | 6 | 6.5 | 6 | 6.5 | 88.6 | 153 | 165 | 177 | 5 | 6.5 | 0 |
| 12 FT | 10 | 13 | 11 | 6 | 7.5 | 6 | 6 | 60.0 | 32.4 | 34.8 | 37.3 | | 6 | 6.5 | 6 | 6.5 | 74.4 | 153 | 165 | 177 | 5 | 7.5 | 0 |
| 14 FT | 11 | 13 | 11 | 6 | 6.5 | 6 | 6 | 60.0 | 35.9 | 38.5 | 41.1 | | 6 | 6 | 6 | 6 | 70.1 | 153 | 165 | 177 | 5 | 7 | 0 |
| 16 FT | 12 | 14 | 12 | 6 | 6.5 | 6 | 7 | 60.5 | 36.3 | 39.0 | 41.6 | | 7 | 8 | 6 | 6.5 | 67.6 | 154 | 166 | 178 | 5 | 7 | 0 |
| 18 FT | 13 | 15 | 13 | 6 | 6 | 6 | 7 | 59.5 | 38.4 | 41.1 | 43.9 | | 7 | 7.5 | 6 | 7 | 65.3 | 155 | 167 | 179 | 5 | 6.5 | 0 |
| 20 FT | 14 | 16 | 13 | 6 | 6 | 6 | 6.5 | 60.9 | 38.9 | 41.6 | 44.4 | | 7 | 7.5 | 6 | 6.5 | 66.8 | 156 | 168 | 180 | 5 | 6.5 | 0 |
| 22 FT | 14 | 17 | 14 | 7 | 7.5 | 6 | 6.5 | 59.9 | 39.1 | 41.9 | 44.6 | | 7 | 7 | 6 | 6.5 | 64.3 | 157 | 169 | 181 | 5 | 6 | 0 |
| 24 FT | 15 | 17 | 14 | 7 | 7 | 6 | 6 | 65.8 | 39.4 | 42.1 | 44.9 | | 7 | 6.5 | 6 | 6 | 64.3 | 157 | 169 | 181 | 5 | 6 | 0 |
| 26 FT | 16 | 18 | 15 | 7 | 7 | 6 | 6 | 66.1 | 41.5 | 44.4 | 47.3 | | 7 | 6.5 | 6 | 6 | 63.3 | 158 | 170 | 182 | 6 | 8 | 0 |
| 28 FT | 17 | 19 | 15 | 7 | 7 | 6 | 6 | 66.1 | 42.0 | 44.9 | 47.8 | | 7 | 6.5 | 6 | 6 | 64.6 | 159 | 171 | 183 | 6 | 8 | 0 |
| 30 FT | 18 | 20 | 16 | 7 | 7 | 6 | 6 | 66.6 | 42.5 | 45.4 | 48.3 | | 7 | 6.5 | 6 | 6 | 63.6 | 160 | 172 | 184 | 6 | 8 | 0 |
| 32 FT | 19 | 21 | 16 | 7 | 6.5 | 7 | 8 | 72.5 | 44.8 | 47.8 | 50.8 | | 7 | 6.5 | 7 | 8 | 68.1 | 161 | 173 | 185 | 6 | 8 | 0 |
| 34 FT | 20 | 22 | 16 | 7 | 6.5 | 7 | 7 | 72.5 | 45.3 | 48.3 | 51.3 | | 7 | 6.5 | 7 | 7 | 68.1 | 162 | 174 | 186 | 6 | 8 | 0 |
| 36 FT | 20 | 22 | 17 | 7 | 6 | 7 | 7.5 | 71.5 | 50.6 | 54.0 | 57.4 | | 7 | 6 | 7 | 7 | 67.0 | 162 | 174 | 186 | 6 | 7.5 | 0 |
| 38 FT | 21 | 23 | 18 | 7 | 6 | 7 | 7.5 | 72.0 | 45.8 | 48.8 | 51.8 | | 7 | 6 | 7 | 7.5 | 67.5 | 163 | 175 | 187 | 6 | 7 | 0 |
| 40 FT | 22 | 24 | 18 | 7 | 6 | 7 | 7 | 73.5 | 46.3 | 49.3 | 52.3 | | 7 | 6 | 7 | 7.5 | 69.0 | 164 | 176 | 188 | 6 | 7 | 0 |
| 42 FT | 23 | 25 | 19 | 7 | 6 | 7 | 7.5 | 74.0 | 48.6 | 51.8 | 54.9 | | 7 | 6 | 7 | 8 | 68.0 | 165 | 177 | 189 | 6 | 6.5 | 0 |
| 44 FT | 23 | 26 | 20 | 7 | 6 | 7 | 7.5 | 73.0 | 47.0 | 50.0 | 53.0 | | 7 | 6 | 6 | 6 | 65.4 | 166 | 178 | 190 | 6 | 6.5 | 0 |
| 46 FT | 24 | 26 | 20 | 8 | 7.5 | 7 | 7 | 73.0 | 49.1 | 52.3 | 55.4 | | 8 | 7.5 | 7 | 7.5 | 68.4 | 166 | 178 | 190 | 6 | 6.5 | 0 |
| 48 FT | 25 | 27 | 21 | 8 | 7.5 | 7 | 7.5 | 73.5 | 49.6 | 52.8 | 55.9 | | 8 | 7.5 | 7 | 8 | 68.9 | 167 | 179 | 191 | 6 | 6 | 0 |
| 50 FT | 25 | 27 | 21 | 8 | 7 | 7 | 7 | 73.5 | 49.6 | 52.8 | 55.9 | | 8 | 7 | 7 | 7 | 68.9 | 167 | 179 | 191 | 6 | 6 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

## SPAN (S) = 11 FT  HEIGHT (HT) = 9 FT OR 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | K2 | | | | A2 BARS | | J4 BARS | | | K3 | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | HT=9′ | HT=10′ | HT=11′ | | SIZE | SPA. | SIZE | SPA. | C4 | HT=9′ | HT=10′ | HT=11′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 11 | 8 | 6 | 7.5 | 5 | 7 | 82.6 | 32.8 | 35.9 | 39.0 | | 6 | 7.5 | 6 | 6.5 | 85.4 | 115 | 127 | 139 | 5 | 9.5 | 12 |
| 2 FT | 12 | 11 | 8 | 6 | 7 | 5 | 6.5 | 82.6 | 32.8 | 35.9 | 39.0 | | 6 | 7 | 6 | 6 | 85.4 | 115 | 127 | 139 | 5 | 9.5 | 12 |
| 4 FT | 9 | 10 | 9 | 6 | 7 | 6 | 6.5 | 70.5 | 34.1 | 37.5 | 40.9 | | 6 | 6.5 | 6 | 6 | 73.4 | 114 | 126 | 138 | 5 | 9.5 | 0 |
| 6 FT | 9 | 11 | 9 | 6 | 7.5 | 6 | 6 | 57.8 | 30.8 | 33.8 | 36.8 | | 6 | 6.5 | 6 | 6 | 64.9 | 115 | 127 | 139 | 5 | 9.5 | 0 |
| 8 FT | 9 | 11 | 9 | 6 | 7 | 7 | 6.5 | 56.4 | 30.8 | 33.8 | 36.8 | | 6 | 6 | 6 | 6 | 56.4 | 115 | 127 | 139 | 5 | 9 | 0 |
| 10 FT | 10 | 12 | 9 | 6 | 6.5 | 6 | 6 | 50.8 | 31.3 | 34.3 | 37.3 | | 6 | 6 | 6 | 6 | 55.0 | 116 | 128 | 140 | 5 | 8.5 | 0 |
| 12 FT | 10 | 12 | 9 | 6 | 6.5 | 6 | 6 | 46.5 | 31.3 | 34.3 | 37.3 | | 6 | 6 | 6 | 6 | 48.0 | 116 | 128 | 140 | 5 | 10 | 0 |
| 14 FT | 11 | 12 | 9 | 6 | 6 | 6 | 6.5 | 45.1 | 35.3 | 38.6 | 42.0 | | 7 | 7.5 | 6 | 6 | 46.5 | 116 | 128 | 140 | 5 | 9 | 0 |
| 16 FT | 11 | 13 | 10 | 7 | 7.5 | 6 | 6 | 45.5 | 33.0 | 36.1 | 39.3 | | 7 | 7 | 6 | 6.5 | 46.9 | 117 | 129 | 141 | 5 | 9.5 | 0 |
| 18 FT | 12 | 14 | 10 | 7 | 7 | 6 | 6.5 | 45.5 | 32.3 | 35.3 | 38.3 | | 7 | 7 | 6 | 6.5 | 45.5 | 118 | 130 | 142 | 5 | 8.5 | 0 |
| 20 FT | 13 | 15 | 10 | 7 | 7 | 6 | 6 | 45.5 | 34.0 | 37.1 | 40.3 | | 7 | 6.5 | 6 | 6.5 | 45.5 | 119 | 131 | 143 | 5 | 8 | 0 |
| 22 FT | 14 | 16 | 11 | 7 | 7 | 6 | 6.5 | 45.8 | 35.9 | 39.1 | 42.4 | | 7 | 6.5 | 6 | 7.5 | 45.8 | 120 | 132 | 144 | 5 | 8 | 0 |
| 24 FT | 15 | 17 | 11 | 7 | 6.5 | 6 | 6 | 51.5 | 36.5 | 39.8 | 42.9 | | 7 | 6.5 | 6 | 7.5 | 45.8 | 121 | 133 | 145 | 5 | 7.5 | 0 |
| 26 FT | 16 | 18 | 12 | 7 | 6.5 | 6 | 6.5 | 51.9 | 37.0 | 40.3 | 43.5 | | 7 | 6.5 | 6 | 8 | 46.1 | 122 | 134 | 146 | 5 | 7.5 | 0 |
| 28 FT | 17 | 19 | 12 | 7 | 6.5 | 6 | 6.5 | 51.9 | 37.5 | 40.8 | 44.0 | | 7 | 6.5 | 6 | 7.5 | 46.1 | 123 | 135 | 147 | 5 | 7 | 0 |
| 30 FT | 18 | 20 | 13 | 7 | 6.5 | 6 | 6.5 | 52.3 | 38.1 | 41.3 | 44.5 | | 7 | 6.5 | 6 | 8 | 46.4 | 124 | 136 | 148 | 5 | 7.5 | 0 |
| 32 FT | 19 | 21 | 13 | 7 | 6 | 6 | 6.5 | 52.3 | 40.0 | 43.4 | 46.8 | | 7 | 6 | 6 | 7.5 | 46.4 | 125 | 137 | 149 | 5 | 6.5 | 0 |
| 34 FT | 20 | 22 | 13 | 7 | 6 | 6 | 6 | 52.3 | 40.6 | 44.0 | 47.4 | | 7 | 6 | 6 | 7.5 | 46.4 | 126 | 138 | 150 | 5 | 6.5 | 0 |
| 36 FT | 21 | 22 | 13 | 7 | 6 | 6 | 6 | 52.3 | 45.3 | 49.0 | 52.8 | | 7 | 6 | 6 | 6.5 | 46.4 | 126 | 138 | 150 | 5 | 6.5 | 0 |
| 38 FT | 21 | 23 | 14 | 8 | 7.5 | 6 | 6 | 52.5 | 41.1 | 44.5 | 47.9 | | 7 | 6 | 6 | 7.5 | 46.8 | 127 | 139 | 151 | 5 | 6 | 0 |
| 40 FT | 22 | 24 | 14 | 8 | 7.5 | 6 | 6 | 52.5 | 43.3 | 46.8 | 50.1 | | 8 | 7.5 | 6 | 7 | 48.1 | 128 | 140 | 152 | 5 | 6 | 0 |
| 42 FT | 23 | 25 | 15 | 8 | 7.5 | 6 | 6.5 | 52.9 | 48.4 | 52.1 | 56.0 | | 8 | 7.5 | 6 | 7.5 | 48.5 | 129 | 141 | 153 | 5 | 6 | 0 |
| 44 FT | 24 | 25 | 15 | 8 | 7 | 6 | 6.5 | 52.9 | 48.6 | 52.5 | 56.4 | | 8 | 7 | 6 | 6.5 | 48.5 | 129 | 141 | 153 | 6 | 8 | 0 |
| 46 FT | 24 | 26 | 15 | 8 | 7 | 6 | 6 | 52.9 | 49.0 | 52.8 | 56.6 | | 8 | 7 | 6 | 7 | 48.5 | 130 | 142 | 154 | 6 | 8 | 0 |
| 48 FT | 25 | 27 | 16 | 8 | 7 | 6 | 6 | 53.3 | 49.6 | 53.5 | 57.3 | | 8 | 7 | 6 | 7.5 | 48.9 | 131 | 143 | 155 | 6 | 8 | 0 |
| 50 FT | 26 | 27 | 16 | 8 | 6.5 | 6 | 6 | 53.3 | 51.5 | 55.5 | 59.4 | | 8 | 7 | 6 | 6.5 | 48.9 | 131 | 143 | 155 | 6 | 8 | 0 |

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 11 FEET
HEIGHT (HT): 6 THRU 14 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 9 OF 14

## SPAN (S) = 12 FT  HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=6′ | K2 HT=7′ | K2 HT=8′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=6′ | K3 HT=7′ | K3 HT=8′ | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 8 | 6 | 7.5 | 5 | 8.5 | 89.6 | 33.3 | 37.8 | 42.1 | 6 | 7.5 | 6 | 6.5 | 57.8 | 78 | 90 | 102 | 5 | 12 | 12 |
| 2 FT | 14 | 10 | 8 | 6 | 7 | 5 | 8.5 | 89.6 | 34.6 | 39.1 | 43.8 | 6 | 7 | 6 | 6 | 51.6 | 78 | 90 | 102 | 5 | 12 | 12 |
| 4 FT | 10 | 11 | 8 | 6 | 6.5 | 6 | 6.5 | 47.1 | 30.8 | 35.0 | 39.3 | 6 | 6.5 | 5 | 6.5 | 42.5 | 79 | 91 | 103 | 5 | 12 | 0 |
| 6 FT | 10 | 11 | 8 | 6 | 6.5 | 6 | 6.5 | 44.1 | 30.8 | 35.0 | 39.3 | 6 | 6 | 5 | 6 | 39.5 | 79 | 91 | 103 | 5 | 12 | 0 |
| 8 FT | 10 | 11 | 8 | 6 | 6 | 6 | 6.5 | 41.0 | 30.8 | 35.0 | 39.3 | 7 | 7.5 | 6 | 6.5 | 39.5 | 79 | 91 | 103 | 5 | 12 | 0 |
| 10 FT | 10 | 11 | 8 | 7 | 7 | 7 | 6 | 42.5 | 34.4 | 39.0 | 43.6 | 7 | 6.5 | 6 | 6 | 38.0 | 79 | 91 | 103 | 5 | 12 | 0 |
| 12 FT | 11 | 12 | 8 | 7 | 7 | 6 | 6 | 38.0 | 35.1 | 39.8 | 44.5 | 7 | 6.5 | 6 | 6.5 | 36.5 | 80 | 92 | 104 | 5 | 12 | 0 |
| 14 FT | 11 | 13 | 8 | 7 | 7 | 6 | 6 | 36.5 | 31.9 | 36.0 | 40.3 | 7 | 6.5 | 5 | 7 | 30.4 | 81 | 93 | 105 | 5 | 12 | 0 |
| 16 FT | 12 | 14 | 8 | 7 | 6.5 | 6 | 6 | 35.0 | 32.5 | 36.8 | 41.0 | 7 | 6.5 | 5 | 7 | 30.4 | 82 | 94 | 106 | 5 | 12 | 0 |
| 18 FT | 13 | 15 | 8 | 7 | 6 | 6 | 6.5 | 33.5 | 33.3 | 37.5 | 41.6 | 7 | 6 | 5 | 6.5 | 30.4 | 83 | 95 | 107 | 5 | 12 | 0 |
| 20 FT | 15 | 17 | 8 | 7 | 6 | 6 | 7 | 39.5 | 35.6 | 40.0 | 44.3 | 7 | 6.5 | 5 | 7 | 30.4 | 85 | 97 | 109 | 5 | 12 | 0 |
| 22 FT | 16 | 18 | 8 | 7 | 6 | 6 | 7 | 39.5 | 36.4 | 40.6 | 45.0 | 7 | 6 | 5 | 6.5 | 30.4 | 86 | 98 | 110 | 5 | 12 | 0 |
| 24 FT | 17 | 19 | 8 | 8 | 7.5 | 6 | 7 | 39.5 | 37.1 | 41.4 | 45.8 | 7 | 6 | 5 | 6.5 | 30.4 | 87 | 99 | 111 | 5 | 11 | 0 |
| 26 FT | 18 | 20 | 8 | 8 | 7 | 6 | 7 | 39.5 | 38.9 | 43.3 | 47.8 | 7 | 6 | 5 | 6 | 30.4 | 88 | 100 | 112 | 5 | 9.5 | 0 |
| 28 FT | 19 | 21 | 8 | 8 | 7 | 6 | 7 | 39.5 | 39.6 | 44.0 | 48.5 | 7 | 6 | 6 | 7.5 | 33.5 | 89 | 101 | 113 | 5 | 9.5 | 0 |
| 30 FT | 20 | 21 | 8 | 8 | 7 | 6 | 6.5 | 39.5 | 44.3 | 49.3 | 54.1 | 8 | 7 | 6 | 7.5 | 33.5 | 89 | 101 | 113 | 5 | 9.5 | 0 |
| 32 FT | 21 | 23 | 9 | 8 | 7 | 6 | 7.5 | 39.8 | 41.1 | 45.5 | 50.0 | 8 | 7.5 | 5 | 6 | 30.6 | 91 | 103 | 115 | 5 | 8.5 | 0 |
| 34 FT | 22 | 23 | 9 | 8 | 6.5 | 6 | 7.5 | 39.8 | 42.5 | 47.1 | 51.6 | 8 | 7 | 5 | 6 | 30.6 | 91 | 103 | 115 | 5 | 8.5 | 0 |
| 36 FT | 23 | 24 | 9 | 8 | 6.5 | 6 | 7 | 39.8 | 47.9 | 52.9 | 58.0 | 8 | 7 | 6 | 7 | 33.6 | 92 | 104 | 116 | 5 | 8.5 | 0 |
| 38 FT | 24 | 25 | 9 | 8 | 6.5 | 6 | 6.5 | 39.8 | 48.8 | 53.8 | 58.8 | 8 | 7 | 6 | 7 | 33.6 | 93 | 105 | 117 | 5 | 8.5 | 0 |
| 40 FT | 24 | 26 | 10 | 8 | 6 | 6 | 7 | 40.0 | 44.5 | 49.0 | 53.6 | 8 | 7 | 5 | 6 | 30.8 | 94 | 106 | 118 | 5 | 8 | 0 |
| 42 FT | 25 | 27 | 10 | 8 | 6 | 6 | 7 | 40.0 | 45.3 | 49.8 | 54.4 | 8 | 7 | 6 | 7 | 33.9 | 95 | 107 | 119 | 5 | 8 | 0 |
| 44 FT | 26 | 27 | 10 | 8 | 6 | 6 | 7 | 40.0 | 50.4 | 55.5 | 60.5 | 8 | 6.5 | 6 | 7 | 33.9 | 95 | 107 | 119 | 5 | 8 | 0 |
| 46 FT | 27 | 28 | 10 | 8 | 6 | 6 | 7 | 40.0 | 51.3 | 56.3 | 61.4 | 8 | 6.5 | 6 | 7 | 33.9 | 96 | 108 | 120 | 5 | 7.5 | 0 |
| 48 FT | 28 | 29 | 11 | 8 | 6 | 6 | 7.5 | 40.3 | 52.1 | 57.1 | 62.1 | 8 | 6.5 | 6 | 7.5 | 34.1 | 97 | 109 | 121 | 5 | 7.5 | 0 |
| 50 FT | 28 | 30 | 11 | 8 | 6 | 6 | 7.5 | 40.3 | 52.5 | 57.5 | 62.6 | 8 | 6.5 | 6 | 7 | 34.1 | 98 | 110 | 122 | 5 | 7.5 | 0 |

## SPAN (S) = 12 FT  HEIGHT (HT) = 9 FT OR 10 FT OR 11 FT

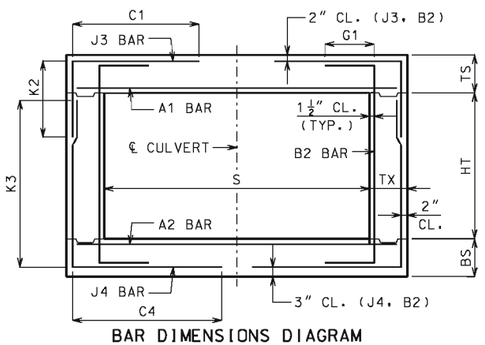
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=9′ | K2 HT=10′ | K2 HT=11′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=9′ | K3 HT=10′ | K3 HT=11′ | SIZE | SPA. | G1 |
| 1 FT | 11 | 12 | 8 | 6 | 6.5 | 6 | 7 | 91.3 | 31.5 | 34.5 | 37.5 | 6 | 7.5 | 6 | 7 | 91.3 | 116 | 128 | 140 | 5 | 10 | 12 |
| 2 FT | 11 | 12 | 8 | 6 | 6 | 6 | 6.5 | 91.3 | 31.5 | 34.5 | 37.5 | 6 | 7 | 6 | 6.5 | 91.3 | 116 | 128 | 140 | 5 | 9.5 | 12 |
| 4 FT | 10 | 12 | 8 | 6 | 6 | 6 | 6 | 69.9 | 30.0 | 32.9 | 35.8 | 6 | 6.5 | 6 | 6.5 | 83.6 | 116 | 128 | 140 | 5 | 9.5 | 0 |
| 6 FT | 10 | 12 | 8 | 6 | 6.5 | 6 | 6 | 57.8 | 31.3 | 34.3 | 37.3 | 6 | 6 | 6 | 6 | 62.4 | 116 | 128 | 140 | 5 | 9.5 | 0 |
| 8 FT | 10 | 12 | 9 | 6 | 6 | 6 | 6 | 52.0 | 31.3 | 34.3 | 37.3 | 7 | 8 | 6 | 6 | 55.1 | 116 | 128 | 140 | 5 | 10 | 0 |
| 10 FT | 10 | 12 | 9 | 7 | 7.5 | 7 | 6 | 52.0 | 35.0 | 38.4 | 41.8 | 7 | 7 | 6 | 6 | 50.5 | 116 | 128 | 140 | 5 | 9.5 | 0 |
| 12 FT | 11 | 13 | 10 | 7 | 7.5 | 6 | 6 | 49.3 | 33.0 | 36.1 | 39.3 | 7 | 7 | 6 | 6.5 | 49.3 | 117 | 129 | 141 | 5 | 10 | 0 |
| 14 FT | 11 | 13 | 10 | 7 | 7.5 | 6 | 6 | 46.3 | 31.8 | 34.8 | 37.8 | 7 | 7 | 6 | 6.5 | 46.3 | 117 | 129 | 141 | 5 | 12 | 0 |
| 16 FT | 12 | 14 | 10 | 7 | 7 | 6 | 6.5 | 46.3 | 32.3 | 35.3 | 38.3 | 7 | 6.5 | 6 | 7 | 44.6 | 118 | 130 | 142 | 5 | 11 | 0 |
| 18 FT | 13 | 15 | 10 | 7 | 6.5 | 6 | 6 | 44.6 | 38.0 | 41.5 | 45.0 | 7 | 6 | 6 | 7 | 44.6 | 119 | 131 | 143 | 5 | 9.5 | 0 |
| 20 FT | 14 | 16 | 10 | 7 | 6 | 7 | 7.5 | 47.8 | 38.6 | 42.0 | 45.5 | 7 | 6 | 6 | 6.5 | 44.6 | 120 | 132 | 144 | 5 | 8.5 | 0 |
| 22 FT | 16 | 18 | 11 | 7 | 6.5 | 6 | 6.5 | 51.1 | 37.0 | 40.3 | 43.5 | 7 | 6.5 | 6 | 7.5 | 45.0 | 122 | 134 | 146 | 5 | 8.5 | 0 |
| 24 FT | 17 | 19 | 11 | 7 | 6 | 6 | 6 | 49.6 | 37.5 | 40.8 | 44.0 | 7 | 6 | 6 | 7.5 | 45.0 | 123 | 135 | 147 | 5 | 7.5 | 0 |
| 26 FT | 18 | 20 | 12 | 7 | 6 | 6 | 6.5 | 49.9 | 38.1 | 41.3 | 44.5 | 7 | 6 | 6 | 7.5 | 45.3 | 124 | 136 | 148 | 5 | 8 | 0 |
| 28 FT | 19 | 21 | 12 | 7 | 6 | 6 | 6 | 49.9 | 40.0 | 43.4 | 46.8 | 7 | 6 | 6 | 7.5 | 45.3 | 125 | 137 | 149 | 5 | 7 | 0 |
| 30 FT | 20 | 22 | 13 | 8 | 7.5 | 6 | 6.5 | 51.8 | 40.6 | 44.0 | 47.4 | 7 | 6 | 6 | 8 | 45.5 | 126 | 138 | 150 | 5 | 7.5 | 0 |
| 32 FT | 21 | 23 | 13 | 8 | 7.5 | 6 | 6 | 50.3 | 41.1 | 44.5 | 47.9 | 8 | 7.5 | 6 | 7.5 | 45.5 | 127 | 139 | 151 | 5 | 7 | 0 |
| 34 FT | 21 | 23 | 13 | 8 | 7 | 6 | 6 | 50.3 | 45.6 | 49.3 | 53.0 | 8 | 7 | 6 | 7 | 45.5 | 127 | 139 | 151 | 5 | 6.5 | 0 |
| 36 FT | 22 | 24 | 14 | 8 | 7 | 6 | 6 | 52.1 | 43.3 | 46.8 | 50.1 | 8 | 7 | 6 | 7.5 | 45.9 | 128 | 140 | 152 | 5 | 7 | 0 |
| 38 FT | 23 | 25 | 14 | 8 | 6.5 | 6 | 6 | 50.5 | 43.8 | 47.3 | 50.8 | 8 | 7 | 6 | 7.5 | 45.9 | 129 | 141 | 153 | 5 | 6 | 0 |
| 40 FT | 24 | 26 | 14 | 8 | 6.5 | 6 | 6 | 50.5 | 44.4 | 47.9 | 51.4 | 8 | 7 | 6 | 7 | 45.9 | 130 | 142 | 154 | 5 | 6 | 0 |
| 42 FT | 25 | 27 | 15 | 8 | 6.5 | 6 | 6 | 52.5 | 49.6 | 53.5 | 57.3 | 8 | 7 | 6 | 7.5 | 46.1 | 131 | 143 | 155 | 5 | 6 | 0 |
| 44 FT | 26 | 28 | 15 | 8 | 6.5 | 6 | 6 | 52.5 | 50.3 | 54.1 | 57.9 | 8 | 6.5 | 6 | 7.5 | 47.8 | 132 | 144 | 156 | 6 | 8 | 0 |
| 46 FT | 27 | 28 | 15 | 8 | 6.5 | 6 | 6 | 50.9 | 52.1 | 56.1 | 60.0 | 8 | 6.5 | 6 | 7 | 47.8 | 132 | 144 | 156 | 6 | 8 | 0 |
| 48 FT | 27 | 29 | 15 | 8 | 6 | 6 | 6 | 52.5 | 52.5 | 56.4 | 60.4 | 8 | 6.5 | 6 | 7 | 47.8 | 133 | 145 | 157 | 6 | 8 | 0 |
| 50 FT | 28 | 30 | 16 | 8 | 6 | 6 | 6 | 52.8 | 53.1 | 57.1 | 61.0 | 8 | 6.5 | 6 | 7.5 | 48.0 | 134 | 146 | 158 | 6 | 8 | 0 |

## SPAN (S) = 12 FT  HEIGHT (HT) = 12 FT OR 13 FT

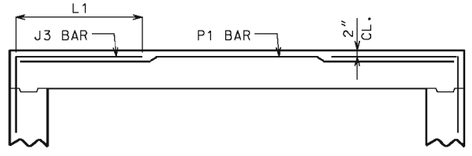
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=12′ | K2 HT=13′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=12′ | K3 HT=13′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 11 | 9 | 6 | 6.5 | 5 | 6 | 90.3 | 32.4 | 34.8 | 6 | 6.5 | 6 | 6 | 91.8 | 151 | 163 | 5 | 8.5 | 12 |
| 2 FT | 12 | 11 | 9 | 6 | 6.5 | 6 | 7 | 91.8 | 34.0 | 36.5 | 6 | 6.5 | 6 | 6 | 91.8 | 151 | 163 | 5 | 8.5 | 12 |
| 4 FT | 10 | 12 | 9 | 6 | 6.5 | 6 | 6 | 91.8 | 35.4 | 38.0 | 6 | 6.5 | 6 | 6 | 91.8 | 152 | 164 | 5 | 8.5 | 0 |
| 6 FT | 10 | 12 | 9 | 6 | 6.5 | 7 | 6.5 | 81.1 | 35.4 | 38.0 | 6 | 6 | 6 | 6 | 91.8 | 152 | 164 | 5 | 8 | 0 |
| 8 FT | 10 | 12 | 10 | 6 | 6.5 | 6 | 6 | 64.6 | 35.4 | 38.0 | 7 | 7.5 | 6 | 6 | 73.9 | 152 | 164 | 5 | 8 | 0 |
| 10 FT | 11 | 13 | 10 | 6 | 6 | 6 | 6 | 61.6 | 35.9 | 38.5 | 7 | 7.5 | 6 | 6 | 69.3 | 153 | 165 | 5 | 8 | 0 |
| 12 FT | 12 | 13 | 11 | 6 | 6 | 6 | 6 | 58.9 | 36.1 | 38.8 | 7 | 7 | 6 | 6 | 62.0 | 153 | 165 | 5 | 7.5 | 0 |
| 14 FT | 12 | 13 | 11 | 6 | 6 | 6 | 7 | 54.3 | 36.1 | 38.8 | 7 | 7 | 6 | 6 | 55.8 | 153 | 165 | 5 | 7.5 | 0 |
| 16 FT | 12 | 14 | 11 | 7 | 7 | 6 | 6 | 52.8 | 36.3 | 39.0 | 7 | 6.5 | 6 | 6.5 | 55.8 | 154 | 166 | 5 | 7.5 | 0 |
| 18 FT | 13 | 16 | 12 | 7 | 7 | 6 | 6 | 53.0 | 38.6 | 41.4 | 7 | 6.5 | 6 | 7 | 56.1 | 156 | 168 | 5 | 7 | 0 |
| 20 FT | 14 | 16 | 12 | 7 | 6.5 | 6 | 6 | 53.0 | 38.9 | 41.6 | 7 | 6 | 6 | 6 | 54.6 | 156 | 168 | 5 | 7 | 0 |
| 22 FT | 16 | 18 | 13 | 7 | 6.5 | 6 | 6 | 59.6 | 41.5 | 44.4 | 7 | 6.5 | 6 | 7 | 55.0 | 158 | 170 | 5 | 6.5 | 0 |
| 24 FT | 16 | 19 | 13 | 7 | 6 | 7 | 7 | 64.4 | 40.0 | 42.8 | 7 | 6 | 6 | 6.5 | 55.0 | 159 | 171 | 5 | 6.5 | 0 |
| 26 FT | 18 | 20 | 14 | 7 | 6.5 | 6 | 6 | 58.5 | 42.5 | 45.4 | 7 | 6 | 6 | 6.5 | 55.3 | 160 | 172 | 5 | 6 | 0 |
| 28 FT | 18 | 21 | 14 | 7 | 6 | 7 | 7 | 63.3 | 42.8 | 45.6 | 7 | 6 | 6 | 6.5 | 55.3 | 161 | 173 | 5 | 6 | 0 |
| 30 FT | 19 | 22 | 14 | 8 | 7.5 | 7 | 6.5 | 63.3 | 43.3 | 46.1 | 7 | 6 | 6 | 6 | 55.3 | 162 | 174 | 5 | 6 | 0 |
| 32 FT | 20 | 23 | 15 | 8 | 7.5 | 7 | 7.5 | 63.6 | 45.5 | 48.5 | 8 | 7.5 | 6 | 6.5 | 55.6 | 163 | 175 | 6 | 8 | 0 |
| 34 FT | 21 | 23 | 15 | 8 | 7 | 7 | 7 | 63.6 | 45.8 | 48.8 | 8 | 7 | 6 | 6 | 55.6 | 163 | 175 | 6 | 8 | 0 |
| 36 FT | 22 | 24 | 16 | 8 | 7 | 7 | 7.5 | 64.0 | 46.3 | 49.3 | 8 | 7 | 6 | 6.5 | 56.0 | 164 | 176 | 6 | 8 | 0 |
| 38 FT | 23 | 25 | 16 | 8 | 7 | 7 | 7 | 64.0 | 48.6 | 51.8 | 8 | 7 | 6 | 6 | 56.0 | 165 | 177 | 6 | 8 | 0 |
| 40 FT | 24 | 26 | 17 | 8 | 7 | 7 | 7.5 | 64.4 | 49.1 | 52.3 | 8 | 7 | 6 | 6.5 | 56.4 | 166 | 178 | 6 | 7.5 | 0 |
| 42 FT | 24 | 27 | 17 | 8 | 6.5 | 7 | 6.5 | 64.4 | 49.4 | 52.5 | 8 | 7 | 6 | 6 | 56.4 | 167 | 179 | 6 | 7.5 | 0 |
| 44 FT | 25 | 28 | 18 | 8 | 6.5 | 7 | 7 | 66.4 | 49.9 | 53.0 | 8 | 7 | 6 | 6.5 | 56.8 | 168 | 180 | 6 | 7 | 0 |
| 46 FT | 26 | 28 | 18 | 8 | 6.5 | 7 | 7 | 66.4 | 50.1 | 53.3 | 8 | 6.5 | 6 | 6 | 56.8 | 168 | 180 | 6 | 7 | 0 |
| 48 FT | 27 | 29 | 19 | 8 | 6.5 | 7 | 7.5 | 66.9 | 52.6 | 55.9 | 8 | 6.5 | 6 | 6.5 | 57.0 | 169 | 181 | 6 | 6.5 | 0 |
| 50 FT | 28 | 30 | 19 | 8 | 6.5 | 7 | 7 | 66.9 | 53.3 | 56.4 | 8 | 6.5 | 6 | 6 | 57.0 | 170 | 182 | 6 | 6.5 | 0 |

## SPAN (S) = 12 FT  HEIGHT (HT) = 14 FT OR 15 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=14′ | K2 HT=15′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=14′ | K3 HT=15′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 12 | 10 | 6 | 7 | 6 | 7.5 | 94.0 | 35.5 | 37.8 | 6 | 7 | 6 | 6.5 | 94.0 | 176 | 188 | 5 | 7.5 | 12 |
| 2 FT | 12 | 12 | 10 | 6 | 6.5 | 6 | 7 | 94.0 | 37.4 | 39.8 | 6 | 6.5 | 6 | 6 | 94.0 | 176 | 188 | 5 | 7.5 | 12 |
| 4 FT | 10 | 13 | 10 | 6 | 6.5 | 6 | 6 | 94.0 | 35.4 | 37.6 | 6 | 6.5 | 6 | 6 | 94.0 | 177 | 189 | 5 | 6.5 | 0 |
| 6 FT | 10 | 13 | 11 | 6 | 7 | 6 | 6.5 | 94.5 | 35.4 | 37.6 | 6 | 6.5 | 6 | 6.5 | 94.5 | 177 | 189 | 5 | 6.5 | 0 |
| 8 FT | 10 | 13 | 11 | 6 | 6.5 | 6 | 6 | 85.3 | 35.4 | 37.6 | 6 | 6 | 6 | 6 | 94.5 | 177 | 189 | 5 | 6 | 0 |
| 10 FT | 11 | 13 | 12 | 6 | 6.5 | 6 | 6.5 | 74.9 | 35.5 | 37.8 | 7 | 7.5 | 6 | 6 | 95.1 | 177 | 189 | 5 | 6 | 0 |
| 12 FT | 12 | 14 | 13 | 6 | 6.5 | 6 | 7 | 70.6 | 37.8 | 40.3 | 7 | 7.5 | 6 | 6.5 | 83.3 | 178 | 190 | 5 | 6 | 0 |
| 14 FT | 12 | 14 | 13 | 6 | 6.5 | 6 | 7 | 62.8 | 37.8 | 40.3 | 7 | 7.5 | 6 | 6.5 | 69.1 | 178 | 190 | 5 | 6.5 | 0 |
| 16 FT | 13 | 15 | 13 | 6 | 6 | 6 | 6.5 | 64.4 | 38.3 | 40.6 | 7 | 7 | 6 | 6.5 | 70.6 | 179 | 191 | 5 | 6.5 | 0 |
| 18 FT | 14 | 16 | 14 | 7 | 7.5 | 6 | 6.5 | 63.3 | 38.6 | 41.0 | 7 | 7 | 6 | 6.5 | 68.0 | 180 | 192 | 5 | 6 | 0 |
| 20 FT | 15 | 17 | 14 | 7 | 7 | 6 | 6 | 69.5 | 39.0 | 41.4 | 7 | 6.5 | 6 | 6 | 68.0 | 181 | 193 | 5 | 6 | 0 |
| 22 FT | 16 | 18 | 15 | 7 | 7 | 6 | 6 | 70.0 | 41.4 | 43.9 | 7 | 6.5 | 6 | 6.5 | 68.4 | 182 | 194 | 6 | 8 | 0 |
| 24 FT | 16 | 19 | 15 | 7 | 6.5 | 7 | 7 | 73.1 | 41.6 | 44.1 | 7 | 6 | 6 | 6 | 68.4 | 183 | 195 | 6 | 8 | 0 |
| 26 FT | 17 | 20 | 16 | 7 | 6.5 | 7 | 7 | 73.6 | 42.0 | 44.5 | 7 | 6 | 6 | 6 | 67.3 | 184 | 196 | 6 | 8 | 0 |
| 28 FT | 18 | 21 | 16 | 7 | 6 | 7 | 7 | 75.3 | 46.5 | 49.3 | 7 | 6 | 7 | 7.5 | 72.0 | 185 | 197 | 6 | 8 | 0 |
| 30 FT | 19 | 22 | 17 | 7 | 6 | 7 | 7 | 74.0 | 46.9 | 49.6 | 7 | 6 | 7 | 7.5 | 70.9 | 186 | 198 | 6 | 7.5 | 0 |
| 32 FT | 20 | 23 | 17 | 7 | 6 | 7 | 6.5 | 75.6 | 47.4 | 50.1 | 7 | 6 | 7 | 7 | 70.9 | 187 | 199 | 6 | 7.5 | 0 |
| 34 FT | 21 | 23 | 18 | 8 | 7.5 | 7 | 7 | 74.5 | 51.8 | 54.8 | 8 | 7.5 | 7 | 6.5 | 71.3 | 187 | 199 | 6 | 7 | 0 |
| 36 FT | 22 | 24 | 19 | 8 | 7.5 | 7 | 7.5 | 75.0 | 52.3 | 55.3 | 8 | 7.5 | 7 | 7 | 70.1 | 188 | 200 | 6 | 6.5 | 0 |
| 38 FT | 23 | 25 | 19 | 8 | 7.5 | 7 | 6.5 | 76.6 | 50.6 | 53.5 | 8 | 7 | 7 | 7 | 71.8 | 189 | 201 | 6 | 6.5 | 0 |
| 40 FT | 24 | 26 | 20 | 8 | 7 | 7 | 7 | 75.5 | 51.1 | 54.0 | 8 | 7 | 7 | 7.5 | 70.5 | 190 | 202 | 6 | 6.5 | 0 |
| 42 FT | 25 | 27 | 20 | 8 | 7 | 7 | 6.5 | 77.1 | 53.8 | 56.8 | 8 | 7 | 7 | 7 | 72.1 | 191 | 203 | 6 | 6.5 | 0 |
| 44 FT | 25 | 28 | 21 | 8 | 7 | 7 | 6.5 | 75.9 | 54.0 | 57.0 | 8 | 7 | 7 | 7.5 | 72.6 | 192 | 204 | 6 | 6 | 0 |
| 46 FT | 26 | 28 | 22 | 8 | 6.5 | 7 | 7 | 76.4 | 56.4 | 59.5 | 8 | 6.5 | 7 | 7 | 71.4 | 192 | 204 | 6 | 6 | 0 |
| 48 FT | 27 | 29 | 22 | 8 | 6.5 | 7 | 6.5 | 76.4 | 59.1 | 62.4 | 8 | 6.5 | 7 | 6.5 | 71.4 | 193 | 205 | 6 | 6 | 0 |
| 50 FT | 27 | 30 | 23 | 8 | 6.5 | 7 | 6.5 | 76.9 | 57.3 | 60.4 | 8 | 6.5 | 7 | 7 | 71.8 | 194 | 206 | 7 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




### ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 12 FEET
HEIGHT (HT): 6 THRU 15 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 10 OF 14

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 13 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=7′ | K2 HT=8′ | K2 HT=9′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=7′ | K3 HT=8′ | K3 HT=9′ | SIZE | SPA. | G1 |
| 1 FT | 13 | 11 | 8 | 6 | 6.5 | 5 | 8.5 | 95.1 | 34.0 | 38.0 | 41.9 | 6 | 7 | 6 | 7 | 67.3 | 91 | 103 | 115 | 5 | 12 | 12 |
| 2 FT | 13 | 11 | 8 | 6 | 6 | 5 | 6.5 | 95.1 | 34.0 | 38.0 | 41.9 | 6 | 6.5 | 6 | 6.5 | 59.0 | 91 | 103 | 115 | 5 | 12 | 12 |
| 4 FT | 10 | 11 | 8 | 7 | 7.5 | 6 | 6 | 49.3 | 31.0 | 34.8 | 38.5 | 6 | 6 | 6 | 6.5 | 49.3 | 91 | 103 | 115 | 5 | 12 | 0 |
| 6 FT | 10 | 11 | 8 | 7 | 7.5 | 6 | 6 | 45.9 | 34.0 | 38.1 | 42.1 | 7 | 7 | 6 | 6 | 45.9 | 91 | 103 | 115 | 5 | 12 | 0 |
| 8 FT | 10 | 12 | 8 | 7 | 7 | 7 | 6 | 47.5 | 30.3 | 33.9 | 37.5 | 7 | 7 | 6 | 7 | 42.6 | 92 | 104 | 116 | 5 | 12 | 0 |
| 10 FT | 11 | 12 | 8 | 7 | 6.5 | 7 | 6.5 | 44.3 | 35.8 | 39.9 | 44.1 | 7 | 6 | 6 | 6 | 41.0 | 92 | 104 | 116 | 5 | 12 | 0 |
| 12 FT | 12 | 13 | 8 | 7 | 6 | 7 | 6.5 | 42.6 | 36.4 | 40.6 | 44.8 | 7 | 6 | 6 | 6.5 | 39.4 | 93 | 105 | 117 | 5 | 12 | 0 |
| 14 FT | 12 | 14 | 8 | 7 | 6 | 7 | 6.5 | 41.0 | 32.5 | 36.3 | 40.0 | 7 | 6 | 5 | 6 | 32.8 | 94 | 106 | 118 | 5 | 12 | 0 |
| 16 FT | 13 | 15 | 8 | 8 | 7.5 | 7 | 6.5 | 39.4 | 33.1 | 36.9 | 40.6 | 7 | 6 | 5 | 6 | 31.1 | 95 | 107 | 119 | 5 | 12 | 0 |
| 18 FT | 14 | 16 | 8 | 8 | 7 | 7 | 7 | 37.8 | 34.9 | 38.8 | 42.5 | 8 | 7.5 | 6 | 8 | 34.5 | 96 | 108 | 120 | 5 | 12 | 0 |
| 20 FT | 15 | 18 | 8 | 8 | 6.5 | 7 | 7 | 45.9 | 35.9 | 39.6 | 43.5 | 8 | 7.5 | 5 | 6 | 31.1 | 98 | 110 | 122 | 5 | 11.5 | 0 |
| 22 FT | 17 | 19 | 8 | 8 | 7 | 6 | 6 | 41.0 | 38.0 | 41.9 | 45.9 | 8 | 7.5 | 6 | 8 | 34.5 | 99 | 111 | 123 | 5 | 9.5 | 0 |
| 24 FT | 18 | 20 | 8 | 8 | 6.5 | 7 | 7.5 | 45.9 | 38.6 | 42.6 | 46.5 | 8 | 7 | 6 | 7.5 | 34.5 | 100 | 112 | 124 | 5 | 9.5 | 0 |
| 26 FT | 19 | 21 | 9 | 8 | 6.5 | 6 | 6 | 41.3 | 39.3 | 43.3 | 47.3 | 8 | 7 | 5 | 6 | 31.4 | 101 | 113 | 125 | 5 | 9 | 0 |
| 28 FT | 20 | 22 | 10 | 8 | 6.5 | 6 | 6.5 | 41.5 | 41.1 | 45.3 | 49.3 | 8 | 7 | 5 | 6 | 33.3 | 102 | 114 | 126 | 5 | 10 | 0 |
| 30 FT | 21 | 23 | 10 | 8 | 6.5 | 6 | 6.5 | 41.5 | 41.9 | 45.9 | 50.0 | 8 | 6.5 | 5 | 6 | 33.3 | 103 | 115 | 127 | 5 | 9 | 0 |
| 32 FT | 22 | 24 | 10 | 8 | 6 | 6 | 6 | 41.5 | 42.5 | 46.6 | 50.6 | 8 | 6.5 | 5 | 6 | 33.3 | 104 | 116 | 128 | 5 | 8 | 0 |
| 34 FT | 23 | 25 | 11 | 8 | 6 | 6 | 6.5 | 41.8 | 43.1 | 47.3 | 51.4 | 8 | 6.5 | 5 | 6.5 | 33.4 | 105 | 117 | 129 | 5 | 8.5 | 0 |
| 36 FT | 24 | 26 | 11 | 8 | 6 | 6 | 6.5 | 41.8 | 45.1 | 49.4 | 53.5 | 8 | 6.5 | 5 | 6 | 33.4 | 106 | 118 | 130 | 5 | 8 | 0 |
| 38 FT | 25 | 27 | 12 | 8 | 6 | 6 | 6.5 | 42.0 | 45.9 | 50.0 | 54.3 | 8 | 6.5 | 5 | 6 | 33.6 | 107 | 119 | 131 | 5 | 8.5 | 0 |
| 40 FT | 26 | 28 | 12 | 8 | 6 | 6 | 7 | 42.0 | 46.5 | 50.8 | 55.0 | 8 | 6.5 | 5 | 6 | 33.6 | 108 | 120 | 132 | 5 | 7.5 | 0 |
| 42 FT | 27 | 29 | 12 | 9 | 7.5 | 6 | 7 | 42.0 | 51.3 | 55.9 | 60.4 | 8 | 6 | 6 | 8.5 | 37.0 | 109 | 121 | 133 | 5 | 7 | 0 |
| 44 FT | 28 | 30 | 12 | 9 | 7 | 6 | 7 | 42.0 | 52.0 | 56.6 | 61.1 | 8 | 6 | 6 | 8 | 37.0 | 110 | 122 | 134 | 5 | 7 | 0 |
| 46 FT | 29 | 30 | 12 | 9 | 7 | 6 | 7 | 42.0 | 53.9 | 58.5 | 63.1 | 8 | 6 | 6 | 7.5 | 37.0 | 110 | 122 | 134 | 5 | 7 | 0 |
| 48 FT | 30 | 31 | 12 | 9 | 7 | 6 | 7 | 42.0 | 54.6 | 59.3 | 64.0 | 8 | 6 | 6 | 7.5 | 37.0 | 111 | 123 | 135 | 5 | 7 | 0 |
| 50 FT | 30 | 32 | 12 | 9 | 7 | 6 | 6.5 | 42.0 | 55.0 | 59.6 | 64.4 | 8 | 6 | 6 | 7.5 | 37.0 | 112 | 124 | 136 | 5 | 7 | 0 |

## SPAN (S) = 13 FT  HEIGHT (HT) = 10 FT OR 11 FT OR 12 FT

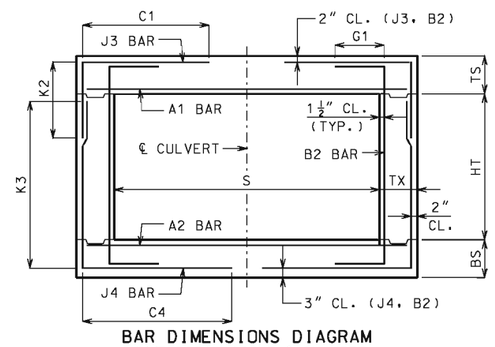
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=10′ | K2 HT=11′ | K2 HT=12′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=10′ | K3 HT=11′ | K3 HT=12′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 12 | 9 | 6 | 6.5 | 5 | 6 | 95.8 | 33.4 | 36.3 | 39.1 | 6 | 7 | 6 | 6.5 | 99.0 | 128 | 140 | 152 | 5 | 9 | 12 |
| 2 FT | 12 | 13 | 9 | 6 | 6 | 6 | 7 | 99.0 | 32.3 | 35.0 | 37.8 | 6 | 6.5 | 6 | 7 | 99.0 | 129 | 141 | 153 | 5 | 9 | 12 |
| 4 FT | 10 | 11 | 9 | 7 | 7.5 | 6 | 6 | 72.6 | 34.0 | 37.0 | 40.0 | 7 | 7.5 | 6 | 6 | 77.5 | 127 | 139 | 151 | 5 | 8.5 | 0 |
| 6 FT | 10 | 11 | 10 | 6 | 6 | 6 | 6 | 61.4 | 34.0 | 37.0 | 40.0 | 7 | 7.5 | 6 | 6 | 63.1 | 127 | 139 | 151 | 5 | 9 | 0 |
| 8 FT | 10 | 12 | 10 | 7 | 7.5 | 7 | 6 | 59.8 | 34.3 | 37.3 | 40.3 | 7 | 7 | 6 | 6.5 | 59.8 | 128 | 140 | 152 | 5 | 9 | 0 |
| 10 FT | 11 | 13 | 10 | 7 | 7 | 6 | 6 | 54.8 | 36.1 | 39.3 | 42.4 | 7 | 6.5 | 6 | 6.5 | 56.5 | 129 | 141 | 153 | 5 | 8.5 | 0 |
| 12 FT | 12 | 14 | 10 | 7 | 6.5 | 6 | 6 | 51.5 | 33.9 | 36.8 | 39.6 | 7 | 6.5 | 6 | 6 | 53.1 | 130 | 142 | 154 | 5 | 8 | 0 |
| 14 FT | 12 | 14 | 10 | 7 | 6.5 | 6 | 6 | 48.1 | 33.9 | 36.8 | 39.6 | 7 | 6 | 6 | 6 | 48.1 | 130 | 142 | 154 | 5 | 9.5 | 0 |
| 16 FT | 13 | 15 | 10 | 7 | 6 | 7 | 7 | 51.5 | 34.4 | 37.3 | 40.1 | 7 | 6 | 6 | 6 | 48.1 | 131 | 143 | 155 | 5 | 8 | 0 |
| 18 FT | 14 | 16 | 11 | 7 | 6 | 7 | 7.5 | 51.8 | 39.1 | 42.4 | 45.6 | 8 | 7.5 | 6 | 6.5 | 48.4 | 132 | 144 | 156 | 5 | 8.5 | 0 |
| 20 FT | 15 | 18 | 11 | 8 | 7.5 | 7 | 7 | 58.5 | 37.0 | 40.0 | 43.0 | 8 | 7.5 | 6 | 7 | 46.8 | 134 | 146 | 158 | 5 | 7.5 | 0 |
| 22 FT | 17 | 19 | 12 | 8 | 7.5 | 6 | 6 | 53.8 | 39.3 | 42.4 | 45.5 | 8 | 7.5 | 6 | 7 | 48.8 | 135 | 147 | 159 | 5 | 7.5 | 0 |
| 24 FT | 18 | 20 | 12 | 8 | 7 | 7 | 7.5 | 58.8 | 39.8 | 42.9 | 46.0 | 8 | 7 | 6 | 6.5 | 48.8 | 136 | 148 | 160 | 5 | 7 | 0 |
| 26 FT | 19 | 21 | 13 | 8 | 7 | 7 | 8 | 59.1 | 40.3 | 43.4 | 46.5 | 8 | 7 | 6 | 7 | 49.0 | 137 | 149 | 161 | 5 | 7 | 0 |
| 28 FT | 20 | 22 | 13 | 8 | 7 | 7 | 7.5 | 59.1 | 42.4 | 45.6 | 48.9 | 8 | 7 | 6 | 6.5 | 49.0 | 138 | 150 | 162 | 5 | 6.5 | 0 |
| 30 FT | 21 | 23 | 14 | 8 | 7 | 7 | 8 | 59.5 | 46.1 | 49.6 | 53.1 | 8 | 7 | 6 | 7 | 49.3 | 139 | 151 | 163 | 5 | 7 | 0 |
| 32 FT | 22 | 24 | 14 | 8 | 6.5 | 7 | 7.5 | 59.5 | 46.8 | 50.1 | 53.6 | 8 | 6.5 | 6 | 6.5 | 49.3 | 140 | 152 | 164 | 5 | 6 | 0 |
| 34 FT | 23 | 25 | 14 | 8 | 6.5 | 7 | 7 | 59.5 | 44.0 | 47.3 | 50.5 | 8 | 6.5 | 6 | 6.5 | 49.3 | 141 | 153 | 165 | 5 | 6 | 0 |
| 36 FT | 24 | 26 | 15 | 8 | 6.5 | 7 | 7.5 | 59.9 | 49.5 | 53.1 | 56.8 | 8 | 6.5 | 6 | 6.5 | 49.6 | 142 | 154 | 166 | 5 | 6 | 0 |
| 38 FT | 25 | 27 | 15 | 8 | 6 | 7 | 7.5 | 59.9 | 50.1 | 53.8 | 57.3 | 8 | 6.5 | 6 | 6.5 | 49.6 | 143 | 155 | 167 | 6 | 8 | 0 |
| 40 FT | 26 | 28 | 15 | 8 | 6 | 7 | 7 | 59.9 | 50.8 | 54.3 | 57.9 | 8 | 6.5 | 6 | 6.5 | 49.6 | 144 | 156 | 168 | 6 | 8 | 0 |
| 42 FT | 27 | 29 | 16 | 8 | 6 | 7 | 7.5 | 60.3 | 51.3 | 54.9 | 58.5 | 8 | 6 | 6 | 6.5 | 49.9 | 145 | 157 | 169 | 6 | 8 | 0 |
| 44 FT | 28 | 30 | 16 | 8 | 6 | 7 | 7.5 | 60.3 | 53.6 | 57.4 | 61.1 | 8 | 6 | 6 | 6.5 | 49.9 | 146 | 158 | 170 | 6 | 8 | 0 |
| 46 FT | 28 | 30 | 16 | 9 | 7 | 7 | 6.5 | 60.3 | 53.6 | 57.4 | 61.1 | 8 | 6 | 6 | 6 | 49.9 | 146 | 158 | 170 | 6 | 8 | 0 |
| 48 FT | 29 | 31 | 17 | 9 | 7 | 7 | 7.5 | 60.5 | 54.3 | 58.0 | 61.8 | 8 | 6 | 6 | 6.5 | 50.1 | 147 | 159 | 171 | 6 | 7.5 | 0 |
| 50 FT | 30 | 32 | 17 | 9 | 7 | 7 | 7.5 | 60.5 | 54.9 | 58.6 | 62.3 | 8 | 6 | 6 | 6.5 | 50.1 | 148 | 160 | 172 | 6 | 7.5 | 0 |

## SPAN (S) = 13 FT  HEIGHT (HT) = 13 FT OR 14 FT

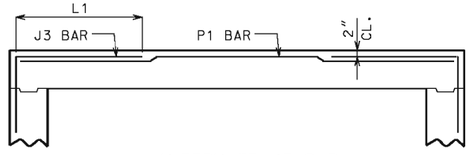
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=13′ | K2 HT=14′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=13′ | K3 HT=14′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 12 | 9 | 6 | 6 | 6 | 6.5 | 99.0 | 36.8 | 39.3 | 6 | 6.5 | 6 | 6 | 99.0 | 164 | 176 | 5 | 8.5 | 12 |
| 2 FT | 12 | 12 | 9 | 7 | 8 | 6 | 6.5 | 99.0 | 36.8 | 39.3 | 6 | 6 | 6 | 6 | 99.0 | 164 | 176 | 5 | 8 | 12 |
| 4 FT | 10 | 12 | 10 | 6 | 6 | 6 | 6 | 99.6 | 34.6 | 37.0 | 7 | 8 | 6 | 6 | 99.6 | 164 | 176 | 5 | 8 | 0 |
| 6 FT | 11 | 13 | 10 | 6 | 6 | 6 | 6.5 | 84.6 | 35.0 | 37.4 | 6 | 6 | 6 | 6.5 | 99.6 | 165 | 177 | 5 | 7.5 | 0 |
| 8 FT | 11 | 13 | 10 | 6 | 6 | 7 | 6.5 | 74.8 | 35.0 | 37.4 | 7 | 7 | 6 | 6 | 84.6 | 165 | 177 | 5 | 7 | 0 |
| 10 FT | 11 | 13 | 11 | 7 | 7.5 | 7 | 6.5 | 68.5 | 35.0 | 37.4 | 7 | 6.5 | 6 | 6 | 70.1 | 165 | 177 | 5 | 7.5 | 0 |
| 12 FT | 12 | 14 | 12 | 7 | 7 | 6 | 6.5 | 62.1 | 37.1 | 39.8 | 7 | 6.5 | 6 | 6.5 | 67.3 | 166 | 178 | 5 | 7 | 0 |
| 14 FT | 13 | 15 | 12 | 7 | 7 | 6 | 6 | 62.1 | 37.6 | 40.1 | 7 | 6 | 6 | 6 | 65.5 | 167 | 179 | 5 | 7 | 0 |
| 16 FT | 13 | 15 | 12 | 7 | 6.5 | 7 | 7 | 60.5 | 37.6 | 40.1 | 7 | 6 | 6 | 6.5 | 58.8 | 167 | 179 | 5 | 7 | 0 |
| 18 FT | 14 | 17 | 13 | 7 | 6.5 | 7 | 8 | 59.1 | 38.3 | 40.8 | 7 | 6 | 6 | 6.5 | 59.1 | 169 | 181 | 5 | 6.5 | 0 |
| 20 FT | 15 | 18 | 13 | 7 | 6 | 7 | 7 | 67.6 | 40.5 | 43.1 | 7 | 6 | 6 | 6 | 59.1 | 170 | 182 | 5 | 6.5 | 0 |
| 22 FT | 17 | 19 | 14 | 7 | 6 | 7 | 7.5 | 68.0 | 41.1 | 43.8 | 7 | 6 | 6 | 6 | 59.5 | 171 | 183 | 5 | 6 | 0 |
| 24 FT | 18 | 20 | 14 | 7 | 6 | 7 | 7.5 | 66.3 | 43.5 | 46.3 | 8 | 7.5 | 6 | 6 | 59.5 | 172 | 184 | 5 | 6 | 0 |
| 26 FT | 19 | 21 | 15 | 8 | 7.5 | 7 | 7.5 | 66.8 | 43.9 | 46.8 | 8 | 7 | 6 | 6 | 58.1 | 173 | 185 | 6 | 8 | 0 |
| 28 FT | 20 | 22 | 15 | 8 | 7 | 7 | 7 | 66.8 | 44.4 | 47.1 | 8 | 7 | 6 | 6 | 58.1 | 174 | 186 | 6 | 8 | 0 |
| 30 FT | 21 | 23 | 16 | 8 | 7 | 7 | 7 | 67.1 | 46.8 | 49.6 | 8 | 7 | 6 | 6 | 58.5 | 175 | 187 | 6 | 8 | 0 |
| 32 FT | 22 | 24 | 16 | 8 | 7 | 7 | 7 | 67.1 | 49.3 | 52.3 | 8 | 7 | 7 | 7.5 | 61.9 | 176 | 188 | 6 | 8 | 0 |
| 34 FT | 23 | 25 | 17 | 8 | 6.5 | 7 | 7 | 67.5 | 47.8 | 50.6 | 8 | 6.5 | 6 | 6 | 58.9 | 177 | 189 | 6 | 7.5 | 0 |
| 36 FT | 24 | 26 | 17 | 8 | 6.5 | 7 | 6.5 | 67.5 | 52.3 | 55.4 | 8 | 6.5 | 7 | 7.5 | 62.3 | 178 | 190 | 6 | 7.5 | 0 |
| 38 FT | 25 | 27 | 18 | 8 | 6.5 | 7 | 7 | 67.9 | 50.8 | 53.8 | 8 | 6.5 | 6 | 6 | 59.1 | 179 | 191 | 6 | 7 | 0 |
| 40 FT | 25 | 28 | 18 | 8 | 6 | 7 | 6 | 67.9 | 51.0 | 54.0 | 8 | 6.5 | 6 | 6 | 59.1 | 180 | 192 | 6 | 7 | 0 |
| 42 FT | 26 | 29 | 19 | 8 | 6 | 7 | 6.5 | 68.3 | 51.5 | 54.5 | 8 | 6.5 | 6 | 6 | 59.5 | 181 | 193 | 6 | 6.5 | 0 |
| 44 FT | 27 | 30 | 19 | 8 | 6 | 7 | 6 | 68.3 | 52.0 | 55.0 | 8 | 6 | 6 | 6 | 59.5 | 182 | 194 | 6 | 6.5 | 0 |
| 46 FT | 28 | 31 | 20 | 8 | 6 | 7 | 6.5 | 68.6 | 52.5 | 55.5 | 8 | 6 | 6 | 6 | 59.9 | 183 | 195 | 6 | 6.5 | 0 |
| 48 FT | 29 | 31 | 20 | 8 | 6 | 7 | 6 | 68.6 | 57.0 | 60.3 | 8 | 6 | 7 | 7.5 | 63.4 | 183 | 195 | 6 | 6.5 | 0 |
| 50 FT | 30 | 32 | 21 | 9 | 7.5 | 7 | 7 | 69.0 | 55.4 | 58.5 | 8 | 6 | 6 | 6 | 60.1 | 184 | 196 | 6 | 6 | 0 |

## SPAN (S) = 13 FT  HEIGHT (HT) = 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=15′ | K2 HT=16′ | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=15′ | K3 HT=16′ | SIZE | SPA. | G1 |
| 1 FT | 13 | 13 | 11 | 6 | 6.5 | 5 | 6 | 98.5 | 34.1 | 36.3 | 6 | 6.5 | 6 | 7 | 100.3 | 189 | 201 | 5 | 7 | 12 |
| 2 FT | 13 | 13 | 11 | 6 | 6.5 | 6 | 7.5 | 100.3 | 36.1 | 38.4 | 6 | 6.5 | 6 | 6.5 | 100.3 | 189 | 201 | 5 | 7 | 12 |
| 4 FT | 10 | 13 | 11 | 6 | 6 | 6 | 6 | 100.3 | 35.6 | 37.8 | 6 | 6 | 6 | 6 | 100.3 | 189 | 201 | 5 | 6 | 0 |
| 6 FT | 10 | 13 | 12 | 6 | 6.5 | 6 | 6 | 100.8 | 35.6 | 37.8 | 6 | 6 | 6 | 6 | 100.8 | 189 | 201 | 5 | 6 | 0 |
| 8 FT | 11 | 13 | 12 | 6 | 6 | 6 | 6 | 94.1 | 35.9 | 38.0 | 7 | 7.5 | 6 | 6 | 100.8 | 189 | 201 | 6 | 8 | 0 |
| 10 FT | 12 | 14 | 13 | 6 | 6 | 6 | 6.5 | 81.1 | 36.1 | 38.4 | 7 | 7 | 6 | 6 | 103.1 | 190 | 202 | 6 | 8.5 | 0 |
| 12 FT | 13 | 15 | 14 | 6 | 6 | 6 | 6.5 | 74.8 | 38.6 | 40.9 | 7 | 7 | 6 | 6 | 85.0 | 191 | 203 | 5 | 6 | 0 |
| 14 FT | 14 | 16 | 14 | 7 | 7.5 | 6 | 6 | 74.8 | 39.0 | 41.3 | 7 | 6.5 | 6 | 6 | 85.0 | 192 | 204 | 6 | 8 | 0 |
| 16 FT | 14 | 16 | 14 | 7 | 7 | 6 | 6 | 68.0 | 39.0 | 41.3 | 7 | 6.5 | 6 | 6 | 73.1 | 192 | 204 | 5 | 6 | 0 |
| 18 FT | 15 | 17 | 14 | 7 | 6.5 | 7 | 7.5 | 78.3 | 43.5 | 46.0 | 7 | 6 | 7 | 7 | 76.5 | 193 | 205 | 6 | 8 | 0 |
| 20 FT | 16 | 18 | 15 | 7 | 6.5 | 7 | 7.5 | 78.6 | 43.9 | 46.4 | 7 | 6 | 7 | 8 | 75.3 | 194 | 206 | 6 | 8 | 0 |
| 22 FT | 17 | 19 | 16 | 7 | 6.5 | 7 | 7.5 | 77.4 | 46.4 | 49.0 | 7 | 6 | 7 | 8 | 74.0 | 195 | 207 | 6 | 8 | 0 |
| 24 FT | 18 | 20 | 16 | 7 | 6 | 7 | 7 | 77.4 | 46.9 | 49.5 | 8 | 7.5 | 7 | 7 | 74.0 | 196 | 208 | 6 | 8 | 0 |
| 26 FT | 19 | 21 | 17 | 7 | 6 | 7 | 7 | 77.9 | 49.5 | 52.3 | 8 | 7.5 | 7 | 7 | 74.4 | 197 | 209 | 6 | 7.5 | 0 |
| 28 FT | 20 | 23 | 18 | 7 | 6 | 7 | 7 | 78.3 | 48.0 | 50.6 | 8 | 7.5 | 7 | 7 | 74.9 | 199 | 211 | 6 | 7 | 0 |
| 30 FT | 21 | 23 | 18 | 8 | 7.5 | 7 | 7 | 78.3 | 52.5 | 55.5 | 8 | 7 | 7 | 6.5 | 74.9 | 199 | 211 | 6 | 7 | 0 |
| 32 FT | 22 | 24 | 19 | 8 | 7 | 7 | 7 | 78.8 | 53.0 | 55.9 | 8 | 7 | 7 | 6.5 | 73.5 | 200 | 212 | 6 | 6.5 | 0 |
| 34 FT | 23 | 25 | 19 | 8 | 7 | 7 | 6 | 78.8 | 53.5 | 56.4 | 8 | 6.5 | 7 | 6 | 73.5 | 201 | 213 | 6 | 6.5 | 0 |
| 36 FT | 24 | 26 | 20 | 8 | 7 | 7 | 6.5 | 79.3 | 54.0 | 56.9 | 8 | 6.5 | 7 | 6.5 | 73.9 | 202 | 214 | 6 | 6.5 | 0 |
| 38 FT | 25 | 27 | 21 | 8 | 6.5 | 7 | 6.5 | 79.6 | 56.8 | 59.8 | 8 | 6.5 | 7 | 7 | 74.4 | 203 | 215 | 6 | 6 | 0 |
| 40 FT | 25 | 28 | 22 | 8 | 6.5 | 7 | 6 | 78.4 | 57.0 | 60.0 | 8 | 6.5 | 7 | 7 | 74.8 | 204 | 216 | 6 | 6 | 0 |
| 42 FT | 26 | 29 | 22 | 8 | 6.5 | 7 | 6 | 80.1 | 57.5 | 60.5 | 8 | 6.5 | 7 | 7 | 74.8 | 205 | 217 | 6 | 6 | 0 |
| 44 FT | 27 | 30 | 23 | 8 | 6.5 | 7 | 6 | 80.5 | 58.0 | 61.0 | 8 | 6.5 | 7 | 7 | 75.1 | 206 | 218 | 7 | 7.5 | 0 |
| 46 FT | 28 | 31 | 24 | 8 | 6 | 7 | 6.5 | 81.0 | 58.5 | 61.5 | 8 | 6 | 7 | 7 | 75.6 | 207 | 219 | 7 | 7.5 | 0 |
| 48 FT | 29 | 31 | 24 | 8 | 6 | 7 | 6 | 81.0 | 61.1 | 64.3 | 8 | 6 | 7 | 6.5 | 75.6 | 207 | 219 | 7 | 7.5 | 0 |
| 50 FT | 29 | 32 | 25 | 8 | 6 | 7 | 6 | 79.6 | 59.0 | 62.0 | 8 | 6 | 7 | 6.5 | 76.0 | 208 | 220 | 7 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




### ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″, DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 13 FEET
HEIGHT (HT): 7 THRU 16 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO.
11 OF 14

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 14 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=7′ | HT=8′ | HT=9′ | | | | | | HT=7′ | HT=8′ | HT=9′ | | | |
| 1 FT | 13 | 12 | 8 | 6 | 6 | 5 | 7 | 102.1 | 33.3 | 37.1 | 41.0 | 6 | 6.5 | 6 | 6.5 | 66.9 | 92 | 104 | 116 | 5 | 12 | 12 |
| 2 FT | 13 | 12 | 8 | 7 | 8 | 5 | 6 | 102.1 | 33.3 | 37.1 | 41.0 | 6 | 6 | 6 | 6 | 58.1 | 92 | 104 | 116 | 5 | 12 | 12 |
| 4 FT | 10 | 11 | 8 | 7 | 6.5 | 7 | 6 | 52.8 | 34.0 | 38.1 | 42.1 | 7 | 7 | 6 | 6 | 49.3 | 91 | 103 | 115 | 5 | 12 | 0 |
| 6 FT | 11 | 12 | 8 | 7 | 7 | 6 | 6 | 45.8 | 31.6 | 35.4 | 39.0 | 7 | 7 | 6 | 7 | 44.0 | 92 | 104 | 116 | 5 | 12 | 0 |
| 8 FT | 11 | 12 | 8 | 7 | 6.5 | 7 | 6.5 | 45.8 | 35.8 | 39.9 | 44.1 | 7 | 6 | 6 | 6 | 42.3 | 92 | 104 | 116 | 5 | 12 | 0 |
| 10 FT | 12 | 13 | 8 | 7 | 6 | 7 | 6.5 | 44.0 | 33.3 | 37.1 | 41.0 | 8 | 7.5 | 6 | 6.5 | 38.8 | 93 | 105 | 117 | 5 | 12 | 0 |
| 12 FT | 12 | 14 | 8 | 8 | 7 | 7 | 6 | 42.3 | 36.8 | 41.0 | 45.1 | 8 | 7 | 6 | 7 | 37.0 | 94 | 106 | 118 | 5 | 12 | 0 |
| 14 FT | 13 | 16 | 8 | 8 | 6.5 | 7 | 6 | 42.3 | 33.5 | 37.3 | 40.9 | 8 | 7 | 5 | 6 | 31.6 | 96 | 108 | 120 | 5 | 12 | 0 |
| 16 FT | 13 | 16 | 8 | 8 | 6.5 | 7 | 6 | 40.5 | 33.5 | 37.3 | 40.9 | 8 | 7 | 5 | 6 | 31.6 | 96 | 108 | 120 | 5 | 12 | 0 |
| 18 FT | 15 | 17 | 8 | 8 | 6.5 | 7 | 7 | 45.8 | 35.5 | 39.4 | 43.3 | 8 | 6.5 | 6 | 7.5 | 35.3 | 97 | 109 | 121 | 5 | 12 | 0 |
| 20 FT | 16 | 19 | 8 | 8 | 6 | 7 | 6.5 | 45.8 | 36.5 | 40.4 | 44.1 | 8 | 7 | 5 | 6 | 31.6 | 99 | 111 | 123 | 5 | 11.5 | 0 |
| 22 FT | 18 | 20 | 8 | 8 | 6 | 7 | 7.5 | 45.8 | 38.6 | 42.6 | 46.5 | 8 | 6.5 | 6 | 7.5 | 35.3 | 100 | 112 | 124 | 5 | 9.5 | 0 |
| 24 FT | 19 | 21 | 8 | 8 | 6 | 7 | 7 | 45.8 | 44.0 | 48.5 | 52.9 | 8 | 6.5 | 6 | 7.5 | 35.3 | 101 | 113 | 125 | 5 | 9.5 | 0 |
| 26 FT | 21 | 23 | 9 | 8 | 6 | 6 | 6.5 | 42.5 | 41.9 | 45.9 | 50.0 | 8 | 6.5 | 5 | 6 | 33.6 | 103 | 115 | 127 | 5 | 8.5 | 0 |
| 28 FT | 22 | 24 | 9 | 8 | 6 | 6 | 6 | 42.5 | 46.3 | 50.8 | 55.1 | 8 | 6.5 | 6 | 7 | 35.4 | 104 | 116 | 128 | 5 | 8.5 | 0 |
| 30 FT | 23 | 25 | 10 | 8 | 6 | 6 | 6.5 | 42.8 | 43.1 | 47.3 | 51.4 | 8 | 6.5 | 5 | 6 | 33.9 | 105 | 117 | 129 | 5 | 8.5 | 0 |
| 32 FT | 24 | 26 | 10 | 9 | 7.5 | 6 | 6 | 42.8 | 45.1 | 49.4 | 53.5 | 8 | 6 | 5 | 6 | 33.9 | 106 | 118 | 130 | 5 | 8 | 0 |
| 34 FT | 25 | 27 | 11 | 9 | 7 | 6 | 7 | 43.0 | 45.9 | 50.0 | 54.3 | 8 | 6 | 5 | 6 | 34.0 | 107 | 119 | 131 | 5 | 8.5 | 0 |
| 36 FT | 26 | 28 | 11 | 9 | 7 | 6 | 7 | 43.0 | 46.5 | 50.8 | 55.0 | 8 | 6 | 5 | 6 | 34.0 | 108 | 120 | 132 | 5 | 7.5 | 0 |
| 38 FT | 27 | 29 | 11 | 9 | 7 | 6 | 7 | 43.0 | 51.3 | 55.9 | 60.4 | 8 | 6 | 6 | 7.5 | 37.6 | 109 | 121 | 133 | 5 | 7.5 | 0 |
| 40 FT | 28 | 30 | 11 | 9 | 7 | 6 | 6.5 | 43.0 | 52.0 | 56.6 | 61.1 | 8 | 6 | 6 | 7 | 37.6 | 110 | 122 | 134 | 5 | 7.5 | 0 |
| 42 FT | 29 | 31 | 12 | 9 | 6.5 | 6 | 7 | 43.3 | 54.3 | 58.9 | 63.6 | 9 | 7.5 | 6 | 7.5 | 37.8 | 111 | 123 | 135 | 5 | 7 | 0 |
| 44 FT | 30 | 32 | 12 | 9 | 6.5 | 6 | 7 | 43.3 | 55.0 | 59.6 | 64.4 | 9 | 7 | 6 | 7.5 | 37.8 | 112 | 124 | 136 | 5 | 7 | 0 |
| 46 FT | 31 | 33 | 12 | 9 | 6.5 | 6 | 7 | 43.3 | 55.8 | 60.5 | 65.1 | 9 | 7 | 6 | 7 | 37.8 | 113 | 125 | 137 | 5 | 7 | 0 |
| 48 FT | 32 | 33 | 12 | 9 | 6.5 | 6 | 7 | 43.3 | 56.1 | 60.9 | 65.5 | 9 | 7 | 6 | 7 | 37.8 | 113 | 125 | 137 | 5 | 7 | 0 |
| 50 FT | 33 | 34 | 12 | 9 | 6.5 | 6 | 7 | 43.3 | 58.4 | 63.3 | 68.0 | 9 | 7 | 6 | 7 | 37.8 | 114 | 126 | 138 | 5 | 6.5 | 0 |

## SPAN (S) = 14 FT  HEIGHT (HT) = 10 FT OR 11 FT OR 12 FT

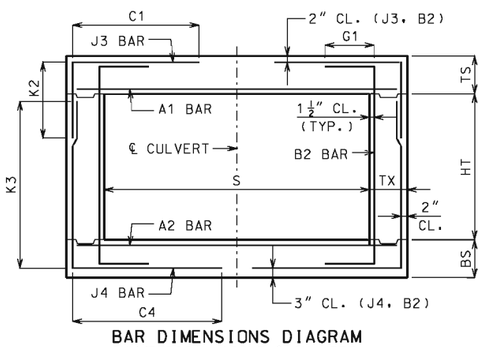
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=10′ | HT=11′ | HT=12′ | | | | | | HT=10′ | HT=11′ | HT=12′ | | | |
| 1 FT | 13 | 12 | 9 | 6 | 6 | 5 | 6.5 | 102.6 | 33.6 | 36.5 | 39.4 | 6 | 6 | 6 | 6 | 106.3 | 128 | 140 | 152 | 5 | 9 | 12 |
| 2 FT | 13 | 12 | 9 | 7 | 7.5 | 5 | 6 | 102.6 | 33.6 | 36.5 | 39.4 | 7 | 7.5 | 6 | 6 | 106.3 | 128 | 140 | 152 | 5 | 8.5 | 12 |
| 4 FT | 11 | 12 | 9 | 7 | 7 | 6 | 6.5 | 69.0 | 35.9 | 39.0 | 42.1 | 7 | 7.5 | 6 | 6 | 72.6 | 128 | 140 | 152 | 5 | 9 | 0 |
| 6 FT | 11 | 12 | 9 | 7 | 7 | 6 | 6 | 60.1 | 35.9 | 39.0 | 42.1 | 7 | 6.5 | 6 | 6 | 62.0 | 128 | 140 | 152 | 5 | 9 | 0 |
| 8 FT | 11 | 12 | 10 | 7 | 7 | 6 | 6 | 55.1 | 35.9 | 39.0 | 42.1 | 7 | 6.5 | 6 | 6 | 57.0 | 128 | 140 | 152 | 5 | 10 | 0 |
| 10 FT | 12 | 13 | 10 | 7 | 6.5 | 6 | 6 | 53.4 | 36.4 | 39.5 | 42.6 | 7 | 6 | 6 | 6 | 53.4 | 129 | 141 | 153 | 5 | 9.5 | 0 |
| 12 FT | 12 | 14 | 10 | 8 | 7.5 | 7 | 6 | 55.1 | 36.6 | 39.8 | 42.9 | 8 | 7 | 6 | 6 | 51.6 | 130 | 142 | 154 | 5 | 9 | 0 |
| 14 FT | 14 | 16 | 10 | 8 | 7.5 | 7 | 7 | 53.4 | 39.1 | 42.4 | 45.6 | 8 | 7.5 | 6 | 6 | 49.9 | 132 | 144 | 156 | 5 | 8 | 0 |
| 16 FT | 14 | 16 | 10 | 8 | 7 | 7 | 7 | 49.9 | 39.1 | 42.4 | 45.6 | 8 | 7 | 6 | 6.5 | 46.3 | 132 | 144 | 156 | 5 | 9 | 0 |
| 18 FT | 15 | 17 | 11 | 8 | 7 | 7 | 7.5 | 59.1 | 39.8 | 42.9 | 46.1 | 8 | 7 | 6 | 6 | 46.5 | 133 | 145 | 157 | 5 | 9.5 | 0 |
| 20 FT | 16 | 19 | 11 | 8 | 6.5 | 7 | 6.5 | 57.3 | 37.5 | 40.5 | 43.5 | 8 | 7 | 6 | 7 | 46.5 | 135 | 147 | 159 | 5 | 8 | 0 |
| 22 FT | 18 | 20 | 12 | 8 | 7 | 7 | 7.5 | 57.6 | 39.8 | 42.9 | 46.0 | 8 | 7 | 6 | 6.5 | 46.8 | 136 | 148 | 160 | 5 | 8 | 0 |
| 24 FT | 19 | 21 | 12 | 8 | 6.5 | 7 | 7 | 57.6 | 43.4 | 46.8 | 50.1 | 8 | 6.5 | 6 | 6.5 | 46.8 | 137 | 149 | 161 | 5 | 7.5 | 0 |
| 26 FT | 20 | 23 | 13 | 8 | 6.5 | 7 | 7 | 57.9 | 41.1 | 44.3 | 47.4 | 8 | 6.5 | 6 | 7 | 47.0 | 139 | 151 | 163 | 5 | 7.5 | 0 |
| 28 FT | 21 | 24 | 13 | 8 | 6 | 7 | 6.5 | 57.9 | 43.3 | 46.5 | 49.6 | 8 | 6.5 | 6 | 7 | 47.0 | 140 | 152 | 164 | 5 | 7 | 0 |
| 30 FT | 22 | 25 | 14 | 8 | 6 | 7 | 6.5 | 58.3 | 43.8 | 47.0 | 50.3 | 8 | 6.5 | 6 | 7 | 47.4 | 141 | 153 | 165 | 5 | 7 | 0 |
| 32 FT | 24 | 26 | 14 | 8 | 6 | 7 | 7.5 | 58.3 | 46.3 | 49.5 | 52.9 | 8 | 6 | 6 | 6.5 | 47.4 | 142 | 154 | 166 | 5 | 6.5 | 0 |
| 34 FT | 25 | 27 | 14 | 8 | 6 | 7 | 7.5 | 58.3 | 46.8 | 50.1 | 53.5 | 8 | 6 | 6 | 6.5 | 47.4 | 143 | 155 | 167 | 5 | 6 | 0 |
| 36 FT | 26 | 28 | 14 | 9 | 7.5 | 7 | 6.5 | 58.3 | 47.4 | 50.6 | 54.0 | 8 | 6 | 6 | 6.5 | 47.4 | 144 | 156 | 168 | 5 | 6 | 0 |
| 38 FT | 27 | 29 | 15 | 9 | 7 | 7 | 7.5 | 58.5 | 51.3 | 54.9 | 58.5 | 8 | 6 | 6 | 6.5 | 47.6 | 145 | 157 | 169 | 6 | 8 | 0 |
| 40 FT | 28 | 30 | 15 | 9 | 7 | 7 | 7.5 | 58.5 | 53.6 | 57.4 | 61.1 | 8 | 6 | 6 | 6.5 | 47.6 | 146 | 158 | 170 | 6 | 8 | 0 |
| 42 FT | 29 | 31 | 15 | 9 | 7 | 7 | 6.5 | 58.5 | 54.3 | 58.0 | 61.8 | 9 | 7.5 | 6 | 6.5 | 47.6 | 147 | 159 | 171 | 6 | 8 | 0 |
| 44 FT | 30 | 32 | 16 | 9 | 7 | 7 | 7.5 | 58.9 | 54.9 | 58.6 | 62.3 | 9 | 7 | 6 | 6.5 | 49.6 | 148 | 160 | 172 | 6 | 8 | 0 |
| 46 FT | 31 | 33 | 16 | 9 | 6.5 | 7 | 7.5 | 58.9 | 55.5 | 59.3 | 62.9 | 9 | 7 | 6 | 6.5 | 49.6 | 149 | 161 | 173 | 6 | 8 | 0 |
| 48 FT | 31 | 33 | 16 | 9 | 6.5 | 7 | 6.5 | 58.9 | 55.5 | 59.3 | 62.9 | 9 | 7 | 6 | 6 | 49.6 | 149 | 161 | 173 | 6 | 8 | 0 |
| 50 FT | 32 | 34 | 17 | 9 | 6.5 | 7 | 7 | 59.3 | 56.1 | 59.9 | 63.5 | 9 | 7 | 6 | 6.5 | 50.0 | 150 | 162 | 174 | 6 | 7.5 | 0 |

## SPAN (S) = 14 FT  HEIGHT (HT) = 13 FT OR 14 FT

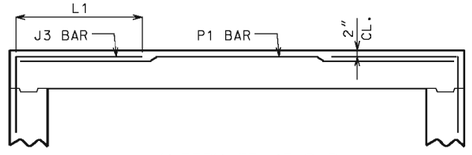
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=13′ | HT=14′ | | | | | | HT=13′ | HT=14′ | | | |
| 1 FT | 12 | 12 | 10 | 6 | 6 | 6 | 7 | 105.0 | 36.8 | 39.3 | 6 | 6 | 6 | 6 | 105.0 | 164 | 176 | 5 | 8 | 12 |
| 2 FT | 13 | 13 | 10 | 7 | 8 | 6 | 7 | 105.0 | 35.4 | 37.8 | 7 | 8 | 6 | 6.5 | 105.0 | 165 | 177 | 5 | 8 | 12 |
| 4 FT | 11 | 12 | 10 | 7 | 7.5 | 6 | 6.5 | 105.0 | 36.5 | 39.0 | 7 | 7 | 6 | 6 | 105.0 | 164 | 176 | 5 | 8 | 0 |
| 6 FT | 11 | 13 | 10 | 7 | 7.5 | 6 | 6 | 76.5 | 35.0 | 37.4 | 7 | 7 | 6 | 6 | 87.3 | 165 | 177 | 5 | 8 | 0 |
| 8 FT | 11 | 13 | 11 | 7 | 7.5 | 6 | 6 | 66.3 | 35.0 | 37.4 | 7 | 6.5 | 6 | 6 | 71.6 | 165 | 177 | 5 | 7.5 | 0 |
| 10 FT | 12 | 14 | 11 | 7 | 7 | 6 | 6 | 64.5 | 37.1 | 39.8 | 7 | 6 | 6 | 6 | 68.0 | 166 | 178 | 5 | 7.5 | 0 |
| 12 FT | 13 | 15 | 12 | 7 | 6.5 | 6 | 6 | 61.3 | 37.6 | 40.1 | 7 | 6 | 6 | 6.5 | 64.8 | 167 | 179 | 5 | 7 | 0 |
| 14 FT | 14 | 16 | 13 | 7 | 6.5 | 6 | 6 | 59.8 | 38.0 | 40.5 | 7 | 6 | 6 | 6.5 | 63.4 | 168 | 180 | 5 | 6.5 | 0 |
| 16 FT | 14 | 16 | 13 | 7 | 6 | 7 | 8 | 59.8 | 38.0 | 40.5 | 8 | 7.5 | 6 | 6 | 56.1 | 168 | 180 | 5 | 7.5 | 0 |
| 18 FT | 15 | 18 | 13 | 7 | 6 | 7 | 7 | 67.0 | 40.5 | 43.1 | 8 | 7.5 | 6 | 6.5 | 56.1 | 170 | 182 | 5 | 6.5 | 0 |
| 20 FT | 16 | 19 | 13 | 8 | 7 | 7 | 6.5 | 65.1 | 40.9 | 43.5 | 8 | 7 | 6 | 6 | 56.1 | 171 | 183 | 5 | 6.5 | 0 |
| 22 FT | 18 | 20 | 14 | 8 | 7 | 7 | 7 | 65.5 | 43.5 | 46.3 | 8 | 7 | 6 | 6 | 56.4 | 172 | 184 | 5 | 6 | 0 |
| 24 FT | 19 | 22 | 14 | 8 | 7 | 7 | 7 | 65.5 | 44.1 | 46.9 | 8 | 7 | 6 | 6 | 56.4 | 174 | 186 | 5 | 6 | 0 |
| 26 FT | 20 | 23 | 15 | 8 | 6.5 | 7 | 7 | 65.9 | 44.6 | 47.4 | 8 | 6.5 | 6 | 6 | 56.8 | 175 | 187 | 6 | 8 | 0 |
| 28 FT | 21 | 24 | 15 | 8 | 6.5 | 7 | 6.5 | 65.9 | 45.1 | 47.9 | 8 | 6.5 | 6 | 6 | 56.8 | 176 | 188 | 6 | 8 | 0 |
| 30 FT | 22 | 25 | 16 | 8 | 6.5 | 7 | 6.5 | 66.3 | 47.5 | 50.4 | 8 | 6.5 | 6 | 6 | 57.0 | 177 | 189 | 6 | 8 | 0 |
| 32 FT | 23 | 26 | 16 | 8 | 6 | 7 | 6 | 66.3 | 50.0 | 53.0 | 8 | 6 | 7 | 8 | 58.9 | 178 | 190 | 6 | 8 | 0 |
| 34 FT | 24 | 27 | 17 | 8 | 6 | 7 | 6 | 66.6 | 48.5 | 51.4 | 8 | 6 | 6 | 6 | 57.4 | 179 | 191 | 6 | 7.5 | 0 |
| 36 FT | 25 | 28 | 17 | 8 | 6 | 7 | 6 | 66.6 | 53.0 | 56.1 | 8 | 6 | 7 | 8 | 59.3 | 180 | 192 | 6 | 7.5 | 0 |
| 38 FT | 26 | 29 | 18 | 9 | 7.5 | 7 | 6 | 67.0 | 51.5 | 54.5 | 8 | 6 | 6 | 6 | 57.6 | 181 | 193 | 6 | 7 | 0 |
| 40 FT | 27 | 30 | 18 | 9 | 7 | 7 | 6 | 67.0 | 54.1 | 57.3 | 8 | 6 | 7 | 8 | 61.4 | 182 | 194 | 6 | 7 | 0 |
| 42 FT | 28 | 31 | 19 | 9 | 7 | 7 | 6 | 67.4 | 52.5 | 55.5 | 9 | 7.5 | 6 | 6 | 58.0 | 183 | 195 | 6 | 6.5 | 0 |
| 44 FT | 29 | 32 | 19 | 9 | 7 | 7 | 6 | 67.4 | 57.3 | 60.5 | 9 | 7 | 7 | 8 | 61.8 | 184 | 196 | 6 | 6.5 | 0 |
| 46 FT | 30 | 33 | 20 | 9 | 7 | 7 | 6.5 | 67.6 | 55.6 | 58.8 | 9 | 7 | 6 | 6 | 58.3 | 185 | 197 | 6 | 6.5 | 0 |
| 48 FT | 31 | 34 | 20 | 9 | 6.5 | 7 | 6 | 67.6 | 58.4 | 61.5 | 9 | 7 | 7 | 8 | 62.0 | 186 | 198 | 6 | 6.5 | 0 |
| 50 FT | 32 | 35 | 21 | 9 | 6.5 | 7 | 6.5 | 69.9 | 56.6 | 59.8 | 9 | 7 | 6 | 6 | 58.6 | 187 | 199 | 6 | 6 | 0 |

## SPAN (S) = 14 FT  HEIGHT (HT) = 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | BOTTOM SLAB BARS | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | A2 BARS | | J4 BARS | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=15′ | HT=16′ | | | | | | HT=15′ | HT=16′ | | | |
| 1 FT | 12 | 13 | 11 | 6 | 6 | 6 | 6 | 105.6 | 36.0 | 38.1 | 6 | 6 | 6 | 6.5 | 105.6 | 189 | 201 | 5 | 7 | 12 |
| 2 FT | 13 | 14 | 11 | 6 | 6 | 6 | 7 | 105.6 | 38.4 | 40.6 | 6 | 6 | 6 | 6.5 | 105.6 | 190 | 202 | 5 | 7 | 12 |
| 4 FT | 11 | 13 | 11 | 7 | 7.5 | 6 | 6 | 105.6 | 35.9 | 38.0 | 7 | 7.5 | 6 | 6 | 105.6 | 189 | 201 | 5 | 6 | 0 |
| 6 FT | 11 | 13 | 12 | 6 | 6 | 6 | 6.5 | 99.0 | 35.9 | 38.0 | 7 | 7 | 6 | 6 | 108.0 | 189 | 201 | 5 | 6 | 0 |
| 8 FT | 12 | 14 | 12 | 7 | 8 | 6 | 6.5 | 86.4 | 36.1 | 38.4 | 7 | 7 | 6 | 6 | 108.0 | 190 | 202 | 5 | 6 | 0 |
| 10 FT | 12 | 15 | 13 | 7 | 7.5 | 6 | 6 | 74.3 | 36.4 | 38.5 | 7 | 6.5 | 6 | 6.5 | 90.5 | 191 | 203 | 5 | 6 | 0 |
| 12 FT | 13 | 16 | 14 | 7 | 7 | 6 | 6 | 71.0 | 38.8 | 41.0 | 7 | 6.5 | 6 | 6.5 | 81.9 | 192 | 204 | 5 | 6 | 0 |
| 14 FT | 14 | 17 | 14 | 7 | 6.5 | 7 | 7.5 | 72.8 | 39.1 | 41.4 | 7 | 6 | 6 | 6 | 78.3 | 193 | 205 | 5 | 6 | 0 |
| 16 FT | 14 | 17 | 14 | 7 | 6.5 | 7 | 7.5 | 67.4 | 39.1 | 41.4 | 7 | 6 | 6 | 6 | 69.1 | 193 | 205 | 5 | 6 | 0 |
| 18 FT | 15 | 18 | 14 | 7 | 6 | 7 | 7 | 76.5 | 43.6 | 46.3 | 8 | 7 | 7 | 7 | 72.8 | 194 | 206 | 5 | 6 | 0 |
| 20 FT | 16 | 19 | 15 | 8 | 7.5 | 7 | 6.5 | 75.0 | 44.1 | 46.6 | 8 | 7 | 7 | 7.5 | 71.4 | 195 | 207 | 6 | 8 | 0 |
| 22 FT | 18 | 20 | 16 | 8 | 7.5 | 7 | 7 | 75.5 | 49.0 | 51.8 | 8 | 7 | 7 | 7 | 71.8 | 196 | 208 | 6 | 8 | 0 |
| 24 FT | 19 | 22 | 16 | 8 | 7 | 7 | 6.5 | 75.5 | 47.5 | 50.1 | 8 | 7 | 7 | 7 | 71.8 | 198 | 210 | 6 | 8 | 0 |
| 26 FT | 20 | 23 | 17 | 8 | 7 | 7 | 6.5 | 75.9 | 48.0 | 50.6 | 8 | 6.5 | 7 | 7 | 72.1 | 199 | 211 | 6 | 7.5 | 0 |
| 28 FT | 21 | 24 | 18 | 8 | 7 | 7 | 6.5 | 76.3 | 48.4 | 51.0 | 8 | 6.5 | 7 | 7 | 70.6 | 200 | 212 | 6 | 7 | 0 |
| 30 FT | 22 | 25 | 18 | 8 | 6.5 | 7 | 6 | 76.3 | 51.0 | 53.9 | 8 | 6.5 | 7 | 6.5 | 70.6 | 201 | 213 | 6 | 7 | 0 |
| 32 FT | 23 | 26 | 19 | 8 | 6.5 | 7 | 6 | 76.6 | 51.5 | 54.3 | 8 | 6.5 | 7 | 7 | 71.0 | 202 | 214 | 6 | 6.5 | 0 |
| 34 FT | 24 | 27 | 20 | 8 | 6.5 | 7 | 6 | 77.1 | 52.0 | 54.8 | 8 | 6 | 7 | 7 | 71.5 | 203 | 215 | 6 | 6.5 | 0 |
| 36 FT | 25 | 28 | 20 | 8 | 6 | 7 | 6 | 77.1 | 52.5 | 55.3 | 8 | 6 | 7 | 6.5 | 71.5 | 204 | 216 | 6 | 6.5 | 0 |
| 38 FT | 26 | 29 | 21 | 8 | 6 | 7 | 6 | 77.5 | 55.3 | 58.1 | 8 | 6 | 7 | 7 | 71.9 | 205 | 217 | 6 | 6 | 0 |
| 40 FT | 27 | 30 | 22 | 8 | 6 | 7 | 6 | 77.9 | 58.0 | 61.0 | 8 | 6 | 7 | 7 | 72.3 | 206 | 218 | 6 | 6 | 0 |
| 42 FT | 28 | 31 | 23 | 8 | 6 | 7 | 6.5 | 78.3 | 58.5 | 61.5 | 8 | 6 | 7 | 7.5 | 72.6 | 207 | 219 | 7 | 8 | 0 |
| 44 FT | 29 | 32 | 23 | 9 | 7.5 | 7 | 6 | 78.3 | 59.0 | 62.0 | 9 | 7.5 | 7 | 7 | 72.6 | 208 | 220 | 7 | 7.5 | 0 |
| 46 FT | 30 | 33 | 24 | 9 | 7 | 7 | 6 | 78.8 | 61.9 | 65.0 | 9 | 7 | 7 | 7 | 73.0 | 209 | 221 | 7 | 7.5 | 0 |
| 48 FT | 31 | 34 | 25 | 9 | 7 | 7 | 6.5 | 79.1 | 62.4 | 65.5 | 9 | 7 | 7 | 7 | 73.4 | 210 | 222 | 7 | 7.5 | 0 |
| 50 FT | 32 | 35 | 25 | 9 | 7 | 7 | 6 | 79.1 | 62.9 | 66.0 | 9 | 7 | 7 | 7 | 73.4 | 211 | 223 | 7 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




### ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″, DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 14 FEET
HEIGHT (HT): 7 THRU 16 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 12 OF 14

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 15 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

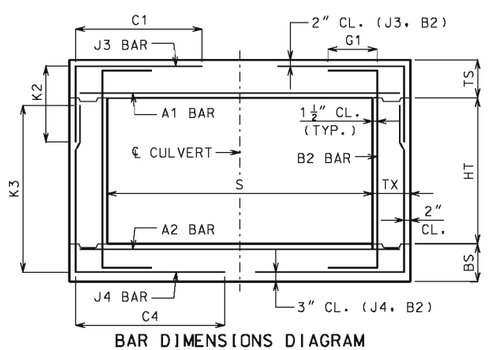
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=8′ | HT=9′ | HT=10′ | | | | | | HT=8′ | HT=9′ | HT=10′ | | | |
| 1 FT | 12 | 13 | 8 | 7 | 7 | 6 | 7 | 109.0 | 32.5 | 35.9 | 39.3 | 6 | 6 | 6 | 7 | 82.8 | 105 | 117 | 129 | 5 | 12 | 12 |
| 2 FT | 12 | 13 | 8 | 7 | 6.5 | 6 | 6.5 | 109.0 | 33.6 | 37.1 | 40.6 | 7 | 7.5 | 6 | 6.5 | 65.8 | 105 | 117 | 129 | 5 | 12 | 12 |
| 4 FT | 11 | 12 | 8 | 7 | 6 | 6 | 6 | 52.6 | 35.4 | 39.0 | 42.8 | 7 | 7 | 6 | 6 | 52.6 | 104 | 116 | 128 | 5 | 12 | 0 |
| 6 FT | 11 | 12 | 9 | 7 | 6.5 | 6 | 6 | 51.0 | 35.4 | 39.0 | 42.8 | 7 | 6.5 | 6 | 6 | 49.1 | 104 | 116 | 128 | 5 | 12 | 0 |
| 8 FT | 11 | 12 | 9 | 7 | 6 | 7 | 6 | 51.0 | 35.4 | 39.0 | 42.8 | 8 | 7.5 | 6 | 6 | 47.3 | 104 | 116 | 128 | 5 | 12 | 0 |
| 10 FT | 12 | 14 | 9 | 8 | 7.5 | 7 | 6 | 49.1 | 32.8 | 36.1 | 39.5 | 8 | 7 | 6 | 7 | 43.5 | 106 | 118 | 130 | 5 | 12 | 0 |
| 12 FT | 13 | 15 | 9 | 8 | 6.5 | 7 | 6.5 | 47.3 | 34.5 | 38.0 | 41.5 | 8 | 6.5 | 6 | 7 | 41.6 | 107 | 119 | 131 | 5 | 12 | 0 |
| 14 FT | 14 | 17 | 9 | 8 | 6.5 | 7 | 6.5 | 45.4 | 34.1 | 37.5 | 40.9 | 8 | 6.5 | 6 | 8 | 39.8 | 109 | 121 | 133 | 5 | 12 | 0 |
| 16 FT | 14 | 17 | 9 | 8 | 6 | 7 | 6 | 43.5 | 34.1 | 37.5 | 40.9 | 8 | 6.5 | 6 | 8 | 37.8 | 109 | 121 | 133 | 5 | 12 | 0 |
| 18 FT | 16 | 19 | 9 | 8 | 6 | 7 | 7 | 49.1 | 36.5 | 40.0 | 43.5 | 8 | 6.5 | 6 | 8 | 37.8 | 111 | 123 | 135 | 5 | 12 | 0 |
| 20 FT | 17 | 20 | 9 | 9 | 7.5 | 7 | 6 | 49.1 | 37.1 | 40.6 | 44.1 | 8 | 6.5 | 6 | 7.5 | 37.8 | 112 | 124 | 136 | 5 | 11 | 0 |
| 22 FT | 19 | 21 | 9 | 9 | 7.5 | 7 | 7 | 49.1 | 43.3 | 47.3 | 51.1 | 8 | 6 | 6 | 7 | 37.8 | 113 | 125 | 137 | 5 | 9 | 0 |
| 24 FT | 21 | 23 | 10 | 8 | 6 | 6 | 6 | 43.8 | 41.9 | 45.6 | 49.3 | 8 | 6 | 6 | 8 | 38.0 | 115 | 127 | 139 | 5 | 9 | 0 |
| 26 FT | 22 | 24 | 11 | 9 | 7.5 | 6 | 6 | 43.9 | 42.5 | 46.3 | 49.9 | 8 | 6 | 6 | 8 | 38.3 | 116 | 128 | 140 | 5 | 10.5 | 0 |
| 28 FT | 23 | 25 | 11 | 9 | 7 | 6 | 6 | 43.9 | 43.1 | 46.8 | 50.5 | 8 | 6 | 6 | 8 | 38.3 | 117 | 129 | 141 | 5 | 9 | 0 |
| 30 FT | 24 | 26 | 11 | 9 | 7 | 7 | 7.5 | 49.6 | 49.4 | 53.5 | 57.8 | 9 | 7.5 | 6 | 7 | 38.3 | 118 | 130 | 142 | 5 | 8 | 0 |
| 32 FT | 26 | 28 | 12 | 9 | 7 | 6 | 6.5 | 46.1 | 46.4 | 50.3 | 54.1 | 8 | 6 | 6 | 8.5 | 38.4 | 120 | 132 | 144 | 5 | 8 | 0 |
| 34 FT | 27 | 29 | 12 | 9 | 7 | 6 | 6.5 | 46.1 | 51.5 | 55.6 | 59.9 | 9 | 7.5 | 6 | 8 | 38.4 | 121 | 133 | 145 | 5 | 7.5 | 0 |
| 36 FT | 28 | 30 | 12 | 9 | 6.5 | 6 | 6.5 | 46.1 | 52.1 | 56.4 | 60.5 | 9 | 7 | 6 | 8 | 38.4 | 122 | 134 | 146 | 5 | 7 | 0 |
| 38 FT | 29 | 31 | 12 | 9 | 6.5 | 6 | 6 | 46.1 | 54.4 | 58.6 | 63.0 | 9 | 7 | 6 | 7.5 | 38.4 | 123 | 135 | 147 | 5 | 7 | 0 |
| 40 FT | 30 | 32 | 13 | 9 | 6.5 | 6 | 6.5 | 46.4 | 55.1 | 59.4 | 63.8 | 9 | 7 | 6 | 7.5 | 40.5 | 124 | 136 | 148 | 5 | 6.5 | 0 |
| 42 FT | 31 | 33 | 13 | 9 | 6.5 | 6 | 6.5 | 46.4 | 55.8 | 60.1 | 64.5 | 9 | 7 | 6 | 7 | 40.5 | 125 | 137 | 149 | 5 | 6.5 | 0 |
| 44 FT | 32 | 34 | 13 | 9 | 6 | 6 | 6.5 | 46.4 | 56.5 | 60.9 | 65.1 | 9 | 6.5 | 6 | 7 | 40.5 | 126 | 138 | 150 | 5 | 6.5 | 0 |
| 46 FT | 33 | 35 | 13 | 9 | 6 | 6 | 6.5 | 46.4 | 57.3 | 61.5 | 65.9 | 9 | 6.5 | 6 | 6.5 | 40.5 | 127 | 139 | 151 | 5 | 6.5 | 0 |
| 48 FT | 34 | 36 | 13 | 9 | 6 | 6 | 6.5 | 46.4 | 59.6 | 64.0 | 68.5 | 9 | 6.5 | 6 | 6.5 | 40.5 | 128 | 140 | 152 | 5 | 6.5 | 0 |
| 50 FT | 35 | 36 | 13 | 9 | 6 | 6 | 6.5 | 46.4 | 60.0 | 64.4 | 68.9 | 9 | 6.5 | 6 | 6 | 40.5 | 128 | 140 | 152 | 5 | 6 | 0 |

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

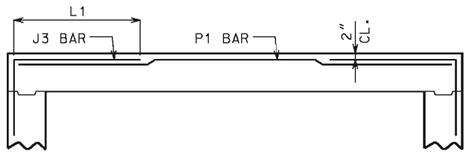
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=11′ | HT=12′ | HT=13′ | | | | | | HT=11′ | HT=12′ | HT=13′ | | | |
| 1 FT | 12 | 12 | 9 | 7 | 7 | 6 | 6.5 | 109.6 | 36.3 | 39.1 | 42.0 | 7 | 7 | 6 | 6 | 109.6 | 140 | 152 | 164 | 5 | 8.5 | 12 |
| 2 FT | 13 | 14 | 9 | 7 | 7 | 6 | 6.5 | 109.6 | 38.5 | 41.5 | 44.5 | 7 | 7.5 | 6 | 6 | 109.6 | 142 | 154 | 166 | 5 | 8.5 | 12 |
| 4 FT | 11 | 12 | 10 | 7 | 6.5 | 6 | 6 | 74.1 | 36.0 | 38.9 | 41.8 | 7 | 7 | 6 | 6 | 76.0 | 140 | 152 | 164 | 5 | 8 | 0 |
| 6 FT | 12 | 13 | 10 | 7 | 7 | 6 | 6.5 | 64.6 | 36.5 | 39.4 | 42.3 | 7 | 6.5 | 6 | 6.5 | 68.4 | 141 | 153 | 165 | 5 | 8 | 0 |
| 8 FT | 12 | 13 | 10 | 7 | 6.5 | 6 | 6 | 58.9 | 36.5 | 39.4 | 42.3 | 7 | 6 | 6 | 6 | 62.8 | 141 | 153 | 165 | 5 | 8 | 0 |
| 10 FT | 13 | 14 | 10 | 7 | 6 | 7 | 7 | 58.9 | 38.5 | 41.5 | 44.5 | 8 | 7 | 6 | 6 | 58.9 | 142 | 154 | 166 | 5 | 8 | 0 |
| 12 FT | 13 | 15 | 10 | 8 | 7 | 7 | 6 | 57.0 | 38.8 | 41.8 | 44.8 | 8 | 6.5 | 7 | 6.5 | 58.9 | 143 | 155 | 167 | 5 | 8 | 0 |
| 14 FT | 14 | 17 | 11 | 8 | 7 | 7 | 6.5 | 57.3 | 39.5 | 42.5 | 45.5 | 8 | 6.5 | 6 | 6 | 53.5 | 145 | 157 | 169 | 5 | 7.5 | 0 |
| 16 FT | 14 | 17 | 11 | 8 | 6.5 | 7 | 6 | 53.5 | 39.5 | 42.5 | 45.5 | 8 | 6.5 | 6 | 6 | 49.6 | 145 | 157 | 169 | 5 | 8.5 | 0 |
| 18 FT | 16 | 19 | 12 | 8 | 6.5 | 7 | 7 | 61.5 | 40.5 | 43.5 | 46.5 | 8 | 6.5 | 6 | 6.5 | 49.9 | 147 | 159 | 171 | 5 | 8.5 | 0 |
| 20 FT | 17 | 20 | 12 | 8 | 6 | 7 | 6 | 61.5 | 41.0 | 44.0 | 47.0 | 8 | 6.5 | 6 | 6 | 49.9 | 148 | 160 | 172 | 5 | 7.5 | 0 |
| 22 FT | 19 | 22 | 13 | 8 | 6.5 | 7 | 7 | 61.8 | 43.6 | 46.8 | 49.9 | 8 | 6.5 | 6 | 6.5 | 50.1 | 150 | 162 | 174 | 5 | 7.5 | 0 |
| 24 FT | 20 | 23 | 13 | 8 | 6 | 7 | 6.5 | 59.9 | 44.3 | 47.4 | 50.5 | 8 | 6 | 6 | 6 | 50.1 | 151 | 163 | 175 | 5 | 6.5 | 0 |
| 26 FT | 21 | 24 | 14 | 8 | 6 | 7 | 6 | 62.1 | 46.5 | 49.6 | 52.9 | 8 | 6 | 6 | 6.5 | 50.5 | 152 | 164 | 176 | 5 | 7 | 0 |
| 28 FT | 23 | 25 | 14 | 8 | 6 | 7 | 7 | 60.1 | 47.3 | 50.5 | 53.8 | 8 | 6 | 6 | 6 | 50.5 | 153 | 165 | 177 | 5 | 6 | 0 |
| 30 FT | 24 | 27 | 15 | 9 | 7.5 | 7 | 7 | 60.5 | 48.0 | 51.3 | 54.5 | 8 | 6 | 6 | 6.5 | 50.8 | 155 | 167 | 179 | 5 | 6 | 0 |
| 32 FT | 25 | 28 | 15 | 9 | 7 | 7 | 6.5 | 60.5 | 50.4 | 53.8 | 57.1 | 8 | 6 | 6 | 6 | 50.8 | 156 | 168 | 180 | 6 | 8 | 0 |
| 34 FT | 26 | 29 | 15 | 9 | 7 | 7 | 6 | 60.5 | 51.0 | 54.4 | 57.6 | 9 | 7.5 | 6 | 6 | 50.8 | 157 | 169 | 181 | 6 | 8 | 0 |
| 36 FT | 27 | 30 | 16 | 9 | 7 | 7 | 6 | 60.8 | 51.5 | 54.9 | 58.3 | 9 | 7 | 6 | 6 | 51.0 | 158 | 170 | 182 | 6 | 8 | 0 |
| 38 FT | 28 | 31 | 16 | 9 | 6.5 | 7 | 6 | 60.8 | 52.1 | 55.5 | 58.8 | 9 | 7 | 6 | 6 | 51.0 | 159 | 171 | 183 | 6 | 8 | 0 |
| 40 FT | 29 | 32 | 17 | 9 | 6.5 | 7 | 6 | 61.1 | 54.5 | 58.0 | 61.5 | 9 | 7 | 6 | 6 | 51.3 | 160 | 172 | 184 | 6 | 7.5 | 0 |
| 42 FT | 31 | 33 | 17 | 9 | 6.5 | 7 | 7 | 61.1 | 55.4 | 58.9 | 62.4 | 9 | 7 | 6 | 6 | 51.3 | 161 | 173 | 185 | 6 | 7.5 | 0 |
| 44 FT | 32 | 34 | 17 | 9 | 6.5 | 7 | 6.5 | 61.1 | 57.9 | 61.5 | 65.1 | 9 | 6.5 | 6 | 6 | 51.3 | 162 | 174 | 186 | 6 | 7.5 | 0 |
| 46 FT | 33 | 35 | 17 | 9 | 6 | 7 | 6 | 61.1 | 58.5 | 62.1 | 65.8 | 9 | 6.5 | 6 | 6 | 53.3 | 163 | 175 | 187 | 6 | 7.5 | 0 |
| 48 FT | 34 | 36 | 18 | 9 | 6 | 7 | 7 | 61.4 | 59.1 | 62.8 | 66.3 | 9 | 6.5 | 6 | 6 | 53.5 | 164 | 176 | 188 | 6 | 7 | 0 |
| 50 FT | 34 | 37 | 18 | 9 | 6 | 7 | 6 | 61.4 | 59.4 | 63.0 | 66.6 | 9 | 6.5 | 6 | 6 | 53.5 | 165 | 177 | 189 | 6 | 7 | 0 |

## SPAN (S) = 15 FT  HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | G1 |
| | | | | | | | | | HT=14′ | HT=15′ | HT=16′ | | | | | | HT=14′ | HT=15′ | HT=16′ | | | |
| 1 FT | 13 | 14 | 11 | 7 | 8 | 6 | 7.5 | 112.8 | 36.1 | 38.4 | 40.6 | 7 | 8 | 6 | 7 | 112.8 | 178 | 190 | 202 | 5 | 7.5 | 12 |
| 2 FT | 13 | 14 | 11 | 7 | 7.5 | 6 | 6.5 | 112.8 | 38.0 | 40.4 | 42.8 | 7 | 7.5 | 6 | 6.5 | 112.8 | 178 | 190 | 202 | 5 | 7 | 12 |
| 4 FT | 12 | 13 | 11 | 7 | 7 | 6 | 6.5 | 112.8 | 37.6 | 40.0 | 42.4 | 7 | 7 | 6 | 6 | 112.8 | 177 | 189 | 201 | 5 | 6.5 | 0 |
| 6 FT | 12 | 13 | 12 | 7 | 7.5 | 6 | 6.5 | 92.1 | 37.6 | 40.0 | 42.4 | 7 | 6.5 | 6 | 6 | 97.9 | 177 | 189 | 201 | 5 | 6.5 | 0 |
| 8 FT | 12 | 14 | 13 | 7 | 7.5 | 6 | 6 | 77.3 | 37.8 | 40.3 | 42.6 | 7 | 6.5 | 6 | 6 | 84.9 | 178 | 190 | 202 | 5 | 6.5 | 0 |
| 10 FT | 13 | 15 | 13 | 7 | 6.5 | 6 | 6 | 73.4 | 38.3 | 40.6 | 43.0 | 7 | 6 | 6 | 6 | 81.0 | 179 | 191 | 203 | 5 | 6.5 | 0 |
| 12 FT | 14 | 16 | 14 | 7 | 6.5 | 7 | 8 | 73.8 | 38.6 | 41.0 | 43.4 | 8 | 7.5 | 6 | 6 | 75.6 | 180 | 192 | 204 | 5 | 6 | 0 |
| 14 FT | 15 | 17 | 14 | 7 | 6 | 7 | 7 | 81.5 | 41.0 | 43.5 | 46.0 | 8 | 7 | 7 | 7.5 | 75.6 | 181 | 193 | 205 | 5 | 6 | 0 |
| 16 FT | 16 | 18 | 15 | 8 | 7.5 | 7 | 7 | 80.0 | 45.3 | 48.1 | 50.9 | 8 | 7 | 7 | 7 | 74.1 | 182 | 194 | 206 | 6 | 8 | 0 |
| 18 FT | 16 | 19 | 15 | 8 | 7 | 7 | 7 | 74.1 | 41.6 | 44.1 | 46.6 | 8 | 7 | 7 | 7.5 | 70.3 | 183 | 195 | 207 | 6 | 8 | 0 |
| 20 FT | 17 | 20 | 15 | 8 | 7 | 7 | 6 | 74.1 | 46.0 | 48.8 | 51.5 | 8 | 6.5 | 7 | 7 | 68.3 | 184 | 196 | 208 | 6 | 8 | 0 |
| 22 FT | 19 | 21 | 15 | 8 | 6.5 | 7 | 6 | 74.1 | 50.8 | 53.8 | 56.8 | 8 | 6 | 7 | 6 | 68.3 | 185 | 197 | 209 | 6 | 8 | 0 |
| 24 FT | 20 | 23 | 16 | 8 | 6.5 | 7 | 6 | 74.5 | 47.4 | 50.1 | 52.9 | 8 | 6 | 7 | 6.5 | 68.6 | 187 | 199 | 211 | 6 | 8 | 0 |
| 26 FT | 21 | 24 | 17 | 8 | 6 | 7 | 6 | 72.9 | 49.9 | 52.8 | 55.6 | 8 | 6 | 7 | 7 | 69.0 | 188 | 200 | 212 | 6 | 7.5 | 0 |
| 28 FT | 23 | 25 | 17 | 8 | 6 | 7 | 6 | 72.9 | 54.9 | 58.0 | 61.1 | 8 | 6 | 7 | 6 | 69.0 | 189 | 201 | 213 | 6 | 7.5 | 0 |
| 30 FT | 24 | 27 | 18 | 8 | 6 | 7 | 6 | 73.3 | 51.4 | 54.3 | 57.1 | 8 | 6 | 7 | 6.5 | 69.3 | 191 | 203 | 215 | 6 | 7 | 0 |
| 32 FT | 25 | 28 | 19 | 8 | 6 | 7 | 6 | 73.6 | 49.6 | 52.5 | 55.3 | 8 | 6 | 7 | 7 | 69.6 | 192 | 204 | 216 | 6 | 6.5 | 0 |
| 34 FT | 26 | 29 | 20 | 8 | 6 | 7 | 6 | 74.0 | 52.4 | 55.3 | 58.1 | 9 | 7.5 | 7 | 7 | 68.0 | 193 | 205 | 217 | 6 | 6.5 | 0 |
| 36 FT | 27 | 30 | 21 | 9 | 7.5 | 7 | 6 | 74.4 | 52.8 | 55.6 | 58.5 | 9 | 7 | 7 | 7.5 | 68.4 | 194 | 206 | 218 | 6 | 6.5 | 0 |
| 38 FT | 28 | 31 | 21 | 9 | 7 | 7 | 6 | 74.4 | 55.5 | 58.5 | 61.5 | 9 | 7 | 7 | 7 | 68.4 | 195 | 207 | 219 | 6 | 6 | 0 |
| 40 FT | 29 | 32 | 22 | 9 | 7 | 7 | 6 | 74.8 | 60.5 | 63.8 | 67.0 | 9 | 7 | 7 | 7 | 68.6 | 196 | 208 | 220 | 6 | 6 | 0 |
| 42 FT | 30 | 33 | 23 | 9 | 7 | 7 | 6 | 77.1 | 61.0 | 64.3 | 67.5 | 9 | 7 | 7 | 7 | 69.0 | 197 | 209 | 221 | 6 | 6 | 0 |
| 44 FT | 31 | 34 | 24 | 9 | 6.5 | 7 | 6 | 77.5 | 61.5 | 64.8 | 68.0 | 9 | 6.5 | 7 | 7 | 69.4 | 198 | 210 | 222 | 6 | 6 | 0 |
| 46 FT | 32 | 35 | 24 | 9 | 6.5 | 7 | 6 | 77.5 | 62.1 | 65.4 | 68.6 | 9 | 6.5 | 7 | 7 | 69.4 | 199 | 211 | 223 | 7 | 8 | 0 |
| 48 FT | 33 | 36 | 25 | 9 | 6.5 | 7 | 6 | 77.9 | 65.0 | 68.4 | 71.6 | 9 | 6.5 | 7 | 7 | 69.8 | 200 | 212 | 224 | 7 | 8 | 0 |
| 50 FT | 34 | 37 | 25 | 9 | 6.5 | 7 | 6 | 77.9 | 65.5 | 68.9 | 72.3 | 9 | 6.5 | 7 | 7 | 71.8 | 201 | 213 | 225 | 7 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.




ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 15 FEET
HEIGHT (HT): 8 THRU 16 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

## SPAN (S) = 16 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

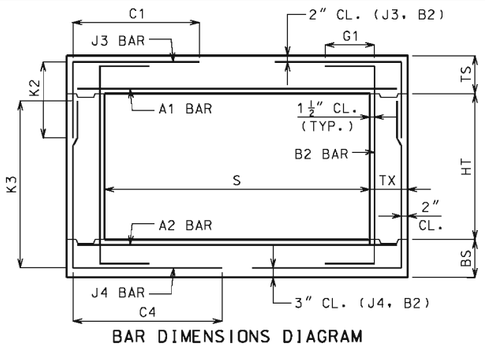
| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | K2 HT=10′ | | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | K3 HT=10′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 13 | 8 | 7 | 6.5 | 6 | 6.5 | 116.0 | 37.1 | 41.0 | 44.8 | | 7 | 7.5 | 6 | 6.5 | 76.0 | 105 | 117 | 129 | 5 | 12 | 12 |
| 2 FT | 12 | 13 | 8 | 7 | 6 | 6 | 6 | 116.0 | 37.1 | 41.0 | 44.8 | | 7 | 7 | 6 | 6 | 64.0 | 105 | 117 | 129 | 5 | 12 | 12 |
| 4 FT | 12 | 12 | 9 | 7 | 6.5 | 6 | 6.5 | 54.3 | 36.8 | 40.6 | 44.5 | | 7 | 6.5 | 6 | 6 | 54.3 | 104 | 116 | 128 | 5 | 12 | 0 |
| 6 FT | 12 | 12 | 9 | 7 | 6 | 6 | 6.5 | 50.3 | 36.8 | 40.6 | 44.5 | | 7 | 6 | 6 | 6 | 50.3 | 104 | 116 | 128 | 5 | 12 | 0 |
| 8 FT | 12 | 13 | 9 | 8 | 7.5 | 7 | 6.5 | 50.3 | 37.1 | 41.0 | 44.8 | | 8 | 7 | 6 | 6 | 46.3 | 105 | 117 | 129 | 5 | 12 | 0 |
| 10 FT | 13 | 14 | 9 | 8 | 6.5 | 7 | 6.5 | 48.3 | 37.8 | 41.6 | 45.5 | | 8 | 6.5 | 6 | 6 | 44.3 | 106 | 118 | 130 | 5 | 12 | 0 |
| 12 FT | 14 | 16 | 9 | 8 | 6.5 | 7 | 6.5 | 46.3 | 35.1 | 38.6 | 42.0 | | 8 | 6.5 | 6 | 7.5 | 40.3 | 108 | 120 | 132 | 5 | 12 | 0 |
| 14 FT | 15 | 18 | 9 | 8 | 6 | 7 | 6 | 52.3 | 36.0 | 39.5 | 42.9 | | 8 | 6 | 6 | 8 | 38.3 | 110 | 122 | 134 | 5 | 12 | 0 |
| 16 FT | 16 | 19 | 9 | 9 | 7 | 7 | 6 | 50.3 | 36.5 | 40.0 | 43.5 | | 8 | 6 | 6 | 7.5 | 38.3 | 111 | 123 | 135 | 5 | 12 | 0 |
| 18 FT | 17 | 20 | 9 | 9 | 7 | 7 | 6.5 | 50.3 | 37.1 | 40.6 | 44.1 | | 8 | 6 | 6 | 8 | 38.3 | 112 | 124 | 136 | 5 | 12 | 0 |
| 20 FT | 19 | 21 | 9 | 9 | 7 | 7 | 7 | 50.3 | 39.3 | 42.9 | 46.5 | | 8 | 6 | 6 | 7.5 | 38.3 | 113 | 125 | 137 | 5 | 10.5 | 0 |
| 22 FT | 20 | 23 | 9 | 9 | 6.5 | 7 | 6.5 | 50.3 | 40.3 | 43.8 | 47.4 | | 8 | 6 | 6 | 7.5 | 38.3 | 115 | 127 | 139 | 5 | 9 | 0 |
| 24 FT | 22 | 24 | 10 | 9 | 7 | 7 | 7.5 | 50.5 | 42.5 | 46.3 | 49.9 | | 9 | 7.5 | 6 | 7.5 | 38.4 | 116 | 128 | 140 | 5 | 9.5 | 0 |
| 26 FT | 23 | 25 | 10 | 9 | 6.5 | 7 | 7 | 50.5 | 47.3 | 51.4 | 55.4 | | 9 | 7 | 6 | 7 | 38.4 | 117 | 129 | 141 | 5 | 8.5 | 0 |
| 28 FT | 25 | 27 | 11 | 9 | 6.5 | 6 | 6 | 46.8 | 45.8 | 49.6 | 53.5 | | 9 | 7 | 6 | 8 | 40.6 | 119 | 131 | 143 | 5 | 8.5 | 0 |
| 30 FT | 26 | 28 | 11 | 9 | 6.5 | 6 | 6 | 46.8 | 46.4 | 50.3 | 54.1 | | 9 | 7 | 6 | 8 | 40.6 | 120 | 132 | 144 | 5 | 7.5 | 0 |
| 32 FT | 28 | 29 | 11 | 9 | 6.5 | 6 | 6.5 | 46.8 | 53.3 | 57.6 | 61.9 | | 9 | 7 | 6 | 7 | 40.6 | 121 | 133 | 145 | 5 | 7.5 | 0 |
| 34 FT | 29 | 31 | 12 | 9 | 6.5 | 6 | 6.5 | 46.9 | 54.4 | 58.6 | 63.0 | | 9 | 7 | 6 | 7.5 | 40.8 | 123 | 135 | 147 | 5 | 7 | 0 |
| 36 FT | 30 | 32 | 12 | 9 | 6 | 6 | 6.5 | 46.9 | 55.1 | 59.4 | 63.8 | | 9 | 6.5 | 6 | 7.5 | 40.8 | 124 | 136 | 148 | 5 | 7 | 0 |
| 38 FT | 31 | 33 | 12 | 9 | 6 | 6 | 6.5 | 46.9 | 55.8 | 60.1 | 64.5 | | 9 | 6.5 | 6 | 7 | 40.8 | 125 | 137 | 149 | 5 | 7 | 0 |
| 40 FT | 32 | 34 | 12 | 9 | 6 | 6 | 6.5 | 46.9 | 56.5 | 60.9 | 65.1 | | 9 | 6.5 | 6 | 7 | 40.8 | 126 | 138 | 150 | 5 | 7 | 0 |
| 42 FT | 33 | 35 | 12 | 9 | 6 | 6 | 6 | 46.9 | 57.3 | 61.5 | 65.9 | | 9 | 6.5 | 6 | 6.5 | 40.8 | 127 | 139 | 151 | 5 | 6.5 | 0 |
| 44 FT | 34 | 36 | 13 | 10 | 7.5 | 6 | 6.5 | 47.1 | 59.6 | 64.0 | 68.5 | | 9 | 6 | 6 | 6.5 | 41.0 | 128 | 140 | 152 | 5 | 6.5 | 0 |
| 46 FT | 35 | 37 | 13 | 10 | 7 | 6 | 6 | 47.1 | 60.3 | 64.8 | 69.3 | | 9 | 6 | 6 | 6.5 | 41.0 | 129 | 141 | 153 | 5 | 6.5 | 0 |
| 48 FT | 36 | 38 | 13 | 10 | 7 | 6 | 6.5 | 47.1 | 61.0 | 65.5 | 69.9 | | 9 | 6 | 6 | 6 | 41.0 | 130 | 142 | 154 | 5 | 6 | 0 |
| 50 FT | 37 | 39 | 13 | 10 | 7 | 6 | 6 | 47.1 | 61.8 | 66.3 | 70.6 | | 9 | 6 | 6 | 6 | 41.0 | 131 | 143 | 155 | 6 | 8.5 | 0 |

## SPAN (S) = 16 FT  HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=11′ | K2 HT=12′ | K2 HT=13′ | | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=11′ | K3 HT=12′ | K3 HT=13′ | SIZE | SPA. | G1 |
| 1 FT | 12 | 14 | 9 | 7 | 6.5 | 6 | 6 | 116.6 | 36.8 | 39.6 | 42.5 | | 7 | 7.5 | 6 | 6 | 116.6 | 142 | 154 | 166 | 5 | 8.5 | 12 |
| 2 FT | 13 | 14 | 10 | 7 | 7 | 6 | 7 | 117.1 | 38.5 | 41.5 | 44.5 | | 7 | 7.5 | 6 | 6 | 101.0 | 142 | 154 | 166 | 5 | 8.5 | 12 |
| 4 FT | 12 | 13 | 10 | 7 | 6.5 | 6 | 6.5 | 72.8 | 36.5 | 39.4 | 42.3 | | 7 | 6.5 | 6 | 6.5 | 74.8 | 141 | 153 | 165 | 5 | 8.5 | 0 |
| 6 FT | 12 | 13 | 10 | 7 | 6 | 6 | 6 | 62.6 | 36.5 | 39.4 | 42.3 | | 7 | 6 | 6 | 6 | 64.6 | 141 | 153 | 165 | 5 | 8.5 | 0 |
| 8 FT | 12 | 14 | 10 | 7 | 6 | 7 | 6 | 62.6 | 36.8 | 39.6 | 42.5 | | 8 | 7.5 | 6 | 6 | 60.6 | 142 | 154 | 166 | 5 | 8.5 | 0 |
| 10 FT | 13 | 15 | 11 | 8 | 7.5 | 7 | 6.5 | 60.9 | 37.3 | 40.1 | 43.0 | | 8 | 7 | 6 | 6.5 | 56.9 | 143 | 155 | 167 | 5 | 9 | 0 |
| 12 FT | 14 | 16 | 11 | 8 | 6.5 | 7 | 6.5 | 58.9 | 39.3 | 42.3 | 45.3 | | 8 | 6.5 | 6 | 6 | 54.8 | 144 | 156 | 168 | 5 | 8.5 | 0 |
| 14 FT | 15 | 17 | 11 | 8 | 6 | 7 | 6 | 65.0 | 46.1 | 49.6 | 53.1 | | 8 | 6 | 7 | 7 | 56.9 | 145 | 157 | 169 | 5 | 8 | 0 |
| 16 FT | 16 | 19 | 12 | 8 | 6 | 7 | 6 | 65.3 | 40.5 | 43.5 | 46.5 | | 8 | 6 | 6 | 6 | 53.0 | 147 | 159 | 171 | 5 | 8 | 0 |
| 18 FT | 17 | 20 | 12 | 8 | 6 | 7 | 6.5 | 61.3 | 41.0 | 44.0 | 47.0 | | 8 | 6 | 6 | 6.5 | 49.0 | 148 | 160 | 172 | 5 | 9 | 0 |
| 20 FT | 19 | 21 | 12 | 8 | 6 | 7 | 6.5 | 59.1 | 43.4 | 46.5 | 49.6 | | 8 | 6 | 6 | 6 | 49.0 | 149 | 161 | 173 | 5 | 7.5 | 0 |
| 22 FT | 20 | 23 | 13 | 9 | 7.5 | 7 | 6.5 | 61.5 | 44.3 | 47.4 | 50.5 | | 8 | 6 | 6 | 6.5 | 49.3 | 151 | 163 | 175 | 5 | 8 | 0 |
| 24 FT | 22 | 24 | 13 | 9 | 7 | 7 | 6.5 | 59.5 | 46.8 | 50.0 | 53.3 | | 9 | 7.5 | 6 | 6 | 49.3 | 152 | 164 | 176 | 5 | 6.5 | 0 |
| 26 FT | 23 | 26 | 14 | 9 | 7 | 7 | 6.5 | 59.8 | 47.5 | 50.8 | 54.0 | | 9 | 7.5 | 6 | 6.5 | 49.5 | 154 | 166 | 178 | 5 | 7 | 0 |
| 28 FT | 24 | 27 | 14 | 9 | 7 | 7 | 6.5 | 59.8 | 48.0 | 51.3 | 54.5 | | 9 | 7 | 6 | 6 | 49.5 | 155 | 167 | 179 | 5 | 6 | 0 |
| 30 FT | 26 | 28 | 14 | 9 | 6.5 | 7 | 6 | 59.8 | 50.6 | 54.0 | 57.4 | | 9 | 7 | 6 | 6 | 49.5 | 156 | 168 | 180 | 5 | 6 | 0 |
| 32 FT | 27 | 29 | 15 | 9 | 6.5 | 7 | 6.5 | 60.0 | 51.3 | 54.6 | 58.0 | | 9 | 7 | 6 | 6 | 49.6 | 157 | 169 | 181 | 5 | 6 | 0 |
| 34 FT | 28 | 31 | 15 | 9 | 6.5 | 7 | 6 | 60.0 | 52.1 | 55.5 | 58.8 | | 9 | 7 | 6 | 6 | 49.6 | 159 | 171 | 183 | 6 | 8 | 0 |
| 36 FT | 29 | 32 | 16 | 9 | 6.5 | 7 | 6.5 | 60.4 | 54.5 | 58.0 | 61.5 | | 9 | 6.5 | 6 | 6 | 49.9 | 160 | 172 | 184 | 6 | 8 | 0 |
| 38 FT | 30 | 33 | 16 | 9 | 6 | 7 | 6 | 60.4 | 55.1 | 58.6 | 62.0 | | 9 | 6.5 | 6 | 6 | 49.9 | 161 | 173 | 185 | 6 | 8 | 0 |
| 40 FT | 32 | 34 | 16 | 9 | 6 | 7 | 6.5 | 60.4 | 57.9 | 61.5 | 65.1 | | 9 | 6.5 | 6 | 6 | 49.9 | 162 | 174 | 186 | 6 | 8 | 0 |
| 42 FT | 33 | 35 | 17 | 9 | 6 | 7 | 7 | 60.6 | 58.5 | 62.1 | 65.8 | | 9 | 6.5 | 6 | 6 | 50.1 | 163 | 175 | 187 | 6 | 7.5 | 0 |
| 44 FT | 34 | 36 | 17 | 9 | 6 | 7 | 7 | 60.6 | 59.1 | 62.8 | 66.3 | | 9 | 6 | 6 | 6 | 50.1 | 164 | 176 | 188 | 6 | 7.5 | 0 |
| 46 FT | 35 | 37 | 17 | 10 | 7.5 | 7 | 6.5 | 60.6 | 59.8 | 63.3 | 66.9 | | 9 | 6 | 6 | 6 | 50.1 | 165 | 177 | 189 | 6 | 7.5 | 0 |
| 48 FT | 36 | 38 | 18 | 10 | 7 | 7 | 7 | 60.9 | 60.3 | 63.9 | 67.5 | | 9 | 6 | 6 | 6 | 52.5 | 166 | 178 | 190 | 6 | 7 | 0 |
| 50 FT | 37 | 39 | 18 | 10 | 7 | 7 | 7 | 60.9 | 62.9 | 66.6 | 70.4 | | 9 | 6 | 6 | 6 | 52.5 | 167 | 179 | 191 | 6 | 7 | 0 |

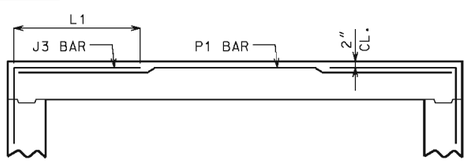
## SPAN (S) = 16 FT  HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | TOP SLAB BARS | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | WALL BARS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A1 BARS | | J3 BARS | | | | | | | A2 BARS | | J4 BARS | | | | | | B2 BARS | | |
| | TS | BS | TX | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=14′ | K2 HT=15′ | K2 HT=16′ | | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=14′ | K3 HT=15′ | K3 HT=16′ | SIZE | SPA. | G1 |
| 1 FT | 13 | 14 | 11 | 7 | 7.5 | 6 | 7 | 117.8 | 38.0 | 40.4 | 42.8 | | 7 | 7.5 | 6 | 6.5 | 117.8 | 178 | 190 | 202 | 5 | 7.5 | 12 |
| 2 FT | 13 | 14 | 11 | 7 | 7 | 7 | 7.5 | 121.8 | 38.0 | 40.4 | 42.8 | | 7 | 7 | 6 | 6.5 | 117.8 | 178 | 190 | 202 | 5 | 7 | 12 |
| 4 FT | 12 | 14 | 11 | 7 | 6.5 | 6 | 6 | 117.8 | 37.8 | 40.3 | 42.6 | | 7 | 6.5 | 6 | 6 | 117.8 | 178 | 190 | 202 | 5 | 6.5 | 0 |
| 6 FT | 12 | 14 | 12 | 7 | 6.5 | 6 | 6 | 83.6 | 37.8 | 40.3 | 42.6 | | 7 | 6.5 | 6 | 6 | 95.9 | 178 | 190 | 202 | 5 | 7 | 0 |
| 8 FT | 12 | 14 | 13 | 7 | 6.5 | 7 | 6.5 | 77.9 | 37.8 | 40.3 | 42.6 | | 7 | 6 | 6 | 6 | 80.0 | 178 | 190 | 202 | 5 | 6.5 | 0 |
| 10 FT | 13 | 16 | 13 | 7 | 6 | 7 | 6.5 | 75.9 | 38.4 | 40.8 | 43.3 | | 8 | 7.5 | 6 | 6 | 77.9 | 180 | 192 | 204 | 5 | 6.5 | 0 |
| 12 FT | 14 | 17 | 14 | 7 | 6 | 7 | 6.5 | 72.1 | 40.8 | 43.3 | 45.8 | | 8 | 7 | 7 | 8 | 76.3 | 181 | 193 | 205 | 5 | 6 | 0 |
| 14 FT | 16 | 18 | 14 | 8 | 7 | 7 | 6.5 | 78.3 | 45.3 | 48.1 | 50.9 | | 8 | 6.5 | 7 | 7 | 74.1 | 182 | 194 | 206 | 5 | 6 | 0 |
| 16 FT | 17 | 19 | 15 | 8 | 7 | 7 | 6.5 | 78.6 | 47.8 | 50.6 | 53.5 | | 8 | 6.5 | 7 | 6.5 | 72.5 | 183 | 195 | 207 | 6 | 8 | 0 |
| 18 FT | 17 | 20 | 15 | 8 | 6.5 | 7 | 6.5 | 72.5 | 42.0 | 44.5 | 47.0 | | 8 | 6 | 7 | 7.5 | 66.3 | 184 | 196 | 208 | 6 | 8 | 0 |
| 20 FT | 19 | 21 | 15 | 8 | 6.5 | 7 | 6 | 72.5 | 50.8 | 53.8 | 56.8 | | 8 | 6 | 7 | 6.5 | 66.3 | 185 | 197 | 209 | 6 | 8 | 0 |
| 22 FT | 20 | 23 | 16 | 8 | 6 | 7 | 6 | 72.8 | 45.4 | 48.0 | 50.6 | | 8 | 6 | 7 | 7 | 66.5 | 187 | 199 | 211 | 6 | 8 | 0 |
| 24 FT | 22 | 24 | 16 | 8 | 6 | 7 | 6 | 72.8 | 52.3 | 55.3 | 58.3 | | 9 | 7.5 | 7 | 6.5 | 66.5 | 188 | 200 | 212 | 6 | 8 | 0 |
| 26 FT | 23 | 26 | 17 | 8 | 6 | 7 | 6 | 73.1 | 50.9 | 53.8 | 56.6 | | 9 | 7.5 | 7 | 7 | 66.9 | 190 | 202 | 214 | 6 | 7.5 | 0 |
| 28 FT | 24 | 27 | 18 | 9 | 7 | 7 | 6 | 73.5 | 51.4 | 54.3 | 57.1 | | 9 | 7 | 7 | 7 | 67.3 | 191 | 203 | 215 | 6 | 7 | 0 |
| 30 FT | 26 | 28 | 18 | 9 | 7 | 7 | 6 | 73.5 | 56.4 | 59.5 | 62.6 | | 9 | 7 | 7 | 6.5 | 67.3 | 192 | 204 | 216 | 6 | 7 | 0 |
| 32 FT | 27 | 30 | 19 | 9 | 7 | 7 | 6 | 73.9 | 55.0 | 58.0 | 61.0 | | 9 | 7 | 7 | 7 | 67.5 | 194 | 206 | 218 | 6 | 6.5 | 0 |
| 34 FT | 28 | 31 | 20 | 9 | 7 | 7 | 6 | 74.3 | 55.5 | 58.5 | 61.5 | | 9 | 7 | 7 | 7 | 67.9 | 195 | 207 | 219 | 6 | 6.5 | 0 |
| 36 FT | 29 | 32 | 21 | 9 | 6.5 | 7 | 6 | 74.5 | 53.8 | 56.6 | 59.5 | | 9 | 6.5 | 7 | 7 | 68.1 | 196 | 208 | 220 | 6 | 6.5 | 0 |
| 38 FT | 30 | 33 | 22 | 9 | 6.5 | 7 | 6 | 74.9 | 61.0 | 64.3 | 67.5 | | 9 | 6.5 | 7 | 7 | 68.5 | 197 | 209 | 221 | 6 | 6.5 | 0 |
| 40 FT | 31 | 34 | 22 | 9 | 6.5 | 7 | 6 | 74.9 | 61.5 | 64.8 | 68.0 | | 9 | 6.5 | 7 | 7 | 68.5 | 198 | 210 | 222 | 6 | 6 | 0 |
| 42 FT | 32 | 35 | 23 | 9 | 6.5 | 7 | 6 | 75.3 | 62.1 | 65.4 | 68.6 | | 9 | 6.5 | 7 | 7 | 68.8 | 199 | 211 | 223 | 6 | 6 | 0 |
| 44 FT | 34 | 36 | 23 | 9 | 6 | 7 | 6 | 75.3 | 65.3 | 68.6 | 72.0 | | 9 | 6 | 7 | 6.5 | 68.8 | 200 | 212 | 224 | 7 | 8 | 0 |
| 46 FT | 35 | 37 | 24 | 9 | 6 | 7 | 6 | 75.6 | 65.8 | 69.1 | 72.5 | | 9 | 6 | 7 | 6.5 | 69.1 | 201 | 213 | 225 | 6 | 6 | 0 |
| 48 FT | 36 | 38 | 24 | 9 | 6 | 7 | 6 | 75.6 | 66.4 | 69.8 | 73.1 | | 9 | 6 | 7 | 7 | 69.1 | 202 | 214 | 226 | 7 | 7.5 | 0 |
| 50 FT | 37 | 39 | 25 | 9 | 6 | 7 | 6 | 76.0 | 69.3 | 72.8 | 76.3 | | 9 | 6 | 7 | 7 | 69.5 | 203 | 215 | 227 | 7 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM

SYMMETRICAL ABOUT ℄ CULVERT.




ALTERNATE J3 BAR

AT CONTRACTOR'S OPTION, ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2′-0″. DIMENSION L1 (NOT C1) SHALL BE USED WITH ALTERNATE J3 BARS, WHERE L1 IS EQUAL TO 18″, 22″ AND 28″ FOR #4, #5 AND #6 BARS, RESPECTIVELY. ADDITIONAL P1 BARS ARE REQUIRED WITH ALTERNATE J3 BARS WITH A LENGTH EQUAL TO A1 BARS, AND SIZE AND SPACING EQUAL TO J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER

THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE SINGLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 16 FEET
HEIGHT (HT): 8 THRU 16 FEET

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.17

SHEET NO. 14 OF 14

## AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN./FT.)
## WALL HEIGHT VS. WALL THICKNESS

① Backfill Slope = 2:1

| Wall Thickness TX (in.) | Wall Height (ft.) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 8 | 0.168 | 0.168 | 0.197 | 0.291 | 0.414 | 0.429 | 0.578 | 0.766 | 1.003 | | | | | | | |
| 9 | 0.168 | 0.168 | 0.168 | 0.244 | 0.346 | 0.456 | 0.477 | 0.626 | 0.809 | 1.034 | 1.312 | | | | | |
| 10 | 0.168 | 0.168 | 0.168 | 0.211 | 0.298 | 0.407 | 0.487 | 0.532 | 0.683 | 0.864 | 1.084 | 1.349 | | | | |
| 11 | 0.168 | 0.168 | 0.168 | 0.185 | 0.261 | 0.357 | 0.475 | 0.520 | 0.592 | 0.746 | 0.929 | 1.147 | 1.405 | | | |
| 12 | | 0.168 | 0.168 | 0.168 | 0.233 | 0.318 | 0.422 | 0.548 | 0.554 | 0.658 | 0.816 | 1.002 | 1.220 | 1.475 | | |
| 13 | | 0.168 | 0.168 | 0.168 | 0.210 | 0.287 | 0.380 | 0.493 | 0.588 | 0.589 | 0.729 | 0.892 | 1.081 | 1.301 | | |
| 14 | | | 0.168 | 0.168 | 0.192 | 0.261 | 0.346 | 0.448 | 0.569 | 0.623 | 0.659 | 0.805 | 0.973 | 1.167 | 1.390 | |
| 15 | | | | 0.168 | 0.176 | 0.240 | 0.317 | 0.411 | 0.521 | 0.652 | 0.658 | 0.734 | 0.886 | 1.059 | 1.258 | |
| 16 | | | | | 0.168 | 0.222 | 0.293 | 0.379 | 0.481 | 0.601 | 0.693 | 0.693 | 0.813 | 0.971 | 1.151 | |
| 17 | | | | | 0.168 | 0.206 | 0.273 | 0.352 | 0.447 | 0.557 | 0.686 | 0.729 | 0.752 | 0.897 | 1.061 | 1.247 |
| 18 | | | | | | | 0.255 | 0.329 | 0.417 | 0.520 | 0.639 | 0.764 | 0.764 | 0.834 | 0.985 | 1.156 |
| 19 | | | | | | | | 0.309 | 0.391 | 0.487 | 0.599 | 0.727 | 0.800 | 0.800 | 0.920 | 1.078 |
| 20 | | | | | | | | 0.291 | 0.368 | 0.459 | 0.563 | 0.684 | 0.821 | 0.836 | 0.863 | 1.011 |
| 21 | | | | | | | | | 0.348 | 0.433 | 0.532 | 0.645 | 0.774 | 0.871 | 0.871 | 0.952 |
| 22 | | | | | | | | | | 0.411 | 0.504 | 0.611 | 0.733 | 0.870 | 0.907 | 0.970 |
| 23 | | | | | | | | | | | 0.479 | 0.580 | 0.696 | 0.826 | 0.943 | 0.943 |
| 24 | | | | | | | | | | | 0.456 | 0.552 | 0.662 | 0.786 | 0.925 | 0.979 |
| 25 | | | | | | | | | | | | 0.527 | 0.632 | 0.750 | 0.882 | 1.015 |
| 26 | | | | | | | | | | | | | 0.604 | 0.717 | 0.843 | 0.984 |
| 27 | | | | | | | | | | | | | | 0.686 | 0.807 | 0.942 |

## AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN./FT.)
## WALL HEIGHT VS. WALL THICKNESS

① Backfill Slope = 3:1

| Wall Thickness TX (in.) | Wall Height (ft.) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 8 | 0.168 | 0.168 | 0.168 | 0.187 | 0.264 | 0.362 | 0.425 | 0.475 | 0.612 | | | | | | | |
| 9 | 0.168 | 0.168 | 0.168 | 0.168 | 0.222 | 0.303 | 0.403 | 0.456 | 0.504 | 0.637 | 0.795 | | | | | |
| 10 | 0.168 | 0.168 | 0.168 | 0.168 | 0.191 | 0.261 | 0.346 | 0.450 | 0.487 | 0.541 | 0.671 | 0.824 | 1.005 | 1.217 | | |
| 11 | 0.168 | 0.168 | 0.168 | 0.168 | 0.168 | 0.229 | 0.304 | 0.394 | 0.501 | 0.520 | 0.583 | 0.713 | 0.864 | 1.039 | | |
| 12 | | 0.168 | 0.168 | 0.168 | 0.168 | 0.204 | 0.271 | 0.351 | 0.445 | 0.554 | 0.554 | 0.629 | 0.760 | 0.910 | | |
| 13 | | 0.168 | 0.168 | 0.168 | 0.168 | 0.185 | 0.244 | 0.316 | 0.401 | 0.501 | 0.588 | 0.588 | 0.679 | 0.812 | 0.963 | |
| 14 | | | 0.168 | 0.168 | 0.168 | 0.168 | 0.223 | 0.288 | 0.365 | 0.455 | 0.560 | 0.623 | 0.623 | 0.733 | 0.868 | |
| 15 | | | | 0.168 | 0.168 | 0.168 | 0.204 | 0.264 | 0.335 | 0.417 | 0.513 | 0.623 | 0.658 | 0.669 | 0.791 | |
| 16 | | | | | 0.168 | 0.168 | 0.189 | 0.244 | 0.309 | 0.385 | 0.474 | 0.575 | 0.690 | 0.693 | 0.727 | |
| 17 | | | | | 0.168 | 0.168 | 0.176 | 0.227 | 0.287 | 0.358 | 0.440 | 0.533 | 0.640 | 0.729 | 0.729 | 0.788 |
| 18 | | | | | | | 0.168 | 0.212 | 0.269 | 0.334 | 0.411 | 0.498 | 0.597 | 0.709 | 0.764 | 0.764 |
| 19 | | | | | | | | 0.199 | 0.252 | 0.314 | 0.385 | 0.467 | 0.559 | 0.664 | 0.782 | 0.800 |
| 20 | | | | | | | | 0.188 | 0.237 | 0.295 | 0.362 | 0.439 | 0.526 | 0.625 | 0.735 | 0.836 |
| 21 | | | | | | | | | 0.224 | 0.279 | 0.342 | 0.415 | 0.497 | 0.590 | 0.694 | 0.810 |
| 22 | | | | | | | | | | 0.265 | 0.325 | 0.393 | 0.471 | 0.558 | 0.657 | 0.766 |
| 23 | | | | | | | | | | | 0.308 | 0.373 | 0.447 | 0.530 | 0.624 | 0.727 |
| 24 | | | | | | | | | | | 0.294 | 0.356 | 0.426 | 0.505 | 0.594 | 0.692 |
| 25 | | | | | | | | | | | | 0.340 | 0.407 | 0.482 | 0.566 | 0.661 |
| 26 | | | | | | | | | | | | | 0.389 | 0.461 | 0.542 | 0.632 |
| 27 | | | | | | | | | | | | | | 0.442 | 0.519 | 0.605 |

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.)

① SEE STANDARD PLAN 703.37C, SHEET 2 OF 2 FOR BACKFILL SLOPE TO BE USED BASED ON SKEW.

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NUMBER PE-27141
PROFESSIONAL ENGINEER

THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE BOX CULVERT

## EXTERIOR WING REINFORCEMENT

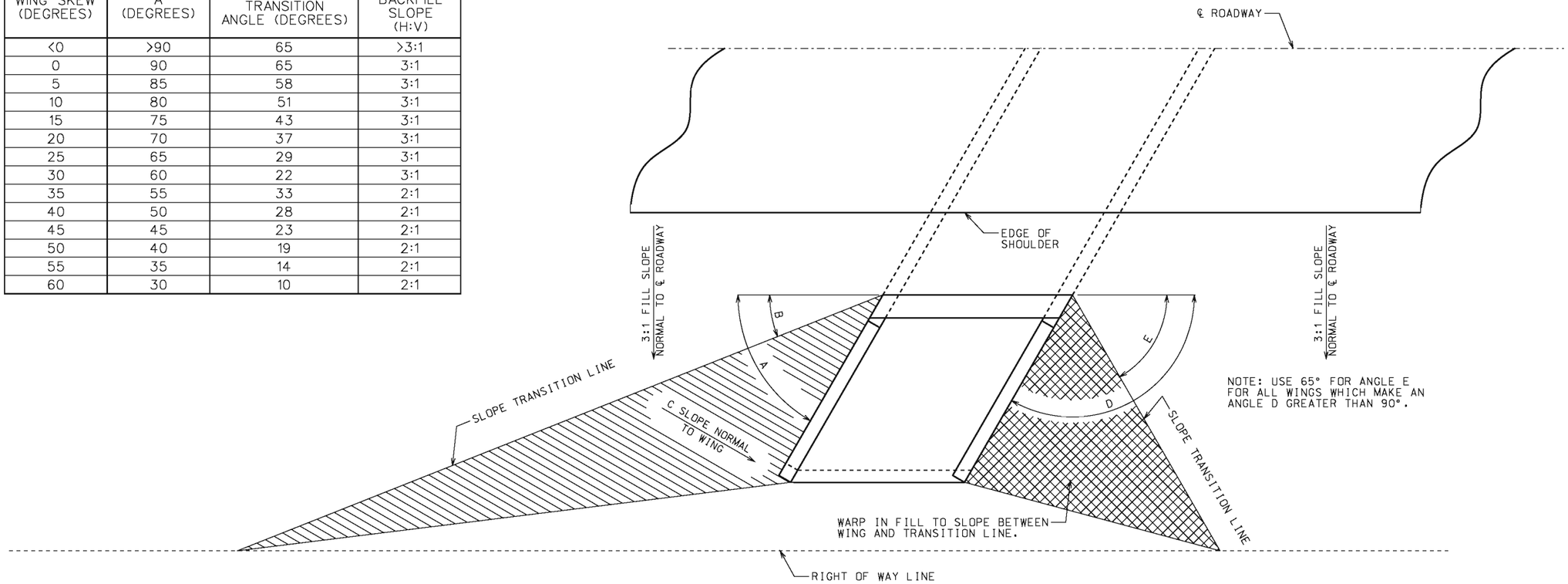
DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.37C

SHEET NO. 1 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

| WING BACKFILL TABLE | | | |
|---|---|---|---|
| WING SKEW (DEGREES) | A (DEGREES) | B TRANSITION ANGLE (DEGREES) | C BACKFILL SLOPE (H:V) |
| <0 | >90 | 65 | >3:1 |
| 0 | 90 | 65 | 3:1 |
| 5 | 85 | 58 | 3:1 |
| 10 | 80 | 51 | 3:1 |
| 15 | 75 | 43 | 3:1 |
| 20 | 70 | 37 | 3:1 |
| 25 | 65 | 29 | 3:1 |
| 30 | 60 | 22 | 3:1 |
| 35 | 55 | 33 | 2:1 |
| 40 | 50 | 28 | 2:1 |
| 45 | 45 | 23 | 2:1 |
| 50 | 40 | 19 | 2:1 |
| 55 | 35 | 14 | 2:1 |
| 60 | 30 | 10 | 2:1 |




## PLAN OF WINGS AND SLOPE TRANSITION LINES

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

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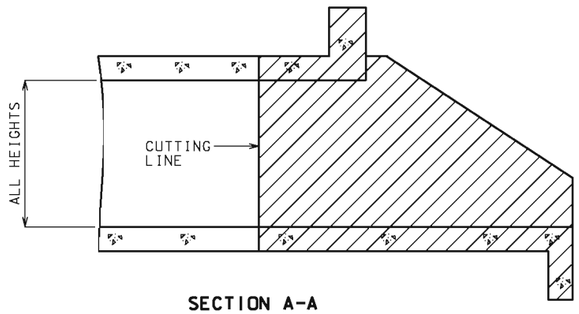
# CONCRETE BOX CULVERT

EXTERIOR WING BACKFILL SLOPE TRANSITION

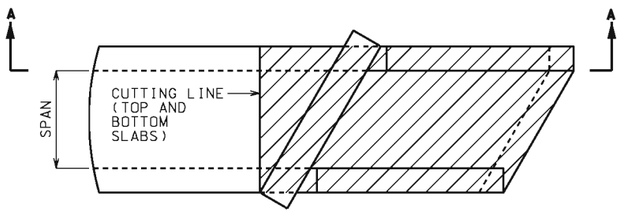
DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/18/2011

703.37C

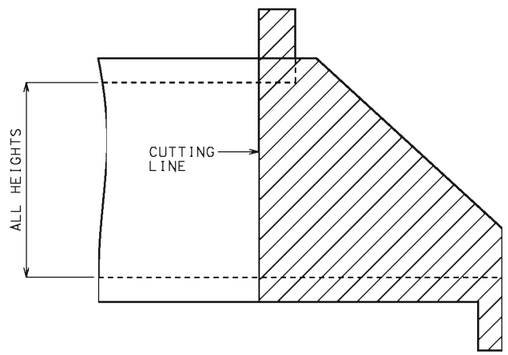
SHEET NO. 2 OF 2



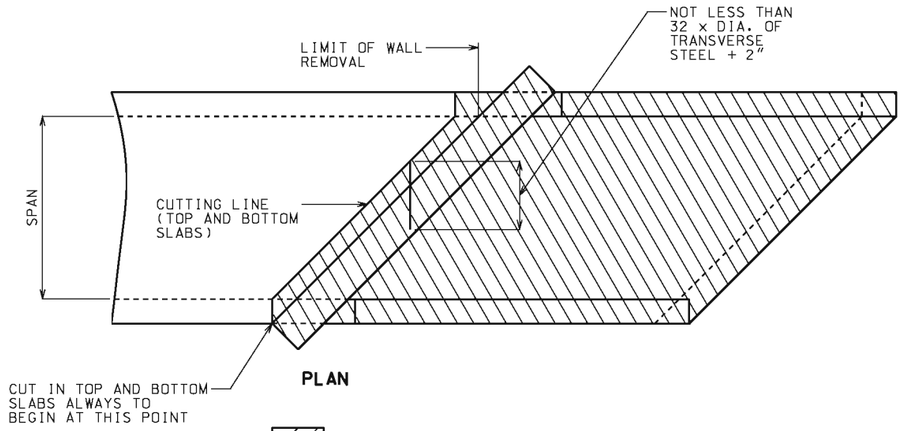

SECTION A-A



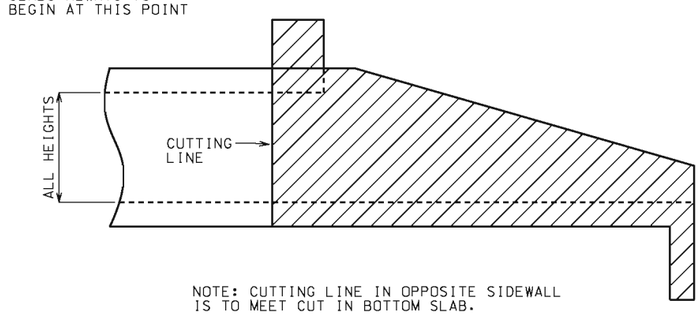

PLAN




SIDE ELEVATION
NO SKEW OR SKEWS LESS THAN 20°




PLAN




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

SIDE ELEVATION
SKEW OF 20° OR MORE

## 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.

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# CONCRETE BOX CULVERTS

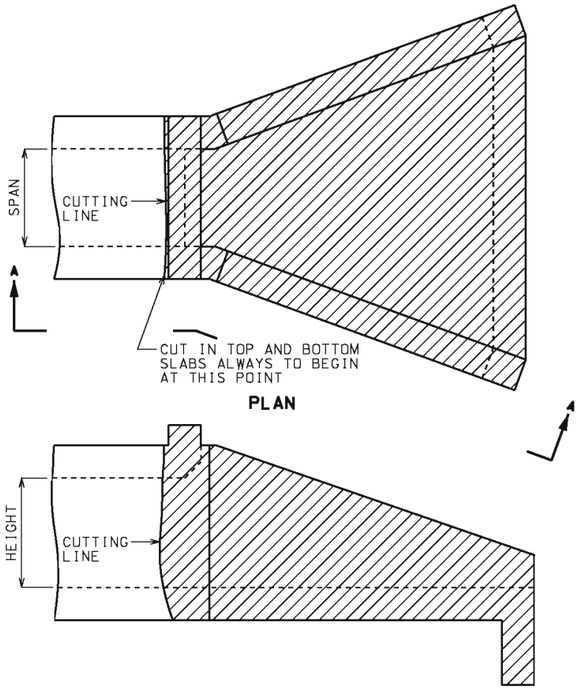
## CUTTING DETAILS EXTENSION TO STRAIGHT WINGS

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

703.38A

SHEET NO. 1 OF 2

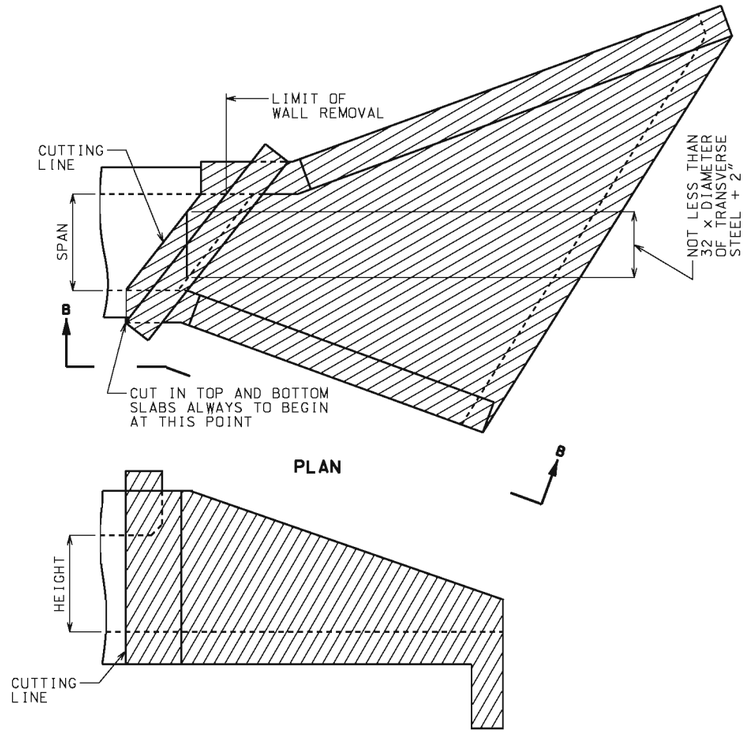
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




**PLAN**

**ELEVATION A-A**

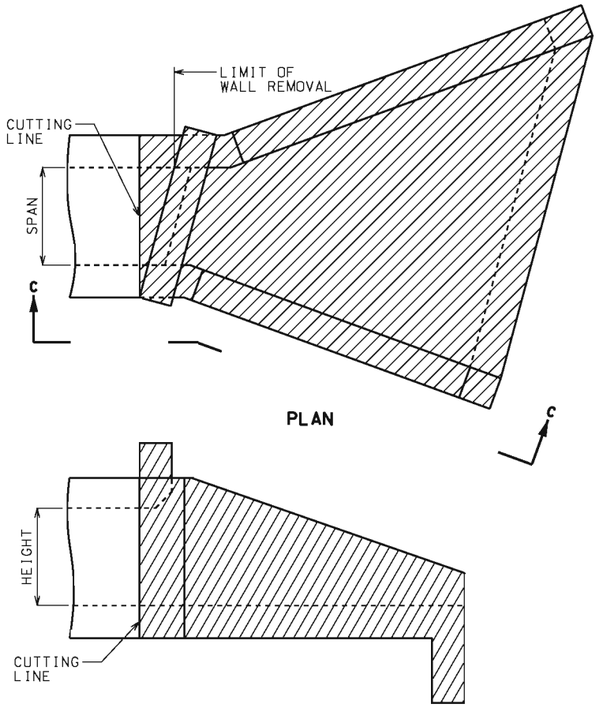
NO SKEW




**PLAN**

**ELEVATION B-B**

SKEWS OF 20° OR MORE




**PLAN**

**ELEVATION C-C**

SKEWS LESS THAN 20°

## 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.

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# CONCRETE BOX CULVERTS

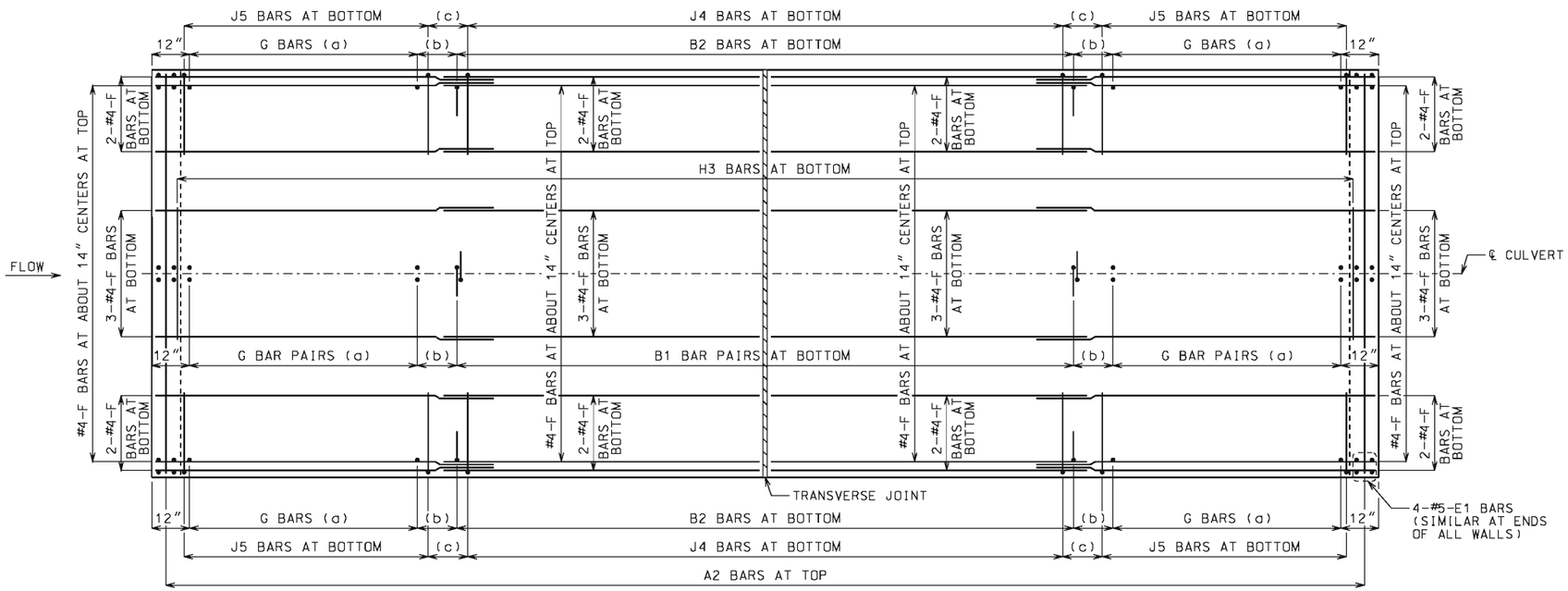
## CUTTING DETAILS EXTENSION TO FLARED WINGS

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

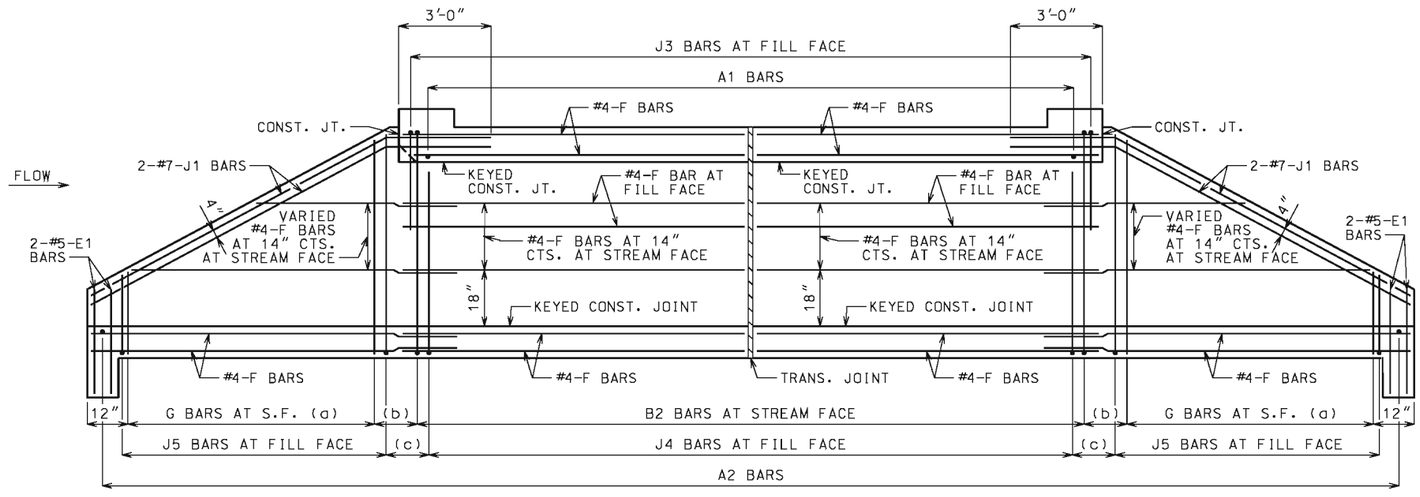
703.38A

SHEET NO. 2 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS
UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.46.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

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# CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

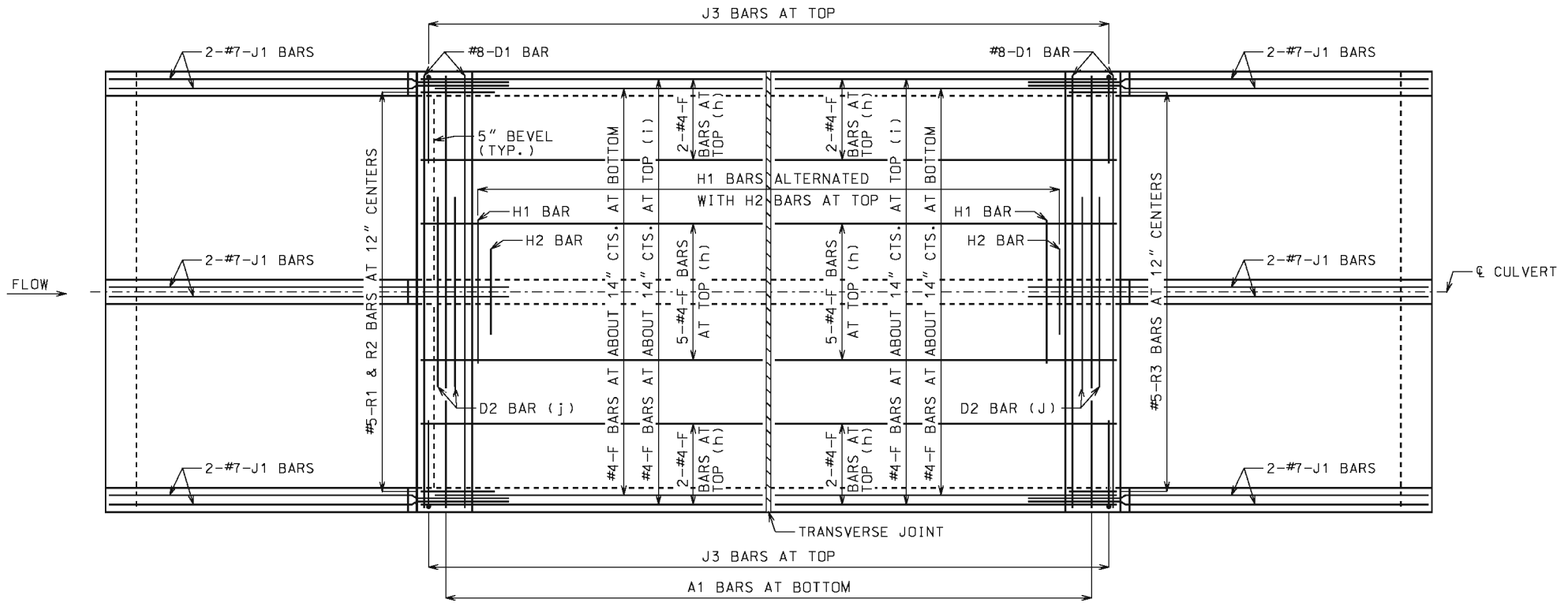
REINFORCEMENT

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

703.40H

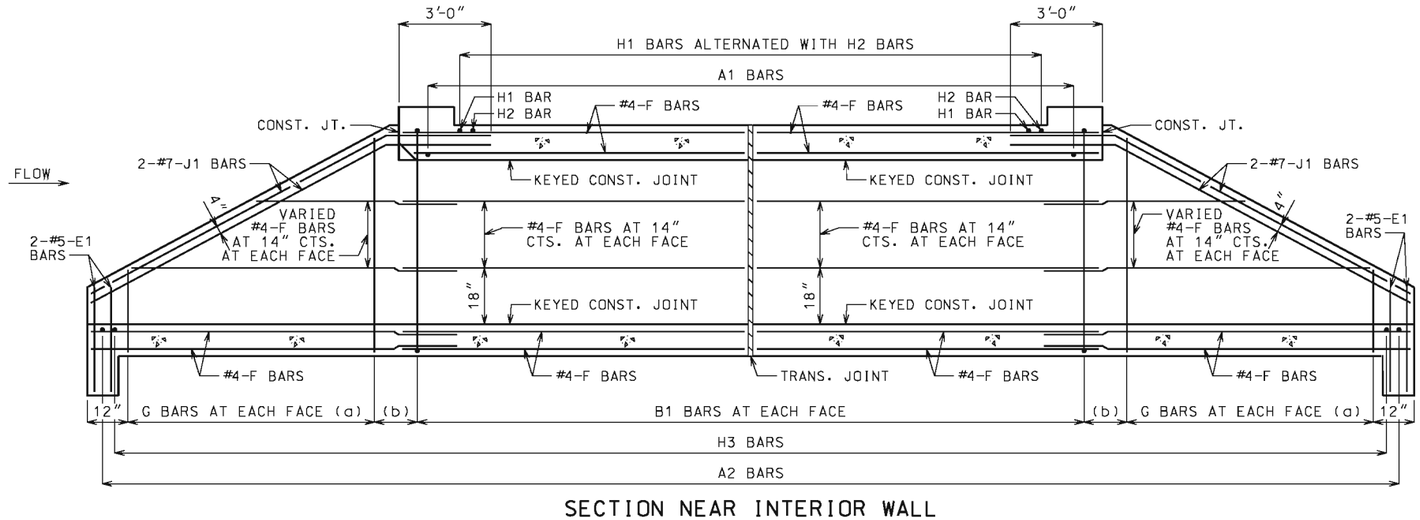
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. 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 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) 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"
#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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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# CONCRETE DOUBLE BOX CULVERT

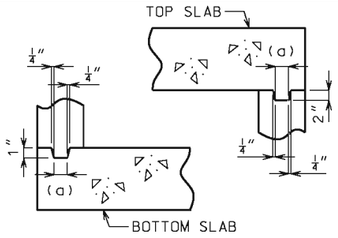
SKEW: SQUARED
WINGS: STRAIGHT

REINFORCEMENT

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

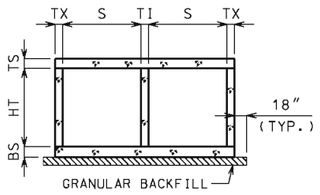
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SHEET NO. 2 OF 3

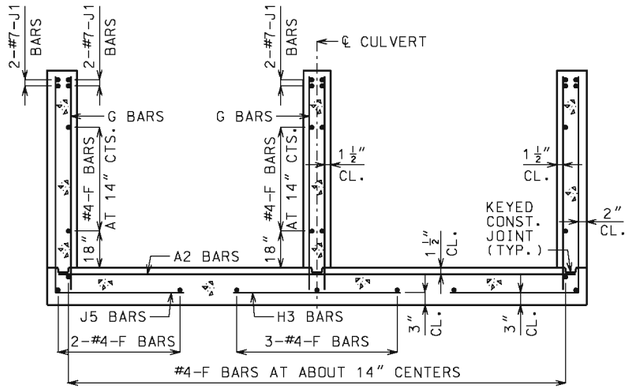



## KEYED CONSTRUCTION JOINT

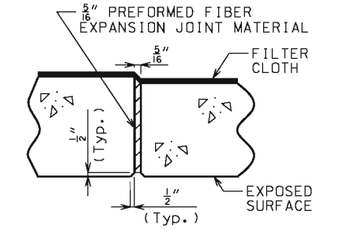
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS




## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



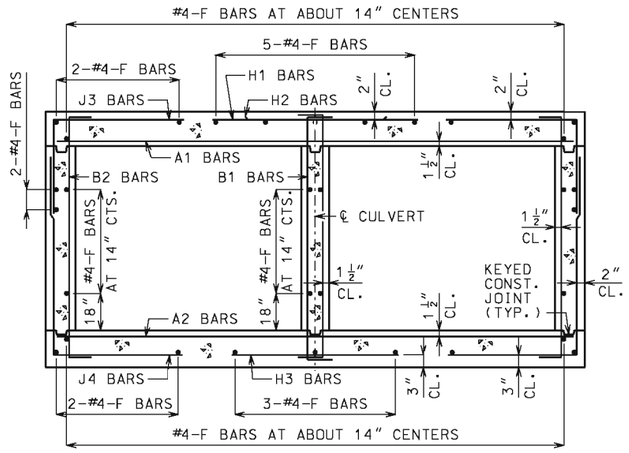

## UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

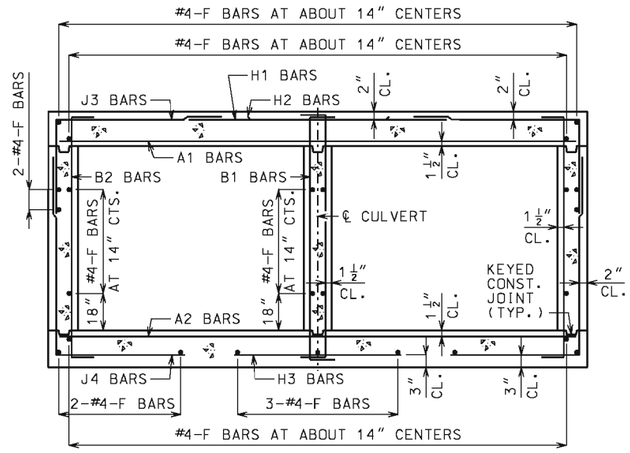
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



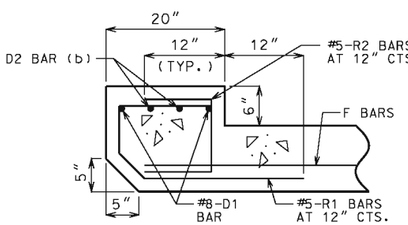

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



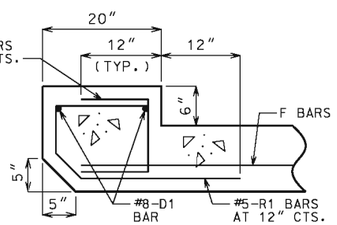

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



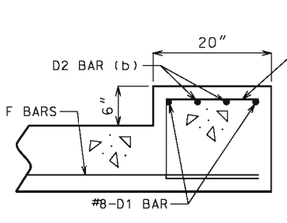

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



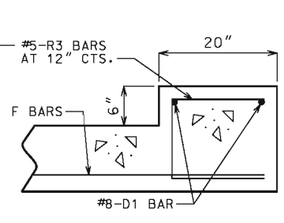

## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) #8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"
NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

IF D2 BARS ARE REQUIRED. THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1/4 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

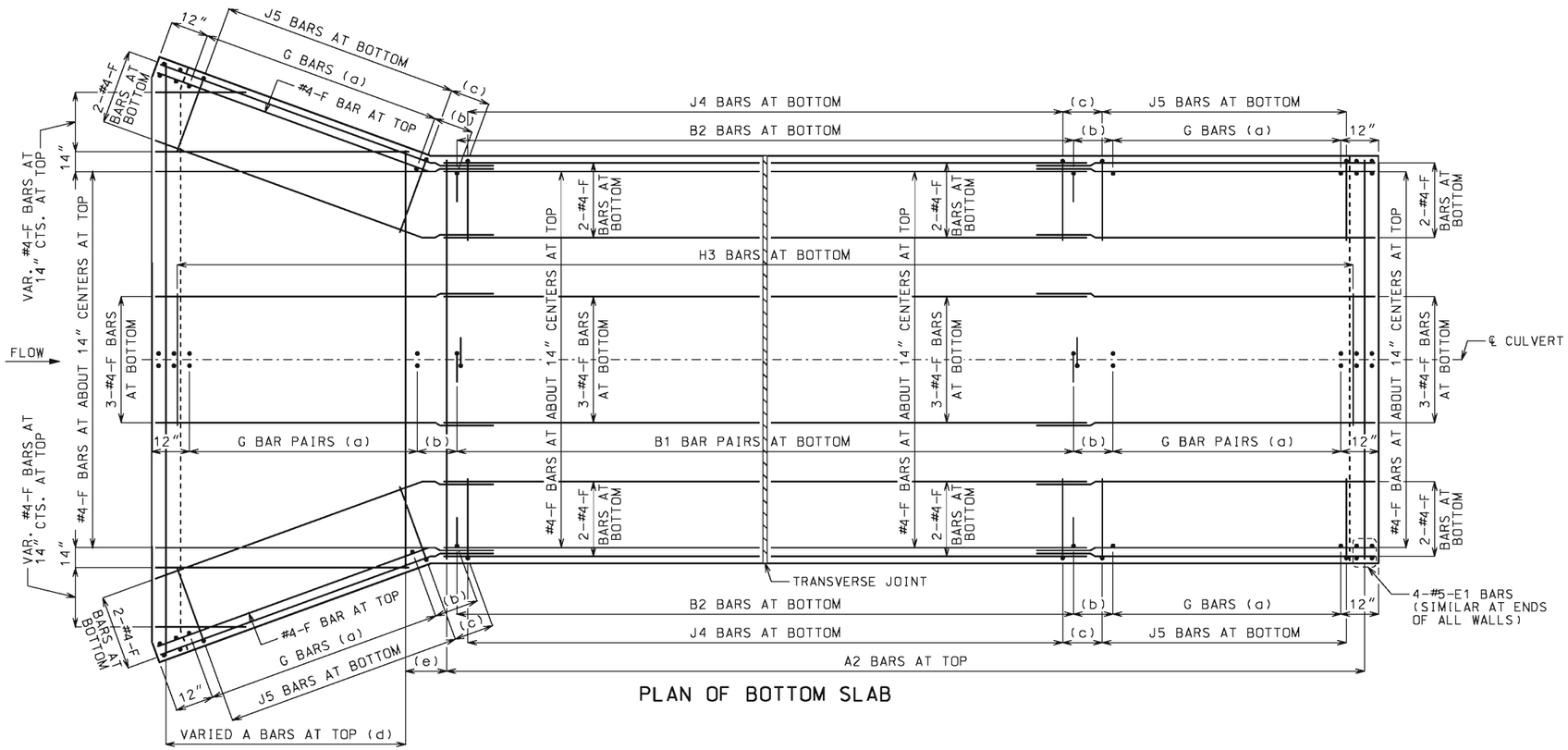
SECTIONS

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

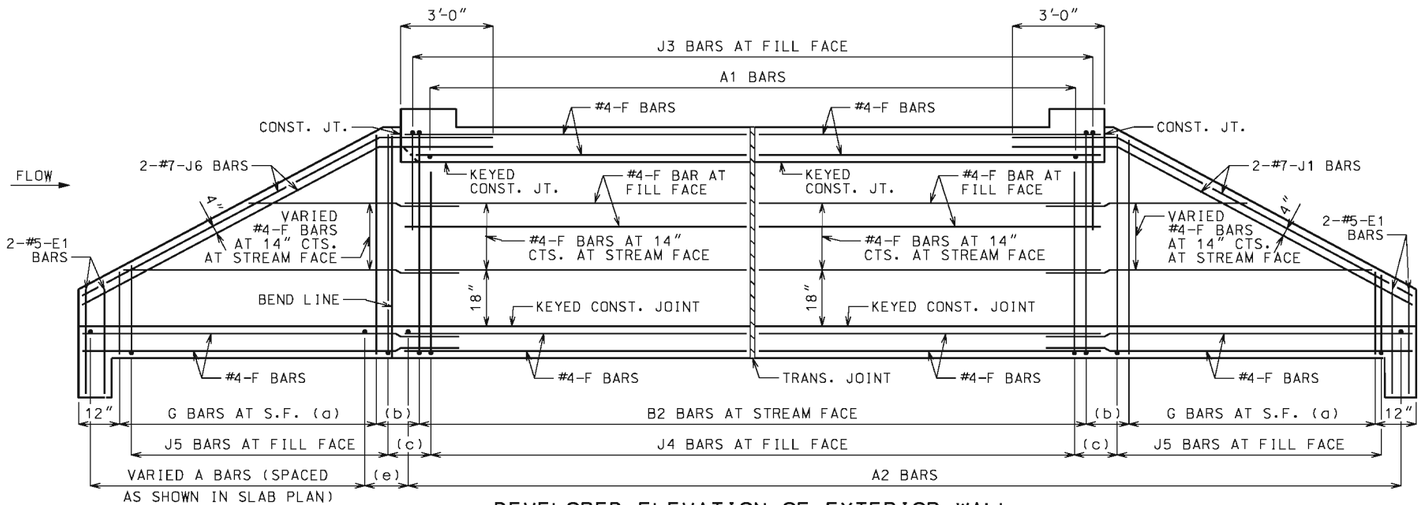
703.40H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




DEVELOPED ELEVATION OF EXTERIOR WALL

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.46.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

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# CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

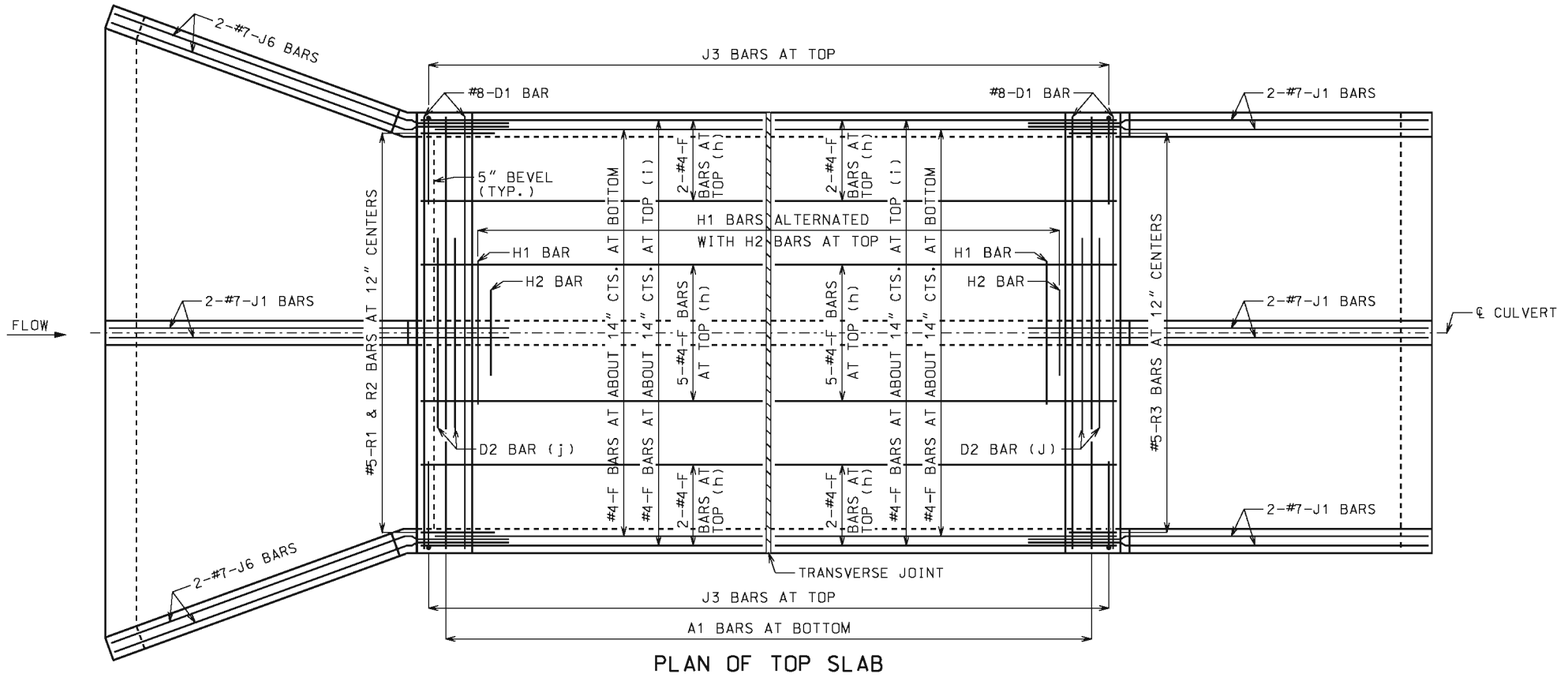
REINFORCEMENT

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

703.41H

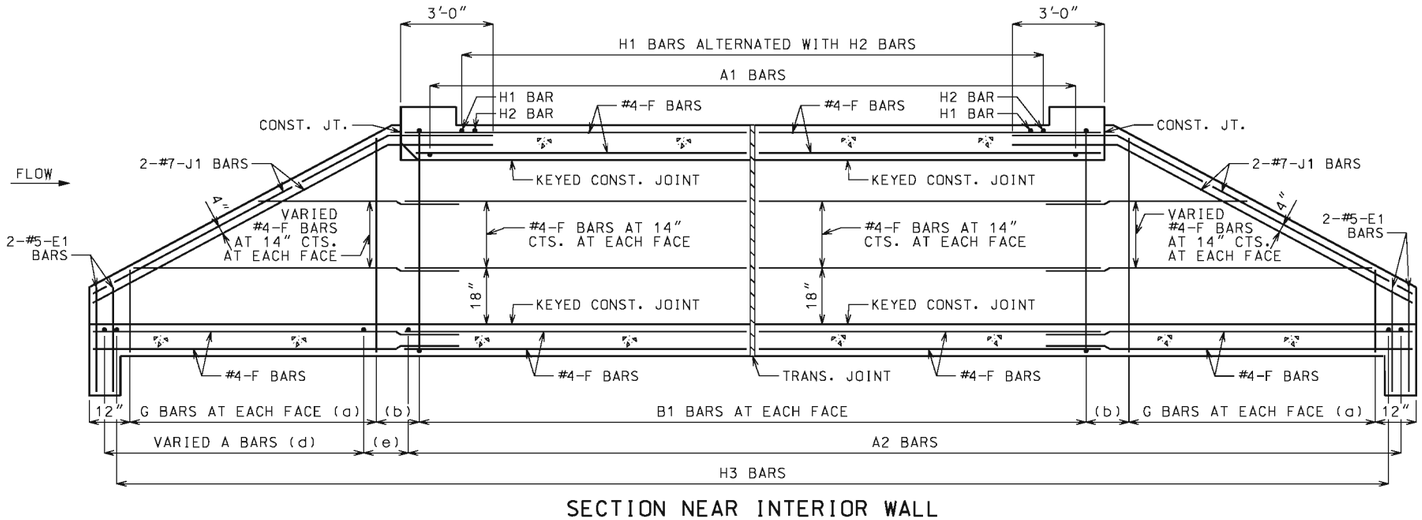
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. 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 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 SPECFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) NOT SPECFIED ON THIS SHEET

(g) NOT SPECFIED 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"
#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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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# CONCRETE DOUBLE BOX CULVERT

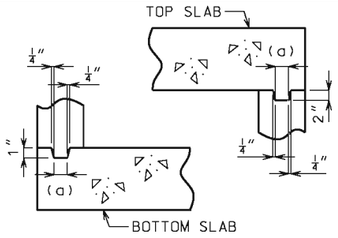
SKEW: SQUARED
WINGS: FLARED

REINFORCEMENT

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

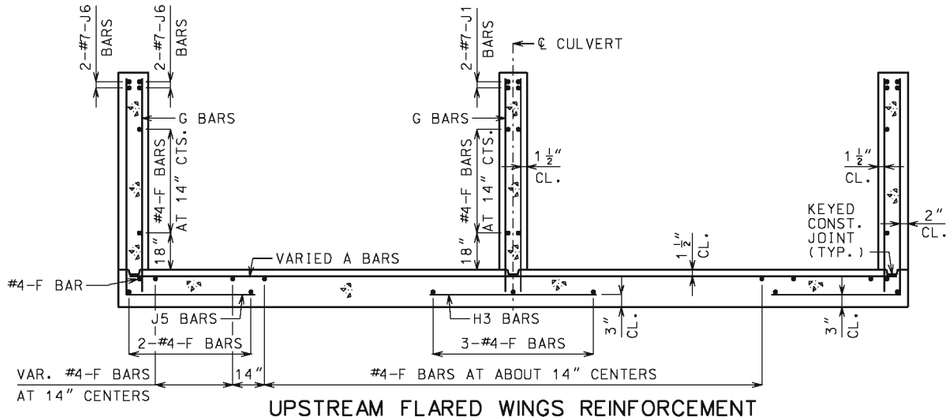
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SHEET NO. 2 OF 3

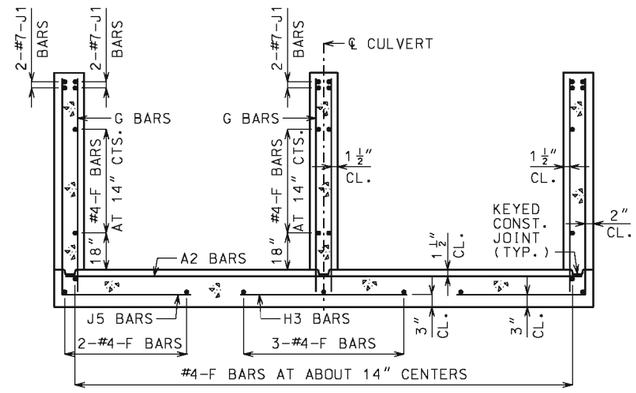



## KEYED CONSTRUCTION JOINT

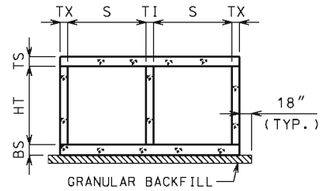
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



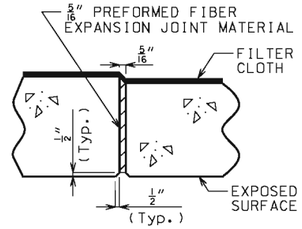

## UPSTREAM FLARED WINGS REINFORCEMENT




## DOWNSTREAM WINGS REINFORCEMENT



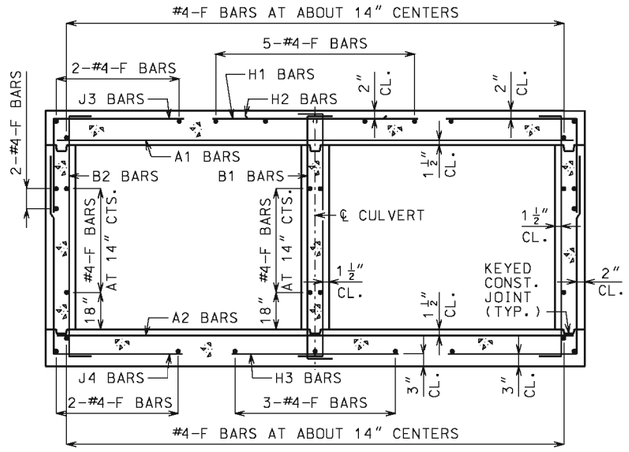

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## TRANSVERSE JOINT THRU BARREL

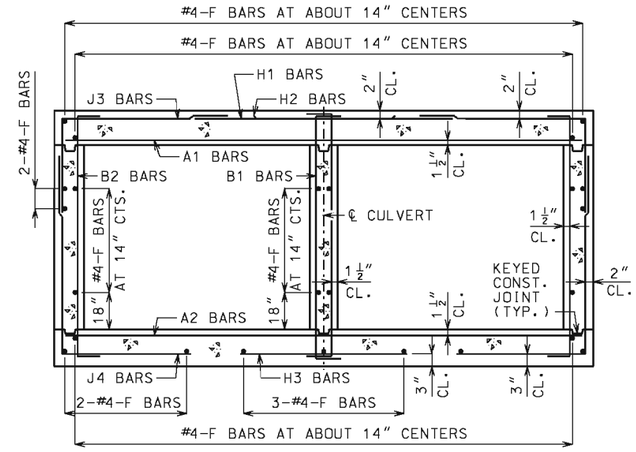
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



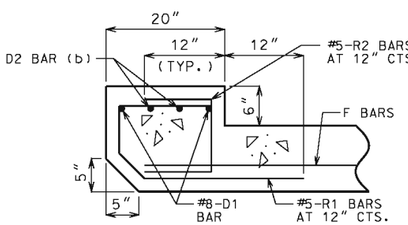

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



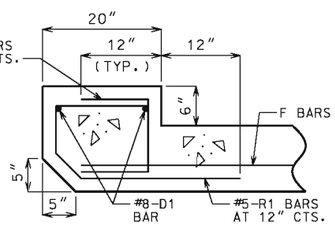

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



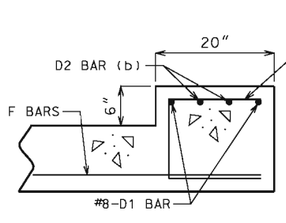

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



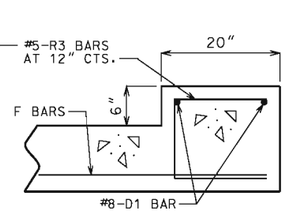

## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) #8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"
NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

IF D2 BARS ARE REQUIRED. THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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STATE OF MISSOURI
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NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

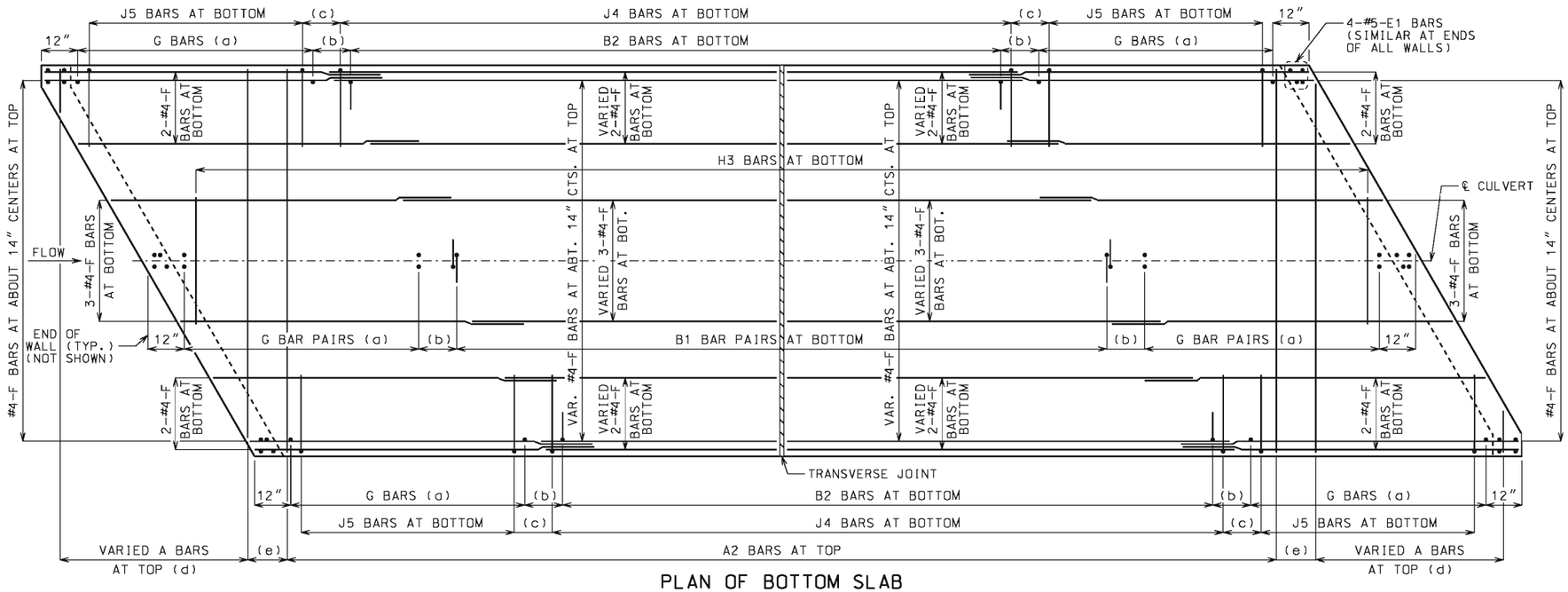
SECTIONS

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

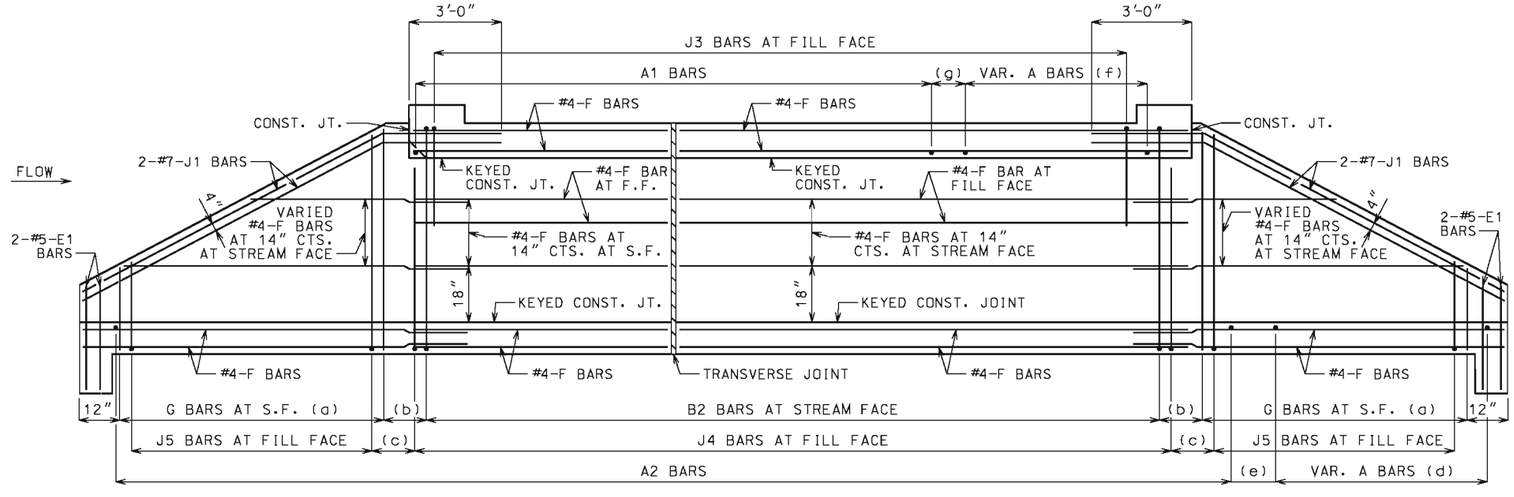
703.41H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.46.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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# CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

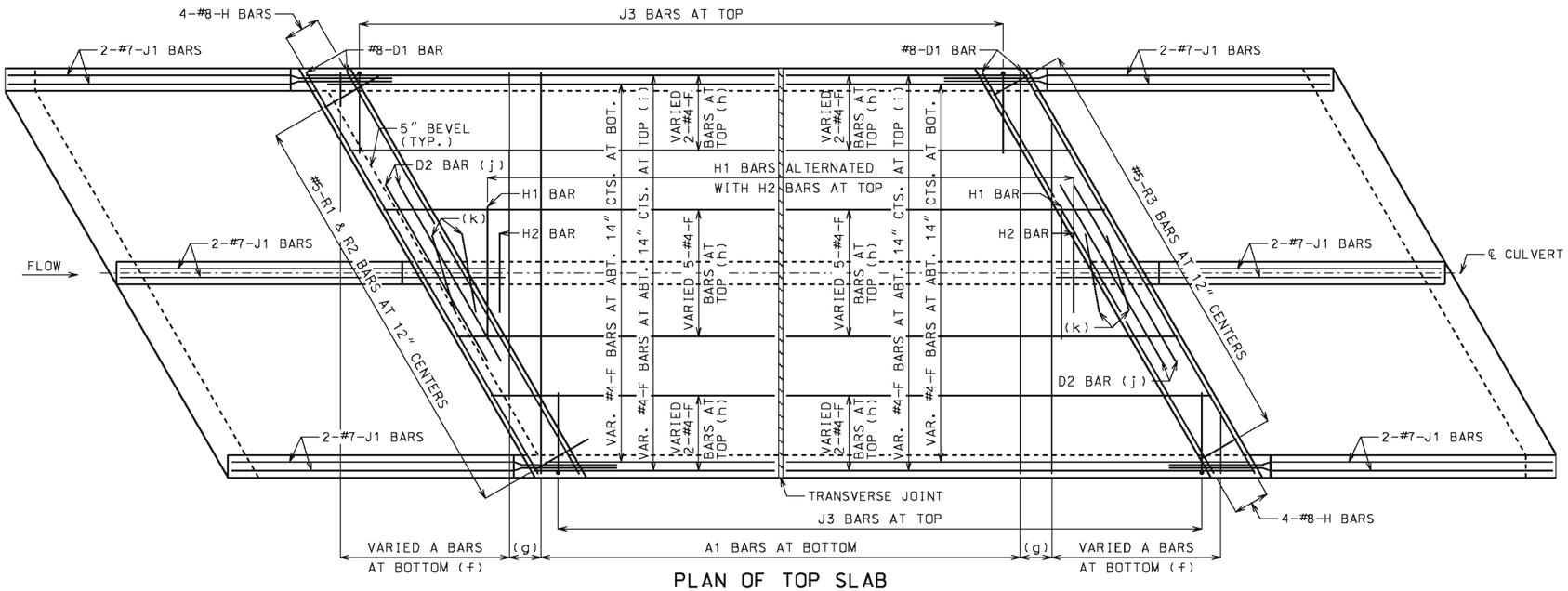
REINFORCEMENT

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

703.42H

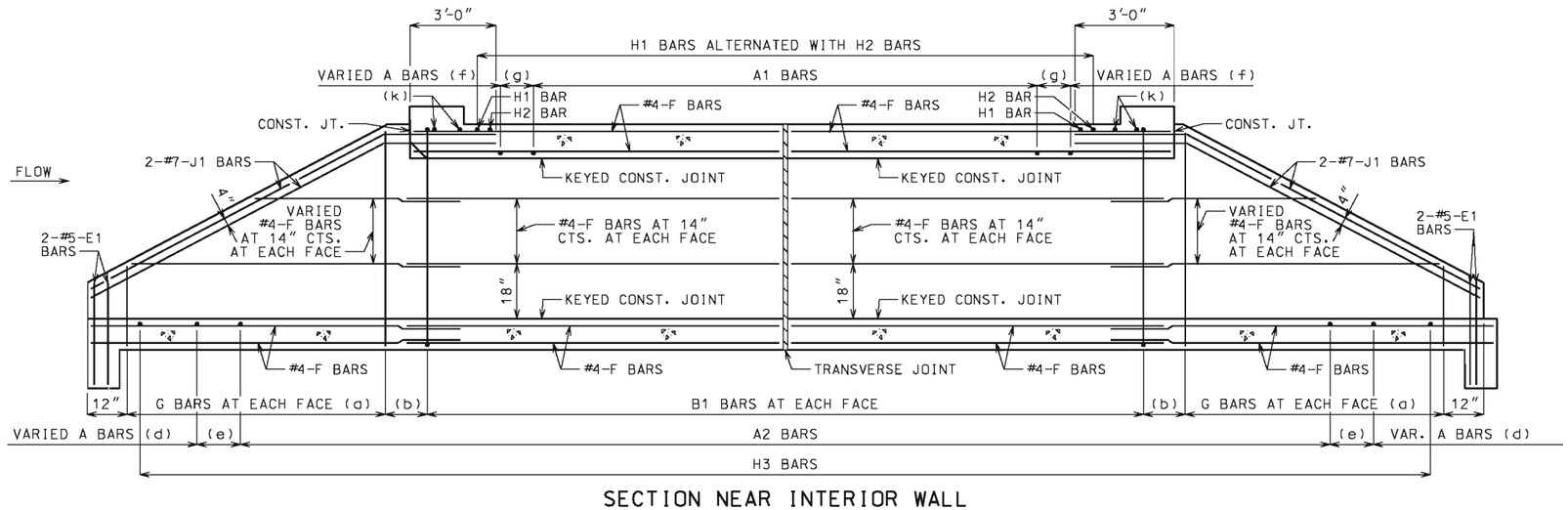
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. 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 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) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

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# CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

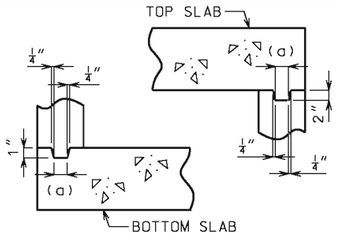
REINFORCEMENT

DATE EFFECTIVE: 10/01/2011
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703.42H

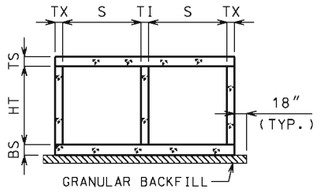
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

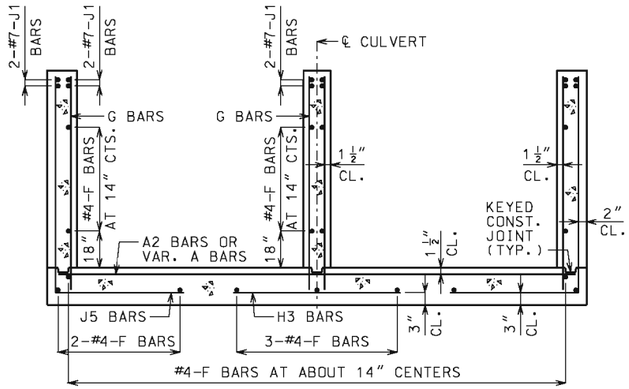



## KEYED CONSTRUCTION JOINT

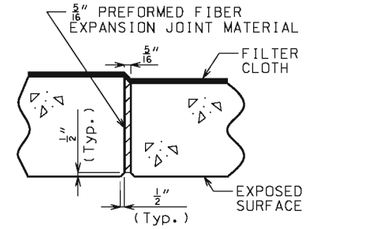
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS




## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



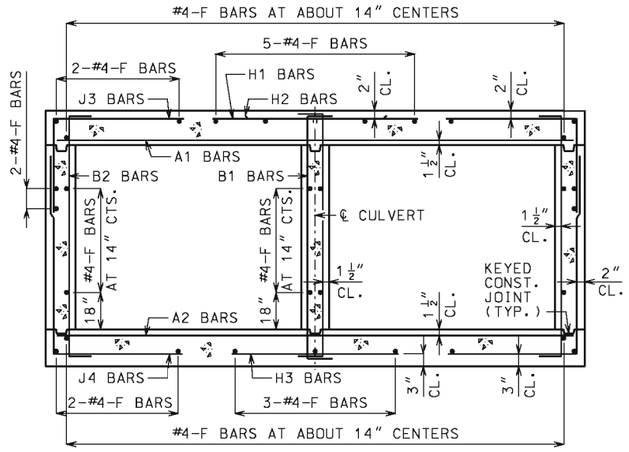

## UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

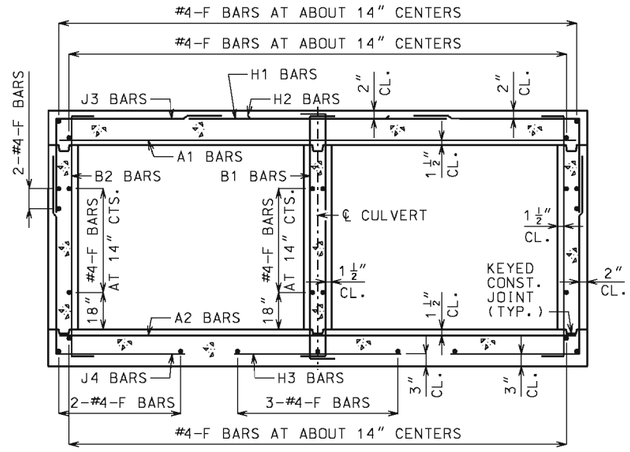
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



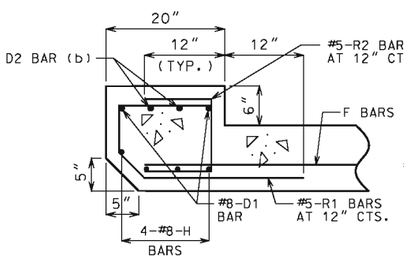

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



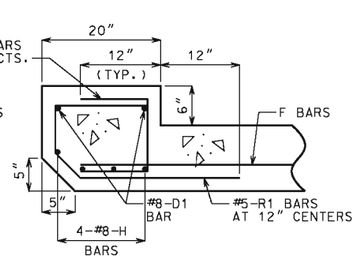

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



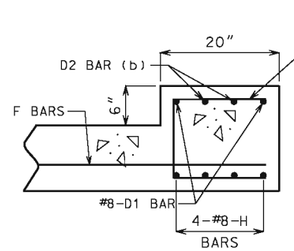

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



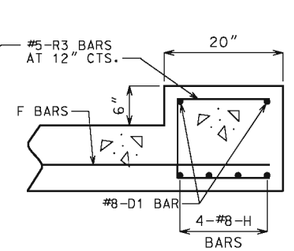

## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) #8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"
NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

IF D2 BARS ARE REQUIRED. THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1/4 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

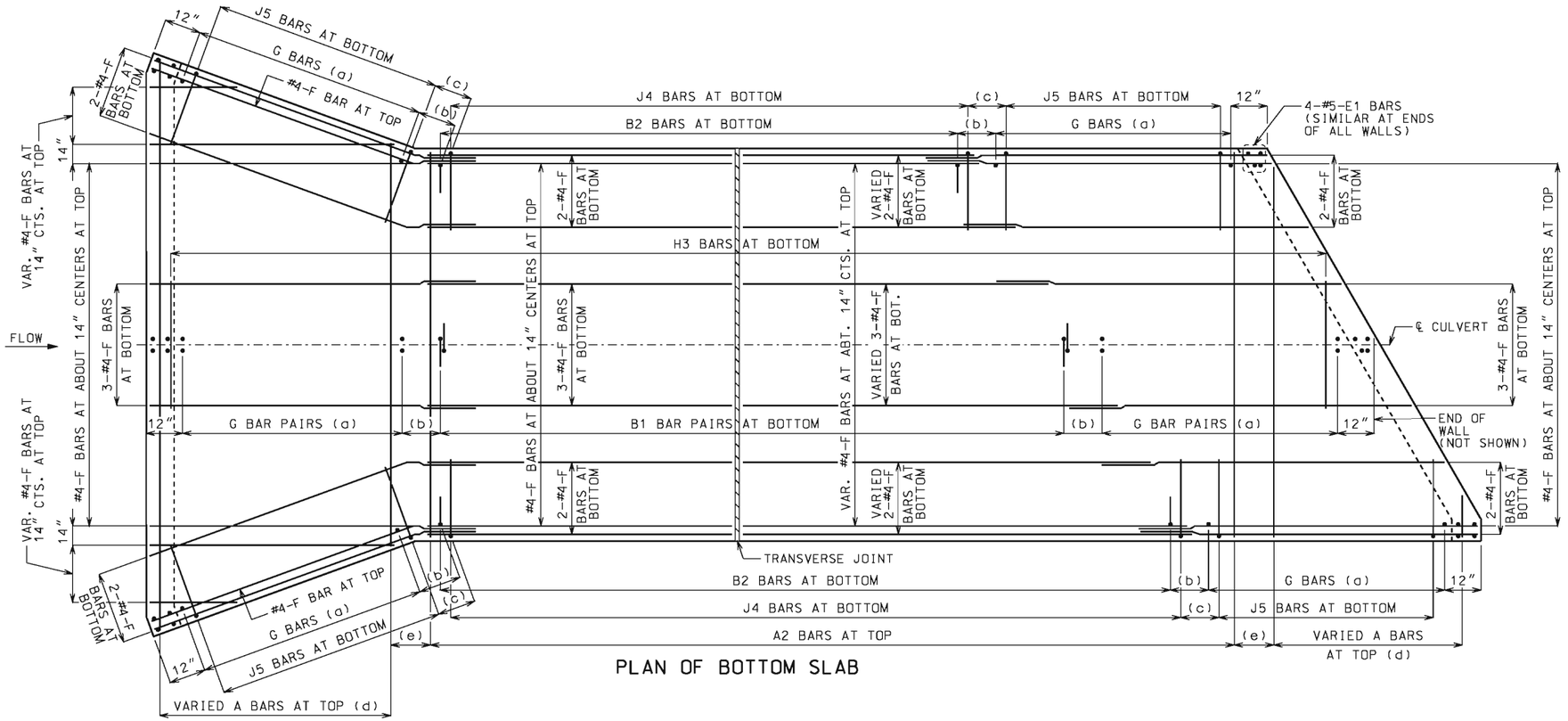
SECTIONS

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

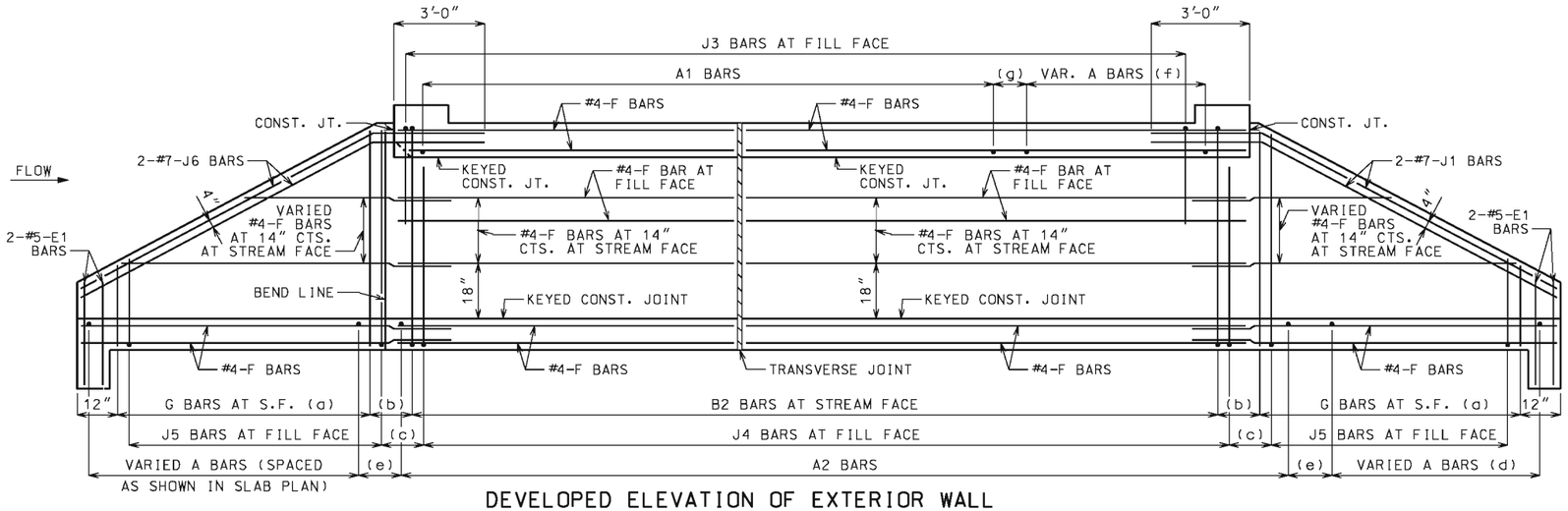
703.42H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




DEVELOPED ELEVATION OF EXTERIOR WALL

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.46.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING


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NUMBER PE-27141
PROFESSIONAL ENGINEER

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# CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

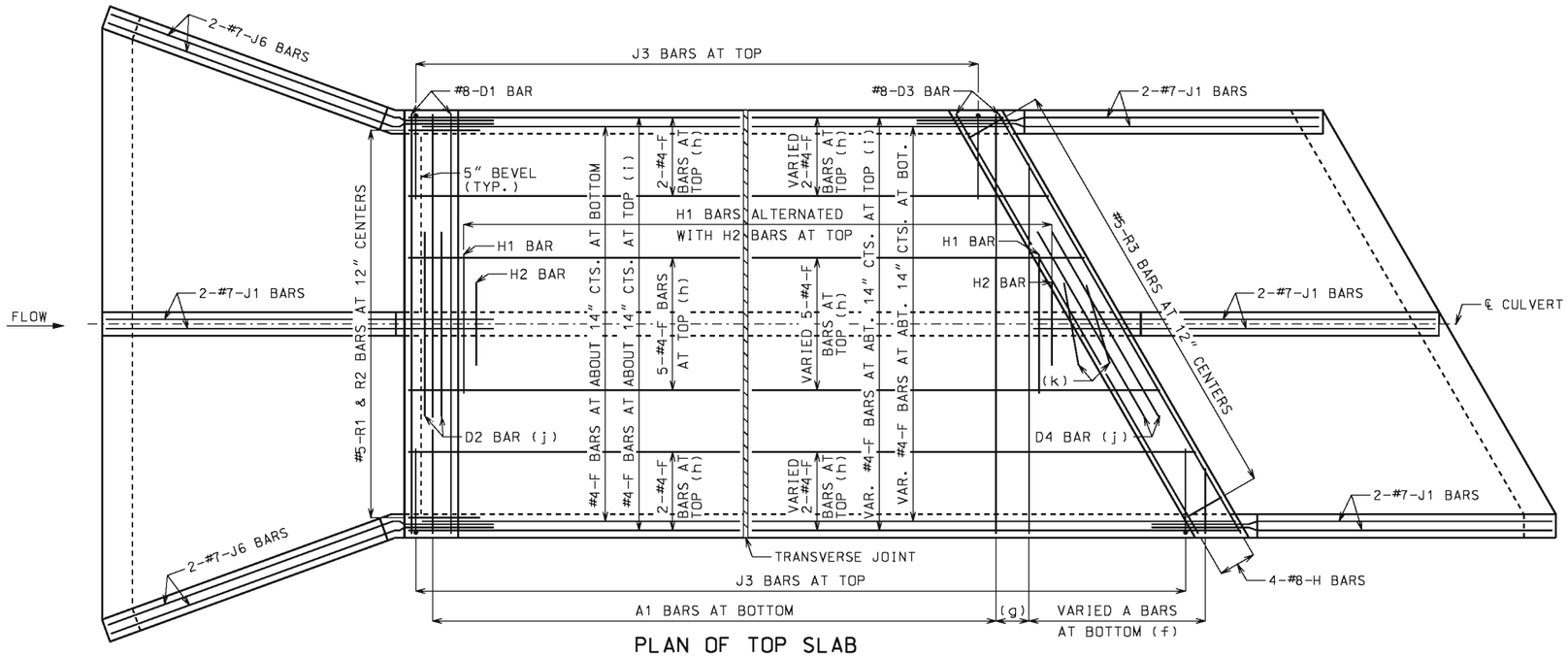
REINFORCEMENT

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

703.43H

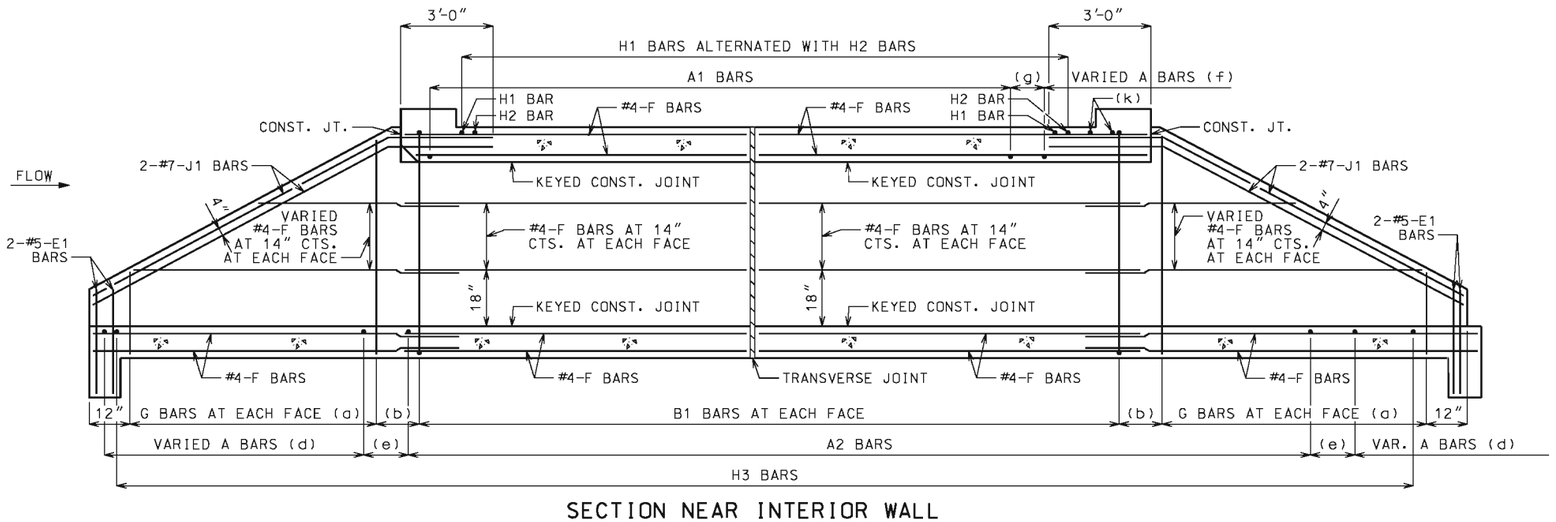
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. 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 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) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

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NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

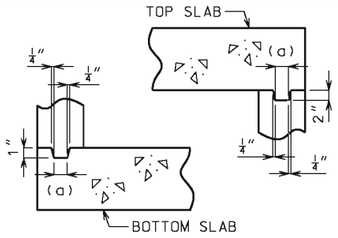
REINFORCEMENT

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

703.43H

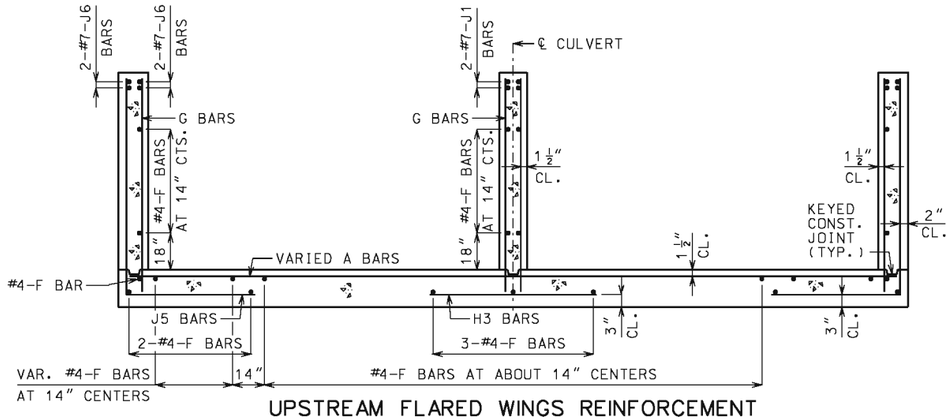
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

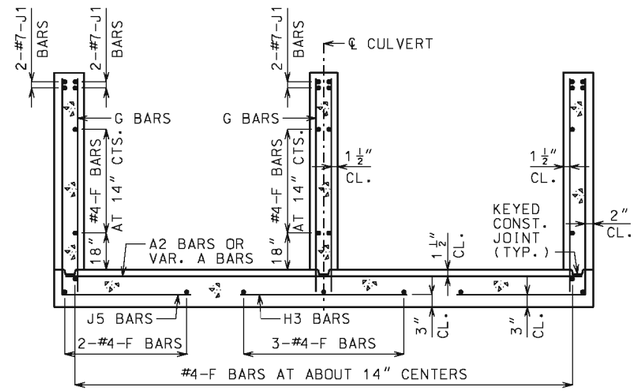



## KEYED CONSTRUCTION JOINT

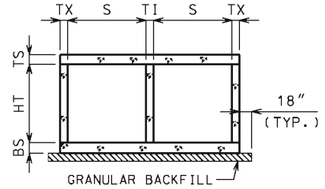
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



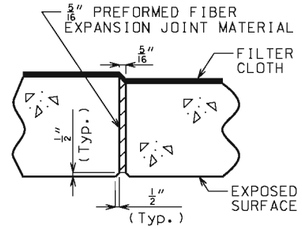

## UPSTREAM FLARED WINGS REINFORCEMENT




## DOWNSTREAM WINGS REINFORCEMENT



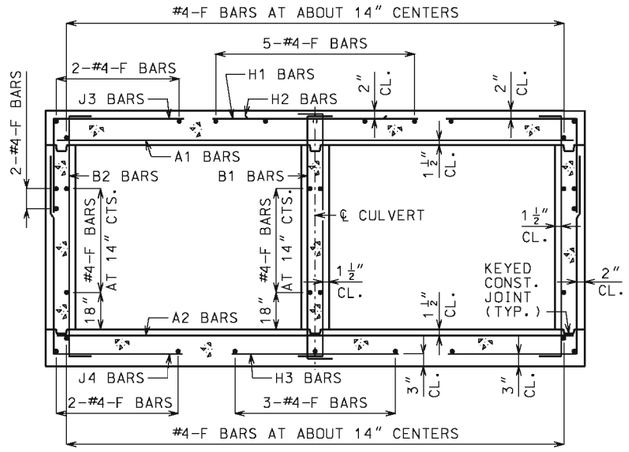

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## TRANSVERSE JOINT THRU BARREL

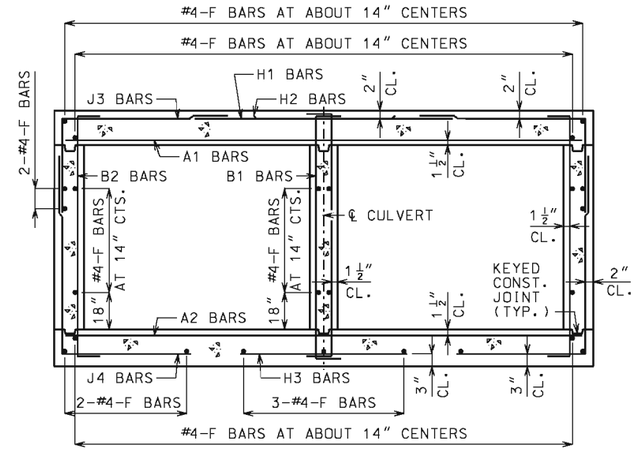
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



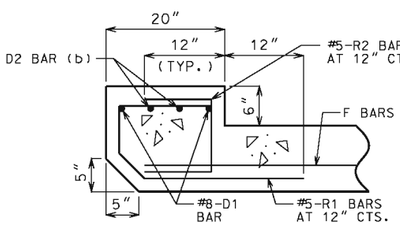

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



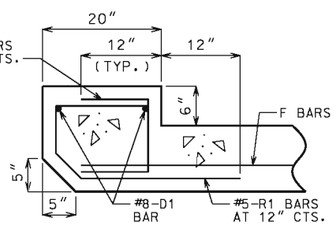

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



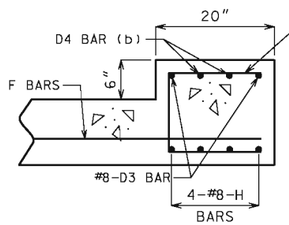

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



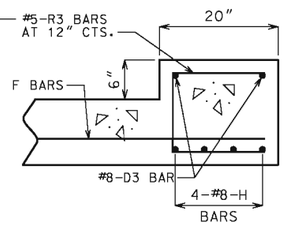

## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) #8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"
NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

IF D2 AND D4 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1/4 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

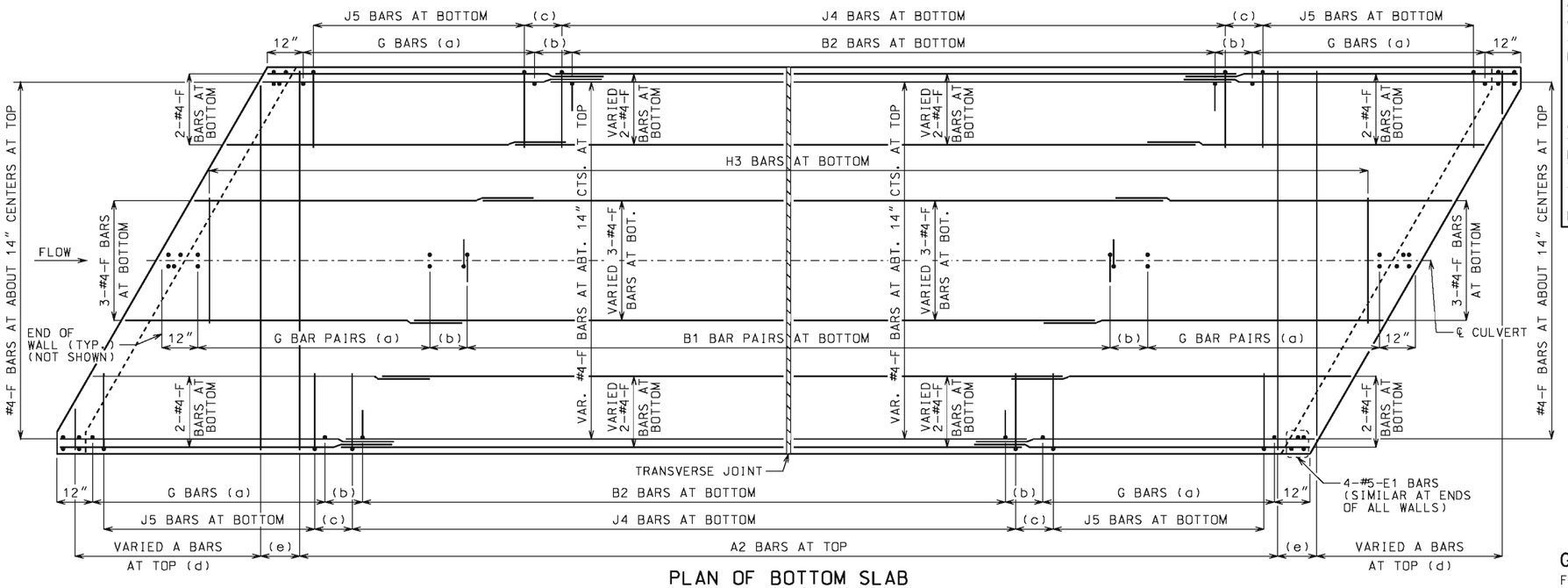
SECTIONS

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

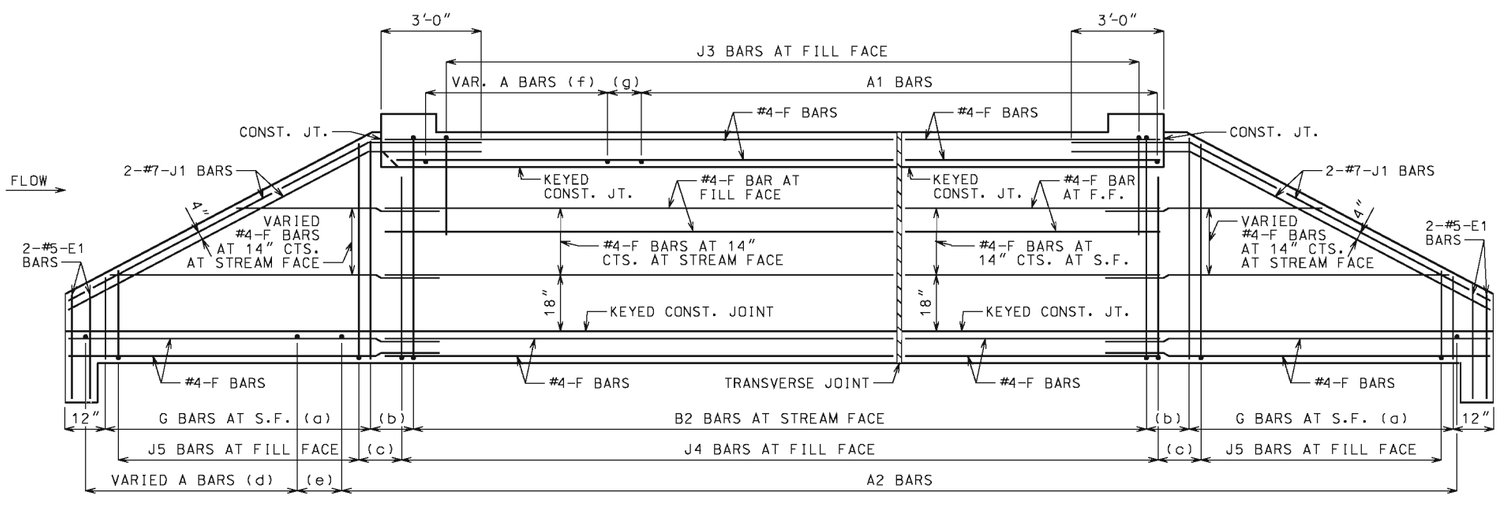
703.43H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS
UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.46.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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PROFESSIONAL ENGINEER
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# CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

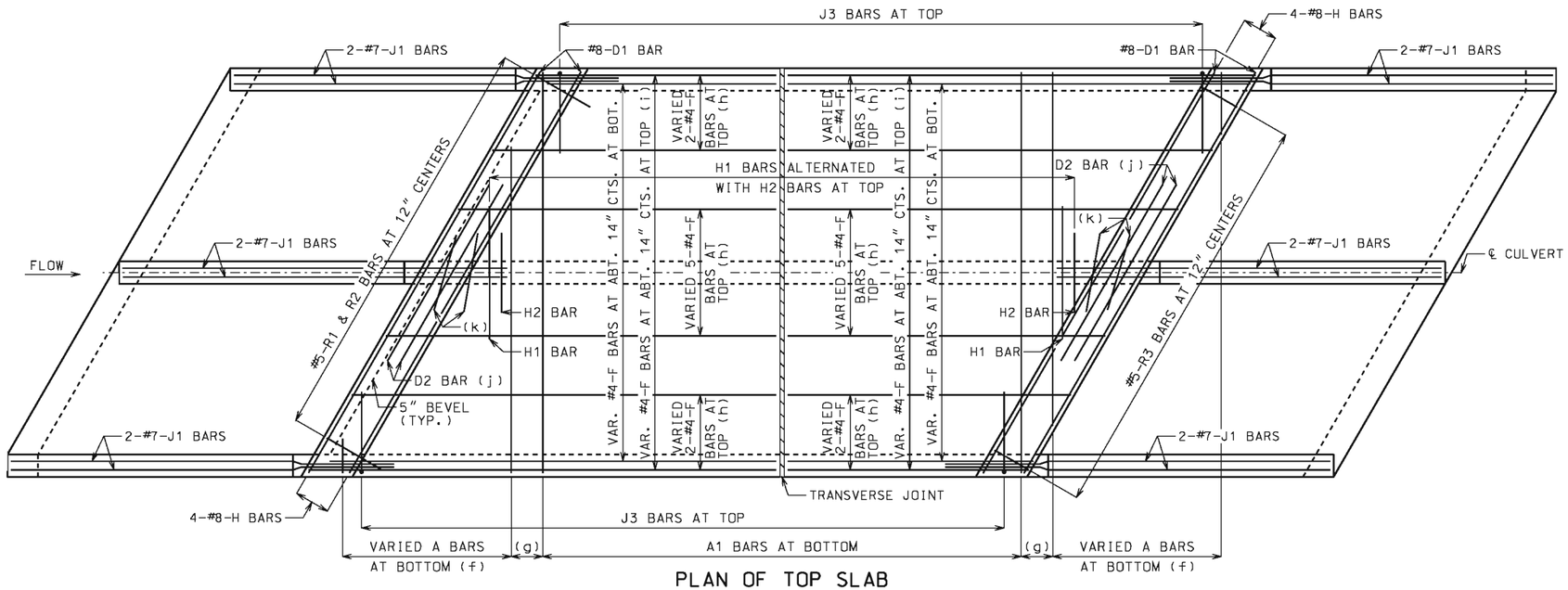
REINFORCEMENT

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

703.44H

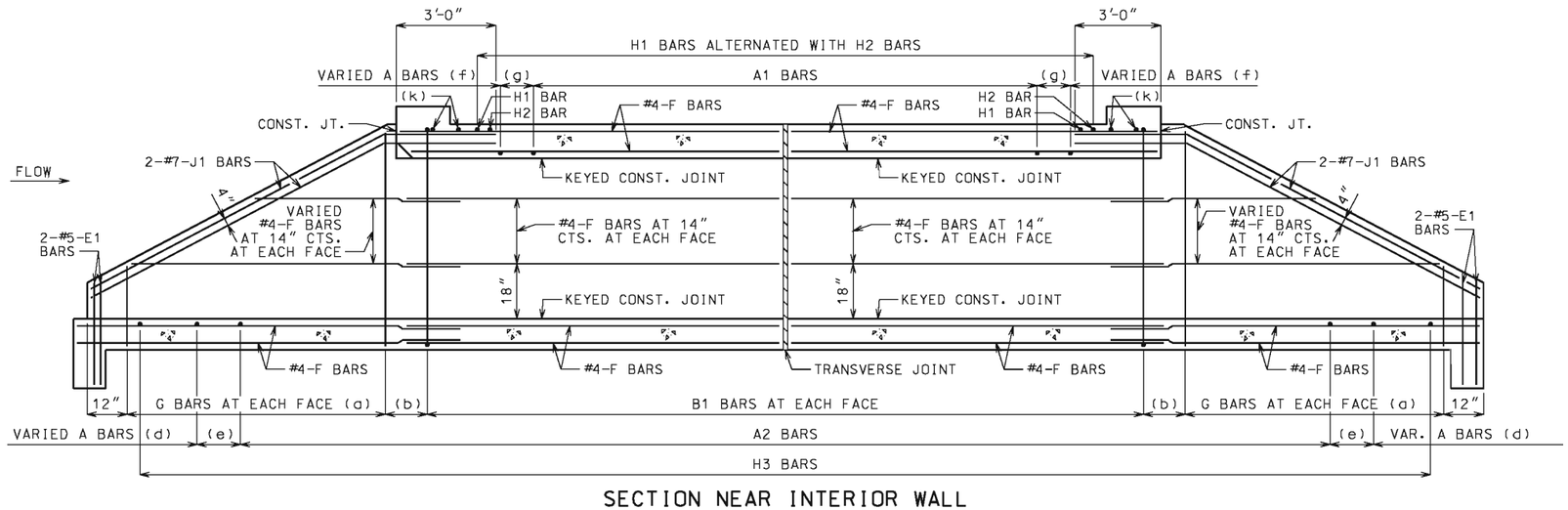
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. 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 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) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ 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)

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

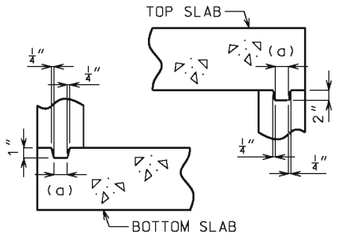
REINFORCEMENT

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

703.44H

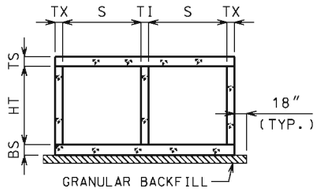
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

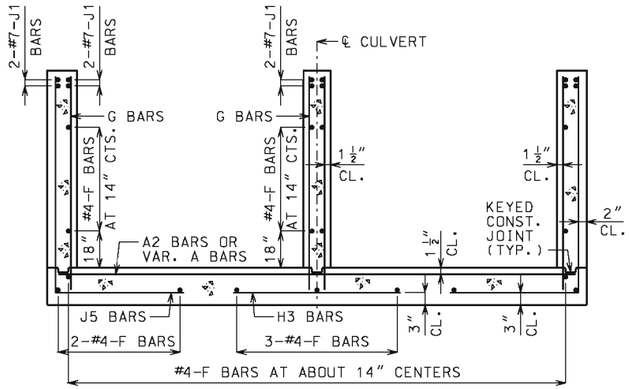



## KEYED CONSTRUCTION JOINT

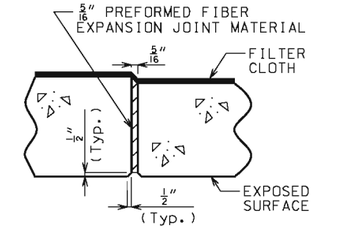
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS




## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



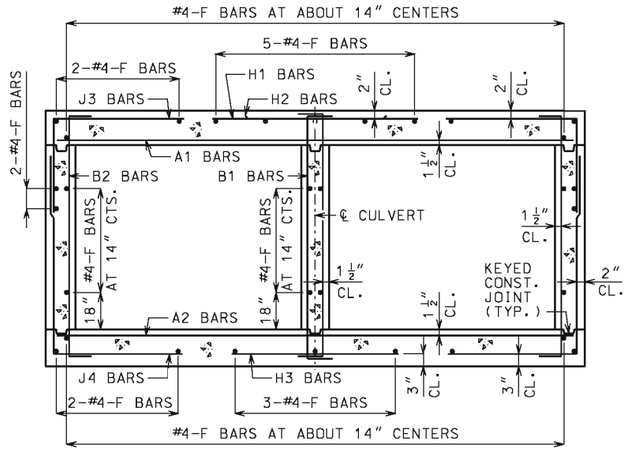

## UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

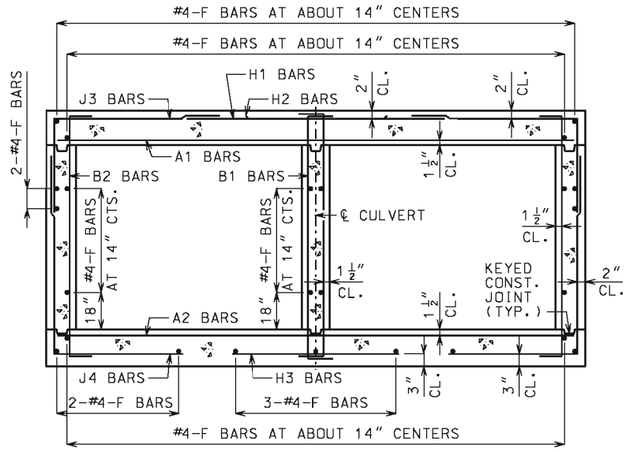
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



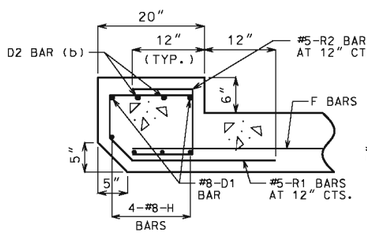

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



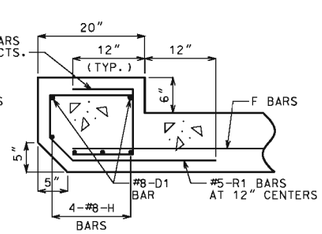

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



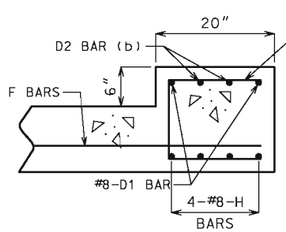

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



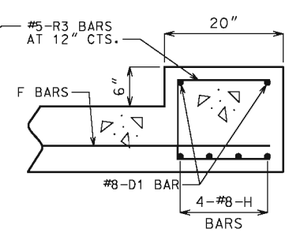

## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) #8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"
NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

IF D2 BARS ARE REQUIRED. THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1/4 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

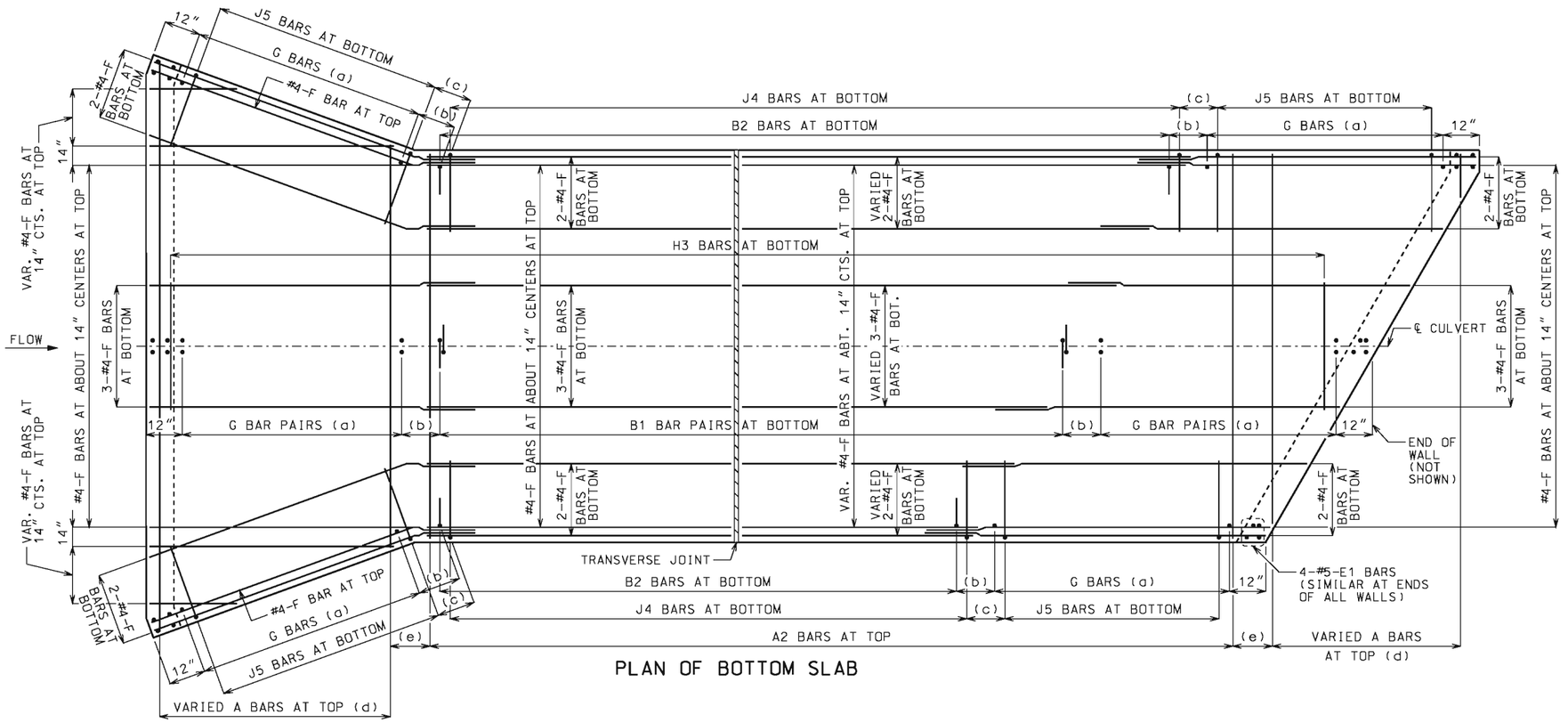
SECTIONS

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

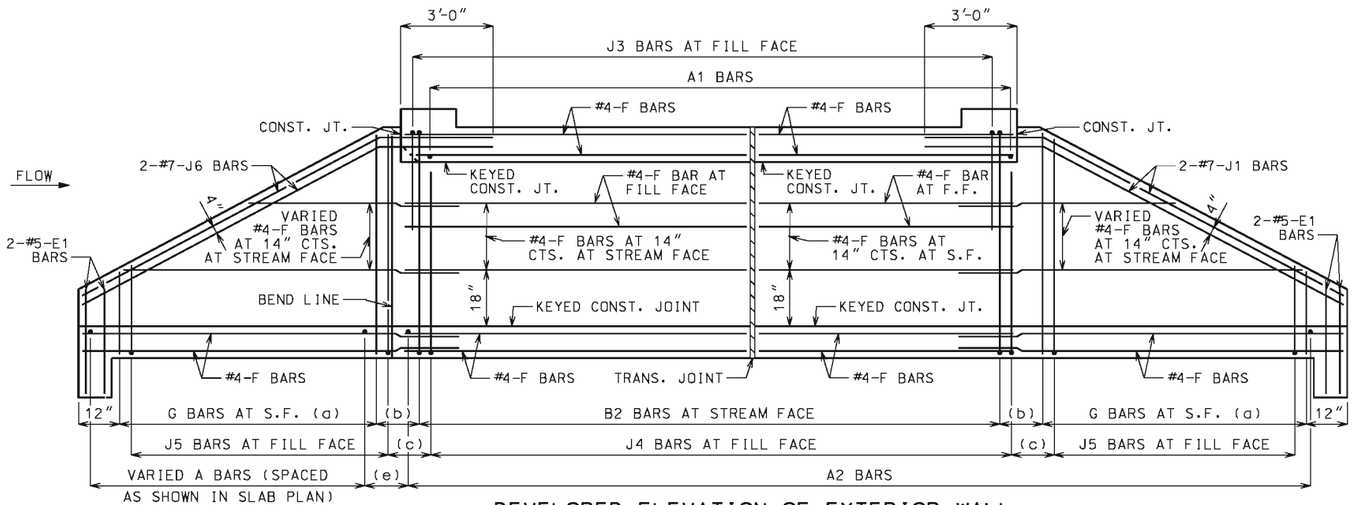
703.44H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




DEVELOPED ELEVATION OF EXTERIOR WALL

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.46.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

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# CONCRETE DOUBLE BOX CULVERT

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WINGS: FLARED

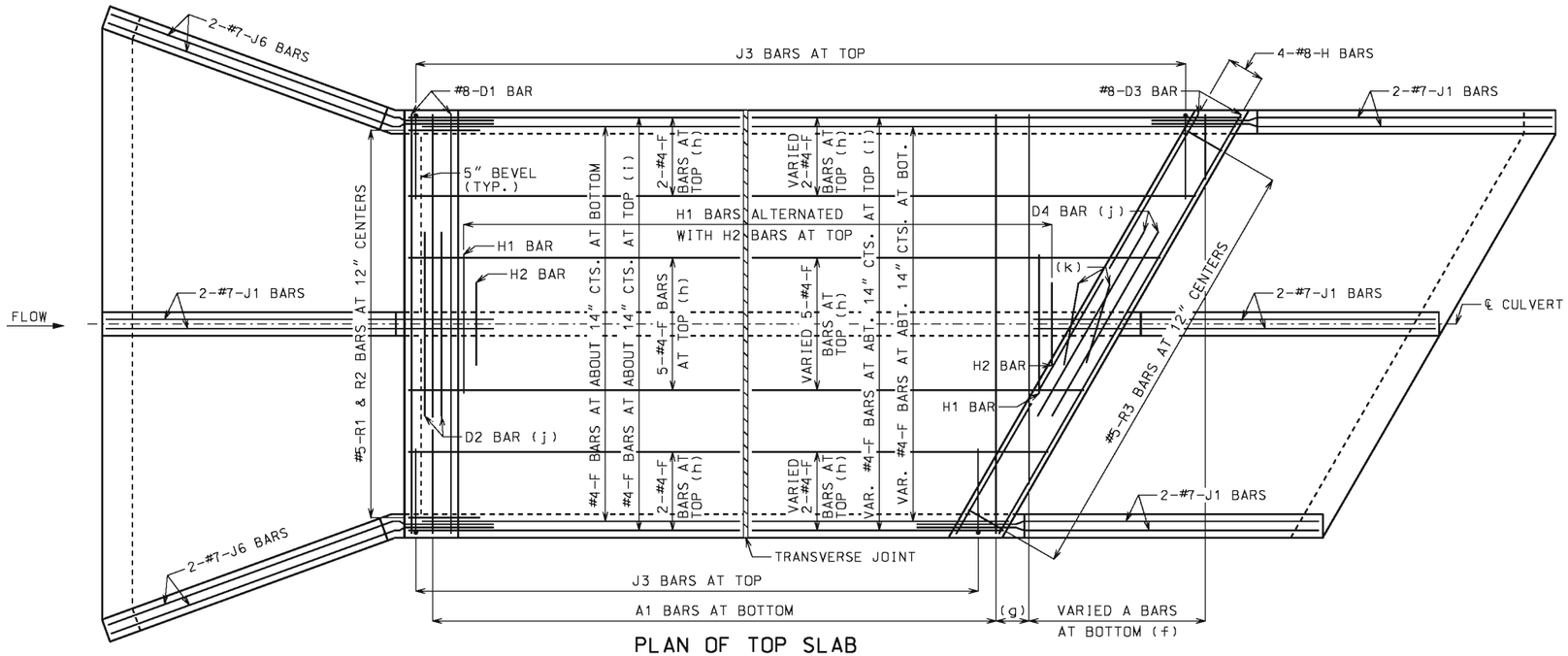
REINFORCEMENT

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

703.45C

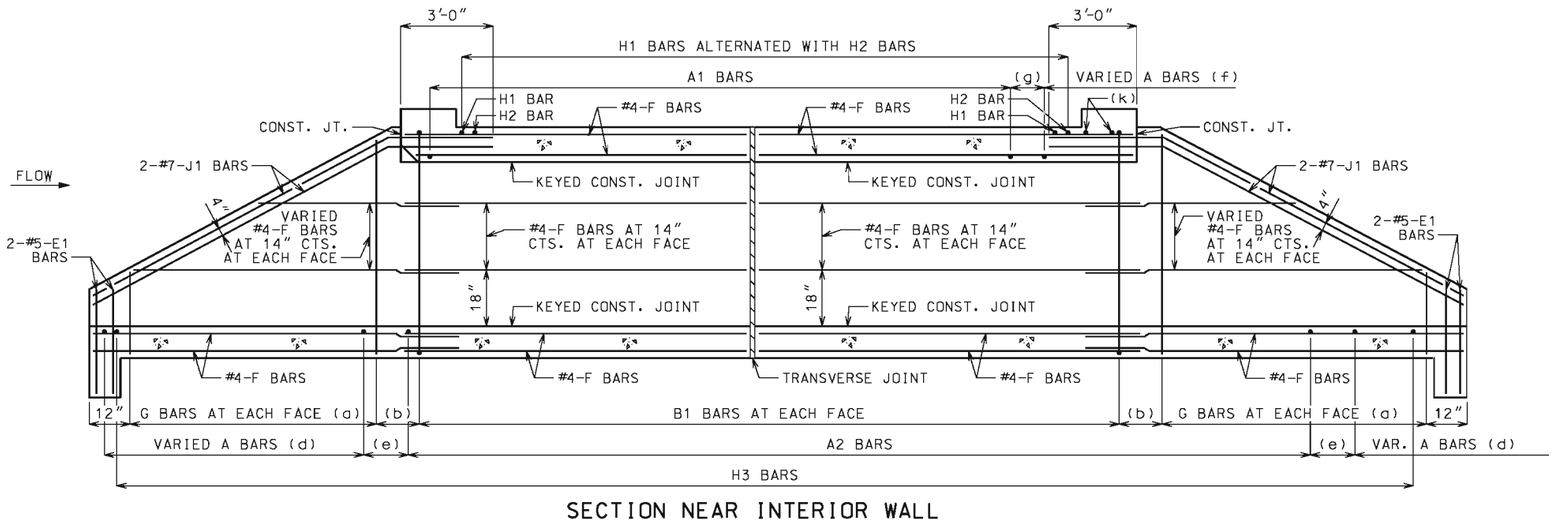
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. 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 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) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

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# CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED

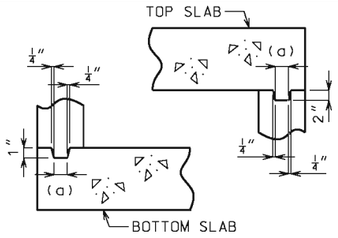
REINFORCEMENT

DATE EFFECTIVE: 10/01/2011
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703.45C

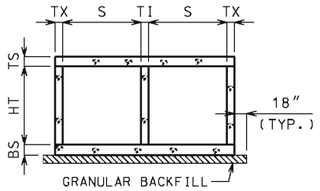
SHEET NO. 2 OF 3

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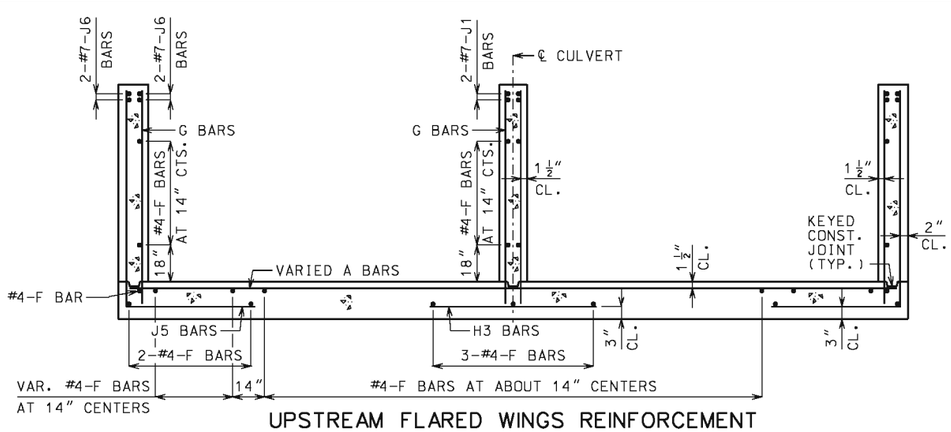



KEYED CONSTRUCTION JOINT

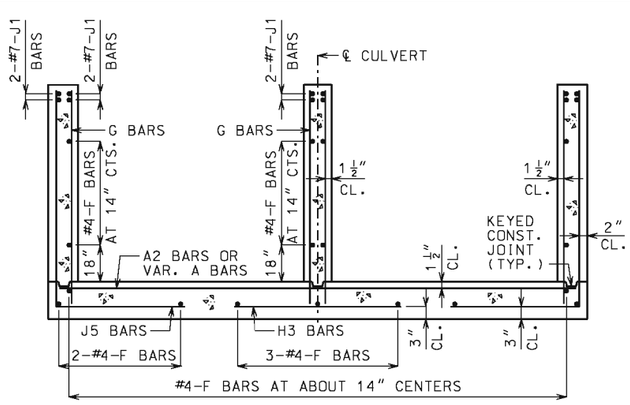
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



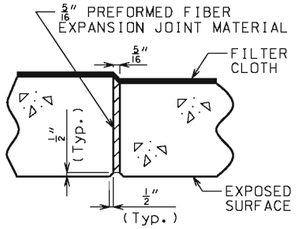

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




UPSTREAM FLARED WINGS REINFORCEMENT



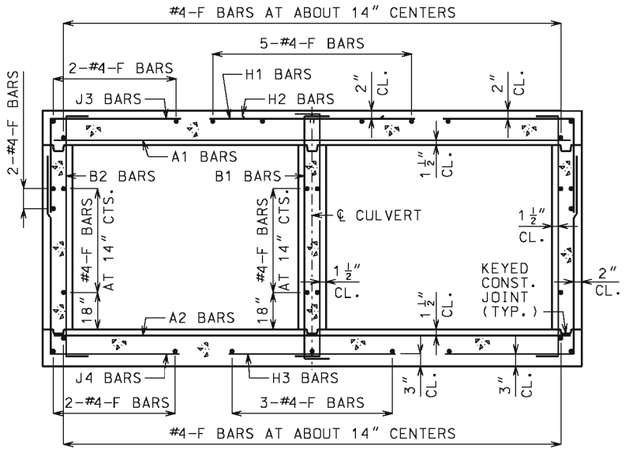

DOWNSTREAM WINGS REINFORCEMENT




TRANSVERSE JOINT THRU BARREL

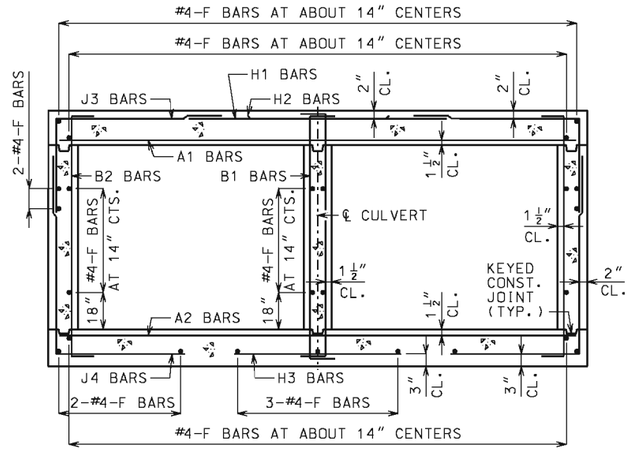
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



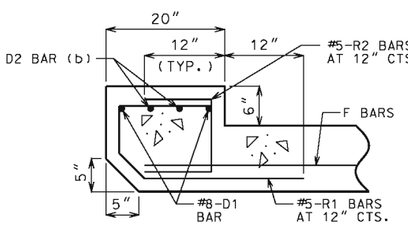

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



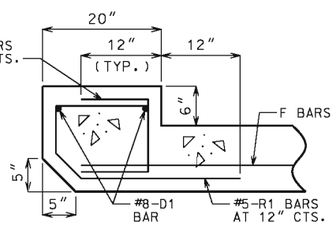

BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



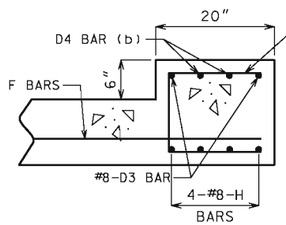

UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



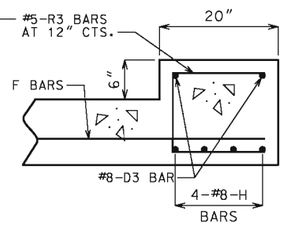

UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) #8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"
NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

IF D2 AND D4 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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# CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED

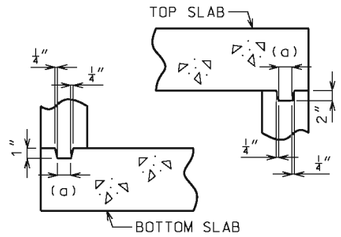
SECTIONS

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

703.45C

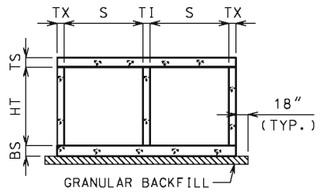
SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

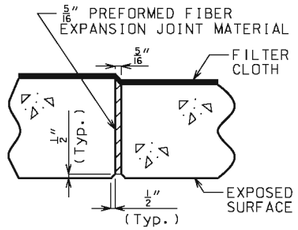



## KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



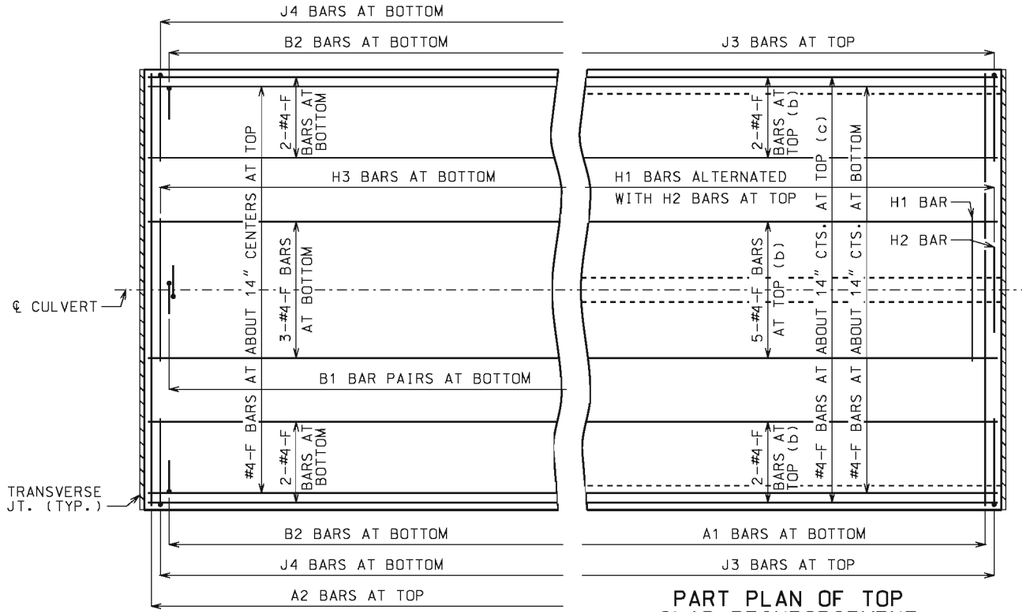

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## TRANSVERSE JOINT THRU BARREL

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

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

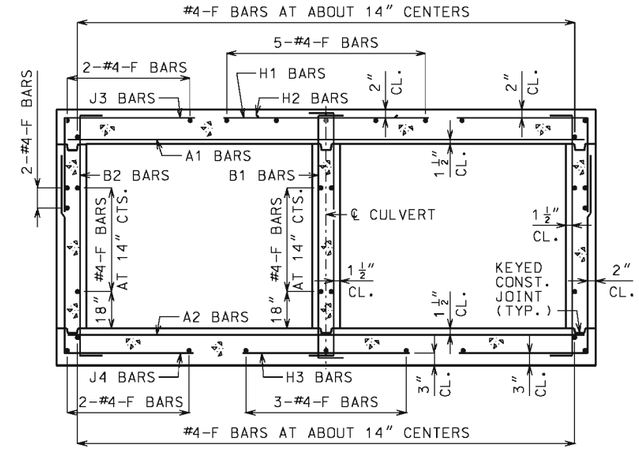



## PART PLAN OF BOTTOM SLAB REINFORCEMENT



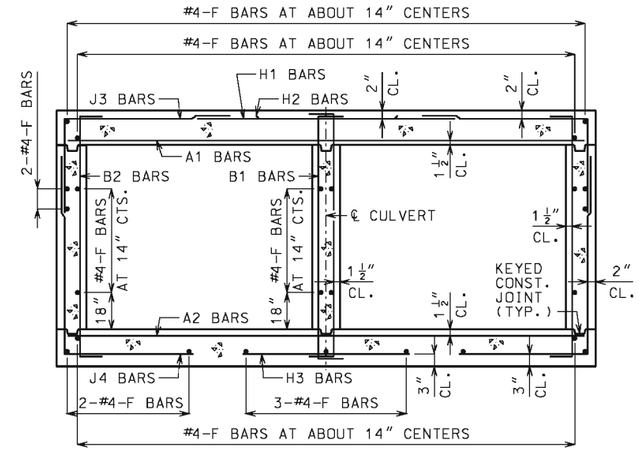

## PART PLAN OF TOP SLAB REINFORCEMENT

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



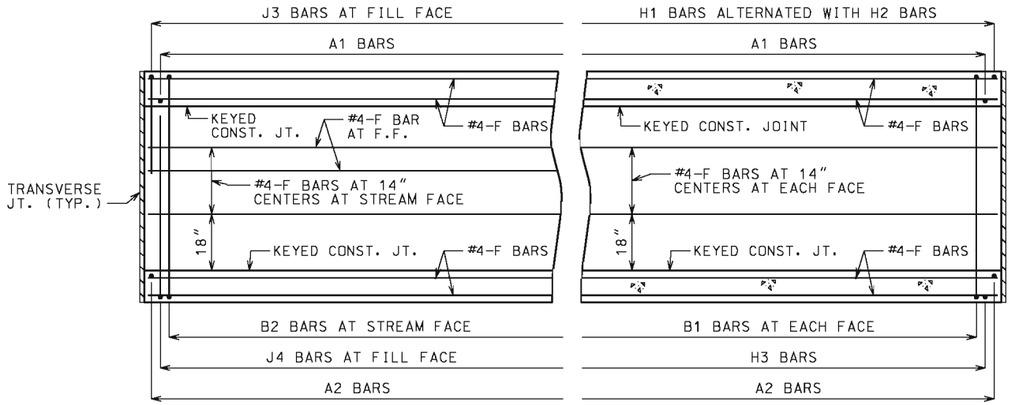

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"
SYMMETRICAL ABOUT AND NORMAL TO ℄ CULVERT.




## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS
SYMMETRICAL ABOUT AND NORMAL TO ℄ CULVERT.




## PART ELEVATION OF EXTERIOR WALL REINFORCEMENT




## PART SECTION NEAR INTERIOR WALL REINFORCEMENT

## GENERAL NOTES

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS, SEE 703.47.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PART PLANS, PART ELEVATION AND PART SECTION.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

CUT SECTION

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

703.46

SHEET NO. 1 OF 1

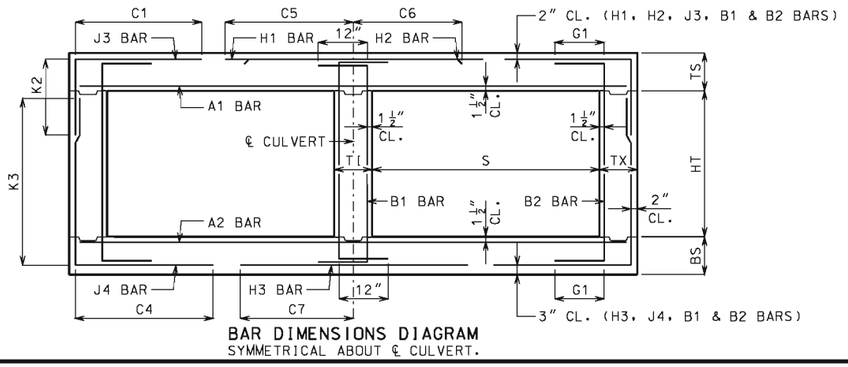
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 3 FT  HEIGHT (HT) = 2 FT OR 3 FT OR 4 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=2′ | K2 HT=3′ | K2 HT=4′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=2′ | K3 HT=3′ | K3 HT=4′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 23.8 | 26.0 | 26.0 | 26.0 | 4 | 24 | 39.5 | 4 | 24 | 16.0 | 4 | 12 | 4 | 12 | 35.3 | 28 | 40 | 52 | 4 | 12 | 24.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 9 | 4 | 10.5 | 23.8 | 26.0 | 26.0 | 26.0 | 4 | 24 | 39.5 | 4 | 24 | 16.0 | 4 | 12 | 4 | 12 | 33.0 | 28 | 40 | 52 | 4 | 12 | 24.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 23.8 | 24.0 | 24.0 | 24.0 | 4 | 24 | 39.5 | 4 | 24 | 15.5 | 4 | 12 | 4 | 12 | 30.1 | 28 | 40 | 52 | 4 | 12 | 23.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 30.0 | 24.0 | 24.0 | 24.0 | 4 | 24 | 24.5 | 4 | 24 | 15.0 | 4 | 12 | 4 | 12 | 28.0 | 28 | 40 | 52 | 4 | 12 | 23.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 28.0 | 24.0 | 24.0 | 24.0 | 4 | 24 | 23.5 | 4 | 24 | 15.0 | 4 | 12 | 4 | 12 | 27.0 | 28 | 40 | 52 | 4 | 12 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 25.0 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 14.5 | 4 | 12 | 4 | 12 | 24.6 | 28 | 40 | 52 | 4 | 12 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.9 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 15.5 | 4 | 12 | 4 | 12 | 24.5 | 28 | 40 | 52 | 4 | 12 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.8 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 16.0 | 4 | 12 | 4 | 12 | 24.5 | 28 | 40 | 52 | 4 | 11.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.6 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 17.0 | 4 | 12 | 4 | 12 | 24.4 | 28 | 40 | 52 | 4 | 10.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.6 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 17.5 | 4 | 12 | 4 | 12 | 24.4 | 28 | 40 | 52 | 4 | 10 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 17.5 | 4 | 12 | 4 | 12 | 24.3 | 28 | 40 | 52 | 4 | 9.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 18.0 | 4 | 12 | 4 | 12 | 24.3 | 28 | 40 | 52 | 4 | 9 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 18.0 | 4 | 12 | 4 | 12 | 24.3 | 28 | 40 | 52 | 4 | 8.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 22.0 | 4 | 24 | 18.0 | 4 | 11 | 4 | 11 | 24.3 | 28 | 40 | 52 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 24.4 | 24.0 | 24.0 | 24.0 | 4 | 23 | 22.0 | 4 | 23 | 18.0 | 4 | 10.5 | 4 | 10.5 | 24.1 | 28 | 40 | 52 | 4 | 7.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 8 | 8 | 8 | 8 | 4 | 11.5 | 4 | 10.5 | 24.4 | 24.0 | 24.0 | 24.0 | 4 | 22 | 22.0 | 4 | 22 | 18.0 | 4 | 9 | 4 | 9.5 | 24.1 | 28 | 40 | 52 | 4 | 7.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 8 | 9 | 8 | 8 | 4 | 11 | 4 | 9.5 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 21 | 22.0 | 4 | 21 | 18.0 | 4 | 10.5 | 4 | 12 | 24.5 | 29 | 41 | 53 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 8 | 9 | 8 | 8 | 4 | 10.5 | 4 | 9 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 20 | 22.0 | 4 | 20 | 18.0 | 4 | 9.5 | 4 | 11.5 | 24.4 | 29 | 41 | 53 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 8 | 9 | 8 | 8 | 4 | 10 | 4 | 8.5 | 24.4 | 24.0 | 24.0 | 24.0 | 4 | 19 | 22.0 | 4 | 19 | 18.0 | 4 | 9 | 4 | 11 | 24.4 | 29 | 41 | 53 | 4 | 7.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 8 | 10 | 8 | 8 | 4 | 9.5 | 4 | 8 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 18 | 22.0 | 4 | 18 | 17.5 | 4 | 10 | 4 | 12 | 24.8 | 30 | 42 | 54 | 4 | 8.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 8 | 10 | 8 | 8 | 4 | 9 | 4 | 7.5 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 17 | 22.0 | 4 | 17 | 17.5 | 4 | 9.5 | 4 | 12 | 24.8 | 30 | 42 | 54 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 9 | 10 | 8 | 8 | 4 | 9 | 4 | 9 | 24.6 | 25.0 | 25.0 | 25.0 | 4 | 19 | 22.0 | 4 | 19 | 17.5 | 4 | 9 | 4 | 11.5 | 24.8 | 30 | 42 | 54 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 9 | 10 | 8 | 8 | 4 | 9 | 4 | 8.5 | 24.6 | 25.0 | 25.0 | 25.0 | 4 | 18 | 22.0 | 4 | 18 | 17.5 | 4 | 8.5 | 4 | 11 | 24.8 | 30 | 42 | 54 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 9 | 11 | 8 | 8 | 4 | 8.5 | 4 | 8 | 24.8 | 25.0 | 25.0 | 25.0 | 4 | 18 | 22.0 | 4 | 18 | 17.5 | 4 | 9 | 4 | 10.5 | 25.0 | 31 | 43 | 55 | 4 | 8.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 9 | 11 | 8 | 8 | 4 | 8 | 4 | 7.5 | 24.8 | 25.0 | 25.0 | 25.0 | 4 | 17 | 22.0 | 4 | 17 | 17.5 | 4 | 8.5 | 4 | 10.5 | 25.0 | 31 | 43 | 55 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 50 FT | 10 | 11 | 8 | 8 | 4 | 8.5 | 4 | 8 | 24.9 | 26.0 | 26.0 | 26.0 | 4 | 19 | 21.5 | 4 | 19 | 17.5 | 4 | 8.5 | 4 | 10.5 | 25.1 | 31 | 43 | 55 | 4 | 8 | 22.5 | 5 | 12 | 5 | 12 | 0 |

## SPAN (S) = 3 FT  HEIGHT (HT) = 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=5′ | K2 HT=6′ | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=5′ | K3 HT=6′ | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 23.8 | 26.0 | 26.0 | | 4 | 24 | 39.5 | 4 | 24 | 16.0 | 4 | 12 | 4 | 11.5 | 39.0 | 64 | 76 | | 4 | 12 | 24.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 23.8 | 26.0 | 26.0 | | 4 | 24 | 39.5 | 4 | 24 | 16.0 | 4 | 12 | 4 | 11 | 39.9 | 64 | 76 | | 4 | 11.5 | 24.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 23.8 | 24.0 | 24.0 | | 4 | 24 | 39.5 | 4 | 24 | 15.0 | 4 | 12 | 4 | 10 | 38.6 | 64 | 76 | | 4 | 12 | 23.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 36.9 | 24.0 | 24.0 | | 4 | 24 | 25.0 | 4 | 24 | 14.5 | 4 | 12 | 4 | 9.5 | 36.9 | 64 | 76 | | 4 | 12 | 23.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 38.6 | 24.0 | 24.0 | | 4 | 24 | 23.5 | 4 | 24 | 15.0 | 4 | 12 | 4 | 9 | 35.8 | 64 | 76 | | 4 | 12 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 33.1 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 14.0 | 4 | 12 | 4 | 9.5 | 32.8 | 64 | 76 | | 4 | 12 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 32.8 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 15.0 | 4 | 12 | 4 | 9 | 32.5 | 64 | 76 | | 4 | 12 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 32.4 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 16.0 | 4 | 12 | 4 | 8.5 | 32.3 | 64 | 76 | | 4 | 12 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 32.1 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 16.5 | 4 | 12 | 4 | 8 | 32.1 | 64 | 76 | | 4 | 11.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 9 | 32.0 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.0 | 4 | 12 | 4 | 7.5 | 32.0 | 64 | 76 | | 4 | 11 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 8 | 31.8 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.0 | 4 | 12 | 4 | 7 | 31.9 | 64 | 76 | | 4 | 10 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 7.5 | 31.6 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.5 | 4 | 12 | 4 | 6.5 | 31.8 | 64 | 76 | | 4 | 9.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 7 | 31.6 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.5 | 4 | 12 | 4 | 6 | 31.6 | 64 | 76 | | 4 | 9.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6.5 | 31.5 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.5 | 4 | 11.5 | 5 | 6.5 | 31.6 | 64 | 76 | | 4 | 9 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6 | 31.5 | 24.0 | 24.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.5 | 4 | 10.5 | 5 | 6 | 31.5 | 64 | 76 | | 4 | 8.5 | 22.5 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 8 | 9 | 8 | 8 | 4 | 12 | 5 | 6.5 | 31.3 | 24.0 | 28.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.5 | 4 | 11.5 | 5 | 6.5 | 32.8 | 65 | 77 | | 4 | 10 | 22.5 | 5 | 12 | 5 | 11.5 | 0 |
| 32 FT | 8 | 9 | 8 | 8 | 4 | 11 | 5 | 6 | 31.3 | 24.0 | 28.0 | | 4 | 24 | 21.5 | 4 | 24 | 17.5 | 4 | 11 | 5 | 6 | 32.6 | 65 | 77 | | 4 | 9.5 | 22.5 | 5 | 12 | 5 | 11 | 0 |
| 34 FT | 8 | 9 | 8 | 8 | 4 | 10.5 | 5 | 6 | 31.3 | 24.0 | 28.0 | | 4 | 23 | 21.5 | 4 | 23 | 17.5 | 4 | 10 | 5 | 6 | 32.6 | 65 | 77 | | 4 | 9 | 22.5 | 5 | 12 | 5 | 10.5 | 0 |
| 36 FT | 8 | 10 | 8 | 8 | 4 | 10 | 6 | 7.5 | 34.1 | 24.0 | 28.0 | | 4 | 22 | 21.5 | 4 | 22 | 17.5 | 4 | 11 | 5 | 6 | 33.5 | 66 | 78 | | 4 | 10.5 | 22.5 | 5 | 12 | 5 | 10 | 0 |
| 38 FT | 8 | 10 | 8 | 8 | 4 | 9.5 | 6 | 7.5 | 34.1 | 24.0 | 28.0 | | 4 | 21 | 21.5 | 4 | 21 | 17.5 | 4 | 10.5 | 5 | 6 | 33.5 | 66 | 78 | | 4 | 10 | 22.5 | 5 | 12 | 5 | 9.5 | 0 |
| 40 FT | 9 | 10 | 8 | 8 | 4 | 10 | 5 | 6 | 31.9 | 25.0 | 29.0 | | 4 | 24 | 21.0 | 4 | 24 | 17.5 | 4 | 10 | 6 | 7 | 36.4 | 66 | 78 | | 4 | 9.5 | 22.5 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 9 | 10 | 8 | 8 | 4 | 9.5 | 5 | 6 | 31.9 | 25.0 | 29.0 | | 4 | 23 | 21.0 | 4 | 23 | 17.5 | 4 | 9.5 | 6 | 7 | 36.3 | 66 | 78 | | 4 | 9 | 22.5 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 9 | 10 | 8 | 8 | 4 | 9 | 6 | 7 | 34.9 | 25.0 | 33.0 | | 4 | 22 | 21.0 | 4 | 22 | 17.5 | 4 | 9 | 6 | 6.5 | 36.3 | 66 | 78 | | 4 | 8.5 | 22.5 | 5 | 12 | 5 | 9.5 | 0 |
| 46 FT | 10 | 11 | 8 | 8 | 4 | 9.5 | 5 | 6 | 32.8 | 26.0 | 30.0 | | 4 | 24 | 20.5 | 4 | 24 | 17.0 | 4 | 10 | 6 | 7 | 36.9 | 67 | 79 | | 4 | 9.5 | 22.5 | 5 | 12 | 5 | 9.5 | 0 |
| 48 FT | 10 | 11 | 8 | 8 | 4 | 9 | 6 | 7 | 35.8 | 26.0 | 34.0 | | 4 | 24 | 20.5 | 4 | 24 | 17.5 | 4 | 9.5 | 6 | 6.5 | 36.9 | 67 | 79 | | 4 | 9 | 22.5 | 5 | 12 | 5 | 9.5 | 0 |
| 50 FT | 10 | 11 | 8 | 8 | 4 | 8.5 | 6 | 7 | 35.6 | 26.0 | 34.0 | | 4 | 24 | 20.5 | 4 | 24 | 17.5 | 4 | 9 | 6 | 6.5 | 36.9 | 67 | 79 | | 4 | 9 | 22.5 | 5 | 12 | 5 | 9.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 3 FEET
HEIGHT (HT): 2 THRU 6 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

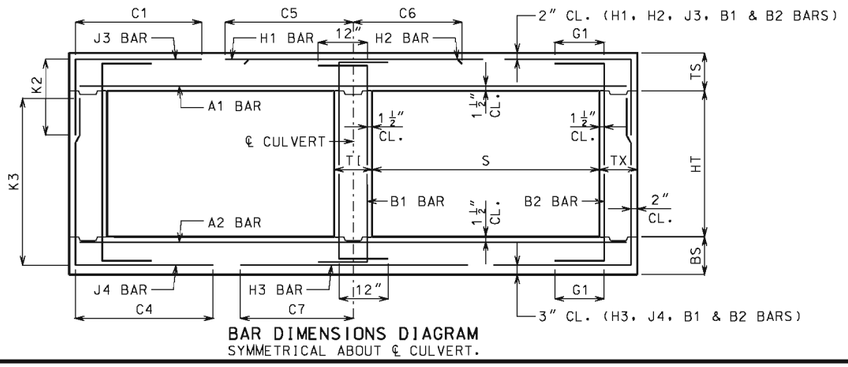
SHEET NO. 1 OF 27

## SPAN (S) = 4 FT  HEIGHT (HT) = 2 FT OR 3 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=2′ | K2 HT=3′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=2′ | K3 HT=3′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 27.3 | 26.0 | 26.0 | 4 | 23 | 48.0 | 4 | 23 | 20.5 | 4 | 12 | 4 | 12 | 29.3 | 28 | 40 | 4 | 9.5 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 27.3 | 26.0 | 26.0 | 4 | 23 | 48.0 | 4 | 23 | 20.0 | 4 | 12 | 4 | 12 | 27.3 | 28 | 40 | 4 | 9 | 27.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.3 | 24.0 | 24.0 | 4 | 24 | 34.0 | 4 | 24 | 19.0 | 4 | 12 | 4 | 12 | 25.0 | 28 | 40 | 4 | 9.5 | 27.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.8 | 24.0 | 24.0 | 4 | 24 | 28.5 | 4 | 24 | 19.0 | 4 | 12 | 4 | 12 | 24.0 | 28 | 40 | 4 | 9.5 | 26.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.1 | 24.0 | 24.0 | 4 | 24 | 27.0 | 4 | 24 | 19.0 | 4 | 12 | 4 | 12 | 23.4 | 28 | 40 | 4 | 9 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.6 | 24.0 | 24.0 | 4 | 24 | 25.5 | 4 | 24 | 18.5 | 4 | 12 | 4 | 12 | 22.1 | 28 | 40 | 4 | 9 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.5 | 24.0 | 24.0 | 4 | 24 | 25.5 | 4 | 24 | 18.5 | 4 | 12 | 4 | 12 | 22.1 | 28 | 40 | 4 | 8 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.5 | 24.0 | 24.0 | 4 | 22 | 25.5 | 4 | 22 | 18.5 | 4 | 12 | 4 | 12 | 22.1 | 28 | 40 | 4 | 7.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.5 | 24.0 | 24.0 | 4 | 20 | 25.5 | 4 | 20 | 18.5 | 4 | 11 | 4 | 12 | 22.1 | 28 | 40 | 4 | 7 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.5 | 24.0 | 24.0 | 4 | 18 | 25.5 | 4 | 18 | 18.5 | 4 | 10 | 4 | 11.5 | 22.0 | 28 | 40 | 4 | 6.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 10.5 | 4 | 11.5 | 22.5 | 24.0 | 24.0 | 4 | 17 | 25.5 | 4 | 17 | 18.5 | 4 | 9 | 4 | 10.5 | 22.0 | 28 | 40 | 4 | 6 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 9 | 8 | 8 | 4 | 10 | 4 | 10.5 | 22.6 | 24.0 | 24.0 | 4 | 15 | 25.5 | 4 | 15 | 18.5 | 4 | 9 | 4 | 12 | 21.4 | 29 | 41 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 9 | 8 | 8 | 4 | 9 | 4 | 9.5 | 22.6 | 24.0 | 24.0 | 4 | 14 | 25.5 | 4 | 14 | 18.5 | 4 | 8.5 | 4 | 12 | 21.4 | 29 | 41 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 10 | 8 | 8 | 4 | 8.5 | 4 | 8.5 | 22.8 | 24.0 | 24.0 | 4 | 13 | 25.5 | 4 | 13 | 18.5 | 4 | 8.5 | 4 | 12 | 20.9 | 30 | 42 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 10 | 8 | 8 | 4 | 7.5 | 4 | 8 | 22.8 | 24.0 | 24.0 | 4 | 12 | 25.5 | 4 | 12 | 18.5 | 4 | 8 | 4 | 12 | 20.9 | 30 | 42 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 9 | 10 | 8 | 8 | 4 | 8 | 4 | 10.5 | 22.3 | 25.0 | 25.0 | 4 | 13 | 25.5 | 4 | 13 | 18.5 | 4 | 7.5 | 4 | 12 | 21.0 | 30 | 42 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 9 | 11 | 8 | 8 | 4 | 7.5 | 4 | 10 | 22.4 | 25.0 | 25.0 | 4 | 12 | 25.5 | 4 | 12 | 18.5 | 4 | 8 | 4 | 10.5 | 20.6 | 31 | 43 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 10 | 11 | 8 | 8 | 4 | 7.5 | 4 | 10.5 | 22.0 | 26.0 | 26.0 | 4 | 13 | 25.0 | 4 | 13 | 18.5 | 4 | 7.5 | 4 | 10.5 | 20.9 | 31 | 43 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 10 | 12 | 8 | 8 | 4 | 7.5 | 4 | 10 | 22.1 | 26.0 | 26.0 | 4 | 12 | 25.0 | 4 | 12 | 18.5 | 4 | 7.5 | 4 | 9.5 | 20.6 | 32 | 44 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 10 | 12 | 8 | 8 | 4 | 7 | 4 | 9.5 | 22.1 | 26.0 | 26.0 | 4 | 12 | 25.0 | 4 | 12 | 18.5 | 4 | 7.5 | 4 | 9.5 | 20.6 | 32 | 44 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 11 | 12 | 8 | 8 | 4 | 7 | 4 | 9.5 | 21.8 | 27.0 | 27.0 | 4 | 13 | 25.0 | 4 | 13 | 18.5 | 4 | 7 | 4 | 9.5 | 20.9 | 32 | 44 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 11 | 13 | 8 | 8 | 4 | 6.5 | 4 | 9.5 | 21.9 | 27.0 | 27.0 | 4 | 12 | 25.0 | 4 | 12 | 18.5 | 4 | 7 | 4 | 8.5 | 20.6 | 33 | 45 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 11 | 13 | 8 | 8 | 4 | 6.5 | 4 | 9 | 21.9 | 27.0 | 27.0 | 4 | 12 | 25.0 | 4 | 12 | 18.5 | 4 | 7 | 4 | 8.5 | 20.6 | 33 | 45 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 12 | 13 | 8 | 8 | 4 | 6.5 | 4 | 8.5 | 21.6 | 28.0 | 28.0 | 4 | 12 | 24.5 | 4 | 12 | 18.5 | 4 | 6.5 | 4 | 8.5 | 20.9 | 33 | 45 | 5 | 8.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 12 | 13 | 8 | 8 | 4 | 6.5 | 4 | 8.5 | 21.6 | 28.0 | 28.0 | 4 | 12 | 24.5 | 4 | 12 | 18.5 | 4 | 6 | 4 | 8.5 | 20.9 | 33 | 45 | 5 | 8.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 50 FT | 12 | 14 | 8 | 8 | 4 | 6 | 4 | 8.5 | 21.8 | 28.0 | 28.0 | 4 | 12 | 24.5 | 4 | 12 | 18.5 | 4 | 6.5 | 4 | 7.5 | 20.8 | 34 | 46 | 5 | 9 | 26.0 | 5 | 12 | 5 | 12 | 0 |

## SPAN (S) = 4 FT  HEIGHT (HT) = 4 FT OR 5 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=4′ | K2 HT=5′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=4′ | K3 HT=5′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 27.3 | 26.0 | 26.0 | 4 | 23 | 48.0 | 4 | 23 | 20.5 | 4 | 12 | 4 | 12 | 39.9 | 52 | 64 | 4 | 9 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 27.3 | 26.0 | 26.0 | 4 | 23 | 48.0 | 4 | 23 | 20.5 | 4 | 12 | 4 | 12 | 36.8 | 52 | 64 | 4 | 9 | 27.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.3 | 24.0 | 24.0 | 4 | 24 | 48.0 | 4 | 24 | 19.5 | 4 | 12 | 4 | 12 | 33.8 | 52 | 64 | 4 | 9 | 27.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 33.5 | 24.0 | 24.0 | 4 | 24 | 28.5 | 4 | 24 | 19.0 | 4 | 12 | 4 | 11.5 | 31.3 | 52 | 64 | 4 | 9 | 26.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 30.6 | 24.0 | 24.0 | 4 | 24 | 27.0 | 4 | 24 | 19.0 | 4 | 12 | 4 | 11 | 29.9 | 52 | 64 | 4 | 8.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.4 | 24.0 | 24.0 | 4 | 24 | 25.5 | 4 | 24 | 18.5 | 4 | 12 | 4 | 12 | 27.1 | 52 | 64 | 4 | 9 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.1 | 24.0 | 24.0 | 4 | 24 | 25.5 | 4 | 24 | 18.5 | 4 | 12 | 4 | 11 | 26.9 | 52 | 64 | 4 | 8 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.0 | 24.0 | 24.0 | 4 | 22 | 25.0 | 4 | 22 | 18.5 | 4 | 12 | 4 | 10.5 | 26.8 | 52 | 64 | 4 | 7.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 26.9 | 24.0 | 24.0 | 4 | 21 | 25.0 | 4 | 21 | 18.5 | 4 | 10.5 | 4 | 10 | 26.6 | 52 | 64 | 4 | 7 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 11.5 | 4 | 10 | 26.8 | 24.0 | 24.0 | 4 | 19 | 25.0 | 4 | 19 | 18.5 | 4 | 9.5 | 4 | 9 | 26.6 | 52 | 64 | 4 | 6.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 10.5 | 4 | 9 | 26.6 | 24.0 | 24.0 | 4 | 17 | 25.0 | 4 | 17 | 18.5 | 4 | 8.5 | 4 | 8 | 26.5 | 52 | 64 | 4 | 6 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 9 | 8 | 8 | 4 | 9.5 | 4 | 8 | 26.8 | 24.0 | 24.0 | 4 | 15 | 25.0 | 4 | 15 | 18.5 | 4 | 9 | 4 | 9.5 | 26.8 | 53 | 65 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 9 | 8 | 8 | 4 | 9 | 4 | 7.5 | 26.6 | 24.0 | 24.0 | 4 | 14 | 25.0 | 4 | 14 | 18.5 | 4 | 8.5 | 4 | 9 | 26.6 | 53 | 65 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 10 | 8 | 8 | 4 | 8.5 | 4 | 6.5 | 26.6 | 24.0 | 24.0 | 4 | 13 | 25.0 | 4 | 13 | 18.5 | 4 | 8.5 | 4 | 10.5 | 26.9 | 54 | 66 | 4 | 7 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 10 | 8 | 8 | 4 | 7.5 | 4 | 6 | 26.6 | 24.0 | 24.0 | 4 | 12 | 25.0 | 4 | 12 | 18.5 | 4 | 8 | 4 | 10 | 26.9 | 54 | 66 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 9 | 10 | 8 | 8 | 4 | 8 | 4 | 7.5 | 26.8 | 25.0 | 25.0 | 4 | 13 | 25.0 | 4 | 13 | 18.5 | 4 | 7 | 4 | 9 | 26.9 | 54 | 66 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 9 | 11 | 8 | 8 | 4 | 7.5 | 4 | 6.5 | 26.9 | 25.0 | 25.0 | 4 | 12 | 25.0 | 4 | 12 | 18.5 | 4 | 8 | 4 | 9 | 27.1 | 55 | 67 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 10 | 11 | 8 | 8 | 4 | 7.5 | 4 | 6.5 | 27.0 | 26.0 | 26.0 | 4 | 14 | 24.5 | 4 | 14 | 18.5 | 4 | 7.5 | 4 | 8.5 | 27.1 | 55 | 67 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 10 | 12 | 8 | 8 | 4 | 7.5 | 4 | 6.5 | 27.1 | 26.0 | 26.0 | 4 | 13 | 24.5 | 4 | 13 | 18.5 | 4 | 8 | 4 | 8.5 | 27.4 | 56 | 68 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 10 | 12 | 8 | 8 | 4 | 7 | 4 | 6 | 27.1 | 26.0 | 26.0 | 4 | 12 | 24.5 | 4 | 12 | 18.5 | 4 | 7.5 | 4 | 8 | 27.4 | 56 | 68 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 11 | 12 | 8 | 8 | 4 | 7 | 4 | 6 | 27.3 | 27.0 | 27.0 | 4 | 14 | 24.5 | 4 | 14 | 18.5 | 4 | 7 | 4 | 7.5 | 27.5 | 56 | 68 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 11 | 13 | 8 | 8 | 4 | 7 | 5 | 9 | 27.3 | 27.0 | 27.0 | 4 | 13 | 24.5 | 4 | 13 | 18.5 | 4 | 7.5 | 4 | 7.5 | 27.8 | 57 | 69 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 11 | 13 | 8 | 8 | 4 | 6.5 | 5 | 8.5 | 27.3 | 27.0 | 27.0 | 4 | 12 | 24.5 | 4 | 12 | 18.5 | 4 | 7 | 4 | 7.5 | 27.6 | 57 | 69 | 4 | 6 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 11 | 13 | 8 | 8 | 4 | 6 | 5 | 8.5 | 27.3 | 27.0 | 27.0 | 4 | 12 | 24.5 | 4 | 12 | 18.5 | 4 | 6.5 | 4 | 7 | 27.6 | 57 | 69 | 5 | 9 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 12 | 13 | 8 | 8 | 4 | 6.5 | 5 | 8.5 | 27.4 | 28.0 | 28.0 | 4 | 13 | 24.0 | 4 | 13 | 18.5 | 4 | 6.5 | 4 | 6.5 | 27.8 | 57 | 69 | 5 | 8.5 | 26.0 | 5 | 12 | 5 | 11.5 | 0 |
| 50 FT | 12 | 14 | 8 | 8 | 4 | 6 | 5 | 8.5 | 27.5 | 28.0 | 28.0 | 4 | 13 | 23.5 | 4 | 13 | 18.0 | 4 | 7 | 4 | 6.5 | 28.0 | 58 | 70 | 4 | 6 | 25.5 | 5 | 12 | 5 | 11 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

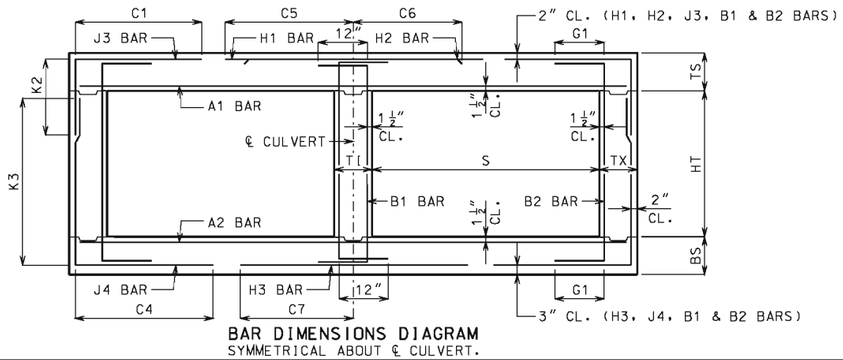
SPAN (S): 4 FEET
HEIGHT (HT): 2 THRU 5 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

## SPAN (S) = 4 FT  HEIGHT (HT) = 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=6′ | HT=7′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=6′ | HT=7′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 6.5 | 4 | 10.5 | 27.3 | 26.0 | 26.0 | 4 | 24 | 48.0 | 4 | 24 | 20.5 | 4 | 12 | 4 | 8.5 | 46.6 | 76 | 88 | 4 | 8.5 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 6.5 | 4 | 10.5 | 27.3 | 26.0 | 26.0 | 4 | 23 | 48.0 | 4 | 23 | 20.5 | 4 | 12 | 4 | 8.5 | 45.3 | 76 | 88 | 4 | 8.5 | 27.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10.5 | 27.3 | 24.0 | 24.0 | 4 | 24 | 48.0 | 4 | 24 | 19.5 | 4 | 12 | 4 | 7.5 | 43.0 | 76 | 88 | 4 | 9 | 27.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 47.3 | 24.0 | 24.0 | 4 | 24 | 28.5 | 4 | 24 | 19.0 | 4 | 12 | 4 | 7 | 40.8 | 76 | 88 | 4 | 9 | 26.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 9 | 41.4 | 24.0 | 24.0 | 4 | 24 | 27.0 | 4 | 24 | 19.0 | 4 | 12 | 4 | 6.5 | 39.0 | 76 | 88 | 4 | 8.5 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 35.4 | 24.0 | 24.0 | 4 | 24 | 25.0 | 4 | 24 | 18.5 | 4 | 12 | 4 | 7 | 35.1 | 76 | 88 | 4 | 8.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 8.5 | 34.9 | 24.0 | 24.0 | 4 | 24 | 25.0 | 4 | 24 | 18.5 | 4 | 12 | 4 | 6.5 | 34.9 | 76 | 88 | 4 | 8 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 7.5 | 34.6 | 24.0 | 24.0 | 4 | 23 | 25.0 | 4 | 23 | 18.5 | 4 | 12 | 4 | 6 | 34.6 | 76 | 88 | 4 | 7.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6.5 | 34.4 | 24.0 | 24.0 | 4 | 22 | 25.0 | 4 | 22 | 18.5 | 4 | 10.5 | 5 | 6.5 | 34.4 | 76 | 88 | 4 | 7 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6 | 34.1 | 24.0 | 24.0 | 4 | 19 | 25.0 | 4 | 19 | 18.5 | 4 | 9.5 | 5 | 6 | 34.3 | 76 | 88 | 4 | 6.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 9 | 9 | 8 | 4 | 11 | 4 | 6.5 | 33.6 | 24.0 | 24.0 | 4 | 18 | 24.5 | 4 | 18 | 18.5 | 4 | 10 | 4 | 6.5 | 34.9 | 77 | 89 | 4 | 7.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 9 | 9 | 8 | 4 | 10 | 4 | 6 | 33.5 | 24.0 | 24.0 | 4 | 16 | 25.0 | 4 | 16 | 18.5 | 4 | 9 | 4 | 6 | 34.8 | 77 | 89 | 4 | 7 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 9 | 9 | 8 | 4 | 9 | 5 | 6.5 | 33.4 | 24.0 | 28.0 | 4 | 15 | 25.0 | 4 | 15 | 18.5 | 4 | 8.5 | 5 | 7 | 34.6 | 77 | 89 | 4 | 6.5 | 25.5 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 10 | 9 | 8 | 4 | 8.5 | 5 | 6 | 33.1 | 24.0 | 24.0 | 4 | 14 | 24.5 | 4 | 14 | 18.5 | 4 | 9 | 4 | 6 | 35.5 | 78 | 90 | 4 | 7 | 26.0 | 5 | 12 | 5 | 11.5 | 0 |
| 28 FT | 8 | 10 | 9 | 8 | 4 | 8 | 6 | 7.5 | 36.1 | 24.0 | 28.0 | 4 | 13 | 24.5 | 4 | 13 | 18.5 | 4 | 8.5 | 5 | 7 | 35.5 | 78 | 90 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 10.5 | 0 |
| 30 FT | 9 | 10 | 9 | 8 | 4 | 8 | 5 | 6 | 34.0 | 25.0 | 29.0 | 4 | 14 | 24.5 | 4 | 14 | 18.5 | 4 | 7.5 | 5 | 6.5 | 35.3 | 78 | 90 | 4 | 6 | 25.5 | 5 | 12 | 5 | 10 | 0 |
| 32 FT | 9 | 11 | 9 | 8 | 4 | 8 | 5 | 6 | 33.9 | 25.0 | 29.0 | 4 | 13 | 24.5 | 4 | 13 | 18.5 | 4 | 8 | 5 | 6.5 | 35.9 | 79 | 91 | 4 | 6.5 | 26.0 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 9 | 11 | 9 | 8 | 4 | 7.5 | 5 | 6 | 33.9 | 25.0 | 29.0 | 4 | 13 | 24.5 | 4 | 13 | 18.5 | 4 | 7.5 | 5 | 6.5 | 35.9 | 79 | 91 | 4 | 6 | 26.0 | 5 | 12 | 5 | 9 | 0 |
| 36 FT | 10 | 11 | 9 | 8 | 4 | 7.5 | 5 | 6.5 | 34.6 | 26.0 | 30.0 | 4 | 14 | 24.0 | 4 | 14 | 18.0 | 4 | 7 | 5 | 6 | 35.8 | 79 | 91 | 4 | 6 | 25.5 | 5 | 12 | 5 | 8.5 | 0 |
| 38 FT | 10 | 12 | 9 | 8 | 4 | 7 | 5 | 6 | 34.5 | 26.0 | 30.0 | 4 | 14 | 24.0 | 4 | 14 | 18.0 | 4 | 7.5 | 5 | 6 | 36.3 | 80 | 92 | 4 | 6 | 25.5 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 10 | 12 | 9 | 8 | 4 | 7 | 5 | 6 | 34.5 | 26.0 | 30.0 | 4 | 13 | 24.0 | 4 | 13 | 18.0 | 4 | 7.5 | 5 | 6 | 36.3 | 80 | 92 | 4 | 6 | 25.5 | 5 | 12 | 5 | 8.5 | 0 |
| 42 FT | 11 | 12 | 9 | 8 | 4 | 7 | 5 | 6 | 35.1 | 31.0 | 31.0 | 4 | 14 | 23.5 | 4 | 14 | 18.0 | 4 | 6.5 | 6 | 7.5 | 39.1 | 80 | 92 | 5 | 9 | 25.5 | 5 | 12 | 5 | 8.5 | 0 |
| 44 FT | 11 | 13 | 10 | 8 | 4 | 6.5 | 5 | 7 | 35.1 | 27.0 | 31.0 | 4 | 14 | 23.0 | 4 | 14 | 18.0 | 4 | 7.5 | 5 | 7.5 | 36.8 | 81 | 93 | 4 | 6 | 25.5 | 5 | 12 | 5 | 8 | 0 |
| 46 FT | 11 | 13 | 10 | 8 | 4 | 6.5 | 5 | 6.5 | 35.0 | 27.0 | 31.0 | 4 | 13 | 23.0 | 4 | 13 | 18.0 | 4 | 7 | 5 | 7 | 36.8 | 81 | 93 | 5 | 9 | 26.0 | 5 | 12 | 5 | 8 | 0 |
| 48 FT | 11 | 13 | 10 | 8 | 4 | 6 | 5 | 6 | 35.0 | 27.0 | 31.0 | 4 | 13 | 23.0 | 4 | 13 | 18.0 | 4 | 6.5 | 5 | 6.5 | 36.8 | 81 | 93 | 5 | 8.5 | 25.5 | 5 | 12 | 5 | 8 | 0 |
| 50 FT | 12 | 14 | 11 | 8 | 4 | 6.5 | 5 | 7 | 35.6 | 28.0 | 32.0 | 4 | 15 | 23.0 | 4 | 15 | 18.0 | 4 | 7 | 5 | 7.5 | 37.3 | 82 | 94 | 5 | 9 | 26.0 | 5 | 12 | 5 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 4 FEET
HEIGHT (HT): 6 THRU 7 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

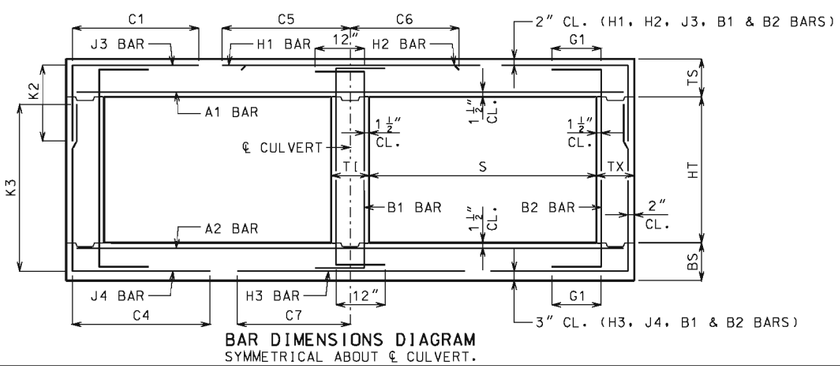
SHEET NO. 3 OF 27

## SPAN (S) = 5 FT  HEIGHT (HT) = 3 FT OR 4 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=3′ | K2 HT=4′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=3′ | K3 HT=4′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 4 | 6.5 | 4 | 9.5 | 30.9 | 27.0 | 27.0 | 4 | 20 | 56.0 | 4 | 20 | 21.5 | 4 | 12 | 4 | 12 | 33.3 | 40 | 52 | 4 | 7.5 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 4 | 6.5 | 4 | 9.5 | 30.9 | 27.0 | 27.0 | 4 | 19 | 56.0 | 4 | 19 | 21.5 | 4 | 11.5 | 4 | 11.5 | 31.0 | 40 | 52 | 4 | 7 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 11 | 4 | 12 | 30.0 | 24.0 | 24.0 | 4 | 18 | 39.0 | 4 | 18 | 20.0 | 4 | 12 | 4 | 12 | 28.4 | 40 | 52 | 4 | 7 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.4 | 24.0 | 24.0 | 4 | 19 | 32.0 | 4 | 19 | 20.0 | 4 | 11.5 | 4 | 12 | 26.9 | 40 | 52 | 4 | 7 | 29.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.6 | 24.0 | 24.0 | 4 | 18 | 30.5 | 4 | 18 | 19.5 | 4 | 10.5 | 4 | 11.5 | 26.0 | 40 | 52 | 4 | 6.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 11 | 4 | 12 | 26.1 | 24.0 | 24.0 | 4 | 16 | 29.5 | 4 | 16 | 19.5 | 4 | 9.5 | 4 | 10.5 | 25.5 | 40 | 52 | 4 | 6 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.6 | 24.0 | 24.0 | 4 | 16 | 28.5 | 4 | 16 | 19.0 | 4 | 9.5 | 4 | 11 | 24.4 | 40 | 52 | 5 | 7.5 | 28.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 10 | 4 | 11 | 24.6 | 24.0 | 24.0 | 4 | 14 | 28.5 | 4 | 14 | 19.0 | 4 | 8.5 | 4 | 10 | 24.3 | 40 | 52 | 5 | 7 | 28.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 9 | 8 | 8 | 4 | 9 | 4 | 9.5 | 24.8 | 24.0 | 24.0 | 4 | 12 | 28.5 | 4 | 12 | 19.0 | 4 | 8.5 | 4 | 12 | 23.5 | 41 | 53 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 8.5 | 24.8 | 24.0 | 24.0 | 5 | 17 | 28.5 | 5 | 17 | 19.5 | 4 | 7.5 | 4 | 11.5 | 23.5 | 41 | 53 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 10 | 8 | 8 | 4 | 7.5 | 4 | 7.5 | 24.9 | 24.0 | 24.0 | 5 | 17 | 28.0 | 5 | 17 | 20.0 | 4 | 7.5 | 4 | 12 | 22.9 | 42 | 54 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 9 | 10 | 8 | 8 | 4 | 7 | 4 | 9 | 24.3 | 25.0 | 25.0 | 5 | 16 | 28.5 | 5 | 16 | 19.0 | 4 | 7 | 4 | 12 | 23.1 | 42 | 54 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 9 | 11 | 8 | 8 | 4 | 6.5 | 4 | 8 | 24.5 | 25.0 | 25.0 | 5 | 16 | 28.5 | 5 | 16 | 20.0 | 4 | 7 | 4 | 10.5 | 22.8 | 43 | 55 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 10 | 11 | 8 | 8 | 4 | 6.5 | 4 | 8.5 | 24.0 | 26.0 | 26.0 | 5 | 16 | 28.5 | 5 | 16 | 19.0 | 4 | 6.5 | 4 | 10.5 | 23.0 | 43 | 55 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 10 | 12 | 8 | 8 | 4 | 6.5 | 4 | 8 | 24.1 | 26.0 | 26.0 | 5 | 15 | 28.0 | 5 | 15 | 19.5 | 4 | 6.5 | 4 | 9.5 | 22.6 | 44 | 56 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 11 | 12 | 8 | 8 | 4 | 6.5 | 4 | 8.5 | 23.8 | 27.0 | 27.0 | 5 | 15 | 28.0 | 5 | 15 | 19.0 | 4 | 6 | 4 | 9.5 | 22.9 | 44 | 56 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 11 | 13 | 8 | 8 | 4 | 6 | 4 | 7.5 | 23.9 | 27.0 | 27.0 | 5 | 15 | 28.0 | 5 | 15 | 19.0 | 4 | 6.5 | 4 | 8.5 | 22.8 | 45 | 57 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 12 | 13 | 8 | 8 | 4 | 6 | 4 | 8.5 | 23.6 | 28.0 | 28.0 | 5 | 15 | 28.0 | 5 | 15 | 19.0 | 4 | 6 | 4 | 8.5 | 22.9 | 45 | 57 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 12 | 14 | 8 | 8 | 5 | 9 | 4 | 7.5 | 23.8 | 28.0 | 28.0 | 5 | 15 | 28.0 | 5 | 15 | 19.0 | 4 | 6 | 4 | 7.5 | 22.8 | 46 | 58 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 13 | 14 | 8 | 8 | 5 | 9 | 4 | 7.5 | 23.5 | 29.0 | 29.0 | 5 | 15 | 27.5 | 5 | 15 | 19.0 | 4 | 6 | 4 | 7.5 | 23.0 | 46 | 58 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 13 | 15 | 8 | 8 | 5 | 8.5 | 4 | 7.5 | 23.8 | 29.0 | 29.0 | 5 | 15 | 27.5 | 5 | 15 | 19.0 | 4 | 6 | 4 | 7 | 22.9 | 47 | 59 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 13 | 15 | 8 | 8 | 5 | 8 | 4 | 7 | 23.8 | 29.0 | 29.0 | 5 | 14 | 27.5 | 5 | 14 | 19.0 | 5 | 9 | 4 | 7 | 22.9 | 47 | 59 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 14 | 15 | 8 | 8 | 5 | 8.5 | 4 | 7 | 23.5 | 30.0 | 30.0 | 5 | 15 | 27.0 | 5 | 15 | 19.0 | 5 | 8.5 | 4 | 7 | 23.1 | 47 | 59 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 14 | 16 | 8 | 8 | 5 | 8 | 4 | 7 | 23.6 | 30.0 | 30.0 | 5 | 14 | 27.0 | 5 | 14 | 19.0 | 5 | 9 | 4 | 6.5 | 23.1 | 48 | 60 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 14 | 16 | 8 | 8 | 5 | 7.5 | 4 | 6.5 | 23.6 | 30.0 | 30.0 | 5 | 14 | 27.0 | 5 | 14 | 19.0 | 5 | 8.5 | 4 | 6.5 | 23.1 | 48 | 60 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 50 FT | 15 | 16 | 8 | 8 | 5 | 7.5 | 4 | 6.5 | 25.6 | 31.0 | 31.0 | 5 | 15 | 31.5 | 5 | 15 | 24.0 | 5 | 8 | 4 | 6.5 | 23.3 | 48 | 60 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |

## SPAN (S) = 5 FT  HEIGHT (HT) = 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=5′ | K2 HT=6′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=5′ | K3 HT=6′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9.5 | 30.9 | 27.0 | 27.0 | 4 | 20 | 56.0 | 4 | 20 | 22.0 | 4 | 11.5 | 4 | 9.5 | 44.1 | 64 | 76 | 4 | 7 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9.5 | 30.9 | 27.0 | 27.0 | 4 | 19 | 56.0 | 4 | 19 | 21.5 | 4 | 10.5 | 4 | 9 | 40.6 | 64 | 76 | 4 | 7 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 10.5 | 4 | 10.5 | 30.9 | 24.0 | 24.0 | 4 | 18 | 56.0 | 4 | 18 | 20.0 | 4 | 11.5 | 4 | 9 | 37.6 | 64 | 76 | 4 | 7 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10.5 | 37.1 | 24.0 | 24.0 | 4 | 19 | 32.0 | 4 | 19 | 20.0 | 4 | 11 | 4 | 8.5 | 34.6 | 64 | 76 | 4 | 6.5 | 29.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 33.8 | 24.0 | 24.0 | 4 | 18 | 30.5 | 4 | 18 | 19.5 | 4 | 10 | 4 | 8 | 33.0 | 64 | 76 | 4 | 6 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 11 | 4 | 9 | 32.3 | 24.0 | 24.0 | 4 | 16 | 29.5 | 4 | 16 | 19.5 | 4 | 9 | 4 | 7.5 | 31.9 | 64 | 76 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 11.5 | 4 | 9.5 | 29.5 | 24.0 | 24.0 | 4 | 16 | 28.5 | 4 | 16 | 19.0 | 4 | 9 | 4 | 7.5 | 29.4 | 64 | 76 | 5 | 7.5 | 28.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 10 | 4 | 8 | 29.3 | 24.0 | 24.0 | 4 | 14 | 28.5 | 4 | 14 | 19.0 | 4 | 8 | 4 | 7 | 29.1 | 64 | 76 | 5 | 7 | 28.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 9 | 8 | 8 | 4 | 9 | 4 | 7 | 29.3 | 24.0 | 24.0 | 4 | 12 | 28.0 | 4 | 12 | 19.0 | 4 | 8 | 4 | 8 | 29.3 | 65 | 77 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 6.5 | 29.1 | 24.0 | 24.0 | 5 | 17 | 28.0 | 5 | 17 | 19.5 | 4 | 7 | 4 | 7.5 | 29.1 | 65 | 77 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 10 | 8 | 8 | 4 | 7 | 5 | 7 | 29.0 | 24.0 | 24.0 | 5 | 17 | 28.0 | 5 | 17 | 20.0 | 4 | 7.5 | 4 | 8.5 | 29.3 | 66 | 78 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 9 | 10 | 8 | 8 | 4 | 7 | 4 | 6.5 | 29.1 | 25.0 | 25.0 | 5 | 16 | 28.0 | 5 | 16 | 19.0 | 4 | 7 | 4 | 7.5 | 29.3 | 66 | 78 | 5 | 7 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 9 | 11 | 8 | 8 | 4 | 6.5 | 4 | 6 | 29.1 | 25.0 | 25.0 | 5 | 16 | 28.0 | 5 | 16 | 19.5 | 4 | 7 | 4 | 7.5 | 29.5 | 67 | 79 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 10 | 11 | 8 | 8 | 4 | 6.5 | 5 | 8 | 29.3 | 26.0 | 26.0 | 5 | 16 | 28.0 | 5 | 16 | 19.0 | 4 | 6.5 | 4 | 6.5 | 29.5 | 67 | 79 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 10 | 12 | 8 | 8 | 4 | 6.5 | 5 | 7.5 | 29.3 | 26.0 | 26.0 | 5 | 15 | 28.0 | 5 | 15 | 19.0 | 4 | 6.5 | 4 | 6.5 | 29.6 | 68 | 80 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 11 | 12 | 8 | 8 | 4 | 6.5 | 5 | 8.5 | 29.4 | 27.0 | 27.0 | 5 | 16 | 27.5 | 5 | 16 | 19.0 | 4 | 6.5 | 4 | 6 | 29.8 | 68 | 80 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 11 | 13 | 8 | 8 | 4 | 6 | 5 | 8 | 29.5 | 27.0 | 27.0 | 5 | 15 | 27.5 | 5 | 15 | 19.0 | 4 | 6.5 | 4 | 6 | 29.9 | 69 | 81 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 12 | 13 | 8 | 8 | 4 | 6 | 5 | 8.5 | 29.5 | 28.0 | 32.0 | 5 | 16 | 27.5 | 5 | 16 | 19.0 | 4 | 6 | 5 | 8.5 | 30.0 | 69 | 81 | 5 | 7 | 29.0 | 5 | 12 | 5 | 11.5 | 0 |
| 36 FT | 12 | 14 | 8 | 8 | 5 | 9 | 5 | 7.5 | 29.6 | 28.0 | 32.0 | 5 | 15 | 27.0 | 5 | 15 | 19.0 | 4 | 6.5 | 5 | 9 | 30.1 | 70 | 82 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 10.5 | 0 |
| 38 FT | 12 | 14 | 8 | 8 | 5 | 8.5 | 5 | 7.5 | 29.6 | 28.0 | 32.0 | 5 | 15 | 27.0 | 5 | 15 | 19.0 | 4 | 6 | 5 | 8.5 | 30.1 | 70 | 82 | 5 | 7 | 29.0 | 5 | 12 | 5 | 10 | 0 |
| 40 FT | 13 | 14 | 8 | 8 | 5 | 8.5 | 5 | 7.5 | 29.6 | 29.0 | 33.0 | 5 | 16 | 27.0 | 5 | 16 | 19.0 | 5 | 8.5 | 5 | 8 | 30.3 | 70 | 82 | 5 | 7 | 29.0 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 13 | 15 | 8 | 8 | 5 | 8.5 | 5 | 7 | 29.8 | 29.0 | 33.0 | 5 | 15 | 26.5 | 5 | 15 | 19.0 | 4 | 6 | 5 | 8 | 30.4 | 71 | 83 | 5 | 7 | 28.5 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 13 | 15 | 8 | 8 | 5 | 8 | 5 | 6.5 | 29.8 | 29.0 | 33.0 | 5 | 14 | 26.5 | 5 | 14 | 19.0 | 5 | 9 | 5 | 8 | 30.4 | 71 | 83 | 5 | 7 | 28.5 | 5 | 12 | 5 | 9.5 | 0 |
| 46 FT | 14 | 16 | 9 | 8 | 5 | 8 | 5 | 8 | 30.5 | 30.0 | 34.0 | 5 | 16 | 26.0 | 5 | 16 | 19.0 | 5 | 9 | 5 | 9 | 31.0 | 72 | 84 | 5 | 7 | 29.0 | 5 | 12 | 5 | 9.5 | 0 |
| 48 FT | 14 | 16 | 9 | 8 | 5 | 8 | 5 | 8 | 30.4 | 30.0 | 34.0 | 5 | 15 | 26.0 | 5 | 15 | 19.0 | 5 | 8.5 | 5 | 8.5 | 31.0 | 72 | 84 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 9 | 0 |
| 50 FT | 14 | 16 | 10 | 8 | 5 | 7.5 | 5 | 7.5 | 31.0 | 30.0 | 30.0 | 5 | 15 | 26.0 | 5 | 15 | 19.0 | 5 | 8 | 4 | 6 | 31.1 | 72 | 84 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 10 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 5 FEET
HEIGHT (HT): 3 THRU 6 FEET

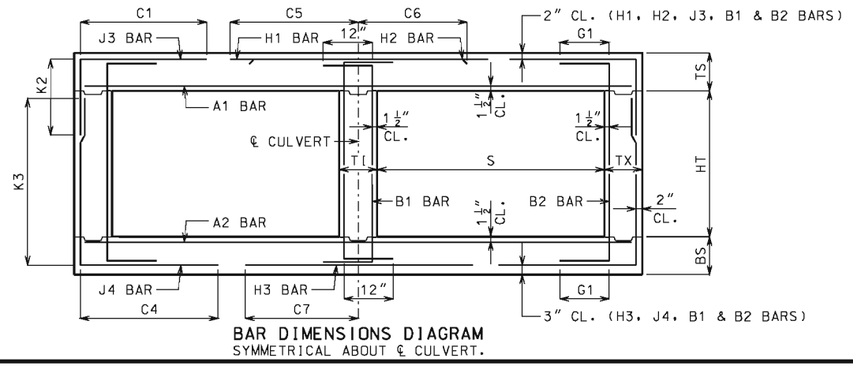
DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO.
4 OF 27

## SPAN (S) = 5 FT  HEIGHT (HT) = 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=7′ | HT=8′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=7′ | HT=8′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9.5 | 30.9 | 27.0 | 27.0 | 4 | 20 | 56.0 | 4 | 20 | 22.0 | 4 | 10.5 | 4 | 7 | 52.1 | 88 | 100 | 4 | 7 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9 | 30.9 | 27.0 | 27.0 | 4 | 20 | 56.0 | 4 | 20 | 22.0 | 4 | 10 | 4 | 6.5 | 50.0 | 88 | 100 | 4 | 6.5 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 10 | 4 | 7 | 30.9 | 24.0 | 24.0 | 4 | 18 | 56.0 | 4 | 18 | 20.5 | 4 | 10.5 | 4 | 6 | 47.4 | 88 | 100 | 4 | 6.5 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 9 | 8 | 8 | 4 | 12 | 4 | 7 | 51.6 | 24.0 | 24.0 | 4 | 19 | 32.5 | 4 | 19 | 20.0 | 4 | 12 | 4 | 6.5 | 46.3 | 89 | 101 | 4 | 7.5 | 29.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 8 | 8 | 4 | 12 | 4 | 6.5 | 44.5 | 24.0 | 24.0 | 4 | 18 | 30.5 | 4 | 18 | 19.5 | 4 | 11 | 4 | 6 | 44.0 | 89 | 101 | 4 | 7 | 29.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 9 | 8 | 4 | 11.5 | 4 | 7 | 40.8 | 24.0 | 24.0 | 4 | 16 | 29.5 | 4 | 16 | 19.5 | 4 | 10 | 4 | 6.5 | 41.4 | 89 | 101 | 4 | 6.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 9 | 8 | 4 | 12 | 4 | 7 | 36.9 | 24.0 | 24.0 | 4 | 17 | 28.0 | 4 | 17 | 19.0 | 4 | 10.5 | 4 | 7 | 38.3 | 89 | 101 | 4 | 6.5 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 9 | 8 | 4 | 10.5 | 4 | 6.5 | 36.4 | 24.0 | 24.0 | 4 | 15 | 28.0 | 4 | 15 | 19.0 | 4 | 9 | 4 | 6.5 | 37.9 | 89 | 101 | 4 | 6 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 9 | 9 | 8 | 4 | 9 | 5 | 7 | 36.0 | 24.0 | 28.0 | 4 | 13 | 28.0 | 4 | 13 | 19.0 | 4 | 8 | 5 | 7 | 37.5 | 89 | 101 | 5 | 7.5 | 28.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 9 | 9 | 8 | 4 | 8 | 5 | 6 | 35.8 | 24.0 | 28.0 | 5 | 18 | 28.0 | 5 | 18 | 19.0 | 4 | 7.5 | 5 | 6 | 37.3 | 89 | 101 | 5 | 7 | 28.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 10 | 9 | 8 | 4 | 7.5 | 6 | 7 | 38.4 | 24.0 | 28.0 | 5 | 17 | 28.0 | 5 | 17 | 19.5 | 4 | 7.5 | 5 | 6.5 | 38.1 | 90 | 102 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 11 | 0 |
| 22 FT | 9 | 10 | 9 | 8 | 4 | 7.5 | 5 | 6 | 36.4 | 25.0 | 29.0 | 5 | 17 | 27.5 | 5 | 17 | 19.0 | 4 | 7 | 5 | 6 | 37.8 | 90 | 102 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 10 | 0 |
| 24 FT | 9 | 11 | 9 | 8 | 4 | 7 | 5 | 6 | 36.1 | 25.0 | 29.0 | 5 | 16 | 27.5 | 5 | 16 | 19.0 | 4 | 7 | 5 | 6 | 38.5 | 91 | 103 | 5 | 8 | 29.0 | 5 | 12 | 5 | 9.5 | 0 |
| 26 FT | 10 | 11 | 9 | 8 | 4 | 7 | 5 | 6 | 36.9 | 26.0 | 30.0 | 5 | 17 | 27.5 | 5 | 17 | 19.0 | 4 | 6.5 | 5 | 6 | 38.3 | 91 | 103 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 9 | 0 |
| 28 FT | 10 | 12 | 9 | 8 | 4 | 6.5 | 5 | 6 | 36.8 | 30.0 | 30.0 | 5 | 16 | 27.5 | 5 | 16 | 19.0 | 4 | 7 | 5 | 6 | 38.9 | 92 | 104 | 5 | 8 | 29.0 | 5 | 12 | 5 | 8.5 | 0 |
| 30 FT | 11 | 12 | 9 | 8 | 4 | 6.5 | 5 | 6 | 37.4 | 31.0 | 31.0 | 5 | 17 | 27.0 | 5 | 17 | 19.0 | 4 | 6.5 | 6 | 7.5 | 41.6 | 92 | 104 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 11 | 13 | 9 | 8 | 4 | 6.5 | 6 | 7 | 40.3 | 31.0 | 31.0 | 5 | 16 | 27.0 | 5 | 16 | 19.0 | 4 | 6.5 | 5 | 6 | 39.1 | 93 | 105 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 8.5 | 0 |
| 34 FT | 11 | 13 | 9 | 8 | 4 | 6 | 6 | 7 | 40.1 | 31.0 | 35.0 | 5 | 15 | 27.0 | 5 | 15 | 19.0 | 4 | 6.5 | 6 | 7 | 42.1 | 93 | 105 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 8.5 | 0 |
| 36 FT | 12 | 14 | 10 | 8 | 4 | 6 | 5 | 6.5 | 37.8 | 32.0 | 32.0 | 5 | 17 | 26.0 | 5 | 17 | 19.0 | 4 | 6.5 | 5 | 7 | 39.5 | 94 | 106 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 12 | 14 | 10 | 8 | 5 | 9 | 5 | 6 | 37.6 | 32.0 | 32.0 | 5 | 16 | 26.0 | 5 | 16 | 19.0 | 4 | 6 | 5 | 6.5 | 39.5 | 94 | 106 | 5 | 7 | 29.0 | 5 | 12 | 5 | 8 | 0 |
| 40 FT | 12 | 15 | 11 | 8 | 5 | 8.5 | 5 | 7 | 37.8 | 28.0 | 32.0 | 5 | 15 | 26.0 | 5 | 15 | 19.0 | 4 | 6 | 5 | 7 | 40.0 | 95 | 107 | 5 | 7.5 | 29.0 | 5 | 12 | 5 | 7.5 | 0 |
| 42 FT | 13 | 15 | 11 | 8 | 5 | 8.5 | 5 | 7 | 38.3 | 33.0 | 33.0 | 5 | 17 | 25.5 | 5 | 17 | 18.5 | 4 | 6 | 5 | 7 | 39.9 | 95 | 107 | 5 | 7 | 29.0 | 5 | 12 | 5 | 7.5 | 0 |
| 44 FT | 13 | 15 | 11 | 8 | 5 | 8.5 | 5 | 6.5 | 38.1 | 33.0 | 33.0 | 5 | 16 | 25.5 | 5 | 16 | 18.5 | 5 | 9 | 5 | 7 | 39.9 | 95 | 107 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 7.5 | 0 |
| 46 FT | 13 | 16 | 12 | 8 | 5 | 8 | 5 | 6.5 | 38.3 | 29.0 | 33.0 | 5 | 16 | 25.5 | 5 | 16 | 18.5 | 4 | 6 | 5 | 7 | 40.4 | 96 | 108 | 5 | 7 | 29.0 | 5 | 12 | 5 | 7.5 | 0 |
| 48 FT | 14 | 16 | 12 | 8 | 5 | 8 | 5 | 6.5 | 38.8 | 34.0 | 34.0 | 5 | 17 | 25.0 | 5 | 17 | 18.5 | 5 | 9 | 5 | 6.5 | 40.4 | 96 | 108 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 7 | 0 |
| 50 FT | 14 | 16 | 12 | 8 | 5 | 7.5 | 5 | 6.5 | 38.8 | 34.0 | 34.0 | 5 | 17 | 25.0 | 5 | 17 | 18.5 | 5 | 8.5 | 5 | 6.5 | 40.3 | 96 | 108 | 5 | 6.5 | 29.0 | 5 | 12 | 5 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 5 FEET
HEIGHT (HT): 7 THRU 8 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 5 OF 27

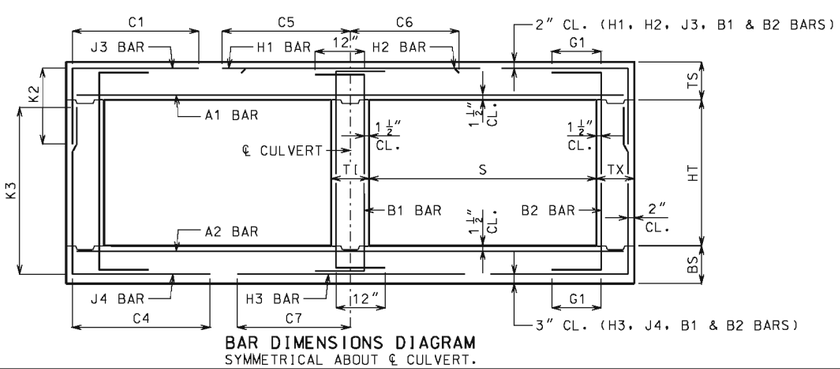
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 6 FT  HEIGHT (HT) = 3 FT OR 4 FT OR 5 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=3′ | HT=4′ | HT=5′ | | | | | | | | | | | | HT=3′ | HT=4′ | HT=5′ | | | | | | | |
| 1 FT | 11 | 8 | 8 | 8 | 5 | 8.5 | 4 | 9.5 | 34.5 | 27.0 | 27.0 | 27.0 | 4 | 16 | 64.5 | 4 | 16 | 23.0 | 4 | 9.5 | 4 | 9.5 | 37.6 | 40 | 52 | 64 | 4 | 6 | 34.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 5 | 8.5 | 4 | 9.5 | 34.5 | 27.0 | 27.0 | 27.0 | 4 | 15 | 64.5 | 4 | 15 | 22.5 | 4 | 9 | 4 | 9 | 35.0 | 40 | 52 | 64 | 5 | 7.5 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 8 | 4 | 9 | 34.0 | 24.0 | 24.0 | 24.0 | 4 | 13 | 43.5 | 4 | 13 | 21.0 | 4 | 9 | 4 | 9.5 | 32.0 | 40 | 52 | 64 | 5 | 7.5 | 33.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 9.5 | 4 | 9.5 | 30.4 | 24.0 | 24.0 | 24.0 | 4 | 13 | 35.5 | 4 | 13 | 20.5 | 4 | 8.5 | 4 | 9 | 29.9 | 40 | 52 | 64 | 5 | 7 | 32.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 9 | 4 | 9 | 29.3 | 24.0 | 24.0 | 24.0 | 4 | 12 | 34.0 | 4 | 12 | 20.5 | 4 | 7.5 | 4 | 8 | 28.9 | 40 | 52 | 64 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 8 | 28.8 | 24.0 | 24.0 | 24.0 | 5 | 17 | 33.0 | 5 | 17 | 20.5 | 4 | 7.5 | 4 | 10 | 27.8 | 41 | 53 | 65 | 5 | 7 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 8 | 8 | 4 | 7 | 4 | 7 | 28.4 | 24.0 | 24.0 | 24.0 | 5 | 16 | 32.5 | 5 | 16 | 21.5 | 4 | 6.5 | 4 | 9 | 27.3 | 41 | 53 | 65 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 8 | 8 | 4 | 7.5 | 4 | 7 | 27.0 | 24.0 | 24.0 | 24.0 | 5 | 16 | 31.5 | 5 | 16 | 21.5 | 4 | 6.6 | 4 | 9.5 | 25.9 | 41 | 53 | 65 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 10 | 8 | 8 | 4 | 6.5 | 4 | 6 | 27.1 | 24.0 | 24.0 | 24.0 | 5 | 15 | 31.5 | 5 | 15 | 22.5 | 4 | 6.5 | 4 | 11.5 | 25.3 | 42 | 54 | 66 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 9 | 11 | 8 | 8 | 4 | 6.5 | 4 | 7.5 | 26.6 | 25.0 | 25.0 | 25.0 | 5 | 16 | 31.5 | 5 | 16 | 21.5 | 4 | 6.5 | 4 | 10.5 | 25.0 | 43 | 55 | 67 | 5 | 7 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 10 | 11 | 8 | 8 | 4 | 6 | 4 | 7.5 | 26.1 | 26.0 | 26.0 | 26.0 | 5 | 15 | 31.5 | 5 | 15 | 21.0 | 4 | 6 | 4 | 10 | 25.3 | 43 | 55 | 67 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 10 | 12 | 8 | 8 | 5 | 9 | 4 | 6.5 | 26.3 | 26.0 | 26.0 | 26.0 | 5 | 15 | 31.5 | 5 | 15 | 21.5 | 4 | 6 | 4 | 9.5 | 24.9 | 44 | 56 | 68 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 11 | 12 | 8 | 8 | 5 | 9 | 4 | 7 | 25.9 | 27.0 | 27.0 | 27.0 | 5 | 14 | 31.5 | 5 | 14 | 21.0 | 5 | 8.5 | 4 | 9 | 25.1 | 44 | 56 | 68 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 11 | 13 | 8 | 8 | 5 | 8.5 | 4 | 6 | 26.0 | 27.0 | 27.0 | 27.0 | 5 | 14 | 31.5 | 5 | 14 | 21.5 | 5 | 8.5 | 4 | 8.5 | 24.9 | 45 | 57 | 69 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 12 | 14 | 8 | 8 | 5 | 8.5 | 4 | 6.5 | 25.9 | 28.0 | 28.0 | 28.0 | 5 | 13 | 31.5 | 5 | 13 | 20.5 | 5 | 9 | 4 | 7.5 | 25.0 | 46 | 58 | 70 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 13 | 14 | 8 | 8 | 5 | 8.5 | 4 | 6.5 | 25.6 | 29.0 | 29.0 | 29.0 | 5 | 12 | 31.0 | 5 | 12 | 20.0 | 5 | 8.5 | 4 | 7.5 | 25.1 | 46 | 58 | 70 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 13 | 15 | 8 | 8 | 5 | 8 | 4 | 6 | 25.8 | 29.0 | 29.0 | 29.0 | 5 | 12 | 31.0 | 5 | 12 | 20.5 | 5 | 8.5 | 4 | 7 | 25.1 | 47 | 59 | 71 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 14 | 15 | 8 | 8 | 5 | 8 | 4 | 6 | 25.5 | 30.0 | 30.0 | 30.0 | 5 | 12 | 31.0 | 5 | 12 | 20.0 | 5 | 8 | 4 | 7 | 25.3 | 47 | 59 | 71 | 6 | 8.5 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 14 | 16 | 8 | 8 | 5 | 7.5 | 5 | 8.5 | 25.8 | 30.0 | 30.0 | 30.0 | 5 | 12 | 31.0 | 5 | 12 | 20.0 | 5 | 8 | 4 | 6.5 | 25.3 | 48 | 60 | 72 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 15 | 16 | 8 | 8 | 5 | 7.5 | 4 | 6 | 27.5 | 31.0 | 31.0 | 31.0 | 5 | 12 | 35.5 | 5 | 12 | 25.0 | 5 | 7.5 | 4 | 6.5 | 25.4 | 48 | 60 | 72 | 6 | 8 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 15 | 17 | 8 | 8 | 5 | 7 | 5 | 8 | 30.8 | 31.0 | 31.0 | 31.0 | 6 | 17 | 39.5 | 6 | 17 | 29.0 | 5 | 7.5 | 4 | 6 | 25.4 | 49 | 61 | 73 | 6 | 8.5 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 16 | 17 | 8 | 8 | 5 | 7 | 5 | 7 | 30.6 | 32.0 | 32.0 | 32.0 | 5 | 12 | 35.0 | 5 | 12 | 25.0 | 5 | 7.5 | 4 | 6 | 25.6 | 49 | 61 | 73 | 6 | 8 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 16 | 18 | 8 | 8 | 5 | 6.5 | 5 | 7 | 30.8 | 32.0 | 32.0 | 36.0 | 6 | 17 | 39.0 | 6 | 17 | 29.0 | 5 | 7.5 | 5 | 6.5 | 25.6 | 50 | 62 | 74 | 6 | 8 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 16 | 18 | 8 | 8 | 5 | 6 | 5 | 7 | 30.8 | 32.0 | 32.0 | 36.0 | 6 | 16 | 39.0 | 6 | 16 | 29.0 | 5 | 7 | 5 | 6.5 | 25.6 | 50 | 62 | 74 | 6 | 8 | 35.0 | 5 | 12 | 5 | 11.5 | 0 |
| 48 FT | 17 | 19 | 8 | 8 | 5 | 6.5 | 5 | 6.5 | 30.8 | 37.0 | 37.0 | 37.0 | 5 | 12 | 34.5 | 5 | 12 | 24.5 | 5 | 7.5 | 5 | 6.5 | 25.9 | 51 | 63 | 75 | 6 | 8 | 35.0 | 5 | 12 | 5 | 10.5 | 0 |
| 50 FT | 17 | 19 | 8 | 8 | 5 | 6 | 5 | 6.5 | 30.8 | 37.0 | 37.0 | 37.0 | 6 | 16 | 38.5 | 6 | 16 | 28.5 | 5 | 7 | 5 | 6.5 | 25.9 | 51 | 63 | 75 | 6 | 7.5 | 35.0 | 5 | 12 | 5 | 10 | 0 |

## SPAN (S) = 6 FT  HEIGHT (HT) = 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=6′ | HT=7′ | | | | | | | | | | | | | HT=6′ | HT=7′ | | | | | | | | |
| 1 FT | 11 | 8 | 8 | 8 | 5 | 8 | 4 | 9.5 | 34.5 | 27.0 | 27.0 | 4 | 16 | 64.5 | 4 | 16 | 23.5 | 4 | 9 | 4 | 7.5 | 48.9 | 76 | 88 | 5 | 7.5 | 34.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 5 | 8 | 4 | 9.5 | 34.5 | 27.0 | 27.0 | 4 | 15 | 64.5 | 4 | 15 | 23.0 | 4 | 8.5 | 4 | 7 | 45.0 | 76 | 88 | 5 | 7.5 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 7.5 | 4 | 7.5 | 34.5 | 24.0 | 24.0 | 4 | 13 | 64.5 | 4 | 13 | 21.0 | 4 | 8.5 | 4 | 7 | 41.6 | 76 | 88 | 5 | 7 | 33.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 9 | 4 | 7.5 | 40.9 | 24.0 | 24.0 | 4 | 13 | 36.0 | 4 | 13 | 20.5 | 4 | 8 | 4 | 6.5 | 38.1 | 76 | 88 | 5 | 7 | 32.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 9 | 4 | 7 | 37.0 | 24.0 | 24.0 | 4 | 12 | 34.0 | 4 | 12 | 20.5 | 4 | 7.5 | 4 | 6 | 36.3 | 76 | 88 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 6 | 35.1 | 24.0 | 24.0 | 5 | 17 | 33.0 | 5 | 17 | 21.0 | 4 | 7.5 | 4 | 6.5 | 35.5 | 77 | 89 | 5 | 7 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 8 | 8 | 4 | 7 | 5 | 6.5 | 34.1 | 24.0 | 24.0 | 5 | 16 | 32.5 | 5 | 16 | 21.5 | 4 | 6.5 | 4 | 6 | 34.5 | 77 | 89 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 8 | 8 | 4 | 7 | 5 | 6.5 | 31.8 | 24.0 | 24.0 | 5 | 16 | 31.5 | 5 | 16 | 21.5 | 4 | 6.5 | 4 | 6 | 32.0 | 77 | 89 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 10 | 8 | 8 | 4 | 6.5 | 5 | 6 | 31.6 | 24.0 | 24.0 | 5 | 15 | 31.0 | 5 | 15 | 22.5 | 4 | 6.5 | 4 | 7 | 32.0 | 78 | 90 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 9 | 11 | 8 | 8 | 4 | 6.5 | 5 | 6.5 | 31.8 | 25.0 | 25.0 | 5 | 16 | 31.0 | 5 | 16 | 21.5 | 4 | 6.5 | 4 | 6.5 | 32.3 | 79 | 91 | 5 | 7 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 10 | 11 | 8 | 8 | 4 | 6 | 5 | 7.5 | 31.8 | 26.0 | 30.0 | 5 | 15 | 31.0 | 5 | 15 | 21.0 | 4 | 6 | 5 | 7.5 | 32.1 | 79 | 91 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 10 | 12 | 8 | 8 | 5 | 9 | 5 | 7 | 31.6 | 26.0 | 30.0 | 5 | 15 | 31.0 | 5 | 15 | 21.5 | 4 | 6 | 5 | 8 | 32.3 | 80 | 92 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 11 | 12 | 8 | 8 | 5 | 9 | 5 | 7.5 | 31.8 | 27.0 | 31.0 | 5 | 14 | 31.0 | 5 | 14 | 20.5 | 5 | 8.5 | 5 | 7.5 | 32.1 | 80 | 92 | 5 | 6 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 11 | 13 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 31.8 | 27.0 | 31.0 | 5 | 14 | 31.0 | 5 | 14 | 21.0 | 5 | 9 | 5 | 7.5 | 32.3 | 81 | 93 | 5 | 6 | 32.0 | 5 | 12 | 5 | 11 | 0 |
| 28 FT | 12 | 14 | 8 | 8 | 5 | 8.5 | 5 | 7 | 31.9 | 28.0 | 32.0 | 5 | 13 | 30.5 | 5 | 13 | 20.0 | 5 | 9 | 5 | 8 | 32.6 | 82 | 94 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 10 | 0 |
| 30 FT | 12 | 14 | 8 | 8 | 5 | 7.5 | 5 | 6.5 | 31.8 | 28.0 | 32.0 | 5 | 13 | 30.5 | 5 | 13 | 20.5 | 5 | 8.5 | 5 | 7.5 | 32.5 | 82 | 94 | 5 | 6 | 32.0 | 5 | 12 | 5 | 9.5 | 0 |
| 32 FT | 13 | 15 | 8 | 8 | 5 | 8 | 5 | 6.5 | 32.0 | 29.0 | 33.0 | 5 | 12 | 30.0 | 5 | 12 | 20.0 | 5 | 8.5 | 5 | 7.5 | 32.8 | 83 | 95 | 5 | 6 | 32.0 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 13 | 15 | 8 | 8 | 5 | 7 | 5 | 6 | 31.9 | 29.0 | 33.0 | 5 | 12 | 30.0 | 5 | 12 | 20.0 | 5 | 8 | 5 | 7 | 32.8 | 83 | 95 | 5 | 6 | 32.0 | 5 | 12 | 5 | 9.5 | 0 |
| 36 FT | 14 | 16 | 9 | 8 | 5 | 7.5 | 5 | 7.5 | 32.6 | 30.0 | 34.0 | 5 | 12 | 29.5 | 5 | 12 | 19.5 | 5 | 8 | 5 | 8 | 33.3 | 84 | 96 | 5 | 6 | 32.0 | 5 | 12 | 5 | 9 | 0 |
| 38 FT | 14 | 16 | 9 | 8 | 5 | 7 | 5 | 7 | 32.5 | 30.0 | 34.0 | 5 | 12 | 29.5 | 5 | 12 | 19.5 | 5 | 8 | 5 | 8 | 33.1 | 84 | 96 | 6 | 8 | 35.0 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 15 | 17 | 9 | 8 | 5 | 7 | 5 | 6.5 | 37.8 | 31.0 | 35.0 | 5 | 13 | 34.0 | 5 | 13 | 24.5 | 5 | 8 | 5 | 8 | 33.5 | 85 | 97 | 6 | 8.5 | 35.0 | 5 | 12 | 5 | 8.5 | 0 |
| 42 FT | 15 | 17 | 10 | 8 | 5 | 7 | 5 | 7.5 | 38.3 | 31.0 | 35.0 | 5 | 12 | 34.0 | 5 | 12 | 24.5 | 5 | 7.5 | 5 | 7.5 | 33.6 | 85 | 97 | 6 | 8 | 35.0 | 5 | 12 | 5 | 9 | 0 |
| 44 FT | 15 | 18 | 10 | 8 | 5 | 6 | 5 | 7 | 38.4 | 31.0 | 35.0 | 5 | 12 | 34.0 | 5 | 12 | 24.5 | 5 | 7.5 | 5 | 7.5 | 33.9 | 86 | 98 | 6 | 8 | 35.0 | 5 | 12 | 5 | 8.5 | 0 |
| 46 FT | 16 | 18 | 10 | 8 | 5 | 6.5 | 5 | 6.5 | 38.4 | 32.0 | 36.0 | 5 | 12 | 33.0 | 5 | 12 | 24.5 | 5 | 7.5 | 5 | 7.5 | 34.0 | 86 | 98 | 6 | 7.5 | 35.0 | 5 | 12 | 5 | 8 | 0 |
| 48 FT | 16 | 19 | 11 | 8 | 5 | 6.5 | 5 | 7 | 39.0 | 32.0 | 36.0 | 5 | 12 | 33.0 | 5 | 12 | 24.5 | 5 | 7.5 | 5 | 8.5 | 34.4 | 87 | 99 | 6 | 8 | 35.0 | 5 | 12 | 5 | 8.5 | 0 |
| 50 FT | 17 | 19 | 11 | 8 | 5 | 6.5 | 5 | 7 | 39.1 | 33.0 | 37.0 | 5 | 13 | 32.5 | 5 | 13 | 24.5 | 5 | 7 | 5 | 8 | 34.5 | 87 | 99 | 6 | 7.5 | 35.0 | 5 | 12 | 5 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 6 FEET
HEIGHT (HT): 3 THRU 7 FEET

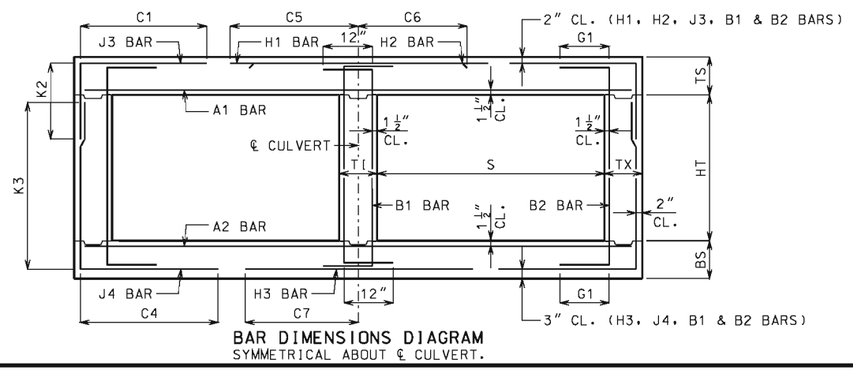
DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO.
6 OF 27

## SPAN (S) = 6 FT  HEIGHT (HT) = 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | |
| | | | | | | | | | | K2 | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=8′ | HT=9′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=8′ | HT=9′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 9 | 8 | 8 | 5 | 8 | 4 | 7 | 34.5 | 27.0 | 27.0 | 4 | 16 | 64.5 | 4 | 16 | 23.5 | 4 | 9.5 | 4 | 6.5 | 59.4 | 101 | 113 | 4 | 6.5 | 34.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 9 | 8 | 8 | 5 | 8 | 4 | 6.5 | 34.5 | 27.0 | 27.0 | 4 | 16 | 64.5 | 4 | 16 | 23.0 | 4 | 9 | 4 | 6 | 57.0 | 101 | 113 | 4 | 6 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 9 | 8 | 4 | 7.5 | 4 | 6.5 | 35.1 | 24.0 | 24.0 | 4 | 13 | 65.0 | 4 | 13 | 21.0 | 4 | 9.5 | 4 | 6.5 | 53.0 | 101 | 113 | 4 | 6 | 33.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 9 | 9 | 8 | 4 | 9 | 4 | 6 | 53.1 | 24.0 | 24.0 | 4 | 13 | 36.0 | 4 | 13 | 20.5 | 4 | 9 | 4 | 6 | 49.5 | 101 | 113 | 4 | 6 | 33.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 9 | 8 | 4 | 9 | 5 | 7 | 46.5 | 24.0 | 28.0 | 4 | 12 | 33.5 | 4 | 12 | 20.5 | 4 | 8 | 5 | 6.5 | 46.5 | 101 | 113 | 5 | 7.5 | 32.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 9 | 8 | 4 | 8 | 5 | 6 | 43.8 | 24.0 | 28.0 | 5 | 17 | 32.5 | 5 | 17 | 20.5 | 4 | 7.5 | 5 | 6 | 44.6 | 101 | 113 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 11.5 | 0 |
| 12 FT | 8 | 9 | 10 | 8 | 4 | 7.5 | 5 | 6.5 | 41.8 | 24.0 | 28.0 | 5 | 17 | 32.0 | 5 | 17 | 21.5 | 4 | 6.5 | 5 | 6.5 | 42.9 | 101 | 113 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 11.5 | 0 |
| 14 FT | 8 | 9 | 10 | 8 | 4 | 7.5 | 5 | 6.5 | 38.5 | 24.0 | 28.0 | 5 | 17 | 31.0 | 5 | 17 | 21.0 | 4 | 6.5 | 5 | 6.5 | 39.6 | 101 | 113 | 5 | 6 | 31.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 10 | 10 | 8 | 4 | 6.5 | 5 | 6 | 38.1 | 24.0 | 28.0 | 5 | 16 | 31.0 | 5 | 16 | 22.0 | 4 | 6.5 | 5 | 7 | 40.6 | 102 | 114 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 11.5 | 0 |
| 18 FT | 9 | 11 | 10 | 8 | 4 | 6.5 | 5 | 6 | 38.8 | 25.0 | 29.0 | 5 | 16 | 31.0 | 5 | 16 | 21.0 | 4 | 6.5 | 5 | 7 | 41.1 | 103 | 115 | 5 | 7 | 32.0 | 5 | 12 | 5 | 10.5 | 0 |
| 20 FT | 9 | 11 | 10 | 8 | 4 | 6 | 5 | 6 | 38.5 | 25.0 | 29.0 | 5 | 16 | 31.0 | 5 | 16 | 22.0 | 4 | 6 | 5 | 6.5 | 40.9 | 103 | 115 | 5 | 6 | 32.0 | 5 | 12 | 5 | 10 | 0 |
| 22 FT | 10 | 12 | 10 | 8 | 4 | 6 | 5 | 6.5 | 39.1 | 30.0 | 30.0 | 5 | 15 | 30.5 | 5 | 15 | 21.0 | 4 | 6 | 5 | 6.5 | 41.4 | 104 | 116 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 9 | 0 |
| 24 FT | 11 | 13 | 10 | 8 | 4 | 6 | 5 | 6.5 | 39.6 | 31.0 | 31.0 | 5 | 14 | 30.5 | 5 | 14 | 20.0 | 4 | 6 | 5 | 6.5 | 41.8 | 105 | 117 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 8.5 | 0 |
| 26 FT | 11 | 13 | 10 | 8 | 5 | 9 | 5 | 6 | 39.4 | 31.0 | 31.0 | 5 | 14 | 30.5 | 5 | 14 | 20.5 | 5 | 9 | 5 | 6.5 | 41.6 | 105 | 117 | 5 | 6 | 32.0 | 5 | 12 | 5 | 8 | 0 |
| 28 FT | 12 | 14 | 10 | 8 | 5 | 9 | 5 | 6 | 40.0 | 32.0 | 32.0 | 5 | 13 | 30.0 | 5 | 13 | 19.5 | 4 | 6 | 5 | 6.5 | 42.0 | 106 | 118 | 5 | 6.5 | 32.0 | 5 | 12 | 5 | 8 | 0 |
| 30 FT | 12 | 14 | 10 | 8 | 5 | 8 | 5 | 6 | 39.9 | 32.0 | 32.0 | 5 | 13 | 30.0 | 5 | 13 | 20.0 | 5 | 8.5 | 5 | 6 | 41.9 | 106 | 118 | 5 | 6 | 32.0 | 5 | 12 | 5 | 8 | 0 |
| 32 FT | 13 | 15 | 11 | 8 | 5 | 8.5 | 5 | 7 | 40.4 | 33.0 | 33.0 | 5 | 13 | 29.0 | 5 | 13 | 19.5 | 5 | 8.5 | 5 | 7 | 42.3 | 107 | 119 | 5 | 6 | 32.0 | 5 | 12 | 5 | 7.5 | 0 |
| 34 FT | 13 | 15 | 11 | 8 | 5 | 8 | 5 | 6.5 | 40.3 | 33.0 | 33.0 | 5 | 13 | 29.0 | 5 | 13 | 19.5 | 5 | 8 | 5 | 7 | 42.1 | 107 | 119 | 6 | 8 | 35.0 | 5 | 12 | 5 | 7.5 | 0 |
| 36 FT | 14 | 16 | 11 | 8 | 5 | 8 | 5 | 6 | 40.8 | 34.0 | 34.0 | 5 | 14 | 28.5 | 5 | 14 | 19.5 | 5 | 8.5 | 5 | 7 | 42.6 | 108 | 120 | 5 | 6 | 32.0 | 5 | 12 | 5 | 7.5 | 0 |
| 38 FT | 14 | 16 | 12 | 8 | 5 | 7.5 | 5 | 6.5 | 40.8 | 34.0 | 34.0 | 5 | 13 | 28.5 | 5 | 13 | 19.5 | 5 | 7.5 | 5 | 6.5 | 42.5 | 108 | 120 | 6 | 8 | 35.0 | 5 | 12 | 5 | 7 | 0 |
| 40 FT | 14 | 17 | 12 | 8 | 5 | 7 | 5 | 6 | 40.8 | 34.0 | 34.0 | 5 | 12 | 28.5 | 5 | 12 | 19.5 | 5 | 8 | 5 | 6.5 | 43.0 | 109 | 121 | 6 | 8 | 35.0 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 15 | 17 | 13 | 8 | 5 | 7 | 5 | 6 | 46.4 | 35.0 | 35.0 | 5 | 13 | 33.0 | 5 | 13 | 24.5 | 5 | 7 | 5 | 6 | 42.8 | 109 | 121 | 6 | 7.5 | 35.0 | 5 | 12 | 5 | 7 | 0 |
| 44 FT | 15 | 18 | 13 | 8 | 5 | 7 | 5 | 6 | 46.4 | 35.0 | 35.0 | 5 | 13 | 33.0 | 5 | 13 | 24.5 | 5 | 7.5 | 5 | 6 | 43.3 | 110 | 122 | 6 | 8 | 35.0 | 5 | 12 | 5 | 6.5 | 0 |
| 46 FT | 15 | 18 | 13 | 8 | 5 | 6 | 5 | 6 | 46.3 | 35.0 | 35.0 | 5 | 12 | 33.0 | 5 | 12 | 24.5 | 5 | 7.5 | 5 | 6 | 43.3 | 110 | 122 | 6 | 7.5 | 35.0 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 16 | 19 | 14 | 8 | 5 | 6.5 | 5 | 6 | 47.0 | 36.0 | 36.0 | 5 | 14 | 32.5 | 5 | 14 | 24.0 | 5 | 7.5 | 5 | 6 | 43.8 | 111 | 123 | 6 | 7.5 | 35.0 | 5 | 12 | 5 | 6.5 | 0 |
| 50 FT | 16 | 19 | 14 | 8 | 5 | 6 | 5 | 6 | 46.9 | 36.0 | 36.0 | 5 | 13 | 32.5 | 5 | 13 | 24.0 | 5 | 7 | 5 | 6 | 43.6 | 111 | 123 | 6 | 7.5 | 35.0 | 5 | 12 | 5 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 6 FEET
HEIGHT (HT): 8 THRU 9 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 7 OF 27

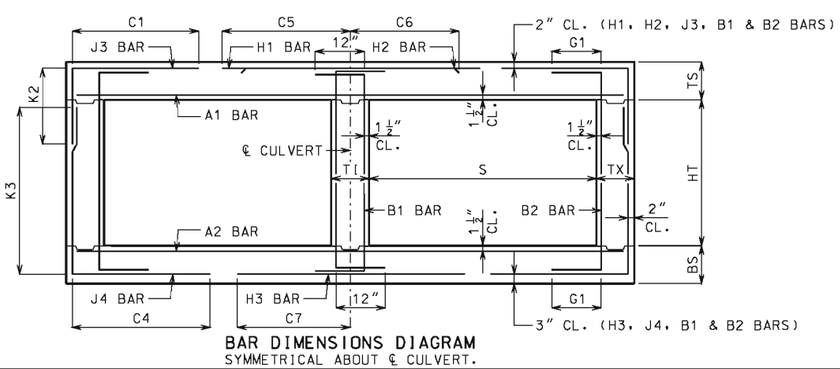
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 7 FT  HEIGHT (HT) = 4 FT OR 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=4′ | HT=5′ | HT=6′ | | | | | | | | | | | | HT=4′ | HT=5′ | HT=6′ | | | | | | | |
| 1 FT | 12 | 8 | 8 | 8 | 5 | 8 | 4 | 8.5 | 38.1 | 28.0 | 28.0 | 28.0 | 4 | 15 | 73.0 | 4 | 15 | 25.5 | 4 | 7 | 4 | 6.5 | 41.8 | 52 | 64 | 76 | 5 | 6.5 | 37.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 9 | 8 | 8 | 5 | 7.5 | 4 | 8.5 | 38.1 | 28.0 | 28.0 | 28.0 | 4 | 14 | 73.0 | 4 | 14 | 24.5 | 4 | 7.5 | 4 | 8.5 | 39.9 | 53 | 65 | 77 | 5 | 7 | 37.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 6 | 4 | 6.5 | 38.4 | 24.0 | 24.0 | 24.0 | 5 | 17 | 48.0 | 5 | 17 | 23.5 | 4 | 7 | 4 | 7 | 35.8 | 52 | 64 | 76 | 5 | 6 | 36.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 7 | 4 | 7 | 33.9 | 24.0 | 24.0 | 24.0 | 5 | 17 | 39.0 | 5 | 17 | 23.5 | 4 | 6.5 | 4 | 6.5 | 33.3 | 52 | 64 | 76 | 6 | 7 | 38.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 8 | 8 | 4 | 7 | 4 | 6.5 | 32.1 | 24.0 | 24.0 | 24.0 | 5 | 16 | 37.0 | 5 | 16 | 24.0 | 4 | 6.5 | 4 | 8 | 31.8 | 53 | 65 | 77 | 5 | 6 | 35.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 10 | 8 | 8 | 4 | 6 | 5 | 7 | 31.5 | 24.0 | 24.0 | 24.0 | 5 | 15 | 36.0 | 5 | 15 | 24.0 | 4 | 6.5 | 4 | 9.5 | 30.5 | 54 | 66 | 78 | 5 | 6.5 | 35.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 9 | 10 | 8 | 8 | 4 | 6 | 4 | 6.5 | 30.5 | 25.0 | 25.0 | 25.0 | 5 | 15 | 35.5 | 5 | 15 | 24.0 | 5 | 9 | 4 | 8.5 | 29.8 | 54 | 66 | 78 | 5 | 6 | 35.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 9 | 11 | 8 | 8 | 5 | 8.5 | 5 | 7 | 30.4 | 25.0 | 25.0 | 25.0 | 5 | 14 | 35.5 | 5 | 14 | 24.0 | 5 | 9 | 4 | 8.5 | 29.1 | 55 | 67 | 79 | 5 | 6 | 35.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 10 | 11 | 8 | 8 | 4 | 6 | 4 | 6.5 | 28.5 | 26.0 | 26.0 | 26.0 | 5 | 15 | 34.5 | 5 | 15 | 23.0 | 5 | 8.5 | 4 | 8 | 27.8 | 55 | 67 | 79 | 5 | 6 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 10 | 12 | 8 | 8 | 5 | 8 | 5 | 8 | 28.6 | 26.0 | 26.0 | 26.0 | 5 | 14 | 34.5 | 5 | 14 | 23.5 | 5 | 8.5 | 4 | 8.5 | 27.4 | 56 | 68 | 80 | 5 | 6 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 11 | 12 | 8 | 8 | 5 | 8 | 5 | 9 | 28.1 | 27.0 | 27.0 | 27.0 | 5 | 14 | 34.5 | 5 | 14 | 23.5 | 5 | 7 | 4 | 7 | 27.5 | 56 | 68 | 80 | 6 | 7 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 12 | 13 | 8 | 8 | 5 | 8 | 5 | 8.5 | 27.9 | 28.0 | 28.0 | 28.0 | 5 | 13 | 34.5 | 5 | 13 | 23.0 | 5 | 7.5 | 4 | 7 | 27.5 | 57 | 69 | 81 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 12 | 14 | 8 | 8 | 5 | 7.5 | 5 | 8.5 | 28.0 | 28.0 | 28.0 | 28.0 | 5 | 13 | 34.5 | 5 | 13 | 23.5 | 5 | 7.5 | 4 | 7 | 27.3 | 58 | 70 | 82 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 13 | 15 | 8 | 8 | 5 | 7 | 5 | 8.5 | 27.9 | 29.0 | 29.0 | 29.0 | 5 | 12 | 34.5 | 5 | 12 | 22.5 | 5 | 7.5 | 4 | 7 | 27.4 | 59 | 71 | 83 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 14 | 15 | 8 | 8 | 5 | 7 | 5 | 8.5 | 27.6 | 30.0 | 30.0 | 30.0 | 5 | 12 | 34.0 | 5 | 12 | 22.0 | 5 | 7 | 4 | 6.5 | 27.6 | 59 | 71 | 83 | 6 | 7 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 14 | 16 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 27.8 | 30.0 | 30.0 | 30.0 | 5 | 12 | 34.0 | 5 | 12 | 22.5 | 5 | 7 | 4 | 6.5 | 27.5 | 60 | 72 | 84 | 6 | 7 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 15 | 17 | 8 | 8 | 5 | 6.5 | 5 | 8 | 32.8 | 31.0 | 31.0 | 31.0 | 6 | 16 | 43.0 | 6 | 16 | 30.5 | 5 | 7.5 | 4 | 6 | 27.8 | 61 | 73 | 85 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 16 | 17 | 8 | 8 | 5 | 6.5 | 5 | 7 | 32.6 | 32.0 | 32.0 | 32.0 | 6 | 15 | 42.5 | 6 | 15 | 29.5 | 5 | 7 | 4 | 6 | 27.9 | 61 | 73 | 85 | 6 | 7 | 38.0 | 5 | 12 | 5 | 11.5 | 0 |
| 36 FT | 16 | 18 | 8 | 8 | 5 | 6 | 5 | 7 | 32.8 | 32.0 | 36.0 | 36.0 | 6 | 15 | 42.5 | 6 | 15 | 30.0 | 5 | 7 | 5 | 6.5 | 27.9 | 62 | 74 | 86 | 6 | 7 | 38.0 | 5 | 12 | 5 | 10.5 | 0 |
| 38 FT | 17 | 18 | 8 | 8 | 5 | 6 | 5 | 6.5 | 32.8 | 37.0 | 37.0 | 37.0 | 6 | 14 | 42.0 | 6 | 14 | 29.5 | 5 | 6 | 5 | 6.5 | 28.0 | 62 | 74 | 86 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 10 | 0 |
| 40 FT | 17 | 19 | 8 | 8 | 5 | 6 | 5 | 6.5 | 32.8 | 37.0 | 37.0 | 37.0 | 6 | 14 | 42.0 | 6 | 14 | 30.0 | 5 | 6.5 | 5 | 6.5 | 28.0 | 63 | 75 | 87 | 6 | 7 | 38.0 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 18 | 20 | 8 | 8 | 5 | 6 | 5 | 6.5 | 32.9 | 38.0 | 38.0 | 38.0 | 6 | 14 | 41.5 | 6 | 14 | 29.5 | 5 | 6.5 | 5 | 6 | 28.3 | 64 | 76 | 88 | 6 | 7 | 38.0 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 18 | 20 | 8 | 8 | 6 | 8 | 5 | 6.5 | 32.9 | 38.0 | 38.0 | 38.0 | 6 | 14 | 41.5 | 6 | 14 | 29.5 | 5 | 6.5 | 5 | 6 | 28.3 | 64 | 76 | 88 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 9.5 | 0 |
| 46 FT | 19 | 21 | 8 | 8 | 6 | 8 | 5 | 6 | 33.0 | 39.0 | 39.0 | 39.0 | 6 | 14 | 41.0 | 6 | 14 | 29.5 | 5 | 6.5 | 6 | 7.5 | 31.5 | 65 | 77 | 89 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 9.5 | 0 |
| 48 FT | 19 | 21 | 8 | 8 | 6 | 8 | 5 | 6 | 32.9 | 39.0 | 39.0 | 39.0 | 6 | 14 | 41.0 | 6 | 14 | 29.5 | 5 | 6 | 6 | 7.5 | 31.4 | 65 | 77 | 89 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 9.5 | 0 |
| 50 FT | 20 | 22 | 9 | 8 | 6 | 8 | 5 | 6.5 | 33.8 | 40.0 | 40.0 | 40.0 | 6 | 15 | 40.0 | 6 | 15 | 29.0 | 5 | 6 | 5 | 6 | 29.0 | 66 | 78 | 90 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 8.5 | 0 |

## SPAN (S) = 7 FT  HEIGHT (HT) = 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=7′ | HT=8′ | | | | | | | | | | | | HT=7′ | HT=8′ | | | | | | | | |
| 1 FT | 12 | 9 | 8 | 8 | 5 | 7.5 | 4 | 8.5 | 38.1 | 28.0 | 28.0 | 4 | 15 | 73.0 | 4 | 15 | 25.5 | 4 | 7.5 | 4 | 7 | 56.0 | 89 | 101 | 5 | 7 | 37.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 9 | 8 | 8 | 5 | 7.5 | 4 | 8 | 38.1 | 28.0 | 28.0 | 4 | 15 | 73.0 | 4 | 15 | 25.0 | 4 | 7 | 4 | 6.5 | 51.4 | 89 | 101 | 5 | 7 | 37.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 8 | 8 | 4 | 6 | 5 | 6.5 | 40.1 | 24.0 | 24.0 | 5 | 17 | 75.0 | 5 | 17 | 23.5 | 4 | 7.5 | 4 | 6.5 | 47.8 | 89 | 101 | 5 | 7 | 37.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 9 | 8 | 8 | 4 | 7 | 5 | 6.5 | 44.6 | 24.0 | 24.0 | 5 | 17 | 39.5 | 5 | 17 | 23.5 | 4 | 7 | 4 | 6 | 43.5 | 89 | 101 | 5 | 6.5 | 36.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 9 | 8 | 4 | 7 | 4 | 6 | 40.1 | 24.0 | 24.0 | 5 | 16 | 37.0 | 5 | 16 | 23.5 | 4 | 6.5 | 4 | 6.5 | 40.4 | 89 | 101 | 5 | 6 | 35.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 10 | 9 | 8 | 4 | 6.5 | 5 | 6 | 38.4 | 24.0 | 24.0 | 5 | 15 | 36.0 | 5 | 15 | 24.0 | 4 | 6.5 | 4 | 7 | 39.5 | 90 | 102 | 5 | 6.5 | 35.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 9 | 10 | 9 | 8 | 4 | 6 | 5 | 6.5 | 37.8 | 25.0 | 25.0 | 5 | 15 | 35.5 | 5 | 15 | 24.0 | 5 | 9 | 4 | 6 | 38.1 | 90 | 102 | 5 | 6 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 9 | 11 | 9 | 8 | 5 | 8.5 | 5 | 6 | 37.1 | 25.0 | 25.0 | 5 | 14 | 35.0 | 5 | 14 | 23.5 | 5 | 9 | 4 | 6 | 37.9 | 91 | 103 | 5 | 6 | 35.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 9 | 11 | 9 | 8 | 5 | 8.5 | 5 | 6 | 34.8 | 25.0 | 25.0 | 5 | 14 | 34.0 | 5 | 14 | 23.5 | 5 | 8.5 | 4 | 6 | 35.3 | 91 | 103 | 5 | 6 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 10 | 12 | 9 | 8 | 5 | 8.5 | 5 | 7 | 34.9 | 26.0 | 30.0 | 5 | 14 | 34.0 | 5 | 14 | 23.5 | 5 | 8.5 | 5 | 8.5 | 35.3 | 92 | 104 | 5 | 6 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 11 | 13 | 9 | 8 | 5 | 8 | 5 | 7.5 | 34.9 | 27.0 | 31.0 | 5 | 14 | 34.0 | 5 | 14 | 23.0 | 5 | 8.5 | 5 | 8 | 35.4 | 93 | 105 | 6 | 8 | 38.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 11 | 13 | 9 | 8 | 5 | 7 | 5 | 6.5 | 34.8 | 27.0 | 31.0 | 5 | 13 | 34.0 | 5 | 13 | 23.5 | 5 | 7.5 | 5 | 8 | 35.1 | 93 | 105 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 11.5 | 0 |
| 24 FT | 12 | 14 | 9 | 8 | 5 | 7.5 | 5 | 7 | 34.8 | 28.0 | 32.0 | 5 | 13 | 34.0 | 5 | 13 | 23.0 | 5 | 8 | 5 | 8 | 35.4 | 94 | 106 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 10.5 | 0 |
| 26 FT | 13 | 15 | 9 | 8 | 5 | 7.5 | 5 | 7 | 34.9 | 29.0 | 33.0 | 5 | 12 | 33.5 | 5 | 12 | 22.0 | 5 | 8 | 5 | 8 | 35.6 | 95 | 107 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 9.5 | 0 |
| 28 FT | 13 | 15 | 9 | 8 | 5 | 6.5 | 5 | 6.5 | 34.8 | 33.0 | 33.0 | 5 | 12 | 33.5 | 5 | 12 | 22.5 | 5 | 7 | 5 | 7.5 | 35.4 | 95 | 107 | 6 | 7 | 38.0 | 5 | 12 | 5 | 9 | 0 |
| 30 FT | 14 | 16 | 9 | 8 | 5 | 7 | 5 | 6.5 | 34.9 | 34.0 | 34.0 | 5 | 12 | 33.0 | 5 | 12 | 21.5 | 5 | 7.5 | 5 | 7.5 | 35.6 | 96 | 108 | 6 | 7 | 38.0 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 15 | 17 | 9 | 8 | 5 | 7 | 5 | 6 | 40.0 | 35.0 | 35.0 | 6 | 16 | 41.5 | 6 | 16 | 29.5 | 5 | 7.5 | 5 | 7.5 | 36.0 | 97 | 109 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 8.5 | 0 |
| 34 FT | 15 | 17 | 10 | 8 | 5 | 6.5 | 5 | 7 | 40.5 | 35.0 | 35.0 | 6 | 16 | 41.5 | 6 | 16 | 30.0 | 5 | 6.5 | 5 | 7.5 | 36.0 | 97 | 109 | 6 | 7 | 38.0 | 5 | 12 | 5 | 8.5 | 0 |
| 36 FT | 16 | 18 | 10 | 8 | 5 | 6.5 | 5 | 6.5 | 40.6 | 36.0 | 36.0 | 6 | 15 | 41.0 | 6 | 15 | 29.5 | 5 | 7 | 5 | 7.5 | 36.4 | 98 | 110 | 6 | 7 | 38.0 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 16 | 19 | 11 | 8 | 5 | 6 | 5 | 7 | 41.3 | 32.0 | 36.0 | 6 | 15 | 40.5 | 6 | 15 | 29.5 | 5 | 7 | 5 | 7 | 36.8 | 99 | 111 | 6 | 7 | 38.0 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 17 | 19 | 11 | 8 | 5 | 6 | 5 | 7 | 41.3 | 33.0 | 37.0 | 6 | 15 | 40.0 | 6 | 15 | 29.0 | 5 | 6.5 | 5 | 7 | 36.8 | 99 | 111 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 8 | 0 |
| 42 FT | 17 | 20 | 11 | 8 | 5 | 6 | 5 | 6.5 | 41.4 | 37.0 | 37.0 | 6 | 15 | 40.0 | 6 | 15 | 29.0 | 5 | 6.5 | 5 | 7 | 36.9 | 100 | 112 | 6 | 7 | 38.0 | 5 | 12 | 5 | 7.5 | 0 |
| 44 FT | 18 | 20 | 11 | 8 | 6 | 8.5 | 5 | 6 | 41.4 | 38.0 | 38.0 | 6 | 16 | 39.5 | 6 | 16 | 29.0 | 5 | 6.5 | 5 | 7 | 37.0 | 100 | 112 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 7.5 | 0 |
| 46 FT | 18 | 21 | 12 | 8 | 6 | 8 | 5 | 6.5 | 42.1 | 38.0 | 38.0 | 6 | 15 | 39.5 | 6 | 15 | 29.0 | 5 | 6.5 | 5 | 7 | 37.4 | 101 | 113 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 7.5 | 0 |
| 48 FT | 19 | 21 | 12 | 8 | 6 | 8 | 5 | 6.5 | 42.0 | 39.0 | 39.0 | 6 | 16 | 39.0 | 6 | 16 | 29.0 | 5 | 6 | 5 | 6.5 | 37.5 | 101 | 113 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 7 | 0 |
| 50 FT | 19 | 22 | 12 | 8 | 6 | 7.5 | 5 | 6 | 42.1 | 39.0 | 39.0 | 6 | 15 | 39.0 | 6 | 15 | 29.0 | 5 | 6 | 5 | 6.5 | 37.6 | 102 | 114 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

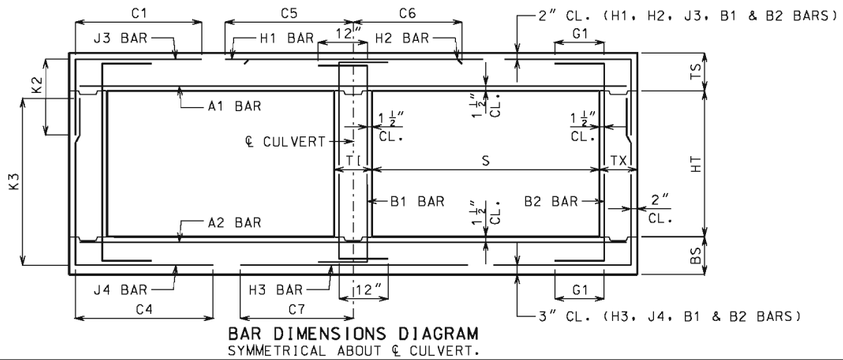
SPAN (S): 7 FEET
HEIGHT (HT): 4 THRU 8 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

## SPAN (S) = 7 FT  HEIGHT (HT) = 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=9' | HT=10' | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=9' | HT=10' | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 12 | 9 | 8 | 8 | 5 | 7.5 | 4 | 6 | 38.1 | 28.0 | 28.0 | 4 | 16 | 73.0 | 4 | 16 | 26.0 | 4 | 7 | 6 | 7 | 68.1 | 113 | 125 | 5 | 7 | 38.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 9 | 8 | 8 | 5 | 7.5 | 5 | 8.5 | 38.1 | 28.0 | 32.0 | 4 | 15 | 73.0 | 4 | 15 | 25.0 | 4 | 6.5 | 6 | 6.5 | 64.9 | 113 | 125 | 5 | 6.5 | 37.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 9 | 8 | 4 | 6 | 5 | 6 | 40.8 | 24.0 | 28.0 | 5 | 17 | 75.5 | 5 | 17 | 23.5 | 4 | 7.5 | 5 | 6 | 57.8 | 113 | 125 | 5 | 7 | 37.0 | 5 | 12 | 5 | 11.5 | 12 |
| 6 FT | 8 | 9 | 10 | 8 | 4 | 7 | 5 | 6.5 | 55.0 | 24.0 | 28.0 | 5 | 17 | 39.5 | 5 | 17 | 23.0 | 4 | 7 | 5 | 6.5 | 51.9 | 113 | 125 | 5 | 6.5 | 36.0 | 5 | 12 | 5 | 11.5 | 12 |
| 8 FT | 8 | 9 | 10 | 8 | 4 | 7 | 5 | 6 | 49.0 | 28.0 | 28.0 | 5 | 16 | 37.0 | 5 | 16 | 23.5 | 4 | 6.5 | 5 | 6 | 49.3 | 113 | 125 | 5 | 6 | 35.5 | 5 | 12 | 5 | 10.5 | 0 |
| 10 FT | 8 | 10 | 10 | 8 | 4 | 6.5 | 6 | 7 | 49.0 | 28.0 | 28.0 | 5 | 15 | 36.0 | 5 | 15 | 24.0 | 4 | 6.5 | 5 | 6 | 49.1 | 114 | 126 | 5 | 6 | 35.5 | 5 | 12 | 5 | 10 | 0 |
| 12 FT | 9 | 10 | 10 | 8 | 4 | 6 | 5 | 6 | 46.1 | 29.0 | 29.0 | 5 | 16 | 35.5 | 5 | 16 | 23.5 | 5 | 9 | 6 | 7 | 50.3 | 114 | 126 | 5 | 6 | 35.0 | 5 | 12 | 5 | 9.5 | 0 |
| 14 FT | 9 | 11 | 10 | 8 | 5 | 9 | 5 | 6 | 44.6 | 29.0 | 29.0 | 5 | 15 | 35.0 | 5 | 15 | 23.5 | 5 | 9 | 6 | 7.5 | 50.6 | 115 | 127 | 5 | 6 | 35.0 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 9 | 11 | 10 | 8 | 5 | 9 | 5 | 6 | 41.5 | 29.0 | 29.0 | 5 | 14 | 34.0 | 5 | 14 | 23.5 | 5 | 8.5 | 5 | 6 | 44.0 | 115 | 127 | 5 | 6 | 35.0 | 5 | 12 | 5 | 9.5 | 0 |
| 18 FT | 10 | 12 | 10 | 8 | 5 | 8.5 | 5 | 6.5 | 42.0 | 30.0 | 30.0 | 5 | 15 | 34.0 | 5 | 15 | 23.5 | 5 | 8.5 | 5 | 6 | 44.3 | 116 | 128 | 5 | 6 | 35.0 | 5 | 12 | 5 | 8.5 | 0 |
| 20 FT | 11 | 13 | 10 | 8 | 5 | 8.5 | 5 | 6 | 42.4 | 31.0 | 31.0 | 5 | 14 | 33.5 | 5 | 14 | 22.5 | 5 | 8.5 | 5 | 6 | 44.6 | 117 | 129 | 6 | 8 | 38.0 | 5 | 12 | 5 | 8 | 0 |
| 22 FT | 11 | 13 | 10 | 8 | 5 | 7.5 | 5 | 6 | 42.1 | 31.0 | 31.0 | 5 | 14 | 33.5 | 5 | 14 | 23.5 | 5 | 7.5 | 6 | 7 | 47.3 | 117 | 129 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 12 | 14 | 10 | 8 | 5 | 7.5 | 5 | 6 | 42.5 | 32.0 | 32.0 | 5 | 13 | 33.5 | 5 | 13 | 22.5 | 5 | 8 | 6 | 7.5 | 47.6 | 118 | 130 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 8 | 0 |
| 26 FT | 13 | 15 | 10 | 8 | 5 | 7.5 | 6 | 7 | 45.8 | 33.0 | 37.0 | 5 | 12 | 33.0 | 5 | 12 | 21.5 | 5 | 8 | 6 | 7.5 | 47.9 | 119 | 131 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 8 | 0 |
| 28 FT | 13 | 16 | 11 | 8 | 5 | 7 | 5 | 6 | 42.9 | 33.0 | 33.0 | 5 | 12 | 32.5 | 5 | 12 | 22.0 | 5 | 8 | 5 | 6.5 | 45.3 | 120 | 132 | 6 | 7.5 | 38.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 14 | 16 | 11 | 8 | 5 | 7 | 6 | 7.5 | 46.1 | 34.0 | 34.0 | 5 | 12 | 32.0 | 5 | 12 | 21.0 | 5 | 7.5 | 5 | 6 | 45.0 | 120 | 132 | 6 | 7 | 38.0 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 14 | 17 | 12 | 8 | 5 | 7 | 5 | 6 | 43.4 | 34.0 | 34.0 | 5 | 12 | 32.0 | 5 | 12 | 21.5 | 5 | 7.5 | 5 | 6.5 | 45.4 | 121 | 133 | 6 | 7 | 38.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 15 | 17 | 12 | 8 | 5 | 6.5 | 6 | 8.5 | 52.6 | 35.0 | 35.0 | 6 | 16 | 40.5 | 6 | 16 | 29.5 | 5 | 6.5 | 5 | 6.5 | 45.1 | 121 | 133 | 6 | 7 | 38.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 15 | 18 | 13 | 8 | 5 | 6 | 6 | 8.5 | 52.9 | 35.0 | 35.0 | 6 | 16 | 40.0 | 6 | 16 | 29.5 | 5 | 7 | 5 | 6 | 45.5 | 122 | 134 | 6 | 7 | 38.0 | 5 | 12 | 5 | 6.5 | 0 |
| 38 FT | 16 | 19 | 13 | 8 | 5 | 6.5 | 6 | 8 | 53.1 | 36.0 | 36.0 | 6 | 16 | 39.5 | 6 | 16 | 29.0 | 5 | 7 | 5 | 6 | 45.9 | 123 | 135 | 6 | 7 | 38.0 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 17 | 19 | 13 | 8 | 5 | 6 | 6 | 7.5 | 53.4 | 37.0 | 37.0 | 5 | 12 | 35.0 | 5 | 12 | 25.0 | 5 | 6.5 | 5 | 6 | 45.8 | 123 | 135 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 17 | 20 | 14 | 8 | 5 | 6 | 6 | 8 | 53.8 | 37.0 | 37.0 | 6 | 16 | 39.0 | 6 | 16 | 29.0 | 5 | 6.5 | 5 | 6 | 46.1 | 124 | 136 | 6 | 6.5 | 38.5 | 5 | 12 | 5 | 6 | 0 |
| 44 FT | 17 | 20 | 14 | 8 | 6 | 8.5 | 6 | 7.5 | 53.6 | 37.0 | 37.0 | 6 | 15 | 39.0 | 6 | 15 | 29.0 | 5 | 6 | 5 | 6 | 46.1 | 124 | 136 | 6 | 6.5 | 38.5 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 18 | 21 | 14 | 8 | 6 | 8 | 6 | 7 | 53.9 | 38.0 | 38.0 | 6 | 17 | 38.5 | 6 | 17 | 29.0 | 5 | 6.5 | 5 | 6 | 46.5 | 125 | 137 | 6 | 6.5 | 38.0 | 5 | 12 | 5 | 6 | 0 |
| 48 FT | 18 | 22 | 15 | 8 | 6 | 8 | 6 | 7.5 | 54.3 | 38.0 | 42.0 | 6 | 16 | 38.5 | 6 | 16 | 29.0 | 5 | 6.5 | 6 | 8 | 49.9 | 126 | 138 | 6 | 6.5 | 38.5 | 5 | 12 | 5 | 6 | 0 |
| 50 FT | 18 | 22 | 15 | 8 | 6 | 7.5 | 6 | 7.5 | 54.3 | 38.0 | 42.0 | 6 | 15 | 38.5 | 6 | 15 | 29.0 | 5 | 6 | 6 | 8 | 49.9 | 126 | 138 | 6 | 6 | 38.5 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 7 FEET
HEIGHT (HT): 9 THRU 10 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

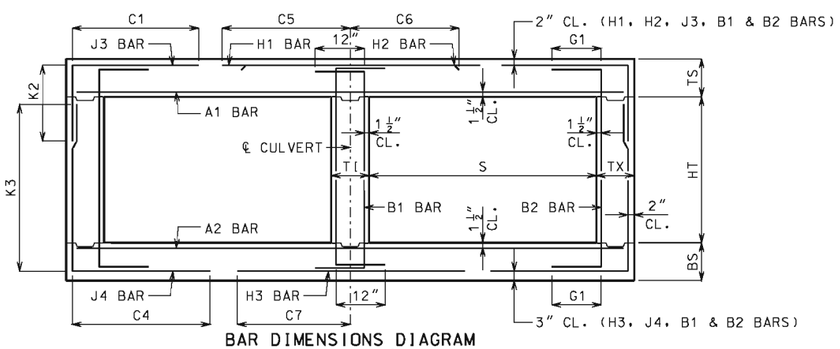
SHEET NO. 9 OF 27

## SPAN (S) = 8 FT  HEIGHT (HT) = 4 FT OR 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=4′ | HT=5′ | HT=6′ | | | | | | | | | | | HT=4′ | HT=5′ | HT=6′ | | | | | | | | |
| 1 FT | 12 | 9 | 8 | 8 | 5 | 7 | 4 | 8.5 | 41.8 | 28.0 | 28.0 | 28.0 | 4 | 12 | 81.5 | 4 | 12 | 26.5 | 4 | 7 | 4 | 8 | 43.0 | 53 | 65 | 77 | 5 | 6.5 | 41.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 9 | 8 | 8 | 5 | 7.5 | 4 | 7.5 | 41.8 | 29.0 | 29.0 | 29.0 | 4 | 13 | 81.5 | 4 | 13 | 26.5 | 4 | 6.5 | 4 | 7 | 39.1 | 53 | 65 | 77 | 5 | 6 | 40.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 6 | 5 | 6.5 | 36.4 | 24.0 | 24.0 | 24.0 | 5 | 15 | 51.0 | 5 | 15 | 26.5 | 4 | 6 | 4 | 6 | 35.3 | 52 | 64 | 76 | 6 | 6.5 | 42.5 | 5 | 9.5 | 5 | 12 | 12 |
| 6 FT | 8 | 9 | 8 | 8 | 4 | 6 | 5 | 6.5 | 34.3 | 24.0 | 24.0 | 24.0 | 5 | 15 | 42.5 | 5 | 15 | 26.0 | 4 | 6 | 4 | 7.5 | 33.1 | 53 | 65 | 77 | 6 | 7 | 42.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 8 | 8 | 4 | 6 | 5 | 6 | 33.1 | 24.0 | 24.0 | 24.0 | 5 | 13 | 40.5 | 5 | 13 | 25.5 | 5 | 8.5 | 4 | 7 | 31.6 | 53 | 65 | 77 | 6 | 6.5 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 4 | 6 | 31.9 | 25.0 | 25.0 | 25.0 | 5 | 14 | 39.5 | 5 | 14 | 25.5 | 5 | 8 | 4 | 8 | 30.4 | 54 | 66 | 78 | 6 | 7 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 10 | 11 | 8 | 8 | 5 | 8 | 4 | 6 | 30.6 | 26.0 | 26.0 | 26.0 | 5 | 14 | 39.0 | 5 | 14 | 25.0 | 5 | 8 | 4 | 8 | 29.3 | 55 | 67 | 79 | 6 | 7 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 11 | 12 | 8 | 8 | 5 | 8 | 4 | 6 | 29.8 | 27.0 | 27.0 | 27.0 | 5 | 14 | 38.5 | 5 | 14 | 25.0 | 5 | 7.5 | 4 | 7.5 | 28.6 | 56 | 68 | 80 | 6 | 7 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 11 | 13 | 8 | 8 | 5 | 7.5 | 5 | 8.5 | 29.6 | 27.0 | 27.0 | 27.0 | 5 | 12 | 38.5 | 5 | 12 | 25.0 | 5 | 7.5 | 4 | 8 | 28.0 | 57 | 69 | 81 | 6 | 7 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 12 | 13 | 8 | 8 | 5 | 7.5 | 4 | 6 | 27.5 | 28.0 | 28.0 | 28.0 | 5 | 13 | 37.5 | 5 | 13 | 25.0 | 5 | 7 | 4 | 7.5 | 26.8 | 57 | 69 | 81 | 6 | 7 | 41.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 12 | 14 | 8 | 8 | 5 | 7 | 5 | 8.5 | 27.8 | 28.0 | 28.0 | 28.0 | 5 | 12 | 37.5 | 5 | 12 | 25.0 | 5 | 7 | 4 | 7.5 | 26.4 | 58 | 70 | 82 | 6 | 7 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 13 | 15 | 8 | 8 | 5 | 6.5 | 6 | 8.5 | 27.4 | 29.0 | 29.0 | 29.0 | 5 | 12 | 37.5 | 5 | 12 | 25.0 | 5 | 7 | 4 | 7 | 26.4 | 59 | 71 | 83 | 6 | 7 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 14 | 16 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 27.3 | 30.0 | 30.0 | 30.0 | 5 | 12 | 37.5 | 5 | 12 | 24.5 | 5 | 7 | 4 | 6.5 | 26.5 | 60 | 72 | 84 | 6 | 7 | 41.5 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 15 | 16 | 8 | 8 | 5 | 6.5 | 5 | 8 | 31.9 | 31.0 | 31.0 | 31.0 | 6 | 16 | 46.5 | 6 | 16 | 33.0 | 5 | 6.5 | 4 | 6.5 | 26.6 | 60 | 72 | 84 | 6 | 7 | 41.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 16 | 17 | 8 | 8 | 5 | 6 | 5 | 7 | 31.8 | 32.0 | 32.0 | 32.0 | 6 | 15 | 46.0 | 6 | 15 | 32.0 | 5 | 6.5 | 4 | 6 | 26.8 | 61 | 73 | 85 | 6 | 6.5 | 41.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 16 | 18 | 8 | 8 | 5 | 6 | 5 | 7 | 32.0 | 32.0 | 32.0 | 36.0 | 6 | 15 | 46.0 | 6 | 15 | 33.0 | 5 | 6.5 | 5 | 6.5 | 26.6 | 62 | 74 | 86 | 6 | 6.5 | 41.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 17 | 19 | 8 | 8 | 5 | 6 | 5 | 6.5 | 31.9 | 37.0 | 37.0 | 37.0 | 6 | 14 | 45.5 | 6 | 14 | 32.0 | 5 | 6.5 | 5 | 6.5 | 26.8 | 63 | 75 | 87 | 6 | 6.5 | 41.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 18 | 19 | 8 | 8 | 6 | 8.5 | 5 | 6.5 | 31.8 | 38.0 | 38.0 | 38.0 | 6 | 13 | 45.5 | 6 | 13 | 31.0 | 5 | 6 | 5 | 6.5 | 26.9 | 63 | 75 | 87 | 6 | 6 | 41.0 | 5 | 12 | 5 | 11 | 0 |
| 36 FT | 18 | 20 | 8 | 8 | 6 | 8 | 5 | 6.5 | 31.9 | 38.0 | 38.0 | 38.0 | 6 | 13 | 45.5 | 6 | 13 | 32.0 | 5 | 6 | 5 | 6 | 26.9 | 64 | 76 | 88 | 6 | 6 | 41.0 | 5 | 12 | 5 | 10 | 0 |
| 38 FT | 19 | 21 | 8 | 8 | 6 | 8 | 5 | 6 | 32.0 | 39.0 | 39.0 | 39.0 | 6 | 13 | 45.0 | 6 | 13 | 31.0 | 5 | 6 | 6 | 7.5 | 30.1 | 65 | 77 | 89 | 6 | 6 | 41.0 | 5 | 12 | 5 | 9.5 | 0 |
| 40 FT | 20 | 22 | 8 | 8 | 6 | 7.5 | 6 | 7.5 | 36.0 | 44.0 | 44.0 | 44.0 | 6 | 13 | 44.5 | 6 | 13 | 30.5 | 5 | 6 | 6 | 7 | 30.4 | 66 | 78 | 90 | 6 | 6 | 41.0 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 20 | 22 | 8 | 8 | 6 | 7.5 | 6 | 7.5 | 36.0 | 44.0 | 44.0 | 44.0 | 6 | 12 | 44.5 | 6 | 12 | 30.5 | 6 | 8.5 | 6 | 7 | 30.3 | 66 | 78 | 90 | 6 | 6 | 41.0 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 21 | 23 | 8 | 8 | 6 | 7.5 | 6 | 7 | 36.0 | 45.0 | 45.0 | 45.0 | 6 | 12 | 43.5 | 6 | 12 | 30.0 | 6 | 8.5 | 6 | 6.5 | 30.5 | 67 | 79 | 91 | 6 | 6 | 41.0 | 5 | 12 | 5 | 9.5 | 0 |
| 46 FT | 21 | 23 | 8 | 8 | 6 | 7 | 6 | 7 | 36.0 | 45.0 | 45.0 | 45.0 | 6 | 12 | 43.5 | 6 | 12 | 30.0 | 6 | 8 | 6 | 6.5 | 30.5 | 67 | 79 | 91 | 7 | 7.5 | 44.0 | 5 | 12 | 5 | 9.5 | 0 |
| 48 FT | 22 | 24 | 8 | 8 | 6 | 7 | 6 | 6.5 | 36.1 | 46.0 | 46.0 | 46.0 | 6 | 12 | 43.0 | 6 | 12 | 30.0 | 6 | 8 | 6 | 6 | 30.8 | 68 | 80 | 92 | 7 | 7.5 | 44.0 | 5 | 12 | 5 | 9 | 0 |
| 50 FT | 22 | 24 | 8 | 8 | 6 | 6.5 | 6 | 6.5 | 36.1 | 46.0 | 46.0 | 46.0 | 6 | 12 | 43.0 | 6 | 12 | 30.0 | 6 | 7.5 | 6 | 6 | 30.8 | 68 | 80 | 92 | 7 | 7.5 | 44.0 | 5 | 12 | 5 | 8.5 | 0 |

## SPAN (S) = 8 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=7′ | HT=8′ | HT=9′ | | | | | | | | | | | HT=7′ | HT=8′ | HT=9′ | | | | | | | | |
| 1 FT | 12 | 9 | 8 | 8 | 5 | 7 | 4 | 6.5 | 41.8 | 28.0 | 28.0 | 28.0 | 4 | 12 | 81.5 | 4 | 12 | 27.5 | 4 | 6 | 5 | 6.5 | 61.6 | 89 | 101 | 113 | 5 | 6 | 41.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 10 | 8 | 8 | 5 | 7 | 4 | 6.5 | 41.8 | 29.0 | 29.0 | 29.0 | 4 | 13 | 81.5 | 4 | 13 | 27.0 | 4 | 6.5 | 4 | 6 | 58.3 | 90 | 102 | 114 | 5 | 6.5 | 40.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 8 | 8 | 4 | 6 | 6 | 7.5 | 43.8 | 24.0 | 24.0 | 28.0 | 5 | 15 | 83.5 | 5 | 15 | 27.0 | 4 | 6 | 5 | 6 | 52.3 | 89 | 101 | 113 | 5 | 6 | 40.0 | 5 | 11 | 5 | 12 | 12 |
| 6 FT | 8 | 10 | 8 | 8 | 4 | 6 | 6 | 7.5 | 51.4 | 24.0 | 24.0 | 28.0 | 5 | 15 | 43.0 | 5 | 15 | 26.0 | 4 | 6.5 | 5 | 6 | 49.0 | 90 | 102 | 114 | 5 | 6.5 | 39.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 11 | 8 | 8 | 4 | 6 | 6 | 7.5 | 46.6 | 24.0 | 24.0 | 28.0 | 5 | 13 | 40.5 | 5 | 13 | 25.5 | 4 | 6.5 | 5 | 6.5 | 46.3 | 91 | 103 | 115 | 5 | 6 | 39.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 9 | 11 | 8 | 8 | 5 | 8.5 | 6 | 7 | 45.3 | 25.0 | 25.0 | 29.0 | 5 | 14 | 39.5 | 5 | 14 | 25.5 | 5 | 8.5 | 5 | 6 | 43.6 | 91 | 103 | 115 | 5 | 6 | 38.5 | 5 | 12 | 5 | 11 | 0 |
| 12 FT | 10 | 12 | 8 | 8 | 5 | 8 | 6 | 7 | 44.4 | 26.0 | 30.0 | 30.0 | 5 | 14 | 39.0 | 5 | 14 | 25.0 | 5 | 8.5 | 5 | 6 | 42.5 | 92 | 104 | 116 | 5 | 6 | 38.5 | 5 | 12 | 5 | 10 | 0 |
| 14 FT | 11 | 12 | 8 | 8 | 5 | 8 | 6 | 7 | 43.5 | 27.0 | 31.0 | 35.0 | 5 | 12 | 38.5 | 5 | 12 | 25.0 | 5 | 7.5 | 6 | 7 | 44.4 | 92 | 104 | 116 | 6 | 7 | 41.5 | 5 | 12 | 5 | 9.5 | 0 |
| 16 FT | 11 | 13 | 8 | 8 | 5 | 7.5 | 6 | 6.5 | 42.9 | 27.0 | 31.0 | 35.0 | 5 | 12 | 38.0 | 5 | 12 | 25.0 | 5 | 7.5 | 6 | 7 | 44.0 | 93 | 105 | 117 | 6 | 7.5 | 41.5 | 5 | 12 | 5 | 9.5 | 0 |
| 18 FT | 12 | 13 | 8 | 8 | 5 | 7.5 | 5 | 6 | 37.1 | 28.0 | 32.0 | 32.0 | 5 | 13 | 37.5 | 5 | 13 | 25.0 | 5 | 7 | 6 | 7.5 | 41.1 | 93 | 105 | 117 | 6 | 7 | 41.0 | 5 | 12 | 5 | 9.5 | 0 |
| 20 FT | 12 | 14 | 8 | 8 | 5 | 7 | 6 | 7 | 39.9 | 32.0 | 32.0 | 36.0 | 5 | 12 | 37.5 | 5 | 12 | 25.0 | 5 | 7 | 6 | 7.5 | 41.1 | 94 | 106 | 118 | 6 | 7 | 41.0 | 5 | 12 | 5 | 9.5 | 0 |
| 22 FT | 13 | 15 | 8 | 8 | 5 | 6.5 | 6 | 7 | 39.9 | 33.0 | 33.0 | 37.0 | 5 | 12 | 37.0 | 5 | 12 | 25.0 | 5 | 7 | 6 | 7.5 | 41.3 | 95 | 107 | 119 | 6 | 7 | 41.0 | 5 | 12 | 5 | 9.5 | 0 |
| 24 FT | 14 | 16 | 8 | 8 | 5 | 6.5 | 6 | 7 | 40.0 | 34.0 | 34.0 | 38.0 | 5 | 12 | 37.0 | 5 | 12 | 24.0 | 5 | 7 | 6 | 7 | 41.4 | 96 | 108 | 120 | 6 | 7 | 41.0 | 5 | 12 | 5 | 9 | 0 |
| 26 FT | 15 | 16 | 9 | 8 | 5 | 6.5 | 5 | 6 | 42.4 | 35.0 | 35.0 | 35.0 | 6 | 16 | 45.5 | 6 | 16 | 32.0 | 5 | 6.5 | 5 | 6 | 38.5 | 96 | 108 | 120 | 6 | 7 | 41.0 | 5 | 12 | 5 | 8.5 | 0 |
| 28 FT | 15 | 17 | 10 | 8 | 5 | 6 | 5 | 6.5 | 42.9 | 31.0 | 35.0 | 35.0 | 6 | 16 | 45.5 | 6 | 16 | 33.0 | 5 | 6.5 | 5 | 7.5 | 38.8 | 97 | 109 | 121 | 6 | 6.5 | 41.5 | 5 | 12 | 5 | 8 | 0 |
| 30 FT | 16 | 18 | 11 | 8 | 5 | 6 | 5 | 6.5 | 43.6 | 32.0 | 36.0 | 36.0 | 6 | 15 | 44.5 | 6 | 15 | 31.5 | 5 | 6.5 | 5 | 7 | 39.1 | 98 | 110 | 122 | 6 | 6.5 | 41.5 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 17 | 19 | 11 | 8 | 5 | 6 | 5 | 6.5 | 43.6 | 33.0 | 37.0 | 37.0 | 6 | 14 | 44.0 | 6 | 14 | 31.0 | 5 | 6.5 | 5 | 7 | 39.4 | 99 | 111 | 123 | 6 | 6 | 41.5 | 5 | 12 | 5 | 7.5 | 0 |
| 34 FT | 17 | 20 | 11 | 8 | 6 | 8 | 5 | 6 | 43.8 | 37.0 | 37.0 | 37.0 | 6 | 14 | 44.0 | 6 | 14 | 31.5 | 5 | 6.5 | 5 | 7 | 39.5 | 100 | 112 | 124 | 6 | 6 | 41.5 | 5 | 12 | 5 | 7.5 | 0 |
| 36 FT | 18 | 20 | 12 | 8 | 6 | 8 | 5 | 6.5 | 44.3 | 38.0 | 38.0 | 38.0 | 6 | 13 | 43.5 | 6 | 13 | 30.5 | 5 | 6 | 5 | 6.5 | 39.6 | 100 | 112 | 124 | 6 | 6 | 41.5 | 5 | 12 | 5 | 7.5 | 0 |
| 38 FT | 18 | 21 | 12 | 8 | 6 | 7.5 | 5 | 6 | 44.4 | 38.0 | 38.0 | 38.0 | 6 | 13 | 43.5 | 6 | 13 | 31.0 | 5 | 6 | 5 | 6.5 | 39.9 | 101 | 113 | 125 | 6 | 6 | 41.5 | 5 | 12 | 5 | 7 | 0 |
| 40 FT | 19 | 22 | 12 | 8 | 6 | 7.5 | 6 | 8.5 | 48.4 | 39.0 | 39.0 | 39.0 | 6 | 13 | 42.5 | 6 | 13 | 30.0 | 5 | 6 | 5 | 6.5 | 40.1 | 102 | 114 | 126 | 6 | 6 | 41.5 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 19 | 22 | 13 | 8 | 6 | 7 | 5 | 6 | 45.0 | 39.0 | 39.0 | 39.0 | 6 | 13 | 42.5 | 6 | 13 | 30.5 | 6 | 8 | 5 | 6.5 | 40.3 | 102 | 114 | 126 | 7 | 7.5 | 44.5 | 5 | 12 | 5 | 7 | 0 |
| 44 FT | 20 | 23 | 13 | 8 | 6 | 7 | 6 | 8.5 | 49.1 | 40.0 | 40.0 | 40.0 | 6 | 13 | 42.0 | 6 | 13 | 30.0 | 6 | 8 | 5 | 6 | 40.5 | 103 | 115 | 127 | 7 | 7.5 | 44.5 | 5 | 12 | 5 | 7 | 0 |
| 46 FT | 20 | 24 | 13 | 8 | 6 | 6.5 | 6 | 8 | 49.3 | 40.0 | 40.0 | 40.0 | 6 | 12 | 42.0 | 6 | 12 | 30.0 | 6 | 8 | 5 | 6 | 40.6 | 104 | 116 | 128 | 7 | 7.5 | 44.5 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 21 | 24 | 13 | 8 | 6 | 7 | 6 | 7.5 | 49.1 | 41.0 | 41.0 | 41.0 | 6 | 13 | 41.5 | 6 | 13 | 29.5 | 6 | 8 | 5 | 6 | 40.8 | 104 | 116 | 128 | 7 | 7.5 | 44.5 | 5 | 12 | 5 | 6.5 | 0 |
| 50 FT | 21 | 25 | 14 | 8 | 6 | 6.5 | 6 | 8 | 49.9 | 41.0 | 41.0 | 41.0 | 6 | 13 | 41.5 | 6 | 13 | 29.5 | 6 | 8 | 5 | 6.5 | 41.1 | 105 | 117 | 129 | 7 | 7.5 | 44.5 | 5 | 12 | 5 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 8 FEET
HEIGHT (HT): 4 THRU 9 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

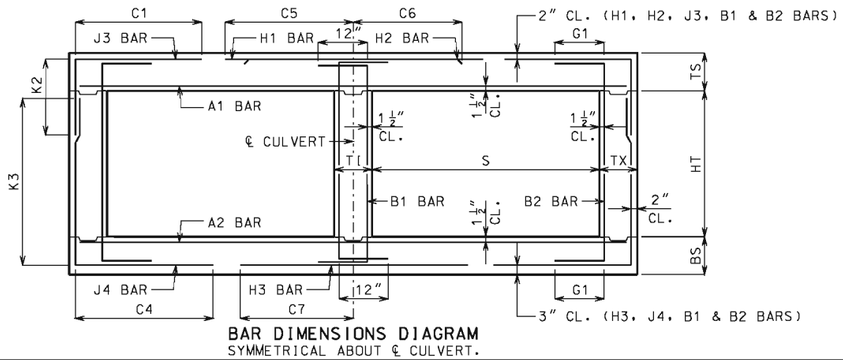
703.47

SHEET NO.
10 OF 27

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 8 FT  HEIGHT (HT) = 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=10' | HT=11' | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=10' | HT=11' | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 12 | 9 | 8 | 9 | 5 | 7 | 5 | 7.5 | 41.9 | 32.0 | 32.0 | 4 | 12 | 81.5 | 4 | 12 | 27.5 | 5 | 9 | 6 | 6 | 73.9 | 125 | 137 | 5 | 6 | 41.5 | 5 | 12 | 5 | 10.5 | 12 |
| 2 FT | 13 | 10 | 9 | 9 | 5 | 7 | 5 | 8 | 42.5 | 29.0 | 33.0 | 4 | 13 | 82.0 | 4 | 13 | 27.0 | 4 | 6 | 5 | 6 | 66.8 | 126 | 138 | 5 | 6.5 | 41.0 | 5 | 12 | 5 | 11 | 12 |
| 4 FT | 8 | 11 | 9 | 9 | 4 | 6 | 6 | 7 | 44.5 | 24.0 | 28.0 | 5 | 16 | 84.0 | 5 | 16 | 27.0 | 4 | 7 | 5 | 6 | 66.0 | 127 | 139 | 5 | 7.5 | 41.0 | 5 | 10.5 | 5 | 9.5 | 12 |
| 6 FT | 8 | 11 | 9 | 9 | 4 | 6 | 6 | 7 | 61.5 | 28.0 | 32.0 | 5 | 15 | 43.0 | 5 | 15 | 26.0 | 4 | 6.5 | 6 | 7 | 64.5 | 127 | 139 | 5 | 7 | 40.0 | 5 | 11.5 | 5 | 9 | 12 |
| 8 FT | 8 | 11 | 9 | 9 | 4 | 6 | 6 | 7 | 55.6 | 28.0 | 32.0 | 5 | 14 | 40.5 | 5 | 14 | 25.5 | 4 | 6 | 6 | 6.5 | 60.4 | 127 | 139 | 5 | 6 | 39.5 | 5 | 11.5 | 5 | 8.5 | 0 |
| 10 FT | 9 | 11 | 9 | 9 | 5 | 8.5 | 6 | 7.5 | 54.9 | 29.0 | 33.0 | 5 | 14 | 39.5 | 5 | 14 | 25.5 | 5 | 8.5 | 6 | 6 | 57.5 | 127 | 139 | 5 | 6 | 39.0 | 5 | 12 | 5 | 8.5 | 0 |
| 12 FT | 10 | 11 | 9 | 9 | 5 | 8 | 5 | 6 | 51.1 | 30.0 | 30.0 | 5 | 14 | 39.0 | 5 | 14 | 25.5 | 5 | 7.5 | 6 | 6 | 55.3 | 127 | 139 | 6 | 7 | 41.5 | 5 | 12 | 5 | 8.5 | 0 |
| 14 FT | 10 | 12 | 9 | 9 | 5 | 8 | 6 | 6.5 | 52.0 | 30.0 | 34.0 | 5 | 13 | 38.5 | 5 | 13 | 25.5 | 5 | 7.5 | 6 | 6 | 54.8 | 128 | 140 | 6 | 7 | 41.5 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 11 | 13 | 10 | 9 | 5 | 7.5 | 5 | 6 | 48.6 | 31.0 | 31.0 | 5 | 13 | 38.0 | 5 | 13 | 25.5 | 5 | 7.5 | 6 | 6.5 | 54.1 | 129 | 141 | 6 | 7.5 | 41.5 | 5 | 12 | 5 | 8 | 0 |
| 18 FT | 11 | 13 | 10 | 9 | 5 | 7.5 | 5 | 6 | 45.1 | 31.0 | 31.0 | 5 | 12 | 37.0 | 5 | 12 | 25.0 | 5 | 7 | 6 | 6.5 | 50.4 | 129 | 141 | 6 | 7 | 41.5 | 5 | 12 | 5 | 8 | 0 |
| 20 FT | 12 | 14 | 10 | 9 | 5 | 7 | 6 | 7.5 | 48.4 | 32.0 | 36.0 | 5 | 13 | 37.0 | 5 | 13 | 25.0 | 5 | 7 | 6 | 6.5 | 50.5 | 130 | 142 | 6 | 7.5 | 41.5 | 5 | 12 | 5 | 8 | 0 |
| 22 FT | 13 | 15 | 10 | 9 | 5 | 7 | 6 | 7 | 48.5 | 33.0 | 37.0 | 5 | 12 | 37.0 | 5 | 12 | 24.5 | 5 | 7 | 6 | 6.5 | 50.6 | 131 | 143 | 6 | 7 | 41.5 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 13 | 16 | 11 | 9 | 5 | 6.5 | 6 | 8 | 48.5 | 33.0 | 33.0 | 5 | 12 | 36.5 | 5 | 12 | 25.0 | 5 | 7 | 5 | 6 | 47.8 | 132 | 144 | 6 | 7 | 41.5 | 5 | 12 | 5 | 7.5 | 0 |
| 26 FT | 14 | 16 | 12 | 9 | 5 | 6.5 | 5 | 6 | 46.0 | 34.0 | 34.0 | 5 | 12 | 36.0 | 5 | 12 | 24.5 | 5 | 6 | 5 | 6 | 47.5 | 132 | 144 | 6 | 7 | 41.5 | 5 | 12 | 5 | 7 | 0 |
| 28 FT | 15 | 17 | 12 | 9 | 5 | 6.5 | 6 | 8 | 55.3 | 35.0 | 35.0 | 6 | 16 | 44.5 | 6 | 16 | 32.5 | 5 | 6.5 | 5 | 6 | 47.8 | 133 | 145 | 6 | 6.5 | 41.5 | 5 | 12 | 5 | 7 | 0 |
| 30 FT | 16 | 18 | 13 | 9 | 5 | 6.5 | 6 | 8 | 55.8 | 36.0 | 36.0 | 6 | 15 | 44.0 | 6 | 15 | 31.5 | 5 | 6.5 | 5 | 6 | 48.0 | 134 | 146 | 6 | 6.5 | 41.5 | 5 | 12 | 5 | 6.5 | 0 |
| 32 FT | 16 | 19 | 13 | 9 | 5 | 6 | 6 | 7.5 | 55.8 | 36.0 | 36.0 | 6 | 15 | 44.0 | 6 | 15 | 32.0 | 5 | 6.5 | 5 | 6 | 48.3 | 135 | 147 | 6 | 6 | 41.5 | 5 | 12 | 5 | 6.5 | 0 |
| 34 FT | 17 | 20 | 13 | 9 | 5 | 6 | 6 | 7 | 56.0 | 37.0 | 37.0 | 6 | 14 | 43.5 | 6 | 14 | 31.0 | 5 | 6.5 | 5 | 6 | 48.5 | 136 | 148 | 6 | 6.5 | 41.5 | 5 | 12 | 5 | 6.5 | 0 |
| 36 FT | 17 | 20 | 14 | 9 | 6 | 8 | 6 | 7.5 | 56.1 | 37.0 | 37.0 | 6 | 14 | 43.0 | 6 | 14 | 31.5 | 5 | 6 | 5 | 6 | 48.6 | 136 | 148 | 6 | 6 | 41.5 | 5 | 12 | 5 | 6 | 0 |
| 38 FT | 18 | 21 | 14 | 9 | 6 | 8 | 6 | 7 | 56.4 | 38.0 | 38.0 | 6 | 13 | 42.5 | 6 | 13 | 30.5 | 5 | 6 | 5 | 6 | 48.9 | 137 | 149 | 6 | 6 | 41.5 | 5 | 12 | 5 | 6 | 0 |
| 40 FT | 18 | 22 | 15 | 9 | 6 | 7 | 6 | 7.5 | 56.8 | 38.0 | 42.0 | 6 | 13 | 42.5 | 6 | 13 | 30.5 | 5 | 6 | 6 | 8 | 52.3 | 138 | 150 | 6 | 6 | 41.5 | 5 | 12 | 6 | 8 | 0 |
| 42 FT | 19 | 22 | 15 | 9 | 6 | 7.5 | 6 | 7 | 57.0 | 39.0 | 43.0 | 6 | 14 | 42.0 | 6 | 14 | 30.0 | 6 | 8.5 | 6 | 8 | 52.3 | 138 | 150 | 7 | 7.5 | 44.5 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 19 | 23 | 15 | 9 | 6 | 6.5 | 6 | 6.5 | 56.9 | 39.0 | 43.0 | 6 | 13 | 42.0 | 6 | 13 | 30.0 | 6 | 8.5 | 6 | 8 | 52.5 | 139 | 151 | 7 | 8 | 44.5 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 20 | 24 | 16 | 9 | 6 | 7 | 6 | 7 | 57.6 | 40.0 | 44.0 | 6 | 14 | 41.5 | 6 | 14 | 30.0 | 6 | 8 | 6 | 7.5 | 52.9 | 140 | 152 | 7 | 8 | 44.5 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 20 | 24 | 16 | 9 | 6 | 6.5 | 6 | 6.5 | 57.5 | 40.0 | 44.0 | 6 | 13 | 41.5 | 6 | 13 | 30.0 | 6 | 8 | 6 | 7.5 | 52.9 | 140 | 152 | 7 | 7.5 | 44.5 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 21 | 25 | 16 | 9 | 6 | 6.5 | 6 | 6 | 57.8 | 41.0 | 45.0 | 6 | 14 | 41.0 | 6 | 14 | 30.0 | 6 | 8 | 6 | 7.5 | 53.1 | 141 | 153 | 7 | 7.5 | 44.5 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 8 FEET
HEIGHT (HT): 10 THRU 11 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 11 OF 27

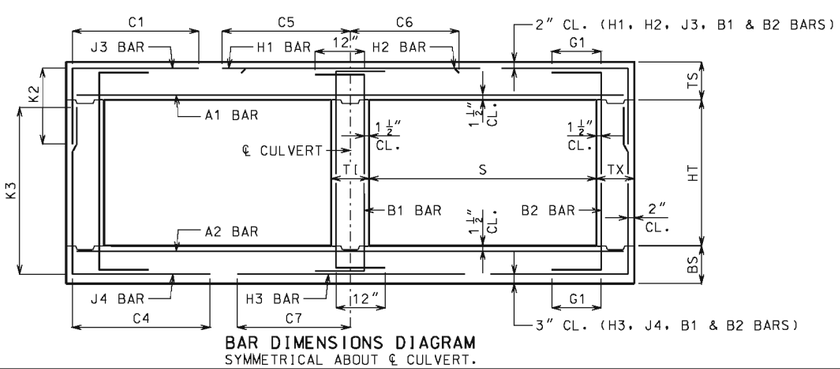
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 9 FT  HEIGHT (HT) = 5 FT OR 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=5′ | K2 HT=6′ | K2 HT=7′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=5′ | K3 HT=6′ | K3 HT=7′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 4 | 7.5 | 45.3 | 29.0 | 29.0 | 29.0 | 5 | 17 | 89.5 | 5 | 17 | 28.5 | 4 | 6 | 4 | 6 | 47.3 | 65 | 77 | 89 | 5 | 6 | 44.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 10 | 8 | 8 | 5 | 6.5 | 4 | 7.5 | 45.3 | 29.0 | 29.0 | 29.0 | 5 | 16 | 89.5 | 5 | 16 | 27.5 | 4 | 6 | 4 | 7.5 | 44.5 | 66 | 78 | 90 | 5 | 6.5 | 44.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 9 | 9 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 42.1 | 25.0 | 25.0 | 25.0 | 5 | 15 | 59.0 | 5 | 15 | 28.5 | 5 | 8 | 4 | 6 | 39.5 | 65 | 77 | 89 | 6 | 6.5 | 46.0 | 5 | 11 | 5 | 12 | 12 |
| 6 FT | 9 | 9 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 36.9 | 25.0 | 25.0 | 29.0 | 5 | 14 | 47.0 | 5 | 14 | 27.5 | 5 | 7.5 | 5 | 7 | 36.5 | 65 | 77 | 89 | 6 | 6 | 45.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 35.6 | 25.0 | 25.0 | 25.0 | 5 | 12 | 44.0 | 5 | 12 | 27.0 | 5 | 7.5 | 4 | 6.5 | 34.6 | 66 | 78 | 90 | 6 | 6.5 | 45.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 10 | 11 | 8 | 8 | 5 | 8 | 5 | 7.5 | 34.3 | 26.0 | 26.0 | 26.0 | 5 | 12 | 43.0 | 5 | 12 | 26.5 | 5 | 7.5 | 4 | 6.5 | 33.3 | 67 | 79 | 91 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 5 | 8.5 | 33.0 | 27.0 | 27.0 | 27.0 | 5 | 12 | 42.5 | 5 | 12 | 26.5 | 5 | 7 | 4 | 6 | 32.1 | 68 | 80 | 92 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 8.5 | 32.1 | 28.0 | 28.0 | 28.0 | 5 | 12 | 42.0 | 5 | 12 | 26.5 | 5 | 6.5 | 4 | 6 | 31.5 | 69 | 81 | 93 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 31.5 | 29.0 | 29.0 | 33.0 | 6 | 16 | 44.5 | 6 | 16 | 29.5 | 5 | 6.5 | 5 | 8.5 | 31.0 | 70 | 82 | 94 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 13 | 15 | 8 | 8 | 5 | 6.5 | 5 | 8 | 31.3 | 29.0 | 29.0 | 33.0 | 6 | 15 | 44.5 | 6 | 15 | 29.5 | 5 | 6.5 | 5 | 8.5 | 30.5 | 71 | 83 | 95 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8.5 | 29.3 | 30.0 | 30.0 | 34.0 | 6 | 16 | 43.5 | 6 | 16 | 29.0 | 5 | 6 | 5 | 8.5 | 29.1 | 71 | 83 | 95 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 15 | 16 | 8 | 8 | 5 | 6 | 5 | 8 | 34.1 | 31.0 | 31.0 | 35.0 | 6 | 15 | 49.5 | 6 | 15 | 35.0 | 5 | 6 | 5 | 8 | 29.1 | 72 | 84 | 96 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 15 | 17 | 8 | 8 | 6 | 7.5 | 5 | 8 | 34.3 | 31.0 | 31.0 | 35.0 | 6 | 14 | 49.5 | 6 | 14 | 35.0 | 5 | 6 | 5 | 7 | 28.9 | 73 | 85 | 97 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 16 | 18 | 8 | 8 | 6 | 8 | 5 | 7 | 34.1 | 32.0 | 36.0 | 36.0 | 6 | 14 | 49.0 | 6 | 14 | 35.0 | 5 | 6 | 5 | 6.5 | 29.0 | 74 | 86 | 98 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 11 | 0 |
| 28 FT | 17 | 19 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 34.0 | 37.0 | 37.0 | 37.0 | 6 | 14 | 49.0 | 6 | 14 | 35.0 | 5 | 6 | 5 | 6.5 | 29.1 | 75 | 87 | 99 | 6 | 6 | 44.5 | 5 | 12 | 5 | 10 | 0 |
| 30 FT | 18 | 20 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 34.0 | 38.0 | 38.0 | 38.0 | 6 | 13 | 48.5 | 6 | 13 | 34.0 | 6 | 8.5 | 5 | 6 | 29.3 | 76 | 88 | 100 | 6 | 6 | 44.5 | 5 | 12 | 5 | 9.5 | 0 |
| 32 FT | 19 | 21 | 8 | 8 | 6 | 7.5 | 5 | 6 | 34.1 | 39.0 | 39.0 | 39.0 | 6 | 13 | 48.0 | 6 | 13 | 33.0 | 6 | 8.5 | 6 | 7.5 | 32.5 | 77 | 89 | 101 | 7 | 7.5 | 47.0 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 20 | 21 | 8 | 8 | 6 | 7.5 | 6 | 7.5 | 38.0 | 44.0 | 44.0 | 44.0 | 6 | 12 | 47.5 | 6 | 12 | 32.5 | 6 | 7.5 | 6 | 7.5 | 32.6 | 77 | 89 | 101 | 7 | 7.5 | 47.0 | 5 | 12 | 5 | 9.5 | 0 |
| 36 FT | 20 | 22 | 8 | 8 | 6 | 7 | 6 | 7.5 | 38.0 | 44.0 | 44.0 | 44.0 | 6 | 12 | 47.5 | 6 | 12 | 33.0 | 6 | 8 | 6 | 7 | 32.6 | 78 | 90 | 102 | 7 | 7.5 | 47.0 | 5 | 12 | 5 | 9.5 | 0 |
| 38 FT | 21 | 23 | 8 | 8 | 6 | 7 | 6 | 7 | 38.1 | 45.0 | 45.0 | 45.0 | 6 | 12 | 47.0 | 6 | 12 | 32.0 | 6 | 7.5 | 6 | 6.5 | 32.8 | 79 | 91 | 103 | 7 | 7 | 47.0 | 5 | 12 | 5 | 9 | 0 |
| 40 FT | 22 | 24 | 8 | 8 | 6 | 6.5 | 6 | 6.5 | 38.3 | 46.0 | 46.0 | 46.0 | 7 | 15 | 51.5 | 7 | 15 | 36.0 | 6 | 7.5 | 6 | 6 | 33.0 | 80 | 92 | 104 | 7 | 7 | 47.0 | 5 | 12 | 5 | 8 | 0 |
| 42 FT | 22 | 24 | 8 | 8 | 6 | 6.5 | 6 | 6 | 38.1 | 46.0 | 46.0 | 46.0 | 7 | 15 | 51.5 | 7 | 15 | 36.5 | 6 | 7.5 | 6 | 6 | 33.0 | 80 | 92 | 104 | 7 | 7 | 47.0 | 5 | 12 | 5 | 7.5 | 0 |
| 44 FT | 23 | 25 | 9 | 8 | 6 | 6.5 | 6 | 7 | 39.0 | 47.0 | 47.0 | 47.0 | 7 | 15 | 50.5 | 7 | 15 | 36.0 | 6 | 7.5 | 6 | 7 | 33.5 | 81 | 93 | 105 | 7 | 7 | 47.0 | 5 | 12 | 5 | 8.5 | 0 |
| 46 FT | 24 | 26 | 9 | 8 | 6 | 6 | 6 | 7 | 39.0 | 48.0 | 48.0 | 48.0 | 7 | 15 | 49.5 | 7 | 15 | 35.5 | 6 | 7.5 | 6 | 6.5 | 33.8 | 82 | 94 | 106 | 7 | 7 | 47.0 | 5 | 12 | 5 | 8 | 0 |
| 48 FT | 24 | 26 | 9 | 8 | 6 | 6 | 6 | 7 | 39.0 | 48.0 | 48.0 | 48.0 | 7 | 15 | 49.5 | 7 | 15 | 35.5 | 6 | 6.5 | 6 | 6.5 | 33.8 | 82 | 94 | 106 | 7 | 6.5 | 47.0 | 5 | 12 | 5 | 8 | 0 |
| 50 FT | 25 | 27 | 9 | 8 | 6 | 6 | 6 | 6.5 | 39.0 | 49.0 | 49.0 | 49.0 | 7 | 15 | 49.0 | 7 | 15 | 35.5 | 6 | 7 | 6 | 6.5 | 34.0 | 83 | 95 | 107 | 7 | 6.5 | 47.0 | 5 | 12 | 5 | 7.5 | 0 |

## SPAN (S) = 9 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | K2 HT=10′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | K3 HT=10′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 47.3 | 29.0 | 29.0 | 33.0 | 5 | 18 | 91.5 | 5 | 18 | 29.0 | 4 | 6 | 5 | 6 | 69.0 | 102 | 114 | 126 | 5 | 6.5 | 44.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 10 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 47.3 | 29.0 | 29.0 | 33.0 | 5 | 17 | 91.5 | 5 | 17 | 28.0 | 5 | 9 | 6 | 7 | 66.6 | 102 | 114 | 126 | 5 | 6 | 44.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 9 | 9 | 8 | 8 | 5 | 8.5 | 6 | 7 | 47.3 | 29.0 | 33.0 | 33.0 | 5 | 15 | 91.5 | 5 | 15 | 29.0 | 5 | 7.5 | 6 | 6 | 59.4 | 101 | 113 | 125 | 6 | 6 | 46.0 | 5 | 12 | 5 | 10.5 | 12 |
| 6 FT | 9 | 10 | 9 | 8 | 5 | 8.5 | 5 | 6 | 54.1 | 25.0 | 25.0 | 29.0 | 5 | 14 | 48.0 | 5 | 14 | 27.5 | 5 | 8 | 5 | 6 | 51.8 | 102 | 114 | 126 | 6 | 6.5 | 45.5 | 5 | 12 | 5 | 11.5 | 12 |
| 8 FT | 9 | 11 | 9 | 8 | 5 | 8.5 | 5 | 6 | 48.0 | 25.0 | 29.0 | 29.0 | 5 | 13 | 44.0 | 5 | 13 | 27.0 | 5 | 8 | 5 | 6 | 49.3 | 103 | 115 | 127 | 6 | 7 | 45.0 | 5 | 12 | 5 | 11 | 0 |
| 10 FT | 10 | 11 | 9 | 8 | 5 | 8 | 5 | 6 | 46.6 | 26.0 | 30.0 | 30.0 | 5 | 12 | 43.0 | 5 | 12 | 26.5 | 5 | 7 | 6 | 7 | 50.0 | 103 | 115 | 127 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 10 | 0 |
| 12 FT | 11 | 12 | 9 | 8 | 5 | 7.5 | 6 | 7 | 48.4 | 31.0 | 31.0 | 35.0 | 5 | 12 | 42.0 | 5 | 12 | 26.5 | 5 | 7 | 6 | 7 | 49.0 | 104 | 116 | 128 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 9.5 | 0 |
| 14 FT | 12 | 13 | 9 | 8 | 5 | 7 | 6 | 7.5 | 47.4 | 32.0 | 32.0 | 36.0 | 5 | 12 | 41.5 | 5 | 12 | 26.5 | 5 | 6.5 | 6 | 7 | 48.1 | 105 | 117 | 129 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 12 | 14 | 9 | 8 | 5 | 7 | 6 | 6.5 | 46.4 | 32.0 | 32.0 | 36.0 | 6 | 15 | 44.5 | 6 | 15 | 29.5 | 5 | 6.5 | 6 | 7 | 47.5 | 106 | 118 | 130 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 8.5 | 0 |
| 18 FT | 13 | 15 | 9 | 8 | 5 | 6.5 | 6 | 6.5 | 46.0 | 33.0 | 33.0 | 37.0 | 6 | 15 | 44.0 | 6 | 15 | 29.0 | 5 | 6.5 | 6 | 7.5 | 47.3 | 107 | 119 | 131 | 6 | 7 | 44.5 | 5 | 12 | 5 | 8.5 | 0 |
| 20 FT | 14 | 15 | 9 | 8 | 5 | 6.5 | 5 | 6 | 40.1 | 34.0 | 34.0 | 34.0 | 6 | 16 | 43.0 | 6 | 16 | 29.0 | 5 | 6 | 6 | 7.5 | 44.4 | 107 | 119 | 131 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 8.5 | 0 |
| 22 FT | 14 | 16 | 10 | 8 | 5 | 6 | 5 | 6 | 40.5 | 34.0 | 34.0 | 34.0 | 6 | 15 | 43.0 | 6 | 15 | 29.0 | 5 | 6 | 5 | 7 | 41.5 | 108 | 120 | 132 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 15 | 17 | 10 | 8 | 6 | 8 | 6 | 8 | 49.5 | 35.0 | 35.0 | 35.0 | 6 | 15 | 48.5 | 6 | 15 | 35.0 | 5 | 6 | 5 | 6.5 | 41.6 | 109 | 121 | 133 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 8 | 0 |
| 26 FT | 16 | 18 | 11 | 8 | 6 | 8 | 5 | 6 | 46.1 | 36.0 | 36.0 | 36.0 | 6 | 15 | 48.0 | 6 | 15 | 34.5 | 5 | 6 | 5 | 7 | 41.9 | 110 | 122 | 134 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 17 | 19 | 11 | 8 | 6 | 8 | 6 | 8 | 50.1 | 37.0 | 37.0 | 37.0 | 6 | 14 | 47.5 | 6 | 14 | 33.5 | 5 | 6 | 5 | 7 | 42.0 | 111 | 123 | 135 | 6 | 6 | 44.5 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 18 | 20 | 12 | 8 | 6 | 8 | 5 | 6 | 46.8 | 38.0 | 38.0 | 38.0 | 6 | 13 | 47.0 | 6 | 13 | 32.5 | 6 | 8.5 | 5 | 6.5 | 42.4 | 112 | 124 | 136 | 6 | 6 | 44.5 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 18 | 21 | 12 | 8 | 6 | 7.5 | 6 | 8 | 50.8 | 38.0 | 38.0 | 38.0 | 6 | 13 | 47.0 | 6 | 13 | 33.5 | 6 | 8 | 5 | 6.5 | 42.5 | 113 | 125 | 137 | 7 | 7.5 | 47.5 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 19 | 22 | 12 | 8 | 6 | 7 | 6 | 7.5 | 50.9 | 39.0 | 39.0 | 39.0 | 6 | 13 | 46.0 | 6 | 13 | 32.5 | 6 | 8 | 5 | 6.5 | 42.8 | 114 | 126 | 138 | 7 | 7.5 | 47.5 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 20 | 23 | 13 | 8 | 6 | 7 | 6 | 8 | 51.5 | 40.0 | 40.0 | 40.0 | 6 | 12 | 45.0 | 6 | 12 | 31.5 | 6 | 8 | 5 | 6 | 43.1 | 115 | 127 | 139 | 7 | 7 | 47.5 | 5 | 12 | 5 | 6.5 | 0 |
| 38 FT | 20 | 23 | 13 | 8 | 6 | 6.5 | 6 | 7.5 | 51.4 | 40.0 | 40.0 | 40.0 | 6 | 12 | 45.0 | 6 | 12 | 32.0 | 6 | 7.5 | 5 | 6 | 43.0 | 115 | 127 | 139 | 7 | 7 | 47.5 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 21 | 24 | 13 | 8 | 6 | 6.5 | 6 | 7 | 51.5 | 41.0 | 41.0 | 41.0 | 6 | 12 | 44.5 | 6 | 12 | 31.0 | 6 | 7.5 | 5 | 6 | 43.3 | 116 | 128 | 140 | 7 | 7 | 47.5 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 21 | 25 | 14 | 8 | 6 | 6 | 6 | 7.5 | 52.3 | 41.0 | 41.0 | 41.0 | 6 | 12 | 44.5 | 6 | 12 | 31.5 | 6 | 7.5 | 5 | 6 | 43.5 | 117 | 129 | 141 | 7 | 7 | 47.5 | 5 | 12 | 5 | 6 | 0 |
| 44 FT | 22 | 25 | 14 | 8 | 6 | 6.5 | 6 | 7 | 52.1 | 42.0 | 42.0 | 42.0 | 7 | 16 | 49.0 | 7 | 16 | 35.5 | 6 | 6.5 | 5 | 6 | 43.6 | 117 | 129 | 141 | 7 | 6.5 | 47.5 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 23 | 26 | 14 | 8 | 6 | 6 | 6 | 7 | 52.1 | 43.0 | 43.0 | 43.0 | 6 | 12 | 43.5 | 6 | 12 | 30.5 | 6 | 7 | 5 | 6 | 43.9 | 118 | 130 | 142 | 7 | 6.5 | 47.5 | 5 | 12 | 5 | 6 | 0 |
| 48 FT | 23 | 27 | 15 | 8 | 6 | 6 | 6 | 7 | 53.0 | 43.0 | 43.0 | 47.0 | 6 | 12 | 43.5 | 6 | 12 | 30.0 | 6 | 7 | 6 | 8.5 | 47.1 | 119 | 131 | 143 | 7 | 6.5 | 47.5 | 5 | 12 | 5 | 6 | 0 |
| 50 FT | 24 | 28 | 15 | 8 | 6 | 6 | 6 | 7 | 53.0 | 44.0 | 44.0 | 48.0 | 6 | 12 | 43.0 | 6 | 12 | 30.0 | 6 | 7 | 6 | 8 | 47.5 | 120 | 132 | 144 | 7 | 6.5 | 47.5 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 9 FEET
HEIGHT (HT): 5 THRU 10 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

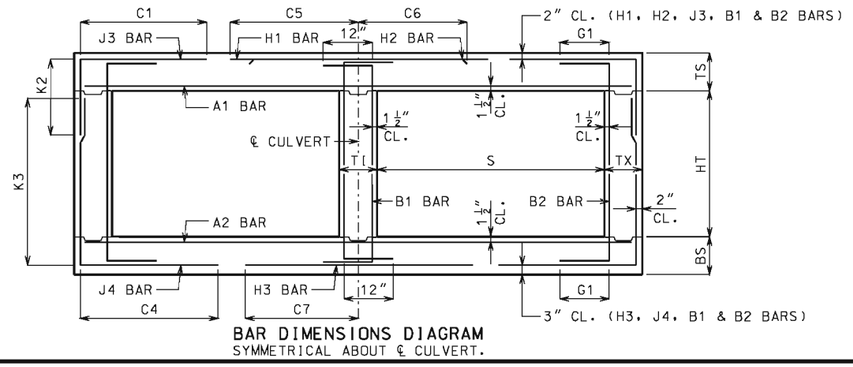
703.47

SHEET NO.
12 OF 27

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 9 FT  HEIGHT (HT) = 11 FT OR 12 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | K3 | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=11' | HT=12' | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=11' | HT=12' | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 9 | 10 | 5 | 6.5 | 5 | 8 | 48.3 | 33.0 | 33.0 | 5 | 17 | 93.0 | 5 | 17 | 29.0 | 5 | 9 | 6 | 6.5 | 79.4 | 138 | 150 | 5 | 6 | 44.5 | 5 | 12 | 5 | 9.5 | 12 |
| 2 FT | 13 | 11 | 9 | 10 | 5 | 6.5 | 5 | 7.5 | 48.3 | 33.0 | 33.0 | 5 | 16 | 93.0 | 5 | 16 | 28.0 | 4 | 6 | 6 | 7 | 77.0 | 139 | 151 | 5 | 6 | 44.5 | 5 | 12 | 5 | 9 | 12 |
| 4 FT | 9 | 10 | 9 | 10 | 5 | 8.5 | 5 | 6 | 48.3 | 29.0 | 29.0 | 5 | 15 | 93.0 | 5 | 15 | 29.0 | 5 | 8 | 6 | 6 | 71.4 | 138 | 150 | 6 | 7 | 46.5 | 5 | 12 | 5 | 8.5 | 12 |
| 6 FT | 9 | 11 | 9 | 10 | 5 | 8.5 | 6 | 7 | 69.3 | 29.0 | 33.0 | 5 | 15 | 47.0 | 5 | 15 | 28.0 | 5 | 8.5 | 6 | 6 | 68.0 | 139 | 151 | 5 | 6 | 43.0 | 5 | 12 | 5 | 8.5 | 12 |
| 8 FT | 9 | 11 | 9 | 10 | 5 | 8.5 | 6 | 6.5 | 61.6 | 29.0 | 33.0 | 5 | 13 | 44.0 | 5 | 13 | 27.5 | 5 | 7.5 | 6 | 6 | 63.8 | 139 | 151 | 6 | 7 | 45.5 | 5 | 12 | 5 | 8.5 | 0 |
| 10 FT | 10 | 11 | 10 | 10 | 5 | 8 | 5 | 6 | 56.4 | 30.0 | 30.0 | 5 | 13 | 43.0 | 5 | 13 | 27.5 | 5 | 7 | 6 | 6 | 60.1 | 139 | 151 | 6 | 6.5 | 45.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 11 | 12 | 10 | 10 | 5 | 7.5 | 5 | 6 | 55.0 | 31.0 | 31.0 | 5 | 13 | 42.5 | 5 | 13 | 27.0 | 5 | 6.5 | 6 | 6.5 | 59.1 | 140 | 152 | 6 | 6.5 | 45.0 | 5 | 12 | 5 | 8 | 0 |
| 14 FT | 11 | 13 | 10 | 10 | 5 | 7.5 | 6 | 7 | 55.6 | 31.0 | 35.0 | 6 | 16 | 45.0 | 6 | 16 | 30.0 | 5 | 6.5 | 6 | 6.5 | 58.5 | 141 | 153 | 6 | 6.5 | 45.0 | 5 | 12 | 5 | 8 | 0 |
| 16 FT | 12 | 14 | 11 | 10 | 5 | 7 | 6 | 8.5 | 54.6 | 32.0 | 36.0 | 6 | 16 | 44.5 | 6 | 16 | 30.0 | 5 | 6.5 | 6 | 7 | 57.4 | 142 | 154 | 6 | 6.5 | 45.0 | 5 | 12 | 5 | 7.5 | 0 |
| 18 FT | 13 | 15 | 11 | 10 | 5 | 6.5 | 6 | 7.5 | 54.6 | 33.0 | 37.0 | 6 | 16 | 44.0 | 6 | 16 | 30.0 | 5 | 6.5 | 6 | 6.5 | 57.1 | 143 | 155 | 6 | 7 | 44.5 | 5 | 12 | 5 | 7.5 | 0 |
| 20 FT | 13 | 15 | 11 | 10 | 5 | 6.5 | 6 | 7.5 | 51.5 | 33.0 | 37.0 | 6 | 15 | 43.5 | 6 | 15 | 29.5 | 5 | 6 | 6 | 6.5 | 53.4 | 143 | 155 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 7.5 | 0 |
| 22 FT | 14 | 16 | 12 | 10 | 5 | 6 | 6 | 8 | 51.9 | 34.0 | 38.0 | 6 | 16 | 43.0 | 6 | 16 | 29.5 | 5 | 6 | 6 | 7.5 | 53.6 | 144 | 156 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 7 | 0 |
| 24 FT | 15 | 17 | 12 | 10 | 5 | 6 | 6 | 7.5 | 58.0 | 35.0 | 39.0 | 6 | 16 | 48.5 | 6 | 16 | 35.5 | 5 | 6 | 6 | 7.5 | 53.8 | 145 | 157 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 7 | 0 |
| 26 FT | 16 | 18 | 13 | 10 | 6 | 8.5 | 6 | 7.5 | 58.5 | 36.0 | 40.0 | 6 | 15 | 48.0 | 6 | 15 | 34.5 | 5 | 6 | 6 | 8 | 54.0 | 146 | 158 | 6 | 6.5 | 44.5 | 5 | 12 | 5 | 6.5 | 0 |
| 28 FT | 17 | 19 | 13 | 10 | 6 | 8 | 6 | 7 | 58.6 | 37.0 | 41.0 | 6 | 14 | 47.5 | 6 | 14 | 33.5 | 6 | 8.5 | 6 | 8 | 54.1 | 147 | 159 | 6 | 6 | 44.5 | 5 | 12 | 5 | 6.5 | 0 |
| 30 FT | 17 | 20 | 13 | 10 | 6 | 7.5 | 6 | 6.5 | 58.5 | 37.0 | 41.0 | 6 | 14 | 47.5 | 6 | 14 | 34.5 | 6 | 8 | 6 | 7 | 54.4 | 148 | 160 | 6 | 6 | 44.5 | 5 | 12 | 5 | 6.5 | 0 |
| 32 FT | 18 | 21 | 14 | 10 | 6 | 7.5 | 6 | 7 | 59.1 | 38.0 | 42.0 | 6 | 13 | 47.0 | 6 | 13 | 33.5 | 6 | 8 | 6 | 8 | 54.6 | 149 | 161 | 7 | 7.5 | 47.5 | 5 | 12 | 5 | 6 | 0 |
| 34 FT | 19 | 22 | 14 | 10 | 6 | 7.5 | 6 | 6.5 | 59.3 | 39.0 | 43.0 | 6 | 13 | 46.5 | 6 | 13 | 32.5 | 6 | 8 | 6 | 8 | 54.9 | 150 | 162 | 7 | 7.5 | 47.5 | 5 | 12 | 5 | 6 | 0 |
| 36 FT | 19 | 22 | 15 | 10 | 6 | 7 | 6 | 6.5 | 59.5 | 43.0 | 43.0 | 6 | 13 | 46.0 | 6 | 13 | 33.0 | 6 | 7 | 6 | 8 | 54.9 | 150 | 162 | 7 | 7.5 | 48.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 20 | 23 | 15 | 10 | 6 | 7 | 6 | 6.5 | 59.6 | 44.0 | 44.0 | 6 | 12 | 45.5 | 6 | 12 | 32.0 | 6 | 7.5 | 6 | 8 | 55.1 | 151 | 163 | 7 | 7 | 47.5 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 20 | 24 | 16 | 10 | 6 | 6 | 6 | 6.5 | 60.0 | 44.0 | 44.0 | 6 | 12 | 45.0 | 6 | 12 | 32.5 | 6 | 7.5 | 6 | 7.5 | 55.5 | 152 | 164 | 7 | 7 | 48.0 | 5 | 12 | 6 | 8 | 0 |
| 42 FT | 21 | 25 | 16 | 10 | 6 | 6.5 | 6 | 6 | 60.3 | 45.0 | 45.0 | 6 | 12 | 44.5 | 6 | 12 | 31.5 | 6 | 7.5 | 6 | 7.5 | 55.8 | 153 | 165 | 7 | 7 | 48.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 22 | 25 | 17 | 10 | 6 | 6.5 | 6 | 6.5 | 60.8 | 46.0 | 46.0 | 6 | 12 | 44.0 | 6 | 12 | 31.0 | 6 | 6.5 | 6 | 7 | 55.9 | 153 | 165 | 7 | 6.5 | 48.0 | 5 | 12 | 6 | 7.5 | 0 |
| 46 FT | 22 | 26 | 17 | 10 | 6 | 6 | 6 | 6 | 60.8 | 46.0 | 46.0 | 6 | 12 | 44.0 | 6 | 12 | 31.0 | 6 | 7 | 6 | 7 | 56.1 | 154 | 166 | 7 | 6.5 | 48.0 | 5 | 12 | 6 | 7.5 | 0 |
| 48 FT | 23 | 27 | 18 | 10 | 6 | 6 | 6 | 6.5 | 61.5 | 47.0 | 47.0 | 6 | 12 | 43.5 | 6 | 12 | 31.0 | 6 | 7 | 6 | 6.5 | 56.6 | 155 | 167 | 7 | 6.5 | 48.0 | 5 | 12 | 6 | 7 | 0 |
| 50 FT | 23 | 28 | 19 | 10 | 6 | 6 | 6 | 6.5 | 62.0 | 43.0 | 47.0 | 6 | 12 | 43.5 | 6 | 12 | 31.0 | 6 | 7 | 6 | 7 | 57.0 | 156 | 168 | 7 | 6.5 | 48.0 | 5 | 12 | 6 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 9 FEET
HEIGHT (HT): 11 THRU 12 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 13 OF 27

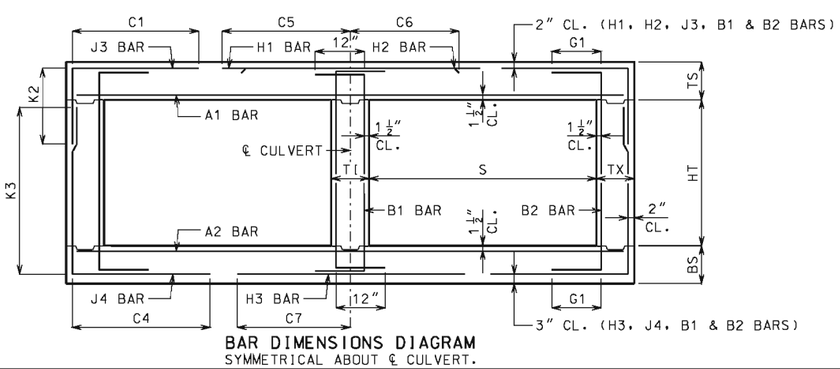
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 10 FT  HEIGHT (HT) = 5 FT OR 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | H1 BARS | | | H2 BARS | | | BOTTOM SLAB BARS | | | | | | | | | | H3 BARS | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | | | | | | | | | A2 BARS | | J4 BARS | | | | | | | | | | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=5′ | K2 HT=6′ | K2 HT=7′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=5′ | K3 HT=6′ | K3 HT=7′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 8 | 8 | 5 | 6.5 | 4 | 7 | 48.9 | 29.0 | 29.0 | 29.0 | 5 | 15 | 98.0 | 5 | 15 | 29.0 | 4 | 6 | 4 | 7 | 48.1 | 66 | 78 | 90 | 5 | 6 | 47.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 10 | 8 | 8 | 5 | 6.5 | 4 | 7 | 48.9 | 29.0 | 29.0 | 29.0 | 5 | 13 | 98.0 | 5 | 13 | 28.5 | 5 | 8.5 | 4 | 6.5 | 43.8 | 66 | 78 | 90 | 6 | 7 | 50.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 9 | 10 | 8 | 8 | 5 | 7.5 | 6 | 7.5 | 43.1 | 25.0 | 25.0 | 25.0 | 5 | 12 | 62.0 | 5 | 12 | 30.0 | 5 | 8 | 4 | 7 | 38.9 | 66 | 78 | 90 | 6 | 6.5 | 49.5 | 5 | 8.5 | 5 | 12 | 12 |
| 6 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 5 | 6 | 38.0 | 25.0 | 25.0 | 25.0 | 6 | 15 | 53.5 | 6 | 15 | 32.0 | 5 | 7 | 4 | 6.5 | 36.1 | 66 | 78 | 90 | 6 | 6 | 48.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 10 | 11 | 8 | 8 | 5 | 8 | 5 | 7.5 | 36.0 | 26.0 | 26.0 | 26.0 | 6 | 16 | 51.0 | 6 | 16 | 31.5 | 5 | 7 | 4 | 6.5 | 34.1 | 67 | 79 | 91 | 6 | 6 | 48.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 5 | 8 | 34.1 | 27.0 | 27.0 | 27.0 | 6 | 15 | 49.5 | 6 | 15 | 31.0 | 5 | 6.5 | 4 | 6 | 32.6 | 68 | 80 | 92 | 6 | 6.5 | 48.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 8.5 | 32.8 | 28.0 | 28.0 | 28.0 | 6 | 15 | 48.5 | 6 | 15 | 31.0 | 5 | 6.5 | 4 | 6 | 31.5 | 69 | 81 | 93 | 6 | 6.5 | 48.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 31.6 | 29.0 | 29.0 | 33.0 | 6 | 15 | 48.5 | 6 | 15 | 31.0 | 5 | 6 | 5 | 9 | 30.8 | 70 | 82 | 94 | 6 | 6 | 47.5 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8.5 | 30.8 | 30.0 | 30.0 | 34.0 | 6 | 14 | 48.0 | 6 | 14 | 31.0 | 5 | 6 | 5 | 8.5 | 30.1 | 71 | 83 | 95 | 6 | 6 | 47.5 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 8 | 35.1 | 31.0 | 31.0 | 35.0 | 6 | 14 | 53.5 | 6 | 14 | 36.5 | 6 | 8 | 5 | 8 | 29.9 | 72 | 84 | 96 | 6 | 6 | 47.5 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 15 | 17 | 8 | 8 | 6 | 7.5 | 5 | 8 | 35.1 | 31.0 | 31.0 | 35.0 | 6 | 13 | 53.5 | 6 | 13 | 36.5 | 6 | 8 | 5 | 7 | 29.4 | 73 | 85 | 97 | 6 | 6 | 47.5 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 16 | 18 | 8 | 8 | 6 | 8 | 5 | 7 | 33.4 | 32.0 | 36.0 | 36.0 | 6 | 13 | 52.5 | 6 | 13 | 36.5 | 6 | 8 | 5 | 6.5 | 28.0 | 74 | 86 | 98 | 6 | 6.5 | 47.5 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 17 | 19 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 33.3 | 37.0 | 37.0 | 37.0 | 6 | 13 | 52.5 | 6 | 13 | 36.5 | 6 | 8 | 5 | 6.5 | 28.0 | 75 | 87 | 99 | 6 | 6 | 47.5 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 18 | 20 | 8 | 8 | 6 | 7 | 5 | 6.5 | 33.1 | 38.0 | 38.0 | 38.0 | 6 | 13 | 52.0 | 6 | 13 | 36.5 | 6 | 8 | 5 | 6 | 28.1 | 76 | 88 | 100 | 6 | 6 | 47.5 | 5 | 12 | 5 | 10.5 | 0 |
| 28 FT | 19 | 21 | 8 | 8 | 6 | 7 | 5 | 6 | 33.1 | 39.0 | 39.0 | 39.0 | 6 | 13 | 52.0 | 6 | 13 | 36.0 | 6 | 7.5 | 6 | 7.5 | 31.3 | 77 | 89 | 101 | 7 | 7.5 | 50.5 | 5 | 12 | 5 | 9.5 | 0 |
| 30 FT | 20 | 22 | 8 | 8 | 6 | 7 | 6 | 7.5 | 37.1 | 44.0 | 44.0 | 44.0 | 6 | 12 | 51.5 | 6 | 12 | 35.5 | 6 | 7.5 | 6 | 7 | 31.4 | 78 | 90 | 102 | 7 | 7.5 | 50.5 | 5 | 12 | 5 | 9.5 | 0 |
| 32 FT | 21 | 23 | 8 | 8 | 6 | 6.5 | 6 | 7 | 37.1 | 45.0 | 45.0 | 45.0 | 6 | 12 | 51.0 | 6 | 12 | 34.5 | 6 | 7.5 | 6 | 6.5 | 31.5 | 79 | 91 | 103 | 7 | 7 | 50.5 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 22 | 23 | 8 | 8 | 6 | 6.5 | 6 | 6.5 | 37.0 | 46.0 | 46.0 | 46.0 | 7 | 15 | 55.5 | 7 | 15 | 38.5 | 6 | 6.5 | 6 | 6.5 | 31.6 | 79 | 91 | 103 | 7 | 7 | 50.5 | 5 | 12 | 5 | 9.5 | 0 |
| 36 FT | 22 | 24 | 8 | 8 | 6 | 6 | 6 | 6.5 | 37.1 | 46.0 | 46.0 | 46.0 | 7 | 15 | 55.5 | 7 | 15 | 39.5 | 6 | 7 | 6 | 6 | 31.6 | 80 | 92 | 104 | 7 | 7 | 50.0 | 5 | 12 | 5 | 9 | 0 |
| 38 FT | 23 | 25 | 8 | 8 | 6 | 6 | 6 | 6 | 37.1 | 47.0 | 47.0 | 47.0 | 7 | 15 | 55.0 | 7 | 15 | 38.5 | 6 | 7 | 6 | 6 | 31.9 | 81 | 93 | 105 | 7 | 6.5 | 50.0 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 24 | 26 | 9 | 8 | 6 | 6 | 6 | 7 | 38.0 | 48.0 | 48.0 | 48.0 | 7 | 14 | 54.0 | 7 | 14 | 37.5 | 6 | 7 | 6 | 6.5 | 32.5 | 82 | 94 | 106 | 7 | 6.5 | 50.0 | 5 | 12 | 5 | 8.5 | 0 |
| 42 FT | 25 | 27 | 9 | 8 | 6 | 6 | 6 | 6.5 | 38.0 | 49.0 | 49.0 | 49.0 | 7 | 14 | 53.5 | 7 | 14 | 37.0 | 6 | 7 | 6 | 6.5 | 32.6 | 83 | 95 | 107 | 7 | 6 | 50.0 | 5 | 12 | 5 | 8.5 | 0 |
| 44 FT | 25 | 28 | 9 | 8 | 7 | 7.5 | 6 | 6.5 | 38.1 | 49.0 | 49.0 | 49.0 | 7 | 14 | 53.0 | 7 | 14 | 37.5 | 6 | 6.5 | 6 | 6 | 32.8 | 84 | 96 | 108 | 7 | 6 | 50.0 | 5 | 12 | 5 | 8.5 | 0 |
| 46 FT | 26 | 28 | 9 | 8 | 7 | 7.5 | 6 | 6.5 | 38.1 | 50.0 | 50.0 | 50.0 | 7 | 13 | 52.5 | 7 | 13 | 36.5 | 6 | 6.5 | 6 | 6 | 32.9 | 84 | 96 | 108 | 7 | 6 | 50.0 | 5 | 12 | 5 | 8 | 0 |
| 48 FT | 27 | 29 | 9 | 8 | 7 | 7.5 | 6 | 6 | 38.1 | 51.0 | 51.0 | 51.0 | 7 | 14 | 51.5 | 7 | 14 | 36.5 | 6 | 6.5 | 6 | 6 | 33.0 | 85 | 97 | 109 | 7 | 6 | 50.0 | 5 | 12 | 5 | 7.5 | 0 |
| 50 FT | 27 | 30 | 10 | 8 | 7 | 7 | 6 | 7 | 39.0 | 51.0 | 51.0 | 51.0 | 7 | 13 | 51.5 | 7 | 13 | 36.0 | 6 | 6.5 | 6 | 6.5 | 33.5 | 86 | 98 | 110 | 7 | 6 | 50.0 | 5 | 12 | 5 | 8 | 0 |

## SPAN (S) = 10 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | H1 BARS | | | H2 BARS | | | BOTTOM SLAB BARS | | | | | | | | | | H3 BARS | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | | | | | | | | | A2 BARS | | J4 BARS | | | | | | | | | | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | K2 HT=10′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | K3 HT=10′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 50.9 | 29.0 | 33.0 | 33.0 | 5 | 14 | 100.0 | 5 | 14 | 29.5 | 5 | 8.5 | 6 | 7.5 | 71.6 | 102 | 114 | 126 | 5 | 6 | 47.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 11 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 50.9 | 29.0 | 33.0 | 33.0 | 5 | 13 | 100.0 | 5 | 13 | 28.5 | 5 | 8.5 | 5 | 6 | 64.1 | 103 | 115 | 127 | 5 | 6 | 47.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 9 | 10 | 9 | 8 | 5 | 7.5 | 5 | 6 | 69.0 | 25.0 | 25.0 | 29.0 | 5 | 12 | 73.0 | 5 | 12 | 30.0 | 5 | 7.5 | 5 | 6 | 55.4 | 102 | 114 | 126 | 6 | 6.5 | 49.5 | 5 | 10 | 5 | 12 | 12 |
| 6 FT | 9 | 10 | 9 | 8 | 5 | 8.5 | 5 | 6 | 51.4 | 25.0 | 29.0 | 29.0 | 6 | 15 | 54.0 | 6 | 15 | 32.0 | 5 | 7 | 6 | 7 | 53.4 | 102 | 114 | 126 | 6 | 6 | 48.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 10 | 11 | 9 | 8 | 5 | 8 | 5 | 6 | 48.0 | 26.0 | 30.0 | 30.0 | 5 | 12 | 48.0 | 5 | 12 | 28.5 | 5 | 7 | 6 | 7.5 | 50.9 | 103 | 115 | 127 | 6 | 6 | 48.0 | 5 | 12 | 5 | 11.5 | 0 |
| 10 FT | 11 | 12 | 9 | 8 | 5 | 7.5 | 5 | 6 | 46.0 | 31.0 | 31.0 | 31.0 | 6 | 16 | 49.5 | 6 | 16 | 31.0 | 5 | 6.5 | 5 | 6 | 46.3 | 104 | 116 | 128 | 6 | 6 | 48.0 | 5 | 12 | 5 | 10.5 | 0 |
| 12 FT | 12 | 13 | 9 | 8 | 5 | 7 | 5 | 6 | 44.5 | 32.0 | 32.0 | 32.0 | 6 | 15 | 48.5 | 6 | 15 | 31.0 | 5 | 6.5 | 5 | 6 | 45.0 | 105 | 117 | 129 | 6 | 6 | 47.5 | 5 | 12 | 5 | 9.5 | 0 |
| 14 FT | 13 | 14 | 9 | 8 | 5 | 6.5 | 5 | 6 | 43.3 | 33.0 | 33.0 | 33.0 | 6 | 15 | 48.0 | 6 | 15 | 30.5 | 5 | 6 | 5 | 6 | 43.9 | 106 | 118 | 130 | 6 | 6 | 47.5 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 14 | 15 | 9 | 8 | 5 | 6 | 5 | 6 | 42.1 | 34.0 | 34.0 | 34.0 | 6 | 15 | 47.5 | 6 | 15 | 30.5 | 5 | 6 | 5 | 6 | 43.0 | 107 | 119 | 131 | 6 | 6 | 47.5 | 5 | 12 | 5 | 8.5 | 0 |
| 18 FT | 15 | 16 | 10 | 8 | 6 | 8.5 | 5 | 6.5 | 47.1 | 35.0 | 35.0 | 35.0 | 6 | 15 | 53.0 | 6 | 15 | 36.5 | 6 | 8 | 5 | 7 | 42.8 | 108 | 120 | 132 | 6 | 6 | 47.5 | 5 | 12 | 5 | 8.5 | 0 |
| 20 FT | 15 | 17 | 10 | 8 | 6 | 8 | 6 | 8 | 50.6 | 35.0 | 35.0 | 35.0 | 6 | 13 | 52.5 | 6 | 13 | 36.5 | 6 | 8 | 5 | 6.5 | 42.3 | 109 | 121 | 133 | 6 | 6 | 47.5 | 5 | 12 | 5 | 8 | 0 |
| 22 FT | 16 | 18 | 10 | 8 | 6 | 8 | 5 | 6 | 44.5 | 36.0 | 36.0 | 36.0 | 6 | 14 | 52.0 | 6 | 14 | 36.0 | 6 | 8 | 5 | 7 | 40.0 | 110 | 122 | 134 | 6 | 6.5 | 47.5 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 17 | 19 | 10 | 8 | 6 | 7.5 | 6 | 8 | 48.4 | 37.0 | 37.0 | 37.0 | 6 | 14 | 51.5 | 6 | 14 | 36.0 | 6 | 8 | 5 | 6.5 | 40.1 | 111 | 123 | 135 | 6 | 6 | 47.5 | 5 | 12 | 5 | 8 | 0 |
| 26 FT | 18 | 20 | 11 | 8 | 6 | 7.5 | 5 | 6 | 45.0 | 38.0 | 38.0 | 38.0 | 6 | 13 | 51.0 | 6 | 13 | 35.5 | 6 | 7.5 | 5 | 7 | 40.5 | 112 | 124 | 136 | 6 | 6 | 47.5 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 19 | 21 | 11 | 8 | 6 | 7 | 6 | 8 | 49.0 | 39.0 | 39.0 | 39.0 | 6 | 13 | 50.5 | 6 | 13 | 35.0 | 6 | 7.5 | 5 | 7 | 40.5 | 113 | 125 | 137 | 7 | 7.5 | 50.5 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 19 | 22 | 12 | 8 | 6 | 6.5 | 6 | 8 | 49.8 | 39.0 | 39.0 | 39.0 | 6 | 13 | 50.0 | 6 | 13 | 35.5 | 6 | 7.5 | 5 | 6.5 | 40.9 | 114 | 126 | 138 | 7 | 7.5 | 50.5 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 20 | 23 | 12 | 8 | 6 | 6.5 | 6 | 8 | 49.6 | 40.0 | 40.0 | 40.0 | 6 | 12 | 49.5 | 6 | 12 | 34.5 | 6 | 7.5 | 5 | 6.5 | 41.0 | 115 | 127 | 139 | 7 | 7 | 50.5 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 21 | 24 | 12 | 8 | 6 | 6.5 | 6 | 7.5 | 49.6 | 41.0 | 41.0 | 41.0 | 6 | 12 | 49.0 | 6 | 12 | 33.5 | 6 | 7.5 | 5 | 6.5 | 41.1 | 116 | 128 | 140 | 7 | 7 | 50.5 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 22 | 25 | 12 | 8 | 6 | 6.5 | 6 | 6.5 | 49.6 | 42.0 | 42.0 | 42.0 | 7 | 15 | 53.0 | 7 | 15 | 38.0 | 6 | 7 | 5 | 6.5 | 41.3 | 117 | 129 | 141 | 7 | 6.5 | 50.5 | 5 | 12 | 5 | 7 | 0 |
| 38 FT | 23 | 26 | 13 | 8 | 6 | 6 | 6 | 7.5 | 50.4 | 43.0 | 43.0 | 43.0 | 7 | 15 | 52.0 | 7 | 15 | 37.0 | 6 | 7 | 5 | 6 | 41.8 | 118 | 130 | 142 | 7 | 6.5 | 50.5 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 23 | 26 | 13 | 8 | 6 | 6 | 6 | 7 | 50.3 | 43.0 | 43.0 | 43.0 | 7 | 15 | 52.0 | 7 | 15 | 37.5 | 6 | 6.5 | 5 | 6 | 41.6 | 118 | 130 | 142 | 7 | 6.5 | 50.5 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 24 | 27 | 14 | 8 | 6 | 6 | 6 | 7.5 | 51.0 | 44.0 | 44.0 | 44.0 | 7 | 14 | 51.5 | 7 | 14 | 36.5 | 6 | 6.5 | 5 | 6 | 42.1 | 119 | 131 | 143 | 7 | 6 | 50.5 | 5 | 12 | 5 | 6 | 0 |
| 44 FT | 24 | 28 | 14 | 8 | 7 | 7 | 6 | 7 | 51.1 | 44.0 | 44.0 | 44.0 | 7 | 14 | 51.5 | 7 | 14 | 37.0 | 6 | 6.5 | 5 | 6 | 42.1 | 120 | 132 | 144 | 7 | 6 | 50.5 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 25 | 29 | 14 | 8 | 7 | 7.5 | 6 | 6.5 | 51.1 | 45.0 | 49.0 | 49.0 | 7 | 14 | 51.0 | 7 | 14 | 36.0 | 6 | 6.5 | 6 | 8.5 | 45.4 | 121 | 133 | 145 | 7 | 6 | 50.5 | 5 | 12 | 5 | 6 | 0 |
| 48 FT | 26 | 30 | 14 | 8 | 7 | 7 | 6 | 6 | 51.1 | 46.0 | 50.0 | 50.0 | 7 | 15 | 50.5 | 7 | 15 | 36.0 | 6 | 6.5 | 6 | 8 | 45.6 | 122 | 134 | 146 | 7 | 6 | 50.5 | 5 | 12 | 5 | 6 | 0 |
| 50 FT | 26 | 30 | 15 | 8 | 7 | 7 | 6 | 6.5 | 51.9 | 50.0 | 50.0 | 50.0 | 7 | 14 | 50.5 | 7 | 14 | 36.0 | 6 | 6 | 6 | 8 | 45.8 | 122 | 134 | 146 | 8 | 7.5 | 56.5 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

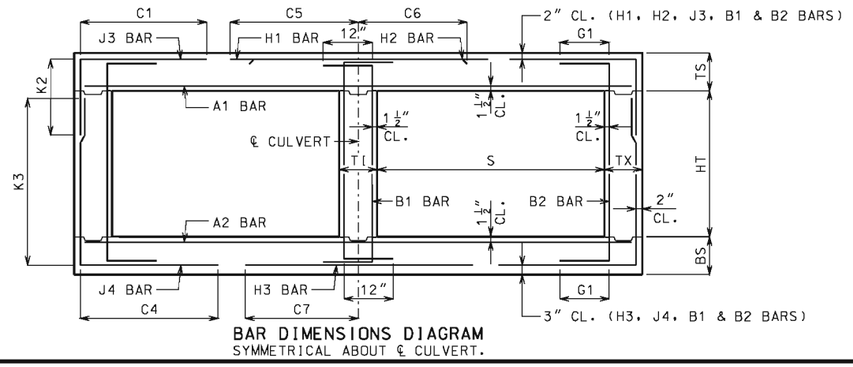
SPAN (S): 10 FEET
HEIGHT (HT): 5 THRU 10 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

## SPAN (S) = 10 FT  HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=11' | K2 HT=12' | K2 HT=13' | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=11' | K3 HT=12' | K3 HT=13' | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 9 | 10 | 5 | 6.5 | 5 | 6.5 | 51.9 | 33.0 | 33.0 | 33.0 | 5 | 14 | 101.0 | 5 | 14 | 30.0 | 5 | 7.5 | 6 | 6 | 85.4 | 138 | 150 | 162 | 6 | 7 | 51.0 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 13 | 11 | 9 | 10 | 5 | 6.5 | 5 | 6 | 51.9 | 33.0 | 33.0 | 33.0 | 5 | 13 | 101.0 | 5 | 13 | 29.0 | 5 | 8 | 6 | 6 | 82.6 | 139 | 151 | 163 | 5 | 6 | 47.5 | 5 | 12 | 5 | 8.5 | 12 |
| 4 FT | 9 | 10 | 10 | 10 | 5 | 7.5 | 6 | 7 | 52.5 | 29.0 | 29.0 | 33.0 | 5 | 12 | 101.5 | 5 | 12 | 30.5 | 5 | 7 | 6 | 6 | 74.5 | 138 | 150 | 162 | 6 | 6 | 50.0 | 5 | 10 | 5 | 8 | 12 |
| 6 FT | 9 | 11 | 10 | 10 | 5 | 8.5 | 6 | 7 | 70.4 | 29.0 | 29.0 | 33.0 | 5 | 12 | 50.5 | 5 | 12 | 29.5 | 5 | 7 | 6 | 6 | 71.0 | 139 | 151 | 163 | 6 | 6.5 | 49.5 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 10 | 12 | 11 | 10 | 5 | 8 | 5 | 6 | 62.6 | 30.0 | 30.0 | 30.0 | 5 | 12 | 47.5 | 5 | 12 | 29.0 | 5 | 7 | 5 | 6 | 64.6 | 140 | 152 | 164 | 6 | 6.5 | 48.5 | 5 | 12 | 5 | 7.5 | 0 |
| 10 FT | 11 | 12 | 11 | 10 | 5 | 7.5 | 5 | 6.5 | 60.9 | 31.0 | 31.0 | 31.0 | 5 | 12 | 46.5 | 5 | 12 | 28.5 | 5 | 6.5 | 6 | 6.5 | 64.4 | 140 | 152 | 164 | 6 | 6 | 48.0 | 5 | 12 | 5 | 7.5 | 0 |
| 12 FT | 11 | 13 | 11 | 10 | 5 | 7.5 | 6 | 7.5 | 60.6 | 31.0 | 31.0 | 35.0 | 6 | 15 | 48.5 | 6 | 15 | 31.5 | 5 | 6 | 6 | 6.5 | 63.6 | 141 | 153 | 165 | 6 | 6 | 48.0 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 12 | 14 | 11 | 10 | 5 | 7 | 6 | 7.5 | 59.6 | 32.0 | 32.0 | 36.0 | 6 | 14 | 48.0 | 6 | 14 | 31.5 | 5 | 6 | 6 | 6.5 | 62.5 | 142 | 154 | 166 | 6 | 6 | 48.0 | 5 | 12 | 5 | 7.5 | 0 |
| 16 FT | 13 | 15 | 12 | 10 | 5 | 6.5 | 6 | 7.5 | 58.4 | 33.0 | 33.0 | 37.0 | 6 | 14 | 47.5 | 6 | 14 | 31.0 | 6 | 8 | 6 | 7 | 61.1 | 143 | 155 | 167 | 6 | 6 | 48.0 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 14 | 16 | 12 | 10 | 5 | 6 | 6 | 7 | 58.0 | 34.0 | 38.0 | 38.0 | 6 | 14 | 47.0 | 6 | 14 | 31.0 | 6 | 8 | 6 | 6.5 | 60.5 | 144 | 156 | 168 | 6 | 6.5 | 48.0 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 15 | 17 | 13 | 10 | 6 | 8 | 6 | 7 | 64.0 | 35.0 | 39.0 | 39.0 | 6 | 14 | 52.5 | 6 | 14 | 37.0 | 6 | 8 | 6 | 6.5 | 59.9 | 145 | 157 | 169 | 6 | 6.5 | 48.0 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 15 | 18 | 13 | 10 | 6 | 7.5 | 6 | 7 | 61.1 | 35.0 | 35.0 | 39.0 | 6 | 13 | 52.0 | 6 | 13 | 37.0 | 6 | 8 | 6 | 7.5 | 57.4 | 146 | 158 | 170 | 6 | 6.5 | 48.0 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 16 | 19 | 13 | 10 | 6 | 7.5 | 6 | 6.5 | 61.3 | 36.0 | 36.0 | 40.0 | 6 | 13 | 51.5 | 6 | 13 | 36.5 | 6 | 7.5 | 6 | 7.5 | 57.4 | 147 | 159 | 171 | 6 | 6 | 48.0 | 5 | 12 | 5 | 6.5 | 0 |
| 26 FT | 17 | 20 | 14 | 10 | 6 | 7.5 | 6 | 7 | 61.8 | 37.0 | 37.0 | 41.0 | 6 | 13 | 51.5 | 6 | 13 | 36.5 | 6 | 7.5 | 6 | 7.5 | 57.6 | 148 | 160 | 172 | 6 | 6 | 48.0 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 18 | 21 | 14 | 10 | 6 | 7 | 6 | 6.5 | 61.9 | 38.0 | 38.0 | 42.0 | 6 | 13 | 51.0 | 6 | 13 | 36.5 | 6 | 7.5 | 6 | 7.5 | 57.8 | 149 | 161 | 173 | 7 | 7.5 | 51.0 | 5 | 12 | 5 | 6 | 0 |
| 30 FT | 19 | 22 | 15 | 10 | 6 | 7 | 6 | 6.5 | 62.4 | 39.0 | 43.0 | 43.0 | 6 | 13 | 50.0 | 6 | 13 | 35.5 | 6 | 7.5 | 6 | 7.5 | 58.0 | 150 | 162 | 174 | 7 | 7.5 | 51.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 20 | 23 | 15 | 10 | 6 | 7 | 6 | 6 | 62.5 | 44.0 | 44.0 | 44.0 | 6 | 12 | 49.5 | 6 | 12 | 34.5 | 6 | 7 | 6 | 7.5 | 58.1 | 151 | 163 | 175 | 7 | 7 | 51.0 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 21 | 24 | 16 | 10 | 6 | 6.5 | 6 | 6.5 | 63.0 | 41.0 | 45.0 | 45.0 | 6 | 12 | 48.5 | 6 | 12 | 33.5 | 6 | 7 | 6 | 7.5 | 58.5 | 152 | 164 | 176 | 7 | 7 | 51.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 21 | 25 | 16 | 10 | 6 | 6 | 6 | 6 | 62.9 | 45.0 | 45.0 | 45.0 | 6 | 12 | 48.5 | 6 | 12 | 34.0 | 6 | 7 | 6 | 7.5 | 58.6 | 153 | 165 | 177 | 7 | 6.5 | 51.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 22 | 26 | 17 | 10 | 6 | 6.5 | 6 | 6 | 63.5 | 42.0 | 46.0 | 46.0 | 7 | 15 | 52.5 | 7 | 15 | 38.5 | 6 | 7 | 6 | 7 | 59.0 | 154 | 166 | 178 | 7 | 6.5 | 51.0 | 5 | 12 | 6 | 7.5 | 0 |
| 40 FT | 23 | 26 | 17 | 10 | 6 | 6 | 6 | 6 | 63.5 | 47.0 | 47.0 | 47.0 | 7 | 15 | 52.0 | 7 | 15 | 37.5 | 6 | 6 | 6 | 7 | 58.9 | 154 | 166 | 178 | 7 | 6.5 | 51.0 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 24 | 27 | 18 | 10 | 6 | 6 | 6 | 6 | 64.1 | 44.0 | 48.0 | 48.0 | 7 | 15 | 51.5 | 7 | 15 | 37.0 | 6 | 6.5 | 6 | 6.5 | 59.3 | 155 | 167 | 179 | 7 | 6 | 51.0 | 5 | 12 | 6 | 7 | 0 |
| 44 FT | 24 | 28 | 19 | 10 | 7 | 8 | 6 | 6 | 64.6 | 44.0 | 48.0 | 48.0 | 7 | 14 | 51.5 | 7 | 14 | 37.0 | 6 | 6.5 | 6 | 6.5 | 59.6 | 156 | 168 | 180 | 7 | 6 | 51.0 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 25 | 29 | 19 | 10 | 7 | 7.5 | 6 | 6 | 64.8 | 49.0 | 49.0 | 49.0 | 7 | 15 | 51.0 | 7 | 15 | 36.5 | 6 | 6.5 | 6 | 6.5 | 59.9 | 157 | 169 | 181 | 7 | 6 | 51.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 25 | 30 | 20 | 10 | 7 | 7.5 | 7 | 8 | 70.3 | 49.0 | 49.0 | 49.0 | 7 | 15 | 51.0 | 7 | 15 | 36.5 | 6 | 6.5 | 6 | 6.5 | 60.3 | 158 | 170 | 182 | 7 | 6 | 51.0 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 26 | 31 | 20 | 10 | 7 | 7 | 7 | 7 | 70.4 | 50.0 | 50.0 | 50.0 | 7 | 15 | 50.5 | 7 | 15 | 36.5 | 6 | 6 | 6 | 6 | 60.5 | 159 | 171 | 183 | 7 | 6 | 51.0 | 5 | 12 | 6 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 10 FEET
HEIGHT (HT): 11 THRU 13 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 15 OF 27

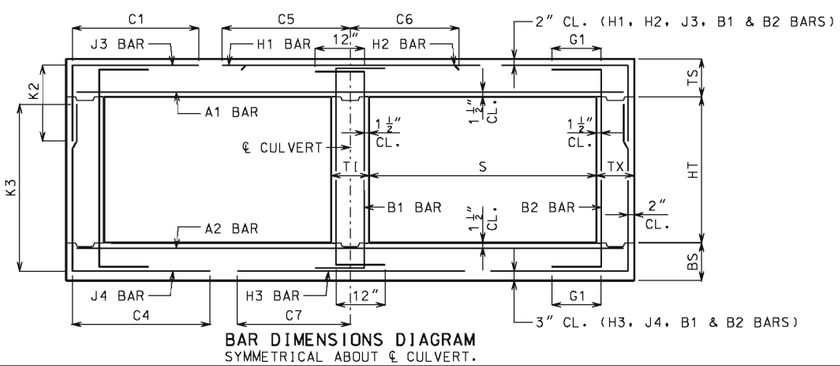
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 11 FT  HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=6′ | HT=7′ | HT=8′ | | | | | | | | | | | | HT=6′ | HT=7′ | HT=8′ | | | | | | | |
| 1 FT | 14 | 10 | 8 | 8 | 5 | 6 | 4 | 6.5 | 52.5 | 30.0 | 30.0 | 30.0 | 5 | 13 | 106.5 | 5 | 13 | 30.0 | 5 | 8 | 5 | 7 | 52.9 | 78 | 90 | 102 | 6 | 7 | 53.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 14 | 11 | 8 | 8 | 5 | 6 | 4 | 6 | 52.5 | 30.0 | 30.0 | 30.0 | 5 | 12 | 106.5 | 5 | 12 | 29.0 | 5 | 8 | 5 | 8 | 49.1 | 79 | 91 | 103 | 6 | 7 | 53.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 10 | 10 | 8 | 8 | 5 | 7 | 5 | 6 | 45.6 | 26.0 | 26.0 | 30.0 | 6 | 16 | 72.5 | 6 | 16 | 35.0 | 5 | 7 | 5 | 6.5 | 43.0 | 78 | 90 | 102 | 6 | 6 | 52.5 | 5 | 10.5 | 5 | 12 | 12 |
| 6 FT | 10 | 11 | 8 | 8 | 5 | 7.5 | 5 | 6 | 40.8 | 26.0 | 26.0 | 30.0 | 6 | 15 | 58.5 | 6 | 15 | 33.5 | 5 | 6.5 | 5 | 7.5 | 39.5 | 79 | 91 | 103 | 6 | 6 | 52.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 5 | 7 | 38.6 | 27.0 | 27.0 | 31.0 | 6 | 15 | 54.5 | 6 | 15 | 33.0 | 5 | 6.5 | 5 | 8 | 37.3 | 80 | 92 | 104 | 6 | 6 | 51.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 7.5 | 36.6 | 28.0 | 28.0 | 32.0 | 6 | 14 | 53.0 | 6 | 14 | 32.5 | 5 | 6 | 5 | 8 | 35.6 | 81 | 93 | 105 | 6 | 6 | 51.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 7.5 | 35.3 | 29.0 | 33.0 | 33.0 | 6 | 14 | 52.0 | 6 | 14 | 32.5 | 6 | 8.5 | 5 | 8.5 | 34.6 | 82 | 94 | 106 | 6 | 6 | 51.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8 | 34.1 | 30.0 | 34.0 | 34.0 | 6 | 13 | 51.5 | 6 | 13 | 32.0 | 6 | 8 | 5 | 8.5 | 33.8 | 83 | 95 | 107 | 6 | 6 | 51.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 7.5 | 38.3 | 31.0 | 35.0 | 35.0 | 6 | 13 | 57.0 | 6 | 13 | 38.0 | 6 | 7.5 | 5 | 8 | 33.1 | 84 | 96 | 108 | 6 | 6 | 51.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 7 | 37.5 | 32.0 | 36.0 | 36.0 | 6 | 12 | 56.5 | 6 | 12 | 38.0 | 6 | 7 | 5 | 7 | 32.6 | 85 | 97 | 109 | 7 | 7 | 53.5 | 5 | 12 | 5 | 10.5 | 0 |
| 20 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 37.1 | 37.0 | 37.0 | 37.0 | 6 | 12 | 56.5 | 6 | 12 | 38.0 | 6 | 7 | 5 | 6.5 | 32.4 | 86 | 98 | 110 | 7 | 7 | 53.5 | 5 | 12 | 5 | 9.5 | 0 |
| 22 FT | 18 | 20 | 8 | 8 | 6 | 7 | 5 | 6.5 | 37.1 | 38.0 | 38.0 | 38.0 | 6 | 12 | 56.0 | 6 | 12 | 37.5 | 6 | 7.5 | 5 | 6 | 32.4 | 88 | 100 | 112 | 6 | 6 | 50.5 | 5 | 12 | 5 | 9.5 | 0 |
| 24 FT | 19 | 20 | 8 | 8 | 6 | 6.5 | 5 | 6 | 35.1 | 39.0 | 39.0 | 39.0 | 6 | 12 | 55.0 | 6 | 12 | 37.5 | 6 | 7 | 5 | 6 | 30.9 | 88 | 100 | 112 | 6 | 6 | 50.5 | 5 | 12 | 5 | 9.5 | 0 |
| 26 FT | 20 | 21 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 39.1 | 44.0 | 44.0 | 44.0 | 6 | 12 | 54.5 | 6 | 12 | 37.5 | 6 | 6.5 | 6 | 7.5 | 33.9 | 89 | 101 | 113 | 7 | 7 | 53.5 | 5 | 12 | 5 | 9.5 | 0 |
| 28 FT | 21 | 22 | 8 | 8 | 6 | 6.5 | 6 | 7 | 39.1 | 45.0 | 45.0 | 45.0 | 6 | 12 | 54.5 | 6 | 12 | 37.0 | 6 | 6 | 6 | 7 | 34.0 | 90 | 102 | 114 | 7 | 7 | 53.5 | 5 | 12 | 5 | 9.5 | 0 |
| 30 FT | 22 | 23 | 8 | 8 | 6 | 6 | 6 | 6.5 | 39.1 | 46.0 | 46.0 | 46.0 | 7 | 15 | 59.0 | 7 | 15 | 41.0 | 6 | 6 | 6 | 6.5 | 34.1 | 91 | 103 | 115 | 7 | 7 | 53.5 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 23 | 24 | 8 | 8 | 6 | 6 | 6 | 6 | 39.1 | 47.0 | 47.0 | 47.0 | 7 | 15 | 58.5 | 7 | 15 | 40.5 | 6 | 6 | 6 | 6 | 34.3 | 92 | 104 | 116 | 7 | 7 | 53.5 | 5 | 12 | 5 | 8 | 0 |
| 34 FT | 23 | 26 | 9 | 8 | 7 | 7.5 | 6 | 7 | 40.3 | 47.0 | 47.0 | 47.0 | 7 | 15 | 58.0 | 7 | 15 | 41.0 | 6 | 6.5 | 6 | 6.5 | 34.8 | 94 | 106 | 118 | 7 | 6.5 | 53.5 | 5 | 12 | 5 | 8.5 | 0 |
| 36 FT | 24 | 27 | 9 | 8 | 7 | 7.5 | 6 | 7 | 40.3 | 48.0 | 48.0 | 48.0 | 7 | 14 | 57.5 | 7 | 14 | 40.5 | 6 | 6.5 | 6 | 6.5 | 34.9 | 95 | 107 | 119 | 7 | 6 | 53.5 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 25 | 27 | 9 | 8 | 7 | 7.5 | 6 | 6.5 | 40.1 | 49.0 | 49.0 | 49.0 | 7 | 14 | 57.0 | 7 | 14 | 39.5 | 6 | 6 | 6 | 6.5 | 35.0 | 95 | 107 | 119 | 7 | 6 | 53.5 | 5 | 12 | 5 | 7.5 | 0 |
| 40 FT | 26 | 28 | 10 | 8 | 7 | 7.5 | 6 | 7 | 40.9 | 50.0 | 50.0 | 50.0 | 7 | 13 | 56.0 | 7 | 13 | 38.5 | 6 | 6 | 6 | 7 | 35.5 | 96 | 108 | 120 | 7 | 6 | 53.5 | 5 | 12 | 5 | 8 | 0 |
| 42 FT | 27 | 29 | 10 | 8 | 7 | 7 | 6 | 7 | 41.0 | 51.0 | 51.0 | 51.0 | 7 | 13 | 55.0 | 7 | 13 | 37.5 | 6 | 6 | 6 | 6.5 | 35.8 | 97 | 109 | 121 | 8 | 7.5 | 59.5 | 5 | 12 | 5 | 8 | 0 |
| 44 FT | 27 | 30 | 11 | 8 | 7 | 6.5 | 5 | 6 | 37.9 | 47.0 | 47.0 | 47.0 | 7 | 13 | 54.5 | 7 | 13 | 38.0 | 6 | 6 | 6 | 7 | 36.1 | 98 | 110 | 122 | 8 | 7.5 | 59.5 | 5 | 12 | 5 | 7.5 | 0 |
| 46 FT | 28 | 31 | 11 | 8 | 7 | 6.5 | 6 | 7.5 | 41.9 | 52.0 | 52.0 | 52.0 | 7 | 12 | 54.0 | 7 | 12 | 37.5 | 6 | 6 | 6 | 7 | 36.4 | 99 | 111 | 123 | 8 | 7 | 59.5 | 5 | 12 | 5 | 7.5 | 0 |
| 48 FT | 29 | 32 | 11 | 8 | 7 | 6.5 | 6 | 7 | 41.9 | 53.0 | 53.0 | 53.0 | 7 | 12 | 53.5 | 7 | 12 | 37.0 | 6 | 6 | 6 | 6.5 | 36.5 | 100 | 112 | 124 | 8 | 7 | 59.0 | 5 | 12 | 5 | 7.5 | 0 |
| 50 FT | 29 | 33 | 11 | 8 | 7 | 6.5 | 6 | 7 | 42.0 | 53.0 | 53.0 | 53.0 | 7 | 12 | 53.5 | 7 | 12 | 37.0 | 6 | 6 | 6 | 6.5 | 36.6 | 101 | 113 | 125 | 8 | 7 | 59.0 | 5 | 12 | 5 | 7 | 0 |

## SPAN (S) = 11 FT  HEIGHT (HT) = 9 FT OR 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=9′ | HT=10′ | HT=11′ | | | | | | | | | | | | HT=9′ | HT=10′ | HT=11′ | | | | | | | |
| 1 FT | 14 | 10 | 8 | 9 | 5 | 6 | 5 | 8 | 54.6 | 34.0 | 34.0 | 34.0 | 5 | 13 | 109.0 | 5 | 13 | 30.5 | 5 | 7.5 | 6 | 6 | 76.4 | 114 | 126 | 138 | 6 | 6.5 | 54.0 | 5 | 12 | 5 | 10 | 12 |
| 2 FT | 14 | 11 | 8 | 9 | 5 | 6 | 5 | 8 | 54.6 | 34.0 | 34.0 | 34.0 | 5 | 12 | 109.0 | 5 | 12 | 29.5 | 5 | 7.5 | 6 | 6.5 | 71.8 | 115 | 127 | 139 | 6 | 7 | 53.5 | 5 | 12 | 5 | 10 | 12 |
| 4 FT | 10 | 10 | 9 | 9 | 5 | 7 | 5 | 6 | 82.4 | 30.0 | 30.0 | 30.0 | 6 | 16 | 84.0 | 6 | 16 | 35.0 | 5 | 7 | 6 | 6.5 | 62.1 | 114 | 126 | 138 | 7 | 7 | 55.5 | 5 | 10.5 | 5 | 10 | 12 |
| 6 FT | 10 | 11 | 9 | 9 | 5 | 7.5 | 5 | 6 | 56.3 | 30.0 | 30.0 | 30.0 | 6 | 15 | 58.5 | 6 | 15 | 33.5 | 5 | 6.5 | 6 | 6.5 | 58.1 | 115 | 127 | 139 | 6 | 6 | 52.0 | 5 | 12 | 5 | 9.5 | 12 |
| 8 FT | 11 | 12 | 10 | 9 | 5 | 7.5 | 5 | 6 | 52.4 | 31.0 | 31.0 | 31.0 | 6 | 15 | 54.5 | 6 | 15 | 33.0 | 5 | 6 | 5 | 6 | 52.1 | 116 | 128 | 140 | 6 | 6 | 51.5 | 5 | 12 | 5 | 10.5 | 0 |
| 10 FT | 11 | 13 | 10 | 9 | 5 | 7.5 | 5 | 6 | 49.6 | 31.0 | 31.0 | 31.0 | 6 | 14 | 52.5 | 6 | 14 | 32.5 | 5 | 6 | 5 | 6 | 50.5 | 117 | 129 | 141 | 6 | 6 | 51.5 | 5 | 12 | 5 | 9.5 | 0 |
| 12 FT | 12 | 14 | 10 | 9 | 5 | 6.5 | 5 | 6 | 48.1 | 32.0 | 32.0 | 32.0 | 6 | 13 | 52.0 | 6 | 13 | 32.5 | 6 | 8 | 5 | 6 | 49.0 | 118 | 130 | 142 | 6 | 6 | 51.0 | 5 | 12 | 5 | 9 | 0 |
| 14 FT | 14 | 15 | 10 | 9 | 5 | 6 | 5 | 6 | 47.1 | 34.0 | 34.0 | 34.0 | 6 | 14 | 51.5 | 6 | 14 | 32.5 | 6 | 8 | 5 | 6 | 47.9 | 119 | 131 | 143 | 6 | 6 | 51.0 | 5 | 12 | 5 | 8 | 0 |
| 16 FT | 15 | 16 | 10 | 9 | 6 | 8 | 6 | 8 | 55.0 | 35.0 | 35.0 | 35.0 | 6 | 13 | 57.0 | 6 | 13 | 38.5 | 6 | 7.5 | 5 | 6 | 46.9 | 120 | 132 | 144 | 6 | 6 | 51.0 | 5 | 12 | 5 | 8 | 0 |
| 18 FT | 16 | 17 | 10 | 9 | 6 | 8 | 6 | 7.5 | 53.9 | 36.0 | 36.0 | 40.0 | 6 | 13 | 56.5 | 6 | 13 | 38.0 | 6 | 7 | 6 | 7 | 49.0 | 121 | 133 | 145 | 6 | 6 | 51.0 | 5 | 12 | 5 | 8 | 0 |
| 20 FT | 17 | 18 | 11 | 9 | 6 | 7.5 | 6 | 8 | 54.0 | 37.0 | 37.0 | 37.0 | 6 | 13 | 56.0 | 6 | 13 | 38.0 | 6 | 6.5 | 5 | 6 | 45.9 | 122 | 134 | 146 | 6 | 6 | 51.0 | 5 | 12 | 5 | 7.5 | 0 |
| 22 FT | 18 | 20 | 12 | 9 | 6 | 7 | 6 | 8 | 54.4 | 38.0 | 38.0 | 38.0 | 6 | 13 | 55.5 | 6 | 13 | 38.0 | 6 | 7.5 | 5 | 6.5 | 46.0 | 124 | 136 | 148 | 6 | 6 | 51.0 | 5 | 12 | 5 | 7 | 0 |
| 24 FT | 18 | 20 | 12 | 9 | 6 | 7 | 6 | 8 | 52.1 | 38.0 | 38.0 | 38.0 | 6 | 12 | 54.5 | 6 | 12 | 37.5 | 6 | 6.5 | 5 | 6.5 | 43.5 | 124 | 136 | 148 | 6 | 6 | 51.0 | 5 | 12 | 5 | 7.5 | 0 |
| 26 FT | 19 | 22 | 12 | 9 | 6 | 6.5 | 6 | 7.5 | 52.1 | 39.0 | 39.0 | 39.0 | 6 | 12 | 54.5 | 6 | 12 | 37.5 | 6 | 7 | 5 | 6.5 | 43.6 | 126 | 138 | 150 | 7 | 7.5 | 54.0 | 5 | 12 | 5 | 7 | 0 |
| 28 FT | 20 | 23 | 12 | 9 | 6 | 6.5 | 6 | 7 | 52.1 | 40.0 | 40.0 | 40.0 | 6 | 12 | 54.0 | 6 | 12 | 37.5 | 6 | 7 | 5 | 6 | 43.8 | 127 | 139 | 151 | 7 | 7 | 54.0 | 5 | 12 | 5 | 7 | 0 |
| 30 FT | 21 | 24 | 13 | 9 | 6 | 6 | 6 | 7.5 | 52.8 | 41.0 | 41.0 | 41.0 | 6 | 12 | 53.0 | 6 | 12 | 37.0 | 6 | 6.5 | 5 | 6 | 44.1 | 128 | 140 | 152 | 7 | 7 | 54.0 | 5 | 12 | 5 | 6.5 | 0 |
| 32 FT | 22 | 25 | 13 | 9 | 6 | 6 | 6 | 7 | 52.8 | 42.0 | 42.0 | 42.0 | 7 | 15 | 56.5 | 7 | 15 | 41.0 | 6 | 6.5 | 5 | 6 | 44.3 | 129 | 141 | 153 | 7 | 6.5 | 54.0 | 5 | 12 | 5 | 6.5 | 0 |
| 34 FT | 23 | 26 | 13 | 9 | 6 | 6 | 6 | 6.5 | 52.8 | 43.0 | 43.0 | 43.0 | 7 | 15 | 57.0 | 7 | 15 | 40.0 | 6 | 6.5 | 5 | 6 | 44.4 | 130 | 142 | 154 | 7 | 6.5 | 54.0 | 5 | 12 | 5 | 6.5 | 0 |
| 36 FT | 24 | 27 | 14 | 9 | 7 | 8 | 6 | 7 | 53.4 | 44.0 | 44.0 | 44.0 | 7 | 14 | 56.0 | 7 | 14 | 39.5 | 6 | 6.5 | 5 | 6 | 44.8 | 131 | 143 | 155 | 7 | 6 | 54.0 | 5 | 12 | 5 | 6 | 0 |
| 38 FT | 25 | 28 | 14 | 9 | 7 | 7.5 | 6 | 7 | 53.4 | 45.0 | 45.0 | 45.0 | 7 | 14 | 55.0 | 7 | 14 | 38.5 | 6 | 6.5 | 5 | 6 | 44.9 | 132 | 144 | 156 | 7 | 6 | 54.0 | 5 | 12 | 5 | 6 | 0 |
| 40 FT | 25 | 29 | 14 | 9 | 7 | 7 | 6 | 6 | 53.4 | 45.0 | 49.0 | 49.0 | 7 | 14 | 55.0 | 7 | 14 | 39.0 | 6 | 6 | 6 | 8.5 | 47.9 | 133 | 145 | 157 | 8 | 7.5 | 60.0 | 5 | 12 | 5 | 6 | 0 |
| 42 FT | 26 | 30 | 15 | 9 | 7 | 7 | 6 | 6.5 | 54.1 | 50.0 | 50.0 | 50.0 | 7 | 13 | 54.0 | 7 | 13 | 38.0 | 6 | 6 | 6 | 8 | 48.4 | 134 | 146 | 158 | 8 | 7.5 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 27 | 31 | 15 | 9 | 7 | 7 | 6 | 6.5 | 54.1 | 51.0 | 51.0 | 51.0 | 7 | 13 | 54.0 | 7 | 13 | 37.0 | 6 | 6 | 6 | 7.5 | 48.6 | 135 | 147 | 159 | 8 | 7 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 27 | 32 | 16 | 9 | 7 | 6.5 | 6 | 6.5 | 55.0 | 51.0 | 51.0 | 51.0 | 7 | 13 | 53.5 | 7 | 13 | 37.5 | 6 | 6 | 6 | 7.5 | 48.9 | 136 | 148 | 160 | 8 | 7 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 28 | 32 | 16 | 9 | 7 | 6.5 | 6 | 6 | 54.9 | 52.0 | 52.0 | 52.0 | 7 | 13 | 53.0 | 7 | 13 | 37.0 | 7 | 8 | 6 | 7.5 | 49.0 | 136 | 148 | 160 | 8 | 7 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 29 | 33 | 17 | 9 | 7 | 6.5 | 6 | 6.5 | 55.6 | 53.0 | 53.0 | 53.0 | 7 | 13 | 52.5 | 7 | 13 | 37.0 | 7 | 7.5 | 6 | 7 | 49.5 | 137 | 149 | 161 | 8 | 7 | 60.0 | 5 | 12 | 6 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 11 FEET
HEIGHT (HT): 6 THRU 11 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

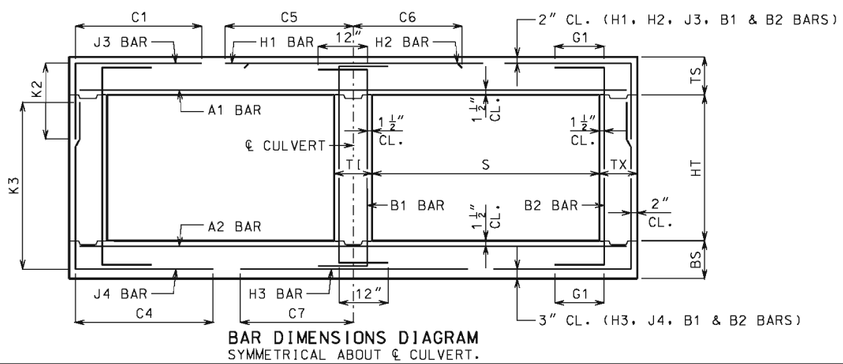
703.47

SHEET NO.
16 OF 27

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 11 FT  HEIGHT (HT) = 12 FT OR 13 FT OR 14 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=12' | HT=13' | HT=14' | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=12' | HT=13' | HT=14' | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 12 | 9 | 11 | 5 | 6 | 5 | 6 | 55.6 | 34.0 | 34.0 | 34.0 | 5 | 13 | 110.0 | 5 | 13 | 30.5 | 5 | 8 | 6 | 6 | 94.6 | 152 | 164 | 176 | 5 | 6 | 51.5 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 14 | 12 | 9 | 11 | 5 | 6 | 6 | 7.5 | 55.6 | 34.0 | 34.0 | 38.0 | 5 | 12 | 110.0 | 5 | 12 | 30.0 | 5 | 7.5 | 6 | 6 | 89.4 | 152 | 164 | 176 | 5 | 6 | 51.0 | 5 | 12 | 5 | 8.5 | 12 |
| 4 FT | 10 | 12 | 10 | 11 | 5 | 7 | 6 | 7 | 58.3 | 30.0 | 30.0 | 34.0 | 6 | 16 | 112.5 | 6 | 16 | 35.5 | 5 | 7 | 6 | 6.5 | 83.4 | 152 | 164 | 176 | 6 | 7 | 53.5 | 5 | 11.5 | 5 | 8 | 12 |
| 6 FT | 10 | 12 | 10 | 11 | 5 | 7.5 | 6 | 6.5 | 78.8 | 30.0 | 34.0 | 34.0 | 6 | 15 | 57.5 | 6 | 15 | 34.0 | 5 | 6.5 | 6 | 6 | 77.1 | 152 | 164 | 176 | 6 | 6.5 | 52.5 | 5 | 12 | 5 | 7.5 | 12 |
| 8 FT | 10 | 13 | 10 | 11 | 5 | 7.5 | 6 | 6 | 70.1 | 34.0 | 34.0 | 34.0 | 6 | 14 | 54.0 | 6 | 14 | 33.5 | 5 | 6 | 6 | 6 | 74.1 | 153 | 165 | 177 | 6 | 6.5 | 52.0 | 5 | 12 | 5 | 7 | 0 |
| 10 FT | 11 | 13 | 11 | 11 | 5 | 7.5 | 6 | 7 | 67.0 | 31.0 | 31.0 | 35.0 | 6 | 14 | 52.5 | 6 | 14 | 33.0 | 5 | 6 | 6 | 6 | 69.9 | 153 | 165 | 177 | 6 | 6 | 51.5 | 5 | 12 | 5 | 7.5 | 0 |
| 12 FT | 12 | 14 | 12 | 11 | 5 | 7 | 6 | 8 | 64.6 | 32.0 | 32.0 | 36.0 | 6 | 14 | 51.5 | 6 | 14 | 33.0 | 6 | 8 | 6 | 7 | 67.6 | 154 | 166 | 178 | 6 | 6 | 51.5 | 5 | 12 | 5 | 7 | 0 |
| 14 FT | 13 | 15 | 12 | 11 | 5 | 6.5 | 6 | 7 | 63.4 | 33.0 | 37.0 | 37.0 | 6 | 13 | 51.0 | 6 | 13 | 33.0 | 6 | 7.5 | 6 | 6.5 | 66.4 | 155 | 167 | 179 | 6 | 6 | 51.0 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 14 | 16 | 13 | 11 | 5 | 6 | 6 | 7 | 62.3 | 34.0 | 38.0 | 38.0 | 6 | 13 | 51.0 | 6 | 13 | 33.0 | 6 | 7 | 6 | 7 | 64.8 | 156 | 168 | 180 | 6 | 6 | 51.0 | 5 | 12 | 5 | 6.5 | 0 |
| 18 FT | 15 | 17 | 13 | 11 | 6 | 8 | 6 | 6.5 | 67.6 | 35.0 | 39.0 | 39.0 | 6 | 12 | 56.5 | 6 | 12 | 38.5 | 6 | 6.5 | 6 | 6 | 63.8 | 157 | 169 | 181 | 6 | 6 | 51.0 | 5 | 12 | 5 | 6.5 | 0 |
| 20 FT | 16 | 19 | 14 | 11 | 6 | 8 | 6 | 6.5 | 67.4 | 36.0 | 40.0 | 40.0 | 6 | 12 | 56.0 | 6 | 12 | 38.5 | 6 | 7.5 | 6 | 6.5 | 63.8 | 159 | 171 | 183 | 6 | 6 | 51.5 | 5 | 12 | 5 | 6 | 0 |
| 22 FT | 17 | 20 | 14 | 11 | 6 | 7.5 | 6 | 6 | 67.3 | 37.0 | 41.0 | 41.0 | 6 | 12 | 55.5 | 6 | 12 | 38.5 | 6 | 7 | 6 | 6 | 63.5 | 160 | 172 | 184 | 6 | 6 | 51.0 | 5 | 12 | 5 | 6 | 0 |
| 24 FT | 18 | 21 | 15 | 11 | 6 | 7 | 6 | 6.5 | 67.4 | 42.0 | 42.0 | 42.0 | 6 | 12 | 55.0 | 6 | 12 | 38.5 | 6 | 7 | 6 | 6.5 | 63.4 | 161 | 173 | 185 | 7 | 7.5 | 54.5 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 19 | 22 | 15 | 11 | 6 | 6.5 | 6 | 6.5 | 65.3 | 43.0 | 43.0 | 43.0 | 6 | 13 | 54.5 | 6 | 13 | 38.0 | 6 | 7 | 6 | 7 | 61.1 | 162 | 174 | 186 | 7 | 7.5 | 54.0 | 5 | 12 | 6 | 8 | 0 |
| 28 FT | 20 | 23 | 15 | 11 | 6 | 6.5 | 6 | 6 | 65.3 | 44.0 | 44.0 | 44.0 | 6 | 12 | 54.0 | 6 | 12 | 38.0 | 6 | 7 | 6 | 6.5 | 61.3 | 163 | 175 | 187 | 7 | 7 | 54.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 21 | 24 | 16 | 11 | 6 | 6.5 | 6 | 6 | 65.8 | 45.0 | 45.0 | 45.0 | 6 | 12 | 53.0 | 6 | 12 | 37.0 | 6 | 6.5 | 6 | 7 | 61.4 | 164 | 176 | 188 | 7 | 7 | 54.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 22 | 25 | 16 | 11 | 6 | 6 | 7 | 7.5 | 70.8 | 46.0 | 46.0 | 46.0 | 7 | 15 | 57.5 | 7 | 15 | 41.0 | 6 | 6.5 | 6 | 6.5 | 61.6 | 165 | 177 | 189 | 7 | 6.5 | 54.0 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 23 | 26 | 17 | 11 | 6 | 6 | 6 | 6 | 66.4 | 47.0 | 47.0 | 47.0 | 7 | 15 | 56.5 | 7 | 15 | 40.0 | 6 | 6.5 | 6 | 7 | 61.9 | 166 | 178 | 190 | 7 | 6.5 | 54.5 | 5 | 12 | 6 | 7.5 | 0 |
| 36 FT | 23 | 27 | 17 | 11 | 7 | 7.5 | 7 | 7 | 71.3 | 47.0 | 47.0 | 47.0 | 7 | 15 | 56.5 | 7 | 15 | 41.0 | 6 | 6.5 | 6 | 6.5 | 62.0 | 167 | 179 | 191 | 7 | 6 | 54.5 | 5 | 12 | 6 | 7.5 | 0 |
| 38 FT | 24 | 28 | 18 | 11 | 7 | 7.5 | 7 | 7.5 | 71.8 | 48.0 | 48.0 | 48.0 | 7 | 14 | 55.5 | 7 | 14 | 40.0 | 6 | 6 | 6 | 6.5 | 62.4 | 168 | 180 | 192 | 7 | 6 | 54.5 | 5 | 12 | 6 | 7 | 0 |
| 40 FT | 25 | 29 | 19 | 11 | 7 | 7.5 | 7 | 7.5 | 72.4 | 49.0 | 49.0 | 49.0 | 7 | 14 | 55.0 | 7 | 14 | 39.0 | 6 | 6 | 6 | 6.5 | 62.6 | 169 | 181 | 193 | 8 | 7.5 | 60.5 | 5 | 12 | 6 | 6.5 | 0 |
| 42 FT | 26 | 30 | 19 | 11 | 7 | 7.5 | 7 | 7 | 72.5 | 50.0 | 50.0 | 50.0 | 7 | 13 | 54.5 | 7 | 13 | 38.0 | 6 | 6 | 6 | 6.5 | 62.9 | 170 | 182 | 194 | 8 | 7.5 | 60.5 | 5 | 12 | 6 | 6.5 | 0 |
| 44 FT | 27 | 31 | 20 | 11 | 7 | 7 | 7 | 7.5 | 73.0 | 51.0 | 51.0 | 51.0 | 7 | 14 | 54.0 | 7 | 14 | 38.0 | 6 | 6 | 6 | 6 | 63.3 | 171 | 183 | 195 | 8 | 7 | 60.5 | 5 | 12 | 6 | 6.5 | 0 |
| 46 FT | 28 | 32 | 20 | 11 | 7 | 7 | 7 | 6.5 | 73.1 | 52.0 | 52.0 | 52.0 | 7 | 14 | 53.5 | 7 | 14 | 38.0 | 6 | 6 | 6 | 6 | 63.5 | 172 | 184 | 196 | 8 | 7 | 60.5 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 28 | 32 | 21 | 11 | 7 | 6.5 | 7 | 6.5 | 73.6 | 52.0 | 52.0 | 52.0 | 7 | 14 | 53.5 | 7 | 14 | 37.5 | 7 | 7 | 6 | 6 | 63.5 | 172 | 184 | 196 | 8 | 7 | 60.5 | 5 | 12 | 6 | 6 | 0 |
| 50 FT | 28 | 33 | 22 | 11 | 7 | 6.5 | 7 | 6.5 | 74.1 | 52.0 | 52.0 | 52.0 | 7 | 13 | 53.5 | 7 | 13 | 37.5 | 7 | 7.5 | 6 | 6 | 63.9 | 173 | 185 | 197 | 8 | 7 | 60.5 | 5 | 12 | 6 | 6 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 11 FEET
HEIGHT (HT): 12 THRU 14 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 17 OF 27

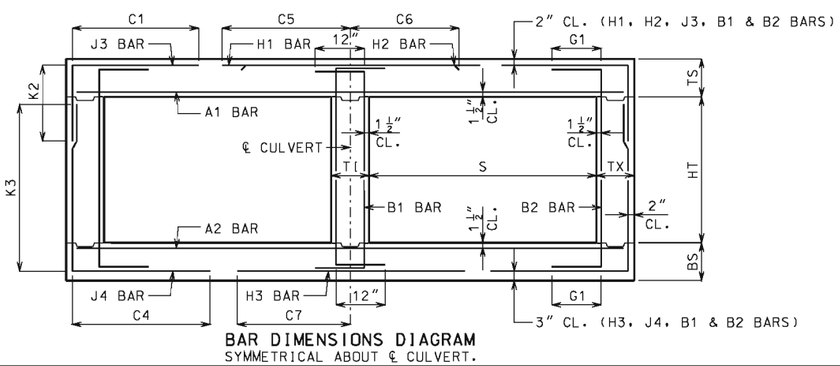
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 12 FT  HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=6′ | HT=7′ | HT=8′ | | | | | | | | | | | | HT=6′ | HT=7′ | HT=8′ | | | | | | | |
| 1 FT | 14 | 10 | 8 | 8 | 5 | 6 | 4 | 6 | 56.1 | 30.0 | 30.0 | 30.0 | 5 | 12 | 115.0 | 5 | 12 | 31.5 | 5 | 7.5 | 5 | 6.5 | 52.4 | 78 | 90 | 102 | 6 | 6.5 | 56.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 15 | 11 | 8 | 8 | 6 | 8 | 4 | 6.5 | 59.1 | 31.0 | 31.0 | 31.0 | 6 | 16 | 118.0 | 6 | 16 | 39.0 | 5 | 7.5 | 5 | 7.5 | 47.9 | 79 | 91 | 103 | 6 | 6.5 | 56.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 11 | 10 | 8 | 8 | 5 | 6.5 | 5 | 7 | 43.6 | 31.0 | 31.0 | 31.0 | 6 | 15 | 77.5 | 6 | 15 | 36.5 | 5 | 6.5 | 5 | 6 | 42.6 | 78 | 90 | 102 | 7 | 6.5 | 58.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 11 | 11 | 8 | 8 | 5 | 7 | 5 | 6.5 | 40.9 | 27.0 | 31.0 | 31.0 | 6 | 14 | 63.0 | 6 | 14 | 35.0 | 5 | 6.5 | 5 | 7 | 39.3 | 79 | 91 | 103 | 7 | 6.5 | 57.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 11 | 13 | 8 | 8 | 5 | 7 | 5 | 6 | 39.1 | 27.0 | 27.0 | 31.0 | 6 | 12 | 58.0 | 6 | 12 | 34.0 | 5 | 6 | 5 | 8.5 | 36.3 | 81 | 93 | 105 | 6 | 6 | 54.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 12 | 14 | 8 | 8 | 5 | 6.5 | 5 | 6.5 | 37.0 | 28.0 | 28.0 | 32.0 | 6 | 12 | 56.5 | 6 | 12 | 33.5 | 6 | 8 | 5 | 8.5 | 34.5 | 82 | 94 | 106 | 6 | 6 | 54.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8 | 34.6 | 30.0 | 34.0 | 34.0 | 6 | 13 | 55.5 | 6 | 13 | 33.5 | 6 | 7.5 | 5 | 8.5 | 33.8 | 83 | 95 | 107 | 7 | 7 | 57.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 7.5 | 38.4 | 31.0 | 35.0 | 35.0 | 6 | 12 | 61.0 | 6 | 12 | 39.5 | 6 | 7.5 | 5 | 8 | 32.9 | 84 | 96 | 108 | 7 | 7 | 57.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 7 | 37.5 | 32.0 | 36.0 | 36.0 | 7 | 16 | 65.5 | 7 | 16 | 44.5 | 6 | 7 | 5 | 7 | 32.3 | 85 | 97 | 109 | 7 | 6.5 | 57.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 17 | 19 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 37.0 | 37.0 | 37.0 | 37.0 | 7 | 15 | 65.0 | 7 | 15 | 44.0 | 6 | 7 | 5 | 6.5 | 31.6 | 87 | 99 | 111 | 7 | 7 | 57.0 | 5 | 12 | 5 | 10.5 | 0 |
| 20 FT | 18 | 20 | 8 | 8 | 6 | 7 | 5 | 6.5 | 36.4 | 38.0 | 38.0 | 38.0 | 7 | 15 | 64.5 | 7 | 15 | 44.0 | 6 | 6.5 | 5 | 6 | 31.3 | 88 | 100 | 112 | 7 | 7 | 57.0 | 5 | 12 | 5 | 9.5 | 0 |
| 22 FT | 19 | 21 | 8 | 8 | 6 | 6 | 5 | 6 | 36.0 | 39.0 | 39.0 | 39.0 | 7 | 14 | 64.0 | 7 | 14 | 44.0 | 6 | 6.5 | 6 | 7.5 | 34.1 | 89 | 101 | 113 | 7 | 7 | 57.0 | 5 | 12 | 5 | 9.5 | 0 |
| 24 FT | 21 | 22 | 8 | 8 | 6 | 6 | 6 | 7 | 39.6 | 45.0 | 45.0 | 45.0 | 7 | 15 | 63.5 | 7 | 15 | 44.0 | 6 | 6.5 | 6 | 7 | 34.4 | 90 | 102 | 114 | 7 | 7 | 56.5 | 5 | 12 | 5 | 9.5 | 0 |
| 26 FT | 21 | 23 | 8 | 8 | 6 | 6 | 6 | 7 | 38.3 | 45.0 | 45.0 | 45.0 | 7 | 14 | 63.0 | 7 | 14 | 43.5 | 6 | 6.5 | 6 | 6.5 | 32.8 | 91 | 103 | 115 | 7 | 7 | 56.5 | 5 | 12 | 5 | 9.5 | 0 |
| 28 FT | 23 | 24 | 8 | 8 | 6 | 6 | 6 | 6 | 38.3 | 47.0 | 47.0 | 47.0 | 7 | 15 | 62.0 | 7 | 15 | 43.0 | 6 | 6 | 6 | 6 | 33.0 | 92 | 104 | 116 | 7 | 7 | 56.5 | 5 | 12 | 5 | 9 | 0 |
| 30 FT | 23 | 25 | 8 | 8 | 7 | 7 | 6 | 6 | 38.3 | 47.0 | 47.0 | 47.0 | 7 | 14 | 62.0 | 7 | 14 | 43.5 | 6 | 6 | 6 | 6 | 33.0 | 93 | 105 | 117 | 7 | 6.5 | 56.5 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 25 | 27 | 9 | 8 | 7 | 7.5 | 6 | 6.5 | 39.1 | 49.0 | 49.0 | 49.0 | 7 | 14 | 61.0 | 7 | 14 | 41.5 | 6 | 6 | 6 | 6.5 | 33.8 | 95 | 107 | 119 | 7 | 6 | 56.5 | 5 | 12 | 5 | 8.5 | 0 |
| 34 FT | 25 | 28 | 9 | 8 | 7 | 6.5 | 6 | 6.5 | 39.3 | 49.0 | 49.0 | 49.0 | 7 | 13 | 61.0 | 7 | 13 | 42.5 | 6 | 6 | 6 | 6 | 33.8 | 96 | 108 | 120 | 7 | 6 | 56.5 | 5 | 12 | 5 | 8.5 | 0 |
| 36 FT | 26 | 29 | 9 | 8 | 7 | 6.5 | 6 | 6.5 | 39.3 | 50.0 | 50.0 | 50.0 | 7 | 13 | 60.0 | 7 | 13 | 41.5 | 6 | 6 | 6 | 6 | 33.9 | 97 | 109 | 121 | 8 | 7.5 | 62.5 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 27 | 30 | 10 | 8 | 7 | 6.5 | 6 | 7 | 40.1 | 51.0 | 51.0 | 51.0 | 7 | 13 | 59.0 | 7 | 13 | 41.0 | 6 | 6 | 6 | 6.5 | 34.5 | 98 | 110 | 122 | 8 | 7.5 | 62.5 | 5 | 12 | 5 | 8 | 0 |
| 40 FT | 28 | 31 | 10 | 8 | 7 | 6.5 | 6 | 6.5 | 40.1 | 52.0 | 52.0 | 52.0 | 7 | 12 | 58.5 | 7 | 12 | 40.0 | 7 | 8 | 6 | 6 | 34.6 | 99 | 111 | 123 | 8 | 7 | 62.5 | 5 | 12 | 5 | 8 | 0 |
| 42 FT | 29 | 32 | 10 | 8 | 7 | 6.5 | 6 | 6.5 | 40.1 | 53.0 | 53.0 | 53.0 | 7 | 12 | 57.5 | 7 | 12 | 39.0 | 7 | 8 | 6 | 6 | 34.9 | 100 | 112 | 124 | 8 | 7 | 62.5 | 5 | 12 | 5 | 7.5 | 0 |
| 44 FT | 30 | 33 | 10 | 8 | 7 | 6.5 | 6 | 6 | 40.3 | 54.0 | 54.0 | 54.0 | 7 | 12 | 56.5 | 7 | 12 | 38.5 | 7 | 7.5 | 7 | 6.5 | 38.1 | 101 | 113 | 125 | 8 | 6.5 | 62.0 | 5 | 12 | 5 | 7 | 0 |
| 46 FT | 31 | 34 | 10 | 8 | 7 | 6 | 6 | 6 | 40.3 | 55.0 | 55.0 | 55.0 | 8 | 15 | 64.0 | 8 | 15 | 45.5 | 7 | 7.5 | 7 | 6.5 | 38.3 | 102 | 114 | 126 | 8 | 6.5 | 62.0 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 31 | 34 | 11 | 8 | 7 | 6 | 6 | 6.5 | 41.0 | 55.0 | 55.0 | 55.0 | 8 | 15 | 64.0 | 8 | 15 | 46.0 | 7 | 6.5 | 6 | 6 | 35.6 | 102 | 114 | 126 | 8 | 6.5 | 62.5 | 5 | 12 | 5 | 7.5 | 0 |
| 50 FT | 32 | 35 | 11 | 8 | 8 | 7.5 | 6 | 6.5 | 41.0 | 56.0 | 56.0 | 56.0 | 8 | 15 | 63.5 | 8 | 15 | 45.5 | 7 | 7 | 6 | 6 | 35.8 | 103 | 115 | 127 | 8 | 6.5 | 62.0 | 5 | 12 | 5 | 7 | 0 |

## SPAN (S) = 12 FT  HEIGHT (HT) = 9 FT OR 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=9′ | HT=10′ | HT=11′ | | | | | | | | | | | | HT=9′ | HT=10′ | HT=11′ | | | | | | | |
| 1 FT | 14 | 11 | 8 | 9 | 5 | 6 | 5 | 8 | 58.3 | 34.0 | 34.0 | 34.0 | 5 | 12 | 117.5 | 5 | 12 | 32.0 | 5 | 7.5 | 6 | 6.5 | 77.5 | 115 | 127 | 139 | 6 | 7 | 57.0 | 5 | 12 | 5 | 10 | 12 |
| 2 FT | 15 | 12 | 8 | 9 | 6 | 8 | 5 | 8 | 62.3 | 35.0 | 35.0 | 35.0 | 6 | 16 | 121.5 | 6 | 16 | 39.5 | 5 | 7.5 | 6 | 7 | 71.9 | 116 | 128 | 140 | 6 | 7 | 56.5 | 5 | 12 | 5 | 10 | 12 |
| 4 FT | 11 | 11 | 9 | 9 | 5 | 6.5 | 6 | 7 | 76.1 | 31.0 | 31.0 | 35.0 | 6 | 15 | 86.0 | 6 | 15 | 37.0 | 5 | 6.5 | 6 | 7 | 61.8 | 115 | 127 | 139 | 6 | 6 | 56.0 | 5 | 11.5 | 5 | 10.5 | 12 |
| 6 FT | 11 | 12 | 9 | 9 | 5 | 7 | 6 | 7 | 59.0 | 31.0 | 31.0 | 35.0 | 6 | 14 | 63.0 | 6 | 14 | 35.5 | 5 | 6 | 6 | 7 | 57.6 | 116 | 128 | 140 | 6 | 6 | 55.0 | 5 | 12 | 5 | 10 | 12 |
| 8 FT | 11 | 13 | 9 | 9 | 5 | 7 | 6 | 7 | 54.0 | 31.0 | 31.0 | 35.0 | 6 | 13 | 58.0 | 6 | 13 | 34.5 | 5 | 6 | 6 | 7 | 54.5 | 117 | 129 | 141 | 6 | 6 | 55.0 | 5 | 12 | 5 | 9.5 | 0 |
| 10 FT | 12 | 14 | 10 | 9 | 5 | 7 | 5 | 6 | 49.0 | 32.0 | 32.0 | 32.0 | 6 | 12 | 56.0 | 6 | 12 | 34.0 | 6 | 8 | 5 | 6.5 | 49.3 | 118 | 130 | 142 | 7 | 7 | 57.5 | 5 | 12 | 5 | 10 | 0 |
| 12 FT | 13 | 15 | 10 | 9 | 5 | 6.5 | 6 | 7.5 | 50.1 | 33.0 | 33.0 | 33.0 | 6 | 12 | 55.0 | 6 | 12 | 33.5 | 6 | 7.5 | 5 | 6.5 | 47.6 | 119 | 131 | 143 | 7 | 7 | 57.5 | 5 | 12 | 5 | 9 | 0 |
| 14 FT | 15 | 16 | 10 | 9 | 6 | 8 | 5 | 6 | 50.6 | 35.0 | 35.0 | 35.0 | 6 | 12 | 60.0 | 6 | 12 | 39.5 | 6 | 7 | 5 | 6 | 46.4 | 120 | 132 | 144 | 7 | 7 | 57.0 | 5 | 12 | 5 | 8 | 0 |
| 16 FT | 16 | 17 | 10 | 9 | 6 | 8 | 6 | 7.5 | 53.8 | 36.0 | 36.0 | 36.0 | 6 | 12 | 60.0 | 6 | 12 | 39.5 | 6 | 6.5 | 5 | 6 | 45.4 | 121 | 133 | 145 | 7 | 6.5 | 57.0 | 5 | 12 | 5 | 8 | 0 |
| 18 FT | 17 | 19 | 10 | 9 | 6 | 7.5 | 6 | 7 | 53.1 | 37.0 | 37.0 | 41.0 | 7 | 16 | 64.5 | 7 | 16 | 44.5 | 6 | 7 | 6 | 7.5 | 47.8 | 123 | 135 | 147 | 7 | 7 | 57.0 | 5 | 12 | 5 | 8 | 0 |
| 20 FT | 18 | 20 | 11 | 9 | 6 | 7 | 6 | 7.5 | 53.1 | 38.0 | 38.0 | 38.0 | 7 | 15 | 64.0 | 7 | 15 | 44.0 | 6 | 6.5 | 5 | 6 | 44.6 | 124 | 136 | 148 | 7 | 7 | 57.0 | 5 | 12 | 5 | 7.5 | 0 |
| 22 FT | 19 | 21 | 12 | 9 | 6 | 6.5 | 6 | 7.5 | 53.5 | 39.0 | 39.0 | 39.0 | 7 | 15 | 63.5 | 7 | 15 | 44.0 | 6 | 6.5 | 5 | 6.5 | 44.8 | 125 | 137 | 149 | 7 | 7 | 57.0 | 5 | 12 | 5 | 7.5 | 0 |
| 24 FT | 20 | 23 | 12 | 9 | 6 | 6.5 | 6 | 7 | 53.4 | 40.0 | 40.0 | 40.0 | 7 | 15 | 63.0 | 7 | 15 | 44.0 | 6 | 6.5 | 5 | 6.5 | 44.6 | 127 | 139 | 151 | 7 | 7 | 57.0 | 5 | 12 | 5 | 7 | 0 |
| 26 FT | 21 | 23 | 12 | 9 | 6 | 6 | 6 | 7.5 | 51.4 | 41.0 | 41.0 | 41.0 | 7 | 15 | 62.0 | 7 | 15 | 43.5 | 6 | 6 | 5 | 6.5 | 42.8 | 127 | 139 | 151 | 7 | 7 | 57.0 | 5 | 12 | 5 | 7 | 0 |
| 28 FT | 22 | 25 | 12 | 9 | 6 | 6 | 6 | 7 | 51.4 | 42.0 | 42.0 | 42.0 | 7 | 15 | 61.5 | 7 | 15 | 43.5 | 6 | 6.5 | 5 | 6.5 | 42.9 | 129 | 141 | 153 | 7 | 6.5 | 57.0 | 5 | 12 | 5 | 7 | 0 |
| 30 FT | 23 | 26 | 12 | 9 | 7 | 7.5 | 6 | 6.5 | 51.3 | 43.0 | 43.0 | 43.0 | 7 | 15 | 61.0 | 7 | 15 | 43.5 | 6 | 6 | 5 | 6 | 43.0 | 130 | 142 | 154 | 7 | 6.5 | 57.0 | 5 | 12 | 5 | 7 | 0 |
| 32 FT | 24 | 27 | 13 | 9 | 7 | 7.5 | 6 | 7 | 52.0 | 44.0 | 44.0 | 44.0 | 7 | 14 | 60.5 | 7 | 14 | 42.5 | 6 | 6 | 5 | 6 | 43.4 | 131 | 143 | 155 | 7 | 6 | 57.0 | 5 | 12 | 5 | 6.5 | 0 |
| 34 FT | 25 | 28 | 13 | 9 | 7 | 7 | 6 | 7 | 52.0 | 45.0 | 45.0 | 45.0 | 7 | 14 | 59.5 | 7 | 14 | 41.5 | 6 | 6 | 5 | 6 | 43.5 | 132 | 144 | 156 | 7 | 6 | 57.0 | 5 | 12 | 5 | 6.5 | 0 |
| 36 FT | 26 | 29 | 13 | 9 | 7 | 7 | 6 | 6 | 51.9 | 46.0 | 50.0 | 50.0 | 7 | 13 | 58.5 | 7 | 13 | 41.0 | 6 | 6 | 6 | 8.5 | 46.6 | 133 | 145 | 157 | 8 | 7.5 | 63.0 | 5 | 12 | 5 | 6.5 | 0 |
| 38 FT | 27 | 30 | 14 | 9 | 7 | 7 | 6 | 6.5 | 52.6 | 47.0 | 51.0 | 51.0 | 7 | 13 | 57.5 | 7 | 13 | 40.0 | 7 | 8 | 6 | 8 | 47.1 | 134 | 146 | 158 | 8 | 7.5 | 63.0 | 5 | 12 | 5 | 6 | 0 |
| 40 FT | 28 | 31 | 14 | 9 | 7 | 6.5 | 6 | 6.5 | 52.6 | 52.0 | 52.0 | 52.0 | 7 | 12 | 56.5 | 7 | 12 | 39.0 | 7 | 7.5 | 6 | 7.5 | 47.3 | 135 | 147 | 159 | 8 | 7 | 63.0 | 5 | 12 | 5 | 6 | 0 |
| 42 FT | 28 | 32 | 15 | 9 | 7 | 6 | 6 | 6.5 | 53.5 | 52.0 | 52.0 | 52.0 | 7 | 12 | 56.5 | 7 | 12 | 39.5 | 7 | 7.5 | 6 | 7.5 | 47.5 | 136 | 148 | 160 | 8 | 7 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 29 | 33 | 15 | 9 | 7 | 6 | 6 | 6.5 | 53.4 | 53.0 | 53.0 | 53.0 | 7 | 12 | 56.0 | 7 | 12 | 38.5 | 7 | 7.5 | 6 | 7 | 47.8 | 137 | 149 | 161 | 8 | 6.5 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 30 | 34 | 15 | 9 | 7 | 6 | 6 | 6 | 53.4 | 54.0 | 54.0 | 54.0 | 7 | 12 | 55.5 | 7 | 12 | 38.0 | 7 | 7.5 | 6 | 7 | 47.9 | 138 | 150 | 162 | 8 | 6.5 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 31 | 35 | 16 | 9 | 7 | 6 | 6 | 6.5 | 54.1 | 55.0 | 55.0 | 55.0 | 7 | 12 | 55.0 | 7 | 12 | 37.5 | 7 | 7 | 6 | 6.5 | 48.4 | 139 | 151 | 163 | 8 | 6.5 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 31 | 36 | 16 | 9 | 8 | 7.5 | 6 | 6 | 54.3 | 55.0 | 55.0 | 55.0 | 7 | 12 | 55.0 | 7 | 12 | 37.5 | 7 | 7 | 6 | 6.5 | 48.4 | 140 | 152 | 164 | 8 | 6.5 | 63.0 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 12 FEET
HEIGHT (HT): 6 THRU 11 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

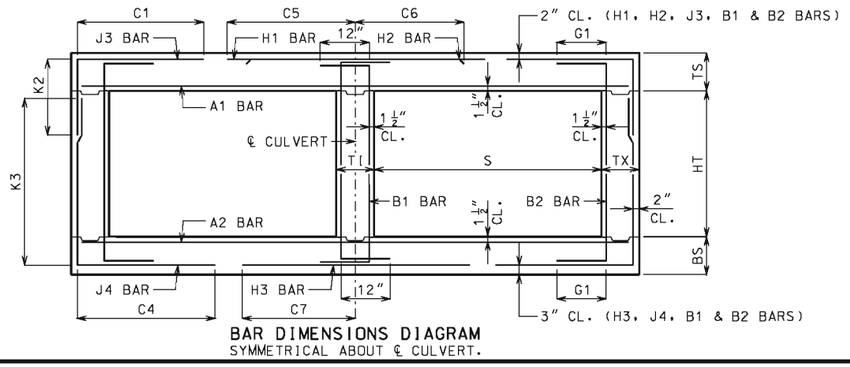
703.47

## SPAN (S) = 12 FT  HEIGHT (HT) = 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | K2 | | H1 BARS | | | H2 BARS | | A2 BARS | | J4 BARS | | | K3 | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=12′ | HT=13′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=12′ | HT=13′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 11 | 9 | 10 | 5 | 6 | 5 | 6.5 | 59.0 | 34.0 | 34.0 | 5 | 12 | 118.0 | 5 | 12 | 32.5 | 5 | 7 | 6 | 6 | 88.9 | 151 | 163 | 6 | 6.5 | 57.5 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 15 | 12 | 9 | 10 | 6 | 8 | 5 | 7 | 63.0 | 35.0 | 35.0 | 6 | 16 | 122.0 | 6 | 16 | 39.5 | 5 | 7 | 6 | 6 | 83.6 | 152 | 164 | 6 | 7 | 57.0 | 5 | 12 | 5 | 8.5 | 12 |
| 4 FT | 11 | 12 | 9 | 10 | 5 | 6.5 | 6 | 7 | 61.0 | 35.0 | 35.0 | 6 | 15 | 120.0 | 6 | 15 | 37.0 | 5 | 6.5 | 6 | 6 | 76.5 | 152 | 164 | 6 | 6.5 | 56.5 | 5 | 12 | 5 | 8.5 | 12 |
| 6 FT | 11 | 12 | 9 | 10 | 5 | 7 | 6 | 6.5 | 73.5 | 35.0 | 35.0 | 6 | 14 | 63.5 | 6 | 14 | 35.5 | 5 | 6 | 6 | 6 | 70.0 | 152 | 164 | 6 | 6 | 55.5 | 5 | 12 | 5 | 8.5 | 12 |
| 8 FT | 11 | 13 | 10 | 10 | 5 | 7 | 6 | 7 | 63.9 | 31.0 | 35.0 | 6 | 13 | 58.0 | 6 | 13 | 34.5 | 5 | 6 | 6 | 6.5 | 65.8 | 153 | 165 | 6 | 6 | 55.0 | 5 | 12 | 5 | 8 | 0 |
| 10 FT | 12 | 14 | 10 | 10 | 5 | 7 | 6 | 7 | 61.6 | 36.0 | 36.0 | 6 | 12 | 56.5 | 6 | 12 | 34.5 | 6 | 8 | 6 | 6 | 63.1 | 154 | 166 | 7 | 7 | 57.5 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 13 | 15 | 11 | 10 | 5 | 6.5 | 6 | 7.5 | 59.9 | 33.0 | 37.0 | 6 | 12 | 55.0 | 6 | 12 | 34.0 | 6 | 7.5 | 6 | 6.5 | 61.4 | 155 | 167 | 7 | 7 | 57.5 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 14 | 16 | 12 | 10 | 5 | 6 | 6 | 7.5 | 58.8 | 34.0 | 38.0 | 6 | 12 | 54.5 | 6 | 12 | 34.0 | 6 | 7 | 6 | 7.5 | 60.0 | 156 | 168 | 7 | 7 | 57.5 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 16 | 18 | 12 | 10 | 6 | 8 | 6 | 7 | 64.1 | 36.0 | 40.0 | 6 | 12 | 60.0 | 6 | 12 | 40.0 | 6 | 7 | 6 | 7.5 | 59.5 | 158 | 170 | 6 | 6 | 54.0 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 17 | 19 | 12 | 10 | 6 | 7.5 | 6 | 6.5 | 63.1 | 37.0 | 41.0 | 6 | 12 | 59.5 | 6 | 12 | 39.5 | 6 | 7 | 6 | 6.5 | 58.5 | 159 | 171 | 7 | 7 | 57.0 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 18 | 20 | 13 | 10 | 6 | 7 | 6 | 6.5 | 62.6 | 38.0 | 42.0 | 6 | 12 | 58.5 | 6 | 12 | 39.5 | 6 | 6.5 | 6 | 7.5 | 57.9 | 160 | 172 | 7 | 7 | 57.0 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 19 | 21 | 13 | 10 | 6 | 6.5 | 6 | 6.5 | 62.3 | 39.0 | 43.0 | 7 | 16 | 63.0 | 7 | 16 | 44.5 | 6 | 6 | 6 | 6.5 | 57.5 | 161 | 173 | 7 | 7 | 57.0 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 20 | 23 | 14 | 10 | 6 | 6.5 | 6 | 6.5 | 62.5 | 40.0 | 44.0 | 7 | 16 | 62.5 | 7 | 16 | 44.0 | 6 | 6.5 | 6 | 7.5 | 57.8 | 163 | 175 | 7 | 7 | 57.0 | 5 | 12 | 5 | 6 | 0 |
| 26 FT | 21 | 24 | 14 | 10 | 6 | 6 | 6 | 6 | 62.3 | 41.0 | 45.0 | 7 | 15 | 62.0 | 7 | 15 | 44.0 | 6 | 6.5 | 6 | 7 | 57.6 | 164 | 176 | 7 | 7 | 57.0 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 22 | 25 | 14 | 10 | 6 | 6 | 6 | 6 | 59.8 | 42.0 | 46.0 | 7 | 15 | 61.0 | 7 | 15 | 43.5 | 6 | 6.5 | 6 | 7.5 | 55.1 | 165 | 177 | 7 | 6.5 | 57.0 | 5 | 12 | 5 | 6 | 0 |
| 30 FT | 23 | 26 | 15 | 10 | 7 | 8 | 6 | 6 | 60.3 | 47.0 | 47.0 | 7 | 15 | 60.0 | 7 | 15 | 42.5 | 6 | 6 | 6 | 7.5 | 55.4 | 166 | 178 | 7 | 6.5 | 57.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 24 | 27 | 15 | 10 | 7 | 7.5 | 6 | 6 | 60.3 | 48.0 | 48.0 | 7 | 14 | 59.5 | 7 | 14 | 42.0 | 6 | 6 | 6 | 7.5 | 55.5 | 167 | 179 | 7 | 6 | 57.0 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 25 | 28 | 16 | 10 | 7 | 7.5 | 6 | 6 | 60.9 | 49.0 | 49.0 | 7 | 14 | 58.5 | 7 | 14 | 41.0 | 6 | 6 | 6 | 7.5 | 55.8 | 168 | 180 | 7 | 6 | 57.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 25 | 29 | 16 | 10 | 7 | 6.5 | 7 | 7.5 | 65.8 | 49.0 | 49.0 | 7 | 13 | 58.5 | 7 | 13 | 41.5 | 6 | 6 | 6 | 7.5 | 55.8 | 169 | 181 | 8 | 7.5 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 26 | 30 | 17 | 10 | 7 | 7 | 6 | 6 | 61.5 | 50.0 | 50.0 | 7 | 13 | 57.5 | 7 | 13 | 40.5 | 7 | 7.5 | 6 | 7 | 56.1 | 170 | 182 | 8 | 7.5 | 63.0 | 5 | 12 | 6 | 7.5 | 0 |
| 40 FT | 27 | 31 | 17 | 10 | 7 | 6.5 | 7 | 7.5 | 66.5 | 51.0 | 51.0 | 7 | 13 | 57.0 | 7 | 13 | 40.0 | 7 | 7.5 | 6 | 7 | 56.3 | 171 | 183 | 8 | 7 | 63.0 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 28 | 32 | 18 | 10 | 7 | 6.5 | 7 | 7.5 | 67.1 | 52.0 | 52.0 | 7 | 12 | 56.5 | 7 | 12 | 39.0 | 7 | 7.5 | 6 | 6.5 | 56.6 | 172 | 184 | 8 | 7 | 63.0 | 5 | 12 | 6 | 7 | 0 |
| 44 FT | 29 | 33 | 18 | 10 | 7 | 6.5 | 7 | 7 | 67.1 | 53.0 | 53.0 | 7 | 12 | 56.0 | 7 | 12 | 38.0 | 7 | 7.5 | 6 | 6.5 | 56.9 | 173 | 185 | 8 | 6.5 | 63.0 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 29 | 34 | 19 | 10 | 7 | 6 | 7 | 7.5 | 67.9 | 53.0 | 53.0 | 7 | 12 | 56.0 | 7 | 12 | 38.5 | 7 | 7.5 | 6 | 6.5 | 57.0 | 174 | 186 | 8 | 6.5 | 63.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 30 | 35 | 19 | 10 | 7 | 6 | 7 | 6.5 | 67.9 | 54.0 | 54.0 | 7 | 12 | 55.0 | 7 | 12 | 38.0 | 7 | 7 | 6 | 6.5 | 57.3 | 175 | 187 | 8 | 6.5 | 63.0 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 31 | 36 | 20 | 10 | 7 | 6 | 7 | 7 | 68.6 | 55.0 | 55.0 | 7 | 13 | 54.5 | 7 | 13 | 37.5 | 7 | 7 | 6 | 6.5 | 57.6 | 176 | 188 | 8 | 6 | 63.0 | 5 | 12 | 6 | 6.5 | 0 |

## SPAN (S) = 12 FT  HEIGHT (HT) = 14 FT OR 15 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | K2 | | H1 BARS | | | H2 BARS | | A2 BARS | | J4 BARS | | | K3 | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=14′ | HT=15′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=14′ | HT=15′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 12 | 10 | 12 | 5 | 6 | 5 | 6 | 60.0 | 34.0 | 34.0 | 5 | 12 | 119.0 | 5 | 12 | 32.5 | 5 | 7 | 6 | 6 | 98.8 | 176 | 188 | 6 | 7 | 58.0 | 5 | 12 | 5 | 8 | 12 |
| 2 FT | 15 | 12 | 10 | 12 | 6 | 8 | 6 | 8 | 67.0 | 35.0 | 39.0 | 6 | 16 | 126.0 | 6 | 16 | 40.0 | 5 | 6.5 | 6 | 6 | 92.5 | 176 | 188 | 6 | 6.5 | 57.0 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 11 | 13 | 10 | 12 | 5 | 6.5 | 6 | 6.5 | 62.0 | 35.0 | 35.0 | 6 | 16 | 121.0 | 6 | 16 | 37.5 | 5 | 6.5 | 6 | 6 | 89.8 | 177 | 189 | 6 | 7 | 57.0 | 5 | 12 | 5 | 7 | 12 |
| 6 FT | 11 | 13 | 11 | 12 | 5 | 7 | 6 | 7 | 83.8 | 31.0 | 35.0 | 6 | 15 | 61.0 | 6 | 15 | 36.0 | 5 | 6 | 6 | 6.5 | 81.4 | 177 | 189 | 6 | 6.5 | 56.0 | 5 | 12 | 5 | 7 | 12 |
| 8 FT | 11 | 13 | 12 | 12 | 5 | 7 | 6 | 7.5 | 73.9 | 35.0 | 35.0 | 6 | 13 | 57.5 | 6 | 13 | 35.0 | 5 | 6 | 6 | 6.5 | 76.1 | 177 | 189 | 7 | 7 | 58.0 | 5 | 12 | 5 | 7 | 0 |
| 10 FT | 12 | 14 | 12 | 12 | 5 | 7 | 6 | 7 | 71.4 | 36.0 | 36.0 | 6 | 13 | 56.0 | 6 | 13 | 35.0 | 6 | 8 | 6 | 6.5 | 74.1 | 178 | 190 | 7 | 7 | 58.0 | 5 | 12 | 5 | 7 | 0 |
| 12 FT | 13 | 15 | 13 | 12 | 5 | 6.5 | 6 | 7.5 | 68.8 | 37.0 | 37.0 | 6 | 13 | 55.0 | 6 | 13 | 34.5 | 6 | 7.5 | 6 | 6.5 | 71.6 | 179 | 191 | 7 | 7 | 57.5 | 5 | 12 | 5 | 6.5 | 0 |
| 14 FT | 14 | 16 | 13 | 12 | 5 | 6 | 6 | 6.5 | 67.3 | 38.0 | 38.0 | 6 | 12 | 54.5 | 6 | 12 | 34.5 | 6 | 6.5 | 6 | 6 | 70.1 | 180 | 192 | 7 | 7 | 57.5 | 5 | 12 | 5 | 6.5 | 0 |
| 16 FT | 15 | 18 | 14 | 12 | 6 | 8 | 6 | 6.5 | 72.1 | 39.0 | 39.0 | 6 | 12 | 60.0 | 6 | 12 | 40.5 | 6 | 7 | 6 | 6.5 | 69.5 | 182 | 194 | 6 | 6 | 54.5 | 5 | 12 | 5 | 6 | 0 |
| 18 FT | 17 | 19 | 14 | 12 | 6 | 7.5 | 6 | 6 | 72.1 | 41.0 | 41.0 | 6 | 12 | 59.5 | 6 | 12 | 40.5 | 6 | 6.5 | 6 | 6 | 68.1 | 183 | 195 | 6 | 6 | 54.5 | 5 | 12 | 5 | 6 | 0 |
| 20 FT | 18 | 20 | 15 | 12 | 6 | 7 | 6 | 6 | 71.5 | 42.0 | 42.0 | 6 | 12 | 59.0 | 6 | 12 | 40.0 | 6 | 6.5 | 6 | 6 | 67.1 | 184 | 196 | 7 | 7 | 57.5 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 19 | 22 | 16 | 12 | 6 | 6.5 | 6 | 6 | 71.4 | 43.0 | 43.0 | 6 | 12 | 58.5 | 6 | 12 | 40.0 | 6 | 6.5 | 6 | 6 | 67.4 | 186 | 198 | 7 | 7 | 57.5 | 5 | 12 | 6 | 8 | 0 |
| 24 FT | 20 | 23 | 16 | 12 | 6 | 6.5 | 6 | 6 | 71.3 | 44.0 | 44.0 | 6 | 12 | 58.0 | 6 | 12 | 40.0 | 6 | 6.5 | 6 | 6 | 67.1 | 187 | 199 | 7 | 7 | 57.5 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 21 | 24 | 17 | 12 | 6 | 6 | 6 | 6 | 71.4 | 45.0 | 45.0 | 6 | 12 | 57.0 | 6 | 12 | 39.5 | 6 | 6 | 6 | 6 | 67.1 | 188 | 200 | 7 | 7 | 57.5 | 5 | 12 | 6 | 7.5 | 0 |
| 28 FT | 22 | 25 | 17 | 12 | 6 | 6 | 6 | 6 | 69.1 | 46.0 | 46.0 | 7 | 15 | 61.5 | 7 | 15 | 44.0 | 6 | 6 | 6 | 6.5 | 64.9 | 189 | 201 | 7 | 6.5 | 57.5 | 5 | 12 | 6 | 7.5 | 0 |
| 30 FT | 23 | 26 | 17 | 12 | 6 | 6 | 7 | 7.5 | 74.1 | 47.0 | 47.0 | 7 | 15 | 61.0 | 7 | 15 | 43.0 | 6 | 6 | 6 | 6.5 | 64.9 | 190 | 202 | 7 | 6.5 | 57.5 | 5 | 12 | 6 | 7.5 | 0 |
| 32 FT | 23 | 27 | 17 | 12 | 7 | 7 | 7 | 6.5 | 74.0 | 47.0 | 47.0 | 7 | 14 | 61.0 | 7 | 14 | 44.0 | 6 | 6 | 6 | 6 | 65.0 | 191 | 203 | 7 | 6 | 57.5 | 5 | 12 | 6 | 7.5 | 0 |
| 34 FT | 24 | 28 | 18 | 12 | 7 | 7 | 7 | 7 | 74.5 | 48.0 | 48.0 | 7 | 14 | 60.0 | 7 | 14 | 43.0 | 6 | 6 | 6 | 6 | 65.3 | 192 | 204 | 7 | 6 | 57.5 | 5 | 12 | 6 | 7 | 0 |
| 36 FT | 25 | 29 | 19 | 12 | 7 | 7 | 7 | 7 | 75.0 | 49.0 | 49.0 | 7 | 14 | 59.0 | 7 | 14 | 42.0 | 7 | 7.5 | 6 | 6.5 | 65.5 | 193 | 205 | 8 | 7.5 | 63.5 | 5 | 12 | 6 | 6.5 | 0 |
| 38 FT | 26 | 30 | 20 | 12 | 7 | 7 | 7 | 7.5 | 75.5 | 50.0 | 50.0 | 7 | 13 | 58.0 | 7 | 13 | 41.5 | 7 | 7.5 | 6 | 6 | 65.9 | 194 | 206 | 8 | 7.5 | 63.5 | 5 | 12 | 6 | 6.5 | 0 |
| 40 FT | 27 | 31 | 20 | 12 | 7 | 7 | 7 | 6.5 | 75.6 | 51.0 | 51.0 | 7 | 13 | 57.5 | 7 | 13 | 40.5 | 7 | 7.5 | 6 | 6 | 66.0 | 195 | 207 | 8 | 7 | 63.5 | 5 | 12 | 6 | 6.5 | 0 |
| 42 FT | 28 | 32 | 21 | 12 | 7 | 6.5 | 7 | 7 | 76.3 | 52.0 | 52.0 | 7 | 12 | 57.0 | 7 | 12 | 39.5 | 7 | 7 | 6 | 6 | 66.4 | 196 | 208 | 8 | 7 | 63.5 | 5 | 12 | 6 | 6 | 0 |
| 44 FT | 28 | 33 | 22 | 12 | 7 | 6.5 | 7 | 7 | 76.6 | 52.0 | 58.0 | 7 | 12 | 57.0 | 7 | 12 | 40.0 | 7 | 7 | 7 | 7.5 | 69.6 | 197 | 209 | 8 | 6.5 | 63.5 | 5 | 12 | 6 | 6 | 0 |
| 46 FT | 29 | 34 | 22 | 12 | 7 | 6.5 | 7 | 6 | 76.8 | 53.0 | 59.0 | 7 | 12 | 56.5 | 7 | 12 | 39.0 | 7 | 7 | 7 | 7.5 | 69.9 | 198 | 210 | 8 | 6.5 | 63.5 | 5 | 12 | 6 | 6 | 0 |
| 48 FT | 30 | 35 | 24 | 12 | 7 | 6 | 7 | 7 | 78.0 | 54.0 | 60.0 | 7 | 12 | 56.0 | 7 | 12 | 39.0 | 7 | 7 | 7 | 7.5 | 70.4 | 199 | 211 | 8 | 6.5 | 64.0 | 5 | 12 | 6 | 6 | 0 |
| 50 FT | 30 | 36 | 24 | 12 | 7 | 6 | 7 | 6 | 78.0 | 54.0 | 60.0 | 7 | 12 | 56.0 | 7 | 12 | 39.0 | 7 | 7 | 7 | 7.5 | 70.5 | 200 | 212 | 8 | 6 | 64.0 | 5 | 12 | 7 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 12 FEET
HEIGHT (HT): 12 THRU 15 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

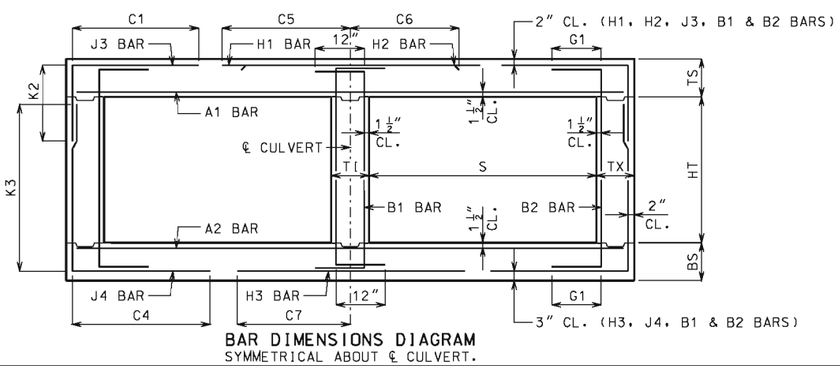
SHEET NO.
19 OF 27

## SPAN (S) = 13 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=7′ | K2 HT=8′ | K2 HT=9′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=7′ | K3 HT=8′ | K3 HT=9′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 10 | 8 | 8 | 5 | 6 | 5 | 8.5 | 61.8 | 30.0 | 34.0 | 34.0 | 5 | 12 | 125.5 | 5 | 12 | 36.5 | 5 | 7 | 6 | 7 | 61.0 | 90 | 102 | 114 | 6 | 6 | 60.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 15 | 12 | 8 | 8 | 6 | 8 | 5 | 8 | 65.8 | 31.0 | 35.0 | 35.0 | 6 | 16 | 129.5 | 6 | 16 | 43.5 | 5 | 7 | 5 | 7 | 53.8 | 92 | 104 | 116 | 6 | 6.5 | 59.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 11 | 11 | 8 | 8 | 6 | 8 | 6 | 7 | 52.1 | 31.0 | 31.0 | 31.0 | 6 | 13 | 82.0 | 6 | 13 | 38.0 | 5 | 6.5 | 5 | 6 | 46.5 | 91 | 103 | 115 | 7 | 6.5 | 62.0 | 5 | 11 | 5 | 12 | 12 |
| 6 FT | 12 | 12 | 8 | 8 | 5 | 6.5 | 5 | 6.5 | 44.1 | 32.0 | 32.0 | 32.0 | 6 | 13 | 68.0 | 6 | 13 | 36.5 | 5 | 6 | 5 | 6.5 | 42.8 | 92 | 104 | 116 | 7 | 6.5 | 61.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 12 | 13 | 8 | 8 | 5 | 6 | 5 | 6 | 41.5 | 32.0 | 32.0 | 32.0 | 7 | 16 | 65.0 | 7 | 16 | 38.5 | 5 | 6 | 5 | 6.5 | 40.0 | 93 | 105 | 117 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 13 | 15 | 8 | 8 | 5 | 6 | 5 | 6 | 39.5 | 29.0 | 33.0 | 33.0 | 7 | 15 | 63.0 | 7 | 15 | 38.0 | 6 | 7.5 | 5 | 8 | 38.0 | 95 | 107 | 119 | 7 | 7 | 60.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 6.5 | 42.4 | 35.0 | 35.0 | 35.0 | 7 | 16 | 70.0 | 7 | 16 | 46.0 | 6 | 7 | 5 | 7.5 | 37.1 | 96 | 108 | 120 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 11 | 0 |
| 14 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 6 | 41.1 | 36.0 | 36.0 | 36.0 | 7 | 15 | 69.0 | 7 | 15 | 46.0 | 6 | 7 | 5 | 7 | 36.1 | 97 | 109 | 121 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 10 | 0 |
| 16 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 5 | 6 | 40.1 | 37.0 | 37.0 | 37.0 | 7 | 14 | 68.5 | 7 | 14 | 45.5 | 6 | 6 | 5 | 6.5 | 35.4 | 98 | 110 | 122 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 9.5 | 0 |
| 18 FT | 18 | 20 | 8 | 8 | 6 | 6.5 | 6 | 8 | 43.5 | 38.0 | 38.0 | 38.0 | 7 | 14 | 68.0 | 7 | 14 | 45.5 | 6 | 6.5 | 5 | 6 | 34.8 | 100 | 112 | 124 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 9.5 | 0 |
| 20 FT | 20 | 21 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 42.6 | 44.0 | 44.0 | 44.0 | 7 | 14 | 67.0 | 7 | 14 | 45.5 | 6 | 6 | 6 | 7.5 | 37.5 | 101 | 113 | 125 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 9 | 0 |
| 22 FT | 21 | 23 | 8 | 8 | 6 | 6 | 6 | 6.5 | 42.5 | 45.0 | 45.0 | 45.0 | 7 | 14 | 66.5 | 7 | 14 | 45.0 | 6 | 6 | 6 | 6.5 | 37.3 | 103 | 115 | 127 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 22 | 24 | 9 | 8 | 6 | 6 | 6 | 7.5 | 43.1 | 42.0 | 42.0 | 46.0 | 7 | 13 | 66.0 | 7 | 13 | 45.0 | 6 | 6 | 6 | 7 | 37.6 | 104 | 116 | 128 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 8.5 | 0 |
| 26 FT | 23 | 25 | 9 | 8 | 7 | 7.5 | 6 | 6.5 | 42.9 | 47.0 | 47.0 | 47.0 | 7 | 13 | 65.5 | 7 | 13 | 45.0 | 6 | 6 | 6 | 7 | 37.6 | 105 | 117 | 129 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 8.5 | 0 |
| 28 FT | 24 | 26 | 9 | 8 | 7 | 7.5 | 6 | 7 | 41.3 | 48.0 | 48.0 | 48.0 | 7 | 13 | 64.5 | 7 | 13 | 44.5 | 7 | 8 | 6 | 6.5 | 36.1 | 106 | 118 | 130 | 7 | 6.5 | 59.5 | 5 | 12 | 5 | 8.5 | 0 |
| 30 FT | 25 | 27 | 9 | 8 | 7 | 7 | 6 | 6 | 41.3 | 49.0 | 49.0 | 49.0 | 7 | 13 | 64.0 | 7 | 13 | 44.5 | 7 | 7.5 | 6 | 6.5 | 36.3 | 107 | 119 | 131 | 7 | 6 | 59.5 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 26 | 29 | 10 | 8 | 7 | 7 | 6 | 7 | 42.3 | 50.0 | 50.0 | 50.0 | 7 | 13 | 63.5 | 7 | 13 | 44.0 | 7 | 8 | 6 | 6.5 | 36.9 | 109 | 121 | 133 | 8 | 7.5 | 65.5 | 5 | 12 | 5 | 8 | 0 |
| 34 FT | 27 | 30 | 10 | 8 | 7 | 6.5 | 6 | 6.5 | 42.3 | 51.0 | 51.0 | 51.0 | 7 | 13 | 62.5 | 7 | 13 | 43.5 | 7 | 7.5 | 6 | 6.5 | 37.0 | 110 | 122 | 134 | 8 | 7.5 | 65.5 | 5 | 12 | 5 | 7.5 | 0 |
| 36 FT | 28 | 31 | 11 | 8 | 7 | 6.5 | 6 | 7.5 | 43.1 | 52.0 | 52.0 | 52.0 | 7 | 12 | 62.0 | 7 | 12 | 42.5 | 7 | 7.5 | 6 | 7 | 37.5 | 111 | 123 | 135 | 8 | 7 | 65.5 | 5 | 12 | 5 | 7.5 | 0 |
| 38 FT | 29 | 32 | 11 | 8 | 7 | 6 | 6 | 7 | 43.1 | 53.0 | 53.0 | 53.0 | 7 | 12 | 61.0 | 7 | 12 | 41.5 | 7 | 7.5 | 6 | 6.5 | 37.6 | 112 | 124 | 136 | 8 | 7 | 65.5 | 5 | 12 | 5 | 7.5 | 0 |
| 40 FT | 30 | 33 | 11 | 8 | 7 | 6 | 6 | 7 | 43.1 | 54.0 | 54.0 | 54.0 | 7 | 12 | 60.0 | 7 | 12 | 41.0 | 7 | 7 | 6 | 6.5 | 37.9 | 113 | 125 | 137 | 8 | 6.5 | 65.5 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 31 | 34 | 12 | 8 | 7 | 6 | 6 | 7.5 | 44.0 | 55.0 | 55.0 | 55.0 | 8 | 15 | 67.0 | 8 | 15 | 48.0 | 7 | 7 | 6 | 7 | 38.4 | 114 | 126 | 138 | 8 | 6.5 | 65.5 | 5 | 12 | 5 | 7 | 0 |
| 44 FT | 32 | 35 | 12 | 8 | 8 | 7.5 | 6 | 7 | 44.0 | 56.0 | 56.0 | 56.0 | 8 | 14 | 66.5 | 8 | 14 | 47.0 | 7 | 7 | 6 | 6.5 | 38.5 | 115 | 127 | 139 | 8 | 6.5 | 65.5 | 5 | 12 | 5 | 7 | 0 |
| 46 FT | 33 | 36 | 12 | 8 | 8 | 7 | 6 | 7 | 44.0 | 57.0 | 57.0 | 57.0 | 8 | 14 | 66.0 | 8 | 14 | 46.0 | 7 | 7 | 6 | 6.5 | 38.8 | 116 | 128 | 140 | 8 | 6 | 65.5 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 33 | 37 | 12 | 8 | 8 | 6.5 | 6 | 7 | 44.0 | 57.0 | 57.0 | 57.0 | 8 | 13 | 66.0 | 8 | 13 | 46.5 | 7 | 6.5 | 6 | 6.5 | 38.8 | 117 | 129 | 141 | 8 | 6 | 65.5 | 5 | 12 | 5 | 6.5 | 0 |
| 50 FT | 34 | 38 | 12 | 8 | 8 | 7 | 6 | 6 | 44.0 | 58.0 | 58.0 | 58.0 | 8 | 14 | 65.0 | 8 | 14 | 46.0 | 7 | 6.5 | 6 | 6 | 39.0 | 118 | 130 | 142 | 8 | 6 | 65.5 | 5 | 12 | 5 | 6 | 0 |

## SPAN (S) = 13 FT  HEIGHT (HT) = 10 FT OR 11 FT OR 12 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=10′ | K2 HT=11′ | K2 HT=12′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=10′ | K3 HT=11′ | K3 HT=12′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 11 | 9 | 10 | 5 | 6 | 5 | 7.5 | 62.6 | 34.0 | 34.0 | 34.0 | 5 | 12 | 126.5 | 5 | 12 | 36.5 | 5 | 6.5 | 6 | 6.5 | 81.1 | 127 | 139 | 151 | 6 | 6.5 | 60.5 | 5 | 11.5 | 5 | 9.5 | 12 |
| 2 FT | 15 | 12 | 9 | 10 | 6 | 8 | 5 | 7.5 | 66.6 | 35.0 | 35.0 | 35.0 | 6 | 16 | 130.5 | 6 | 16 | 43.5 | 5 | 6.5 | 6 | 6.5 | 75.6 | 128 | 140 | 152 | 6 | 6.5 | 60.0 | 5 | 12 | 5 | 9 | 12 |
| 4 FT | 11 | 11 | 9 | 10 | 6 | 8 | 6 | 7 | 78.5 | 35.0 | 35.0 | 35.0 | 6 | 13 | 84.0 | 6 | 13 | 38.0 | 5 | 6.5 | 6 | 6 | 66.3 | 127 | 139 | 151 | 7 | 6.5 | 62.0 | 5 | 9 | 5 | 8.5 | 12 |
| 6 FT | 12 | 12 | 9 | 10 | 5 | 6.5 | 6 | 6.5 | 63.6 | 32.0 | 36.0 | 36.0 | 6 | 13 | 67.0 | 6 | 13 | 37.0 | 5 | 6 | 6 | 6 | 61.5 | 128 | 140 | 152 | 7 | 6.5 | 61.5 | 5 | 12 | 5 | 8.5 | 12 |
| 8 FT | 12 | 14 | 9 | 10 | 5 | 6 | 6 | 6.5 | 58.3 | 32.0 | 32.0 | 36.0 | 6 | 12 | 61.5 | 6 | 12 | 36.0 | 6 | 8 | 6 | 6.5 | 59.1 | 130 | 142 | 154 | 7 | 7 | 61.0 | 5 | 12 | 5 | 8.5 | 0 |
| 10 FT | 13 | 15 | 9 | 10 | 5 | 6 | 6 | 6 | 55.4 | 33.0 | 33.0 | 37.0 | 7 | 15 | 63.0 | 7 | 15 | 38.5 | 6 | 7.5 | 6 | 6.5 | 56.6 | 131 | 143 | 155 | 7 | 7 | 61.0 | 5 | 12 | 5 | 8.5 | 0 |
| 12 FT | 14 | 16 | 10 | 10 | 5 | 6 | 6 | 6.5 | 53.6 | 34.0 | 34.0 | 38.0 | 7 | 15 | 61.5 | 7 | 15 | 38.5 | 6 | 7 | 6 | 7 | 54.6 | 132 | 144 | 156 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 8 | 0 |
| 14 FT | 16 | 17 | 10 | 10 | 6 | 8 | 6 | 7 | 58.0 | 36.0 | 36.0 | 40.0 | 7 | 15 | 69.0 | 7 | 15 | 46.5 | 6 | 7 | 6 | 6.5 | 53.3 | 133 | 145 | 157 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 8 | 0 |
| 16 FT | 17 | 19 | 11 | 10 | 6 | 7.5 | 6 | 7 | 57.5 | 37.0 | 37.0 | 41.0 | 7 | 15 | 68.5 | 7 | 15 | 46.0 | 6 | 6.5 | 6 | 8 | 52.4 | 135 | 147 | 159 | 7 | 7 | 60.5 | 5 | 12 | 5 | 7.5 | 0 |
| 18 FT | 18 | 20 | 12 | 10 | 6 | 7 | 6 | 7.5 | 57.4 | 38.0 | 38.0 | 38.0 | 7 | 14 | 68.0 | 7 | 14 | 46.0 | 6 | 6.5 | 5 | 6 | 48.8 | 136 | 148 | 160 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 19 | 21 | 12 | 10 | 6 | 6.5 | 6 | 7 | 56.6 | 39.0 | 39.0 | 43.0 | 7 | 14 | 67.5 | 7 | 14 | 46.0 | 6 | 6 | 6 | 8 | 51.1 | 137 | 149 | 161 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 7 | 0 |
| 22 FT | 21 | 23 | 12 | 10 | 6 | 6 | 6 | 6.5 | 56.1 | 41.0 | 41.0 | 45.0 | 7 | 14 | 66.5 | 7 | 14 | 45.5 | 6 | 6 | 6 | 7.5 | 51.0 | 139 | 151 | 163 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 7 | 0 |
| 24 FT | 22 | 24 | 13 | 10 | 6 | 6 | 6 | 7 | 56.5 | 42.0 | 42.0 | 46.0 | 7 | 14 | 66.0 | 7 | 14 | 45.5 | 6 | 6 | 6 | 8 | 51.1 | 140 | 152 | 164 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 6.5 | 0 |
| 26 FT | 23 | 25 | 13 | 10 | 7 | 7.5 | 6 | 6.5 | 56.3 | 43.0 | 43.0 | 47.0 | 7 | 14 | 65.5 | 7 | 14 | 45.5 | 7 | 7.5 | 6 | 7.5 | 51.0 | 141 | 153 | 165 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 6.5 | 0 |
| 28 FT | 24 | 26 | 13 | 10 | 7 | 7.5 | 6 | 6.5 | 54.4 | 44.0 | 44.0 | 48.0 | 7 | 14 | 64.5 | 7 | 14 | 45.0 | 7 | 7.5 | 6 | 8 | 49.1 | 142 | 154 | 166 | 7 | 6.5 | 60.0 | 5 | 12 | 5 | 6.5 | 0 |
| 30 FT | 25 | 28 | 13 | 10 | 7 | 7 | 6 | 6 | 54.4 | 45.0 | 45.0 | 49.0 | 7 | 14 | 64.0 | 7 | 14 | 45.0 | 7 | 8 | 6 | 8 | 49.3 | 144 | 156 | 168 | 7 | 6 | 60.0 | 5 | 12 | 5 | 6.5 | 0 |
| 32 FT | 26 | 29 | 14 | 10 | 7 | 7 | 6 | 6.5 | 55.1 | 46.0 | 50.0 | 50.0 | 7 | 13 | 63.5 | 7 | 13 | 44.0 | 7 | 7.5 | 6 | 8.5 | 49.8 | 145 | 157 | 169 | 8 | 7.5 | 66.0 | 5 | 12 | 5 | 6 | 0 |
| 34 FT | 27 | 30 | 14 | 10 | 7 | 6.5 | 6 | 6 | 55.0 | 47.0 | 51.0 | 51.0 | 7 | 13 | 62.5 | 7 | 13 | 43.0 | 7 | 7.5 | 6 | 8 | 49.8 | 146 | 158 | 170 | 8 | 7.5 | 66.0 | 5 | 12 | 5 | 6 | 0 |
| 36 FT | 28 | 31 | 15 | 10 | 7 | 6.5 | 6 | 6.5 | 55.8 | 52.0 | 52.0 | 52.0 | 7 | 12 | 61.5 | 7 | 12 | 42.5 | 7 | 7 | 6 | 7.5 | 50.3 | 147 | 159 | 171 | 8 | 7 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 29 | 32 | 15 | 10 | 7 | 6 | 6 | 6 | 55.6 | 53.0 | 53.0 | 53.0 | 7 | 12 | 60.5 | 7 | 12 | 41.5 | 7 | 7 | 6 | 7.5 | 50.4 | 148 | 160 | 172 | 8 | 7 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 30 | 33 | 16 | 10 | 7 | 6 | 6 | 6 | 56.4 | 54.0 | 54.0 | 54.0 | 7 | 12 | 59.5 | 7 | 12 | 41.0 | 7 | 6.5 | 6 | 7 | 50.8 | 149 | 161 | 173 | 8 | 6.5 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 42 FT | 31 | 35 | 16 | 10 | 7 | 6 | 6 | 6 | 56.5 | 55.0 | 55.0 | 55.0 | 8 | 15 | 67.0 | 8 | 15 | 48.0 | 7 | 7 | 6 | 6.5 | 51.0 | 151 | 163 | 175 | 8 | 6.5 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 31 | 35 | 16 | 10 | 8 | 7 | 7 | 7.5 | 61.4 | 55.0 | 55.0 | 55.0 | 8 | 14 | 67.0 | 8 | 14 | 48.5 | 7 | 6 | 6 | 6.5 | 50.9 | 151 | 163 | 175 | 8 | 6.5 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 32 | 36 | 17 | 10 | 8 | 7.5 | 6 | 6 | 57.1 | 56.0 | 56.0 | 56.0 | 8 | 14 | 66.5 | 8 | 14 | 47.5 | 7 | 6 | 6 | 6.5 | 51.4 | 152 | 164 | 176 | 8 | 6 | 66.0 | 5 | 12 | 6 | 7.5 | 0 |
| 48 FT | 33 | 37 | 17 | 10 | 8 | 7 | 7 | 7.5 | 62.1 | 57.0 | 57.0 | 57.0 | 8 | 14 | 66.0 | 8 | 14 | 47.0 | 7 | 6 | 6 | 6.5 | 51.5 | 153 | 165 | 177 | 8 | 6 | 66.0 | 5 | 12 | 6 | 7.5 | 0 |
| 50 FT | 34 | 38 | 17 | 10 | 8 | 7 | 7 | 7 | 62.1 | 58.0 | 58.0 | 58.0 | 8 | 14 | 65.5 | 8 | 14 | 46.5 | 7 | 6 | 6 | 6 | 51.8 | 154 | 166 | 178 | 8 | 6 | 66.0 | 5 | 12 | 6 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 13 FEET
HEIGHT (HT): 7 THRU 12 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

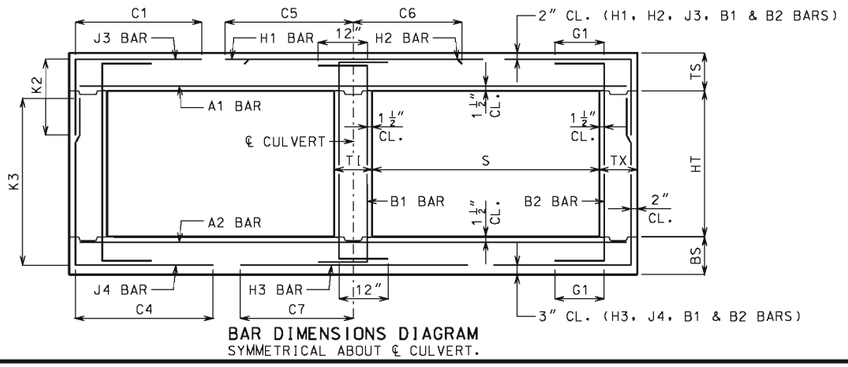
703.47

## SPAN (S) = 13 FT  HEIGHT (HT) = 13 FT OR 14 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | K2 | | H1 BARS | | | H2 BARS | | A2 BARS | | J4 BARS | | | K3 | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=13′ | HT=14′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=13′ | HT=14′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 11 | 11 | 11 | 5 | 6 | 5 | 7 | 64.1 | 34.0 | 34.0 | 5 | 12 | 127.5 | 5 | 12 | 36.5 | 5 | 6.5 | 5 | 6 | 85.3 | 163 | 175 | 6 | 6 | 60.5 | 5 | 12 | 5 | 8 | 12 |
| 2 FT | 15 | 12 | 11 | 11 | 6 | 8 | 5 | 7 | 68.1 | 35.0 | 35.0 | 6 | 16 | 131.5 | 6 | 16 | 43.5 | 5 | 6.5 | 5 | 6 | 80.9 | 164 | 176 | 6 | 6.5 | 60.0 | 5 | 12 | 5 | 7.5 | 12 |
| 4 FT | 11 | 12 | 11 | 11 | 5 | 6 | 5 | 6 | 92.9 | 31.0 | 31.0 | 6 | 13 | 82.5 | 6 | 13 | 38.0 | 5 | 6 | 5 | 6 | 75.5 | 164 | 176 | 7 | 7 | 62.5 | 5 | 11.5 | 5 | 7.5 | 12 |
| 6 FT | 11 | 12 | 11 | 11 | 5 | 6 | 6 | 7.5 | 74.6 | 31.0 | 35.0 | 6 | 12 | 64.5 | 6 | 12 | 37.0 | 5 | 6 | 6 | 6.5 | 72.1 | 164 | 176 | 7 | 6.5 | 61.5 | 5 | 12 | 5 | 7.5 | 12 |
| 8 FT | 12 | 14 | 11 | 11 | 5 | 6.5 | 6 | 7.5 | 68.5 | 32.0 | 36.0 | 6 | 12 | 61.5 | 6 | 12 | 36.5 | 6 | 8 | 6 | 7 | 70.1 | 166 | 178 | 7 | 7 | 61.5 | 5 | 12 | 5 | 7.5 | 0 |
| 10 FT | 13 | 15 | 11 | 11 | 5 | 6.5 | 6 | 7 | 65.9 | 37.0 | 37.0 | 6 | 12 | 59.5 | 6 | 12 | 36.0 | 6 | 7.5 | 6 | 6.5 | 67.4 | 167 | 179 | 7 | 6.5 | 61.0 | 5 | 12 | 5 | 7.5 | 0 |
| 12 FT | 14 | 16 | 12 | 11 | 5 | 6 | 6 | 7 | 64.0 | 38.0 | 38.0 | 7 | 15 | 61.5 | 7 | 15 | 38.5 | 6 | 7 | 6 | 7 | 65.5 | 168 | 180 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 7 | 0 |
| 14 FT | 15 | 17 | 12 | 11 | 6 | 7.5 | 6 | 6.5 | 68.5 | 39.0 | 39.0 | 7 | 15 | 69.0 | 7 | 15 | 46.5 | 6 | 6.5 | 6 | 6 | 64.1 | 169 | 181 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 17 | 19 | 13 | 11 | 6 | 7.5 | 6 | 6.5 | 68.0 | 41.0 | 41.0 | 7 | 15 | 68.0 | 7 | 15 | 46.5 | 6 | 6.5 | 6 | 7 | 63.4 | 171 | 183 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 6.5 | 0 |
| 18 FT | 18 | 20 | 13 | 11 | 6 | 7 | 6 | 6 | 66.9 | 42.0 | 42.0 | 7 | 15 | 67.5 | 7 | 15 | 46.5 | 6 | 6 | 6 | 6 | 62.4 | 172 | 184 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 6.5 | 0 |
| 20 FT | 19 | 22 | 14 | 11 | 6 | 6.5 | 6 | 6 | 66.5 | 43.0 | 43.0 | 7 | 14 | 67.0 | 7 | 14 | 46.0 | 6 | 6 | 6 | 7 | 62.0 | 174 | 186 | 7 | 7 | 60.5 | 5 | 12 | 5 | 6 | 0 |
| 22 FT | 20 | 23 | 14 | 11 | 6 | 6 | 7 | 8 | 70.6 | 44.0 | 44.0 | 7 | 14 | 66.5 | 7 | 14 | 46.0 | 6 | 6 | 6 | 6 | 61.3 | 175 | 187 | 7 | 6.5 | 60.5 | 5 | 12 | 5 | 6 | 0 |
| 24 FT | 22 | 25 | 15 | 11 | 6 | 6 | 6 | 6 | 66.1 | 46.0 | 46.0 | 7 | 15 | 65.5 | 7 | 15 | 45.5 | 6 | 6 | 6 | 7 | 61.5 | 177 | 189 | 7 | 6.5 | 60.5 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 23 | 25 | 15 | 11 | 7 | 7.5 | 7 | 7.5 | 70.6 | 47.0 | 47.0 | 7 | 14 | 65.0 | 7 | 14 | 45.5 | 7 | 7 | 6 | 6 | 60.9 | 177 | 189 | 7 | 6.5 | 60.5 | 5 | 12 | 6 | 8 | 0 |
| 28 FT | 24 | 27 | 16 | 11 | 7 | 7.5 | 7 | 8 | 71.0 | 48.0 | 48.0 | 7 | 14 | 64.5 | 7 | 14 | 45.0 | 7 | 8 | 6 | 7 | 61.3 | 179 | 191 | 7 | 6 | 60.5 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 25 | 28 | 16 | 11 | 7 | 7 | 7 | 8 | 68.5 | 49.0 | 49.0 | 7 | 14 | 63.5 | 7 | 14 | 44.0 | 7 | 7.5 | 6 | 7 | 58.9 | 180 | 192 | 7 | 6 | 60.5 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 26 | 29 | 16 | 11 | 7 | 7 | 7 | 7.5 | 68.4 | 50.0 | 50.0 | 7 | 13 | 62.5 | 7 | 13 | 43.5 | 7 | 7.5 | 6 | 6.5 | 58.9 | 181 | 193 | 8 | 7.5 | 66.5 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 27 | 30 | 17 | 11 | 7 | 6.5 | 7 | 7.5 | 69.0 | 51.0 | 51.0 | 7 | 13 | 61.5 | 7 | 13 | 42.5 | 7 | 7.5 | 6 | 7 | 59.1 | 182 | 194 | 8 | 7.5 | 66.5 | 5 | 12 | 6 | 7.5 | 0 |
| 36 FT | 27 | 31 | 17 | 11 | 7 | 6 | 7 | 6.5 | 68.9 | 51.0 | 51.0 | 7 | 12 | 61.5 | 7 | 12 | 43.5 | 7 | 7 | 6 | 7 | 59.1 | 183 | 195 | 8 | 7 | 66.5 | 5 | 12 | 6 | 7.5 | 0 |
| 38 FT | 28 | 33 | 18 | 11 | 7 | 6 | 7 | 7 | 69.8 | 52.0 | 52.0 | 7 | 12 | 60.0 | 7 | 12 | 42.5 | 7 | 7 | 6 | 6.5 | 59.6 | 185 | 197 | 8 | 6.5 | 66.5 | 5 | 12 | 6 | 7 | 0 |
| 40 FT | 29 | 34 | 19 | 11 | 7 | 6 | 7 | 7 | 70.4 | 53.0 | 53.0 | 7 | 12 | 59.5 | 7 | 12 | 41.5 | 7 | 7 | 6 | 6.5 | 60.0 | 186 | 198 | 8 | 6.5 | 66.5 | 5 | 12 | 6 | 6.5 | 0 |
| 42 FT | 30 | 35 | 19 | 11 | 7 | 6 | 7 | 6.5 | 70.4 | 54.0 | 54.0 | 7 | 12 | 59.0 | 7 | 12 | 40.5 | 7 | 7 | 6 | 6.5 | 60.1 | 187 | 199 | 8 | 6.5 | 66.5 | 5 | 12 | 6 | 6.5 | 0 |
| 44 FT | 31 | 36 | 20 | 11 | 7 | 6 | 7 | 7 | 71.0 | 55.0 | 55.0 | 8 | 15 | 66.5 | 8 | 15 | 47.5 | 7 | 7 | 6 | 6 | 60.5 | 188 | 200 | 8 | 6 | 66.5 | 5 | 12 | 6 | 6.5 | 0 |
| 46 FT | 32 | 37 | 21 | 11 | 8 | 7.5 | 7 | 7 | 71.8 | 56.0 | 56.0 | 8 | 15 | 66.0 | 8 | 15 | 47.0 | 7 | 6.5 | 6 | 6 | 60.8 | 189 | 201 | 8 | 6 | 66.5 | 5 | 12 | 6 | 6 | 0 |
| 48 FT | 32 | 38 | 21 | 11 | 8 | 7 | 7 | 6 | 71.8 | 56.0 | 56.0 | 8 | 14 | 66.0 | 8 | 14 | 47.0 | 7 | 6.5 | 6 | 6 | 60.9 | 190 | 202 | 8 | 6 | 66.5 | 5 | 12 | 6 | 6 | 0 |
| 50 FT | 33 | 39 | 22 | 11 | 8 | 7 | 7 | 6.5 | 72.5 | 57.0 | 57.0 | 8 | 15 | 65.5 | 8 | 15 | 47.0 | 7 | 6.5 | 6 | 6 | 61.3 | 191 | 203 | 8 | 6 | 66.5 | 5 | 12 | 6 | 6 | 0 |

## SPAN (S) = 13 FT  HEIGHT (HT) = 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | K2 | | H1 BARS | | | H2 BARS | | A2 BARS | | J4 BARS | | | K3 | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=15′ | HT=16′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=15′ | HT=16′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 12 | 12 | 13 | 5 | 6 | 5 | 6 | 65.0 | 34.0 | 34.0 | 5 | 12 | 128.5 | 5 | 12 | 36.0 | 5 | 6.5 | 6 | 7 | 99.8 | 188 | 200 | 6 | 6.5 | 61.0 | 5 | 12 | 5 | 7 | 12 |
| 2 FT | 15 | 13 | 12 | 13 | 6 | 8 | 6 | 8.5 | 72.0 | 35.0 | 39.0 | 6 | 16 | 135.5 | 6 | 16 | 43.5 | 5 | 6.5 | 6 | 7 | 96.4 | 189 | 201 | 6 | 6.5 | 60.5 | 5 | 12 | 5 | 7 | 12 |
| 4 FT | 11 | 13 | 12 | 13 | 5 | 6 | 6 | 7 | 115.0 | 35.0 | 35.0 | 6 | 14 | 81.0 | 6 | 14 | 38.5 | 5 | 6 | 6 | 6.5 | 91.6 | 189 | 201 | 6 | 6 | 60.5 | 5 | 12 | 5 | 7 | 12 |
| 6 FT | 11 | 13 | 12 | 13 | 5 | 6.5 | 6 | 6.5 | 84.8 | 35.0 | 35.0 | 6 | 13 | 63.5 | 6 | 13 | 37.5 | 5 | 6 | 6 | 6 | 84.8 | 189 | 201 | 7 | 7 | 62.0 | 5 | 12 | 5 | 6.5 | 12 |
| 8 FT | 12 | 14 | 13 | 13 | 5 | 6.5 | 6 | 7 | 78.8 | 36.0 | 36.0 | 6 | 13 | 61.0 | 6 | 13 | 37.0 | 6 | 8 | 6 | 6.5 | 80.6 | 190 | 202 | 7 | 7 | 61.5 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 13 | 15 | 13 | 13 | 5 | 6.5 | 6 | 7 | 75.9 | 37.0 | 37.0 | 6 | 12 | 59.5 | 6 | 12 | 36.5 | 6 | 7.5 | 6 | 6.5 | 78.4 | 191 | 203 | 7 | 6.5 | 61.0 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 14 | 16 | 14 | 13 | 5 | 6 | 6 | 7 | 72.9 | 38.0 | 38.0 | 6 | 12 | 58.5 | 6 | 12 | 36.5 | 6 | 6.5 | 6 | 6.5 | 75.6 | 192 | 204 | 7 | 6.5 | 61.0 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 15 | 18 | 14 | 13 | 6 | 8 | 6 | 6 | 77.1 | 39.0 | 39.0 | 7 | 16 | 69.0 | 7 | 16 | 47.0 | 6 | 6.5 | 6 | 6 | 75.3 | 194 | 206 | 7 | 7 | 61.0 | 5 | 12 | 5 | 6 | 0 |
| 16 FT | 16 | 19 | 15 | 13 | 6 | 7.5 | 6 | 6 | 76.0 | 40.0 | 40.0 | 7 | 15 | 68.0 | 7 | 15 | 47.0 | 6 | 6.5 | 6 | 6 | 73.3 | 195 | 207 | 7 | 6.5 | 61.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 18 | 20 | 16 | 13 | 6 | 7 | 6 | 6 | 76.0 | 42.0 | 42.0 | 7 | 15 | 67.5 | 7 | 15 | 47.0 | 6 | 6 | 6 | 6 | 71.6 | 196 | 208 | 7 | 6.5 | 61.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 19 | 22 | 16 | 13 | 6 | 6.5 | 7 | 8 | 80.4 | 43.0 | 49.0 | 7 | 15 | 67.5 | 7 | 15 | 47.0 | 6 | 6 | 7 | 7.5 | 74.5 | 198 | 210 | 7 | 7 | 61.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 20 | 23 | 17 | 13 | 6 | 6.5 | 7 | 8 | 79.9 | 44.0 | 50.0 | 7 | 14 | 67.0 | 7 | 14 | 46.5 | 6 | 6 | 7 | 7.5 | 73.9 | 199 | 211 | 7 | 6.5 | 61.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 21 | 24 | 17 | 13 | 6 | 6 | 7 | 7.5 | 79.6 | 45.0 | 51.0 | 7 | 14 | 66.5 | 7 | 14 | 46.5 | 7 | 7 | 7 | 7 | 73.6 | 200 | 212 | 7 | 6.5 | 61.0 | 5 | 12 | 6 | 7.5 | 0 |
| 26 FT | 23 | 26 | 18 | 13 | 7 | 7.5 | 7 | 7.5 | 80.1 | 47.0 | 53.0 | 7 | 15 | 65.5 | 7 | 15 | 46.0 | 7 | 8 | 7 | 8 | 73.9 | 202 | 214 | 7 | 6.5 | 61.0 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 23 | 27 | 19 | 13 | 7 | 7.5 | 7 | 7.5 | 80.0 | 47.0 | 47.0 | 7 | 14 | 65.0 | 7 | 14 | 46.0 | 7 | 7.5 | 6 | 6 | 70.9 | 203 | 215 | 7 | 6 | 61.0 | 5 | 12 | 6 | 6.5 | 0 |
| 30 FT | 24 | 28 | 19 | 13 | 7 | 7.5 | 7 | 7.5 | 77.8 | 48.0 | 48.0 | 7 | 14 | 64.5 | 7 | 14 | 46.0 | 7 | 7.5 | 6 | 6 | 68.5 | 204 | 216 | 7 | 6 | 61.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 25 | 29 | 19 | 13 | 7 | 7 | 7 | 7 | 77.8 | 49.0 | 49.0 | 7 | 14 | 63.5 | 7 | 14 | 45.5 | 7 | 7.5 | 6 | 6 | 68.6 | 205 | 217 | 8 | 7.5 | 67.0 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 26 | 30 | 20 | 13 | 7 | 7 | 7 | 7 | 78.3 | 50.0 | 50.0 | 7 | 13 | 63.0 | 7 | 13 | 44.5 | 7 | 6.5 | 6 | 6 | 68.9 | 206 | 218 | 8 | 7.5 | 67.0 | 5 | 12 | 6 | 6.5 | 0 |
| 36 FT | 27 | 32 | 21 | 13 | 7 | 6.5 | 7 | 7 | 78.9 | 51.0 | 51.0 | 7 | 13 | 62.0 | 7 | 13 | 43.5 | 7 | 7 | 6 | 6 | 69.4 | 208 | 220 | 8 | 7 | 67.0 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 28 | 33 | 22 | 13 | 7 | 6.5 | 7 | 7 | 79.4 | 52.0 | 58.0 | 7 | 12 | 61.0 | 7 | 12 | 43.0 | 7 | 7 | 7 | 7.5 | 72.6 | 209 | 221 | 8 | 6.5 | 67.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 29 | 34 | 22 | 13 | 7 | 6.5 | 7 | 6.5 | 79.5 | 59.0 | 59.0 | 7 | 12 | 60.0 | 7 | 12 | 42.0 | 7 | 7 | 7 | 7.5 | 72.9 | 210 | 222 | 8 | 6.5 | 67.0 | 5 | 12 | 6 | 6 | 0 |
| 42 FT | 30 | 35 | 23 | 13 | 7 | 6 | 7 | 6.5 | 80.1 | 60.0 | 60.0 | 7 | 12 | 60.0 | 7 | 12 | 41.0 | 7 | 7 | 7 | 7.5 | 73.1 | 211 | 223 | 8 | 6.5 | 67.0 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 31 | 36 | 24 | 13 | 7 | 6 | 7 | 6.5 | 80.8 | 55.0 | 61.0 | 8 | 15 | 67.5 | 8 | 15 | 48.5 | 7 | 6.5 | 7 | 7 | 73.5 | 212 | 224 | 8 | 6 | 67.0 | 5 | 12 | 7 | 7.5 | 0 |
| 46 FT | 32 | 37 | 24 | 13 | 7 | 6 | 7 | 6 | 80.8 | 56.0 | 62.0 | 8 | 15 | 67.0 | 8 | 15 | 48.0 | 7 | 6.5 | 7 | 7 | 73.6 | 213 | 225 | 8 | 6 | 67.0 | 5 | 12 | 7 | 7.5 | 0 |
| 48 FT | 32 | 38 | 26 | 13 | 8 | 7.5 | 7 | 6 | 81.9 | 56.0 | 62.0 | 8 | 14 | 67.0 | 8 | 14 | 48.0 | 7 | 6.5 | 7 | 7.5 | 74.1 | 214 | 226 | 8 | 6 | 67.0 | 5 | 12 | 7 | 7.5 | 0 |
| 50 FT | 33 | 39 | 27 | 13 | 8 | 7 | 7 | 6 | 82.6 | 57.0 | 63.0 | 8 | 15 | 66.0 | 8 | 15 | 47.5 | 7 | 6.5 | 7 | 7.5 | 74.5 | 215 | 227 | 8 | 6 | 67.0 | 5 | 12 | 7 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 13 FEET
HEIGHT (HT): 13 THRU 16 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

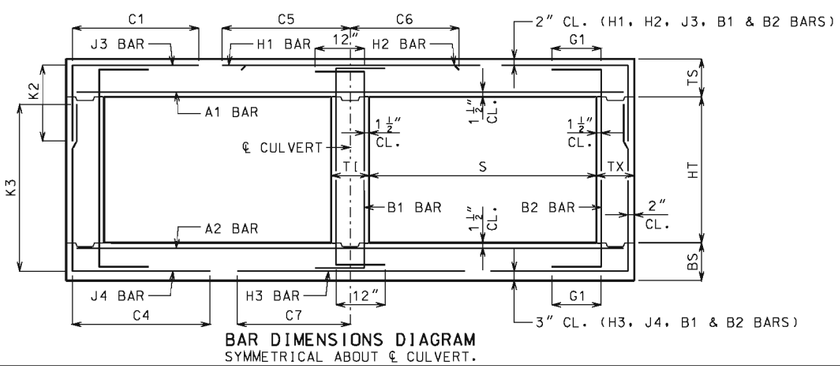
SHEET NO.
21 OF 27

## SPAN (S) = 14 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=7′ | K2 HT=8′ | K2 HT=9′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=7′ | K3 HT=8′ | K3 HT=9′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 11 | 8 | 8 | 6 | 8 | 5 | 8 | 69.3 | 31.0 | 35.0 | 35.0 | 6 | 16 | 137.5 | 6 | 16 | 46.5 | 5 | 6.5 | 5 | 6 | 57.8 | 91 | 103 | 115 | 6 | 6 | 63.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 15 | 12 | 8 | 8 | 6 | 8 | 5 | 8 | 69.3 | 35.0 | 35.0 | 35.0 | 6 | 16 | 137.5 | 6 | 16 | 48.0 | 5 | 6 | 5 | 6.5 | 52.5 | 92 | 104 | 116 | 6 | 6 | 62.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 12 | 11 | 8 | 8 | 6 | 7.5 | 5 | 6 | 48.0 | 32.0 | 32.0 | 32.0 | 6 | 12 | 86.0 | 6 | 12 | 39.5 | 5 | 6.5 | 6 | 7 | 49.3 | 91 | 103 | 115 | 7 | 6 | 64.5 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 12 | 13 | 8 | 8 | 6 | 8 | 6 | 7.5 | 47.6 | 32.0 | 32.0 | 32.0 | 7 | 15 | 74.0 | 7 | 15 | 41.0 | 5 | 6 | 5 | 7 | 41.9 | 93 | 105 | 117 | 7 | 6.5 | 64.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 13 | 14 | 8 | 8 | 5 | 6 | 5 | 6.5 | 41.1 | 33.0 | 33.0 | 33.0 | 7 | 15 | 68.5 | 7 | 15 | 40.0 | 6 | 8 | 5 | 7.5 | 39.1 | 94 | 106 | 118 | 7 | 6.5 | 64.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 14 | 15 | 8 | 8 | 6 | 8 | 5 | 6.5 | 38.6 | 34.0 | 34.0 | 34.0 | 7 | 14 | 66.5 | 7 | 14 | 39.5 | 6 | 7.5 | 5 | 7.5 | 37.4 | 95 | 107 | 119 | 7 | 6 | 63.5 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 6.5 | 41.5 | 36.0 | 36.0 | 36.0 | 7 | 14 | 73.0 | 7 | 14 | 47.5 | 6 | 7 | 5 | 7 | 36.1 | 97 | 109 | 121 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 11 | 0 |
| 14 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 5 | 6 | 40.3 | 37.0 | 37.0 | 37.0 | 7 | 14 | 72.5 | 7 | 14 | 47.0 | 6 | 6.5 | 5 | 6.5 | 35.1 | 98 | 110 | 122 | 7 | 6.5 | 63.0 | 5 | 12 | 5 | 10 | 0 |
| 16 FT | 18 | 20 | 8 | 8 | 6 | 7 | 6 | 8 | 43.4 | 38.0 | 38.0 | 38.0 | 7 | 13 | 71.5 | 7 | 13 | 47.0 | 6 | 6 | 5 | 6 | 34.4 | 100 | 112 | 124 | 7 | 6.5 | 63.0 | 5 | 12 | 5 | 9.5 | 0 |
| 18 FT | 20 | 21 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 42.4 | 44.0 | 44.0 | 44.0 | 7 | 13 | 71.0 | 7 | 13 | 46.5 | 6 | 6 | 6 | 7.5 | 37.0 | 101 | 113 | 125 | 7 | 6.5 | 63.0 | 5 | 12 | 5 | 9.5 | 0 |
| 20 FT | 21 | 22 | 8 | 8 | 6 | 6 | 6 | 7 | 41.8 | 45.0 | 45.0 | 45.0 | 7 | 13 | 70.5 | 7 | 13 | 46.5 | 7 | 7.5 | 6 | 7 | 36.5 | 102 | 114 | 126 | 7 | 6 | 63.0 | 5 | 12 | 5 | 9 | 0 |
| 22 FT | 23 | 24 | 8 | 8 | 7 | 7.5 | 6 | 6 | 41.3 | 47.0 | 47.0 | 47.0 | 7 | 13 | 69.5 | 7 | 13 | 46.5 | 7 | 7.5 | 6 | 6 | 36.4 | 104 | 116 | 128 | 7 | 6 | 63.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 24 | 26 | 9 | 8 | 7 | 7.5 | 6 | 7 | 42.1 | 48.0 | 48.0 | 48.0 | 7 | 13 | 69.0 | 7 | 13 | 46.0 | 7 | 7.5 | 6 | 6.5 | 36.8 | 106 | 118 | 130 | 7 | 6.5 | 63.0 | 5 | 12 | 5 | 8.5 | 0 |
| 26 FT | 25 | 27 | 9 | 8 | 7 | 7 | 6 | 6.5 | 41.9 | 49.0 | 49.0 | 49.0 | 7 | 12 | 68.5 | 7 | 12 | 46.0 | 7 | 7.5 | 6 | 6.5 | 36.6 | 107 | 119 | 131 | 7 | 6 | 63.0 | 5 | 12 | 5 | 8 | 0 |
| 28 FT | 26 | 28 | 9 | 8 | 7 | 7 | 6 | 6 | 41.8 | 50.0 | 50.0 | 50.0 | 7 | 12 | 68.0 | 7 | 12 | 46.0 | 7 | 7.5 | 6 | 6 | 36.6 | 108 | 120 | 132 | 7 | 6 | 63.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 27 | 29 | 9 | 8 | 7 | 6.5 | 6 | 6 | 41.1 | 51.0 | 51.0 | 51.0 | 7 | 12 | 67.0 | 7 | 12 | 45.5 | 7 | 7 | 6 | 6 | 35.4 | 109 | 121 | 133 | 8 | 7.5 | 68.5 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 28 | 31 | 10 | 8 | 7 | 6.5 | 6 | 6.5 | 41.8 | 52.0 | 52.0 | 52.0 | 7 | 12 | 66.0 | 7 | 12 | 45.0 | 7 | 7 | 6 | 6 | 35.9 | 111 | 123 | 135 | 8 | 7 | 68.5 | 5 | 12 | 5 | 8 | 0 |
| 34 FT | 29 | 32 | 10 | 8 | 7 | 6 | 6 | 6.5 | 41.8 | 53.0 | 53.0 | 53.0 | 7 | 12 | 65.5 | 7 | 12 | 44.5 | 7 | 7 | 6 | 6 | 36.0 | 112 | 124 | 136 | 8 | 7 | 68.5 | 5 | 12 | 5 | 7.5 | 0 |
| 36 FT | 31 | 33 | 10 | 8 | 7 | 6 | 6 | 6 | 41.8 | 55.0 | 55.0 | 55.0 | 8 | 15 | 71.5 | 8 | 15 | 50.5 | 7 | 7 | 7 | 6.5 | 39.4 | 113 | 125 | 137 | 8 | 6.5 | 68.5 | 5 | 12 | 5 | 6.5 | 0 |
| 38 FT | 31 | 34 | 11 | 8 | 8 | 7 | 6 | 6.5 | 42.3 | 55.0 | 55.0 | 55.0 | 8 | 14 | 71.5 | 8 | 14 | 51.0 | 7 | 6.5 | 6 | 6 | 36.8 | 114 | 126 | 138 | 8 | 6.5 | 68.5 | 5 | 12 | 5 | 7.5 | 0 |
| 40 FT | 33 | 35 | 11 | 8 | 8 | 7.5 | 6 | 6 | 42.3 | 57.0 | 57.0 | 57.0 | 8 | 14 | 69.5 | 8 | 14 | 49.0 | 7 | 6 | 6 | 6 | 37.0 | 115 | 127 | 139 | 8 | 6.5 | 68.5 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 33 | 37 | 11 | 8 | 8 | 7 | 6 | 6 | 42.3 | 57.0 | 57.0 | 57.0 | 8 | 14 | 69.5 | 8 | 14 | 49.5 | 7 | 6.5 | 7 | 6.5 | 40.1 | 117 | 129 | 141 | 8 | 6 | 68.5 | 5 | 12 | 5 | 6.5 | 0 |
| 44 FT | 34 | 38 | 12 | 8 | 8 | 7 | 6 | 6.5 | 43.3 | 58.0 | 58.0 | 58.0 | 8 | 14 | 69.0 | 8 | 14 | 48.5 | 7 | 6.5 | 6 | 6 | 37.6 | 118 | 130 | 142 | 8 | 6 | 68.5 | 5 | 12 | 5 | 7 | 0 |
| 46 FT | 35 | 39 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 43.1 | 59.0 | 59.0 | 59.0 | 8 | 13 | 68.5 | 8 | 13 | 47.5 | 7 | 6.5 | 6 | 6 | 37.9 | 119 | 131 | 143 | 8 | 6 | 68.5 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 36 | 40 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 43.1 | 60.0 | 60.0 | 60.0 | 8 | 13 | 67.5 | 8 | 13 | 46.5 | 7 | 6.5 | 6 | 6 | 38.1 | 120 | 132 | 144 | 9 | 7 | 74.5 | 5 | 11.5 | 5 | 6 | 0 |
| 50 FT | 37 | 41 | 12 | 8 | 8 | 6.5 | 6 | 6 | 43.3 | 61.0 | 61.0 | 61.0 | 8 | 13 | 67.0 | 8 | 13 | 46.5 | 7 | 6 | 7 | 6.5 | 41.3 | 121 | 133 | 145 | 9 | 7 | 74.5 | 5 | 8.5 | 6 | 8 | 0 |

## SPAN (S) = 14 FT  HEIGHT (HT) = 10 FT OR 11 FT OR 12 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=10′ | K2 HT=11′ | K2 HT=12′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=10′ | K3 HT=11′ | K3 HT=12′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 12 | 8 | 10 | 6 | 8 | 5 | 7 | 69.6 | 35.0 | 35.0 | 35.0 | 6 | 16 | 138.5 | 6 | 16 | 47.0 | 5 | 6.5 | 6 | 6 | 83.9 | 128 | 140 | 152 | 6 | 6.5 | 63.5 | 5 | 12 | 5 | 9.5 | 12 |
| 2 FT | 15 | 13 | 8 | 10 | 6 | 8 | 5 | 6.5 | 69.6 | 35.0 | 35.0 | 35.0 | 6 | 16 | 138.5 | 6 | 16 | 48.0 | 5 | 6 | 6 | 6 | 77.4 | 129 | 141 | 153 | 6 | 6.5 | 63.0 | 5 | 12 | 5 | 9.5 | 12 |
| 4 FT | 12 | 12 | 10 | 10 | 6 | 8 | 5 | 6 | 70.1 | 32.0 | 32.0 | 32.0 | 6 | 13 | 85.5 | 6 | 13 | 40.0 | 5 | 6 | 6 | 7 | 65.5 | 128 | 140 | 152 | 7 | 6.5 | 65.5 | 5 | 10 | 5 | 9.5 | 12 |
| 6 FT | 12 | 13 | 10 | 10 | 6 | 8.5 | 5 | 6 | 58.6 | 32.0 | 32.0 | 32.0 | 6 | 12 | 69.0 | 6 | 12 | 38.0 | 5 | 6 | 6 | 7 | 60.8 | 129 | 141 | 153 | 7 | 6.5 | 64.5 | 5 | 12 | 5 | 9.5 | 12 |
| 8 FT | 13 | 14 | 10 | 10 | 5 | 6 | 6 | 7 | 57.1 | 33.0 | 33.0 | 37.0 | 7 | 15 | 68.0 | 7 | 15 | 40.5 | 6 | 8 | 6 | 7 | 57.4 | 130 | 142 | 154 | 7 | 6.5 | 64.0 | 5 | 12 | 5 | 9 | 0 |
| 10 FT | 14 | 16 | 10 | 10 | 5 | 6 | 6 | 7 | 54.4 | 34.0 | 34.0 | 34.0 | 7 | 15 | 66.5 | 7 | 15 | 40.0 | 6 | 7 | 5 | 6 | 52.0 | 132 | 144 | 156 | 7 | 6.5 | 64.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 15 | 17 | 10 | 10 | 6 | 8 | 6 | 7 | 58.6 | 35.0 | 35.0 | 39.0 | 7 | 14 | 73.0 | 7 | 14 | 48.0 | 6 | 7 | 6 | 7.5 | 53.1 | 133 | 145 | 157 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 8 | 0 |
| 14 FT | 17 | 18 | 10 | 10 | 6 | 7.5 | 6 | 7 | 57.1 | 37.0 | 37.0 | 41.0 | 7 | 14 | 72.5 | 7 | 14 | 47.5 | 6 | 6.5 | 6 | 6.5 | 52.0 | 134 | 146 | 158 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 8 | 0 |
| 16 FT | 18 | 20 | 11 | 10 | 6 | 7 | 6 | 7 | 57.0 | 38.0 | 38.0 | 42.0 | 7 | 14 | 71.5 | 7 | 14 | 47.5 | 6 | 6 | 6 | 8 | 51.5 | 136 | 148 | 160 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 7.5 | 0 |
| 18 FT | 19 | 21 | 12 | 10 | 6 | 6.5 | 6 | 7 | 56.9 | 39.0 | 39.0 | 43.0 | 7 | 13 | 71.0 | 7 | 13 | 47.5 | 6 | 6 | 6 | 8.5 | 51.1 | 137 | 149 | 161 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 21 | 23 | 12 | 10 | 6 | 6 | 6 | 7 | 56.1 | 41.0 | 41.0 | 45.0 | 7 | 13 | 70.5 | 7 | 13 | 47.0 | 7 | 8 | 6 | 8 | 50.8 | 139 | 151 | 163 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 7 | 0 |
| 22 FT | 22 | 24 | 12 | 10 | 6 | 6 | 6 | 6.5 | 55.5 | 42.0 | 42.0 | 46.0 | 7 | 13 | 70.0 | 7 | 13 | 47.0 | 7 | 7.5 | 6 | 7.5 | 50.1 | 140 | 152 | 164 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 7 | 0 |
| 24 FT | 23 | 26 | 13 | 10 | 7 | 7 | 6 | 6.5 | 55.9 | 43.0 | 43.0 | 47.0 | 7 | 12 | 69.5 | 7 | 12 | 47.0 | 7 | 7.5 | 6 | 8.5 | 50.3 | 142 | 154 | 166 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 6.5 | 0 |
| 26 FT | 25 | 27 | 13 | 10 | 7 | 7 | 6 | 6.5 | 55.5 | 45.0 | 45.0 | 49.0 | 7 | 13 | 68.5 | 7 | 13 | 46.5 | 7 | 7.5 | 6 | 8 | 50.3 | 143 | 155 | 167 | 7 | 6 | 63.5 | 5 | 12 | 5 | 6.5 | 0 |
| 28 FT | 26 | 29 | 14 | 10 | 7 | 7 | 6 | 6.5 | 56.3 | 46.0 | 50.0 | 50.0 | 7 | 13 | 67.5 | 7 | 13 | 46.5 | 7 | 7.5 | 6 | 8.5 | 50.5 | 145 | 157 | 169 | 8 | 7.5 | 69.5 | 5 | 12 | 5 | 6 | 0 |
| 30 FT | 27 | 30 | 14 | 10 | 7 | 6.5 | 6 | 6.5 | 56.0 | 47.0 | 51.0 | 51.0 | 7 | 13 | 67.0 | 7 | 13 | 46.0 | 7 | 7 | 6 | 8 | 50.5 | 146 | 158 | 170 | 8 | 7.5 | 69.5 | 5 | 12 | 5 | 6 | 0 |
| 32 FT | 28 | 31 | 14 | 10 | 7 | 6.5 | 6 | 6.5 | 54.3 | 52.0 | 52.0 | 52.0 | 7 | 12 | 66.0 | 7 | 12 | 45.5 | 7 | 7 | 6 | 7.5 | 48.9 | 147 | 159 | 171 | 8 | 7 | 69.5 | 5 | 12 | 5 | 6 | 0 |
| 34 FT | 29 | 32 | 14 | 10 | 7 | 6 | 6 | 6 | 54.1 | 53.0 | 53.0 | 53.0 | 7 | 12 | 65.0 | 7 | 12 | 44.5 | 7 | 7 | 6 | 7.5 | 48.9 | 148 | 160 | 172 | 8 | 7 | 69.0 | 5 | 12 | 5 | 6 | 0 |
| 36 FT | 30 | 33 | 15 | 10 | 7 | 6 | 6 | 6.5 | 54.9 | 54.0 | 54.0 | 54.0 | 7 | 12 | 64.0 | 7 | 12 | 44.0 | 7 | 6 | 6 | 7 | 49.4 | 149 | 161 | 173 | 8 | 6.5 | 69.5 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 31 | 35 | 15 | 10 | 8 | 7.5 | 6 | 6 | 55.0 | 55.0 | 55.0 | 55.0 | 8 | 15 | 71.0 | 8 | 15 | 51.0 | 7 | 6.5 | 6 | 6.5 | 49.6 | 151 | 163 | 175 | 8 | 6.5 | 69.0 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 32 | 36 | 16 | 10 | 8 | 7.5 | 6 | 6 | 55.8 | 56.0 | 56.0 | 56.0 | 8 | 14 | 70.0 | 8 | 14 | 50.0 | 7 | 6.5 | 6 | 6.5 | 50.0 | 152 | 164 | 176 | 8 | 6 | 69.5 | 5 | 12 | 6 | 8 | 0 |
| 42 FT | 33 | 37 | 16 | 10 | 8 | 7 | 6 | 6 | 55.8 | 57.0 | 57.0 | 57.0 | 8 | 14 | 69.5 | 8 | 14 | 49.5 | 7 | 6.5 | 6 | 6.5 | 50.1 | 153 | 165 | 177 | 8 | 6 | 69.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 34 | 38 | 16 | 10 | 8 | 7 | 6 | 6 | 55.6 | 58.0 | 58.0 | 58.0 | 8 | 14 | 69.0 | 8 | 14 | 48.5 | 7 | 6.5 | 6 | 6 | 50.3 | 154 | 166 | 178 | 8 | 6 | 69.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 35 | 39 | 17 | 10 | 8 | 7 | 6 | 6 | 56.5 | 59.0 | 59.0 | 59.0 | 8 | 13 | 68.5 | 8 | 13 | 47.5 | 7 | 6 | 6 | 6 | 50.8 | 155 | 167 | 179 | 8 | 6 | 69.0 | 5 | 12 | 6 | 7.5 | 0 |
| 48 FT | 35 | 40 | 17 | 10 | 8 | 6 | 7 | 7.5 | 61.5 | 59.0 | 59.0 | 59.0 | 8 | 12 | 68.5 | 8 | 12 | 48.0 | 7 | 6 | 6 | 6 | 50.8 | 156 | 168 | 180 | 9 | 7 | 75.0 | 5 | 12 | 6 | 7.5 | 0 |
| 50 FT | 36 | 41 | 17 | 10 | 8 | 6.5 | 7 | 7 | 61.5 | 60.0 | 60.0 | 66.0 | 8 | 13 | 68.0 | 8 | 13 | 47.5 | 7 | 6 | 7 | 8 | 53.9 | 157 | 169 | 181 | 9 | 7 | 75.0 | 5 | 12 | 6 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 14 FEET
HEIGHT (HT): 7 THRU 12 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 22 OF 27

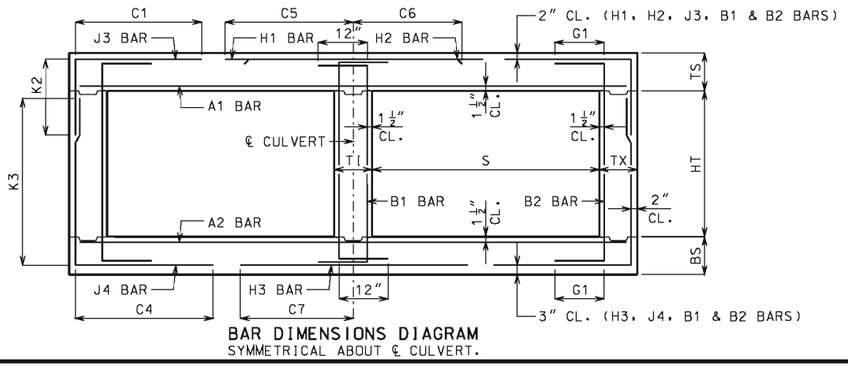
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 14 FT  HEIGHT (HT) = 13 FT OR 14 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | K2 | | H1 BARS | | | H2 BARS | | A2 BARS | | J4 BARS | | | K3 | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=13′ | HT=14′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=13′ | HT=14′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 12 | 9 | 11 | 6 | 8 | 5 | 6 | 70.4 | 35.0 | 35.0 | 6 | 16 | 139.0 | 6 | 16 | 47.0 | 5 | 6 | 6 | 6 | 96.1 | 164 | 176 | 6 | 6 | 64.0 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 15 | 13 | 10 | 11 | 6 | 8 | 5 | 6 | 71.0 | 35.0 | 35.0 | 6 | 16 | 139.5 | 6 | 16 | 47.5 | 5 | 6 | 6 | 6.5 | 87.6 | 165 | 177 | 6 | 6.5 | 63.5 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 12 | 12 | 10 | 11 | 6 | 7.5 | 6 | 7.5 | 100.0 | 36.0 | 36.0 | 6 | 13 | 94.5 | 6 | 13 | 40.0 | 5 | 6 | 6 | 6 | 77.9 | 164 | 176 | 7 | 6.5 | 65.5 | 5 | 12 | 5 | 8 | 12 |
| 6 FT | 12 | 13 | 10 | 11 | 6 | 8 | 6 | 7 | 74.8 | 36.0 | 36.0 | 6 | 12 | 69.0 | 6 | 12 | 38.5 | 5 | 6 | 6 | 6 | 72.4 | 165 | 177 | 7 | 6.5 | 65.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 13 | 14 | 11 | 11 | 5 | 6 | 6 | 7 | 68.4 | 37.0 | 37.0 | 7 | 16 | 68.0 | 7 | 16 | 41.0 | 6 | 8 | 6 | 7 | 68.4 | 166 | 178 | 7 | 6 | 64.0 | 5 | 12 | 5 | 7.5 | 0 |
| 10 FT | 14 | 16 | 11 | 11 | 5 | 6 | 6 | 6.5 | 65.4 | 38.0 | 38.0 | 7 | 15 | 66.5 | 7 | 15 | 40.5 | 6 | 7 | 6 | 6.5 | 66.8 | 168 | 180 | 7 | 6.5 | 64.0 | 5 | 12 | 5 | 7.5 | 0 |
| 12 FT | 15 | 17 | 12 | 11 | 6 | 8 | 6 | 6.5 | 69.4 | 39.0 | 39.0 | 7 | 14 | 73.0 | 7 | 14 | 48.0 | 6 | 7 | 6 | 7 | 64.6 | 169 | 181 | 7 | 6.5 | 64.0 | 5 | 12 | 5 | 7 | 0 |
| 14 FT | 17 | 18 | 12 | 11 | 6 | 7.5 | 6 | 6.5 | 67.9 | 41.0 | 41.0 | 7 | 15 | 72.0 | 7 | 15 | 48.0 | 6 | 6 | 6 | 6 | 63.0 | 170 | 182 | 7 | 6 | 63.5 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 18 | 20 | 13 | 11 | 6 | 7 | 6 | 6.5 | 66.9 | 42.0 | 42.0 | 7 | 14 | 71.5 | 7 | 14 | 47.5 | 6 | 6 | 6 | 7 | 62.1 | 172 | 184 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 6.5 | 0 |
| 18 FT | 19 | 21 | 13 | 11 | 6 | 6.5 | 6 | 6 | 65.6 | 43.0 | 43.0 | 7 | 13 | 71.0 | 7 | 13 | 47.5 | 7 | 8 | 6 | 6 | 61.0 | 173 | 185 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 6.5 | 0 |
| 20 FT | 21 | 23 | 14 | 11 | 6 | 6 | 6 | 6 | 65.4 | 45.0 | 45.0 | 7 | 14 | 70.0 | 7 | 14 | 47.5 | 7 | 8 | 6 | 7 | 60.6 | 175 | 187 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 6 | 0 |
| 22 FT | 22 | 24 | 14 | 11 | 6 | 6 | 7 | 8 | 69.4 | 46.0 | 46.0 | 7 | 13 | 69.5 | 7 | 13 | 47.0 | 7 | 7 | 6 | 6 | 59.8 | 176 | 188 | 7 | 6.5 | 63.5 | 5 | 12 | 5 | 6 | 0 |
| 24 FT | 23 | 26 | 15 | 11 | 7 | 7.5 | 7 | 8 | 69.5 | 47.0 | 47.0 | 7 | 13 | 69.0 | 7 | 13 | 47.0 | 7 | 7.5 | 6 | 7 | 59.5 | 178 | 190 | 7 | 6.5 | 63.5 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 24 | 27 | 15 | 11 | 7 | 7 | 7 | 7.5 | 69.0 | 48.0 | 48.0 | 7 | 13 | 68.5 | 7 | 13 | 47.0 | 7 | 7 | 6 | 6.5 | 59.3 | 179 | 191 | 7 | 6 | 63.5 | 5 | 12 | 6 | 8 | 0 |
| 28 FT | 25 | 29 | 16 | 11 | 7 | 6.5 | 7 | 7.5 | 69.5 | 49.0 | 49.0 | 7 | 13 | 67.5 | 7 | 13 | 46.5 | 7 | 7 | 6 | 7 | 59.5 | 181 | 193 | 8 | 7.5 | 69.5 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 27 | 30 | 16 | 11 | 7 | 6.5 | 7 | 7 | 69.3 | 51.0 | 51.0 | 7 | 13 | 66.0 | 7 | 13 | 45.5 | 7 | 7 | 6 | 6.5 | 59.5 | 182 | 194 | 8 | 7.5 | 69.5 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 28 | 31 | 16 | 11 | 7 | 6.5 | 7 | 7.5 | 67.1 | 52.0 | 52.0 | 7 | 12 | 65.0 | 7 | 12 | 44.5 | 7 | 7 | 6 | 7 | 57.1 | 183 | 195 | 8 | 7 | 69.5 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 29 | 32 | 17 | 11 | 7 | 6 | 7 | 7.5 | 67.8 | 53.0 | 53.0 | 7 | 12 | 64.0 | 7 | 12 | 44.0 | 7 | 6.5 | 6 | 7 | 57.5 | 184 | 196 | 8 | 7 | 69.5 | 5 | 12 | 6 | 7.5 | 0 |
| 36 FT | 30 | 34 | 17 | 11 | 7 | 6 | 7 | 6.5 | 67.8 | 54.0 | 54.0 | 7 | 12 | 63.0 | 7 | 12 | 43.0 | 7 | 7 | 6 | 7 | 57.6 | 186 | 198 | 8 | 6.5 | 69.5 | 5 | 12 | 6 | 7.5 | 0 |
| 38 FT | 31 | 35 | 18 | 11 | 7 | 6 | 7 | 7 | 68.5 | 55.0 | 55.0 | 8 | 15 | 70.0 | 8 | 15 | 50.5 | 7 | 6.5 | 6 | 6.5 | 58.0 | 187 | 199 | 8 | 6.5 | 69.5 | 5 | 12 | 6 | 7 | 0 |
| 40 FT | 32 | 36 | 18 | 11 | 8 | 7.5 | 7 | 6.5 | 68.4 | 56.0 | 56.0 | 8 | 14 | 69.5 | 8 | 14 | 49.5 | 7 | 6.5 | 6 | 6.5 | 58.1 | 188 | 200 | 8 | 6 | 69.5 | 5 | 12 | 6 | 7 | 0 |
| 42 FT | 33 | 37 | 19 | 11 | 8 | 7 | 7 | 7 | 69.1 | 57.0 | 57.0 | 8 | 14 | 69.0 | 8 | 14 | 48.5 | 7 | 6.5 | 6 | 6.5 | 58.5 | 189 | 201 | 8 | 6 | 69.5 | 5 | 12 | 6 | 6.5 | 0 |
| 44 FT | 33 | 38 | 20 | 11 | 8 | 7 | 7 | 7 | 69.9 | 57.0 | 57.0 | 8 | 14 | 69.0 | 8 | 14 | 49.0 | 7 | 6 | 6 | 6 | 58.9 | 190 | 202 | 8 | 6 | 69.5 | 5 | 12 | 6 | 6.5 | 0 |
| 46 FT | 34 | 39 | 20 | 11 | 8 | 7 | 7 | 6 | 69.8 | 58.0 | 58.0 | 8 | 14 | 68.5 | 8 | 14 | 48.5 | 7 | 6 | 6 | 6 | 59.0 | 191 | 203 | 8 | 6 | 69.5 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 35 | 41 | 21 | 11 | 8 | 6.5 | 7 | 6.5 | 70.6 | 65.0 | 65.0 | 8 | 13 | 68.0 | 8 | 13 | 47.5 | 7 | 6 | 7 | 8 | 62.5 | 193 | 205 | 9 | 7 | 75.5 | 5 | 12 | 6 | 6 | 0 |
| 50 FT | 36 | 42 | 22 | 11 | 8 | 6.5 | 7 | 6.5 | 71.4 | 66.0 | 66.0 | 8 | 14 | 67.0 | 8 | 14 | 47.5 | 7 | 6 | 7 | 7.5 | 63.0 | 194 | 206 | 9 | 7 | 75.5 | 5 | 12 | 6 | 6 | 0 |

## SPAN (S) = 14 FT  HEIGHT (HT) = 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | K2 | | H1 BARS | | | H2 BARS | | A2 BARS | | J4 BARS | | | K3 | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=15′ | HT=16′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=15′ | HT=16′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 13 | 12 | 13 | 6 | 8 | 5 | 6 | 72.6 | 35.0 | 35.0 | 6 | 16 | 141.0 | 6 | 16 | 46.0 | 5 | 6.5 | 6 | 7.5 | 102.5 | 189 | 201 | 6 | 6.5 | 64.5 | 5 | 12 | 5 | 7 | 12 |
| 2 FT | 15 | 13 | 12 | 13 | 6 | 8 | 6 | 8 | 75.6 | 35.0 | 39.0 | 6 | 16 | 144.0 | 6 | 16 | 47.5 | 5 | 6 | 6 | 7 | 95.8 | 189 | 201 | 6 | 6 | 63.5 | 5 | 12 | 5 | 7 | 12 |
| 4 FT | 12 | 12 | 12 | 13 | 6 | 8 | 6 | 7.5 | 118.3 | 36.0 | 36.0 | 6 | 13 | 86.5 | 6 | 13 | 40.0 | 5 | 6 | 6 | 6 | 86.6 | 188 | 200 | 7 | 6.5 | 65.5 | 5 | 12 | 5 | 7 | 12 |
| 6 FT | 12 | 13 | 12 | 13 | 5 | 6 | 6 | 7 | 86.4 | 36.0 | 36.0 | 6 | 12 | 68.0 | 6 | 12 | 39.0 | 5 | 6 | 6 | 6 | 83.0 | 189 | 201 | 7 | 6 | 65.0 | 5 | 12 | 5 | 7 | 12 |
| 8 FT | 13 | 15 | 13 | 13 | 5 | 6 | 6 | 7 | 78.9 | 37.0 | 37.0 | 6 | 12 | 64.5 | 6 | 12 | 38.0 | 6 | 7.5 | 6 | 6.5 | 80.3 | 191 | 203 | 7 | 6.5 | 64.5 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 14 | 16 | 13 | 13 | 5 | 6 | 6 | 6.5 | 75.0 | 38.0 | 38.0 | 7 | 15 | 66.0 | 7 | 15 | 41.0 | 6 | 7 | 6 | 6.5 | 77.3 | 192 | 204 | 7 | 6.5 | 64.5 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 15 | 17 | 14 | 13 | 6 | 8 | 6 | 6.5 | 78.5 | 39.0 | 39.0 | 7 | 15 | 73.0 | 7 | 15 | 48.5 | 6 | 6.5 | 6 | 6.5 | 74.1 | 193 | 205 | 7 | 6.5 | 64.0 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 16 | 19 | 14 | 13 | 6 | 8 | 6 | 6 | 77.0 | 40.0 | 40.0 | 7 | 14 | 72.0 | 7 | 14 | 48.5 | 6 | 6 | 6 | 6 | 73.6 | 195 | 207 | 7 | 6.5 | 64.0 | 5 | 12 | 5 | 6 | 0 |
| 16 FT | 18 | 20 | 15 | 13 | 6 | 7 | 6 | 6 | 76.5 | 42.0 | 42.0 | 7 | 14 | 71.5 | 7 | 14 | 48.5 | 6 | 6 | 6 | 6 | 72.1 | 196 | 208 | 7 | 6.5 | 64.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 19 | 21 | 15 | 13 | 6 | 6.5 | 7 | 7.5 | 80.5 | 43.0 | 49.0 | 7 | 14 | 71.0 | 7 | 14 | 48.5 | 7 | 8 | 7 | 7 | 74.1 | 197 | 209 | 7 | 6.5 | 64.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 20 | 23 | 16 | 13 | 6 | 6.5 | 7 | 7.5 | 79.9 | 44.0 | 50.0 | 7 | 13 | 70.5 | 7 | 13 | 48.0 | 7 | 7.5 | 7 | 8 | 73.8 | 199 | 211 | 7 | 6.5 | 64.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 22 | 25 | 17 | 13 | 6 | 6 | 7 | 7.5 | 79.8 | 46.0 | 46.0 | 7 | 14 | 69.5 | 7 | 14 | 48.0 | 7 | 7.5 | 6 | 6 | 70.5 | 201 | 213 | 7 | 6.5 | 64.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 23 | 26 | 18 | 13 | 7 | 7.5 | 7 | 7.5 | 79.5 | 47.0 | 47.0 | 7 | 13 | 69.0 | 7 | 13 | 47.5 | 7 | 7.5 | 6 | 6 | 69.9 | 202 | 214 | 7 | 6.5 | 64.0 | 5 | 12 | 6 | 7 | 0 |
| 26 FT | 24 | 27 | 18 | 13 | 7 | 7.5 | 7 | 7 | 79.1 | 48.0 | 48.0 | 7 | 13 | 68.5 | 7 | 13 | 47.5 | 7 | 6.5 | 6 | 6 | 69.6 | 203 | 215 | 7 | 6 | 64.0 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 25 | 29 | 19 | 13 | 7 | 7 | 7 | 7 | 79.5 | 49.0 | 49.0 | 7 | 13 | 68.0 | 7 | 13 | 47.5 | 7 | 7 | 6 | 6 | 70.0 | 205 | 217 | 8 | 7.5 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 30 FT | 26 | 30 | 20 | 13 | 7 | 6.5 | 7 | 7 | 79.8 | 50.0 | 50.0 | 7 | 13 | 67.0 | 7 | 13 | 47.0 | 7 | 6.5 | 6 | 6 | 69.9 | 206 | 218 | 8 | 7.5 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 27 | 31 | 20 | 13 | 7 | 6.5 | 7 | 7 | 77.4 | 51.0 | 51.0 | 7 | 13 | 66.5 | 7 | 13 | 47.0 | 7 | 6.5 | 6 | 6 | 67.5 | 207 | 219 | 8 | 7 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 28 | 32 | 20 | 13 | 7 | 6 | 7 | 7 | 77.4 | 52.0 | 52.0 | 7 | 12 | 65.5 | 7 | 12 | 46.0 | 7 | 6 | 6 | 6 | 67.6 | 208 | 220 | 8 | 7 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 36 FT | 29 | 34 | 21 | 13 | 7 | 6 | 7 | 7 | 78.0 | 53.0 | 53.0 | 7 | 12 | 64.5 | 7 | 12 | 45.0 | 7 | 6.5 | 6 | 6 | 68.1 | 210 | 222 | 8 | 6.5 | 70.0 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 30 | 35 | 22 | 13 | 7 | 6 | 7 | 6.5 | 78.6 | 54.0 | 60.0 | 7 | 12 | 63.5 | 7 | 12 | 44.5 | 7 | 6.5 | 7 | 7.5 | 71.4 | 211 | 223 | 8 | 6.5 | 70.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 31 | 36 | 22 | 13 | 8 | 7.5 | 7 | 6 | 78.6 | 61.0 | 61.0 | 8 | 15 | 71.0 | 8 | 15 | 51.5 | 7 | 6.5 | 7 | 7.5 | 71.5 | 212 | 224 | 8 | 6 | 70.0 | 5 | 12 | 6 | 6 | 0 |
| 42 FT | 32 | 37 | 23 | 13 | 8 | 7.5 | 7 | 6.5 | 79.3 | 56.0 | 62.0 | 8 | 14 | 70.0 | 8 | 14 | 51.0 | 7 | 6 | 7 | 7.5 | 71.8 | 213 | 225 | 8 | 6 | 70.0 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 33 | 39 | 24 | 13 | 8 | 7 | 7 | 6.5 | 80.0 | 57.0 | 63.0 | 8 | 14 | 70.0 | 8 | 14 | 50.0 | 7 | 6 | 7 | 7 | 72.4 | 215 | 227 | 8 | 6 | 70.0 | 5 | 12 | 7 | 7.5 | 0 |
| 46 FT | 34 | 40 | 25 | 13 | 8 | 7 | 7 | 6.5 | 80.6 | 58.0 | 64.0 | 8 | 14 | 69.5 | 8 | 14 | 49.0 | 7 | 6 | 7 | 7.5 | 72.6 | 216 | 228 | 9 | 7 | 76.0 | 5 | 12 | 7 | 7.5 | 0 |
| 48 FT | 35 | 41 | 26 | 13 | 8 | 7 | 7 | 6 | 81.4 | 65.0 | 65.0 | 8 | 14 | 68.5 | 8 | 14 | 48.5 | 7 | 6 | 7 | 7.5 | 73.0 | 217 | 229 | 9 | 7 | 76.5 | 5 | 12 | 7 | 8 | 0 |
| 50 FT | 35 | 42 | 27 | 13 | 8 | 6.5 | 7 | 6 | 82.0 | 65.0 | 65.0 | 8 | 13 | 68.5 | 8 | 13 | 48.5 | 7 | 6 | 7 | 7.5 | 73.3 | 218 | 230 | 9 | 7 | 76.5 | 5 | 12 | 7 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

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

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


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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 14 FEET
HEIGHT (HT): 13 THRU 16 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

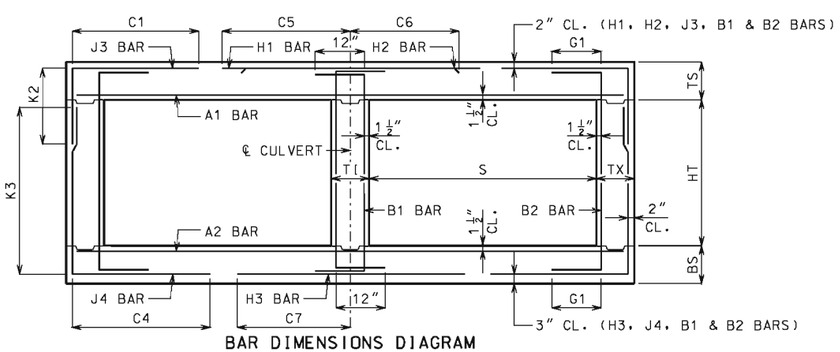
SHEET NO. 23 OF 27

## SPAN (S) = 15 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | K2 HT=10′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | K3 HT=10′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 12 | 8 | 8 | 6 | 8 | 5 | 8 | 72.9 | 35.0 | 35.0 | 35.0 | 6 | 16 | 146.0 | 6 | 16 | 51.0 | 5 | 6 | 5 | 6 | 64.9 | 104 | 116 | 128 | 6 | 6 | 66.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 17 | 13 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 72.9 | 37.0 | 37.0 | 37.0 | 6 | 14 | 146.0 | 6 | 14 | 45.5 | 5 | 6 | 5 | 6 | 57.8 | 105 | 117 | 129 | 6 | 6 | 65.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 13 | 12 | 8 | 8 | 6 | 7 | 5 | 6 | 53.1 | 33.0 | 33.0 | 33.0 | 6 | 12 | 92.5 | 6 | 12 | 41.5 | 5 | 6 | 6 | 6.5 | 53.3 | 104 | 116 | 128 | 7 | 6 | 68.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 13 | 13 | 8 | 8 | 6 | 7.5 | 6 | 7.5 | 50.4 | 33.0 | 33.0 | 37.0 | 7 | 15 | 78.5 | 7 | 15 | 42.5 | 5 | 6 | 6 | 7 | 48.9 | 105 | 117 | 129 | 7 | 6 | 67.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 14 | 15 | 8 | 8 | 6 | 8 | 5 | 6 | 44.0 | 34.0 | 34.0 | 34.0 | 7 | 14 | 72.5 | 7 | 14 | 41.5 | 6 | 7.5 | 5 | 6.5 | 42.8 | 107 | 119 | 131 | 7 | 6 | 67.0 | 5 | 12 | 5 | 11 | 0 |
| 10 FT | 15 | 16 | 8 | 8 | 6 | 7.5 | 6 | 8 | 50.5 | 35.0 | 35.0 | 35.0 | 7 | 13 | 78.0 | 7 | 13 | 49.0 | 6 | 7 | 5 | 6.5 | 40.9 | 108 | 120 | 132 | 7 | 6 | 66.5 | 5 | 12 | 5 | 10 | 0 |
| 12 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 6 | 8 | 48.4 | 37.0 | 37.0 | 37.0 | 7 | 13 | 76.5 | 7 | 13 | 48.5 | 6 | 6.5 | 5 | 6 | 39.6 | 110 | 122 | 134 | 7 | 6 | 66.5 | 5 | 12 | 5 | 9.5 | 0 |
| 14 FT | 18 | 19 | 8 | 8 | 6 | 7 | 6 | 7.5 | 47.0 | 38.0 | 38.0 | 42.0 | 7 | 13 | 75.5 | 7 | 13 | 48.5 | 6 | 6 | 6 | 8 | 41.5 | 111 | 123 | 135 | 7 | 6 | 66.5 | 5 | 12 | 5 | 9.5 | 0 |
| 16 FT | 19 | 21 | 8 | 8 | 6 | 6 | 6 | 6.5 | 46.1 | 39.0 | 43.0 | 43.0 | 7 | 12 | 75.0 | 7 | 12 | 48.0 | 6 | 6 | 6 | 7 | 40.8 | 113 | 125 | 137 | 7 | 6 | 66.5 | 5 | 12 | 5 | 9 | 0 |
| 18 FT | 21 | 22 | 9 | 8 | 6 | 6 | 6 | 7.5 | 46.0 | 41.0 | 41.0 | 41.0 | 7 | 12 | 74.0 | 7 | 12 | 48.0 | 7 | 7.5 | 5 | 6 | 37.8 | 114 | 126 | 138 | 7 | 6 | 66.0 | 5 | 12 | 5 | 8.5 | 0 |
| 20 FT | 22 | 24 | 9 | 8 | 6 | 6 | 6 | 6.5 | 45.5 | 42.0 | 42.0 | 46.0 | 7 | 12 | 73.5 | 7 | 12 | 47.5 | 7 | 7.5 | 6 | 7 | 40.3 | 116 | 128 | 140 | 7 | 6 | 66.0 | 5 | 12 | 5 | 8.5 | 0 |
| 22 FT | 24 | 26 | 10 | 8 | 7 | 7.5 | 6 | 7.5 | 46.0 | 44.0 | 44.0 | 44.0 | 7 | 12 | 72.5 | 7 | 12 | 47.5 | 7 | 7.5 | 5 | 6 | 37.5 | 118 | 130 | 142 | 7 | 6 | 66.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 25 | 27 | 11 | 8 | 7 | 7 | 6 | 8 | 46.5 | 45.0 | 45.0 | 45.0 | 7 | 12 | 71.5 | 7 | 12 | 47.0 | 7 | 6.5 | 5 | 6 | 37.5 | 119 | 131 | 143 | 8 | 7 | 72.0 | 5 | 12 | 5 | 7.5 | 0 |
| 26 FT | 27 | 29 | 11 | 8 | 7 | 6.5 | 6 | 8 | 46.1 | 47.0 | 47.0 | 51.0 | 7 | 12 | 70.5 | 7 | 12 | 47.0 | 7 | 7 | 6 | 7.5 | 40.6 | 121 | 133 | 145 | 8 | 7 | 72.0 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 28 | 30 | 11 | 8 | 7 | 6.5 | 6 | 7 | 45.9 | 52.0 | 52.0 | 52.0 | 7 | 12 | 69.5 | 7 | 12 | 46.5 | 7 | 6.5 | 6 | 7 | 40.5 | 122 | 134 | 146 | 8 | 7 | 72.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 29 | 32 | 12 | 8 | 7 | 6 | 6 | 7.5 | 46.9 | 53.0 | 53.0 | 53.0 | 7 | 12 | 69.0 | 7 | 12 | 46.5 | 7 | 7 | 6 | 7.5 | 41.0 | 124 | 136 | 148 | 8 | 7 | 72.0 | 5 | 12 | 5 | 7 | 0 |
| 32 FT | 30 | 33 | 12 | 8 | 7 | 6 | 6 | 7.5 | 45.4 | 54.0 | 54.0 | 54.0 | 7 | 12 | 67.5 | 7 | 12 | 46.0 | 7 | 6.5 | 6 | 7 | 39.5 | 125 | 137 | 149 | 8 | 6.5 | 72.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 31 | 34 | 12 | 8 | 8 | 7.5 | 6 | 7.5 | 45.3 | 55.0 | 55.0 | 55.0 | 8 | 15 | 75.0 | 8 | 15 | 53.0 | 7 | 6.5 | 6 | 7 | 39.6 | 126 | 138 | 150 | 8 | 6.5 | 72.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 32 | 36 | 12 | 8 | 8 | 7 | 6 | 7 | 45.4 | 56.0 | 56.0 | 56.0 | 8 | 14 | 73.5 | 8 | 14 | 52.5 | 7 | 6.5 | 6 | 6.5 | 39.9 | 128 | 140 | 152 | 8 | 6 | 72.0 | 5 | 12 | 5 | 7 | 0 |
| 38 FT | 33 | 37 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 45.4 | 57.0 | 57.0 | 57.0 | 8 | 13 | 72.5 | 8 | 13 | 51.5 | 7 | 6.5 | 6 | 6.5 | 40.0 | 129 | 141 | 153 | 8 | 6 | 72.0 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 35 | 38 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 45.1 | 59.0 | 59.0 | 59.0 | 8 | 13 | 71.0 | 8 | 13 | 49.5 | 7 | 6 | 6 | 6 | 40.3 | 130 | 142 | 154 | 8 | 6 | 71.5 | 5 | 12 | 5 | 6 | 0 |
| 42 FT | 35 | 39 | 13 | 8 | 8 | 6 | 6 | 6.5 | 46.1 | 59.0 | 59.0 | 59.0 | 8 | 12 | 71.0 | 8 | 12 | 50.0 | 7 | 6 | 6 | 6 | 40.6 | 131 | 143 | 155 | 8 | 6 | 72.0 | 5 | 12 | 5 | 6.5 | 0 |
| 44 FT | 36 | 41 | 13 | 8 | 8 | 6 | 6 | 6.5 | 46.3 | 60.0 | 60.0 | 60.0 | 8 | 12 | 70.5 | 8 | 12 | 49.0 | 7 | 6 | 7 | 7 | 43.9 | 133 | 145 | 157 | 9 | 7 | 77.5 | 5 | 9 | 5 | 6 | 0 |
| 46 FT | 37 | 42 | 13 | 8 | 8 | 6 | 6 | 6 | 46.3 | 61.0 | 61.0 | 61.0 | 8 | 12 | 70.0 | 8 | 12 | 48.0 | 7 | 6 | 7 | 7 | 44.1 | 134 | 146 | 158 | 9 | 7 | 77.5 | 5 | 6.5 | 6 | 8.5 | 0 |
| 48 FT | 38 | 43 | 13 | 9 | 8 | 6 | 6 | 6 | 46.3 | 62.0 | 62.0 | 62.0 | 8 | 12 | 70.5 | 8 | 12 | 48.5 | 7 | 6 | 7 | 6.5 | 44.3 | 135 | 147 | 159 | 9 | 7 | 77.5 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 39 | 44 | 14 | 9 | 8 | 6 | 6 | 6 | 47.1 | 63.0 | 63.0 | 63.0 | 8 | 12 | 70.0 | 8 | 12 | 47.5 | 8 | 7.5 | 7 | 7 | 44.8 | 136 | 148 | 160 | 9 | 6.5 | 77.5 | 5 | 12 | 6 | 8 | 0 |

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

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=11′ | K2 HT=12′ | K2 HT=13′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=11′ | K3 HT=12′ | K3 HT=13′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 12 | 9 | 10 | 6 | 8 | 5 | 6.5 | 73.9 | 35.0 | 35.0 | 35.0 | 6 | 16 | 147.0 | 6 | 16 | 51.0 | 5 | 6 | 6 | 6 | 88.3 | 140 | 152 | 164 | 6 | 6 | 67.0 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 17 | 13 | 9 | 10 | 6 | 7.5 | 5 | 6.5 | 73.9 | 37.0 | 37.0 | 37.0 | 6 | 14 | 147.0 | 6 | 14 | 46.0 | 5 | 6 | 6 | 6 | 80.4 | 141 | 153 | 165 | 6 | 6 | 66.0 | 5 | 12 | 5 | 8.5 | 12 |
| 4 FT | 13 | 12 | 9 | 10 | 6 | 7 | 6 | 6 | 85.5 | 33.0 | 37.0 | 37.0 | 6 | 12 | 96.0 | 6 | 12 | 42.0 | 5 | 6 | 6 | 6 | 70.6 | 140 | 152 | 164 | 7 | 6 | 68.5 | 5 | 12 | 5 | 8.5 | 12 |
| 6 FT | 13 | 14 | 10 | 10 | 6 | 8 | 6 | 7 | 67.4 | 33.0 | 33.0 | 37.0 | 7 | 15 | 76.5 | 7 | 15 | 43.0 | 6 | 8 | 6 | 6.5 | 66.0 | 142 | 154 | 166 | 7 | 6.5 | 68.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 14 | 15 | 10 | 10 | 6 | 8 | 6 | 6.5 | 62.0 | 34.0 | 34.0 | 38.0 | 7 | 14 | 72.0 | 7 | 14 | 42.0 | 6 | 7.5 | 6 | 6.5 | 62.1 | 143 | 155 | 167 | 7 | 6 | 67.0 | 5 | 12 | 5 | 8 | 0 |
| 10 FT | 15 | 17 | 10 | 10 | 6 | 8 | 6 | 6.5 | 64.6 | 35.0 | 35.0 | 39.0 | 7 | 14 | 78.0 | 7 | 14 | 49.5 | 6 | 7 | 6 | 6.5 | 59.6 | 145 | 157 | 169 | 7 | 6.5 | 67.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 16 | 18 | 11 | 10 | 6 | 7.5 | 6 | 6.5 | 62.6 | 36.0 | 36.0 | 40.0 | 7 | 13 | 76.5 | 7 | 13 | 49.0 | 6 | 6.5 | 6 | 7.5 | 57.4 | 146 | 158 | 170 | 7 | 6 | 67.0 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 18 | 20 | 12 | 10 | 6 | 7 | 6 | 7 | 62.0 | 38.0 | 38.0 | 42.0 | 7 | 13 | 75.5 | 7 | 13 | 48.0 | 6 | 6 | 6 | 8 | 56.4 | 148 | 160 | 172 | 7 | 6.5 | 67.0 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 19 | 21 | 12 | 10 | 6 | 6.5 | 6 | 6.5 | 60.9 | 39.0 | 39.0 | 43.0 | 7 | 13 | 74.5 | 7 | 13 | 48.5 | 7 | 8 | 6 | 7.5 | 55.4 | 149 | 161 | 173 | 7 | 6 | 66.5 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 21 | 22 | 12 | 10 | 6 | 6 | 6 | 6.5 | 59.8 | 41.0 | 45.0 | 45.0 | 7 | 13 | 74.0 | 7 | 13 | 48.5 | 7 | 7 | 6 | 6 | 54.6 | 150 | 162 | 174 | 7 | 6 | 66.5 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 22 | 24 | 13 | 10 | 6 | 6 | 6 | 6.5 | 59.9 | 42.0 | 42.0 | 46.0 | 7 | 12 | 73.5 | 7 | 12 | 48.5 | 7 | 7 | 6 | 7.5 | 54.4 | 152 | 164 | 176 | 7 | 6 | 66.5 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 23 | 26 | 13 | 10 | 7 | 7 | 6 | 6 | 59.3 | 43.0 | 43.0 | 47.0 | 7 | 12 | 72.5 | 7 | 12 | 48.0 | 7 | 7 | 6 | 7 | 53.9 | 154 | 166 | 178 | 7 | 6 | 66.5 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 25 | 28 | 14 | 10 | 7 | 7 | 6 | 6 | 59.5 | 45.0 | 45.0 | 49.0 | 7 | 12 | 71.5 | 7 | 12 | 48.0 | 7 | 7 | 6 | 7.5 | 54.0 | 156 | 168 | 180 | 7 | 6 | 66.5 | 5 | 12 | 5 | 6 | 0 |
| 26 FT | 26 | 29 | 14 | 10 | 7 | 6.5 | 6 | 6 | 59.0 | 50.0 | 50.0 | 50.0 | 7 | 12 | 71.0 | 7 | 12 | 47.5 | 7 | 7 | 6 | 7.5 | 53.6 | 157 | 169 | 181 | 8 | 7 | 72.5 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 27 | 31 | 15 | 10 | 7 | 6 | 6 | 6 | 59.6 | 51.0 | 51.0 | 51.0 | 7 | 12 | 70.5 | 7 | 12 | 47.5 | 7 | 7 | 6 | 7.5 | 53.9 | 159 | 171 | 183 | 8 | 7 | 72.5 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 29 | 32 | 15 | 10 | 7 | 6 | 7 | 8 | 64.3 | 53.0 | 53.0 | 53.0 | 7 | 12 | 69.0 | 7 | 12 | 47.0 | 7 | 6.5 | 6 | 7.5 | 54.0 | 160 | 172 | 184 | 8 | 7 | 72.5 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 30 | 33 | 16 | 10 | 7 | 6 | 6 | 6 | 59.9 | 54.0 | 54.0 | 54.0 | 7 | 12 | 68.0 | 7 | 12 | 46.5 | 7 | 6 | 6 | 7 | 54.3 | 161 | 173 | 185 | 8 | 6.5 | 72.5 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 31 | 35 | 16 | 10 | 8 | 7.5 | 6 | 6 | 58.3 | 55.0 | 55.0 | 55.0 | 8 | 15 | 75.0 | 8 | 15 | 53.0 | 7 | 6.5 | 6 | 6.5 | 52.6 | 163 | 175 | 187 | 8 | 6.5 | 72.5 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 32 | 36 | 16 | 10 | 8 | 7.5 | 7 | 7.5 | 63.1 | 56.0 | 56.0 | 56.0 | 8 | 14 | 74.0 | 8 | 14 | 52.5 | 7 | 6.5 | 6 | 6.5 | 52.8 | 164 | 176 | 188 | 8 | 6 | 72.5 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 33 | 37 | 16 | 10 | 8 | 7 | 7 | 7 | 63.1 | 57.0 | 57.0 | 57.0 | 8 | 14 | 72.5 | 8 | 14 | 52.0 | 7 | 6 | 6 | 6.5 | 52.9 | 165 | 177 | 189 | 8 | 6 | 72.5 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 34 | 38 | 17 | 10 | 8 | 7 | 7 | 7.5 | 63.9 | 58.0 | 58.0 | 58.0 | 8 | 14 | 72.0 | 8 | 14 | 51.0 | 7 | 6 | 6 | 6 | 53.3 | 166 | 178 | 190 | 8 | 6 | 72.5 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 35 | 40 | 18 | 10 | 8 | 6.5 | 7 | 7.5 | 64.8 | 59.0 | 59.0 | 59.0 | 8 | 13 | 71.5 | 8 | 13 | 50.0 | 7 | 6 | 6 | 6 | 53.8 | 168 | 180 | 192 | 9 | 7 | 78.5 | 5 | 12 | 6 | 7 | 0 |
| 44 FT | 36 | 41 | 18 | 10 | 8 | 6.5 | 7 | 7.5 | 64.6 | 60.0 | 60.0 | 66.0 | 8 | 13 | 71.0 | 8 | 13 | 49.5 | 7 | 6 | 7 | 8 | 56.9 | 169 | 181 | 193 | 9 | 7 | 78.5 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 37 | 42 | 18 | 10 | 8 | 6.5 | 7 | 6.5 | 64.6 | 61.0 | 61.0 | 67.0 | 8 | 12 | 70.5 | 8 | 12 | 48.5 | 7 | 6 | 7 | 7.5 | 57.0 | 170 | 182 | 194 | 9 | 7 | 78.5 | 5 | 12 | 6 | 7 | 0 |
| 48 FT | 38 | 43 | 19 | 10 | 8 | 6 | 7 | 7 | 65.4 | 62.0 | 62.0 | 68.0 | 8 | 13 | 69.5 | 8 | 13 | 48.0 | 8 | 7.5 | 7 | 7.5 | 57.5 | 171 | 183 | 195 | 9 | 7 | 78.5 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 39 | 44 | 19 | 10 | 8 | 6 | 7 | 6.5 | 65.3 | 63.0 | 63.0 | 69.0 | 8 | 13 | 69.0 | 8 | 13 | 47.5 | 8 | 7.5 | 7 | 7 | 57.6 | 172 | 184 | 196 | 9 | 6.5 | 78.5 | 5 | 12 | 6 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 15 FEET
HEIGHT (HT): 8 THRU 13 FEET

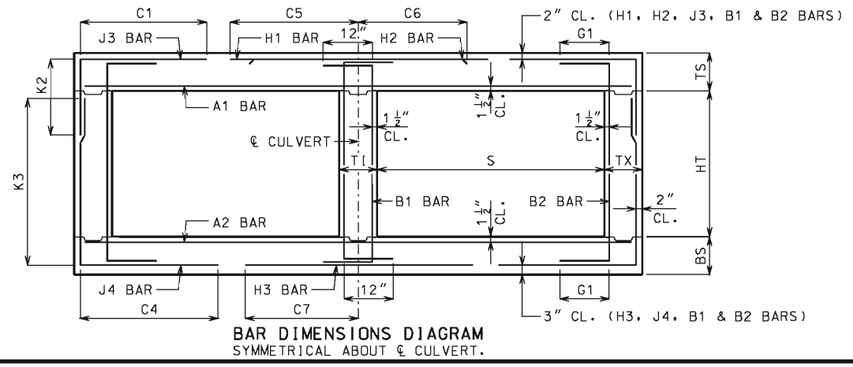
DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO.
24 OF 27

## SPAN (S) = 15 FT  HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 13 | 12 | 13 | 6 | 8 | 6 | 8.5 | 79.3 | 35.0 | 35.0 | 39.0 | 6 | 16 | 152.5 | 6 | 16 | 50.0 | 5 | 6 | 6 | 7 | 102.4 | 177 | 189 | 201 | 6 | 6 | 67.5 | 5 | 11 | 5 | 7 | 12 |
| 2 FT | 16 | 14 | 12 | 13 | 6 | 7.5 | 5 | 6 | 76.3 | 36.0 | 36.0 | 36.0 | 6 | 15 | 149.5 | 6 | 15 | 48.5 | 6 | 8 | 6 | 7.5 | 96.3 | 178 | 190 | 202 | 6 | 6 | 67.0 | 5 | 12 | 5 | 7 | 12 |
| 4 FT | 12 | 13 | 12 | 13 | 6 | 7 | 6 | 7 | 101.4 | 36.0 | 36.0 | 36.0 | 6 | 12 | 86.5 | 6 | 12 | 41.5 | 5 | 6 | 6 | 6.5 | 88.5 | 177 | 189 | 201 | 7 | 6.5 | 69.0 | 5 | 10.5 | 5 | 7 | 12 |
| 6 FT | 13 | 14 | 12 | 13 | 6 | 8 | 6 | 6.5 | 86.3 | 37.0 | 37.0 | 37.0 | 7 | 16 | 74.5 | 7 | 16 | 43.5 | 6 | 8 | 6 | 6.5 | 82.9 | 178 | 190 | 202 | 7 | 6 | 68.0 | 5 | 12 | 5 | 7 | 12 |
| 8 FT | 13 | 15 | 13 | 13 | 6 | 8 | 6 | 6.5 | 76.4 | 37.0 | 37.0 | 37.0 | 7 | 14 | 70.5 | 7 | 14 | 42.5 | 6 | 7.5 | 6 | 6.5 | 77.9 | 179 | 191 | 203 | 7 | 6 | 68.0 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 15 | 17 | 13 | 13 | 6 | 8 | 6 | 6 | 80.6 | 39.0 | 39.0 | 39.0 | 7 | 14 | 77.5 | 7 | 14 | 50.5 | 6 | 7 | 6 | 6.5 | 76.0 | 181 | 193 | 205 | 7 | 6.5 | 67.5 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 16 | 18 | 14 | 13 | 6 | 8 | 6 | 6 | 78.4 | 40.0 | 40.0 | 40.0 | 7 | 14 | 76.5 | 7 | 14 | 50.0 | 6 | 6.5 | 6 | 6.5 | 73.8 | 182 | 194 | 206 | 7 | 6 | 67.5 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 17 | 20 | 14 | 13 | 6 | 7.5 | 7 | 7.5 | 81.6 | 41.0 | 41.0 | 41.0 | 7 | 13 | 75.5 | 7 | 13 | 50.0 | 6 | 6 | 6 | 6 | 72.9 | 184 | 196 | 208 | 7 | 6 | 67.5 | 5 | 12 | 5 | 6 | 0 |
| 16 FT | 19 | 21 | 15 | 13 | 6 | 6.5 | 7 | 8 | 80.9 | 43.0 | 43.0 | 49.0 | 7 | 13 | 75.0 | 7 | 13 | 49.5 | 7 | 8 | 7 | 8 | 74.4 | 185 | 197 | 209 | 7 | 6 | 67.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 20 | 23 | 16 | 13 | 6 | 6.5 | 7 | 8 | 80.1 | 44.0 | 44.0 | 44.0 | 7 | 13 | 74.0 | 7 | 13 | 49.5 | 7 | 7.5 | 6 | 6 | 70.8 | 187 | 199 | 211 | 7 | 6 | 67.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 21 | 24 | 17 | 13 | 6 | 6 | 7 | 7.5 | 79.5 | 45.0 | 45.0 | 45.0 | 7 | 12 | 73.5 | 7 | 12 | 49.5 | 7 | 7 | 6 | 6 | 69.8 | 188 | 200 | 212 | 7 | 6 | 67.0 | 5 | 12 | 6 | 7.5 | 0 |
| 22 FT | 23 | 26 | 17 | 13 | 7 | 7.5 | 7 | 7.5 | 78.9 | 47.0 | 47.0 | 47.0 | 7 | 12 | 73.0 | 7 | 12 | 49.0 | 7 | 7 | 6 | 6 | 69.4 | 190 | 202 | 214 | 7 | 6 | 67.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 24 | 28 | 18 | 13 | 7 | 7 | 7 | 7.5 | 78.6 | 48.0 | 48.0 | 48.0 | 7 | 12 | 72.5 | 7 | 12 | 49.0 | 7 | 7 | 6 | 6.5 | 69.0 | 192 | 204 | 216 | 7 | 6 | 67.0 | 5 | 12 | 6 | 7 | 0 |
| 26 FT | 26 | 29 | 18 | 13 | 7 | 7 | 7 | 7 | 78.1 | 50.0 | 50.0 | 50.0 | 7 | 12 | 71.5 | 7 | 12 | 49.0 | 7 | 6 | 6 | 6 | 68.5 | 193 | 205 | 217 | 8 | 7 | 73.0 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 27 | 31 | 19 | 13 | 7 | 6.5 | 7 | 7 | 78.5 | 51.0 | 51.0 | 51.0 | 7 | 12 | 71.0 | 7 | 12 | 48.5 | 7 | 6.5 | 6 | 6 | 68.6 | 195 | 207 | 219 | 8 | 7 | 73.0 | 5 | 12 | 6 | 6.5 | 0 |
| 30 FT | 28 | 32 | 19 | 13 | 7 | 6 | 7 | 6 | 78.1 | 52.0 | 52.0 | 52.0 | 7 | 12 | 70.5 | 7 | 12 | 48.5 | 7 | 6.5 | 6 | 6 | 68.5 | 196 | 208 | 220 | 8 | 7 | 73.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 30 | 34 | 20 | 13 | 7 | 6 | 7 | 6.5 | 78.8 | 54.0 | 54.0 | 54.0 | 7 | 12 | 69.0 | 7 | 12 | 47.0 | 7 | 6.5 | 6 | 6 | 68.9 | 198 | 210 | 222 | 8 | 6.5 | 73.0 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 31 | 35 | 20 | 13 | 7 | 6 | 7 | 6.5 | 76.3 | 55.0 | 55.0 | 55.0 | 8 | 15 | 76.0 | 8 | 15 | 54.0 | 7 | 6.5 | 6 | 6 | 66.4 | 199 | 211 | 223 | 8 | 6.5 | 73.0 | 5 | 12 | 6 | 6.5 | 0 |
| 36 FT | 32 | 36 | 21 | 13 | 8 | 7.5 | 7 | 6.5 | 76.8 | 56.0 | 56.0 | 56.0 | 8 | 14 | 75.0 | 8 | 14 | 53.5 | 7 | 6 | 6 | 6 | 66.6 | 200 | 212 | 224 | 8 | 6 | 73.0 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 33 | 37 | 21 | 13 | 8 | 7 | 7 | 6 | 76.8 | 57.0 | 57.0 | 57.0 | 8 | 14 | 74.0 | 8 | 14 | 53.0 | 7 | 6 | 6 | 6 | 66.6 | 201 | 213 | 225 | 8 | 6 | 73.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 34 | 39 | 22 | 13 | 8 | 7 | 7 | 6 | 77.5 | 58.0 | 58.0 | 64.0 | 8 | 14 | 73.0 | 8 | 14 | 52.0 | 7 | 6 | 7 | 7.5 | 70.1 | 203 | 215 | 227 | 8 | 6 | 73.0 | 5 | 12 | 6 | 6 | 0 |
| 42 FT | 35 | 40 | 23 | 13 | 8 | 7 | 7 | 6.5 | 78.1 | 59.0 | 59.0 | 65.0 | 8 | 13 | 72.5 | 8 | 13 | 51.0 | 7 | 6 | 7 | 7.5 | 70.4 | 204 | 216 | 228 | 9 | 7 | 79.0 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 35 | 41 | 24 | 13 | 8 | 6 | 7 | 6 | 78.9 | 65.0 | 65.0 | 65.0 | 8 | 12 | 72.5 | 8 | 12 | 52.0 | 8 | 7.5 | 7 | 7 | 70.6 | 205 | 217 | 229 | 9 | 7 | 79.5 | 5 | 12 | 7 | 8 | 0 |
| 46 FT | 36 | 42 | 25 | 13 | 8 | 6 | 7 | 6 | 79.5 | 66.0 | 66.0 | 66.0 | 8 | 12 | 72.0 | 8 | 12 | 51.0 | 8 | 7 | 7 | 7.5 | 70.9 | 206 | 218 | 230 | 9 | 7 | 79.5 | 5 | 12 | 7 | 8 | 0 |
| 48 FT | 37 | 43 | 26 | 13 | 8 | 6.5 | 7 | 6 | 80.3 | 67.0 | 67.0 | 67.0 | 8 | 12 | 71.5 | 8 | 12 | 50.0 | 8 | 6.5 | 7 | 7.5 | 71.3 | 207 | 219 | 231 | 9 | 7 | 79.5 | 5 | 12 | 7 | 8 | 0 |
| 50 FT | 38 | 45 | 27 | 13 | 8 | 6 | 7 | 6 | 81.1 | 68.0 | 68.0 | 68.0 | 8 | 12 | 71.0 | 8 | 12 | 49.0 | 8 | 7 | 7 | 7 | 71.8 | 209 | 221 | 233 | 9 | 6.5 | 79.5 | 5 | 12 | 7 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 15 FEET
HEIGHT (HT): 14 THRU 16 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO. 25 OF 27

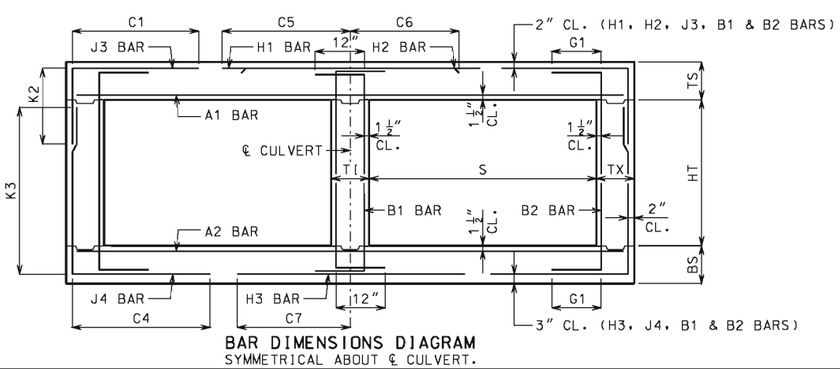
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 16 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | K2 HT=10′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | K3 HT=10′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 12 | 8 | 8 | 6 | 7.5 | 5 | 8 | 76.5 | 35.0 | 35.0 | 35.0 | 6 | 15 | 154.5 | 6 | 15 | 54.0 | 5 | 6 | 6 | 7 | 66.9 | 104 | 116 | 128 | 7 | 7 | 72.5 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 17 | 13 | 8 | 8 | 6 | 7 | 5 | 6.5 | 76.5 | 37.0 | 37.0 | 37.0 | 6 | 14 | 154.5 | 6 | 14 | 50.0 | 5 | 6 | 5 | 6 | 56.4 | 105 | 117 | 129 | 7 | 7 | 71.5 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 13 | 13 | 8 | 8 | 6 | 6.5 | 6 | 7 | 55.6 | 33.0 | 33.0 | 33.0 | 7 | 14 | 97.0 | 7 | 14 | 45.5 | 5 | 6 | 5 | 6 | 49.6 | 105 | 117 | 129 | 7 | 6 | 71.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 14 | 14 | 8 | 8 | 6 | 7 | 5 | 6 | 47.1 | 34.0 | 34.0 | 34.0 | 7 | 14 | 82.0 | 7 | 14 | 44.0 | 6 | 8 | 5 | 6 | 45.1 | 106 | 118 | 130 | 7 | 6 | 70.5 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 15 | 16 | 8 | 8 | 6 | 7.5 | 5 | 6 | 48.4 | 35.0 | 35.0 | 35.0 | 7 | 13 | 84.0 | 7 | 13 | 51.0 | 6 | 7 | 5 | 7 | 41.9 | 108 | 120 | 132 | 7 | 6 | 70.0 | 5 | 12 | 5 | 11 | 0 |
| 10 FT | 16 | 17 | 8 | 8 | 6 | 7 | 6 | 8 | 49.6 | 36.0 | 36.0 | 36.0 | 7 | 12 | 81.5 | 7 | 12 | 50.5 | 6 | 7 | 5 | 6.5 | 39.9 | 109 | 121 | 133 | 7 | 6 | 69.5 | 5 | 12 | 5 | 10 | 0 |
| 12 FT | 18 | 19 | 8 | 8 | 6 | 7 | 6 | 7.5 | 47.5 | 38.0 | 38.0 | 38.0 | 7 | 12 | 80.0 | 7 | 12 | 50.0 | 6 | 6 | 5 | 6 | 38.6 | 111 | 123 | 135 | 7 | 6 | 69.5 | 5 | 12 | 5 | 9.5 | 0 |
| 14 FT | 19 | 20 | 8 | 8 | 6 | 6.5 | 6 | 7 | 46.0 | 39.0 | 39.0 | 43.0 | 7 | 12 | 79.0 | 7 | 12 | 49.5 | 6 | 6 | 6 | 7.5 | 40.5 | 112 | 124 | 136 | 7 | 6 | 69.5 | 5 | 12 | 5 | 9.5 | 0 |
| 16 FT | 21 | 22 | 8 | 8 | 6 | 6 | 6 | 7 | 44.9 | 45.0 | 45.0 | 45.0 | 7 | 12 | 78.0 | 7 | 12 | 49.5 | 7 | 7.5 | 6 | 7 | 39.9 | 114 | 126 | 138 | 7 | 6 | 69.5 | 5 | 12 | 5 | 8.5 | 0 |
| 18 FT | 22 | 23 | 9 | 8 | 6 | 6 | 6 | 7.5 | 45.1 | 42.0 | 42.0 | 42.0 | 8 | 15 | 85.0 | 8 | 15 | 57.0 | 7 | 6.5 | 5 | 6 | 36.8 | 115 | 127 | 139 | 8 | 6.5 | 75.5 | 5 | 12 | 5 | 8.5 | 0 |
| 20 FT | 24 | 25 | 9 | 8 | 7 | 7.5 | 6 | 7 | 44.4 | 48.0 | 48.0 | 48.0 | 8 | 15 | 84.0 | 8 | 15 | 57.0 | 7 | 7 | 6 | 7 | 39.4 | 117 | 129 | 141 | 8 | 7 | 75.5 | 5 | 12 | 5 | 8.5 | 0 |
| 22 FT | 25 | 27 | 10 | 8 | 7 | 7 | 6 | 7.5 | 45.0 | 45.0 | 45.0 | 49.0 | 8 | 14 | 83.5 | 8 | 14 | 56.5 | 7 | 6.5 | 6 | 7 | 39.5 | 119 | 131 | 143 | 8 | 7 | 75.5 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 27 | 29 | 10 | 8 | 7 | 6.5 | 6 | 6.5 | 44.5 | 51.0 | 51.0 | 51.0 | 8 | 14 | 82.5 | 8 | 14 | 56.5 | 7 | 6.5 | 6 | 6.5 | 39.3 | 121 | 133 | 145 | 8 | 7 | 75.0 | 5 | 12 | 5 | 8 | 0 |
| 26 FT | 28 | 31 | 11 | 8 | 7 | 6 | 6 | 7.5 | 45.3 | 52.0 | 52.0 | 52.0 | 8 | 14 | 81.5 | 8 | 14 | 56.0 | 7 | 6.5 | 6 | 7 | 39.5 | 123 | 135 | 147 | 8 | 7 | 75.0 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 30 | 32 | 11 | 8 | 7 | 6 | 6 | 7 | 44.9 | 54.0 | 54.0 | 54.0 | 8 | 14 | 80.5 | 8 | 14 | 56.0 | 7 | 6.5 | 6 | 6.5 | 39.6 | 124 | 136 | 148 | 8 | 7 | 75.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 31 | 34 | 11 | 8 | 8 | 7.5 | 6 | 6 | 44.9 | 55.0 | 55.0 | 55.0 | 8 | 14 | 79.5 | 8 | 14 | 55.5 | 7 | 6.5 | 6 | 6 | 39.6 | 126 | 138 | 150 | 8 | 6.5 | 75.0 | 5 | 12 | 5 | 7 | 0 |
| 32 FT | 32 | 35 | 12 | 8 | 8 | 7 | 6 | 7 | 45.8 | 56.0 | 56.0 | 56.0 | 8 | 14 | 78.5 | 8 | 14 | 55.0 | 7 | 6 | 6 | 6.5 | 40.0 | 127 | 139 | 151 | 8 | 6.5 | 75.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 33 | 36 | 12 | 8 | 8 | 7 | 6 | 7 | 45.3 | 57.0 | 57.0 | 57.0 | 8 | 14 | 77.5 | 8 | 14 | 54.5 | 7 | 6 | 6 | 6.5 | 39.3 | 128 | 140 | 152 | 8 | 6 | 75.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 35 | 38 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 45.3 | 59.0 | 59.0 | 59.0 | 8 | 13 | 75.0 | 8 | 13 | 52.0 | 7 | 6 | 6 | 6 | 39.3 | 130 | 142 | 154 | 8 | 6 | 75.0 | 5 | 12 | 5 | 7 | 0 |
| 38 FT | 36 | 39 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 45.3 | 60.0 | 60.0 | 60.0 | 8 | 13 | 74.0 | 8 | 13 | 51.5 | 7 | 6 | 6 | 6 | 39.3 | 131 | 143 | 155 | 8 | 6 | 75.0 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 37 | 41 | 12 | 8 | 8 | 6.5 | 6 | 6 | 45.3 | 61.0 | 61.0 | 61.0 | 8 | 12 | 73.5 | 8 | 12 | 50.5 | 7 | 6 | 7 | 6.5 | 42.5 | 133 | 145 | 157 | 9 | 7 | 80.5 | 5 | 11 | 5 | 6 | 0 |
| 42 FT | 38 | 42 | 12 | 8 | 8 | 6 | 6 | 6 | 45.3 | 62.0 | 62.0 | 62.0 | 8 | 12 | 73.0 | 8 | 12 | 50.0 | 7 | 6 | 7 | 6 | 42.6 | 134 | 146 | 158 | 9 | 7 | 80.5 | 5 | 7 | 6 | 8 | 0 |
| 44 FT | 39 | 43 | 13 | 9 | 8 | 6 | 6 | 6 | 45.8 | 63.0 | 63.0 | 63.0 | 8 | 12 | 73.5 | 8 | 12 | 50.5 | 8 | 7.5 | 7 | 6.5 | 43.1 | 135 | 147 | 159 | 9 | 7 | 81.0 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 40 | 44 | 13 | 9 | 8 | 6 | 7 | 7 | 50.8 | 70.0 | 70.0 | 70.0 | 8 | 12 | 73.0 | 8 | 12 | 49.5 | 8 | 7.5 | 7 | 6.5 | 43.4 | 136 | 148 | 160 | 9 | 6.5 | 80.5 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 41 | 45 | 13 | 9 | 9 | 7.5 | 7 | 7 | 50.8 | 71.0 | 71.0 | 71.0 | 9 | 15 | 80.5 | 9 | 15 | 56.5 | 8 | 7 | 7 | 6.5 | 43.5 | 137 | 149 | 161 | 9 | 6.5 | 80.5 | 5 | 12 | 6 | 7.5 | 0 |
| 50 FT | 42 | 46 | 13 | 9 | 9 | 7 | 7 | 6.5 | 50.8 | 72.0 | 72.0 | 72.0 | 9 | 14 | 80.0 | 9 | 14 | 56.0 | 8 | 7 | 7 | 6 | 43.8 | 138 | 150 | 162 | 9 | 6.5 | 80.5 | 5 | 9.5 | 6 | 7 | 0 |

## SPAN (S) = 16 FT  HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=11′ | K2 HT=12′ | K2 HT=13′ | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=11′ | K3 HT=12′ | K3 HT=13′ | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 13 | 9 | 10 | 6 | 7.5 | 5 | 6 | 77.5 | 35.0 | 35.0 | 35.0 | 6 | 15 | 155.5 | 6 | 15 | 53.5 | 5 | 6 | 6 | 6 | 89.5 | 141 | 153 | 165 | 6 | 6 | 70.0 | 5 | 11.5 | 5 | 8.5 | 12 |
| 2 FT | 17 | 14 | 9 | 10 | 6 | 7.5 | 5 | 6.5 | 77.5 | 37.0 | 37.0 | 37.0 | 6 | 14 | 155.5 | 6 | 14 | 50.0 | 6 | 8 | 6 | 6.5 | 79.8 | 142 | 154 | 166 | 6 | 6 | 69.5 | 5 | 12 | 5 | 8.5 | 12 |
| 4 FT | 13 | 13 | 10 | 10 | 6 | 6.5 | 6 | 7 | 76.9 | 33.0 | 37.0 | 37.0 | 7 | 15 | 96.5 | 7 | 15 | 46.0 | 5 | 6 | 6 | 6.5 | 70.0 | 141 | 153 | 165 | 7 | 6 | 71.5 | 5 | 11 | 5 | 8.5 | 12 |
| 6 FT | 13 | 14 | 10 | 10 | 6 | 7 | 6 | 7 | 65.3 | 33.0 | 37.0 | 37.0 | 7 | 13 | 79.5 | 7 | 13 | 44.0 | 6 | 8 | 6 | 6.5 | 64.5 | 142 | 154 | 166 | 7 | 6 | 71.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 14 | 16 | 10 | 10 | 6 | 7 | 6 | 6.5 | 60.3 | 34.0 | 34.0 | 38.0 | 7 | 13 | 75.0 | 7 | 13 | 43.0 | 6 | 7 | 6 | 7 | 60.6 | 144 | 156 | 168 | 7 | 6 | 70.5 | 5 | 12 | 5 | 8 | 0 |
| 10 FT | 16 | 17 | 10 | 10 | 6 | 7 | 6 | 6.5 | 63.1 | 36.0 | 40.0 | 40.0 | 7 | 13 | 81.5 | 7 | 13 | 51.0 | 6 | 7 | 6 | 6.5 | 57.8 | 145 | 157 | 169 | 7 | 6 | 70.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 17 | 19 | 11 | 10 | 6 | 7 | 6 | 6.5 | 62.3 | 37.0 | 37.0 | 41.0 | 7 | 12 | 80.0 | 7 | 12 | 50.5 | 6 | 6 | 6 | 7.5 | 56.5 | 147 | 159 | 171 | 7 | 6 | 70.0 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 19 | 21 | 12 | 10 | 6 | 6.5 | 6 | 7 | 61.5 | 39.0 | 39.0 | 43.0 | 7 | 12 | 78.5 | 7 | 12 | 50.0 | 7 | 8 | 6 | 8 | 55.8 | 149 | 161 | 173 | 7 | 6 | 70.0 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 20 | 22 | 12 | 10 | 6 | 6.5 | 6 | 6.5 | 60.3 | 40.0 | 40.0 | 44.0 | 7 | 12 | 78.0 | 7 | 12 | 50.0 | 7 | 7.5 | 6 | 7 | 54.6 | 150 | 162 | 174 | 7 | 6 | 70.0 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 22 | 24 | 12 | 10 | 6 | 6 | 6 | 6 | 59.3 | 42.0 | 46.0 | 46.0 | 7 | 12 | 77.0 | 7 | 12 | 50.0 | 7 | 7 | 6 | 6.5 | 54.0 | 152 | 164 | 176 | 7 | 6 | 69.5 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 23 | 25 | 13 | 10 | 7 | 7.5 | 6 | 6 | 59.1 | 43.0 | 43.0 | 47.0 | 8 | 15 | 84.5 | 8 | 15 | 57.5 | 7 | 6.5 | 6 | 7 | 53.6 | 153 | 165 | 177 | 8 | 7 | 75.5 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 25 | 27 | 13 | 10 | 7 | 7 | 6 | 6 | 58.4 | 45.0 | 45.0 | 49.0 | 8 | 15 | 83.5 | 8 | 15 | 57.5 | 7 | 6.5 | 6 | 7 | 53.1 | 155 | 167 | 179 | 8 | 7 | 75.5 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 27 | 29 | 14 | 10 | 7 | 6.5 | 6 | 6 | 58.6 | 51.0 | 51.0 | 51.0 | 8 | 15 | 82.5 | 8 | 15 | 57.0 | 7 | 6.5 | 6 | 7.5 | 53.3 | 157 | 169 | 181 | 8 | 7 | 75.5 | 5 | 12 | 5 | 6 | 0 |
| 26 FT | 28 | 31 | 14 | 10 | 7 | 6.5 | 6 | 6 | 58.3 | 52.0 | 52.0 | 52.0 | 8 | 14 | 82.0 | 8 | 14 | 57.0 | 7 | 6.5 | 6 | 7.5 | 52.9 | 159 | 171 | 183 | 8 | 7 | 75.5 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 30 | 33 | 15 | 10 | 7 | 6 | 6 | 6 | 58.8 | 54.0 | 54.0 | 54.0 | 8 | 15 | 80.5 | 8 | 15 | 56.5 | 7 | 6.5 | 6 | 7 | 53.3 | 161 | 173 | 185 | 8 | 6.5 | 75.5 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 31 | 34 | 15 | 10 | 8 | 7.5 | 7 | 8 | 63.5 | 55.0 | 55.0 | 55.0 | 8 | 15 | 79.5 | 8 | 15 | 56.0 | 7 | 6 | 6 | 7 | 53.1 | 162 | 174 | 186 | 8 | 6.5 | 75.5 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 32 | 35 | 15 | 10 | 8 | 7.5 | 7 | 7 | 63.3 | 56.0 | 56.0 | 56.0 | 8 | 14 | 79.0 | 8 | 14 | 55.5 | 7 | 6 | 6 | 6.5 | 53.0 | 163 | 175 | 187 | 8 | 6.5 | 75.5 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 33 | 37 | 16 | 10 | 8 | 7 | 7 | 7.5 | 64.0 | 57.0 | 57.0 | 57.0 | 8 | 14 | 77.5 | 8 | 14 | 55.0 | 7 | 6 | 6 | 6.5 | 53.5 | 165 | 177 | 189 | 8 | 6 | 75.5 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 34 | 38 | 16 | 10 | 8 | 7 | 7 | 7.5 | 62.4 | 58.0 | 58.0 | 58.0 | 8 | 14 | 76.5 | 8 | 14 | 54.0 | 7 | 6 | 6 | 6 | 51.9 | 166 | 178 | 190 | 8 | 6 | 75.5 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 35 | 40 | 16 | 10 | 8 | 6.5 | 7 | 7 | 62.4 | 59.0 | 59.0 | 59.0 | 8 | 13 | 75.0 | 8 | 13 | 53.5 | 7 | 6 | 6 | 6 | 52.0 | 168 | 180 | 192 | 9 | 7 | 81.5 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 36 | 41 | 17 | 10 | 8 | 6 | 7 | 7.5 | 63.1 | 60.0 | 60.0 | 66.0 | 8 | 12 | 74.5 | 8 | 12 | 52.5 | 8 | 7.5 | 7 | 8 | 55.5 | 169 | 181 | 193 | 9 | 7 | 81.5 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 38 | 42 | 17 | 10 | 8 | 6 | 7 | 7.5 | 62.9 | 62.0 | 62.0 | 68.0 | 8 | 12 | 73.5 | 8 | 12 | 50.0 | 8 | 7.5 | 7 | 7.5 | 55.8 | 170 | 182 | 194 | 9 | 7 | 81.5 | 5 | 12 | 6 | 7.5 | 0 |
| 44 FT | 39 | 43 | 18 | 10 | 8 | 6 | 7 | 7.5 | 63.8 | 63.0 | 63.0 | 69.0 | 8 | 12 | 73.0 | 8 | 12 | 49.0 | 8 | 7 | 7 | 7.5 | 56.1 | 171 | 183 | 195 | 9 | 7 | 81.5 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 40 | 44 | 18 | 10 | 8 | 6 | 7 | 7.5 | 63.6 | 70.0 | 70.0 | 70.0 | 8 | 12 | 72.0 | 8 | 12 | 48.5 | 8 | 6.5 | 7 | 7 | 56.3 | 172 | 184 | 196 | 9 | 6.5 | 81.5 | 5 | 12 | 6 | 7 | 0 |
| 48 FT | 40 | 46 | 19 | 10 | 8 | 6 | 7 | 7 | 64.8 | 70.0 | 70.0 | 70.0 | 8 | 12 | 72.0 | 8 | 12 | 49.0 | 8 | 7 | 7 | 7 | 56.6 | 174 | 186 | 198 | 9 | 6.5 | 81.5 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 41 | 47 | 19 | 10 | 9 | 7.5 | 7 | 6.5 | 64.6 | 71.0 | 71.0 | 71.0 | 8 | 12 | 71.5 | 8 | 12 | 48.5 | 8 | 7 | 7 | 6.5 | 56.9 | 175 | 187 | 199 | 9 | 6 | 81.5 | 5 | 12 | 6 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 16 FEET
HEIGHT (HT): 8 THRU 13 FEET

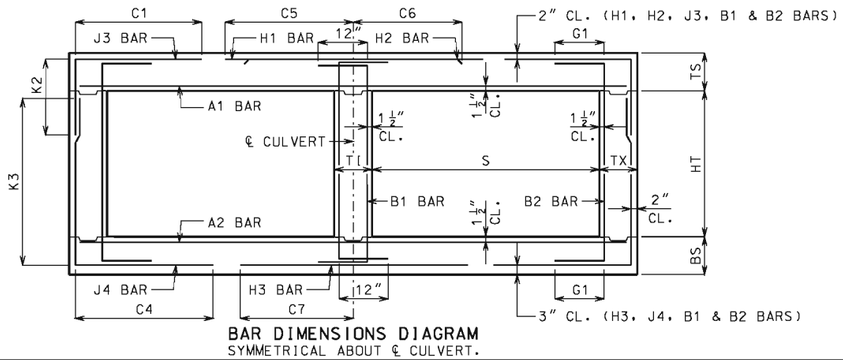
DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

SHEET NO.
26 OF 27

## SPAN (S) = 16 FT  HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | H2 BARS | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C5 | SIZE | SPA. | C6 | SIZE | SPA. | SIZE | SPA. | C4 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C7 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 13 | 12 | 13 | 6 | 7.5 | 6 | 8 | 82.9 | 35.0 | 35.0 | 39.0 | 6 | 15 | 160.5 | 6 | 15 | 53.0 | 5 | 6 | 6 | 7 | 101.1 | 177 | 189 | 201 | 6 | 6 | 70.5 | 5 | 10 | 5 | 7 | 12 |
| 2 FT | 17 | 14 | 12 | 13 | 6 | 7.5 | 6 | 8.5 | 82.9 | 37.0 | 37.0 | 41.0 | 6 | 14 | 160.5 | 6 | 14 | 50.0 | 6 | 8 | 6 | 7 | 95.1 | 178 | 190 | 202 | 7 | 7 | 73.0 | 5 | 12 | 5 | 7 | 12 |
| 4 FT | 13 | 13 | 12 | 13 | 6 | 7 | 6 | 7 | 99.8 | 37.0 | 37.0 | 37.0 | 7 | 15 | 94.0 | 7 | 15 | 46.0 | 6 | 8.5 | 6 | 6 | 86.1 | 177 | 189 | 201 | 7 | 6 | 72.0 | 5 | 11 | 5 | 7 | 12 |
| 6 FT | 13 | 15 | 12 | 13 | 6 | 7 | 6 | 6.5 | 82.6 | 37.0 | 37.0 | 37.0 | 7 | 14 | 77.5 | 7 | 14 | 44.5 | 6 | 7.5 | 6 | 6.5 | 82.5 | 179 | 191 | 203 | 7 | 6 | 71.5 | 5 | 12 | 5 | 7 | 12 |
| 8 FT | 14 | 16 | 13 | 13 | 6 | 7.5 | 6 | 6.5 | 76.6 | 38.0 | 38.0 | 38.0 | 7 | 13 | 74.5 | 7 | 13 | 44.0 | 6 | 7 | 6 | 6.5 | 77.6 | 180 | 192 | 204 | 7 | 6 | 71.0 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 15 | 18 | 13 | 13 | 6 | 6.5 | 6 | 6 | 79.5 | 39.0 | 39.0 | 39.0 | 7 | 13 | 80.5 | 7 | 13 | 51.5 | 6 | 6.5 | 6 | 6 | 75.6 | 182 | 194 | 206 | 7 | 6 | 71.0 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 17 | 19 | 14 | 13 | 6 | 7 | 6 | 6 | 77.8 | 41.0 | 41.0 | 41.0 | 7 | 13 | 79.5 | 7 | 13 | 51.5 | 6 | 6 | 6 | 6 | 73.1 | 183 | 195 | 207 | 7 | 6 | 70.5 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 18 | 21 | 15 | 13 | 6 | 7 | 6 | 6 | 76.3 | 42.0 | 42.0 | 42.0 | 7 | 12 | 78.5 | 7 | 12 | 51.0 | 7 | 8 | 6 | 6 | 71.8 | 185 | 197 | 209 | 7 | 6 | 70.5 | 5 | 12 | 6 | 8 | 0 |
| 16 FT | 20 | 22 | 15 | 13 | 6 | 6.5 | 7 | 7.5 | 79.9 | 44.0 | 44.0 | 44.0 | 7 | 12 | 78.0 | 7 | 12 | 51.0 | 7 | 7.5 | 6 | 6 | 70.3 | 186 | 198 | 210 | 7 | 6 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 22 | 24 | 15 | 13 | 6 | 6 | 7 | 7 | 78.8 | 46.0 | 46.0 | 52.0 | 7 | 12 | 77.5 | 7 | 12 | 51.0 | 7 | 7 | 7 | 7 | 72.4 | 188 | 200 | 212 | 7 | 6 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 23 | 25 | 16 | 13 | 7 | 7.5 | 7 | 7 | 78.0 | 47.0 | 47.0 | 53.0 | 8 | 15 | 85.0 | 8 | 15 | 58.5 | 7 | 6 | 7 | 7.5 | 71.4 | 189 | 201 | 213 | 8 | 7 | 76.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 25 | 27 | 17 | 13 | 7 | 7 | 7 | 7.5 | 77.8 | 49.0 | 49.0 | 49.0 | 7 | 12 | 76.0 | 7 | 12 | 50.5 | 7 | 6 | 6 | 6 | 68.0 | 191 | 203 | 215 | 8 | 7 | 76.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 26 | 29 | 17 | 13 | 7 | 7 | 7 | 7 | 76.9 | 50.0 | 50.0 | 56.0 | 8 | 15 | 83.5 | 8 | 15 | 58.5 | 7 | 6.5 | 7 | 7.5 | 70.4 | 193 | 205 | 217 | 8 | 7 | 76.0 | 5 | 12 | 6 | 7.5 | 0 |
| 26 FT | 28 | 31 | 18 | 13 | 7 | 6.5 | 7 | 7 | 76.9 | 52.0 | 52.0 | 52.0 | 8 | 15 | 82.5 | 8 | 15 | 58.0 | 7 | 6.5 | 6 | 6 | 67.1 | 195 | 207 | 219 | 8 | 7 | 76.5 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 29 | 33 | 19 | 13 | 7 | 6 | 7 | 7 | 77.1 | 53.0 | 53.0 | 53.0 | 8 | 15 | 82.0 | 8 | 15 | 58.0 | 7 | 6 | 6 | 6 | 67.1 | 197 | 209 | 221 | 8 | 6.5 | 76.5 | 5 | 12 | 6 | 6.5 | 0 |
| 30 FT | 31 | 34 | 19 | 13 | 8 | 7.5 | 7 | 6.5 | 76.8 | 55.0 | 55.0 | 55.0 | 8 | 15 | 80.5 | 8 | 15 | 57.0 | 7 | 6 | 6 | 6 | 67.0 | 198 | 210 | 222 | 8 | 6.5 | 76.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 32 | 36 | 20 | 13 | 8 | 7.5 | 7 | 6.5 | 77.3 | 56.0 | 56.0 | 56.0 | 8 | 14 | 79.5 | 8 | 14 | 56.5 | 7 | 6 | 6 | 6 | 67.3 | 200 | 212 | 224 | 8 | 6 | 76.5 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 33 | 37 | 21 | 13 | 8 | 7 | 7 | 6.5 | 77.6 | 57.0 | 57.0 | 57.0 | 8 | 14 | 78.5 | 8 | 14 | 55.5 | 7 | 6 | 6 | 6 | 67.3 | 201 | 213 | 225 | 8 | 6 | 76.5 | 5 | 12 | 6 | 6 | 0 |
| 36 FT | 34 | 38 | 21 | 13 | 8 | 7 | 7 | 6.5 | 75.5 | 58.0 | 58.0 | 58.0 | 8 | 14 | 77.5 | 8 | 14 | 55.0 | 8 | 7 | 6 | 6 | 64.9 | 202 | 214 | 226 | 8 | 6 | 76.5 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 35 | 40 | 21 | 13 | 8 | 6.5 | 7 | 6 | 75.5 | 59.0 | 59.0 | 59.0 | 8 | 13 | 76.5 | 8 | 13 | 54.0 | 8 | 7.5 | 6 | 6 | 65.1 | 204 | 216 | 228 | 9 | 7 | 82.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 36 | 41 | 22 | 13 | 8 | 6.5 | 7 | 6 | 76.1 | 66.0 | 66.0 | 66.0 | 8 | 13 | 75.5 | 8 | 13 | 53.5 | 8 | 7.5 | 7 | 7.5 | 68.5 | 205 | 217 | 229 | 9 | 7 | 82.0 | 5 | 12 | 6 | 6 | 0 |
| 42 FT | 37 | 42 | 23 | 13 | 8 | 6.5 | 7 | 6.5 | 76.9 | 67.0 | 67.0 | 67.0 | 8 | 12 | 75.0 | 8 | 12 | 52.5 | 8 | 6.5 | 7 | 7.5 | 68.8 | 206 | 218 | 230 | 9 | 7 | 82.5 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 38 | 44 | 24 | 13 | 8 | 6 | 7 | 6 | 77.6 | 68.0 | 68.0 | 68.0 | 8 | 12 | 74.5 | 8 | 12 | 52.0 | 8 | 7 | 7 | 7 | 69.4 | 208 | 220 | 232 | 9 | 6.5 | 82.5 | 5 | 12 | 7 | 7.5 | 0 |
| 46 FT | 39 | 45 | 25 | 13 | 8 | 6 | 7 | 6 | 78.4 | 69.0 | 69.0 | 69.0 | 8 | 12 | 74.0 | 8 | 12 | 51.0 | 8 | 7 | 7 | 7 | 69.8 | 209 | 221 | 233 | 9 | 6.5 | 82.5 | 5 | 12 | 7 | 7.5 | 0 |
| 48 FT | 40 | 46 | 26 | 13 | 8 | 6 | 7 | 6 | 79.1 | 70.0 | 70.0 | 70.0 | 8 | 12 | 73.5 | 8 | 12 | 50.0 | 8 | 6.5 | 7 | 7 | 70.1 | 210 | 222 | 234 | 9 | 6.5 | 82.5 | 5 | 12 | 7 | 8 | 0 |
| 50 FT | 41 | 47 | 27 | 13 | 9 | 7.5 | 7 | 6 | 79.9 | 71.0 | 71.0 | 71.0 | 8 | 12 | 73.0 | 8 | 12 | 49.5 | 8 | 6 | 7 | 6.5 | 70.5 | 211 | 223 | 235 | 9 | 6 | 82.5 | 5 | 12 | 7 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE DOUBLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

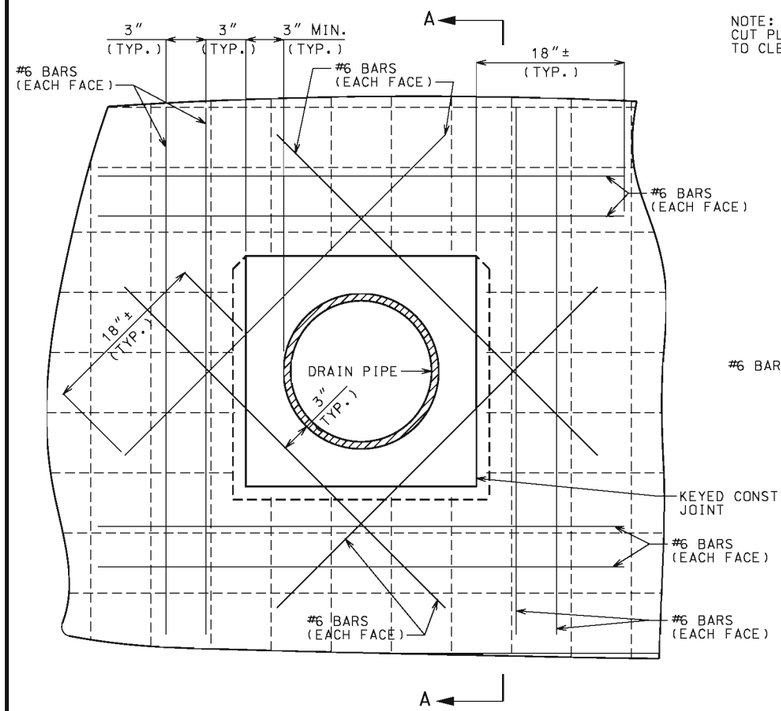
SPAN (S): 16 FEET
HEIGHT (HT): 14 THRU 16 FEET

DATE EFFECTIVE: 10/01/2011
DATE PREPARED: 9/8/2011

703.47

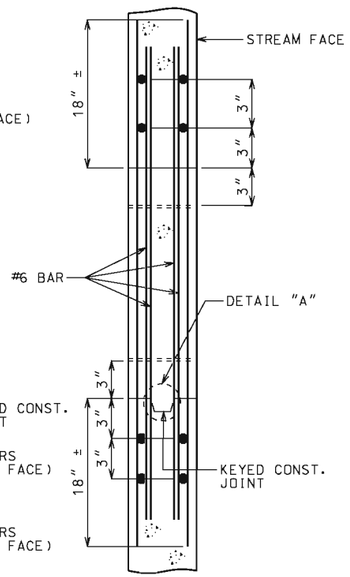
SHEET NO. 27 OF 27

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

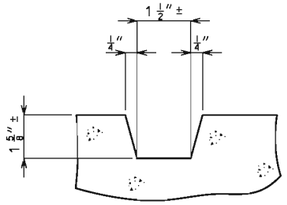



PART ELEVATION OF EXTERIOR WALL
(PIPE DIAMETER = 24" OR MORE)
(WALL THICKNESS = 12" OR MORE)

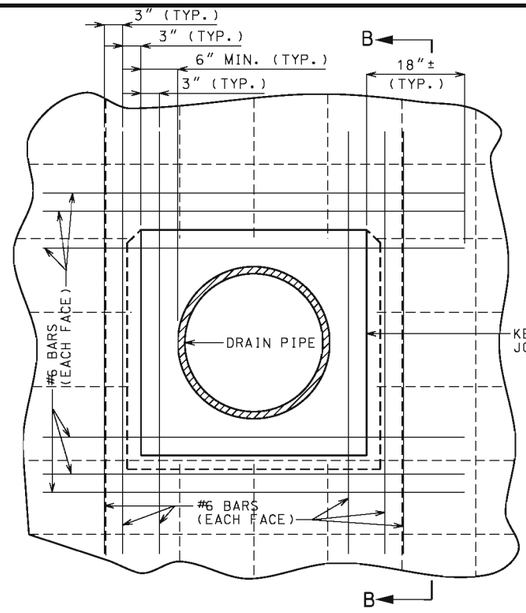
NOTE:
CUT PLAN REINFORCING BARS
TO CLEAR PIPE BLOCK-OUT.




SECTION A-A

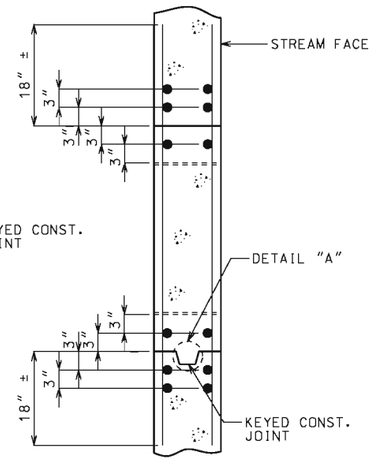



DETAIL "A"
(KEYED JOINT)

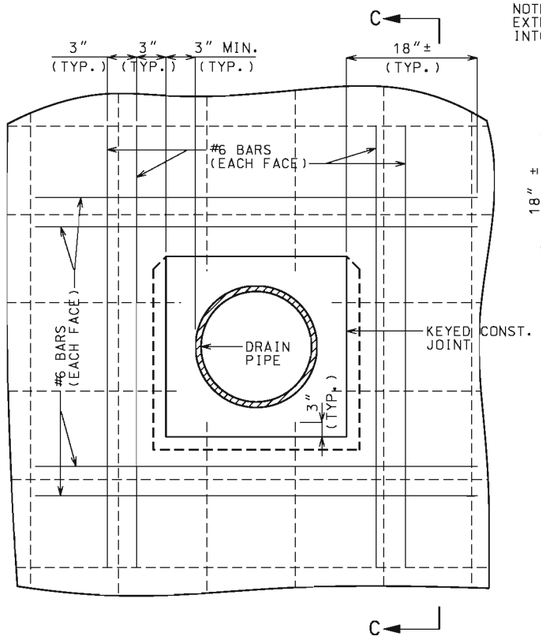



PART ELEVATION OF EXTERIOR WALL
(PIPE DIAMETER = 24" OR MORE)
(WALL THICKNESS = 8" TO 12")

NOTE:
CUT PLAN REINFORCING BARS
TO CLEAR PIPE BLOCK-OUT.

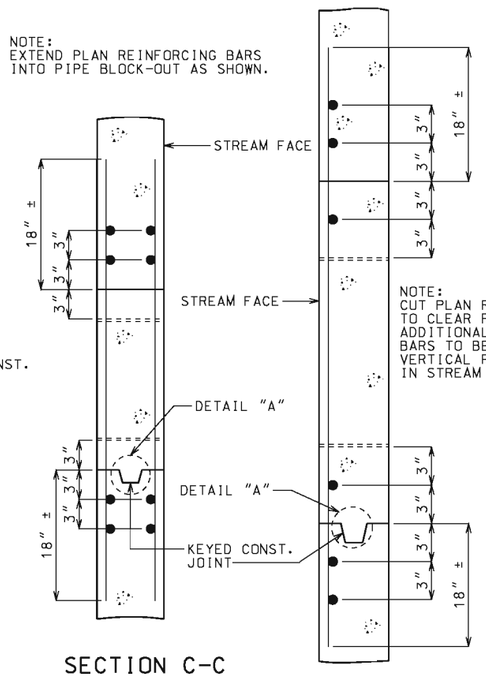



SECTION B-B




PART ELEVATION OF EXTERIOR WALL
(PIPE DIAMETER = LESS THAN 24")
(WALL THICKNESS = 8" OR MORE)

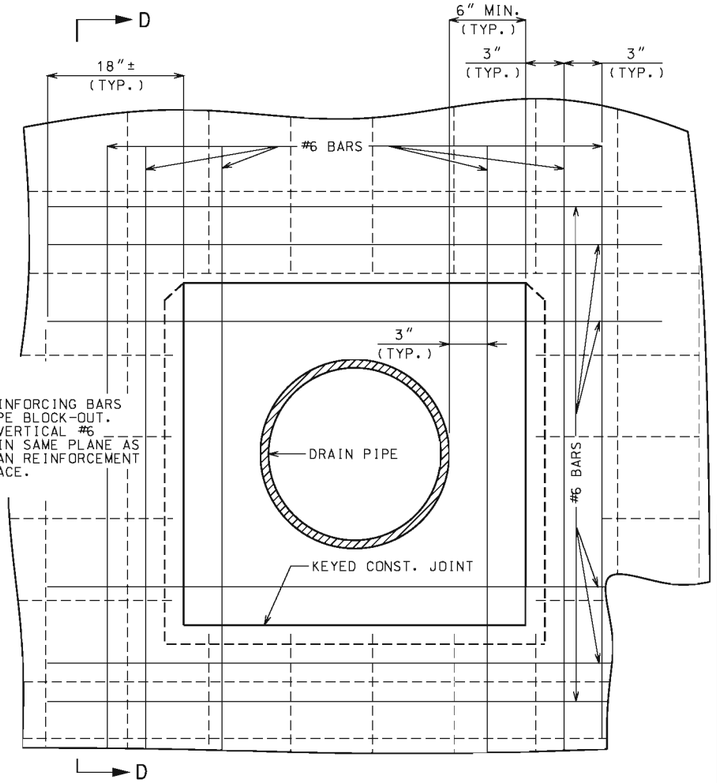
NOTE:
EXTEND PLAN REINFORCING BARS
INTO PIPE BLOCK-OUT AS SHOWN.




SECTION C-C

NOTE:
CUT PLAN REINFORCING BARS
TO CLEAR PIPE BLOCK-OUT.
ADDITIONAL VERTICAL #6
BARS TO BE IN SAME PLANE AS
VERTICAL PLAN REINFORCEMENT
IN STREAM FACE.

SECTION D-D




PART ELEVATION OF EXTERIOR WALL
(PIPE DIAMETER = 36" OR LESS)
(WALL THICKNESS = LESS THAN 8")

**NOTE:**
DASHED BARS REPRESENT PLAN REINFORCEMENT.

SOLID BARS INDICATE ADDITIONAL #6 BARS.

BAR COVER FROM FACE OF CONCRETE = 1-1/2" CLEAR.

SEE ROAD PLANS FOR LOCATION, SIZE AND TYPE OF PIPE.

PLACE 5/16" JOINT FILLER AROUND REINFORCED CONCRETE PIPE AND EMULSIFIED ASPHALT AROUND CORRUGATED METAL PIPE AT PIPE INLET.

THE BLOCK-OUT MAY BE ELIMINATED AT CONTRACTORS ELECTION. IF BLOCK-OUT IS ELIMINATED, REINFORCEMENT SHALL BE AS SHOWN EXCEPT PLAN REINFORCEMENT MAY BE BENT TO CLEAR PIPE.

ADDITIONAL REINFORCEMENT REQUIRED FOR BLOCK-OUT IS NOT INCLUDED IN ESTIMATED QUANTITIES. NO SEPARATE PAYMENT WILL BE MADE FOR ADDITIONAL REINFORCING REQUIRED.

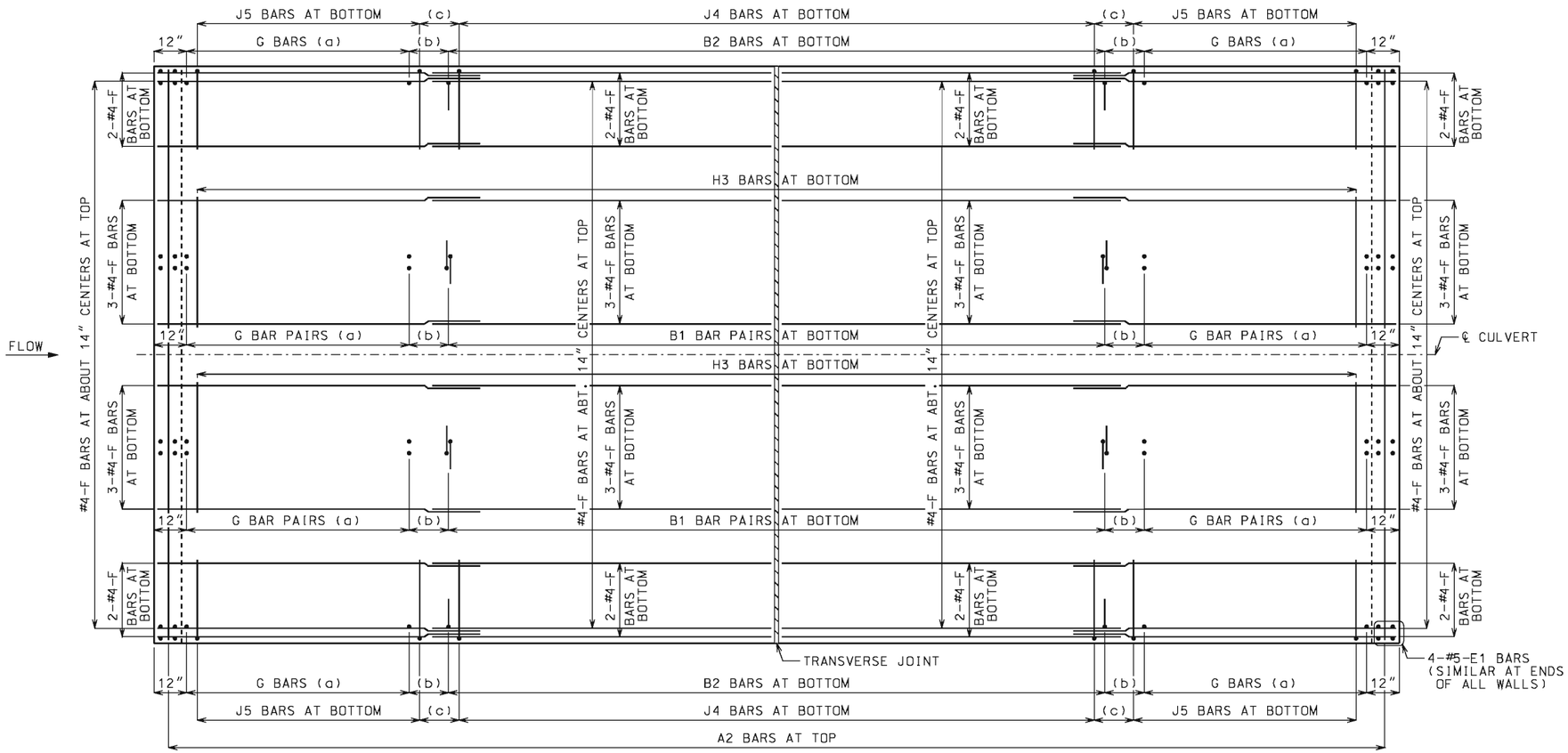
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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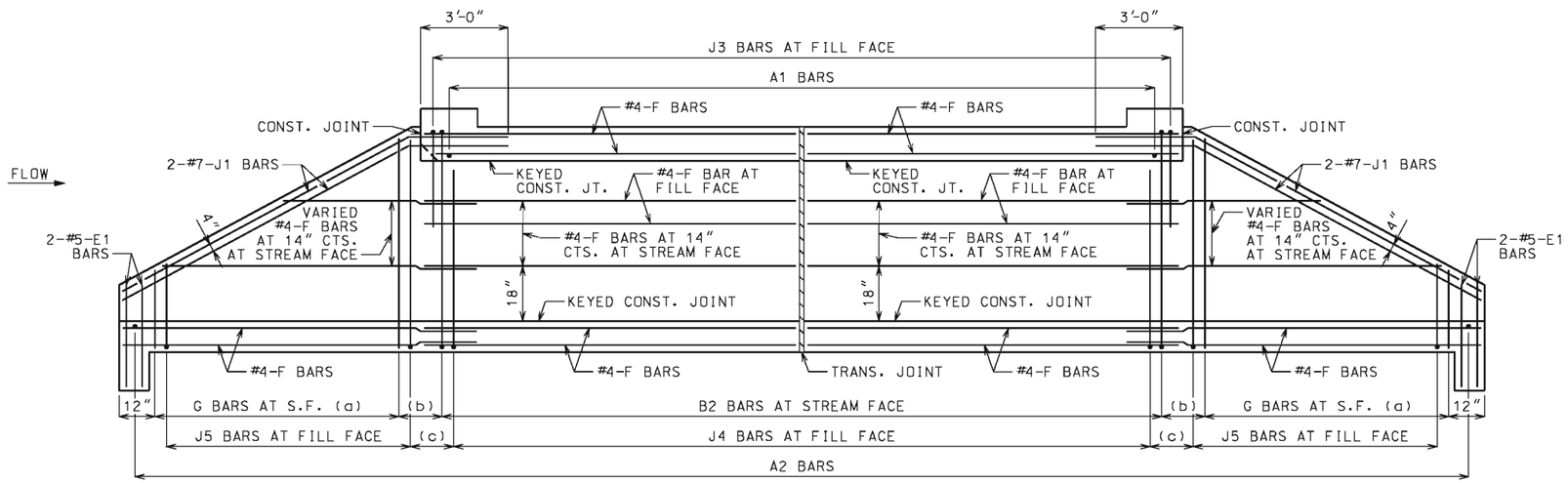
STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE BOX STRUCTURE PIPE INLET

| DATE EFFECTIVE: | 07/01/2001 | 703.60E | SHEET NO. |
|---|---|---|---|
| DATE PREPARED: | 9/3/2009 | | 1 OF 1 |




PLAN OF BOTTOM SLAB




ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.86.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT 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 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

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NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

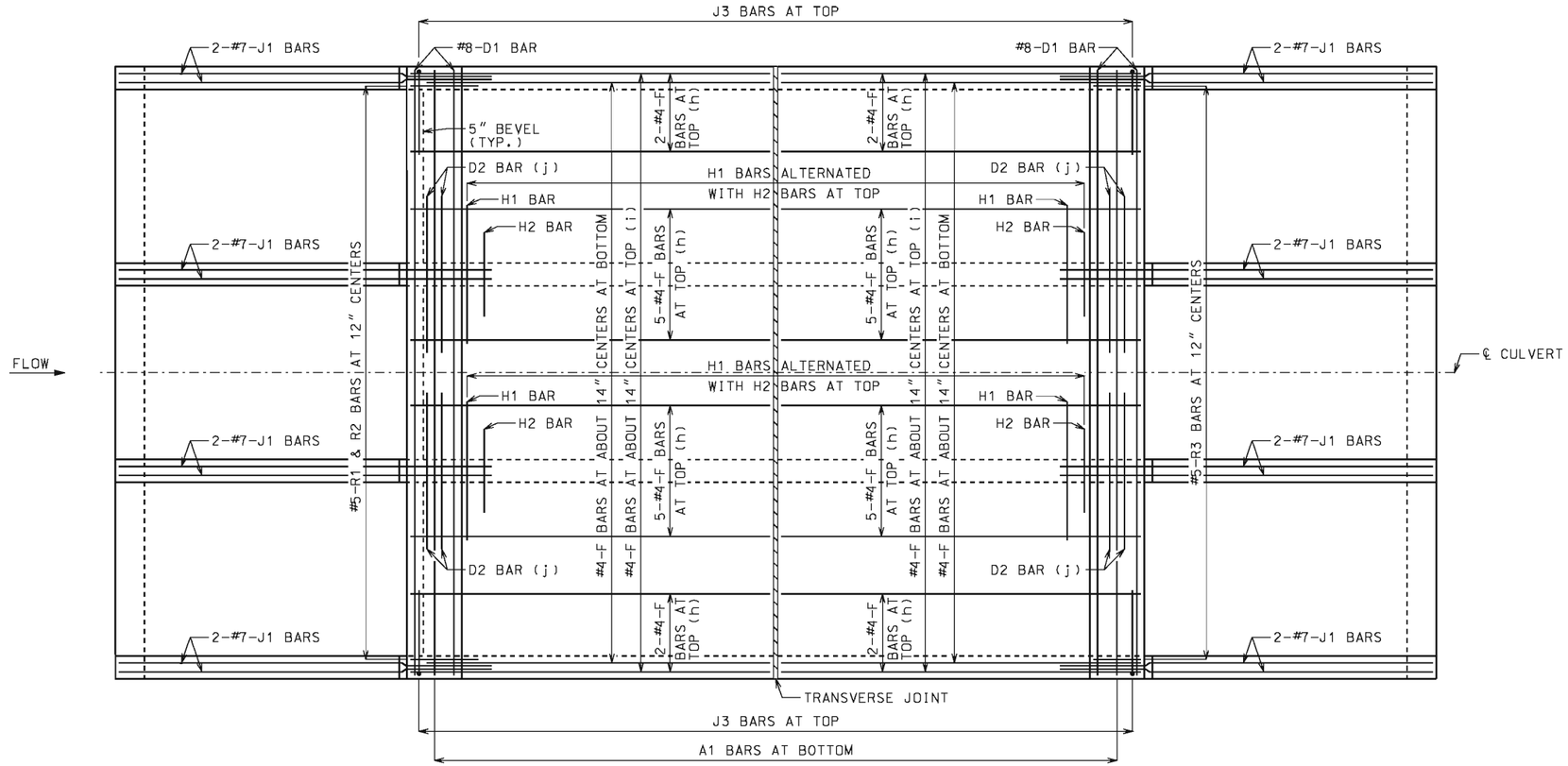
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.80H

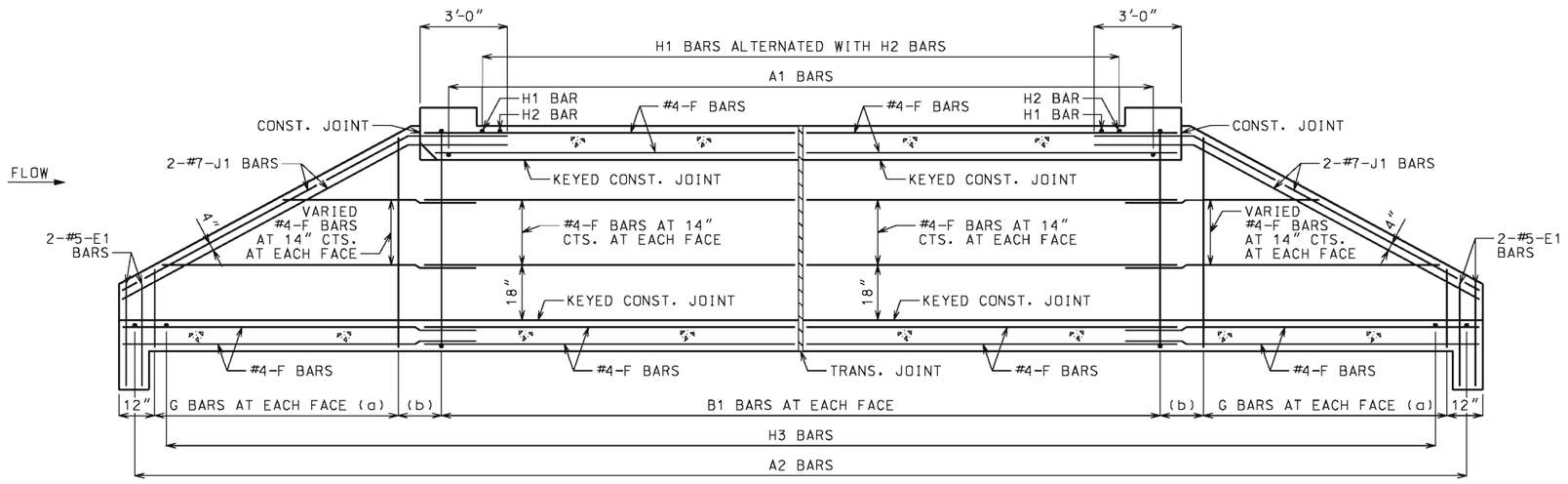
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) 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"
#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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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# CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

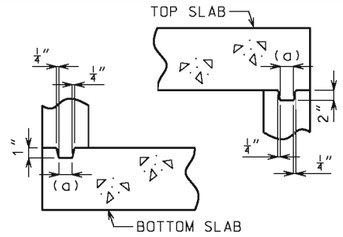
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.80H

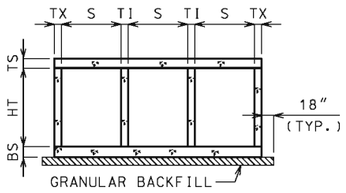
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

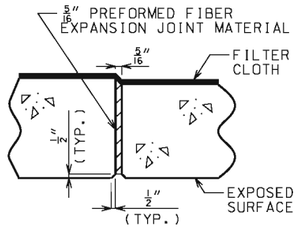



KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



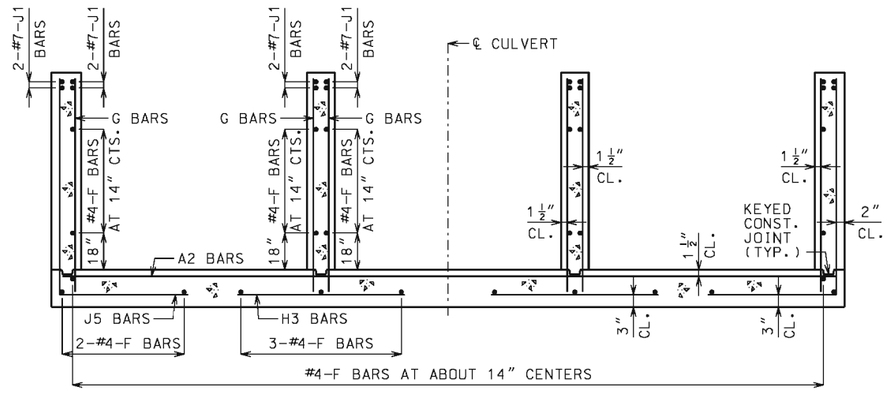

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



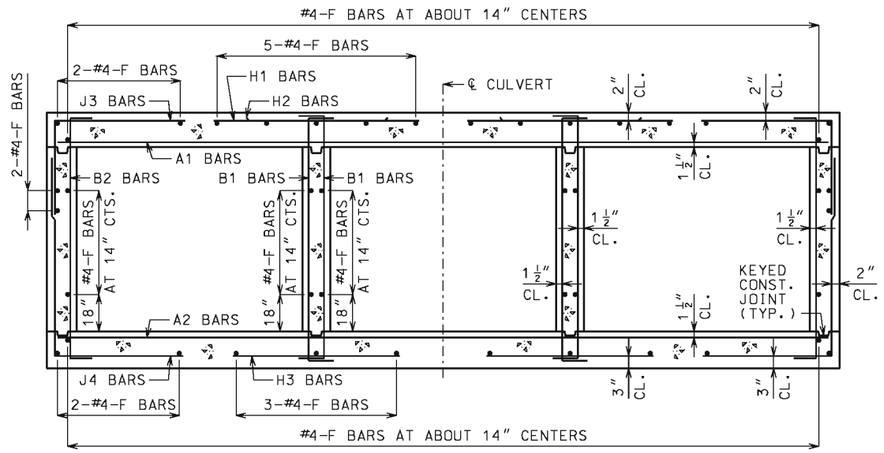

TRANSVERSE JOINT THRU BARREL

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

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

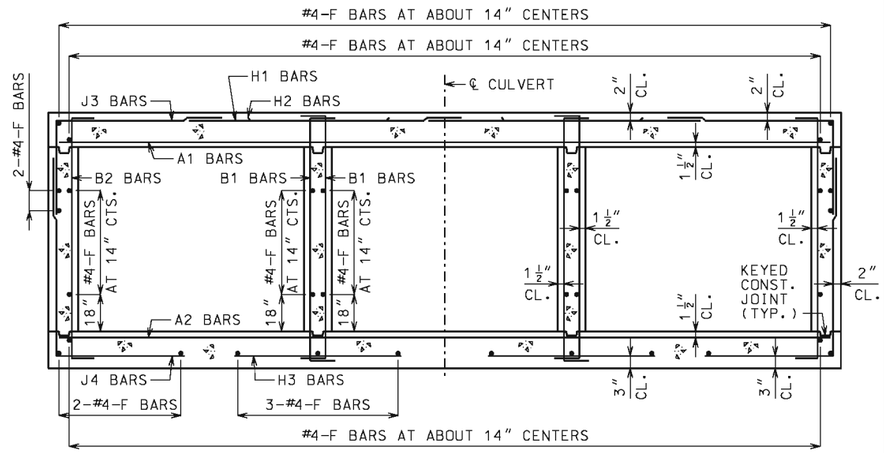



UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT



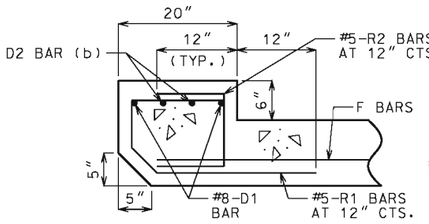

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



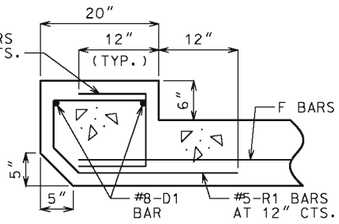

BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



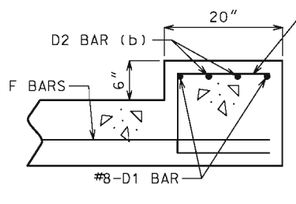

UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



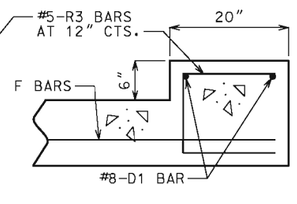

UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"

IF D2 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

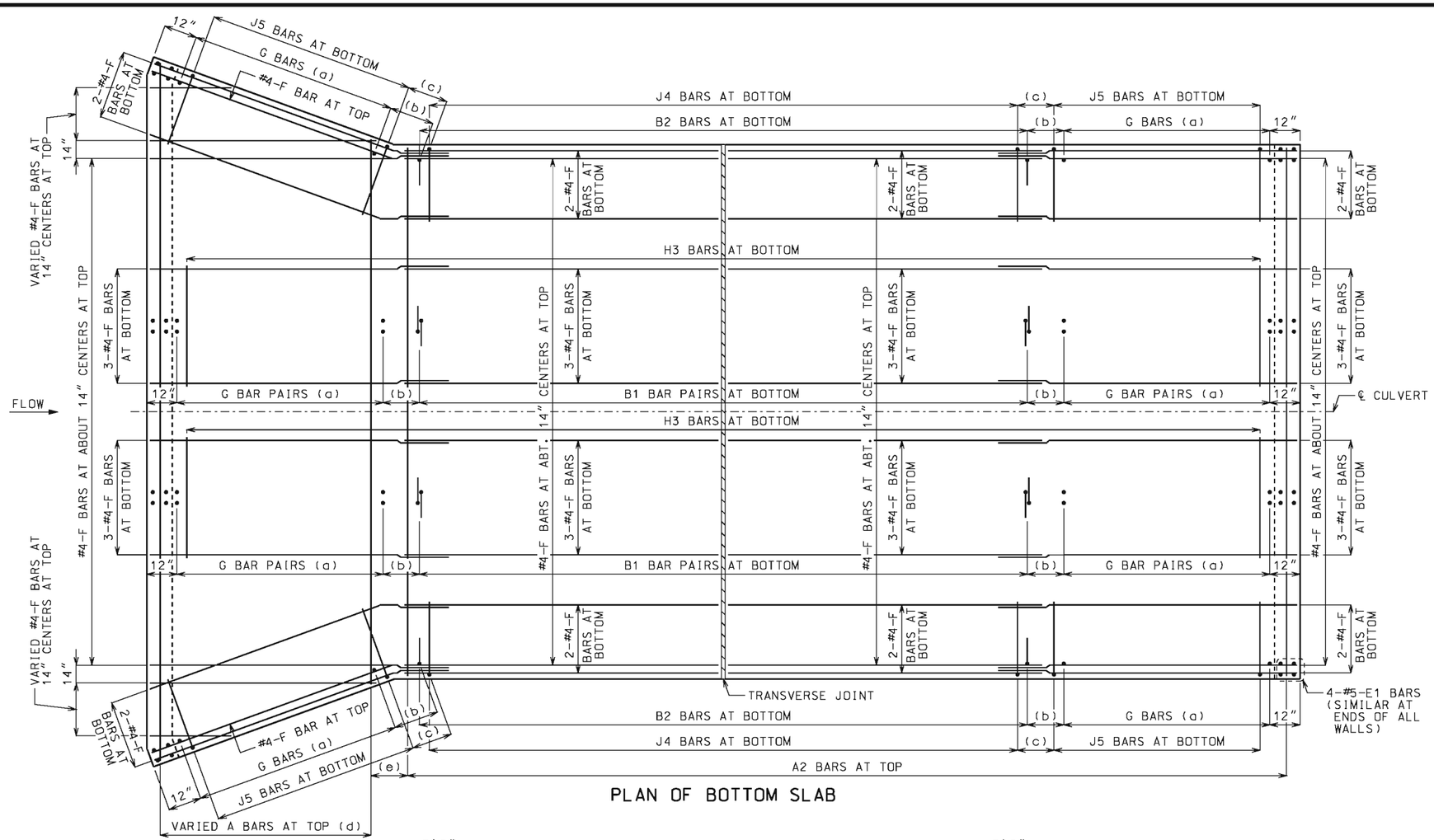
SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

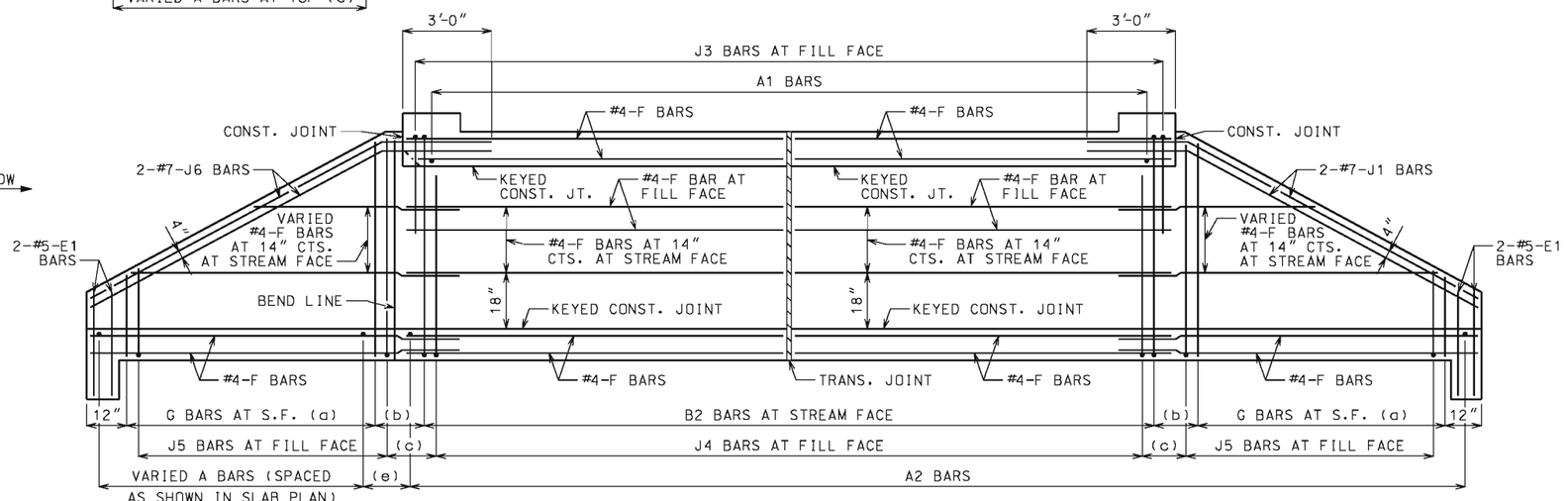
703.80H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




DEVELOPED ELEVATION OF EXTERIOR WALL

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.86.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT 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 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

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# CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

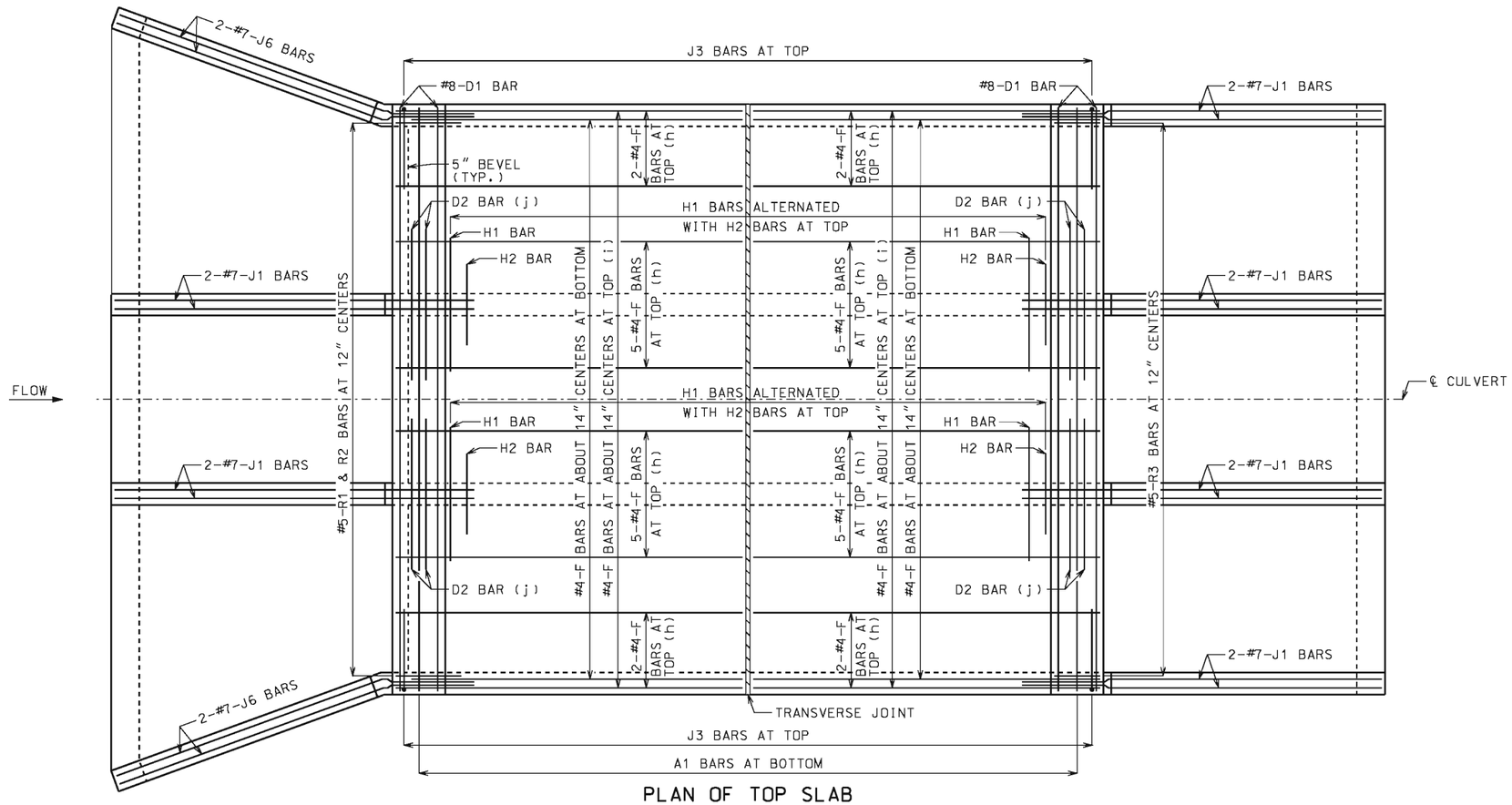
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.81H

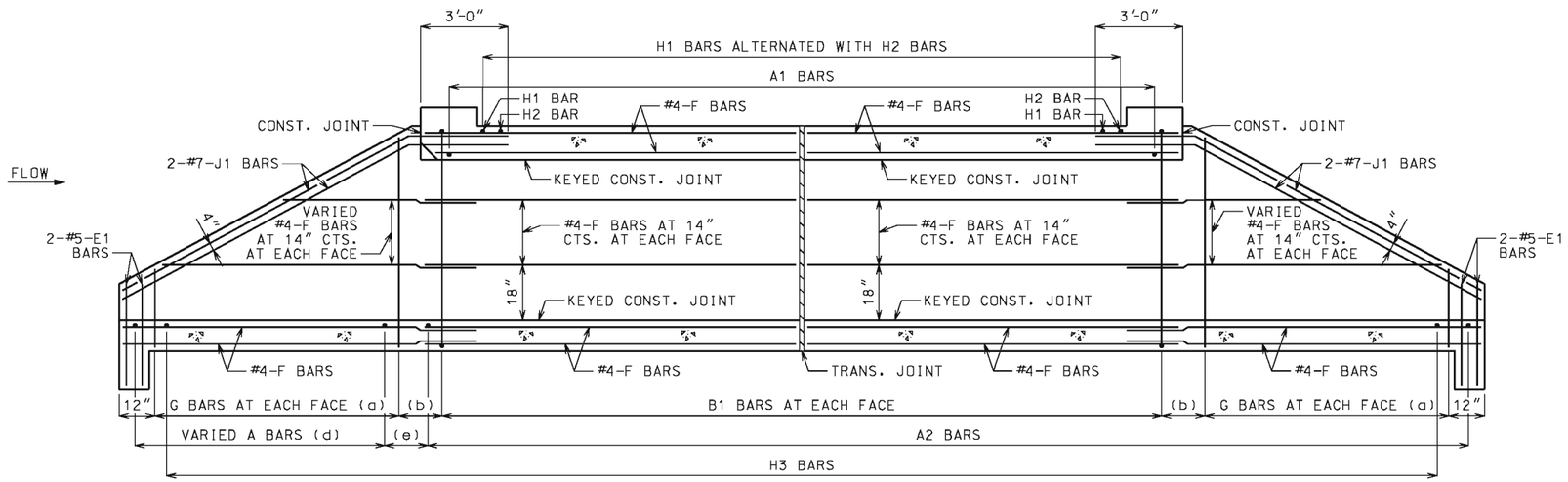
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) NOT SPECIFIED ON THIS SHEET

(g) NOT SPECIFIED ON THIS SHEET

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

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

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

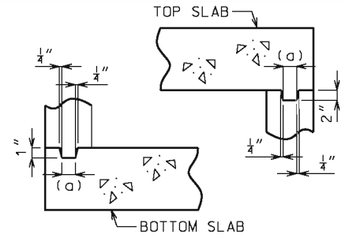
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.81H

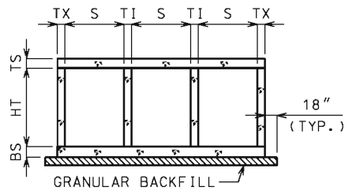
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

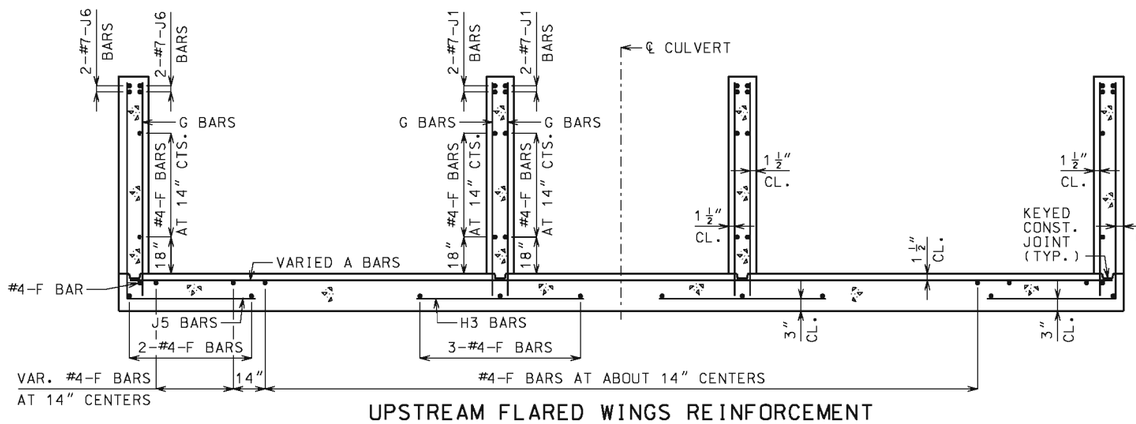



## KEYED CONSTRUCTION JOINT

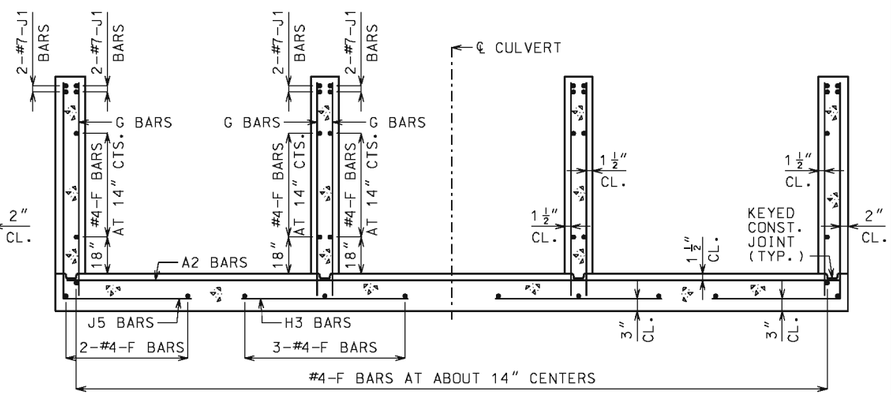
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



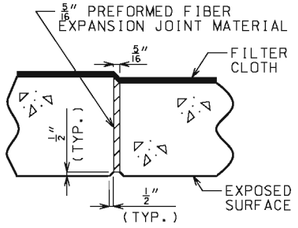

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## UPSTREAM FLARED WINGS REINFORCEMENT



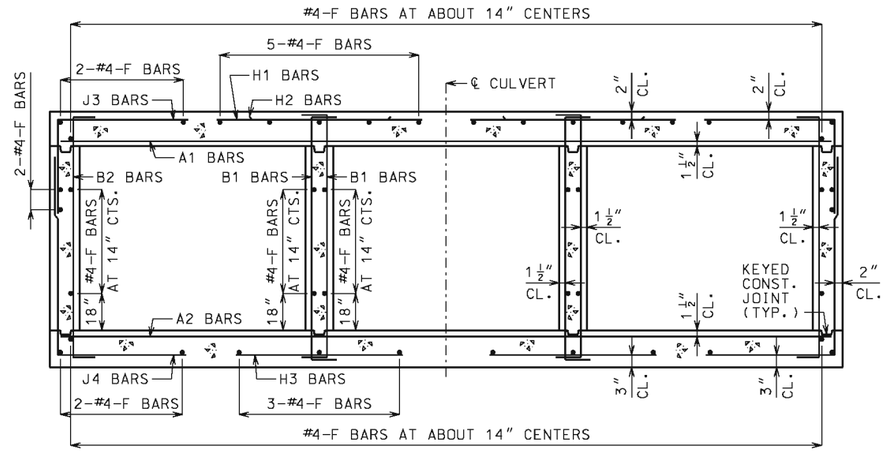

## DOWNSTREAM WINGS REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

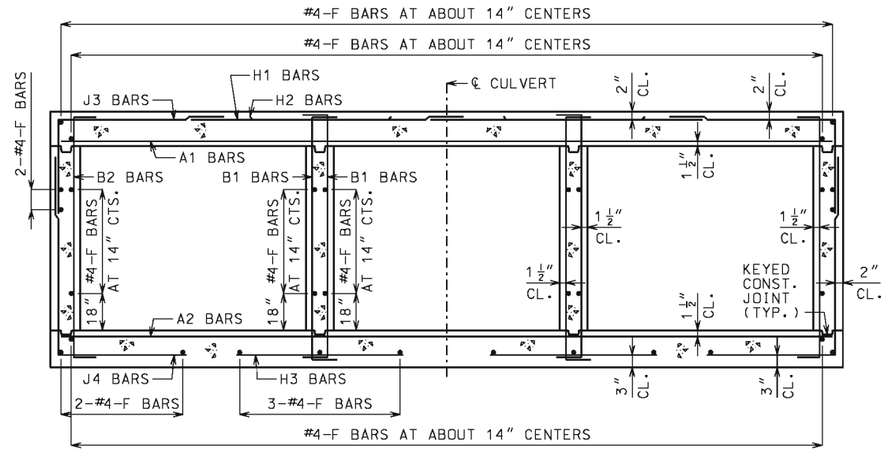
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



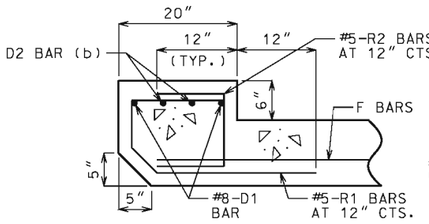

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



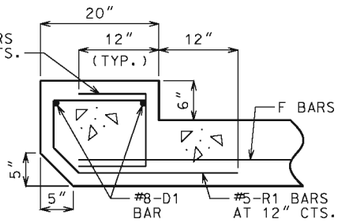

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



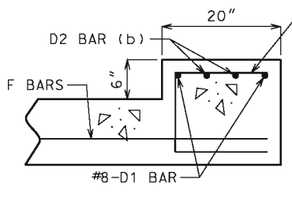

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



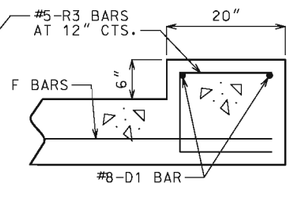

## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"

IF D2 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

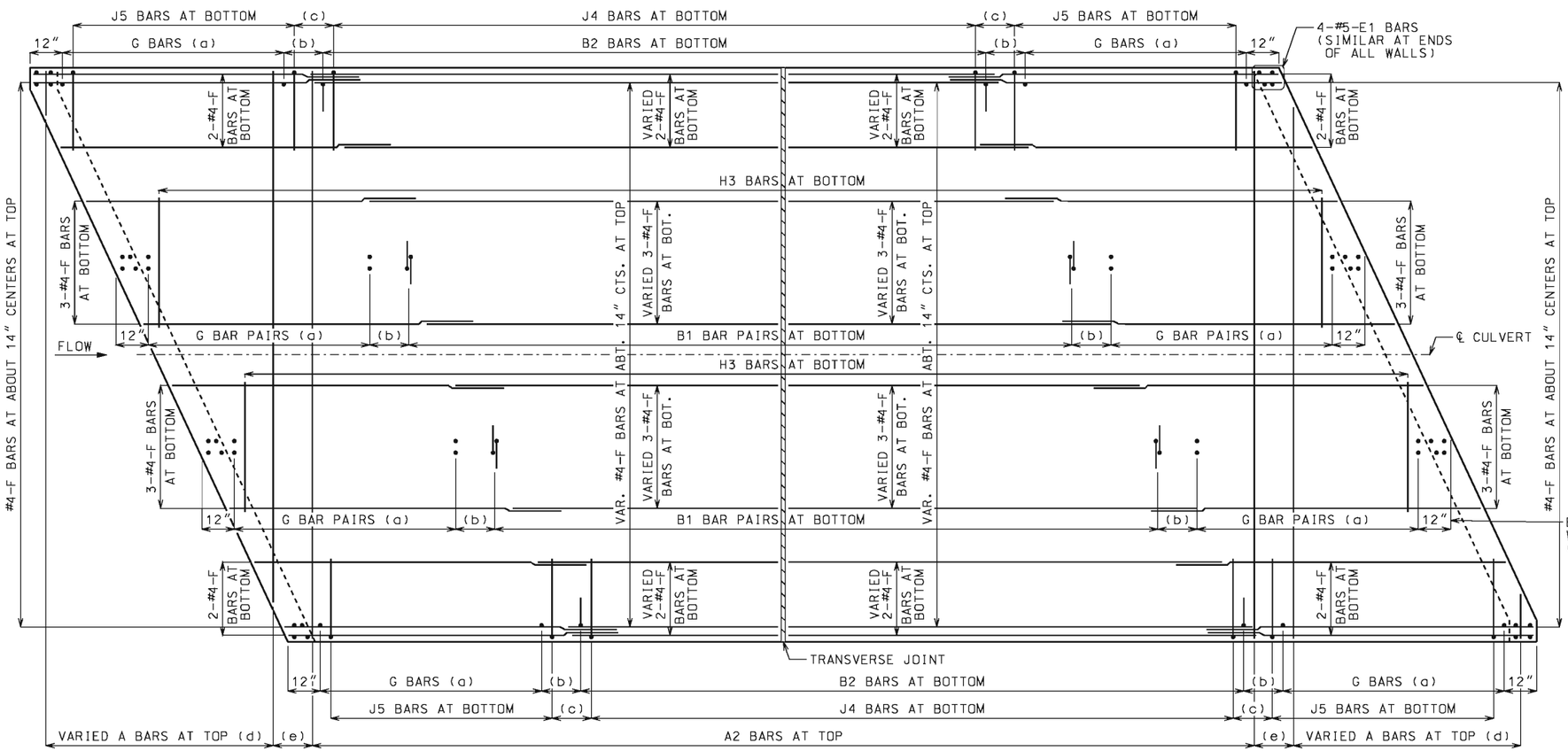
SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

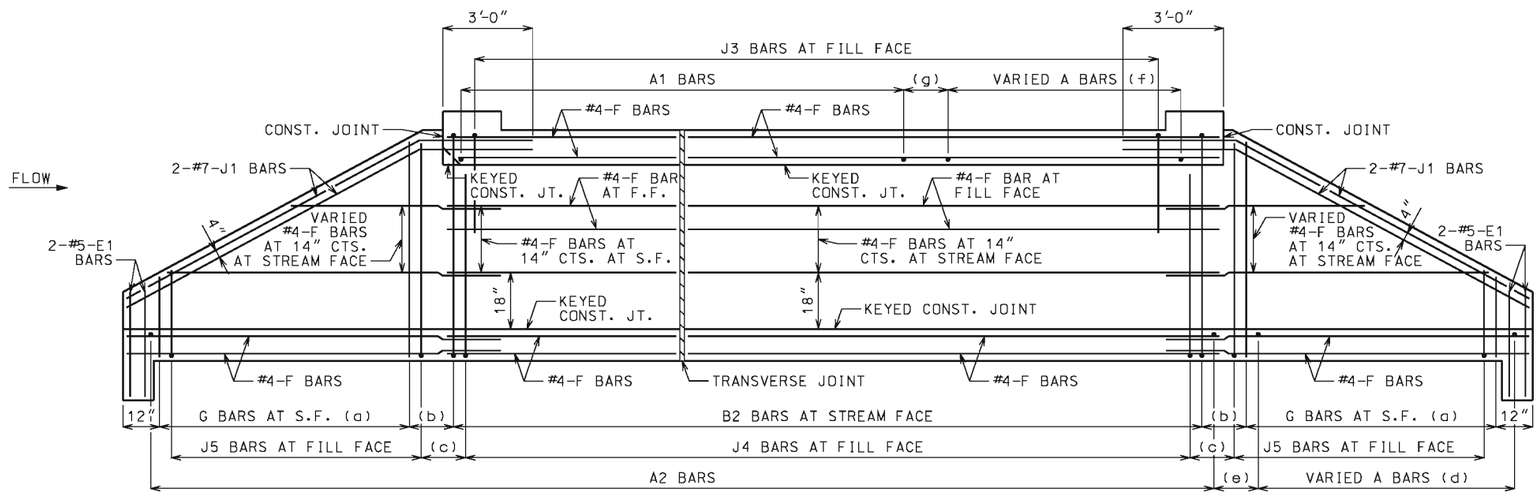
703.81H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.86.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT 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 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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# CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

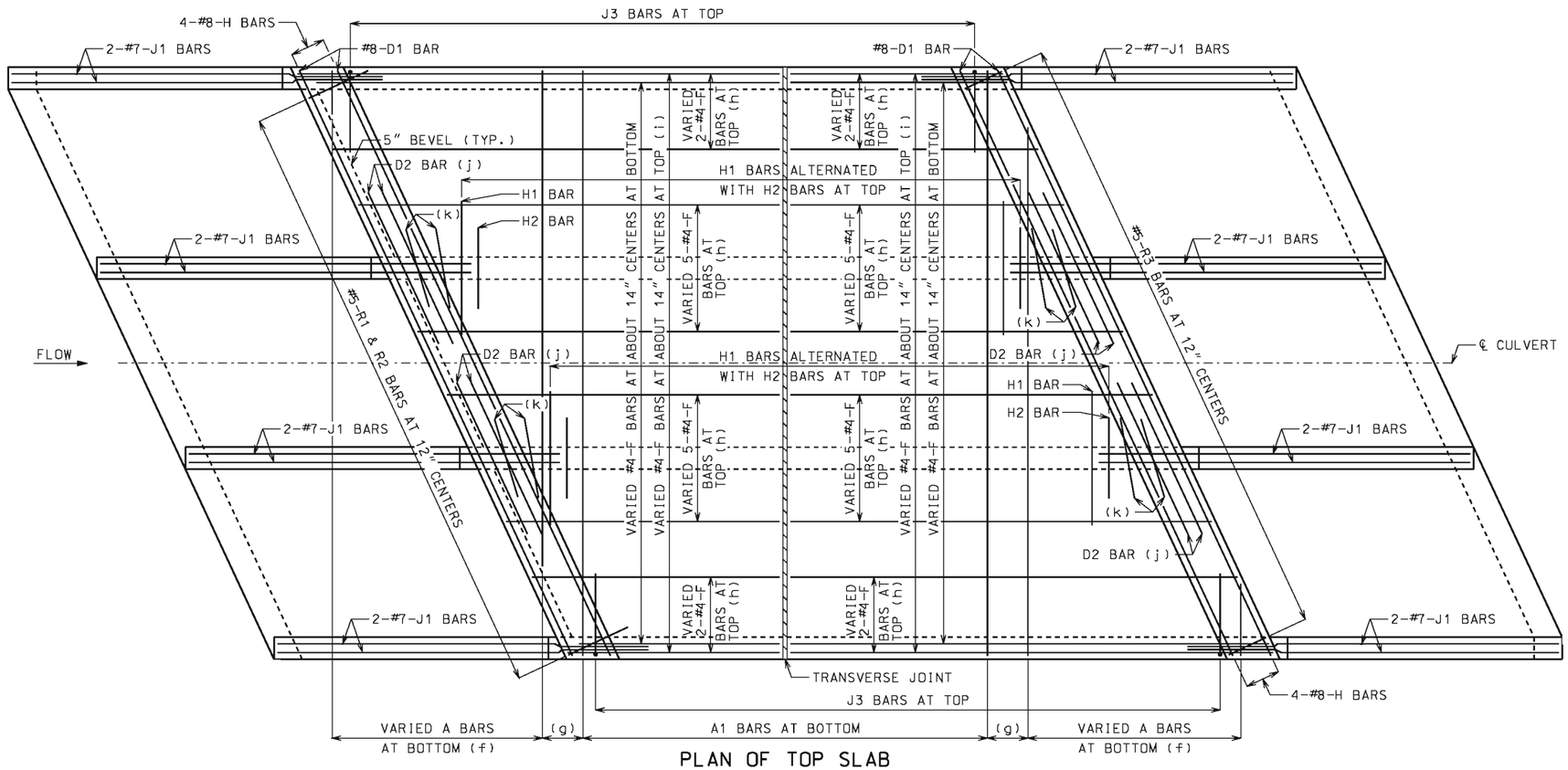
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.82H

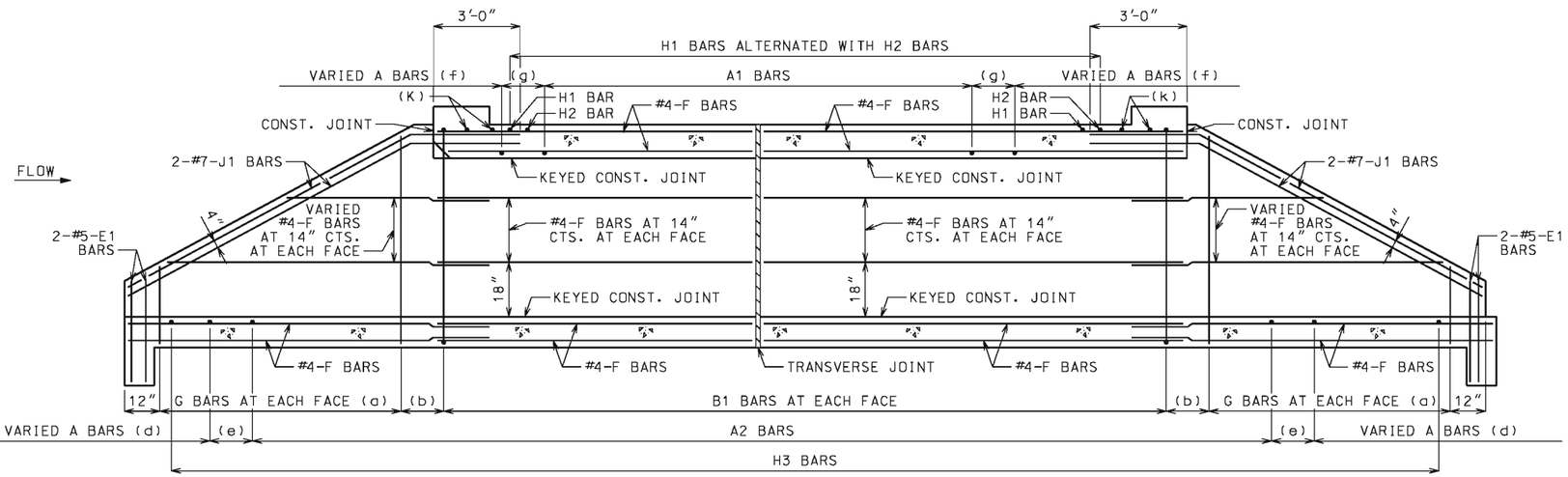
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

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# CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

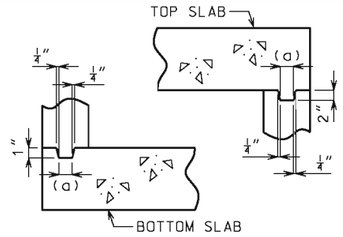
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.82H

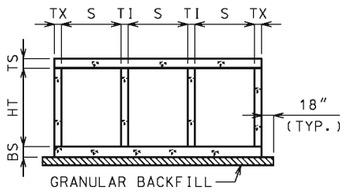
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

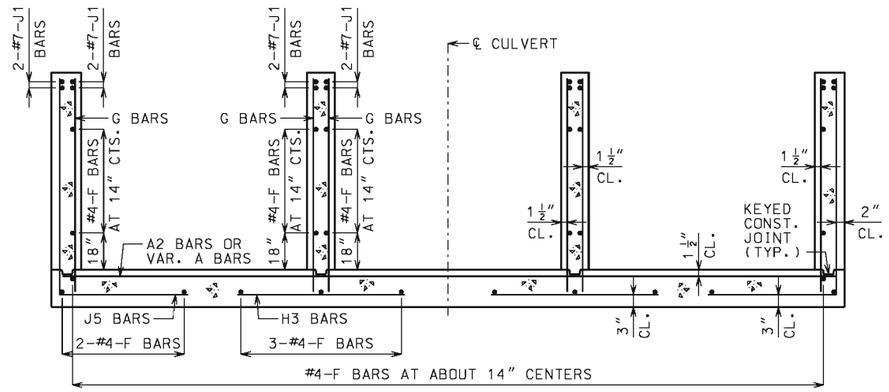



## KEYED CONSTRUCTION JOINT

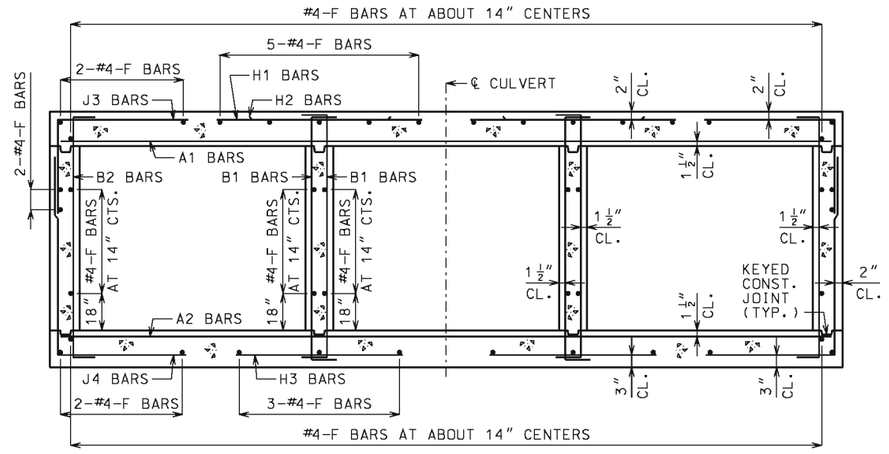
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS




## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

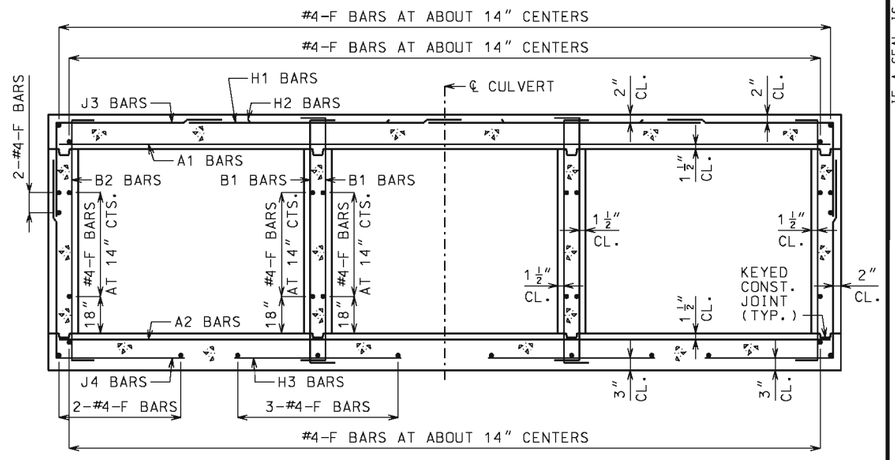



## UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT



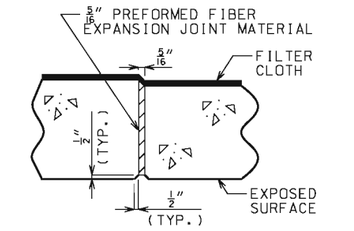

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"




## BARREL REINFORCEMENT

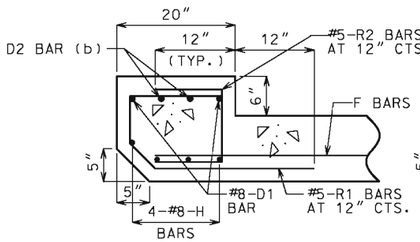
FOR DESIGN FILLS 2'-0" OR LESS




## TRANSVERSE JOINT THRU BARREL

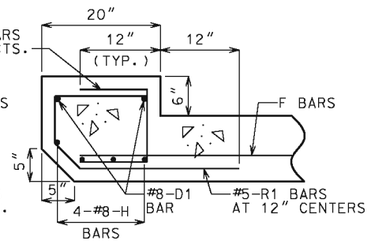
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



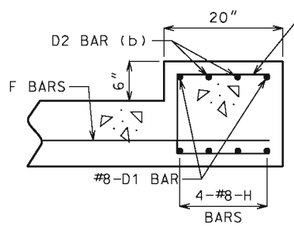

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL



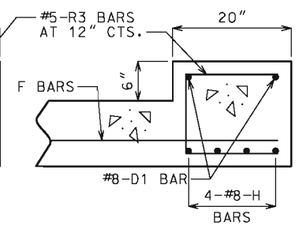

## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"

IF D2 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

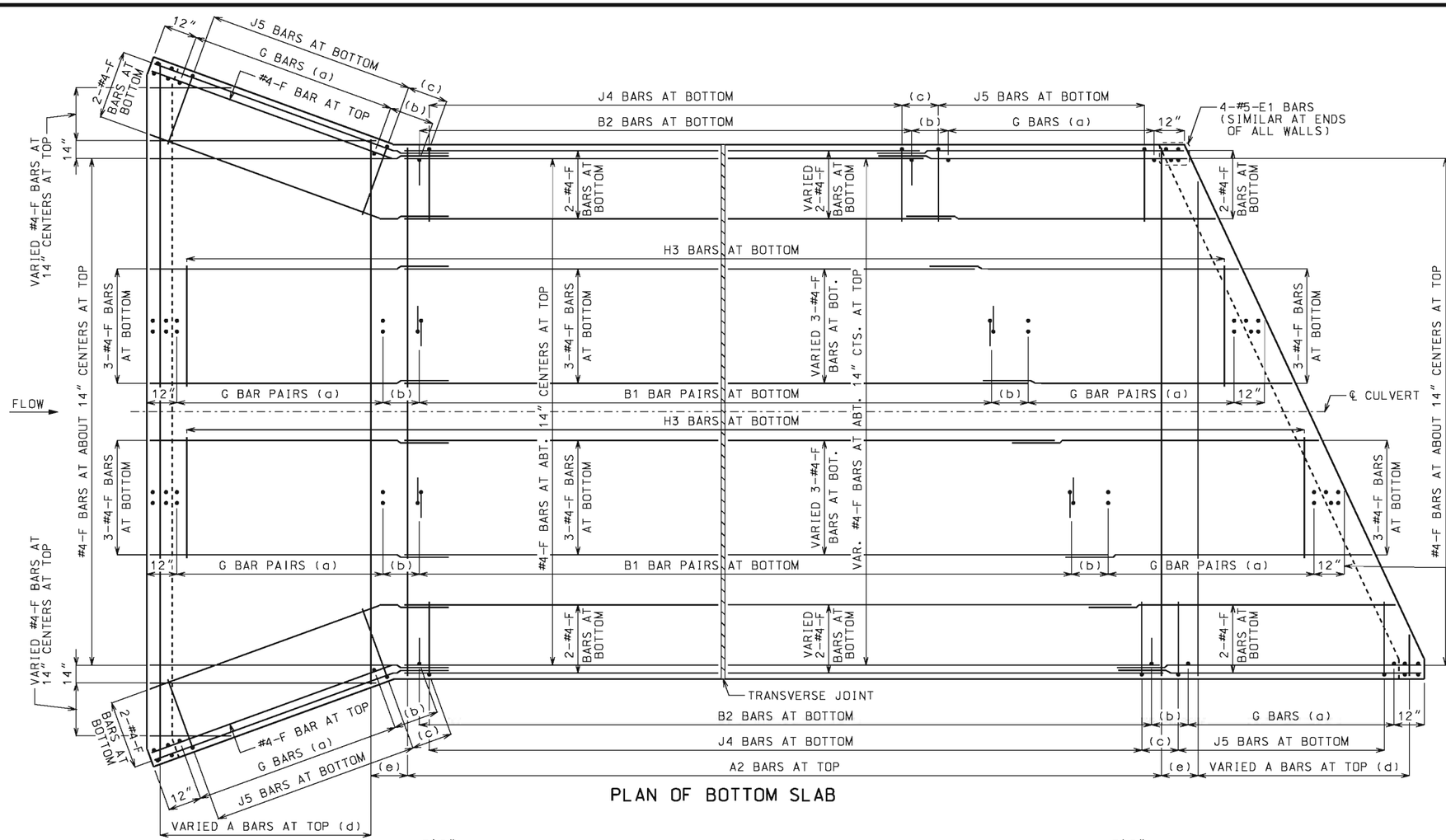
SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.82H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.86.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT 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 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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PROFESSIONAL ENGINEER
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# CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

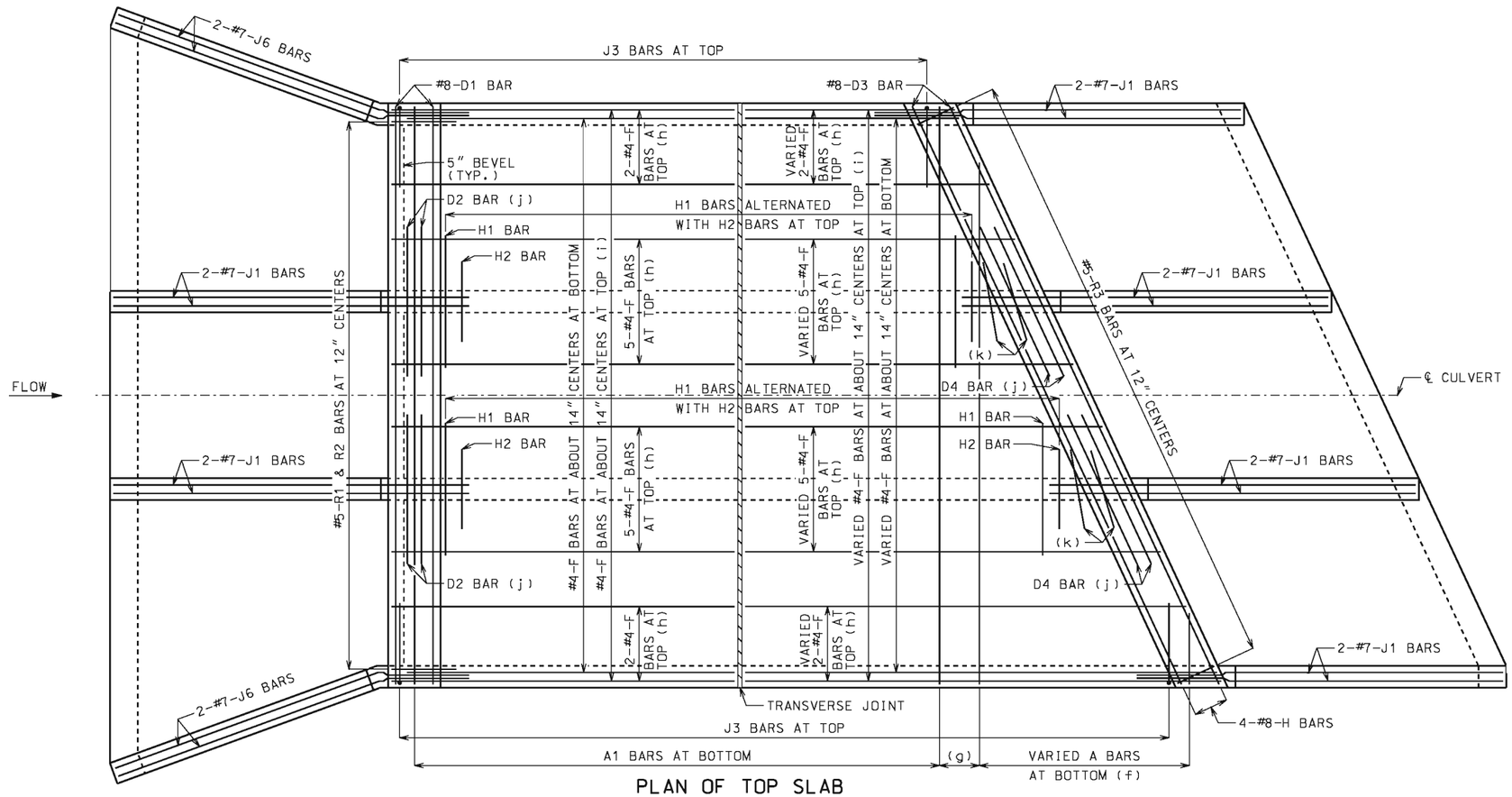
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.83H

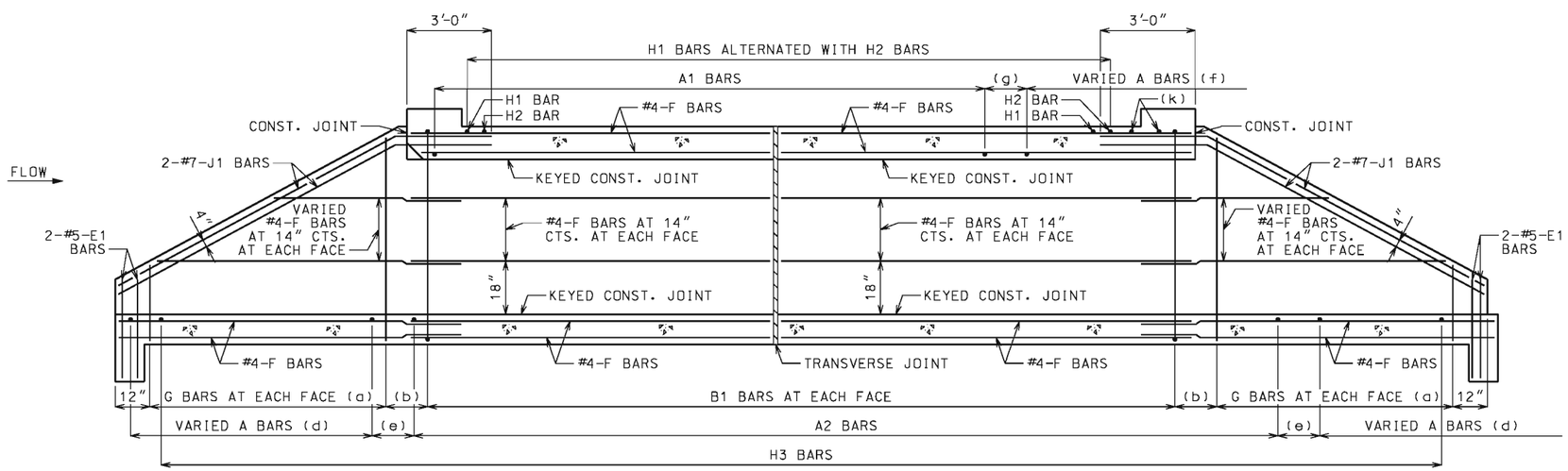
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

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NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

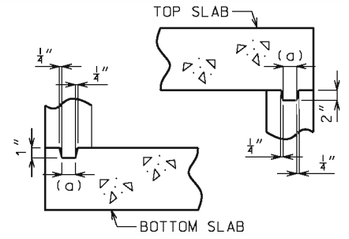
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
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703.83H

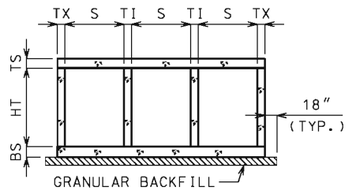
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

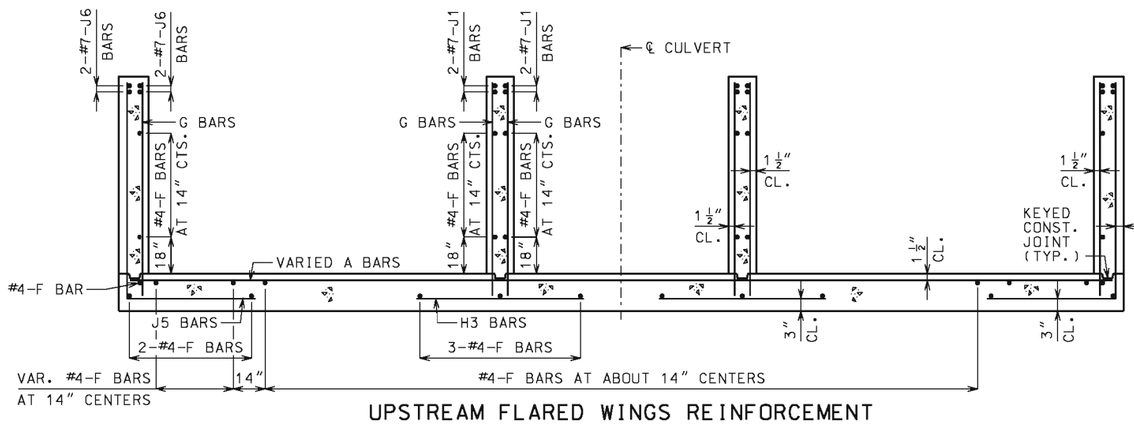



## KEYED CONSTRUCTION JOINT

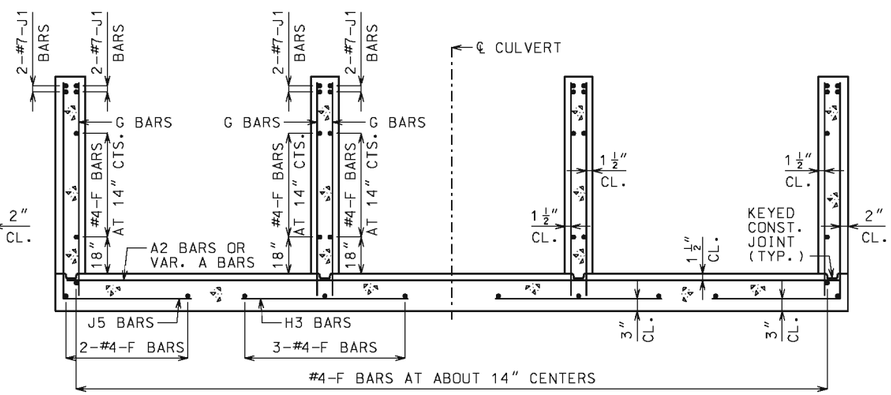
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



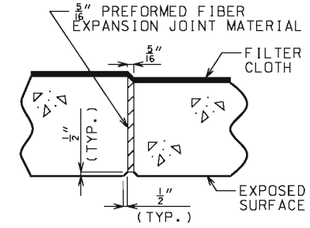

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## UPSTREAM FLARED WINGS REINFORCEMENT



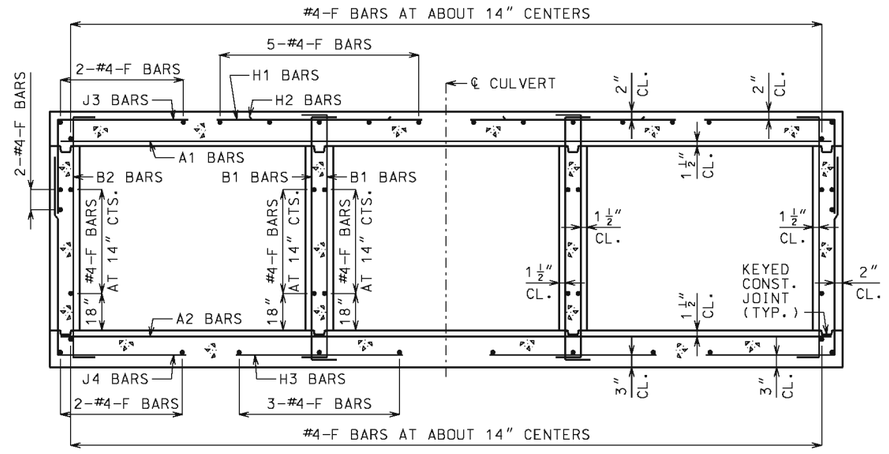

## DOWNSTREAM WINGS REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

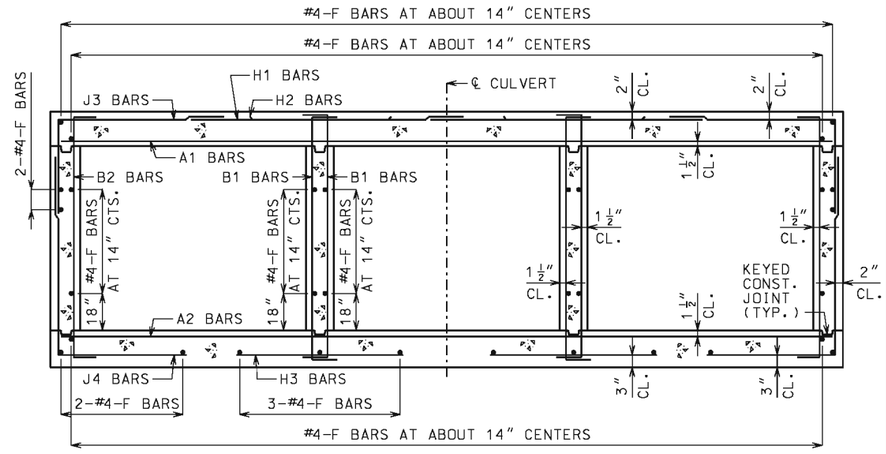
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FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



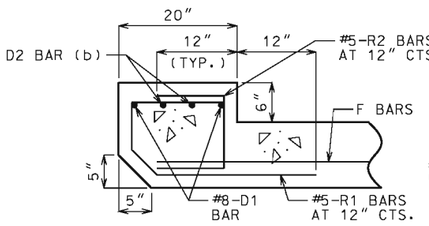

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



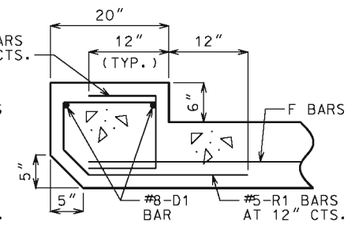

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



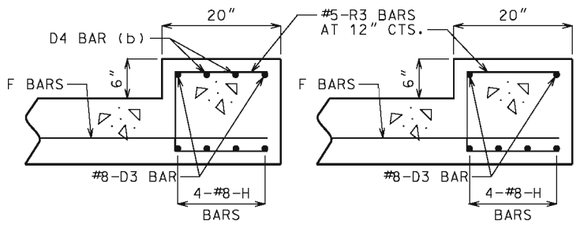

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"

IF D2 AND D4 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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# CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

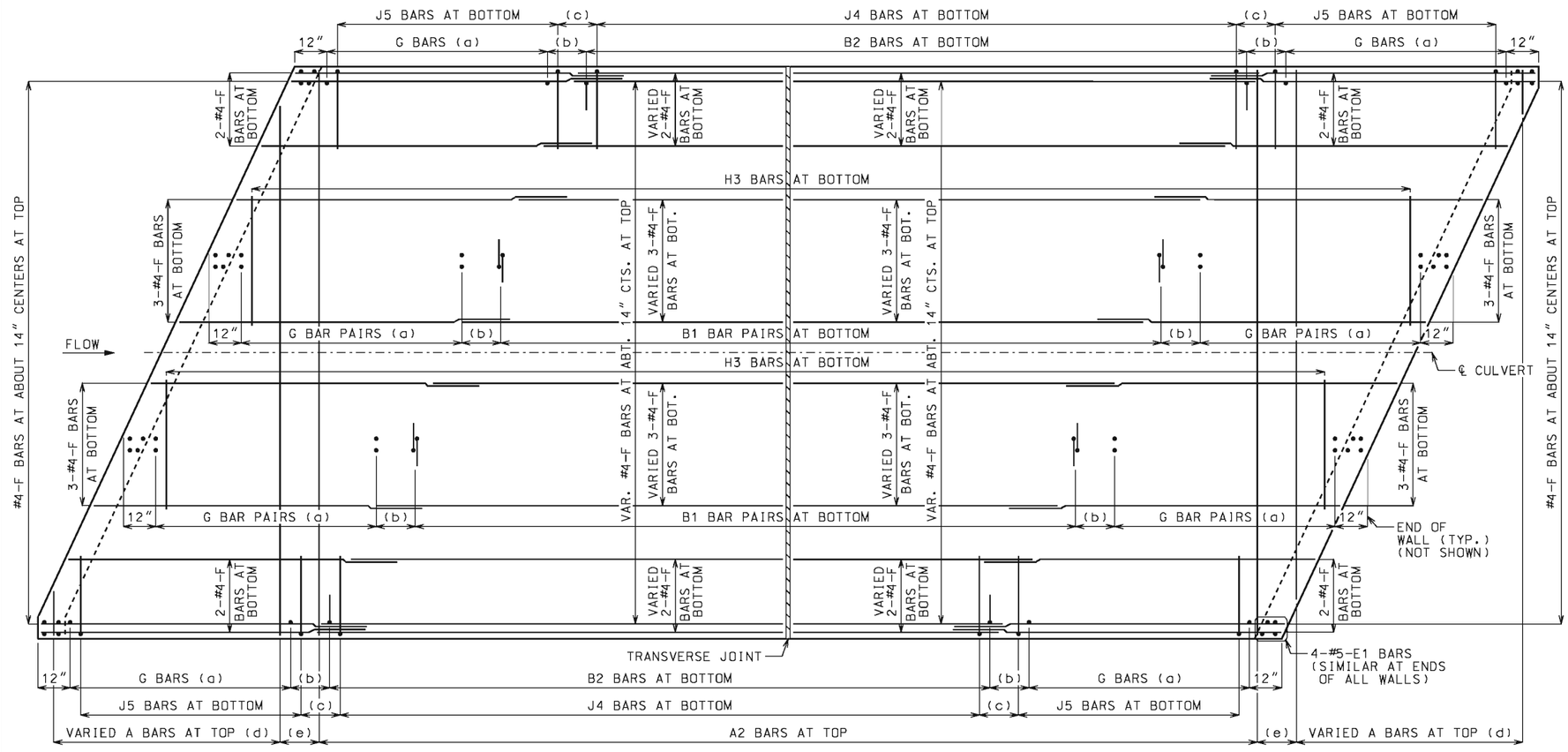
SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

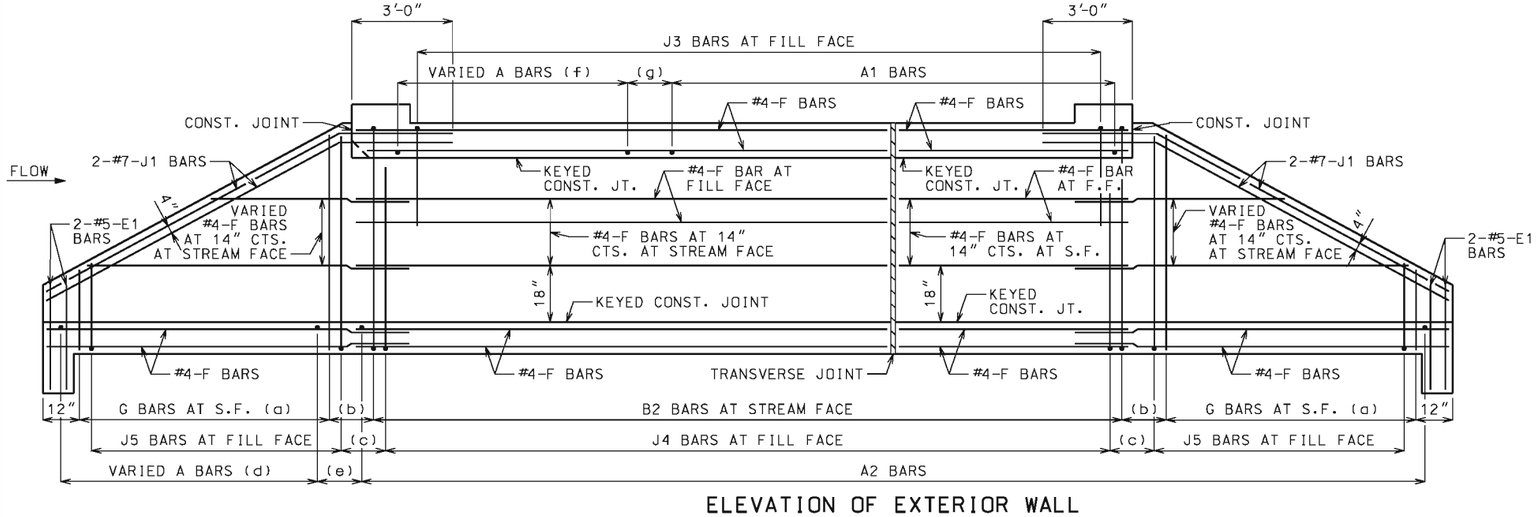
703.83H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.86.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT 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 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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# CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

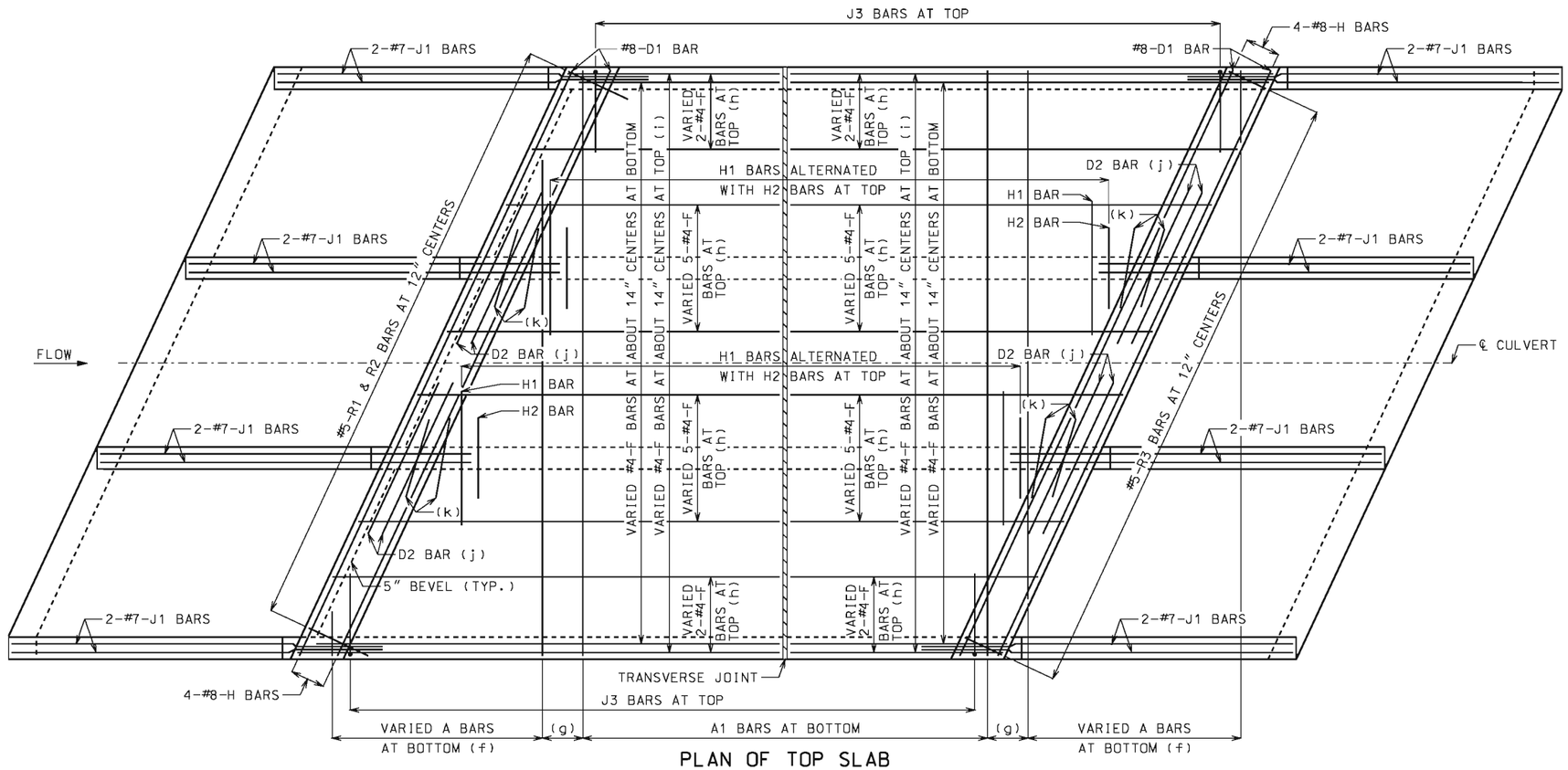
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.84H

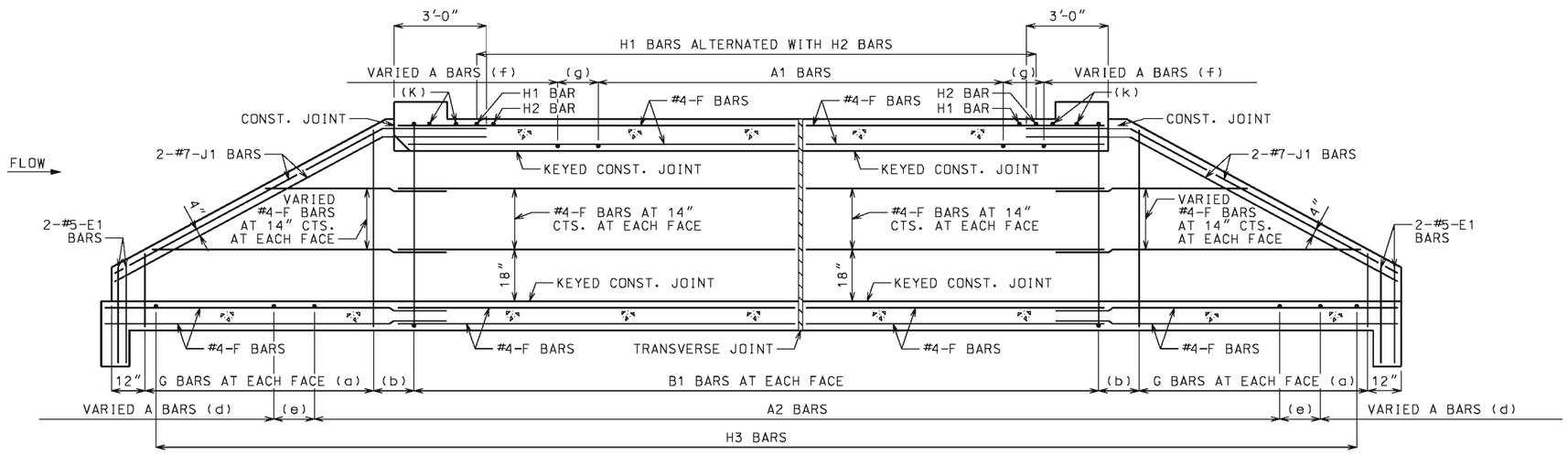
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

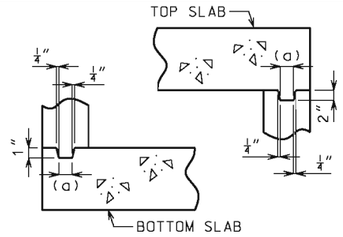
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.84H

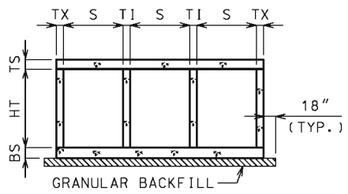
SHEET NO. 2 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

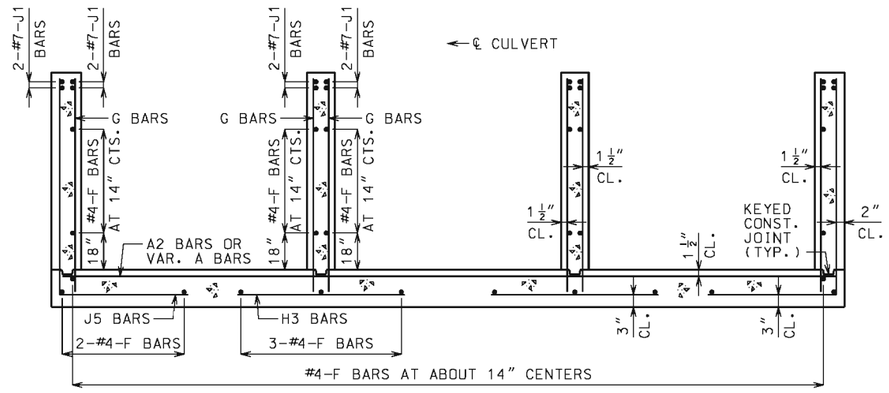



## KEYED CONSTRUCTION JOINT

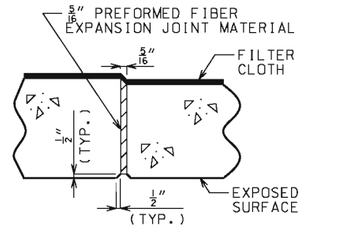
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS




## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS



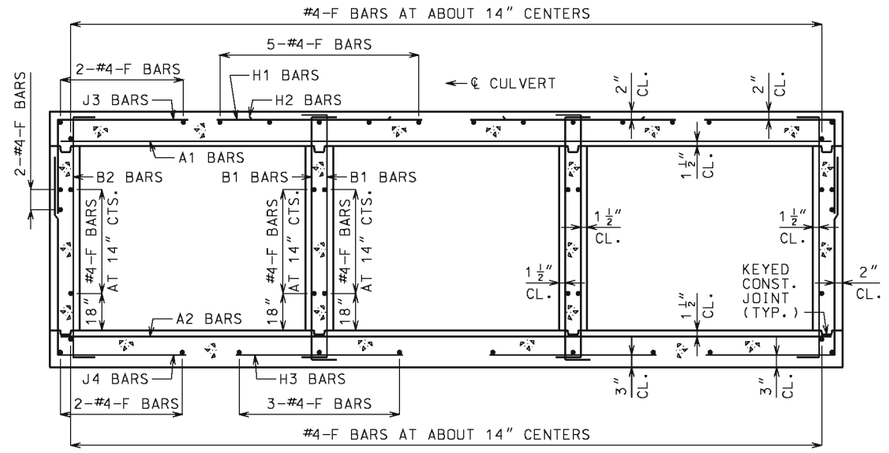

## UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

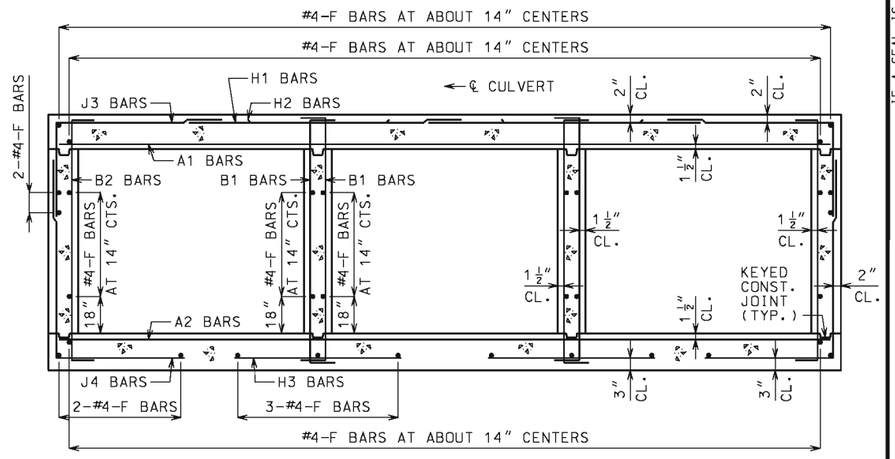
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



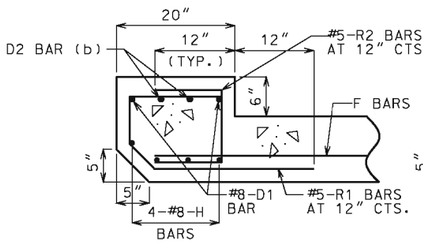

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



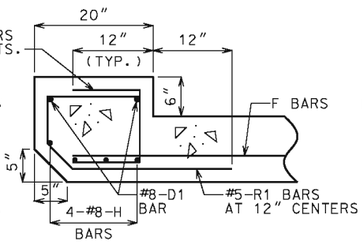

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



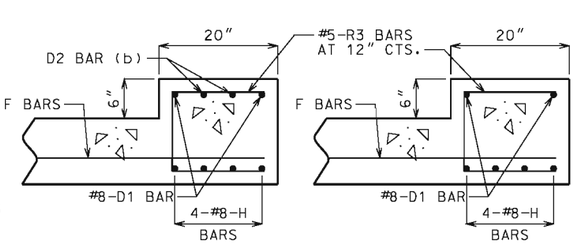

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL

## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"

IF D2 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".


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# CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

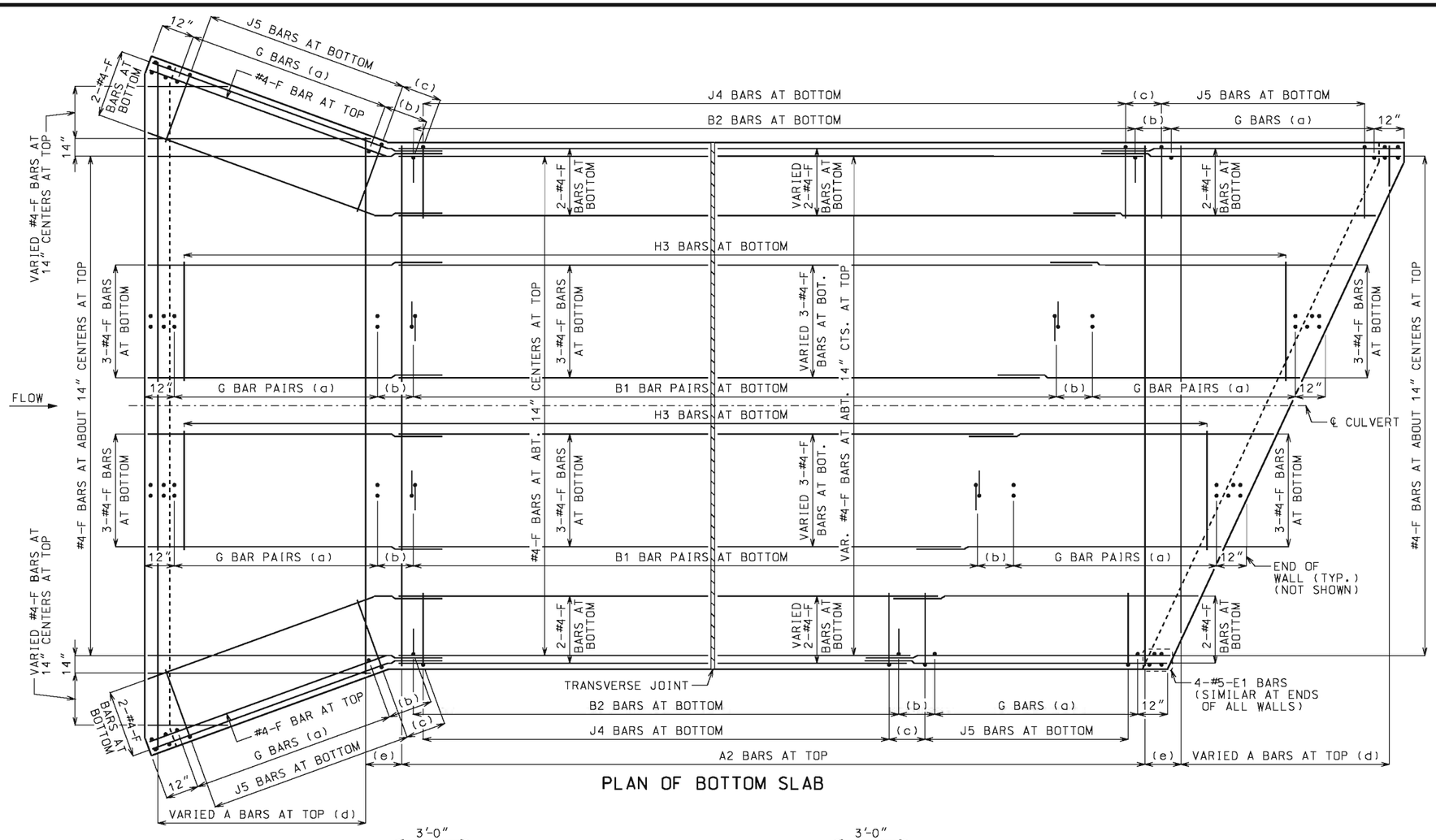
SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

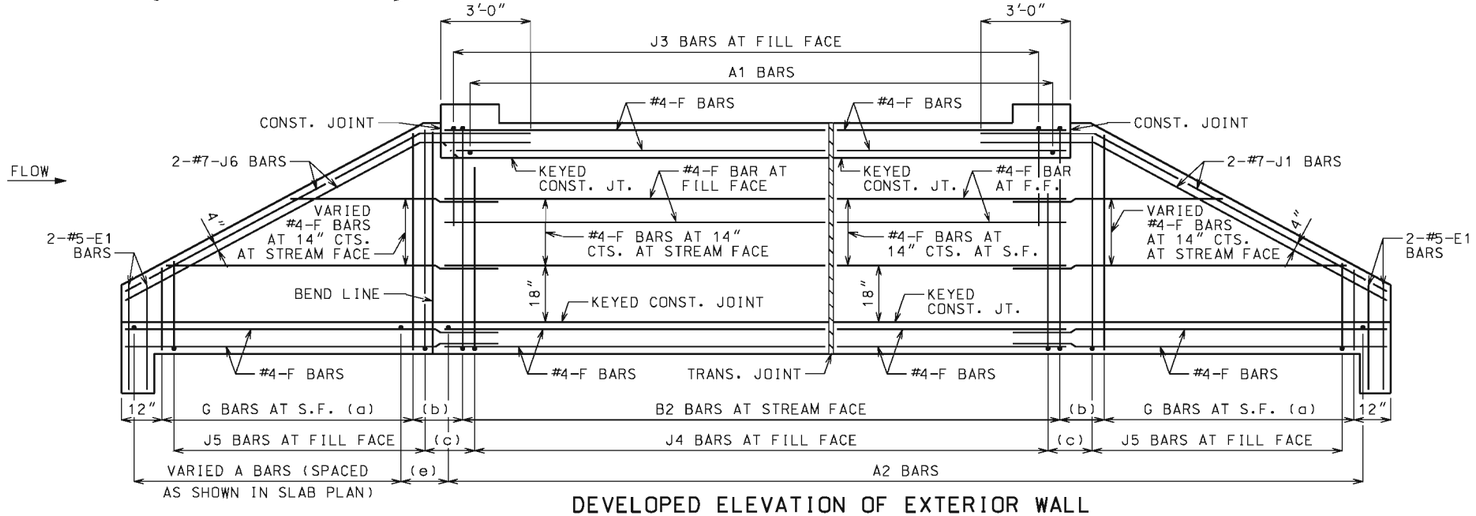
703.84H

SHEET NO. 3 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN OF BOTTOM SLAB




DEVELOPED ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

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

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

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE 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 703.86.

## GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT 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 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

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# CONCRETE TRIPLE BOX CULVERT

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WINGS: FLARED

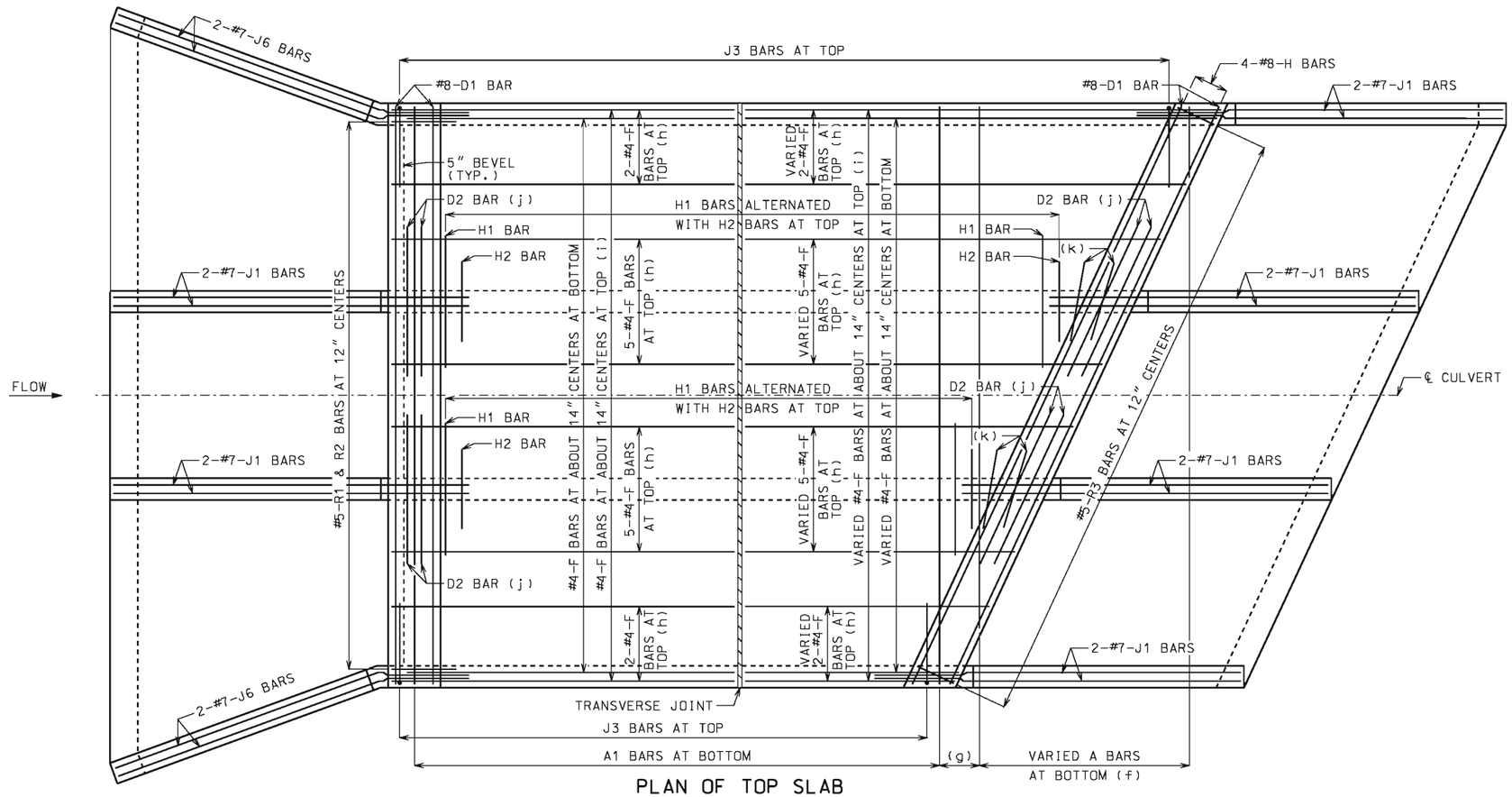
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
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703.85C

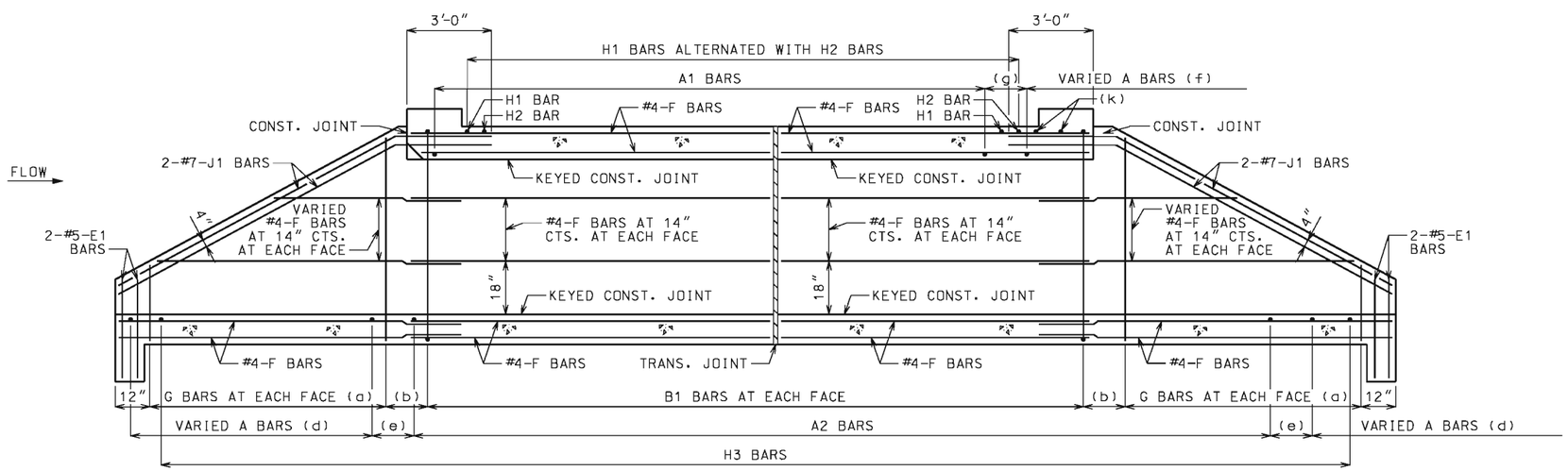
SHEET NO. 1 OF 3

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## PLAN OF TOP SLAB

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




## SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

## GENERAL NOTES:

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(b) VARIES, 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-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 ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

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# CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED

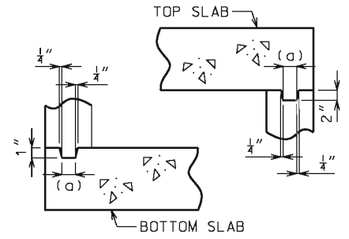
REINFORCEMENT

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703.85C

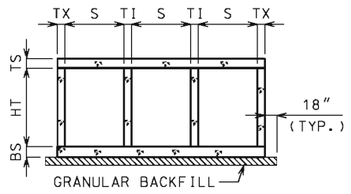
SHEET NO. 2 OF 3

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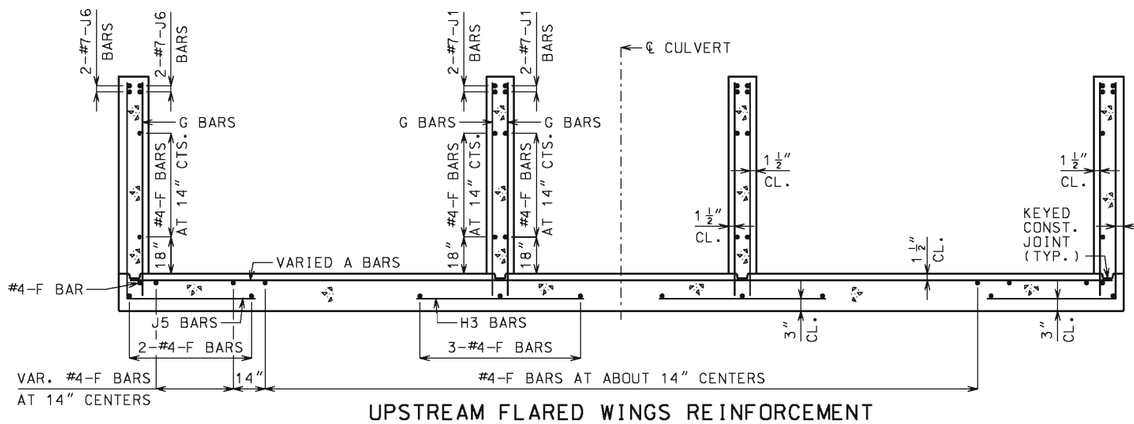



## KEYED CONSTRUCTION JOINT

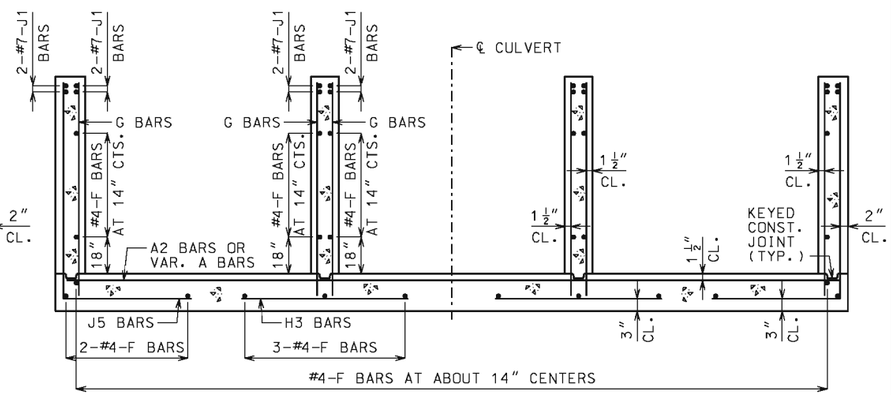
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS



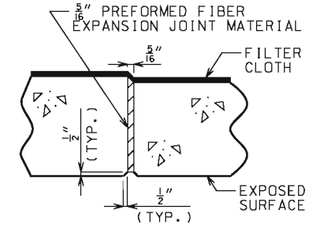

## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## UPSTREAM FLARED WINGS REINFORCEMENT



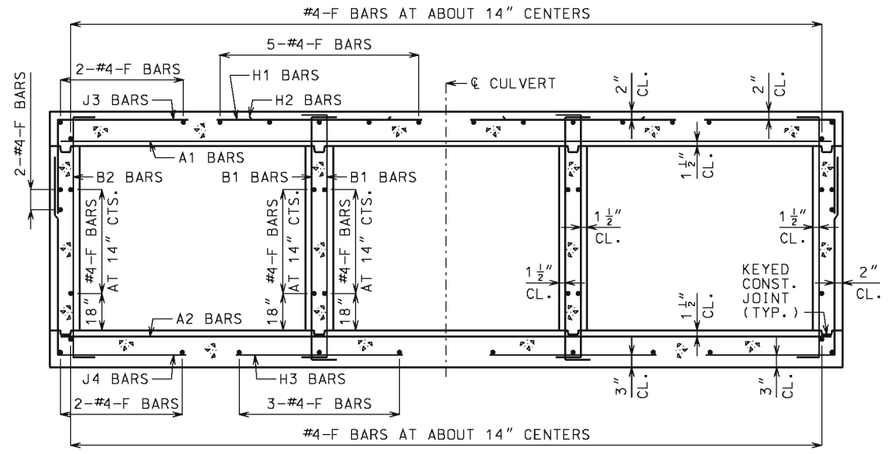

## DOWNSTREAM WINGS REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

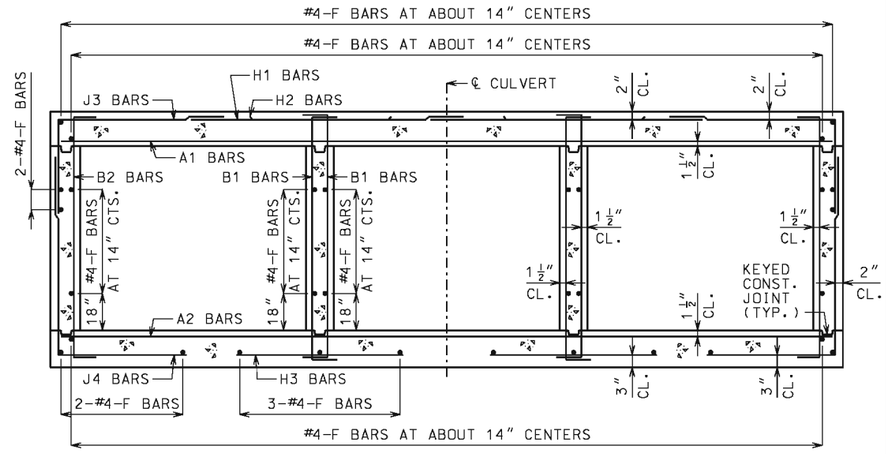
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FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.



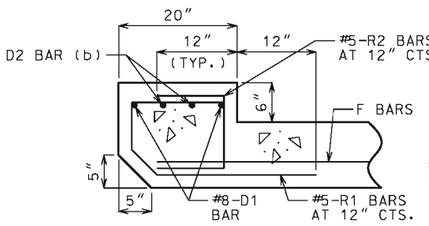

## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"



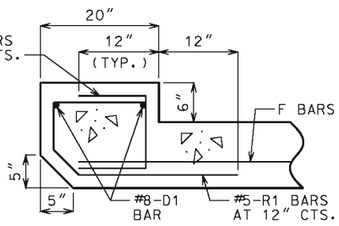

## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS



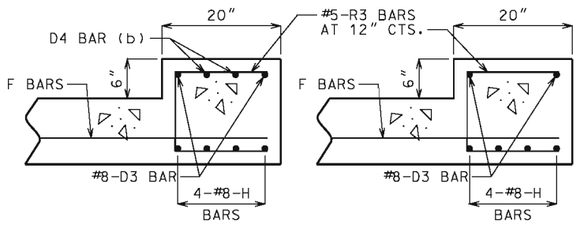

## UPSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## UPSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR INTERIOR WALL




## DOWNSTREAM HEADWALL REINFORCEMENT

NEAR MIDSPAN

(b) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"
#8 FOR CLEAR SPAN > 10'-0"
#9 FOR CLEAR SPAN > 13'-0"

IF D2 AND D4 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ℄ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR ¼ CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

## GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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# CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED

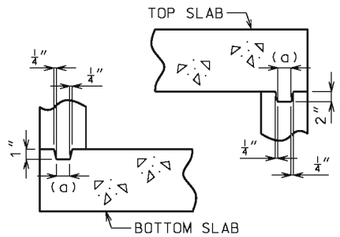
SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.85C

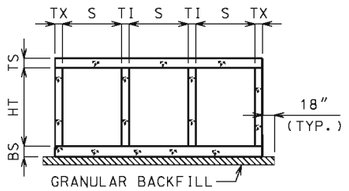
SHEET NO. 3 OF 3

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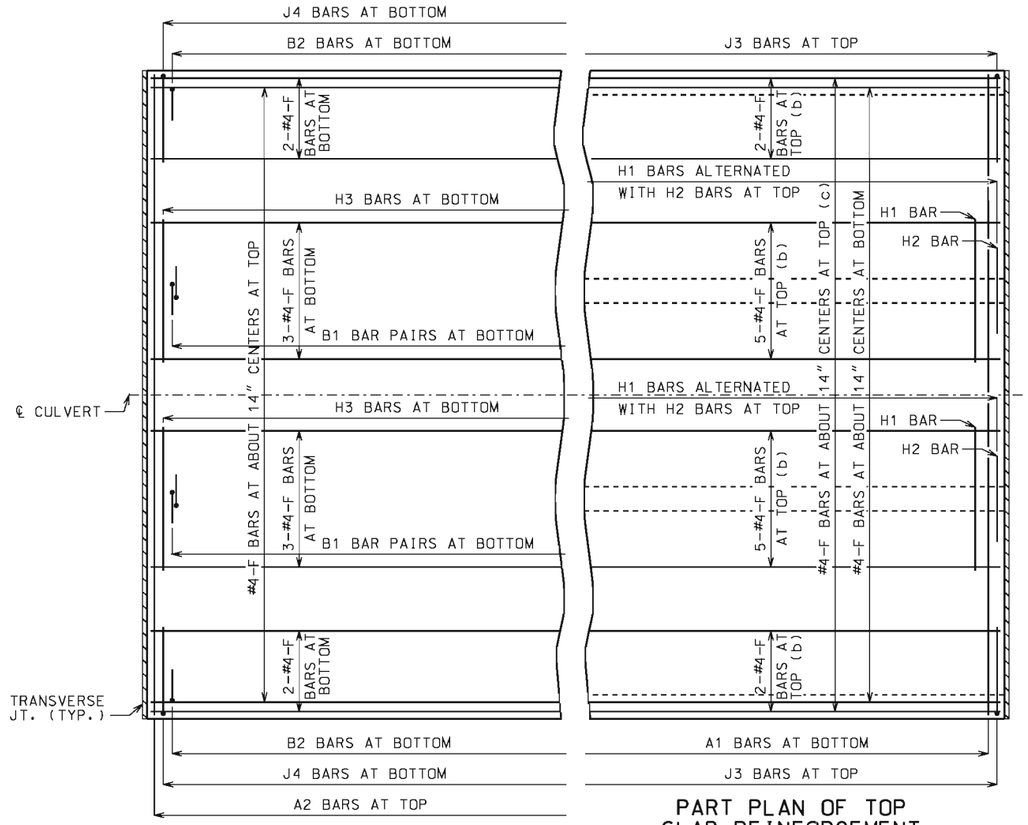



## KEYED CONSTRUCTION JOINT

(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS




## GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS




## PART PLAN OF BOTTOM SLAB REINFORCEMENT

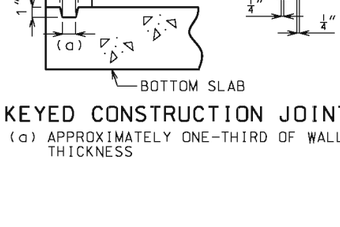
## PART PLAN OF TOP SLAB REINFORCEMENT

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




## PART ELEVATION OF EXTERIOR WALL REINFORCEMENT

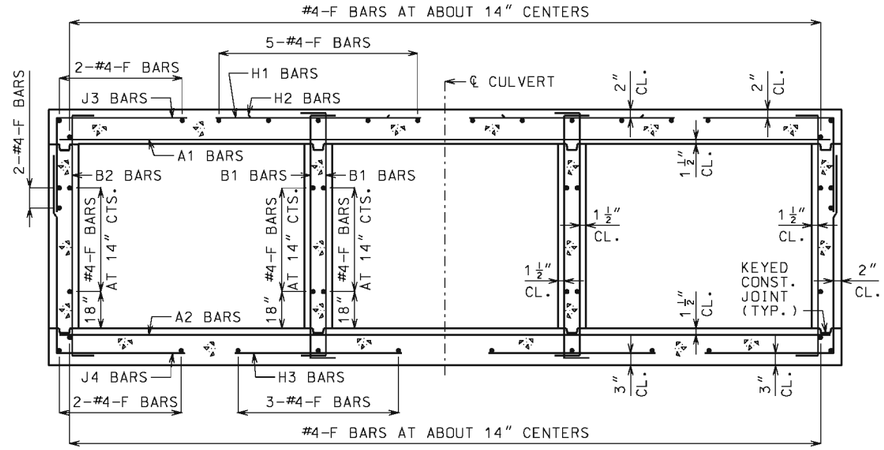
## PART SECTION NEAR INTERIOR WALL REINFORCEMENT




## TRANSVERSE JOINT THRU BARREL

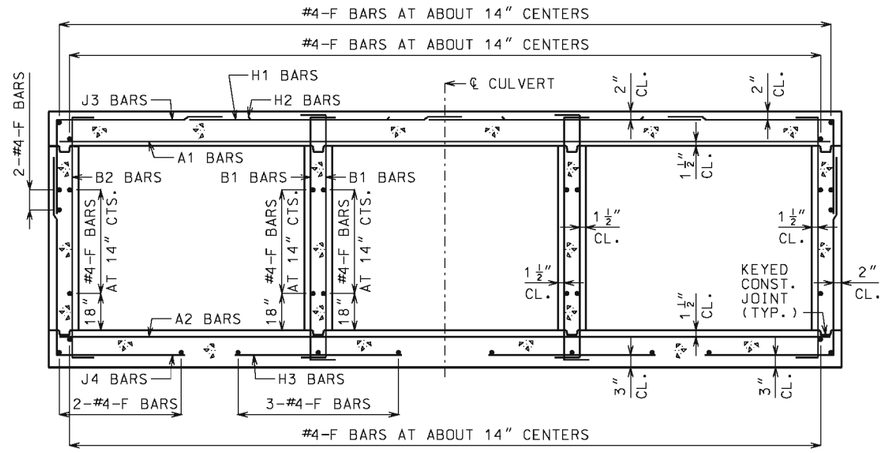
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.




## BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"
SYMMETRICAL ABOUT AND NORMAL TO ℄ CULVERT.




## BARREL REINFORCEMENT

FOR DESIGN FILLS 2'-0" OR LESS
SYMMETRICAL ABOUT AND NORMAL TO ℄ CULVERT.

## GENERAL NOTES

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

**DESIGN LOADING:**
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LB/CF
EQUIVALENT FLUID PRESSURE = 30 LB/CF (MIN.), 60 LB/CF (MAX.)

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

**MISCELLANEOUS:**
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS, SEE 703.87.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PART PLANS, PART ELEVATION AND PART SECTION.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

CUT SECTION

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

703.86

SHEET NO. 1 OF 1

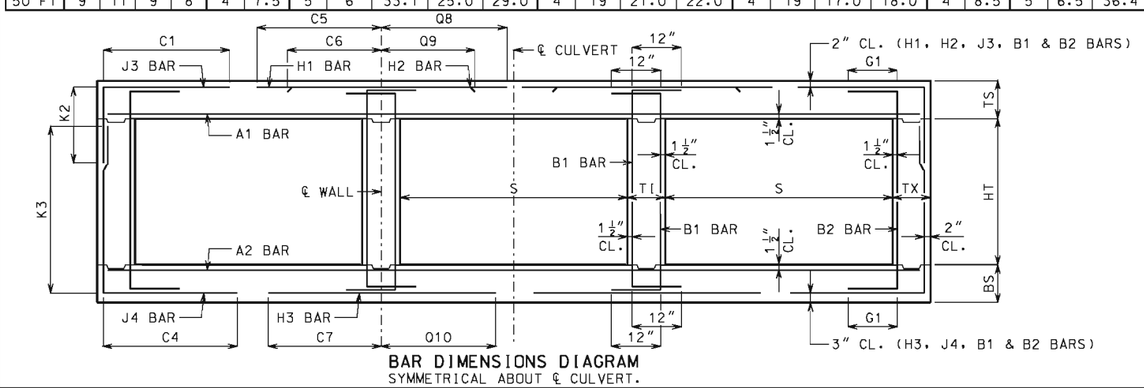
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 3 FT  HEIGHT (HT) = 2 FT OR 3 FT OR 4 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=2' | HT=3' | HT=4' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=2' | HT=3' | HT=4' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 26.8 | 26.0 | 26.0 | 26.0 | 4 | 24 | 39.5 | 30.5 | 4 | 24 | 20.0 | 20.0 | 4 | 12 | 4 | 12 | 36.0 | 28 | 40 | 52 | 4 | 12 | 25.0 | 25.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 26.8 | 26.0 | 26.0 | 26.0 | 4 | 24 | 39.5 | 30.5 | 4 | 24 | 20.0 | 20.0 | 4 | 12 | 4 | 12 | 35.0 | 28 | 40 | 52 | 4 | 12 | 24.0 | 24.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.8 | 24.0 | 24.0 | 24.0 | 4 | 24 | 39.5 | 34.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 12 | 31.1 | 28 | 40 | 52 | 4 | 12 | 23.0 | 24.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 31.1 | 24.0 | 24.0 | 24.0 | 4 | 24 | 26.0 | 26.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 28.9 | 28 | 40 | 52 | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 28.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 24.0 | 24.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 27.3 | 28 | 40 | 52 | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.1 | 24.0 | 24.0 | 24.0 | 4 | 24 | 23.0 | 24.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 26.5 | 28 | 40 | 52 | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 25.0 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 23.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 24.5 | 28 | 40 | 52 | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.9 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 23.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 24.5 | 28 | 40 | 52 | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.8 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 24.4 | 28 | 40 | 52 | 4 | 11.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.8 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 24.4 | 28 | 40 | 52 | 4 | 11 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.6 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 24.3 | 28 | 40 | 52 | 4 | 10.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.6 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 12 | 24.3 | 28 | 40 | 52 | 4 | 9.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 11.5 | 4 | 12 | 24.3 | 28 | 40 | 52 | 4 | 9 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 10.5 | 4 | 11 | 24.1 | 28 | 40 | 52 | 4 | 9 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 10 | 4 | 10 | 24.1 | 28 | 40 | 52 | 4 | 8.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 8 | 8 | 8 | 8 | 4 | 11 | 4 | 10.5 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 18.0 | 18.0 | 4 | 9 | 4 | 9.5 | 24.1 | 28 | 40 | 52 | 4 | 8 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 8 | 9 | 8 | 8 | 4 | 10.5 | 4 | 9.5 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 23 | 21.0 | 22.0 | 4 | 23 | 18.0 | 18.0 | 4 | 9.5 | 4 | 12 | 24.5 | 29 | 41 | 53 | 4 | 9.5 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 8 | 9 | 8 | 8 | 4 | 10 | 4 | 9 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 22 | 21.0 | 22.0 | 4 | 22 | 18.0 | 18.0 | 4 | 9 | 4 | 11 | 24.4 | 29 | 41 | 53 | 4 | 9 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 8 | 9 | 8 | 8 | 4 | 9.5 | 4 | 8.5 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 21 | 21.0 | 22.0 | 4 | 21 | 18.0 | 18.0 | 4 | 8.5 | 4 | 10.5 | 24.4 | 29 | 41 | 53 | 4 | 8.5 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 8 | 9 | 8 | 8 | 4 | 9 | 4 | 8 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 20 | 21.0 | 22.0 | 4 | 20 | 18.0 | 18.0 | 4 | 8 | 4 | 10 | 24.4 | 29 | 41 | 53 | 4 | 8.5 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 8 | 10 | 8 | 8 | 4 | 8.5 | 4 | 7.5 | 24.5 | 24.0 | 24.0 | 24.0 | 4 | 19 | 21.0 | 22.0 | 4 | 19 | 18.0 | 18.0 | 4 | 8.5 | 4 | 12 | 24.8 | 30 | 42 | 54 | 4 | 9 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 9 | 10 | 8 | 8 | 4 | 9 | 4 | 9 | 24.8 | 25.0 | 25.0 | 25.0 | 4 | 21 | 21.0 | 23.0 | 4 | 21 | 17.0 | 18.0 | 4 | 8 | 4 | 11.5 | 24.8 | 30 | 42 | 54 | 4 | 9 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 9 | 10 | 8 | 8 | 4 | 8.5 | 4 | 8.5 | 24.8 | 25.0 | 25.0 | 25.0 | 4 | 20 | 21.0 | 23.0 | 4 | 20 | 17.0 | 18.0 | 4 | 8 | 4 | 11 | 24.8 | 30 | 42 | 54 | 4 | 9 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 9 | 10 | 8 | 8 | 4 | 8 | 4 | 8 | 24.8 | 25.0 | 25.0 | 25.0 | 4 | 19 | 21.0 | 23.0 | 4 | 19 | 17.0 | 18.0 | 4 | 7.5 | 4 | 10.5 | 24.8 | 30 | 42 | 54 | 4 | 8.5 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 9 | 11 | 8 | 8 | 4 | 8 | 4 | 7.5 | 24.9 | 25.0 | 25.0 | 25.0 | 4 | 19 | 21.0 | 22.0 | 4 | 19 | 18.0 | 18.0 | 4 | 8 | 4 | 10.5 | 25.0 | 31 | 43 | 55 | 4 | 9.5 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 50 FT | 10 | 11 | 8 | 8 | 4 | 8 | 4 | 8 | 25.1 | 26.0 | 26.0 | 26.0 | 4 | 20 | 21.0 | 23.0 | 4 | 20 | 17.0 | 18.0 | 4 | 7.5 | 4 | 10.5 | 25.1 | 31 | 43 | 55 | 4 | 9 | 21.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |

## SPAN (S) = 3 FT  HEIGHT (HT) = 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=5' | HT=6' | | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=5' | HT=6' | | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 26.8 | 26.0 | 26.0 | | 4 | 24 | 39.5 | 30.5 | 4 | 24 | 21.0 | 20.0 | 4 | 12 | 4 | 11.5 | 36.0 | 64 | 76 | | 4 | 12 | 34.0 | 25.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 8.5 | 4 | 10.5 | 26.8 | 26.0 | 26.0 | | 4 | 24 | 39.5 | 30.5 | 4 | 24 | 20.0 | 20.0 | 4 | 12 | 4 | 11 | 36.0 | 64 | 76 | | 4 | 12 | 34.0 | 24.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.8 | 24.0 | 24.0 | | 4 | 24 | 39.5 | 34.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 10 | 36.0 | 64 | 76 | | 4 | 12 | 34.0 | 24.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.8 | 24.0 | 24.0 | | 4 | 24 | 39.5 | 26.0 | 4 | 24 | 18.0 | 19.0 | 4 | 12 | 4 | 9.5 | 36.0 | 64 | 76 | | 4 | 12 | 34.0 | 23.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.8 | 24.0 | 24.0 | | 4 | 24 | 39.5 | 24.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 9 | 36.0 | 64 | 76 | | 4 | 12 | 24.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.8 | 24.0 | 24.0 | | 4 | 24 | 39.5 | 23.0 | 4 | 24 | 18.0 | 18.0 | 4 | 12 | 4 | 8.5 | 36.0 | 64 | 76 | | 4 | 12 | 23.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 34.9 | 24.0 | 24.0 | | 4 | 24 | 22.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 12 | 4 | 9 | 34.4 | 64 | 76 | | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 34.5 | 24.0 | 24.0 | | 4 | 24 | 22.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 12 | 4 | 8.5 | 34.1 | 64 | 76 | | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 34.3 | 24.0 | 24.0 | | 4 | 24 | 22.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 12 | 4 | 8 | 33.9 | 64 | 76 | | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 9 | 34.0 | 24.0 | 24.0 | | 4 | 24 | 22.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 12 | 4 | 7.5 | 33.8 | 64 | 76 | | 4 | 12 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 8 | 33.8 | 24.0 | 24.0 | | 4 | 24 | 22.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 12 | 4 | 7 | 33.6 | 64 | 76 | | 4 | 11.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 7.5 | 33.6 | 24.0 | 24.0 | | 4 | 24 | 22.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 12 | 4 | 6.5 | 33.5 | 64 | 76 | | 4 | 10.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 7 | 33.5 | 24.0 | 24.0 | | 4 | 24 | 22.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 11.5 | 4 | 6 | 33.4 | 64 | 76 | | 4 | 10.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6.5 | 33.4 | 24.0 | 24.0 | | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 10.5 | 5 | 6.5 | 33.3 | 64 | 76 | | 4 | 10 | 22.0 | 22.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6 | 33.3 | 24.0 | 24.0 | | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 10 | 5 | 6 | 33.1 | 64 | 76 | | 4 | 9.5 | 22.0 | 22.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 8 | 8 | 9 | 8 | 4 | 11.5 | 4 | 6.5 | 32.3 | 24.0 | 24.0 | | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 9.5 | 4 | 6 | 32.1 | 64 | 76 | | 4 | 9 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 8 | 9 | 9 | 8 | 4 | 11 | 4 | 6.5 | 32.1 | 24.0 | 24.0 | | 4 | 24 | 21.0 | 22.0 | 4 | 24 | 17.0 | 18.0 | 4 | 10 | 4 | 6.5 | 34.1 | 65 | 77 | | 4 | 10.5 | 22.0 | 23.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 8 | 9 | 9 | 8 | 4 | 10 | 4 | 6 | 32.0 | 24.0 | 24.0 | | 4 | 23 | 21.0 | 22.0 | 4 | 23 | 17.0 | 18.0 | 4 | 9.5 | 4 | 6 | 34.0 | 65 | 77 | | 4 | 10 | 22.0 | 23.0 | 5 | 12 | 5 | 11.5 | 0 |
| 36 FT | 8 | 9 | 9 | 8 | 4 | 9.5 | 5 | 7 | 32.0 | 24.0 | 24.0 | | 4 | 22 | 21.0 | 22.0 | 4 | 22 | 17.0 | 18.0 | 4 | 9 | 4 | 6 | 34.0 | 65 | 77 | | 4 | 10 | 22.0 | 23.0 | 5 | 12 | 5 | 11 | 0 |
| 38 FT | 8 | 9 | 9 | 8 | 4 | 9 | 5 | 6.5 | 32.0 | 24.0 | 28.0 | | 4 | 21 | 21.0 | 22.0 | 4 | 21 | 17.0 | 18.0 | 4 | 8.5 | 5 | 7 | 34.0 | 65 | 77 | | 4 | 9.5 | 22.0 | 23.0 | 5 | 12 | 5 | 10 | 0 |
| 40 FT | 8 | 10 | 9 | 8 | 4 | 8.5 | 5 | 6 | 31.9 | 24.0 | 24.0 | | 4 | 20 | 21.0 | 22.0 | 4 | 20 | 17.0 | 18.0 | 4 | 9 | 4 | 6 | 35.5 | 66 | 78 | | 4 | 10.5 | 23.0 | 23.0 | 5 | 12 | 5 | 10 | 0 |
| 42 FT | 9 | 10 | 9 | 8 | 4 | 9.5 | 5 | 6.5 | 33.4 | 25.0 | 29.0 | | 4 | 22 | 21.0 | 22.0 | 4 | 22 | 17.0 | 18.0 | 4 | 9 | 5 | 7 | 35.3 | 66 | 78 | | 4 | 10 | 23.0 | 23.0 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 9 | 10 | 9 | 8 | 4 | 9 | 5 | 6.5 | 33.3 | 25.0 | 29.0 | | 4 | 21 | 21.0 | 22.0 | 4 | 21 | 17.0 | 18.0 | 4 | 8.5 | 5 | 6.5 | 35.3 | 66 | 78 | | 4 | 10 | 23.0 | 23.0 | 5 | 12 | 5 | 9 | 0 |
| 46 FT | 9 | 10 | 9 | 8 | 4 | 8.5 | 5 | 6 | 33.3 | 25.0 | 29.0 | | 4 | 21 | 21.0 | 22.0 | 4 | 21 | 17.0 | 18.0 | 4 | 8 | 5 | 6.5 | 35.1 | 66 | 78 | | 4 | 9.5 | 23.0 | 23.0 | 5 | 12 | 5 | 8.5 | 0 |
| 48 FT | 9 | 11 | 9 | 8 | 4 | 8 | 5 | 6 | 33.1 | 25.0 | 29.0 | | 4 | 20 | 21.0 | 22.0 | 4 | 20 | 17.0 | 18.0 | 4 | 8.5 | 5 | 6.5 | 36.4 | 67 | 79 | | 4 | 10 | 23.0 | 23.0 | 5 | 12 | 5 | 8.5 | 0 |
| 50 FT | 9 | 11 | 9 | 8 | 4 | 7.5 | 5 | 6 | 33.1 | 25.0 | 29.0 | | 4 | 19 | 21.0 | 22.0 | 4 | 19 | 17.0 | 18.0 | 4 | 8.5 | 5 | 6.5 | 36.4 | 67 | 79 | | 4 | 10 | 23.0 | 23.0 | 5 | 12 | 5 | 8.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 3 FEET
HEIGHT (HT): 2 THRU 6 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

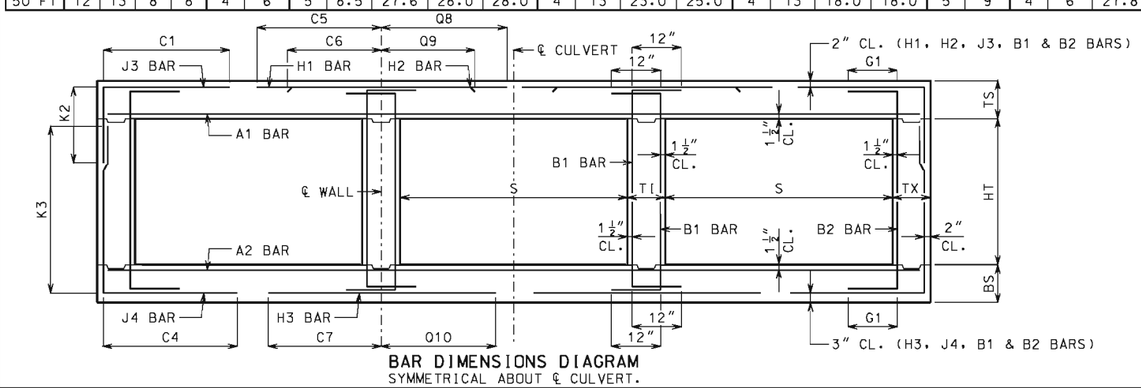
703.87

## SPAN (S) = 4 FT  HEIGHT (HT) = 2 FT OR 3 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=2′ | HT=3′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=2′ | HT=3′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 30.3 | 26.0 | 26.0 | 4 | 24 | 47.5 | 36.5 | 4 | 24 | 21.0 | 20.0 | 4 | 12 | 4 | 12 | 29.4 | 28 | 40 | 4 | 12 | 27.0 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 30.3 | 26.0 | 26.0 | 4 | 24 | 47.5 | 36.5 | 4 | 24 | 21.0 | 20.0 | 4 | 12 | 4 | 12 | 27.3 | 28 | 40 | 4 | 11.5 | 27.0 | 27.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 28.6 | 24.0 | 24.0 | 4 | 24 | 33.0 | 36.0 | 4 | 24 | 20.0 | 20.0 | 4 | 12 | 4 | 12 | 25.0 | 28 | 40 | 4 | 11.5 | 26.0 | 27.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 26.0 | 24.0 | 24.0 | 4 | 24 | 28.0 | 29.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 12 | 24.1 | 28 | 40 | 4 | 10.5 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.8 | 24.0 | 24.0 | 4 | 24 | 26.0 | 28.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 12 | 23.5 | 28 | 40 | 4 | 10 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 24.1 | 24.0 | 24.0 | 4 | 24 | 26.0 | 27.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 12 | 23.1 | 28 | 40 | 4 | 9 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 23.6 | 24.0 | 24.0 | 4 | 23 | 25.0 | 26.0 | 4 | 23 | 18.0 | 19.0 | 4 | 12 | 4 | 12 | 22.9 | 28 | 40 | 4 | 8 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 23.4 | 24.0 | 24.0 | 4 | 22 | 25.0 | 26.0 | 4 | 22 | 18.0 | 18.0 | 4 | 11 | 4 | 12 | 22.6 | 28 | 40 | 4 | 7.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 22.5 | 24.0 | 24.0 | 4 | 21 | 24.0 | 25.0 | 4 | 21 | 18.0 | 18.0 | 4 | 10.5 | 4 | 12 | 22.1 | 28 | 40 | 4 | 7.5 | 24.0 | 25.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 11.5 | 4 | 12 | 22.5 | 24.0 | 24.0 | 4 | 20 | 24.0 | 25.0 | 4 | 20 | 18.0 | 18.0 | 4 | 9.5 | 4 | 10.5 | 22.1 | 28 | 40 | 4 | 7 | 24.0 | 25.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 10.5 | 4 | 11 | 22.4 | 24.0 | 24.0 | 4 | 18 | 24.0 | 25.0 | 4 | 18 | 18.0 | 18.0 | 4 | 8.5 | 4 | 9.5 | 22.1 | 28 | 40 | 4 | 6.5 | 24.0 | 25.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 8 | 4 | 9.5 | 4 | 10 | 22.4 | 24.0 | 24.0 | 4 | 17 | 24.0 | 25.0 | 4 | 17 | 18.0 | 18.0 | 4 | 7.5 | 4 | 9 | 22.0 | 28 | 40 | 4 | 6 | 24.0 | 25.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 9 | 8 | 8 | 4 | 8.5 | 4 | 9 | 22.6 | 24.0 | 24.0 | 4 | 15 | 24.0 | 25.0 | 4 | 15 | 18.0 | 18.0 | 4 | 8 | 4 | 11.5 | 21.4 | 29 | 41 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 8.5 | 22.5 | 24.0 | 24.0 | 4 | 14 | 24.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 7 | 4 | 11 | 21.4 | 29 | 41 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 10 | 8 | 8 | 4 | 7.5 | 4 | 8 | 22.8 | 24.0 | 24.0 | 4 | 13 | 24.0 | 25.0 | 4 | 13 | 18.0 | 18.0 | 4 | 7.5 | 4 | 12 | 20.9 | 30 | 42 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 9 | 10 | 8 | 8 | 4 | 7.5 | 4 | 10 | 22.1 | 25.0 | 25.0 | 4 | 15 | 24.0 | 26.0 | 4 | 15 | 18.0 | 18.0 | 4 | 7 | 4 | 12 | 21.0 | 30 | 42 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 9 | 10 | 8 | 8 | 4 | 7 | 4 | 9.5 | 22.1 | 25.0 | 25.0 | 4 | 14 | 24.0 | 26.0 | 4 | 14 | 18.0 | 18.0 | 4 | 6 | 4 | 12 | 21.0 | 30 | 42 | 4 | 6 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 9 | 11 | 8 | 8 | 4 | 6.5 | 4 | 9 | 22.3 | 25.0 | 25.0 | 4 | 13 | 24.0 | 26.0 | 4 | 13 | 18.0 | 18.0 | 4 | 6.5 | 4 | 10.5 | 20.6 | 31 | 43 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 10 | 11 | 8 | 8 | 4 | 7 | 4 | 10 | 21.9 | 26.0 | 26.0 | 4 | 14 | 24.0 | 26.0 | 4 | 14 | 18.0 | 19.0 | 4 | 6.5 | 4 | 10.5 | 20.9 | 31 | 43 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 10 | 12 | 8 | 8 | 4 | 6.5 | 4 | 9.5 | 22.0 | 26.0 | 26.0 | 4 | 13 | 24.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 4 | 6.5 | 4 | 9.5 | 20.5 | 32 | 44 | 4 | 7.5 | 24.0 | 27.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 10 | 12 | 8 | 8 | 4 | 6 | 4 | 9 | 22.0 | 26.0 | 26.0 | 4 | 13 | 24.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 4 | 6.5 | 4 | 9.5 | 20.5 | 32 | 44 | 4 | 7 | 24.0 | 27.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 11 | 12 | 8 | 8 | 4 | 6.5 | 4 | 9.5 | 21.6 | 27.0 | 27.0 | 4 | 14 | 23.0 | 26.0 | 4 | 14 | 18.0 | 19.0 | 4 | 6 | 4 | 9.5 | 20.8 | 32 | 44 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 11 | 12 | 8 | 8 | 4 | 6 | 4 | 9.5 | 21.6 | 27.0 | 27.0 | 4 | 13 | 23.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 4 | 6 | 4 | 9.5 | 20.8 | 32 | 44 | 4 | 6 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 11 | 13 | 8 | 8 | 4 | 6 | 4 | 8.5 | 21.8 | 27.0 | 27.0 | 4 | 12 | 23.0 | 26.0 | 4 | 12 | 18.0 | 19.0 | 4 | 6 | 4 | 8.5 | 20.5 | 33 | 45 | 4 | 6.5 | 23.0 | 27.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 12 | 13 | 8 | 8 | 4 | 6 | 4 | 8.5 | 21.5 | 28.0 | 28.0 | 4 | 13 | 23.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 4 | 6 | 4 | 8.5 | 20.8 | 33 | 45 | 4 | 6.5 | 24.0 | 27.0 | 5 | 12 | 5 | 12 | 0 |
| 50 FT | 12 | 13 | 8 | 8 | 5 | 9 | 4 | 8.5 | 21.5 | 28.0 | 28.0 | 4 | 13 | 23.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 5 | 8.5 | 4 | 8.5 | 20.8 | 33 | 45 | 4 | 6 | 24.0 | 27.0 | 5 | 12 | 5 | 12 | 0 |

## SPAN (S) = 4 FT  HEIGHT (HT) = 4 FT OR 5 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=4′ | HT=5′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=4′ | HT=5′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 30.3 | 26.0 | 26.0 | 4 | 24 | 47.5 | 36.5 | 4 | 24 | 21.0 | 21.0 | 4 | 12 | 4 | 12 | 42.0 | 52 | 64 | 4 | 12 | 28.0 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 7 | 4 | 10.5 | 30.3 | 26.0 | 26.0 | 4 | 24 | 47.5 | 36.5 | 4 | 24 | 21.0 | 21.0 | 4 | 12 | 4 | 12 | 39.1 | 52 | 64 | 4 | 11 | 27.0 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 30.3 | 24.0 | 24.0 | 4 | 24 | 47.5 | 37.0 | 4 | 24 | 20.0 | 20.0 | 4 | 12 | 4 | 12 | 34.8 | 52 | 64 | 4 | 11 | 26.0 | 27.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 34.6 | 24.0 | 24.0 | 4 | 24 | 29.0 | 30.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 11.5 | 32.1 | 52 | 64 | 4 | 10.5 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 31.4 | 24.0 | 24.0 | 4 | 24 | 27.0 | 28.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 11 | 30.3 | 52 | 64 | 4 | 9.5 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 29.9 | 24.0 | 24.0 | 4 | 24 | 26.0 | 27.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 10.5 | 29.3 | 52 | 64 | 4 | 9 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 29.1 | 24.0 | 24.0 | 4 | 24 | 25.0 | 27.0 | 4 | 24 | 18.0 | 19.0 | 4 | 11.5 | 4 | 10 | 28.5 | 52 | 64 | 4 | 8.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 28.5 | 24.0 | 24.0 | 4 | 23 | 25.0 | 26.0 | 4 | 23 | 18.0 | 19.0 | 4 | 10.5 | 4 | 9.5 | 28.1 | 52 | 64 | 4 | 7.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 11 | 26.9 | 24.0 | 24.0 | 4 | 22 | 24.0 | 26.0 | 4 | 22 | 18.0 | 19.0 | 4 | 10 | 4 | 9.5 | 26.6 | 52 | 64 | 4 | 7.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 11 | 4 | 10 | 26.8 | 24.0 | 24.0 | 4 | 21 | 24.0 | 26.0 | 4 | 21 | 18.0 | 19.0 | 4 | 9 | 4 | 8.5 | 26.5 | 52 | 64 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 10 | 4 | 9 | 26.8 | 24.0 | 24.0 | 4 | 19 | 24.0 | 26.0 | 4 | 19 | 18.0 | 19.0 | 4 | 8 | 4 | 8 | 26.4 | 52 | 64 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 8 | 8 | 8 | 4 | 9 | 4 | 8 | 26.6 | 24.0 | 24.0 | 4 | 17 | 24.0 | 26.0 | 4 | 17 | 18.0 | 18.0 | 4 | 7 | 4 | 7 | 26.4 | 52 | 64 | 4 | 6 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 8 | 9 | 8 | 8 | 4 | 8.5 | 4 | 7.5 | 26.6 | 24.0 | 24.0 | 4 | 16 | 24.0 | 25.0 | 4 | 16 | 18.0 | 18.0 | 4 | 7.5 | 4 | 8.5 | 26.6 | 53 | 65 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 7 | 26.6 | 24.0 | 24.0 | 4 | 14 | 24.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 7 | 4 | 8 | 26.5 | 53 | 65 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 8 | 10 | 8 | 8 | 4 | 7.5 | 4 | 6 | 26.6 | 24.0 | 24.0 | 4 | 13 | 24.0 | 25.0 | 4 | 13 | 18.0 | 18.0 | 4 | 7.5 | 4 | 9.5 | 26.8 | 54 | 66 | 4 | 7.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 9 | 10 | 8 | 8 | 4 | 7.5 | 4 | 7.5 | 26.9 | 25.0 | 25.0 | 4 | 15 | 24.0 | 26.0 | 4 | 15 | 18.0 | 19.0 | 4 | 7 | 4 | 9 | 26.9 | 54 | 66 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 9 | 10 | 8 | 8 | 4 | 7 | 4 | 7 | 26.9 | 25.0 | 25.0 | 4 | 14 | 24.0 | 26.0 | 4 | 14 | 18.0 | 19.0 | 4 | 6 | 4 | 8 | 26.8 | 54 | 66 | 4 | 6 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 9 | 11 | 8 | 8 | 4 | 6.5 | 4 | 6.5 | 26.9 | 25.0 | 25.0 | 4 | 13 | 24.0 | 26.0 | 4 | 13 | 18.0 | 18.0 | 4 | 6.5 | 4 | 8.5 | 27.0 | 55 | 67 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 10 | 11 | 8 | 8 | 4 | 7 | 4 | 6.5 | 27.1 | 26.0 | 26.0 | 4 | 14 | 23.0 | 26.0 | 4 | 14 | 18.0 | 19.0 | 4 | 6.5 | 4 | 8 | 27.1 | 55 | 67 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 10 | 12 | 8 | 8 | 4 | 6.5 | 4 | 6 | 27.3 | 26.0 | 26.0 | 4 | 14 | 23.0 | 26.0 | 4 | 14 | 18.0 | 19.0 | 4 | 6.5 | 4 | 8 | 27.4 | 56 | 68 | 4 | 7.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 10 | 12 | 8 | 8 | 4 | 6 | 5 | 8 | 27.1 | 26.0 | 26.0 | 4 | 13 | 23.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 4 | 6.5 | 4 | 7.5 | 27.4 | 56 | 68 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 11 | 12 | 8 | 8 | 4 | 6.5 | 5 | 9 | 27.4 | 27.0 | 27.0 | 4 | 14 | 23.0 | 26.0 | 4 | 14 | 18.0 | 19.0 | 4 | 6 | 4 | 7 | 27.4 | 56 | 68 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 11 | 12 | 8 | 8 | 4 | 6 | 5 | 8.5 | 27.4 | 27.0 | 27.0 | 4 | 13 | 23.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 4 | 6 | 4 | 6.5 | 27.4 | 56 | 68 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 11 | 13 | 8 | 8 | 4 | 6 | 5 | 8.5 | 27.5 | 27.0 | 27.0 | 4 | 13 | 23.0 | 26.0 | 4 | 13 | 18.0 | 19.0 | 4 | 6 | 4 | 7 | 27.6 | 57 | 69 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 12 | 13 | 8 | 8 | 4 | 6 | 5 | 8.5 | 27.6 | 28.0 | 28.0 | 4 | 14 | 23.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 6 | 4 | 6.5 | 27.8 | 57 | 69 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 11.5 | 0 |
| 50 FT | 12 | 13 | 8 | 8 | 4 | 6 | 5 | 8.5 | 27.6 | 28.0 | 28.0 | 4 | 13 | 23.0 | 25.0 | 4 | 13 | 18.0 | 18.0 | 5 | 9 | 4 | 6 | 27.8 | 57 | 69 | 4 | 6 | 24.0 | 26.0 | 5 | 12 | 5 | 11 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 4 FEET
HEIGHT (HT): 2 THRU 5 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

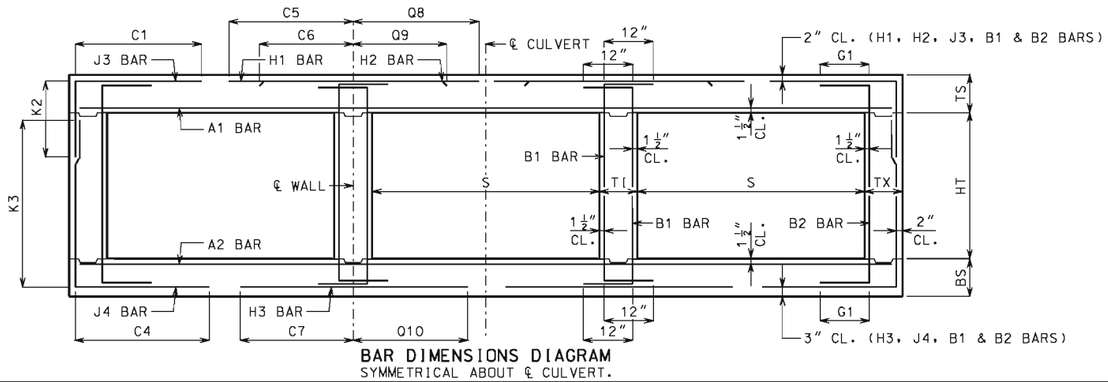
703.87

SHEET NO. 2 OF 27

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 4 FT  HEIGHT (HT) = 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | K2 | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | K3 | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=6′ | HT=7′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=6′ | HT=7′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 4 | 6.5 | 4 | 10.5 | 30.3 | 26.0 | 26.0 | 4 | 24 | 47.5 | 36.5 | 4 | 24 | 22.0 | 21.0 | 4 | 12 | 4 | 9 | 42.0 | 76 | 88 | 4 | 11.5 | 40.0 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 10 | 8 | 8 | 8 | 4 | 6.5 | 4 | 10.5 | 30.3 | 26.0 | 26.0 | 4 | 24 | 47.5 | 36.5 | 4 | 24 | 21.0 | 21.0 | 4 | 12 | 4 | 8.5 | 42.0 | 76 | 88 | 4 | 11 | 40.0 | 28.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 30.3 | 24.0 | 24.0 | 4 | 24 | 47.5 | 37.0 | 4 | 24 | 20.0 | 20.0 | 4 | 12 | 4 | 7.5 | 42.0 | 76 | 88 | 4 | 11 | 29.0 | 27.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 30.3 | 24.0 | 24.0 | 4 | 24 | 47.5 | 29.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 7 | 42.0 | 76 | 88 | 4 | 10 | 27.0 | 26.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 9 | 30.3 | 24.0 | 24.0 | 4 | 24 | 47.5 | 28.0 | 4 | 24 | 19.0 | 19.0 | 4 | 12 | 4 | 6.5 | 42.0 | 76 | 88 | 4 | 9.5 | 26.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 8 | 43.1 | 24.0 | 24.0 | 4 | 24 | 28.0 | 27.0 | 4 | 24 | 18.0 | 19.0 | 4 | 12 | 4 | 6.5 | 40.6 | 76 | 88 | 4 | 9 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 7.5 | 40.5 | 24.0 | 24.0 | 4 | 24 | 27.0 | 26.0 | 4 | 24 | 18.0 | 19.0 | 4 | 11.5 | 4 | 6 | 39.1 | 76 | 88 | 4 | 8.5 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6.5 | 39.3 | 24.0 | 24.0 | 4 | 23 | 26.0 | 26.0 | 4 | 23 | 18.0 | 19.0 | 4 | 10.5 | 5 | 6.5 | 38.4 | 76 | 88 | 4 | 8 | 25.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6.5 | 35.5 | 24.0 | 24.0 | 4 | 23 | 24.0 | 25.0 | 4 | 23 | 18.0 | 19.0 | 4 | 10 | 5 | 6.5 | 35.4 | 76 | 88 | 4 | 7.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 8 | 8 | 8 | 4 | 11.5 | 4 | 6 | 35.3 | 24.0 | 24.0 | 4 | 21 | 24.0 | 25.0 | 4 | 21 | 18.0 | 18.0 | 4 | 9 | 5 | 6 | 35.1 | 76 | 88 | 4 | 7 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 8 | 8 | 8 | 4 | 10 | 5 | 6.5 | 35.0 | 24.0 | 28.0 | 4 | 19 | 24.0 | 25.0 | 4 | 19 | 18.0 | 18.0 | 4 | 8 | 6 | 6.5 | 38.0 | 76 | 88 | 4 | 6.5 | 24.0 | 26.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 8 | 9 | 8 | 8 | 4 | 9.5 | 5 | 6 | 34.6 | 24.0 | 28.0 | 4 | 18 | 24.0 | 25.0 | 4 | 18 | 18.0 | 18.0 | 4 | 8.5 | 5 | 6 | 36.1 | 77 | 89 | 4 | 8 | 25.0 | 26.0 | 5 | 12 | 5 | 11.5 | 0 |
| 24 FT | 8 | 9 | 9 | 8 | 4 | 8.5 | 5 | 6.5 | 34.1 | 24.0 | 28.0 | 4 | 16 | 24.0 | 25.0 | 4 | 16 | 18.0 | 18.0 | 4 | 8 | 5 | 7 | 35.6 | 77 | 89 | 4 | 7.5 | 25.0 | 26.0 | 5 | 12 | 5 | 11.5 | 0 |
| 26 FT | 8 | 9 | 9 | 8 | 4 | 8 | 5 | 6 | 34.0 | 24.0 | 28.0 | 4 | 15 | 24.0 | 25.0 | 4 | 15 | 18.0 | 18.0 | 4 | 7.5 | 5 | 6.5 | 35.5 | 77 | 89 | 4 | 7 | 25.0 | 26.0 | 5 | 12 | 5 | 11 | 0 |
| 28 FT | 8 | 10 | 9 | 8 | 4 | 7.5 | 6 | 7.5 | 36.8 | 24.0 | 28.0 | 4 | 14 | 24.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 7.5 | 5 | 7 | 36.6 | 78 | 90 | 4 | 7.5 | 25.0 | 26.0 | 5 | 12 | 5 | 10.5 | 0 |
| 30 FT | 9 | 10 | 9 | 8 | 4 | 8 | 5 | 6 | 35.0 | 25.0 | 29.0 | 4 | 15 | 24.0 | 25.0 | 4 | 15 | 18.0 | 18.0 | 4 | 7 | 5 | 6.5 | 36.4 | 78 | 90 | 4 | 7 | 25.0 | 26.0 | 5 | 12 | 5 | 10 | 0 |
| 32 FT | 9 | 10 | 9 | 8 | 4 | 7.5 | 5 | 6 | 35.0 | 25.0 | 29.0 | 4 | 14 | 24.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 6.5 | 5 | 6 | 36.3 | 78 | 90 | 4 | 6.5 | 25.0 | 26.0 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 9 | 11 | 9 | 8 | 4 | 7 | 5 | 6 | 34.9 | 25.0 | 29.0 | 4 | 13 | 24.0 | 25.0 | 4 | 13 | 18.0 | 18.0 | 4 | 7 | 5 | 6.5 | 37.4 | 79 | 91 | 4 | 7 | 25.0 | 26.0 | 5 | 12 | 5 | 9 | 0 |
| 36 FT | 10 | 11 | 9 | 8 | 4 | 7 | 5 | 6.5 | 35.9 | 26.0 | 30.0 | 4 | 15 | 24.0 | 25.0 | 4 | 15 | 18.0 | 18.0 | 4 | 7 | 5 | 6 | 37.0 | 79 | 91 | 4 | 7 | 25.0 | 26.0 | 5 | 12 | 5 | 8.5 | 0 |
| 38 FT | 10 | 11 | 9 | 8 | 4 | 7 | 5 | 6 | 35.8 | 26.0 | 30.0 | 4 | 14 | 24.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 6.5 | 6 | 7.5 | 40.0 | 79 | 91 | 4 | 6.5 | 25.0 | 26.0 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 10 | 12 | 9 | 8 | 4 | 6.5 | 5 | 6 | 35.6 | 26.0 | 30.0 | 4 | 13 | 24.0 | 25.0 | 4 | 13 | 18.0 | 18.0 | 4 | 6.5 | 5 | 6 | 38.3 | 80 | 92 | 4 | 7 | 25.0 | 26.0 | 5 | 12 | 5 | 8.5 | 0 |
| 42 FT | 10 | 12 | 9 | 8 | 4 | 6 | 5 | 6 | 35.6 | 30.0 | 30.0 | 4 | 12 | 24.0 | 25.0 | 4 | 12 | 18.0 | 18.0 | 4 | 6.5 | 6 | 7.5 | 41.1 | 80 | 92 | 4 | 6.5 | 25.0 | 26.0 | 5 | 12 | 5 | 8.5 | 0 |
| 44 FT | 11 | 12 | 9 | 8 | 4 | 6.5 | 6 | 7.5 | 39.5 | 31.0 | 35.0 | 4 | 14 | 24.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 6 | 6 | 7 | 40.9 | 80 | 92 | 4 | 6.5 | 25.0 | 26.0 | 5 | 12 | 5 | 8.5 | 0 |
| 46 FT | 11 | 13 | 9 | 8 | 4 | 6 | 6 | 6.5 | 39.4 | 31.0 | 35.0 | 4 | 13 | 24.0 | 25.0 | 4 | 13 | 18.0 | 18.0 | 4 | 6.5 | 6 | 7.5 | 42.0 | 81 | 93 | 4 | 6.5 | 26.0 | 26.0 | 5 | 12 | 5 | 8.5 | 0 |
| 48 FT | 11 | 13 | 10 | 8 | 4 | 6 | 5 | 6 | 36.3 | 27.0 | 31.0 | 4 | 13 | 23.0 | 25.0 | 4 | 13 | 18.0 | 18.0 | 4 | 6 | 5 | 6.5 | 38.4 | 81 | 93 | 4 | 6.5 | 25.0 | 26.0 | 5 | 12 | 5 | 8 | 0 |
| 50 FT | 12 | 13 | 11 | 8 | 4 | 6 | 5 | 7 | 37.0 | 28.0 | 32.0 | 4 | 14 | 23.0 | 25.0 | 4 | 14 | 18.0 | 18.0 | 4 | 6 | 5 | 7.5 | 37.9 | 81 | 93 | 4 | 6 | 25.0 | 26.0 | 5 | 12 | 5 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 4 FEET
HEIGHT (HT): 6 THRU 7 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 3 OF 27

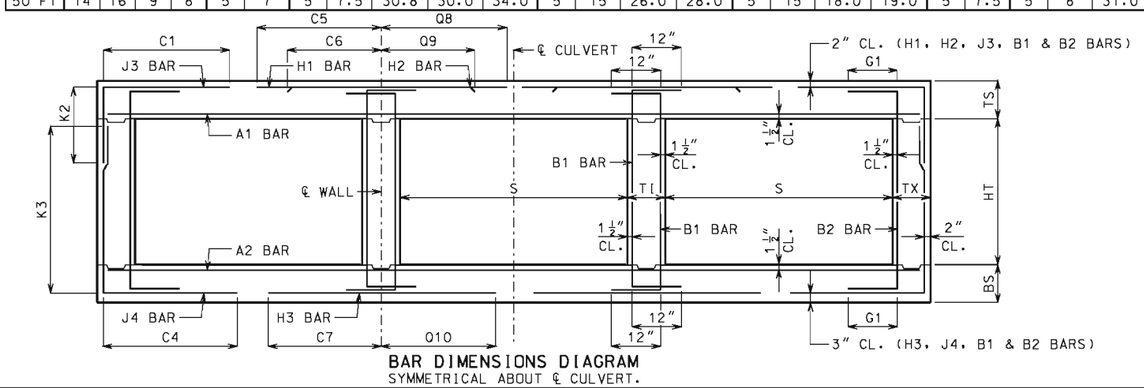
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 5 FT  HEIGHT (HT) = 3 FT OR 4 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=3′ | HT=4′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=3′ | HT=4′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 10 | 8 | 8 | 8 | 5 | 9 | 4 | 10.5 | 33.9 | 26.0 | 26.0 | 4 | 19 | 56.5 | 42.5 | 4 | 19 | 22.0 | 21.0 | 4 | 12 | 4 | 12 | 33.9 | 40 | 52 | 4 | 8.5 | 30.0 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9.5 | 33.9 | 27.0 | 27.0 | 4 | 21 | 56.5 | 42.5 | 4 | 21 | 22.0 | 21.0 | 4 | 12 | 4 | 12 | 31.1 | 40 | 52 | 4 | 8.5 | 30.0 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 10.5 | 4 | 12 | 32.1 | 24.0 | 24.0 | 4 | 20 | 38.0 | 46.0 | 4 | 20 | 20.0 | 20.0 | 4 | 12 | 4 | 12 | 28.4 | 40 | 52 | 4 | 8.5 | 29.0 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 29.3 | 24.0 | 24.0 | 4 | 21 | 31.0 | 34.0 | 4 | 21 | 20.0 | 20.0 | 4 | 12 | 4 | 12 | 27.0 | 40 | 52 | 4 | 8 | 28.0 | 29.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 12 | 27.5 | 24.0 | 24.0 | 4 | 20 | 30.0 | 31.0 | 4 | 20 | 19.0 | 19.0 | 4 | 11 | 4 | 11 | 26.3 | 40 | 52 | 4 | 7 | 28.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 11 | 4 | 12 | 26.6 | 24.0 | 24.0 | 4 | 18 | 29.0 | 30.0 | 4 | 18 | 19.0 | 19.0 | 4 | 9.5 | 4 | 10.5 | 25.6 | 40 | 52 | 4 | 6.5 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 10 | 4 | 10.5 | 26.1 | 24.0 | 24.0 | 4 | 16 | 28.0 | 30.0 | 4 | 16 | 19.0 | 19.0 | 4 | 8 | 4 | 9.5 | 25.3 | 40 | 52 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 8.5 | 4 | 9.5 | 25.6 | 24.0 | 24.0 | 4 | 14 | 28.0 | 29.0 | 4 | 14 | 19.0 | 19.0 | 4 | 7 | 4 | 8.5 | 25.0 | 40 | 52 | 5 | 7 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 8.5 | 25.6 | 24.0 | 24.0 | 4 | 13 | 28.0 | 29.0 | 4 | 13 | 19.0 | 19.0 | 4 | 7 | 4 | 11 | 24.3 | 41 | 53 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 9 | 8 | 8 | 4 | 7.5 | 4 | 8 | 24.8 | 24.0 | 24.0 | 4 | 12 | 27.0 | 28.0 | 4 | 12 | 19.0 | 19.0 | 4 | 7 | 4 | 10.5 | 23.5 | 41 | 53 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 9 | 8 | 8 | 4 | 7 | 4 | 7.5 | 24.6 | 24.0 | 24.0 | 5 | 17 | 27.0 | 28.0 | 5 | 17 | 19.0 | 19.0 | 4 | 6 | 4 | 9.5 | 23.5 | 41 | 53 | 5 | 7 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 9 | 10 | 8 | 8 | 4 | 7 | 4 | 9 | 24.3 | 25.0 | 25.0 | 4 | 12 | 27.0 | 29.0 | 4 | 12 | 19.0 | 19.0 | 4 | 6.5 | 4 | 12 | 23.1 | 42 | 54 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 9 | 11 | 8 | 8 | 4 | 6.5 | 4 | 8 | 24.4 | 25.0 | 25.0 | 5 | 17 | 27.0 | 29.0 | 5 | 17 | 19.0 | 19.0 | 4 | 6.5 | 4 | 10.5 | 22.6 | 43 | 55 | 4 | 6 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 10 | 11 | 8 | 8 | 4 | 6.5 | 4 | 8.5 | 23.9 | 26.0 | 26.0 | 5 | 18 | 26.0 | 29.0 | 5 | 18 | 19.0 | 19.0 | 4 | 6 | 4 | 10.5 | 22.9 | 43 | 55 | 5 | 8 | 26.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 10 | 11 | 8 | 8 | 4 | 6 | 4 | 8 | 23.9 | 26.0 | 26.0 | 5 | 17 | 26.0 | 29.0 | 5 | 17 | 19.0 | 19.0 | 5 | 8.5 | 4 | 10.5 | 22.9 | 43 | 55 | 5 | 8 | 26.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 10 | 12 | 8 | 8 | 5 | 8 | 4 | 7 | 24.0 | 26.0 | 26.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 19.0 | 19.0 | 5 | 9 | 4 | 9.5 | 22.5 | 44 | 56 | 5 | 8.5 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 11 | 12 | 8 | 8 | 5 | 9 | 4 | 8 | 23.6 | 27.0 | 27.0 | 5 | 17 | 26.0 | 29.0 | 5 | 17 | 19.0 | 19.0 | 5 | 8.5 | 4 | 9.5 | 22.8 | 44 | 56 | 5 | 8 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 11 | 13 | 8 | 8 | 5 | 8.5 | 4 | 7 | 23.8 | 27.0 | 27.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 19.0 | 19.0 | 5 | 8.5 | 4 | 8.5 | 22.5 | 45 | 57 | 5 | 8.5 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 12 | 13 | 8 | 8 | 5 | 8.5 | 4 | 8 | 23.5 | 28.0 | 28.0 | 5 | 17 | 26.0 | 29.0 | 5 | 17 | 19.0 | 19.0 | 5 | 8 | 4 | 8.5 | 22.8 | 45 | 57 | 5 | 8 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 12 | 14 | 8 | 8 | 5 | 8 | 4 | 7 | 23.6 | 28.0 | 28.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 19.0 | 19.0 | 5 | 8 | 4 | 7.5 | 22.6 | 46 | 58 | 5 | 8.5 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 13 | 14 | 8 | 8 | 5 | 8 | 4 | 7.5 | 23.4 | 29.0 | 29.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 19.0 | 19.0 | 5 | 8 | 4 | 7.5 | 22.8 | 46 | 58 | 5 | 8 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 13 | 14 | 8 | 8 | 5 | 7.5 | 4 | 7.5 | 23.4 | 29.0 | 29.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 19.0 | 19.0 | 5 | 7.5 | 4 | 7.5 | 22.8 | 46 | 58 | 5 | 7.5 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 13 | 15 | 8 | 8 | 5 | 7.5 | 4 | 7 | 23.6 | 29.0 | 29.0 | 5 | 15 | 26.0 | 29.0 | 5 | 15 | 19.0 | 19.0 | 5 | 7.5 | 4 | 7 | 22.8 | 47 | 59 | 5 | 8 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 14 | 15 | 8 | 8 | 5 | 7.5 | 4 | 7 | 23.4 | 30.0 | 30.0 | 5 | 16 | 25.0 | 29.0 | 5 | 16 | 18.0 | 19.0 | 5 | 7.5 | 4 | 7 | 22.9 | 47 | 59 | 5 | 7.5 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 14 | 15 | 8 | 8 | 5 | 7 | 4 | 7 | 23.4 | 30.0 | 30.0 | 5 | 15 | 25.0 | 29.0 | 5 | 15 | 18.0 | 19.0 | 5 | 7 | 4 | 7 | 22.9 | 47 | 59 | 5 | 7 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 50 FT | 14 | 16 | 8 | 8 | 5 | 7 | 4 | 6.5 | 23.6 | 30.0 | 30.0 | 5 | 15 | 25.0 | 29.0 | 5 | 15 | 18.0 | 19.0 | 5 | 7 | 4 | 6.5 | 22.9 | 48 | 60 | 5 | 7.5 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |

## SPAN (S) = 5 FT  HEIGHT (HT) = 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=5′ | HT=6′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=5′ | HT=6′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9.5 | 33.9 | 27.0 | 27.0 | 4 | 22 | 56.5 | 42.5 | 4 | 22 | 23.0 | 23.0 | 4 | 12 | 4 | 10 | 47.5 | 64 | 76 | 4 | 8.5 | 31.0 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9.5 | 33.9 | 27.0 | 27.0 | 4 | 21 | 56.5 | 42.5 | 4 | 21 | 22.0 | 22.0 | 4 | 11 | 4 | 9.5 | 42.8 | 64 | 76 | 4 | 8 | 30.0 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 10 | 4 | 10 | 33.9 | 24.0 | 24.0 | 4 | 20 | 56.5 | 46.0 | 4 | 20 | 21.0 | 21.0 | 4 | 12 | 4 | 9 | 38.9 | 64 | 76 | 4 | 8.5 | 29.0 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10.5 | 38.3 | 24.0 | 24.0 | 4 | 21 | 33.0 | 35.0 | 4 | 21 | 20.0 | 20.0 | 4 | 12 | 4 | 8.5 | 35.5 | 64 | 76 | 4 | 7.5 | 28.0 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 10 | 34.4 | 24.0 | 24.0 | 4 | 20 | 30.0 | 31.0 | 4 | 20 | 19.0 | 20.0 | 4 | 10.5 | 4 | 8 | 33.5 | 64 | 76 | 4 | 7 | 28.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 10.5 | 4 | 9 | 32.9 | 24.0 | 24.0 | 4 | 18 | 29.0 | 30.0 | 4 | 18 | 19.0 | 19.0 | 4 | 9 | 4 | 7.5 | 32.3 | 64 | 76 | 4 | 6.5 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 8 | 8 | 4 | 9.5 | 4 | 8 | 31.9 | 24.0 | 24.0 | 4 | 16 | 28.0 | 30.0 | 4 | 16 | 19.0 | 19.0 | 4 | 7.5 | 4 | 7 | 31.3 | 64 | 76 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 8 | 8 | 8 | 4 | 8.5 | 4 | 7 | 31.1 | 24.0 | 24.0 | 4 | 14 | 28.0 | 29.0 | 4 | 14 | 19.0 | 19.0 | 4 | 7 | 4 | 6 | 30.8 | 64 | 76 | 5 | 7 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 8 | 9 | 8 | 8 | 4 | 8 | 4 | 6.5 | 30.8 | 24.0 | 24.0 | 4 | 13 | 28.0 | 29.0 | 4 | 13 | 19.0 | 19.0 | 4 | 7 | 4 | 7 | 30.9 | 65 | 77 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 8 | 9 | 8 | 8 | 4 | 7.5 | 4 | 6.5 | 29.1 | 24.0 | 24.0 | 4 | 12 | 27.0 | 28.0 | 4 | 12 | 19.0 | 19.0 | 4 | 6.5 | 4 | 7 | 29.1 | 65 | 77 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 8 | 9 | 8 | 8 | 4 | 7 | 5 | 7 | 29.0 | 24.0 | 24.0 | 5 | 17 | 27.0 | 28.0 | 5 | 17 | 19.0 | 19.0 | 4 | 6 | 4 | 6.5 | 29.0 | 65 | 77 | 5 | 7.5 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 9 | 10 | 8 | 8 | 4 | 7 | 4 | 6.5 | 29.1 | 25.0 | 25.0 | 4 | 12 | 26.0 | 29.0 | 4 | 12 | 19.0 | 19.0 | 4 | 6 | 4 | 7.5 | 29.3 | 66 | 78 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 9 | 10 | 8 | 8 | 4 | 6.5 | 4 | 6 | 29.1 | 25.0 | 25.0 | 5 | 17 | 26.0 | 29.0 | 5 | 17 | 19.0 | 19.0 | 5 | 8.5 | 4 | 7 | 29.1 | 66 | 78 | 5 | 7.5 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 10 | 11 | 8 | 8 | 4 | 6.5 | 5 | 8 | 29.4 | 26.0 | 26.0 | 4 | 12 | 26.0 | 29.0 | 4 | 12 | 19.0 | 19.0 | 4 | 6 | 4 | 6.5 | 29.4 | 67 | 79 | 5 | 8.5 | 26.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 10 | 11 | 8 | 8 | 4 | 6 | 5 | 7.5 | 29.3 | 26.0 | 26.0 | 5 | 17 | 26.0 | 29.0 | 5 | 17 | 19.0 | 19.0 | 5 | 8.5 | 4 | 6 | 29.4 | 67 | 79 | 5 | 8 | 26.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 10 | 12 | 8 | 8 | 5 | 8.5 | 5 | 7.5 | 29.3 | 26.0 | 26.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 19.0 | 19.0 | 5 | 9 | 4 | 6 | 29.5 | 68 | 80 | 5 | 8.5 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 11 | 12 | 8 | 8 | 5 | 9 | 5 | 8 | 29.5 | 27.0 | 31.0 | 5 | 17 | 26.0 | 29.0 | 5 | 17 | 19.0 | 19.0 | 5 | 8.5 | 5 | 8 | 29.6 | 68 | 80 | 5 | 8 | 26.0 | 30.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 11 | 13 | 8 | 8 | 5 | 8.5 | 5 | 7.5 | 29.5 | 27.0 | 31.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 19.0 | 19.0 | 5 | 8.5 | 5 | 8.5 | 29.8 | 69 | 81 | 5 | 8.5 | 26.0 | 30.0 | 5 | 12 | 5 | 11.5 | 0 |
| 36 FT | 12 | 13 | 8 | 8 | 5 | 8.5 | 5 | 8 | 29.8 | 28.0 | 32.0 | 5 | 17 | 26.0 | 29.0 | 5 | 17 | 18.0 | 19.0 | 5 | 8 | 5 | 8 | 29.9 | 69 | 81 | 5 | 8 | 26.0 | 30.0 | 5 | 12 | 5 | 11 | 0 |
| 38 FT | 12 | 14 | 8 | 8 | 5 | 8 | 5 | 7.5 | 29.8 | 28.0 | 32.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 18.0 | 19.0 | 5 | 8.5 | 5 | 8.5 | 30.1 | 70 | 82 | 5 | 8.5 | 26.0 | 30.0 | 5 | 12 | 5 | 10 | 0 |
| 40 FT | 12 | 14 | 8 | 8 | 5 | 7.5 | 5 | 7 | 29.8 | 28.0 | 32.0 | 5 | 15 | 26.0 | 29.0 | 5 | 15 | 18.0 | 19.0 | 5 | 8 | 5 | 8 | 30.0 | 70 | 82 | 5 | 8 | 26.0 | 30.0 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 13 | 14 | 8 | 8 | 5 | 8 | 5 | 7.5 | 29.9 | 29.0 | 33.0 | 5 | 16 | 26.0 | 29.0 | 5 | 16 | 18.0 | 19.0 | 5 | 7.5 | 5 | 7.5 | 30.1 | 70 | 82 | 5 | 7.5 | 26.0 | 30.0 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 13 | 15 | 8 | 8 | 5 | 7.5 | 5 | 7 | 30.0 | 29.0 | 33.0 | 5 | 15 | 26.0 | 29.0 | 5 | 15 | 18.0 | 19.0 | 5 | 8 | 5 | 8 | 30.4 | 71 | 83 | 5 | 8 | 27.0 | 30.0 | 5 | 12 | 5 | 9.5 | 0 |
| 46 FT | 14 | 15 | 8 | 8 | 5 | 7.5 | 5 | 6.5 | 30.1 | 30.0 | 34.0 | 5 | 16 | 26.0 | 28.0 | 5 | 16 | 18.0 | 19.0 | 5 | 7.5 | 5 | 7.5 | 30.5 | 71 | 83 | 5 | 7.5 | 27.0 | 30.0 | 5 | 12 | 5 | 9.5 | 0 |
| 48 FT | 14 | 15 | 9 | 8 | 5 | 7.5 | 5 | 8 | 30.6 | 30.0 | 34.0 | 5 | 16 | 26.0 | 28.0 | 5 | 16 | 18.0 | 19.0 | 5 | 7.5 | 5 | 8 | 30.8 | 71 | 83 | 5 | 7.5 | 27.0 | 30.0 | 5 | 12 | 5 | 9 | 0 |
| 50 FT | 14 | 16 | 9 | 8 | 5 | 7 | 5 | 7.5 | 30.8 | 30.0 | 34.0 | 5 | 15 | 26.0 | 28.0 | 5 | 15 | 18.0 | 19.0 | 5 | 7.5 | 5 | 8 | 31.0 | 72 | 84 | 5 | 7.5 | 27.0 | 30.0 | 5 | 12 | 5 | 8.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

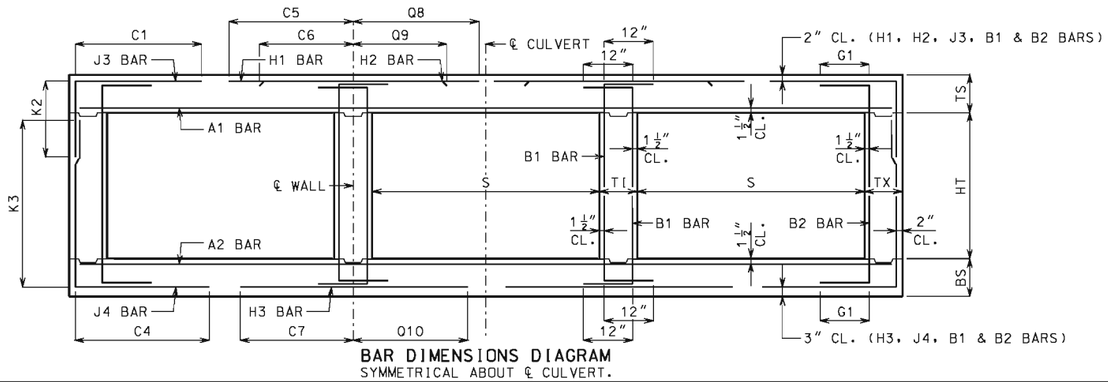
SPAN (S): 5 FEET
HEIGHT (HT): 3 THRU 6 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

## SPAN (S) = 5 FT  HEIGHT (HT) = 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=7′ | K2 HT=8′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=7′ | K3 HT=8′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 9 | 33.9 | 27.0 | 27.0 | 4 | 22 | 56.5 | 42.5 | 4 | 22 | 23.0 | 23.0 | 4 | 11 | 4 | 7 | 48.0 | 88 | 100 | 4 | 8 | 46.0 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 4 | 6 | 4 | 8.5 | 33.9 | 27.0 | 27.0 | 4 | 21 | 56.5 | 42.5 | 4 | 21 | 23.0 | 23.0 | 4 | 10.5 | 4 | 6.5 | 48.0 | 88 | 100 | 4 | 8 | 32.0 | 31.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 9.5 | 4 | 7 | 33.9 | 24.0 | 24.0 | 4 | 20 | 56.5 | 46.0 | 4 | 20 | 21.0 | 21.0 | 4 | 11.5 | 4 | 6 | 48.0 | 88 | 100 | 4 | 8 | 31.0 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 7 | 33.9 | 24.0 | 24.0 | 4 | 21 | 56.5 | 35.0 | 4 | 21 | 20.0 | 20.0 | 4 | 11 | 5 | 6 | 48.0 | 88 | 100 | 4 | 7.5 | 29.0 | 30.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 12 | 4 | 6.5 | 51.8 | 24.0 | 24.0 | 4 | 20 | 34.0 | 31.0 | 4 | 20 | 19.0 | 20.0 | 4 | 10 | 5 | 6 | 46.0 | 88 | 100 | 4 | 7 | 28.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 9 | 8 | 4 | 11 | 4 | 7 | 43.8 | 24.0 | 24.0 | 4 | 18 | 30.0 | 30.0 | 4 | 18 | 19.0 | 20.0 | 4 | 9 | 4 | 6 | 41.6 | 88 | 100 | 4 | 6.5 | 28.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 8 | 9 | 8 | 4 | 9.5 | 4 | 6 | 41.3 | 24.0 | 24.0 | 4 | 16 | 29.0 | 30.0 | 4 | 16 | 19.0 | 19.0 | 4 | 8 | 5 | 6 | 40.4 | 88 | 100 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 9 | 8 | 4 | 9 | 5 | 7 | 39.9 | 24.0 | 28.0 | 4 | 15 | 28.0 | 29.0 | 4 | 15 | 19.0 | 19.0 | 4 | 8 | 5 | 6.5 | 41.4 | 89 | 101 | 4 | 6.5 | 27.0 | 29.0 | 5 | 12 | 5 | 11.5 | 0 |
| 16 FT | 8 | 9 | 9 | 8 | 4 | 8 | 5 | 6 | 39.1 | 24.0 | 28.0 | 4 | 13 | 28.0 | 29.0 | 4 | 13 | 19.0 | 19.0 | 4 | 7 | 5 | 6 | 40.8 | 89 | 101 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 11 | 0 |
| 18 FT | 8 | 9 | 9 | 8 | 4 | 7.5 | 5 | 6 | 36.5 | 24.0 | 28.0 | 4 | 13 | 26.0 | 28.0 | 4 | 13 | 19.0 | 19.0 | 4 | 7 | 5 | 6 | 38.1 | 89 | 101 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 11.5 | 0 |
| 20 FT | 8 | 9 | 9 | 8 | 4 | 7 | 6 | 7 | 39.1 | 24.0 | 32.0 | 5 | 18 | 26.0 | 28.0 | 5 | 18 | 19.0 | 19.0 | 4 | 6 | 6 | 7 | 40.9 | 89 | 101 | 5 | 7.5 | 27.0 | 29.0 | 5 | 12 | 5 | 10.5 | 0 |
| 22 FT | 8 | 10 | 9 | 8 | 4 | 6.5 | 6 | 7 | 38.8 | 24.0 | 28.0 | 5 | 17 | 27.0 | 28.0 | 5 | 17 | 19.0 | 20.0 | 4 | 6.5 | 5 | 6 | 39.0 | 90 | 102 | 5 | 8 | 27.0 | 29.0 | 5 | 12 | 5 | 10 | 0 |
| 24 FT | 9 | 11 | 9 | 8 | 4 | 6.5 | 5 | 6 | 37.0 | 25.0 | 29.0 | 5 | 18 | 26.0 | 28.0 | 5 | 18 | 19.0 | 19.0 | 4 | 6.5 | 5 | 6 | 39.8 | 91 | 103 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 9.5 | 0 |
| 26 FT | 9 | 11 | 9 | 8 | 4 | 6 | 5 | 6 | 36.9 | 25.0 | 29.0 | 5 | 16 | 26.0 | 28.0 | 5 | 16 | 19.0 | 19.0 | 4 | 6 | 5 | 6 | 39.6 | 91 | 103 | 5 | 8.5 | 27.0 | 29.0 | 5 | 12 | 5 | 8.5 | 0 |
| 28 FT | 10 | 12 | 9 | 8 | 4 | 6 | 5 | 6 | 37.9 | 30.0 | 30.0 | 5 | 17 | 26.0 | 28.0 | 5 | 17 | 19.0 | 19.0 | 4 | 6 | 5 | 6 | 40.3 | 92 | 104 | 4 | 6 | 27.0 | 29.0 | 5 | 12 | 5 | 8.5 | 0 |
| 30 FT | 10 | 12 | 9 | 8 | 4 | 6 | 5 | 6 | 37.8 | 30.0 | 30.0 | 5 | 16 | 26.0 | 28.0 | 5 | 16 | 19.0 | 19.0 | 4 | 6 | 6 | 7.5 | 43.1 | 92 | 104 | 5 | 8.5 | 27.0 | 29.0 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 11 | 12 | 10 | 8 | 4 | 6 | 5 | 6.5 | 38.4 | 31.0 | 31.0 | 5 | 17 | 26.0 | 28.0 | 5 | 17 | 18.0 | 19.0 | 5 | 9 | 5 | 6.5 | 39.6 | 92 | 104 | 5 | 8 | 27.0 | 29.0 | 5 | 12 | 5 | 8 | 0 |
| 34 FT | 11 | 13 | 10 | 8 | 5 | 9 | 5 | 6.5 | 38.3 | 31.0 | 31.0 | 5 | 16 | 26.0 | 28.0 | 5 | 16 | 19.0 | 19.0 | 5 | 9 | 5 | 6.5 | 40.4 | 93 | 105 | 5 | 8.5 | 28.0 | 30.0 | 5 | 12 | 5 | 8 | 0 |
| 36 FT | 12 | 13 | 10 | 8 | 5 | 9 | 5 | 6.5 | 39.1 | 32.0 | 32.0 | 5 | 17 | 26.0 | 28.0 | 5 | 17 | 18.0 | 19.0 | 5 | 8.5 | 5 | 6.5 | 40.3 | 93 | 105 | 5 | 8 | 27.0 | 30.0 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 12 | 14 | 10 | 8 | 5 | 8.5 | 5 | 6 | 39.0 | 32.0 | 32.0 | 5 | 17 | 26.0 | 28.0 | 5 | 17 | 18.0 | 19.0 | 5 | 9 | 5 | 6.5 | 40.9 | 94 | 106 | 5 | 8.5 | 28.0 | 30.0 | 5 | 12 | 5 | 8 | 0 |
| 40 FT | 12 | 14 | 11 | 8 | 5 | 8 | 5 | 7 | 38.9 | 32.0 | 32.0 | 5 | 16 | 26.0 | 28.0 | 5 | 16 | 18.0 | 19.0 | 5 | 8.5 | 5 | 7 | 40.8 | 94 | 106 | 5 | 8 | 28.0 | 30.0 | 5 | 12 | 5 | 7.5 | 0 |
| 42 FT | 13 | 14 | 11 | 8 | 5 | 8.5 | 5 | 7 | 39.6 | 33.0 | 33.0 | 5 | 17 | 26.0 | 28.0 | 5 | 17 | 18.0 | 19.0 | 5 | 8 | 5 | 7 | 40.5 | 94 | 106 | 5 | 7.5 | 28.0 | 30.0 | 5 | 12 | 5 | 7.5 | 0 |
| 44 FT | 13 | 15 | 11 | 8 | 5 | 8 | 5 | 6.5 | 39.5 | 33.0 | 33.0 | 5 | 16 | 26.0 | 28.0 | 5 | 16 | 18.0 | 19.0 | 5 | 8 | 5 | 7 | 41.3 | 95 | 107 | 5 | 8 | 28.0 | 30.0 | 5 | 12 | 5 | 7.5 | 0 |
| 46 FT | 13 | 15 | 12 | 8 | 5 | 7.5 | 5 | 6.5 | 39.5 | 33.0 | 33.0 | 5 | 15 | 26.0 | 28.0 | 5 | 15 | 18.0 | 19.0 | 5 | 8 | 5 | 6.5 | 41.0 | 95 | 107 | 5 | 7.5 | 28.0 | 30.0 | 5 | 12 | 5 | 7 | 0 |
| 48 FT | 14 | 15 | 12 | 8 | 5 | 8 | 5 | 6.5 | 40.3 | 34.0 | 34.0 | 5 | 17 | 26.0 | 27.0 | 5 | 17 | 18.0 | 19.0 | 5 | 7.5 | 5 | 6.5 | 40.9 | 95 | 107 | 5 | 7 | 28.0 | 30.0 | 5 | 12 | 5 | 7 | 0 |
| 50 FT | 14 | 16 | 12 | 8 | 5 | 7.5 | 5 | 6.5 | 40.1 | 34.0 | 34.0 | 5 | 16 | 26.0 | 27.0 | 5 | 16 | 18.0 | 19.0 | 5 | 8 | 5 | 6.5 | 41.6 | 96 | 108 | 5 | 7.5 | 28.0 | 30.0 | 5 | 12 | 5 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 5 FEET
HEIGHT (HT): 7 THRU 8 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 5 OF 27

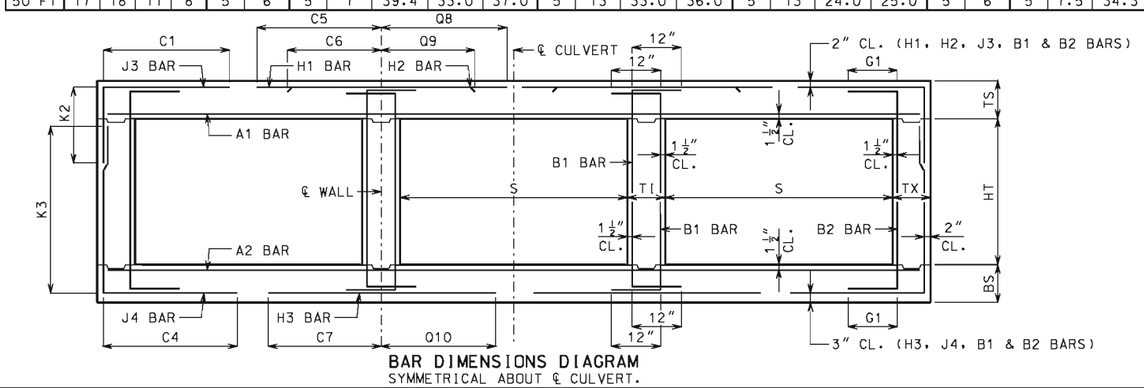
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 6 FT  HEIGHT (HT) = 3 FT OR 4 FT OR 5 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=3' | HT=4' | HT=5' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=3' | HT=4' | HT=5' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 5 | 8 | 4 | 9.5 | 37.5 | 27.0 | 27.0 | 27.0 | 4 | 17 | 64.5 | 48.5 | 4 | 17 | 24.0 | 23.0 | 4 | 10 | 4 | 10 | 38.1 | 40 | 52 | 64 | 4 | 7.5 | 33.0 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 5 | 8 | 4 | 9.5 | 37.5 | 27.0 | 27.0 | 27.0 | 4 | 17 | 64.5 | 48.5 | 4 | 17 | 23.0 | 22.0 | 4 | 9.5 | 4 | 9 | 35.1 | 40 | 52 | 64 | 4 | 7 | 33.0 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 7.5 | 4 | 8.5 | 35.8 | 24.0 | 24.0 | 24.0 | 4 | 14 | 43.0 | 52.0 | 4 | 14 | 21.0 | 21.0 | 4 | 9 | 4 | 9.5 | 32.1 | 40 | 52 | 64 | 4 | 6.5 | 32.0 | 33.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 9 | 4 | 9.5 | 32.6 | 24.0 | 24.0 | 24.0 | 4 | 14 | 35.0 | 38.0 | 4 | 14 | 21.0 | 20.0 | 4 | 8.5 | 4 | 8.5 | 30.0 | 40 | 52 | 64 | 4 | 6 | 31.0 | 32.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 9 | 4 | 9 | 30.4 | 24.0 | 24.0 | 24.0 | 4 | 13 | 33.0 | 35.0 | 4 | 13 | 20.0 | 20.0 | 4 | 8 | 4 | 8 | 29.0 | 40 | 52 | 64 | 5 | 7.5 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 8 | 4 | 8 | 29.4 | 24.0 | 24.0 | 24.0 | 4 | 12 | 32.0 | 34.0 | 4 | 12 | 20.0 | 20.0 | 4 | 7 | 4 | 7 | 28.4 | 40 | 52 | 64 | 5 | 6.5 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 8 | 8 | 4 | 7 | 4 | 7 | 28.8 | 24.0 | 24.0 | 24.0 | 5 | 17 | 31.0 | 33.0 | 5 | 17 | 20.0 | 20.0 | 4 | 6.5 | 4 | 9 | 27.4 | 41 | 53 | 65 | 5 | 7 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 8 | 8 | 4 | 6.5 | 4 | 6.5 | 28.3 | 24.0 | 24.0 | 24.0 | 5 | 16 | 31.0 | 32.0 | 5 | 16 | 21.0 | 21.0 | 5 | 9 | 4 | 8 | 26.9 | 41 | 53 | 65 | 5 | 6.5 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 9 | 10 | 8 | 8 | 4 | 6 | 4 | 7.5 | 27.6 | 25.0 | 25.0 | 25.0 | 5 | 16 | 30.0 | 33.0 | 5 | 16 | 20.0 | 20.0 | 5 | 9 | 4 | 9.5 | 26.5 | 42 | 54 | 66 | 5 | 7 | 29.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 9 | 10 | 8 | 8 | 5 | 9 | 4 | 6.5 | 27.4 | 25.0 | 25.0 | 25.0 | 5 | 16 | 30.0 | 32.0 | 5 | 16 | 21.0 | 21.0 | 5 | 8 | 4 | 8.5 | 26.3 | 42 | 54 | 66 | 5 | 6.5 | 29.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 10 | 11 | 8 | 8 | 5 | 9 | 4 | 7 | 27.0 | 26.0 | 26.0 | 26.0 | 5 | 15 | 30.0 | 33.0 | 5 | 15 | 20.0 | 20.0 | 5 | 8 | 4 | 8.5 | 26.0 | 43 | 55 | 67 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 10 | 11 | 8 | 8 | 5 | 8.5 | 4 | 6.5 | 26.0 | 26.0 | 26.0 | 26.0 | 5 | 15 | 29.0 | 32.0 | 5 | 15 | 20.0 | 20.0 | 5 | 7.5 | 4 | 8.5 | 25.0 | 43 | 55 | 67 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 11 | 12 | 8 | 8 | 5 | 8.5 | 4 | 6.5 | 25.8 | 27.0 | 27.0 | 27.0 | 5 | 15 | 29.0 | 32.0 | 5 | 15 | 20.0 | 20.0 | 5 | 8 | 4 | 8.5 | 24.9 | 44 | 56 | 68 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 4 | 6 | 25.6 | 27.0 | 27.0 | 27.0 | 5 | 14 | 29.0 | 32.0 | 5 | 14 | 20.0 | 20.0 | 5 | 6.5 | 4 | 8 | 24.9 | 44 | 56 | 68 | 5 | 6.5 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 12 | 13 | 8 | 8 | 5 | 7.5 | 4 | 6.5 | 25.5 | 28.0 | 28.0 | 28.0 | 5 | 14 | 29.0 | 32.0 | 5 | 14 | 19.0 | 20.0 | 5 | 7.5 | 4 | 8 | 24.9 | 45 | 57 | 69 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 12 | 14 | 8 | 8 | 5 | 7 | 4 | 6 | 25.6 | 28.0 | 28.0 | 28.0 | 5 | 13 | 29.0 | 32.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7.5 | 4 | 7.5 | 24.8 | 46 | 58 | 70 | 5 | 7 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 13 | 14 | 8 | 8 | 5 | 7 | 4 | 6 | 25.4 | 29.0 | 29.0 | 29.0 | 5 | 14 | 28.0 | 33.0 | 5 | 14 | 19.0 | 20.0 | 5 | 7 | 4 | 7.5 | 24.9 | 46 | 58 | 70 | 5 | 6.5 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 13 | 15 | 8 | 8 | 5 | 7 | 5 | 8.5 | 25.6 | 29.0 | 29.0 | 29.0 | 5 | 13 | 28.0 | 32.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7 | 4 | 7 | 24.8 | 47 | 59 | 71 | 5 | 7 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 36 FT | 14 | 15 | 8 | 8 | 5 | 7 | 4 | 6 | 25.4 | 30.0 | 30.0 | 30.0 | 5 | 13 | 28.0 | 33.0 | 5 | 13 | 19.0 | 20.0 | 5 | 6.5 | 4 | 7 | 25.0 | 47 | 59 | 71 | 5 | 6.5 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 38 FT | 14 | 16 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 25.5 | 30.0 | 30.0 | 30.0 | 5 | 13 | 28.0 | 32.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7 | 4 | 6.5 | 24.9 | 48 | 60 | 72 | 5 | 6.5 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 40 FT | 15 | 16 | 8 | 8 | 5 | 6.5 | 5 | 8 | 30.4 | 31.0 | 31.0 | 31.0 | 5 | 13 | 33.0 | 38.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6.5 | 4 | 6.5 | 25.1 | 48 | 60 | 72 | 5 | 6.5 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 42 FT | 15 | 17 | 8 | 8 | 5 | 6.5 | 5 | 8 | 30.6 | 31.0 | 31.0 | 31.0 | 5 | 12 | 33.0 | 37.0 | 5 | 12 | 24.0 | 25.0 | 5 | 6.5 | 4 | 6 | 25.1 | 49 | 61 | 73 | 5 | 6.5 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 44 FT | 16 | 17 | 8 | 8 | 5 | 6.5 | 5 | 7 | 30.5 | 32.0 | 32.0 | 32.0 | 5 | 13 | 33.0 | 37.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6.5 | 4 | 6 | 25.3 | 49 | 61 | 73 | 5 | 6 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 46 FT | 16 | 17 | 8 | 8 | 5 | 6 | 5 | 7 | 30.5 | 32.0 | 32.0 | 32.0 | 5 | 12 | 33.0 | 37.0 | 5 | 12 | 24.0 | 25.0 | 5 | 6 | 4 | 6 | 25.3 | 49 | 61 | 73 | 5 | 6 | 28.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 48 FT | 17 | 18 | 8 | 8 | 5 | 6 | 5 | 6.5 | 30.6 | 37.0 | 37.0 | 37.0 | 5 | 13 | 33.0 | 37.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6 | 5 | 6.5 | 25.5 | 50 | 62 | 74 | 5 | 6 | 28.0 | 33.0 | 5 | 12 | 5 | 11 | 0 |
| 50 FT | 17 | 18 | 8 | 8 | 5 | 6 | 5 | 6.5 | 30.6 | 37.0 | 37.0 | 37.0 | 5 | 12 | 33.0 | 37.0 | 5 | 12 | 24.0 | 25.0 | 5 | 6 | 5 | 6.5 | 25.4 | 50 | 62 | 74 | 5 | 6 | 28.0 | 33.0 | 5 | 12 | 5 | 10.5 | 0 |

## SPAN (S) = 6 FT  HEIGHT (HT) = 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=6' | HT=7' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=6' | HT=7' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 5 | 8 | 4 | 9.5 | 37.5 | 27.0 | 27.0 | 4 | 17 | 64.5 | 48.5 | 4 | 17 | 24.0 | 24.0 | 4 | 9.5 | 4 | 7.5 | 52.8 | 76 | 88 | 4 | 7 | 34.0 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 5 | 8 | 4 | 9.5 | 37.5 | 27.0 | 27.0 | 4 | 17 | 64.5 | 48.5 | 4 | 17 | 23.0 | 23.0 | 4 | 8.5 | 4 | 7 | 47.3 | 76 | 88 | 4 | 6.5 | 33.0 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 7 | 4 | 7 | 37.5 | 24.0 | 24.0 | 4 | 14 | 64.5 | 52.0 | 4 | 14 | 21.0 | 22.0 | 4 | 8.5 | 4 | 7 | 43.0 | 76 | 88 | 4 | 6.5 | 32.0 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 8.5 | 4 | 7.5 | 41.9 | 24.0 | 24.0 | 4 | 14 | 37.0 | 39.0 | 4 | 14 | 21.0 | 21.0 | 4 | 8 | 4 | 6.5 | 39.1 | 76 | 88 | 4 | 6 | 31.0 | 33.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 8.5 | 4 | 7 | 37.6 | 24.0 | 24.0 | 4 | 13 | 34.0 | 35.0 | 4 | 13 | 20.0 | 20.0 | 4 | 7.5 | 4 | 6 | 36.9 | 76 | 88 | 5 | 7 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 8 | 8 | 8 | 4 | 8 | 4 | 6 | 36.0 | 24.0 | 24.0 | 4 | 12 | 32.0 | 34.0 | 4 | 12 | 20.0 | 20.0 | 4 | 6.5 | 5 | 6 | 35.4 | 76 | 88 | 5 | 6.5 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 8 | 8 | 4 | 7 | 5 | 6.5 | 34.8 | 24.0 | 24.0 | 5 | 17 | 31.0 | 33.0 | 5 | 17 | 20.0 | 20.0 | 4 | 6.5 | 4 | 6 | 35.0 | 77 | 89 | 5 | 7 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 8 | 9 | 8 | 8 | 4 | 6 | 5 | 6 | 33.9 | 24.0 | 28.0 | 5 | 16 | 31.0 | 33.0 | 5 | 16 | 21.0 | 21.0 | 5 | 8.5 | 5 | 6.5 | 34.1 | 77 | 89 | 5 | 6.5 | 30.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 9 | 10 | 8 | 8 | 4 | 6 | 5 | 6.5 | 33.8 | 25.0 | 25.0 | 5 | 16 | 30.0 | 33.0 | 5 | 16 | 20.0 | 20.0 | 5 | 9 | 4 | 6 | 34.0 | 78 | 90 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 9 | 10 | 8 | 8 | 5 | 9 | 5 | 6.5 | 33.4 | 25.0 | 29.0 | 5 | 16 | 30.0 | 32.0 | 5 | 16 | 21.0 | 21.0 | 5 | 8 | 5 | 6.5 | 33.6 | 78 | 90 | 5 | 6.5 | 29.0 | 32.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 9 | 11 | 8 | 8 | 5 | 8 | 5 | 6 | 33.1 | 25.0 | 29.0 | 5 | 16 | 30.0 | 32.0 | 5 | 16 | 21.0 | 22.0 | 5 | 8 | 5 | 7 | 33.8 | 79 | 91 | 5 | 7.5 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 10 | 11 | 8 | 8 | 5 | 8.5 | 5 | 7 | 31.6 | 26.0 | 30.0 | 5 | 15 | 29.0 | 32.0 | 5 | 15 | 20.0 | 20.0 | 5 | 7.5 | 5 | 7 | 31.9 | 79 | 91 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 10 | 12 | 8 | 8 | 5 | 7.5 | 5 | 6.5 | 31.6 | 26.0 | 30.0 | 5 | 15 | 29.0 | 32.0 | 5 | 15 | 20.0 | 21.0 | 5 | 8 | 5 | 7.5 | 32.0 | 80 | 92 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 11 | 13 | 8 | 8 | 5 | 8 | 5 | 6.5 | 31.9 | 27.0 | 31.0 | 5 | 14 | 29.0 | 32.0 | 5 | 14 | 20.0 | 20.0 | 5 | 8 | 5 | 7.5 | 32.3 | 81 | 93 | 5 | 7.5 | 29.0 | 33.0 | 5 | 12 | 5 | 11 | 0 |
| 28 FT | 12 | 13 | 8 | 8 | 5 | 8 | 5 | 7 | 31.9 | 28.0 | 32.0 | 5 | 14 | 29.0 | 32.0 | 5 | 14 | 19.0 | 20.0 | 5 | 7.5 | 5 | 7 | 32.3 | 81 | 93 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 10 | 0 |
| 30 FT | 12 | 14 | 8 | 8 | 5 | 7.5 | 5 | 6.5 | 32.0 | 28.0 | 32.0 | 5 | 13 | 29.0 | 32.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7.5 | 5 | 7.5 | 32.4 | 82 | 94 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 9.5 | 0 |
| 32 FT | 13 | 14 | 8 | 8 | 5 | 7.5 | 5 | 6.5 | 32.0 | 33.0 | 33.0 | 5 | 14 | 28.0 | 32.0 | 5 | 14 | 19.0 | 20.0 | 5 | 7 | 5 | 7 | 32.5 | 82 | 94 | 5 | 6.5 | 29.0 | 33.0 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 13 | 15 | 8 | 8 | 5 | 7 | 5 | 6.5 | 32.1 | 33.0 | 33.0 | 5 | 13 | 28.0 | 32.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7 | 5 | 7 | 32.6 | 83 | 95 | 5 | 7 | 29.0 | 33.0 | 5 | 12 | 5 | 9.5 | 0 |
| 36 FT | 14 | 15 | 8 | 8 | 5 | 7 | 5 | 6 | 32.3 | 34.0 | 34.0 | 5 | 14 | 28.0 | 32.0 | 5 | 14 | 19.0 | 20.0 | 5 | 7 | 5 | 6.5 | 32.8 | 83 | 95 | 5 | 6.5 | 29.0 | 33.0 | 5 | 12 | 5 | 9.5 | 0 |
| 38 FT | 14 | 16 | 9 | 8 | 5 | 6.5 | 5 | 7 | 32.9 | 30.0 | 34.0 | 5 | 13 | 28.0 | 32.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7 | 5 | 8 | 33.1 | 84 | 96 | 5 | 6.5 | 29.0 | 33.0 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 14 | 16 | 10 | 8 | 5 | 6 | 5 | 7.5 | 33.3 | 30.0 | 34.0 | 5 | 12 | 28.0 | 32.0 | 5 | 12 | 19.0 | 20.0 | 5 | 6.5 | 5 | 7.5 | 33.4 | 84 | 96 | 5 | 6.5 | 29.0 | 33.0 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 15 | 17 | 10 | 8 | 5 | 6.5 | 5 | 7.5 | 38.5 | 31.0 | 35.0 | 5 | 13 | 33.0 | 37.0 | 5 | 13 | 24.0 | 25.0 | 5 | 7 | 5 | 7.5 | 33.6 | 85 | 97 | 5 | 6.5 | 29.0 | 33.0 | 5 | 12 | 5 | 9 | 0 |
| 44 FT | 15 | 17 | 10 | 8 | 5 | 6.5 | 5 | 7.5 | 38.5 | 31.0 | 35.0 | 5 | 12 | 33.0 | 37.0 | 5 | 12 | 24.0 | 25.0 | 5 | 6.5 | 5 | 7.5 | 33.6 | 85 | 97 | 5 | 6 | 29.0 | 33.0 | 5 | 12 | 5 | 8.5 | 0 |
| 46 FT | 16 | 17 | 10 | 8 | 5 | 6.5 | 5 | 7 | 38.6 | 32.0 | 36.0 | 5 | 13 | 33.0 | 36.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6 | 5 | 7.5 | 33.8 | 85 | 97 | 5 | 6 | 29.0 | 33.0 | 5 | 12 | 5 | 8 | 0 |
| 48 FT | 16 | 18 | 11 | 8 | 5 | 6 | 5 | 7 | 39.3 | 32.0 | 36.0 | 5 | 12 | 33.0 | 36.0 | 5 | 12 | 24.0 | 25.0 | 5 | 6.5 | 5 | 7.5 | 34.1 | 86 | 98 | 5 | 6 | 29.0 | 34.0 | 5 | 12 | 5 | 8.5 | 0 |
| 50 FT | 17 | 18 | 11 | 8 | 5 | 6 | 5 | 7 | 39.4 | 33.0 | 37.0 | 5 | 13 | 33.0 | 36.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6 | 5 | 7.5 | 34.3 | 86 | 98 | 5 | 6 | 29.0 | 33.0 | 5 | 12 | 5 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

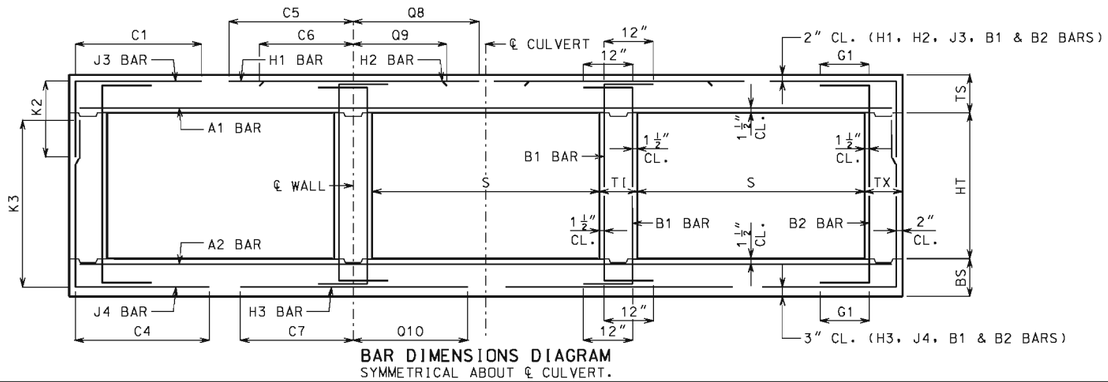
SPAN (S): 6 FEET
HEIGHT (HT): 3 THRU 7 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

## SPAN (S) = 6 FT  HEIGHT (HT) = 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 11 | 8 | 8 | 8 | 5 | 7.5 | 4 | 7 | 37.5 | 27.0 | 27.0 | 4 | 17 | 64.5 | 48.5 | 4 | 17 | 24.0 | 25.0 | 4 | 8.5 | 5 | 6.5 | 54.0 | 100 | 112 | 4 | 7 | 52.0 | 35.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 11 | 8 | 8 | 8 | 5 | 7.5 | 4 | 6.5 | 37.5 | 27.0 | 27.0 | 4 | 17 | 64.5 | 48.5 | 4 | 17 | 23.0 | 24.0 | 4 | 8 | 5 | 6 | 54.0 | 100 | 112 | 4 | 6.5 | 35.0 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 9 | 8 | 4 | 7 | 4 | 6 | 38.1 | 24.0 | 24.0 | 4 | 14 | 64.5 | 52.0 | 4 | 14 | 22.0 | 22.0 | 4 | 8 | 5 | 6.5 | 54.8 | 100 | 112 | 4 | 6 | 33.0 | 34.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 9 | 8 | 4 | 8.5 | 4 | 6 | 38.1 | 24.0 | 24.0 | 4 | 14 | 64.5 | 40.0 | 4 | 14 | 21.0 | 21.0 | 4 | 8 | 5 | 6 | 50.8 | 100 | 112 | 4 | 6 | 32.0 | 33.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 9 | 8 | 4 | 8.5 | 4 | 6 | 50.1 | 24.0 | 24.0 | 4 | 14 | 35.0 | 35.0 | 4 | 14 | 20.0 | 20.0 | 4 | 8.5 | 5 | 6.5 | 50.8 | 101 | 113 | 4 | 6.5 | 31.0 | 33.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 9 | 8 | 4 | 8 | 5 | 6.5 | 45.8 | 24.0 | 28.0 | 4 | 12 | 33.0 | 33.0 | 4 | 12 | 20.0 | 20.0 | 4 | 7.5 | 5 | 6 | 47.5 | 101 | 113 | 4 | 6 | 31.0 | 33.0 | 5 | 12 | 5 | 11 | 0 |
| 12 FT | 8 | 9 | 10 | 8 | 4 | 7 | 5 | 6.5 | 43.0 | 24.0 | 28.0 | 5 | 17 | 32.0 | 33.0 | 5 | 17 | 20.0 | 20.0 | 4 | 6.5 | 5 | 6.5 | 44.8 | 101 | 113 | 5 | 7 | 30.0 | 32.0 | 5 | 12 | 5 | 11 | 0 |
| 14 FT | 8 | 9 | 10 | 8 | 4 | 6.5 | 5 | 6 | 41.6 | 28.0 | 28.0 | 5 | 17 | 31.0 | 32.0 | 5 | 17 | 21.0 | 21.0 | 4 | 6 | 5 | 6 | 43.5 | 101 | 113 | 5 | 6.5 | 30.0 | 32.0 | 5 | 12 | 5 | 10 | 0 |
| 16 FT | 8 | 10 | 10 | 8 | 4 | 6 | 6 | 7 | 43.3 | 28.0 | 28.0 | 5 | 16 | 30.0 | 32.0 | 5 | 16 | 22.0 | 22.0 | 5 | 9 | 5 | 6 | 44.4 | 102 | 114 | 5 | 7 | 30.0 | 33.0 | 5 | 12 | 5 | 9.5 | 0 |
| 18 FT | 9 | 10 | 10 | 8 | 4 | 6 | 5 | 6 | 41.8 | 29.0 | 29.0 | 5 | 16 | 30.0 | 32.0 | 5 | 16 | 20.0 | 21.0 | 5 | 8.5 | 6 | 7.5 | 46.4 | 102 | 114 | 5 | 7 | 30.0 | 32.0 | 5 | 12 | 5 | 9 | 0 |
| 20 FT | 9 | 11 | 10 | 8 | 5 | 8.5 | 5 | 6 | 41.0 | 29.0 | 29.0 | 5 | 16 | 30.0 | 32.0 | 5 | 16 | 21.0 | 22.0 | 5 | 8.5 | 5 | 6 | 44.4 | 103 | 115 | 5 | 7 | 30.0 | 33.0 | 5 | 12 | 5 | 8.5 | 0 |
| 22 FT | 10 | 11 | 10 | 8 | 5 | 9 | 5 | 6.5 | 39.9 | 30.0 | 30.0 | 5 | 15 | 29.0 | 32.0 | 5 | 15 | 20.0 | 20.0 | 5 | 8 | 5 | 6 | 41.4 | 103 | 115 | 5 | 7 | 30.0 | 33.0 | 5 | 12 | 5 | 9 | 0 |
| 24 FT | 10 | 12 | 10 | 8 | 5 | 8 | 5 | 6.5 | 39.5 | 30.0 | 30.0 | 5 | 15 | 29.0 | 32.0 | 5 | 15 | 20.0 | 21.0 | 5 | 8 | 5 | 6 | 42.3 | 104 | 116 | 5 | 7 | 30.0 | 33.0 | 5 | 12 | 5 | 8.5 | 0 |
| 26 FT | 11 | 12 | 10 | 8 | 5 | 8 | 5 | 6 | 40.5 | 31.0 | 31.0 | 5 | 14 | 29.0 | 32.0 | 5 | 14 | 19.0 | 20.0 | 5 | 7 | 5 | 6 | 41.9 | 104 | 116 | 5 | 6.5 | 30.0 | 33.0 | 5 | 12 | 5 | 8 | 0 |
| 28 FT | 11 | 13 | 10 | 8 | 5 | 7.5 | 5 | 6 | 40.3 | 31.0 | 31.0 | 5 | 14 | 29.0 | 32.0 | 5 | 14 | 20.0 | 20.0 | 5 | 7.5 | 5 | 6 | 42.8 | 105 | 117 | 5 | 7 | 30.0 | 33.0 | 5 | 12 | 5 | 8 | 0 |
| 30 FT | 12 | 14 | 10 | 8 | 5 | 8 | 5 | 6 | 41.0 | 32.0 | 32.0 | 5 | 14 | 29.0 | 31.0 | 5 | 14 | 19.0 | 20.0 | 5 | 8 | 5 | 6 | 43.3 | 106 | 118 | 5 | 7 | 30.0 | 33.0 | 5 | 12 | 5 | 8 | 0 |
| 32 FT | 12 | 14 | 11 | 8 | 5 | 7.5 | 5 | 6.5 | 40.8 | 32.0 | 32.0 | 5 | 13 | 29.0 | 31.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7.5 | 5 | 7 | 42.9 | 106 | 118 | 5 | 6.5 | 30.0 | 33.0 | 5 | 12 | 5 | 7.5 | 0 |
| 34 FT | 13 | 15 | 11 | 8 | 5 | 7.5 | 5 | 6.5 | 41.5 | 33.0 | 33.0 | 5 | 13 | 28.0 | 31.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7.5 | 5 | 7 | 43.5 | 107 | 119 | 5 | 7 | 30.0 | 33.0 | 5 | 12 | 5 | 7.5 | 0 |
| 36 FT | 13 | 15 | 11 | 8 | 5 | 7 | 5 | 6 | 41.4 | 33.0 | 33.0 | 5 | 13 | 28.0 | 31.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7 | 5 | 6.5 | 43.4 | 107 | 119 | 5 | 6.5 | 30.0 | 33.0 | 5 | 12 | 5 | 7.5 | 0 |
| 38 FT | 14 | 16 | 12 | 8 | 5 | 7 | 5 | 6.5 | 42.1 | 34.0 | 34.0 | 5 | 13 | 28.0 | 31.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7 | 5 | 6.5 | 43.8 | 108 | 120 | 5 | 6.5 | 30.0 | 33.0 | 5 | 12 | 5 | 7 | 0 |
| 40 FT | 14 | 16 | 12 | 8 | 5 | 7 | 5 | 6 | 42.0 | 34.0 | 34.0 | 5 | 13 | 28.0 | 31.0 | 5 | 13 | 19.0 | 20.0 | 5 | 7 | 5 | 6.5 | 43.6 | 108 | 120 | 5 | 6.5 | 30.0 | 33.0 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 15 | 17 | 12 | 8 | 5 | 7 | 5 | 6 | 47.6 | 35.0 | 35.0 | 5 | 13 | 33.0 | 36.0 | 5 | 13 | 24.0 | 25.0 | 5 | 7 | 5 | 6.5 | 44.3 | 109 | 121 | 5 | 6.5 | 30.0 | 33.0 | 5 | 12 | 5 | 7 | 0 |
| 44 FT | 15 | 17 | 13 | 8 | 5 | 6.5 | 5 | 6 | 47.6 | 35.0 | 35.0 | 5 | 13 | 33.0 | 36.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6.5 | 5 | 6 | 44.0 | 109 | 121 | 5 | 6 | 30.0 | 33.0 | 5 | 12 | 5 | 6.5 | 0 |
| 46 FT | 15 | 17 | 13 | 8 | 5 | 6 | 5 | 6 | 47.6 | 35.0 | 35.0 | 5 | 12 | 33.0 | 36.0 | 5 | 12 | 24.0 | 25.0 | 5 | 6 | 5 | 6 | 43.9 | 109 | 121 | 5 | 6 | 30.0 | 33.0 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 16 | 18 | 13 | 8 | 5 | 6.5 | 5 | 6 | 48.3 | 36.0 | 36.0 | 5 | 13 | 33.0 | 35.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6.5 | 5 | 6 | 44.5 | 110 | 122 | 5 | 6 | 30.0 | 33.0 | 5 | 12 | 5 | 6.5 | 0 |
| 50 FT | 16 | 18 | 14 | 8 | 5 | 6 | 5 | 6 | 48.3 | 36.0 | 36.0 | 5 | 12 | 33.0 | 35.0 | 5 | 12 | 24.0 | 25.0 | 5 | 6 | 5 | 6 | 44.3 | 110 | 122 | 6 | 8.5 | 32.0 | 37.0 | 5 | 12 | 5 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 6 FEET
HEIGHT (HT): 8 THRU 9 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 7 OF 27

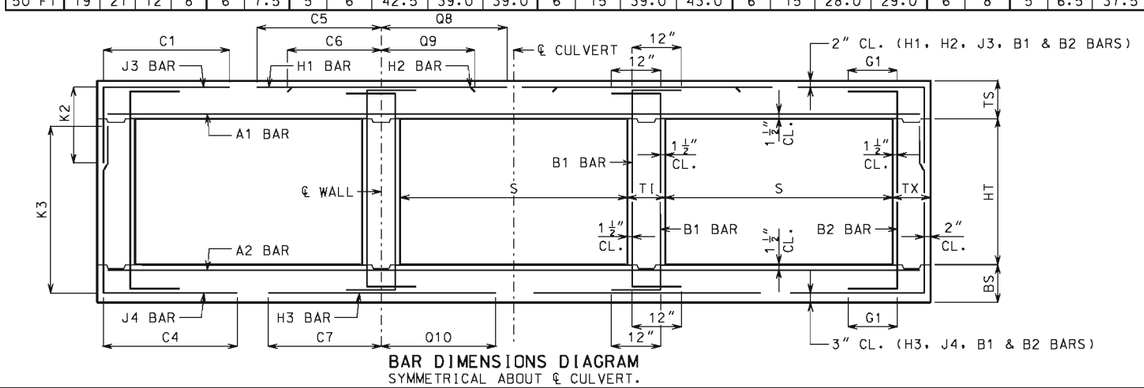
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 7 FT  HEIGHT (HT) = 4 FT OR 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=4′ | HT=5′ | HT=6′ | | | | | | | | | | | | | | HT=4′ | HT=5′ | HT=6′ | | | | | | | | |
| 1 FT | 12 | 8 | 8 | 8 | 5 | 7.5 | 4 | 8.5 | 41.1 | 28.0 | 28.0 | 28.0 | 4 | 16 | 72.5 | 54.5 | 4 | 16 | 25.0 | 25.0 | 4 | 8.5 | 4 | 7.5 | 42.5 | 52 | 64 | 76 | 4 | 6 | 36.0 | 37.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 8 | 8 | 8 | 5 | 7.5 | 4 | 8.5 | 41.1 | 28.0 | 28.0 | 28.0 | 4 | 15 | 72.5 | 54.5 | 4 | 15 | 24.0 | 24.0 | 4 | 7.5 | 4 | 7 | 39.0 | 52 | 64 | 76 | 5 | 7.5 | 35.0 | 37.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 6 | 4 | 6.5 | 39.5 | 24.0 | 24.0 | 24.0 | 5 | 17 | 47.0 | 58.0 | 5 | 17 | 23.0 | 23.0 | 4 | 7 | 4 | 7 | 36.0 | 52 | 64 | 76 | 5 | 7 | 35.0 | 37.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 6.5 | 4 | 7 | 36.0 | 24.0 | 24.0 | 24.0 | 5 | 17 | 38.0 | 42.0 | 5 | 17 | 22.0 | 22.0 | 4 | 6.5 | 4 | 6.5 | 33.4 | 52 | 64 | 76 | 5 | 6.5 | 34.0 | 36.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 8 | 8 | 4 | 6.5 | 4 | 6.5 | 33.5 | 24.0 | 24.0 | 24.0 | 5 | 17 | 36.0 | 38.0 | 5 | 17 | 23.0 | 22.0 | 5 | 9 | 4 | 6 | 32.0 | 52 | 64 | 76 | 5 | 6 | 33.0 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 8 | 8 | 4 | 6 | 5 | 7 | 32.3 | 24.0 | 24.0 | 24.0 | 5 | 16 | 35.0 | 37.0 | 5 | 16 | 23.0 | 23.0 | 5 | 9 | 4 | 7 | 30.9 | 53 | 65 | 77 | 5 | 6.5 | 33.0 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 8 | 8 | 4 | 6 | 5 | 6 | 31.4 | 24.0 | 24.0 | 24.0 | 5 | 14 | 34.0 | 36.0 | 5 | 14 | 23.0 | 23.0 | 5 | 7.5 | 4 | 6 | 30.1 | 53 | 65 | 77 | 5 | 6 | 32.0 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 4 | 6 | 30.5 | 25.0 | 25.0 | 25.0 | 5 | 15 | 33.0 | 36.0 | 5 | 15 | 23.0 | 23.0 | 5 | 7.5 | 4 | 7 | 29.5 | 54 | 66 | 78 | 5 | 6 | 32.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 10 | 11 | 8 | 8 | 5 | 8 | 5 | 8 | 29.9 | 26.0 | 26.0 | 26.0 | 5 | 15 | 33.0 | 36.0 | 5 | 15 | 22.0 | 22.0 | 5 | 7.5 | 4 | 7 | 29.0 | 55 | 67 | 79 | 5 | 6.5 | 32.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 10 | 11 | 8 | 8 | 5 | 8 | 5 | 7.5 | 29.5 | 26.0 | 26.0 | 26.0 | 5 | 15 | 33.0 | 36.0 | 5 | 15 | 23.0 | 24.0 | 5 | 6 | 4 | 6.5 | 28.6 | 55 | 67 | 79 | 5 | 6 | 32.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 5 | 8.5 | 29.1 | 27.0 | 27.0 | 27.0 | 5 | 14 | 32.0 | 36.0 | 5 | 14 | 22.0 | 23.0 | 5 | 6.5 | 4 | 6.5 | 28.4 | 56 | 68 | 80 | 5 | 6 | 31.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 8.5 | 28.9 | 28.0 | 28.0 | 28.0 | 5 | 13 | 32.0 | 36.0 | 5 | 13 | 21.0 | 22.0 | 5 | 6.5 | 4 | 6 | 28.3 | 57 | 69 | 81 | 5 | 6 | 31.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 8.5 | 27.6 | 28.0 | 28.0 | 28.0 | 5 | 13 | 31.0 | 36.0 | 5 | 13 | 21.0 | 22.0 | 5 | 6 | 4 | 6 | 27.1 | 57 | 69 | 81 | 6 | 8 | 34.0 | 39.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 27.5 | 29.0 | 29.0 | 29.0 | 5 | 12 | 31.0 | 36.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6.5 | 4 | 6 | 27.1 | 58 | 70 | 82 | 5 | 6 | 31.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 13 | 15 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 27.6 | 29.0 | 29.0 | 29.0 | 5 | 12 | 31.0 | 36.0 | 5 | 12 | 21.0 | 22.0 | 5 | 6.5 | 4 | 6.5 | 27.0 | 59 | 71 | 83 | 5 | 6 | 31.0 | 37.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8.5 | 27.5 | 30.0 | 30.0 | 34.0 | 5 | 12 | 31.0 | 36.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6 | 5 | 8.5 | 27.1 | 59 | 71 | 83 | 6 | 8 | 34.0 | 39.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 15 | 16 | 8 | 8 | 5 | 6 | 5 | 8 | 32.5 | 31.0 | 31.0 | 35.0 | 6 | 17 | 39.0 | 45.0 | 6 | 17 | 29.0 | 30.0 | 5 | 6 | 5 | 8 | 27.3 | 60 | 72 | 84 | 6 | 8 | 34.0 | 40.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 15 | 17 | 8 | 8 | 5 | 6 | 5 | 8 | 32.6 | 31.0 | 31.0 | 31.0 | 6 | 16 | 39.0 | 45.0 | 6 | 16 | 29.0 | 30.0 | 5 | 6 | 4 | 6 | 27.3 | 61 | 73 | 85 | 6 | 8.5 | 34.0 | 40.0 | 5 | 12 | 5 | 11.5 | 0 |
| 36 FT | 16 | 17 | 8 | 8 | 5 | 6 | 5 | 7 | 32.5 | 32.0 | 32.0 | 36.0 | 6 | 16 | 39.0 | 45.0 | 6 | 16 | 29.0 | 30.0 | 6 | 8.5 | 5 | 7 | 27.4 | 61 | 73 | 85 | 6 | 8 | 34.0 | 40.0 | 5 | 12 | 5 | 11 | 0 |
| 38 FT | 16 | 18 | 8 | 8 | 6 | 8 | 5 | 7 | 32.6 | 32.0 | 36.0 | 36.0 | 6 | 15 | 39.0 | 45.0 | 6 | 15 | 29.0 | 30.0 | 5 | 6 | 5 | 6.5 | 27.4 | 62 | 74 | 86 | 6 | 8 | 34.0 | 40.0 | 5 | 12 | 5 | 10 | 0 |
| 40 FT | 17 | 18 | 8 | 8 | 6 | 8 | 5 | 6.5 | 32.6 | 37.0 | 37.0 | 37.0 | 6 | 16 | 39.0 | 45.0 | 6 | 16 | 29.0 | 30.0 | 6 | 8 | 5 | 6.5 | 27.6 | 62 | 74 | 86 | 6 | 7.5 | 34.0 | 40.0 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 17 | 19 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 32.8 | 37.0 | 37.0 | 37.0 | 6 | 15 | 39.0 | 45.0 | 6 | 15 | 29.0 | 30.0 | 6 | 8 | 5 | 6.5 | 27.6 | 63 | 75 | 87 | 6 | 8 | 34.0 | 40.0 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 18 | 19 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 32.6 | 38.0 | 38.0 | 38.0 | 6 | 15 | 39.0 | 45.0 | 6 | 15 | 29.0 | 30.0 | 6 | 7.5 | 5 | 6.5 | 27.8 | 63 | 75 | 87 | 6 | 7.5 | 34.0 | 40.0 | 5 | 12 | 5 | 9.5 | 0 |
| 46 FT | 18 | 20 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 32.8 | 38.0 | 38.0 | 38.0 | 6 | 15 | 39.0 | 44.0 | 6 | 15 | 29.0 | 30.0 | 6 | 8 | 5 | 6 | 27.8 | 64 | 76 | 88 | 6 | 7.5 | 34.0 | 40.0 | 5 | 12 | 5 | 9.5 | 0 |
| 48 FT | 19 | 20 | 8 | 8 | 6 | 7.5 | 5 | 6 | 32.8 | 39.0 | 39.0 | 39.0 | 6 | 15 | 39.0 | 44.0 | 6 | 15 | 29.0 | 30.0 | 6 | 7.5 | 5 | 6 | 27.9 | 64 | 76 | 88 | 6 | 7 | 34.0 | 40.0 | 5 | 12 | 5 | 9.5 | 0 |
| 50 FT | 19 | 21 | 8 | 8 | 6 | 7 | 5 | 6 | 32.9 | 39.0 | 39.0 | 39.0 | 6 | 14 | 39.0 | 44.0 | 6 | 14 | 29.0 | 30.0 | 6 | 7.5 | 6 | 7.5 | 31.0 | 65 | 77 | 89 | 6 | 7.5 | 34.0 | 40.0 | 5 | 12 | 5 | 9 | 0 |

## SPAN (S) = 7 FT  HEIGHT (HT) = 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 | | | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 | | | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| | | | | | | | | | | HT=7′ | HT=8′ | | | | | | | | | | | | | | | HT=7′ | HT=8′ | | | | | | | | | |
| 1 FT | 12 | 8 | 8 | 8 | 5 | 7.5 | 4 | 8 | 41.1 | 28.0 | 28.0 | | 4 | 16 | 72.5 | 54.5 | 4 | 16 | 25.0 | 26.0 | 4 | 8 | 4 | 6 | 57.4 | 88 | 100 | | 4 | 6 | 37.0 | 37.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 8 | 8 | 8 | 5 | 7.5 | 4 | 7.5 | 41.1 | 28.0 | 28.0 | | 4 | 15 | 72.5 | 54.5 | 4 | 15 | 25.0 | 25.0 | 4 | 7 | 5 | 6.5 | 51.3 | 88 | 100 | | 5 | 7 | 36.0 | 37.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 9 | 8 | 4 | 6 | 4 | 6 | 41.8 | 24.0 | 24.0 | | 5 | 17 | 73.5 | 58.0 | 5 | 17 | 23.0 | 23.0 | 4 | 7 | 4 | 6.5 | 45.9 | 88 | 100 | | 5 | 7 | 35.0 | 37.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 9 | 8 | 4 | 6.5 | 4 | 6 | 44.3 | 24.0 | 24.0 | | 5 | 17 | 40.0 | 43.0 | 5 | 17 | 22.0 | 22.0 | 4 | 6.5 | 5 | 6.5 | 41.8 | 88 | 100 | | 5 | 6.5 | 34.0 | 36.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 8 | 9 | 8 | 4 | 6.5 | 4 | 6 | 40.9 | 24.0 | 24.0 | | 5 | 17 | 37.0 | 38.0 | 5 | 17 | 22.0 | 23.0 | 5 | 9 | 5 | 6 | 39.9 | 88 | 100 | | 5 | 6 | 33.0 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 8 | 9 | 9 | 8 | 4 | 6 | 5 | 6.5 | 39.1 | 24.0 | 28.0 | | 5 | 16 | 35.0 | 37.0 | 5 | 16 | 23.0 | 23.0 | 5 | 9 | 5 | 7 | 39.4 | 89 | 101 | | 5 | 6.5 | 33.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 8 | 9 | 9 | 8 | 4 | 6 | 6 | 7 | 41.0 | 24.0 | 28.0 | | 5 | 15 | 34.0 | 36.0 | 5 | 15 | 23.0 | 24.0 | 5 | 7 | 5 | 6 | 38.3 | 89 | 101 | | 5 | 6 | 32.0 | 35.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 9 | 10 | 9 | 8 | 5 | 8.5 | 5 | 6 | 37.8 | 25.0 | 29.0 | | 5 | 15 | 34.0 | 36.0 | 5 | 15 | 23.0 | 23.0 | 5 | 7.5 | 5 | 6.5 | 37.9 | 90 | 102 | | 5 | 6 | 32.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 10 | 11 | 9 | 8 | 5 | 8 | 5 | 7 | 37.4 | 26.0 | 30.0 | | 5 | 15 | 33.0 | 36.0 | 5 | 15 | 22.0 | 22.0 | 5 | 7.5 | 5 | 7 | 37.6 | 91 | 103 | | 5 | 6.5 | 32.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 10 | 11 | 9 | 8 | 5 | 8 | 5 | 6.5 | 36.8 | 30.0 | 30.0 | | 5 | 15 | 33.0 | 36.0 | 5 | 15 | 23.0 | 23.0 | 5 | 6 | 5 | 6.5 | 36.9 | 91 | 103 | | 5 | 6 | 32.0 | 36.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 11 | 12 | 9 | 8 | 5 | 7.5 | 5 | 6.5 | 36.8 | 31.0 | 31.0 | | 5 | 14 | 32.0 | 36.0 | 5 | 14 | 21.0 | 22.0 | 5 | 7 | 5 | 6.5 | 37.0 | 92 | 104 | | 5 | 6 | 32.0 | 36.0 | 5 | 12 | 5 | 11 | 0 |
| 22 FT | 11 | 13 | 9 | 8 | 5 | 7 | 5 | 6 | 36.5 | 31.0 | 31.0 | | 5 | 14 | 32.0 | 35.0 | 5 | 14 | 22.0 | 23.0 | 5 | 7 | 5 | 7 | 37.0 | 93 | 105 | | 5 | 6 | 32.0 | 36.0 | 5 | 12 | 5 | 10 | 0 |
| 24 FT | 12 | 13 | 9 | 8 | 5 | 7 | 5 | 7 | 34.8 | 32.0 | 32.0 | | 5 | 13 | 31.0 | 35.0 | 5 | 13 | 21.0 | 22.0 | 5 | 6 | 5 | 7 | 35.0 | 93 | 105 | | 6 | 8 | 34.0 | 39.0 | 5 | 12 | 5 | 10.5 | 0 |
| 26 FT | 13 | 14 | 9 | 8 | 5 | 7 | 5 | 7 | 34.9 | 33.0 | 33.0 | | 5 | 12 | 31.0 | 35.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6.5 | 5 | 7.5 | 35.3 | 94 | 106 | | 5 | 6 | 31.0 | 36.0 | 5 | 12 | 5 | 9.5 | 0 |
| 28 FT | 13 | 15 | 9 | 8 | 5 | 6.5 | 5 | 6.5 | 34.9 | 33.0 | 33.0 | | 5 | 12 | 31.0 | 35.0 | 5 | 12 | 21.0 | 22.0 | 5 | 6.5 | 5 | 7.5 | 35.4 | 95 | 107 | | 5 | 6 | 31.0 | 36.0 | 5 | 12 | 5 | 9 | 0 |
| 30 FT | 14 | 15 | 9 | 8 | 5 | 6.5 | 5 | 7 | 35.0 | 34.0 | 34.0 | | 5 | 12 | 31.0 | 35.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6 | 5 | 7 | 35.4 | 95 | 107 | | 6 | 8 | 34.0 | 39.0 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 14 | 16 | 9 | 8 | 5 | 6 | 5 | 6 | 35.0 | 34.0 | 34.0 | | 5 | 12 | 31.0 | 35.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6 | 5 | 7 | 35.5 | 96 | 108 | | 6 | 8 | 35.0 | 39.0 | 5 | 12 | 5 | 8.5 | 0 |
| 34 FT | 15 | 17 | 10 | 8 | 5 | 6 | 5 | 7 | 40.8 | 35.0 | 35.0 | | 6 | 16 | 40.0 | 44.0 | 6 | 16 | 29.0 | 30.0 | 5 | 6 | 5 | 7.5 | 36.0 | 97 | 109 | | 6 | 8.5 | 35.0 | 40.0 | 5 | 12 | 5 | 8.5 | 0 |
| 36 FT | 16 | 17 | 10 | 8 | 5 | 6 | 5 | 7 | 40.8 | 36.0 | 36.0 | | 6 | 17 | 39.0 | 44.0 | 6 | 17 | 29.0 | 30.0 | 5 | 6 | 5 | 7.5 | 36.0 | 97 | 109 | | 6 | 8 | 35.0 | 40.0 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 16 | 18 | 11 | 8 | 5 | 6 | 5 | 7 | 41.5 | 36.0 | 36.0 | | 6 | 16 | 39.0 | 44.0 | 6 | 16 | 29.0 | 30.0 | 5 | 6 | 5 | 7 | 36.5 | 98 | 110 | | 6 | 8 | 35.0 | 40.0 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 17 | 18 | 11 | 8 | 5 | 6 | 5 | 7 | 41.5 | 37.0 | 37.0 | | 6 | 16 | 39.0 | 43.0 | 6 | 16 | 29.0 | 30.0 | 6 | 8 | 5 | 7 | 36.5 | 98 | 110 | | 6 | 7.5 | 35.0 | 40.0 | 5 | 12 | 5 | 8 | 0 |
| 42 FT | 17 | 19 | 11 | 8 | 6 | 8 | 5 | 6.5 | 41.6 | 37.0 | 37.0 | | 6 | 16 | 39.0 | 43.0 | 6 | 16 | 29.0 | 30.0 | 6 | 8.5 | 5 | 7 | 36.8 | 99 | 111 | | 6 | 7.5 | 35.0 | 40.0 | 5 | 12 | 5 | 7.5 | 0 |
| 44 FT | 18 | 19 | 12 | 8 | 6 | 8 | 5 | 6.5 | 42.3 | 38.0 | 38.0 | | 6 | 16 | 39.0 | 43.0 | 6 | 16 | 29.0 | 29.0 | 6 | 8 | 5 | 6.5 | 37.0 | 99 | 111 | | 6 | 7.5 | 35.0 | 40.0 | 5 | 12 | 5 | 8 | 0 |
| 46 FT | 18 | 20 | 12 | 8 | 6 | 8 | 5 | 6.5 | 42.4 | 38.0 | 38.0 | | 6 | 15 | 39.0 | 43.0 | 6 | 15 | 29.0 | 29.0 | 6 | 8 | 5 | 6.5 | 37.1 | 100 | 112 | | 6 | 7.5 | 35.0 | 40.0 | 5 | 12 | 5 | 7.5 | 0 |
| 48 FT | 18 | 20 | 12 | 8 | 6 | 7.5 | 5 | 6.5 | 42.4 | 38.0 | 38.0 | | 6 | 15 | 39.0 | 43.0 | 6 | 15 | 29.0 | 29.0 | 6 | 7.5 | 5 | 6.5 | 37.1 | 100 | 112 | | 6 | 7 | 35.0 | 40.0 | 5 | 12 | 5 | 7.5 | 0 |
| 50 FT | 19 | 21 | 12 | 8 | 6 | 7.5 | 5 | 6 | 42.5 | 39.0 | 39.0 | | 6 | 15 | 39.0 | 43.0 | 6 | 15 | 28.0 | 29.0 | 6 | 8 | 5 | 6.5 | 37.5 | 101 | 113 | | 6 | 7.5 | 35.0 | 40.0 | 5 | 12 | 5 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

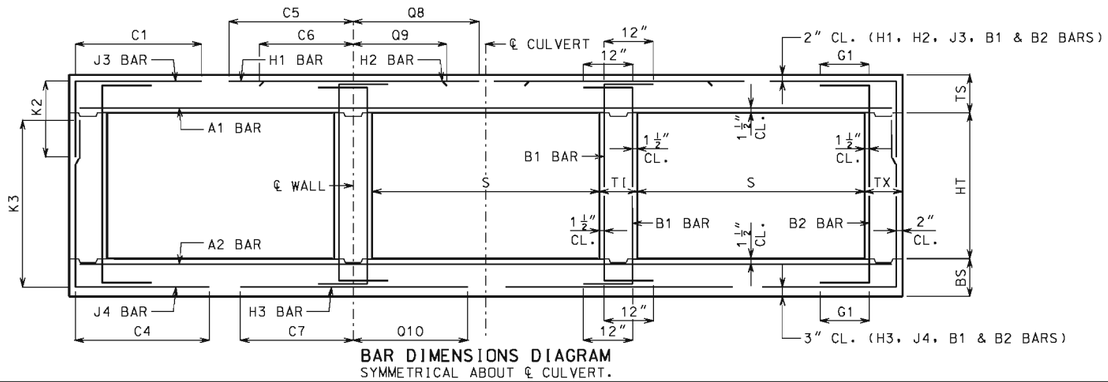
SPAN (S): 7 FEET
HEIGHT (HT): 4 THRU 8 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

## SPAN (S) = 7 FT  HEIGHT (HT) = 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=9' | K2 HT=10' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=9' | K3 HT=10' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 12 | 9 | 8 | 8 | 5 | 7.5 | 5 | 9 | 41.1 | 28.0 | 32.0 | 4 | 16 | 72.5 | 54.5 | 4 | 16 | 26.0 | 27.0 | 4 | 8 | 5 | 6 | 60.0 | 113 | 125 | 4 | 7 | 58.0 | 38.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 9 | 8 | 8 | 5 | 7 | 5 | 8.5 | 41.1 | 28.0 | 32.0 | 4 | 15 | 72.5 | 54.5 | 4 | 15 | 25.0 | 26.0 | 4 | 7.5 | 6 | 7 | 63.0 | 113 | 125 | 4 | 6.5 | 39.0 | 38.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 9 | 9 | 8 | 4 | 6 | 5 | 6 | 44.8 | 24.0 | 28.0 | 5 | 17 | 75.5 | 58.0 | 5 | 17 | 23.0 | 23.0 | 4 | 7 | 5 | 6 | 60.8 | 113 | 125 | 4 | 6 | 37.0 | 38.0 | 5 | 12 | 5 | 11 | 12 |
| 6 FT | 8 | 9 | 10 | 8 | 4 | 6.5 | 5 | 6.5 | 59.1 | 24.0 | 28.0 | 5 | 17 | 45.0 | 43.0 | 5 | 17 | 22.0 | 22.0 | 4 | 7 | 5 | 6.5 | 56.3 | 113 | 125 | 5 | 7.5 | 34.0 | 37.0 | 5 | 12 | 5 | 11 | 12 |
| 8 FT | 8 | 9 | 10 | 8 | 4 | 6.5 | 5 | 6.5 | 50.8 | 28.0 | 28.0 | 5 | 17 | 38.0 | 38.0 | 5 | 17 | 22.0 | 22.0 | 4 | 6.5 | 5 | 6 | 51.8 | 113 | 125 | 5 | 7 | 33.0 | 36.0 | 5 | 12 | 5 | 10.5 | 0 |
| 10 FT | 8 | 9 | 10 | 8 | 4 | 6 | 6 | 7.5 | 50.9 | 28.0 | 32.0 | 5 | 16 | 36.0 | 37.0 | 5 | 16 | 23.0 | 23.0 | 5 | 9 | 6 | 6.5 | 52.6 | 113 | 125 | 5 | 6 | 33.0 | 36.0 | 5 | 12 | 5 | 9.5 | 0 |
| 12 FT | 8 | 10 | 10 | 8 | 4 | 6 | 6 | 6.5 | 48.5 | 28.0 | 32.0 | 5 | 15 | 35.0 | 36.0 | 5 | 15 | 23.0 | 24.0 | 5 | 8.5 | 6 | 7 | 53.1 | 114 | 126 | 5 | 6.5 | 33.0 | 36.0 | 5 | 12 | 5 | 9 | 0 |
| 14 FT | 9 | 10 | 10 | 8 | 5 | 8.5 | 5 | 6 | 46.4 | 29.0 | 29.0 | 5 | 16 | 34.0 | 36.0 | 5 | 16 | 23.0 | 23.0 | 5 | 8 | 6 | 7 | 51.3 | 114 | 126 | 5 | 6 | 33.0 | 36.0 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 9 | 11 | 10 | 8 | 5 | 8 | 5 | 6 | 44.8 | 29.0 | 29.0 | 5 | 15 | 33.0 | 35.0 | 5 | 15 | 23.0 | 24.0 | 5 | 7.5 | 6 | 7 | 51.8 | 115 | 127 | 5 | 6 | 33.0 | 36.0 | 5 | 12 | 5 | 8 | 0 |
| 18 FT | 10 | 12 | 10 | 8 | 5 | 8 | 5 | 6.5 | 45.3 | 30.0 | 30.0 | 5 | 15 | 33.0 | 35.0 | 5 | 15 | 22.0 | 23.0 | 5 | 7.5 | 6 | 7 | 51.8 | 116 | 128 | 5 | 6.5 | 33.0 | 36.0 | 5 | 12 | 5 | 8 | 0 |
| 20 FT | 11 | 12 | 10 | 8 | 5 | 7.5 | 5 | 6 | 46.1 | 31.0 | 31.0 | 5 | 14 | 33.0 | 35.0 | 5 | 14 | 21.0 | 22.0 | 5 | 7 | 6 | 6.5 | 50.8 | 116 | 128 | 5 | 6 | 33.0 | 36.0 | 5 | 12 | 5 | 8 | 0 |
| 22 FT | 11 | 13 | 10 | 8 | 5 | 7.5 | 5 | 6 | 45.4 | 31.0 | 31.0 | 5 | 14 | 32.0 | 35.0 | 5 | 14 | 22.0 | 23.0 | 5 | 7 | 6 | 6.5 | 51.4 | 117 | 129 | 5 | 6 | 33.0 | 36.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 12 | 13 | 10 | 8 | 5 | 7 | 5 | 6 | 43.4 | 32.0 | 32.0 | 5 | 13 | 31.0 | 35.0 | 5 | 13 | 21.0 | 22.0 | 5 | 6 | 6 | 6.5 | 48.0 | 117 | 129 | 6 | 8 | 35.0 | 39.0 | 5 | 12 | 5 | 8 | 0 |
| 26 FT | 12 | 14 | 10 | 8 | 5 | 7 | 6 | 7.5 | 46.1 | 32.0 | 36.0 | 5 | 13 | 31.0 | 35.0 | 5 | 13 | 21.0 | 22.0 | 5 | 6.5 | 6 | 7 | 48.6 | 118 | 130 | 6 | 8.5 | 35.0 | 39.0 | 5 | 12 | 5 | 8 | 0 |
| 28 FT | 13 | 15 | 11 | 8 | 5 | 6.5 | 5 | 6 | 43.6 | 33.0 | 33.0 | 5 | 12 | 31.0 | 35.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6.5 | 5 | 6.5 | 45.9 | 119 | 131 | 5 | 6 | 32.0 | 36.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 14 | 15 | 11 | 8 | 5 | 6.5 | 5 | 6 | 44.3 | 34.0 | 34.0 | 5 | 12 | 31.0 | 35.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6 | 5 | 6 | 45.5 | 119 | 131 | 6 | 8 | 35.0 | 39.0 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 14 | 16 | 12 | 8 | 5 | 6.5 | 5 | 6 | 44.1 | 34.0 | 34.0 | 5 | 12 | 31.0 | 34.0 | 5 | 12 | 20.0 | 21.0 | 5 | 6.5 | 5 | 6 | 45.9 | 120 | 132 | 6 | 8 | 35.0 | 40.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 15 | 17 | 12 | 8 | 5 | 6.5 | 5 | 6 | 49.6 | 35.0 | 35.0 | 6 | 17 | 40.0 | 43.0 | 6 | 17 | 29.0 | 30.0 | 5 | 6.5 | 5 | 6.5 | 46.5 | 121 | 133 | 6 | 8 | 36.0 | 40.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 15 | 17 | 13 | 8 | 5 | 6 | 5 | 6 | 49.6 | 35.0 | 35.0 | 6 | 16 | 40.0 | 43.0 | 6 | 16 | 29.0 | 30.0 | 5 | 6 | 5 | 6 | 46.0 | 121 | 133 | 6 | 7.5 | 35.0 | 40.0 | 5 | 12 | 5 | 6.5 | 0 |
| 38 FT | 16 | 18 | 13 | 8 | 5 | 6 | 6 | 8.5 | 54.1 | 36.0 | 36.0 | 6 | 16 | 40.0 | 43.0 | 6 | 16 | 29.0 | 29.0 | 5 | 6 | 5 | 6 | 46.6 | 122 | 134 | 6 | 8 | 36.0 | 40.0 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 16 | 18 | 13 | 8 | 6 | 8.5 | 6 | 8 | 54.0 | 36.0 | 36.0 | 6 | 15 | 40.0 | 43.0 | 6 | 15 | 29.0 | 30.0 | 5 | 6 | 5 | 6 | 46.5 | 122 | 134 | 6 | 7.5 | 36.0 | 40.0 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 17 | 19 | 14 | 8 | 5 | 6 | 6 | 8 | 54.8 | 37.0 | 37.0 | 6 | 16 | 39.0 | 42.0 | 6 | 16 | 29.0 | 29.0 | 5 | 6 | 5 | 6 | 46.9 | 123 | 135 | 6 | 7.5 | 36.0 | 40.0 | 5 | 12 | 5 | 6 | 0 |
| 44 FT | 17 | 19 | 14 | 8 | 6 | 8 | 6 | 8 | 54.6 | 37.0 | 37.0 | 6 | 15 | 39.0 | 42.0 | 6 | 15 | 29.0 | 29.0 | 6 | 8 | 5 | 6 | 46.8 | 123 | 135 | 6 | 7 | 36.0 | 40.0 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 18 | 20 | 14 | 8 | 6 | 8 | 6 | 7.5 | 55.3 | 38.0 | 38.0 | 6 | 16 | 39.0 | 42.0 | 6 | 16 | 28.0 | 29.0 | 6 | 8 | 5 | 6 | 47.3 | 124 | 136 | 6 | 7.5 | 36.0 | 40.0 | 5 | 12 | 5 | 6 | 0 |
| 48 FT | 18 | 20 | 15 | 8 | 6 | 7.5 | 6 | 8 | 55.4 | 38.0 | 42.0 | 6 | 15 | 39.0 | 42.0 | 6 | 15 | 28.0 | 29.0 | 6 | 7.5 | 6 | 8 | 50.0 | 124 | 136 | 6 | 7 | 36.0 | 40.0 | 5 | 12 | 6 | 8.5 | 0 |
| 50 FT | 18 | 21 | 15 | 8 | 6 | 7 | 6 | 7.5 | 55.4 | 38.0 | 42.0 | 6 | 14 | 39.0 | 42.0 | 6 | 14 | 28.0 | 29.0 | 6 | 8 | 6 | 8 | 50.6 | 125 | 137 | 6 | 7 | 36.0 | 40.0 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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


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


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 7 FEET
HEIGHT (HT): 9 THRU 10 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 9 OF 27

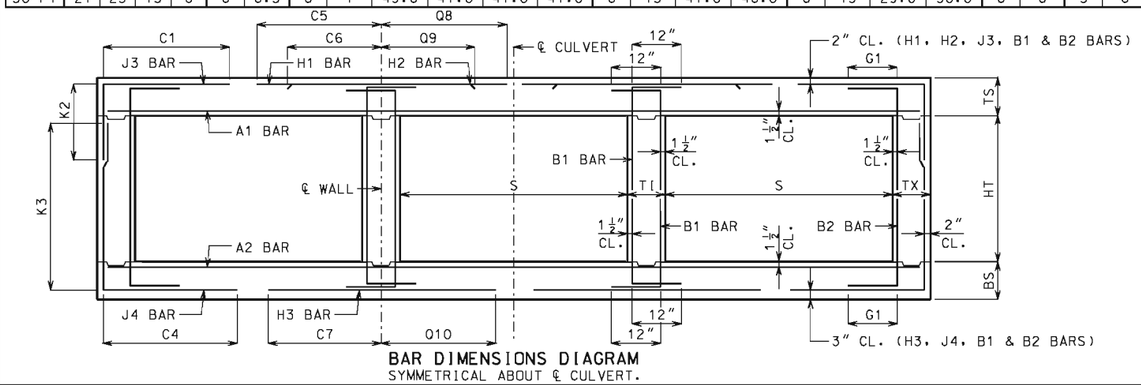
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 8 FT  HEIGHT (HT) = 4 FT OR 5 FT OR 6 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=4′ | K2 HT=5′ | K2 HT=6′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=4′ | K3 HT=5′ | K3 HT=6′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 12 | 8 | 8 | 8 | 5 | 7 | 4 | 8.5 | 44.8 | 28.0 | 28.0 | 28.0 | 4 | 13 | 81.5 | 60.5 | 4 | 13 | 27.0 | 23.0 | 4 | 7.5 | 4 | 6.5 | 42.0 | 52 | 64 | 76 | 5 | 7 | 39.0 | 40.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 8 | 8 | 8 | 5 | 7 | 4 | 8.5 | 44.8 | 28.0 | 28.0 | 28.0 | 4 | 12 | 81.5 | 60.5 | 4 | 12 | 26.0 | 25.0 | 4 | 6.5 | 4 | 6 | 38.8 | 52 | 64 | 76 | 5 | 6.5 | 38.0 | 40.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 6 | 5 | 6 | 40.6 | 24.0 | 24.0 | 24.0 | 5 | 16 | 50.0 | 64.0 | 5 | 16 | 27.0 | 27.0 | 4 | 6 | 4 | 6 | 35.4 | 52 | 64 | 76 | 5 | 6 | 38.0 | 40.0 | 5 | 11 | 5 | 12 | 12 |
| 6 FT | 8 | 8 | 8 | 8 | 4 | 6 | 5 | 6.5 | 36.5 | 28.0 | 24.0 | 28.0 | 5 | 15 | 42.0 | 45.0 | 5 | 15 | 26.0 | 26.0 | 5 | 8.5 | 5 | 6.5 | 33.5 | 52 | 64 | 76 | 6 | 7 | 39.0 | 41.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 8 | 8 | 4 | 6 | 5 | 6 | 34.4 | 24.0 | 24.0 | 24.0 | 5 | 14 | 39.0 | 41.0 | 5 | 14 | 25.0 | 25.0 | 5 | 8 | 4 | 6.5 | 31.9 | 53 | 65 | 77 | 5 | 6 | 36.0 | 39.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 4 | 6 | 32.6 | 25.0 | 25.0 | 25.0 | 5 | 15 | 38.0 | 41.0 | 5 | 15 | 25.0 | 25.0 | 5 | 8 | 4 | 7.5 | 30.5 | 54 | 66 | 78 | 5 | 6 | 35.0 | 39.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 31.6 | 25.0 | 25.0 | 25.0 | 5 | 14 | 37.0 | 40.0 | 5 | 14 | 24.0 | 25.0 | 5 | 7 | 4 | 6.5 | 29.8 | 54 | 66 | 78 | 6 | 7 | 38.0 | 42.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 10 | 11 | 8 | 8 | 5 | 8 | 5 | 7.5 | 30.5 | 26.0 | 26.0 | 26.0 | 5 | 14 | 36.0 | 40.0 | 5 | 14 | 24.0 | 25.0 | 5 | 6.5 | 4 | 6.5 | 29.0 | 55 | 67 | 79 | 5 | 6 | 34.0 | 39.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 5 | 8.5 | 29.6 | 27.0 | 27.0 | 27.0 | 5 | 14 | 35.0 | 40.0 | 5 | 14 | 24.0 | 25.0 | 5 | 6.5 | 4 | 6.5 | 28.4 | 56 | 68 | 80 | 5 | 6 | 34.0 | 39.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 11 | 13 | 8 | 8 | 5 | 7.5 | 5 | 8 | 29.5 | 27.0 | 27.0 | 27.0 | 5 | 13 | 35.0 | 39.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6 | 4 | 6.5 | 27.6 | 57 | 69 | 81 | 6 | 8 | 37.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 12 | 14 | 8 | 8 | 5 | 7 | 5 | 8.5 | 28.8 | 28.0 | 28.0 | 28.0 | 5 | 13 | 35.0 | 39.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6 | 4 | 6.5 | 27.3 | 58 | 70 | 82 | 6 | 8 | 36.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 28.1 | 29.0 | 29.0 | 29.0 | 5 | 12 | 34.0 | 40.0 | 5 | 12 | 23.0 | 24.0 | 6 | 8 | 4 | 6 | 27.4 | 58 | 70 | 82 | 6 | 7.5 | 37.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8.5 | 27.9 | 30.0 | 30.0 | 30.0 | 5 | 12 | 34.0 | 40.0 | 5 | 12 | 22.0 | 23.0 | 6 | 8 | 4 | 6 | 27.3 | 59 | 71 | 83 | 6 | 7.5 | 36.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 26 FT | 15 | 16 | 8 | 8 | 6 | 8.5 | 5 | 8 | 32.6 | 31.0 | 31.0 | 31.0 | 6 | 16 | 42.0 | 49.0 | 6 | 16 | 30.0 | 32.0 | 6 | 8 | 4 | 6 | 27.3 | 60 | 72 | 84 | 6 | 7.5 | 36.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 28 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 8 | 31.6 | 31.0 | 31.0 | 31.0 | 6 | 16 | 42.0 | 48.0 | 6 | 16 | 31.0 | 32.0 | 6 | 7.5 | 4 | 6 | 26.1 | 60 | 72 | 84 | 6 | 7 | 36.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 30 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 7 | 31.5 | 32.0 | 32.0 | 32.0 | 6 | 15 | 42.0 | 48.0 | 6 | 15 | 30.0 | 31.0 | 6 | 7.5 | 4 | 6 | 26.3 | 61 | 73 | 85 | 6 | 7 | 36.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 32 FT | 16 | 18 | 8 | 8 | 6 | 7.5 | 5 | 7 | 31.6 | 32.0 | 36.0 | 36.0 | 6 | 15 | 42.0 | 48.0 | 6 | 15 | 31.0 | 32.0 | 6 | 7.5 | 5 | 6.5 | 26.1 | 62 | 74 | 86 | 6 | 7 | 36.0 | 43.0 | 5 | 12 | 5 | 12 | 0 |
| 34 FT | 17 | 19 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 31.6 | 37.0 | 37.0 | 37.0 | 6 | 14 | 42.0 | 48.0 | 6 | 14 | 30.0 | 31.0 | 6 | 7.5 | 5 | 6.5 | 26.3 | 63 | 75 | 87 | 6 | 7 | 36.0 | 43.0 | 5 | 12 | 5 | 11.5 | 0 |
| 36 FT | 18 | 19 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 31.5 | 38.0 | 38.0 | 38.0 | 6 | 14 | 42.0 | 48.0 | 6 | 14 | 30.0 | 31.0 | 6 | 7.5 | 5 | 6.5 | 26.4 | 63 | 75 | 87 | 6 | 7 | 36.0 | 43.0 | 5 | 12 | 5 | 10.5 | 0 |
| 38 FT | 18 | 20 | 8 | 8 | 6 | 7 | 5 | 6.5 | 31.6 | 38.0 | 38.0 | 38.0 | 6 | 13 | 42.0 | 48.0 | 6 | 13 | 30.0 | 31.0 | 6 | 7.5 | 5 | 6 | 26.4 | 64 | 76 | 88 | 6 | 7 | 36.0 | 43.0 | 5 | 12 | 5 | 10 | 0 |
| 40 FT | 19 | 20 | 8 | 8 | 6 | 7 | 5 | 6 | 31.6 | 39.0 | 39.0 | 39.0 | 6 | 13 | 42.0 | 48.0 | 6 | 13 | 29.0 | 31.0 | 6 | 6.5 | 5 | 6 | 26.5 | 64 | 76 | 88 | 6 | 6.5 | 36.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 42 FT | 19 | 21 | 8 | 8 | 6 | 6 | 5 | 6 | 31.8 | 39.0 | 39.0 | 39.0 | 6 | 12 | 42.0 | 48.0 | 6 | 12 | 30.0 | 31.0 | 6 | 7 | 6 | 7.5 | 29.6 | 65 | 77 | 89 | 6 | 6.5 | 36.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 44 FT | 20 | 22 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 35.9 | 44.0 | 44.0 | 44.0 | 6 | 13 | 41.0 | 48.0 | 6 | 13 | 29.0 | 30.0 | 6 | 7 | 6 | 7 | 29.8 | 66 | 78 | 90 | 6 | 6.5 | 36.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 46 FT | 21 | 22 | 8 | 8 | 6 | 6.5 | 6 | 7 | 35.8 | 45.0 | 45.0 | 45.0 | 6 | 13 | 41.0 | 48.0 | 6 | 13 | 29.0 | 30.0 | 6 | 6.5 | 6 | 7 | 29.9 | 66 | 78 | 90 | 6 | 6.5 | 36.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 48 FT | 21 | 23 | 8 | 8 | 6 | 6.5 | 6 | 7 | 36.0 | 45.0 | 45.0 | 45.0 | 6 | 13 | 41.0 | 48.0 | 6 | 13 | 29.0 | 30.0 | 6 | 7 | 6 | 6.5 | 30.0 | 67 | 79 | 91 | 6 | 6.5 | 36.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 50 FT | 22 | 23 | 8 | 8 | 6 | 6.5 | 6 | 6.5 | 35.9 | 46.0 | 46.0 | 46.0 | 6 | 13 | 41.0 | 47.0 | 6 | 13 | 29.0 | 30.0 | 6 | 6.5 | 6 | 6.5 | 30.1 | 67 | 79 | 91 | 6 | 6 | 36.0 | 43.0 | 5 | 12 | 5 | 9 | 0 |

## SPAN (S) = 8 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=7′ | K2 HT=8′ | K2 HT=9′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=7′ | K3 HT=8′ | K3 HT=9′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 12 | 9 | 8 | 8 | 5 | 7 | 4 | 6 | 44.8 | 28.0 | 28.0 | 28.0 | 4 | 13 | 81.5 | 60.5 | 4 | 13 | 27.0 | 25.0 | 4 | 7.5 | 4 | 6 | 66.0 | 89 | 101 | 113 | 5 | 8 | 41.0 | 41.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 12 | 9 | 8 | 8 | 5 | 7 | 4 | 6 | 44.8 | 28.0 | 28.0 | 28.0 | 4 | 12 | 81.5 | 60.5 | 4 | 12 | 26.0 | 24.0 | 4 | 6.5 | 5 | 6.5 | 61.3 | 89 | 101 | 113 | 5 | 7.5 | 39.0 | 41.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 8 | 8 | 8 | 8 | 4 | 6 | 6 | 7.5 | 47.8 | 28.0 | 32.0 | 32.0 | 5 | 16 | 83.5 | 64.0 | 5 | 16 | 27.0 | 28.0 | 5 | 8.5 | 6 | 6 | 55.0 | 88 | 100 | 112 | 5 | 6 | 38.0 | 40.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 8 | 9 | 8 | 8 | 4 | 6 | 6 | 7.5 | 52.5 | 24.0 | 28.0 | 32.0 | 5 | 15 | 44.0 | 47.0 | 5 | 15 | 26.0 | 26.0 | 5 | 8.5 | 6 | 6.5 | 52.3 | 89 | 101 | 113 | 5 | 6.5 | 37.0 | 40.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 8 | 9 | 8 | 8 | 4 | 6 | 6 | 7.5 | 47.4 | 24.0 | 28.0 | 32.0 | 5 | 14 | 40.0 | 42.0 | 5 | 14 | 25.0 | 25.0 | 5 | 7.5 | 6 | 6 | 48.1 | 89 | 101 | 113 | 5 | 6 | 36.0 | 39.0 | 5 | 12 | 5 | 11.5 | 0 |
| 10 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 6 | 7 | 46.3 | 25.0 | 29.0 | 33.0 | 5 | 15 | 39.0 | 41.0 | 5 | 15 | 25.0 | 25.0 | 5 | 7.5 | 6 | 6.5 | 46.9 | 90 | 102 | 114 | 5 | 6 | 35.0 | 39.0 | 5 | 12 | 5 | 11 | 0 |
| 12 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 6 | 7 | 44.8 | 29.0 | 33.0 | 33.0 | 5 | 14 | 37.0 | 40.0 | 5 | 14 | 24.0 | 25.0 | 5 | 6.5 | 6 | 6 | 45.4 | 90 | 102 | 114 | 6 | 7 | 38.0 | 42.0 | 5 | 12 | 5 | 10 | 0 |
| 14 FT | 10 | 11 | 8 | 8 | 5 | 8 | 6 | 6.5 | 44.1 | 30.0 | 30.0 | 34.0 | 5 | 14 | 37.0 | 40.0 | 5 | 14 | 24.0 | 25.0 | 5 | 6.5 | 6 | 6 | 44.9 | 91 | 103 | 115 | 5 | 6 | 35.0 | 39.0 | 5 | 12 | 5 | 9.5 | 0 |
| 16 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 6 | 6.5 | 43.6 | 31.0 | 31.0 | 35.0 | 5 | 14 | 36.0 | 40.0 | 5 | 14 | 24.0 | 25.0 | 5 | 6.5 | 6 | 6.5 | 44.4 | 92 | 104 | 116 | 5 | 6 | 34.0 | 39.0 | 5 | 12 | 5 | 9.5 | 0 |
| 18 FT | 11 | 13 | 8 | 8 | 5 | 7.5 | 6 | 6 | 42.8 | 31.0 | 31.0 | 35.0 | 5 | 13 | 35.0 | 39.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6 | 6 | 6.5 | 43.9 | 93 | 105 | 117 | 6 | 8 | 37.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 20 FT | 12 | 14 | 8 | 8 | 5 | 7 | 6 | 6 | 42.4 | 32.0 | 32.0 | 36.0 | 5 | 13 | 35.0 | 39.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6 | 6 | 6.5 | 43.4 | 94 | 106 | 118 | 6 | 8 | 37.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 22 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 6 | 6 | 42.1 | 33.0 | 33.0 | 37.0 | 5 | 12 | 35.0 | 39.0 | 5 | 12 | 23.0 | 24.0 | 6 | 8 | 6 | 6 | 43.0 | 94 | 106 | 118 | 6 | 7.5 | 37.0 | 43.0 | 5 | 12 | 5 | 9 | 0 |
| 24 FT | 14 | 15 | 10 | 8 | 5 | 6 | 5 | 6.5 | 40.0 | 34.0 | 34.0 | 34.0 | 5 | 12 | 34.0 | 39.0 | 5 | 12 | 22.0 | 23.0 | 6 | 8.5 | 5 | 7 | 40.4 | 95 | 107 | 119 | 6 | 7 | 37.0 | 43.0 | 5 | 12 | 5 | 8 | 0 |
| 26 FT | 14 | 16 | 10 | 8 | 5 | 6 | 5 | 6 | 39.8 | 34.0 | 34.0 | 34.0 | 5 | 12 | 34.0 | 39.0 | 5 | 12 | 22.0 | 24.0 | 6 | 8 | 5 | 7 | 40.4 | 96 | 108 | 120 | 6 | 7.5 | 37.0 | 43.0 | 5 | 12 | 5 | 8 | 0 |
| 28 FT | 15 | 16 | 10 | 8 | 6 | 8 | 5 | 6.5 | 43.0 | 35.0 | 35.0 | 35.0 | 6 | 16 | 42.0 | 48.0 | 6 | 16 | 30.0 | 32.0 | 6 | 7.5 | 5 | 7 | 38.4 | 96 | 108 | 120 | 6 | 7 | 37.0 | 43.0 | 5 | 12 | 5 | 8 | 0 |
| 30 FT | 15 | 17 | 11 | 8 | 6 | 7.5 | 5 | 6.5 | 43.5 | 31.0 | 35.0 | 35.0 | 6 | 15 | 42.0 | 47.0 | 6 | 15 | 31.0 | 32.0 | 6 | 8 | 5 | 7 | 38.8 | 97 | 109 | 121 | 6 | 7 | 37.0 | 43.0 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 16 | 18 | 11 | 8 | 6 | 8 | 5 | 6 | 43.8 | 32.0 | 36.0 | 36.0 | 6 | 15 | 42.0 | 47.0 | 6 | 15 | 30.0 | 32.0 | 6 | 8 | 5 | 7 | 39.0 | 98 | 110 | 122 | 6 | 7 | 37.0 | 43.0 | 5 | 12 | 5 | 8 | 0 |
| 34 FT | 17 | 19 | 11 | 8 | 6 | 7.5 | 5 | 6 | 43.9 | 33.0 | 37.0 | 37.0 | 6 | 14 | 42.0 | 47.0 | 6 | 14 | 30.0 | 31.0 | 6 | 8 | 5 | 7 | 39.3 | 99 | 111 | 123 | 6 | 7 | 37.0 | 43.0 | 5 | 12 | 5 | 7.5 | 0 |
| 36 FT | 17 | 19 | 12 | 8 | 6 | 7 | 5 | 6 | 44.4 | 33.0 | 37.0 | 37.0 | 6 | 14 | 42.0 | 47.0 | 6 | 14 | 30.0 | 31.0 | 6 | 7.5 | 5 | 6.5 | 39.3 | 99 | 111 | 123 | 6 | 6.5 | 37.0 | 43.0 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 18 | 20 | 12 | 8 | 6 | 7.5 | 5 | 6 | 44.6 | 38.0 | 38.0 | 38.0 | 6 | 13 | 42.0 | 47.0 | 6 | 13 | 29.0 | 31.0 | 6 | 7.5 | 5 | 6.5 | 39.6 | 100 | 112 | 124 | 6 | 6.5 | 37.0 | 43.0 | 5 | 12 | 5 | 7.5 | 0 |
| 40 FT | 19 | 20 | 12 | 8 | 6 | 7 | 5 | 6 | 44.6 | 39.0 | 39.0 | 39.0 | 6 | 14 | 42.0 | 47.0 | 6 | 14 | 29.0 | 30.0 | 6 | 6.5 | 5 | 6.5 | 39.6 | 100 | 112 | 124 | 6 | 6.5 | 37.0 | 43.0 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 19 | 21 | 12 | 8 | 6 | 7 | 6 | 7.5 | 48.8 | 39.0 | 39.0 | 39.0 | 6 | 13 | 42.0 | 47.0 | 6 | 13 | 29.0 | 30.0 | 6 | 7 | 5 | 6.5 | 39.8 | 101 | 113 | 125 | 6 | 6.5 | 37.0 | 43.0 | 5 | 12 | 5 | 7 | 0 |
| 44 FT | 20 | 22 | 13 | 8 | 6 | 7 | 5 | 6 | 45.5 | 40.0 | 40.0 | 40.0 | 6 | 14 | 41.0 | 46.0 | 6 | 14 | 29.0 | 30.0 | 6 | 7 | 5 | 6 | 40.3 | 102 | 114 | 126 | 6 | 6.5 | 37.0 | 44.0 | 5 | 12 | 5 | 7 | 0 |
| 46 FT | 20 | 22 | 13 | 8 | 6 | 6.5 | 6 | 8 | 49.5 | 40.0 | 40.0 | 40.0 | 6 | 13 | 41.0 | 46.0 | 6 | 13 | 29.0 | 30.0 | 6 | 7 | 5 | 6 | 40.3 | 102 | 114 | 126 | 6 | 6 | 37.0 | 44.0 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 21 | 23 | 13 | 8 | 6 | 6.5 | 6 | 8 | 49.6 | 41.0 | 41.0 | 41.0 | 6 | 13 | 41.0 | 46.0 | 6 | 13 | 29.0 | 30.0 | 6 | 7 | 5 | 6 | 40.5 | 103 | 115 | 127 | 6 | 6.5 | 37.0 | 44.0 | 5 | 12 | 5 | 6.5 | 0 |
| 50 FT | 21 | 23 | 13 | 8 | 6 | 6.5 | 6 | 7 | 49.6 | 41.0 | 41.0 | 41.0 | 6 | 13 | 41.0 | 46.0 | 6 | 13 | 29.0 | 30.0 | 6 | 6 | 5 | 6 | 40.5 | 103 | 115 | 127 | 6 | 6 | 37.0 | 44.0 | 5 | 12 | 5 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

GENERAL NOTES:

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

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

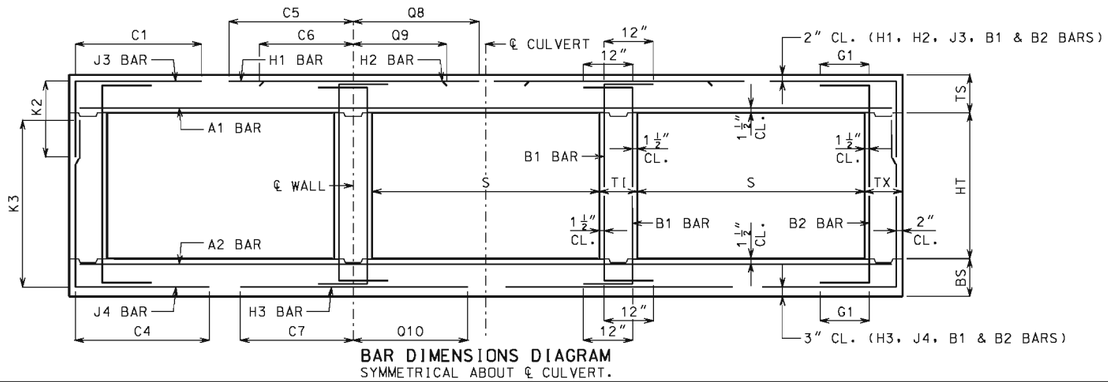
SPAN (S): 8 FEET
HEIGHT (HT): 4 THRU 9 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

## SPAN (S) = 8 FT  HEIGHT (HT) = 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=10' | K2 HT=11' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=10' | K3 HT=11' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 12 | 9 | 8 | 9 | 5 | 7 | 5 | 7 | 44.9 | 32.0 | 32.0 | 4 | 13 | 81.5 | 61.5 | 4 | 13 | 28.0 | 26.0 | 4 | 6.5 | 6 | 6 | 69.3 | 125 | 137 | 5 | 7.5 | 43.0 | 42.0 | 5 | 11.5 | 5 | 10 | 12 |
| 2 FT | 12 | 9 | 9 | 9 | 5 | 7 | 5 | 8 | 45.5 | 32.0 | 32.0 | 4 | 12 | 82.5 | 61.5 | 4 | 12 | 27.0 | 24.0 | 4 | 6.5 | 6 | 6.5 | 70.0 | 125 | 137 | 5 | 7 | 41.0 | 41.0 | 5 | 11.5 | 5 | 10.5 | 12 |
| 4 FT | 8 | 9 | 10 | 9 | 4 | 6 | 6 | 7 | 49.1 | 28.0 | 28.0 | 5 | 16 | 84.5 | 65.0 | 5 | 16 | 27.0 | 27.0 | 4 | 6 | 5 | 6 | 65.8 | 125 | 137 | 5 | 7 | 39.0 | 41.0 | 5 | 11.5 | 5 | 9.5 | 12 |
| 6 FT | 8 | 9 | 11 | 9 | 4 | 6 | 5 | 6 | 57.1 | 28.0 | 28.0 | 5 | 16 | 44.0 | 44.0 | 5 | 16 | 26.0 | 26.0 | 5 | 9 | 5 | 6 | 56.6 | 125 | 137 | 5 | 6.5 | 37.0 | 39.0 | 5 | 11.5 | 5 | 9.5 | 12 |
| 8 FT | 8 | 10 | 11 | 9 | 4 | 6 | 6 | 7 | 54.8 | 28.0 | 28.0 | 5 | 15 | 41.0 | 41.0 | 5 | 15 | 25.0 | 26.0 | 5 | 9 | 5 | 6.5 | 56.4 | 126 | 138 | 5 | 6.5 | 37.0 | 39.0 | 5 | 12 | 5 | 9 | 0 |
| 10 FT | 8 | 10 | 11 | 9 | 4 | 6 | 6 | 6.5 | 51.9 | 28.0 | 28.0 | 5 | 14 | 39.0 | 40.0 | 5 | 14 | 25.0 | 25.0 | 5 | 7.5 | 5 | 6 | 54.0 | 126 | 138 | 5 | 6 | 36.0 | 39.0 | 5 | 12 | 5 | 8.5 | 0 |
| 12 FT | 9 | 11 | 11 | 9 | 5 | 8.5 | 6 | 7 | 52.5 | 29.0 | 29.0 | 5 | 14 | 38.0 | 39.0 | 5 | 14 | 25.0 | 25.0 | 5 | 7.5 | 5 | 6 | 53.9 | 127 | 139 | 5 | 6 | 36.0 | 39.0 | 5 | 12 | 5 | 8 | 0 |
| 14 FT | 10 | 11 | 11 | 9 | 5 | 8 | 5 | 6 | 50.1 | 30.0 | 30.0 | 5 | 15 | 37.0 | 39.0 | 5 | 15 | 25.0 | 25.0 | 5 | 7 | 5 | 6 | 51.9 | 127 | 139 | 5 | 6 | 35.0 | 39.0 | 5 | 12 | 5 | 7.5 | 0 |
| 16 FT | 10 | 12 | 11 | 9 | 5 | 7.5 | 5 | 6 | 48.3 | 30.0 | 30.0 | 5 | 13 | 36.0 | 39.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6.5 | 5 | 6 | 52.3 | 128 | 140 | 5 | 6 | 35.0 | 39.0 | 5 | 12 | 5 | 7.5 | 0 |
| 18 FT | 11 | 13 | 11 | 9 | 5 | 7.5 | 5 | 6.5 | 48.6 | 31.0 | 31.0 | 5 | 14 | 36.0 | 39.0 | 5 | 14 | 24.0 | 25.0 | 5 | 6.5 | 6 | 7 | 55.0 | 129 | 141 | 6 | 8 | 38.0 | 42.0 | 5 | 12 | 5 | 7.5 | 0 |
| 20 FT | 12 | 14 | 11 | 9 | 5 | 7 | 5 | 6 | 48.8 | 32.0 | 32.0 | 5 | 13 | 35.0 | 39.0 | 5 | 13 | 24.0 | 25.0 | 5 | 6.5 | 6 | 7 | 54.9 | 130 | 142 | 6 | 8 | 38.0 | 43.0 | 5 | 12 | 5 | 7.5 | 0 |
| 22 FT | 13 | 15 | 11 | 9 | 5 | 6.5 | 6 | 8 | 52.1 | 33.0 | 37.0 | 5 | 12 | 35.0 | 39.0 | 5 | 12 | 23.0 | 24.0 | 5 | 6 | 6 | 7 | 54.9 | 131 | 143 | 6 | 8 | 38.0 | 43.0 | 5 | 12 | 5 | 7.5 | 0 |
| 24 FT | 13 | 15 | 12 | 9 | 5 | 6.5 | 5 | 6 | 48.3 | 33.0 | 33.0 | 5 | 12 | 35.0 | 38.0 | 5 | 12 | 23.0 | 25.0 | 5 | 6 | 6 | 7.5 | 53.9 | 131 | 143 | 6 | 7 | 38.0 | 43.0 | 5 | 12 | 5 | 7 | 0 |
| 26 FT | 14 | 16 | 12 | 9 | 5 | 6 | 6 | 8 | 51.8 | 34.0 | 38.0 | 5 | 12 | 35.0 | 38.0 | 5 | 12 | 22.0 | 24.0 | 5 | 6 | 6 | 7.5 | 54.1 | 132 | 144 | 6 | 7.5 | 38.0 | 43.0 | 5 | 12 | 5 | 7 | 0 |
| 28 FT | 15 | 16 | 12 | 9 | 5 | 6 | 6 | 8 | 56.1 | 35.0 | 39.0 | 6 | 16 | 43.0 | 47.0 | 6 | 16 | 31.0 | 32.0 | 6 | 7.5 | 6 | 8 | 51.0 | 132 | 144 | 6 | 7 | 38.0 | 43.0 | 5 | 12 | 5 | 7 | 0 |
| 30 FT | 15 | 17 | 12 | 9 | 6 | 8 | 6 | 7 | 55.9 | 35.0 | 39.0 | 6 | 16 | 43.0 | 47.0 | 6 | 16 | 31.0 | 32.0 | 6 | 8 | 6 | 7.5 | 51.5 | 133 | 145 | 6 | 7 | 38.0 | 43.0 | 5 | 12 | 5 | 7 | 0 |
| 32 FT | 16 | 18 | 13 | 9 | 6 | 8 | 6 | 8 | 56.5 | 36.0 | 40.0 | 6 | 15 | 42.0 | 47.0 | 6 | 15 | 30.0 | 31.0 | 6 | 8 | 6 | 8.5 | 51.8 | 134 | 146 | 6 | 7 | 38.0 | 43.0 | 5 | 12 | 5 | 6.5 | 0 |
| 34 FT | 17 | 19 | 13 | 9 | 6 | 8 | 6 | 7.5 | 56.9 | 37.0 | 41.0 | 6 | 14 | 42.0 | 47.0 | 6 | 14 | 30.0 | 31.0 | 6 | 8 | 6 | 8.5 | 52.3 | 135 | 147 | 6 | 7 | 38.0 | 43.0 | 5 | 12 | 5 | 6.5 | 0 |
| 36 FT | 17 | 19 | 14 | 9 | 6 | 7.5 | 6 | 7.5 | 57.0 | 37.0 | 41.0 | 6 | 14 | 42.0 | 46.0 | 6 | 14 | 30.0 | 31.0 | 6 | 7.5 | 6 | 8 | 51.9 | 135 | 147 | 6 | 6.5 | 38.0 | 43.0 | 5 | 12 | 5 | 6 | 0 |
| 38 FT | 18 | 20 | 14 | 9 | 6 | 7.5 | 6 | 7.5 | 57.4 | 38.0 | 42.0 | 6 | 14 | 42.0 | 46.0 | 6 | 14 | 30.0 | 31.0 | 6 | 7.5 | 6 | 8 | 52.3 | 136 | 148 | 6 | 7 | 38.0 | 43.0 | 5 | 12 | 5 | 6 | 0 |
| 40 FT | 18 | 20 | 14 | 9 | 6 | 7 | 6 | 6.5 | 57.3 | 38.0 | 42.0 | 6 | 13 | 42.0 | 46.0 | 6 | 13 | 30.0 | 31.0 | 6 | 6.5 | 6 | 8 | 52.1 | 136 | 148 | 6 | 6.5 | 38.0 | 43.0 | 5 | 12 | 5 | 6 | 0 |
| 42 FT | 19 | 21 | 15 | 9 | 6 | 7 | 6 | 7 | 57.9 | 43.0 | 43.0 | 6 | 14 | 42.0 | 46.0 | 6 | 14 | 30.0 | 30.0 | 6 | 7 | 6 | 8 | 52.6 | 137 | 149 | 6 | 6.5 | 38.0 | 43.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 19 | 22 | 15 | 9 | 6 | 7 | 6 | 7 | 57.9 | 43.0 | 43.0 | 6 | 13 | 42.0 | 46.0 | 6 | 13 | 30.0 | 30.0 | 6 | 7 | 6 | 8 | 53.0 | 138 | 150 | 6 | 6.5 | 38.0 | 43.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 20 | 22 | 15 | 9 | 6 | 7 | 6 | 6 | 58.1 | 44.0 | 44.0 | 6 | 14 | 42.0 | 45.0 | 6 | 14 | 30.0 | 30.0 | 6 | 7 | 6 | 7.5 | 52.9 | 138 | 150 | 6 | 6.5 | 38.0 | 43.0 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 20 | 23 | 16 | 9 | 6 | 6.5 | 6 | 7 | 58.5 | 44.0 | 44.0 | 6 | 13 | 42.0 | 45.0 | 6 | 13 | 30.0 | 30.0 | 6 | 7 | 6 | 7.5 | 53.3 | 139 | 151 | 6 | 6.5 | 38.0 | 44.0 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 21 | 23 | 16 | 9 | 6 | 6.5 | 6 | 6.5 | 58.9 | 45.0 | 45.0 | 6 | 13 | 42.0 | 45.0 | 6 | 13 | 29.0 | 30.0 | 6 | 6.5 | 6 | 7.5 | 53.3 | 139 | 151 | 6 | 6 | 38.0 | 44.0 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 8 FEET
HEIGHT (HT): 10 THRU 11 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 11 OF 27

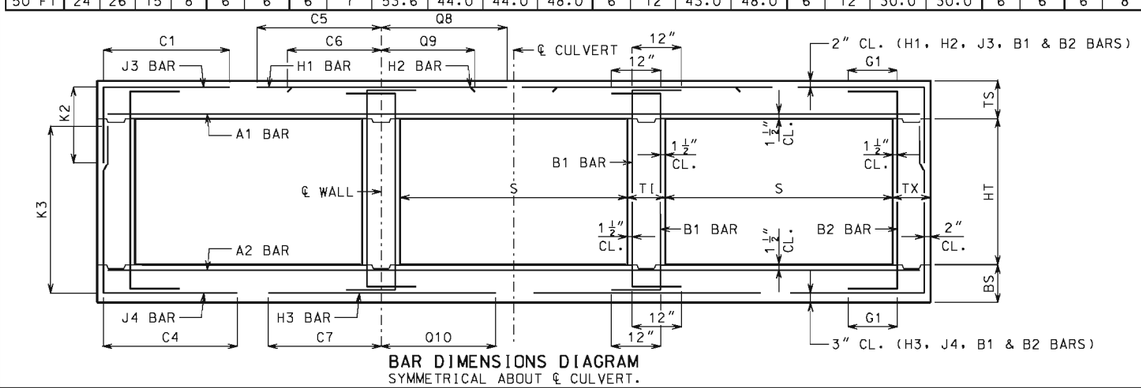
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 9 FT  HEIGHT (HT) = 5 FT OR 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=5′ | HT=6′ | HT=7′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=5′ | HT=6′ | HT=7′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 8 | 8 | 8 | 5 | 6.5 | 4 | 7.5 | 48.3 | 29.0 | 29.0 | 29.0 | 4 | 12 | 89.5 | 66.5 | 4 | 12 | 28.0 | 26.0 | 4 | 6.5 | 5 | 6 | 46.1 | 64 | 76 | 88 | 5 | 6 | 42.0 | 43.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 4 | 7.5 | 48.3 | 29.0 | 29.0 | 29.0 | 5 | 17 | 89.5 | 68.5 | 5 | 17 | 27.0 | 27.0 | 4 | 6.5 | 4 | 6 | 43.9 | 65 | 77 | 89 | 5 | 6.5 | 41.0 | 43.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 9 | 9 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 44.8 | 25.0 | 25.0 | 25.0 | 5 | 16 | 57.0 | 70.0 | 5 | 16 | 29.0 | 29.0 | 5 | 8.5 | 4 | 6 | 39.6 | 65 | 77 | 89 | 5 | 6 | 40.0 | 43.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 9 | 9 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 39.6 | 25.0 | 25.0 | 29.0 | 5 | 15 | 46.0 | 52.0 | 5 | 15 | 27.0 | 28.0 | 5 | 7.5 | 5 | 6.5 | 36.5 | 65 | 77 | 89 | 6 | 7 | 42.0 | 45.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 5 | 6.5 | 36.8 | 25.0 | 25.0 | 25.0 | 5 | 14 | 42.0 | 45.0 | 5 | 14 | 26.0 | 27.0 | 5 | 7.5 | 4 | 6.5 | 34.8 | 66 | 78 | 90 | 5 | 6 | 38.0 | 42.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 9 | 10 | 8 | 8 | 5 | 8.5 | 5 | 6 | 35.4 | 25.0 | 25.0 | 29.0 | 5 | 12 | 41.0 | 44.0 | 5 | 12 | 26.0 | 26.0 | 5 | 7 | 5 | 7 | 33.5 | 66 | 78 | 90 | 6 | 6.5 | 41.0 | 45.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 10 | 11 | 8 | 8 | 5 | 8 | 5 | 7 | 33.9 | 26.0 | 26.0 | 30.0 | 5 | 12 | 40.0 | 44.0 | 5 | 12 | 26.0 | 26.0 | 5 | 6.5 | 5 | 7.5 | 32.4 | 67 | 79 | 91 | 6 | 7 | 40.0 | 45.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 5 | 7.5 | 32.8 | 27.0 | 27.0 | 31.0 | 5 | 13 | 39.0 | 43.0 | 5 | 13 | 25.0 | 26.0 | 5 | 6 | 5 | 8.5 | 31.6 | 68 | 80 | 92 | 6 | 7 | 40.0 | 46.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 8 | 31.9 | 28.0 | 28.0 | 32.0 | 5 | 13 | 38.0 | 43.0 | 5 | 13 | 25.0 | 27.0 | 5 | 6 | 5 | 8.5 | 31.0 | 69 | 81 | 93 | 6 | 7 | 39.0 | 46.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 8 | 31.3 | 29.0 | 29.0 | 33.0 | 5 | 12 | 37.0 | 43.0 | 5 | 12 | 25.0 | 26.0 | 6 | 8 | 5 | 8.5 | 30.6 | 70 | 82 | 94 | 6 | 7.5 | 39.0 | 46.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8.5 | 30.6 | 30.0 | 30.0 | 34.0 | 5 | 12 | 37.0 | 43.0 | 5 | 12 | 24.0 | 26.0 | 6 | 8 | 5 | 8.5 | 30.3 | 71 | 83 | 95 | 6 | 7 | 39.0 | 46.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 8 | 35.3 | 31.0 | 31.0 | 35.0 | 6 | 16 | 45.0 | 52.0 | 6 | 16 | 32.0 | 34.0 | 6 | 7.5 | 5 | 8 | 30.0 | 72 | 84 | 96 | 6 | 7 | 39.0 | 46.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 7.5 | 35.0 | 31.0 | 35.0 | 35.0 | 6 | 16 | 45.0 | 52.0 | 6 | 16 | 33.0 | 35.0 | 6 | 6.5 | 5 | 8 | 29.8 | 72 | 84 | 96 | 6 | 6.5 | 39.0 | 46.0 | 5 | 12 | 5 | 11.5 | 0 |
| 26 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 7 | 34.9 | 32.0 | 36.0 | 36.0 | 6 | 15 | 45.0 | 52.0 | 6 | 15 | 32.0 | 34.0 | 6 | 7 | 5 | 7 | 29.8 | 73 | 85 | 97 | 6 | 6.5 | 39.0 | 46.0 | 5 | 12 | 5 | 10.5 | 0 |
| 28 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 34.8 | 37.0 | 37.0 | 37.0 | 6 | 14 | 45.0 | 52.0 | 6 | 14 | 32.0 | 34.0 | 6 | 7 | 5 | 6.5 | 29.8 | 74 | 86 | 98 | 6 | 6.5 | 39.0 | 46.0 | 5 | 12 | 5 | 9.5 | 0 |
| 30 FT | 18 | 19 | 8 | 8 | 6 | 7 | 5 | 6.5 | 33.6 | 38.0 | 38.0 | 38.0 | 6 | 13 | 44.0 | 52.0 | 6 | 13 | 31.0 | 32.0 | 6 | 7 | 5 | 6.5 | 28.8 | 75 | 87 | 99 | 6 | 6 | 39.0 | 46.0 | 5 | 12 | 5 | 9.5 | 0 |
| 32 FT | 18 | 20 | 8 | 8 | 6 | 7 | 5 | 6.5 | 33.8 | 38.0 | 38.0 | 38.0 | 6 | 13 | 44.0 | 51.0 | 6 | 13 | 32.0 | 33.0 | 6 | 7 | 5 | 6 | 28.8 | 76 | 88 | 100 | 6 | 6.5 | 39.0 | 46.0 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 19 | 20 | 8 | 8 | 6 | 6.5 | 5 | 6 | 33.6 | 39.0 | 39.0 | 39.0 | 6 | 13 | 44.0 | 51.0 | 6 | 13 | 31.0 | 33.0 | 6 | 6 | 5 | 6 | 28.9 | 76 | 88 | 100 | 6 | 6 | 39.0 | 46.0 | 5 | 12 | 5 | 9.5 | 0 |
| 36 FT | 20 | 21 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 37.8 | 44.0 | 44.0 | 44.0 | 6 | 12 | 44.0 | 51.0 | 6 | 12 | 30.0 | 32.0 | 6 | 6.5 | 6 | 7.5 | 32.0 | 77 | 89 | 101 | 6 | 6 | 39.0 | 46.0 | 5 | 12 | 5 | 9.5 | 0 |
| 38 FT | 20 | 22 | 8 | 8 | 6 | 6 | 6 | 7.5 | 37.9 | 44.0 | 44.0 | 44.0 | 6 | 12 | 44.0 | 51.0 | 6 | 12 | 31.0 | 32.0 | 6 | 6.5 | 6 | 7 | 32.0 | 78 | 90 | 102 | 6 | 6 | 39.0 | 46.0 | 5 | 12 | 5 | 9 | 0 |
| 40 FT | 21 | 23 | 8 | 8 | 6 | 6 | 6 | 7 | 38.0 | 45.0 | 45.0 | 45.0 | 6 | 12 | 44.0 | 51.0 | 6 | 12 | 30.0 | 32.0 | 6 | 6.5 | 6 | 6.5 | 32.3 | 79 | 91 | 103 | 6 | 6 | 39.0 | 46.0 | 5 | 12 | 5 | 8.5 | 0 |
| 42 FT | 22 | 23 | 8 | 8 | 6 | 6 | 6 | 6.5 | 37.9 | 46.0 | 46.0 | 46.0 | 6 | 12 | 44.0 | 51.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6 | 6 | 6.5 | 32.3 | 79 | 91 | 103 | 7 | 8 | 42.0 | 49.0 | 5 | 12 | 5 | 8 | 0 |
| 44 FT | 23 | 24 | 9 | 8 | 6 | 6 | 6 | 7 | 38.8 | 47.0 | 47.0 | 47.0 | 6 | 12 | 44.0 | 50.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6 | 6 | 7 | 33.0 | 80 | 92 | 104 | 7 | 8 | 42.0 | 50.0 | 5 | 12 | 5 | 8.5 | 0 |
| 46 FT | 23 | 25 | 9 | 8 | 7 | 8 | 6 | 7 | 38.9 | 47.0 | 47.0 | 47.0 | 7 | 16 | 49.0 | 55.0 | 7 | 16 | 35.0 | 36.0 | 6 | 6 | 6 | 7 | 33.0 | 81 | 93 | 105 | 7 | 8 | 42.0 | 50.0 | 5 | 12 | 5 | 8.5 | 0 |
| 48 FT | 24 | 25 | 9 | 8 | 7 | 8 | 6 | 7 | 38.9 | 48.0 | 48.0 | 48.0 | 6 | 12 | 43.0 | 50.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6 | 6 | 7 | 33.1 | 81 | 93 | 105 | 7 | 7.5 | 42.0 | 50.0 | 5 | 12 | 5 | 8 | 0 |
| 50 FT | 24 | 26 | 9 | 8 | 7 | 7.5 | 6 | 6.5 | 39.0 | 48.0 | 48.0 | 48.0 | 7 | 15 | 48.0 | 55.0 | 7 | 15 | 35.0 | 36.0 | 6 | 6 | 6 | 6.5 | 33.3 | 82 | 94 | 106 | 7 | 7.5 | 42.0 | 50.0 | 5 | 12 | 5 | 7.5 | 0 |

## SPAN (S) = 9 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=8′ | HT=9′ | HT=10′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=8′ | HT=9′ | HT=10′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 48.3 | 29.0 | 29.0 | 33.0 | 4 | 12 | 89.5 | 66.5 | 4 | 12 | 29.0 | 27.0 | 4 | 6.5 | 6 | 6.5 | 75.0 | 101 | 113 | 125 | 5 | 7 | 43.0 | 44.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 51.3 | 29.0 | 33.0 | 33.0 | 5 | 18 | 91.5 | 68.5 | 5 | 18 | 28.0 | 25.0 | 5 | 9 | 6 | 6.5 | 69.0 | 101 | 113 | 125 | 5 | 6.5 | 42.0 | 44.0 | 5 | 12 | 5 | 11.5 | 12 |
| 4 FT | 9 | 9 | 8 | 8 | 5 | 8.5 | 6 | 7 | 51.3 | 29.0 | 33.0 | 33.0 | 5 | 16 | 91.5 | 70.0 | 5 | 16 | 29.0 | 30.0 | 5 | 8 | 6 | 6 | 62.0 | 101 | 113 | 125 | 5 | 6 | 41.0 | 44.0 | 5 | 12 | 5 | 10 | 12 |
| 6 FT | 9 | 10 | 9 | 8 | 5 | 8.5 | 5 | 6 | 54.9 | 25.0 | 25.0 | 29.0 | 5 | 15 | 49.0 | 53.0 | 5 | 15 | 27.0 | 28.0 | 5 | 8 | 5 | 6 | 53.9 | 102 | 114 | 126 | 5 | 6.5 | 39.0 | 43.0 | 5 | 12 | 5 | 11 | 12 |
| 8 FT | 9 | 10 | 9 | 8 | 5 | 8.5 | 5 | 6 | 48.8 | 25.0 | 29.0 | 29.0 | 5 | 14 | 44.0 | 46.0 | 5 | 14 | 26.0 | 27.0 | 5 | 7 | 6 | 6.5 | 52.4 | 102 | 114 | 126 | 6 | 7 | 41.0 | 46.0 | 5 | 12 | 5 | 10.5 | 0 |
| 10 FT | 9 | 11 | 9 | 8 | 5 | 8.5 | 5 | 6 | 46.5 | 25.0 | 29.0 | 29.0 | 5 | 12 | 42.0 | 44.0 | 5 | 12 | 26.0 | 26.0 | 5 | 6.5 | 6 | 7 | 51.4 | 103 | 115 | 127 | 5 | 6 | 38.0 | 43.0 | 5 | 12 | 5 | 9.5 | 0 |
| 12 FT | 10 | 11 | 9 | 8 | 5 | 8 | 5 | 6 | 45.8 | 30.0 | 30.0 | 30.0 | 5 | 13 | 40.0 | 43.0 | 5 | 13 | 26.0 | 27.0 | 5 | 6.5 | 6 | 6 | 49.5 | 103 | 115 | 127 | 6 | 7 | 40.0 | 45.0 | 5 | 12 | 5 | 9 | 0 |
| 14 FT | 11 | 12 | 9 | 8 | 5 | 7.5 | 6 | 7 | 48.1 | 31.0 | 31.0 | 35.0 | 5 | 13 | 39.0 | 43.0 | 5 | 13 | 25.0 | 27.0 | 5 | 6 | 6 | 6.5 | 48.8 | 104 | 116 | 128 | 6 | 7 | 40.0 | 46.0 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 12 | 13 | 9 | 8 | 5 | 7 | 6 | 6.5 | 47.4 | 32.0 | 32.0 | 36.0 | 5 | 13 | 39.0 | 43.0 | 5 | 13 | 25.0 | 27.0 | 5 | 6 | 6 | 6.5 | 48.3 | 105 | 117 | 129 | 6 | 7 | 40.0 | 46.0 | 5 | 12 | 5 | 8.5 | 0 |
| 18 FT | 13 | 14 | 9 | 8 | 5 | 6.5 | 6 | 7 | 46.9 | 33.0 | 33.0 | 37.0 | 5 | 12 | 38.0 | 43.0 | 5 | 12 | 24.0 | 26.0 | 6 | 8 | 6 | 6.5 | 47.6 | 106 | 118 | 130 | 6 | 7.5 | 40.0 | 46.0 | 5 | 12 | 5 | 8.5 | 0 |
| 20 FT | 13 | 15 | 9 | 8 | 5 | 6.5 | 6 | 6 | 46.0 | 33.0 | 33.0 | 37.0 | 5 | 12 | 38.0 | 43.0 | 5 | 12 | 25.0 | 27.0 | 6 | 8 | 6 | 6.5 | 47.1 | 107 | 119 | 131 | 6 | 7 | 40.0 | 46.0 | 5 | 12 | 5 | 8.5 | 0 |
| 22 FT | 14 | 16 | 11 | 8 | 5 | 6 | 5 | 6 | 43.5 | 34.0 | 34.0 | 34.0 | 5 | 12 | 37.0 | 42.0 | 5 | 12 | 25.0 | 26.0 | 6 | 7.5 | 5 | 7 | 44.0 | 108 | 120 | 132 | 6 | 7 | 40.0 | 46.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 15 | 17 | 11 | 8 | 6 | 8 | 5 | 6 | 48.4 | 35.0 | 35.0 | 35.0 | 6 | 16 | 46.0 | 51.0 | 6 | 16 | 33.0 | 35.0 | 6 | 7.5 | 5 | 7 | 44.0 | 109 | 121 | 133 | 6 | 6.5 | 40.0 | 46.0 | 5 | 12 | 5 | 7.5 | 0 |
| 26 FT | 16 | 17 | 11 | 8 | 6 | 8 | 6 | 8 | 52.1 | 36.0 | 36.0 | 36.0 | 6 | 15 | 45.0 | 51.0 | 6 | 15 | 32.0 | 34.0 | 6 | 6.5 | 5 | 6 | 43.6 | 109 | 121 | 133 | 6 | 6.5 | 40.0 | 46.0 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 17 | 18 | 12 | 8 | 6 | 7.5 | 5 | 6 | 48.8 | 37.0 | 37.0 | 37.0 | 6 | 14 | 45.0 | 51.0 | 6 | 14 | 31.0 | 33.0 | 6 | 7 | 5 | 6.5 | 43.9 | 110 | 122 | 134 | 6 | 6.5 | 40.0 | 46.0 | 5 | 12 | 5 | 7 | 0 |
| 30 FT | 17 | 19 | 12 | 8 | 6 | 7.5 | 5 | 6 | 46.9 | 37.0 | 37.0 | 37.0 | 6 | 14 | 44.0 | 51.0 | 6 | 14 | 32.0 | 33.0 | 6 | 7 | 5 | 6.5 | 42.0 | 111 | 123 | 135 | 6 | 6 | 40.0 | 47.0 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 18 | 20 | 12 | 8 | 6 | 7 | 6 | 8 | 51.0 | 38.0 | 38.0 | 38.0 | 6 | 13 | 44.0 | 50.0 | 6 | 13 | 31.0 | 33.0 | 6 | 7 | 5 | 6.5 | 42.3 | 112 | 124 | 136 | 6 | 6 | 40.0 | 47.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 19 | 20 | 12 | 8 | 6 | 7 | 6 | 8 | 50.9 | 39.0 | 39.0 | 39.0 | 6 | 13 | 44.0 | 50.0 | 6 | 13 | 30.0 | 32.0 | 6 | 6 | 5 | 6.5 | 42.3 | 112 | 124 | 136 | 6 | 6 | 40.0 | 47.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 19 | 21 | 13 | 8 | 6 | 6.5 | 6 | 8 | 51.6 | 39.0 | 39.0 | 39.0 | 6 | 13 | 44.0 | 50.0 | 6 | 13 | 31.0 | 32.0 | 6 | 6.5 | 5 | 6 | 42.5 | 113 | 125 | 137 | 6 | 6 | 40.0 | 47.0 | 5 | 12 | 5 | 7 | 0 |
| 38 FT | 20 | 22 | 13 | 8 | 6 | 6.5 | 6 | 7.5 | 51.8 | 40.0 | 40.0 | 40.0 | 6 | 12 | 44.0 | 50.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6.5 | 5 | 6 | 42.8 | 114 | 126 | 138 | 6 | 6 | 40.0 | 47.0 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 21 | 23 | 13 | 8 | 6 | 6.5 | 6 | 7.5 | 51.9 | 41.0 | 41.0 | 41.0 | 6 | 12 | 44.0 | 49.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6.5 | 5 | 6 | 43.0 | 115 | 127 | 139 | 6 | 6 | 40.0 | 47.0 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 21 | 24 | 14 | 8 | 6 | 6 | 6 | 7.5 | 52.6 | 41.0 | 41.0 | 41.0 | 6 | 12 | 44.0 | 49.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6.5 | 5 | 6 | 43.4 | 116 | 128 | 140 | 6 | 6 | 40.0 | 47.0 | 5 | 12 | 5 | 6.5 | 0 |
| 44 FT | 22 | 24 | 14 | 8 | 6 | 6 | 6 | 7.5 | 52.6 | 42.0 | 42.0 | 42.0 | 6 | 12 | 44.0 | 49.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6 | 5 | 6 | 43.4 | 116 | 128 | 140 | 7 | 7.5 | 43.0 | 50.0 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 23 | 25 | 14 | 8 | 6 | 6 | 6 | 7 | 52.8 | 43.0 | 43.0 | 43.0 | 6 | 12 | 43.0 | 48.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6 | 5 | 6 | 43.6 | 117 | 129 | 141 | 7 | 7.5 | 43.0 | 50.0 | 5 | 12 | 5 | 6 | 0 |
| 48 FT | 23 | 26 | 15 | 8 | 6 | 6 | 6 | 7 | 53.6 | 43.0 | 43.0 | 47.0 | 6 | 12 | 44.0 | 48.0 | 6 | 12 | 30.0 | 31.0 | 6 | 6 | 6 | 8 | 47.0 | 118 | 130 | 142 | 7 | 7.5 | 43.0 | 50.0 | 5 | 12 | 5 | 6 | 0 |
| 50 FT | 24 | 26 | 15 | 8 | 6 | 6 | 6 | 7 | 53.6 | 44.0 | 44.0 | 48.0 | 6 | 12 | 43.0 | 48.0 | 6 | 12 | 30.0 | 30.0 | 6 | 6 | 6 | 8 | 47.1 | 118 | 130 | 142 | 7 | 7.5 | 43.0 | 50.0 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

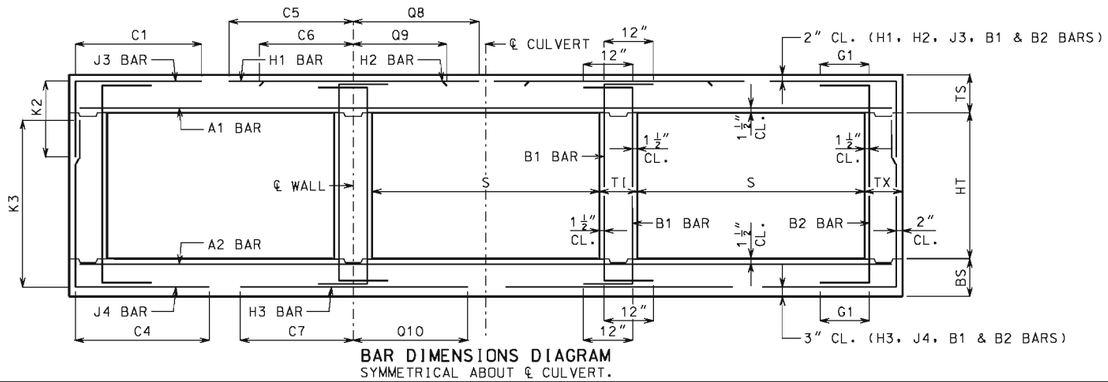
SPAN (S): 9 FEET
HEIGHT (HT): 5 THRU 10 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

## SPAN (S) = 9 FT  HEIGHT (HT) = 11 FT OR 12 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=11' | K2 HT=12' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=11' | K3 HT=12' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 9 | 9 | 10 | 5 | 6.5 | 5 | 7.5 | 49.3 | 33.0 | 33.0 | 4 | 12 | 90.5 | 67.5 | 4 | 12 | 29.0 | 27.0 | 4 | 6 | 6 | 6 | 76.3 | 137 | 149 | 5 | 6.5 | 44.0 | 44.0 | 5 | 10 | 5 | 9 | 12 |
| 2 FT | 13 | 10 | 9 | 10 | 5 | 6.5 | 5 | 7 | 52.3 | 33.0 | 33.0 | 5 | 18 | 92.5 | 69.5 | 5 | 18 | 28.0 | 25.0 | 4 | 6 | 6 | 6.5 | 76.3 | 138 | 150 | 5 | 7 | 44.0 | 45.0 | 5 | 11.5 | 5 | 9 | 12 |
| 4 FT | 9 | 10 | 9 | 10 | 5 | 8.5 | 5 | 6 | 52.3 | 29.0 | 29.0 | 5 | 16 | 92.5 | 71.0 | 5 | 16 | 29.0 | 30.0 | 5 | 8.5 | 6 | 6 | 76.3 | 138 | 150 | 5 | 7 | 43.0 | 45.0 | 5 | 11.5 | 5 | 8.5 | 12 |
| 6 FT | 9 | 10 | 10 | 10 | 5 | 8.5 | 5 | 6 | 69.4 | 29.0 | 29.0 | 5 | 16 | 51.0 | 49.0 | 5 | 16 | 28.0 | 28.0 | 5 | 7.5 | 6 | 6.5 | 68.8 | 138 | 150 | 5 | 6 | 41.0 | 43.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 9 | 10 | 10 | 10 | 5 | 8.5 | 5 | 6 | 60.0 | 29.0 | 29.0 | 5 | 14 | 45.0 | 45.0 | 5 | 14 | 27.0 | 27.0 | 5 | 7 | 6 | 6 | 63.9 | 138 | 150 | 6 | 7 | 43.0 | 45.0 | 5 | 12 | 5 | 8 | 0 |
| 10 FT | 9 | 11 | 10 | 10 | 5 | 8.5 | 6 | 7 | 59.0 | 29.0 | 33.0 | 5 | 13 | 42.0 | 43.0 | 5 | 13 | 27.0 | 27.0 | 5 | 6.5 | 6 | 6 | 63.6 | 139 | 151 | 5 | 6 | 39.0 | 43.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 10 | 12 | 10 | 10 | 5 | 8 | 6 | 7 | 58.6 | 30.0 | 34.0 | 5 | 13 | 41.0 | 43.0 | 5 | 13 | 26.0 | 27.0 | 5 | 6.5 | 6 | 6.5 | 62.8 | 140 | 152 | 5 | 6 | 39.0 | 43.0 | 5 | 12 | 5 | 8 | 0 |
| 14 FT | 11 | 12 | 10 | 10 | 5 | 7.5 | 6 | 7.5 | 58.5 | 31.0 | 35.0 | 5 | 13 | 41.0 | 43.0 | 5 | 13 | 26.0 | 27.0 | 5 | 6 | 6 | 6 | 60.4 | 140 | 152 | 6 | 7 | 41.0 | 45.0 | 5 | 12 | 5 | 8 | 0 |
| 16 FT | 12 | 13 | 11 | 10 | 5 | 7 | 5 | 6 | 54.4 | 32.0 | 32.0 | 5 | 13 | 40.0 | 42.0 | 5 | 13 | 26.0 | 27.0 | 5 | 6 | 6 | 7 | 59.1 | 141 | 153 | 6 | 7 | 41.0 | 45.0 | 5 | 12 | 5 | 7.5 | 0 |
| 18 FT | 12 | 14 | 11 | 10 | 5 | 7 | 6 | 7.5 | 55.6 | 32.0 | 36.0 | 5 | 12 | 39.0 | 42.0 | 5 | 12 | 26.0 | 27.0 | 6 | 8 | 6 | 6.5 | 59.0 | 142 | 154 | 6 | 7.5 | 41.0 | 46.0 | 5 | 12 | 5 | 7.5 | 0 |
| 20 FT | 13 | 15 | 12 | 10 | 5 | 6.5 | 6 | 8 | 55.0 | 33.0 | 37.0 | 5 | 12 | 38.0 | 42.0 | 5 | 12 | 26.0 | 27.0 | 6 | 8 | 6 | 7 | 58.1 | 143 | 155 | 6 | 7 | 41.0 | 46.0 | 5 | 12 | 5 | 7 | 0 |
| 22 FT | 14 | 16 | 12 | 10 | 5 | 6 | 6 | 7.5 | 55.0 | 34.0 | 38.0 | 5 | 12 | 38.0 | 42.0 | 5 | 12 | 25.0 | 27.0 | 6 | 7.5 | 6 | 7 | 57.9 | 144 | 156 | 6 | 7 | 41.0 | 46.0 | 5 | 12 | 5 | 7 | 0 |
| 24 FT | 15 | 17 | 13 | 10 | 6 | 8 | 6 | 7.5 | 61.0 | 35.0 | 39.0 | 6 | 16 | 47.0 | 51.0 | 6 | 16 | 33.0 | 35.0 | 6 | 7.5 | 6 | 7.5 | 57.4 | 145 | 157 | 6 | 6.5 | 41.0 | 46.0 | 5 | 12 | 5 | 6.5 | 0 |
| 26 FT | 16 | 17 | 13 | 10 | 6 | 8 | 6 | 7 | 61.3 | 40.0 | 40.0 | 6 | 15 | 46.0 | 51.0 | 6 | 15 | 33.0 | 34.0 | 6 | 6.5 | 6 | 7 | 56.6 | 145 | 157 | 6 | 6.5 | 41.0 | 46.0 | 5 | 12 | 5 | 6.5 | 0 |
| 28 FT | 16 | 18 | 14 | 10 | 6 | 8 | 6 | 7.5 | 61.0 | 36.0 | 40.0 | 6 | 15 | 46.0 | 51.0 | 6 | 15 | 33.0 | 35.0 | 6 | 7 | 6 | 7 | 56.6 | 146 | 158 | 6 | 6.5 | 41.0 | 46.0 | 5 | 12 | 5 | 6 | 0 |
| 30 FT | 17 | 19 | 14 | 10 | 6 | 7.5 | 6 | 7.5 | 59.6 | 37.0 | 41.0 | 6 | 14 | 45.0 | 50.0 | 6 | 14 | 32.0 | 34.0 | 6 | 7 | 6 | 7.5 | 54.8 | 147 | 159 | 6 | 6 | 41.0 | 46.0 | 5 | 12 | 5 | 6 | 0 |
| 32 FT | 18 | 20 | 14 | 10 | 6 | 7 | 6 | 7 | 59.9 | 38.0 | 42.0 | 6 | 13 | 45.0 | 50.0 | 6 | 13 | 32.0 | 33.0 | 6 | 7 | 6 | 7.5 | 55.0 | 148 | 160 | 6 | 6 | 41.0 | 46.0 | 5 | 12 | 5 | 6 | 0 |
| 34 FT | 18 | 20 | 14 | 10 | 6 | 6.5 | 6 | 6.5 | 59.8 | 38.0 | 42.0 | 6 | 13 | 45.0 | 50.0 | 6 | 13 | 32.0 | 34.0 | 6 | 6 | 6 | 7.5 | 54.9 | 148 | 160 | 6 | 6 | 41.0 | 46.0 | 5 | 12 | 5 | 6 | 0 |
| 36 FT | 19 | 21 | 15 | 10 | 6 | 6.5 | 6 | 7 | 60.3 | 43.0 | 43.0 | 6 | 13 | 45.0 | 50.0 | 6 | 13 | 31.0 | 33.0 | 6 | 6.5 | 6 | 7.5 | 55.3 | 149 | 161 | 6 | 6 | 41.0 | 47.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 20 | 22 | 15 | 10 | 6 | 6.5 | 6 | 6.5 | 60.6 | 44.0 | 44.0 | 6 | 12 | 45.0 | 50.0 | 6 | 12 | 31.0 | 32.0 | 6 | 6.5 | 6 | 7.5 | 55.5 | 150 | 162 | 6 | 6 | 41.0 | 47.0 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 20 | 23 | 16 | 10 | 6 | 6.5 | 6 | 6.5 | 60.9 | 44.0 | 44.0 | 6 | 12 | 45.0 | 49.0 | 6 | 12 | 31.0 | 32.0 | 6 | 6.5 | 6 | 7.5 | 55.9 | 151 | 163 | 6 | 6 | 41.0 | 47.0 | 5 | 12 | 6 | 8 | 0 |
| 42 FT | 21 | 23 | 16 | 10 | 6 | 6.5 | 6 | 6.5 | 61.1 | 45.0 | 45.0 | 6 | 12 | 45.0 | 49.0 | 6 | 12 | 31.0 | 32.0 | 6 | 6 | 6 | 7.5 | 55.8 | 151 | 163 | 7 | 7.5 | 44.0 | 50.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 22 | 24 | 17 | 10 | 6 | 6 | 6 | 6.5 | 61.9 | 46.0 | 46.0 | 6 | 12 | 45.0 | 49.0 | 6 | 12 | 31.0 | 32.0 | 6 | 6 | 6 | 7 | 56.3 | 152 | 164 | 7 | 7.5 | 44.0 | 50.0 | 5 | 12 | 6 | 7.5 | 0 |
| 46 FT | 22 | 25 | 17 | 10 | 6 | 6 | 6 | 6 | 61.9 | 46.0 | 46.0 | 6 | 12 | 45.0 | 48.0 | 6 | 12 | 31.0 | 32.0 | 6 | 6 | 6 | 7 | 56.5 | 153 | 165 | 7 | 8 | 44.0 | 50.0 | 5 | 12 | 6 | 7.5 | 0 |
| 48 FT | 23 | 26 | 18 | 10 | 6 | 6 | 6 | 6.5 | 62.5 | 47.0 | 47.0 | 6 | 12 | 44.0 | 48.0 | 6 | 12 | 31.0 | 31.0 | 6 | 6 | 6 | 6.5 | 57.0 | 154 | 166 | 7 | 8 | 44.0 | 50.0 | 5 | 12 | 6 | 7 | 0 |
| 50 FT | 23 | 26 | 18 | 10 | 7 | 8 | 6 | 6 | 62.5 | 47.0 | 47.0 | 6 | 12 | 44.0 | 48.0 | 6 | 12 | 31.0 | 31.0 | 6 | 6 | 6 | 6.5 | 56.9 | 154 | 166 | 7 | 7.5 | 44.0 | 50.0 | 5 | 12 | 6 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

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CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 9 FEET
HEIGHT (HT): 11 THRU 12 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 13 OF 27

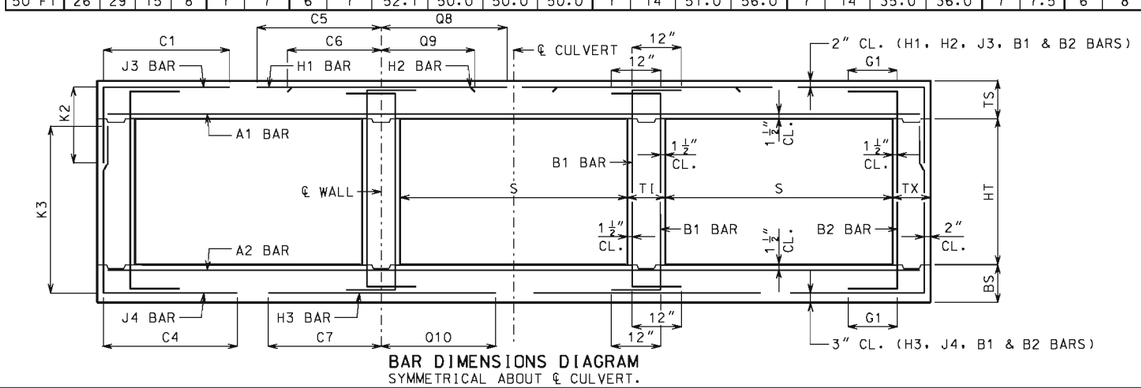
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 10 FT  HEIGHT (HT) = 5 FT OR 6 FT OR 7 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=5' | K2 HT=6' | K2 HT=7' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=5' | K3 HT=6' | K3 HT=7' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 4 | 7 | 51.9 | 29.0 | 29.0 | 29.0 | 5 | 16 | 98.5 | 74.5 | 5 | 16 | 29.0 | 27.0 | 4 | 6 | 4 | 6 | 47.4 | 65 | 77 | 89 | 5 | 6.5 | 45.0 | 47.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 4 | 6.5 | 51.9 | 29.0 | 29.0 | 29.0 | 5 | 14 | 98.5 | 74.5 | 5 | 14 | 28.0 | 29.0 | 5 | 8.5 | 5 | 6.5 | 43.3 | 65 | 77 | 89 | 5 | 6 | 44.0 | 46.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 9 | 9 | 8 | 8 | 5 | 7.5 | 6 | 7.5 | 48.4 | 25.0 | 29.0 | 29.0 | 5 | 13 | 59.0 | 76.0 | 5 | 13 | 30.0 | 30.0 | 5 | 7.5 | 5 | 6.5 | 39.0 | 65 | 77 | 89 | 6 | 6.5 | 46.0 | 49.0 | 5 | 10 | 5 | 12 | 12 |
| 6 FT | 9 | 9 | 8 | 8 | 5 | 8 | 5 | 6 | 39.8 | 29.0 | 29.0 | 29.0 | 5 | 13 | 49.0 | 55.0 | 5 | 13 | 28.0 | 29.0 | 5 | 7.5 | 6 | 7 | 39.8 | 65 | 77 | 89 | 6 | 6 | 45.0 | 48.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 10 | 10 | 8 | 8 | 5 | 8 | 5 | 7.5 | 36.8 | 26.0 | 26.0 | 30.0 | 5 | 13 | 45.0 | 50.0 | 5 | 13 | 28.0 | 28.0 | 5 | 7 | 5 | 6.5 | 34.8 | 66 | 78 | 90 | 6 | 6.5 | 44.0 | 48.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 10 | 11 | 8 | 8 | 5 | 8 | 5 | 6.5 | 35.4 | 26.0 | 26.0 | 30.0 | 6 | 15 | 47.0 | 51.0 | 6 | 15 | 30.0 | 31.0 | 5 | 6.5 | 5 | 7.5 | 32.9 | 67 | 79 | 91 | 6 | 6.5 | 43.0 | 49.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 11 | 12 | 8 | 8 | 5 | 7.5 | 5 | 7 | 33.6 | 27.0 | 27.0 | 31.0 | 6 | 16 | 45.0 | 50.0 | 6 | 16 | 30.0 | 31.0 | 5 | 6 | 5 | 8.5 | 31.6 | 68 | 80 | 92 | 6 | 6.5 | 42.0 | 49.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 8 | 32.4 | 28.0 | 28.0 | 32.0 | 6 | 16 | 44.0 | 50.0 | 6 | 16 | 29.0 | 31.0 | 5 | 6 | 5 | 8.5 | 30.9 | 69 | 81 | 93 | 6 | 6.5 | 42.0 | 49.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 8 | 31.3 | 29.0 | 29.0 | 33.0 | 6 | 16 | 44.0 | 50.0 | 6 | 16 | 29.0 | 31.0 | 6 | 8 | 5 | 8.5 | 30.3 | 70 | 82 | 94 | 6 | 7 | 42.0 | 49.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 8.5 | 30.5 | 30.0 | 30.0 | 34.0 | 6 | 16 | 43.0 | 50.0 | 6 | 16 | 29.0 | 31.0 | 6 | 7.5 | 5 | 8.5 | 29.8 | 71 | 83 | 95 | 6 | 7 | 41.0 | 49.0 | 5 | 12 | 5 | 12 | 0 |
| 20 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 8 | 34.9 | 31.0 | 31.0 | 35.0 | 6 | 16 | 48.0 | 56.0 | 6 | 16 | 35.0 | 37.0 | 6 | 7 | 5 | 8 | 29.4 | 72 | 84 | 96 | 6 | 7 | 41.0 | 49.0 | 5 | 12 | 5 | 12 | 0 |
| 22 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 7 | 34.4 | 32.0 | 32.0 | 36.0 | 6 | 15 | 48.0 | 56.0 | 6 | 15 | 34.0 | 37.0 | 6 | 7 | 5 | 7 | 29.0 | 73 | 85 | 97 | 6 | 6.5 | 41.0 | 50.0 | 5 | 12 | 5 | 12 | 0 |
| 24 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 34.0 | 37.0 | 37.0 | 37.0 | 6 | 14 | 48.0 | 56.0 | 6 | 14 | 34.0 | 36.0 | 6 | 6.5 | 5 | 6.5 | 28.9 | 74 | 86 | 98 | 6 | 6.5 | 41.0 | 50.0 | 5 | 12 | 5 | 11 | 0 |
| 26 FT | 18 | 19 | 8 | 8 | 6 | 7 | 5 | 6.5 | 33.9 | 38.0 | 38.0 | 38.0 | 6 | 13 | 47.0 | 55.0 | 6 | 13 | 33.0 | 35.0 | 6 | 6.5 | 5 | 6.5 | 28.8 | 75 | 87 | 99 | 6 | 6 | 41.0 | 50.0 | 5 | 12 | 5 | 10 | 0 |
| 28 FT | 19 | 20 | 8 | 8 | 6 | 6.5 | 5 | 6 | 33.8 | 39.0 | 39.0 | 39.0 | 6 | 13 | 47.0 | 55.0 | 6 | 13 | 33.0 | 35.0 | 6 | 6.5 | 5 | 6 | 28.8 | 76 | 88 | 100 | 6 | 6 | 41.0 | 50.0 | 5 | 12 | 5 | 9.5 | 0 |
| 30 FT | 19 | 21 | 8 | 8 | 6 | 6 | 5 | 6 | 33.8 | 39.0 | 39.0 | 39.0 | 6 | 12 | 47.0 | 55.0 | 6 | 12 | 33.0 | 36.0 | 6 | 6 | 6 | 7.5 | 31.6 | 77 | 89 | 101 | 7 | 7.5 | 44.0 | 53.0 | 5 | 12 | 5 | 9.5 | 0 |
| 32 FT | 20 | 22 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 37.8 | 44.0 | 44.0 | 44.0 | 6 | 12 | 47.0 | 55.0 | 6 | 12 | 33.0 | 35.0 | 6 | 6 | 6 | 7 | 31.8 | 78 | 90 | 102 | 7 | 7.5 | 44.0 | 53.0 | 5 | 12 | 5 | 9.5 | 0 |
| 34 FT | 21 | 23 | 8 | 8 | 6 | 6 | 6 | 7 | 36.8 | 45.0 | 45.0 | 45.0 | 6 | 12 | 46.0 | 55.0 | 6 | 12 | 32.0 | 34.0 | 6 | 6 | 6 | 6.5 | 30.9 | 79 | 91 | 103 | 7 | 7.5 | 44.0 | 53.0 | 5 | 12 | 5 | 9.5 | 0 |
| 36 FT | 22 | 23 | 8 | 8 | 6 | 6 | 6 | 6.5 | 36.8 | 46.0 | 46.0 | 46.0 | 7 | 15 | 51.0 | 60.0 | 7 | 15 | 36.0 | 38.0 | 6 | 6 | 6 | 6.5 | 31.0 | 79 | 91 | 103 | 7 | 7 | 44.0 | 53.0 | 5 | 12 | 5 | 9.5 | 0 |
| 38 FT | 23 | 24 | 8 | 8 | 7 | 7.5 | 6 | 6 | 36.8 | 47.0 | 47.0 | 47.0 | 7 | 15 | 51.0 | 59.0 | 7 | 15 | 36.0 | 37.0 | 6 | 6 | 6 | 6 | 31.1 | 80 | 92 | 104 | 7 | 7 | 44.0 | 53.0 | 5 | 12 | 5 | 8.5 | 0 |
| 40 FT | 23 | 25 | 8 | 8 | 7 | 7.5 | 6 | 6 | 36.9 | 47.0 | 47.0 | 47.0 | 7 | 15 | 51.0 | 59.0 | 7 | 15 | 36.0 | 38.0 | 6 | 6 | 6 | 6 | 31.1 | 81 | 93 | 105 | 7 | 7 | 44.0 | 53.0 | 5 | 12 | 5 | 8 | 0 |
| 42 FT | 24 | 26 | 8 | 8 | 7 | 7.5 | 6 | 6 | 37.0 | 48.0 | 48.0 | 48.0 | 7 | 14 | 51.0 | 59.0 | 7 | 14 | 36.0 | 37.0 | 7 | 8 | 7 | 6.5 | 34.4 | 82 | 94 | 106 | 7 | 7 | 44.0 | 53.0 | 5 | 12 | 5 | 7.5 | 0 |
| 44 FT | 25 | 26 | 9 | 8 | 7 | 7 | 6 | 6.5 | 37.8 | 49.0 | 49.0 | 49.0 | 7 | 14 | 51.0 | 59.0 | 7 | 14 | 36.0 | 37.0 | 7 | 7.5 | 6 | 6.5 | 32.0 | 82 | 94 | 106 | 7 | 7 | 44.0 | 53.0 | 5 | 12 | 5 | 8.5 | 0 |
| 46 FT | 25 | 27 | 9 | 8 | 7 | 7 | 6 | 6.5 | 37.9 | 49.0 | 49.0 | 49.0 | 7 | 14 | 51.0 | 59.0 | 7 | 14 | 36.0 | 37.0 | 7 | 7.5 | 6 | 6.5 | 32.0 | 83 | 95 | 107 | 7 | 7 | 44.0 | 53.0 | 5 | 12 | 5 | 8 | 0 |
| 48 FT | 26 | 28 | 9 | 8 | 7 | 7 | 6 | 6.5 | 38.0 | 50.0 | 50.0 | 50.0 | 7 | 14 | 51.0 | 58.0 | 7 | 14 | 35.0 | 37.0 | 7 | 7.5 | 6 | 6 | 32.3 | 84 | 96 | 108 | 7 | 7 | 44.0 | 53.0 | 5 | 12 | 5 | 7.5 | 0 |
| 50 FT | 27 | 28 | 9 | 8 | 7 | 7 | 6 | 6 | 38.0 | 51.0 | 51.0 | 51.0 | 7 | 14 | 51.0 | 58.0 | 7 | 14 | 35.0 | 37.0 | 7 | 7 | 6 | 6 | 32.4 | 84 | 96 | 108 | 7 | 6.5 | 44.0 | 53.0 | 5 | 12 | 5 | 7 | 0 |

## SPAN (S) = 10 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8' | K2 HT=9' | K2 HT=10' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8' | K3 HT=9' | K3 HT=10' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 5 | 8.5 | 54.9 | 29.0 | 33.0 | 33.0 | 5 | 16 | 100.5 | 74.5 | 5 | 16 | 30.0 | 30.0 | 5 | 8.5 | 6 | 6.5 | 74.1 | 101 | 113 | 125 | 5 | 6 | 46.0 | 47.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 5 | 8 | 54.9 | 29.0 | 33.0 | 33.0 | 5 | 14 | 100.5 | 74.5 | 5 | 14 | 28.0 | 28.0 | 5 | 7.5 | 6 | 6 | 65.8 | 101 | 113 | 125 | 6 | 7 | 47.0 | 50.0 | 5 | 12 | 5 | 11.5 | 12 |
| 4 FT | 9 | 9 | 9 | 8 | 5 | 7 | 5 | 6 | 65.9 | 29.0 | 29.0 | 29.0 | 5 | 13 | 74.0 | 76.0 | 5 | 13 | 30.0 | 31.0 | 5 | 7.5 | 6 | 6.5 | 57.6 | 101 | 113 | 125 | 6 | 6.5 | 46.0 | 50.0 | 5 | 12 | 5 | 11.5 | 12 |
| 6 FT | 9 | 9 | 9 | 8 | 5 | 8 | 5 | 6 | 51.8 | 29.0 | 29.0 | 29.0 | 5 | 13 | 51.0 | 57.0 | 5 | 13 | 29.0 | 29.0 | 5 | 7 | 6 | 6 | 52.9 | 101 | 113 | 125 | 6 | 6 | 45.0 | 48.0 | 5 | 12 | 5 | 11.5 | 12 |
| 8 FT | 9 | 10 | 9 | 8 | 5 | 8 | 5 | 6 | 48.1 | 29.0 | 29.0 | 29.0 | 6 | 15 | 49.0 | 52.0 | 6 | 15 | 30.0 | 31.0 | 5 | 7 | 6 | 6.5 | 51.0 | 102 | 114 | 126 | 6 | 6 | 44.0 | 49.0 | 5 | 12 | 5 | 11 | 0 |
| 10 FT | 10 | 11 | 9 | 8 | 5 | 8 | 5 | 6 | 46.5 | 30.0 | 30.0 | 30.0 | 5 | 12 | 44.0 | 48.0 | 5 | 12 | 27.0 | 28.0 | 5 | 6.5 | 6 | 6.5 | 49.5 | 103 | 115 | 127 | 6 | 6.5 | 43.0 | 49.0 | 5 | 12 | 5 | 10.5 | 0 |
| 12 FT | 11 | 12 | 9 | 8 | 5 | 7.5 | 6 | 7 | 48.1 | 31.0 | 31.0 | 35.0 | 6 | 16 | 45.0 | 50.0 | 6 | 16 | 30.0 | 31.0 | 5 | 6 | 6 | 6.5 | 48.4 | 104 | 116 | 128 | 6 | 6.5 | 43.0 | 49.0 | 5 | 12 | 5 | 9.5 | 0 |
| 14 FT | 12 | 13 | 9 | 8 | 5 | 7 | 6 | 7 | 47.0 | 32.0 | 32.0 | 36.0 | 6 | 16 | 45.0 | 50.0 | 6 | 16 | 29.0 | 31.0 | 5 | 6 | 6 | 7 | 47.4 | 105 | 117 | 129 | 6 | 6.5 | 42.0 | 49.0 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 13 | 14 | 9 | 8 | 5 | 6.5 | 6 | 7 | 46.0 | 33.0 | 33.0 | 37.0 | 6 | 16 | 44.0 | 50.0 | 6 | 16 | 29.0 | 31.0 | 6 | 8 | 6 | 7 | 46.5 | 106 | 118 | 130 | 6 | 7 | 42.0 | 49.0 | 5 | 12 | 5 | 8.5 | 0 |
| 18 FT | 14 | 15 | 9 | 8 | 5 | 6 | 6 | 7 | 45.3 | 34.0 | 34.0 | 38.0 | 6 | 16 | 43.0 | 49.0 | 6 | 16 | 29.0 | 31.0 | 6 | 7.5 | 6 | 7 | 45.9 | 107 | 119 | 131 | 6 | 7 | 42.0 | 49.0 | 5 | 12 | 5 | 8.5 | 0 |
| 20 FT | 15 | 16 | 9 | 8 | 6 | 8 | 6 | 7 | 50.5 | 35.0 | 35.0 | 39.0 | 6 | 16 | 49.0 | 55.0 | 6 | 16 | 35.0 | 37.0 | 6 | 7 | 6 | 6.5 | 45.3 | 108 | 120 | 132 | 6 | 7 | 42.0 | 49.0 | 5 | 12 | 5 | 8.5 | 0 |
| 22 FT | 15 | 17 | 11 | 8 | 6 | 7.5 | 5 | 6 | 47.1 | 35.0 | 35.0 | 35.0 | 6 | 15 | 48.0 | 55.0 | 6 | 15 | 35.0 | 37.0 | 6 | 7 | 5 | 7 | 42.1 | 109 | 121 | 133 | 6 | 6.5 | 42.0 | 50.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 17 | 18 | 11 | 8 | 6 | 7.5 | 6 | 8.5 | 50.8 | 37.0 | 37.0 | 37.0 | 6 | 14 | 48.0 | 55.0 | 6 | 14 | 33.0 | 36.0 | 6 | 6.5 | 5 | 6.5 | 42.0 | 110 | 122 | 134 | 6 | 6.5 | 42.0 | 50.0 | 5 | 12 | 5 | 7.5 | 0 |
| 26 FT | 18 | 19 | 11 | 8 | 6 | 7 | 6 | 8 | 50.4 | 38.0 | 38.0 | 38.0 | 6 | 13 | 47.0 | 55.0 | 6 | 13 | 33.0 | 35.0 | 6 | 6.5 | 5 | 6 | 41.8 | 111 | 123 | 135 | 6 | 6 | 42.0 | 50.0 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 18 | 20 | 12 | 8 | 6 | 7 | 6 | 8 | 51.0 | 38.0 | 38.0 | 38.0 | 6 | 13 | 47.0 | 54.0 | 6 | 13 | 34.0 | 36.0 | 6 | 6.5 | 5 | 6.5 | 41.9 | 112 | 124 | 136 | 6 | 6 | 42.0 | 50.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 19 | 21 | 12 | 8 | 6 | 6.5 | 6 | 7.5 | 50.9 | 39.0 | 39.0 | 39.0 | 6 | 13 | 47.0 | 54.0 | 6 | 13 | 33.0 | 35.0 | 6 | 6.5 | 5 | 6.5 | 41.9 | 113 | 125 | 137 | 7 | 7.5 | 45.0 | 53.0 | 5 | 12 | 5 | 7 | 0 |
| 32 FT | 20 | 22 | 12 | 8 | 6 | 6.5 | 6 | 7 | 50.9 | 40.0 | 40.0 | 40.0 | 6 | 12 | 47.0 | 54.0 | 6 | 12 | 32.0 | 34.0 | 6 | 6 | 5 | 6.5 | 42.0 | 114 | 126 | 138 | 7 | 7.5 | 45.0 | 53.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 21 | 23 | 12 | 8 | 6 | 6 | 6 | 7.5 | 49.6 | 41.0 | 41.0 | 41.0 | 6 | 12 | 46.0 | 53.0 | 6 | 12 | 31.0 | 33.0 | 6 | 6 | 5 | 6.5 | 40.8 | 115 | 127 | 139 | 7 | 7.5 | 45.0 | 53.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 22 | 24 | 12 | 8 | 6 | 6 | 6 | 7 | 49.8 | 42.0 | 42.0 | 42.0 | 7 | 15 | 51.0 | 58.0 | 7 | 15 | 36.0 | 37.0 | 6 | 6 | 5 | 6.5 | 40.9 | 116 | 128 | 140 | 7 | 7.5 | 45.0 | 53.0 | 5 | 12 | 5 | 7 | 0 |
| 38 FT | 22 | 24 | 13 | 8 | 6 | 6 | 6 | 7.5 | 50.4 | 42.0 | 42.0 | 42.0 | 7 | 15 | 51.0 | 58.0 | 7 | 15 | 36.0 | 38.0 | 6 | 6 | 5 | 6 | 41.1 | 116 | 128 | 140 | 7 | 7 | 45.0 | 53.0 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 23 | 25 | 13 | 8 | 7 | 7.5 | 6 | 7.5 | 50.5 | 43.0 | 43.0 | 43.0 | 7 | 15 | 51.0 | 58.0 | 7 | 15 | 36.0 | 37.0 | 6 | 6 | 5 | 6 | 41.4 | 117 | 129 | 141 | 7 | 7 | 45.0 | 53.0 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 24 | 26 | 13 | 8 | 7 | 7.5 | 6 | 6.5 | 50.5 | 44.0 | 44.0 | 44.0 | 7 | 15 | 51.0 | 57.0 | 7 | 15 | 35.0 | 36.0 | 7 | 8 | 5 | 6 | 41.5 | 118 | 130 | 142 | 7 | 7 | 45.0 | 53.0 | 5 | 12 | 5 | 6.5 | 0 |
| 44 FT | 24 | 27 | 14 | 8 | 7 | 7.5 | 6 | 7 | 51.3 | 44.0 | 44.0 | 44.0 | 7 | 14 | 51.0 | 57.0 | 7 | 14 | 36.0 | 37.0 | 7 | 8 | 5 | 6 | 41.9 | 119 | 131 | 143 | 7 | 7 | 45.0 | 54.0 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 25 | 27 | 14 | 8 | 7 | 7 | 6 | 7 | 51.3 | 45.0 | 45.0 | 45.0 | 7 | 14 | 51.0 | 57.0 | 7 | 14 | 35.0 | 36.0 | 7 | 7.5 | 5 | 6 | 42.0 | 119 | 131 | 143 | 7 | 6.5 | 45.0 | 53.0 | 5 | 12 | 5 | 6 | 0 |
| 48 FT | 26 | 28 | 14 | 8 | 7 | 7 | 6 | 7 | 51.4 | 46.0 | 46.0 | 46.0 | 7 | 15 | 51.0 | 56.0 | 7 | 15 | 35.0 | 36.0 | 7 | 7.5 | 5 | 6 | 42.1 | 120 | 132 | 144 | 7 | 6.5 | 45.0 | 53.0 | 5 | 12 | 5 | 6 | 0 |
| 50 FT | 26 | 29 | 15 | 8 | 7 | 7 | 6 | 7 | 52.1 | 50.0 | 50.0 | 50.0 | 7 | 14 | 51.0 | 56.0 | 7 | 14 | 35.0 | 36.0 | 7 | 7.5 | 6 | 8 | 45.5 | 121 | 133 | 145 | 7 | 6.5 | 45.0 | 54.0 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

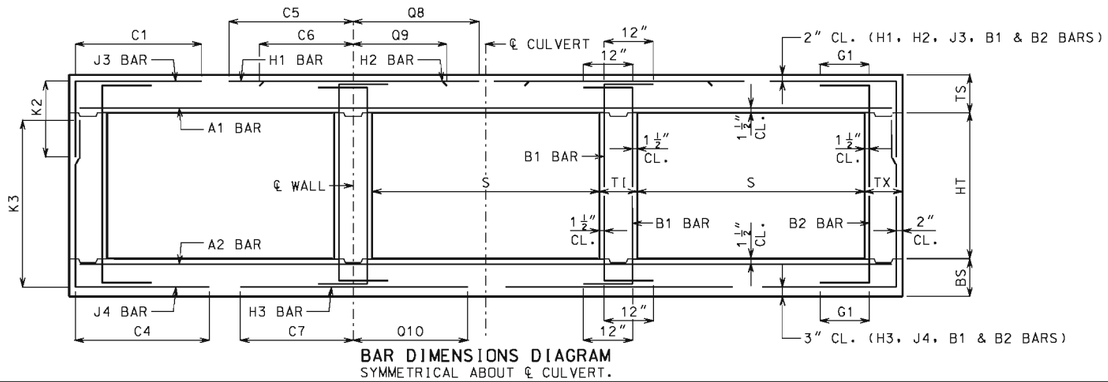
SPAN (S): 10 FEET
HEIGHT (HT): 5 THRU 10 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

## SPAN (S) = 10 FT  HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | | K3 | | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=11' | HT=12' | HT=13' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=11' | HT=12' | HT=13' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 9 | 10 | 5 | 6.5 | 5 | 6.5 | 55.9 | 33.0 | 33.0 | 33.0 | 5 | 16 | 101.5 | 75.5 | 5 | 16 | 30.0 | 29.0 | 5 | 8.5 | 6 | 6 | 82.3 | 138 | 150 | 162 | 5 | 6.5 | 49.0 | 49.0 | 5 | 10 | 5 | 8.5 | 12 |
| 2 FT | 13 | 10 | 10 | 10 | 5 | 6.5 | 5 | 6.5 | 56.5 | 33.0 | 33.0 | 33.0 | 5 | 14 | 101.5 | 75.5 | 5 | 14 | 29.0 | 29.0 | 5 | 8 | 6 | 6.5 | 83.0 | 138 | 150 | 162 | 5 | 6.5 | 47.0 | 48.0 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 9 | 10 | 10 | 10 | 5 | 7 | 6 | 7 | 56.5 | 29.0 | 29.0 | 33.0 | 5 | 13 | 101.5 | 77.0 | 5 | 13 | 31.0 | 31.0 | 5 | 7 | 6 | 6 | 81.3 | 138 | 150 | 162 | 5 | 6 | 46.0 | 48.0 | 5 | 11 | 5 | 8 | 12 |
| 6 FT | 9 | 11 | 10 | 10 | 5 | 8 | 6 | 7 | 75.6 | 29.0 | 29.0 | 33.0 | 5 | 13 | 54.0 | 53.0 | 5 | 13 | 29.0 | 29.0 | 5 | 7 | 6 | 6 | 77.8 | 139 | 151 | 163 | 5 | 6 | 44.0 | 47.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 9 | 11 | 11 | 10 | 5 | 8 | 6 | 7 | 64.6 | 29.0 | 29.0 | 33.0 | 5 | 12 | 47.0 | 48.0 | 5 | 12 | 28.0 | 28.0 | 5 | 6.5 | 6 | 6.5 | 69.5 | 139 | 151 | 163 | 6 | 7 | 45.0 | 49.0 | 5 | 12 | 5 | 7.5 | 0 |
| 10 FT | 10 | 11 | 11 | 10 | 5 | 8 | 5 | 6 | 61.1 | 30.0 | 30.0 | 30.0 | 5 | 12 | 46.0 | 47.0 | 5 | 12 | 28.0 | 28.0 | 5 | 6 | 6 | 6 | 65.8 | 139 | 151 | 163 | 6 | 6.5 | 45.0 | 48.0 | 5 | 12 | 5 | 7.5 | 0 |
| 12 FT | 11 | 12 | 11 | 10 | 5 | 7.5 | 5 | 6 | 60.3 | 31.0 | 31.0 | 31.0 | 5 | 12 | 44.0 | 47.0 | 5 | 12 | 27.0 | 28.0 | 5 | 6 | 6 | 6 | 65.1 | 140 | 152 | 164 | 6 | 6.5 | 44.0 | 49.0 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 12 | 13 | 11 | 10 | 5 | 7 | 6 | 7.5 | 62.6 | 32.0 | 32.0 | 36.0 | 5 | 12 | 43.0 | 46.0 | 5 | 12 | 27.0 | 28.0 | 5 | 6 | 6 | 6.5 | 64.4 | 141 | 153 | 165 | 6 | 6.5 | 44.0 | 49.0 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 13 | 14 | 12 | 10 | 5 | 6.5 | 6 | 8 | 61.3 | 33.0 | 33.0 | 37.0 | 5 | 12 | 42.0 | 46.0 | 5 | 12 | 27.0 | 28.0 | 6 | 8 | 6 | 7 | 63.0 | 142 | 154 | 166 | 6 | 7 | 44.0 | 49.0 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 13 | 15 | 12 | 10 | 5 | 6.5 | 6 | 7 | 59.3 | 33.0 | 37.0 | 37.0 | 6 | 15 | 45.0 | 48.0 | 6 | 15 | 30.0 | 31.0 | 6 | 7.5 | 6 | 6.5 | 62.8 | 143 | 155 | 167 | 6 | 7 | 44.0 | 49.0 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 14 | 16 | 13 | 10 | 5 | 6 | 6 | 7.5 | 58.8 | 34.0 | 38.0 | 38.0 | 6 | 15 | 44.0 | 48.0 | 6 | 15 | 30.0 | 31.0 | 6 | 7 | 6 | 7 | 61.8 | 144 | 156 | 168 | 6 | 7 | 44.0 | 49.0 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 15 | 17 | 13 | 10 | 6 | 8 | 6 | 6.5 | 64.6 | 35.0 | 39.0 | 39.0 | 6 | 15 | 50.0 | 54.0 | 6 | 15 | 36.0 | 37.0 | 6 | 7 | 6 | 6.5 | 61.4 | 145 | 157 | 169 | 6 | 6.5 | 44.0 | 50.0 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 16 | 18 | 14 | 10 | 6 | 8 | 6 | 7 | 64.6 | 36.0 | 40.0 | 40.0 | 6 | 15 | 49.0 | 54.0 | 6 | 15 | 35.0 | 37.0 | 6 | 6.5 | 6 | 6.5 | 60.5 | 146 | 158 | 170 | 6 | 6.5 | 44.0 | 50.0 | 5 | 12 | 5 | 6 | 0 |
| 26 FT | 17 | 19 | 14 | 10 | 6 | 7.5 | 6 | 6.5 | 64.5 | 37.0 | 41.0 | 41.0 | 6 | 14 | 49.0 | 54.0 | 6 | 14 | 35.0 | 37.0 | 6 | 6.5 | 6 | 6.5 | 60.4 | 147 | 159 | 171 | 6 | 6 | 44.0 | 50.0 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 18 | 20 | 15 | 10 | 6 | 7 | 6 | 6.5 | 64.9 | 42.0 | 42.0 | 42.0 | 6 | 13 | 48.0 | 54.0 | 6 | 13 | 34.0 | 36.0 | 6 | 6.5 | 6 | 6.5 | 60.3 | 148 | 160 | 172 | 6 | 6 | 44.0 | 50.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 19 | 21 | 15 | 10 | 6 | 6.5 | 6 | 6.5 | 65.1 | 43.0 | 43.0 | 43.0 | 6 | 13 | 48.0 | 54.0 | 6 | 13 | 33.0 | 35.0 | 6 | 6.5 | 6 | 6.5 | 60.4 | 149 | 161 | 173 | 7 | 7.5 | 47.0 | 53.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 20 | 22 | 16 | 10 | 6 | 6.5 | 6 | 6.5 | 65.5 | 44.0 | 44.0 | 44.0 | 6 | 12 | 48.0 | 53.0 | 6 | 12 | 33.0 | 34.0 | 6 | 6 | 6 | 7 | 60.5 | 150 | 162 | 174 | 7 | 7.5 | 47.0 | 53.0 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 20 | 23 | 16 | 10 | 6 | 6.5 | 6 | 6.5 | 63.5 | 44.0 | 44.0 | 44.0 | 6 | 12 | 47.0 | 53.0 | 6 | 12 | 33.0 | 35.0 | 6 | 6 | 6 | 7.5 | 58.9 | 151 | 163 | 175 | 7 | 7.5 | 46.0 | 53.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 21 | 24 | 16 | 10 | 6 | 6 | 6 | 6 | 63.9 | 45.0 | 45.0 | 45.0 | 6 | 12 | 47.0 | 53.0 | 6 | 12 | 32.0 | 34.0 | 6 | 6 | 6 | 7 | 59.1 | 152 | 164 | 176 | 7 | 7.5 | 46.0 | 53.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 22 | 24 | 17 | 10 | 6 | 6 | 6 | 6 | 64.4 | 46.0 | 46.0 | 46.0 | 7 | 15 | 52.0 | 58.0 | 7 | 15 | 37.0 | 38.0 | 6 | 6 | 6 | 7 | 59.0 | 152 | 164 | 176 | 7 | 7 | 46.0 | 53.0 | 5 | 12 | 6 | 7.5 | 0 |
| 40 FT | 23 | 25 | 17 | 10 | 6 | 6 | 6 | 6 | 64.6 | 47.0 | 47.0 | 47.0 | 7 | 15 | 52.0 | 57.0 | 7 | 15 | 36.0 | 37.0 | 6 | 6 | 6 | 7 | 59.3 | 153 | 165 | 177 | 7 | 7 | 46.0 | 53.0 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 23 | 26 | 18 | 10 | 7 | 7.5 | 6 | 6 | 65.0 | 47.0 | 47.0 | 47.0 | 7 | 15 | 52.0 | 57.0 | 7 | 15 | 37.0 | 38.0 | 7 | 8 | 6 | 6.5 | 59.6 | 154 | 166 | 178 | 7 | 7 | 46.0 | 54.0 | 5 | 12 | 6 | 7 | 0 |
| 44 FT | 24 | 27 | 19 | 10 | 7 | 7.5 | 6 | 6 | 65.8 | 44.0 | 48.0 | 48.0 | 7 | 15 | 52.0 | 57.0 | 7 | 15 | 36.0 | 37.0 | 7 | 8 | 6 | 6.5 | 60.0 | 155 | 167 | 179 | 7 | 7 | 46.0 | 54.0 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 24 | 27 | 19 | 10 | 7 | 7 | 6 | 6 | 65.6 | 48.0 | 48.0 | 48.0 | 7 | 14 | 52.0 | 57.0 | 7 | 14 | 36.0 | 38.0 | 7 | 7.5 | 6 | 6.5 | 59.9 | 155 | 167 | 179 | 7 | 6.5 | 46.0 | 54.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 25 | 28 | 20 | 10 | 7 | 7 | 6 | 6 | 66.4 | 45.0 | 49.0 | 49.0 | 7 | 14 | 52.0 | 56.0 | 7 | 14 | 36.0 | 37.0 | 7 | 7.5 | 6 | 6 | 60.4 | 156 | 168 | 180 | 7 | 6.5 | 46.0 | 54.0 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 26 | 29 | 20 | 10 | 7 | 7 | 7 | 7.5 | 71.6 | 50.0 | 50.0 | 50.0 | 7 | 15 | 51.0 | 55.0 | 7 | 15 | 36.0 | 37.0 | 7 | 7.5 | 6 | 6 | 60.6 | 157 | 169 | 181 | 7 | 6.5 | 47.0 | 54.0 | 5 | 12 | 6 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 10 FEET
HEIGHT (HT): 11 THRU 13 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 15 OF 27

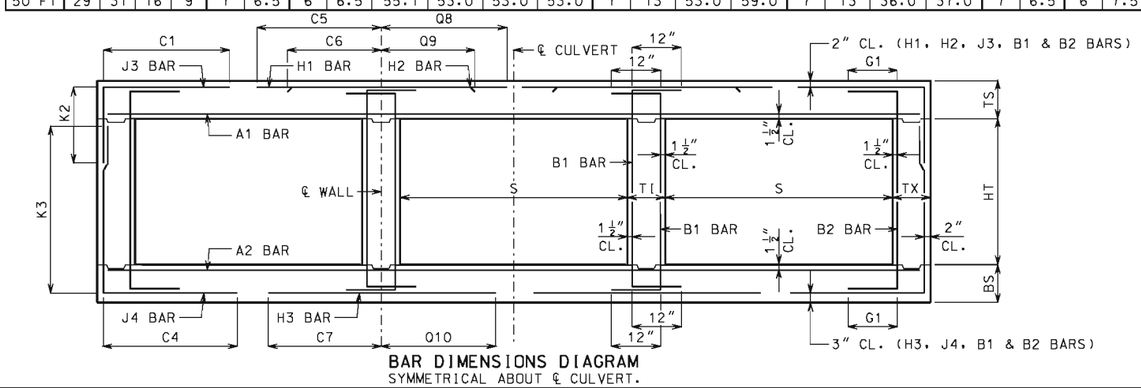
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 11 FT  HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=6′ | K2 HT=7′ | K2 HT=8′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=6′ | K3 HT=7′ | K3 HT=8′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 9 | 8 | 8 | 5 | 6.5 | 5 | 9 | 58.5 | 29.0 | 29.0 | 33.0 | 5 | 13 | 108.5 | 80.5 | 5 | 13 | 30.0 | 33.0 | 5 | 8.5 | 5 | 6 | 52.6 | 77 | 89 | 101 | 6 | 7 | 50.0 | 53.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 14 | 9 | 8 | 8 | 5 | 6 | 4 | 6 | 55.5 | 30.0 | 30.0 | 30.0 | 5 | 14 | 106.5 | 80.5 | 5 | 14 | 29.0 | 28.0 | 5 | 7.5 | 6 | 6.5 | 50.8 | 77 | 89 | 101 | 6 | 6.5 | 49.0 | 52.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 10 | 9 | 8 | 8 | 5 | 6.5 | 5 | 6 | 49.1 | 30.0 | 30.0 | 30.0 | 5 | 12 | 66.0 | 82.0 | 5 | 12 | 32.0 | 33.0 | 5 | 7.5 | 6 | 6.5 | 45.9 | 77 | 89 | 101 | 6 | 6 | 49.0 | 52.0 | 5 | 11.5 | 5 | 12 | 12 |
| 6 FT | 10 | 10 | 8 | 8 | 5 | 7 | 5 | 6 | 42.8 | 30.0 | 30.0 | 30.0 | 5 | 12 | 53.0 | 63.0 | 5 | 12 | 30.0 | 31.0 | 5 | 7 | 5 | 6 | 39.8 | 78 | 90 | 102 | 6 | 6 | 47.0 | 52.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 10 | 11 | 8 | 8 | 5 | 7 | 6 | 7 | 43.0 | 26.0 | 30.0 | 30.0 | 6 | 15 | 52.0 | 56.0 | 6 | 15 | 32.0 | 32.0 | 5 | 6.5 | 5 | 6.5 | 37.4 | 79 | 91 | 103 | 6 | 6.5 | 46.0 | 52.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 11 | 12 | 8 | 8 | 5 | 7 | 5 | 6 | 37.6 | 27.0 | 31.0 | 31.0 | 6 | 15 | 50.0 | 55.0 | 6 | 15 | 31.0 | 32.0 | 5 | 6 | 5 | 7 | 35.6 | 80 | 92 | 104 | 6 | 6.5 | 45.0 | 52.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 12 | 13 | 8 | 8 | 5 | 7 | 5 | 6.5 | 36.0 | 28.0 | 32.0 | 32.0 | 6 | 15 | 48.0 | 54.0 | 6 | 15 | 31.0 | 32.0 | 5 | 6 | 5 | 7.5 | 34.6 | 81 | 93 | 105 | 6 | 6.5 | 45.0 | 52.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 13 | 14 | 8 | 8 | 5 | 6.5 | 5 | 7 | 34.6 | 33.0 | 33.0 | 33.0 | 6 | 15 | 47.0 | 54.0 | 6 | 15 | 31.0 | 32.0 | 6 | 8 | 5 | 7.5 | 33.8 | 82 | 94 | 106 | 6 | 6.5 | 44.0 | 53.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 7 | 33.6 | 34.0 | 34.0 | 34.0 | 6 | 14 | 46.0 | 53.0 | 6 | 14 | 30.0 | 32.0 | 6 | 7.5 | 5 | 7.5 | 33.1 | 83 | 95 | 107 | 6 | 6.5 | 44.0 | 53.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 6.5 | 37.9 | 35.0 | 35.0 | 35.0 | 6 | 14 | 51.0 | 59.0 | 6 | 14 | 36.0 | 38.0 | 6 | 7 | 5 | 7.5 | 32.6 | 84 | 96 | 108 | 6 | 6.5 | 44.0 | 53.0 | 5 | 12 | 5 | 11 | 0 |
| 20 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 6.5 | 37.3 | 36.0 | 36.0 | 36.0 | 6 | 14 | 51.0 | 59.0 | 6 | 14 | 36.0 | 38.0 | 6 | 7 | 5 | 7 | 32.1 | 85 | 97 | 109 | 6 | 6.5 | 44.0 | 53.0 | 5 | 12 | 5 | 10 | 0 |
| 22 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 5 | 6 | 36.9 | 37.0 | 37.0 | 37.0 | 6 | 14 | 50.0 | 59.0 | 6 | 14 | 36.0 | 38.0 | 6 | 6.5 | 5 | 6.5 | 31.9 | 86 | 98 | 110 | 6 | 6.5 | 44.0 | 53.0 | 5 | 12 | 5 | 9.5 | 0 |
| 24 FT | 18 | 19 | 8 | 8 | 6 | 7 | 5 | 6 | 36.5 | 38.0 | 38.0 | 38.0 | 6 | 13 | 50.0 | 59.0 | 6 | 13 | 36.0 | 38.0 | 6 | 6 | 5 | 6.5 | 31.6 | 87 | 99 | 111 | 6 | 6 | 44.0 | 53.0 | 5 | 12 | 5 | 9.5 | 0 |
| 26 FT | 19 | 21 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 40.4 | 39.0 | 39.0 | 43.0 | 6 | 13 | 50.0 | 59.0 | 6 | 13 | 35.0 | 38.0 | 6 | 6 | 6 | 7.5 | 34.4 | 89 | 101 | 113 | 7 | 7.5 | 47.0 | 56.0 | 5 | 12 | 5 | 9.5 | 0 |
| 28 FT | 20 | 22 | 9 | 8 | 6 | 6.5 | 5 | 6 | 37.1 | 40.0 | 40.0 | 40.0 | 6 | 12 | 49.0 | 58.0 | 6 | 12 | 35.0 | 37.0 | 6 | 6 | 5 | 6 | 31.9 | 90 | 102 | 114 | 7 | 7.5 | 47.0 | 56.0 | 5 | 12 | 5 | 8.5 | 0 |
| 30 FT | 21 | 23 | 10 | 8 | 6 | 6 | 5 | 6.5 | 37.9 | 41.0 | 41.0 | 41.0 | 6 | 12 | 49.0 | 58.0 | 6 | 12 | 34.0 | 37.0 | 7 | 8 | 5 | 6.5 | 32.4 | 91 | 103 | 115 | 7 | 7 | 47.0 | 56.0 | 5 | 12 | 5 | 8.5 | 0 |
| 32 FT | 22 | 24 | 10 | 8 | 6 | 6 | 5 | 6.5 | 37.8 | 42.0 | 42.0 | 42.0 | 7 | 15 | 54.0 | 63.0 | 7 | 15 | 39.0 | 41.0 | 7 | 7.5 | 5 | 6.5 | 32.5 | 92 | 104 | 116 | 7 | 7 | 47.0 | 57.0 | 5 | 12 | 5 | 8 | 0 |
| 34 FT | 23 | 25 | 10 | 8 | 7 | 7.5 | 5 | 6.5 | 37.8 | 43.0 | 43.0 | 43.0 | 7 | 15 | 54.0 | 63.0 | 7 | 15 | 38.0 | 40.0 | 7 | 7.5 | 5 | 6 | 32.5 | 93 | 105 | 117 | 7 | 6.5 | 47.0 | 57.0 | 5 | 12 | 5 | 8 | 0 |
| 36 FT | 24 | 25 | 10 | 8 | 7 | 7.5 | 5 | 6 | 36.5 | 44.0 | 44.0 | 44.0 | 7 | 14 | 54.0 | 62.0 | 7 | 14 | 37.0 | 39.0 | 7 | 7 | 5 | 6 | 31.6 | 93 | 105 | 117 | 7 | 6.5 | 47.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 38 FT | 25 | 26 | 10 | 8 | 7 | 7 | 5 | 6 | 36.6 | 45.0 | 45.0 | 45.0 | 7 | 14 | 53.0 | 62.0 | 7 | 14 | 37.0 | 38.0 | 7 | 7 | 5 | 6 | 31.8 | 94 | 106 | 118 | 7 | 6.5 | 47.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 40 FT | 25 | 27 | 10 | 8 | 7 | 6.5 | 5 | 6 | 36.8 | 45.0 | 45.0 | 45.0 | 7 | 13 | 53.0 | 62.0 | 7 | 13 | 37.0 | 39.0 | 7 | 7 | 6 | 7 | 34.6 | 95 | 107 | 119 | 7 | 6.5 | 46.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 42 FT | 26 | 28 | 10 | 8 | 7 | 7 | 6 | 7 | 40.8 | 50.0 | 50.0 | 50.0 | 7 | 13 | 53.0 | 62.0 | 7 | 13 | 37.0 | 38.0 | 7 | 7 | 6 | 7 | 34.9 | 96 | 108 | 120 | 7 | 6.5 | 46.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 44 FT | 27 | 29 | 10 | 8 | 7 | 6.5 | 6 | 7 | 40.9 | 51.0 | 51.0 | 51.0 | 7 | 13 | 53.0 | 61.0 | 7 | 13 | 36.0 | 37.0 | 7 | 7 | 6 | 6.5 | 35.0 | 97 | 109 | 121 | 7 | 6.5 | 46.0 | 56.0 | 5 | 12 | 5 | 7.5 | 0 |
| 46 FT | 28 | 29 | 11 | 8 | 7 | 6.5 | 6 | 7.5 | 41.6 | 52.0 | 52.0 | 52.0 | 7 | 13 | 53.0 | 61.0 | 7 | 13 | 36.0 | 37.0 | 7 | 6 | 6 | 7.5 | 35.6 | 97 | 109 | 121 | 7 | 6 | 47.0 | 57.0 | 5 | 12 | 5 | 7.5 | 0 |
| 48 FT | 28 | 30 | 11 | 8 | 7 | 6 | 6 | 7.5 | 41.8 | 52.0 | 52.0 | 52.0 | 7 | 12 | 53.0 | 61.0 | 7 | 12 | 36.0 | 37.0 | 7 | 6.5 | 6 | 7 | 35.6 | 98 | 110 | 122 | 7 | 6 | 47.0 | 57.0 | 5 | 12 | 5 | 7.5 | 0 |
| 50 FT | 29 | 31 | 11 | 8 | 7 | 6 | 6 | 7 | 41.9 | 53.0 | 53.0 | 53.0 | 7 | 12 | 53.0 | 60.0 | 7 | 12 | 36.0 | 37.0 | 7 | 6.5 | 6 | 7 | 35.9 | 99 | 111 | 123 | 7 | 6 | 47.0 | 57.0 | 5 | 12 | 5 | 7.5 | 0 |

## SPAN (S) = 11 FT  HEIGHT (HT) = 9 FT OR 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=9′ | K2 HT=10′ | K2 HT=11′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=9′ | K3 HT=10′ | K3 HT=11′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 9 | 9 | 9 | 5 | 6.5 | 5 | 8 | 59.3 | 33.0 | 33.0 | 33.0 | 5 | 13 | 109.5 | 81.5 | 5 | 13 | 31.0 | 33.0 | 5 | 7.5 | 6 | 6 | 74.5 | 113 | 125 | 137 | 6 | 7 | 51.0 | 53.0 | 5 | 11.5 | 5 | 10.5 | 12 |
| 2 FT | 14 | 10 | 9 | 9 | 5 | 6 | 5 | 8 | 59.3 | 34.0 | 34.0 | 34.0 | 5 | 14 | 109.5 | 81.5 | 5 | 14 | 29.0 | 28.0 | 5 | 7.5 | 6 | 7 | 70.6 | 114 | 126 | 138 | 5 | 6 | 47.0 | 50.0 | 5 | 12 | 5 | 10.5 | 12 |
| 4 FT | 10 | 10 | 9 | 9 | 5 | 6.5 | 5 | 6 | 59.3 | 30.0 | 30.0 | 30.0 | 5 | 13 | 109.5 | 83.0 | 5 | 13 | 32.0 | 33.0 | 5 | 7 | 6 | 6.5 | 64.1 | 114 | 126 | 138 | 6 | 6.5 | 50.0 | 53.0 | 5 | 11.5 | 5 | 9.5 | 12 |
| 6 FT | 10 | 10 | 9 | 9 | 5 | 7 | 5 | 6 | 56.6 | 30.0 | 30.0 | 30.0 | 5 | 12 | 55.0 | 61.0 | 5 | 12 | 30.0 | 31.0 | 5 | 7 | 6 | 6 | 57.8 | 114 | 126 | 138 | 6 | 6 | 48.0 | 52.0 | 5 | 12 | 5 | 9.5 | 12 |
| 8 FT | 10 | 11 | 9 | 9 | 5 | 7 | 6 | 7.5 | 55.5 | 30.0 | 30.0 | 34.0 | 6 | 15 | 53.0 | 56.0 | 6 | 15 | 32.0 | 33.0 | 5 | 6.5 | 6 | 6 | 55.6 | 115 | 127 | 139 | 6 | 6 | 47.0 | 52.0 | 5 | 12 | 5 | 9 | 0 |
| 10 FT | 11 | 12 | 9 | 9 | 5 | 7 | 6 | 7 | 53.5 | 31.0 | 35.0 | 35.0 | 6 | 15 | 51.0 | 55.0 | 6 | 15 | 32.0 | 33.0 | 5 | 6 | 6 | 6 | 53.8 | 116 | 128 | 140 | 6 | 6.5 | 46.0 | 52.0 | 5 | 12 | 5 | 8.5 | 0 |
| 12 FT | 12 | 13 | 9 | 9 | 5 | 7 | 6 | 6.5 | 51.9 | 32.0 | 36.0 | 36.0 | 6 | 15 | 49.0 | 54.0 | 6 | 15 | 31.0 | 33.0 | 5 | 6 | 6 | 6 | 52.4 | 117 | 129 | 141 | 6 | 6.5 | 46.0 | 52.0 | 5 | 12 | 5 | 8.5 | 0 |
| 14 FT | 13 | 14 | 9 | 9 | 5 | 6.5 | 6 | 6 | 50.5 | 33.0 | 37.0 | 37.0 | 6 | 15 | 48.0 | 53.0 | 6 | 15 | 31.0 | 33.0 | 6 | 8 | 6 | 6 | 51.3 | 118 | 130 | 142 | 6 | 6.5 | 45.0 | 52.0 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 14 | 15 | 10 | 9 | 5 | 6 | 6 | 7 | 49.9 | 34.0 | 34.0 | 38.0 | 6 | 15 | 47.0 | 53.0 | 6 | 15 | 31.0 | 33.0 | 6 | 7.5 | 6 | 7 | 50.4 | 119 | 131 | 143 | 6 | 6.5 | 45.0 | 52.0 | 5 | 12 | 5 | 8 | 0 |
| 18 FT | 15 | 16 | 10 | 9 | 6 | 8 | 6 | 7 | 54.9 | 35.0 | 35.0 | 39.0 | 6 | 15 | 52.0 | 59.0 | 6 | 15 | 37.0 | 39.0 | 6 | 7 | 6 | 7 | 49.6 | 120 | 132 | 144 | 6 | 6.5 | 45.0 | 53.0 | 5 | 12 | 5 | 8 | 0 |
| 20 FT | 16 | 17 | 11 | 9 | 6 | 8 | 6 | 7.5 | 54.8 | 36.0 | 36.0 | 40.0 | 6 | 14 | 52.0 | 58.0 | 6 | 14 | 36.0 | 39.0 | 6 | 7 | 6 | 8 | 49.3 | 121 | 133 | 145 | 6 | 6.5 | 45.0 | 53.0 | 5 | 12 | 5 | 7.5 | 0 |
| 22 FT | 17 | 18 | 12 | 9 | 6 | 7.5 | 6 | 8 | 54.8 | 37.0 | 37.0 | 37.0 | 6 | 14 | 51.0 | 58.0 | 6 | 14 | 36.0 | 39.0 | 6 | 6.5 | 5 | 6 | 45.9 | 122 | 134 | 146 | 6 | 6.5 | 45.0 | 53.0 | 5 | 12 | 5 | 7.5 | 0 |
| 24 FT | 18 | 20 | 12 | 9 | 6 | 7 | 6 | 7.5 | 54.4 | 38.0 | 38.0 | 38.0 | 6 | 13 | 51.0 | 58.0 | 6 | 13 | 36.0 | 38.0 | 6 | 6 | 5 | 6 | 45.8 | 124 | 136 | 148 | 6 | 6 | 45.0 | 53.0 | 5 | 12 | 5 | 7 | 0 |
| 26 FT | 19 | 21 | 12 | 9 | 6 | 6.5 | 6 | 7 | 53.9 | 39.0 | 39.0 | 43.0 | 6 | 13 | 50.0 | 58.0 | 6 | 13 | 35.0 | 38.0 | 6 | 6 | 6 | 8.5 | 48.4 | 125 | 137 | 149 | 7 | 7.5 | 48.0 | 56.0 | 5 | 12 | 5 | 7 | 0 |
| 28 FT | 20 | 22 | 13 | 9 | 6 | 6.5 | 6 | 7.5 | 54.3 | 40.0 | 40.0 | 40.0 | 6 | 12 | 50.0 | 58.0 | 6 | 12 | 35.0 | 37.0 | 6 | 6 | 5 | 6 | 45.4 | 126 | 138 | 150 | 7 | 7.5 | 48.0 | 57.0 | 5 | 12 | 5 | 6.5 | 0 |
| 30 FT | 21 | 23 | 13 | 9 | 6 | 6 | 6 | 7 | 54.1 | 41.0 | 41.0 | 41.0 | 6 | 12 | 50.0 | 57.0 | 6 | 12 | 34.0 | 36.0 | 7 | 8 | 5 | 6 | 45.4 | 127 | 139 | 151 | 7 | 7 | 48.0 | 57.0 | 5 | 12 | 5 | 6.5 | 0 |
| 32 FT | 22 | 24 | 13 | 9 | 6 | 6 | 6 | 6.5 | 54.1 | 42.0 | 42.0 | 46.0 | 7 | 15 | 54.0 | 62.0 | 7 | 15 | 39.0 | 41.0 | 7 | 7.5 | 6 | 8 | 48.4 | 128 | 140 | 152 | 7 | 7 | 48.0 | 57.0 | 5 | 12 | 5 | 6.5 | 0 |
| 34 FT | 23 | 25 | 14 | 9 | 7 | 7.5 | 6 | 7 | 54.8 | 43.0 | 43.0 | 43.0 | 7 | 15 | 54.0 | 62.0 | 7 | 15 | 38.0 | 40.0 | 7 | 7.5 | 5 | 6 | 45.8 | 129 | 141 | 153 | 7 | 6.5 | 48.0 | 57.0 | 5 | 12 | 5 | 6 | 0 |
| 36 FT | 23 | 25 | 14 | 9 | 7 | 7 | 6 | 7 | 53.3 | 43.0 | 43.0 | 43.0 | 7 | 14 | 54.0 | 62.0 | 7 | 14 | 38.0 | 40.0 | 7 | 7 | 5 | 6 | 44.1 | 129 | 141 | 153 | 7 | 6.5 | 48.0 | 57.0 | 5 | 12 | 5 | 6 | 0 |
| 38 FT | 24 | 26 | 14 | 9 | 7 | 7.5 | 6 | 7 | 53.4 | 44.0 | 44.0 | 44.0 | 7 | 14 | 54.0 | 61.0 | 7 | 14 | 38.0 | 40.0 | 7 | 7 | 5 | 6 | 44.3 | 130 | 142 | 154 | 7 | 6.5 | 48.0 | 57.0 | 5 | 12 | 5 | 6 | 0 |
| 40 FT | 25 | 27 | 14 | 9 | 7 | 7 | 6 | 6.5 | 53.4 | 45.0 | 45.0 | 45.0 | 7 | 14 | 54.0 | 61.0 | 7 | 14 | 37.0 | 39.0 | 7 | 7 | 5 | 6 | 44.5 | 131 | 143 | 155 | 7 | 6.5 | 48.0 | 57.0 | 5 | 12 | 5 | 6 | 0 |
| 42 FT | 26 | 28 | 15 | 9 | 7 | 7 | 6 | 7 | 54.3 | 46.0 | 50.0 | 50.0 | 7 | 13 | 54.0 | 60.0 | 7 | 13 | 37.0 | 38.0 | 7 | 7 | 6 | 8 | 48.0 | 132 | 144 | 156 | 7 | 6 | 48.0 | 57.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 27 | 29 | 15 | 9 | 7 | 6.5 | 6 | 6.5 | 54.3 | 51.0 | 51.0 | 51.0 | 7 | 13 | 53.0 | 60.0 | 7 | 13 | 36.0 | 38.0 | 7 | 7 | 6 | 8 | 48.1 | 133 | 145 | 157 | 7 | 6 | 48.0 | 57.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 27 | 30 | 15 | 9 | 7 | 6.5 | 6 | 6 | 54.4 | 51.0 | 51.0 | 51.0 | 7 | 13 | 53.0 | 60.0 | 7 | 13 | 37.0 | 38.0 | 7 | 7 | 6 | 8 | 48.1 | 134 | 146 | 158 | 7 | 6 | 48.0 | 57.0 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 28 | 30 | 16 | 9 | 7 | 6.5 | 6 | 6.5 | 55.0 | 52.0 | 52.0 | 52.0 | 7 | 13 | 53.0 | 59.0 | 7 | 13 | 36.0 | 37.0 | 7 | 6 | 6 | 7.5 | 48.5 | 134 | 146 | 158 | 7 | 6 | 48.0 | 57.0 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 29 | 31 | 16 | 9 | 7 | 6.5 | 6 | 6.5 | 55.1 | 53.0 | 53.0 | 53.0 | 7 | 13 | 53.0 | 59.0 | 7 | 13 | 36.0 | 37.0 | 7 | 6.5 | 6 | 7.5 | 48.8 | 135 | 147 | 159 | 7 | 6 | 48.0 | 57.0 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

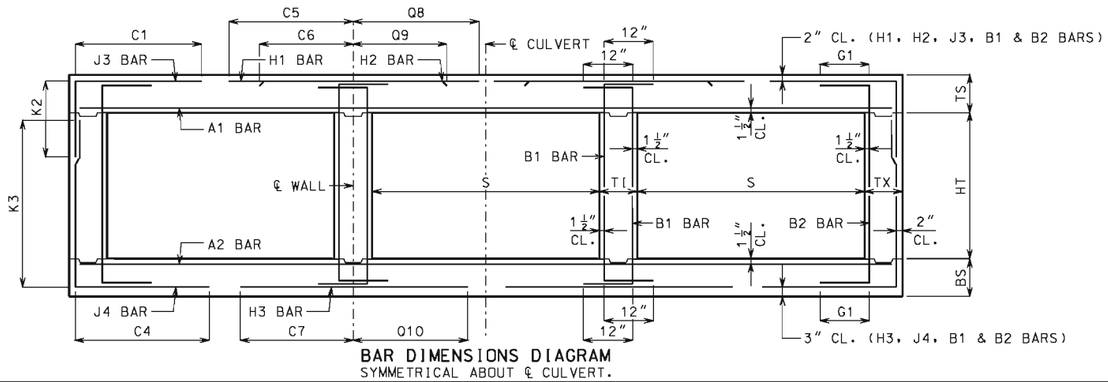
SPAN (S): 11 FEET
HEIGHT (HT): 6 THRU 11 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

## SPAN (S) = 11 FT  HEIGHT (HT) = 12 FT OR 13 FT OR 14 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | | K3 | | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=12' | HT=13' | HT=14' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=12' | HT=13' | HT=14' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 13 | 10 | 10 | 11 | 5 | 6.5 | 5 | 6 | 60.3 | 33.0 | 33.0 | 33.0 | 5 | 13 | 110.5 | 82.5 | 5 | 13 | 31.0 | 33.0 | 5 | 7.5 | 6 | 6 | 89.3 | 150 | 162 | 174 | 5 | 6 | 51.0 | 51.0 | 5 | 10 | 5 | 8 | 12 |
| 2 FT | 14 | 11 | 10 | 11 | 5 | 6 | 5 | 6 | 60.3 | 34.0 | 34.0 | 34.0 | 5 | 14 | 110.5 | 82.5 | 5 | 14 | 30.0 | 32.0 | 5 | 7.5 | 6 | 6 | 89.3 | 151 | 163 | 175 | 5 | 6 | 50.0 | 51.0 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 10 | 11 | 11 | 11 | 5 | 7 | 5 | 6 | 60.9 | 30.0 | 30.0 | 30.0 | 5 | 13 | 110.5 | 80.0 | 5 | 13 | 33.0 | 33.0 | 5 | 7 | 6 | 6.5 | 85.9 | 151 | 163 | 175 | 5 | 6 | 49.0 | 51.0 | 5 | 12 | 5 | 7.5 | 12 |
| 6 FT | 10 | 11 | 11 | 11 | 5 | 7.5 | 5 | 6 | 79.0 | 30.0 | 30.0 | 30.0 | 5 | 12 | 58.0 | 57.0 | 5 | 12 | 31.0 | 31.0 | 5 | 6.5 | 6 | 6 | 77.5 | 151 | 163 | 175 | 6 | 6.5 | 50.0 | 53.0 | 5 | 12 | 5 | 7.5 | 12 |
| 8 FT | 10 | 11 | 12 | 11 | 5 | 7.5 | 6 | 7.5 | 70.1 | 30.0 | 30.0 | 34.0 | 6 | 15 | 54.0 | 55.0 | 6 | 15 | 33.0 | 33.0 | 5 | 6.5 | 6 | 6 | 70.9 | 151 | 163 | 175 | 6 | 6 | 48.0 | 52.0 | 5 | 12 | 5 | 7 | 0 |
| 10 FT | 11 | 12 | 12 | 11 | 5 | 7.5 | 6 | 8 | 68.5 | 31.0 | 31.0 | 35.0 | 6 | 16 | 52.0 | 54.0 | 6 | 16 | 32.0 | 33.0 | 5 | 6 | 6 | 6 | 69.9 | 152 | 164 | 176 | 6 | 6 | 47.0 | 52.0 | 5 | 12 | 5 | 7 | 0 |
| 12 FT | 12 | 13 | 12 | 11 | 5 | 7 | 6 | 8 | 67.4 | 32.0 | 32.0 | 36.0 | 6 | 16 | 50.0 | 53.0 | 6 | 16 | 32.0 | 33.0 | 5 | 6 | 6 | 6.5 | 69.0 | 153 | 165 | 177 | 6 | 6 | 47.0 | 52.0 | 5 | 12 | 5 | 7 | 0 |
| 14 FT | 13 | 14 | 12 | 11 | 5 | 6.5 | 6 | 7 | 66.4 | 33.0 | 37.0 | 37.0 | 6 | 16 | 49.0 | 53.0 | 6 | 16 | 32.0 | 33.0 | 6 | 8 | 6 | 6.5 | 68.3 | 154 | 166 | 178 | 6 | 6.5 | 47.0 | 52.0 | 5 | 12 | 5 | 6.5 | 0 |
| 16 FT | 14 | 15 | 13 | 11 | 5 | 6 | 6 | 7 | 64.9 | 34.0 | 38.0 | 38.0 | 6 | 15 | 48.0 | 52.0 | 6 | 15 | 32.0 | 33.0 | 6 | 7.5 | 6 | 7 | 66.6 | 155 | 167 | 179 | 6 | 6.5 | 47.0 | 52.0 | 5 | 12 | 5 | 6.5 | 0 |
| 18 FT | 15 | 16 | 13 | 11 | 6 | 8 | 6 | 6.5 | 70.3 | 39.0 | 39.0 | 39.0 | 6 | 15 | 54.0 | 58.0 | 6 | 15 | 37.0 | 39.0 | 6 | 7 | 6 | 6 | 66.0 | 156 | 168 | 180 | 6 | 6.5 | 47.0 | 52.0 | 5 | 12 | 5 | 6.5 | 0 |
| 20 FT | 15 | 17 | 14 | 11 | 6 | 8 | 6 | 6.5 | 68.4 | 39.0 | 39.0 | 39.0 | 6 | 14 | 53.0 | 58.0 | 6 | 14 | 37.0 | 39.0 | 6 | 7 | 6 | 6.5 | 65.1 | 157 | 169 | 181 | 6 | 6.5 | 46.0 | 53.0 | 5 | 12 | 5 | 6 | 0 |
| 22 FT | 17 | 18 | 14 | 11 | 6 | 7.5 | 6 | 6.5 | 69.0 | 41.0 | 41.0 | 41.0 | 6 | 14 | 53.0 | 58.0 | 6 | 14 | 37.0 | 39.0 | 6 | 6 | 6 | 6 | 64.5 | 158 | 170 | 182 | 6 | 6 | 46.0 | 53.0 | 5 | 12 | 5 | 6 | 0 |
| 24 FT | 18 | 20 | 15 | 11 | 6 | 7 | 6 | 6.5 | 68.9 | 42.0 | 42.0 | 42.0 | 6 | 13 | 52.0 | 58.0 | 6 | 13 | 36.0 | 38.0 | 6 | 6 | 6 | 6 | 64.6 | 160 | 172 | 184 | 6 | 6 | 46.0 | 53.0 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 19 | 21 | 15 | 11 | 6 | 6.5 | 6 | 6 | 68.6 | 43.0 | 43.0 | 43.0 | 6 | 13 | 52.0 | 57.0 | 6 | 13 | 36.0 | 38.0 | 6 | 6 | 6 | 6 | 64.3 | 161 | 173 | 185 | 7 | 7.5 | 49.0 | 56.0 | 5 | 12 | 6 | 8 | 0 |
| 28 FT | 20 | 22 | 16 | 11 | 6 | 6.5 | 6 | 6 | 68.6 | 44.0 | 44.0 | 44.0 | 6 | 12 | 51.0 | 57.0 | 6 | 12 | 35.0 | 37.0 | 6 | 6 | 6 | 6 | 63.9 | 162 | 174 | 186 | 7 | 7.5 | 49.0 | 56.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 21 | 23 | 17 | 11 | 6 | 6 | 6 | 6 | 69.0 | 45.0 | 45.0 | 45.0 | 6 | 12 | 51.0 | 57.0 | 6 | 12 | 34.0 | 36.0 | 7 | 8 | 6 | 6.5 | 64.0 | 163 | 175 | 187 | 7 | 7 | 49.0 | 57.0 | 5 | 12 | 6 | 7.5 | 0 |
| 32 FT | 21 | 24 | 17 | 11 | 6 | 6 | 6 | 6 | 68.6 | 45.0 | 45.0 | 45.0 | 6 | 12 | 51.0 | 57.0 | 6 | 12 | 35.0 | 37.0 | 7 | 7.5 | 6 | 6.5 | 64.1 | 164 | 176 | 188 | 7 | 7 | 49.0 | 57.0 | 5 | 12 | 6 | 7.5 | 0 |
| 34 FT | 22 | 25 | 18 | 11 | 6 | 6 | 6 | 6 | 69.1 | 46.0 | 46.0 | 46.0 | 7 | 15 | 55.0 | 62.0 | 7 | 15 | 40.0 | 41.0 | 7 | 7.5 | 6 | 6.5 | 64.4 | 165 | 177 | 189 | 7 | 6.5 | 49.0 | 57.0 | 5 | 12 | 6 | 7 | 0 |
| 36 FT | 23 | 26 | 18 | 11 | 7 | 7.5 | 7 | 7.5 | 74.3 | 47.0 | 47.0 | 47.0 | 7 | 15 | 55.0 | 61.0 | 7 | 15 | 39.0 | 41.0 | 7 | 7.5 | 6 | 6 | 64.5 | 166 | 178 | 190 | 7 | 6.5 | 49.0 | 57.0 | 5 | 12 | 6 | 7 | 0 |
| 38 FT | 24 | 26 | 18 | 11 | 7 | 7.5 | 7 | 8 | 72.6 | 48.0 | 48.0 | 48.0 | 7 | 14 | 55.0 | 61.0 | 7 | 14 | 38.0 | 40.0 | 7 | 7 | 6 | 6.5 | 62.4 | 166 | 178 | 190 | 7 | 6.5 | 49.0 | 57.0 | 5 | 12 | 6 | 7 | 0 |
| 40 FT | 25 | 27 | 18 | 11 | 7 | 7 | 7 | 7 | 72.9 | 49.0 | 49.0 | 49.0 | 7 | 14 | 55.0 | 61.0 | 7 | 14 | 38.0 | 39.0 | 7 | 7 | 6 | 6 | 62.6 | 167 | 179 | 191 | 7 | 6.5 | 49.0 | 57.0 | 5 | 12 | 6 | 7 | 0 |
| 42 FT | 25 | 28 | 19 | 11 | 7 | 7 | 7 | 7 | 73.3 | 49.0 | 49.0 | 49.0 | 7 | 14 | 55.0 | 60.0 | 7 | 14 | 38.0 | 40.0 | 7 | 7 | 6 | 6 | 62.9 | 168 | 180 | 192 | 7 | 6.5 | 49.0 | 57.0 | 5 | 12 | 6 | 6.5 | 0 |
| 44 FT | 26 | 29 | 20 | 11 | 7 | 7 | 7 | 7.5 | 74.0 | 50.0 | 50.0 | 50.0 | 7 | 13 | 54.0 | 60.0 | 7 | 13 | 38.0 | 39.0 | 7 | 7 | 6 | 6 | 63.3 | 169 | 181 | 193 | 7 | 6 | 49.0 | 57.0 | 5 | 12 | 6 | 6.5 | 0 |
| 46 FT | 27 | 30 | 21 | 11 | 7 | 6.5 | 7 | 7.5 | 74.6 | 51.0 | 51.0 | 51.0 | 7 | 13 | 54.0 | 59.0 | 7 | 13 | 37.0 | 38.0 | 7 | 7 | 6 | 6 | 63.6 | 170 | 182 | 194 | 7 | 6 | 49.0 | 57.0 | 5 | 12 | 6 | 6 | 0 |
| 48 FT | 27 | 30 | 21 | 11 | 7 | 6 | 7 | 7 | 74.5 | 51.0 | 51.0 | 51.0 | 7 | 12 | 54.0 | 59.0 | 7 | 12 | 37.0 | 39.0 | 7 | 6 | 6 | 6 | 63.5 | 170 | 182 | 194 | 7 | 6 | 49.0 | 57.0 | 5 | 12 | 6 | 6 | 0 |
| 50 FT | 28 | 31 | 22 | 11 | 7 | 6.5 | 7 | 7 | 75.3 | 52.0 | 52.0 | 58.0 | 7 | 13 | 54.0 | 59.0 | 7 | 13 | 37.0 | 38.0 | 7 | 6.5 | 7 | 7.5 | 67.0 | 171 | 183 | 195 | 7 | 6 | 49.0 | 58.0 | 5 | 12 | 6 | 6 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 11 FEET
HEIGHT (HT): 12 THRU 14 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 17 OF 27

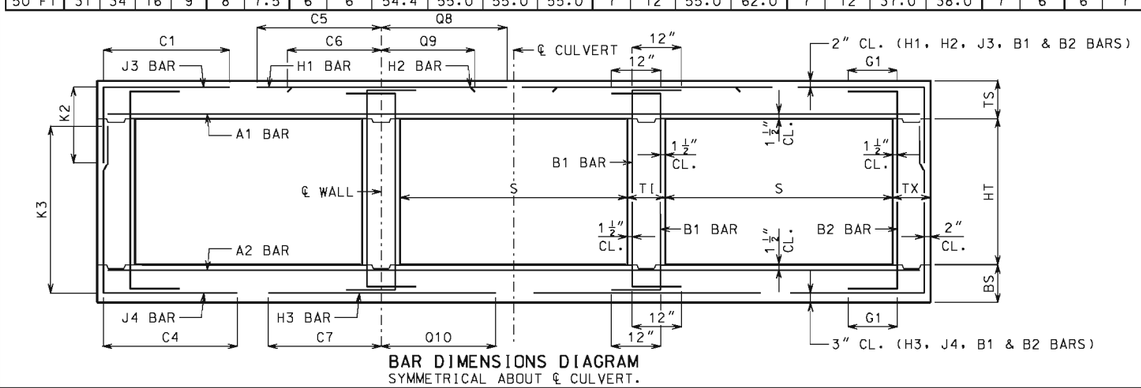
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 12 FT  HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=6′ | K2 HT=7′ | K2 HT=8′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=6′ | K3 HT=7′ | K3 HT=8′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 9 | 8 | 8 | 5 | 6 | 4 | 6 | 59.1 | 30.0 | 30.0 | 30.0 | 5 | 12 | 114.5 | 86.5 | 5 | 12 | 31.0 | 34.0 | 5 | 7.5 | 6 | 7 | 54.6 | 77 | 89 | 101 | 6 | 6.5 | 53.0 | 56.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 14 | 9 | 8 | 8 | 5 | 6 | 5 | 8.5 | 62.1 | 30.0 | 30.0 | 34.0 | 5 | 12 | 116.5 | 86.5 | 5 | 12 | 30.0 | 33.0 | 5 | 7.5 | 6 | 6.5 | 50.3 | 77 | 89 | 101 | 6 | 6 | 52.0 | 55.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 11 | 10 | 8 | 8 | 5 | 6 | 5 | 6.5 | 48.9 | 31.0 | 31.0 | 31.0 | 5 | 12 | 69.0 | 88.0 | 5 | 12 | 33.0 | 35.0 | 5 | 7 | 5 | 6 | 42.6 | 78 | 90 | 102 | 6 | 6 | 51.0 | 56.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 11 | 11 | 8 | 8 | 5 | 6.5 | 5 | 6.5 | 42.8 | 31.0 | 31.0 | 31.0 | 6 | 16 | 59.0 | 71.0 | 6 | 16 | 34.0 | 36.0 | 5 | 6.5 | 5 | 6.5 | 39.3 | 79 | 91 | 103 | 6 | 6.5 | 49.0 | 56.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 11 | 12 | 8 | 8 | 5 | 6.5 | 5 | 6 | 39.9 | 31.0 | 31.0 | 31.0 | 6 | 14 | 55.0 | 61.0 | 6 | 14 | 33.0 | 34.0 | 5 | 6 | 5 | 7.5 | 36.6 | 80 | 92 | 104 | 6 | 6.5 | 48.0 | 56.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 12 | 13 | 8 | 8 | 5 | 6.5 | 5 | 6.5 | 37.3 | 32.0 | 32.0 | 32.0 | 6 | 14 | 52.0 | 59.0 | 6 | 14 | 32.0 | 34.0 | 5 | 6 | 5 | 7.5 | 34.9 | 81 | 93 | 105 | 6 | 6 | 47.0 | 56.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 13 | 14 | 8 | 8 | 5 | 6 | 5 | 7 | 35.4 | 33.0 | 33.0 | 33.0 | 6 | 14 | 51.0 | 58.0 | 6 | 14 | 32.0 | 34.0 | 6 | 8 | 5 | 8 | 33.8 | 82 | 94 | 106 | 6 | 6 | 47.0 | 56.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 14 | 15 | 8 | 8 | 5 | 6 | 5 | 7 | 33.9 | 34.0 | 34.0 | 34.0 | 6 | 13 | 49.0 | 57.0 | 6 | 13 | 32.0 | 34.0 | 6 | 7.5 | 5 | 8 | 32.8 | 83 | 95 | 107 | 6 | 6 | 47.0 | 56.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 15 | 16 | 8 | 8 | 6 | 8 | 5 | 6.5 | 37.9 | 35.0 | 35.0 | 35.0 | 6 | 13 | 55.0 | 63.0 | 6 | 13 | 37.0 | 40.0 | 6 | 7 | 5 | 8 | 32.1 | 84 | 96 | 108 | 6 | 6 | 46.0 | 56.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 16 | 17 | 8 | 8 | 6 | 8 | 5 | 6.5 | 37.0 | 36.0 | 36.0 | 36.0 | 6 | 13 | 54.0 | 63.0 | 6 | 13 | 37.0 | 40.0 | 6 | 7 | 5 | 7 | 31.6 | 85 | 97 | 109 | 6 | 6 | 46.0 | 56.0 | 5 | 12 | 5 | 11.5 | 0 |
| 20 FT | 17 | 18 | 8 | 8 | 6 | 7.5 | 5 | 6.5 | 36.4 | 37.0 | 37.0 | 37.0 | 6 | 12 | 53.0 | 63.0 | 6 | 12 | 37.0 | 40.0 | 6 | 6.5 | 5 | 6.5 | 31.1 | 86 | 98 | 110 | 6 | 6 | 46.0 | 56.0 | 5 | 12 | 5 | 10 | 0 |
| 22 FT | 18 | 20 | 8 | 8 | 6 | 6.5 | 5 | 6 | 36.1 | 38.0 | 38.0 | 38.0 | 6 | 12 | 53.0 | 62.0 | 6 | 12 | 37.0 | 40.0 | 6 | 6 | 5 | 6 | 30.8 | 88 | 100 | 112 | 6 | 6 | 46.0 | 57.0 | 5 | 12 | 5 | 9.5 | 0 |
| 24 FT | 20 | 21 | 8 | 8 | 6 | 6.5 | 6 | 7.5 | 39.5 | 44.0 | 44.0 | 44.0 | 6 | 12 | 52.0 | 62.0 | 6 | 12 | 36.0 | 39.0 | 7 | 8 | 6 | 7.5 | 33.8 | 89 | 101 | 113 | 7 | 7.5 | 49.0 | 59.0 | 5 | 12 | 5 | 9.5 | 0 |
| 26 FT | 21 | 22 | 8 | 8 | 6 | 6 | 6 | 7 | 39.3 | 45.0 | 45.0 | 45.0 | 6 | 12 | 52.0 | 62.0 | 6 | 12 | 36.0 | 39.0 | 7 | 7.5 | 6 | 7 | 33.6 | 90 | 102 | 114 | 7 | 7.5 | 49.0 | 60.0 | 5 | 12 | 5 | 9.5 | 0 |
| 28 FT | 22 | 23 | 8 | 8 | 6 | 6 | 6 | 6.5 | 39.0 | 46.0 | 46.0 | 46.0 | 7 | 15 | 57.0 | 67.0 | 7 | 15 | 41.0 | 44.0 | 7 | 7 | 6 | 6.5 | 33.4 | 91 | 103 | 115 | 7 | 7 | 49.0 | 60.0 | 5 | 12 | 5 | 8.5 | 0 |
| 30 FT | 23 | 24 | 8 | 8 | 7 | 7.5 | 6 | 6 | 38.9 | 47.0 | 47.0 | 47.0 | 7 | 15 | 56.0 | 67.0 | 7 | 15 | 40.0 | 43.0 | 7 | 6.5 | 6 | 6 | 33.4 | 92 | 104 | 116 | 7 | 6.5 | 49.0 | 60.0 | 5 | 12 | 5 | 8 | 0 |
| 32 FT | 24 | 25 | 9 | 8 | 7 | 7.5 | 6 | 7 | 39.8 | 48.0 | 48.0 | 48.0 | 7 | 14 | 56.0 | 66.0 | 7 | 14 | 40.0 | 42.0 | 7 | 6.5 | 6 | 7 | 34.0 | 93 | 105 | 117 | 7 | 6.5 | 49.0 | 60.0 | 5 | 12 | 5 | 8.5 | 0 |
| 34 FT | 25 | 26 | 9 | 8 | 7 | 7 | 6 | 6.5 | 39.8 | 49.0 | 49.0 | 49.0 | 7 | 14 | 56.0 | 66.0 | 7 | 14 | 39.0 | 42.0 | 7 | 6 | 6 | 6.5 | 34.0 | 94 | 106 | 118 | 7 | 6 | 49.0 | 60.0 | 5 | 12 | 5 | 8 | 0 |
| 36 FT | 26 | 27 | 9 | 8 | 7 | 7 | 6 | 6.5 | 39.8 | 50.0 | 50.0 | 50.0 | 7 | 13 | 56.0 | 66.0 | 7 | 13 | 39.0 | 41.0 | 7 | 6 | 6 | 6.5 | 34.1 | 95 | 107 | 119 | 7 | 6 | 49.0 | 60.0 | 5 | 12 | 5 | 7.5 | 0 |
| 38 FT | 27 | 28 | 9 | 8 | 7 | 6.5 | 6 | 6 | 39.8 | 51.0 | 51.0 | 51.0 | 7 | 13 | 56.0 | 66.0 | 7 | 13 | 38.0 | 40.0 | 7 | 6 | 6 | 6 | 34.3 | 96 | 108 | 120 | 7 | 6 | 49.0 | 60.0 | 5 | 12 | 5 | 7 | 0 |
| 40 FT | 28 | 29 | 9 | 8 | 7 | 6.5 | 6 | 6 | 38.9 | 52.0 | 52.0 | 52.0 | 7 | 12 | 56.0 | 65.0 | 7 | 12 | 37.0 | 39.0 | 7 | 6.5 | 6 | 6 | 33.4 | 97 | 109 | 121 | 8 | 7.5 | 55.0 | 66.0 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 28 | 30 | 10 | 8 | 7 | 6 | 6 | 6.5 | 39.8 | 52.0 | 52.0 | 52.0 | 7 | 12 | 56.0 | 65.0 | 7 | 12 | 38.0 | 40.0 | 7 | 6.5 | 6 | 6.5 | 33.9 | 98 | 110 | 122 | 8 | 7.5 | 55.0 | 66.0 | 5 | 12 | 5 | 8 | 0 |
| 44 FT | 29 | 31 | 10 | 8 | 7 | 6 | 6 | 6.5 | 39.9 | 53.0 | 53.0 | 53.0 | 7 | 12 | 55.0 | 64.0 | 7 | 12 | 38.0 | 39.0 | 7 | 6.5 | 6 | 6 | 34.0 | 99 | 111 | 123 | 8 | 7.5 | 55.0 | 66.0 | 5 | 12 | 5 | 7 | 0 |
| 46 FT | 30 | 32 | 10 | 8 | 7 | 6 | 6 | 6 | 40.0 | 54.0 | 54.0 | 54.0 | 7 | 12 | 55.0 | 64.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 6 | 34.3 | 100 | 112 | 124 | 8 | 7.5 | 55.0 | 66.0 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 31 | 33 | 10 | 8 | 8 | 7.5 | 6 | 6 | 40.1 | 55.0 | 55.0 | 55.0 | 8 | 15 | 63.0 | 71.0 | 8 | 15 | 45.0 | 46.0 | 7 | 6 | 7 | 6.5 | 37.5 | 101 | 113 | 125 | 8 | 7.5 | 55.0 | 66.0 | 5 | 12 | 5 | 6.5 | 0 |
| 50 FT | 32 | 34 | 11 | 8 | 8 | 7.5 | 6 | 6.5 | 41.0 | 56.0 | 56.0 | 56.0 | 7 | 12 | 55.0 | 63.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 6 | 35.1 | 102 | 114 | 126 | 8 | 7 | 55.0 | 66.0 | 5 | 12 | 5 | 7 | 0 |

## SPAN (S) = 12 FT  HEIGHT (HT) = 9 FT OR 10 FT OR 11 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=9′ | K2 HT=10′ | K2 HT=11′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=9′ | K3 HT=10′ | K3 HT=11′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 10 | 8 | 9 | 5 | 6 | 5 | 7.5 | 62.3 | 34.0 | 34.0 | 34.0 | 5 | 12 | 117.5 | 87.5 | 5 | 12 | 31.0 | 35.0 | 5 | 7.5 | 6 | 6 | 79.4 | 114 | 126 | 138 | 5 | 6 | 51.0 | 54.0 | 5 | 12 | 5 | 10 | 12 |
| 2 FT | 14 | 10 | 9 | 9 | 5 | 6 | 5 | 8 | 62.9 | 34.0 | 34.0 | 34.0 | 5 | 12 | 117.5 | 87.5 | 5 | 12 | 30.0 | 33.0 | 5 | 7 | 6 | 6.5 | 68.6 | 114 | 126 | 138 | 6 | 6.5 | 53.0 | 56.0 | 5 | 12 | 5 | 10.5 | 12 |
| 4 FT | 11 | 10 | 9 | 9 | 5 | 6 | 6 | 7 | 75.1 | 31.0 | 31.0 | 35.0 | 5 | 12 | 82.0 | 89.0 | 5 | 12 | 34.0 | 36.0 | 5 | 7 | 6 | 6 | 61.3 | 114 | 126 | 138 | 6 | 6 | 52.0 | 56.0 | 5 | 12 | 5 | 10 | 12 |
| 6 FT | 11 | 11 | 9 | 9 | 5 | 6.5 | 6 | 7 | 59.8 | 31.0 | 35.0 | 35.0 | 6 | 16 | 61.0 | 70.0 | 6 | 16 | 35.0 | 36.0 | 5 | 6.5 | 6 | 6 | 57.5 | 115 | 127 | 139 | 6 | 6 | 50.0 | 56.0 | 5 | 12 | 5 | 9.5 | 12 |
| 8 FT | 11 | 12 | 9 | 9 | 5 | 6.5 | 6 | 7 | 55.3 | 31.0 | 31.0 | 35.0 | 6 | 15 | 56.0 | 60.0 | 6 | 15 | 33.0 | 34.0 | 5 | 6 | 6 | 6.5 | 54.5 | 116 | 128 | 140 | 6 | 6 | 49.0 | 56.0 | 5 | 12 | 5 | 9 | 0 |
| 10 FT | 12 | 13 | 9 | 9 | 5 | 6.5 | 6 | 6.5 | 52.5 | 32.0 | 32.0 | 36.0 | 6 | 14 | 54.0 | 59.0 | 6 | 14 | 33.0 | 34.0 | 5 | 6 | 6 | 6.5 | 52.4 | 117 | 129 | 141 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 8.5 | 0 |
| 12 FT | 13 | 14 | 9 | 9 | 5 | 6 | 6 | 6.5 | 50.4 | 33.0 | 33.0 | 37.0 | 6 | 14 | 52.0 | 58.0 | 6 | 14 | 32.0 | 34.0 | 5 | 6 | 6 | 6.5 | 50.6 | 118 | 130 | 142 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 8.5 | 0 |
| 14 FT | 14 | 15 | 9 | 9 | 5 | 6 | 6 | 6.5 | 48.8 | 34.0 | 34.0 | 38.0 | 6 | 14 | 51.0 | 57.0 | 6 | 14 | 32.0 | 34.0 | 6 | 7.5 | 6 | 6.5 | 49.4 | 119 | 131 | 143 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 8.5 | 0 |
| 16 FT | 15 | 16 | 10 | 9 | 6 | 8 | 6 | 7.5 | 54.3 | 35.0 | 35.0 | 39.0 | 6 | 13 | 55.0 | 63.0 | 6 | 13 | 38.0 | 40.0 | 6 | 7 | 6 | 7.5 | 48.5 | 120 | 132 | 144 | 6 | 6 | 47.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 18 FT | 16 | 17 | 11 | 9 | 6 | 8 | 6 | 8 | 54.3 | 36.0 | 36.0 | 36.0 | 6 | 13 | 55.0 | 62.0 | 6 | 13 | 38.0 | 40.0 | 6 | 7 | 5 | 6 | 45.4 | 121 | 133 | 145 | 6 | 6 | 47.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 20 FT | 17 | 18 | 11 | 9 | 6 | 7.5 | 6 | 7.5 | 53.6 | 37.0 | 37.0 | 41.0 | 6 | 13 | 54.0 | 62.0 | 6 | 13 | 37.0 | 40.0 | 6 | 6 | 6 | 8 | 47.8 | 122 | 134 | 146 | 6 | 6 | 47.0 | 56.0 | 5 | 12 | 5 | 7.5 | 0 |
| 22 FT | 18 | 20 | 11 | 9 | 6 | 7 | 6 | 6.5 | 53.3 | 38.0 | 38.0 | 42.0 | 6 | 12 | 54.0 | 62.0 | 6 | 12 | 37.0 | 40.0 | 6 | 6 | 6 | 7.5 | 47.5 | 124 | 136 | 148 | 6 | 6 | 47.0 | 57.0 | 5 | 12 | 5 | 7.5 | 0 |
| 24 FT | 19 | 21 | 12 | 9 | 6 | 6.5 | 6 | 7 | 53.5 | 39.0 | 39.0 | 39.0 | 6 | 12 | 53.0 | 62.0 | 6 | 12 | 37.0 | 40.0 | 7 | 8 | 5 | 6 | 44.5 | 125 | 137 | 149 | 7 | 7.5 | 50.0 | 60.0 | 5 | 12 | 5 | 7 | 0 |
| 26 FT | 20 | 22 | 13 | 9 | 6 | 6 | 6 | 7.5 | 53.9 | 40.0 | 40.0 | 40.0 | 6 | 12 | 53.0 | 61.0 | 6 | 12 | 37.0 | 40.0 | 7 | 7.5 | 5 | 6 | 44.6 | 126 | 138 | 150 | 7 | 7.5 | 50.0 | 60.0 | 5 | 12 | 5 | 7 | 0 |
| 28 FT | 22 | 23 | 13 | 9 | 6 | 6 | 6 | 7.5 | 53.5 | 42.0 | 42.0 | 42.0 | 7 | 15 | 57.0 | 66.0 | 7 | 15 | 40.0 | 43.0 | 7 | 7 | 5 | 6 | 44.5 | 127 | 139 | 151 | 7 | 7 | 50.0 | 60.0 | 5 | 12 | 5 | 6.5 | 0 |
| 30 FT | 23 | 25 | 13 | 9 | 7 | 7.5 | 6 | 7 | 53.4 | 43.0 | 43.0 | 43.0 | 7 | 15 | 57.0 | 66.0 | 7 | 15 | 40.0 | 42.0 | 7 | 7 | 5 | 6 | 44.4 | 129 | 141 | 153 | 7 | 6.5 | 50.0 | 60.0 | 5 | 12 | 5 | 6.5 | 0 |
| 32 FT | 24 | 26 | 13 | 9 | 7 | 7.5 | 6 | 6.5 | 53.3 | 44.0 | 44.0 | 48.0 | 7 | 14 | 57.0 | 66.0 | 7 | 14 | 40.0 | 42.0 | 7 | 7 | 6 | 8.5 | 47.4 | 130 | 142 | 154 | 7 | 6.5 | 50.0 | 60.0 | 5 | 12 | 5 | 6.5 | 0 |
| 34 FT | 25 | 26 | 13 | 9 | 7 | 7 | 6 | 6 | 53.0 | 45.0 | 45.0 | 49.0 | 7 | 14 | 57.0 | 65.0 | 7 | 14 | 39.0 | 41.0 | 7 | 6 | 6 | 7.5 | 47.3 | 130 | 142 | 154 | 7 | 6 | 50.0 | 60.0 | 5 | 12 | 5 | 6.5 | 0 |
| 36 FT | 26 | 28 | 14 | 9 | 7 | 7 | 6 | 6.5 | 53.9 | 46.0 | 46.0 | 46.0 | 7 | 13 | 56.0 | 65.0 | 7 | 13 | 38.0 | 40.0 | 7 | 7 | 5 | 6 | 44.9 | 132 | 144 | 156 | 7 | 6 | 50.0 | 60.0 | 5 | 12 | 5 | 6 | 0 |
| 38 FT | 26 | 29 | 15 | 9 | 7 | 6.5 | 6 | 6.5 | 54.6 | 50.0 | 50.0 | 50.0 | 7 | 13 | 56.0 | 65.0 | 7 | 13 | 39.0 | 41.0 | 7 | 6.5 | 6 | 8 | 48.1 | 133 | 145 | 157 | 7 | 6 | 50.0 | 60.0 | 5 | 12 | 6 | 8.5 | 0 |
| 40 FT | 27 | 29 | 15 | 9 | 7 | 6.5 | 6 | 7 | 53.4 | 51.0 | 51.0 | 51.0 | 7 | 13 | 56.0 | 64.0 | 7 | 13 | 38.0 | 40.0 | 7 | 6 | 6 | 8 | 46.9 | 133 | 145 | 157 | 8 | 7.5 | 56.0 | 66.0 | 5 | 12 | 5 | 6 | 0 |
| 42 FT | 28 | 30 | 15 | 9 | 7 | 6.5 | 6 | 6.5 | 53.4 | 52.0 | 52.0 | 52.0 | 7 | 12 | 56.0 | 64.0 | 7 | 12 | 38.0 | 39.0 | 7 | 6 | 6 | 8 | 47.0 | 134 | 146 | 158 | 8 | 7.5 | 56.0 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 29 | 31 | 15 | 9 | 7 | 6 | 6 | 6.5 | 53.4 | 53.0 | 53.0 | 53.0 | 7 | 12 | 56.0 | 63.0 | 7 | 12 | 37.0 | 39.0 | 7 | 6 | 6 | 7.5 | 47.1 | 135 | 147 | 159 | 8 | 7.5 | 56.0 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 30 | 32 | 15 | 9 | 7 | 6 | 6 | 6.5 | 53.5 | 54.0 | 54.0 | 54.0 | 7 | 12 | 55.0 | 63.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 7.5 | 47.4 | 136 | 148 | 160 | 8 | 7.5 | 56.0 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 31 | 33 | 15 | 9 | 7 | 6 | 6 | 6 | 53.5 | 55.0 | 55.0 | 55.0 | 7 | 12 | 55.0 | 62.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 7 | 47.5 | 137 | 149 | 161 | 8 | 7 | 56.0 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 31 | 34 | 16 | 9 | 8 | 7.5 | 6 | 6 | 54.4 | 55.0 | 55.0 | 55.0 | 7 | 12 | 55.0 | 62.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 7 | 47.9 | 138 | 150 | 162 | 8 | 7 | 56.0 | 67.0 | 5 | 12 | 6 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 12 FEET
HEIGHT (HT): 6 THRU 11 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

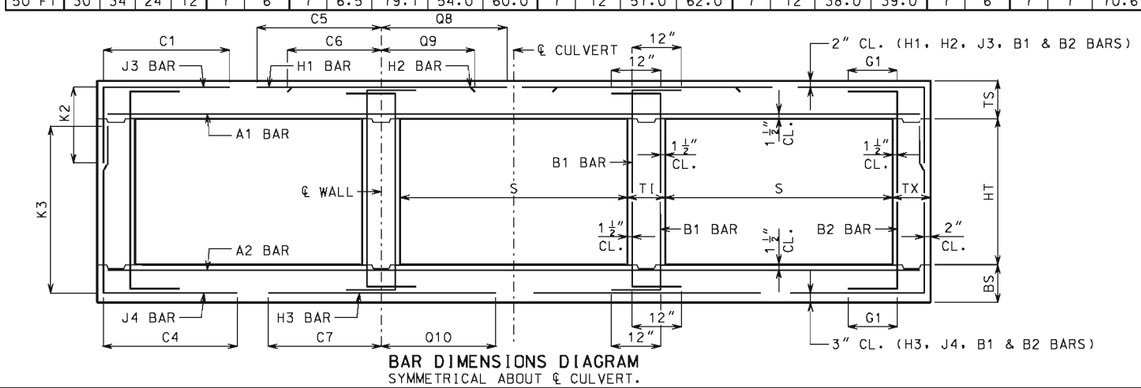
703.87

## SPAN (S) = 12 FT  HEIGHT (HT) = 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=12' | K2 HT=13' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=12' | K3 HT=13' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 10 | 10 | 10 | 5 | 6 | 5 | 7 | 63.8 | 34.0 | 34.0 | 5 | 12 | 118.5 | 87.5 | 5 | 12 | 32.0 | 35.0 | 5 | 7 | 6 | 6.5 | 89.1 | 150 | 162 | 6 | 7 | 55.0 | 57.0 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 14 | 10 | 10 | 10 | 5 | 6 | 5 | 7 | 63.8 | 34.0 | 34.0 | 5 | 12 | 118.5 | 87.5 | 5 | 12 | 31.0 | 33.0 | 5 | 7 | 6 | 6 | 79.6 | 150 | 162 | 6 | 6.5 | 54.0 | 56.0 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 11 | 11 | 10 | 10 | 5 | 6.5 | 5 | 6 | 63.8 | 31.0 | 31.0 | 5 | 12 | 118.5 | 89.0 | 5 | 12 | 34.0 | 35.0 | 5 | 6.5 | 6 | 6.5 | 76.3 | 151 | 163 | 6 | 6.5 | 53.0 | 57.0 | 5 | 12 | 5 | 8 | 12 |
| 6 FT | 11 | 11 | 10 | 10 | 5 | 6.5 | 5 | 6 | 71.3 | 31.0 | 31.0 | 6 | 16 | 65.0 | 69.0 | 6 | 16 | 35.0 | 36.0 | 5 | 6.5 | 6 | 6 | 69.1 | 151 | 163 | 6 | 6 | 51.0 | 56.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 11 | 12 | 10 | 10 | 5 | 6.5 | 6 | 7 | 65.4 | 31.0 | 35.0 | 6 | 15 | 57.0 | 60.0 | 6 | 15 | 34.0 | 35.0 | 5 | 6 | 6 | 6 | 66.4 | 152 | 164 | 6 | 6 | 50.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 10 FT | 12 | 13 | 10 | 10 | 5 | 6.5 | 6 | 7 | 62.9 | 36.0 | 36.0 | 6 | 15 | 55.0 | 58.0 | 6 | 15 | 33.0 | 34.0 | 5 | 6 | 6 | 6 | 63.8 | 153 | 165 | 6 | 6 | 49.0 | 56.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 13 | 14 | 11 | 10 | 5 | 6.5 | 6 | 7.5 | 61.1 | 33.0 | 37.0 | 6 | 14 | 53.0 | 57.0 | 6 | 14 | 33.0 | 34.0 | 6 | 8 | 6 | 7 | 62.0 | 154 | 166 | 6 | 6 | 49.0 | 56.0 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 14 | 15 | 11 | 10 | 5 | 6 | 6 | 7 | 59.9 | 38.0 | 38.0 | 6 | 14 | 51.0 | 57.0 | 6 | 14 | 32.0 | 34.0 | 6 | 7.5 | 6 | 6 | 60.9 | 155 | 167 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 7.5 | 0 |
| 16 FT | 15 | 16 | 12 | 10 | 6 | 8 | 6 | 7 | 65.0 | 39.0 | 39.0 | 6 | 14 | 56.0 | 62.0 | 6 | 14 | 38.0 | 40.0 | 6 | 7 | 6 | 7 | 59.9 | 156 | 168 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 16 | 17 | 12 | 10 | 6 | 8 | 6 | 6.5 | 64.1 | 40.0 | 40.0 | 6 | 13 | 55.0 | 62.0 | 6 | 13 | 38.0 | 40.0 | 6 | 7 | 6 | 6 | 59.1 | 157 | 169 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 17 | 18 | 13 | 10 | 6 | 7.5 | 6 | 6.5 | 63.8 | 41.0 | 41.0 | 6 | 13 | 55.0 | 61.0 | 6 | 13 | 38.0 | 40.0 | 6 | 6 | 6 | 7 | 58.5 | 158 | 170 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 18 | 20 | 13 | 10 | 6 | 7 | 6 | 6 | 63.3 | 42.0 | 42.0 | 6 | 13 | 54.0 | 61.0 | 6 | 13 | 38.0 | 40.0 | 6 | 6 | 6 | 6.5 | 58.4 | 160 | 172 | 6 | 6 | 48.0 | 56.0 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 19 | 21 | 14 | 10 | 6 | 6.5 | 6 | 6.5 | 63.1 | 39.0 | 43.0 | 6 | 12 | 54.0 | 61.0 | 6 | 12 | 37.0 | 40.0 | 7 | 8 | 6 | 7 | 58.0 | 161 | 173 | 7 | 7.5 | 51.0 | 60.0 | 5 | 12 | 5 | 6 | 0 |
| 26 FT | 20 | 22 | 14 | 10 | 6 | 6.5 | 6 | 6 | 62.8 | 44.0 | 44.0 | 6 | 12 | 53.0 | 61.0 | 6 | 12 | 37.0 | 40.0 | 7 | 7.5 | 6 | 6.5 | 57.6 | 162 | 174 | 7 | 7.5 | 51.0 | 60.0 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 21 | 23 | 15 | 10 | 6 | 6 | 6 | 6 | 62.9 | 45.0 | 45.0 | 6 | 12 | 53.0 | 61.0 | 6 | 12 | 37.0 | 40.0 | 7 | 7 | 6 | 7 | 57.4 | 163 | 175 | 7 | 7 | 51.0 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 23 | 25 | 15 | 10 | 7 | 7.5 | 6 | 6 | 62.8 | 47.0 | 47.0 | 7 | 15 | 57.0 | 65.0 | 7 | 15 | 40.0 | 42.0 | 7 | 7 | 6 | 7 | 57.5 | 165 | 177 | 7 | 6.5 | 51.0 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 23 | 26 | 16 | 10 | 7 | 7 | 6 | 6 | 63.1 | 47.0 | 47.0 | 7 | 14 | 57.0 | 65.0 | 7 | 14 | 41.0 | 43.0 | 7 | 7 | 6 | 7.5 | 57.5 | 166 | 178 | 7 | 6.5 | 51.0 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 24 | 27 | 16 | 10 | 7 | 7 | 7 | 7.5 | 68.1 | 48.0 | 48.0 | 7 | 14 | 57.0 | 65.0 | 7 | 14 | 40.0 | 42.0 | 7 | 7 | 6 | 7 | 57.5 | 167 | 179 | 7 | 6 | 51.0 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 25 | 28 | 17 | 10 | 7 | 7 | 6 | 6 | 63.6 | 49.0 | 49.0 | 7 | 14 | 57.0 | 64.0 | 7 | 14 | 40.0 | 42.0 | 7 | 7 | 6 | 7 | 57.8 | 168 | 180 | 7 | 6 | 51.0 | 60.0 | 5 | 12 | 6 | 7.5 | 0 |
| 38 FT | 26 | 29 | 17 | 10 | 7 | 7 | 7 | 7.5 | 68.6 | 50.0 | 50.0 | 7 | 13 | 57.0 | 64.0 | 7 | 13 | 39.0 | 41.0 | 7 | 6.5 | 6 | 7 | 57.9 | 169 | 181 | 7 | 6 | 51.0 | 60.0 | 5 | 12 | 6 | 7.5 | 0 |
| 40 FT | 27 | 29 | 17 | 10 | 7 | 6.5 | 7 | 8 | 66.8 | 51.0 | 51.0 | 7 | 13 | 56.0 | 63.0 | 7 | 13 | 38.0 | 40.0 | 7 | 6 | 6 | 7 | 55.9 | 169 | 181 | 8 | 7.5 | 57.0 | 66.0 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 28 | 30 | 17 | 10 | 7 | 6.5 | 7 | 7 | 66.9 | 52.0 | 52.0 | 7 | 12 | 56.0 | 63.0 | 7 | 12 | 38.0 | 39.0 | 7 | 6 | 6 | 7 | 56.0 | 170 | 182 | 8 | 7.5 | 57.0 | 66.0 | 5 | 12 | 6 | 7.5 | 0 |
| 44 FT | 29 | 31 | 18 | 10 | 7 | 6 | 7 | 7.5 | 67.8 | 53.0 | 53.0 | 7 | 12 | 56.0 | 62.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 6.5 | 56.4 | 171 | 183 | 8 | 7.5 | 57.0 | 66.0 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 29 | 32 | 19 | 10 | 7 | 6 | 7 | 7.5 | 68.5 | 53.0 | 53.0 | 7 | 12 | 56.0 | 62.0 | 7 | 12 | 38.0 | 39.0 | 7 | 6 | 6 | 6.5 | 56.8 | 172 | 184 | 8 | 7 | 57.0 | 67.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 30 | 33 | 19 | 10 | 7 | 6 | 7 | 7 | 68.5 | 54.0 | 54.0 | 7 | 12 | 56.0 | 61.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 6.5 | 56.9 | 173 | 185 | 8 | 7 | 57.0 | 67.0 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 31 | 34 | 19 | 10 | 7 | 6 | 7 | 6.5 | 68.6 | 55.0 | 55.0 | 7 | 12 | 56.0 | 61.0 | 7 | 12 | 37.0 | 38.0 | 7 | 6 | 6 | 6.5 | 57.3 | 174 | 186 | 8 | 7 | 57.0 | 67.0 | 5 | 12 | 6 | 6.5 | 0 |

## SPAN (S) = 12 FT  HEIGHT (HT) = 14 FT OR 15 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=14' | K2 HT=15' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=14' | K3 HT=15' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 11 | 10 | 12 | 5 | 6 | 6 | 7.5 | 64.0 | 34.0 | 38.0 | 5 | 12 | 119.5 | 88.5 | 5 | 12 | 32.0 | 35.0 | 5 | 7 | 6 | 6 | 95.5 | 175 | 187 | 5 | 6 | 55.0 | 55.0 | 5 | 12 | 5 | 8 | 12 |
| 2 FT | 14 | 12 | 10 | 12 | 5 | 6 | 6 | 7 | 64.0 | 34.0 | 38.0 | 5 | 12 | 119.5 | 88.5 | 5 | 12 | 31.0 | 34.0 | 5 | 7 | 6 | 6 | 95.5 | 176 | 188 | 5 | 6 | 54.0 | 55.0 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 10 | 11 | 12 | 12 | 5 | 6 | 6 | 7.5 | 68.3 | 34.0 | 34.0 | 6 | 15 | 121.5 | 77.0 | 6 | 15 | 37.0 | 37.0 | 5 | 6.5 | 6 | 6 | 86.8 | 175 | 187 | 6 | 6.5 | 55.0 | 57.0 | 5 | 11 | 5 | 7 | 12 |
| 6 FT | 10 | 12 | 12 | 12 | 5 | 6.5 | 6 | 7 | 80.0 | 34.0 | 34.0 | 6 | 15 | 61.0 | 61.0 | 6 | 15 | 35.0 | 35.0 | 5 | 6 | 6 | 6.5 | 83.1 | 176 | 188 | 6 | 6.5 | 53.0 | 57.0 | 5 | 12 | 5 | 7 | 12 |
| 8 FT | 11 | 12 | 12 | 12 | 5 | 7 | 6 | 7.5 | 76.8 | 35.0 | 35.0 | 6 | 15 | 58.0 | 59.0 | 6 | 15 | 35.0 | 35.0 | 5 | 6 | 6 | 6 | 77.1 | 176 | 188 | 6 | 6 | 52.0 | 55.0 | 5 | 12 | 5 | 7 | 0 |
| 10 FT | 12 | 13 | 12 | 12 | 5 | 6.5 | 6 | 7.5 | 74.4 | 36.0 | 36.0 | 6 | 15 | 56.0 | 58.0 | 6 | 15 | 34.0 | 35.0 | 5 | 6 | 6 | 6 | 75.5 | 177 | 189 | 6 | 6 | 51.0 | 55.0 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 13 | 14 | 13 | 12 | 5 | 6.5 | 6 | 7.5 | 71.5 | 37.0 | 37.0 | 6 | 15 | 54.0 | 57.0 | 6 | 15 | 34.0 | 35.0 | 6 | 8 | 6 | 6 | 73.0 | 178 | 190 | 6 | 6 | 50.0 | 55.0 | 5 | 12 | 5 | 6.5 | 0 |
| 14 FT | 14 | 15 | 13 | 12 | 5 | 6 | 6 | 6.5 | 70.3 | 38.0 | 38.0 | 6 | 14 | 52.0 | 56.0 | 6 | 14 | 33.0 | 35.0 | 6 | 7.5 | 6 | 6 | 72.0 | 179 | 191 | 6 | 6 | 50.0 | 55.0 | 5 | 12 | 5 | 6.5 | 0 |
| 16 FT | 15 | 16 | 14 | 12 | 6 | 8 | 6 | 6.5 | 74.5 | 39.0 | 39.0 | 6 | 14 | 57.0 | 62.0 | 6 | 14 | 39.0 | 41.0 | 6 | 7 | 6 | 6.5 | 70.3 | 180 | 192 | 6 | 6 | 49.0 | 55.0 | 5 | 12 | 5 | 6 | 0 |
| 18 FT | 15 | 17 | 15 | 12 | 6 | 7.5 | 6 | 6.5 | 72.4 | 39.0 | 39.0 | 6 | 13 | 56.0 | 61.0 | 6 | 13 | 39.0 | 40.0 | 6 | 6.5 | 6 | 6.5 | 69.0 | 181 | 193 | 6 | 6 | 49.0 | 56.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 17 | 19 | 15 | 12 | 6 | 7.5 | 6 | 6 | 73.0 | 41.0 | 41.0 | 6 | 13 | 56.0 | 61.0 | 6 | 13 | 39.0 | 41.0 | 6 | 6 | 6 | 6 | 69.6 | 183 | 195 | 6 | 6 | 49.0 | 56.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 18 | 20 | 16 | 12 | 6 | 7 | 6 | 6.5 | 72.8 | 42.0 | 42.0 | 6 | 13 | 55.0 | 61.0 | 6 | 13 | 39.0 | 41.0 | 6 | 6 | 6 | 6 | 68.4 | 184 | 196 | 6 | 6 | 49.0 | 56.0 | 5 | 12 | 6 | 8 | 0 |
| 24 FT | 19 | 21 | 16 | 12 | 6 | 6.5 | 6 | 6 | 72.4 | 43.0 | 43.0 | 6 | 13 | 55.0 | 61.0 | 6 | 13 | 38.0 | 41.0 | 7 | 8 | 7 | 7.5 | 71.1 | 185 | 197 | 7 | 7.5 | 52.0 | 59.0 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 20 | 22 | 16 | 12 | 6 | 6.5 | 7 | 7.5 | 77.1 | 44.0 | 50.0 | 6 | 12 | 55.0 | 61.0 | 6 | 12 | 38.0 | 40.0 | 7 | 7.5 | 7 | 7 | 70.8 | 186 | 198 | 7 | 7.5 | 52.0 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 28 FT | 21 | 23 | 17 | 12 | 6 | 6 | 7 | 7.5 | 77.1 | 45.0 | 51.0 | 6 | 12 | 54.0 | 60.0 | 6 | 12 | 37.0 | 40.0 | 7 | 6.5 | 7 | 7.5 | 70.5 | 187 | 199 | 7 | 6.5 | 52.0 | 60.0 | 5 | 12 | 6 | 7.5 | 0 |
| 30 FT | 22 | 25 | 18 | 12 | 6 | 6 | 7 | 7.5 | 77.3 | 46.0 | 46.0 | 7 | 15 | 59.0 | 65.0 | 7 | 15 | 42.0 | 44.0 | 7 | 7 | 6 | 6 | 67.8 | 189 | 201 | 7 | 6.5 | 52.0 | 60.0 | 5 | 12 | 6 | 7 | 0 |
| 32 FT | 23 | 26 | 19 | 12 | 7 | 7.5 | 7 | 7.5 | 77.5 | 47.0 | 47.0 | 7 | 15 | 58.0 | 65.0 | 7 | 15 | 41.0 | 44.0 | 7 | 7 | 6 | 6 | 67.8 | 190 | 202 | 7 | 6.5 | 52.0 | 60.0 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 24 | 27 | 19 | 12 | 7 | 7.5 | 7 | 7 | 77.6 | 48.0 | 48.0 | 7 | 14 | 58.0 | 65.0 | 7 | 14 | 41.0 | 43.0 | 7 | 7 | 6 | 6 | 67.9 | 191 | 203 | 7 | 6 | 52.0 | 60.0 | 5 | 12 | 6 | 6.5 | 0 |
| 36 FT | 25 | 28 | 20 | 12 | 7 | 7 | 7 | 7.5 | 78.1 | 49.0 | 49.0 | 7 | 14 | 58.0 | 64.0 | 7 | 14 | 40.0 | 42.0 | 7 | 7 | 6 | 6 | 68.1 | 192 | 204 | 7 | 6 | 52.0 | 60.0 | 5 | 12 | 6 | 6.5 | 0 |
| 38 FT | 26 | 29 | 21 | 12 | 7 | 7 | 7 | 7.5 | 78.6 | 50.0 | 50.0 | 7 | 13 | 58.0 | 64.0 | 7 | 13 | 40.0 | 41.0 | 7 | 6.5 | 6 | 6 | 68.3 | 193 | 205 | 7 | 6 | 52.0 | 61.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 27 | 30 | 21 | 12 | 7 | 6.5 | 7 | 7.5 | 77.1 | 51.0 | 51.0 | 7 | 13 | 57.0 | 63.0 | 7 | 13 | 39.0 | 40.0 | 7 | 6.5 | 6 | 6 | 66.5 | 194 | 206 | 7 | 6 | 52.0 | 61.0 | 5 | 12 | 6 | 6 | 0 |
| 42 FT | 27 | 31 | 21 | 12 | 7 | 6 | 7 | 7 | 77.0 | 51.0 | 51.0 | 7 | 12 | 57.0 | 63.0 | 7 | 12 | 40.0 | 41.0 | 7 | 6.5 | 6 | 6 | 66.8 | 195 | 207 | 7 | 6 | 52.0 | 61.0 | 5 | 12 | 6 | 6 | 0 |
| 44 FT | 28 | 31 | 22 | 12 | 7 | 6.5 | 7 | 7 | 77.6 | 52.0 | 58.0 | 7 | 12 | 57.0 | 63.0 | 7 | 12 | 39.0 | 40.0 | 7 | 6 | 7 | 7.5 | 69.6 | 195 | 207 | 8 | 7.5 | 58.0 | 67.0 | 5 | 12 | 6 | 6 | 0 |
| 46 FT | 29 | 32 | 22 | 12 | 7 | 6 | 7 | 6.5 | 77.9 | 59.0 | 59.0 | 7 | 12 | 57.0 | 62.0 | 7 | 12 | 38.0 | 40.0 | 7 | 6 | 7 | 7.5 | 70.0 | 196 | 208 | 8 | 7.5 | 58.0 | 67.0 | 5 | 12 | 6 | 6 | 0 |
| 48 FT | 30 | 33 | 23 | 12 | 7 | 6 | 7 | 6.5 | 78.6 | 54.0 | 60.0 | 7 | 12 | 57.0 | 62.0 | 7 | 12 | 38.0 | 39.0 | 7 | 6 | 7 | 7.5 | 70.4 | 197 | 209 | 8 | 7 | 58.0 | 67.0 | 5 | 12 | 7 | 8 | 0 |
| 50 FT | 30 | 34 | 24 | 12 | 7 | 6 | 7 | 6.5 | 79.1 | 54.0 | 60.0 | 7 | 12 | 57.0 | 62.0 | 7 | 12 | 38.0 | 39.0 | 7 | 6 | 7 | 7 | 70.6 | 198 | 210 | 8 | 7 | 58.0 | 67.0 | 5 | 12 | 7 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 12 FEET
HEIGHT (HT): 12 THRU 15 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

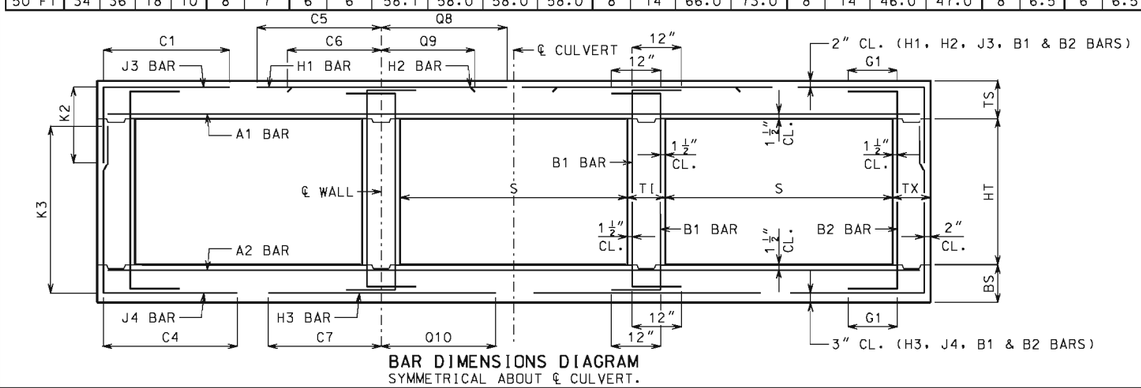
703.87

## SPAN (S) = 13 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=7′ | K2 HT=8′ | K2 HT=9′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=7′ | K3 HT=8′ | K3 HT=9′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 9 | 8 | 8 | 5 | 6 | 5 | 8.5 | 65.8 | 34.0 | 34.0 | 34.0 | 5 | 12 | 125.5 | 92.5 | 5 | 12 | 34.0 | 38.0 | 5 | 7.5 | 6 | 6 | 60.0 | 89 | 101 | 113 | 6 | 6 | 56.0 | 59.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 15 | 10 | 8 | 8 | 6 | 8 | 5 | 8 | 65.8 | 31.0 | 35.0 | 35.0 | 6 | 16 | 129.5 | 99.5 | 6 | 16 | 40.0 | 44.0 | 5 | 7 | 6 | 6.5 | 55.5 | 90 | 102 | 114 | 6 | 6 | 54.0 | 59.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 11 | 10 | 8 | 8 | 6 | 8 | 6 | 7 | 56.4 | 31.0 | 35.0 | 35.0 | 6 | 14 | 77.0 | 97.0 | 6 | 14 | 38.0 | 40.0 | 5 | 7 | 6 | 6 | 49.5 | 90 | 102 | 114 | 7 | 6.5 | 57.0 | 62.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 11 | 11 | 8 | 8 | 6 | 8.5 | 6 | 7 | 49.0 | 31.0 | 31.0 | 35.0 | 6 | 13 | 63.0 | 75.0 | 6 | 13 | 35.0 | 37.0 | 5 | 6.5 | 6 | 7 | 45.9 | 91 | 103 | 115 | 7 | 7 | 55.0 | 62.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 12 | 12 | 8 | 8 | 5 | 6 | 5 | 6 | 42.0 | 32.0 | 32.0 | 32.0 | 6 | 14 | 58.0 | 67.0 | 6 | 14 | 34.0 | 36.0 | 5 | 6 | 6 | 7 | 43.3 | 92 | 104 | 116 | 7 | 7 | 54.0 | 62.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 13 | 14 | 8 | 8 | 5 | 6 | 5 | 6 | 39.8 | 33.0 | 33.0 | 33.0 | 6 | 13 | 55.0 | 63.0 | 6 | 13 | 33.0 | 36.0 | 6 | 8 | 5 | 6.5 | 38.1 | 94 | 106 | 118 | 6 | 6 | 50.0 | 59.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 14 | 15 | 8 | 8 | 6 | 8 | 5 | 6 | 37.9 | 34.0 | 34.0 | 34.0 | 6 | 13 | 53.0 | 62.0 | 6 | 13 | 33.0 | 35.0 | 6 | 7.5 | 5 | 6.5 | 36.9 | 95 | 107 | 119 | 6 | 6 | 49.0 | 59.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 15 | 16 | 8 | 8 | 6 | 7.5 | 5 | 6 | 41.4 | 35.0 | 35.0 | 35.0 | 6 | 12 | 58.0 | 67.0 | 6 | 12 | 39.0 | 41.0 | 6 | 7 | 5 | 6.5 | 35.9 | 96 | 108 | 120 | 6 | 6 | 49.0 | 59.0 | 5 | 12 | 5 | 10.5 | 0 |
| 16 FT | 16 | 17 | 8 | 8 | 6 | 7.5 | 6 | 8 | 44.4 | 36.0 | 36.0 | 36.0 | 6 | 12 | 57.0 | 67.0 | 6 | 12 | 38.0 | 41.0 | 6 | 7 | 5 | 6.5 | 35.1 | 97 | 109 | 121 | 6 | 6 | 49.0 | 60.0 | 5 | 12 | 5 | 9.5 | 0 |
| 18 FT | 17 | 18 | 8 | 8 | 6 | 7 | 6 | 7.5 | 43.5 | 37.0 | 37.0 | 37.0 | 6 | 12 | 56.0 | 66.0 | 6 | 12 | 38.0 | 41.0 | 6 | 6.5 | 5 | 6 | 34.5 | 98 | 110 | 122 | 7 | 7 | 52.0 | 63.0 | 5 | 12 | 5 | 9.5 | 0 |
| 20 FT | 18 | 20 | 9 | 8 | 6 | 6.5 | 6 | 8 | 44.3 | 38.0 | 38.0 | 38.0 | 7 | 15 | 61.0 | 71.0 | 7 | 15 | 43.0 | 46.0 | 6 | 6 | 5 | 7 | 34.6 | 100 | 112 | 124 | 6 | 6 | 49.0 | 60.0 | 5 | 12 | 5 | 9 | 0 |
| 22 FT | 20 | 21 | 9 | 8 | 6 | 6.5 | 6 | 8 | 43.4 | 40.0 | 40.0 | 40.0 | 6 | 12 | 55.0 | 66.0 | 6 | 12 | 38.0 | 41.0 | 7 | 8 | 5 | 6.5 | 34.5 | 101 | 113 | 125 | 7 | 7 | 52.0 | 63.0 | 5 | 12 | 5 | 8.5 | 0 |
| 24 FT | 21 | 22 | 9 | 8 | 6 | 6 | 6 | 7.5 | 43.0 | 41.0 | 41.0 | 41.0 | 7 | 15 | 60.0 | 71.0 | 7 | 15 | 43.0 | 46.0 | 7 | 7.5 | 5 | 6 | 34.3 | 102 | 114 | 126 | 7 | 7 | 51.0 | 63.0 | 5 | 12 | 5 | 8.5 | 0 |
| 26 FT | 22 | 24 | 10 | 8 | 6 | 6 | 6 | 8 | 43.8 | 42.0 | 42.0 | 42.0 | 7 | 15 | 59.0 | 70.0 | 7 | 15 | 42.0 | 46.0 | 7 | 7 | 5 | 6.5 | 34.5 | 104 | 116 | 128 | 7 | 7 | 51.0 | 63.0 | 5 | 12 | 5 | 8 | 0 |
| 28 FT | 23 | 25 | 11 | 8 | 7 | 7 | 5 | 6 | 40.5 | 43.0 | 43.0 | 43.0 | 7 | 14 | 59.0 | 70.0 | 7 | 14 | 42.0 | 46.0 | 7 | 6.5 | 5 | 7 | 34.9 | 105 | 117 | 129 | 7 | 6.5 | 51.0 | 63.0 | 5 | 12 | 5 | 8.5 | 0 |
| 30 FT | 25 | 26 | 11 | 8 | 7 | 7 | 5 | 6 | 40.0 | 45.0 | 45.0 | 45.0 | 7 | 14 | 59.0 | 70.0 | 7 | 14 | 41.0 | 44.0 | 7 | 6.5 | 5 | 6.5 | 34.9 | 106 | 118 | 130 | 7 | 6.5 | 51.0 | 63.0 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 26 | 27 | 11 | 8 | 7 | 7 | 5 | 6 | 39.8 | 46.0 | 46.0 | 46.0 | 7 | 13 | 59.0 | 69.0 | 7 | 13 | 40.0 | 43.0 | 7 | 6 | 5 | 6 | 34.8 | 107 | 119 | 131 | 7 | 6 | 51.0 | 63.0 | 5 | 12 | 5 | 7.5 | 0 |
| 34 FT | 27 | 29 | 11 | 8 | 7 | 6.5 | 6 | 8 | 43.9 | 47.0 | 47.0 | 51.0 | 7 | 13 | 58.0 | 69.0 | 7 | 13 | 40.0 | 42.0 | 7 | 6.5 | 6 | 7.5 | 37.9 | 109 | 121 | 133 | 8 | 7.5 | 57.0 | 69.0 | 5 | 12 | 5 | 7.5 | 0 |
| 36 FT | 28 | 30 | 11 | 8 | 7 | 6.5 | 6 | 7.5 | 43.9 | 52.0 | 52.0 | 52.0 | 7 | 12 | 58.0 | 68.0 | 7 | 12 | 40.0 | 42.0 | 7 | 6 | 6 | 7 | 37.9 | 110 | 122 | 134 | 8 | 7.5 | 57.0 | 69.0 | 5 | 12 | 5 | 7.5 | 0 |
| 38 FT | 29 | 31 | 11 | 8 | 7 | 6 | 6 | 6.5 | 43.9 | 53.0 | 53.0 | 53.0 | 7 | 12 | 58.0 | 68.0 | 7 | 12 | 39.0 | 41.0 | 7 | 6 | 6 | 7 | 38.0 | 111 | 123 | 135 | 8 | 7 | 57.0 | 69.0 | 5 | 12 | 5 | 7 | 0 |
| 40 FT | 30 | 32 | 12 | 8 | 7 | 6 | 6 | 7.5 | 44.8 | 54.0 | 54.0 | 54.0 | 7 | 12 | 58.0 | 68.0 | 7 | 12 | 38.0 | 40.0 | 7 | 6 | 6 | 7.5 | 38.5 | 112 | 124 | 136 | 8 | 7 | 57.0 | 70.0 | 5 | 12 | 5 | 7 | 0 |
| 42 FT | 31 | 33 | 12 | 8 | 8 | 7.5 | 6 | 7.5 | 43.8 | 55.0 | 55.0 | 55.0 | 8 | 15 | 66.0 | 75.0 | 8 | 15 | 46.0 | 47.0 | 7 | 6 | 6 | 7 | 37.6 | 113 | 125 | 137 | 8 | 7 | 57.0 | 69.0 | 5 | 12 | 5 | 7 | 0 |
| 44 FT | 32 | 34 | 12 | 8 | 8 | 7.5 | 6 | 7 | 43.9 | 56.0 | 56.0 | 56.0 | 8 | 14 | 65.0 | 74.0 | 8 | 14 | 45.0 | 47.0 | 7 | 6 | 6 | 7 | 37.8 | 114 | 126 | 138 | 8 | 7 | 57.0 | 69.0 | 5 | 12 | 5 | 7 | 0 |
| 46 FT | 32 | 35 | 12 | 8 | 8 | 7 | 6 | 7 | 43.9 | 56.0 | 56.0 | 56.0 | 8 | 14 | 65.0 | 74.0 | 8 | 14 | 46.0 | 47.0 | 7 | 6 | 6 | 6.5 | 37.8 | 115 | 127 | 139 | 8 | 7 | 57.0 | 69.0 | 5 | 12 | 5 | 7 | 0 |
| 48 FT | 33 | 35 | 12 | 8 | 8 | 7 | 6 | 7 | 43.9 | 57.0 | 57.0 | 57.0 | 8 | 14 | 65.0 | 74.0 | 8 | 14 | 45.0 | 47.0 | 8 | 7 | 6 | 6.5 | 37.9 | 115 | 127 | 139 | 8 | 6.5 | 57.0 | 69.0 | 5 | 12 | 5 | 6.5 | 0 |
| 50 FT | 34 | 36 | 12 | 8 | 8 | 7 | 6 | 6.5 | 43.9 | 58.0 | 58.0 | 58.0 | 8 | 14 | 65.0 | 73.0 | 8 | 14 | 45.0 | 46.0 | 8 | 7 | 6 | 6.5 | 38.1 | 116 | 128 | 140 | 8 | 6.5 | 57.0 | 69.0 | 5 | 12 | 5 | 6 | 0 |

## SPAN (S) = 13 FT  HEIGHT (HT) = 10 FT OR 11 FT OR 12 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=10′ | K2 HT=11′ | K2 HT=12′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=10′ | K3 HT=11′ | K3 HT=12′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 10 | 9 | 10 | 5 | 6 | 5 | 7 | 66.6 | 34.0 | 34.0 | 34.0 | 5 | 12 | 126.5 | 93.5 | 5 | 12 | 35.0 | 38.0 | 5 | 7 | 6 | 6 | 81.5 | 126 | 138 | 150 | 6 | 6.5 | 57.0 | 60.0 | 5 | 12 | 5 | 9 | 12 |
| 2 FT | 15 | 10 | 10 | 10 | 6 | 8 | 5 | 7.5 | 67.3 | 35.0 | 35.0 | 35.0 | 6 | 16 | 130.5 | 100.5 | 6 | 16 | 41.0 | 44.0 | 5 | 7 | 6 | 6 | 70.1 | 126 | 138 | 150 | 6 | 6 | 56.0 | 58.0 | 5 | 12 | 5 | 9.5 | 12 |
| 4 FT | 11 | 10 | 10 | 10 | 6 | 8 | 5 | 6 | 72.3 | 31.0 | 31.0 | 31.0 | 6 | 15 | 82.0 | 97.0 | 6 | 15 | 38.0 | 39.0 | 5 | 7 | 6 | 6 | 64.6 | 126 | 138 | 150 | 7 | 6.5 | 58.0 | 61.0 | 5 | 9.5 | 5 | 9 | 12 |
| 6 FT | 11 | 11 | 10 | 10 | 5 | 6 | 5 | 6 | 60.5 | 31.0 | 31.0 | 31.0 | 6 | 14 | 64.0 | 71.0 | 6 | 14 | 36.0 | 37.0 | 5 | 6.5 | 6 | 6 | 61.0 | 127 | 139 | 151 | 7 | 6.5 | 57.0 | 61.0 | 5 | 12 | 5 | 9 | 12 |
| 8 FT | 12 | 13 | 10 | 10 | 5 | 6 | 5 | 6 | 56.8 | 32.0 | 32.0 | 32.0 | 6 | 14 | 60.0 | 64.0 | 6 | 14 | 35.0 | 36.0 | 5 | 6 | 6 | 6.5 | 59.1 | 129 | 141 | 153 | 6 | 6 | 52.0 | 59.0 | 5 | 12 | 5 | 8.5 | 0 |
| 10 FT | 13 | 14 | 10 | 10 | 5 | 6 | 6 | 7 | 56.9 | 33.0 | 33.0 | 37.0 | 6 | 13 | 57.0 | 62.0 | 6 | 13 | 34.0 | 36.0 | 6 | 8 | 6 | 6.5 | 56.8 | 130 | 142 | 154 | 6 | 6 | 51.0 | 59.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 14 | 15 | 10 | 10 | 5 | 6 | 6 | 6.5 | 54.6 | 34.0 | 34.0 | 38.0 | 6 | 13 | 55.0 | 61.0 | 6 | 13 | 34.0 | 36.0 | 6 | 7.5 | 6 | 6.5 | 54.9 | 131 | 143 | 155 | 6 | 6 | 51.0 | 59.0 | 5 | 12 | 5 | 8 | 0 |
| 14 FT | 15 | 16 | 10 | 10 | 6 | 8 | 6 | 6.5 | 58.9 | 35.0 | 35.0 | 39.0 | 6 | 13 | 60.0 | 66.0 | 6 | 13 | 39.0 | 42.0 | 6 | 7 | 6 | 6 | 53.5 | 132 | 144 | 156 | 6 | 6 | 50.0 | 59.0 | 5 | 12 | 5 | 8 | 0 |
| 16 FT | 16 | 17 | 11 | 10 | 6 | 7.5 | 6 | 7 | 58.0 | 36.0 | 36.0 | 40.0 | 6 | 12 | 58.0 | 66.0 | 6 | 12 | 39.0 | 42.0 | 6 | 7 | 6 | 7.5 | 52.5 | 133 | 145 | 157 | 6 | 6 | 50.0 | 59.0 | 5 | 12 | 5 | 7.5 | 0 |
| 18 FT | 17 | 18 | 12 | 10 | 6 | 7.5 | 6 | 7 | 57.9 | 37.0 | 37.0 | 41.0 | 6 | 12 | 58.0 | 66.0 | 6 | 12 | 39.0 | 42.0 | 6 | 6 | 6 | 7.5 | 52.0 | 134 | 146 | 158 | 7 | 7 | 53.0 | 62.0 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 18 | 20 | 12 | 10 | 6 | 7 | 6 | 6.5 | 57.3 | 38.0 | 38.0 | 42.0 | 6 | 12 | 57.0 | 65.0 | 6 | 12 | 39.0 | 42.0 | 6 | 6 | 6 | 7.5 | 51.5 | 136 | 148 | 160 | 6 | 6 | 50.0 | 60.0 | 5 | 12 | 5 | 7 | 0 |
| 22 FT | 19 | 21 | 12 | 10 | 6 | 6 | 6 | 6.5 | 56.8 | 39.0 | 39.0 | 43.0 | 7 | 15 | 62.0 | 70.0 | 7 | 15 | 44.0 | 47.0 | 7 | 8 | 6 | 7 | 51.0 | 137 | 149 | 161 | 7 | 7 | 53.0 | 63.0 | 5 | 12 | 5 | 7 | 0 |
| 24 FT | 21 | 22 | 13 | 10 | 6 | 6 | 6 | 6.5 | 56.9 | 41.0 | 41.0 | 45.0 | 6 | 12 | 56.0 | 65.0 | 6 | 12 | 38.0 | 42.0 | 7 | 7 | 6 | 7.5 | 51.1 | 138 | 150 | 162 | 7 | 7 | 53.0 | 63.0 | 5 | 12 | 5 | 6.5 | 0 |
| 26 FT | 22 | 24 | 13 | 10 | 6 | 6 | 6 | 6.5 | 56.6 | 42.0 | 42.0 | 46.0 | 7 | 15 | 60.0 | 70.0 | 7 | 15 | 43.0 | 46.0 | 7 | 7 | 6 | 7.5 | 50.9 | 140 | 152 | 164 | 7 | 7 | 53.0 | 63.0 | 5 | 12 | 5 | 6.5 | 0 |
| 28 FT | 23 | 25 | 14 | 10 | 7 | 7.5 | 6 | 6.5 | 57.0 | 43.0 | 43.0 | 47.0 | 7 | 15 | 60.0 | 69.0 | 7 | 15 | 43.0 | 46.0 | 7 | 6.5 | 6 | 8 | 51.0 | 141 | 153 | 165 | 7 | 6.5 | 53.0 | 63.0 | 5 | 12 | 5 | 6 | 0 |
| 30 FT | 24 | 26 | 14 | 10 | 7 | 7 | 6 | 6.5 | 56.6 | 44.0 | 44.0 | 48.0 | 7 | 14 | 60.0 | 69.0 | 7 | 14 | 42.0 | 45.0 | 7 | 6.5 | 6 | 7.5 | 50.8 | 142 | 154 | 166 | 7 | 6.5 | 53.0 | 63.0 | 5 | 12 | 5 | 6 | 0 |
| 32 FT | 26 | 28 | 14 | 10 | 7 | 7 | 6 | 6 | 56.5 | 46.0 | 46.0 | 50.0 | 7 | 13 | 59.0 | 69.0 | 7 | 13 | 41.0 | 43.0 | 7 | 6.5 | 6 | 7.5 | 50.8 | 144 | 156 | 168 | 7 | 6 | 53.0 | 63.0 | 5 | 12 | 5 | 6 | 0 |
| 34 FT | 27 | 29 | 15 | 10 | 7 | 6.5 | 6 | 6.5 | 57.1 | 51.0 | 51.0 | 51.0 | 7 | 13 | 59.0 | 68.0 | 7 | 13 | 40.0 | 43.0 | 7 | 6.5 | 6 | 8 | 51.1 | 145 | 157 | 169 | 8 | 7.5 | 59.0 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 28 | 30 | 15 | 10 | 7 | 6.5 | 6 | 6 | 57.1 | 52.0 | 52.0 | 52.0 | 7 | 12 | 59.0 | 68.0 | 7 | 12 | 40.0 | 42.0 | 7 | 6 | 6 | 7.5 | 51.1 | 146 | 158 | 170 | 8 | 7.5 | 59.0 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 29 | 31 | 16 | 10 | 7 | 6 | 6 | 6 | 57.8 | 53.0 | 53.0 | 53.0 | 7 | 12 | 59.0 | 68.0 | 7 | 12 | 39.0 | 41.0 | 7 | 6 | 6 | 7.5 | 51.6 | 147 | 159 | 171 | 8 | 7 | 59.0 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 30 | 32 | 16 | 10 | 7 | 6 | 6 | 6 | 57.8 | 54.0 | 54.0 | 54.0 | 7 | 12 | 59.0 | 67.0 | 7 | 12 | 39.0 | 40.0 | 7 | 6 | 6 | 7.5 | 51.6 | 148 | 160 | 172 | 8 | 7 | 59.0 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 42 FT | 30 | 33 | 17 | 10 | 7 | 6 | 6 | 6 | 58.5 | 54.0 | 54.0 | 54.0 | 7 | 12 | 59.0 | 67.0 | 7 | 12 | 40.0 | 41.0 | 7 | 6 | 6 | 7 | 51.9 | 149 | 161 | 173 | 8 | 7 | 59.0 | 70.0 | 5 | 12 | 6 | 7.5 | 0 |
| 44 FT | 31 | 34 | 17 | 10 | 8 | 7.5 | 6 | 6 | 57.4 | 55.0 | 55.0 | 55.0 | 8 | 15 | 66.0 | 74.0 | 8 | 15 | 47.0 | 48.0 | 7 | 6 | 6 | 7 | 50.8 | 150 | 162 | 174 | 8 | 7 | 59.0 | 70.0 | 5 | 12 | 6 | 7.5 | 0 |
| 46 FT | 32 | 35 | 17 | 10 | 8 | 7.5 | 6 | 6 | 57.4 | 56.0 | 56.0 | 56.0 | 8 | 14 | 66.0 | 74.0 | 8 | 14 | 46.0 | 48.0 | 8 | 7.5 | 6 | 6.5 | 50.9 | 151 | 163 | 175 | 8 | 7 | 59.0 | 70.0 | 5 | 12 | 6 | 7.5 | 0 |
| 48 FT | 33 | 36 | 17 | 10 | 8 | 7 | 6 | 6 | 57.4 | 57.0 | 57.0 | 57.0 | 8 | 14 | 66.0 | 73.0 | 8 | 14 | 46.0 | 47.0 | 8 | 7.5 | 6 | 6.5 | 51.1 | 152 | 164 | 176 | 8 | 6.5 | 59.0 | 70.0 | 5 | 12 | 6 | 7.5 | 0 |
| 50 FT | 34 | 36 | 18 | 10 | 8 | 7 | 6 | 6 | 58.1 | 58.0 | 58.0 | 58.0 | 8 | 14 | 66.0 | 73.0 | 8 | 14 | 46.0 | 47.0 | 8 | 6.5 | 6 | 6.5 | 51.5 | 152 | 164 | 176 | 8 | 6.5 | 59.0 | 70.0 | 5 | 12 | 6 | 7 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 13 FEET
HEIGHT (HT): 7 THRU 12 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

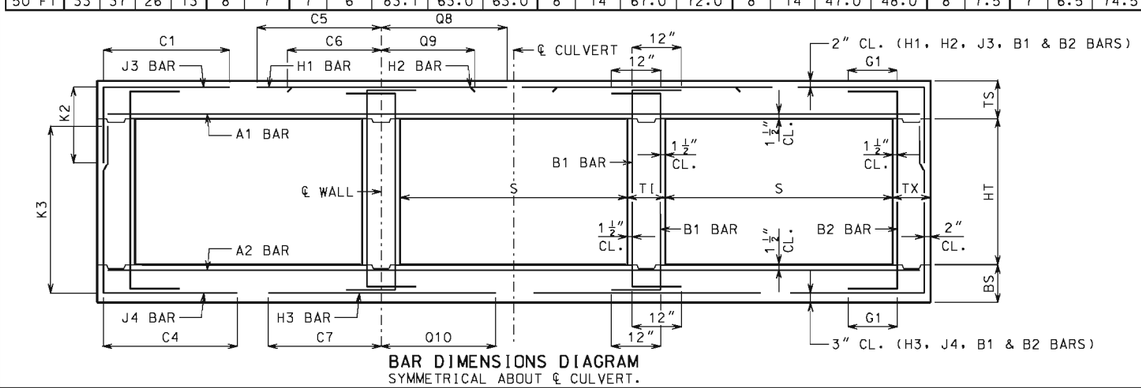
703.87

## SPAN (S) = 13 FT  HEIGHT (HT) = 13 FT OR 14 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=13' | K2 HT=14' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=13' | K3 HT=14' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 11 | 10 | 11 | 5 | 6 | 5 | 6 | 67.5 | 34.0 | 34.0 | 5 | 12 | 127.5 | 94.5 | 5 | 12 | 35.0 | 38.0 | 5 | 7 | 6 | 6.5 | 100.1 | 163 | 175 | 5 | 6 | 56.0 | 58.0 | 5 | 12 | 5 | 8 | 12 |
| 2 FT | 15 | 11 | 10 | 11 | 6 | 8 | 5 | 6 | 67.5 | 35.0 | 35.0 | 6 | 16 | 131.5 | 101.5 | 6 | 16 | 41.0 | 44.0 | 5 | 6.5 | 6 | 6 | 88.9 | 163 | 175 | 6 | 6.5 | 57.0 | 60.0 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 11 | 11 | 11 | 11 | 6 | 8 | 5 | 6 | 68.1 | 31.0 | 31.0 | 6 | 15 | 127.5 | 92.0 | 6 | 15 | 38.0 | 39.0 | 5 | 6.5 | 6 | 6 | 78.6 | 163 | 175 | 6 | 6 | 56.0 | 60.0 | 5 | 12 | 5 | 7.5 | 12 |
| 6 FT | 11 | 12 | 11 | 11 | 5 | 6 | 6 | 7.5 | 75.9 | 31.0 | 35.0 | 6 | 14 | 65.0 | 69.0 | 6 | 14 | 36.0 | 37.0 | 5 | 6 | 6 | 6.5 | 74.6 | 164 | 176 | 6 | 6 | 54.0 | 59.0 | 5 | 12 | 5 | 7.5 | 12 |
| 8 FT | 12 | 13 | 11 | 11 | 5 | 6 | 6 | 7.5 | 70.1 | 32.0 | 36.0 | 6 | 14 | 61.0 | 64.0 | 6 | 14 | 35.0 | 36.0 | 5 | 6 | 6 | 6.5 | 70.9 | 165 | 177 | 6 | 6 | 53.0 | 59.0 | 5 | 12 | 5 | 7.5 | 0 |
| 10 FT | 12 | 14 | 12 | 11 | 5 | 6 | 6 | 7.5 | 65.9 | 36.0 | 36.0 | 6 | 12 | 58.0 | 61.0 | 6 | 12 | 35.0 | 35.0 | 6 | 8 | 6 | 7 | 67.9 | 166 | 178 | 6 | 6 | 52.0 | 59.0 | 5 | 12 | 5 | 7 | 0 |
| 12 FT | 13 | 15 | 12 | 11 | 6 | 8 | 6 | 7 | 64.4 | 37.0 | 37.0 | 6 | 12 | 56.0 | 60.0 | 6 | 12 | 34.0 | 35.0 | 6 | 7.5 | 6 | 7 | 66.3 | 167 | 179 | 6 | 6 | 52.0 | 59.0 | 5 | 12 | 5 | 7 | 0 |
| 14 FT | 15 | 16 | 12 | 11 | 6 | 8 | 6 | 6.5 | 69.9 | 39.0 | 39.0 | 6 | 13 | 60.0 | 66.0 | 6 | 13 | 40.0 | 42.0 | 6 | 7 | 6 | 6 | 64.9 | 168 | 180 | 6 | 6 | 51.0 | 59.0 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 16 | 17 | 13 | 11 | 6 | 8 | 6 | 6.5 | 68.9 | 40.0 | 40.0 | 6 | 13 | 59.0 | 65.0 | 6 | 13 | 40.0 | 42.0 | 6 | 7 | 6 | 6.5 | 63.8 | 169 | 181 | 6 | 6 | 51.0 | 59.0 | 5 | 12 | 5 | 6.5 | 0 |
| 18 FT | 17 | 19 | 14 | 11 | 6 | 7.5 | 6 | 6.5 | 68.3 | 41.0 | 41.0 | 6 | 12 | 58.0 | 65.0 | 6 | 12 | 40.0 | 42.0 | 6 | 6 | 6 | 6.5 | 63.5 | 171 | 183 | 6 | 6 | 51.0 | 60.0 | 5 | 12 | 5 | 6 | 0 |
| 20 FT | 18 | 20 | 14 | 11 | 6 | 7 | 6 | 6 | 67.5 | 42.0 | 42.0 | 6 | 12 | 58.0 | 65.0 | 6 | 12 | 39.0 | 42.0 | 6 | 6 | 6 | 6.5 | 62.8 | 172 | 184 | 6 | 6 | 51.0 | 60.0 | 5 | 12 | 5 | 6 | 0 |
| 22 FT | 19 | 21 | 14 | 11 | 6 | 6.5 | 6 | 6 | 66.9 | 43.0 | 43.0 | 6 | 12 | 57.0 | 65.0 | 6 | 12 | 39.0 | 42.0 | 7 | 8 | 6 | 6 | 62.1 | 173 | 185 | 7 | 7 | 54.0 | 63.0 | 5 | 12 | 5 | 6 | 0 |
| 24 FT | 20 | 22 | 16 | 11 | 6 | 6 | 6 | 6 | 67.3 | 44.0 | 44.0 | 7 | 15 | 62.0 | 69.0 | 7 | 15 | 44.0 | 47.0 | 7 | 7 | 6 | 6.5 | 61.8 | 174 | 186 | 7 | 7 | 54.0 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 22 | 24 | 16 | 11 | 6 | 6 | 6 | 6 | 67.1 | 46.0 | 46.0 | 7 | 15 | 61.0 | 69.0 | 7 | 15 | 43.0 | 46.0 | 7 | 7 | 6 | 7 | 61.8 | 176 | 188 | 7 | 7 | 54.0 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 28 FT | 23 | 25 | 16 | 11 | 7 | 7.5 | 7 | 8 | 71.6 | 47.0 | 47.0 | 7 | 15 | 61.0 | 69.0 | 7 | 15 | 43.0 | 46.0 | 7 | 6.5 | 6 | 6.5 | 61.4 | 177 | 189 | 7 | 6.5 | 54.0 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 24 | 26 | 16 | 11 | 7 | 7.5 | 7 | 7 | 71.3 | 48.0 | 48.0 | 7 | 14 | 60.0 | 69.0 | 7 | 14 | 42.0 | 45.0 | 7 | 6.5 | 6 | 6 | 61.0 | 178 | 190 | 7 | 6.5 | 54.0 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 25 | 28 | 17 | 11 | 7 | 7 | 7 | 7.5 | 71.6 | 49.0 | 49.0 | 7 | 14 | 60.0 | 68.0 | 7 | 14 | 42.0 | 45.0 | 7 | 6.5 | 6 | 6.5 | 61.1 | 180 | 192 | 7 | 6 | 54.0 | 64.0 | 5 | 12 | 6 | 7.5 | 0 |
| 34 FT | 26 | 29 | 17 | 11 | 7 | 6.5 | 7 | 6.5 | 71.4 | 50.0 | 50.0 | 7 | 13 | 60.0 | 68.0 | 7 | 13 | 42.0 | 44.0 | 7 | 6.5 | 6 | 6.5 | 61.0 | 181 | 193 | 8 | 7.5 | 60.0 | 70.0 | 5 | 12 | 6 | 7.5 | 0 |
| 36 FT | 27 | 30 | 18 | 11 | 7 | 6.5 | 7 | 7 | 72.0 | 51.0 | 51.0 | 7 | 13 | 60.0 | 68.0 | 7 | 13 | 41.0 | 43.0 | 7 | 6 | 6 | 6.5 | 61.3 | 182 | 194 | 8 | 7.5 | 60.0 | 70.0 | 5 | 12 | 6 | 7 | 0 |
| 38 FT | 28 | 31 | 19 | 11 | 7 | 6.5 | 7 | 7.5 | 72.5 | 52.0 | 52.0 | 7 | 12 | 59.0 | 67.0 | 7 | 12 | 41.0 | 43.0 | 7 | 6 | 6 | 6.5 | 61.5 | 183 | 195 | 8 | 7 | 60.0 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 40 FT | 29 | 32 | 19 | 11 | 7 | 6 | 7 | 6.5 | 72.6 | 53.0 | 53.0 | 7 | 12 | 59.0 | 67.0 | 7 | 12 | 40.0 | 42.0 | 7 | 6 | 6 | 6 | 61.5 | 184 | 196 | 8 | 7 | 60.0 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 42 FT | 30 | 33 | 20 | 11 | 7 | 6 | 7 | 7 | 73.3 | 54.0 | 54.0 | 7 | 12 | 59.0 | 66.0 | 7 | 12 | 39.0 | 41.0 | 7 | 6 | 6 | 6 | 61.9 | 185 | 197 | 8 | 7 | 60.0 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 44 FT | 31 | 34 | 20 | 11 | 8 | 7.5 | 7 | 7 | 71.6 | 55.0 | 55.0 | 8 | 15 | 67.0 | 73.0 | 8 | 15 | 47.0 | 48.0 | 7 | 6 | 6 | 6 | 60.1 | 186 | 198 | 8 | 7 | 60.0 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 46 FT | 32 | 35 | 20 | 11 | 8 | 7.5 | 7 | 6.5 | 71.6 | 56.0 | 56.0 | 8 | 15 | 67.0 | 73.0 | 8 | 15 | 46.0 | 48.0 | 8 | 7.5 | 6 | 6 | 60.3 | 187 | 199 | 8 | 7 | 60.0 | 70.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 32 | 36 | 21 | 11 | 8 | 7 | 7 | 7 | 72.4 | 56.0 | 56.0 | 8 | 14 | 67.0 | 73.0 | 8 | 14 | 47.0 | 48.0 | 8 | 7.5 | 6 | 6 | 60.5 | 188 | 200 | 8 | 6.5 | 60.0 | 70.0 | 5 | 12 | 6 | 6 | 0 |
| 50 FT | 33 | 36 | 22 | 11 | 8 | 7 | 7 | 7 | 73.1 | 57.0 | 63.0 | 8 | 14 | 66.0 | 72.0 | 8 | 14 | 46.0 | 47.0 | 8 | 6.5 | 7 | 7.5 | 63.8 | 188 | 200 | 8 | 6.5 | 60.0 | 70.0 | 5 | 12 | 6 | 6 | 0 |

## SPAN (S) = 13 FT  HEIGHT (HT) = 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=15' | K2 HT=16' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=15' | K3 HT=16' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 11 | 12 | 13 | 5 | 6 | 5 | 6 | 69.0 | 34.0 | 34.0 | 5 | 12 | 128.5 | 95.5 | 5 | 12 | 35.0 | 37.0 | 5 | 6.5 | 6 | 6.5 | 103.3 | 187 | 199 | 6 | 7 | 60.0 | 61.0 | 5 | 10.5 | 5 | 7 | 12 |
| 2 FT | 15 | 11 | 12 | 13 | 6 | 8 | 6 | 8 | 72.0 | 35.0 | 39.0 | 6 | 16 | 135.5 | 102.5 | 6 | 16 | 41.0 | 44.0 | 5 | 6.5 | 6 | 6 | 95.4 | 187 | 199 | 6 | 6.5 | 58.0 | 59.0 | 5 | 12 | 5 | 7 | 12 |
| 4 FT | 11 | 11 | 12 | 13 | 6 | 8 | 6 | 7 | 72.0 | 35.0 | 35.0 | 6 | 15 | 130.5 | 82.0 | 6 | 15 | 39.0 | 39.0 | 5 | 6.5 | 7 | 6 | 92.5 | 187 | 199 | 6 | 6 | 57.0 | 59.0 | 5 | 12 | 5 | 6.5 | 12 |
| 6 FT | 11 | 12 | 12 | 13 | 5 | 6 | 6 | 6.5 | 90.4 | 35.0 | 35.0 | 6 | 14 | 65.0 | 66.0 | 6 | 14 | 37.0 | 37.0 | 5 | 6 | 7 | 6 | 88.9 | 188 | 200 | 6 | 6 | 56.0 | 59.0 | 5 | 12 | 5 | 6.5 | 12 |
| 8 FT | 11 | 13 | 13 | 13 | 5 | 6 | 6 | 6.5 | 78.1 | 35.0 | 35.0 | 6 | 13 | 60.0 | 62.0 | 6 | 13 | 36.0 | 36.0 | 5 | 6 | 6 | 6 | 82.4 | 189 | 201 | 6 | 6 | 55.0 | 59.0 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 12 | 14 | 13 | 13 | 5 | 6 | 6 | 6.5 | 76.0 | 36.0 | 36.0 | 6 | 13 | 58.0 | 60.0 | 6 | 13 | 35.0 | 36.0 | 6 | 8 | 6 | 6 | 80.4 | 190 | 202 | 6 | 6 | 54.0 | 59.0 | 5 | 12 | 5 | 6 | 0 |
| 12 FT | 13 | 15 | 14 | 13 | 5 | 6 | 6 | 6.5 | 73.3 | 37.0 | 37.0 | 6 | 12 | 57.0 | 59.0 | 6 | 12 | 35.0 | 36.0 | 6 | 7.5 | 6 | 6 | 77.5 | 191 | 203 | 6 | 6 | 53.0 | 59.0 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 14 | 16 | 14 | 13 | 6 | 8 | 6 | 6 | 72.3 | 38.0 | 38.0 | 6 | 12 | 55.0 | 59.0 | 6 | 12 | 35.0 | 36.0 | 6 | 7 | 6 | 6 | 76.3 | 192 | 204 | 7 | 7 | 55.0 | 62.0 | 5 | 12 | 5 | 6 | 0 |
| 16 FT | 15 | 17 | 16 | 13 | 6 | 7.5 | 6 | 6.5 | 76.6 | 39.0 | 39.0 | 6 | 12 | 60.0 | 64.0 | 6 | 12 | 41.0 | 42.0 | 6 | 6.5 | 6 | 6.5 | 73.3 | 193 | 205 | 7 | 7 | 55.0 | 62.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 16 | 19 | 16 | 13 | 6 | 7 | 6 | 6 | 76.3 | 40.0 | 40.0 | 6 | 12 | 59.0 | 64.0 | 6 | 12 | 40.0 | 42.0 | 6 | 6 | 6 | 6 | 74.1 | 195 | 207 | 6 | 6 | 52.0 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 18 | 20 | 16 | 13 | 6 | 7 | 6 | 6 | 76.8 | 42.0 | 42.0 | 6 | 12 | 59.0 | 64.0 | 6 | 12 | 40.0 | 42.0 | 6 | 6 | 6 | 6 | 73.0 | 196 | 208 | 6 | 6 | 52.0 | 60.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 19 | 21 | 17 | 13 | 6 | 6.5 | 6 | 6 | 76.4 | 43.0 | 43.0 | 6 | 12 | 58.0 | 64.0 | 6 | 12 | 40.0 | 42.0 | 7 | 7.5 | 7 | 7.5 | 75.1 | 197 | 209 | 7 | 7 | 55.0 | 63.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 20 | 23 | 17 | 13 | 6 | 6.5 | 7 | 7.5 | 81.1 | 44.0 | 50.0 | 6 | 12 | 58.0 | 64.0 | 6 | 12 | 40.0 | 42.0 | 7 | 7 | 7 | 7 | 75.4 | 199 | 211 | 7 | 7 | 55.0 | 63.0 | 5 | 12 | 6 | 7.5 | 0 |
| 26 FT | 22 | 24 | 18 | 13 | 6 | 6 | 7 | 7.5 | 81.5 | 46.0 | 52.0 | 7 | 15 | 62.0 | 69.0 | 7 | 15 | 44.0 | 46.0 | 7 | 7 | 7 | 7.5 | 74.9 | 200 | 212 | 7 | 7 | 55.0 | 63.0 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 23 | 25 | 18 | 13 | 7 | 7.5 | 7 | 6.5 | 81.3 | 47.0 | 53.0 | 7 | 15 | 62.0 | 69.0 | 7 | 15 | 43.0 | 46.0 | 7 | 6.5 | 7 | 6.5 | 74.6 | 201 | 213 | 7 | 6.5 | 55.0 | 63.0 | 5 | 12 | 6 | 7 | 0 |
| 30 FT | 24 | 26 | 19 | 13 | 7 | 7.5 | 7 | 7 | 81.3 | 48.0 | 54.0 | 7 | 14 | 61.0 | 69.0 | 7 | 14 | 43.0 | 46.0 | 7 | 6.5 | 7 | 7 | 74.4 | 202 | 214 | 7 | 6.5 | 55.0 | 63.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 25 | 28 | 20 | 13 | 7 | 7 | 7 | 7 | 81.4 | 49.0 | 55.0 | 7 | 14 | 61.0 | 68.0 | 7 | 14 | 42.0 | 45.0 | 7 | 6.5 | 7 | 7.5 | 74.6 | 204 | 216 | 7 | 6 | 55.0 | 64.0 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 26 | 29 | 21 | 13 | 7 | 7 | 7 | 7 | 81.6 | 50.0 | 56.0 | 7 | 13 | 61.0 | 68.0 | 7 | 13 | 42.0 | 44.0 | 7 | 6.5 | 7 | 7.5 | 74.5 | 205 | 217 | 8 | 7.5 | 61.0 | 70.0 | 5 | 12 | 6 | 6 | 0 |
| 36 FT | 27 | 30 | 22 | 13 | 7 | 6.5 | 7 | 7 | 82.0 | 57.0 | 57.0 | 7 | 13 | 60.0 | 68.0 | 7 | 13 | 42.0 | 44.0 | 7 | 6 | 7 | 7.5 | 74.8 | 206 | 218 | 8 | 7.5 | 61.0 | 70.0 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 28 | 31 | 22 | 13 | 7 | 6.5 | 7 | 6.5 | 82.1 | 58.0 | 58.0 | 7 | 12 | 60.0 | 67.0 | 7 | 12 | 41.0 | 43.0 | 7 | 6 | 7 | 7 | 74.8 | 207 | 219 | 8 | 7 | 61.0 | 70.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 29 | 32 | 23 | 13 | 7 | 6 | 7 | 6.5 | 82.6 | 59.0 | 59.0 | 7 | 12 | 60.0 | 67.0 | 7 | 12 | 41.0 | 42.0 | 7 | 6 | 7 | 7 | 75.0 | 208 | 220 | 8 | 7 | 61.0 | 70.0 | 5 | 12 | 7 | 7.5 | 0 |
| 42 FT | 30 | 33 | 24 | 13 | 7 | 6 | 7 | 6.5 | 83.3 | 60.0 | 60.0 | 7 | 12 | 60.0 | 66.0 | 7 | 12 | 40.0 | 42.0 | 7 | 6 | 7 | 7 | 75.3 | 209 | 221 | 8 | 7 | 61.0 | 70.0 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 31 | 34 | 24 | 13 | 7 | 6 | 7 | 7 | 81.8 | 61.0 | 61.0 | 8 | 15 | 68.0 | 74.0 | 8 | 15 | 47.0 | 49.0 | 7 | 6 | 7 | 7 | 73.5 | 210 | 222 | 8 | 7 | 61.0 | 70.0 | 5 | 12 | 7 | 7.5 | 0 |
| 46 FT | 31 | 35 | 24 | 13 | 8 | 7.5 | 7 | 6 | 81.6 | 61.0 | 61.0 | 8 | 15 | 68.0 | 74.0 | 8 | 15 | 48.0 | 49.0 | 8 | 7.5 | 7 | 7 | 73.8 | 211 | 223 | 8 | 7 | 61.0 | 70.0 | 5 | 12 | 7 | 7.5 | 0 |
| 48 FT | 32 | 36 | 25 | 13 | 8 | 7.5 | 7 | 6 | 82.4 | 62.0 | 62.0 | 8 | 14 | 67.0 | 73.0 | 8 | 14 | 47.0 | 49.0 | 8 | 7.5 | 7 | 7 | 74.1 | 212 | 224 | 8 | 6.5 | 61.0 | 71.0 | 5 | 12 | 7 | 7.5 | 0 |
| 50 FT | 33 | 37 | 26 | 13 | 8 | 7 | 7 | 6 | 83.1 | 63.0 | 63.0 | 8 | 14 | 67.0 | 72.0 | 8 | 14 | 47.0 | 48.0 | 8 | 7.5 | 7 | 6.5 | 74.5 | 213 | 225 | 8 | 6.5 | 61.0 | 71.0 | 5 | 12 | 7 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 13 FEET
HEIGHT (HT): 13 THRU 16 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

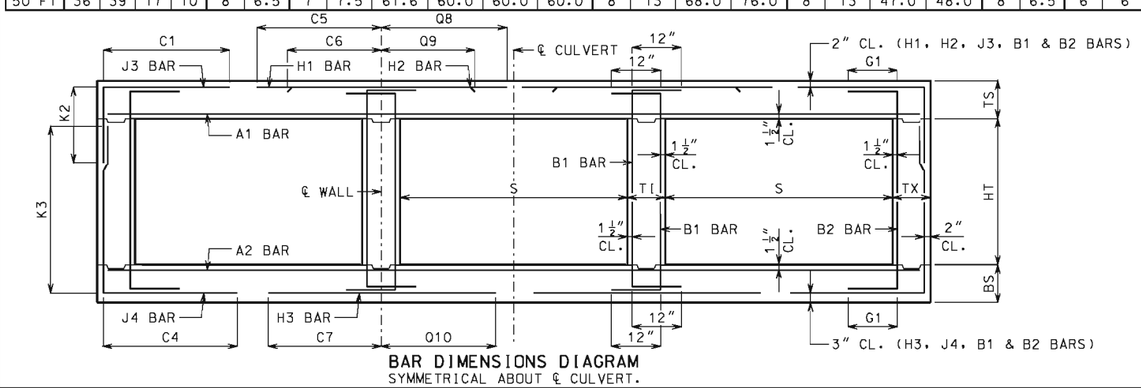
SHEET NO. 21 OF 27

## SPAN (S) = 14 FT  HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=7′ | K2 HT=8′ | K2 HT=9′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=7′ | K3 HT=8′ | K3 HT=9′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 10 | 8 | 8 | 6 | 8.5 | 5 | 8.5 | 69.3 | 34.0 | 34.0 | 34.0 | 5 | 12 | 133.5 | 98.5 | 5 | 12 | 39.0 | 43.0 | 5 | 7 | 6 | 7 | 60.9 | 90 | 102 | 114 | 6 | 6.5 | 58.0 | 63.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 15 | 10 | 8 | 8 | 6 | 8 | 5 | 8 | 69.3 | 35.0 | 35.0 | 35.0 | 6 | 16 | 137.5 | 105.5 | 6 | 16 | 45.0 | 49.0 | 5 | 7 | 6 | 6 | 54.8 | 90 | 102 | 114 | 7 | 7 | 60.0 | 64.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 12 | 11 | 8 | 8 | 6 | 7.5 | 5 | 6 | 52.4 | 32.0 | 32.0 | 32.0 | 6 | 14 | 80.0 | 103.0 | 6 | 14 | 39.0 | 42.0 | 5 | 6.5 | 6 | 7 | 49.1 | 91 | 103 | 115 | 6 | 6 | 56.0 | 62.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 12 | 12 | 8 | 8 | 6 | 8 | 6 | 7.5 | 48.9 | 32.0 | 32.0 | 32.0 | 6 | 13 | 66.0 | 81.0 | 6 | 13 | 37.0 | 39.0 | 5 | 6 | 5 | 6 | 42.1 | 92 | 104 | 116 | 7 | 7 | 57.0 | 65.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 12 | 13 | 8 | 8 | 6 | 7.5 | 6 | 7 | 45.5 | 32.0 | 32.0 | 32.0 | 6 | 12 | 61.0 | 69.0 | 6 | 12 | 35.0 | 37.0 | 6 | 8.5 | 5 | 6 | 39.1 | 93 | 105 | 117 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 13 | 14 | 9 | 8 | 6 | 7 | 5 | 6 | 41.3 | 33.0 | 33.0 | 33.0 | 7 | 15 | 61.0 | 69.0 | 7 | 15 | 38.0 | 40.0 | 6 | 8 | 5 | 7 | 38.4 | 94 | 106 | 118 | 7 | 6.5 | 55.0 | 65.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 15 | 16 | 9 | 8 | 6 | 7.5 | 5 | 6.5 | 43.5 | 35.0 | 35.0 | 35.0 | 6 | 12 | 62.0 | 71.0 | 6 | 12 | 40.0 | 43.0 | 6 | 7 | 5 | 8 | 36.8 | 96 | 108 | 120 | 6 | 6 | 52.0 | 63.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 16 | 17 | 9 | 8 | 6 | 7 | 5 | 6 | 41.9 | 36.0 | 36.0 | 36.0 | 6 | 12 | 61.0 | 70.0 | 6 | 12 | 40.0 | 43.0 | 6 | 7 | 5 | 7.5 | 35.8 | 97 | 109 | 121 | 7 | 7 | 54.0 | 66.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 17 | 18 | 9 | 8 | 6 | 7 | 5 | 6 | 40.8 | 37.0 | 37.0 | 37.0 | 7 | 15 | 65.0 | 75.0 | 7 | 15 | 44.0 | 48.0 | 6 | 6.5 | 5 | 7 | 34.9 | 98 | 110 | 122 | 7 | 7 | 54.0 | 66.0 | 5 | 12 | 5 | 12 | 0 |
| 18 FT | 18 | 20 | 9 | 8 | 6 | 6.5 | 6 | 8 | 44.0 | 38.0 | 38.0 | 38.0 | 7 | 15 | 64.0 | 75.0 | 7 | 15 | 44.0 | 47.0 | 6 | 6 | 5 | 7 | 34.0 | 100 | 112 | 124 | 7 | 7 | 54.0 | 66.0 | 5 | 12 | 5 | 10 | 0 |
| 20 FT | 20 | 21 | 9 | 8 | 6 | 6.5 | 5 | 6 | 38.9 | 40.0 | 40.0 | 40.0 | 7 | 15 | 63.0 | 75.0 | 7 | 15 | 44.0 | 48.0 | 7 | 8 | 5 | 6.5 | 33.9 | 101 | 113 | 125 | 7 | 7 | 54.0 | 66.0 | 5 | 12 | 5 | 9 | 0 |
| 22 FT | 21 | 22 | 9 | 8 | 6 | 6 | 6 | 8 | 42.4 | 41.0 | 41.0 | 41.0 | 7 | 14 | 63.0 | 74.0 | 7 | 14 | 44.0 | 47.0 | 7 | 7 | 5 | 6 | 33.5 | 102 | 114 | 126 | 7 | 6.5 | 54.0 | 66.0 | 5 | 12 | 5 | 8.5 | 0 |
| 24 FT | 23 | 24 | 9 | 8 | 7 | 7.5 | 6 | 7 | 42.0 | 47.0 | 47.0 | 47.0 | 7 | 15 | 62.0 | 74.0 | 7 | 15 | 44.0 | 47.0 | 7 | 7 | 6 | 7 | 36.4 | 104 | 116 | 128 | 7 | 7 | 54.0 | 66.0 | 5 | 12 | 5 | 8.5 | 0 |
| 26 FT | 24 | 25 | 9 | 8 | 7 | 7.5 | 6 | 7 | 41.6 | 48.0 | 48.0 | 48.0 | 7 | 14 | 62.0 | 74.0 | 7 | 14 | 43.0 | 47.0 | 7 | 6.5 | 6 | 7 | 36.1 | 105 | 117 | 129 | 7 | 6.5 | 54.0 | 66.0 | 5 | 12 | 5 | 8.5 | 0 |
| 28 FT | 25 | 26 | 9 | 8 | 7 | 7 | 6 | 6 | 41.4 | 49.0 | 49.0 | 49.0 | 7 | 14 | 61.0 | 73.0 | 7 | 14 | 43.0 | 47.0 | 7 | 6 | 6 | 6.5 | 35.9 | 106 | 118 | 130 | 7 | 6 | 54.0 | 66.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 27 | 28 | 10 | 8 | 7 | 6.5 | 6 | 7 | 42.3 | 51.0 | 51.0 | 51.0 | 7 | 13 | 61.0 | 73.0 | 7 | 13 | 42.0 | 45.0 | 7 | 6 | 6 | 7 | 36.5 | 108 | 120 | 132 | 7 | 6 | 54.0 | 67.0 | 5 | 12 | 5 | 8 | 0 |
| 32 FT | 28 | 29 | 10 | 8 | 7 | 6.5 | 6 | 6.5 | 42.0 | 52.0 | 52.0 | 52.0 | 7 | 12 | 61.0 | 73.0 | 7 | 12 | 41.0 | 44.0 | 7 | 6 | 6 | 6.5 | 36.4 | 109 | 121 | 133 | 8 | 7.5 | 60.0 | 73.0 | 5 | 12 | 5 | 7.5 | 0 |
| 34 FT | 29 | 30 | 10 | 8 | 7 | 6 | 6 | 6 | 41.9 | 53.0 | 53.0 | 53.0 | 7 | 12 | 61.0 | 72.0 | 7 | 12 | 41.0 | 44.0 | 8 | 7 | 6 | 6.5 | 36.4 | 110 | 122 | 134 | 8 | 7 | 60.0 | 73.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 30 | 32 | 11 | 8 | 7 | 6 | 6 | 7 | 42.9 | 54.0 | 54.0 | 54.0 | 7 | 12 | 61.0 | 72.0 | 7 | 12 | 41.0 | 43.0 | 7 | 6 | 6 | 6.5 | 36.9 | 112 | 124 | 136 | 8 | 7 | 60.0 | 73.0 | 5 | 12 | 5 | 7.5 | 0 |
| 38 FT | 31 | 33 | 11 | 8 | 8 | 7.5 | 6 | 6.5 | 42.9 | 55.0 | 55.0 | 55.0 | 8 | 15 | 68.0 | 79.0 | 8 | 15 | 48.0 | 51.0 | 8 | 7.5 | 6 | 6.5 | 37.0 | 113 | 125 | 137 | 8 | 6.5 | 60.0 | 73.0 | 5 | 12 | 5 | 7 | 0 |
| 40 FT | 32 | 34 | 11 | 8 | 8 | 7.5 | 6 | 6.5 | 42.9 | 56.0 | 56.0 | 56.0 | 8 | 14 | 68.0 | 79.0 | 8 | 14 | 48.0 | 50.0 | 8 | 7.5 | 6 | 6 | 37.1 | 114 | 126 | 138 | 8 | 6.5 | 60.0 | 73.0 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 33 | 35 | 12 | 8 | 8 | 7 | 6 | 7 | 43.8 | 57.0 | 57.0 | 57.0 | 8 | 14 | 68.0 | 78.0 | 8 | 14 | 47.0 | 49.0 | 8 | 7 | 6 | 6.5 | 37.6 | 115 | 127 | 139 | 8 | 6.5 | 60.0 | 73.0 | 5 | 12 | 5 | 7 | 0 |
| 44 FT | 34 | 36 | 12 | 8 | 8 | 7 | 6 | 6.5 | 43.8 | 58.0 | 58.0 | 58.0 | 8 | 14 | 68.0 | 78.0 | 8 | 14 | 47.0 | 48.0 | 8 | 7 | 6 | 6.5 | 37.8 | 116 | 128 | 140 | 8 | 6 | 60.0 | 73.0 | 5 | 12 | 5 | 6.5 | 0 |
| 46 FT | 35 | 37 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 42.9 | 59.0 | 59.0 | 59.0 | 8 | 13 | 67.0 | 77.0 | 8 | 13 | 46.0 | 47.0 | 8 | 7 | 6 | 6.5 | 37.0 | 117 | 129 | 141 | 8 | 6 | 60.0 | 73.0 | 5 | 12 | 5 | 6.5 | 0 |
| 48 FT | 36 | 38 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 43.0 | 60.0 | 60.0 | 60.0 | 8 | 13 | 67.0 | 76.0 | 8 | 13 | 46.0 | 47.0 | 8 | 7 | 6 | 6 | 37.1 | 118 | 130 | 142 | 8 | 6 | 60.0 | 73.0 | 5 | 12 | 5 | 6 | 0 |
| 50 FT | 37 | 39 | 12 | 8 | 8 | 6.5 | 6 | 6 | 43.1 | 61.0 | 61.0 | 61.0 | 8 | 13 | 67.0 | 75.0 | 8 | 13 | 46.0 | 47.0 | 8 | 7 | 6 | 6 | 37.4 | 119 | 131 | 143 | 8 | 6 | 60.0 | 73.0 | 5 | 12 | 5 | 6 | 0 |

## SPAN (S) = 14 FT  HEIGHT (HT) = 10 FT OR 11 FT OR 12 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=10′ | K2 HT=11′ | K2 HT=12′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=10′ | K3 HT=11′ | K3 HT=12′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 10 | 9 | 10 | 6 | 8.5 | 5 | 7 | 70.3 | 34.0 | 34.0 | 34.0 | 5 | 12 | 134.5 | 99.5 | 5 | 12 | 39.0 | 43.0 | 5 | 7 | 6 | 6 | 80.1 | 126 | 138 | 150 | 6 | 6 | 60.0 | 63.0 | 5 | 10.5 | 5 | 9 | 12 |
| 2 FT | 15 | 11 | 9 | 10 | 6 | 8 | 5 | 7 | 70.3 | 35.0 | 35.0 | 35.0 | 6 | 16 | 138.5 | 106.5 | 6 | 16 | 45.0 | 48.0 | 5 | 6.5 | 6 | 6 | 73.6 | 127 | 139 | 151 | 6 | 6.5 | 59.0 | 62.0 | 5 | 12 | 5 | 9 | 12 |
| 4 FT | 11 | 11 | 11 | 10 | 6 | 7 | 5 | 6 | 66.6 | 31.0 | 31.0 | 31.0 | 6 | 13 | 81.0 | 94.0 | 6 | 13 | 39.0 | 40.0 | 5 | 6.5 | 5 | 6 | 61.8 | 127 | 139 | 151 | 7 | 7 | 61.0 | 65.0 | 5 | 9.5 | 5 | 10 | 12 |
| 6 FT | 12 | 12 | 11 | 10 | 6 | 8 | 5 | 6.5 | 60.6 | 32.0 | 32.0 | 32.0 | 6 | 13 | 67.0 | 75.0 | 6 | 13 | 37.0 | 39.0 | 5 | 6 | 5 | 6 | 57.3 | 128 | 140 | 152 | 7 | 7 | 59.0 | 65.0 | 5 | 12 | 5 | 10.5 | 12 |
| 8 FT | 12 | 13 | 11 | 10 | 6 | 8 | 5 | 6 | 56.3 | 32.0 | 32.0 | 32.0 | 6 | 12 | 62.0 | 67.0 | 6 | 12 | 36.0 | 37.0 | 5 | 6 | 6 | 7 | 57.4 | 129 | 141 | 153 | 7 | 6.5 | 57.0 | 65.0 | 5 | 12 | 5 | 10 | 0 |
| 10 FT | 13 | 14 | 11 | 10 | 6 | 7.5 | 6 | 8 | 56.3 | 33.0 | 33.0 | 37.0 | 6 | 12 | 59.0 | 65.0 | 6 | 12 | 35.0 | 37.0 | 6 | 7.5 | 6 | 7 | 55.0 | 130 | 142 | 154 | 7 | 6.5 | 57.0 | 65.0 | 5 | 12 | 5 | 9.5 | 0 |
| 12 FT | 14 | 16 | 12 | 10 | 6 | 7.5 | 6 | 8 | 54.9 | 34.0 | 34.0 | 34.0 | 7 | 15 | 61.0 | 67.0 | 7 | 15 | 38.0 | 39.0 | 6 | 7 | 5 | 6 | 50.9 | 132 | 144 | 156 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 5 | 9.5 | 0 |
| 14 FT | 16 | 17 | 12 | 10 | 6 | 7.5 | 6 | 8 | 59.3 | 36.0 | 36.0 | 36.0 | 6 | 12 | 62.0 | 70.0 | 6 | 12 | 41.0 | 43.0 | 6 | 7 | 5 | 6 | 49.9 | 133 | 145 | 157 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 5 | 9 | 0 |
| 16 FT | 17 | 18 | 12 | 10 | 6 | 7 | 6 | 7.5 | 58.1 | 37.0 | 37.0 | 41.0 | 7 | 16 | 66.0 | 74.0 | 7 | 16 | 45.0 | 48.0 | 6 | 6.5 | 6 | 8 | 52.0 | 134 | 146 | 158 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 5 | 8 | 0 |
| 18 FT | 18 | 20 | 12 | 10 | 6 | 7 | 6 | 7 | 57.5 | 38.0 | 38.0 | 42.0 | 7 | 15 | 65.0 | 74.0 | 7 | 15 | 45.0 | 48.0 | 6 | 6 | 6 | 8 | 51.3 | 136 | 148 | 160 | 7 | 7 | 55.0 | 66.0 | 5 | 12 | 5 | 7.5 | 0 |
| 20 FT | 19 | 21 | 12 | 10 | 6 | 6 | 6 | 6.5 | 56.6 | 39.0 | 39.0 | 43.0 | 7 | 14 | 64.0 | 74.0 | 7 | 14 | 45.0 | 48.0 | 7 | 8 | 6 | 7.5 | 50.6 | 137 | 149 | 161 | 7 | 7 | 55.0 | 66.0 | 5 | 12 | 5 | 7 | 0 |
| 22 FT | 21 | 22 | 12 | 10 | 6 | 6 | 6 | 6.5 | 55.9 | 41.0 | 41.0 | 45.0 | 7 | 15 | 64.0 | 74.0 | 7 | 15 | 45.0 | 48.0 | 7 | 7 | 6 | 6.5 | 50.3 | 138 | 150 | 162 | 7 | 7 | 55.0 | 66.0 | 5 | 12 | 5 | 7 | 0 |
| 24 FT | 22 | 24 | 13 | 10 | 6 | 6 | 6 | 6.5 | 56.4 | 42.0 | 42.0 | 46.0 | 7 | 14 | 63.0 | 73.0 | 7 | 14 | 44.0 | 48.0 | 7 | 7 | 6 | 7.5 | 50.4 | 140 | 152 | 164 | 7 | 7 | 55.0 | 67.0 | 5 | 12 | 5 | 6.5 | 0 |
| 26 FT | 23 | 25 | 14 | 10 | 7 | 7 | 6 | 6.5 | 56.6 | 43.0 | 43.0 | 47.0 | 7 | 14 | 63.0 | 73.0 | 7 | 14 | 44.0 | 48.0 | 7 | 6.5 | 6 | 8 | 50.4 | 141 | 153 | 165 | 7 | 6.5 | 55.0 | 67.0 | 5 | 12 | 5 | 6.5 | 0 |
| 28 FT | 25 | 27 | 14 | 10 | 7 | 7 | 6 | 6.5 | 56.4 | 45.0 | 45.0 | 49.0 | 7 | 14 | 62.0 | 73.0 | 7 | 14 | 43.0 | 47.0 | 7 | 6.5 | 6 | 8 | 50.3 | 143 | 155 | 167 | 7 | 6 | 55.0 | 67.0 | 5 | 12 | 5 | 6 | 0 |
| 30 FT | 26 | 28 | 14 | 10 | 7 | 7 | 6 | 6.5 | 56.0 | 46.0 | 46.0 | 50.0 | 7 | 13 | 62.0 | 73.0 | 7 | 13 | 43.0 | 47.0 | 7 | 6 | 6 | 7.5 | 50.0 | 144 | 156 | 168 | 7 | 6 | 55.0 | 67.0 | 5 | 12 | 5 | 6 | 0 |
| 32 FT | 27 | 29 | 14 | 10 | 7 | 6 | 6 | 6 | 55.6 | 51.0 | 51.0 | 51.0 | 7 | 12 | 62.0 | 72.0 | 7 | 12 | 43.0 | 46.0 | 7 | 6 | 6 | 7.5 | 49.8 | 145 | 157 | 169 | 8 | 7.5 | 61.0 | 73.0 | 5 | 12 | 5 | 6 | 0 |
| 34 FT | 29 | 31 | 15 | 10 | 7 | 6 | 6 | 6.5 | 56.3 | 53.0 | 53.0 | 53.0 | 7 | 12 | 61.0 | 72.0 | 7 | 12 | 41.0 | 44.0 | 7 | 6 | 6 | 7.5 | 50.3 | 147 | 159 | 171 | 8 | 7 | 61.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 30 | 32 | 15 | 10 | 7 | 6 | 6 | 6 | 56.1 | 54.0 | 54.0 | 54.0 | 7 | 12 | 61.0 | 71.0 | 7 | 12 | 41.0 | 43.0 | 8 | 7.5 | 6 | 7.5 | 50.3 | 148 | 160 | 172 | 8 | 7 | 61.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 31 | 33 | 16 | 10 | 8 | 7.5 | 6 | 6 | 56.9 | 55.0 | 55.0 | 55.0 | 8 | 15 | 69.0 | 79.0 | 8 | 15 | 49.0 | 51.0 | 8 | 7.5 | 6 | 7 | 50.6 | 149 | 161 | 173 | 8 | 6.5 | 61.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 40 FT | 32 | 34 | 16 | 10 | 8 | 7.5 | 6 | 6 | 56.9 | 56.0 | 56.0 | 56.0 | 8 | 14 | 69.0 | 78.0 | 8 | 14 | 48.0 | 50.0 | 8 | 7 | 6 | 7 | 50.6 | 150 | 162 | 174 | 8 | 6.5 | 61.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 42 FT | 33 | 35 | 16 | 10 | 8 | 7 | 6 | 6 | 56.9 | 57.0 | 57.0 | 57.0 | 8 | 14 | 69.0 | 78.0 | 8 | 14 | 48.0 | 49.0 | 8 | 7 | 6 | 6.5 | 50.8 | 151 | 163 | 175 | 8 | 6.5 | 61.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 44 FT | 34 | 36 | 17 | 10 | 8 | 7 | 6 | 6 | 57.6 | 58.0 | 58.0 | 58.0 | 8 | 14 | 68.0 | 77.0 | 8 | 14 | 47.0 | 49.0 | 8 | 7 | 6 | 6.5 | 51.3 | 152 | 164 | 176 | 8 | 6 | 61.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |
| 46 FT | 35 | 37 | 17 | 10 | 8 | 6.5 | 6 | 6 | 56.5 | 59.0 | 59.0 | 59.0 | 8 | 13 | 68.0 | 77.0 | 8 | 13 | 47.0 | 48.0 | 8 | 7 | 6 | 6.5 | 50.1 | 153 | 165 | 177 | 8 | 6 | 61.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |
| 48 FT | 35 | 38 | 17 | 10 | 8 | 6.5 | 6 | 6 | 56.5 | 59.0 | 59.0 | 59.0 | 8 | 13 | 68.0 | 77.0 | 8 | 13 | 47.0 | 49.0 | 8 | 7 | 6 | 6 | 50.1 | 154 | 166 | 178 | 8 | 6 | 61.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |
| 50 FT | 36 | 39 | 17 | 10 | 8 | 6.5 | 7 | 7.5 | 61.6 | 60.0 | 60.0 | 60.0 | 8 | 13 | 68.0 | 76.0 | 8 | 13 | 47.0 | 48.0 | 8 | 6.5 | 6 | 6 | 50.3 | 155 | 167 | 179 | 8 | 6 | 61.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 14 FEET
HEIGHT (HT): 7 THRU 12 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

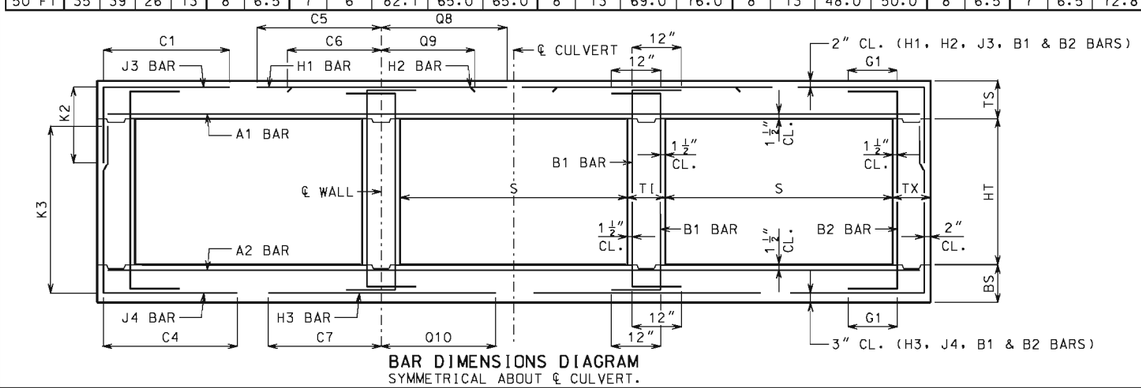
SHEET NO. 22 OF 27

## SPAN (S) = 14 FT  HEIGHT (HT) = 13 FT OR 14 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=13' | HT=14' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=13' | HT=14' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 10 | 11 | 11 | 5 | 6 | 5 | 6.5 | 71.8 | 34.0 | 34.0 | 5 | 12 | 135.5 | 100.5 | 5 | 12 | 39.0 | 42.0 | 5 | 7 | 6 | 6 | 87.3 | 162 | 174 | 6 | 6 | 60.0 | 62.0 | 5 | 12 | 5 | 7.5 | 12 |
| 2 FT | 15 | 11 | 11 | 11 | 6 | 8 | 5 | 6.5 | 71.8 | 35.0 | 35.0 | 6 | 16 | 139.5 | 107.5 | 6 | 16 | 45.0 | 48.0 | 5 | 6.5 | 6 | 6.5 | 83.4 | 163 | 175 | 6 | 6 | 59.0 | 62.0 | 5 | 12 | 5 | 7.5 | 12 |
| 4 FT | 11 | 11 | 11 | 11 | 6 | 6.5 | 6 | 7 | 88.0 | 31.0 | 35.0 | 6 | 13 | 86.0 | 92.0 | 6 | 13 | 40.0 | 40.0 | 5 | 6.5 | 6 | 6 | 76.4 | 163 | 175 | 7 | 6.5 | 62.0 | 66.0 | 5 | 10.5 | 5 | 7.5 | 12 |
| 6 FT | 12 | 12 | 11 | 11 | 6 | 8 | 6 | 7.5 | 74.5 | 32.0 | 36.0 | 6 | 13 | 68.0 | 75.0 | 6 | 13 | 38.0 | 39.0 | 5 | 6 | 6 | 6 | 71.3 | 164 | 176 | 7 | 6.5 | 60.0 | 65.0 | 5 | 12 | 5 | 7.5 | 12 |
| 8 FT | 12 | 13 | 11 | 11 | 6 | 8 | 6 | 7 | 68.5 | 36.0 | 36.0 | 6 | 12 | 63.0 | 67.0 | 6 | 12 | 36.0 | 37.0 | 6 | 8 | 6 | 6.5 | 68.8 | 165 | 177 | 7 | 6.5 | 58.0 | 65.0 | 5 | 12 | 5 | 7.5 | 0 |
| 10 FT | 13 | 15 | 11 | 11 | 6 | 7.5 | 6 | 6.5 | 66.0 | 37.0 | 37.0 | 6 | 12 | 60.0 | 65.0 | 6 | 12 | 36.0 | 37.0 | 6 | 7.5 | 6 | 6 | 67.4 | 167 | 179 | 6 | 6 | 55.0 | 63.0 | 5 | 12 | 5 | 7.5 | 0 |
| 12 FT | 14 | 16 | 12 | 11 | 6 | 7.5 | 6 | 6.5 | 64.0 | 38.0 | 38.0 | 7 | 16 | 61.0 | 67.0 | 7 | 16 | 38.0 | 40.0 | 6 | 7 | 6 | 7 | 65.3 | 168 | 180 | 7 | 7 | 57.0 | 66.0 | 5 | 12 | 5 | 7 | 0 |
| 14 FT | 16 | 17 | 13 | 11 | 6 | 7.5 | 6 | 7 | 69.1 | 40.0 | 40.0 | 6 | 12 | 63.0 | 69.0 | 6 | 12 | 41.0 | 43.0 | 6 | 7 | 6 | 6.5 | 63.6 | 169 | 181 | 7 | 7 | 57.0 | 65.0 | 5 | 12 | 5 | 6.5 | 0 |
| 16 FT | 17 | 18 | 13 | 11 | 6 | 7 | 6 | 6.5 | 67.8 | 41.0 | 41.0 | 6 | 12 | 62.0 | 69.0 | 6 | 12 | 41.0 | 43.0 | 6 | 6 | 6 | 6.5 | 62.4 | 170 | 182 | 7 | 6.5 | 56.0 | 66.0 | 5 | 12 | 5 | 6.5 | 0 |
| 18 FT | 18 | 20 | 13 | 11 | 6 | 7 | 6 | 6 | 66.6 | 42.0 | 42.0 | 7 | 15 | 66.0 | 74.0 | 7 | 15 | 46.0 | 48.0 | 6 | 6 | 6 | 6 | 61.9 | 172 | 184 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 5 | 6.5 | 0 |
| 20 FT | 19 | 21 | 14 | 11 | 6 | 6.5 | 6 | 6 | 66.3 | 43.0 | 43.0 | 7 | 15 | 65.0 | 73.0 | 7 | 15 | 45.0 | 48.0 | 7 | 8 | 6 | 6.5 | 61.0 | 173 | 185 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 5 | 6 | 0 |
| 22 FT | 21 | 23 | 14 | 11 | 6 | 6 | 7 | 8 | 70.6 | 45.0 | 45.0 | 7 | 15 | 64.0 | 73.0 | 7 | 15 | 45.0 | 48.0 | 7 | 7 | 6 | 6 | 60.8 | 175 | 187 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 5 | 6 | 0 |
| 24 FT | 22 | 24 | 15 | 11 | 6 | 6 | 7 | 8 | 70.5 | 46.0 | 46.0 | 7 | 15 | 64.0 | 73.0 | 7 | 15 | 45.0 | 48.0 | 7 | 7 | 6 | 6.5 | 60.3 | 176 | 188 | 7 | 7 | 56.0 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 26 FT | 23 | 25 | 15 | 11 | 7 | 7.5 | 7 | 7.5 | 69.9 | 47.0 | 47.0 | 7 | 14 | 64.0 | 73.0 | 7 | 14 | 45.0 | 48.0 | 7 | 6.5 | 6 | 6 | 59.6 | 177 | 189 | 7 | 6.5 | 56.0 | 67.0 | 5 | 12 | 6 | 8 | 0 |
| 28 FT | 25 | 27 | 16 | 11 | 7 | 7 | 7 | 7.5 | 70.3 | 49.0 | 49.0 | 7 | 14 | 63.0 | 72.0 | 7 | 14 | 44.0 | 47.0 | 7 | 6.5 | 6 | 6.5 | 59.9 | 179 | 191 | 7 | 6 | 56.0 | 67.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 26 | 28 | 16 | 11 | 7 | 7 | 7 | 7 | 69.8 | 50.0 | 50.0 | 7 | 13 | 62.0 | 72.0 | 7 | 13 | 43.0 | 46.0 | 7 | 6 | 6 | 6 | 59.4 | 180 | 192 | 7 | 6 | 56.0 | 67.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 27 | 30 | 17 | 11 | 7 | 6.5 | 7 | 7.5 | 70.1 | 51.0 | 51.0 | 7 | 13 | 62.0 | 72.0 | 7 | 13 | 43.0 | 46.0 | 7 | 6 | 6 | 6.5 | 59.5 | 182 | 194 | 8 | 7.5 | 62.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |
| 34 FT | 28 | 31 | 17 | 11 | 7 | 6 | 7 | 6.5 | 69.8 | 52.0 | 52.0 | 7 | 12 | 62.0 | 71.0 | 7 | 12 | 43.0 | 45.0 | 7 | 6 | 6 | 6.5 | 59.1 | 183 | 195 | 8 | 7 | 62.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |
| 36 FT | 29 | 32 | 18 | 11 | 7 | 6 | 7 | 7 | 70.3 | 53.0 | 53.0 | 7 | 12 | 62.0 | 71.0 | 7 | 12 | 42.0 | 45.0 | 8 | 7.5 | 6 | 6.5 | 59.3 | 184 | 196 | 8 | 7 | 62.0 | 73.0 | 5 | 12 | 6 | 7 | 0 |
| 38 FT | 31 | 33 | 19 | 11 | 8 | 7.5 | 7 | 7.5 | 71.0 | 55.0 | 55.0 | 8 | 15 | 70.0 | 78.0 | 8 | 15 | 48.0 | 50.0 | 8 | 7.5 | 6 | 6.5 | 59.6 | 185 | 197 | 8 | 6.5 | 62.0 | 73.0 | 5 | 12 | 6 | 6.5 | 0 |
| 40 FT | 31 | 34 | 19 | 11 | 8 | 7 | 7 | 6.5 | 70.9 | 55.0 | 55.0 | 8 | 14 | 70.0 | 78.0 | 8 | 14 | 49.0 | 51.0 | 8 | 7 | 6 | 6.5 | 59.5 | 186 | 198 | 8 | 6.5 | 62.0 | 73.0 | 5 | 12 | 6 | 6.5 | 0 |
| 42 FT | 32 | 35 | 20 | 11 | 8 | 7 | 7 | 7 | 71.5 | 56.0 | 56.0 | 8 | 14 | 69.0 | 77.0 | 8 | 14 | 49.0 | 51.0 | 8 | 7 | 6 | 6 | 59.8 | 187 | 199 | 8 | 6.5 | 62.0 | 74.0 | 5 | 12 | 6 | 6.5 | 0 |
| 44 FT | 33 | 36 | 20 | 11 | 8 | 7 | 7 | 6.5 | 71.5 | 57.0 | 57.0 | 8 | 14 | 69.0 | 77.0 | 8 | 14 | 48.0 | 50.0 | 8 | 7 | 6 | 6 | 59.9 | 188 | 200 | 8 | 6 | 62.0 | 74.0 | 5 | 12 | 6 | 6.5 | 0 |
| 46 FT | 34 | 37 | 20 | 11 | 8 | 7 | 7 | 7 | 70.1 | 58.0 | 58.0 | 8 | 14 | 69.0 | 76.0 | 8 | 14 | 47.0 | 49.0 | 8 | 7 | 6 | 6 | 58.5 | 189 | 201 | 8 | 6 | 62.0 | 74.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 35 | 38 | 21 | 11 | 8 | 6.5 | 7 | 7 | 70.9 | 59.0 | 59.0 | 8 | 13 | 68.0 | 75.0 | 8 | 13 | 47.0 | 48.0 | 8 | 7 | 6 | 6 | 59.0 | 190 | 202 | 8 | 6 | 62.0 | 74.0 | 5 | 12 | 6 | 6 | 0 |
| 50 FT | 36 | 39 | 21 | 11 | 8 | 6.5 | 7 | 6.5 | 70.9 | 60.0 | 60.0 | 8 | 13 | 68.0 | 75.0 | 8 | 13 | 47.0 | 48.0 | 8 | 6.5 | 6 | 6 | 59.1 | 191 | 203 | 8 | 6 | 62.0 | 74.0 | 5 | 12 | 6 | 6 | 0 |

## SPAN (S) = 14 FT  HEIGHT (HT) = 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | H3 BARS | | | | B1 BARS | | B2 BARS | | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | K3 | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=15' | HT=16' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=15' | HT=16' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 14 | 11 | 12 | 13 | 5 | 6 | 5 | 6 | 72.6 | 34.0 | 34.0 | 5 | 12 | 136.5 | 101.5 | 5 | 12 | 38.0 | 41.0 | 5 | 6.5 | 6 | 6 | 103.4 | 187 | 199 | 6 | 6.5 | 62.0 | 63.0 | 5 | 11.5 | 5 | 7 | 12 |
| 2 FT | 15 | 12 | 12 | 13 | 6 | 8 | 6 | 8 | 75.6 | 35.0 | 39.0 | 6 | 16 | 143.5 | 108.5 | 6 | 16 | 45.0 | 48.0 | 5 | 6 | 6 | 6.5 | 99.0 | 188 | 200 | 6 | 6.5 | 61.0 | 63.0 | 5 | 12 | 5 | 7 | 12 |
| 4 FT | 12 | 12 | 12 | 13 | 6 | 8 | 6 | 7.5 | 75.6 | 36.0 | 36.0 | 6 | 15 | 138.5 | 89.0 | 6 | 15 | 40.0 | 41.0 | 5 | 6 | 6 | 6 | 90.1 | 188 | 200 | 6 | 6 | 60.0 | 63.0 | 5 | 12 | 5 | 7 | 12 |
| 6 FT | 12 | 13 | 12 | 13 | 6 | 8 | 6 | 7 | 89.3 | 36.0 | 36.0 | 6 | 14 | 69.0 | 71.0 | 6 | 14 | 38.0 | 39.0 | 5 | 6 | 6 | 6 | 86.4 | 189 | 201 | 6 | 6 | 58.0 | 63.0 | 5 | 12 | 5 | 6.5 | 12 |
| 8 FT | 12 | 14 | 13 | 13 | 6 | 8 | 6 | 6.5 | 78.1 | 36.0 | 36.0 | 6 | 12 | 64.0 | 66.0 | 6 | 12 | 37.0 | 37.0 | 6 | 8 | 6 | 6 | 81.9 | 190 | 202 | 6 | 6 | 57.0 | 62.0 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 13 | 15 | 13 | 13 | 6 | 8 | 6 | 6.5 | 75.1 | 37.0 | 37.0 | 6 | 12 | 61.0 | 64.0 | 6 | 12 | 37.0 | 37.0 | 6 | 7.5 | 6 | 6.5 | 79.1 | 191 | 203 | 7 | 7 | 59.0 | 65.0 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 14 | 16 | 14 | 13 | 6 | 7.5 | 6 | 6.5 | 72.9 | 38.0 | 38.0 | 6 | 12 | 59.0 | 63.0 | 6 | 12 | 36.0 | 37.0 | 6 | 7 | 6 | 6.5 | 75.6 | 192 | 204 | 7 | 7 | 58.0 | 65.0 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 15 | 17 | 15 | 13 | 6 | 7.5 | 6 | 6.5 | 77.6 | 39.0 | 39.0 | 7 | 16 | 69.0 | 73.0 | 7 | 16 | 47.0 | 48.0 | 6 | 7 | 6 | 6.5 | 73.6 | 193 | 205 | 7 | 7 | 58.0 | 65.0 | 5 | 12 | 6 | 8 | 0 |
| 16 FT | 17 | 19 | 15 | 13 | 6 | 7.5 | 6 | 6 | 77.6 | 41.0 | 41.0 | 6 | 12 | 63.0 | 68.0 | 6 | 12 | 42.0 | 44.0 | 6 | 6 | 6 | 6 | 73.5 | 195 | 207 | 6 | 6 | 55.0 | 63.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 18 | 20 | 15 | 13 | 6 | 7 | 7 | 7.5 | 81.8 | 42.0 | 48.0 | 7 | 16 | 67.0 | 73.0 | 7 | 16 | 46.0 | 49.0 | 6 | 6 | 7 | 7 | 75.6 | 196 | 208 | 7 | 7 | 57.0 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 19 | 21 | 16 | 13 | 6 | 6.5 | 7 | 7.5 | 81.1 | 43.0 | 49.0 | 7 | 15 | 66.0 | 73.0 | 7 | 15 | 46.0 | 49.0 | 7 | 7.5 | 7 | 7.5 | 74.8 | 197 | 209 | 7 | 7 | 57.0 | 66.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 20 | 23 | 17 | 13 | 6 | 6 | 7 | 7.5 | 80.8 | 44.0 | 50.0 | 7 | 15 | 65.0 | 73.0 | 7 | 15 | 46.0 | 49.0 | 7 | 7 | 7 | 7.5 | 74.6 | 199 | 211 | 7 | 7 | 57.0 | 66.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 22 | 24 | 17 | 13 | 6 | 6 | 7 | 7 | 80.8 | 46.0 | 52.0 | 7 | 15 | 65.0 | 73.0 | 7 | 15 | 46.0 | 49.0 | 7 | 7 | 7 | 7 | 74.1 | 200 | 212 | 7 | 7 | 57.0 | 66.0 | 5 | 12 | 6 | 7.5 | 0 |
| 26 FT | 23 | 25 | 18 | 13 | 7 | 7.5 | 7 | 7 | 80.5 | 47.0 | 53.0 | 7 | 15 | 65.0 | 72.0 | 7 | 15 | 46.0 | 49.0 | 7 | 6 | 7 | 7.5 | 73.6 | 201 | 213 | 7 | 6 | 57.0 | 67.0 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 24 | 27 | 19 | 13 | 7 | 7.5 | 7 | 7 | 80.5 | 48.0 | 54.0 | 7 | 14 | 64.0 | 72.0 | 7 | 14 | 45.0 | 48.0 | 7 | 6.5 | 7 | 8 | 73.8 | 203 | 215 | 7 | 6 | 57.0 | 67.0 | 5 | 12 | 6 | 6.5 | 0 |
| 30 FT | 25 | 28 | 20 | 13 | 7 | 6.5 | 7 | 7 | 80.6 | 49.0 | 55.0 | 7 | 13 | 64.0 | 72.0 | 7 | 13 | 45.0 | 48.0 | 7 | 6 | 7 | 8 | 73.5 | 204 | 216 | 7 | 6 | 57.0 | 67.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 27 | 30 | 21 | 13 | 7 | 6.5 | 7 | 7 | 81.1 | 51.0 | 51.0 | 7 | 13 | 63.0 | 71.0 | 7 | 13 | 43.0 | 46.0 | 7 | 6 | 6 | 6 | 70.8 | 206 | 218 | 8 | 7.5 | 63.0 | 73.0 | 5 | 12 | 6 | 6 | 0 |
| 34 FT | 28 | 31 | 21 | 13 | 7 | 6.5 | 7 | 7 | 80.9 | 52.0 | 52.0 | 7 | 12 | 63.0 | 71.0 | 7 | 12 | 43.0 | 46.0 | 7 | 6 | 6 | 6 | 70.4 | 207 | 219 | 8 | 7 | 63.0 | 73.0 | 5 | 12 | 6 | 6 | 0 |
| 36 FT | 29 | 32 | 22 | 13 | 7 | 6 | 7 | 7 | 81.1 | 59.0 | 59.0 | 7 | 12 | 63.0 | 71.0 | 7 | 12 | 43.0 | 45.0 | 8 | 7.5 | 7 | 7.5 | 73.3 | 208 | 220 | 8 | 7 | 63.0 | 73.0 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 30 | 33 | 22 | 13 | 7 | 6 | 7 | 6 | 81.1 | 60.0 | 60.0 | 7 | 12 | 63.0 | 71.0 | 7 | 12 | 42.0 | 45.0 | 8 | 7.5 | 7 | 7 | 73.4 | 209 | 221 | 8 | 6.5 | 63.0 | 74.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 31 | 34 | 23 | 13 | 8 | 7.5 | 7 | 6.5 | 81.8 | 61.0 | 61.0 | 8 | 15 | 70.0 | 78.0 | 8 | 15 | 50.0 | 52.0 | 8 | 7 | 7 | 7.5 | 73.5 | 210 | 222 | 8 | 6.5 | 63.0 | 74.0 | 5 | 12 | 7 | 7.5 | 0 |
| 42 FT | 32 | 35 | 24 | 13 | 8 | 7.5 | 7 | 6.5 | 82.3 | 62.0 | 62.0 | 8 | 14 | 70.0 | 78.0 | 8 | 14 | 49.0 | 51.0 | 8 | 6.5 | 7 | 7 | 73.8 | 211 | 223 | 8 | 6.5 | 63.0 | 74.0 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 33 | 36 | 24 | 13 | 8 | 7 | 7 | 6 | 82.4 | 63.0 | 63.0 | 8 | 14 | 70.0 | 77.0 | 8 | 14 | 49.0 | 50.0 | 8 | 6.5 | 7 | 7 | 73.9 | 212 | 224 | 8 | 6 | 63.0 | 74.0 | 5 | 12 | 7 | 7.5 | 0 |
| 46 FT | 34 | 38 | 26 | 13 | 8 | 7 | 7 | 6 | 83.8 | 64.0 | 64.0 | 8 | 14 | 70.0 | 76.0 | 8 | 14 | 48.0 | 49.0 | 8 | 7 | 7 | 7 | 74.6 | 214 | 226 | 8 | 6.5 | 63.0 | 74.0 | 5 | 12 | 7 | 7.5 | 0 |
| 48 FT | 35 | 38 | 26 | 13 | 8 | 6.5 | 7 | 6.5 | 82.1 | 65.0 | 65.0 | 8 | 13 | 69.0 | 76.0 | 8 | 13 | 48.0 | 49.0 | 8 | 6.5 | 7 | 7 | 72.6 | 214 | 226 | 8 | 6 | 63.0 | 74.0 | 5 | 12 | 7 | 8 | 0 |
| 50 FT | 35 | 39 | 26 | 13 | 8 | 6.5 | 7 | 6 | 82.1 | 65.0 | 65.0 | 8 | 13 | 69.0 | 76.0 | 8 | 13 | 48.0 | 50.0 | 8 | 6.5 | 7 | 6.5 | 72.8 | 215 | 227 | 8 | 6 | 63.0 | 74.0 | 5 | 12 | 7 | 7.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 14 FEET
HEIGHT (HT): 13 THRU 16 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

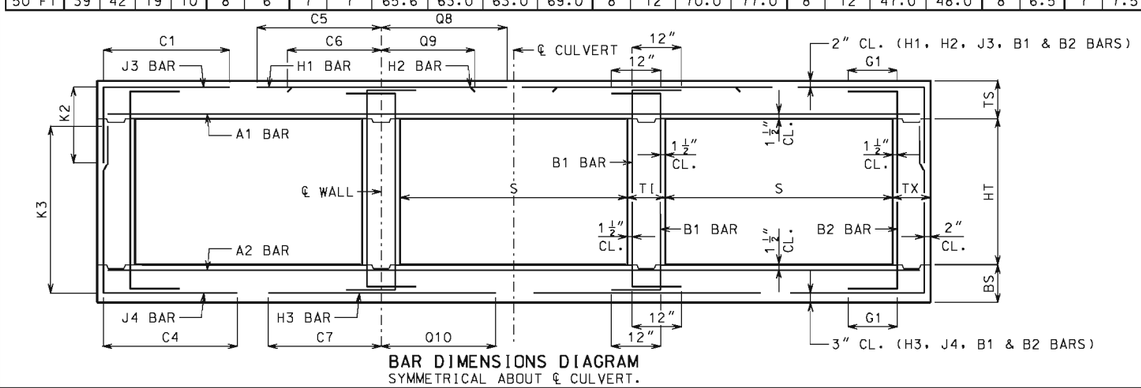
703.87

## SPAN (S) = 15 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | K2 HT=10′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | K3 HT=10′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 10 | 8 | 8 | 6 | 8 | 5 | 8 | 72.9 | 35.0 | 35.0 | 35.0 | 6 | 16 | 146.5 | 111.5 | 6 | 16 | 48.0 | 53.0 | 5 | 7 | 7 | 6.5 | 69.0 | 102 | 114 | 126 | 6 | 6 | 61.0 | 65.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 15 | 11 | 9 | 8 | 6 | 7.5 | 5 | 8 | 73.5 | 35.0 | 35.0 | 35.0 | 6 | 16 | 146.5 | 111.5 | 6 | 16 | 49.0 | 53.0 | 5 | 6.5 | 6 | 7 | 60.4 | 103 | 115 | 127 | 6 | 6 | 59.0 | 65.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 12 | 11 | 9 | 8 | 6 | 6.5 | 6 | 7 | 60.8 | 32.0 | 36.0 | 36.0 | 6 | 12 | 84.0 | 109.0 | 6 | 12 | 40.0 | 43.0 | 5 | 6.5 | 6 | 6.5 | 53.9 | 103 | 115 | 127 | 7 | 6.5 | 61.0 | 68.0 | 5 | 11.5 | 5 | 12 | 12 |
| 6 FT | 12 | 12 | 9 | 8 | 6 | 7 | 6 | 6.5 | 53.5 | 32.0 | 32.0 | 36.0 | 7 | 16 | 72.0 | 86.0 | 7 | 16 | 41.0 | 43.0 | 6 | 8 | 6 | 7 | 49.9 | 104 | 116 | 128 | 7 | 6.5 | 60.0 | 68.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 13 | 14 | 9 | 8 | 6 | 7 | 6 | 7 | 49.5 | 33.0 | 33.0 | 33.0 | 7 | 15 | 67.0 | 77.0 | 7 | 15 | 39.0 | 42.0 | 6 | 8 | 5 | 6.5 | 43.4 | 106 | 118 | 130 | 7 | 7 | 58.0 | 69.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 14 | 15 | 9 | 8 | 6 | 7 | 6 | 7.5 | 46.6 | 34.0 | 34.0 | 34.0 | 7 | 15 | 64.0 | 73.0 | 7 | 15 | 39.0 | 41.0 | 6 | 7.5 | 5 | 6.5 | 41.5 | 107 | 119 | 131 | 7 | 6.5 | 58.0 | 69.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 15 | 16 | 9 | 8 | 6 | 6 | 6 | 7.5 | 50.4 | 35.0 | 35.0 | 35.0 | 7 | 14 | 70.0 | 80.0 | 7 | 14 | 46.0 | 49.0 | 6 | 6 | 5 | 6 | 40.0 | 108 | 120 | 132 | 7 | 6.5 | 57.0 | 69.0 | 5 | 12 | 5 | 11.5 | 0 |
| 14 FT | 17 | 18 | 9 | 8 | 6 | 6.5 | 6 | 7.5 | 48.4 | 37.0 | 37.0 | 37.0 | 7 | 15 | 68.0 | 79.0 | 7 | 15 | 46.0 | 49.0 | 6 | 6.5 | 5 | 6 | 38.9 | 110 | 122 | 134 | 7 | 6.5 | 57.0 | 69.0 | 5 | 12 | 5 | 9.5 | 0 |
| 16 FT | 18 | 19 | 9 | 8 | 6 | 6.5 | 6 | 7.5 | 47.1 | 38.0 | 38.0 | 42.0 | 7 | 14 | 67.0 | 79.0 | 7 | 14 | 45.0 | 49.0 | 6 | 6 | 6 | 8.5 | 41.0 | 111 | 123 | 135 | 7 | 6.5 | 57.0 | 69.0 | 5 | 12 | 5 | 8.5 | 0 |
| 18 FT | 19 | 21 | 10 | 8 | 6 | 6 | 6 | 7.5 | 47.8 | 39.0 | 39.0 | 39.0 | 7 | 14 | 66.0 | 78.0 | 7 | 14 | 45.0 | 49.0 | 7 | 8 | 5 | 6.5 | 37.9 | 113 | 125 | 137 | 7 | 6.5 | 57.0 | 70.0 | 5 | 12 | 5 | 9.5 | 0 |
| 20 FT | 21 | 22 | 10 | 8 | 6 | 6 | 6 | 7.5 | 46.6 | 41.0 | 41.0 | 41.0 | 7 | 14 | 66.0 | 78.0 | 7 | 14 | 45.0 | 49.0 | 7 | 7.5 | 5 | 6 | 37.5 | 114 | 126 | 138 | 7 | 6.5 | 56.0 | 70.0 | 5 | 12 | 5 | 8 | 0 |
| 22 FT | 23 | 24 | 10 | 8 | 7 | 7.5 | 6 | 7.5 | 46.0 | 43.0 | 43.0 | 43.0 | 7 | 14 | 65.0 | 77.0 | 7 | 14 | 45.0 | 49.0 | 7 | 7 | 5 | 6 | 37.3 | 116 | 128 | 140 | 7 | 6.5 | 56.0 | 70.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 24 | 25 | 11 | 8 | 7 | 7.5 | 6 | 8 | 46.5 | 44.0 | 44.0 | 44.0 | 7 | 13 | 64.0 | 77.0 | 7 | 13 | 45.0 | 49.0 | 7 | 6.5 | 6 | 6.5 | 37.5 | 117 | 129 | 141 | 7 | 6.5 | 56.0 | 70.0 | 5 | 12 | 5 | 7.5 | 0 |
| 26 FT | 25 | 27 | 11 | 8 | 7 | 7 | 6 | 7.5 | 46.4 | 45.0 | 45.0 | 45.0 | 7 | 13 | 64.0 | 77.0 | 7 | 13 | 44.0 | 48.0 | 7 | 6.5 | 5 | 6 | 37.1 | 119 | 131 | 143 | 7 | 6 | 56.0 | 70.0 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 27 | 28 | 11 | 8 | 7 | 6.5 | 6 | 7.5 | 45.8 | 47.0 | 47.0 | 47.0 | 7 | 13 | 64.0 | 76.0 | 7 | 13 | 44.0 | 48.0 | 7 | 6 | 5 | 6 | 37.1 | 120 | 132 | 144 | 7 | 6 | 56.0 | 70.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 28 | 30 | 12 | 8 | 7 | 6.5 | 6 | 7.5 | 46.8 | 52.0 | 52.0 | 52.0 | 7 | 12 | 63.0 | 76.0 | 7 | 12 | 43.0 | 47.0 | 8 | 7.5 | 6 | 8 | 40.4 | 122 | 134 | 146 | 8 | 7.5 | 62.0 | 76.0 | 5 | 12 | 5 | 7 | 0 |
| 32 FT | 30 | 31 | 12 | 8 | 7 | 6 | 6 | 7.5 | 46.3 | 54.0 | 54.0 | 54.0 | 7 | 12 | 63.0 | 75.0 | 7 | 12 | 42.0 | 45.0 | 8 | 7.5 | 6 | 7.5 | 40.5 | 123 | 135 | 147 | 8 | 7 | 62.0 | 76.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 31 | 32 | 12 | 8 | 8 | 7.5 | 6 | 7.5 | 46.1 | 55.0 | 55.0 | 55.0 | 8 | 15 | 71.0 | 83.0 | 8 | 15 | 50.0 | 53.0 | 8 | 6.5 | 6 | 7.5 | 40.3 | 124 | 136 | 148 | 8 | 6.5 | 62.0 | 76.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 32 | 34 | 12 | 8 | 8 | 7.5 | 6 | 7 | 46.1 | 56.0 | 56.0 | 56.0 | 8 | 14 | 71.0 | 82.0 | 8 | 14 | 49.0 | 52.0 | 8 | 7 | 6 | 7 | 40.3 | 126 | 138 | 150 | 8 | 6.5 | 62.0 | 76.0 | 5 | 12 | 5 | 7 | 0 |
| 38 FT | 33 | 35 | 13 | 8 | 8 | 7 | 6 | 7 | 47.0 | 57.0 | 57.0 | 57.0 | 8 | 14 | 71.0 | 82.0 | 8 | 14 | 49.0 | 51.0 | 8 | 7 | 6 | 6.5 | 40.8 | 127 | 139 | 151 | 8 | 6.5 | 62.0 | 76.0 | 5 | 12 | 5 | 6.5 | 0 |
| 40 FT | 34 | 36 | 13 | 8 | 8 | 7 | 6 | 6.5 | 46.9 | 58.0 | 58.0 | 58.0 | 8 | 14 | 70.0 | 81.0 | 8 | 14 | 49.0 | 51.0 | 8 | 6.5 | 6 | 6.5 | 40.8 | 128 | 140 | 152 | 8 | 6 | 62.0 | 76.0 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 35 | 37 | 13 | 8 | 8 | 6.5 | 6 | 6.5 | 46.9 | 59.0 | 59.0 | 59.0 | 8 | 13 | 70.0 | 81.0 | 8 | 13 | 48.0 | 50.0 | 8 | 6 | 6 | 6.5 | 40.9 | 129 | 141 | 153 | 8 | 6 | 62.0 | 76.0 | 5 | 12 | 5 | 6.5 | 0 |
| 44 FT | 36 | 38 | 13 | 8 | 8 | 6.5 | 6 | 6.5 | 46.9 | 60.0 | 60.0 | 60.0 | 8 | 13 | 70.0 | 80.0 | 8 | 13 | 48.0 | 49.0 | 8 | 6 | 6 | 6 | 41.0 | 130 | 142 | 154 | 8 | 6 | 62.0 | 76.0 | 5 | 12 | 5 | 6 | 0 |
| 46 FT | 37 | 39 | 13 | 8 | 8 | 6.5 | 6 | 6 | 46.9 | 61.0 | 61.0 | 61.0 | 8 | 12 | 70.0 | 79.0 | 8 | 12 | 47.0 | 49.0 | 8 | 6 | 6 | 6 | 41.1 | 131 | 143 | 155 | 8 | 6 | 62.0 | 76.0 | 5 | 12 | 6 | 8 | 0 |
| 48 FT | 38 | 41 | 13 | 8 | 8 | 6 | 6 | 6 | 46.1 | 62.0 | 62.0 | 62.0 | 8 | 12 | 69.0 | 78.0 | 8 | 12 | 46.0 | 48.0 | 8 | 6.5 | 7 | 7 | 43.3 | 133 | 145 | 157 | 9 | 7.5 | 68.0 | 82.0 | 5 | 12 | 6 | 8 | 0 |
| 50 FT | 39 | 42 | 14 | 8 | 8 | 6 | 6 | 6 | 47.1 | 63.0 | 63.0 | 63.0 | 8 | 12 | 69.0 | 77.0 | 8 | 12 | 46.0 | 47.0 | 8 | 6.5 | 7 | 7.5 | 43.9 | 134 | 146 | 158 | 9 | 7 | 68.0 | 82.0 | 5 | 12 | 5 | 6 | 0 |

## SPAN (S) = 15 FT  HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=11′ | K2 HT=12′ | K2 HT=13′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=11′ | K3 HT=12′ | K3 HT=13′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 11 | 9 | 10 | 6 | 8 | 5 | 6.5 | 73.9 | 35.0 | 35.0 | 35.0 | 6 | 16 | 147.5 | 112.5 | 6 | 16 | 48.0 | 52.0 | 5 | 6.5 | 6 | 6 | 89.3 | 139 | 151 | 163 | 6 | 6.5 | 63.0 | 67.0 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 15 | 11 | 10 | 10 | 6 | 7.5 | 5 | 6.5 | 74.5 | 35.0 | 35.0 | 35.0 | 6 | 16 | 147.5 | 112.5 | 6 | 16 | 49.0 | 53.0 | 5 | 6.5 | 6 | 6 | 77.1 | 139 | 151 | 163 | 6 | 6 | 61.0 | 65.0 | 5 | 12 | 5 | 8 | 12 |
| 4 FT | 12 | 12 | 10 | 10 | 6 | 7 | 6 | 7.5 | 77.5 | 32.0 | 36.0 | 36.0 | 6 | 13 | 89.0 | 107.0 | 6 | 13 | 41.0 | 43.0 | 5 | 6 | 6 | 6.5 | 71.3 | 140 | 152 | 164 | 6 | 6 | 60.0 | 67.0 | 5 | 10 | 5 | 8 | 12 |
| 6 FT | 12 | 12 | 10 | 10 | 6 | 7 | 6 | 7 | 67.9 | 32.0 | 36.0 | 36.0 | 7 | 16 | 74.0 | 83.0 | 7 | 16 | 41.0 | 43.0 | 6 | 8 | 6 | 6 | 65.1 | 140 | 152 | 164 | 7 | 6 | 61.0 | 68.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 13 | 14 | 10 | 10 | 6 | 7.5 | 6 | 6.5 | 63.0 | 33.0 | 37.0 | 37.0 | 7 | 16 | 69.0 | 75.0 | 7 | 16 | 40.0 | 42.0 | 6 | 7.5 | 6 | 6 | 62.3 | 142 | 154 | 166 | 7 | 6.5 | 60.0 | 69.0 | 5 | 12 | 5 | 8 | 0 |
| 10 FT | 14 | 15 | 10 | 10 | 6 | 7 | 6 | 6.5 | 59.4 | 34.0 | 38.0 | 38.0 | 7 | 15 | 66.0 | 73.0 | 7 | 15 | 40.0 | 42.0 | 6 | 7 | 7 | 6.5 | 62.4 | 143 | 155 | 167 | 7 | 6.5 | 59.0 | 69.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 15 | 17 | 11 | 10 | 6 | 7 | 6 | 6.5 | 63.5 | 35.0 | 35.0 | 39.0 | 7 | 14 | 71.0 | 79.0 | 7 | 14 | 47.0 | 49.0 | 6 | 7 | 6 | 7 | 57.5 | 145 | 157 | 169 | 7 | 7 | 59.0 | 69.0 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 17 | 18 | 12 | 10 | 6 | 7 | 6 | 6.5 | 62.4 | 37.0 | 41.0 | 41.0 | 7 | 15 | 70.0 | 78.0 | 7 | 15 | 47.0 | 49.0 | 6 | 6.5 | 6 | 7 | 56.4 | 146 | 158 | 170 | 7 | 6.5 | 58.0 | 69.0 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 18 | 19 | 12 | 10 | 6 | 6.5 | 6 | 6.5 | 61.1 | 38.0 | 42.0 | 42.0 | 7 | 14 | 68.0 | 78.0 | 7 | 14 | 46.0 | 49.0 | 6 | 6 | 6 | 7 | 55.4 | 147 | 159 | 171 | 7 | 6.5 | 58.0 | 69.0 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 19 | 21 | 12 | 10 | 6 | 6 | 6 | 6 | 60.4 | 39.0 | 43.0 | 43.0 | 7 | 14 | 68.0 | 77.0 | 7 | 14 | 46.0 | 49.0 | 7 | 8 | 6 | 6 | 54.6 | 149 | 161 | 173 | 7 | 6.5 | 58.0 | 70.0 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 21 | 22 | 13 | 10 | 6 | 6 | 6 | 6 | 60.3 | 41.0 | 45.0 | 45.0 | 7 | 14 | 67.0 | 77.0 | 7 | 14 | 46.0 | 49.0 | 7 | 7 | 6 | 6.5 | 54.5 | 150 | 162 | 174 | 7 | 6.5 | 58.0 | 70.0 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 22 | 24 | 13 | 10 | 6 | 6 | 6 | 6 | 59.6 | 42.0 | 46.0 | 46.0 | 7 | 14 | 66.0 | 77.0 | 7 | 14 | 46.0 | 49.0 | 7 | 7 | 6 | 6.5 | 54.0 | 152 | 164 | 176 | 7 | 6.5 | 58.0 | 70.0 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 24 | 25 | 14 | 10 | 7 | 7.5 | 6 | 6 | 59.8 | 44.0 | 48.0 | 48.0 | 7 | 14 | 66.0 | 77.0 | 7 | 14 | 45.0 | 49.0 | 7 | 6.5 | 6 | 7 | 54.1 | 153 | 165 | 177 | 7 | 6.5 | 58.0 | 70.0 | 5 | 12 | 5 | 6 | 0 |
| 26 FT | 25 | 27 | 14 | 10 | 7 | 7 | 6 | 6 | 59.5 | 45.0 | 49.0 | 49.0 | 7 | 13 | 65.0 | 76.0 | 7 | 13 | 45.0 | 49.0 | 7 | 6.5 | 6 | 7 | 53.8 | 155 | 167 | 179 | 7 | 6 | 58.0 | 70.0 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 26 | 28 | 15 | 10 | 7 | 6.5 | 6 | 6 | 59.9 | 50.0 | 50.0 | 50.0 | 7 | 13 | 65.0 | 76.0 | 7 | 13 | 45.0 | 49.0 | 7 | 6 | 6 | 7 | 53.9 | 156 | 168 | 180 | 7 | 6 | 58.0 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 28 | 30 | 15 | 10 | 7 | 6.5 | 7 | 8 | 64.5 | 52.0 | 52.0 | 52.0 | 7 | 12 | 64.0 | 76.0 | 7 | 12 | 44.0 | 47.0 | 8 | 7.5 | 6 | 7 | 53.8 | 158 | 170 | 182 | 8 | 7.5 | 64.0 | 76.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 29 | 31 | 15 | 10 | 7 | 6 | 7 | 7 | 64.3 | 53.0 | 53.0 | 53.0 | 7 | 12 | 64.0 | 75.0 | 7 | 12 | 44.0 | 47.0 | 8 | 7.5 | 6 | 6.5 | 53.5 | 159 | 171 | 183 | 8 | 7 | 64.0 | 76.0 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 31 | 32 | 16 | 10 | 8 | 7.5 | 6 | 6 | 59.6 | 55.0 | 55.0 | 55.0 | 8 | 15 | 72.0 | 83.0 | 8 | 15 | 50.0 | 53.0 | 8 | 6.5 | 6 | 7 | 53.8 | 160 | 172 | 184 | 8 | 6.5 | 64.0 | 76.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 32 | 34 | 16 | 10 | 8 | 7.5 | 7 | 7 | 64.5 | 56.0 | 56.0 | 56.0 | 8 | 14 | 72.0 | 82.0 | 8 | 14 | 50.0 | 52.0 | 8 | 7 | 6 | 7 | 53.8 | 162 | 174 | 186 | 8 | 6.5 | 63.0 | 77.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 33 | 35 | 17 | 10 | 8 | 7 | 7 | 7.5 | 65.1 | 57.0 | 57.0 | 57.0 | 8 | 14 | 71.0 | 82.0 | 8 | 14 | 49.0 | 52.0 | 8 | 7 | 6 | 6.5 | 54.0 | 163 | 175 | 187 | 8 | 6.5 | 63.0 | 77.0 | 5 | 12 | 6 | 7.5 | 0 |
| 40 FT | 34 | 36 | 17 | 10 | 8 | 7 | 7 | 7 | 65.1 | 58.0 | 58.0 | 58.0 | 8 | 14 | 71.0 | 81.0 | 8 | 14 | 49.0 | 51.0 | 8 | 6.5 | 6 | 6.5 | 54.0 | 164 | 176 | 188 | 8 | 6 | 63.0 | 77.0 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 35 | 37 | 18 | 10 | 8 | 6.5 | 7 | 7.5 | 65.9 | 59.0 | 59.0 | 59.0 | 8 | 13 | 71.0 | 80.0 | 8 | 13 | 49.0 | 50.0 | 8 | 6 | 6 | 6.5 | 54.4 | 165 | 177 | 189 | 8 | 6 | 64.0 | 77.0 | 5 | 12 | 6 | 7 | 0 |
| 44 FT | 36 | 39 | 18 | 10 | 8 | 6.5 | 7 | 7 | 66.0 | 60.0 | 60.0 | 60.0 | 8 | 13 | 71.0 | 80.0 | 8 | 13 | 48.0 | 50.0 | 8 | 6.5 | 6 | 6 | 54.6 | 167 | 179 | 191 | 8 | 6 | 63.0 | 77.0 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 37 | 40 | 19 | 10 | 8 | 6.5 | 7 | 7.5 | 66.8 | 61.0 | 61.0 | 61.0 | 8 | 12 | 70.0 | 79.0 | 8 | 12 | 48.0 | 49.0 | 8 | 6.5 | 6 | 6 | 55.0 | 168 | 180 | 192 | 9 | 7.5 | 70.0 | 83.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 38 | 41 | 19 | 10 | 8 | 6 | 7 | 6.5 | 66.8 | 62.0 | 62.0 | 68.0 | 8 | 12 | 70.0 | 78.0 | 8 | 12 | 47.0 | 48.0 | 8 | 6.5 | 7 | 8 | 58.1 | 169 | 181 | 193 | 9 | 7 | 70.0 | 83.0 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 39 | 42 | 19 | 10 | 8 | 6 | 7 | 7 | 65.6 | 63.0 | 63.0 | 69.0 | 8 | 12 | 70.0 | 77.0 | 8 | 12 | 47.0 | 48.0 | 8 | 6.5 | 7 | 7.5 | 57.0 | 170 | 182 | 194 | 9 | 7 | 69.0 | 83.0 | 5 | 12 | 6 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 15 FEET
HEIGHT (HT): 8 THRU 13 FEET

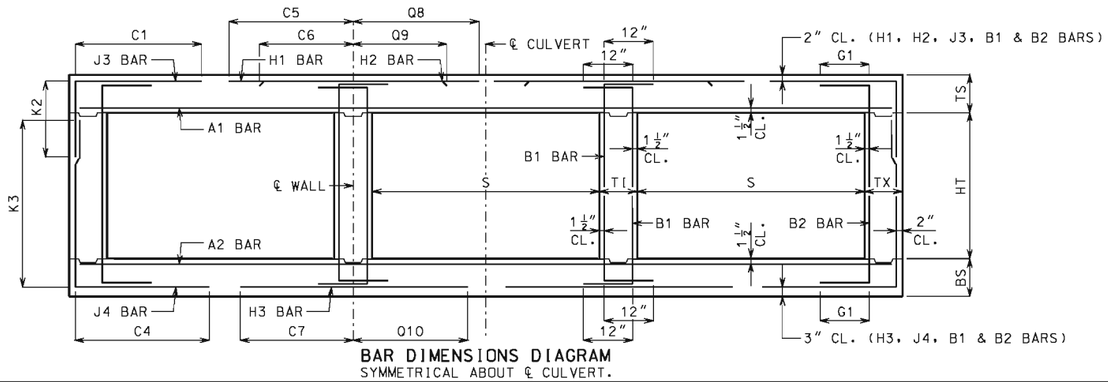
DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 24 OF 27

## SPAN (S) = 15 FT  HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | | K3 | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 11 | 12 | 13 | 6 | 8 | 6 | 8 | 79.3 | 35.0 | 35.0 | 39.0 | 6 | 16 | 152.5 | 114.5 | 6 | 16 | 48.0 | 51.0 | 5 | 6.5 | 6 | 6 | 99.0 | 175 | 187 | 199 | 6 | 6 | 64.0 | 65.0 | 5 | 11.5 | 5 | 7 | 12 |
| 2 FT | 15 | 12 | 12 | 13 | 6 | 8 | 6 | 8 | 79.3 | 35.0 | 35.0 | 39.0 | 6 | 16 | 152.5 | 114.5 | 6 | 16 | 49.0 | 52.0 | 5 | 6 | 6 | 6.5 | 95.5 | 176 | 188 | 200 | 6 | 6 | 63.0 | 66.0 | 5 | 11.5 | 5 | 7 | 12 |
| 4 FT | 12 | 12 | 12 | 13 | 6 | 7 | 6 | 7 | 111.5 | 36.0 | 36.0 | 36.0 | 6 | 13 | 99.0 | 91.0 | 6 | 13 | 41.0 | 42.0 | 5 | 6 | 6 | 6 | 88.6 | 176 | 188 | 200 | 7 | 6.5 | 65.0 | 69.0 | 5 | 9.5 | 5 | 7 | 12 |
| 6 FT | 12 | 13 | 12 | 13 | 6 | 7.5 | 6 | 6.5 | 85.6 | 36.0 | 36.0 | 36.0 | 6 | 12 | 71.0 | 73.0 | 6 | 12 | 40.0 | 40.0 | 6 | 8 | 6 | 6 | 84.0 | 177 | 189 | 201 | 7 | 6.5 | 64.0 | 69.0 | 5 | 12 | 5 | 6.5 | 12 |
| 8 FT | 13 | 14 | 13 | 13 | 6 | 7.5 | 6 | 7 | 77.4 | 37.0 | 37.0 | 37.0 | 6 | 12 | 67.0 | 70.0 | 6 | 12 | 38.0 | 39.0 | 6 | 7.5 | 6 | 6 | 78.1 | 178 | 190 | 202 | 7 | 6.5 | 62.0 | 68.0 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 14 | 16 | 13 | 13 | 6 | 7.5 | 6 | 6 | 75.0 | 38.0 | 38.0 | 38.0 | 7 | 15 | 67.0 | 71.0 | 7 | 15 | 41.0 | 42.0 | 6 | 7 | 6 | 6 | 77.0 | 180 | 192 | 204 | 7 | 7 | 61.0 | 69.0 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 15 | 17 | 14 | 13 | 6 | 7 | 6 | 6 | 78.9 | 39.0 | 39.0 | 39.0 | 7 | 15 | 73.0 | 78.0 | 7 | 15 | 48.0 | 50.0 | 6 | 7 | 6 | 6.5 | 74.8 | 181 | 193 | 205 | 7 | 6.5 | 60.0 | 69.0 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 16 | 18 | 15 | 13 | 6 | 7 | 6 | 6 | 77.5 | 40.0 | 40.0 | 40.0 | 7 | 14 | 71.0 | 77.0 | 7 | 14 | 48.0 | 49.0 | 6 | 6.5 | 6 | 6.5 | 73.0 | 182 | 194 | 206 | 7 | 6.5 | 60.0 | 69.0 | 5 | 12 | 6 | 8 | 0 |
| 16 FT | 18 | 20 | 15 | 13 | 6 | 7 | 7 | 8 | 81.9 | 42.0 | 42.0 | 42.0 | 7 | 15 | 70.0 | 77.0 | 7 | 15 | 48.0 | 50.0 | 6 | 6 | 6 | 6 | 72.4 | 184 | 196 | 208 | 7 | 7 | 60.0 | 69.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 19 | 21 | 15 | 13 | 6 | 6.5 | 7 | 7 | 80.8 | 43.0 | 43.0 | 49.0 | 7 | 14 | 69.0 | 77.0 | 7 | 14 | 48.0 | 50.0 | 7 | 8 | 7 | 7 | 74.4 | 185 | 197 | 209 | 7 | 6.5 | 60.0 | 69.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 20 | 23 | 16 | 13 | 6 | 6 | 7 | 7 | 80.3 | 44.0 | 44.0 | 50.0 | 7 | 14 | 69.0 | 76.0 | 7 | 14 | 47.0 | 50.0 | 7 | 7 | 7 | 7.5 | 74.0 | 187 | 199 | 211 | 7 | 7 | 59.0 | 70.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 22 | 24 | 17 | 13 | 6 | 6 | 7 | 7.5 | 80.1 | 46.0 | 46.0 | 52.0 | 7 | 14 | 68.0 | 76.0 | 7 | 14 | 47.0 | 50.0 | 7 | 7 | 7 | 7.5 | 73.3 | 188 | 200 | 212 | 7 | 6.5 | 59.0 | 70.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 23 | 25 | 17 | 13 | 7 | 7.5 | 7 | 7 | 79.4 | 47.0 | 47.0 | 53.0 | 7 | 14 | 67.0 | 76.0 | 7 | 14 | 47.0 | 50.0 | 7 | 6 | 7 | 7 | 72.5 | 189 | 201 | 213 | 7 | 6 | 59.0 | 70.0 | 5 | 12 | 6 | 7.5 | 0 |
| 26 FT | 25 | 27 | 18 | 13 | 7 | 7 | 7 | 7 | 79.6 | 49.0 | 49.0 | 55.0 | 7 | 14 | 67.0 | 76.0 | 7 | 14 | 47.0 | 50.0 | 7 | 6.5 | 7 | 7.5 | 72.5 | 191 | 203 | 215 | 7 | 6 | 59.0 | 70.0 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 26 | 29 | 19 | 13 | 7 | 7 | 7 | 7 | 79.6 | 50.0 | 50.0 | 50.0 | 7 | 13 | 66.0 | 76.0 | 7 | 13 | 46.0 | 50.0 | 7 | 6 | 6 | 6 | 69.5 | 193 | 205 | 217 | 8 | 7.5 | 65.0 | 76.0 | 5 | 12 | 6 | 6.5 | 0 |
| 30 FT | 27 | 30 | 19 | 13 | 7 | 6.5 | 7 | 6.5 | 79.3 | 51.0 | 51.0 | 57.0 | 7 | 13 | 66.0 | 76.0 | 7 | 13 | 46.0 | 49.0 | 8 | 7.5 | 7 | 7.5 | 72.1 | 194 | 206 | 218 | 8 | 7.5 | 65.0 | 77.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 29 | 31 | 20 | 13 | 7 | 6 | 7 | 7 | 79.5 | 53.0 | 53.0 | 59.0 | 7 | 12 | 65.0 | 75.0 | 7 | 12 | 44.0 | 47.0 | 8 | 7 | 7 | 8 | 71.9 | 195 | 207 | 219 | 8 | 7 | 65.0 | 77.0 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 30 | 33 | 21 | 13 | 7 | 6 | 7 | 7 | 79.9 | 54.0 | 54.0 | 54.0 | 7 | 12 | 65.0 | 75.0 | 7 | 12 | 44.0 | 47.0 | 8 | 7 | 6 | 6 | 69.0 | 197 | 209 | 221 | 8 | 6.5 | 65.0 | 77.0 | 5 | 12 | 6 | 6 | 0 |
| 36 FT | 31 | 34 | 22 | 13 | 8 | 7.5 | 7 | 6.5 | 80.1 | 55.0 | 61.0 | 61.0 | 8 | 15 | 73.0 | 82.0 | 8 | 15 | 52.0 | 55.0 | 8 | 7 | 7 | 7.5 | 71.9 | 198 | 210 | 222 | 8 | 6.5 | 65.0 | 77.0 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 32 | 35 | 22 | 13 | 8 | 7 | 7 | 6 | 79.8 | 56.0 | 62.0 | 62.0 | 8 | 14 | 73.0 | 82.0 | 8 | 14 | 52.0 | 54.0 | 8 | 6.5 | 7 | 7.5 | 71.6 | 199 | 211 | 223 | 8 | 6.5 | 65.0 | 77.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 33 | 36 | 23 | 13 | 8 | 6.5 | 7 | 6.5 | 80.4 | 57.0 | 63.0 | 63.0 | 8 | 13 | 73.0 | 82.0 | 8 | 13 | 51.0 | 54.0 | 8 | 6 | 7 | 7.5 | 71.8 | 200 | 212 | 224 | 8 | 6 | 65.0 | 77.0 | 5 | 12 | 7 | 7.5 | 0 |
| 42 FT | 34 | 38 | 24 | 13 | 8 | 6.5 | 7 | 6.5 | 81.1 | 58.0 | 64.0 | 64.0 | 8 | 13 | 72.0 | 81.0 | 8 | 13 | 51.0 | 53.0 | 8 | 6.5 | 7 | 7 | 72.4 | 202 | 214 | 226 | 8 | 6 | 65.0 | 78.0 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 35 | 39 | 25 | 13 | 8 | 6.5 | 7 | 6.5 | 81.9 | 59.0 | 65.0 | 65.0 | 8 | 13 | 72.0 | 81.0 | 8 | 13 | 50.0 | 52.0 | 8 | 6.5 | 7 | 7 | 72.5 | 203 | 215 | 227 | 8 | 6 | 65.0 | 78.0 | 5 | 12 | 7 | 7.5 | 0 |
| 46 FT | 36 | 40 | 26 | 13 | 8 | 6.5 | 7 | 6.5 | 82.5 | 60.0 | 66.0 | 66.0 | 8 | 13 | 72.0 | 80.0 | 8 | 13 | 50.0 | 52.0 | 8 | 6.5 | 7 | 7 | 72.9 | 204 | 216 | 228 | 9 | 7.5 | 71.0 | 84.0 | 5 | 12 | 7 | 8 | 0 |
| 48 FT | 37 | 41 | 27 | 13 | 8 | 6.5 | 7 | 6 | 83.3 | 67.0 | 67.0 | 67.0 | 8 | 12 | 72.0 | 79.0 | 8 | 12 | 49.0 | 51.0 | 8 | 6.5 | 7 | 7 | 73.1 | 205 | 217 | 229 | 9 | 7 | 71.0 | 84.0 | 5 | 12 | 7 | 8 | 0 |
| 50 FT | 38 | 42 | 27 | 13 | 8 | 6 | 7 | 6.5 | 81.8 | 68.0 | 68.0 | 68.0 | 8 | 12 | 71.0 | 79.0 | 8 | 12 | 49.0 | 50.0 | 8 | 6 | 7 | 7 | 71.4 | 206 | 218 | 230 | 9 | 7 | 71.0 | 84.0 | 5 | 12 | 6 | 6 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

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DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 15 FEET
HEIGHT (HT): 14 THRU 16 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 25 OF 27

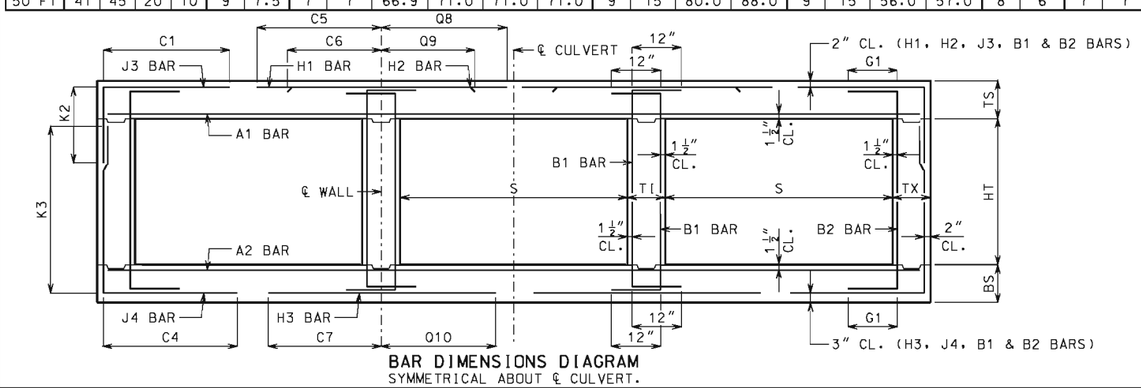
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## SPAN (S) = 16 FT  HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=8′ | K2 HT=9′ | K2 HT=10′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=8′ | K3 HT=9′ | K3 HT=10′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 10 | 9 | 8 | 6 | 7.5 | 5 | 8 | 77.1 | 35.0 | 35.0 | 35.0 | 6 | 16 | 154.5 | 117.5 | 6 | 16 | 52.0 | 57.0 | 5 | 7 | 6 | 6 | 64.6 | 102 | 114 | 126 | 7 | 6.5 | 66.0 | 71.0 | 5 | 12 | 5 | 12 | 12 |
| 2 FT | 16 | 11 | 9 | 8 | 6 | 7 | 5 | 8 | 77.1 | 36.0 | 36.0 | 36.0 | 6 | 14 | 154.5 | 117.5 | 6 | 14 | 48.0 | 53.0 | 5 | 6.5 | 6 | 6.5 | 59.3 | 103 | 115 | 127 | 7 | 7 | 65.0 | 71.0 | 5 | 12 | 5 | 12 | 12 |
| 4 FT | 13 | 11 | 9 | 8 | 6 | 6.5 | 5 | 6 | 55.9 | 33.0 | 33.0 | 33.0 | 6 | 12 | 87.0 | 115.0 | 6 | 12 | 42.0 | 45.0 | 6 | 8 | 6 | 6 | 54.0 | 103 | 115 | 127 | 7 | 6 | 64.0 | 71.0 | 5 | 12 | 5 | 12 | 12 |
| 6 FT | 13 | 12 | 10 | 8 | 6 | 7 | 5 | 6 | 51.4 | 33.0 | 33.0 | 33.0 | 7 | 15 | 75.0 | 91.0 | 7 | 15 | 42.0 | 45.0 | 6 | 7 | 6 | 6.5 | 51.4 | 104 | 116 | 128 | 7 | 6 | 62.0 | 70.0 | 5 | 12 | 5 | 12 | 12 |
| 8 FT | 14 | 14 | 10 | 8 | 6 | 7 | 5 | 6 | 47.3 | 34.0 | 34.0 | 34.0 | 7 | 15 | 70.0 | 81.0 | 7 | 15 | 41.0 | 43.0 | 6 | 7.5 | 5 | 6.5 | 44.5 | 106 | 118 | 130 | 7 | 6 | 61.0 | 71.0 | 5 | 12 | 5 | 12 | 0 |
| 10 FT | 15 | 16 | 10 | 8 | 6 | 6.5 | 6 | 8 | 53.6 | 35.0 | 35.0 | 35.0 | 7 | 14 | 75.0 | 85.0 | 7 | 14 | 48.0 | 51.0 | 6 | 7 | 5 | 7 | 41.6 | 108 | 120 | 132 | 7 | 6.5 | 60.0 | 72.0 | 5 | 12 | 5 | 12 | 0 |
| 12 FT | 16 | 17 | 10 | 8 | 6 | 6.5 | 6 | 8 | 51.3 | 36.0 | 36.0 | 36.0 | 7 | 13 | 73.0 | 83.0 | 7 | 13 | 47.0 | 50.0 | 6 | 6.5 | 5 | 6.5 | 40.1 | 109 | 121 | 133 | 7 | 6 | 60.0 | 72.0 | 5 | 12 | 5 | 12 | 0 |
| 14 FT | 18 | 19 | 10 | 8 | 6 | 6 | 6 | 8 | 49.0 | 38.0 | 38.0 | 38.0 | 7 | 14 | 71.0 | 83.0 | 7 | 14 | 47.0 | 50.0 | 6 | 6 | 5 | 6.5 | 38.8 | 111 | 123 | 135 | 7 | 6.5 | 59.0 | 73.0 | 5 | 12 | 5 | 12 | 0 |
| 16 FT | 19 | 20 | 10 | 8 | 6 | 6 | 6 | 7.5 | 47.6 | 39.0 | 39.0 | 39.0 | 7 | 13 | 69.0 | 82.0 | 7 | 13 | 46.0 | 50.0 | 6 | 6 | 5 | 6.5 | 37.8 | 112 | 124 | 136 | 7 | 6 | 59.0 | 73.0 | 5 | 12 | 5 | 11 | 0 |
| 18 FT | 20 | 22 | 10 | 8 | 7 | 7 | 6 | 7.5 | 46.9 | 40.0 | 40.0 | 40.0 | 7 | 13 | 69.0 | 81.0 | 7 | 13 | 46.0 | 50.0 | 7 | 7.5 | 5 | 6.5 | 36.8 | 114 | 126 | 138 | 7 | 6.5 | 59.0 | 73.0 | 5 | 12 | 5 | 9.5 | 0 |
| 20 FT | 22 | 23 | 10 | 8 | 7 | 7.5 | 6 | 7.5 | 45.6 | 42.0 | 42.0 | 42.0 | 7 | 13 | 68.0 | 81.0 | 7 | 13 | 46.0 | 50.0 | 7 | 6.5 | 5 | 6 | 36.5 | 115 | 127 | 139 | 7 | 6 | 59.0 | 73.0 | 5 | 12 | 5 | 8 | 0 |
| 22 FT | 24 | 25 | 10 | 8 | 7 | 7.5 | 6 | 7.5 | 45.0 | 44.0 | 44.0 | 44.0 | 7 | 13 | 67.0 | 81.0 | 7 | 13 | 46.0 | 50.0 | 7 | 6.5 | 5 | 6 | 36.3 | 117 | 129 | 141 | 7 | 6.5 | 59.0 | 73.0 | 5 | 12 | 5 | 8 | 0 |
| 24 FT | 25 | 27 | 11 | 8 | 7 | 7 | 6 | 7.5 | 45.9 | 45.0 | 45.0 | 45.0 | 7 | 12 | 67.0 | 80.0 | 7 | 12 | 46.0 | 50.0 | 7 | 6.5 | 5 | 6 | 36.4 | 119 | 131 | 143 | 7 | 6 | 59.0 | 73.0 | 5 | 12 | 5 | 7.5 | 0 |
| 26 FT | 27 | 28 | 11 | 8 | 7 | 6.5 | 6 | 7.5 | 45.1 | 47.0 | 47.0 | 47.0 | 7 | 12 | 66.0 | 80.0 | 7 | 12 | 45.0 | 50.0 | 7 | 6 | 5 | 6 | 36.4 | 120 | 132 | 144 | 7 | 6 | 59.0 | 73.0 | 5 | 12 | 5 | 7.5 | 0 |
| 28 FT | 28 | 30 | 11 | 8 | 7 | 6 | 6 | 7 | 45.0 | 52.0 | 52.0 | 52.0 | 7 | 12 | 66.0 | 80.0 | 7 | 12 | 45.0 | 50.0 | 8 | 7.5 | 6 | 7 | 39.0 | 122 | 134 | 146 | 8 | 7.5 | 65.0 | 79.0 | 5 | 12 | 5 | 7.5 | 0 |
| 30 FT | 30 | 31 | 11 | 8 | 7 | 6 | 6 | 6.5 | 44.6 | 54.0 | 54.0 | 54.0 | 7 | 12 | 66.0 | 79.0 | 7 | 12 | 44.0 | 48.0 | 8 | 7 | 6 | 7 | 39.0 | 123 | 135 | 147 | 8 | 7 | 65.0 | 79.0 | 5 | 12 | 5 | 7.5 | 0 |
| 32 FT | 31 | 33 | 12 | 8 | 8 | 7.5 | 6 | 7.5 | 45.5 | 55.0 | 55.0 | 55.0 | 8 | 15 | 74.0 | 87.0 | 8 | 15 | 52.0 | 56.0 | 8 | 7 | 6 | 7 | 39.4 | 125 | 137 | 149 | 8 | 6.5 | 65.0 | 80.0 | 5 | 12 | 5 | 7 | 0 |
| 34 FT | 33 | 34 | 12 | 8 | 8 | 7 | 6 | 7 | 45.3 | 57.0 | 57.0 | 57.0 | 8 | 14 | 73.0 | 86.0 | 8 | 14 | 51.0 | 54.0 | 8 | 6.5 | 6 | 7 | 39.5 | 126 | 138 | 150 | 8 | 6.5 | 65.0 | 80.0 | 5 | 12 | 5 | 7 | 0 |
| 36 FT | 34 | 36 | 12 | 8 | 8 | 7 | 6 | 6.5 | 45.3 | 58.0 | 58.0 | 58.0 | 8 | 14 | 73.0 | 85.0 | 8 | 14 | 50.0 | 53.0 | 8 | 6.5 | 6 | 6.5 | 39.4 | 128 | 140 | 152 | 8 | 6 | 65.0 | 80.0 | 5 | 12 | 5 | 6.5 | 0 |
| 38 FT | 35 | 37 | 12 | 8 | 8 | 6.5 | 6 | 6.5 | 45.3 | 59.0 | 59.0 | 59.0 | 8 | 13 | 73.0 | 85.0 | 8 | 13 | 50.0 | 53.0 | 8 | 6.5 | 6 | 6.5 | 39.4 | 129 | 141 | 153 | 8 | 6 | 65.0 | 80.0 | 5 | 12 | 5 | 6 | 0 |
| 40 FT | 36 | 39 | 13 | 8 | 8 | 6 | 6 | 6.5 | 46.1 | 60.0 | 60.0 | 60.0 | 8 | 12 | 73.0 | 84.0 | 8 | 12 | 50.0 | 52.0 | 8 | 6.5 | 6 | 6 | 39.9 | 131 | 143 | 155 | 8 | 6 | 65.0 | 80.0 | 5 | 12 | 5 | 6.5 | 0 |
| 42 FT | 38 | 40 | 13 | 8 | 8 | 6 | 6 | 6 | 46.0 | 62.0 | 62.0 | 62.0 | 8 | 12 | 72.0 | 83.0 | 8 | 12 | 48.0 | 50.0 | 8 | 6.5 | 6 | 6 | 40.1 | 132 | 144 | 156 | 9 | 7 | 71.0 | 86.0 | 5 | 12 | 5 | 6 | 0 |
| 44 FT | 39 | 41 | 13 | 8 | 8 | 6 | 6 | 6 | 46.0 | 63.0 | 63.0 | 63.0 | 8 | 12 | 72.0 | 82.0 | 8 | 12 | 48.0 | 49.0 | 8 | 6 | 7 | 7 | 43.3 | 133 | 145 | 157 | 9 | 7 | 71.0 | 86.0 | 5 | 12 | 6 | 8 | 0 |
| 46 FT | 40 | 42 | 13 | 8 | 8 | 6 | 7 | 7 | 51.1 | 70.0 | 70.0 | 70.0 | 8 | 12 | 72.0 | 82.0 | 8 | 12 | 47.0 | 48.0 | 8 | 6 | 7 | 7 | 43.4 | 134 | 146 | 158 | 9 | 7 | 71.0 | 86.0 | 5 | 12 | 6 | 7.5 | 0 |
| 48 FT | 41 | 43 | 13 | 8 | 9 | 7.5 | 7 | 7 | 51.1 | 71.0 | 71.0 | 71.0 | 9 | 15 | 79.0 | 89.0 | 9 | 15 | 55.0 | 56.0 | 8 | 6 | 7 | 6.5 | 43.5 | 135 | 147 | 159 | 9 | 7 | 70.0 | 86.0 | 5 | 12 | 6 | 7.5 | 0 |
| 50 FT | 42 | 45 | 13 | 8 | 9 | 7 | 7 | 6 | 51.4 | 72.0 | 72.0 | 72.0 | 9 | 15 | 79.0 | 88.0 | 9 | 15 | 55.0 | 56.0 | 8 | 6 | 7 | 6.5 | 43.8 | 137 | 149 | 161 | 9 | 7 | 70.0 | 86.0 | 5 | 10.5 | 6 | 7 | 0 |

## SPAN (S) = 16 FT  HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | K2 HT=11′ | K2 HT=12′ | K2 HT=13′ | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | K3 HT=11′ | K3 HT=12′ | K3 HT=13′ | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 11 | 9 | 10 | 6 | 7.5 | 5 | 6 | 77.5 | 35.0 | 35.0 | 35.0 | 6 | 16 | 155.5 | 118.5 | 6 | 16 | 52.0 | 57.0 | 5 | 6.5 | 6 | 6 | 87.6 | 139 | 151 | 163 | 6 | 6 | 65.0 | 69.0 | 5 | 12 | 5 | 8.5 | 12 |
| 2 FT | 16 | 12 | 9 | 10 | 6 | 7 | 5 | 6 | 77.5 | 36.0 | 36.0 | 36.0 | 6 | 14 | 155.5 | 118.5 | 6 | 14 | 49.0 | 54.0 | 5 | 6 | 6 | 6 | 79.0 | 140 | 152 | 164 | 6 | 6 | 64.0 | 69.0 | 5 | 12 | 5 | 8.5 | 12 |
| 4 FT | 13 | 12 | 10 | 10 | 6 | 6.5 | 6 | 7 | 76.3 | 37.0 | 37.0 | 37.0 | 6 | 12 | 91.0 | 115.0 | 6 | 12 | 42.0 | 45.0 | 5 | 6 | 6 | 6 | 69.6 | 140 | 152 | 164 | 7 | 6.5 | 65.0 | 72.0 | 5 | 10.5 | 5 | 8 | 12 |
| 6 FT | 13 | 13 | 10 | 10 | 6 | 6.5 | 6 | 7 | 67.3 | 37.0 | 37.0 | 37.0 | 7 | 15 | 77.0 | 88.0 | 7 | 15 | 43.0 | 45.0 | 6 | 7.5 | 6 | 6.5 | 64.3 | 141 | 153 | 165 | 7 | 6 | 64.0 | 72.0 | 5 | 12 | 5 | 8 | 12 |
| 8 FT | 14 | 14 | 10 | 10 | 6 | 7 | 6 | 6.5 | 61.5 | 38.0 | 38.0 | 38.0 | 7 | 15 | 71.0 | 79.0 | 7 | 15 | 41.0 | 44.0 | 6 | 7 | 6 | 6 | 60.3 | 142 | 154 | 166 | 7 | 6 | 62.0 | 72.0 | 5 | 12 | 5 | 8 | 0 |
| 10 FT | 15 | 16 | 10 | 10 | 6 | 6.5 | 6 | 6 | 63.9 | 35.0 | 39.0 | 39.0 | 7 | 14 | 76.0 | 85.0 | 7 | 14 | 49.0 | 51.0 | 6 | 6.5 | 6 | 6 | 57.6 | 144 | 156 | 168 | 7 | 6.5 | 61.0 | 72.0 | 5 | 12 | 5 | 8 | 0 |
| 12 FT | 16 | 18 | 11 | 10 | 6 | 6.5 | 6 | 6 | 62.9 | 36.0 | 40.0 | 40.0 | 7 | 14 | 74.0 | 83.0 | 7 | 14 | 48.0 | 51.0 | 6 | 6.5 | 6 | 7 | 56.4 | 146 | 158 | 170 | 7 | 6.5 | 61.0 | 73.0 | 5 | 12 | 5 | 7.5 | 0 |
| 14 FT | 18 | 19 | 12 | 10 | 6 | 6.5 | 6 | 6.5 | 61.8 | 38.0 | 42.0 | 42.0 | 7 | 14 | 72.0 | 82.0 | 7 | 14 | 48.0 | 51.0 | 6 | 6 | 6 | 7 | 55.8 | 147 | 159 | 171 | 7 | 6.5 | 61.0 | 73.0 | 5 | 12 | 5 | 7 | 0 |
| 16 FT | 19 | 21 | 12 | 10 | 6 | 6 | 6 | 6 | 60.8 | 39.0 | 43.0 | 43.0 | 7 | 13 | 71.0 | 81.0 | 7 | 13 | 47.0 | 51.0 | 7 | 8 | 6 | 7 | 54.6 | 149 | 161 | 173 | 7 | 6.5 | 60.0 | 73.0 | 5 | 12 | 5 | 7 | 0 |
| 18 FT | 20 | 22 | 12 | 10 | 7 | 8 | 7 | 8 | 64.6 | 40.0 | 44.0 | 44.0 | 7 | 13 | 70.0 | 81.0 | 7 | 13 | 47.0 | 51.0 | 7 | 7.5 | 6 | 6 | 53.8 | 150 | 162 | 174 | 7 | 6.5 | 60.0 | 73.0 | 5 | 12 | 5 | 7 | 0 |
| 20 FT | 22 | 24 | 13 | 10 | 7 | 8 | 6 | 6 | 59.6 | 42.0 | 46.0 | 46.0 | 7 | 13 | 69.0 | 81.0 | 7 | 13 | 47.0 | 51.0 | 7 | 7 | 6 | 7 | 53.6 | 152 | 164 | 176 | 7 | 6.5 | 60.0 | 73.0 | 5 | 12 | 5 | 6.5 | 0 |
| 22 FT | 23 | 25 | 14 | 10 | 7 | 7 | 6 | 6 | 59.8 | 43.0 | 47.0 | 47.0 | 7 | 12 | 69.0 | 80.0 | 7 | 12 | 47.0 | 50.0 | 7 | 6.5 | 6 | 7 | 53.5 | 153 | 165 | 177 | 7 | 6.5 | 60.0 | 73.0 | 5 | 12 | 5 | 6.5 | 0 |
| 24 FT | 25 | 27 | 14 | 10 | 7 | 7 | 6 | 6 | 59.1 | 45.0 | 49.0 | 49.0 | 7 | 13 | 68.0 | 80.0 | 7 | 13 | 46.0 | 50.0 | 7 | 6.5 | 6 | 7 | 53.3 | 155 | 167 | 179 | 7 | 6 | 60.0 | 74.0 | 5 | 12 | 5 | 6 | 0 |
| 26 FT | 27 | 29 | 14 | 10 | 7 | 6.5 | 6 | 6 | 58.6 | 51.0 | 51.0 | 51.0 | 7 | 13 | 67.0 | 80.0 | 7 | 13 | 46.0 | 50.0 | 7 | 6 | 6 | 7 | 53.0 | 157 | 169 | 181 | 8 | 7.5 | 66.0 | 80.0 | 5 | 12 | 5 | 6 | 0 |
| 28 FT | 28 | 30 | 15 | 10 | 7 | 6.5 | 6 | 6 | 59.1 | 52.0 | 52.0 | 52.0 | 7 | 12 | 67.0 | 79.0 | 7 | 12 | 46.0 | 50.0 | 8 | 7.5 | 6 | 7 | 53.1 | 158 | 170 | 182 | 8 | 7.5 | 66.0 | 80.0 | 5 | 12 | 6 | 8 | 0 |
| 30 FT | 30 | 32 | 15 | 10 | 7 | 6 | 6 | 6 | 58.8 | 54.0 | 54.0 | 54.0 | 7 | 12 | 67.0 | 79.0 | 7 | 12 | 45.0 | 48.0 | 8 | 7 | 6 | 7 | 53.0 | 160 | 172 | 184 | 8 | 7 | 66.0 | 80.0 | 5 | 12 | 6 | 8 | 0 |
| 32 FT | 31 | 33 | 15 | 10 | 8 | 7.5 | 7 | 7 | 63.4 | 55.0 | 55.0 | 55.0 | 8 | 15 | 74.0 | 87.0 | 8 | 15 | 53.0 | 56.0 | 8 | 7 | 6 | 7 | 52.8 | 161 | 173 | 185 | 8 | 6.5 | 66.0 | 80.0 | 5 | 12 | 6 | 8 | 0 |
| 34 FT | 32 | 34 | 16 | 10 | 8 | 7 | 7 | 7.5 | 63.9 | 56.0 | 56.0 | 56.0 | 8 | 14 | 74.0 | 86.0 | 8 | 14 | 52.0 | 56.0 | 8 | 6 | 6 | 7 | 52.9 | 162 | 174 | 186 | 8 | 6 | 66.0 | 80.0 | 5 | 12 | 6 | 8 | 0 |
| 36 FT | 34 | 36 | 16 | 10 | 8 | 7 | 7 | 7.5 | 63.8 | 58.0 | 58.0 | 58.0 | 8 | 14 | 74.0 | 85.0 | 8 | 14 | 51.0 | 54.0 | 8 | 6.5 | 6 | 6.5 | 52.9 | 164 | 176 | 188 | 8 | 6 | 66.0 | 80.0 | 5 | 12 | 6 | 8 | 0 |
| 38 FT | 35 | 37 | 17 | 10 | 8 | 6.5 | 7 | 7.5 | 64.4 | 59.0 | 59.0 | 59.0 | 8 | 13 | 74.0 | 85.0 | 8 | 13 | 51.0 | 53.0 | 8 | 6 | 6 | 6.5 | 53.1 | 165 | 177 | 189 | 8 | 6 | 66.0 | 80.0 | 5 | 12 | 6 | 7.5 | 0 |
| 40 FT | 36 | 39 | 17 | 10 | 8 | 6.5 | 7 | 7 | 64.4 | 60.0 | 60.0 | 60.0 | 8 | 13 | 73.0 | 84.0 | 8 | 13 | 50.0 | 53.0 | 8 | 6.5 | 6 | 6 | 53.1 | 167 | 179 | 191 | 8 | 6 | 66.0 | 80.0 | 5 | 12 | 6 | 7.5 | 0 |
| 42 FT | 37 | 40 | 17 | 10 | 8 | 6 | 7 | 6.5 | 64.3 | 61.0 | 61.0 | 61.0 | 8 | 12 | 73.0 | 84.0 | 8 | 12 | 50.0 | 52.0 | 8 | 6 | 6 | 6 | 53.1 | 168 | 180 | 192 | 9 | 7 | 72.0 | 86.0 | 5 | 12 | 6 | 7.5 | 0 |
| 44 FT | 38 | 41 | 18 | 10 | 8 | 6 | 7 | 7 | 65.0 | 62.0 | 62.0 | 68.0 | 8 | 12 | 73.0 | 83.0 | 8 | 12 | 49.0 | 51.0 | 8 | 6 | 7 | 8 | 56.6 | 169 | 181 | 193 | 9 | 7 | 72.0 | 86.0 | 5 | 12 | 6 | 7 | 0 |
| 46 FT | 39 | 43 | 19 | 10 | 8 | 6 | 7 | 7.5 | 66.0 | 63.0 | 63.0 | 69.0 | 8 | 12 | 73.0 | 82.0 | 8 | 12 | 49.0 | 51.0 | 8 | 6 | 7 | 7.5 | 57.1 | 171 | 183 | 195 | 9 | 7 | 72.0 | 87.0 | 5 | 12 | 6 | 6.5 | 0 |
| 48 FT | 40 | 44 | 19 | 10 | 8 | 6 | 7 | 6.5 | 66.0 | 70.0 | 70.0 | 70.0 | 8 | 12 | 72.0 | 81.0 | 8 | 12 | 48.0 | 50.0 | 8 | 6 | 7 | 7 | 57.3 | 172 | 184 | 196 | 9 | 7 | 72.0 | 87.0 | 5 | 12 | 6 | 6.5 | 0 |
| 50 FT | 41 | 45 | 20 | 10 | 9 | 7.5 | 7 | 7 | 66.9 | 71.0 | 71.0 | 71.0 | 9 | 15 | 80.0 | 88.0 | 9 | 15 | 56.0 | 57.0 | 8 | 6 | 7 | 7 | 57.6 | 173 | 185 | 197 | 9 | 6.5 | 72.0 | 87.0 | 5 | 12 | 6 | 6.5 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 16 FEET
HEIGHT (HT): 8 THRU 13 FEET

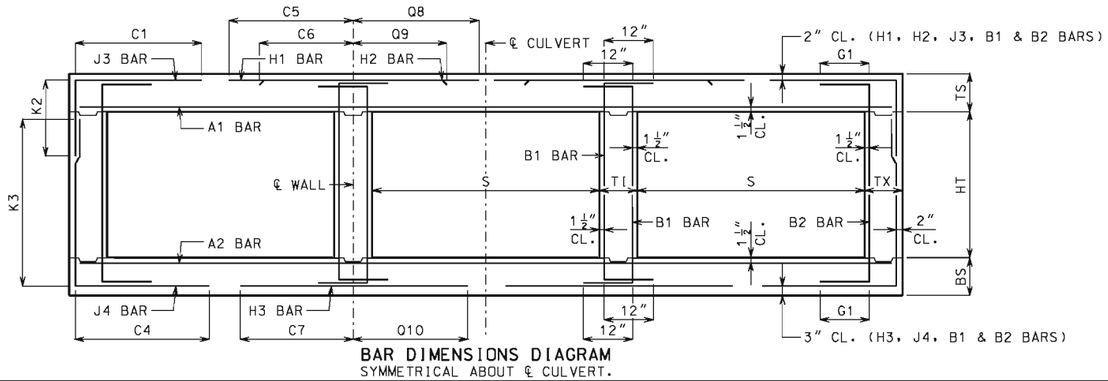
DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

703.87

SHEET NO. 26 OF 27

## SPAN (S) = 16 FT  HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT

| DESIGN FILL | MEMBER THICKNESS | | | | TOP SLAB BARS | | | | | | | | | | | | | | BOTTOM SLAB BARS | | | | | | | | | | | | WALL BARS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A1 BARS | | J3 BARS | | | | | | H1 BARS | | | | H2 BARS | | | | A2 BARS | | J4 BARS | | | | | H3 BARS | | | | B1 BARS | | B2 BARS | |
| | | | | | | | | | | K2 | | | | | | | | | | | | | | K3 | | | | | | | | | | |
| | TS | BS | TX | TI | SIZE | SPA. | SIZE | SPA. | C1 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C5 | Q8 | SIZE | SPA. | C6 | Q9 | SIZE | SPA. | SIZE | SPA. | C4 | HT=14' | HT=15' | HT=16' | SIZE | SPA. | C7 | Q10 | SIZE | SPA. | SIZE | SPA. | G1 |
| 1 FT | 15 | 11 | 12 | 13 | 6 | 7.5 | 6 | 8 | 82.9 | 35.0 | 35.0 | 39.0 | 6 | 16 | 160.5 | 120.5 | 6 | 16 | 51.0 | 55.0 | 5 | 6.5 | 6 | 6 | 97.5 | 175 | 187 | 199 | 7 | 7 | 70.0 | 71.0 | 5 | 10.5 | 5 | 7 | 12 |
| 2 FT | 16 | 12 | 12 | 13 | 6 | 7.5 | 6 | 8 | 82.9 | 36.0 | 36.0 | 40.0 | 6 | 15 | 160.5 | 120.5 | 6 | 15 | 49.0 | 52.0 | 5 | 6 | 6 | 6 | 93.3 | 176 | 188 | 200 | 7 | 7 | 69.0 | 71.0 | 5 | 12 | 5 | 7 | 12 |
| 4 FT | 12 | 13 | 13 | 13 | 6 | 6.5 | 6 | 6.5 | 94.8 | 36.0 | 36.0 | 36.0 | 7 | 16 | 92.0 | 94.0 | 7 | 16 | 46.0 | 46.0 | 5 | 6 | 6 | 6.5 | 87.8 | 177 | 189 | 201 | 7 | 7 | 68.0 | 73.0 | 5 | 8.5 | 5 | 6.5 | 12 |
| 6 FT | 13 | 13 | 13 | 13 | 6 | 7 | 6 | 7 | 82.5 | 37.0 | 37.0 | 37.0 | 7 | 16 | 77.0 | 81.0 | 7 | 16 | 44.0 | 45.0 | 6 | 7.5 | 6 | 6 | 79.3 | 177 | 189 | 201 | 7 | 6 | 66.0 | 71.0 | 5 | 12 | 5 | 6.5 | 12 |
| 8 FT | 14 | 15 | 13 | 13 | 6 | 7 | 6 | 6.5 | 77.9 | 38.0 | 38.0 | 38.0 | 7 | 15 | 73.0 | 77.0 | 7 | 15 | 43.0 | 44.0 | 6 | 7.5 | 6 | 6.5 | 77.8 | 179 | 191 | 203 | 7 | 6.5 | 64.0 | 72.0 | 5 | 12 | 5 | 6.5 | 0 |
| 10 FT | 15 | 16 | 13 | 13 | 6 | 7 | 6 | 6 | 80.9 | 39.0 | 39.0 | 39.0 | 7 | 15 | 78.0 | 83.0 | 7 | 15 | 50.0 | 51.0 | 6 | 6.5 | 6 | 6 | 75.3 | 180 | 192 | 204 | 7 | 6 | 63.0 | 72.0 | 5 | 12 | 5 | 6.5 | 0 |
| 12 FT | 16 | 18 | 14 | 13 | 6 | 6.5 | 6 | 6 | 78.5 | 40.0 | 40.0 | 40.0 | 7 | 14 | 76.0 | 82.0 | 7 | 14 | 49.0 | 51.0 | 6 | 6.5 | 6 | 6 | 73.8 | 182 | 194 | 206 | 7 | 6.5 | 63.0 | 72.0 | 5 | 12 | 5 | 6 | 0 |
| 14 FT | 17 | 19 | 14 | 13 | 6 | 6 | 7 | 7.5 | 81.6 | 41.0 | 41.0 | 47.0 | 7 | 13 | 74.0 | 81.0 | 7 | 13 | 49.0 | 51.0 | 6 | 6 | 7 | 7.5 | 75.0 | 183 | 195 | 207 | 7 | 6.5 | 62.0 | 72.0 | 5 | 12 | 5 | 6 | 0 |
| 16 FT | 19 | 21 | 15 | 13 | 6 | 6.5 | 7 | 7.5 | 80.9 | 43.0 | 43.0 | 49.0 | 7 | 14 | 73.0 | 81.0 | 7 | 14 | 49.0 | 51.0 | 7 | 8 | 7 | 7.5 | 74.0 | 185 | 197 | 209 | 7 | 6.5 | 62.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 18 FT | 20 | 22 | 16 | 13 | 6 | 6 | 7 | 7.5 | 80.0 | 44.0 | 44.0 | 50.0 | 7 | 13 | 72.0 | 80.0 | 7 | 13 | 49.0 | 51.0 | 7 | 7.5 | 7 | 7.5 | 72.9 | 186 | 198 | 210 | 7 | 6.5 | 62.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 20 FT | 22 | 24 | 16 | 13 | 6 | 6 | 7 | 7 | 79.1 | 46.0 | 46.0 | 52.0 | 7 | 13 | 71.0 | 80.0 | 7 | 13 | 48.0 | 51.0 | 7 | 7 | 7 | 7.5 | 72.3 | 188 | 200 | 212 | 7 | 6.5 | 62.0 | 73.0 | 5 | 12 | 6 | 8 | 0 |
| 22 FT | 23 | 25 | 17 | 13 | 7 | 7.5 | 7 | 7 | 78.8 | 47.0 | 47.0 | 53.0 | 7 | 13 | 70.0 | 80.0 | 7 | 13 | 48.0 | 51.0 | 7 | 6 | 7 | 8 | 71.5 | 189 | 201 | 213 | 7 | 6 | 62.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |
| 24 FT | 25 | 27 | 17 | 13 | 7 | 7 | 7 | 7 | 78.1 | 49.0 | 49.0 | 55.0 | 7 | 13 | 70.0 | 80.0 | 7 | 13 | 48.0 | 51.0 | 7 | 6.5 | 7 | 7 | 71.3 | 191 | 203 | 215 | 7 | 6 | 61.0 | 73.0 | 5 | 12 | 6 | 7.5 | 0 |
| 26 FT | 26 | 29 | 18 | 13 | 7 | 7 | 7 | 7 | 78.1 | 50.0 | 50.0 | 56.0 | 7 | 12 | 69.0 | 79.0 | 7 | 12 | 48.0 | 51.0 | 7 | 6 | 7 | 8 | 71.0 | 193 | 205 | 217 | 8 | 7.5 | 67.0 | 80.0 | 5 | 12 | 6 | 7 | 0 |
| 28 FT | 28 | 30 | 19 | 13 | 7 | 6.5 | 7 | 7 | 78.3 | 52.0 | 52.0 | 52.0 | 7 | 12 | 68.0 | 79.0 | 7 | 12 | 47.0 | 51.0 | 8 | 7.5 | 6 | 6 | 67.8 | 194 | 206 | 218 | 8 | 7.5 | 67.0 | 80.0 | 5 | 12 | 6 | 6.5 | 0 |
| 30 FT | 29 | 32 | 19 | 13 | 7 | 6 | 7 | 6.5 | 77.9 | 53.0 | 53.0 | 59.0 | 7 | 12 | 68.0 | 79.0 | 7 | 12 | 47.0 | 51.0 | 8 | 7 | 7 | 7.5 | 70.5 | 196 | 208 | 220 | 8 | 7 | 67.0 | 80.0 | 5 | 12 | 6 | 6.5 | 0 |
| 32 FT | 31 | 33 | 20 | 13 | 8 | 7.5 | 7 | 6.5 | 78.1 | 55.0 | 55.0 | 61.0 | 8 | 15 | 76.0 | 87.0 | 8 | 15 | 53.0 | 57.0 | 8 | 7 | 7 | 8 | 70.4 | 197 | 209 | 221 | 8 | 6.5 | 67.0 | 80.0 | 5 | 12 | 6 | 6.5 | 0 |
| 34 FT | 32 | 34 | 20 | 13 | 8 | 7.5 | 7 | 6 | 77.6 | 56.0 | 56.0 | 62.0 | 8 | 14 | 75.0 | 86.0 | 8 | 14 | 53.0 | 56.0 | 8 | 6 | 7 | 7 | 70.0 | 198 | 210 | 222 | 8 | 6 | 67.0 | 80.0 | 5 | 12 | 6 | 6.5 | 0 |
| 36 FT | 33 | 36 | 22 | 13 | 8 | 7 | 7 | 6.5 | 78.8 | 57.0 | 63.0 | 63.0 | 8 | 14 | 75.0 | 86.0 | 8 | 14 | 53.0 | 56.0 | 8 | 6.5 | 7 | 7.5 | 70.3 | 200 | 212 | 224 | 8 | 6 | 67.0 | 81.0 | 5 | 12 | 6 | 6 | 0 |
| 38 FT | 34 | 37 | 23 | 13 | 8 | 6.5 | 7 | 6.5 | 79.1 | 58.0 | 64.0 | 64.0 | 8 | 13 | 75.0 | 85.0 | 8 | 13 | 53.0 | 56.0 | 8 | 6 | 7 | 7.5 | 70.3 | 201 | 213 | 225 | 8 | 6 | 67.0 | 81.0 | 5 | 12 | 6 | 6 | 0 |
| 40 FT | 36 | 39 | 23 | 13 | 8 | 6.5 | 7 | 6.5 | 79.0 | 60.0 | 66.0 | 66.0 | 8 | 13 | 75.0 | 85.0 | 8 | 13 | 51.0 | 54.0 | 8 | 6.5 | 7 | 7.5 | 70.3 | 203 | 215 | 227 | 8 | 6 | 67.0 | 81.0 | 5 | 12 | 7 | 7.5 | 0 |
| 42 FT | 37 | 40 | 23 | 13 | 8 | 6.5 | 7 | 6 | 78.9 | 61.0 | 67.0 | 67.0 | 8 | 12 | 74.0 | 84.0 | 8 | 12 | 51.0 | 53.0 | 8 | 6 | 7 | 7 | 70.3 | 204 | 216 | 228 | 9 | 7 | 73.0 | 87.0 | 5 | 12 | 7 | 7.5 | 0 |
| 44 FT | 38 | 42 | 24 | 13 | 8 | 6 | 7 | 6 | 79.8 | 68.0 | 68.0 | 68.0 | 8 | 12 | 74.0 | 83.0 | 8 | 12 | 50.0 | 52.0 | 8 | 6 | 7 | 7 | 70.8 | 206 | 218 | 230 | 9 | 7 | 73.0 | 87.0 | 5 | 12 | 7 | 7.5 | 0 |
| 46 FT | 39 | 43 | 26 | 13 | 8 | 6 | 7 | 6.5 | 81.4 | 69.0 | 69.0 | 69.0 | 8 | 12 | 74.0 | 83.0 | 8 | 12 | 50.0 | 52.0 | 8 | 6 | 7 | 7 | 71.3 | 207 | 219 | 231 | 9 | 7 | 73.0 | 87.0 | 5 | 12 | 7 | 7.5 | 0 |
| 48 FT | 40 | 44 | 27 | 13 | 8 | 6 | 7 | 6 | 82.1 | 70.0 | 70.0 | 70.0 | 8 | 12 | 74.0 | 82.0 | 8 | 12 | 49.0 | 51.0 | 8 | 6 | 7 | 7 | 71.6 | 208 | 220 | 232 | 9 | 7 | 73.0 | 88.0 | 5 | 12 | 7 | 8 | 0 |
| 50 FT | 41 | 45 | 28 | 13 | 9 | 7.5 | 7 | 6 | 83.0 | 71.0 | 71.0 | 71.0 | 9 | 15 | 82.0 | 89.0 | 9 | 15 | 57.0 | 58.0 | 8 | 6 | 7 | 7 | 72.0 | 209 | 221 | 233 | 9 | 6.5 | 73.0 | 88.0 | 5 | 12 | 7 | 8 | 0 |




BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT ℄ CULVERT.

### GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
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# CONCRETE TRIPLE BOX CULVERT

## MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

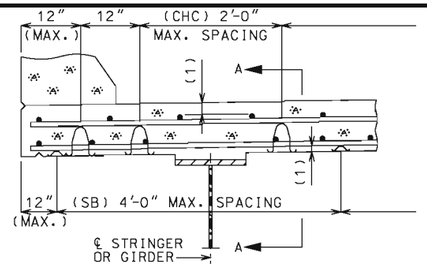
SPAN (S): 16 FEET
HEIGHT (HT): 14 THRU 16 FEET

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/29/2011

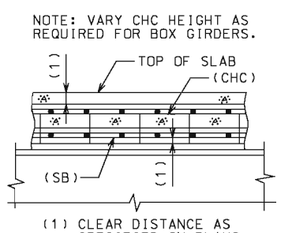
703.87

SHEET NO. 27 OF 27

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



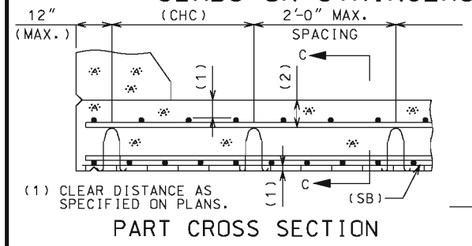

PART CROSS SECTION



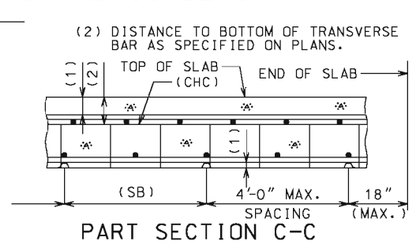

PART SECTION A-A

W BEAM SPANS
PLATE GIRDER SPANS
PRESTRESSED GIRDER SPANS
DECK GIRDER SPANS
BOX GIRDER SPANS (TOP SLAB ONLY)

## SLABS ON STRINGERS AND GIRDERS

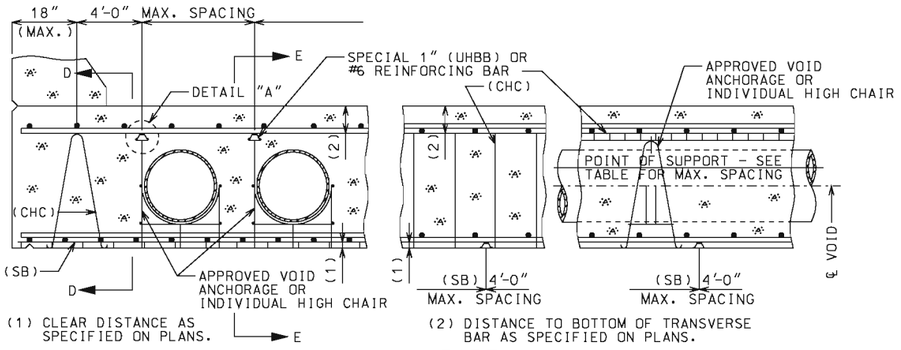



PART CROSS SECTION




PART SECTION C-C

## SLAB SPANS - NO VOIDS (SOLID)
## TRUSSES - NO LONGITUDINAL STRINGERS

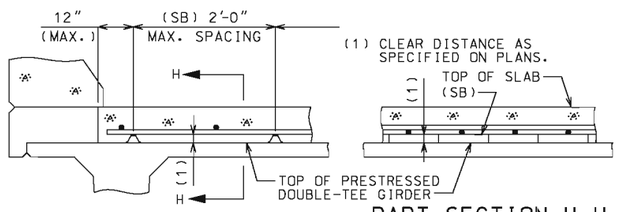



PART CROSS SECTION

PART SECTION D-D

PART SECTION E-E

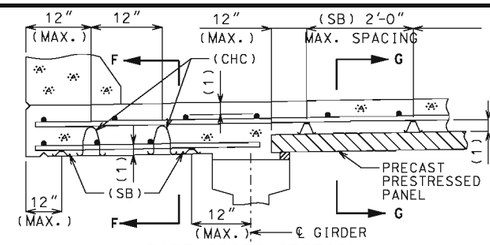
## SLAB SPANS - WITH VOIDS



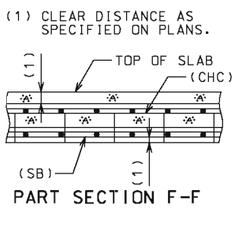

PART CROSS SECTION

PART SECTION H-H

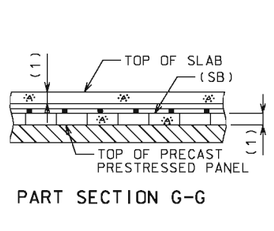
## SLABS ON P/S DOUBLE-TEE GIRDER




PART CROSS SECTION

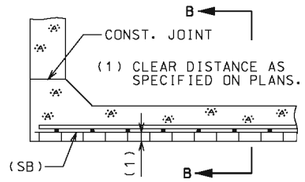



PART SECTION F-F

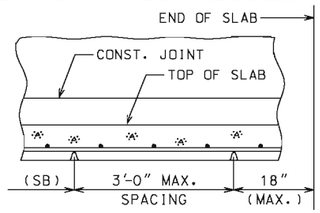



PART SECTION G-G

## SLABS ON PRECAST PRESTRESSED PANELS

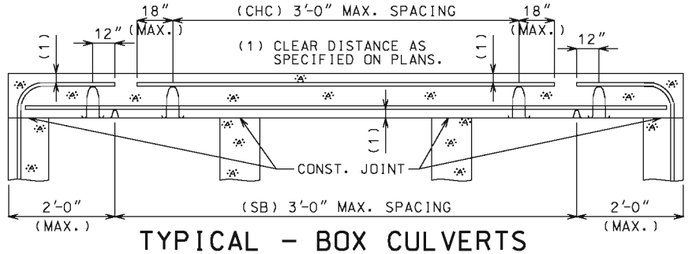



PART CROSS SECTION

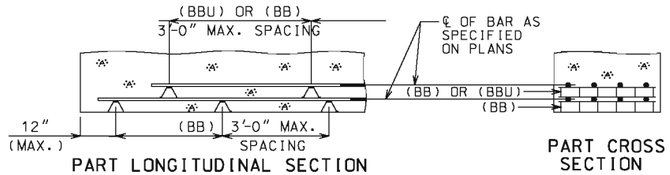



PART SECTION B-B

## BOX GIRDER - BOTTOM SLAB




TYPICAL - BOX CULVERTS

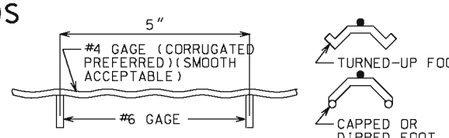



PART LONGITUDINAL SECTION

PART CROSS SECTION

DECK GIRDERS
SUBSTRUCTURE BEAMS
VOIDED SLAB DROP PANELS
BOX GIRDER CROSS BEAMS
} RECOMMENDED METHOD

TYPICAL - BEAMS & GIRDERS

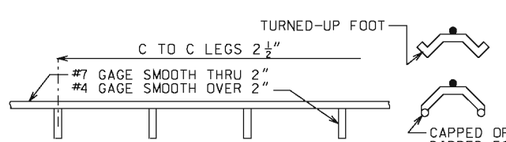



ELEVATION




SECTION

## SLAB BOLSTER - SB

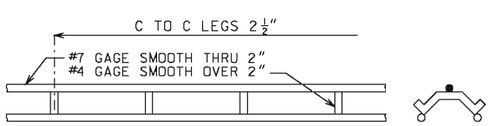



ELEVATION




SECTION

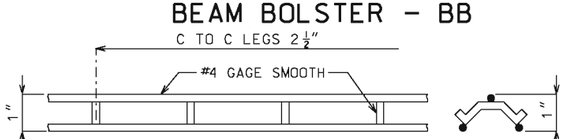
## BEAM BOLSTER - BB




ELEVATION

SECTION

## BEAM BOLSTER UPPER - BBU

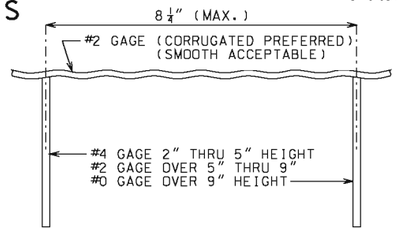



ELEVATION

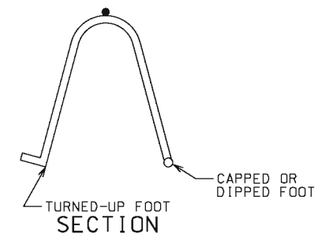
SECTION

## SPECIAL 1" UPPER HEAVY BEAM BOLSTER (SPECIAL 1" UHBB)

## PART DETAIL "A"



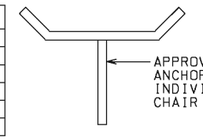

ELEVATION




SECTION

## CONTINUOUS HIGH CHAIR - CHC

| VOIDS | MAX. SPACING |
|---|---|
| 14" & LESS | 4'-0" |
| 16" & 17" | 3'-0" |
| 19" | 2'-6" |
| 21" | 2'-0" |
| 22" | 21" |
| 23" & UP | 18" |




ALL CONTACT POINTS ON WIRE BAR SUPPORTS SHALL BE SECURELY WELDED.

A TURNED-UP, CAPPED OR DIPPED FOOT SHALL BE ON ALL BAR SUPPORTS BEARING ON FORMS. WHERE BAR SUPPORTS ARE USED ON EARTH OR AGGREGATE SUBGRADES, SUITABLE PLATES, CONTINUOUS BARS OR PRECAST CONCRETE BAR SUPPORTS SHALL BE PROVIDED TO PREVENT DISPLACEMENT OF THE SUPPORT FOOT.

ALL DIMENSIONS TO REINFORCING STEEL ARE TO ℄ BAR EXCEPT WHERE CLEAR DISTANCE FROM FACE OF CONCRETE IS INDICATED. HEIGHT OF BAR SUPPORTS TO BE THAT REQUIRED TO SUPPORT BARS IN EXACT POSITIONS SHOWN ON PLANS.

SPIRAL REINFORCING SHALL BE SUPPORTED BY USE OF APPROVED SPIRAL SPACERS AT NOT MORE THAN 3'-0" CENTERS. PAYMENT FOR SPACERS AND ALL OTHER BAR SUPPORTS WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

WHEN BARS OF DIFFERENT SIZES ARE USED IN THE SAME MEMBERS, THE SELECTION OF BAR SUPPORTS SHALL BE BASED ON THE LARGER SIZE.

SUPPORTS FOR THE UPPER LAYERS NEED NOT BE DIRECTLY OVER THE SUPPORTS BELOW.

ALL BAR SUPPORTS SHALL BE IN ACCORDANCE WITH C.R.S.I. MANUAL OF STANDARD PRACTICE, EXCEPT AS SHOWN.

WIRE BAR AND REINFORCING BAR SUPPORTS USED WITH EPOXY COATED REINFORCING STEEL SHALL BE COATED ENTIRELY WITH AN EPOXY OR PLASTIC MATERIAL.

ALL UNCOATED WIRE BAR SUPPORTS SHALL HAVE CAPPED OR DIPPED FEET FOR THOSE APPLICATIONS WHERE MINIMIZING RUST SPOTS AND SURFACE BLEMISHES ARE EXPECTED TO BECOME VISIBLE. COLOR SHALL MATCH CONCRETE.

INDIVIDUAL HIGH CHAIRS AND SPACING WILL BE PERMITTED AS APPROVED BY THE ENGINEER. INDIVIDUAL HIGH CHAIRS SHALL NOT BE PERMITTED FOR USE ON SOLID SLAB AND VOIDED SLAB BRIDGES, EXCEPT AS SHOWN.

PLASTIC BAR SUPPORTS SHALL MEET OR EXCEED THE LOAD CARRYING CAPACITY OF AND BE PLACED AT THE SAME SPACING FOR STEEL WIRE BAR SUPPORTS AS SHOWN.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
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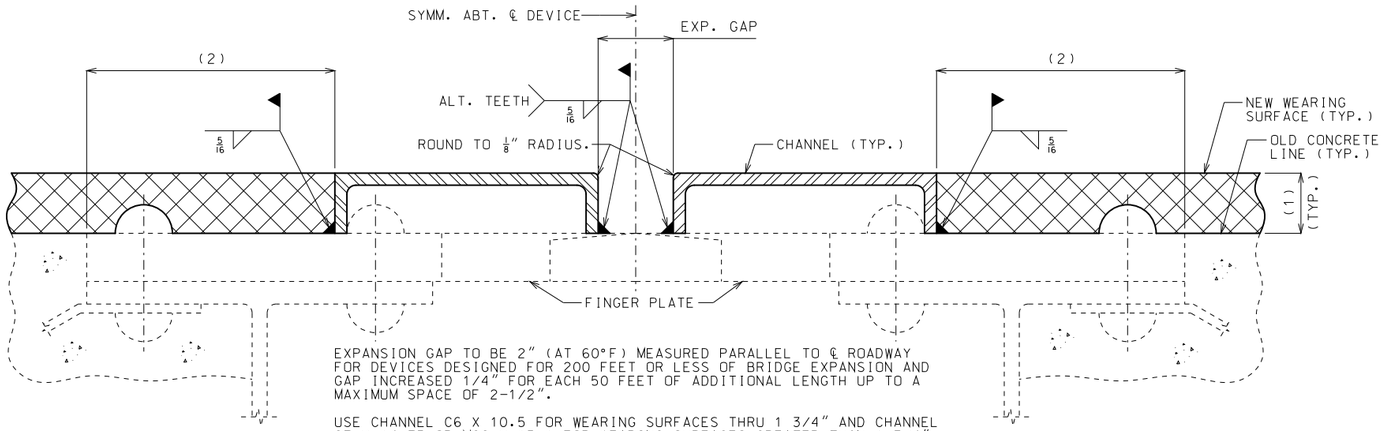

STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
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# BAR SUPPORTS FOR CONCRETE REINFORCEMENT

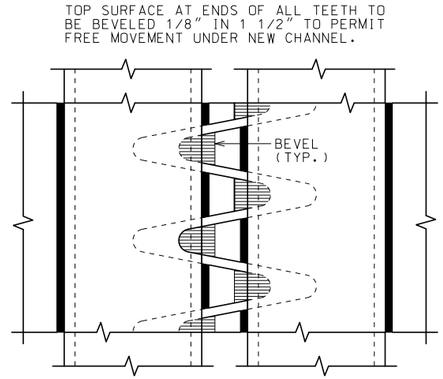
DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 9/3/2009

706.35H

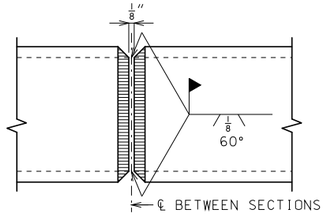
SHEET NO. 1 OF 1




PART SECTION THRU EXPANSION DEVICE

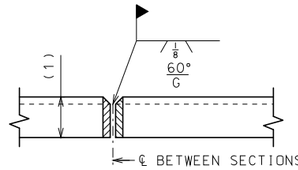



PART PLAN AT EXPANSION DEVICE



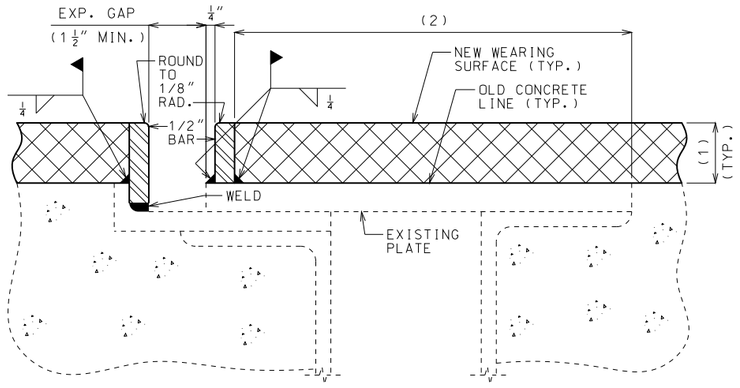

PLAN OF CHANNEL SPLICE

SPLICE TO BE AT ℄ ROADWAY FOR TWO LANE BRIDGES.



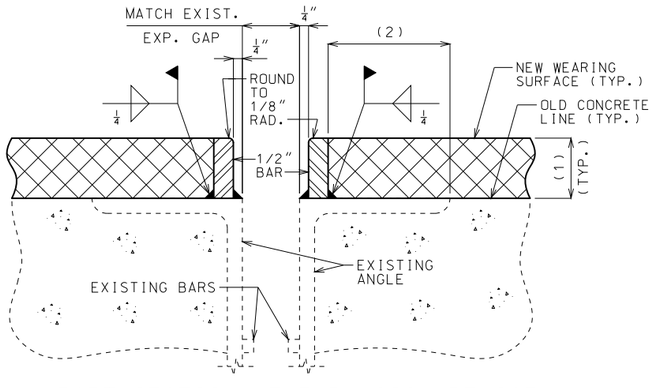

ELEVATION OF CHANNEL SPLICE

## TYPE A – FINGER TYPE EXPANSION DEVICES



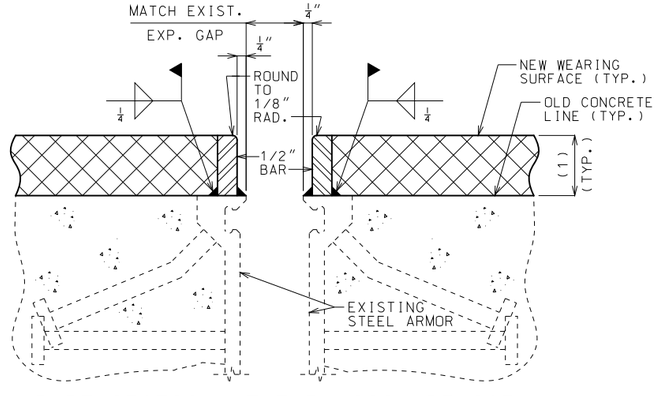

PART SECTION AT EXPANSION DEVICE

## TYPE B – PLATE TYPE EXPANSION DEVICES




PART SECTION AT EXPANSION DEVICE

## TYPE C – ANGLE TYPE EXPANSION DEVICES




PART SECTION AT EXPANSION DEVICE

## TYPE D – STRIP SEAL TYPE EXPANSION DEVICES

(1) WEARING SURFACE THICKNESS

(2) WHEN THIS DIMENSION EXCEEDS 3" AND A CONCRETE WEARING SURFACE IS USED, TACK WELD A ONE INCH BAR CHAIR TO THE PLATE OR ANGLE FOR EACH 3" OF PLATE OR ANGLE TO BE COVERED BY WEARING SURFACE.

### GENERAL NOTES:

OUTLINE OF OLD WORK IS INDICATED BY LIGHT DASHED LINES. HEAVY LINES INDICATE NEW WORK.

STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH ASTM A709 GRADE 36.

QUALIFICATION OF WELDING OPERATORS WILL BE REQUIRED.

E7016 OR E7018 ELECTRODES SHALL BE USED.

THE STEEL DAMS SHALL EXTEND FULL ROADWAY WIDTH BETWEEN CURBS, BUT SHALL BE INSTALLED IN SECTIONS OF SUCH LENGTHS TO PERMIT AT LEAST ONE WAY TRAFFIC AT ALL TIMES. BEFORE TRAFFIC IS PERMITTED TO CROSS OVER SECTIONS OF DAMS IN PLACE, SUFFICIENT WEARING SURFACE SHALL BE PLACED ON ROADWAY SLAB ADJACENT TO BOTH SIDES OF EXPANSION DEVICE TO PREVENT ANY DAMAGE TO EITHER THE STEEL DAMS OR TIRES OF VEHICLES.

STEEL DAMS SHALL BE FABRICATED AND INSTALLED TO THE CROWN AND GRADE OF THE ROADWAY.

STEEL CHANNELS OR BARS ON BOTH SIDES OF EXPANSION JOINT. FOR FULL WIDTH OF ROADWAY, WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR STEEL BAR DAM.

PAINT INSIDE SURFACE OF CHANNEL 5.0 MILS THICKNESS OF INORGANIC ZINC PRIMER.

SHOP DRAWINGS WILL NOT BE REQUIRED FOR STEEL BAR DAMS.

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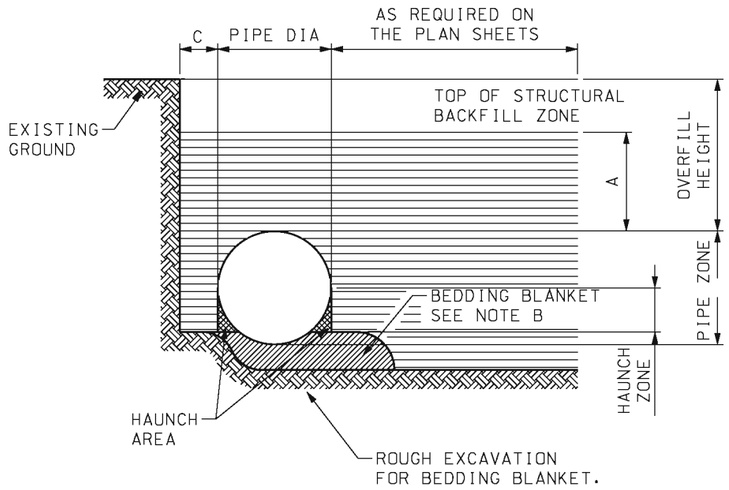
STATE OF MISSOURI
DENNIS W. HECKMAN
NUMBER PE-27141
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# STEEL DAMS

AT EXPANSION DEVICES
FOR RESURFACING BRIDGE FLOORS

| DATE EFFECTIVE: | 04/01/2016 | 712.40K | SHEET NO. |
|---|---|---|---|
| DATE PREPARED: | 2/17/2016 | | 1 OF 1 |

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




TYPICAL TRENCH DETAIL

## PIPE INSTALLATION AND BEDDING

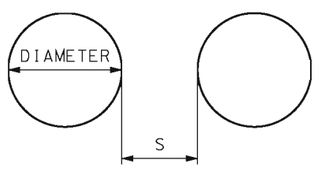
NOTE:

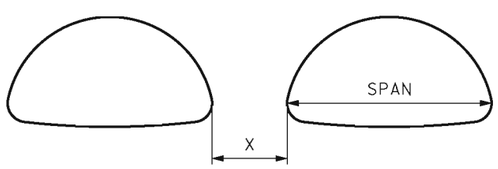
A) MINIMUM STRUCTURAL BACKFILL OVER TOP OF PIPE SHALL BE ONE-EIGHTH DIAMETER OR SPAN OF PIPE OR ONE FOOT WHICHEVER IS GREATER.

B) BEDDING BLANKET OF LOOSE FILL SHALL BE ROUGHLY SHAPED TO FIT BOTTOM OF PIPE. MINIMUM THICKNESS BEFORE PLACING PIPE SHALL BE AS FOLLOWS:

| DEPTH OF CORRUGATION | MIN. BEDDING THICKNESS |
|---|---|
| ½" | 1" |
| 1" | 2" |
| 2" | 3" |

C) TRENCH INSTALLATIONS - 2 FEET MINIMUM EACH SIDE OF CULVERT. THIS RECOMMENDED LIMIT SHOULD BE MODIFIED AS NECESSARY TO ACCOUNT FOR VARIABLES SUCH AS POOR IN-SITU SOILS. EMBANKMENT INSTALLATIONS - ONE DIAMETER OR SPAN EACH SIDE OF CULVERT.

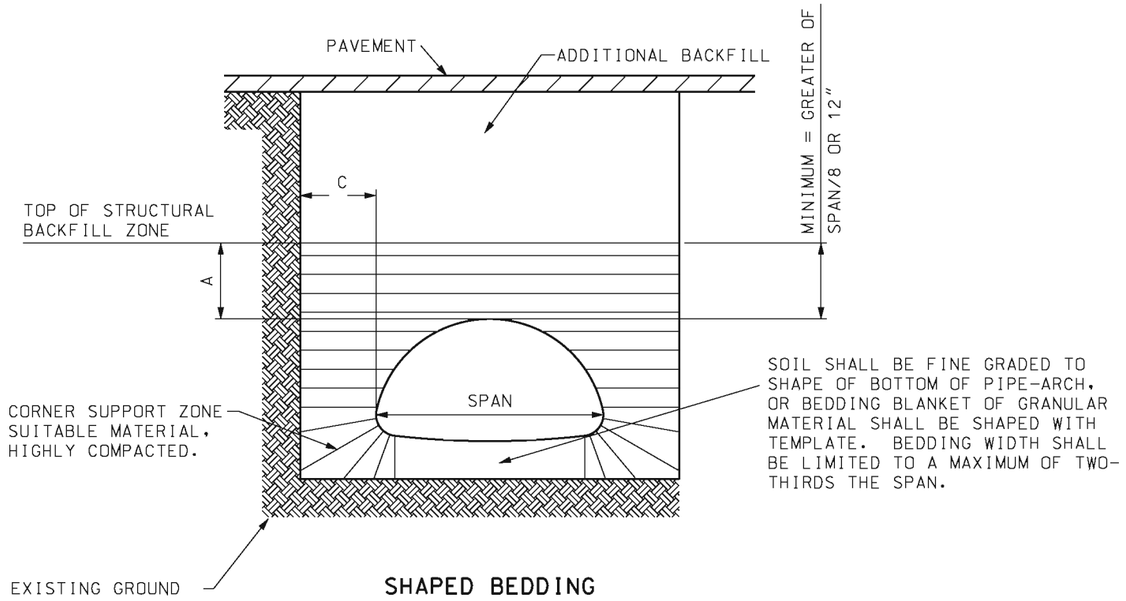


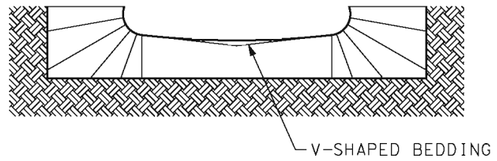

| PIPE | |
|---|---|
| DIAMETER | SPACE S |
| UP TO 24" | 12" |
| 24" TO 72" | ½ PIPE DIA |
| 72" AND OVER | 36" |

| PIPE-ARCHES | |
|---|---|
| SPAN | SPACE X |
| UP TO 36" | 12" |
| 36" TO 108" | 1/3 ARCH SPAN |
| 108" TO 189" | 36" |

## MULTIPLE STRUCTURE SPACING



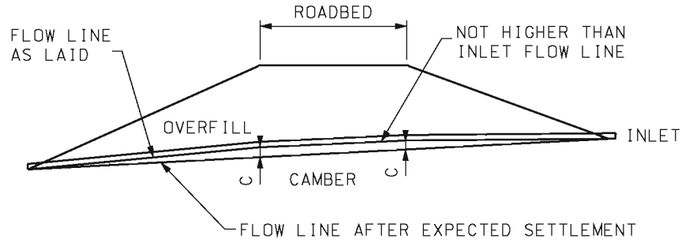

SHAPED BEDDING




ALTERNATIVE-SHAPED BEDDING

PIPE-ARCH TRENCH DETAIL

## BEDDING AND CORNER ZONE TREATMENT FOR PIPE ARCH STRUCTURES




## 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.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CORRUGATED METAL PIPE INSTALLATION METHODS

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 3/10/2011

725.00C

SHEET NO. 1 OF 5

# CORRUGATED METALIC-COATED STEEL CIRCULAR PIPE LOCK SEAM

## MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

| SPECIFIED DIAMETER OF PIPE | MINIMUM COVER | | SPECIFIED THICKNEWW OF COATED SHEET (IN.) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.064 | | | | 0.079 | | | | 0.109 | | | | 0.138 | | | | 0.168 | | | |
| | CORRUGATED | SPIRAL RIB | A | B | C | D | A | B | C | D | A | B | C | D | A | B | C | D | A | B | C | D |
| IN. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. |
| 12 | 1 | 1 | 219 | 251 | 224 | 144 | 273 | 314 | 280 | 201 | 382 | 440 | 392 | 334 | 492 | 566 | 504 | 484 | 602 | 693 | 617 | |
| 15 | 1 | 1 | 175 | 201 | 179 | 115 | 218 | 251 | 224 | 161 | 306 | 352 | 314 | 267 | 394 | 453 | 403 | 387 | 481 | 555 | 493 | |
| 18 | 1 | 1 | 146 | 167 | 149 | 96 | 182 | 209 | 187 | 134 | 255 | 293 | 261 | 223 | 328 | 378 | 336 | 323 | 401 | 462 | 411 | |
| 21 | 1 | 1 | 125 | 143 | 128 | 82 | 156 | 179 | 160 | 115 | 219 | 251 | 224 | 191 | 281 | 324 | 288 | 277 | 344 | 396 | 352 | |
| 24 | 1 | 1 | 109 | 126 | 112 | 72 | 137 | 157 | 140 | 100 | 191 | 220 | 196 | 167 | 246 | 283 | 252 | 242 | 301 | 347 | 308 | |
| 30 | 1 | 1 | 87 | 100 | 90 | 57 | 109 | 126 | 112 | 80 | 153 | 176 | 157 | 134 | 197 | 227 | 202 | 194 | 241 | 277 | 247 | |
| 36 | 1 | 1 | 73 | 84 | 75 | 48 | 91 | 105 | 93 | 67 | 127 | 147 | 131 | 111 | 164 | 189 | 168 | 161 | 201 | 231 | 206 | |
| 42 | 1 | 1 | 62 | 72 | 64 | 41 | 78 | 90 | 80 | 57 | 109 | 126 | 112 | 95 | 141 | 162 | 144 | 138 | 172 | 198 | 176 | |
| 48 | 1 | 1 | 55 | 63 | 56 | 36 | 68 | 78 | 70 | 50 | 96 | 110 | 98 | 83 | 123 | 142 | 126 | 121 | 150 | 173 | 154 | |
| 54 | 1 | 2 | | 56 | 50 | 32✳ | 61 | 70 | 62 | 45 | 85 | 98 | 87 | 74 | 109 | 126 | 112 | 108 | 134 | 154 | 137 | |
| 60 | 1 | 2 | | 50 | 45 | | | 63 | 56 | 40 | 76 | 88 | 78 | 67 | 98 | 113 | 101 | 97 | 120 | 139 | 123 | |
| 66 | 1 | 2 | | 46 | 41 | | | 57 | 51 | 37✳ | | 80 | 71 | 61 | 89 | 103 | 92 | 88 | 109 | 126 | 112 | |
| 72 | 1 | 2 | | 42 | 37 | | | 52 | 47 | | | 73 | 65 | 56 | 82 | 94 | 84 | 81 | 100 | 116 | 103 | |
| 78 | 1 | 2 | | 39 | 34 | | | 48 | 43 | | | 68 | 60 | 51 | | 87 | 78 | 75 | 89 | 107 | 95 | |
| 84 | 1 | 2 | | 36 | 32 | | | 45 | 40 | | | 63 | 56 | 48✳ | | 81 | 72 | 69 | 77 | 99 | 88 | |
| 90 | 1 | 2 | | 33 | 30 | | | 42 | 37 | | | 59 | 52 | | | 76 | 67 | 65 | | 92 | 82 | |
| 96 | 1 | 2 | | | | | | 39 | 35 | | | 55 | 49 | | | 71 | 63 | 60✳ | | 87 | 77 | |
| 102 | 2 | 3 | | | | | | 37 | 33 | | | 52 | 46 | | | 67 | 59 | 53✳ | | 82 | 73 | |
| 108 | 2 | 3 | | | | | | | | | | 49 | 44 | | | 63 | 56 | | | 77 | 69 | |
| 114 | 2 | 3 | | | | | | | | | | 46 | 41 | | | 60 | 53 | | | 73 | 65 | |
| 120 | 2 | 3 | | | | | | | | | | 44 | 39 | | | 57 | 50 | | | 69 | 62 | |
| 126 | 2 | 3 | | | | | | | | | | | | | | 54 | 48 | | | 66 | 59 | |

# CORRUGATED METALIC-COATED STEEL CIRCULAR PIPE RIVETED SEAM

## MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

| SPECIFIED DIAMETER OF PIPE | MINIMUM COVER | | SPECIFIED THICKNEWW OF COATED SHEET (IN.) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.064 | | | | 0.079 | | | | 0.109 | | | | 0.138 | | | | 0.168 | | | |
| | | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | |
| | CORRUGATED | SPIRAL RIB | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| IN. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. |
| 12 | 1 | 1 | 143 | | 185 | 245 | 156 | | 255 | 305 | 200 | | 382 | 440 | 209 | | 419 | 544 | 219 | | 438 | 604 |
| 15 | 1 | 1 | 114 | | 148 | 196 | 124 | | 204 | 244 | 160 | | 306 | 352 | 168 | | 335 | 436 | 175 | | 351 | 483 |
| 18 | 1 | 1 | 95 | | 123 | 164 | 104 | | 170 | 203 | 133 | | 255 | 293 | 140 | | 279 | 363 | 146 | | 292 | 403 |
| 21 | 1 | 1 | 82 | | 105 | 140 | 89 | | 146 | 174 | 114 | | 219 | 251 | 120 | | 239 | 311 | 125 | | 251 | 345 |
| 24 | 1 | 1 | 71 | | 92 | 123 | 78 | | 127 | 153 | 100 | | 191 | 220 | 105 | | 209 | 272 | 109 | | 219 | 302 |
| 30 | 1 | 1 | 57 | | 74 | 98 | 62 | | 102 | 122 | 80 | | 153 | 176 | 84 | | 168 | 218 | 88 | | 175 | 242 |
| 36 | 1 | 1 | 48 | | 62 | 82 | 52 | | 85 | 102 | 67 | | 127 | 147 | 70 | | 140 | 181 | 73 | | 146 | 201 |
| 42 | 1 | 1 | 41 | | 53 | 70 | 44 | | 73 | 87 | 57 | | 109 | 126 | 60 | | 120 | 156 | 63 | | 125 | 173 |
| 48 | 1 | 1 | 36 | | 46 | 61 | 39 | | 64 | 76 | 50 | | 96 | 110 | 52 | | 105 | 136 | 55 | | 110 | 151 |
| 54 | 1 | 2 | | | | 55 | 35 | | 57 | 68 | 44 | | 85 | 98 | 47 | | 93 | 121 | 49 | | 97 | 134 |
| 60 | 1 | 2 | | | | 49 | | | | 61 | 40 | | 76 | 88 | 42 | | 84 | 109 | 44 | | 88 | 121 |
| 66 | 1 | 2 | | | | 45 | | | | 55 | | | | 80 | 38 | | 76 | 99 | 40 | | 80 | 110 |
| 72 | 1 | 2 | | | | 41 | | | | 51 | | | | 73 | 35 | | 70 | 91 | 36 | | 73 | 101 |
| 78 | 1 | 2 | | | | 38 | | | | 47 | | | | 68 | | | | 84 | 34 | | 67 | 93 |
| 84 | 1 | 2 | | | | 35 | | | | 44 | | | | 63 | | | | 78 | 31 | | 63 | 86 |
| 90 | 1 | 2 | | | | 33 | | | | 41 | | | | 59 | | | | 73 | | | | 81 |
| 96 | 1 | 2 | | | | | | | | 38 | | | | 55 | | | | 68 | | | | 76 |
| 102 | 2 | 3 | | | | | | | | 36 | | | | 52 | | | | 64 | | | | 71 |
| 108 | 2 | 3 | | | | | | | | | | | | 49 | | | | 60 | | | | 67 |
| 114 | 2 | 3 | | | | | | | | | | | | 46 | | | | 57 | | | | 64 |
| 120 | 2 | 3 | | | | | | | | | | | | 44 | | | | 54 | | | | 60 |
| 126 | 2 | 3 | | | | | | | | | | | | | | | | 52 | | | | 58 |

✳ FOR TRENCH INSTALLATION ONLY

A = 2-2/3" X 1/2" CORRUGATIONS.
B = 3" X 1" CORRUGATIONS.
C = 5" X 1" CORRAGATIONS
D = 3/4" X 3/4" X 7-1/2" SPIRAL RIB

(1) MAXIMUM OVERFILL MEASURED FROM THE TOP OF PIPE TO SURFACE.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CORRUGATED METAL PIPE INSTALLATION METHODS

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 3/9/2011

725.00C

# CORRUGATED H32 ALUMINUM CIRCULAR PIPE LOCK SEAM

## MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

| SPECIFIED DIAMETER OF PIPE | MINIMUM COVER | | SPECIFIED THICKNEWW OF COATED SHEET (IN.) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.06 | | | | 0.075 | | | | 0.105 | | | | 0.135 | | | | 0.164 | | | |
| | CORRUGATED | SPIRAL RIB | A | B | C | D | A | B | C | D | A | B | C | D | A | B | C | D | A | B | C | D |
| IN. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. |
| 12 | 1 | 1 | 132 | 152 | | 71 | 165 | 191 | | 97 | 232 | 267 | | 156 | 298 | 357 | | 221 | 364 | 420 | | |
| 15 | 1 | 1 | 106 | 122 | | 57 | 132 | 153 | | 78 | 185 | 213 | | 125 | 239 | 286 | | 176 | 291 | 336 | | |
| 18 | 1 | 1 | 88 | 101 | | 47 | 110 | 127 | | 65 | 155 | 178 | | 104 | 199 | 238 | | 147 | 243 | 280 | | |
| 21 | 1 | 1 | 76 | 87 | | 41 | 95 | 109 | | 56 | 132 | 152 | | 89 | 170 | 204 | | 126 | 208 | 240 | | |
| 24 | 1 | 1 | 66 | 76 | | 35 | 83 | 96 | | 49 | 116 | 133 | | 78 | 149 | 178 | | 110 | 182 | 210 | | |
| 30 | 1 | 2 | | 61 | | 28 | 66 | 76 | | 39 | 93 | 107 | | 62 | 119 | 143 | | 88 | 146 | 168 | | |
| 36 | 1 | 2 | | 51 | | 24✳ | 55 | 64 | | 32 | 77 | 89 | | 52 | 99 | 119 | | 74 | 121 | 140 | | |
| 42 | 1 | 2 | | 43 | | | | 55 | | 28✳ | 66 | 76 | | 45 | 85 | 102 | | 63 | 104 | 120 | | |
| 48 | 1 | 2 | | 38 | | | | 48 | | | 58 | 67 | | 39 | 75 | 89 | | 55 | 91 | 105 | | |
| 54 | 1 | 2 | | 34 | | | | 42 | | | 51 | 59 | | 35 | 66 | 79 | | 49 | 81 | 93 | | |
| 60 | 1 | 2 | | 30 | | | | 38 | | | | 53 | | 31✳ | 55 | 71 | | 44 | 68 | 84 | | |
| 66 | 1 | 2 | | 28 | | | | 35 | | | | 48 | | | | 65 | | 40 | 56 | 76 | | |
| 72 | 1 | 3 | | 25 | | | | 32 | | | | 44 | | | | 59 | | 37✳ | 46 | 70 | | |
| 78 | 1 | 3 | | | | | | 29 | | | | 41 | | | | 55 | | | | 65 | | |
| 84 | 1 | 3 | | | | | | | | | | 38 | | | | 51 | | | | 60 | | |
| 90 | 1 | 3 | | | | | | | | | | 36 | | | | 48 | | | | 56 | | |
| 96 | 1 | 3 | | | | | | | | | | 33 | | | | 45 | | | | 53 | | |
| 102 | 2 | 4 | | | | | | | | | | | | | | 42 | | | | 49 | | |
| 108 | 2 | 4 | | | | | | | | | | | | | | 39 | | | | 47 | | |
| 114 | 2 | 4 | | | | | | | | | | | | | | | | | | 42 | | |
| 120 | 2 | 4 | | | | | | | | | | | | | | | | | | 39 | | |
| 126 | 2 | 4 | | | | | | | | | | | | | | | | | | | | |

# CORRUGATED H32 ALUMINUM CIRCULAR PIPE RIVETED SEAM

## MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

| SPECIFIED DIAMETER OF PIPE | MINIMUM COVER | | SPECIFIED THICKNEWW OF COATED SHEET (IN.) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.06 | | | | 0.075 | | | | 0.105 | | | | 0.135 | | | | 0.164 | | | |
| | | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | |
| | CORRUGATED | SPIRAL RIB | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| IN. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. |
| 12 | 1 | 1 | 77 | | 120 | 141 | 77 | | 154 | 175 | 133 | | 269 | 239 | 138 | | 282 | 359 | 144 | | 291 | 466 |
| 15 | 1 | 1 | 62 | | 96 | 113 | 62 | | 123 | 140 | 107 | | 215 | 191 | 111 | | 226 | 287 | 115 | | 232 | 373 |
| 18 | 1 | 1 | 51 | | 80 | 94 | 51 | | 103 | 117 | 89 | | 179 | 160 | 92 | | 188 | 239 | 96 | | 194 | 311 |
| 21 | 1 | 1 | 44 | | 68 | 81 | 44 | | 88 | 100 | 76 | | 154 | 137 | 79 | | 161 | 205 | 82 | | 166 | 266 |
| 24 | 1 | 1 | 38 | | 60 | 71 | 38 | | 77 | 88 | 67 | | 135 | 120 | 69 | | 141 | 179 | 72 | | 145 | 233 |
| 30 | 1 | 2 | | | | 56 | 31 | | 62 | 70 | 53 | | 108 | 96 | 55 | | 113 | 144 | 57 | | 116 | 186 |
| 36 | 1 | 2 | | | | 47 | 26 | | 51 | 58 | 44 | | 90 | 80 | 46 | | 94 | 120 | 48 | | 97 | 155 |
| 42 | 1 | 2 | | | | 40 | | | | 50 | 38 | | 77 | 68 | 40 | | 81 | 103 | 41 | | 83 | 133 |
| 48 | 1 | 2 | | | | 35 | | | | 44 | 33 | | 67 | 60 | 35 | | 71 | 90 | 36 | | 73 | 116 |
| 54 | 1 | 2 | | | | 31 | | | | 39 | 30 | | 56 | 53 | 31 | | 63 | 80 | 32 | | 65 | 104 |
| 60 | 1 | 2 | | | | 28 | | | | 35 | | | | 48 | 28 | | 56 | 72 | 29 | | 58 | 93 |
| 66 | 1 | 2 | | | | 26 | | | | 32 | | | | 44 | | | | 65 | 26 | | 53 | 85 |
| 72 | 1 | 3 | | | | 24 | | | | 29 | | | | 40 | | | | 60 | 24 | | 47 | 78 |
| 78 | 1 | 3 | | | | | | | | 27 | | | | 37 | | | | 55 | | | | 72 |
| 84 | 1 | 3 | | | | | | | | | | | | 34 | | | | 51 | | | | 67 |
| 90 | 1 | 3 | | | | | | | | | | | | 32 | | | | 48 | | | | 62 |
| 96 | 1 | 3 | | | | | | | | | | | | 30 | | | | 45 | | | | 58 |
| 102 | 2 | 4 | | | | | | | | | | | | | | | | 42 | | | | 55 |
| 108 | 2 | 4 | | | | | | | | | | | | | | | | 40 | | | | 51 |
| 114 | 2 | 4 | | | | | | | | | | | | | | | | | | | | 46 |
| 120 | 2 | 4 | | | | | | | | | | | | | | | | | | | | 41 |
| 126 | 2 | 4 | | | | | | | | | | | | | | | | | | | | |

✳ FOR TRENCH INSTALLATION ONLY

A = 2-2/3" X 1/2" CORRUGATIONS.
B = 3" X 1" CORRUGATIONS.
C = 5" X 1" CORRAGATIONS
D = 3/4" X 3/4" X 7-1/2" SPIRAL RIB

(1) MAXIMUM OVERFILL MEASURED FROM THE TOP OF PIPE TO SURFACE.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CORRUGATED METAL PIPE INSTALLATION METHODS

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 3/9/2011

725.00C

# CORRUGATED H34 ALUMINUM CIRCULAR PIPE LOCK SEAM

## MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

| SPECIFIED DIAMETER OF PIPE | MINIMUM COVER | | SPECIFIED THICKNESS OF COATED SHEET (IN.) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.06 | | | | 0.075 | | | | 0.105 | | | | 0.135 | | | | 0.164 | | | |
| | CORRUGATED | SPIRAL RIB | A | B | C | D | A | B | C | D | A | B | C | D | A | B | C | D | A | B | C | D |
| IN. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. |
| 12 | 1 | 1 | 159 | 183 | | 85 | 199 | 229 | | 117 | 278 | 320 | | 187 | 358 | 428 | | 265 | 437 | 504 | | |
| 15 | 1 | 1 | 127 | 146 | | 68 | 159 | 183 | | 93 | 223 | 256 | | 150 | 286 | 343 | | 212 | 350 | 403 | | |
| 18 | 1 | 1 | 106 | 122 | | 57 | 132 | 153 | | 78 | 185 | 213 | | 125 | 239 | 286 | | 176 | 291 | 336 | | |
| 21 | 1 | 1 | 91 | 104 | | 49 | 113 | 131 | | 67 | 159 | 183 | | 107 | 205 | 245 | | 151 | 250 | 288 | | |
| 24 | 1 | 1 | 79 | 91 | | 43 | 99 | 115 | | 58 | 139 | 160 | | 94 | 179 | 214 | | 132 | 218 | 252 | | |
| 30 | 1 | 2 | | 73 | | 34 | 79 | 92 | | 47 | 111 | 128 | | 75 | 143 | 171 | | 106 | 175 | 202 | | |
| 36 | 1 | 2 | | 61 | | 28✳ | 66 | 76 | | 39 | 93 | 107 | | 62 | 119 | 143 | | 88 | 146 | 168 | | |
| 42 | 1 | 2 | | 52 | | | | 66 | | 33✳ | 79 | 91 | | 54 | 102 | 122 | | 76 | 125 | 144 | | |
| 48 | 1 | 2 | | 46 | | | | 57 | | | 68 | 80 | | 47 | 89 | 107 | | 66 | 109 | 126 | | |
| 54 | 1 | 2 | | 41 | | | | 51 | | | 56 | 71 | | 42 | 73 | 95 | | 59 | 90 | 112 | | |
| 60 | 1 | 2 | | 37 | | | | 46 | | | | 64 | | 37✳ | 59 | 86 | | 53 | 73 | 101 | | |
| 66 | 1 | 2 | | 33 | | | | 42 | | | | 58 | | | | 78 | | 48 | 59 | 92 | | |
| 72 | 1 | 3 | | 30 | | | | 38 | | | | 53 | | | | 71 | | 42✳ | 47 | 84 | | |
| 78 | 1 | 3 | | | | | | 35 | | | | 49 | | | | 66 | | | | 78 | | |
| 84 | 1 | 3 | | | | | | | | | | 46 | | | | 61 | | | | 72 | | |
| 90 | 1 | 3 | | | | | | | | | | 43 | | | | 57 | | | | 67 | | |
| 96 | 1 | 3 | | | | | | | | | | 39 | | | | 53 | | | | 62 | | |
| 102 | 2 | 4 | | | | | | | | | | | | | | 48 | | | | 56 | | |
| 108 | 2 | 4 | | | | | | | | | | | | | | 43 | | | | 51 | | |
| 114 | 2 | 4 | | | | | | | | | | | | | | | | | | 46 | | |
| 120 | 2 | 4 | | | | | | | | | | | | | | | | | | 41 | | |
| 126 | 2 | 4 | | | | | | | | | | | | | | | | | | | | |

# CORRUGATED H34 ALUMINUM CIRCULAR PIPE RIVETED SEAM

## MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

| SPECIFIED DIAMETER OF PIPE | MINIMUM COVER | | SPECIFIED THICKNESS OF COATED SHEET (IN.) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.06 | | | | 0.075 | | | | 0.105 | | | | 0.135 | | | | 0.164 | | | |
| | | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | | SINGLE RIVET | | DOUBLE RIVET | |
| | CORRUGATED | SPIRAL RIB | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B | A | B |
| IN. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. | FT. |
| 12 | 1 | 1 | 77 | | 120 | 141 | 77 | | 154 | 175 | 133 | | 269 | 239 | 138 | | 282 | 359 | 144 | | 291 | 466 |
| 15 | 1 | 1 | 62 | | 96 | 113 | 62 | | 123 | 140 | 107 | | 215 | 191 | 111 | | 226 | 287 | 115 | | 232 | 373 |
| 18 | 1 | 1 | 51 | | 80 | 94 | 51 | | 103 | 117 | 89 | | 179 | 160 | 92 | | 188 | 239 | 96 | | 194 | 311 |
| 21 | 1 | 1 | 44 | | 68 | 81 | 44 | | 88 | 100 | 76 | | 154 | 137 | 79 | | 161 | 205 | 82 | | 166 | 266 |
| 24 | 1 | 1 | 38 | | 60 | 71 | 38 | | 77 | 88 | 67 | | 135 | 120 | 69 | | 141 | 179 | 72 | | 145 | 233 |
| 30 | 1 | 2 | | | | 56 | 31 | | 62 | 70 | 53 | | 108 | 96 | 55 | | 113 | 144 | 57 | | 116 | 186 |
| 36 | 1 | 2 | | | | 47 | 26 | | 51 | 58 | 44 | | 90 | 80 | 46 | | 94 | 120 | 48 | | 97 | 155 |
| 42 | 1 | 2 | | | | 40 | | | | 50 | 38 | | 77 | 68 | 40 | | 81 | 103 | 41 | | 83 | 133 |
| 48 | 1 | 2 | | | | 35 | | | | 44 | 33 | | 67 | 60 | 35 | | 71 | 90 | 36 | | 73 | 116 |
| 54 | 1 | 2 | | | | 31 | | | | 39 | 30 | | 56 | 53 | 31 | | 63 | 80 | 32 | | 65 | 104 |
| 60 | 1 | 2 | | | | 28 | | | | 35 | | | | 48 | 28 | | 56 | 72 | 29 | | 58 | 93 |
| 66 | 1 | 2 | | | | 26 | | | | 32 | | | | 44 | | | | 65 | 26 | | 53 | 85 |
| 72 | 1 | 3 | | | | 24 | | | | 29 | | | | 40 | | | | 60 | 24 | | 47 | 78 |
| 78 | 1 | 3 | | | | | | | | 27 | | | | 37 | | | | 55 | | | | 72 |
| 84 | 1 | 3 | | | | | | | | | | | | 34 | | | | 51 | | | | 67 |
| 90 | 1 | 3 | | | | | | | | | | | | 32 | | | | 48 | | | | 62 |
| 96 | 1 | 3 | | | | | | | | | | | | 30 | | | | 45 | | | | 58 |
| 102 | 2 | 4 | | | | | | | | | | | | | | | | 42 | | | | 55 |
| 108 | 2 | 4 | | | | | | | | | | | | | | | | 40 | | | | 51 |
| 114 | 2 | 4 | | | | | | | | | | | | | | | | | | | | 46 |
| 120 | 2 | 4 | | | | | | | | | | | | | | | | | | | | 41 |
| 126 | 2 | 4 | | | | | | | | | | | | | | | | | | | | |

✳ FOR TRENCH INSTALLATION ONLY

A = 2-2/3" X 1/2" CORRUGATIONS.
B = 3" X 1" CORRUGATIONS.
C = 5" X 1" CORRAGATIONS
D = 3/4" X 3/4" X 7-1/2" SPIRAL RIB

(1) MAXIMUM OVERFILL MEASURED FROM THE TOP OF PIPE TO SURFACE.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# CORRUGATED METAL PIPE INSTALLATION METHODS

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 4/1/2013

725.00C

## MINIMUM COVER FOR CONSTRUCTION LOADS (ROUND AND PIPE-ARCH)

| DIAMETER OR PIPE SPAN | MINIMUM COVER (FT.) FOR INDICATED AXLE LOADS (2) | | | |
|---|---|---|---|---|
| | 18K LBS.-50K LBS. | 50K LBS.-75K LBS. | 75K LBS.-110K LBS. | 110K LBS.-150K LBS. |
| IN. | FT. | FT. | FT. | FT. |
| 12-42 | 2.0 | 2.5 | 3.0 | 3.0 |
| 48-72 | 3.0 | 3.0 | 3.5 | 4.0 |
| 78-120 | 3.0 | 3.5 | 4.0 | 4.0 |
| 126-144 | 3.5 | 4.0 | 4.5 | 4.5 |

THE CONTRACTOR SHALL PROVIDE MINIMUM COVER PLUS ANY ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. IN UNPAVED SITUATIONS, THE SURFACE MUST BE MAINTAINED TO A LEVEL AND NON-RUTTED CONDITION.

## PIPE-ARCH REQUIREMENTS 2-2/3" X 1/2" CORRUGATIONS

| TYPE | SPAN (3) | RISE (3) | GALVANIZED SHEET | |
|---|---|---|---|---|
| | (IN.) | (IN.) | THICKNESS (IN.) | GAUGE |
| B1 | 17 | 13 | 0.064 | 16 |
| B2 | 21 | 15 | 0.064 | 16 |
| B3 | 24 | 18 | 0.064 | 16 |
| B4 | 28 | 20 | 0.064 | 16 |
| B5 | 35 | 24 | 0.064 | 16 |
| B6 | 42 | 29 | 0.079 | 14 |
| B7 | 49 | 33 | 0.109 | 12 |
| B8 | 57 | 38 | 0.109 | 12 |
| B9 | 64 | 43 | 0.109 | 12 |
| B10 | 71 | 47 | 0.138 | 10 |
| B11 | 77 | 52 | 0.168 | 8 |
| B12 | 83 | 57 | 0.168 | 8 |

## PIPE-ARCH REQUIREMENTS

| TYPE | SPAN (4) | RISE (4) | GALVANIZED SHEET 3" X 1" CORRUGATIONS | | GALVANIZED SHEET 5" X 1" CORRUGATIONS | | MINIMUM COVER (2) |
|---|---|---|---|---|---|---|---|
| | (IN.) | (IN.) | THICKNESS (IN.) | GAUGE | THICKNESS (IN.) | GAUGE | (IN.) |
| B8A | 53 (-2.4) | 41 (+2.4) | 0.079 | 14 | 0.109 | 12 | 12 |
| B9A | 60 (-2.7) | 46 (+2.7) | 0.079 | 14 | 0.109 | 12 | 15 |
| B10A | 66 (-3.0) | 51 (+3.0) | 0.079 | 14 | 0.109 | 12 | 15 |
| B11A | 73 (-3.3) | 55 (+3.3) | 0.079 | 14 | 0.109 | 12 | 18 |
| B12A | 81 (-3.6) | 59 (+3.6) | 0.079 | 14 | 0.109 | 12 | 18 |
| B13A | 87 (-4.4) | 63 (+4.4) | 0.079 | 14 | 0.109 | 12 | 18 |
| B14A | 95 (-4.8) | 67 (+4.8) | 0.079 | 14 | 0.109 | 12 | 18 |
| B15A | 103 (-5.2) | 71 (+5.2) | 0.079 | 14 | 0.109 | 12 | 18 |
| B16A | 112 (-5.6) | 75 (+5.6) | 0.109 | 12 | 0.109 | 12 | 21 |
| B17A | 117 (-5.9) | 79 (+5.9) | 0.109 | 12 | 0.109 | 12 | 21 |
| B18A | 128 (-6.4) | 83 (+6.4) | 0.109 | 12 | 0.109 | 12 | 24 |
| B19A | 137 (-6.9) | 87 (+6.9) | 0.109 | 12 | 0.109 | 12 | 24 |
| B20A | 142 (-7.1) | 91 (+7.1) | 0.138 | 10 | 0.138 | 10 | 24 |

(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.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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JEFFERSON CITY, MO 65102
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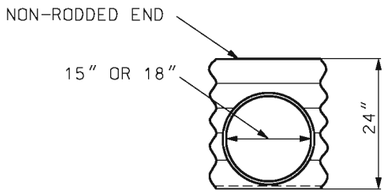
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# CORRUGATED METAL PIPE INSTALLATION METHODS

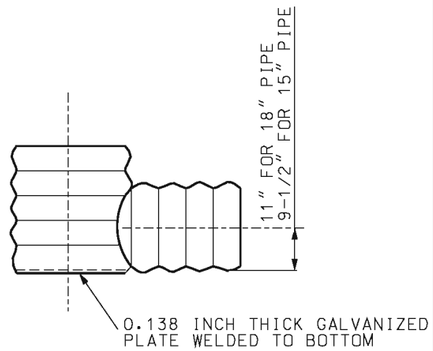
DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 8/24/2015

725.00C

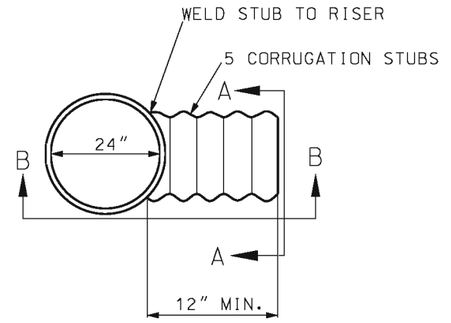
SHEET NO. 5 OF 5




SECTION A-A

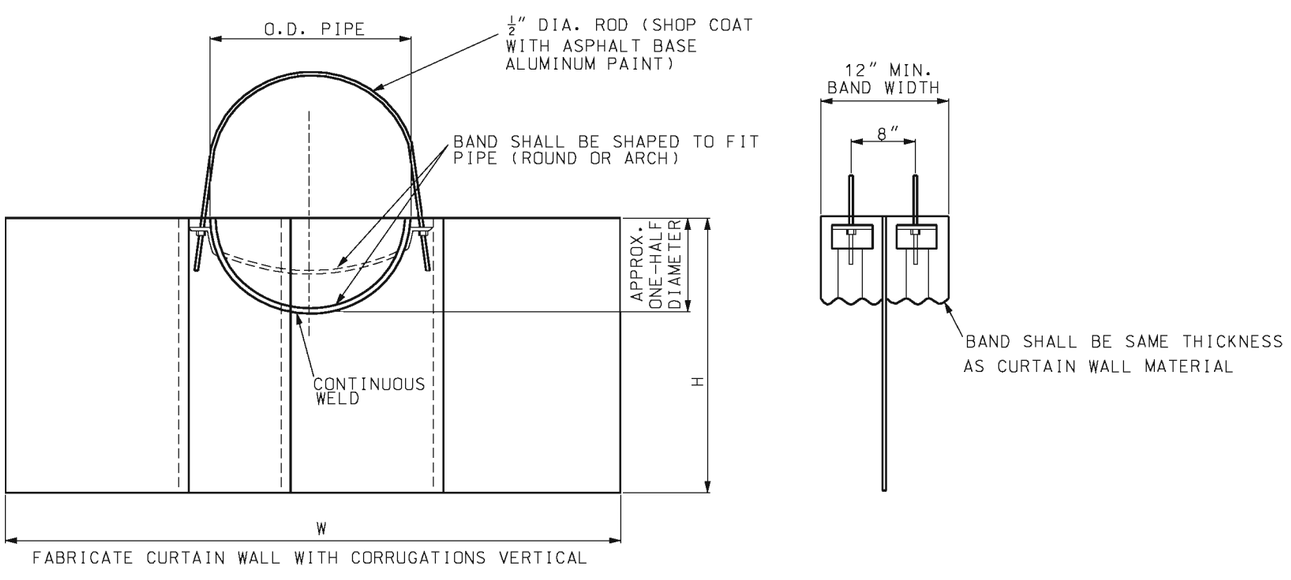



SECTION B-B




PLAN

## METAL INLETS




FABRICATE CURTAIN WALL WITH CORRUGATIONS VERTICAL

## METAL CURTAIN WALL

**TABLE FOR METAL CURTAIN WALL**

| FOR ROUND OR ELLIPTICAL PIPE | | | |
|---|---|---|---|
| DIA. IN. | GALV. SHT. THICK IN. | W IN. | H IN. |
| 18 | 0.064 | 72 | 35 |
| 21 | 0.064 | 72 | 35 |
| 24 | 0.064 | 72 | 40 |
| 30 | 0.064 | 84 | 40 |
| 36 | 0.079 | 84 | 49 |
| 42 | 0.079 | 96 | 49 |
| 48 | 0.079 | 96 | 49 |
| 54 | 0.079 | 120 | 58-1/2 |
| 60 | 0.109 | 120 | 58-1/2 |
| 66 | 0.109 | 132 | 58-1/2 |
| 72 | 0.109 | 132 | 68-1/2 |
| 78 | 0.138 | 132 | 68-1/2 |
| 84 | 0.138 | 144 | 68-1/2 |
| FOR PIPE ARCH | | | |
| B-2 | 0.064 | 72 | 30 |
| B-3 | 0.064 | 72 | 30 |
| B-4 | 0.079 | 84 | 30 |
| B-5 | 0.079 | 84 | 30 |
| B-6 | 0.109 | 96 | 35 |
| B-7 | 0.109 | 96 | 35 |
| B-8 | 0.109 | 108 | 35 |
| B-9 | 0.109 | 120 | 35 |
| B-10 | 0.138 | 120 | 40 |
| B-11 | 0.168 | 125 | 50 |
| B-12 | 0.168 | 131 | 54 |

GENERAL NOTES:

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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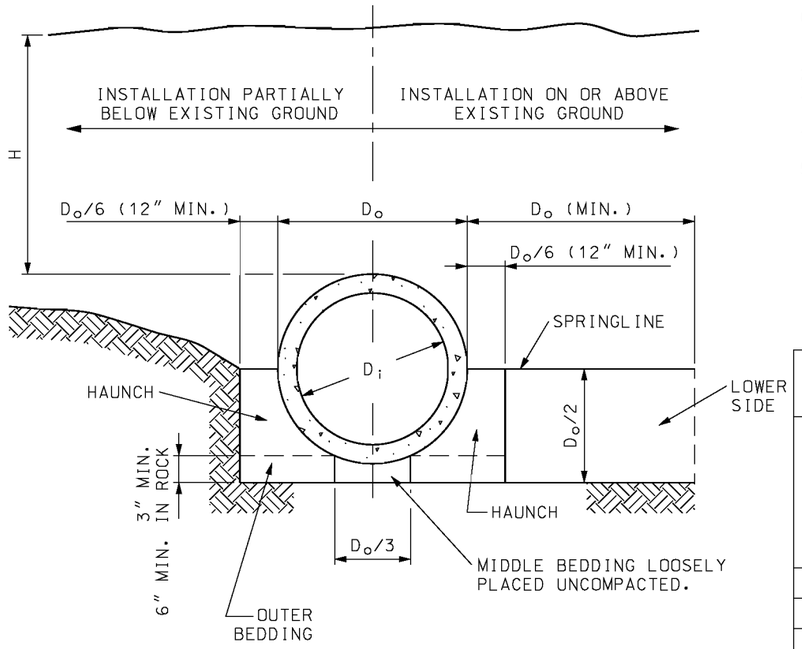
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# METAL CURTAIN WALL AND METAL INLETS

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009

725.31C

SHEET NO. 1 OF 1



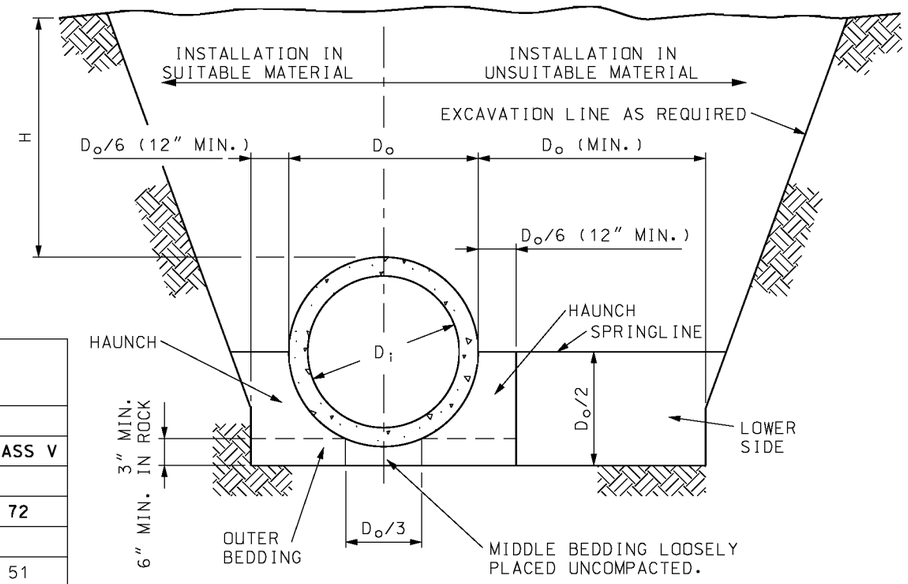

## EMBANKMENT INSTALLATIONS

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

| INSTALLATION TYPE | CLASS OF PIPE | | | | |
|---|---|---|---|---|---|
| | CLASS I | CLASS II | CLASS III | CLASS IV | CLASS V |
| | MAXIMUM DIAMETER (INCHES) | | | | |
| | 108 | 108 | 108 | 84 | 72 |
| | MAXIMUM FILL HEIGHT IN (FEET) | | | | |
| TYPE 1 | 12 | 15 | 21 | 33 | 51 |
| TYPE 2 | 9 | 12 | 17 | 26 | 39 |
| TYPE 3 | 7 | 9 | 13 | 20 | 30 |
| TYPE 4 | 4 | 6 | 9 | 13 | 20 |

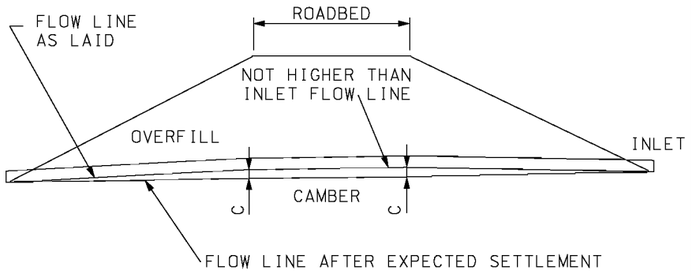
IF FILL HEIGHT EXCEEDS 51 FEET AND PIPE DIAMETER IS 36 INCHES OR LESS A SPECIAL PIPE DESIGN AND INSTALLATION PROCEDURE SHALL BE REQUIRED. IF FILL HEIGHT EXCEEDS 51 FEET AND PIPE DIAMETER IS GREATER THAN 36 INCHES A SPECIAL DESIGN PIPE IS NOT ALLOWED.




## TRENCH INSTALLATION

**- LEGEND -**

$D_i$ = NORMAL INSIDE DIAMETER OF PIPE.
$D_o$ = OUTSIDE DIAMETER OF PIPE.
H = FILL COVER HEIGHT OVER PIPE (FEET)
MIN. = MINIMUM
= UNDISTURBED SOIL




NOTE:
ON YIELDING SOIL, PIPE CULVERTS SHALL BE PLACED ON A CAMBERED FLOW LINE. THE AMOUNT OF CAMBER WILL VARY WITH SOIL CONDITION AND SHALL BE SPECIFIED ON THE DESIGN PLANS.

## TYPICAL CAMBERED FLOW LINE

## BEDDING AND COMPACTION REQUIREMENTS

| INSTALLATION TYPE | BEDDING THICKNESS | COMPACTION REQUIREMENTS (MIN. STANDARD PROCTOR %) | | | | | |
|---|---|---|---|---|---|---|---|
| | | HAUNCH AND OUTER BEDDING | | | LOWER SIDE BEDDING | | |
| | | CATEGORY 1 SOIL (A) | CATEGORY 2 SOIL (B) | CATEGORY 3 SOIL (C) | CATEGORY 1 SOIL (A) | CATEGORY 2 SOIL (B) | CATEGORY 3 SOIL (C) |
| 1 | $D_o$/24 MINIMUM, NOT LESS THAN 3". IF ROCK FOUNDATION, USE $D_o$/12 MIMIMUM, NOT LESS THAN 6". | 95 | N/A | N/A | 90 | 95 | 100 |
| 2 | $D_o$/24 MINIMUM, NOT LESS THAN 3". IF ROCK FOUNDATION, USE $D_o$/12 MIMIMUM, NOT LESS THAN 6". | 90 | 95 | N/A | 85 | 90 | 95 |
| 3 | $D_o$/24 MINIMUM, NOT LESS THAN 3". IF ROCK FOUNDATION, USE $D_o$/12 MIMIMUM, NOT LESS THAN 6". | 85 | 90 | 95 | 85 | 90 | 95 |
| 4 | $D_o$/24 MINIMUM, NOT LESS THAN 3". IF ROCK FOUNDATION, USE $D_o$/12 MIMIMUM, NOT LESS THAN 6". | NO COMPACTION REQUIRED | NO COMPACTION REQUIRED | 85 | NO COMPACTION REQUIRED | NO COMPACTION REQUIRED | 85 |

(A) GRAVELLY SAND
(B) SANDY-SILT
(C) SILTY CLAY

GENERAL NOTES:

MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF $\frac{1}{2}$ $D_o$ 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.

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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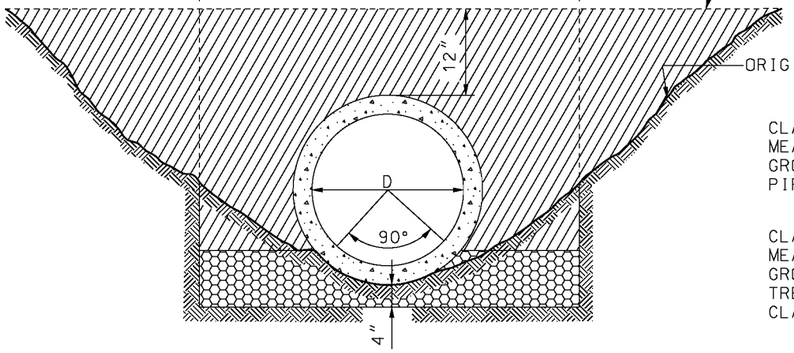
# RIGID CULVERT INSTALLATION METHODS
## REINFORCED CONCRETE PIPE CULVERTS

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

726.30J

SHEET NO. 1 OF 2

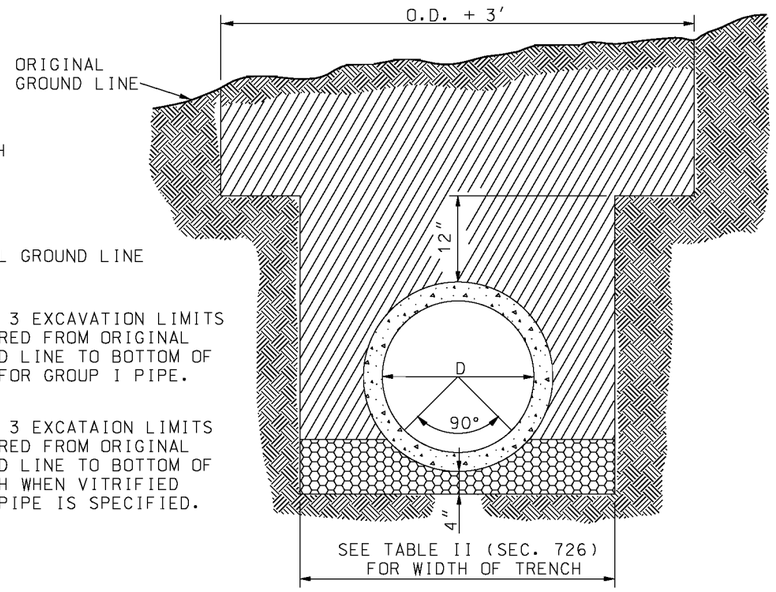
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




EXTRA STRENGTH

CLASS 3 EXCAVATION LIMITS MEASURED FROM ORIGINAL GROUND LINE TO BOTTOM OF PIPE FOR GROUP I PIPE.

CLASS 3 EXCATAION LIMITS MEASURED FROM ORIGINAL GROUND LINE TO BOTTOM OF TRENCH WHEN VITRIFIED CLAY PIPE IS SPECIFIED.




STANDARD STRENGTH

LEGEND

- COMPACTED ROADWAY EMBANKMENT
- SUITABLE BACKFILL
- LOOSE DRY MATERIAL
- COMPACTED SAND

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

| HEIGHT OF FILL OVER V.C. PIPE CULVERTS | | | | | | |
|---|---|---|---|---|---|---|
| | STANDARD STRENGTH | | | EXTRA STRENGTH | | |
| NOMINAL PIPE DIAMETER (INCH) | TRENCH WIDTH AT ONE FOOT ABOVE TOP OF PIPE (FEET) | MINIMUM FILL HEIGHT (FEET) | MAXIMUM FILL HEIGHT (FEET) | TRENCH WIDTH AT ONE FOOT ABOVE TOP OF PIPE (FEET) | MINIMUM FILL HEIGHT (FEET) | MAXIMUM FILL HEIGHT (FEET) |
| 6 | 2.0 | 1.0 | 9.0 | | | |
| 8 | 2.0 | 1.0 | 7.0 | 2.5 | 4.0 | 12.0 |
| 10 | 2.5 | 1.0 | 7.0 | 2.5 | 4.0 | 12.0 |
| 12 | 2.7 | 1.0 | 6.0 | 3.0 | 4.0 | 13.0 |
| 15 | 3.5 | 1.0 | 6.0 | 3.0 | 4.0 | 17.0 |
| 18 | 3.5 | 1.0 | 6.0 | 3.5 | 4.0 | 17.0 |
| 21 | 4.0 | 1.0 | 6.0 | 4.0 | 4.0 | 17.0 |
| 24 | 4.0 | 1.0 | 8.0 | 4.0 | 3.0 | 19.0 |
| 30 | 4.5 | 1.0 | 10.0 | 4.5 | 3.0 | 19.0 |
| 36 | 5.0 | 1.0 | 11.0 | 5.0 | 3.0 | 19.0 |

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
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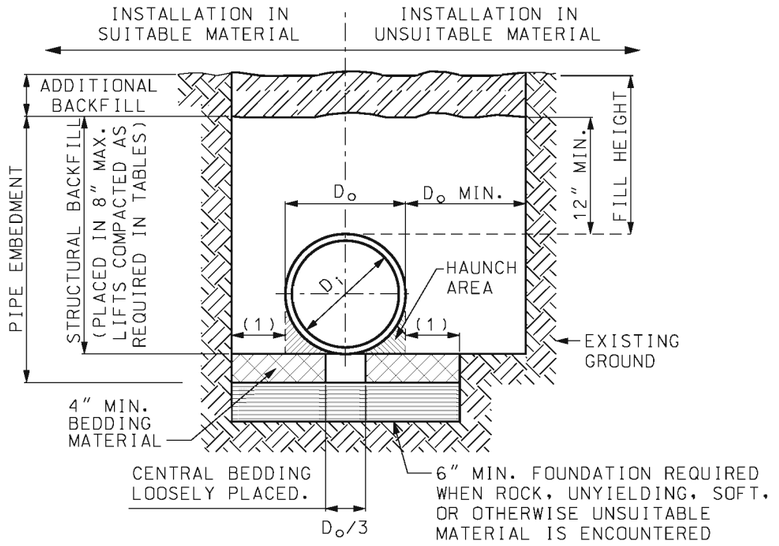
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# RIGID CULVERT INSTALLATION METHODS

## VITRIFIED CLAY PIPE CULVERTS

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

726.30J

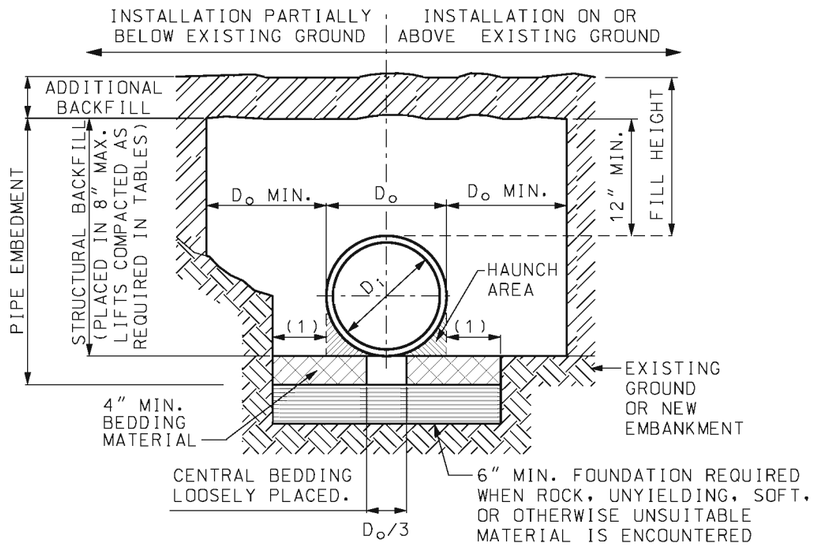



## TRENCH INSTALLATION

### LEGEND

$D_i$ = INSIDE DIAMETER OF PIPE.
$D_o$ = OUTSIDE DIAMETER OF PIPE.
(1) = $(D_o/4)+6"$ (MIN.)

NOTE:
MULTIPLE PIPE SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF $\frac{1}{2}$ $D_o$ OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".




## EMBANKMENT INSTALLATION

### 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

| STRUCTURAL BACKFILL | SPECIFIED NOMINAL DIA OF PIPE (IN.) | POLYETHYLENE | | | | STEEL REINFORCED POLYETHYLENE | | POLYVINYL | | | | DOUBLE WALL POLYPROPYLENE | | | | TRIPLE WALL POLYPROPYLENE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | COMPACTION 90% SPD | | COMPACTION 95% SPD | | COMPACTION 90% SPD | | COMPACTION 90% SPD | | COMPACTION 95% SPD | | COMPACTION 90% SPD | | COMPACTION 95% SPD | | COMPACTION 90% SPD | | COMPACTION 95% SPD | |
| | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. |
| GRAVEL (AASHTO M145 SOIL TYPE A1 & A3) | 12 | 2' | 19' | 2' | 26' | -- | -- | 2' | 32' | 2' | 61' | 2' | 21' | 2' | 29' | -- | -- | -- | -- |
| | 15 | 2' | 19' | 2' | 27' | -- | -- | 2' | 32' | 2' | 55' | 2' | 22' | 2' | 31' | -- | -- | -- | -- |
| | 18 | 2' | 17' | 2' | 25' | -- | -- | 2' | 31' | 2' | 60' | 2' | 19' | 2' | 27' | -- | -- | -- | -- |
| | 24 | 2' | 15' | 2' | 21' | 2' | 50' | 2' | 30' | 2' | 54' | 2' | 16' | 2' | 22' | -- | -- | -- | -- |
| | 30 | 2' | 17' | 2' | 24' | 2' | 50' | 2' | 31' | 2' | 52' | 2' | 11' | 2' | 15' | 2' | 17' | 2' | 23' |
| | 36 | 2' | 13' | 2' | 19' | 2' | 50' | 2' | 30' | 2' | 53' | -- | -- | -- | -- | 2' | 15' | 2' | 21' |
| | 42 | 2' | 13' | 2' | 19' | 2' | 50' | -- | -- | -- | -- | -- | -- | -- | -- | 2' | 19' | 2' | 27' |
| | 48 | 2' | 12' | 2' | 18' | 2' | 30' | -- | -- | -- | -- | -- | -- | -- | -- | 2' | 12' | 2' | 17' |
| | 60 | 2' | 13' | 2' | 20' | 2' | 30' | -- | -- | -- | -- | -- | -- | -- | -- | 2' | 16' | 2' | 23' |
| COURSE SAND (AASHTO M145 SOIL TYPE A-1-b) | 12 | 2' | 17' | 2' | 23' | -- | -- | 2' | 32' | 2' | 55' | 2' | 18' | 2' | 24' | -- | -- | -- | -- |
| | 15 | 2' | 16' | 2' | 22' | -- | -- | 2' | 32' | 2' | 49' | 2' | 22' | 2' | 31' | -- | -- | -- | -- |
| | 18 | 2' | 15' | 2' | 21' | -- | -- | 2' | 31' | 2' | 53' | 2' | 16' | 2' | 21' | -- | -- | -- | -- |
| | 24 | 2' | 14' | 2' | 20' | 2' | 50' | 2' | 30' | 2' | 48' | 2' | 13' | 2' | 17' | -- | -- | -- | -- |
| | 30 | 2' | 13' | 2' | 19' | 2' | 50' | 2' | 31' | 2' | 46' | 2' | 7' | 2' | 10' | 2' | 17' | 2' | 23' |
| | 36 | 2' | 12' | 2' | 17' | 2' | 50' | 2' | 30' | 2' | 46' | -- | -- | -- | -- | 2' | 15' | 2' | 21' |
| | 42 | 2' | 13' | 2' | 18' | 2' | 50' | -- | -- | -- | -- | -- | -- | -- | -- | 2' | 19' | 2' | 27' |
| | 48 | 2' | 12' | 2' | 17' | 2' | 30' | -- | -- | -- | -- | -- | -- | -- | -- | 2' | 12' | 2' | 17' |
| | 60 | 2' | 13' | 2' | 20' | 2' | 30' | -- | -- | -- | -- | -- | -- | -- | -- | 2' | 16' | 2' | 23' |
| SILTY SAND OR SILTY GRAVEL (AASHTO M145 SOIL TYPES A-2-4 & A-2-5) | 12 | 3.3' | 10' | 2' | 17' | -- | -- | 2.7' | 16' | 2' | 33' | 2.8' | 11' | 2' | 19' | -- | -- | -- | -- |
| | 15 | 3.4' | 10' | 2' | 16' | -- | -- | 2.7' | 16' | 2' | 33' | 2.8' | 11' | 2' | 23' | -- | -- | -- | -- |
| | 18 | 3.6' | 10' | 2' | 15' | -- | -- | 2.7' | 15' | 2' | 32' | 3' | 11' | 2' | 16' | -- | -- | -- | -- |
| | 24 | 3.8' | 9' | 2' | 14' | 2' | 50' | 2.7' | 15' | 2' | 31' | 3.3' | 10' | 2' | 13' | -- | -- | -- | -- |
| | 30 | 3.7' | 10' | 2' | 14' | 2' | 50' | 2.8' | 15' | 2' | 31' | 3.4' | 6' | 2' | 7' | 3' | 10' | 2' | 17' |
| | 36 | 4.2' | 7' | 2' | 12' | 2' | 50' | 2.8' | 14' | 2' | 31' | -- | -- | -- | -- | 3.3' | 10' | 2' | 15' |
| | 42 | 4.2' | 7' | 2' | 13' | 2' | 50' | -- | -- | -- | -- | -- | -- | -- | -- | 3.2' | 11' | 2' | 20' |
| | 48 | 4.5' | 6' | 2' | 12' | 2' | 30' | -- | -- | -- | -- | -- | -- | -- | -- | 3.1' | 9' | 2' | 13' |
| | 60 | 3.3' | 7' | 2' | 14' | 2' | 30' | -- | -- | -- | -- | -- | -- | -- | -- | 2' | 10' | 2' | 17' |

NOTE:

SPD = STANDARD PROCTOR DENSITY.

FILL HEIGHT MEASURED FROM THE TOP OF PIPE TO SURFACE.

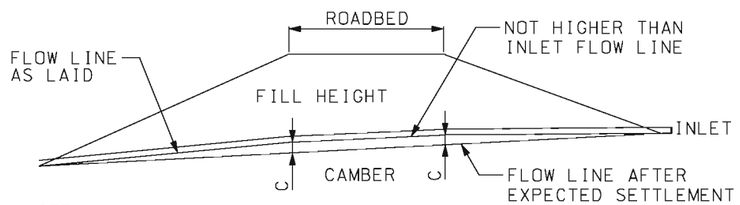
LIMITS ACCOUNT FOR SHORT-TERM TEMPORARY WATER TABLE DEPTHS OF FIVE FEET ABOVE SPRINGLINE. TABLES ARE NOT APPLICABLE FOR LONG-TERM PERMANENT WATER TABLE DEPTHS ABOVE SPRINGLINE.

WHEN PIPES ARE USED AS GROUP A, FILL HEIGHTS ARE LIMITED TO SHADED VALUES.

## MINIMUM COVER FOR CONSTRUCTION LOADS

| NOMINAL PIPE DIA. (IN.) | MINIMUM COVER (FT) FOR INDICATED AXLE LOADS (THOUSANDS OF POUNDS) | | | |
|---|---|---|---|---|
| | 18-50 | 50-75 | 75-110 | 110-150 |
| 12-36 | 2.0 | 2.5 | 3.0 | 3.0 |
| 42-60 | 3.0 | 3.0 | 3.5 | 4.0 |

MINIMUM COVER LIMITS ARE NOT SUFFICIENT FOR SILTY SAND OR SILTY GRAVEL STRUCTURAL BACKFILL COMPACTED TO 90% STANDARD PROCTOR DENSITY. THE CONTRACTOR SHALL PROVIDE MINIMUM COVER PLUS ANY ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. IN UNPAVED SITUATIONS, THE SURFACE MUST BE MAINTAINED TO A LEVEL AND NON-RUTTED CONDITION.




NOTE:
ON YIELDING SOIL, PIPE CULVERTS SHALL BE PLACED ON A CAMBERED FLOW LINE. THE AMOUNT OF CAMBER WILL VARY WITH SOIL CONDITION AND WILL BE SPECIFIED ON THE DESIGN PLANS.

## TYPICAL CAMBERED FLOW LINE

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

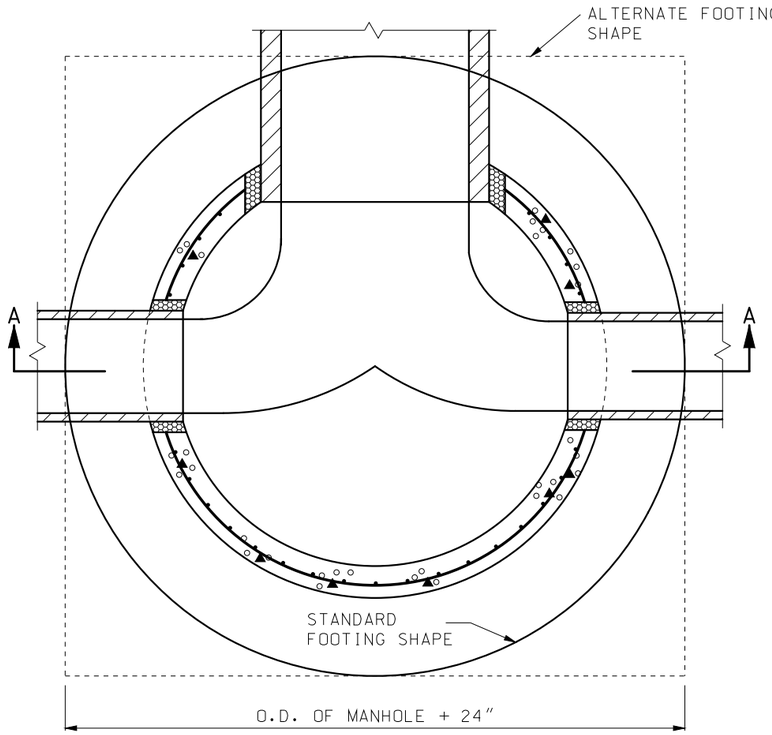
# THERMOPLASTIC PIPE INSTALLATION METHODS

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/27/2015

730.00E

SHEET NO. 1 OF 1

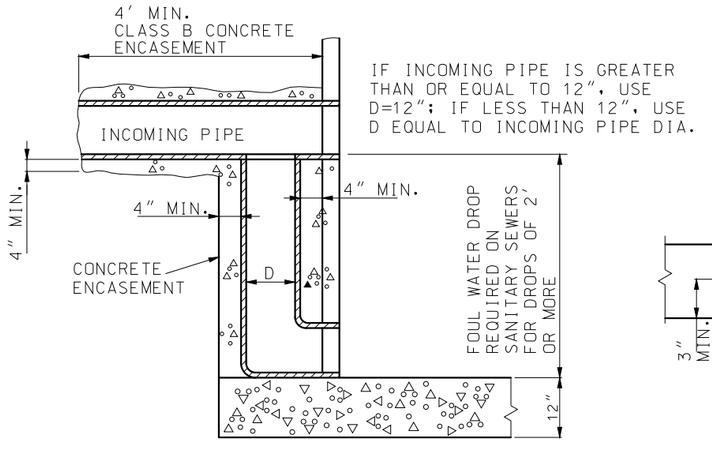
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



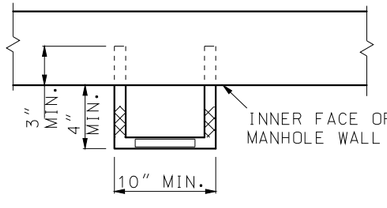

PLAN OF FOOTING

| BASE SECTION DIMENSIONS* | |
|---|---|
| SIZE OF PIPE | MIN. DIA. |
| 24" OR SMALLER | 48" |
| 30" - 36" | 60" |
| 42" - 48" | 72" |

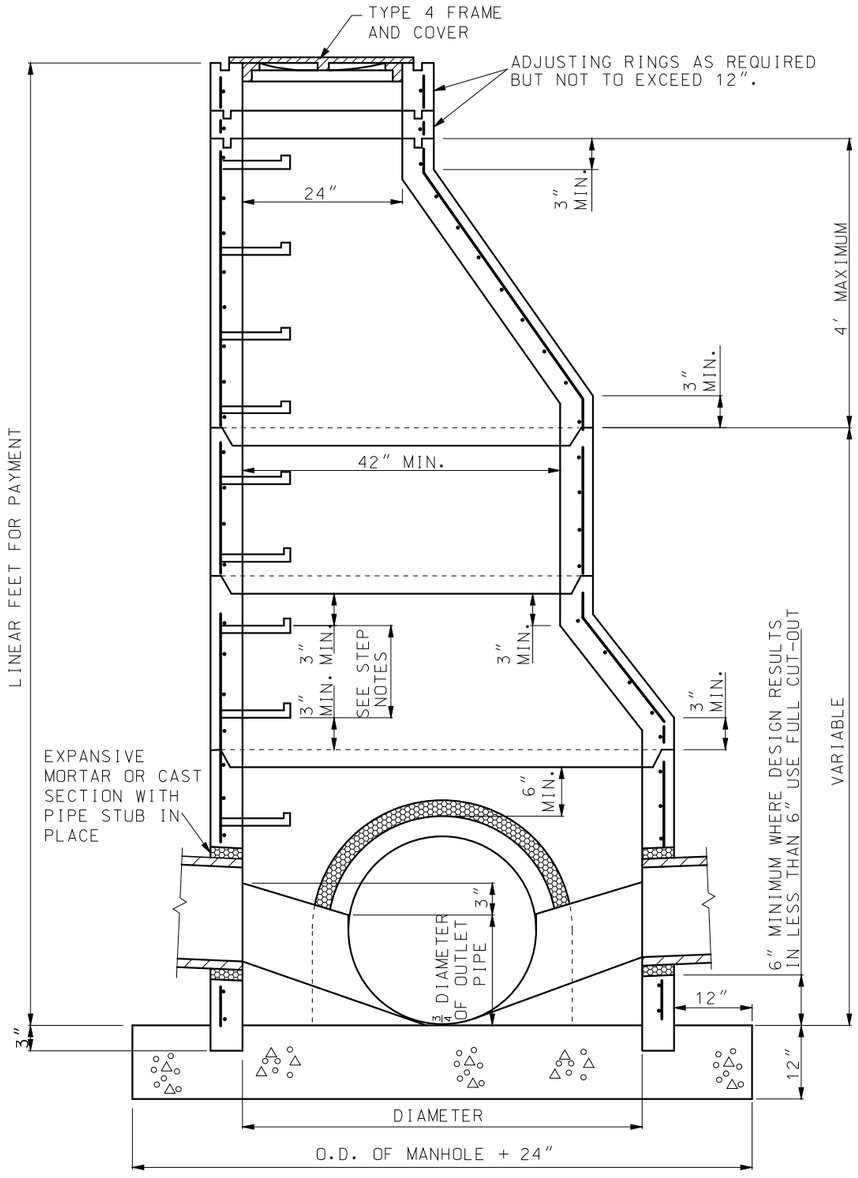
* RISER SECTIONS SHALL NOT BE LESS THAN 42" DIAMETER.




FOUL WATER DROP




STEP INSTALLATION




PRECAST BASE SECTION SET ON CONCRETE BLOCKS FOUNDATION SLAB AND INVERT POURED MONOLITHIC.

SECTION A-A

STEPS SHALL BE PLACED AT VERTICAL INTERVALS OF 16" MAXIMUM IN ALL MANHOLES HAVING A DEPTH OF MORE THAN 4'. STEPS SHALL BEGIN AT AN ELEVATION 6" ABOVE THE TOP OF THE OUTLET PIPE.

STEPS SHALL BE LEVEL AND IN VERTICAL ALIGNMENT.

NO DIRECT PAYMENT WILL BE MADE FOR MANHOLE STEPS.

GENERAL NOTES:

THE CONTRACTOR WILL BE PERMITTED TO CAST IN PLACE THE MANHOLES, IN ACCORDANCE WITH THE CONCRETE MANHOLE STANDARD.

IF THE CONTRACTOR ELECTS TO CAST IN PLACE THE MANHOLES, PAYMENT WILL BE MADE AT THE CONTRACT UNIT PRICE FOR PRECAST MANHOLES.

THE CONFIGURATION DETAILS SHOWN ARE DESCRIPTIVE ONLY AND MAY BE VARIED TO CONFORM WITH AN ESTABLISHED MANUFACTURING PROCEDURE.

FORMED OR CUT OUT OPENINGS SHALL BE PROVIDED WHERE PIPE INLETS AND OUTLETS ARE SHOWN ON THE PLANS.

THE TOP OF THE INLET SHALL NOT BE SET BELOW THE TOP OF THE OUTLET PIPE.

REINFORCEMENT SHALL BE CUT AT PIPE OPENINGS.

NO DIRECT PAYMENT WILL BE MADE FOR CUTTING PIPE, NOR FOR CUTTING AND BENDING REINFORCING STEEL.

WHERE THE WIDTH OF THE BASE SECTION IS GREATER THAN 42" AN ECCENTRIC TAPER SECTION MAY BE USED TO ALLOW THE USE OF 42" RISER SECTIONS.

THE LOWER TRANSITION SECTION AS SHOWN ON SECTION A-A IS OPTIONAL.

FOUL WATER DROPS ARE REQUIRED WHEN SPECIFIED IN THE PLANS. NO DIRECT PAYMENT WILL BE MADE FOR THE FOUL WATER DROP OR ITS ENCASEMENT.

SEE STANDARD PLAN 614.30 FOR MANHOLE FRAMES AND COVERS.

WHERE PIPES DO NOT ENTER OR EXIT RADIALLY, USE NEXT LARGER SIZE MANHOLE. CLASS 3 EXCAVATION WILL BE PAID WITHIN VERTICAL LIMITS 18" OUTSIDE OF THE OUTER WALLS OF THE BASE SECTION ON THE MANHOLE, CLASS 3 EXCAVATION WILL NOT BE PAID FOR OUTSIDE THE FOOTING LIMITS.

ALL PIPE CONNECTED WITH A MANHOLE WILL BE MEASURED AND PAID FOR TO THE INSIDE WALL OF THE MANHOLE.

CIRCUMFERENTIAL REINFORCEMENT SIZE AND PLACEMENT SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS TO A MAXIMUM DEPTH OF 20 FEET. OVER 20 FOOT DEPTH CIRCUMFERENTIAL REINFORCEMENT IS INCREASED TO 0.24 SQUARE INCHES STEEL REQUIRED PER LINEAR FOOT, TO A MAXIMUM DEPTH OF 30 FEET.

FOR PIPE CONNECTIONS, A RUBBER GASKET IN ACCORDANCE WITH ASTM RUBBER GASKET SPECIFICATIONS C-443 OR C-923 AND CAST INTEGRALLY IN MANHOLE MAY BE USED AS AN ALTERNATE TO EXPANSIVE MORTAR.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

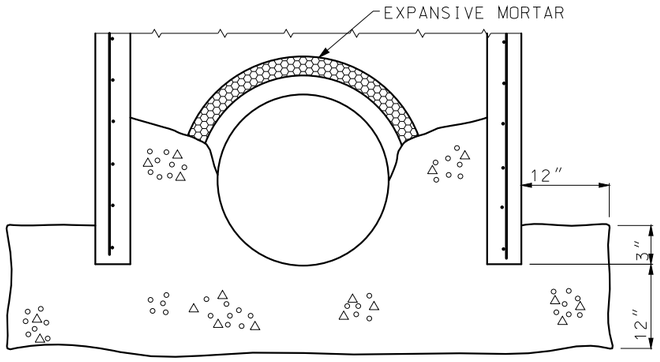
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PRECAST MANHOLES

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

731.00U




ALTERNATE FOOTING

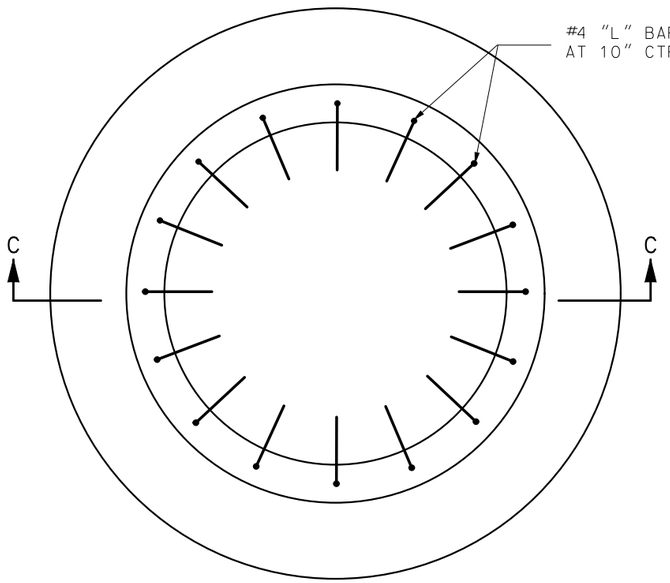
PRECAST BASE SECTION SET ON CONCRETE BLOCKS FOUNDATION SLAB AND INVERT POURED MONOLITHIC.




SECTION C-C

S = 0 FOR DEPTHS LESS THAN OR EQUAL TO 6':
S = 9" FOR DEPTHS GREATER THAN 6'.

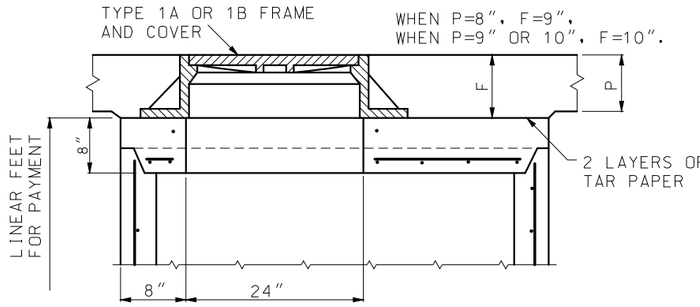
T = 6" FOR DEPTHS OR LESS THAN OR EQUAL TO 6';
T = 9" FOR DEPTHS GREATER THAN 6'.




PRECAST FOUNDATION SLAB

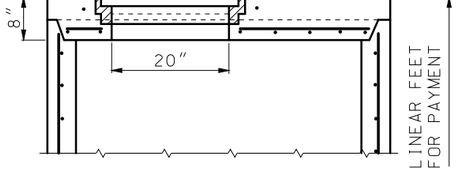
FOUNDATION SLAB AND BASE SECTION MAY BE POURED MONOLITHIC OR SEPARATELY WITH A KEYWAY.

INVERT SHALL BE POURED AFTER PLACEMENT OF MANHOLE.



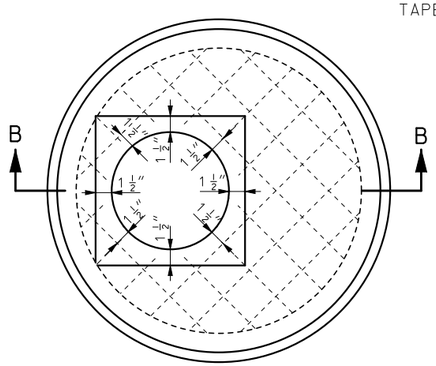

FLAT SLAB MANHOLE TOP (PAVED AREA)

SECTION B-B

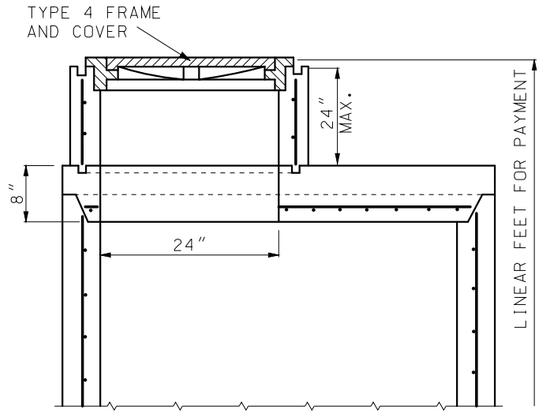



ALTERNATE SECTION B-B

ALTERNATE FLAT SLAB MANHOLE TOP (UNPAVED AREA) USED WHERE DEPTH OF MANHOLE WILL NOT PERMIT USE OF CONE AND TAPER SECTIONS.




PLAN OF FLAT SLAB MANHOLE TOP




ALTERNATE MANHOLE TOP

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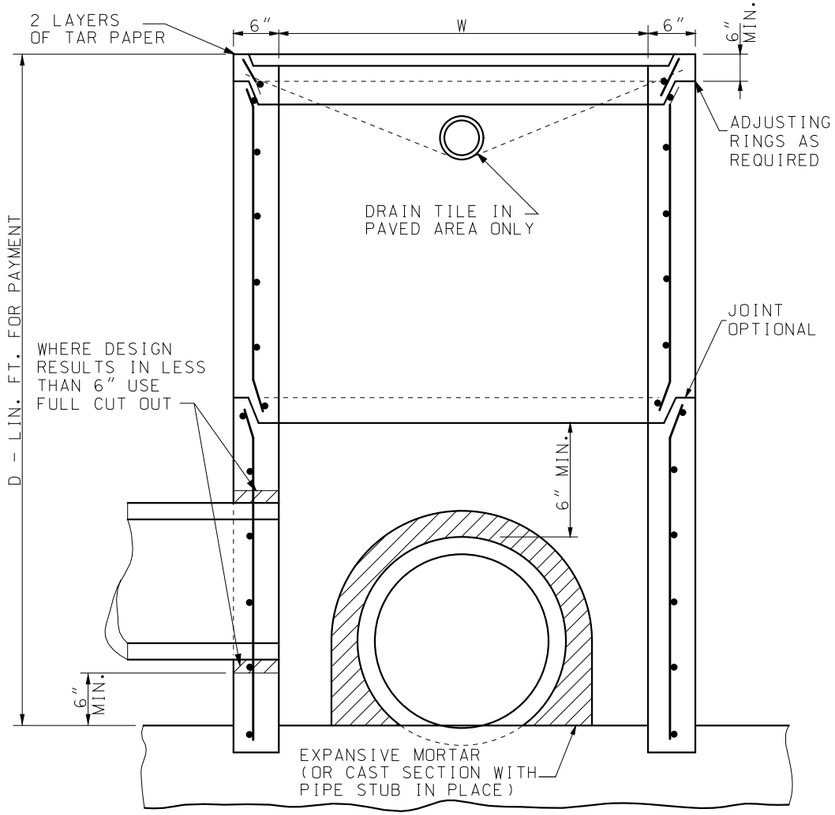

STATE OF MISSOURI
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# PRECAST MANHOLES

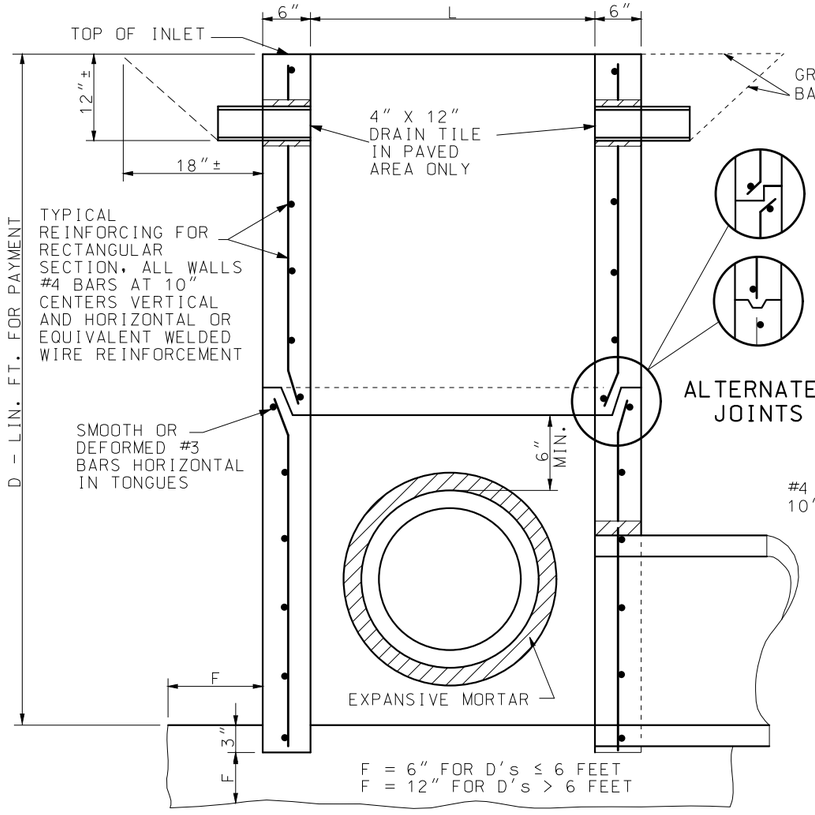
DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

731.00U

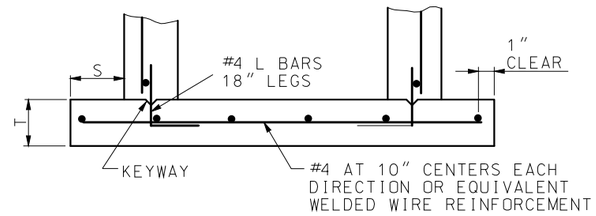
SHEET NO. 2 OF 2



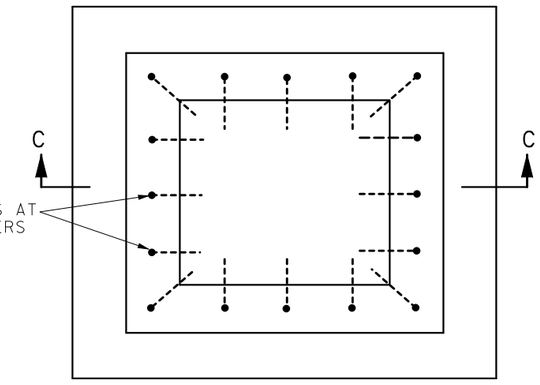

SECTION A-A




SECTION B-B




SECTION C-C

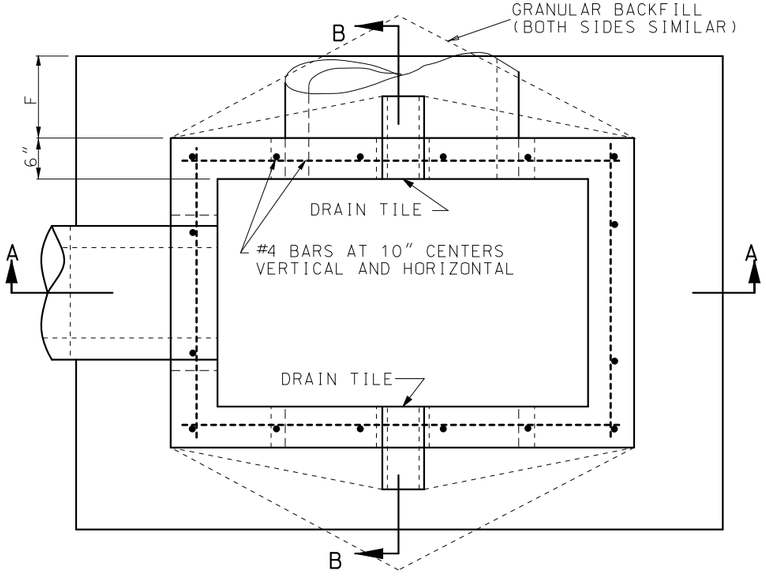



S = 0 FOR D ≤ 6 FEET AND 9" FOR D > 6 FEET

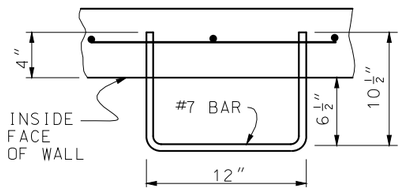
T = 6" FOR D ≤ 6 FEET AND 9" FOR D > 6 FEET

FOUNDATION SLAB AND BASE SECTION MAY BE POURED MONOLITHIC OR SEPARATELY WITH A KEYWAY.

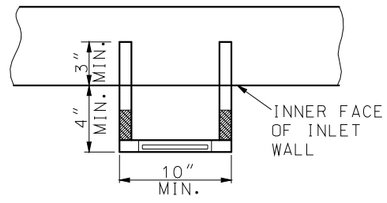
PRECAST FOUNDATION SLAB



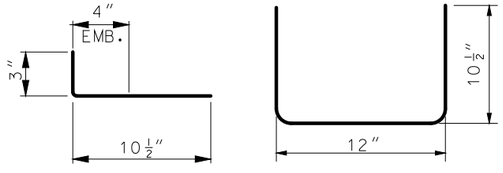

INLET PLAN




STEPS




STEP INSTALLATION (OTHER THAN STEEL BAR)




S - BARS

BENDING DIAGRAM STEEL STEP BAR

GENERAL NOTES:

STEPS SHALL BE PLACED AT VERTICAL INTERVALS OF 16" MAXIMUM IN ALL INLETS HAVING A DEPTH OF MORE THAN 4 FEET. STEPS SHALL BEGIN AT AN ELEVATION 6" ABOVE THE TOP OF THE OUTLET PIPE.

STEPS SHALL BE SET LEVEL AND IN VERTICAL ALIGNMENT AND NOT NEARER THAT 3" TO A JOINT.

NO DIRECT PAYMENT WILL BE MADE FOR INLET STEPS.

STEPS ARE NOT REQUIRED FOR TYPE D INLETS.

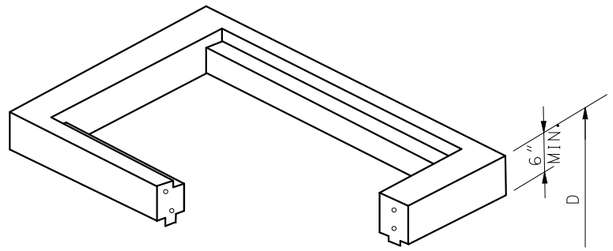

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105 WEST CAPITOL
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STATE OF MISSOURI
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PROFESSIONAL ENGINEER
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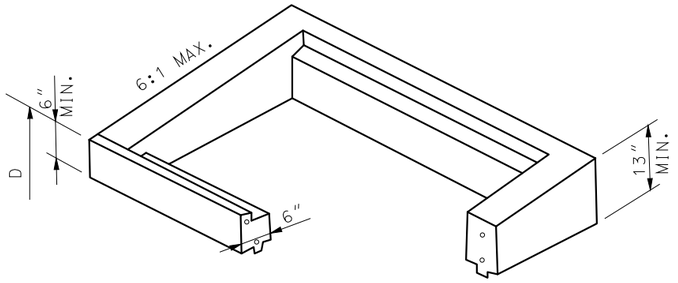
# PRECAST DROP INLET

| DATE EFFECTIVE: | 07/01/2016 | 731.10S | SHEET NO. 1 OF 8 |
|---|---|---|---|
| DATE PREPARED: | 5/13/2016 | | |

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

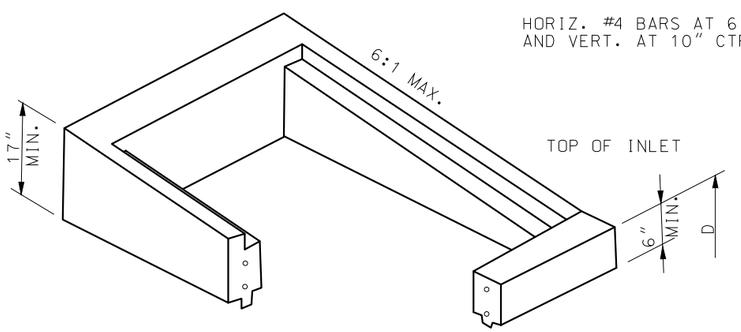



TYPE S-1




TYPE S-2

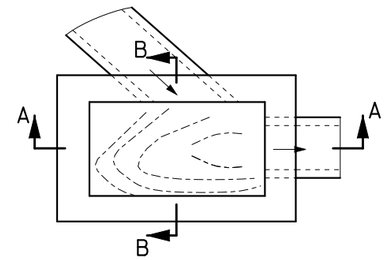
HORIZ. #4 BARS AT 6" CTRS.
AND VERT. AT 10" CTRS.

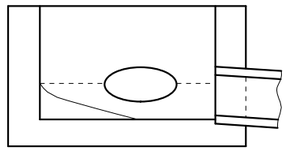



TYPE S-3

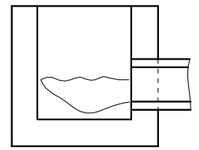
SEE STANDARD PLAN 614.10 FOR GRATES AND BEARING PLATES. TYPICAL LOCATION DETAILS ARE INDICATED ON SHEETS 7 AND 8 OF 8. TOP SECTIONS MAY BE CAST MONOLITHIC WITH BASE SECTION.

| DROP INLET | | |
|---|---|---|
| WIDTH FT. | LENGTH FT. | TYPE |
| 2 | 2 | A,B,C |
| 4 | 2 | |
| 2 | 2 | D |
| 3 | 2 | E,S-1 S-2,S-3 |
| 3 | 3 | |
| 5 | 2 | |
| 5 | 3 | |

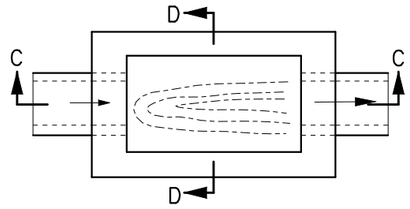


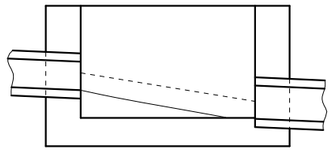



SECTION A-A

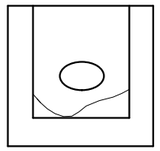


SECTION B-B

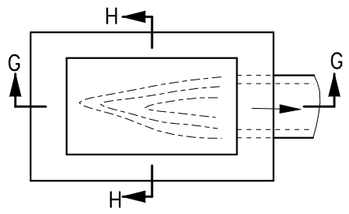


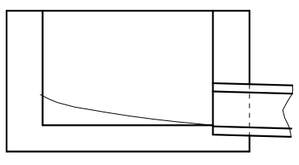



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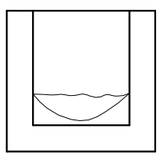


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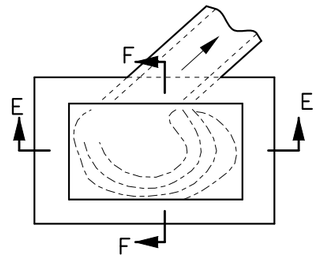



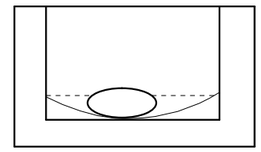
SECTION G-G



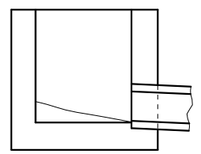
SECTION H-H

TYPICAL INVERTS



SECTION E-E



SECTION F-F

GENERAL NOTES:

THE CONCRETE FOR INVERTS SHALL BE PLACED AFTER COMPLETION OF THE DROP INLET BOX. NO DIRECT PAYMENT WILL BE MADE FOR FURNISHING OR PLACING INVERT CONCRETE.

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

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NUMBER PE-2841
PROFESSIONAL ENGINEER
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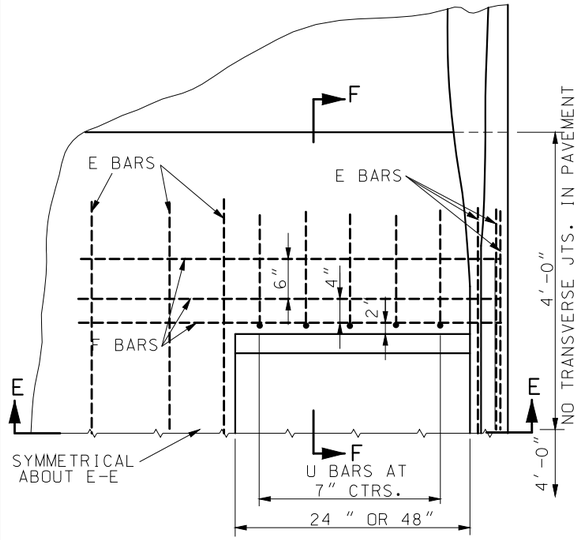
# PRECAST DROP INLET

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

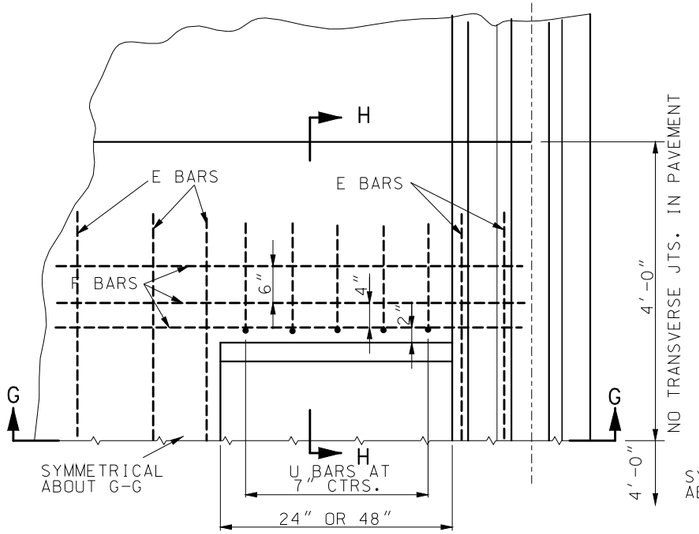
731.10S

SHEET NO. 2 OF 8

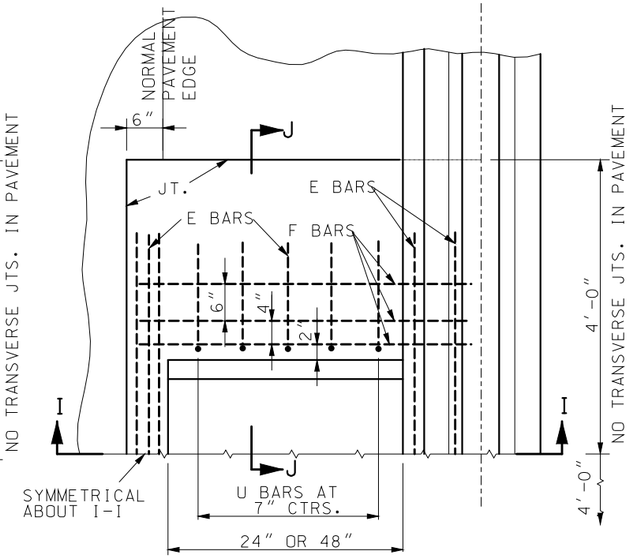
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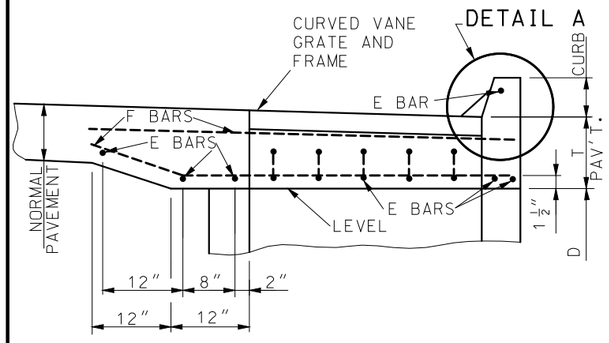

HALF-PLAN



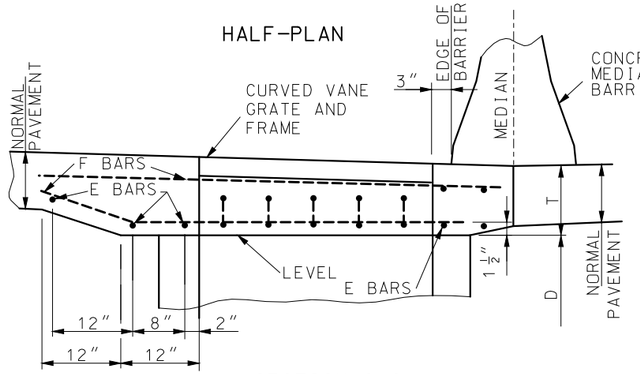

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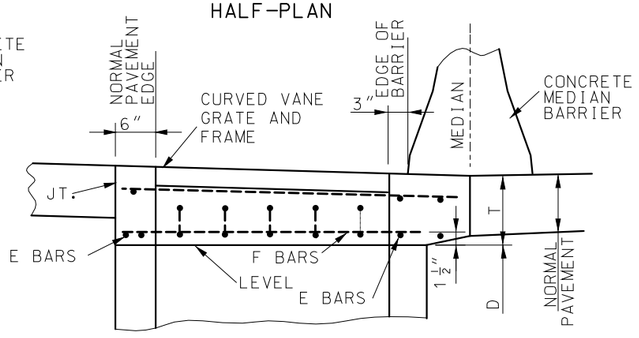

HALF-PLAN



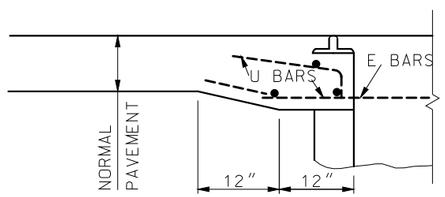

SECTION E-E




SECTION G-G

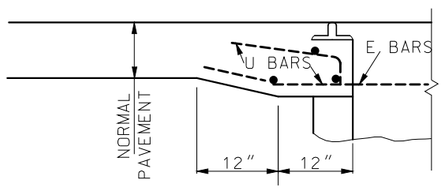



SECTION I-I



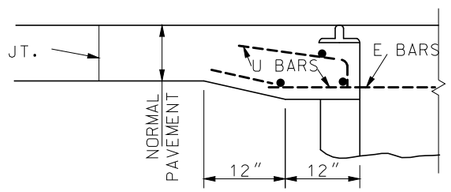

HALF SECTION F-F

## TYPE A
INLET ADJACENT TO CURB



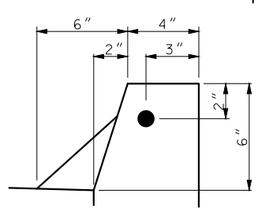

HALF SECTION H-H

## TYPE B
DISTANCE BETWEEN BARRIER AND
PAVEMENT EDGE GREATER THAN INLET WIDTH




HALF SECTIONJ-J

## TYPE C
DISTANCE BETWEEN
BARRIER AND PAVEMENT
EDGE EQUALTO INLET WIDTH

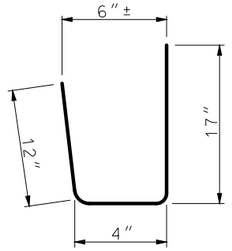



DETAIL A

PAVEMENT BAR BILL

| TYPE | WIDTH | LENGTH | MARK | NO. | LENGTH |
|---|---|---|---|---|---|
| A | 4' | 2' | E | 6 | 6'-0" |
| | | | F | 6 | 6'-6" |
| | | | U | 14 | 2'-9" |
| | 2' | 2' | E | 6 | 6'-0" |
| | | | F | 6 | 4'-6" |
| | | | U | 8 | 2'-9" |
| B | 4' | 2' | E | 7 | 6'-0" |
| | | | F | 6 | 7'-0" |
| | | | U | 14 | 2'-9" |
| | 2' | 2' | E | 7 | 6'-0" |
| | | | F | 6 | 5'-0" |
| | | | U | 8 | 2'-9" |
| C | 4' | 2' | E | 7 | 6'-0" |
| | | | F | 6 | 5'-3" |
| | | | U | 14 | 2'-9" |
| | 2' | 2' | E | 7 | 6'-0" |
| | | | F | 6 | 3'-3" |
| | | | U | 8 | 2'-9" |
| D | 2' | 2' | E | 6 | 7'-0" |
| | | | F | 6 | 2'-9" |
| | | | U | 8 | 2'-9" |

BARS E, F, & U.....#4




U-BARS
BENDING DIAGRAM

GENERAL NOTE:

SEE STANDARD PLAN 614.11 FOR CURVED VANE GRATE.

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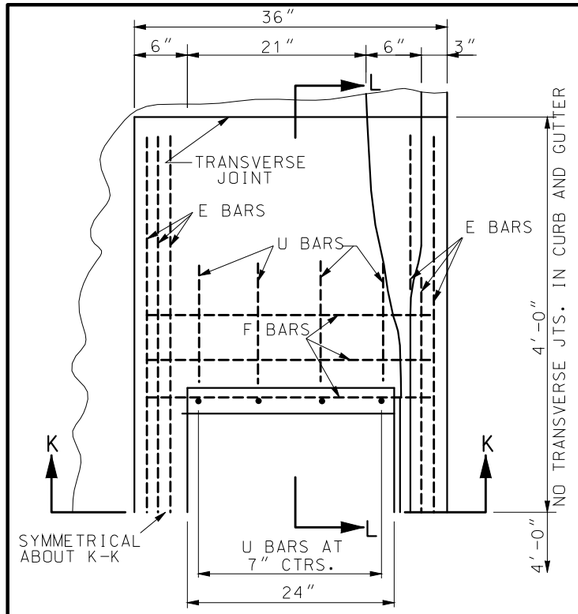

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NUMBER PE-28411
PROFESSIONAL ENGINEER
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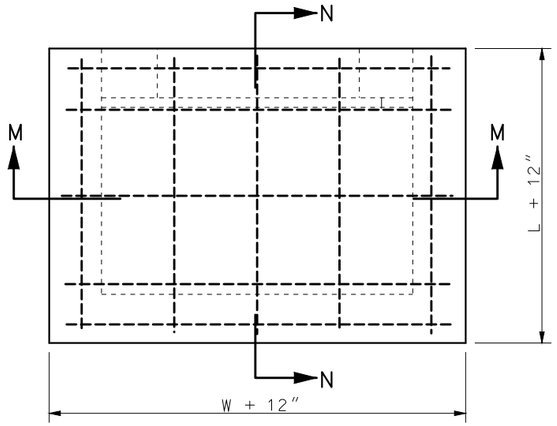
# PRECAST DROP INLET
## COVERS

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

731.10S



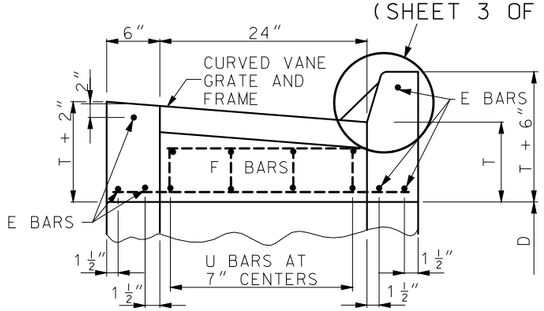

HALF-PLAN



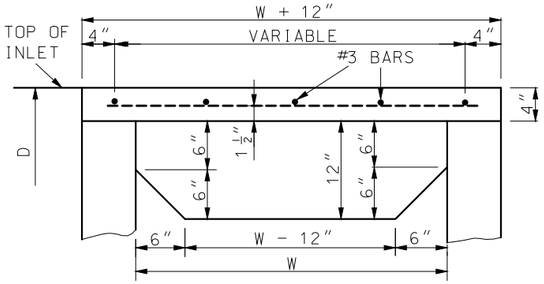

PLAN

| PAVEMENT THICKNESS | "T" DIMENSION |
|---|---|
| LESS THAN OR EQUAL TO 11″ | 11″ |
| 12″ | 12″ |
| 13″ | 13″ |
| GREATER THAN OR EQUAL TO 14″ | 14″ |

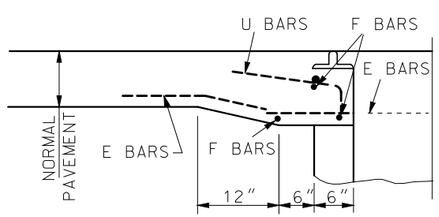
DETAIL A
(SHEET 3 OF 8)




SECTION K-K

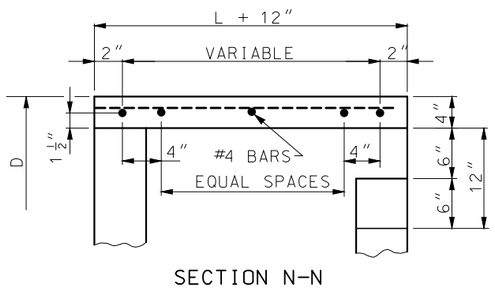



SECTION M-M




HALF SECTION L-L

TYPE D
CURB AND GUTTER




SECTION N-N

TYPE E
PRECAST SLAB

| TYPE E COVER BAR BILL | | | | |
|---|---|---|---|---|
| WIDTH | LENGTH | BAR SIZE | NO. | LENGTH |
| 3′ | 2′ | #3 | 5 | 2′-9″ |
| | | #4 | 5 | 3′-9″ |
| 3′ | 3′ | #3 | 5 | 3′-9″ |
| | | #4 | 5 | 3′-9″ |
| 5′ | 2′ | #3 | 6 | 2′-9″ |
| | | #4 | 6 | 5′-9″ |
| 5′ | 3′ | #3 | 6 | 3′-9″ |
| | | #4 | 7 | 5′-9″ |

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 WALL 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 UNPAVED AREA, THE TOP OF THE DROP INLET WALLS SHALL BE SET TO THE ELEVATION SHOWN ON THE PLANS.

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.

FORMED OR 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 AND 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 726.3.1 OF THE STANDARD SPECIFICATIONS.

THE CONTRACTOR WILL BE PERMITTED TO CAST IN PLACE THE DROP INLETS CALLED FOR IN THE PLANS, TO THE DIMENSIONS REQUIRED FOR PRECAST DROP INLETS.

WELDED WIRE REINFORCEMENT MAY BE IN LIEU OF REINFORCING BARS, THE REINFORCEMENT SHALL NOT BE LESS THAN .23 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 INLET PIPES SHALL NOT BE SET BELOW THE TOP OF THE OUTLET PIPE.

NO DIRECT PAYMENT WILL BE MADE FOR FORMING FOR CURVED VANE 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 1½″ UNLESS OTHERWISE SPECIFIED.

NOT MORE THEN TWO LIFT HOLES OR LIFTING INSERTS MAY BE PROVIDED.

CLASS 3 EXCAVATION WILL BE PAID WITHIN VERTICAL PLANES 18″ OUTSIDE OF THE OUTER WALLS OF THE BASE SECTION OF THE DROP INLETS, CLASS 3 EXCAVATION WILL NOT BE PAID FOR OUTSIDE THE FOOTING LIMITS.

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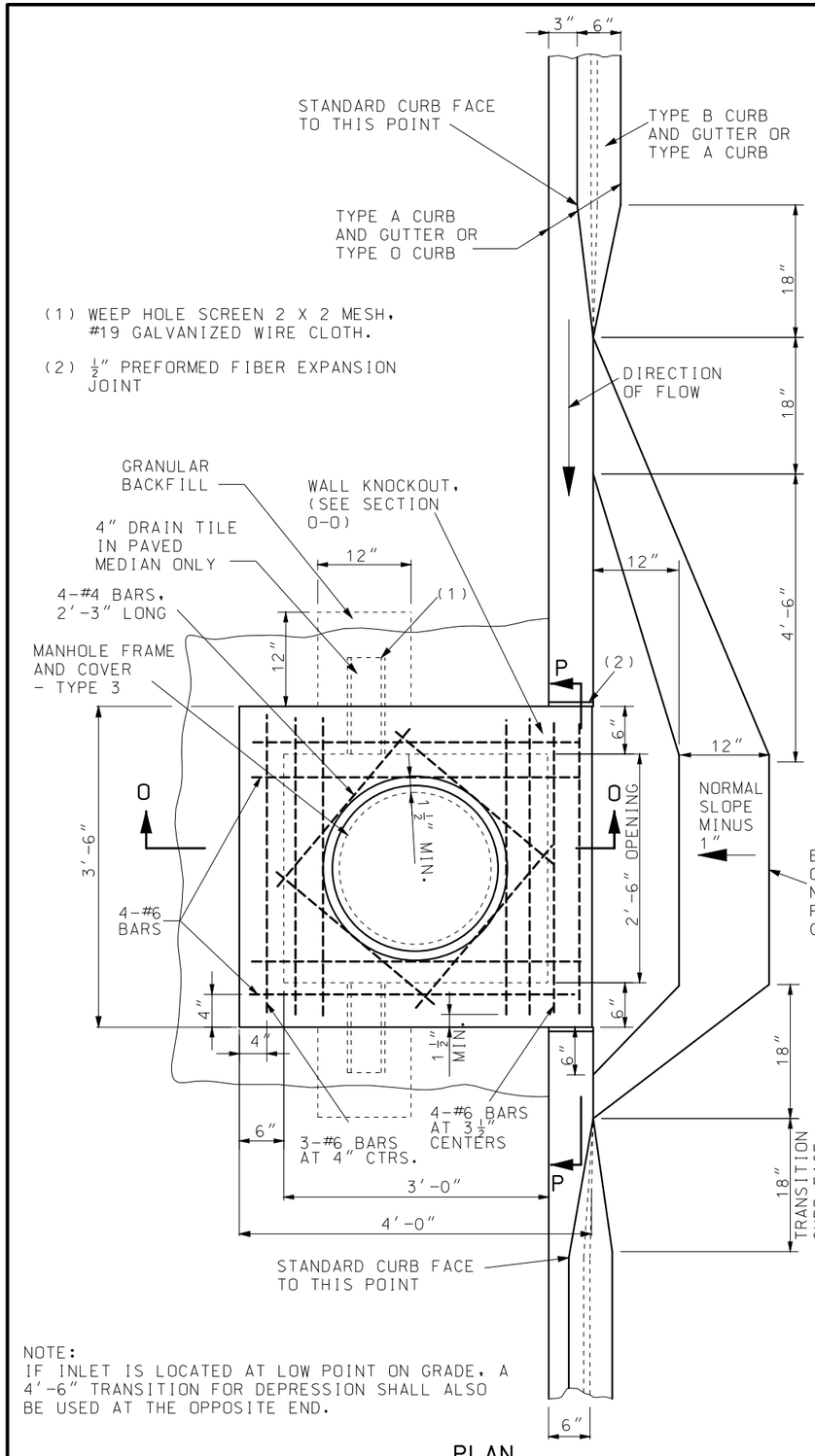
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PRECAST DROP INLET
## COVERS

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

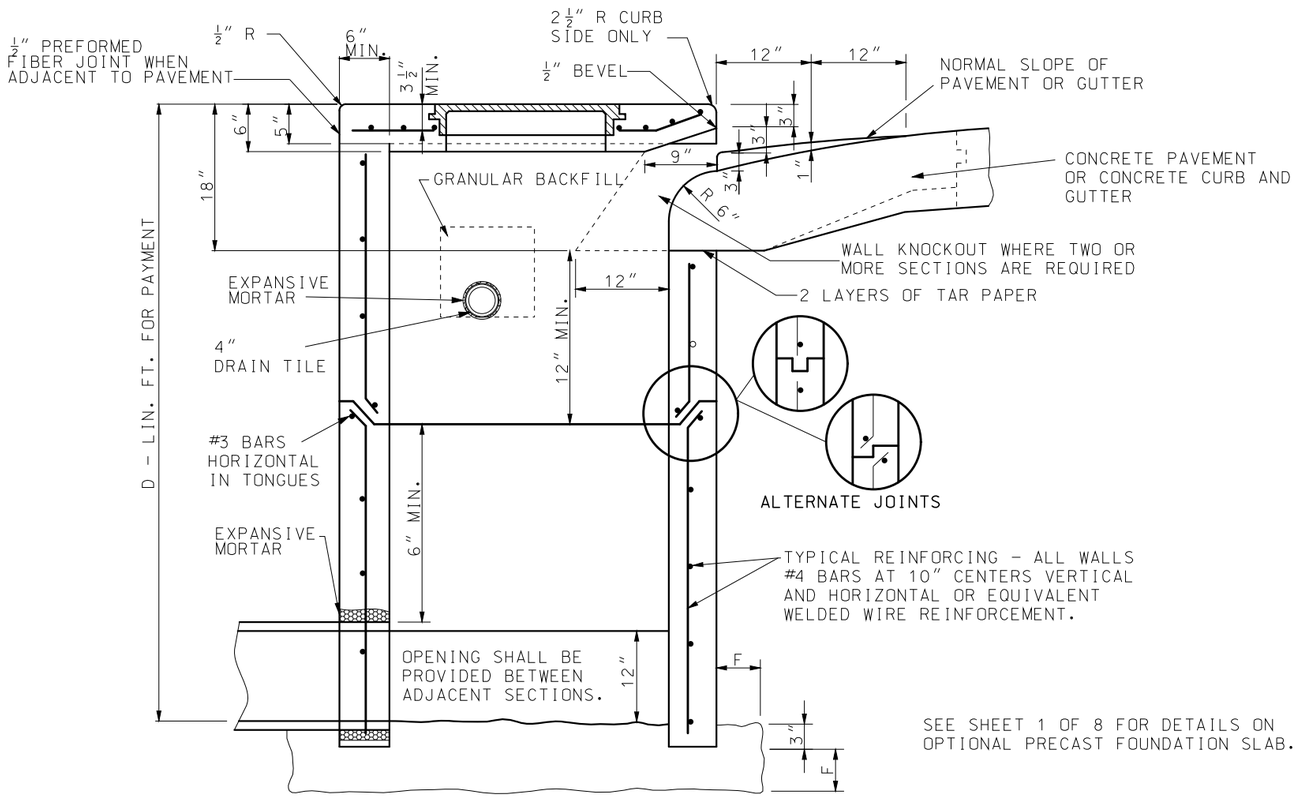
731.10S

SHEET NO. 4 OF 8




NOTE:
IF INLET IS LOCATED AT LOW POINT ON GRADE, A 4′-6″ TRANSITION FOR DEPRESSION SHALL ALSO BE USED AT THE OPPOSITE END.

PLAN

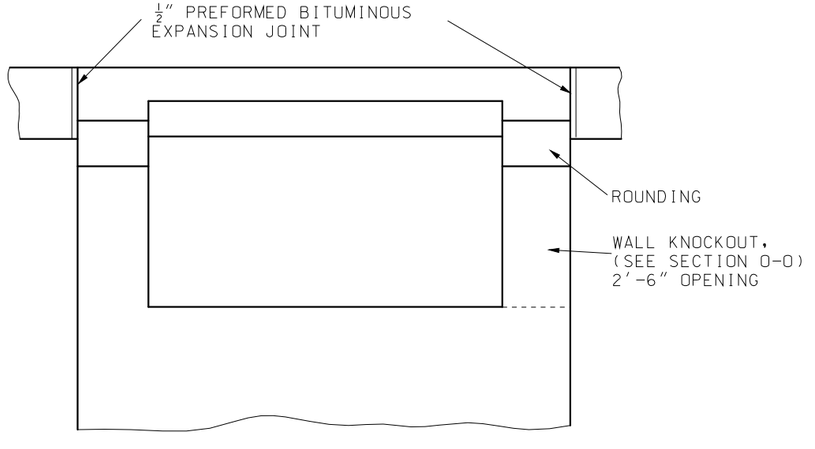



F = 6″ FOR D's ≤ 6′.
F = 12″ FOR D's > 6′.

SECTION O-O

SEE SHEET 1 OF 8 FOR DETAILS ON OPTIONAL PRECAST FOUNDATION SLAB.

PRECAST BASE SECTION SET ON CONCRETE BLOCKS FOUNDATION SLAB AND INVERT POURED MONOLITHIC.




SECTION P-P
DETAILS OF OPENING

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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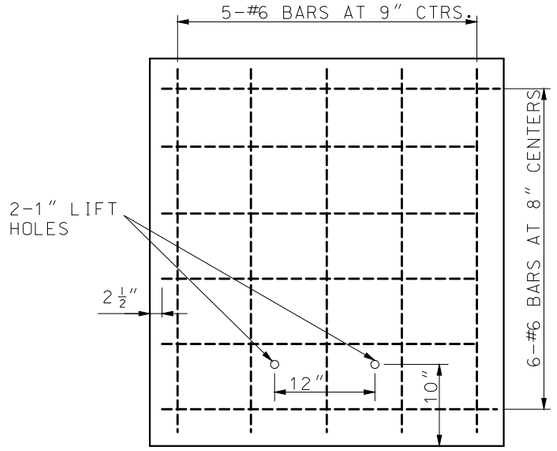
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NUMBER PE-28411
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# PRECAST DROP INLET
## CURB INLET - TYPE T

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 8/11/2016

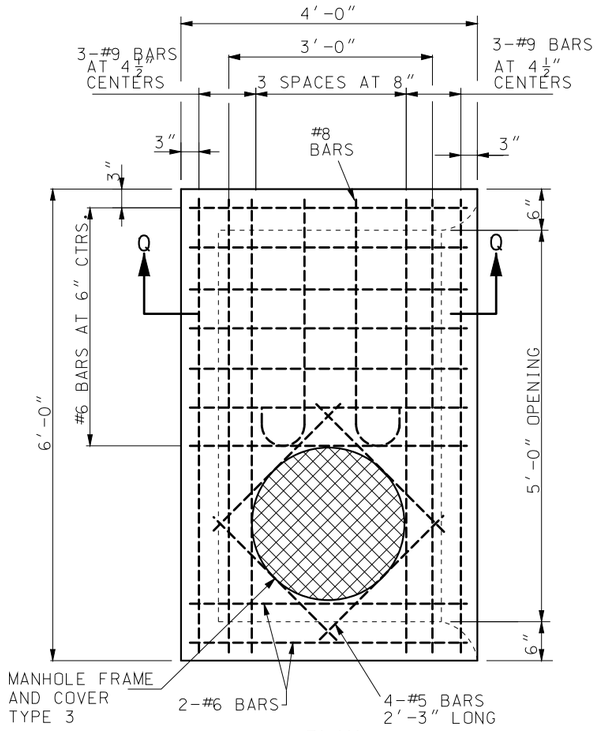
731.10S

SHEET NO. 5 OF 8

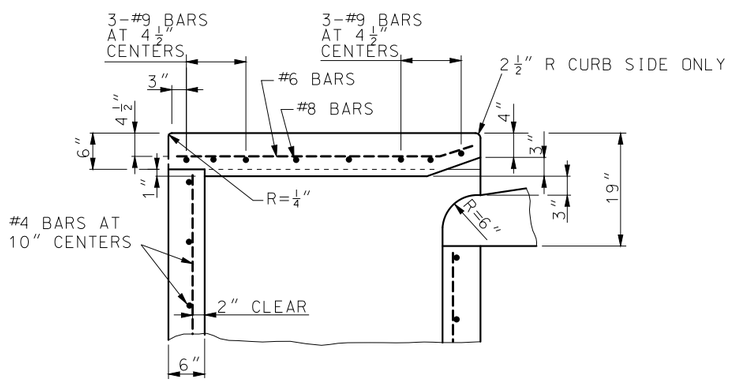



NOTE: REINFORCING FOR LIDS ON UPSTREAM SECTIONS.

## LID FOR ADJACENT SECTIONS




PLAN




SECTION Q-Q

## OPTIONAL PRECAST CURB INLET
## 5'-0" OPENING

OTHER DETAILS ARESAME AS FOR THE 2'-6" OPENING DROP INLET THIS SHEET.

GENERAL NOTES:

NOTES PERTAINING TO TYPE T:

THE LENGTH AND DEPTH OF THE INLET SHALL BE AS SHOWN ON THE PLANS.

WALLS BETWEEN THE ADJACENT SECTIONS SHALL BE SEALED IN ACCORDANCE WITH SECTION 726.3.1 OF THE STANDARD SPECIFICATIONS.

IF DEPTH OF INLET EXCEEDS 6 FEET THE PRECAST UNITS MAY BE FURNISHED IN TWO OR MORE SECTIONS.

IF TWO OR MORE SECTIONS ARE USED, THE TYPE 3 MANHOLE FRAME AND COVER SHALL BE IN THE DOWNSTREAM SECTION ONLY.

IF A 5 FOOT OPENING IS REQUIRED, TWO 2'-6" OPENING SECTIONS OR ONE 5 FOOT OPEING SECTION MAY BE PROVIDED AT THE CONTRACTOR'S OPTION.

SEE SHEET 1 FOR STEP DETAILS AND SHEET 4 FOR GENERAL NOTES.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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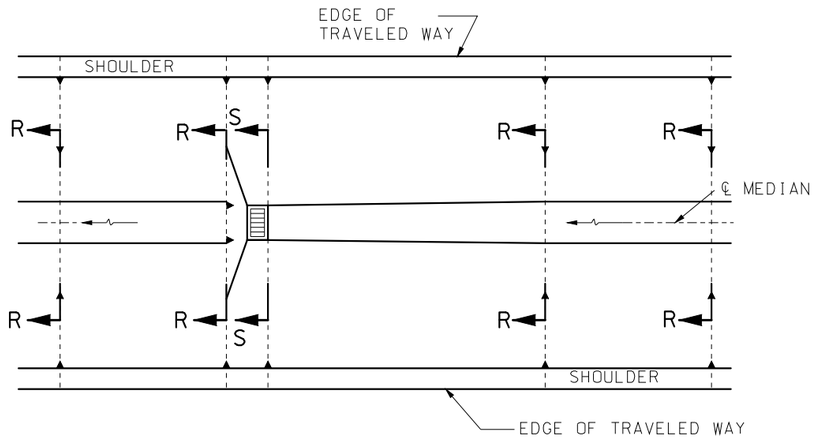
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# PRECAST DROP INLET
## CURB INLET - TYPE T

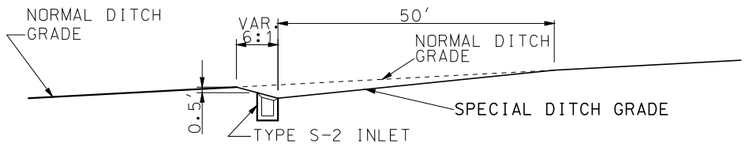
DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

731.10S

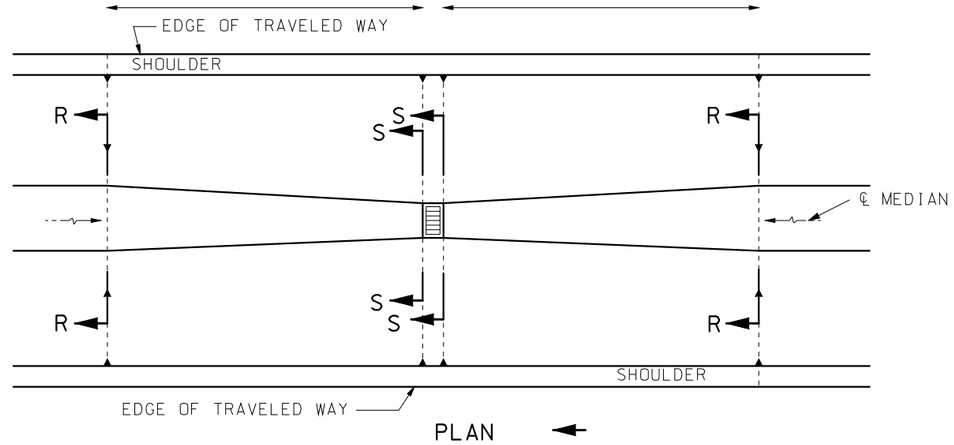
SHEET NO. 6 OF 8



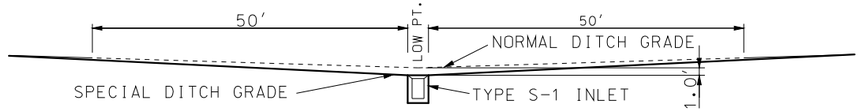

PLAN



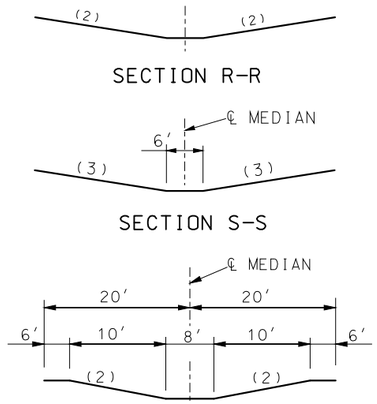

SECTION ALONG CENTERLINE OF MEDIAN RELIEF ON GRADE



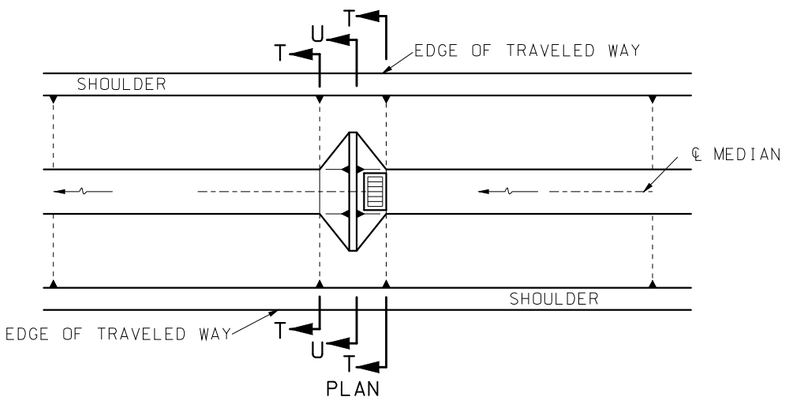

PLAN



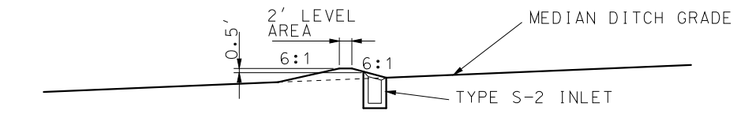

SECTION ALONG CENTERLINE OF MEDIAN RELIEF AT LOW POINT



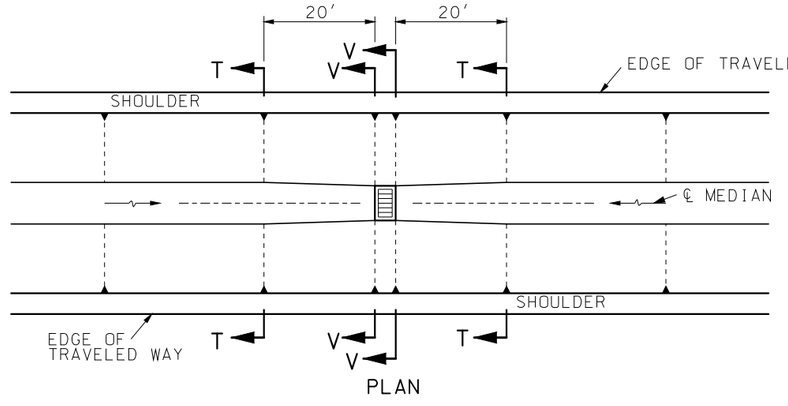

## DETAILS FOR MEDIAN RELIEF-60' MEDIAN



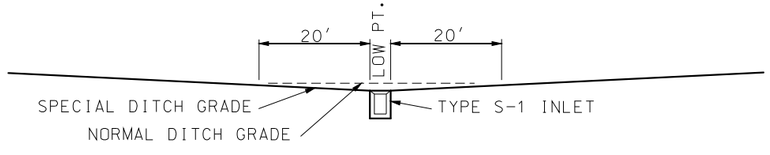

PLAN




SECTION ALONG CENTERLINE OF MEDIAN RELIEF ON GRADE




PLAN




SECTION ALONG CENTERLINE OF MEDIAN RELEIF AT LOW POINT

## DETAILS FOR MEDIAN RELIEF-40' MEDIAN

(1) DITCH WIDTH AS GIVEN ON TYPICAL SECTION.

(2) DITCH SLOPE AS GIVEN ON TYPICAL SECTION.

(3) VARY SLOPE TO ACHIEVE MINIMUM 0.5 FT. FREEBOARD ABOVE TOP OF INLET GRATE ON GRADE, OR 1.0 FT. ADDITIONAL DITCH DEPTH BELOW NORMAL DITCH GRADE AT LOW POINT.

(4) VARY WIDTH TO ACHIEVE MINIMUM .05 FEET REEBORAD ABOVE TOP OF INLET GRATE.

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ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

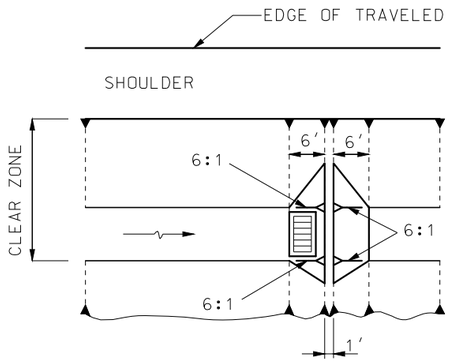
# PRECAST DROP INLET
## TYPICAL LOCATION DETAILS - TYPE S

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

731.10S

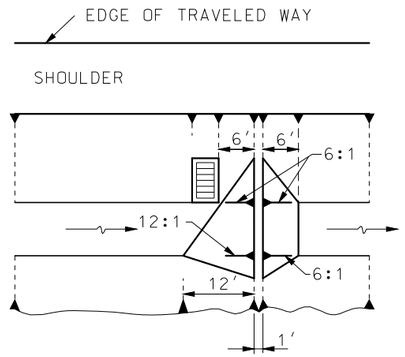
SHEET NO. 7 OF 8

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



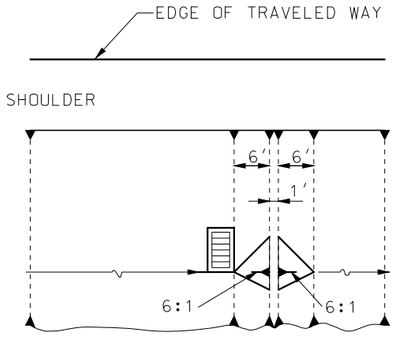

PLAN 1

TYPE S-2 INLET IN ROADWAY DITCH
(FLAT DITCH ON GRADE)



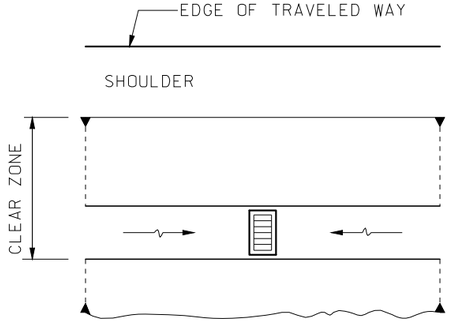

PLAN 2

TYPE S-3 INLET IN ROADWAY DITCH
(FLAT DITCH ON GRADE)



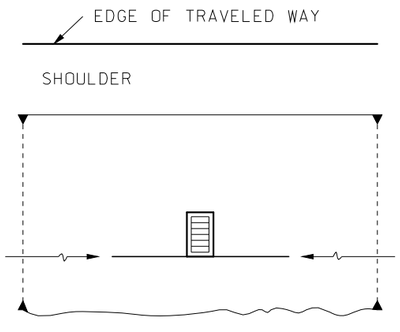

PLAN 3

TYPE S-3 INLET IN ROADWAY DITCH
(V DITCH ON GRADE)




PLAN 4

TYPE S-1 INLET AT LOW POINT
(FLAT DITCH)




PLAN 5

TYPE S-3 INLET AT LOW POINT
(LOW DITCH)

## DETAILS FOR ROADWAY DITCH INLETS LOCATED WITHIN THE CLEAR ZONE

GENERAL NOTES:

THIS DRAWING IS FOR GENERAL INFORMATION ONLY. ACTUAL CONSTRUCTION DETAILS SHALL CONFORM TO THOSE SHOWN ON THE DETAIL PLANS.

DETAILS ON THIS SHEET ARE ONLY FOR USE WITH STRUCTURES LOCATED IN THE MEDIAN OR WITHIN THE CLEAR ZONE.

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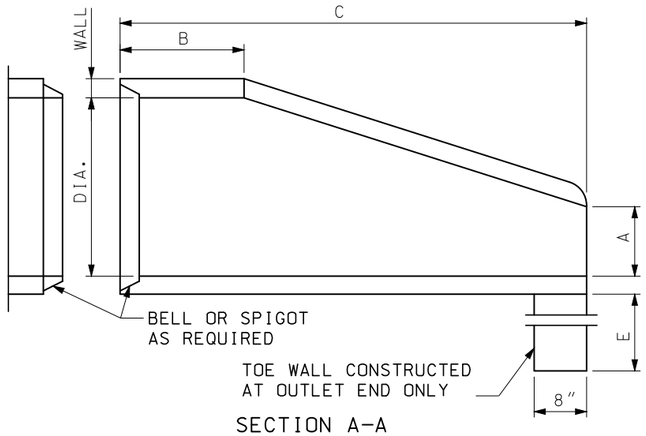
# PRECAST DROP INLET
## TYPICAL LOCATION DETAILS – TYPE S

DATE EFFECTIVE: 07/01/2016
DATE PREPARED: 5/13/2016

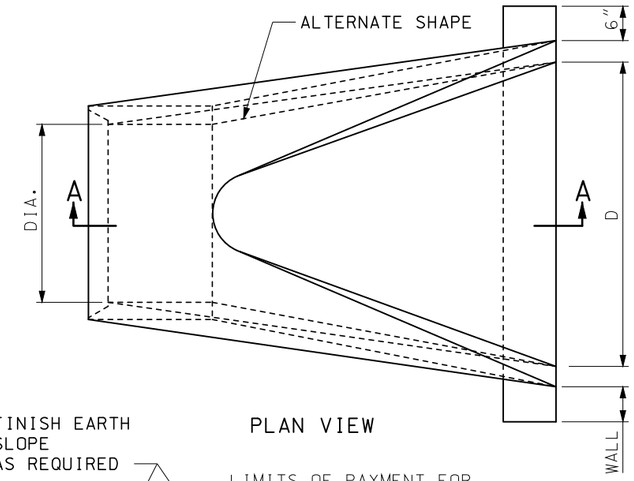
731.10S

SHEET NO. 8 OF 8

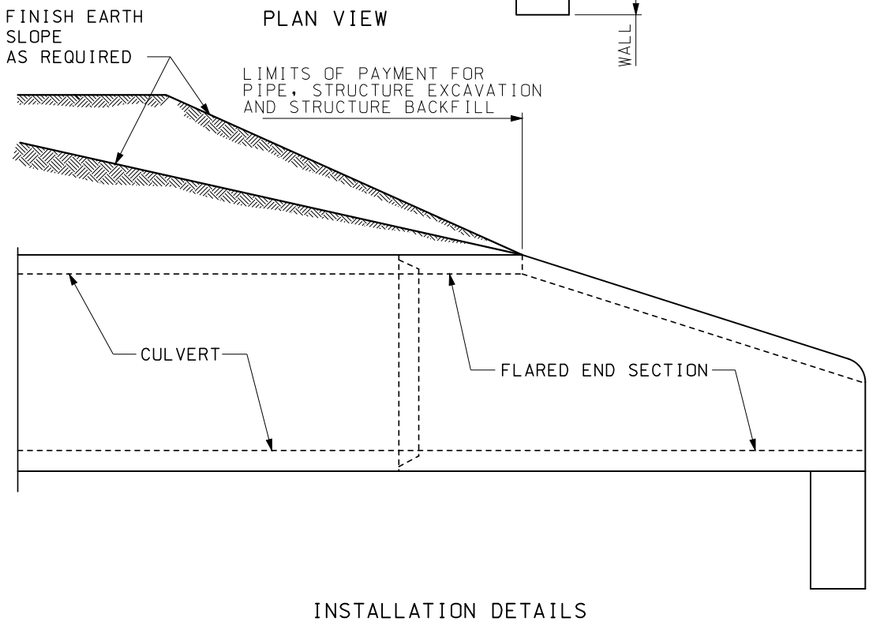
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




SECTION A-A



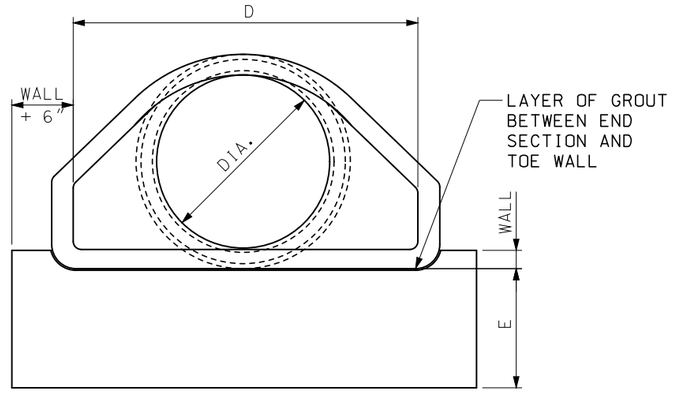

PLAN VIEW




INSTALLATION DETAILS

| DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| DIA. | WALL | A | B MIN. | C MIN. | D | E |
| 12″ | 2″ | 4″ | 4′-0″ | 6′ | 2′-0″ | 18″ |
| 15″ | 2¼″ | 6″ | 3′-10″ | 6′ | 2′-6″ | 18″ |
| 18″ | 2½″ | 9″ | 3′-10″ | 6′ | 3′-0″ | 18″ |
| 21″ | 2¾″ | 9″ | 3′-2″ | 6′ | 3′-6″ | 18″ |
| 24″ | 3″ | 9½″ | 2′-6″ | 6′ | 4′-0″ | 24″ |
| 27″ | 3¼″ | 10½″ | 2′-1″ | 6′ | 4′-6″ | 24″ |
| 30″ | 3½″ | 1′-0″ | 1′-7″ | 6′ | 5′-0″ | 24″ |
| 33″ | 3¾″ | 1′-2″ | 1′-7″ | 6′ | 5′-6″ | 24″ |
| 36″ | 4″ | 1′-3″ | 2′-10″ | 8′ | 6′-0″ | 24″ |
| 42″ | 4½″ | 1′-9″ | 2′-11″ | 8′ | 6′-6″ | 24″ |
| 48″ | 5″ | 2′-0″ | 2′-2″ | 8′ | 7′-0″ | 24″ |
| 54″ | 5½″ | 2′-3″ | 2′-11″ | 8′ | 7′-6″ | 36″ |
| 60″ | 6″ | 2′-6″ | 3′-3″ | 8′ | 8′-0″ | 36″ |
| 66″ | 6½″ | 2′-0″ | 1′-9″ | 8′ | 8′-6″ | 36″ |
| 72″ | 7″ | 2′-0″ | 2′-9″ | 10′ | 9′-0″ | 36″ |
| 78″ | 7½″ | 2′-3″ | 2′-3″ | 10′ | 9′-6″ | 36″ |
| 84″ | 8″ | 2′-6″ | 2′-0″ | 10′ | 10′-0″ | 36″ |

| REINFORCEMENT | | | | | |
|---|---|---|---|---|---|
| ADJOINING PIPE DIA. | BARREL SECTION REINFORCEMENT | | | FLARE SECTION REINFORCEMENT (ONE LAYER ONLY IN CENTER OF WALL) | |
| | CIRCULAR | | ELLIPTICAL | | |
| | INNER CAGE SQ. IN./ LIN. FT. | OUTER CAGE SQ. IN./ LIN. FT. | SQ. IN./ LIN. FT. | AREA OF LONGITUDINAL SQ. IN./ LIN. FT. | AREA OF TRANSVERSE SQ. IN./ LIN. FT. |
| 12″ | 0.07 | | | 0.048 | 0.048 |
| 15″ | 0.07 | | | 0.054 | 0.054 |
| 18″ | 0.07 | | 0.07 | 0.060 | 0.060 |
| 21″ | 0.07 | | 0.07 | 0.066 | 0.066 |
| 24″ | 0.07 | | 0.07 | 0.072 | 0.072 |
| 27″ | 0.13 | | 0.11 | 0.078 | 0.078 |
| 30″ | 0.14 | | 0.12 | 0.084 | 0.084 |
| 33″ | 0.15 | | 0.13 | 0.090 | 0.090 |
| 36″ | 0.12 | 0.09 | 0.13 | 0.096 | 0.096 |
| 42″ | 0.15 | 0.12 | 0.17 | 0.108 | 0.108 |
| 48″ | 0.18 | 0.14 | 0.20 | 0.120 | 0.120 |
| 54″ | 0.22 | 0.16 | 0.24 | 0.132 | 0.132 |
| 60″ | 0.25 | 0.19 | 0.28 | 0.144 | 0.144 |
| 66″ | 0.31 | 0.23 | 0.34 | 0.156 | 0.156 |
| 72″ | 0.35 | 0.21 | 0.39 | 0.170 | 0.170 |
| 78″ | 0.40 | 0.24 | 0.44 | 0.185 | 0.185 |
| 84″ | 0.46 | 0.28 | 0.51 | 0.205 | 0.205 |




END VIEW

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 LAYING.

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 AS PER SECTION 1032.3.4.


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STATE OF MISSOURI
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NUMBER PE-2841
PROFESSIONAL ENGINEER
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# FLARED END SECTION

PRECAST CONCRETE

DATE EFFECTIVE: 04/01/2016
DATE PREPARED: 2/11/2016

732.00S

SHEET NO. 1 OF 3

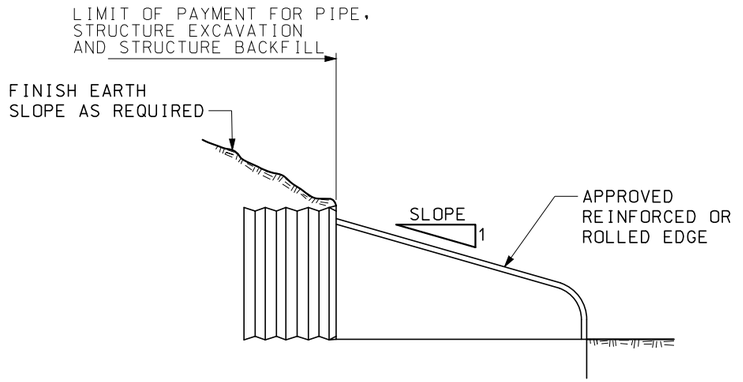
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## END SECTIONS FOR ARCH PIPE

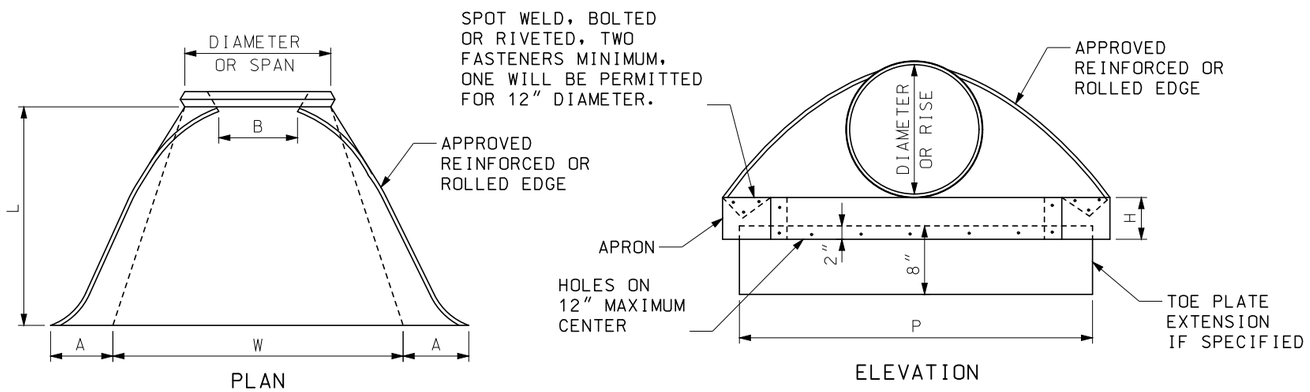
| TYPE | ARCH DIMENSIONS SPAN x RISE | DIAMETER EQUIVALENT ROUND PIPE IN. | GALVANIZED SHEET THICK IN. | DIMENSIONS (IN.) | | | | | APPROXIMATE SLOPE (V:H) (1:SLOPE) | TOE PLATE IF SPECIFIED P, (IN.) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A 1" TOL. | B MAX. | H 1" TOL. | L 1½" TOL. | W 2" TOL. | | |
| B1 | SEE STANDARD PLAN 725.00 | 15 | .064 | 6 | 9 | 6 | 19 | 30 | 2⅛ | 40 |
| B2 | | 18 | .064 | 7 | 11 | 6 | 23 | 36 | 2 | 46 |
| B3 | | 21 | .064 | 8 | 12 | 6 | 28 | 42 | 2⅛ | 52 |
| B4 | | 24 | .064 | 8 | 16 | 6 | 32 | 48 | 2 | 58 |
| B5 | | 30 | .079 | 10 | 16 | 6 | 39 | 60 | 1⅞ | 70 |
| B6 OR B6A | | 36 | .079 | 12 | 18 | 8 | 46 | 75 | 1¾ | 85 |
| B7 OR B7A | | 42 | .109 | 13 | 21 | 9 | 53 | 85 | 1⅞ | 107 |
| B8 OR B8A | | 48 | .109 | 18 | 26 | 12 | 63 | 90 | 1⅞ | 112 |
| B9 OR B9A | | 54 | .109 | 18 | 30 | 12 | 70 | 102 | 1⅞ | 124 |
| B10 OR B10A | | 60 | .109 | 18 | 33 | 12 | 77 | 114 | 1⅞ | 136 |
| B11 OR B11A | | 66 | .109 | 18 | 36 | 12 | 77 | 126 | 1⅝ | 148 |
| B12 OR B12A | | 72 | .109 | 18 | 39 | 12 | 77 | 138 | 1½ | 160 |

## END SECTIONS FOR ROUND PIPE

| PIPE DIAMETER (IN.) | GALVANIZED SHEET THICK (IN.) | DIMENSIONS (IN.) | | | | | APPROXIMATE SLOPE (V:H) (1:SLOPE) | TOE PLATE IF SPECIFIED P, (IN.) |
|---|---|---|---|---|---|---|---|---|
| | | A 1" TOL. | B MAX. | H 1" TOL. | L 1½" TOL. | W 2" TOL. | | |
| 12 | .064 | 6 | 6 | 6 | 21 | 24 | 2½ | 34 |
| 15 | .064 | 7 | 8 | 6 | 26 | 30 | 2½ | 40 |
| 18 | .064 | 8 | 10 | 6 | 31 | 36 | 2½ | 46 |
| 21 | .064 | 9 | 12 | 6 | 36 | 42 | 2½ | 52 |
| 24 | .064 | 10 | 13 | 6 | 41 | 48 | 2½ | 58 |
| 30 | .079 | 12 | 16 | 8 | 51 | 60 | 2½ | 70 |
| 36 | .079 | 14 | 19 | 9 | 60 | 72 | 2½ | 94 |
| 42 | .109 | 16 | 22 | 11 | 69 | 84 | 2½ | 106 |
| 48 | .109 | 18 | 27 | 12 | 78 | 90 | 2½ | 112 |
| 54 | .109 | 18 | 30 | 12 | 84 | 102 | 2 OR 2¼ | 124 |
| 60 | .109 | 18 | 33 | 12 | 87 | 114 | 1¾ OR 2 | 136 |
| 66 | .109 | 18 | 36 | 12 | 87 | 120 | 1½ OR 2 | 144 |
| 72 | .109 | 18 | 39 | 12 | 87 | 126 | 1⅓ OR 2 | 148 |
| 78 | .109 | 18 | 42 | 12 | 87 | 132 | 1¼ OR 1½ | 154 |
| 84 | .109 | 18 | 45 | 12 | 87 | 138 | 1⅙ OR 1½ | 160 |




TYPICAL CROSS-SECTION




PLAN

ELEVATION

END SECTION FOR PIPE AND PIPE ARCH

GENERAL NOTES:

MINOR VARIATIONS OF DETAIL AND DIMENSIONS WILL BE ACCEPTED TO PERMIT THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

END SECTIONS FABRICATED FROM THICKER METAL THAN INDICATED WILL BE ACCEPTED.

ALL BOLTS SHALL BE ⅜" DIAMETER AND GALVANIZED, UNLESS OTHERWISE SHOWN.

TOE PLATE EXTENSIONS, IF SPECIFIED, SHALL HAVE HOLES TO MATCH HOLES IN TOE PLATE.

SKIRT SECTION IS DEFINED AS THE FLARED PORTION OF THE END SECTION INCLUDING SIDE AND BOTTOM (CENTER) PANELS AND APRON.

SKIRT SECTION FOR 12" THROUGH 24" PIPES SHALL BE MADE IN ONE PIECE.

SKIRT SECTIONS FOR 30" AND LARGER PIPES AND B5 AND LARGER PIPE ARCHES MAY BE MADE FROM UP TO 2 SHEETS JOINED BY RIVETING OR BOLTING ON CENTERLINE.

SKIRT SECTIONS FROM 48" AND LARGER PIPES AND B8 OR LARGER PIPE ARCHES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING EQUAL DISTANCE FROM CENTERLINE.

SKIRT SECTIONS FOR 72" AND LARGER PIPES MAY BE MADE FROM UP TO 4 SHEETS JOINED BY RIVETING AND BOLTING. THE BOTTOM PANEL SHALL BE 2 EQUAL WIDTH SHEETS JOINED ON CENTERLINE.

ALL 3 PIECE AND 4 PIECE SKIRTS FOR 60" OR LARGER PIPES AND B10 AND LARGER PIPE ARCHES SHALL HAVE 0.109" THICK SIDES AND 0.138" THICK BOTTOM (CENTER) PANELS. WIDTH OF BOTTOM PANELS SHALL BE GREATER THAN 20% OF THE PIPE PERIPHERY CONNECTOR SECTIONS. CORNER PLATES AND TOE PLATES SHALL BE GALVANIZED AND OF THE SAME OR GREATER THICKNESS AS THE SKIRT.

SEE SHEET 3 OF 3 FOR CONNECTION DETAILS

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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# FLARED END SECTION

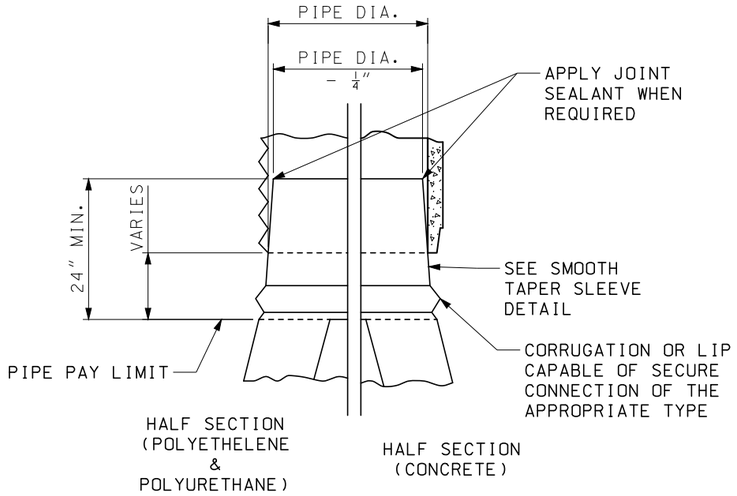
METAL

DATE EFFECTIVE: 04/01/2016
DATE PREPARED: 2/11/2016

732.00S

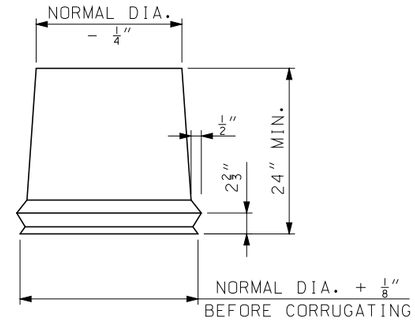
SHEET NO. 2 OF 3

| CONNECTION REQUIREMENTS | | | | | |
|---|---|---|---|---|---|
| TYPE | CONNECTION TYPE | ALLOWABLE SIZE RANGE (IN.) | TAPERED SLEEVE REQUIREMENT | | |
| | | | CMP | RCP PVC | PP PE |
| SAFETY END SECTION | 2 | ALL | N | Y | Y |
| | 6 | 12–24 | N | Y | Y |
| METAL FLARED END SECTION | 1 | 12–24 | N | Y | N |
| | 2 | ALL | N | Y | N |
| | 3 | ALL | N | Y | N |
| | 4 | 12–24 | N | Y | N |
| | 5 | 12–24 | N | Y | N |
| | 6 | 12–24 | N | Y | N |



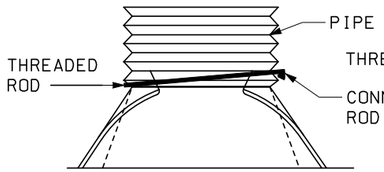

TAPERED SLEEVE CONNECTION FOR CONCRETE AND THERMOPLASTIC PIPE

TAPERED SLEEVE SHALL BE FIRMLY WEDGED INTO PIPE END BEFORE BACKFILLING PIPE PAY LENGTH.



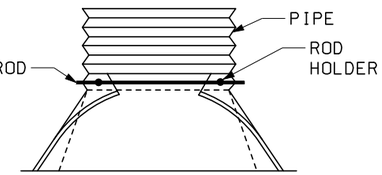

FORM $\frac{1}{2}$" X $2\frac{2}{3}$" CORRUGATIONS.
MAINTAIN INSIDE DIAMETER OF SLEEVE.
FINISHED END TO BE THE SAME DIAMETER AS CORRUGATED STEEL PIPE DIAMETER.

SMOOTH TAPERED SLEEVE DETAIL



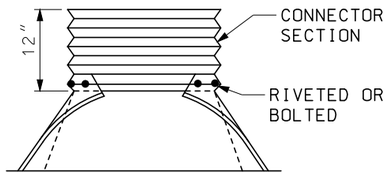

FOR 12" THRU 24" ROUND PIPE ONLY

TYPE 1 CONNECTION



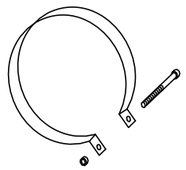

FOR 30" THRU 48" PIPE AND EQUIVALENT PIPE ARCH

TYPE 2 CONNECTION



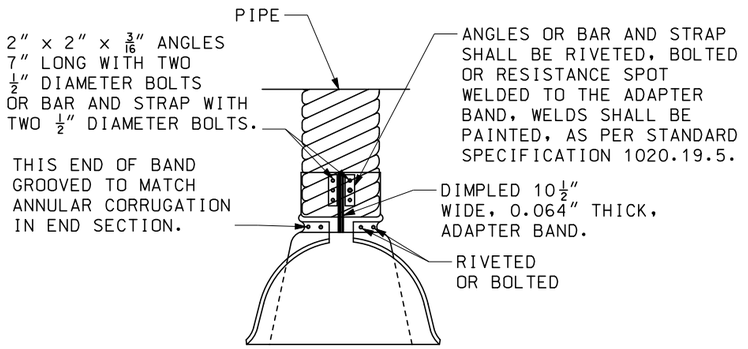

PERMISSIBLE FOR ALL SIZES

TYPE 3 CONNECTION



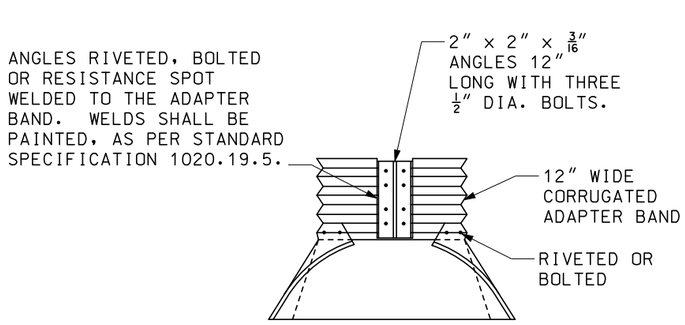
CONNECTOR STRAP

1 INCH WIDE, 0.109" THICK CONNECTOR STRAP OF COMMERCIAL QUALITY STEEL, GALVANIZED WITH SAME WEIGHT COATING AS PIPE, AND 6" × $\frac{1}{2}$" GALVANIZED BAND BOLT AND NUT. USE AS ALTERNATE ON TYPE 1 CONNECTION ONLY.




FOR 12" THRU 42" PIPE AND EQUIVALENT PIPE ARCH

TYPE 4 CONNECTION




PERMISSIBLE FOR ALL SIZES THROUGH 84" PIPE AND B-12 OR B-12A PIPE ARCH

TYPE 5 CONNECTION

END SECTION FOR PIPE AND PIPE ARCH

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 GUAGE STEEL COATED IN ACCORDANCE WITH AASHTO M-218.

TAPERED SLEEVES SHALL BE FIRMLY WEDGED INTO THE PIPE END BEFORE BACKFILLING PIPE PAY LENGTH.

THE LENGTH OF TAPERED SLEEVE SHALL BE SIZED TO PROTECT UV SENSITIVE PIPE MATERIALS FROM SUNLIGHT. THE ENTIRE COST OF THE TAPERED SLEEVE, HARDWARE, AND INSTALLATION SHALL BE INCLUDED IN THE COST OF THE PIPE.

TAPERED SLEEVES SHALL HAVE AT A MINIMUM A HALF CORRUGATION OR LIP DESIGNED TO PROVIDE A SECURE CONNECTION WITH THE END SECTION.

ANY ROD OR STRAP USED FOR MAKING A CONNECTION SHALL BE SECURLY SEATED INTO A VALLEY OF THE PIPE CORRUGATION. THE VALLEY CHOOSEN TO HOLD THE ROD OR STRAP SHALL LEAVE AT LEAST ONE FULL INTACT CORRUGATION BEFORE THE END OF THE PIPE. THE FEMALE PORTION OF A BELL END SHALL NOT COUNT AS A FULL INTACT CORRUGATION.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# FLARED END SECTION

METAL

DATE EFFECTIVE: 04/01/2016
DATE PREPARED: 2/11/2016

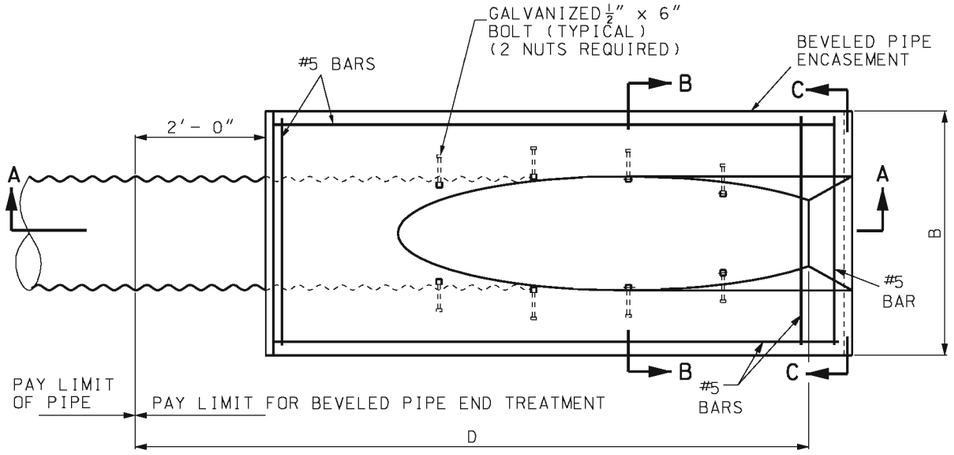
732.00S

SHEET NO. 3 OF 3

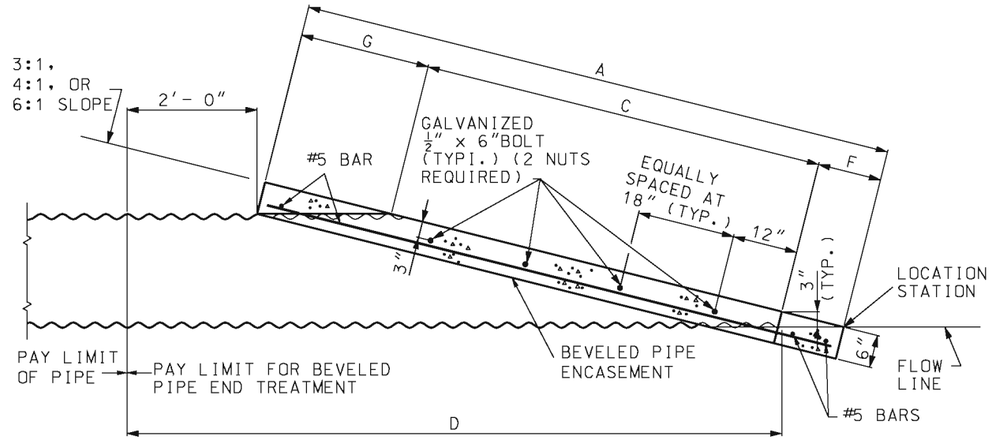
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## BEVELED PIPE ENCASEMENT DETAILS

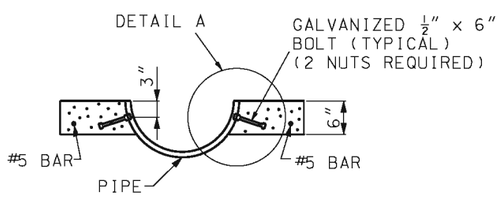
| PIPE DIAMETER | SLOPE | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|---|
| 15" | 3:1 | 5′-5½" | 3′-3" | 3′-2" | 6′-7" | 1 | 9½" | 18" |
| | 4:1 | 7′-2" | | 4′-1½" | 8′-1¼" | 2 | 12½" | 24" |
| | 6:1 | 10′-7¼" | | 6′-1" | 11′-1½" | 3 | 18¼" | 36" |
| 18" | 3:1 | 6′-3" | 3′-6" | 3′-11½" | 7′-4" | 2 | 9½" | 18" |
| | 4:1 | 8′-2¼" | | 5′-1¾" | 9′-1" | 3 | 12½" | 24" |
| | 6:1 | 12′-1½" | | 7′-7¼" | 12′-7½" | 4 | 18¼" | 36" |
| 21" | 3:1 | 7′-½" | 3′-9" | 4′-9" | 8′-1" | 3 | 9½" | 18" |
| | 4:1 | 9′-2¾" | | 6′-2¼" | 10′-1¼" | 3 | 12½" | 24" |
| | 6:1 | 13′-7¾" | | 9′-1½" | 14′-1½" | 5 | 18¼" | 36" |
| 24" | 3:1 | 7′-10" | 4′-0" | 5′-6½" | 8′-10" | 3 | 9½" | 18" |
| | 4:1 | 10′-3" | | 7′-2½" | 11′-1" | 4 | 12½" | 24" |
| | 6:1 | 15′-2" | | 10′-7¾" | 15′-7½" | 6 | 18¼" | 36" |
| 27" | 3:1 | 8′-7½" | 4′-3" | 6′-4" | 9′-7" | 4 | 9½" | 18" |
| | 4:1 | 11′-3½" | | 8′-3" | 12′-1¼" | 5 | 12½" | 24" |
| | 6:1 | 16′-8¼" | | 12′-2" | 17′-1½" | 7 | 18¼" | 36" |
| 30" | 3:1 | 9′-5" | 4′-6" | 7′-1½" | 10′-4" | 4 | 9½" | 18" |
| | 4:1 | 12′-3¾" | | 9′-3¼" | 13′-1" | 6 | 12½" | 24" |
| | 6:1 | 18′-2½" | | 13′-8¼" | 18′-7½" | 8 | 18¼" | 36" |
| 33" | 3:1 | 10′-2¼" | 4′-9" | 7′-10¾" | 11′-¾" | 5 | 9½" | 18" |
| | 4:1 | 13′-4¼" | | 10′-3¾" | 14′-1¼" | 6 | 12½" | 24" |
| | 6:1 | 19′-8¾" | | 15′-2½" | 20′-1½" | 9 | 18¼" | 36" |
| 36" | 3:1 | 10′-11¾" | 5′-0" | 8′-8¼" | 11′-10" | 5 | 9½" | 18" |
| | 4:1 | 14′-4½" | | 11′-4" | 15′-1" | 7 | 12½" | 24" |
| | 6:1 | 21′-3" | | 16′-8¾" | 21′-7½" | 10 | 18¼" | 36" |
| 42" | 3:1 | 12′-6¾" | 5′-6" | 10′-3¼" | 13′-4" | 6 | 9½" | 18" |
| | 4:1 | 16′-5¼" | | 13′-4¾" | 17′-1¼" | 8 | 12½" | 24" |
| | 6:1 | 24′-3½" | | 19′-9¼" | 24′-7½" | 13 | 18¼" | 36" |
| 48" | 3:1 | 14′-1¾" | 6′-0" | 11′-10¼" | 14′-10" | 7 | 9½" | 18" |
| | 4:1 | 18′-6" | | 15′-5½" | 19′-1¼" | 10 | 12½" | 24" |
| | 6:1 | 27′-4" | | 22′-9¾" | 27′-7½" | 15 | 18¼" | 36" |
| 54" | 3:1 | 15′-8¾" | 6′-6" | 13′-5¼" | 16′-4" | 8 | 9½" | 18" |
| | 4:1 | 20′-6¾" | | 17′-6¼" | 21′-1¼" | 11 | 12½" | 24" |
| | 6:1 | 30′-4½" | | 25′-10¼" | 30′-7½" | 17 | 18¼" | 36" |
| 60" | 3:1 | 17′-3¾" | 7′-0" | 15′-¼" | 17′-10" | 9 | 9½" | 18" |
| | 4:1 | 22′-7½" | | 19′-7" | 23′-1¼" | 12 | 12½" | 24" |
| | 6:1 | 33′-5" | | 28′-10¾" | 33′-7½" | 19 | 18¼" | 36" |



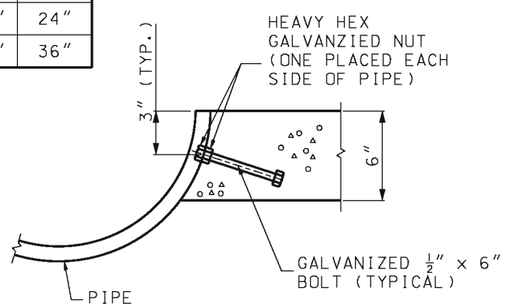

PLAN VIEW FOR HIGHWAYS



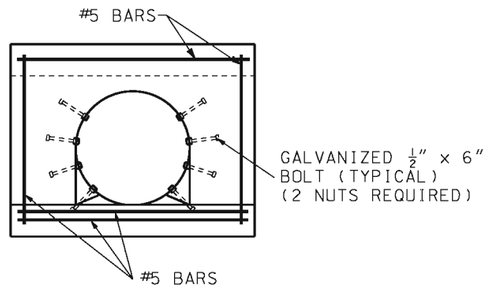

SECTION A-A




SECTION B-B




DETAIL A




SECTION C-C

GENERAL NOTES:

CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL BE CLASS B CONCRETE OR AN APPROVED COMMERCIAL MIX MEETING REQUIREMENTS OF SECTION 501 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL MEET THE REQUIREMENTS OF SECTION 1036 OF THE STANDARD SPECIFICATIONS.

BEVELED PIPE ENCASEMENT MAY BE USED WITH EITHER POLYETHYLENE OR CORRUGATED METALLIC COATED STEEL PIPE.

THE PRICE BID PER EACH FOR "BEVELED PIPE END TREATMENT" SHALL BE CONSIDERED FULL COMPENSATION FOR FURNISHING ALL MATERIALS AND INSTALLATION OF THE BEVELED PIPE SECTION AND BEVELED PIPE ENCASEMENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.

THE ½" x 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 (ASTM A153) SPECIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL MEET ASTM A307.

BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF ½" x 6" GALVANIZED BOLTS. THE ½" x 6" GALVANIZED BOLTS SHALL BE "DOUBLE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.


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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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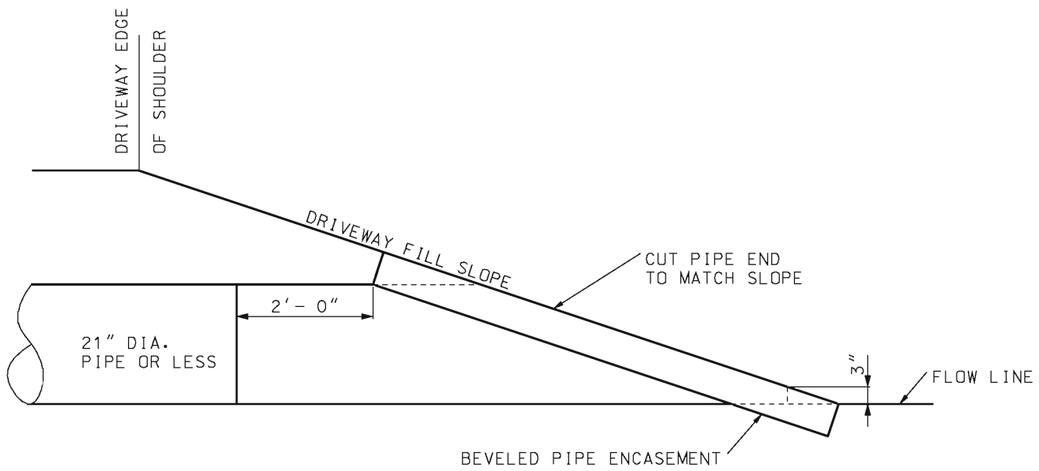
# BEVELED PIPE END TREATMENT FOR HIGHWAYS

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 12/16/2008

732.05C

SHEET NO. 1 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




# PIPE END DETAILS FOR PARALLEL DRAINAGE STRUCTURES FOR DRIVEWAYS

(SINGLE PIPE INSTALLATION)

NOTE:

FOR MULTIPLE PIPE INSTALLATIONS, END SECTIONS WITH SAFETY BARS SYSTEM OR OPTIONAL BAR GATE SYSTEM SHALL BE PROVIDED. SEE STANDARD PLAN 732.10.

SEE DRIVEWAY STANDARD PLANS FOR BEVELED END SECTION REQUIREMENTS.

GENERAL NOTES:

CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL BE CLASS B CONCRETE OR AN APPROVED COMMERCIAL MIX MEETING REQUIREMENTS OF SECTION 501 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL MEET THE REQUIREMENTS OF SECTION 1036 OF THE STANDARD SPECIFICATIONS.

BEVELED PIPE ENCASEMENT MAY BE USED WITH EITHER POLYETHYLENE OR CORRUGATED METALLIC COATED STEEL PIPE.

THE PRICE BID PER EACH FOR "BEVELED PIPE END TREATMENT" SHALL BE CONSIDERED FULL COMPENSATION FOR FURNISHING ALL MATERIALS AND INSTALLATION OF THE BEVELED PIPE SECTION AND BEVELED PIPE ENCASE-MENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.

THE $\frac{1}{2}$" x 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232 (ASTM A123) SPE-CIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL MET ASTM A307.

BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF $\frac{1}{2}$" x 6" GALVANIZED BOLTS. THE $\frac{1}{2}$" x 6" GALVANIZED BOLTS SHALL BE "DOUBLE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.

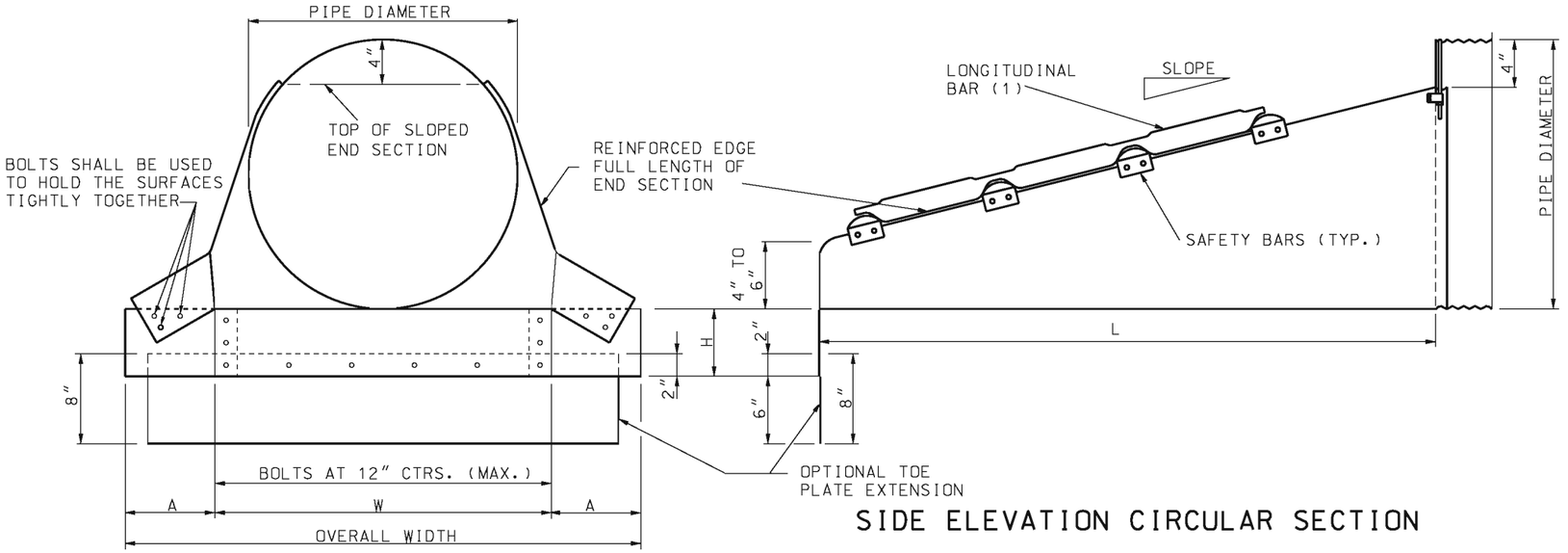
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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## BEVELED PIPE END TREATMENT FOR DRIVEWAYS

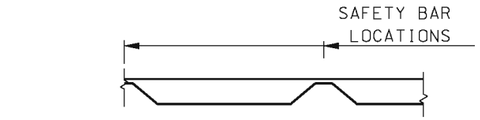
| DATE EFFECTIVE: | DATE PREPARED: | 732.05C | SHEET NO. |
|---|---|---|---|
| 07/01/2004 | 12/16/2008 | | 2 OF 2 |



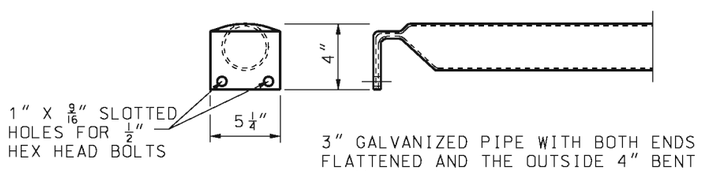

FRONT VIEW CIRCULAR PIPE



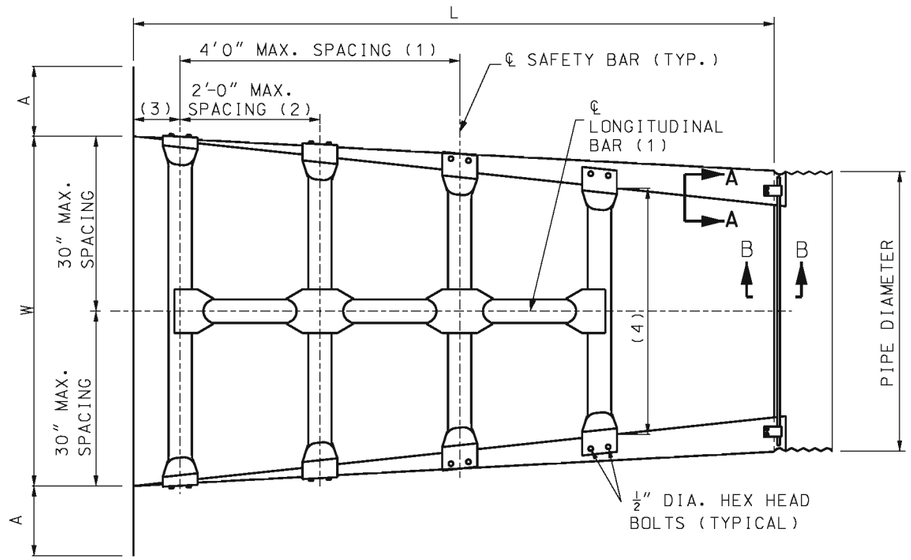

SIDE ELEVATION CIRCULAR SECTION



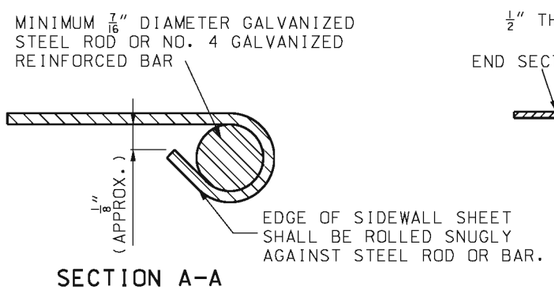

LONGITUDINAL BAR DETAIL



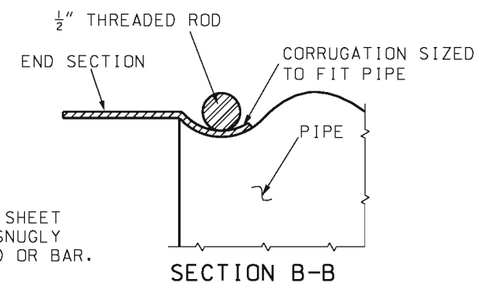

DETAIL OF SAFETY BAR




TOP VIEW CIRCULAR SECTION




SECTION A-A




SECTION B-B

LONGITUDINAL BAR, WHEN REQUIRED, SHALL BE WELDED TO SAFETY BARS TO FORM SINGLE GRATE STRUCTURE. LONGITUDINAL BAR IS NOT TO BE USED FOR PARALLEL DRAINAGE STRUCTURES.

NOTES:
(1) FOR CROSSROAD DRAINAGE STRUCTURES ONLY.
(2) FOR PARALLEL DRAINAGE STRUCTURES ONLY.
(3) 4" TO 6" MINIMUM
(4) SAFETY BARS SHALL BE PROVIDED UNTIL THE LATERAL SPAN OF THE OPENING IS LESS THAN OR EQUAL TO 30".

GENERAL NOTES:

END SECTIONS, INCLUDING ALL BOLTS, NUTS, RODS AND STRAPS, SHALL BE FABRICATED FROM GALVANIZED STEEL MEETING THE REQUIREMENTS OF SECTION 1020.

ALL BOLTS UNLESS OTHERWISE SHOWN SHALL BE A307 BOLTS.

WHEN REQUIRED, OPTIONAL TOE PLATE EXTENSION SHALL BE PUNCHED OR DRILLED AND BOLTED TO END SECTION TOE PLATE, STEEL FOR TOE PLATE EXTENSION SHALL BE SAME GAUGE AS END SECTION. DIMENSIONS SHALL BE OVERALL WIDTH LESS 6' BY 8" HIGH.

ATTACHMENT TO CIRCULAR PIPES 15" THROUGH 24" DIAMETER SHALL BE MADE WITH TYPE #1 STRAPS. ALL OTHER SIZES SHALL BE ATTACHED WITH TYPE #2 CONNECTORS.

SAFETY BARS AND LONGITUDINAL BARS SHALL BE FABRICATED FROM STEEL PIPE MEETING THE REQUIREMENTS OF ASTM A-53 SCHEDULE 40 SPECIFICATIONS. SAFETY BARS AND LONGITUDINAL BARS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SECTION 1020 OF STANDARD SPECIFICATIONS.

INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 725 AND 732 OF THE STANDARD SPECIFICATIONS.

SLOTTED HOLES FOR SAFETY BAR ATTACHMENT SHALL BE PROVIDED FOR ALL END SECTIONS.

MINOR VARIATIONS OF DETAIL WILL BE ACCECTED TO PERMIT THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

END SECTIONS FABRICATED FROM THICKER METAL THAN INDICATED WILL BE ACCEPTED.

ALL BOLTS SHALL BE 3/8" DIAMETER AND GALVANIZED, UNLESS OTHERWISE SHOWN.

SKIRT SECTION IS DEFINED AS THE FLARED PORTION OF THE END SECTION INCLUDING SIDE AND BOTTOM (CENTER) PANELS AND APRON.

SKIRT SECTION FOR 12" TROUGH 24" PIPES SHALL BE MADE IN ONE PIECE.

SKIRT SECTIONS FOR 30" AND LARGER PIPES MAY BE MADE FROM UP TO 2 SHEETS JOINED BY RIVETING OR BOLTING ON CENTERLINE.

SKIRT SECTIONS FROM 48" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING EQUAL DISTANCE FROM CENTERLINE.

ALL 3 PIECE SKIRTS FOR 60" PIPES SHALL HAVE 0.109" THICK SIDES AND 0.138" THICK BOTTOM (CENTER) PANELS. WIDTH OF BOTTOM PANELS SHALL BE GREATER THAN 20% OF THE PIPE PERIPHERY CONNECTOR SECTION. CORNER PLATES AND TOE PLATES SHALL BE GALVANIZED AND OF THE SAME OR GREATER THICKNESS AS THE SKIRT.

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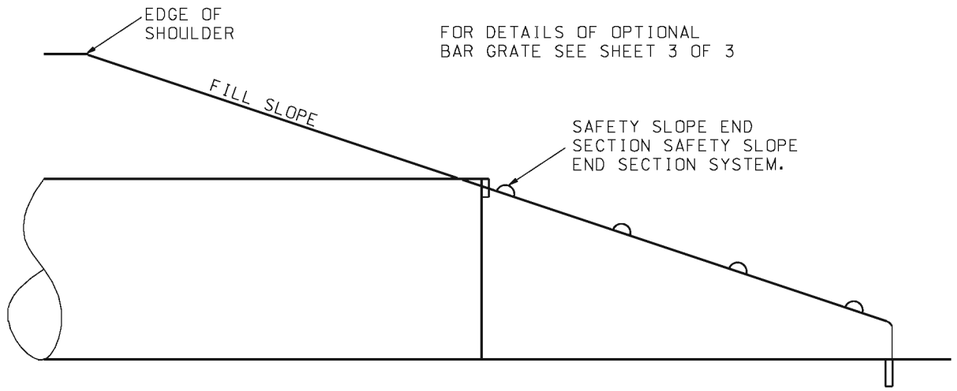
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# SAFETY SLOPE END SECTION

DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 4/1/2013

732.10H

SHEET NO. 1 OF 3




FOR DETAILS OF OPTIONAL
BAR GRATE SEE SHEET 3 OF 3

## PIPE END DETAILS FOR DRAINAGE STRUCTURES

(SINGLE PIPE INSTALLATION)

NOTE:
SEE DRIVEWAY STANDARD PLANS FOR
BEVELED END SECTION REQUIREMENT.

FOR CONNECTION DETAILS, SEE 732.00
SHEET 3 OF 3.

| METAL END SECTIONS FOR CIRCULAR PIPES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PIPE DIA. (IN.) | MIN. GAUGE ENDS (IN.) 4:1 & 6:1 | MIN. GAUGE ENDS (IN.) 10:1 | DIMENSIONS IN INCHES | | | | L DIMENSIONS | | | | | |
| | | | A 1" TOL. | H 1" TOL. | W 2" TOL. | OVERALL WIDTH | SLOPE | LENGTH (IN.) | SLOPE | LENGTH (IN.) | SLOPE | LENGTH (IN.) |
| 15 | 16 | 12 | 8 | 6 | 21 | 37 | 4:1 | 20 | 6:1 | 30 | 10:1 | 70 |
| 18 | 16 | 12 | 8 | 6 | 24 | 40 | 4:1 | 32 | 6:1 | 48 | 10:1 | 100 |
| 21 | 16 | 12 | 8 | 6 | 27 | 43 | 4:1 | 44 | 6:1 | 66 | 10:1 | 130 |
| 24 | 16 | 12 | 8 | 6 | 30 | 46 | 4:1 | 56 | 6:1 | 84 | 10:1 | 160 |
| 30 | 12 | | 12 | 9 | 36 | 60 | 4:1 | 80 | 6:1 | 120 | 10:1 | 220 |
| 36 | 12 | | 12 | 9 | 42 | 66 | 4:1 | 104 | 6:1 | 156 | 10:1 | 280 |
| 42 | 12 | | 16 | 12 | 48 | 80 | 4:1 | 128 | 6:1 | 192 | | |
| 48 | 12 | | 16 | 12 | 54 | 86 | 4:1 | 152 | 6:1 | 228 | | |
| 54 | 12 | | 16 | 12 | 60 | 92 | 4:1 | 176 | 6:1 | 264 | | |
| 60 | 12 | | 16 | 12 | 66 | 98 | 4:1 | 200 | 6:1 | 300 | | |

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# SAFETY SLOPE END SECTION

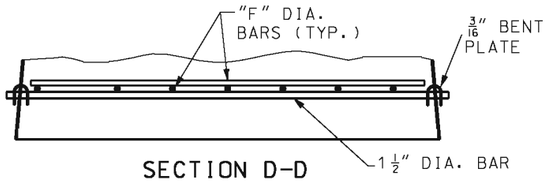
DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 4/1/2013

732.10H

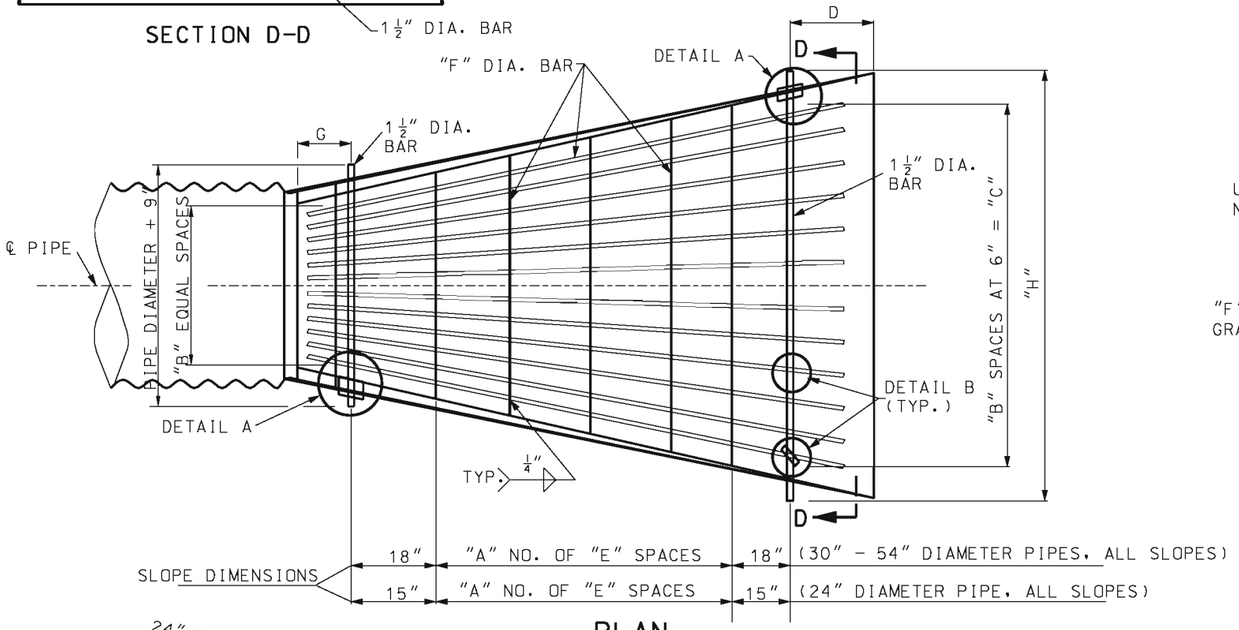
# BAR GRATE SYSTEM DATA

| DRAIN PIPE SIZE | 3:1 SLOPE | | | | | | | | | 4:1 SLOPE | | | | | | | | | 6:1 SLOPE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | "F" BARS | G | H | J | A | B | C | D | E | "F" BARS | G | H | J | A | B | C | D | E | "F" BARS | G | H | J |
| 15"** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18"** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21"** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24" | 0 | 4 | 2'-0" | 6" | 15" | $\frac{5}{8}$" | 8 $\frac{1}{4}$" | 3'-3" | 18.4° | 0 | 4 | 2'-0" | 15 $\frac{3}{4}$" | 15" | $\frac{5}{8}$" | 12" | 3'-3" | 14° | 2 | 4 | 2'-0" | 13 $\frac{1}{8}$" | 15" | $\frac{5}{8}$" | 12" | 3'-3" | 9.5° |
| 30" | 0 | 5 | 2'-6" | 15 $\frac{1}{4}$" | 18" | $\frac{5}{8}$" | 12" | 3'-9" | 18.4° | 1 | 5 | 2'-6" | 16 $\frac{1}{2}$" | 18" | $\frac{5}{8}$" | 12" | 3'-9" | 14° | 3 | 5 | 2'-6" | 19 $\frac{5}{8}$" | 18" | $\frac{5}{8}$" | 12" | 3'-9" | 9.5° |
| 36" | 1 | 6 | 3'-0" | 16 $\frac{1}{4}$" | 18" | $\frac{3}{4}$" | 12" | 4'-3" | 18.4° | 2 | 6 | 3'-0" | 18" | 18" | $\frac{3}{4}$" | 17 $\frac{1}{4}$" | 4'-3" | 14° | 5 | 6 | 3'-0" | 20 $\frac{1}{8}$" | 18" | $\frac{3}{4}$" | 12" | 4'-3" | 9.5° |
| 42" | 2 | 7 | 3'-6" | 17 $\frac{1}{4}$" | 18" | 1" | 12" | 4'-9" | 18.4° | 4 | 7 | 3'-6" | 12" | 18" | 1" | 12" | 4'-9" | 14° | 7 | 7 | 3'-6" | 11 $\frac{7}{8}$" | 18" | 1" | 9" | 4'-9" | 10.1° |
| 48" | 3 | 8 | 4'-0" | 18" | 18" | 1" | 12 $\frac{1}{8}$" | 5'-3" | 18.4° | 5 | 8 | 4'-0" | 18" | 18" | 1" | 12 $\frac{5}{8}$" | 5'-3" | 14° | 7 | 8 | 4'-0" | 13" | 18" | 1" | 9" | 5'-3" | 11.9° |
| 54" | 4 | 9 | 4'-6" | 18" | 18" | 1 $\frac{1}{8}$" | 13 $\frac{1}{8}$" | 5'-9" | 18.4° | 6 | 9 | 4'-6" | 18" | 18" | 1 $\frac{1}{8}$" | 19 $\frac{3}{8}$" | 5'-9" | 14° | 7 | 9 | 4'-6" | 14 $\frac{1}{4}$" | 18" | 1 $\frac{1}{8}$" | 9" | 5'-9" | 13.7° |

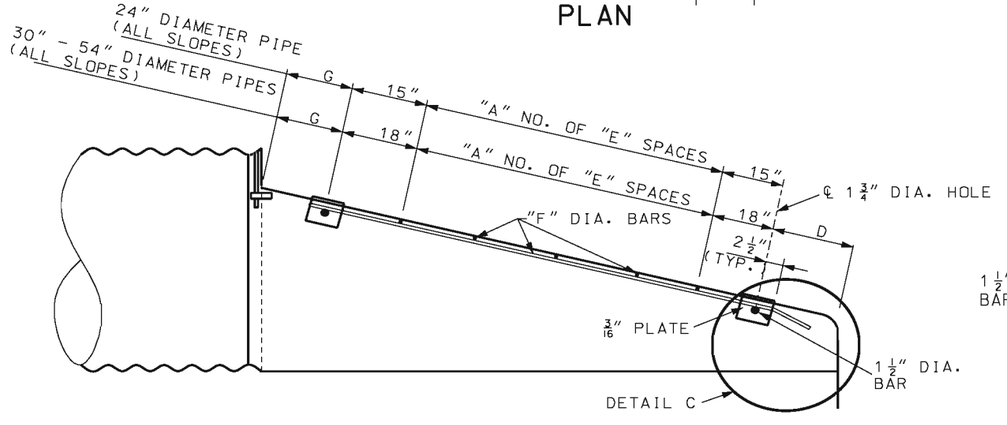
** BAR GRATE SYSTEM IS NOT REQUIRED FOR DRAIN PIPE DIAMETER OF 21" OR LESS, FOR SINGLE PIPE INSTALLATIONS.



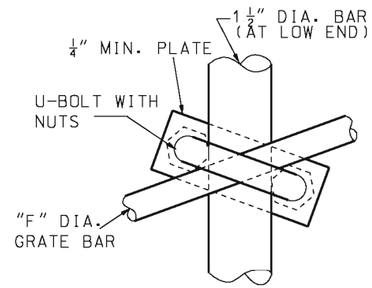

SECTION D-D

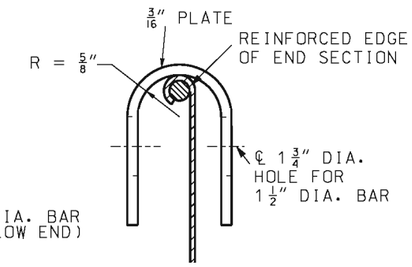


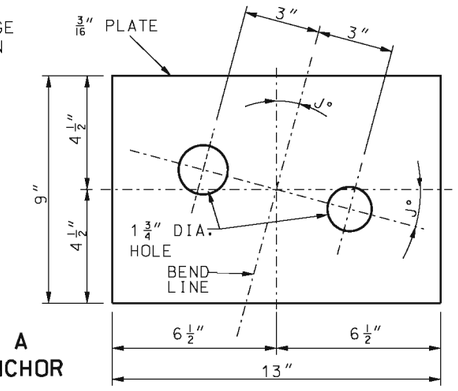

PLAN



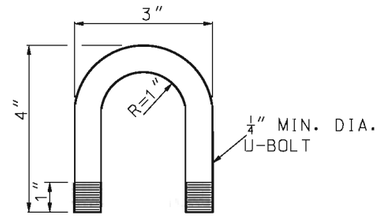

ELEVATION

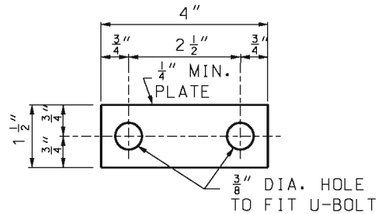


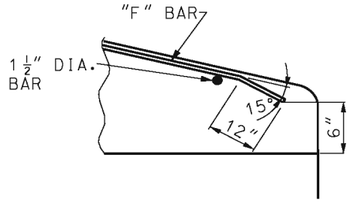




DETAIL A
BENT PLATE ANCHOR




DETAIL B
U-BOLT ANCHOR




DETAIL C

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).


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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# OPTIONAL BAR GRATE SYSTEM FOR SAFETY SLOPE END SECTION

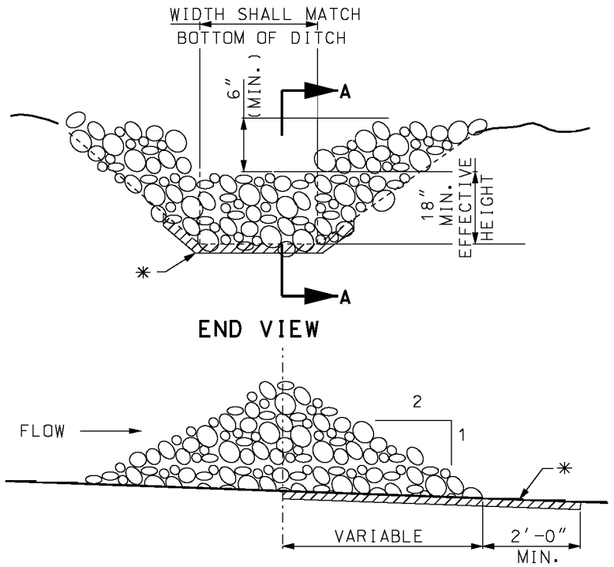
DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 4/1/2013

732.10H

SHEET NO. 3 OF 3


IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## ROCK DITCH CHECK




END VIEW



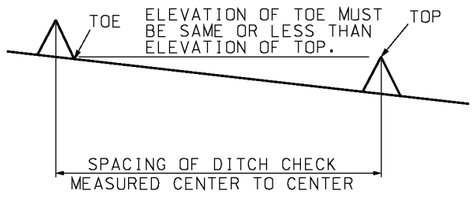

SECTION A-A

* GEOTEXTILE LINING MAY BE INSTALLED AS REQUIRED BY THE ENGINEER.

NOTE:

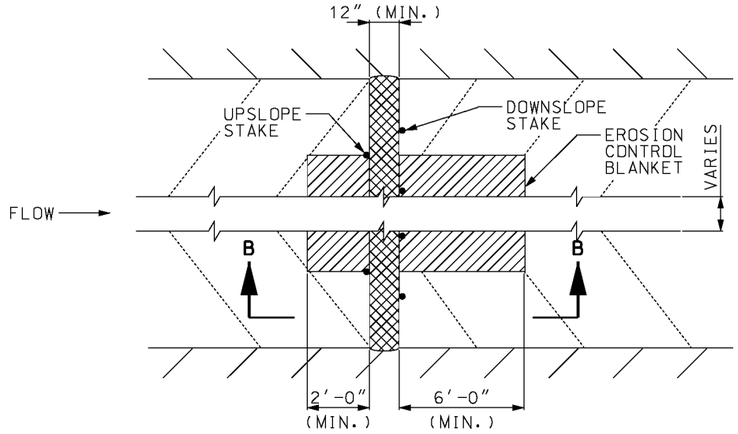
ROCK DITCH CHECK IN THE CLEAR ZONE SHALL BE REMOVED OR LEVELED (IF ALLOWABLE) AFTER THE VEGETATION HAS SUFFICIENTLY MATURED TO PROTECT THE DITCH OR SWALE.

| EXAMPLE DITCH CHECK SPACING FOR STANDARD HEIGHTS (FT.) | | |
|---|---|---|
| DITCH ℄ SLOPE % | SPACING FOR 9" EFF. HEIGHT | SPACING FOR 18" EFF. HEIGHT |
| 0.5 | 150 | 300 |
| 1.0 | 75 | 150 |
| 1.5 | 50 | 100 |
| 2.0 | 37 | 75 |
| 2.5 | 30 | 60 |
| 3.0 | 25 | 50 |
| 3.5 | 21 | 43 |
| 4.0 | 19 | 38 |
| 4.5 | 16 | 33 |
| 5.0 | 15 | 30 |
| 5.5 | 13 | 27 |
| 6.0 | 12 | 25 |
| 6.5 | 11 | 23 |
| 7.0 | 10 | 21 |
| 7.5 | 10 | 20 |
| 8.0 | 9 | 19 |
| 8.5 | 9 | 18 |
| 9.0 | 8 | 17 |
| 9.5 | 8 | 16 |
| 10.0 | 7 | 15 |

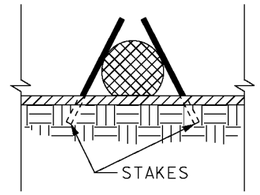



## MINIMUM DITCH CHECK SPACING

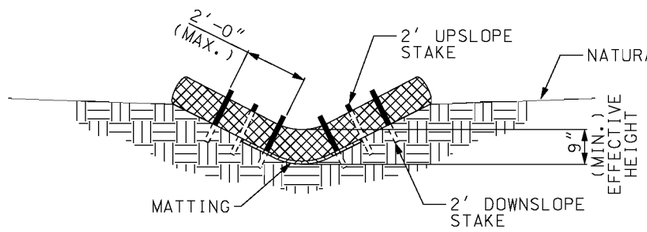
## ALTERNATE DITCH CHECK



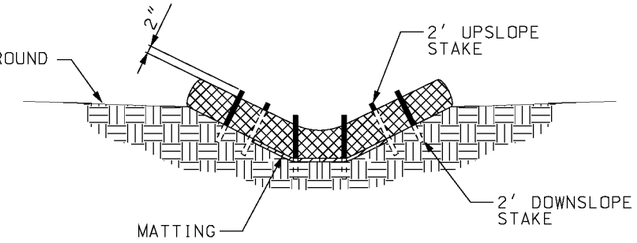

PLAN VIEW




SECTION B-B




TYPICAL SECTION
VEE DITCH




TYPICAL SECTION
TRAPEZOIDAL DITCH

NOTES:

USE MINIMUM 12 IN. DIAMETER LOG/SOCK.

USE 2 FT. WOODEN STAKES WITH A 2 IN. BY 2 IN. NOMINAL CROSS SECTION.

INSTALL LOG/SOCK TO A HEIGHT IN DITCH SO FLOW WILL NOT WASH AROUND LOG/SOCK AND SCOUR DITCH SLOPES OR AS DIRECTED BY ENGINEER.

INSTALL A MINIMUM OF 2 UPSLOPE STAKES AND 4 DOWNSLOPE STAKES AT AN ANGLE TO WEDGE LOG/SOCK TO BOTTOM OF DITCH.

EROSION CONTROL BLANKET SHALL BE ANCHORED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

GENERAL NOTES:

OTHER PROPRIETARY DITCH CHECKS MAY BE SUBSTITUTED IN ACCORDANCE WITH SEC 806 OR AS DIRECTED BY THE ENGINEER.

INSTALLATION OF PROPRIETARY DITCH CHECKS SHALL BE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

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STATE OF MISSOURI
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NUMBER PE-28411
PROFESSIONAL ENGINEER
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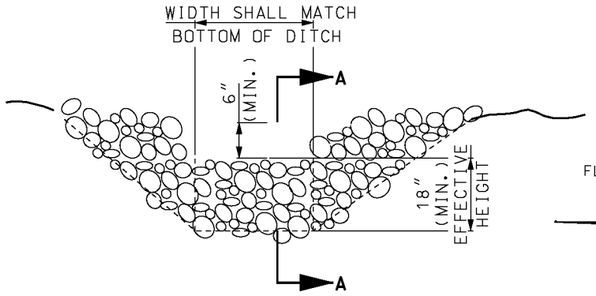
# TEMPORARY EROSION CONTROL MEASURES

## TEMPORARY DITCH CHECKS

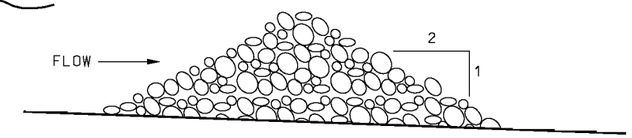
DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

806.10J

SHEET NO. 1 OF 6




END VIEW

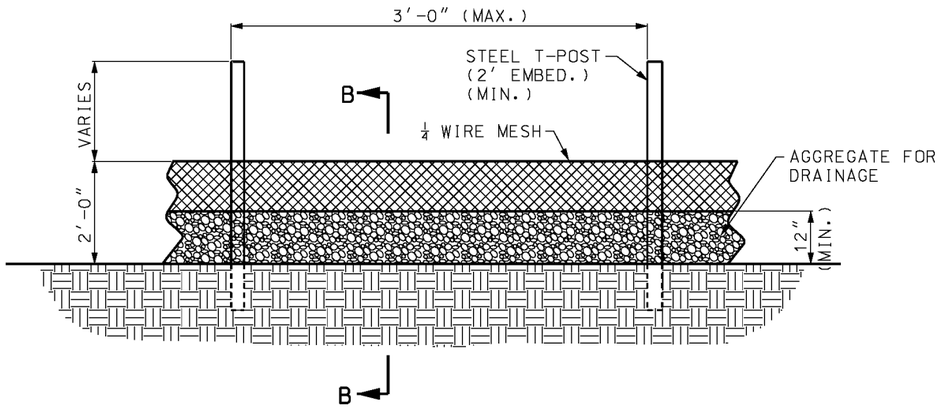



SECTION A-A

# SEDIMENT TRAP

NOTE:

SEDIMENT TRAP IN THE CLEAR ZONE SHALL BE REMOVED OR LEVELED (IF ALLOWABLE) AFTER THE VEGETATION HAS SUFFICIENTLY MATURED TO PROTECT THE DITCH OR SWALE.




ELEVATION DETAIL

NOTES:

AGGREGATE FOR DRAINAGE SHALL BE IN ACCORDANCE WITH SEC 1009, GRADE 4 OR GRADE 5.

USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ¼ INCH MESH OPENINGS.

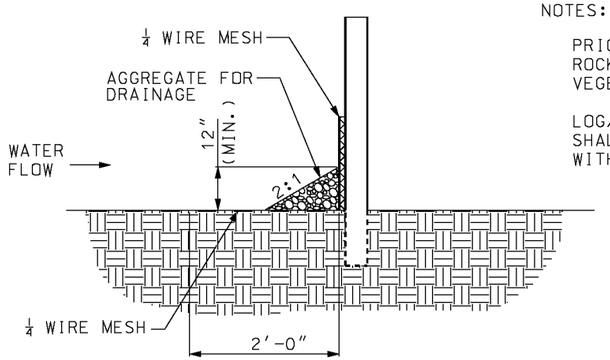
INSTALL 5 FT. T-POST WITH A 2 FOOT EMBEDMENT DEPTH (MIN.).

ATTACH HARDWARE CLOTH TO POST WITH WIRE STAPLE OR OTHER ACCEPTABLE METHODS

SPACE POST A MAXIMUM OF 3 FT.

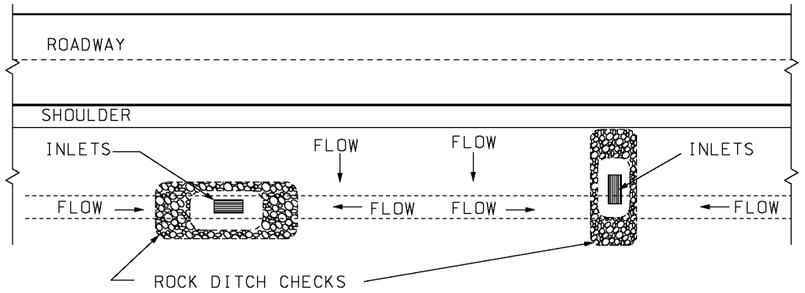
FOR INSTALLATION BETWEEN SECTIONS OF SILT FENCE, EXTEND AGGREGATE FOR DRAINAGE A MINIMUM OF 12 INCHES ON EACH SIDE OF SPECIAL SEDIMENT CONTROL FENCE SECTION.

INSTALLATION SHALL BE FOR AREA INLETS AND PERIMETER PROTECTION BMP'S.



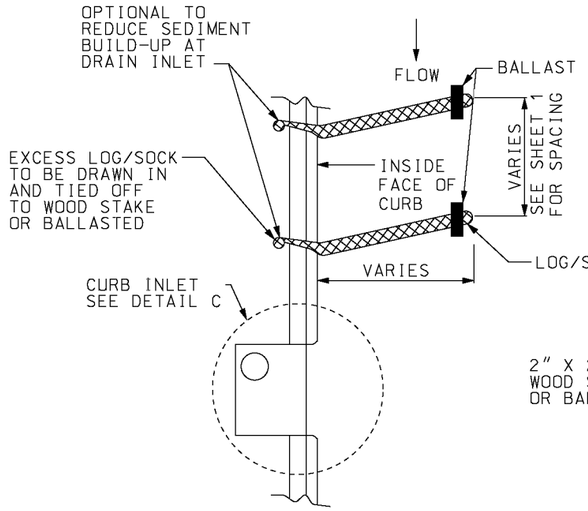

SECTION B-B

## ROCK/MESH SEDIMENT CONTROL FENCE




# DROP INLET CHECK

SEE SHEET 1 OF 6 FOR DETAILS OF ROCK DITCH CHECK.

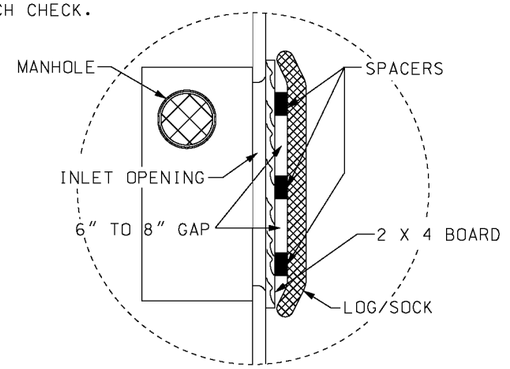



PLAN

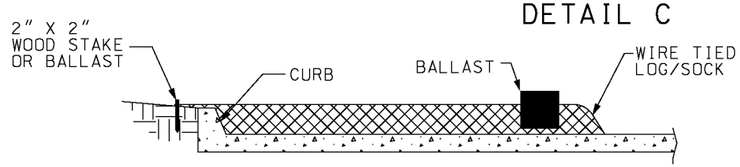
NOTES:

PRIOR TO PLACEMENT ALL DEBRIS, ROCK, LARGE CLODS AND WOOD VEGETATION SHALL BE CLEARED.

LOG/SOCK PLACED ON PAVEMENT SHALL BE WEIGHTED DOWN WITH GRAVEL/SAND BALLAST.




DETAIL C




SECTION

## INLET PROTECTION DROP CONTAINMENT

GENERAL NOTES:

OTHER PROPERIETARY INLET PROTECTION MAY BE SUBSTITUTED IN ACCORDANCE WITH SEC 806 OR AS DIRECTED BY THE ENGINEER.

FOR SEDIMENT CONTROL SPACING SEE SHEET 1 OF 6.


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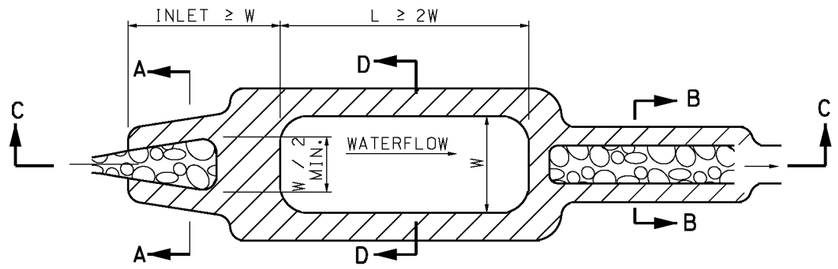
# TEMPORARY EROSION CONTROL MEASURES

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

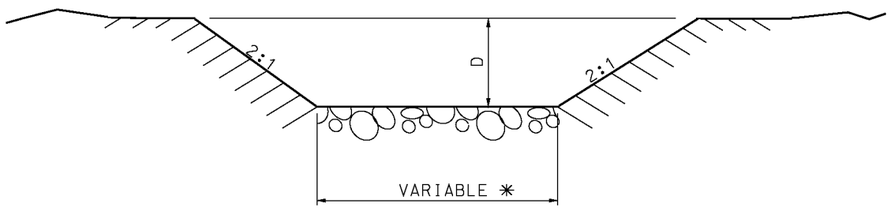
806.10J

SHEET NO. 2 OF 6


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PLAN VIEW

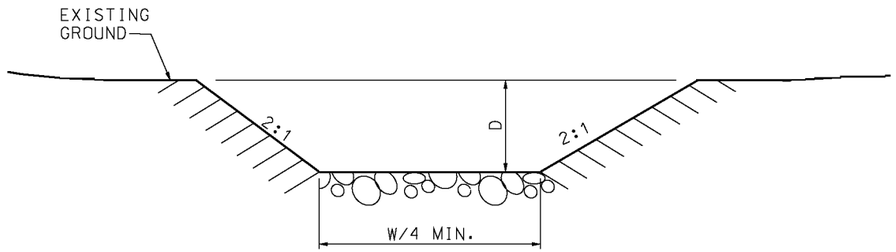



SECTION A-A

INLET

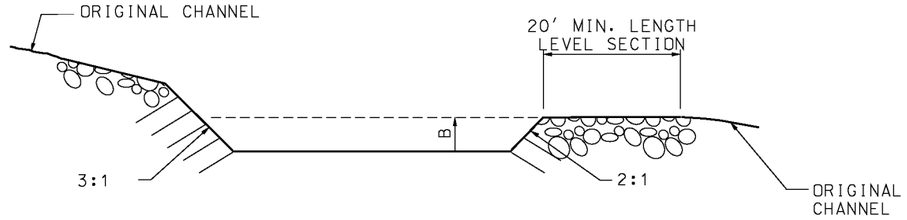
D = 1.0′ + DESIGN FLOW DEPTH-MIN.

✳ VARIES FROM WIDTH OF STREAM AT INLET TO ONE-HALF WIDTH OF POND AT OUTLET.



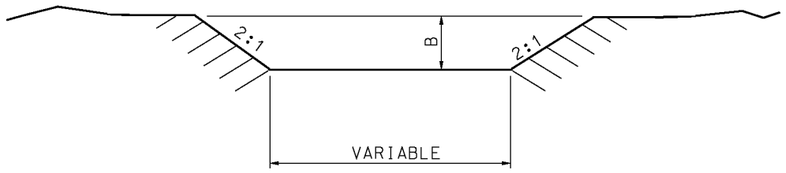

SECTION B-B

OUTLET




SECTION C-C

EFFECTIVE DEPTH "B" = MIN. 2′, MAX. 6′ DEPENDENT UPON CONFIGURATION REQUIRED BY LOCATION AND ESTIMATED VOLUME.




SECTION D-D

LAYER OF APPROVED STABILIZING MATERIAL FOR SCOUR PREVENTION

GENERAL NOTES:

SEDIMENT BASINS ARE TO BE INCLUDED IN THE BMP SYSTEM WHEN THE GEOMETRY OF RIGHT-OF-WAY ALLOWS. WHERE INCLUDED, SEDIMENT BASINS ARE TO BE DESIGNED AND CONSTRUCTED TO PROVIDE STORAGE VOLUME FOR THE LOCAL 2-YR, 24-HOUR STORM FOR DISTURBED ACREAGE DRAINING TO THEM. IF THE DESIGN STORM VOLUME HAS NOT BEEN CALCULATED, BASINS ARE TO BE DESIGNED AND CONSTRUCTED TO PROVIDE A STORAGE VOLUME OF AT LEAST 3,600 CUBIC FEET PER DISTURBED ACRE DRAINING TO THE BASIN(S).

IF SEDIMENT BASIN IS TO BE PERMANENT ITS SLOPES SHALL BE STABILIZED WITH ROCK RIPRAP OR EQUIVALENT.

THE MATERIALS FOR ROCK RIPRAP SHALL MEET THE REQUIREMENTS OF SEC 611.30 FOR TYPE 2 ROCK BLANKET.

SEE PLANS FOR LENGTH, DEPTH AND WIDTH OF BASIN.

SEE PLANS FOR ESTIMATED QUANTITIES OF ROCK RIPRAP - CUBIC YARDS.

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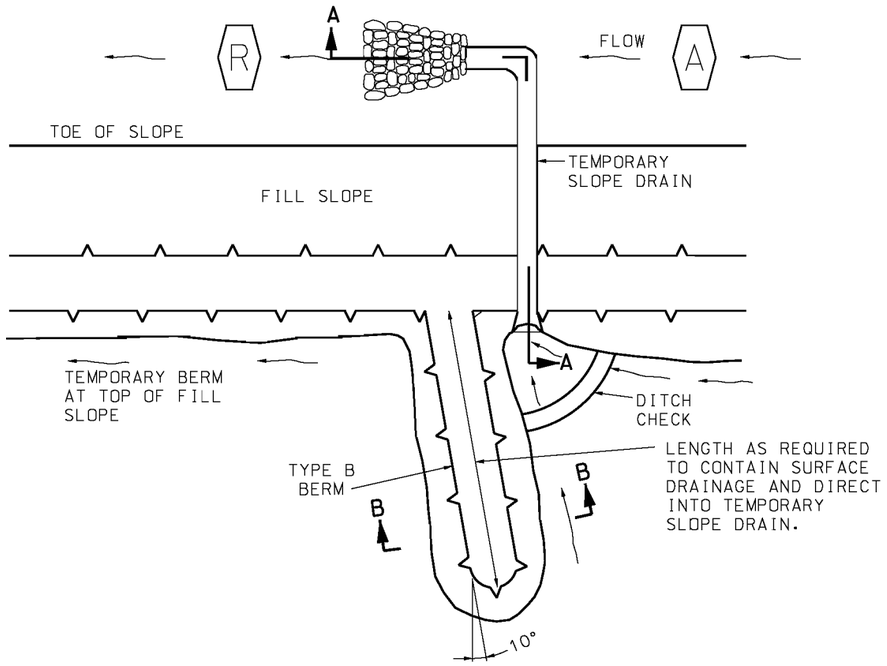
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NUMBER PE-28411
PROFESSIONAL ENGINEER
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# TEMPORARY EROSION CONTROL MEASURES

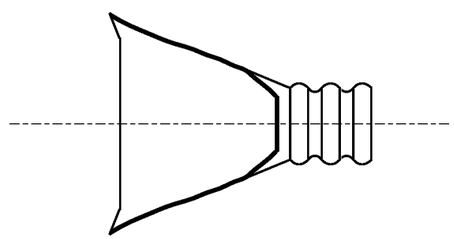
## SEDIMENT BASIN

| DATE EFFECTIVE: | 04/01/2015 | 806.10J | SHEET NO. 3 OF 6 |
|---|---|---|---|
| DATE PREPARED: | 2/20/2015 | | |

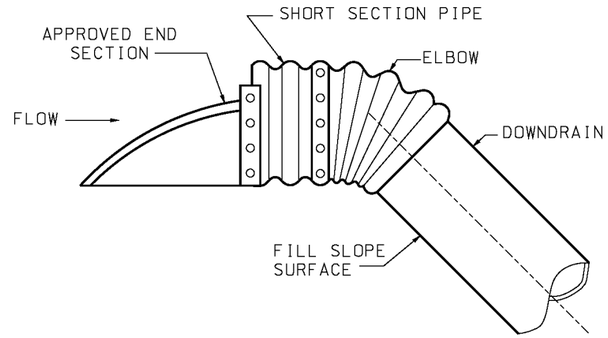
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PLAN VIEW

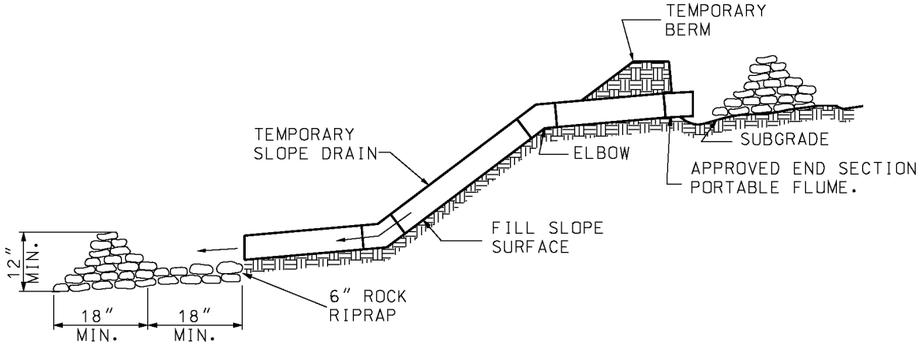


PLAN VIEW




SECTION VIEW

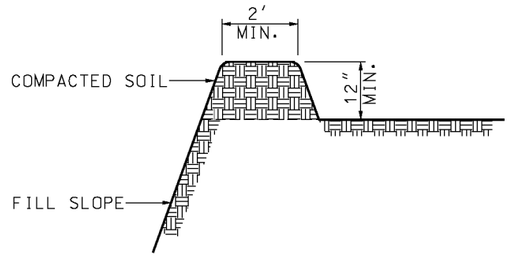
# TEMPORARY SLOPE DRAIN INLET TREATMENT




NOTE:

IN SOME CASES IT MAY BE NECESSARY TO EMBED METAL OR PLASTIC PIPE INTO THE FILL SLOPE TO SECURE PROPER ANCHORAGE.

SECTION A-A




SECTION B-B
TYPE B BERM

## TEMPORARY BERM

(METAL, FLEXIBLE RUBBER OR PLASTIC PIPE)

NOTE:
MAXIMUM LENGTH BETWEEN SLOPE DRAINS SHALL BE APPROXIMATELY 500 FEET.

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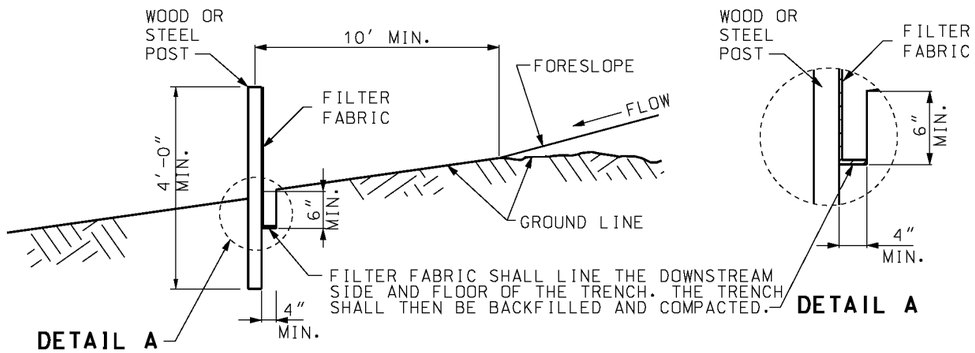
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ERIC E. SCHROETER
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## TEMPORARY EROSION CONTROL MEASURES

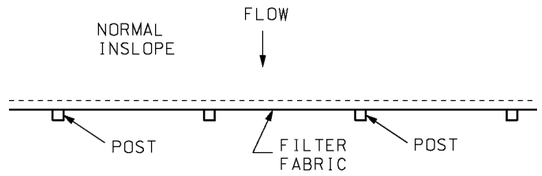
SLOPE DRAINS

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

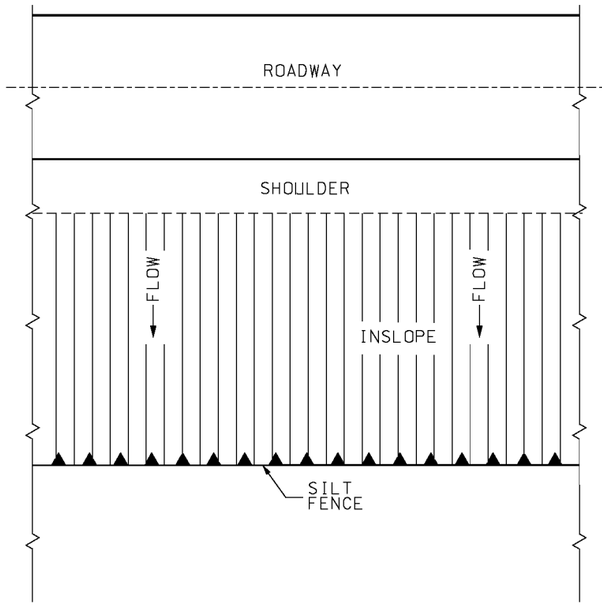
806.10J



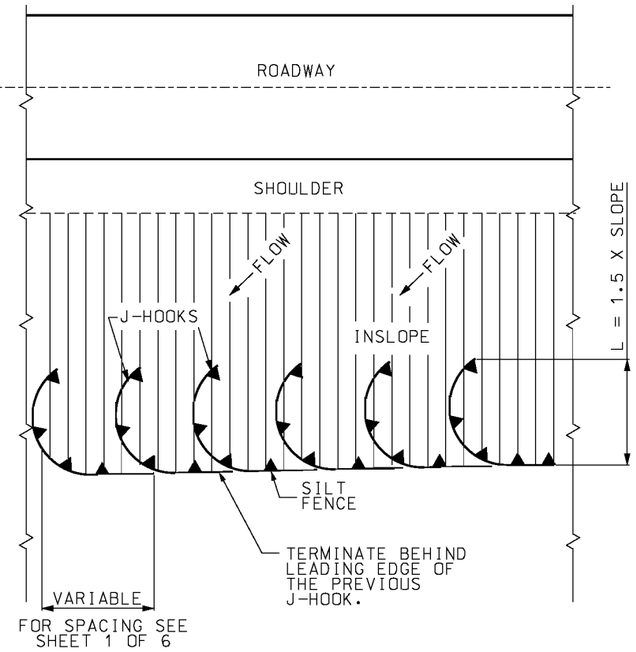

TYPICAL B-B



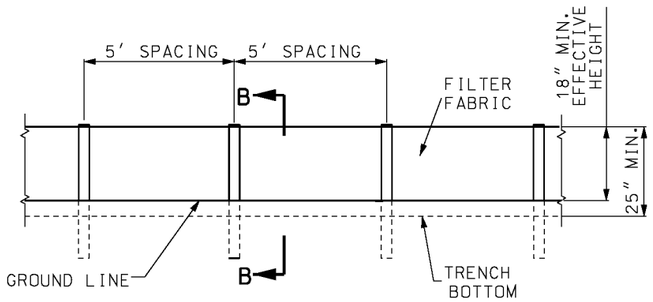

PLAN VIEW



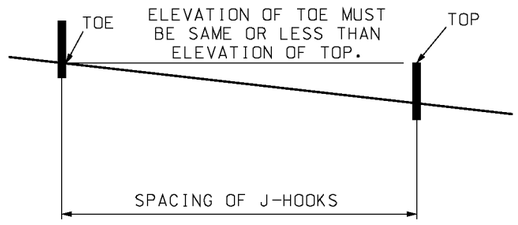

PERIMETER SILT FENCE
FOR TRANSVERSE FLOW




PERIMETER SILT FENCE
FOR ANGULAR FLOW




ELEVATION DETAIL
FABRIC SILT FENCE




**MINIMUM J-HOOK SPACING**

GENERAL NOTES:

USE SILT FENCE FOR FILL HEIGHTS GREATER OR EQUAL TO 10 FEET. ON ALL FILLS GREATER THAN 10 FEET HIGH, MID-SLOPE RUNS OF SILT FENCE SHOULD BE CONSIDERED.

FOR FABRIC SILT FENCE:

MINIMUM LONGITUDINAL SPLICE OVERLAP SHALL BE 2' WITH A POST AT EACH END.

SECURE FABRIC TO POSTS.

INSTEAD OF SILT FENCE ACROSS DRAINAGE DITCHES AND DRAINS, DITCH CHECKS SHALL BE USED AS SHOWN ON PLANS OR AS DIRECTED BY ENGINEER.

AT CULVERTS, PLACE SEDIMENT BARRIERS OVER THE TOP OF THE CULVERTS (NOT IN THE STREAM CHANNEL).

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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TEMPORARY EROSION CONTROL MEASURES

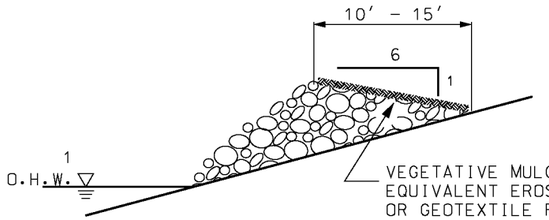
## SILT FENCE

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

806.10J

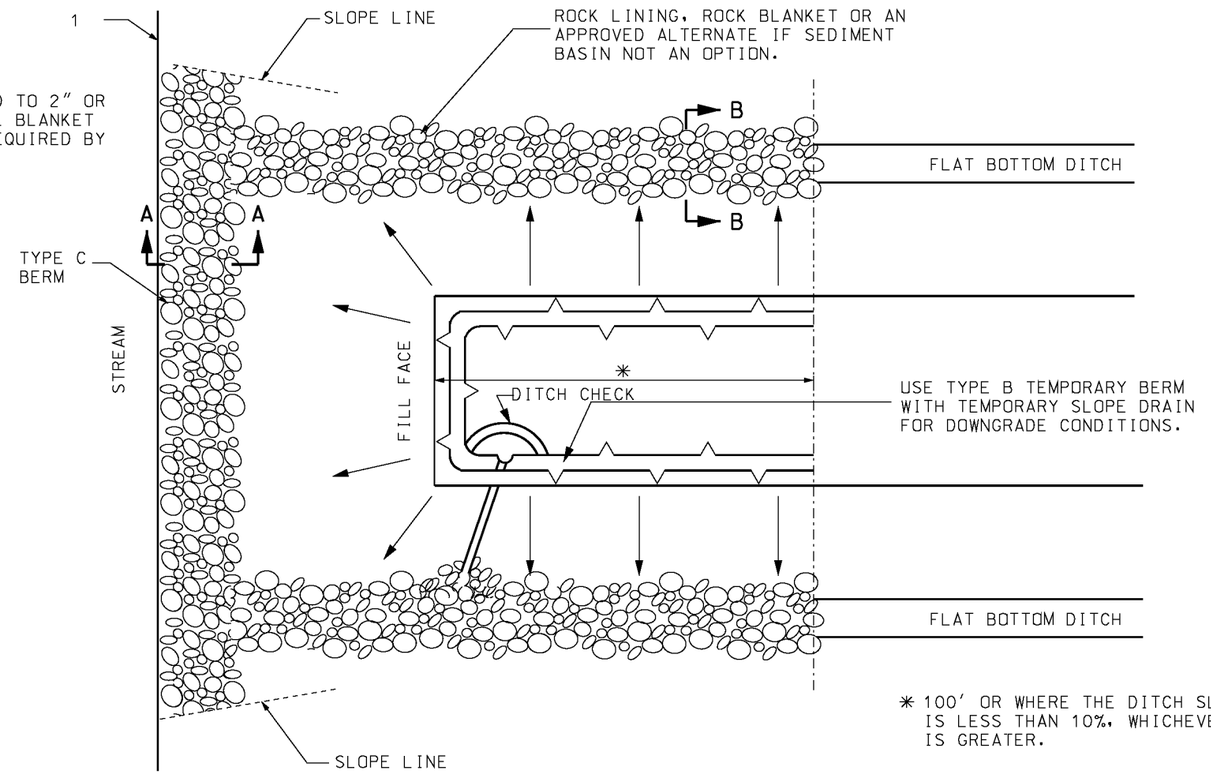
SHEET NO. 5 OF 6

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

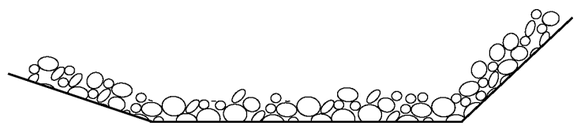



## SECTION A-A
## TYPE C BERM (3)

(1) TYPE C BERM SHALL BE PLACED ABOVE THE ORDINARY HIGH WATER (O.H.W.) OR AT AN ELEVATION AS DIRECTED BY THE ENGINEER.




PLAN VIEW



SECTION B-B (4)

GENERAL NOTES:

TYPE C BERM SHALL BE BUILT TO HANDLE SIGNIFICANT RUN-OFF EVENTS AND SHALL BE INSTALLED PRIOR TO SOIL DISTURBANCE OR PLACEMENT OF FILL IN THE DRAINAGE AREA OF THE BERM.

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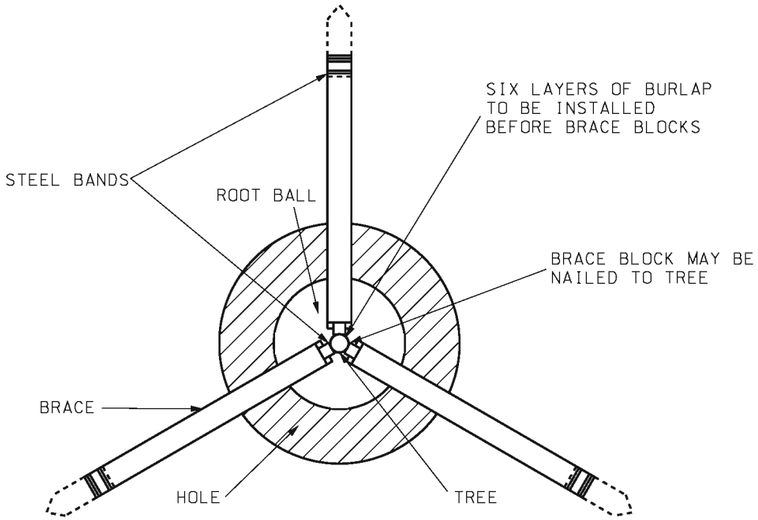
# TEMPORARY EROSION CONTROL MEASURES
## BRIDGES AND BOX CULVERTS AT STREAM CROSSINGS

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DATE PREPARED: 2/20/2015

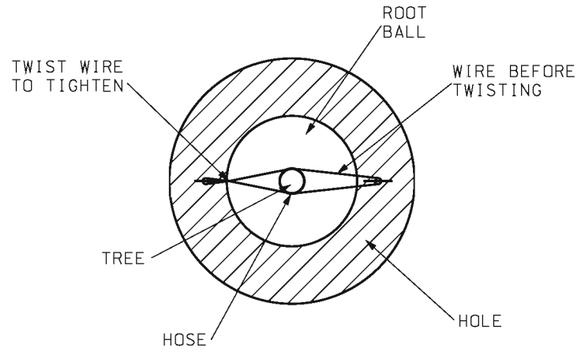
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SHEET NO. 6 OF 6

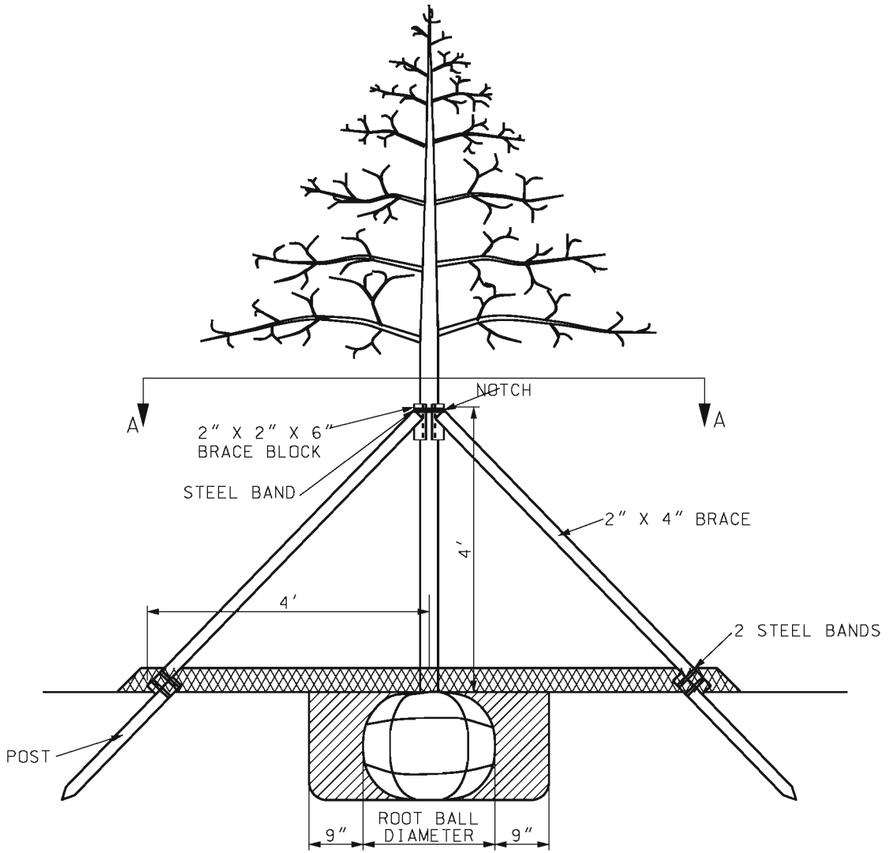
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



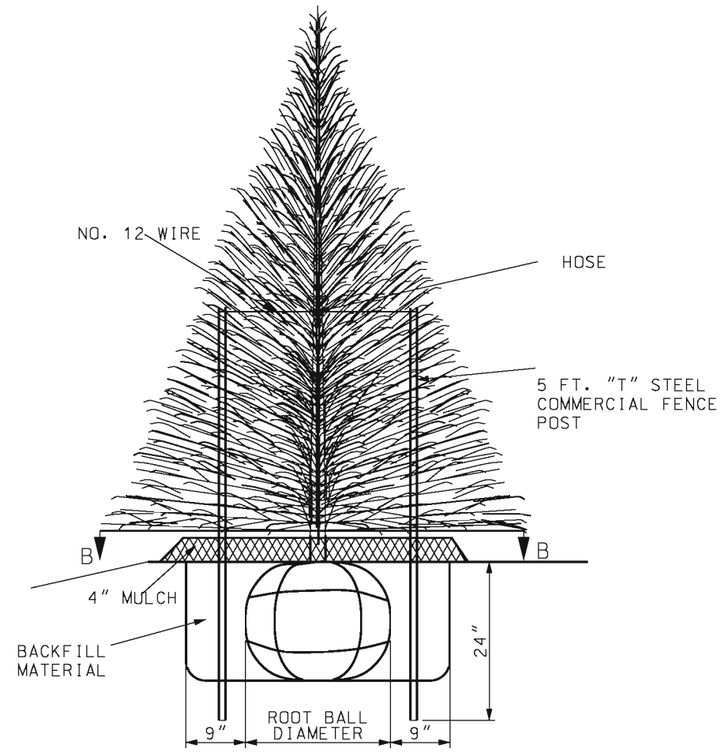

SECTION A-A




SECTION B-B




METHOD OF SUPPORTING DECIDUOUS TREES
3" CALIBER OR LARGER




METHOD OF SUPPORTING EVERGREEN TREES
3' OR MORE IN HEIGHT

NOTES:

TREE WRAP SHALL BE INSTALLED BEFORE BRACING.

BRACE SHALL BE NAILED SECURELY TO POST AND BRACE BLOCK.

BANDING SHALL BE DONE WITH A COMMERICAL BANDING MACHINE.

GENERAL NOTE:

ALL NUMBER MEASUREMENTS ARE NOMINAL.

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NUMBER PE-23751
PROFESSIONAL ENGINEER
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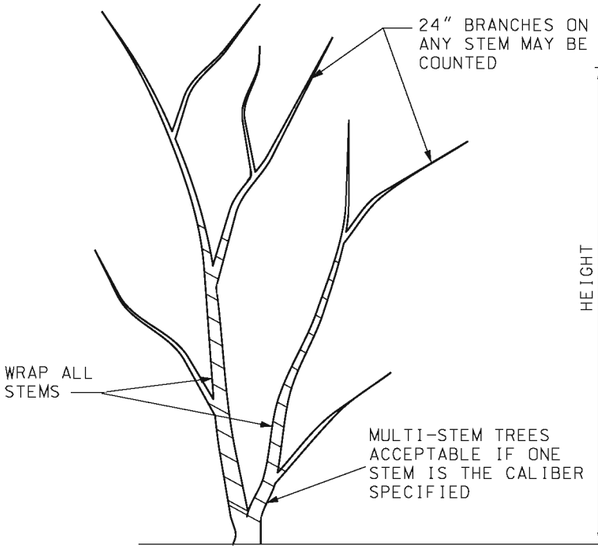
# TYPICAL PLANTING ILLUSTRATIONS
## METHOD OF SUPPORT

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DATE PREPARED: 8/26/2009

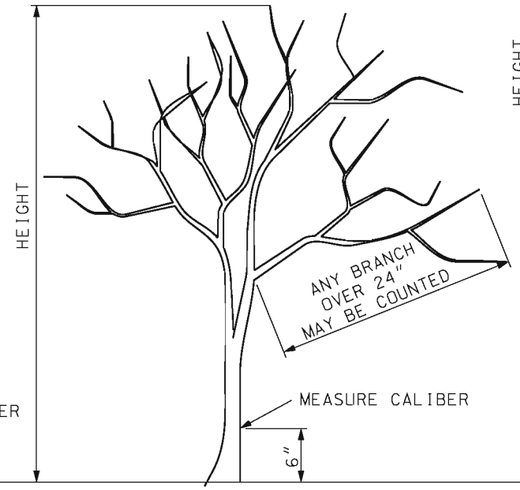
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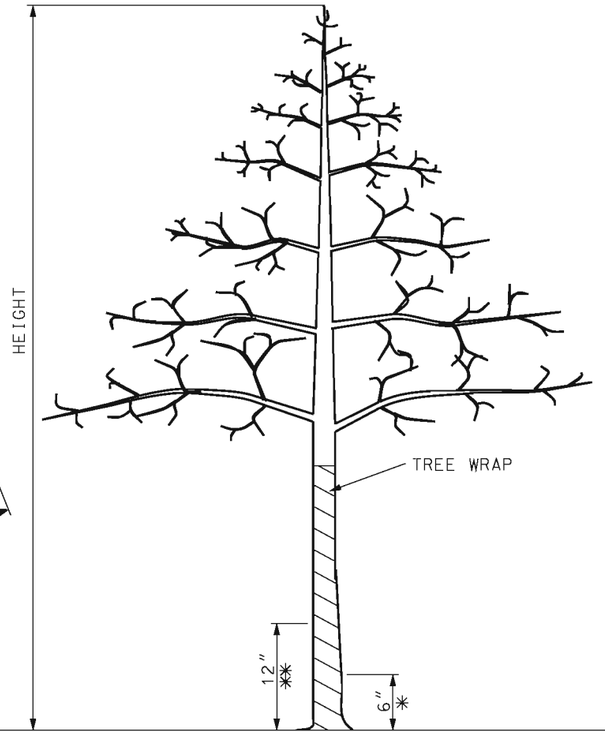
SHEET NO. 1 OF 3

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MEASUREMENT OF SMALL TREES

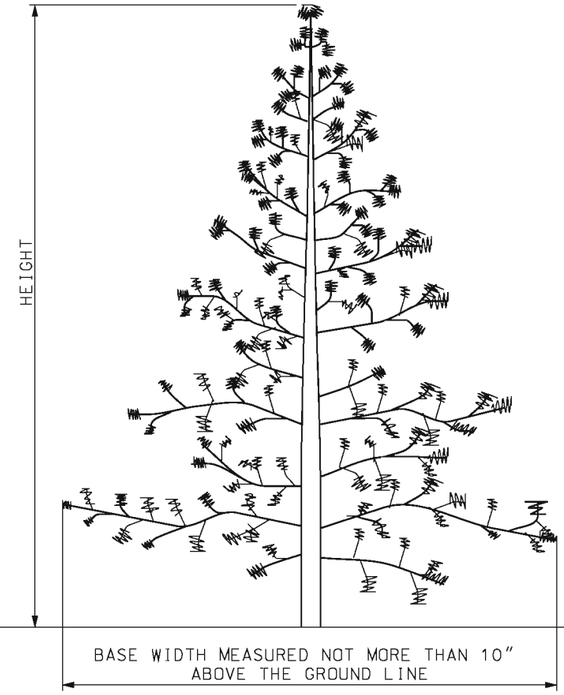


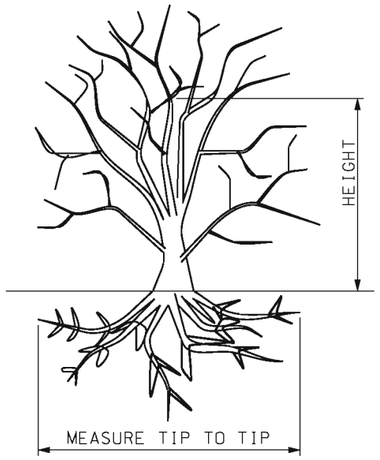

* MEASURE CALIBER FOR TREES 4" OR LESS.

** MEASURE CALIBER FOR TREES MORE THAN 4".

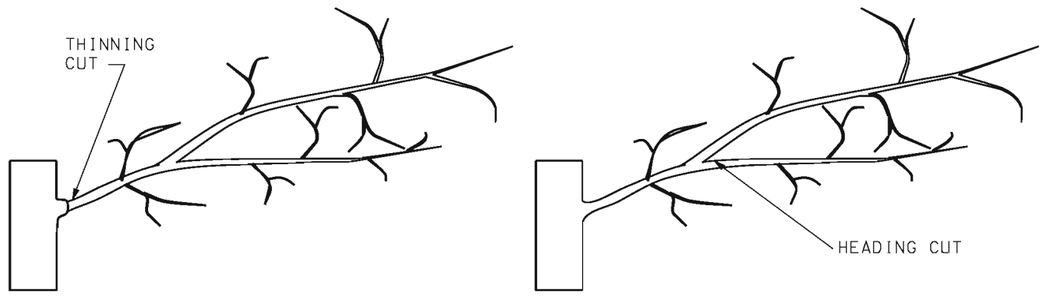
MEASUREMENT OF LARGE TREES




MEASUREMENT OF EVERGREEN TREES




MEASUREMENT OF DECIDUOUS SHRUBS




PRUNING CUTS

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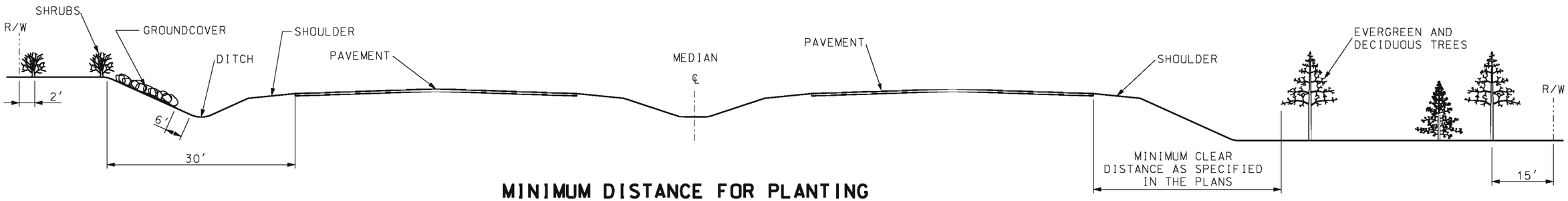
STATE OF MISSOURI
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NUMBER PE-23751
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# TYPICAL PLANTING ILLUSTRATIONS

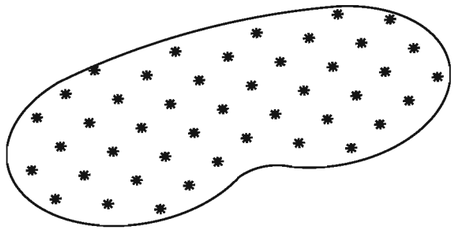
MEASUREMENT AND PRUNING CUTS

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DATE PREPARED: 8/26/2009

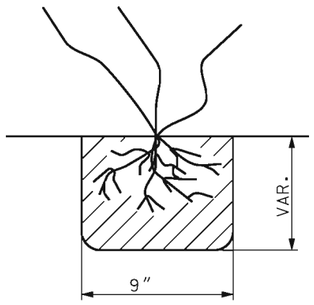
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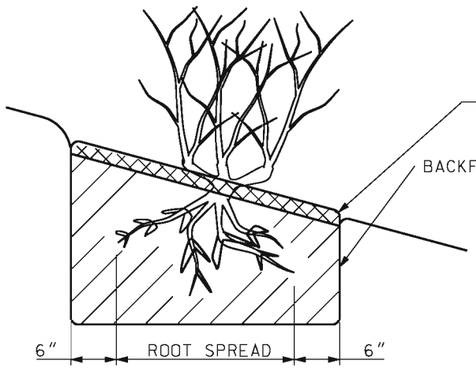

## MINIMUM DISTANCE FOR PLANTING ON TYPICAL CROSS SECTION



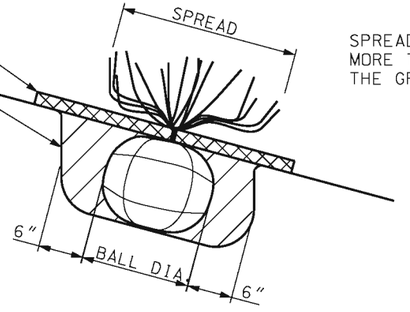
LOCATION OF SHRUBS
IN A TYPICAL PLANT BED




VINES AND SEEDLINGS




DECIDUOUS SHRUB
SLOPE PLANTING




EVERGREEN SHRUB
SLOPE PLANTING

SPREAD MEASURED NO
MORE THAN 10″ ABOVE
THE GROUND LINE.

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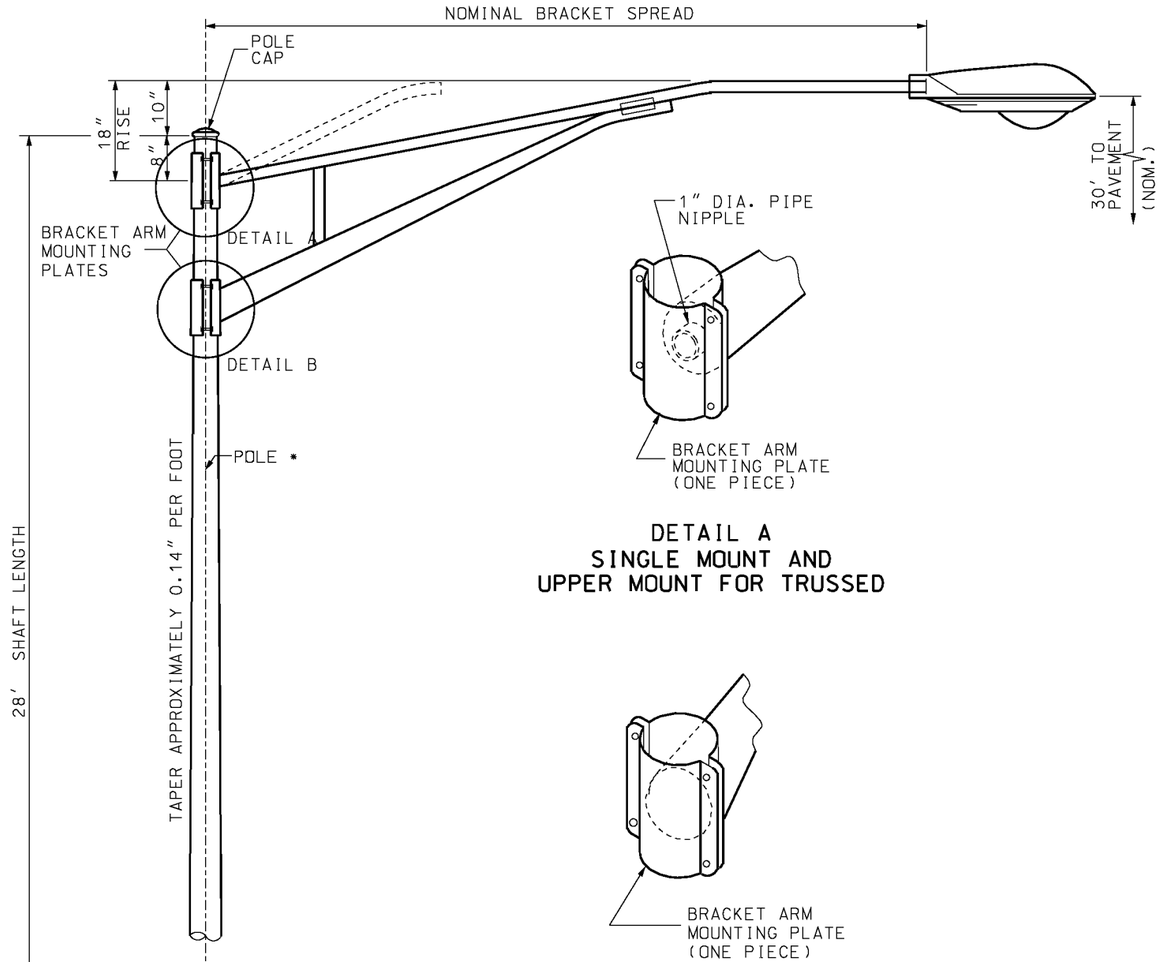
# TYPICAL PLANTING ILLUSTRATIONS

LOCATION AND
SLOPE PLANTING

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/26/2009

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SHEET NO.
3 OF 3





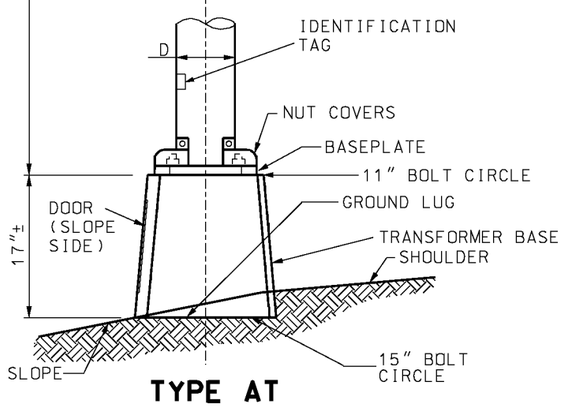


**DETAIL A**
**SINGLE MOUNT AND UPPER MOUNT FOR TRUSSED**

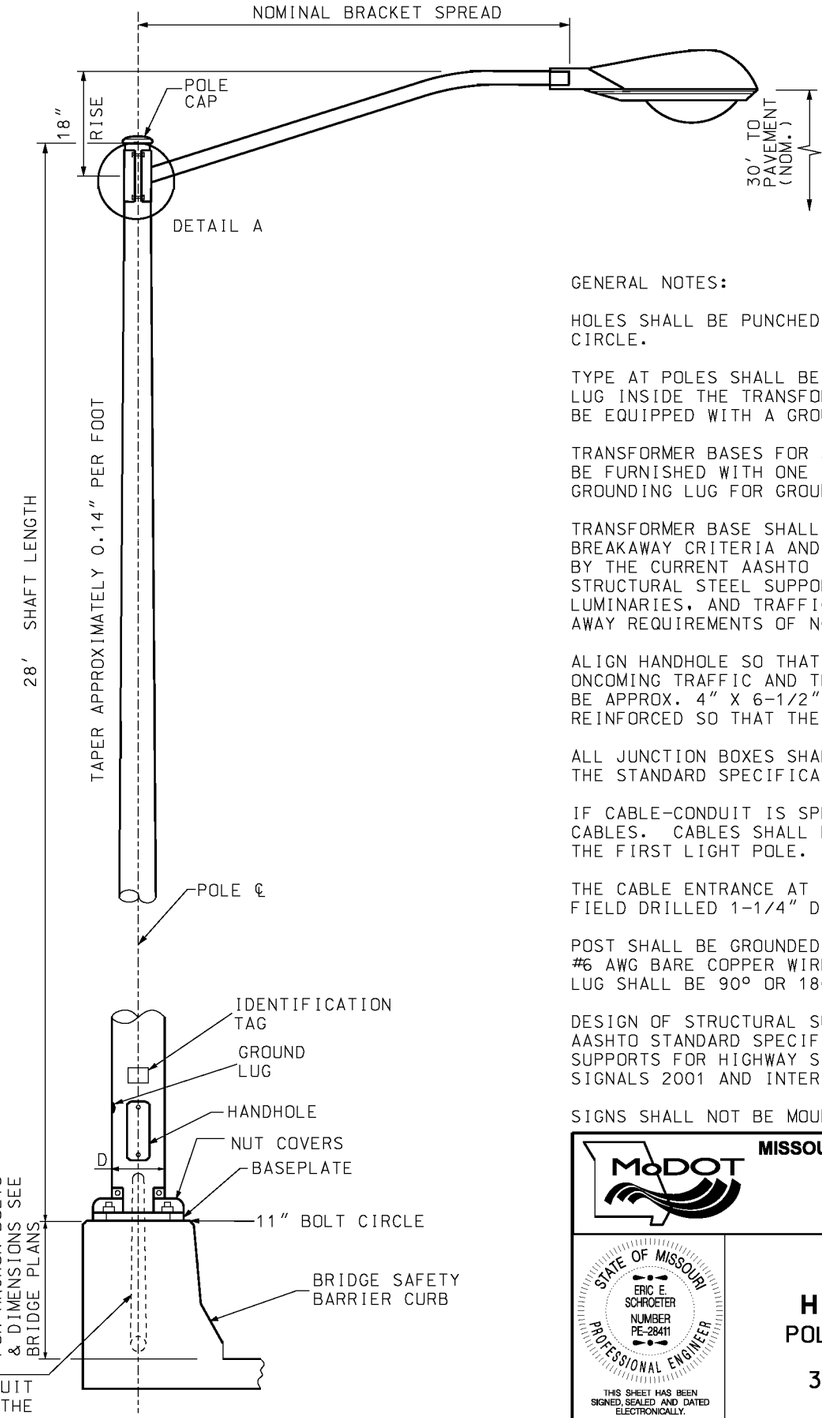



**DETAIL B**
**LOWER MOUNT FOR TRUSSED**

**TYPICAL BRACKET ARM MOUNTING**

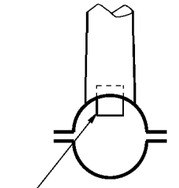



**TYPE AT**




WIRES SHALL BE SPLICED AT FUSED CONNECTOR IN POLE BASE. IF CABLE-CONDUIT IS SPECIFIED, CUT CONDUIT AWAY FROM THE CABLES WHERE CABLE-CONDUIT ENTERS THE RIGID CONDUIT SYSTEM. (SEE DRAWING 901.02)

**TYPE B**




**PLAN VIEW OF DETAIL A**

GENERAL NOTES:

HOLES SHALL BE PUNCHED ONLY FOR SPECIFIED BOLT CIRCLE.

TYPE AT POLES SHALL BE EQUIPPED WITH THE GROUNDING LUG INSIDE THE TRANSFORMER BASE. TYPE B POLES SHALL BE EQUIPPED WITH A GROUNDING LUG INSIDE THE POLE.

TRANSFORMER BASES FOR 30 FOOT MOUNTING HEIGHT SHALL BE FURNISHED WITH ONE (1) DRILLED AND TAPPED HOLE AND GROUNDING LUG FOR GROUNDING EQUIPMENT.

TRANSFORMER BASE SHALL BE CERTIFIED AS MEETING THE BREAKAWAY CRITERIA AND STRUCTURAL REQUIREMENTS AS SET BY THE CURRENT AASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL STEEL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS" AND MEET THE BREAK-AWAY REQUIREMENTS OF NCHRP 350.

ALIGN HANDHOLE SO THAT THE POLE IS BETWEEN THE ONCOMING TRAFFIC AND THE HANDHOLE. HANDHOLE SHALL BE APPROX. 4" X 6-1/2". HANDHOLE FRAME SHALL BE REINFORCED SO THAT THE POLE STRENGTH IS NOT REDUCED.

ALL JUNCTION BOXES SHALL CONFORM TO SECTION 1062 OF THE STANDARD SPECIFICATIONS.

IF CABLE-CONDUIT IS SPECIFIED, CUT CONDUIT AWAY FROM CABLES. CABLES SHALL BE CONTINUOUS AND UNSPLICED TO THE FIRST LIGHT POLE.

THE CABLE ENTRANCE AT THE BRACKET ARM SHALL BE A FIELD DRILLED 1-1/4" DIAMETER HOLE.

POST SHALL BE GROUNDED FROM GROUND LUG IN POST WITH #6 AWG BARE COPPER WIRE TO CONDUIT SYSTEM. GROUND LUG SHALL BE 90° OR 180° FROM THE HANDHOLE.

DESIGN OF STRUCTURAL SUPPORTS SHALL COMPLY WITH AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS 2001 AND INTERIMS THROUGH 2003.

SIGNS SHALL NOT BE MOUNTED ON LIGHTING POLES.

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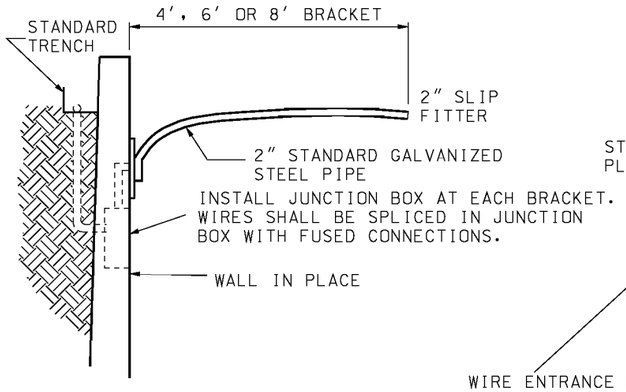
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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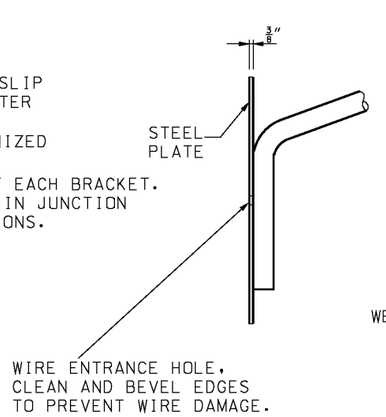
# HIGHWAY LIGHTING
## POLES, FOUNDATIONS AND APPURTENANCES FOR 30' MOUNTING HEIGHT

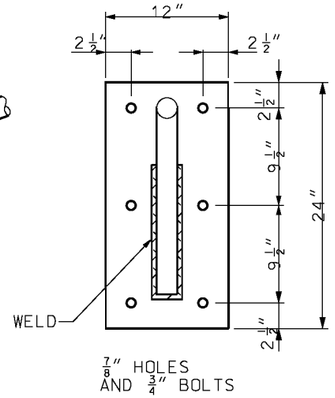
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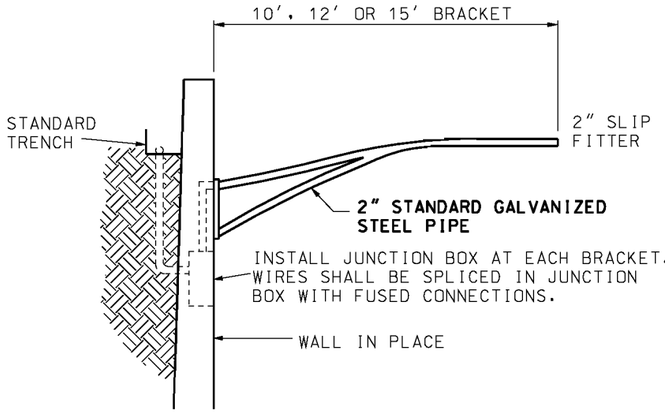
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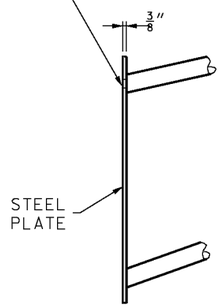
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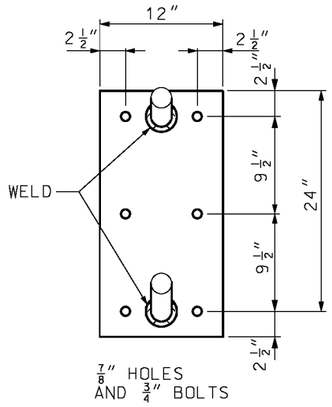


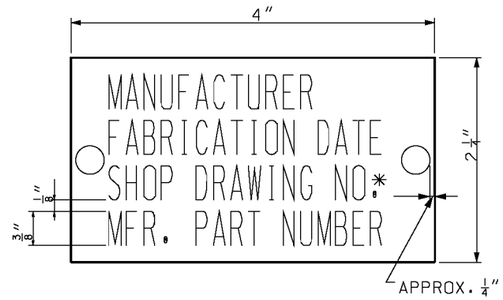

WALL BRACKETS

FACE PLATE DETAILS

| ANSI LAMPS | | | |
|---|---|---|---|
| FUSE RATING | DESIGNATION HPS | WATTS | INITIAL LUMENS |
| 3 A | S55 | 150 | 16,000 |
| TYPE III MEDIUM DISTRIBUTION SEMI-CUTOFF UNLESS OTHERWISE SPECIFIED ON PLANS | | | |

| TYPE AT POLE | | | | |
|---|---|---|---|---|
| BRACKET SPREAD | | 4'-10' | 12' | 15' |
| MAX. LUMINAIRE WEIGHT | | 75 LB | 71 LB | 66 LB |
| MAX. PROJECTED AREA | | 3.3 SQ. FT. | | |
| SINGLE AND TRUSSED BRACKET ARMS | | | | |
| LOCATION | LENGTH POLE | BRACKET SPREAD | TRANS. BASE BOLT CIRC. | D |
| SHOULDER | 28' | 4',6',8', 10',12',15' | 15" | 8" |

| TYPE B POLE | | | | |
|---|---|---|---|---|
| BRACKET SPREAD | | 4' | 6' | 8' |
| MAX. LUMINAIRE WEIGHT | | 75 LB | 75 LB | 54 LB |
| MAX. PROJECTED AREA | | 3.3 SQ. FT. | | |
| SINGLE BRACKET ARM | | | | |
| LOCATION | LENGTH POLE | BRACKET SPREAD | D | ANCHOR BOLT DIA. |
| BRIDGE SAFETY BARRIER CURB | 28' | 4',6' 8' | 8" | 1" |




ID TAG NOTE:
TAG SHALL BE ALUMINUM OR STAINLESS STEEL AND ATTACHED TO POLE USING TWO RIVETS OR STAINLESS STEEL DRIVE SCREWS.

* INCLUDING REVISION

## IDENTIFICATION TAG

GENERAL NOTES:

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TYPE AT POLES SHALL BE EQUIPPED WITH THE GROUNDING LUG INSIDE THE TRANSFORMER BASE. TYPE B POLES SHALL BE EQUIPPED WITH A GROUNDING LUG INSIDE THE POLE.

TRANSFORMER BASES FOR 30 FOOT MOUNTING HEIGHT SHALL BE FURNISHED WITH ONE (1) DRILLED AND TAPPED HOLE AND GROUNDING LUG FOR GROUNDING EQUIPMENT.

TRANSFORMER BASE SHALL BE CERTIFIED AS MEETING THE BREAKAWAY CRITERIA AND STRUCTURAL REQUIREMENTS AS SET BY THE CURRENT AASHTO "STANDARD SPECIFICATIONS FOR STRUCTURAL STEEL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS" AND MEET THE BREAK-AWAY REQUIREMENTS OF NCHRP 350.

ALIGN HANDHOLE SO THAT THE POLE IS BETWEEN THE ONCOMING TRAFFIC AND THE HANDHOLE. HANDHOLE SHALL BE APPROX. 4" X 6-1/2". HANDHOLE FRAME SHALL BE REINFORCED SO THAT THE POLE STRENGTH IS NOT REDUCED.

ALL JUNCTION BOXES SHALL CONFORM TO SECTION 1062 OF THE STANDARD SPECIFICATIONS.

IF CABLE-CONDUIT IS SPECIFIED, CUT CONDUIT AWAY FROM CABLES. CABLES SHALL BE CONTINUOUS AND UNSPLICED TO THE FIRST LIGHT POLE.

THE CABLE ENTRANCE AT THE BRACKET ARM SHALL BE A FIELD DRILLED 1-1/4" DIA. HOLE.

POST SHALL BE GROUNDED FROM GROUND LUG IN POST WITH #6 AWG BARE COPPER WIRE TO CONDUIT SYSTEM. GROUND LUG SHALL BE 90° OR 180° FROM THE HANDHOLE.

ID TAG HOLES SHALL BE DRILLED INTO POLE PRIOR TO GALVANIZING.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

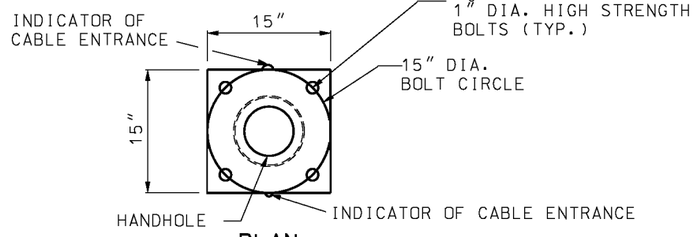
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# HIGHWAY LIGHTING
## POLES, FOUNDATIONS AND APPURTENANCES FOR 30' MOUNTING HEIGHT

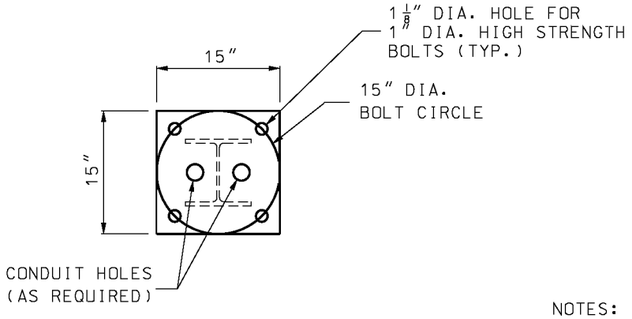
DATE EFFECTIVE: 12/01/2013
DATE PREPARED: 10/22/2013

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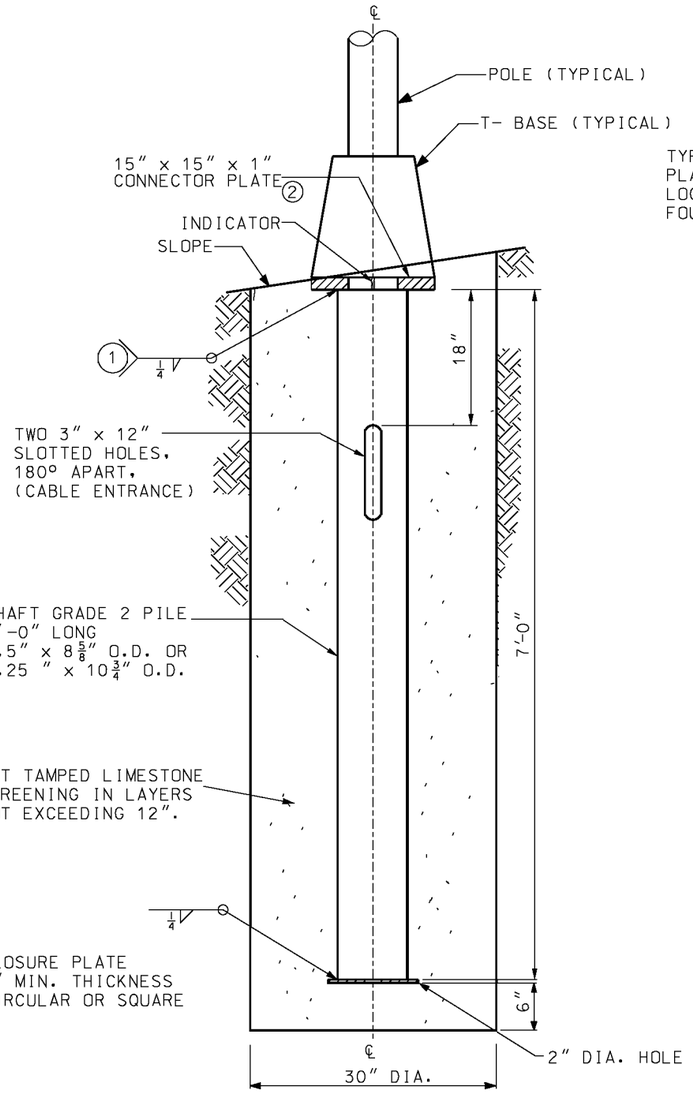
SHEET NO. 2 OF 4




PLAN

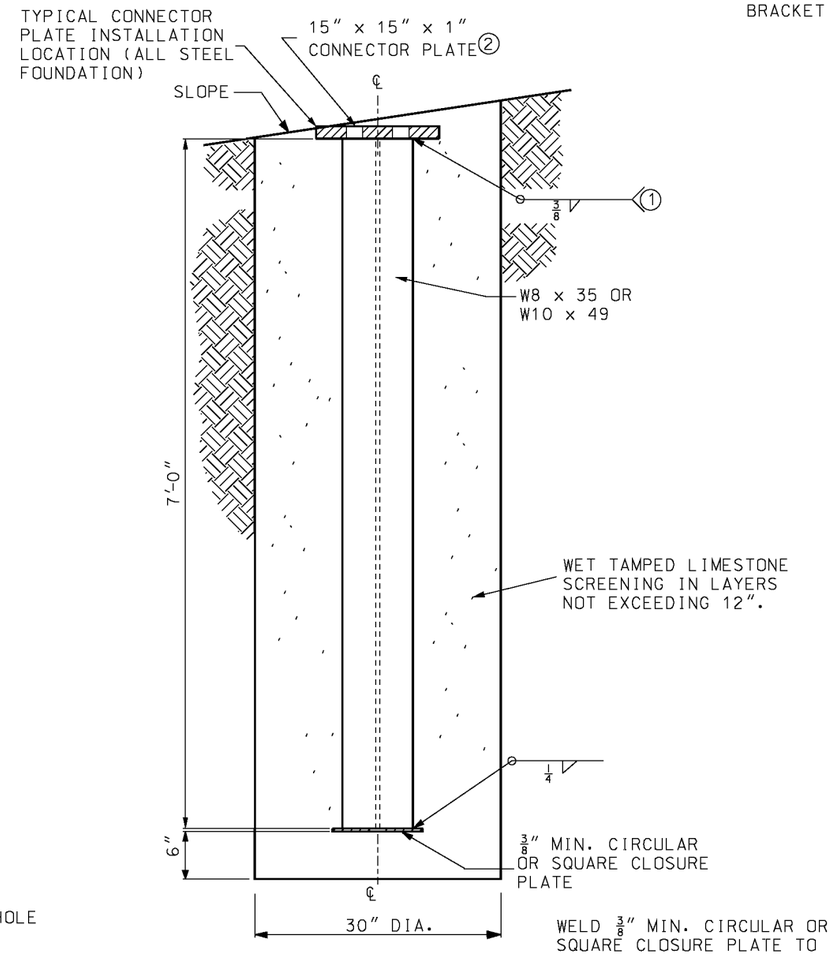



PLAN




ELEVATION

## DETAILS OF CIRCULAR STEEL PILE FOUNDATION




ELEVATION

## DETAILS OF STEEL "H" PILE FOUNDATION

NOTES:

1. GRIND WELD AS NECESSARY TO CLEAR BOLT HEAD.
2. FOUNDATIONS SHALL BE INSTALLED SO THAT CONNECTOR PLATES ARE LEVEL PERPENDICULAR TO THE BRACKET ARM AND SLOPED FOR POLE RAKING PARALLEL TO THE BRACKET ARM.

GENERAL NOTES:

ALL CLASSIFICATIONS ARE ASTM UNLESS OTHERWISE NOTED. SEE STANDARD SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.

ALL CONNECTOR PLATE AND CLOSURE PLATE THICKNESSES SHOWN ARE MINIMUM DIMENSIONS.

ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1″ DIA. HIGH STRENGTH ANCHOR BOLTS.

ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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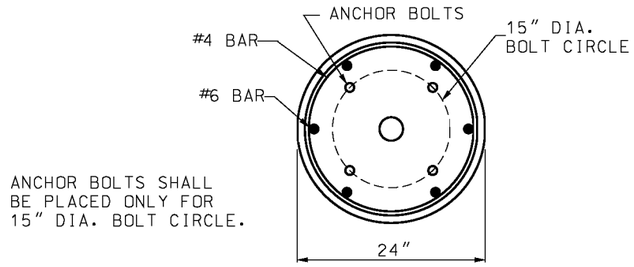
STATE OF MISSOURI
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# HIGHWAY LIGHTING

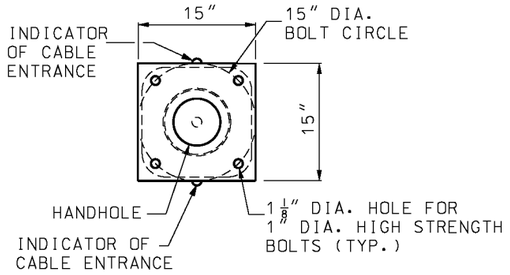
POLES, FOUNDATIONS AND APPURTENANCES FOR 30′ MOUNTING HEIGHT

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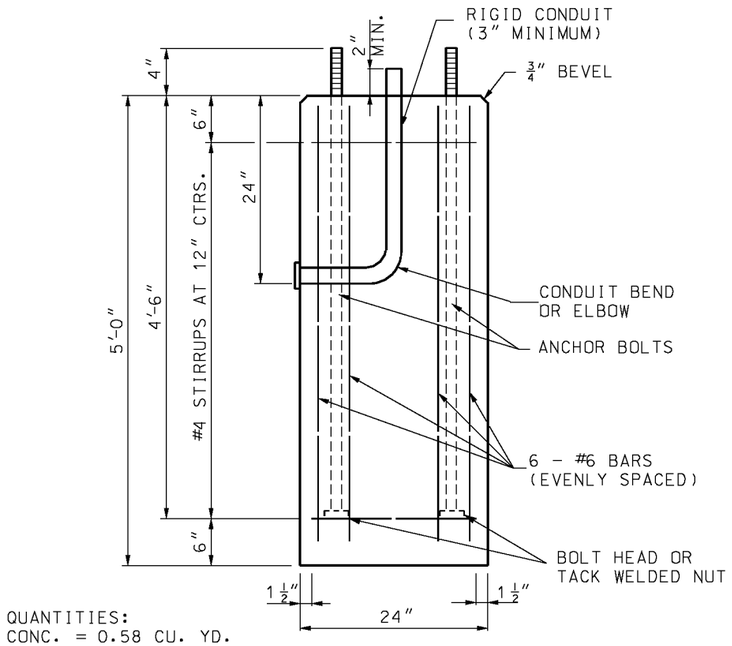



PLAN




PLAN

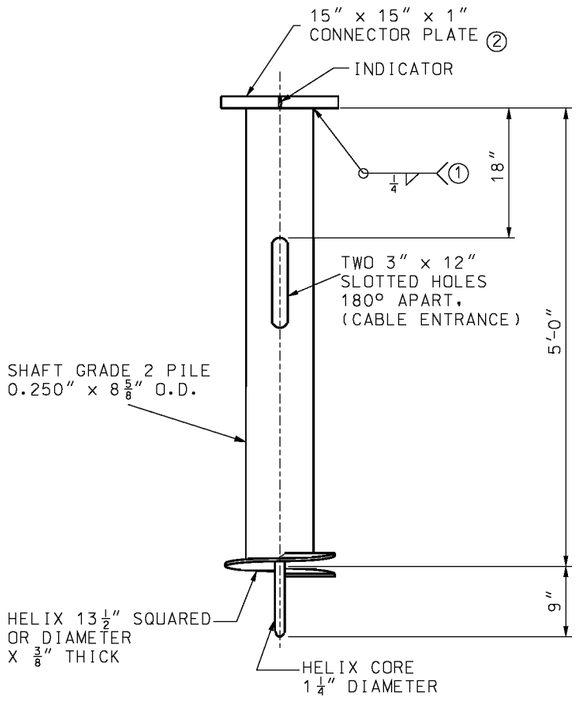
DRIVE HOLES WILL BE PERMITTED PROVIDED THAT THEY DO NOT CONFLICT WITH OR COMPROMISE THE STRUCTURAL INTEGRITY OF THE PLATE, THE WELD BETWEEN THE PLATE AND SHAFT, OR THE BOLT HOLES.




QUANTITIES:
CONC. = 0.58 CU. YD.
REIN. = 64 LBS.

ELEVATION

## DETAILS OF CONCRETE FOUNDATION ③

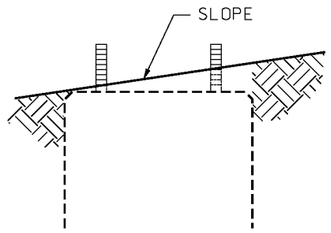



ELEVATION

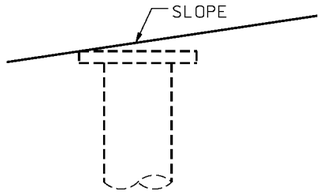
## DETAILS OF SCREW ANCHOR FOUNDATION

NOTES:

1. GRIND WELD AS NECESSARY TO CLEAR BOLT HEAD.
2. FOUNDATIONS SHALL BE INSTALLED SO THAT CONNECTOR PLATES ARE LEVEL PERPENDICULAR TO THE BRACKET ARM AND SLOPED FOR POLE RAKING PARALLEL TO THE BRACKET ARM.
3. AT THE OPTION OF THE CONTRACTOR THE CONCRETE FOUNDATION MAY BE PRECAST. IF PRECAST, THEY SHALL BE SET IN DRILLED HOLES 3 FEET IN DIAMETER AND 6 INCHES DEEPER THAN THE BOTTOM OF THE CONCRETE FOUNDATION. THE BOTTOM 6 INCHES OF THE HOLE AND THE REMAINING SPACE AROUND THE FOUNDATION SHALL BE BACKFILLED WITH WET TAMPED LIMESTONE SCREENINGS IN LAYERS NOT EXCEEDING 12 INCHES.




CONCRETE FOUNDATION
EMBEDMENT




SCREW ANCHOR
EMBEDMENT

GENERAL NOTES:

ALL CLASSIFICATIONS ARE ASTM UNLESS OTHERWISE NOTED. SEE STANDARD SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.

ALL CONNECTOR PLATE AND CLOSURE PLATE THICKNESSES SHOWN ARE MINIMUM DIMENSIONS.

ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1" DIA. HIGH STRENGTH ANCHOR BOLTS.

ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

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NUMBER PE-28411
PROFESSIONAL ENGINEER
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# HIGHWAY LIGHTING

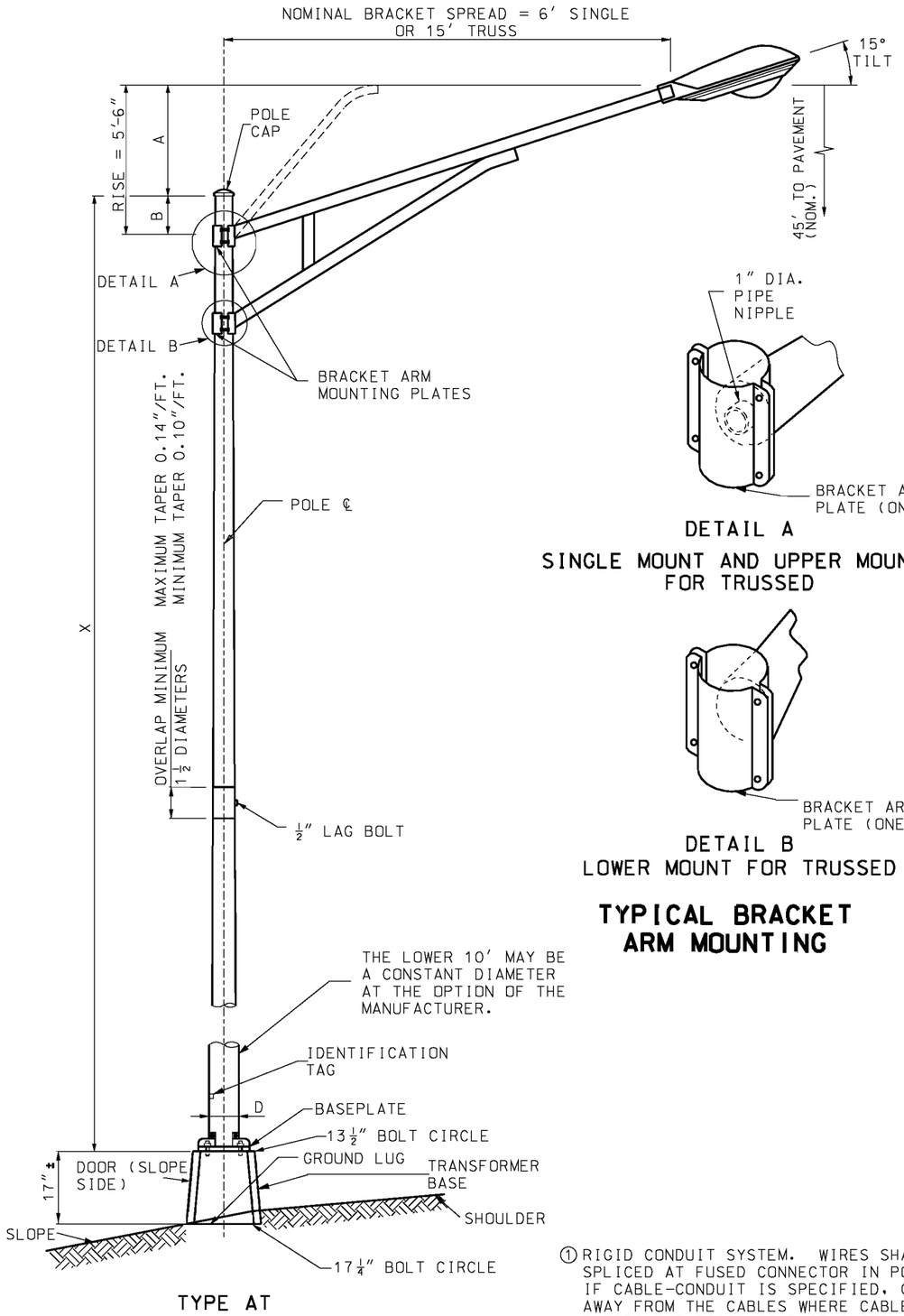
POLES, FOUNDATIONS AND APPURTENANCES FOR 30' MOUNTING HEIGHT

DATE EFFECTIVE: 12/01/2013
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901.00AA

SHEET NO. 4 OF 4

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




TYPE AT




DETAIL A

SINGLE MOUNT AND UPPER MOUNT FOR TRUSSED

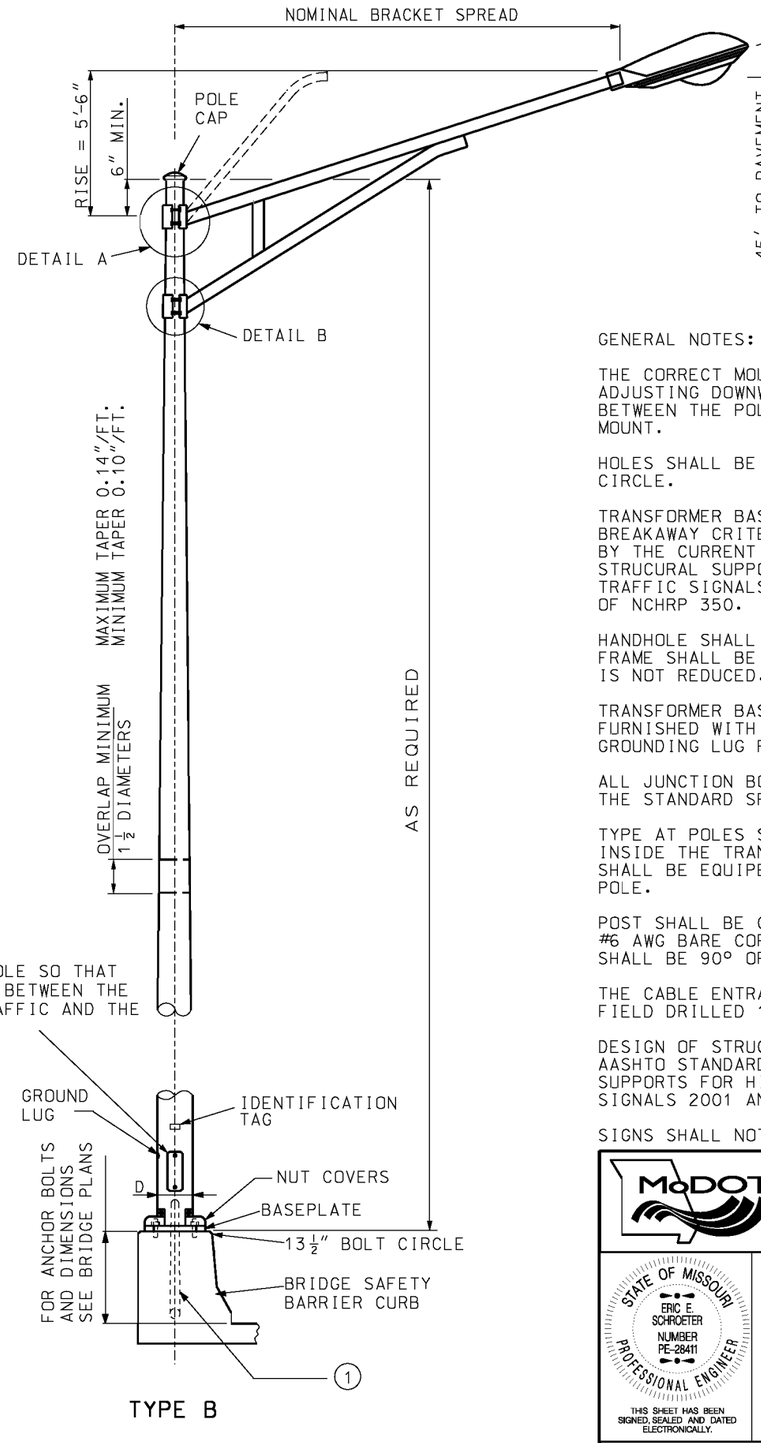



DETAIL B

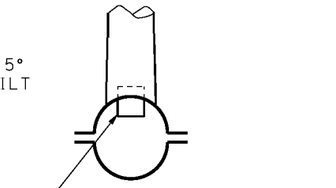
LOWER MOUNT FOR TRUSSED

## TYPICAL BRACKET ARM MOUNTING

① RIGID CONDUIT SYSTEM. WIRES SHALL BE SPLICED AT FUSED CONNECTOR IN POLE BASE. IF CABLE-CONDUIT IS SPECIFIED, CUT CONDUIT AWAY FROM THE CABLES WHERE CABLE-CONDUIT ENTERS THE RIGID CONDUIT SYSTEM. (SEE DRAWING 901.02)




TYPE B




PLAN VIEW OF DETAIL A

GENERAL NOTES:

THE CORRECT MOUNTING HEIGHT WILL BE OBTAINED BY ADJUSTING DOWNWARD FROM THE 6″ MINIMUM CLEARANCE BETWEEN THE POLE CAP AND THE TOP OF THE BRACKET ARM MOUNT.

HOLES SHALL BE PUNCHED ONLY FOR SPECIFIED BOLT CIRCLE.

TRANSFORMER BASE SHALL BE CERTIFIED AS MEETING THE BREAKAWAY CRITERIA AND STRUCTURAL REQUIREMENTS AS SET BY THE CURRENT AASHTO "STANDARD SPECIFICATIONS FOR STRUCURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS" AND MEET THE BREAKAWAY REQUIREMENTS OF NCHRP 350.

HANDHOLE SHALL BE APPROX. 4″ X 6-1/2″. HANDHOLE FRAME SHALL BE REINFORCED SO THAT THE POLE STRENGTH IS NOT REDUCED.

TRANSFORMER BASES FOR 45′ MOUNTING HEIGHT SHALL BE FURNISHED WITH ONE DRILLED AND TAPPED HOLE AND GROUNDING LUG FOR GROUNDING EQUIPMENT.

ALL JUNCTION BOXES SHALL CONFORM TO SECTION 1062 OF THE STANDARD SPECIFICATIONS.

TYPE AT POLES SHALL BE EQUIPED WITH THE GROUNDING LUG INSIDE THE TRANSFORMER BASE. TYPE B AND MB POLES SHALL BE EQUIPED WITH A GROUNDING LUG INSIDE THE POLE.

POST SHALL BE GROUNDED FROM GROUND LUG IN POST WITH #6 AWG BARE COPPER WIRE TO CONDUIT SYSTEM. GROUND LUG SHALL BE 90° OR 180° FROM HANDHOLE.

THE CABLE ENTRANCE AT THE BRACKET ARM SHALL BE A FIELD DRILLED 1-1/4″ DIA. HOLE.

DESIGN OF STRUCTURAL SUPPORTS SHALL COMPLY WITH AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS 2001 AND INTERIMS THROUGH 2003.

SIGNS SHALL NOT BE MOUNTED ON LIGHTING POLES.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
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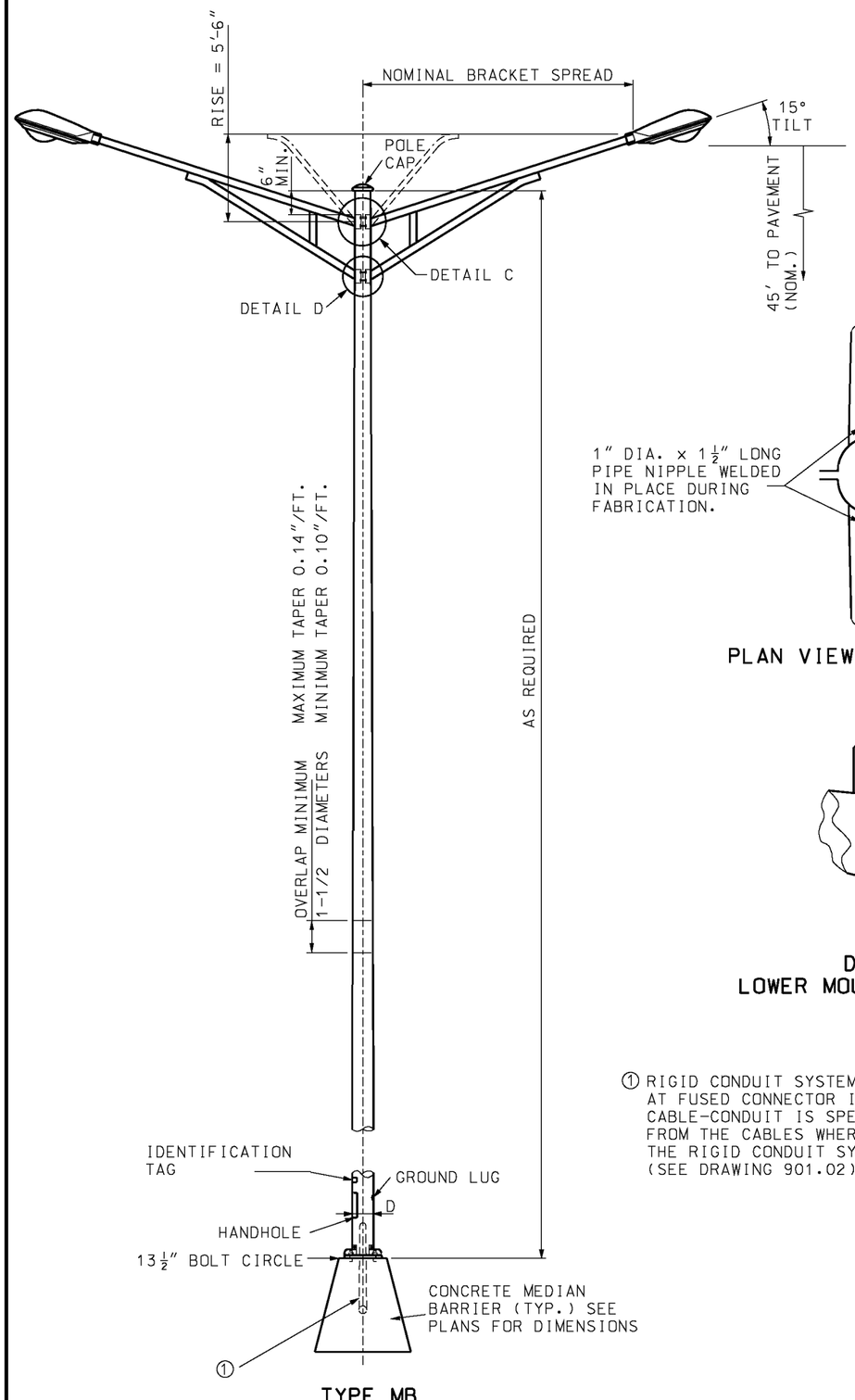
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# HIGHWAY LIGHTING
## POLES, FOUNDATIONS AND APPURTENANCES FOR 45′ MOUNTING HEIGHT

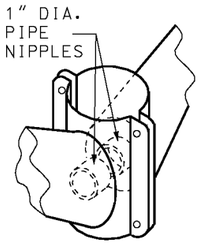
DATE EFFECTIVE: 12/01/2013
DATE PREPARED: 10/22/2013

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SHEET NO. 1 OF 6



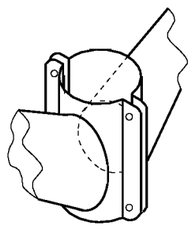

TYPE MB




DETAIL C

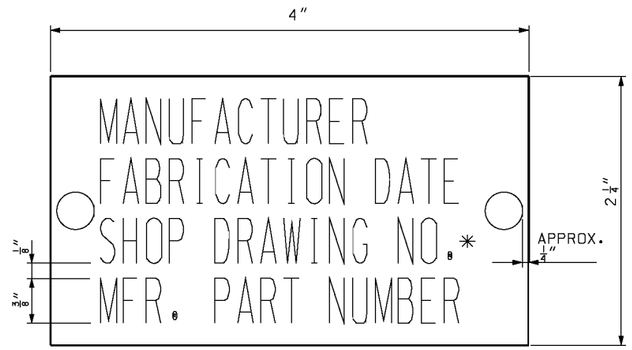



PLAN VIEW OF DETAIL C



DETAIL D
LOWER MOUNT FOR TRUSSED

① RIGID CONDUIT SYSTEM. WIRES SHALL BE SPLICED AT FUSED CONNECTOR IN POLE BASE. IF CABLE-CONDUIT IS SPECIFIED, CUT CONDUIT AWAY FROM THE CABLES WHERE CABLE-CONDUIT ENTERS THE RIGID CONDUIT SYSTEM. (SEE DRAWING 901.02)




IDENTIFICATION TAG

ID TAG NOTE:

TAG SHALL BE ALUMINUM OR STAINLESS STEEL AND ATTACHED TO POLE USING TWO RIVETS OR STAINLESS STEEL DRIVE SCREWS. ID TAG HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.

* INCLUDING REVISION

GENERAL NOTES:

THE CORRECT MOUNTING HEIGHT WILL BE OBTAINED BY ADJUSTING DOWNWARD FROM THE 6" MINIMUM CLEARANCE BETWEEN THE POLE CAP AND THE TOP OF THE BRACKET ARM MOUNT.

HOLES SHALL BE PUNCHED ONLY FOR SPECIFIED BOLT CIRCLE.

TRANSFORMER BASE SHALL BE CERTIFIED AS MEETING THE BREAKAWAY CRITERIA AND STRUCTURAL REQUIREMENTS AS SET BY THE CURRENT AASHTO "STANDARD SPECIFICATIONS FOR STRUCURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS" AND MEET THE BREAKAWAY REQUIREMENTS OF NCHRP 350.

HANDHOLE SHALL BE APPROX. 4" X 6-1/2". HANDHOLE FRAME SHALL BE REINFORCED SO THAT THE POLE STRENGTH IS NOT REDUCED.

TRANSFORMER BASES FOR 45' MOUNTING HEIGHT SHALL BE FURNISHED WITH ONE DRILLED AND TAPPED HOLE AND GROUNDING LUG FOR GROUNDING EQUIPMENT.

ALL JUNCTION BOXES SHALL CONFORM TO SECTION 1062 OF THE STANDARD SPECIFICATIONS.

TYPE AT POLES SHALL BE EQUIPED WITH THE GROUNDING LUG INSIDE THE TRANSFORMER BASE. TYPE B AND MB POLES SHALL BE EQUIPED WITH A GROUNDING LUG INSIDE THE POLE.

POST SHALL BE GROUNDED FROM GROUND LUG IN POST WITH #6 AWG BARE COPPER WIRE TO CONDUIT SYSTEM. GROUND LUG SHALL BE 90° OR 180° FROM HANDHOLE.

THE CABLE ENTRANCE AT THE BRACKET ARM SHALL BE A FIELD DRILLED 1-1/4" DIA. HOLE.

SIGNS SHALL NOT BE MOUNTED ON LIGHTING POLES.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# HIGHWAY LIGHTING
## POLES, FOUNDATIONS AND APPURTENANCES FOR 45' MOUNTING HEIGHT

DATE EFFECTIVE: 12/01/2013
DATE PREPARED: 10/22/2013

901.01AH

SHEET NO. 2 OF 6

| TYPE AT POLE | | | | |
|---|---|---|---|---|
| BRACKET SPREAD | | | | 6′ OR 15′ |
| MAX. LUMINAIRE WEIGHT | | | | 60 LB |
| MAX. PROJECTED AREA | | | | 3.3 SQ. FT. |
| AT-45 DESIGN NO. | X | A | B | D ✳ (NOMINAL) |
| 1 | 50′ | VAR. | 6″ MIN. | 10″ |
| 2 | 45′ | VAR. | 6″ MIN. | 10″ |
| 3 | 40′ | VAR. | 6″ MIN. | 10″ |
| 4 | 35′ | VAR. | 6″ MIN. | 10″ |
| 5 | 30′ | VAR. | 6″ MIN. | 10″ |

✳ THE MINIMUM ALTERNATE DIAMETER SHALL BE 10″ FOR A 50′ POLE, 9-1/2″ FOR A 45′ POLE, 9″ FOR A 40′ POLE, 8-1/2″ FOR A 35′ POLE AND 8″ FOR A 30′ POLE.

| ANSI LAMPS | | | |
|---|---|---|---|
| FUSE RATING | DESIGNATION HPS | WATTS | INITIAL LUMENS |
| 3A | S55 | 150 | 16,000 |
| 5A | S50 | 250 | 27,500 |
| 7A | S51 | 400 | 50,000 |
| TYPE III MEDIUM DISTRIBUTION SEMI-CUTOFF UNLESS OTHERWISE SPECIFIED ON PLANS | | | |

| TYPE B POLE | | | |
|---|---|---|---|
| BRACKET SPREAD | | | 6′ OR 15′ |
| MAX. LUMINAIRE WEIGHT | | | 60 LB |
| MAX. PROJECTED AREA | | | 3.3 SQ. FT. |
| SINGLE BRACKET ARM | | | |
| LOCATION | BRACKET SPREAD | D NOM. | ANCHOR BOLT DIA. |
| BRIDGE SAFETY BARRIER CURB | 6′ | 10″ | 1-1/4″ |
| TRUSSED BRACKET ARM | | | |
| LOCATION | BRACKET SPREAD | D NOM. | ANCHOR BOLT DIA. |
| BRIDGE SAFETY BARRIER CURB | 15′ | 10″ | 1-1/4″ |

| TYPE MB POLE | | |
|---|---|---|
| BRACKET SPREAD | | 6′ OR 15′ |
| MAX. LUMINAIRE WEIGHT | | 60 LB |
| MAX. PROJECTED AREA | | 3.3 SQ. FT. |
| DOUBLE BRACKET ARM | | |
| LOCATION | BRACKET SPREAD | D NOM. |
| MEDIAN BARRIER CURB | 6′ | 10″ |
| DOUBLE TRUSSED BRACKET ARM | | |
| LOCATION | BRACKET SPREAD | D NOM. |
| MEDIAN BARRIER CURB | 15′ | 10″ |

GENERAL NOTES:

THE CORRECT MOUNTING HEIGHT WILL BE OBTAINED BY ADJUSTING DOWNWARD FROM THE 6″ MINIMUM CLEARANCE BETWEEN THE POLE CAP AND THE TOP OF THE BRACKET ARM MOUNT.

HOLES SHALL BE PUNCHED ONLY FOR SPECIFIED BOLT CIRCLE.

TRANSFORMER BASE SHALL BE CERTIFIED AS MEETING THE BREAKAWAY CRITERIA AND STRUCTURAL REQUIREMENTS AS SET BY THE CURRENT AASHTO "STANDARD SPECIFICATIONS FOR STRUCURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS" AND MEET THE BREAKAWAY REQUIREMENTS OF NCHRP 350.

HANDHOLE SHALL BE APPROX. 4″ X 6½″. HANDHOLE FRAME SHALL BE REINFORCED SO THAT THE POLE STRENGTH IS NOT REDUCED.

TRANSFORMER BASES FOR 45′ MOUNTING HEIGHT SHALL BE FURNISHED WITH ONE DRILLED AND TAPPED HOLE AND GROUNDING LUG FOR GROUNDING EQUIPMENT.

ALL JUNCTION BOXES SHALL CONFORM TO SECTION 1062 OF THE STANDARD SPECIFICATIONS.

TYPE AT POLES SHALL BE EQUIPED WITH THE GROUNDING LUG INSIDE THE TRANSFORMER BASE. TYPE B AND MB POLES SHALL BE EQUIPED WITH A GROUNDING LUG INSIDE THE POLE.

POST SHALL BE GROUNDED FROM GROUND LUG IN POST WITH #6 AWG BARE COPPER WIRE TO CONDUIT SYSTEM. GROUND LUG SHALL BE 90° OR 180° FROM HANDHOLE.

THE CABLE ENTRANCE AT THE BRACKET ARM SHALL BE A FIELD DRILLED 1¼″ DIA. HOLE.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

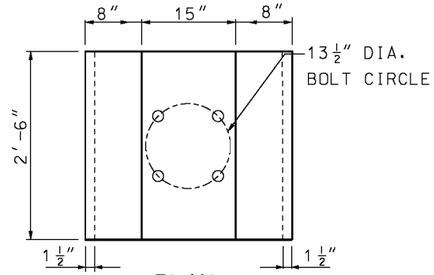
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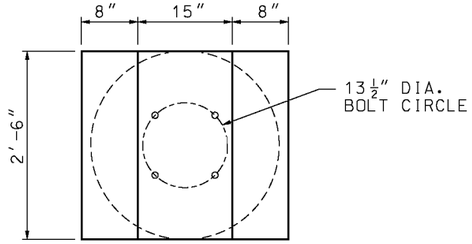
# HIGHWAY LIGHTING
## POLES, FOUNDATIONS AND APPURTENANCES FOR 45′ MOUNTING HEIGHT

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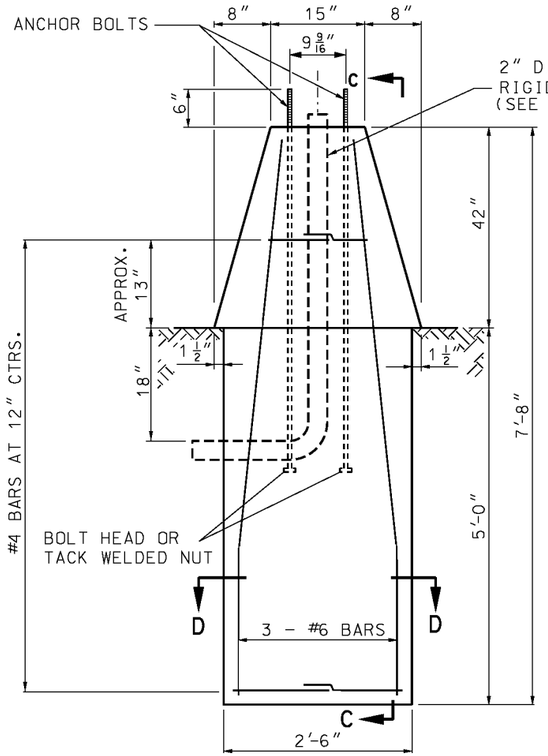
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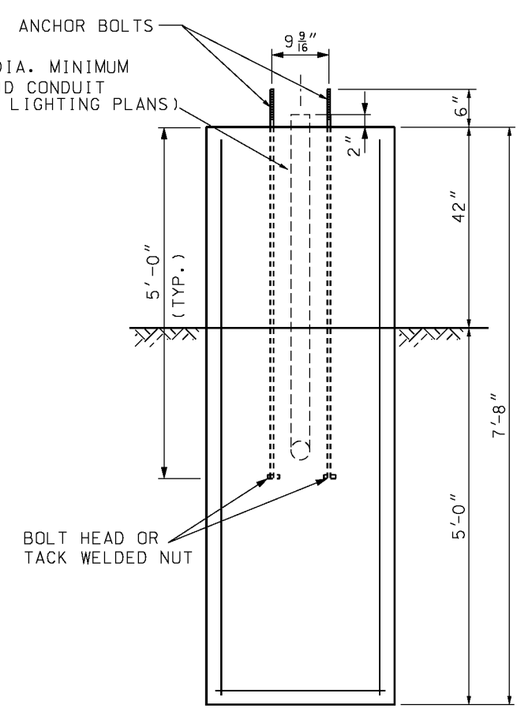

PLAN



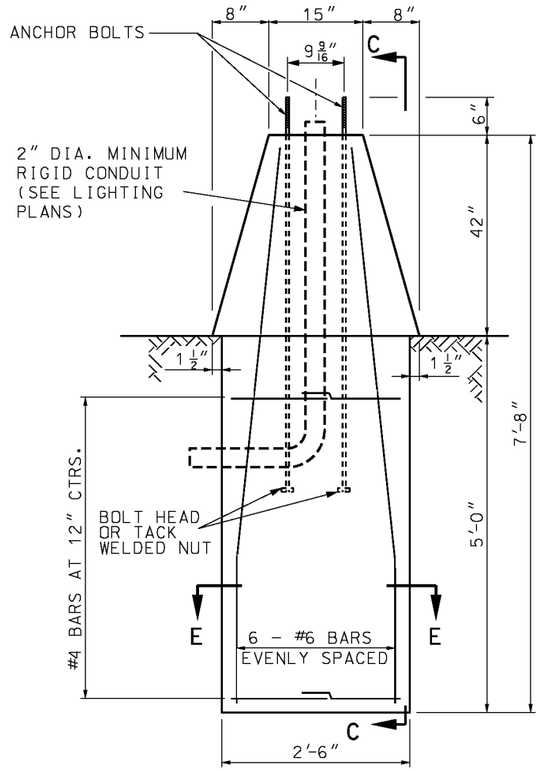

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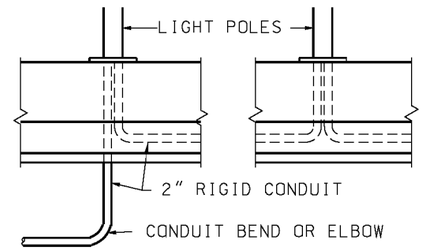

ELEVATION
ALTERNATE 1



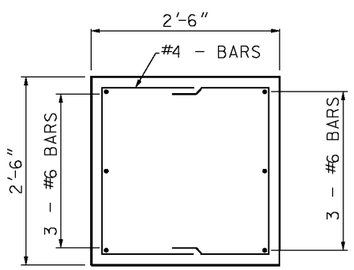

SECTION C-C




ELEVATION
ALTERNATE 2

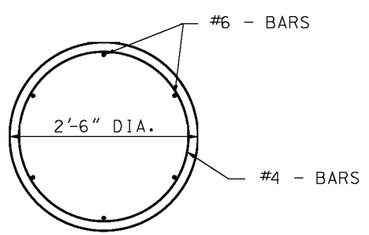



CONDUIT DETAIL FOR
ALTERNATE 1 & 2




SECTION D-D

# CONCRETE MEDIAN BARRIER AND FOUNDATION DESIGN FOR TYPE MB LIGHT POLE




SECTION E-E

GENERAL NOTES:

ALL FOUNDATIONS SHALL INCLUDE 4 ANCHOR BOLTS AND NUTS PLACED AS SHOWN.

ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1¼″ DIAMETER HIGH STRENGTH ANCHOR BOLTS.

TOUNGE AND GROOVE REQUIRED ON MEDIAN BARRIER SECTION FOR TYPEMB POLES WHEN ADJACENT MEDIAN BARRIER IS PRECAST, FOR DETAILS, SEE STANDARD PLANS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

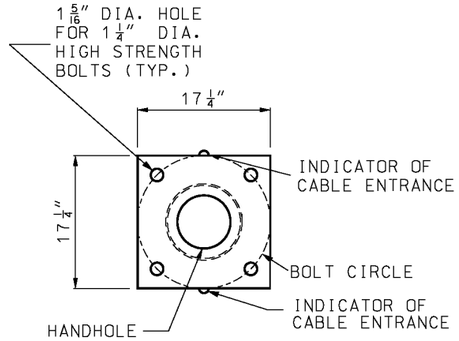
# HIGHWAY LIGHTING
POLES, FOUNDATIONS
AND APPURTENANCES
FOR 45′ MOUNTING HEIGHT

DATE EFFECTIVE: 12/01/2013
DATE PREPARED: 10/22/2013

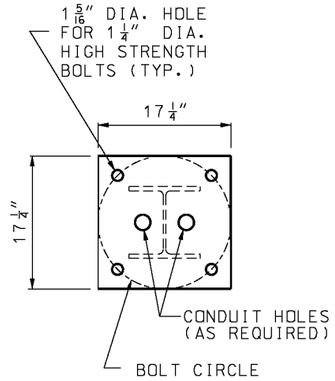
901.01AH

SHEET NO.
4 OF 6

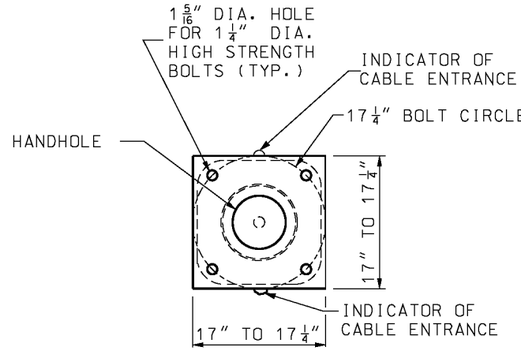
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN

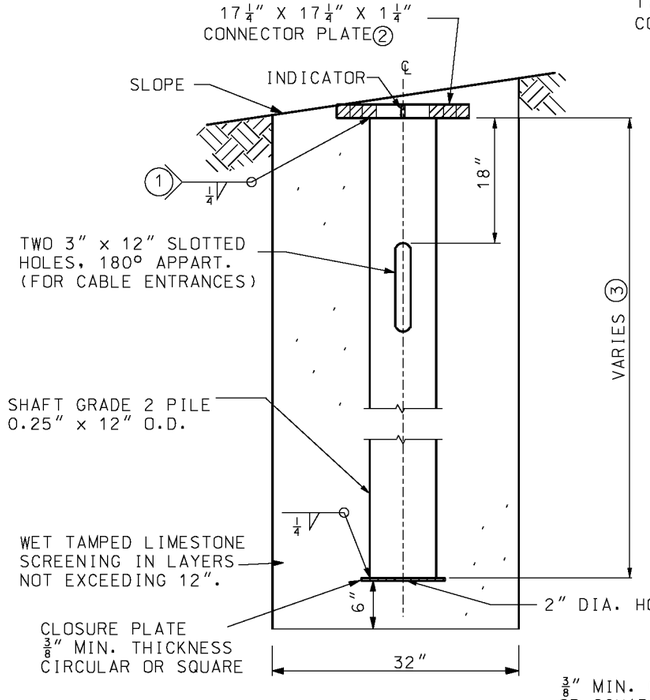



PLAN



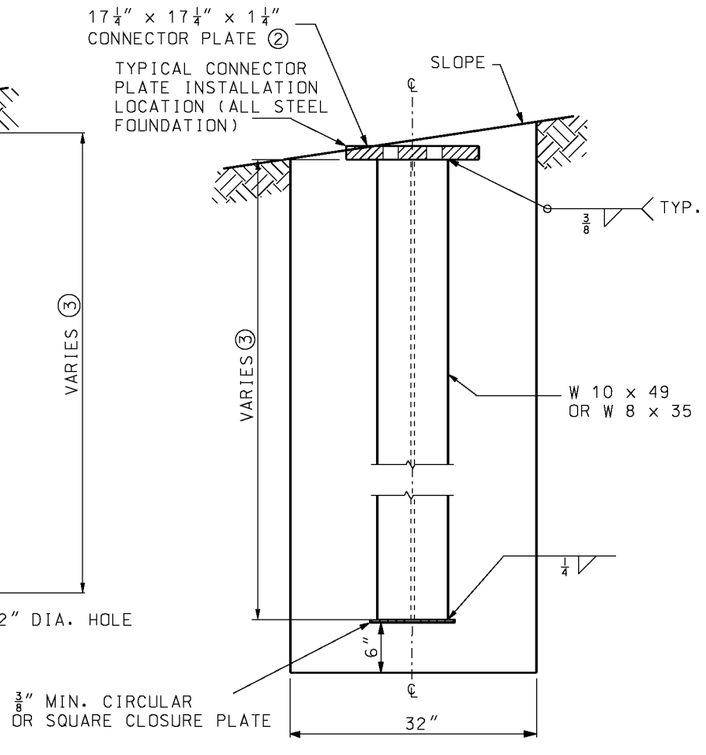

PLAN

NOTE:
DRIVE HOLES WILL BE PERMITTED PROVIDED THEY DO NOT CONFLICT WITH OR COMPROMISE THE STRUCTURAL INTEGRITY OF THE PLATE, THE WELD BETWEEN THE PLATE AND SHAFT, OR THE BOLT HOLES.



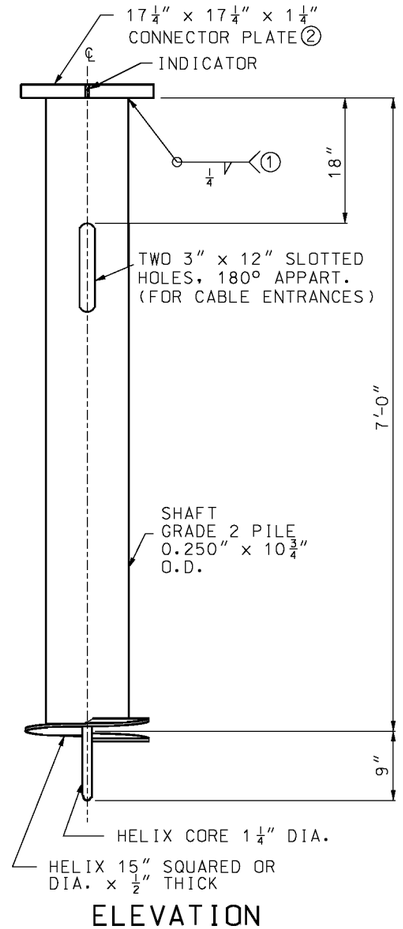

ELEVATION

## DETAILS OF CIRCULAR STEEL PILE FOUNDATION




ELEVATION

## DETAILS OF STEEL "H" PILE FOUNDATION




ELEVATION

## DETAILS OF SCREW ANCHOR FOUNDATION

(1) GRIND WELD AS NECESSARY TO CLEAR BOLT HEAD.

(2) FOUNDATIONS SHALL BE INSTALLED SO THAT CONNECTOR PLATES ARE LEVEL PERPENDICULAR TO THE BRACKET ARM AND SLOPED FOR POLE RAKING PARALLEL TO THE BRACKET ARM.

(3) PILE LENGTHS FOR STEEL PILE FOUNDATIONS:

| AT-45 DESIGN NO. | PILE LENGTH |
|---|---|
| 4 & 5 | 8'-0" |
| 2 & 3 | 9'-0" |
| 1 | 10'-0" |

GENERAL NOTES:

ALL CLASSIFICATIONS ARE ASTM UNLESS OTHERWISE NOTED. SEE STANDARD SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.

ALL BOLT CIRCLES FOR 45' MOUNTING HEIGHT SHALL BE 17 1/4".

ALL CONECTOR PLATE AND CLOSURE PLATE THICKNESSES SHOWN ARE MINIMUM DIMENSIONS.

ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1 1/4" DIAMETER HIGH STRENGTH ANCHOR BOLTS.

ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# HIGHWAY LIGHTING

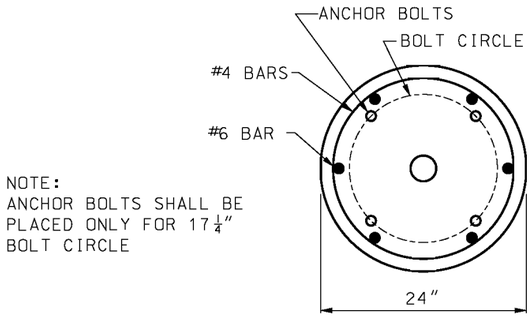
## POLES, FOUNDATIONS AND APPURTENANCES FOR 45' MOUNTING HEIGHT

DATE EFFECTIVE: 12/01/2013
DATE PREPARED: 10/22/2013

901.01AH

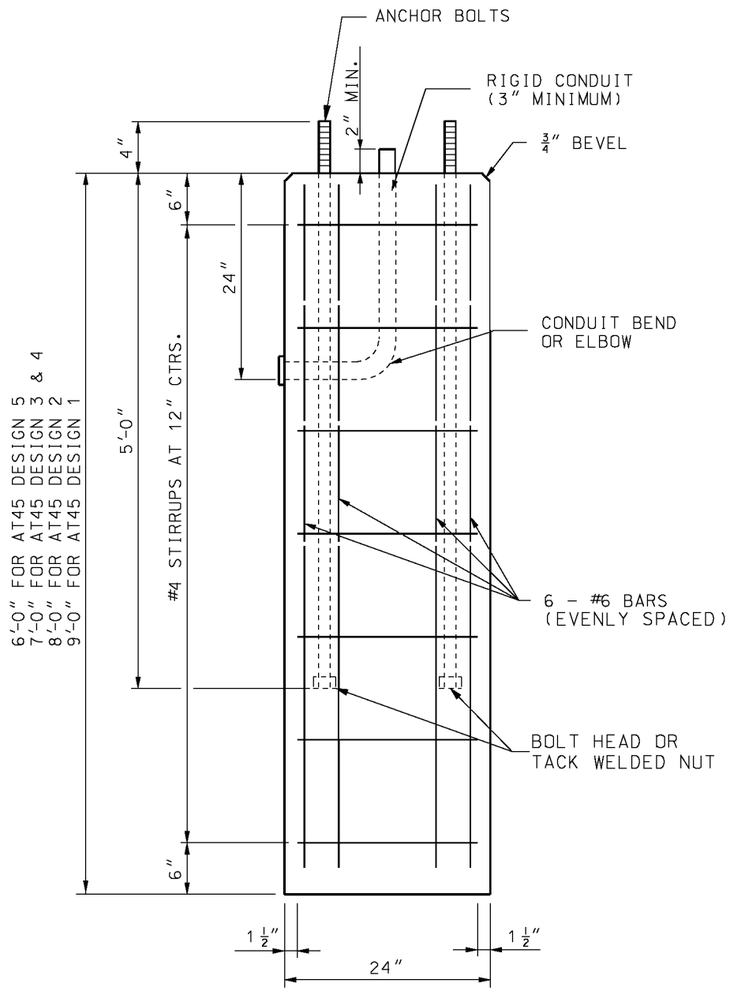
SHEET NO. 5 OF 6

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




NOTE:
ANCHOR BOLTS SHALL BE PLACED ONLY FOR 17 $\frac{1}{4}$" BOLT CIRCLE

PLAN

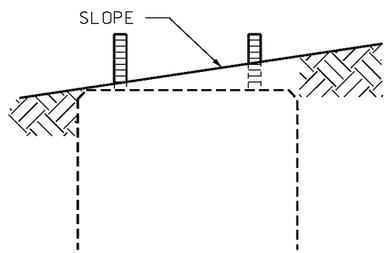



ELEVATION

## DETAILS OF CONCRETE FOUNDATION (4)

(4) AT THE OPTION OF THE CONTRACTOR THE CONCRETE FOUNDATIONS MAY BE PRECAST. IF PRECAST, THEY SHALL BE SET IN DRILLED HOLES 3 FEET IN DIAMETER AND 6 INCHES DEEPER THAN THE BOTTOM OF THE CONCRETE FOUNDATION. THE BOTTOM 6 INCHES OF THE HOLE AND THE REMAINING SPACE AROUND THE FOUNDATION SHALL BE BACKFILLED WITH WET TAMPED LIMESTONE SCREENINGS IN LAYERS NOT EXCEEDING 12 INCHES.

| QUANTITIES | | |
|---|---|---|
| | CONC. | REINF. |
| HEIGHT | CU. YD. | LBS. |
| 6'-0" | .70 | 80 |
| 7'-0" | .81 | 90 |
| 8'-0" | .93 | 104 |
| 9'-0" | 1.05 | 120 |




CONCRETE FOUNDATION EMBEDMENT

GENERAL NOTES:

ALL CLASSIFICATIONS ARE ASTM UNLESS OTHERWISE NOTED. SEE STANDARD SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.

ALL BOLT CIRCLES FOR 45' MOUNTING HEIGHT SHALL BE 17 $\frac{1}{4}$".

ALL CONECTOR PLATE AND CLOSURE PLATE THICKNESSES SHOWN ARE MINIMUM DIMENSIONS.

ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1 $\frac{1}{4}$" DIAMETER HIGH STRENGTH ANCHOR BOLTS.

ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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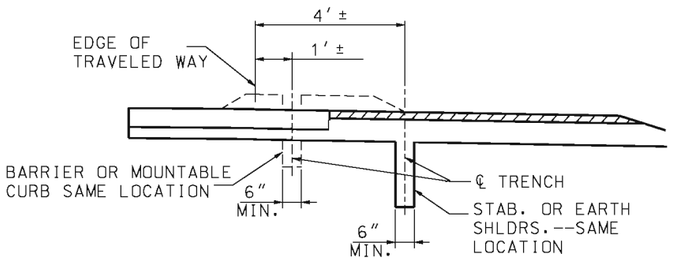
# HIGHWAY LIGHTING
## POLES, FOUNDATIONS AND APPURTENANCES FOR 45' MOUNTING HEIGHT

DATE EFFECTIVE: 12/01/2013
DATE PREPARED: 10/22/2013

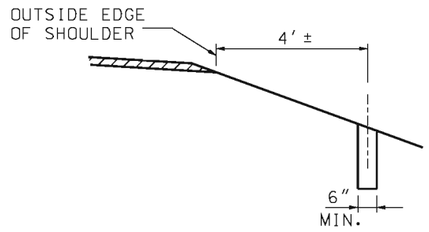
901.01AH

SHEET NO. 6 OF 6

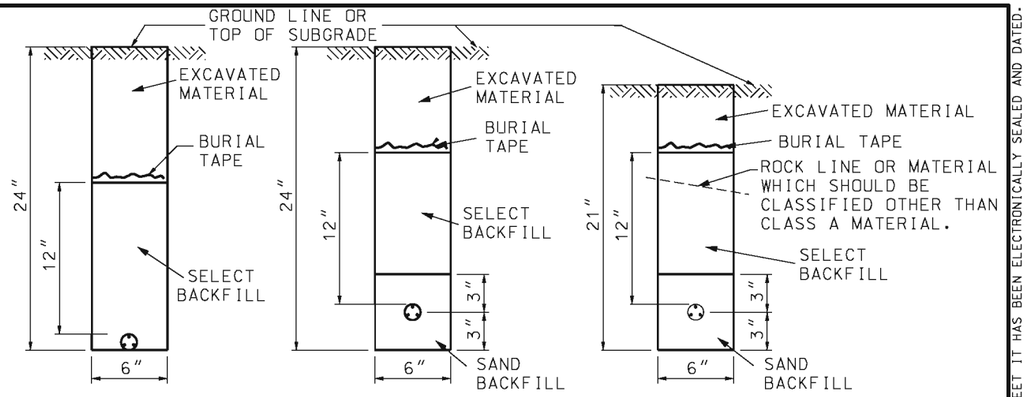
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




TRENCH LOCATION - INSIDE SHOULDER

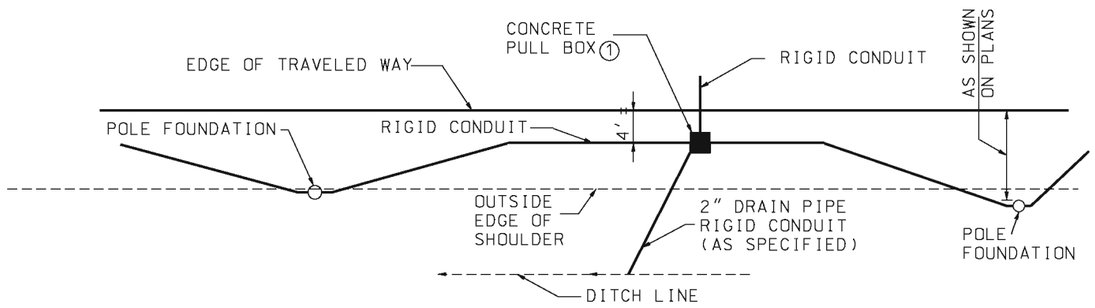



TRENCH LOCATION - OUTSIDE SHOULDER



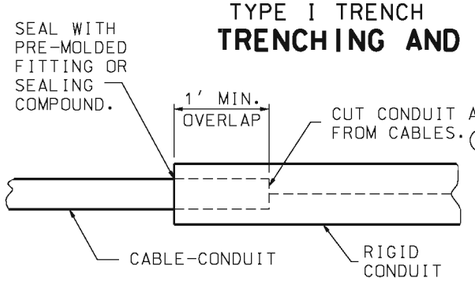

TYPE I TRENCH TYPE II TRENCH TYPE III TRENCH

## TRENCHING AND BACKFILLING FOR CABLE-CONDUIT

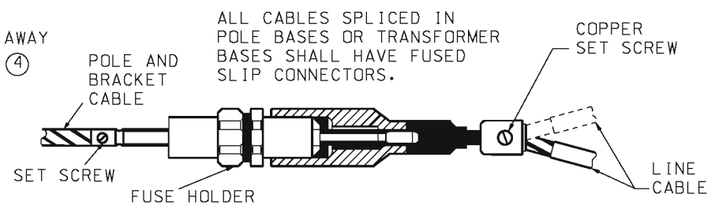



PLAN

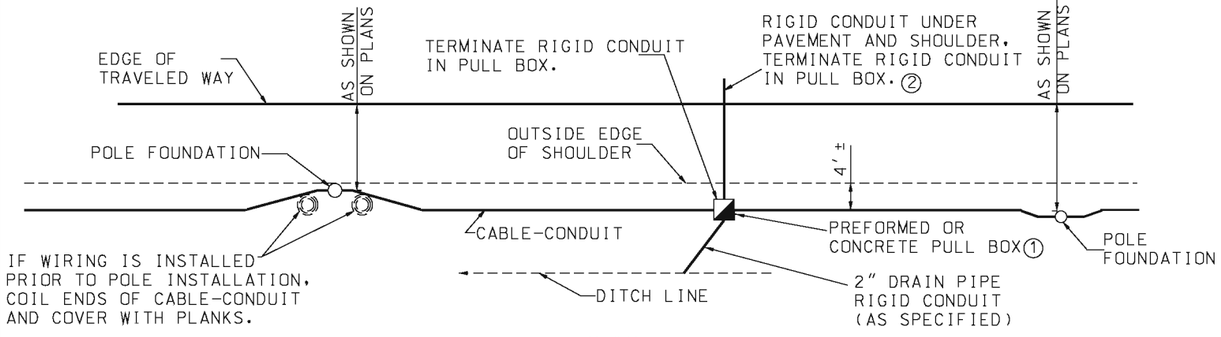
## INSIDE SHOULDER (ALL SHOULDER TYPES)




TERMINATION OF CABLE-CONDUIT INTO RIGID CONDUIT SYSTEM

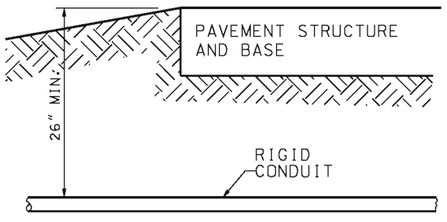



SINGLE OR DUAL CABLE FUSED SLIP CONNECTOR ASSEMBLY ③

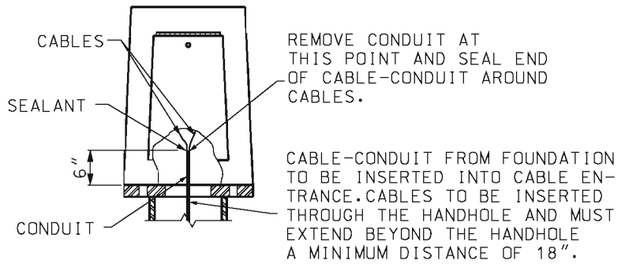



PLAN

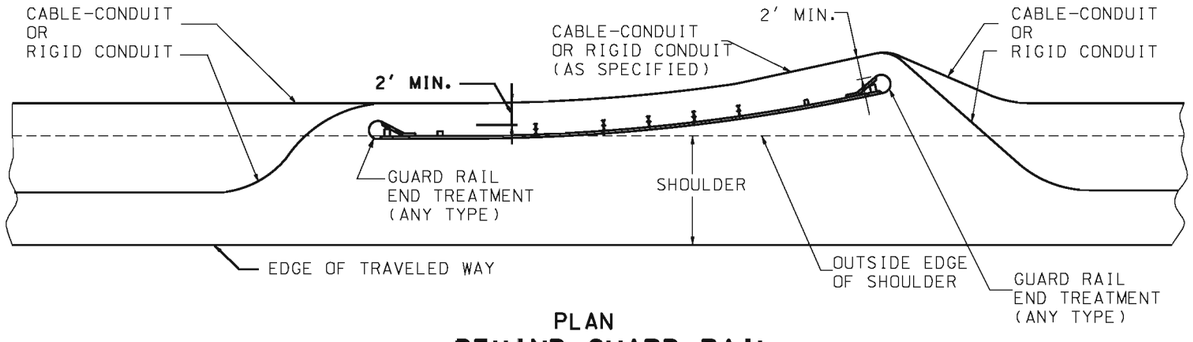
## OUTSIDE SHOULDER (ALL SHOULDER TYPES)




RIGID CONDUIT UNDER PAVEMENT




TYPICAL TRANSFORMER BASE ATTACHMENT




PLAN

## BEHIND GUARD RAIL

NOTES:

① SEE DRAWING 902.20 FOR PULL 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 BEMADE FOR THE PURPOSE OF TERMINATING CABLE-CONDUIT.

GENERAL NOTES:

THE CONDUIT OF THE CABLE-CONDUIT SHALL BE CUT AWAY FROM THE CABLES WHERE THEY ENTER THE RIGID CONDUIT INSIDE A CONCRETE BARRIER OR STRUCTURE.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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JEFFERSON CITY, MO 65102
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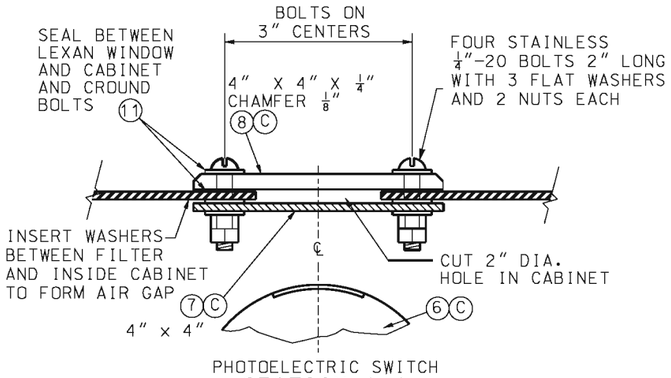
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# HIGHWAY LIGHTING
## CABLE, CONDUIT AND TRENCHING

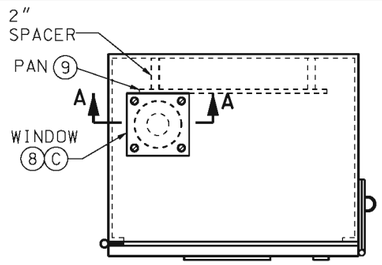
DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 3/10/2011

901.02B

SHEET NO. 1 OF 1




**SECTION A-A**
**WINDOW DETAIL**




**DETAIL A**

| LIST OF MATERIALS | |
|---|---|
| ITEM | DESCRIPTION |
| 1 | #2 CORBIN LOCK |
| 2 | RIGID CONDUIT ✳ |
| 3 | CLASS B CONCRETE, 0.4 C.Y.± |
| 4 | NEMA 4, DUST-TIGHT, WATERTIGHT, CABINET |
| 5 | GROUND ROD, ¾" DIA. X 8' MIN. |
| 6 | PHOTOELECTRIC SWITCH AND SOCKET, 105/285 V., 1000-WATT |
| 7 | TRANSLUCENT, PLEXIGLASS FILTER #W2067, ⅛" THICK |
| 8 | CLEAR, LEXAN #9034 WINDOW, ¼" THICK MIN. |
| 9 | MOUNTING PAN, 31½" x 12" x ¼" ALUMINUM OR STAINLESS STEEL |
| 10 | PLIABLE DUCT SEALANT |
| 11 | LIFETIME SILICONE CAULK |
| 12 | ANCHOR BOLTS, 5/8-11 x 14" LONG BOLTS, HOT DIP GALVANIZED, 4 REQUIRED.USE BOLT HEAD OR TACK WELDED NUT ON EMBEDDED END |
| 13 | WEATHERPROOF ADHESIVE LABEL, VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL) |
| | ✳ - SEE PLANS |

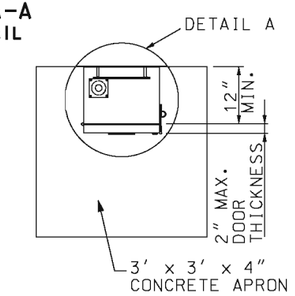
NOTES

(A) IF CABLE-CONDUIT IS SPECIFIED, THE CONDUIT SHALL BE CUT AWAY FROM CABINET BETWEEN PULL BOX AND CONTROL STATION.

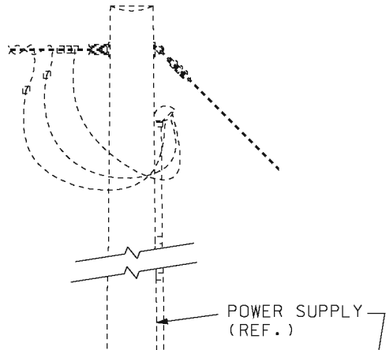
(B) LIGHTING SYSTEM VOLTAGE AS SPECIFIED ON PLANS.

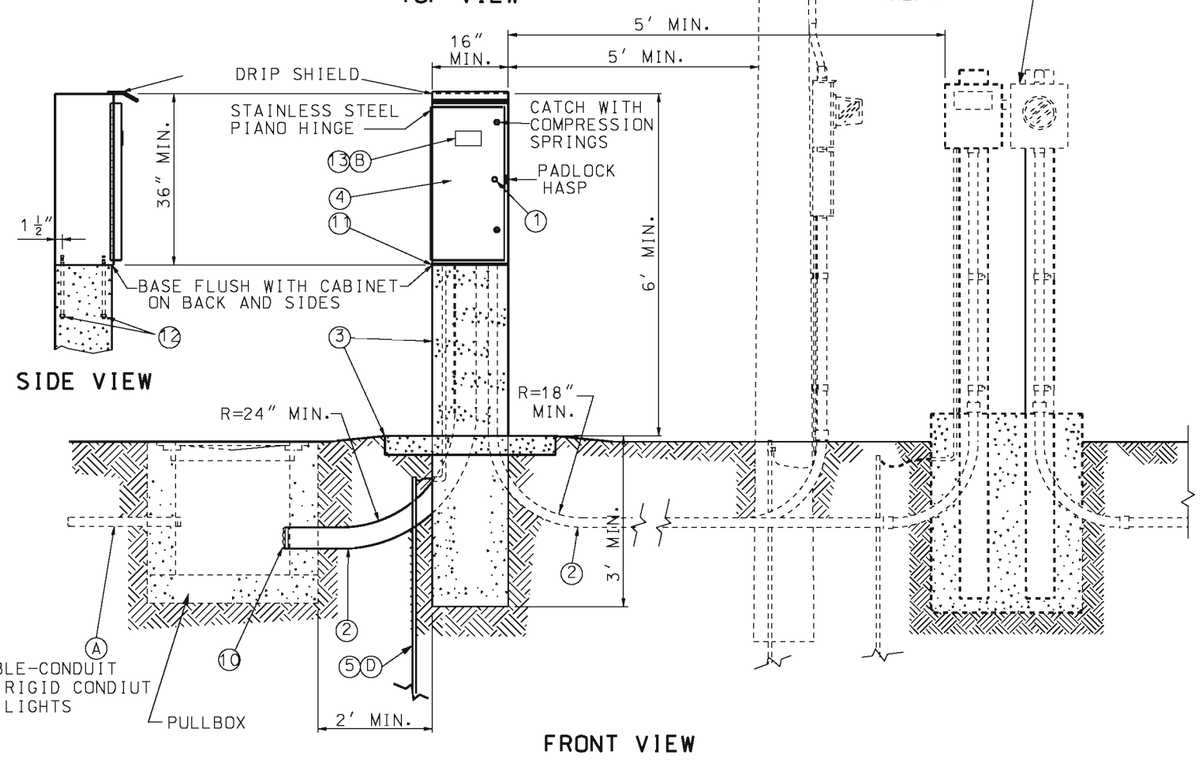
(C) PHOTOELECTRIC SWITCH BRACKETS MAY VARY. LOCATE CENTER OF WIDOW OVER CENTER OF PHOTOELECTRIC SWITCH.

(D) IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADWELDED.



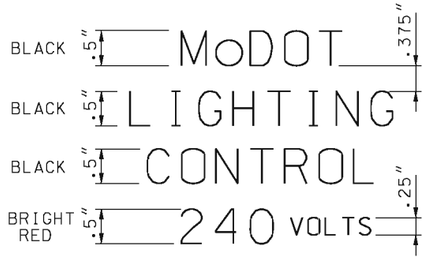

**TOP VIEW**




**SIDE VIEW**

**FRONT VIEW**




**LABEL DETAIL**
**(240 VOLT) (13)(B)**




**LABEL DETAIL**
**(480 VOLT) (13)(B)**

GENERAL NOTES:

ALTERNATE CABINET DIMENSIONS WILL BE ALLOWED AS APPROVED BY THE ENGINEER. INTERIOR CABINET VOLUME SHALL BE EQUAL TO OR GREATER THAN THAT SHOWN ON PLANS AND PROPER CLEARANCES SHALL BE PROVIDED FOR ALL EQUIPMENT. CONCRETE BASE DIMENSIONS SHALL BE MODIFIED TO FIT THE CABINET SUPPLIER.

PLACEMENT OF ALL ITEMS SHALL BE APPROVED BY THE ENGINEER.

CABINET SHALL BE LOCATED AWAY FROM TRAFFIC. TOP MOUNT PHOTO CONTROL SHALL FACE AN OPEN SKY. SIDE MOUNT PHOTO CONTROL SHALL FACE NORTH.

SEE PLANS FOR CIRCUIT WIRING; MAXIMUM LOADING PER CIRCUIT IS 7,400 WATTS FOR 240 VOLT AND 11,000 WATTS FOR 480 VOLT.

SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.

THE UTILITY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

ALL OPENINGS IN CABINET SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR CONTROL STATION.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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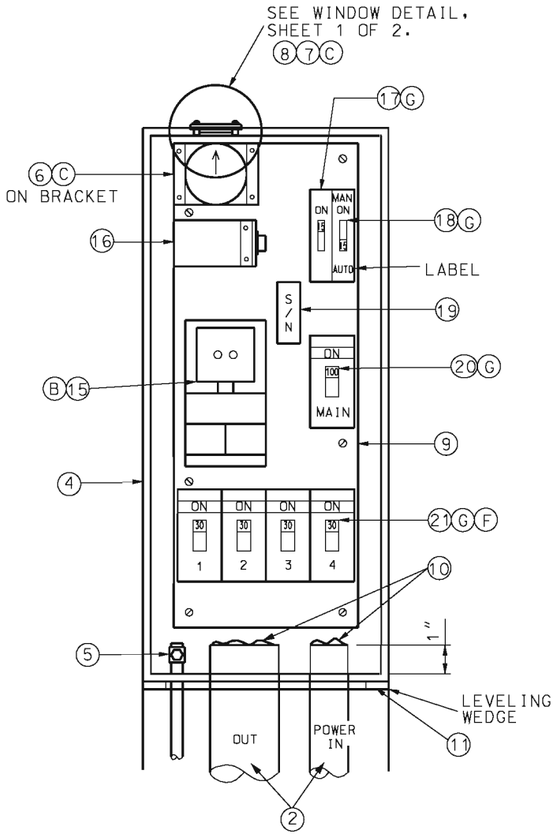
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
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# HIGHWAY LIGHTING
## BASE MOUNTED CONTROL STATION 240 V OR 480 V - 4 CIRCUIT

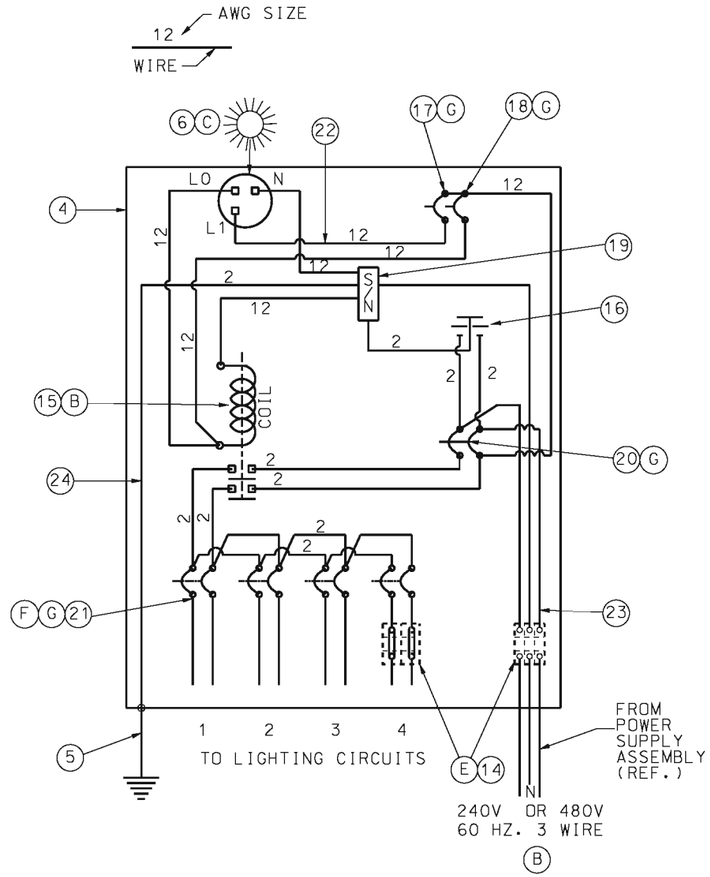
DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 9/14/2010

**901.30F**

SHEET NO. 1 OF 2




EQUIPMENT LAYOUT




WIRING DIAGRAM

| LIST OF MATERIALS | |
|---|---|
| ITEM | DESCRIPTION |
| 2 | RIGID CONDUIT ✳ |
| 4 | NEMA 4, DUST-TIGHT, WATERTIGHT CABINET |
| 5 | GROUND ROD, $\frac{3}{4}$" DIA. X 8' MIN. |
| 6 | PHOTOELECTRIC SWITCH AND SOCKET, 105/285 V., 1000 WATT |
| 7 | TRANSLUCENT, PLEXIGLASS FILTER #W2067, $\frac{1}{8}$" THICK |
| 8 | CLEAR, LEXAN #9034 WINDOW, $\frac{1}{4}$" THICK MIN. |
| 9 | MOUNTING PAN, 31$\frac{1}{2}$" x 12" x $\frac{1}{4}$" ALUMINUM OR STAINLESS STEEL |
| 10 | PLIABLE SEALANT |
| 11 | LIFETIME SILICONE CAULK |
| 14 | INSULATED TERMINAL BLOCK, FOR GREATER THAN 4/0 CABLE |
| 15(240V) | 2-POLE, 100 AMP, 120V COIL LIGHTING CONTACTOR |
| 15(480V) | 2-POLE, 100 AMP, 240V COIL LIGHTING CONTACTOR |
| 16 | 2-POLE, 650 VOLT LIGHTING ARRESTER |
| 17 | 1-POLE, 15 AMP, TYPE B CONTROL BREAKER |
| 18 | 1-POLE, 15 AMP,TYPE B MANUAL-AUTO SWITCH |
| 19 | INSULATED GROUNDABLE NEUTRAL, 100 AMP |
| 20 | 2-POLE, 100 AMP, TYPE A MAIN BREAKER |
| 21 | 2-POLE, 15 AMP(MIN), TYPE A LIGHTING BREAKERS |
| 22 | #12 AWG MIN., 600 V. CONTROL CABLE |
| 23 | #2 AWG MIN., 600 V. ✳ POWER CABLE |
| 24 | #2 AWG MIN., 600 V. GROUND CABLE |
| ✳ | SEE PLANS |

NOTES

(B) LIGHTING SYSTEM VOLTAGE AS SPECIFIED ON PLANS.

(C) PHOTOELECTRIC SWITCH BRACKETS MAY VARY. LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.

(E) 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.

(F) LIGHTING BREAKER SIZING:

| SIZE (AMPS) | 240V TOTAL CIRCUIT LOAD (WATTS) | 480V TOTAL CIRCUIT LOAD (WATTS) |
|---|---|---|
| 15 | 0-2800 | 0 - 5500 |
| 20 | 2850-3700 | 5550 - 7400 |
| 25 | 3750-4600 | 7450 - 9200 |
| 30 | 4650-5500 | 9250 - 11,000 |
| 35 | 5550-6500 | -- |
| 40 | 6550-7400 | -- |

CIRCUIT LOAD INCLUDES LOAD DUE TO LINE LOSS, LAMP, AND BALLAST LOAD.

(G) ALL CIRCUIT BREAKERS SHALL CONFORM TO SECTION 901.4 OF THE STANDARD SPECIFICATIONS.

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# HIGHWAY LIGHTING

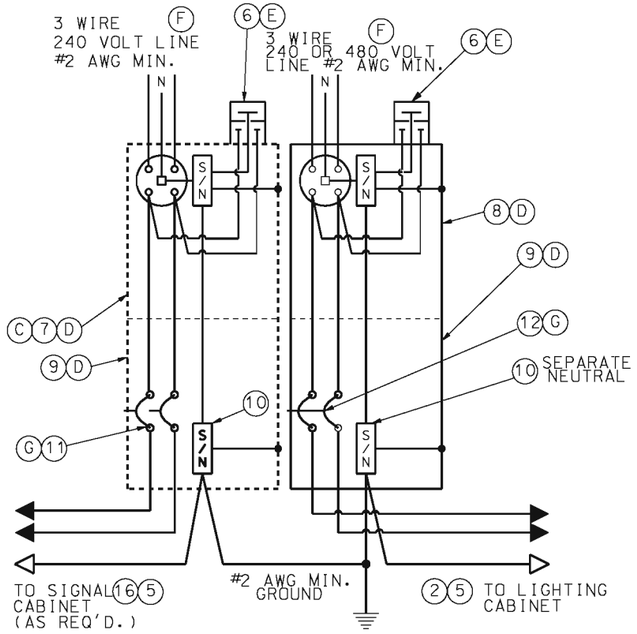
BASE MOUNTED
CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 8/26/2009

901.30F

SHEET NO. 2 OF 2

| LIST OF MATERIALS | |
|---|---|
| ITEM | DESCRIPTION |
| 1 | SERVICE POLE 30' MIN.,CLASS 4 WOOD, CONTRACTOR PROVIDED, MoDOT OWNED* |
| 2 | #2 AWG MIN. CABLE, 600 VOLT * |
| 3 | SERVICE ENTRANCE HEAD |
| 4 | GUY CABLE, AS REQUIRED |
| 5 | RIGID CONDUIT, 2" MIN., WITH PREFORMED ELBOWS |
| 6 | LIGHTNING ARRESTER, VALVE TYPE, 2 POLE, 650 VOLT |
| 7 | METER SOCKET, 200 AMP, FOR SIGNALS |
| 8 | METER SOCKET, 200 AMP, FOR LIGHTING |
| 9 | LOCKING, RAINTIGHT, NEMA 4 SERVICE DISCONNECT BOX |
| 10 | INSULATED, GROUNDABLE NEUTRAL WIRE, 200 AMP MINIMUM |
| 11 | SIGNAL BREAKERS, SINGLE POLE, 40A MIN, TYPE A OR B * |
| 12 | LIGHTING BREAKER, 2 POLE, 240 VOLT, 100A, TYPE A OR B |
| 13 | 1/2" METAL CONDUIT |
| 14 | #2 AWG MIN. GROUND WIRE |
| 15 | GROUND ROD, 3/4" x 8' MIN. |
| 16 | #8 AWG MIN. CABLE, 600 VOLT * |
| 17 | CLASS B CONCRETE, 0.92 C.Y.± |
| 18 | THREADED CONDUIT HUB WITH SEALING WASHERS |
| 19 | WEATHERPROOF ADHESIVE LABEL (LIGHTING), VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL) |
| 20 | WEATHERPROOF ADHESIVE LABEL (SIGNALS), VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL) |
| 21 | W6 x 9 OR W6 x 15 GALVANIZED POST |
| 22 | #2 AWG MIN. CABLE, 600 VOLT |
| 23 | RIGID CONDUIT, 2" MINIMUM |
| * | SEE PLANS |




WIRING DIAGRAM

## LIGHTING AND/OR SIGNALS

NOTES:

(A) SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50 FEET.

(B) INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 30 FEET.

(C) SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAINLESS STEEL.METER SOCKET FOR SIGNALS OR LIGHTING AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED, AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.

(D) SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.

(E) UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE DISCONNECT CABINET.

(F) LIGHTING SYSTEM VOLTAGE OF 240 VOLTS OR 480 VOLTS AS SHOWN ON THE PLANS.

(G) BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.

(H) IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADWELDED.

GENERAL NOTES:

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.

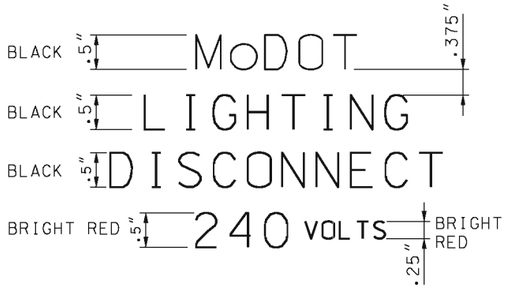
THE POWER SUPPLY ASSEMBLY TYPE IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

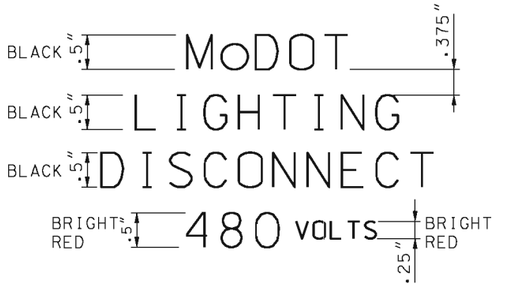
WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, OMIT ITEMS NOT REQUIRED.

ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

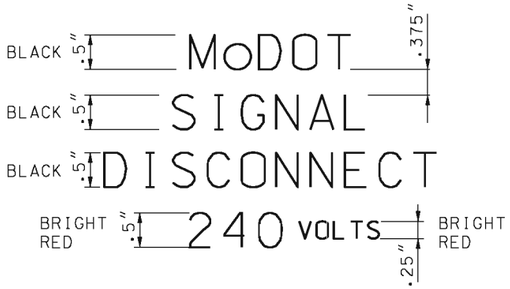
ALL MATERIALS REQUIRED AS SHOWN ON DRAWING, INCLUDING CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES, SHALL BE INCLUDED IN UNIT BID PRICE FOR POWER SUPPLY ASSEMBLY.




LABEL DETAIL (19) (240 VOLT) (F)




LABEL DETAIL (19) (480 VOLT) (F)




LABEL DETAIL (20)


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PROFESSIONAL ENGINEER
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# HIGHWAY LIGHTING
POWER SUPPLY ASSEMBLY
SECONDARY SERVICE

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 4/1/2010

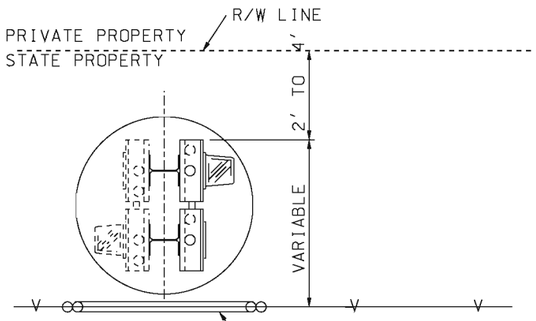
901.80D

SHEET NO. 1 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

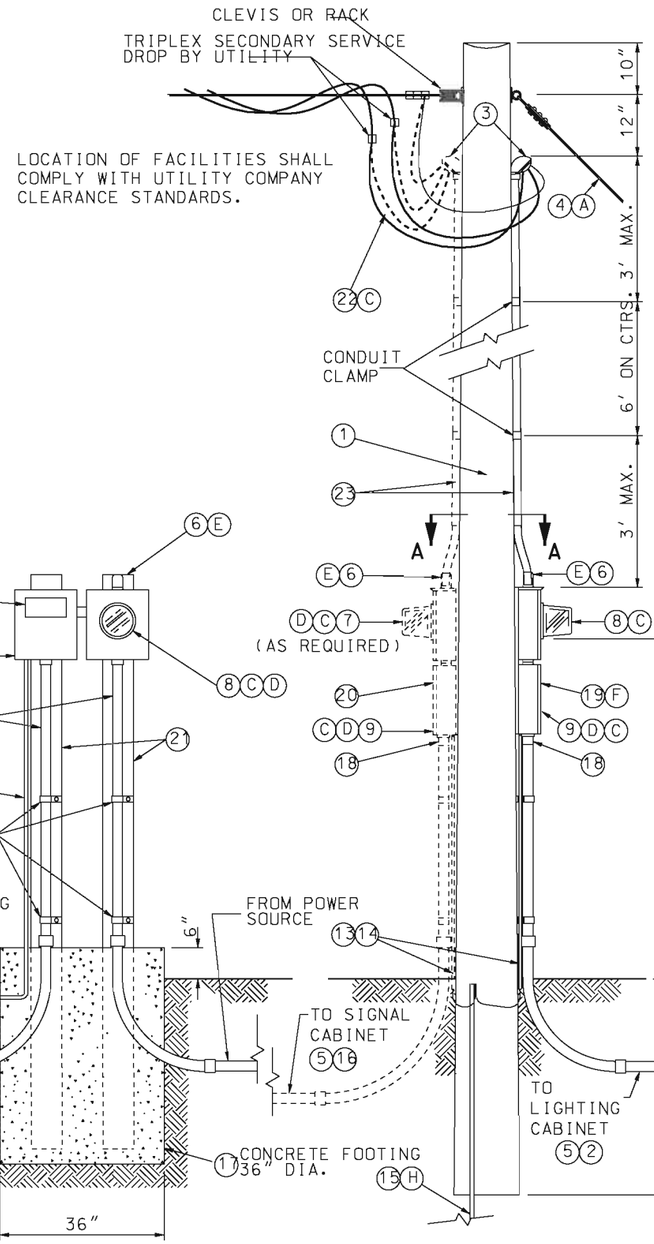
PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2′ TO 4′ OF RIGHT-OF-WAY LINE.

ALL SERVICE POWER SUPPLY ASSEMBLIES ARE TO BE LOCATED ON STATE PROPERTY.

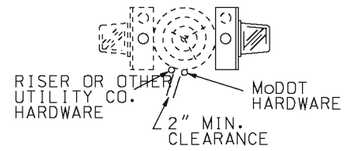



**TOP VIEW**

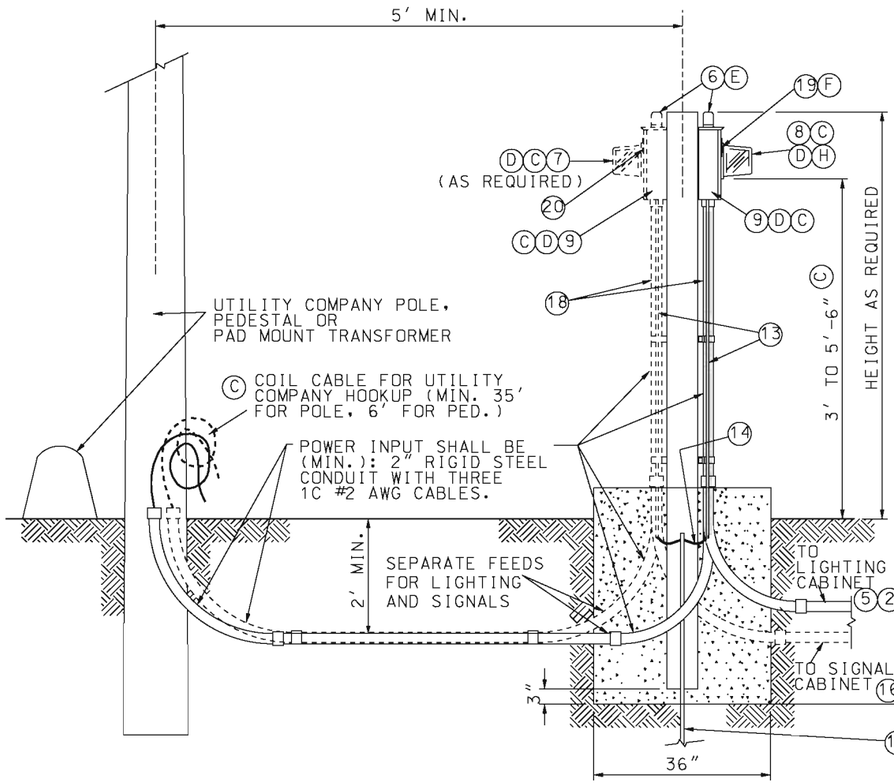
IF FENCE BLOCKS ACCESS TO POWER SUPPLY A 3′ MIN. LOCKING GATE IS TO BE INSTALLED. (NO DIRECT PAY)




**TYPE 1 (POLE) OVERHEAD SERVICE**




**SECTION A-A**




**SIDE VIEW**




**FRONT VIEW**

**TYPE 2 (PEDESTAL) UNDERGROUND SERVICE**

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

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# HIGHWAY LIGHTING
## POWER SUPPLY ASSEMBLY SECONDARY SERVICE

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 5/19/2010

901.80D

SHEET NO. 2 OF 2

400 WATT HIGH PRESSURE SODIUM LUMINAIRE

BRACKET ARM

BOLT DOWN LIGHT STANDARD

EXISTING LIGHT STANDARD AND LUMINAIRE

150 WATT HIGH PRESSURE SODIUM LUMINAIRE

250 WATT HIGH PRESSURE SODIUM LUMINAIRE

150 WATT UNDERPASS LUMINAIRE

HIGH MAST TOWER WITH LUMINAIRE AIM

PULL BOX, TYPE I DRAIN, CONCRETE

PULL BOX, TYPE II DRAIN, CONCRETE

PULL BOX, TYPE I DRAIN, PREFORMED

PULL BOX, TYPE II DRAIN, PREFORMED

EXISTING PULL BOX, TYPE I DRAIN, CONCRETE

EXISTING PULL BOX, TYPE II DRAIN, CONCRETE

EXISTING PULL BOX, TYPE I DRAIN, PREFORMED

EXISTING PULL BOX, TYPE II DRAIN, PREFORMED

SERVICE POLE OR PEDESTAL AND POWER SUPPLY

TRANSFORMER OR SUBSTATION POLE

BASE MOUNTED LIGHTING CONTROL STATION WITH PAD

EXISTING BASE MOUNTED CONTROL STATION

GROUND CONNECTION

RIGID CONDUIT IN TRENCH

CAPPED RIGID CONDUIT

RIGID CONDUIT PUSHED

EXISTING RIGID CONDUIT

RIGID CONDUIT ON BRIDGE

RIGID CONDUIT IN MEDIAN

CABLE CONDUIT WITH CIRCUIT NUMBER

EXISTING CABLE CONDUIT

EXPOSED CONDUIT ON UNDER SIDE OF BRIDGES. NUMBER OF HATCHES DENOTES NUMBER OF WIRES IN CONDUIT

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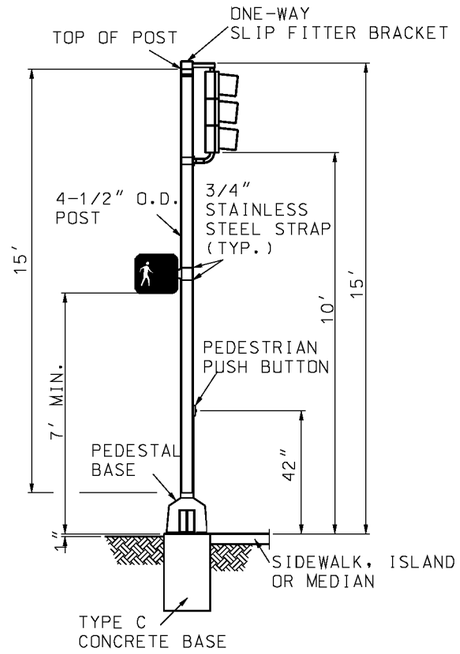

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# HIGHWAY LIGHTING SYMBOLS

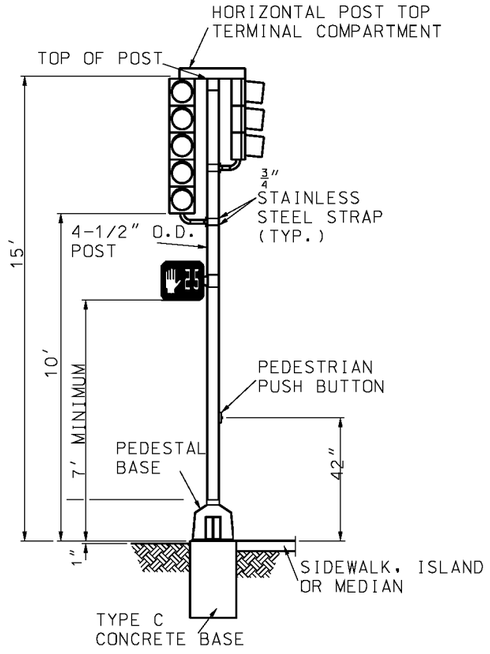
DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/26/2009

901.85A

SHEET NO. 1 OF 1

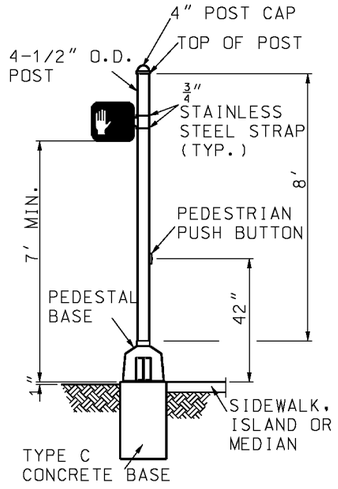


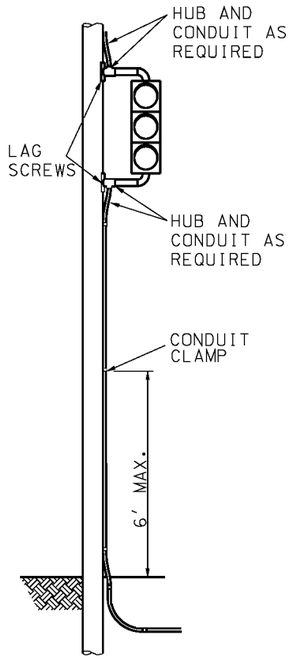

ONE FACE



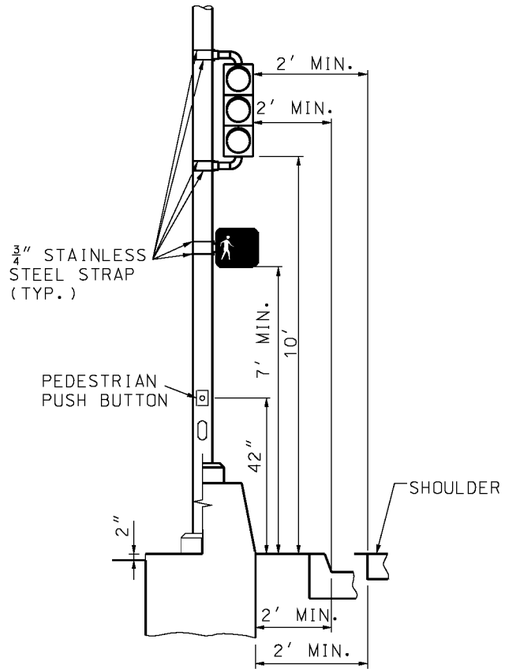

TWO FACE

## PEDESTAL POST MOUNTINGS




WOOD POLE MOUNTING




METAL POST MOUNTING

GENERAL NOTES:

ALL POST WIRE OUTLETS SHALL BE DEBURRED AND EQUIPPED WITH BUSHINGS.

BACKPLATES NOT SHOWN IN MOUNTING DIAGRAMS FOR CLARITY.

POSTS SHALL BE GROUNDED WITH #6 AWG BARE COPPER WIRE FROM GROUNDING BUSHING ON CONDUIT TO GROUNDING LUG IN POST BASE IF STEEL CONDUIT IS USED. IF PVC CONDUIT IS USED, PROVIDE #6 AWG BARE COPPER WIRE FROM GROUNDING LUG IN POST TO POWER SUPPLY GROUND BUSS IN CONTROLLER CABINET.

LEADS FROM PEDESTRIAN SIGNAL LAMPS ARE CONNECTED TO THE SIGNAL HEAD TERMINAL COMPARTMENT.

TYPE C MOUNTED SIGNALS SHALL HAVE A DISCONNECT HANGER.

TYPE B MOUNTED SIGNALS SHALL HAVE A TERMINAL COMPARTMENT.

ONE FACE, TOP-MOUNTED (TYPE T) OR SIDE-MOUNTED (TYPE S) SIGNALS HAVE NO TERMINAL COMPARTMENT.
TWO FACE, TOP-MOUNTED (TYPE T) OR SIDE-MOUNTED (TYPE S) SIGNALS SHALL HAVE A HORIZONTAL TERMINAL COMPARTMENT.

SIDE-MOUNTED OPTICALLY LIMITING HEADS SHALL HAVE A MINIMUM POST CLEARANCE OF 5-1/2".

SIGNAL APPURTENANCES SHALL HAVE A HORIZONTAL CLEARANCE NO LESS THAN 2' FROM THE FACE OF A VERTICAL CURB OR FROM THE OUTSIDE EDGE OF A SHOULDER, EXCEPT SIGNALS LOCATED IN A MEDIAN ISLAND.

SEE STANDARD PLAN 902.30 FOR BASE DETAILS AND CONDUIT LOCATIONS.

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STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
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# TRAFFIC SIGNALS

SIGNAL HEAD MOUNTING

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

902.00N

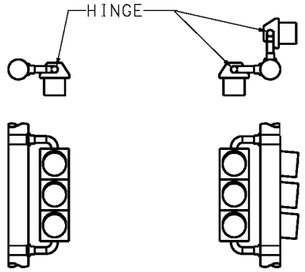
SHEET NO. 1 OF 2




TYPE I BRACKET ONE FACE

TYPE I BRACKET TWO FACE

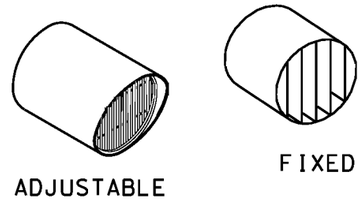
## TOP-MOUNT (TYPE T)




TYPE I BRACKET ONE FACE

TYPE I BRACKET TWO FACE

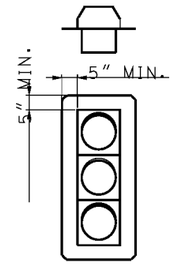
## SIDE-MOUNT (TYPE S)

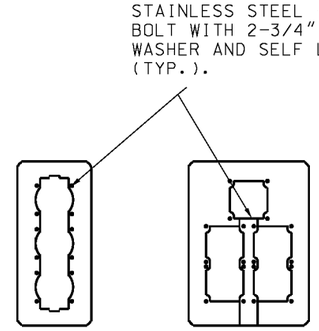


ADJUSTABLE

FIXED

## LOUVERS

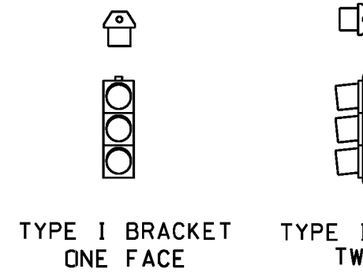



1 THRU 5 SECTION

5 SECTION

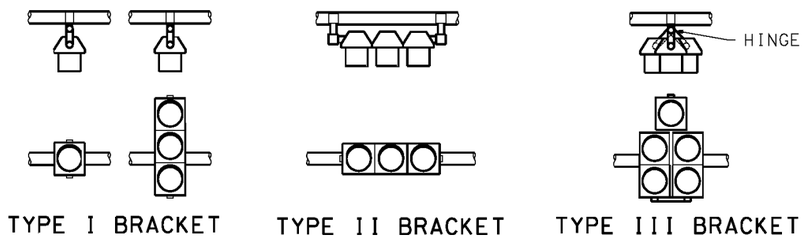
## BACKPLATES



TYPE I BRACKET ONE FACE

TYPE II BRACKET TWO FACE

## OVERHEAD SPANWIRE (TYPE C)



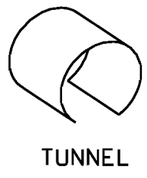

TYPE I BRACKET

TYPE II BRACKET

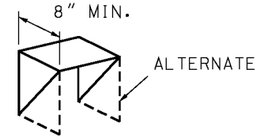
TYPE III BRACKET

## MAST ARM (TYPE B)

(SEE DRAWING 902.40)

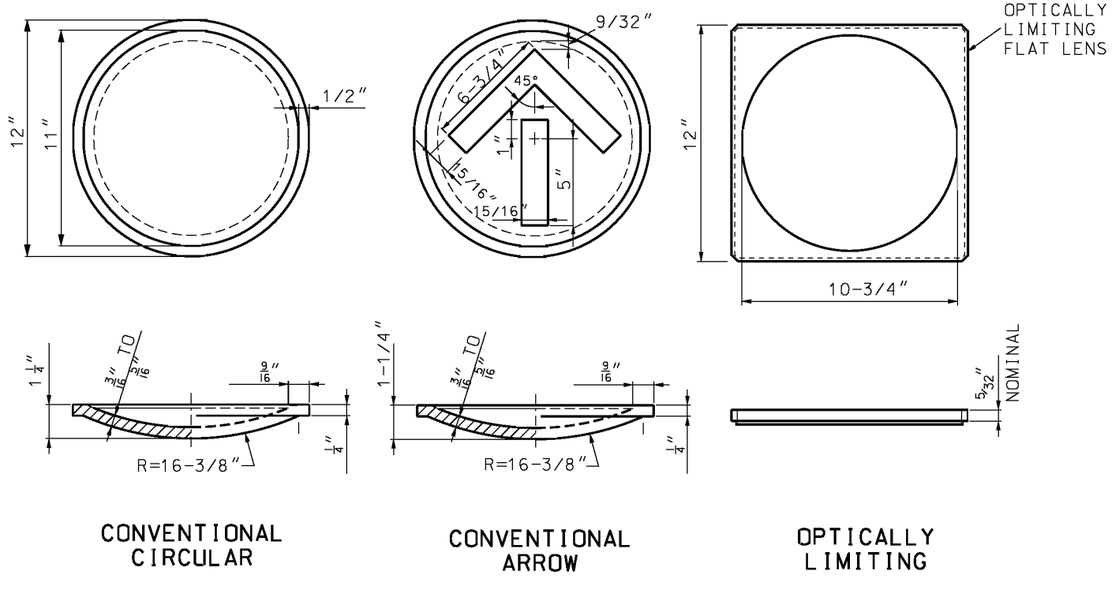


TUNNEL




PEDESTRIAN

## VISORS

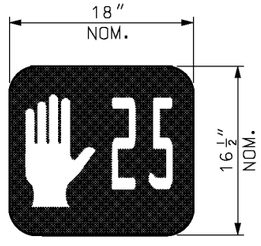



CONVENTIONAL CIRCULAR

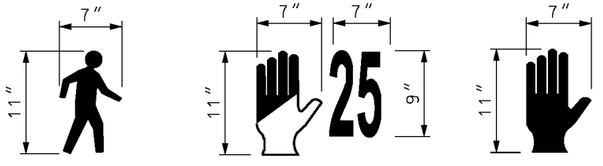
CONVENTIONAL ARROW

OPTICALLY LIMITING

## LENSES




HOUSING



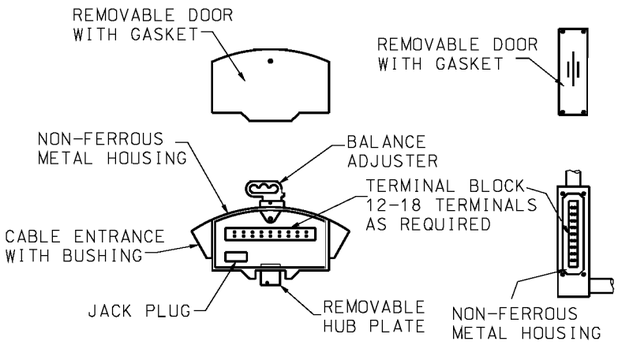

PERSON WALKING INTERVAL

FLASHING UPRAISED HAND INTERVAL WITH COUTDOWN

STEADY UPRAISED HAND INTERVAL

ICONS

## PEDESTRIAN SIGNAL MODULE WITH COUNTDOWN




## TERMINAL COMPARTMENT

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ERIC E. SCHROETER
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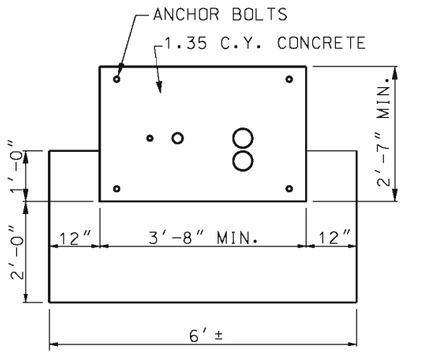
# TRAFFIC SIGNALS

SIGNAL HEAD LOUVERS, VISORS, BACKPLATES AND TERMINAL COMPARTMENT

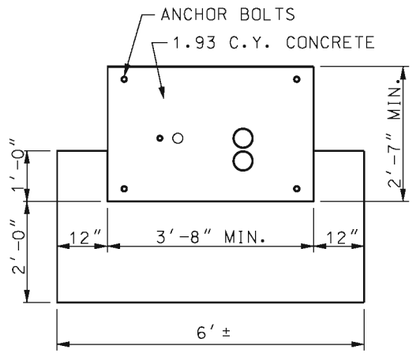
DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 5/29/2015

902.00N

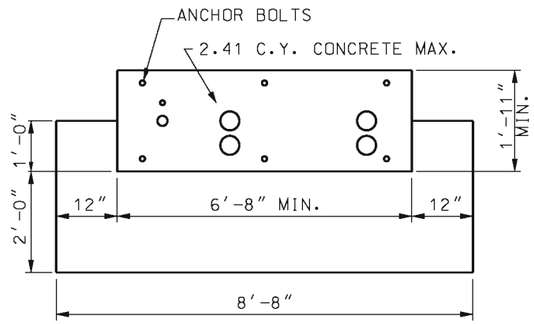
SHEET NO. 2 OF 2



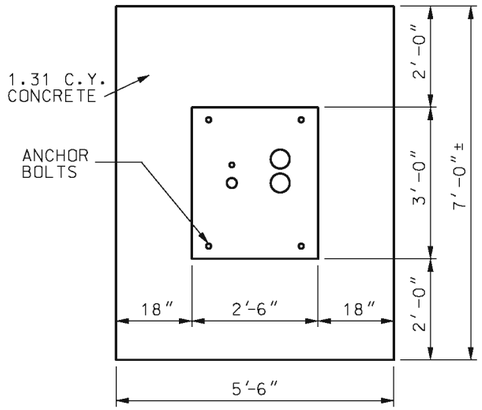

PLAN VIEW



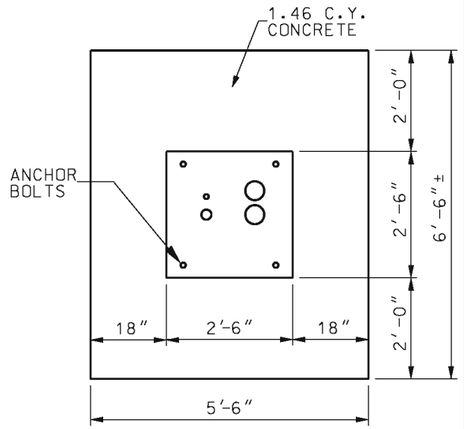

PLAN VIEW



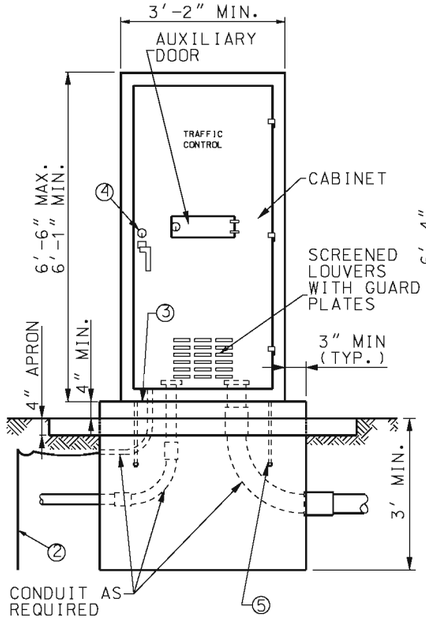

PLAN VIEW




PLAN VIEW

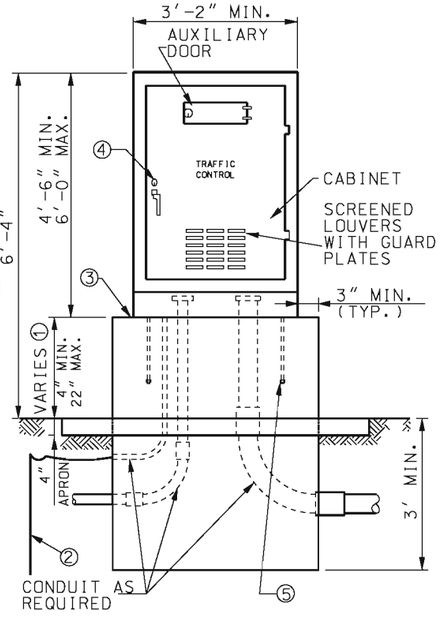



PLAN VIEW



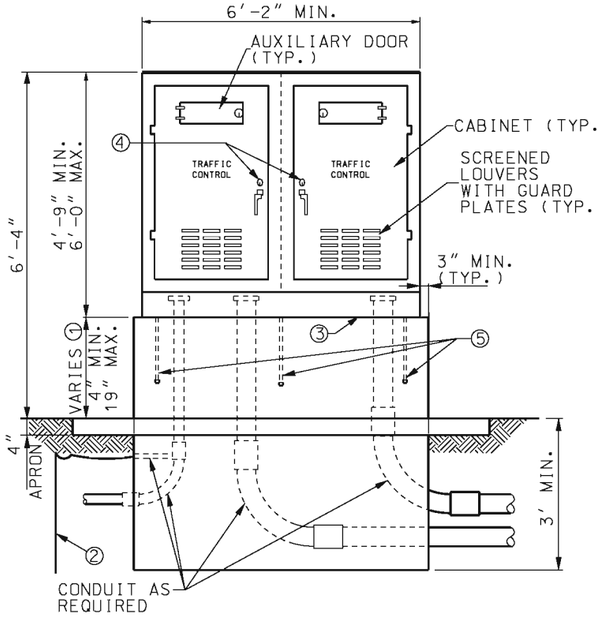

FOR CONTROLLER CABINETS WITH HEIGHTS FROM 6'-1" TO 6'-6"

TYPE E



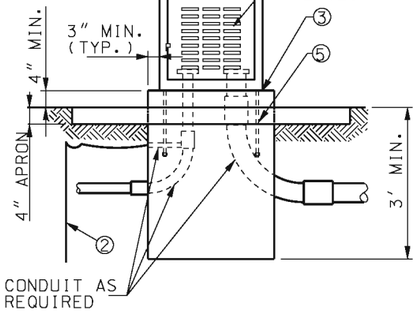

FOR CONTROLLER CABINETS WITH HEIGHTS FROM 4'-4" TO 6'-0"

TYPE EV

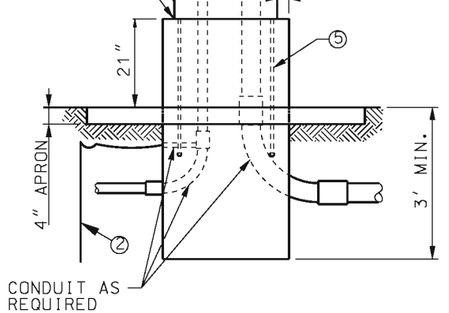



DOUBLE

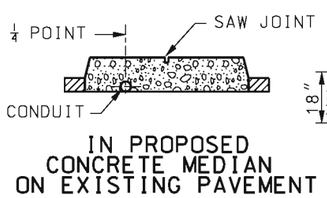
## CONTROLLER CABINETS AND BASE TYPES



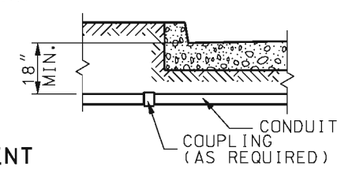

FOR TYPE 170
CONTROLLER CABINETS
TYPE 332



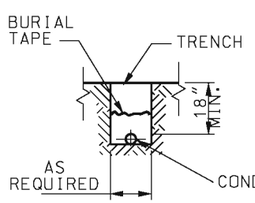

FOR TYPE 170
CONTROLLER CABINETS
TYPE 336S



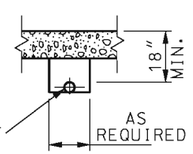

IN PROPOSED CONCRETE MEDIAN ON EXISTING PAVEMENT




0.5% MINIMUM SLOPE




NON-PAVED SURFACED




PAVED SURFACE

## CONDUIT LOCATIONS

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 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADWELDED.

③ LIFETIME SILICONE CAULK 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-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TRAFFIC SIGNALS
## CONTROLLERS
## CONDUIT LOCATION

DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 8/26/2009

902.100

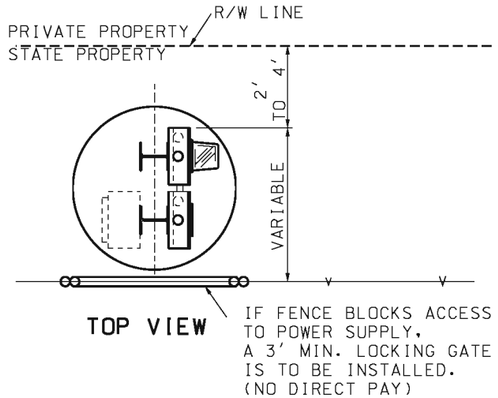
SHEET NO. 1 OF 1

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

| LIST OF MATERIALS | |
|---|---|
| ITEM | DESCRIPTION |
| 1 | SERVICE POLE 30′ MIN.,CLASS IV WOOD, CONTRACTOR PROVIDED, MoDOT OWNED ✳ |
| 2 | #8 AWG MIN. CABLE, 600 VOLT ✳ |
| 3 | SERVICE ENTRANCE HEAD |
| 4 | GUY CABLE, AS REQUIRED |
| 5 | 2″ MIN. RIGID CONDUIT WITH PREFORMED ELBOWS |
| 6 | LIGHTNING ARRESTOR, VALVE TYPE, 2 POLE, 650 VOLT |
| 7 | METER SOCKET, 200 AMP, FOR SIGNALS |
| 8 | 2″ MIN. RIGID CONDUIT |
| 9 | SERVICE DISCONNECT BOX, LOCKING, RAINTIGHT, NEMA 4 |
| 10 | INSULATED, GROUNDABLE NEUTRAL, 200 AMP MINIMUM |
| 11 | SIGNAL BREAKER, SINGLE POLE, 40A MIN, TYPE A OR B ✳ |
| 12 | LIGHTING BREAKER, SINGLE POLE, 40A, TYPE A OR B |
| 13 | METAL CONDUIT, 1/2″ |
| 14 | GROUND WIRE, #2 AWG MIN. |
| 15 | GROUND ROD, 3/4″ x 8′ MIN. |
| 16 | #8 AWG MIN. CABLE, 600 VOLT |
| 17 | CLASS B CONCRETE, 0.92 C.Y. ± |
| 18 | THREADED CONDUIT HUB WITH SEALING WASHERS |
| 19 | LIGHTING CABLES ✳ |
| 20 | WEATHERPROOF ADHESIVE LABEL (SIGNALS) VINYL RAISED LETTERING |
| 21 | TYPE B CONTROLLER AND SIGNAL BREAKER, AS SPECIFIED. |
| 22 | TYPE B AUXILIARY BREAKER, 15 AMP |
| 23 | W6 x 9 OR W6 x 15 GALVANIZED POST |
| 24 | LIGHTING CONTROL CABINET (SEE SHEET 2) |
| 25 | #2 AWG MIN. CABLE, 600 VOLT |
| ✳ | SEE PLANS |

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.




TOP VIEW

NOTES

(A) SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50′.

(B) INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.

(C) SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL, ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAIN-LESS STEEL. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED, AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.

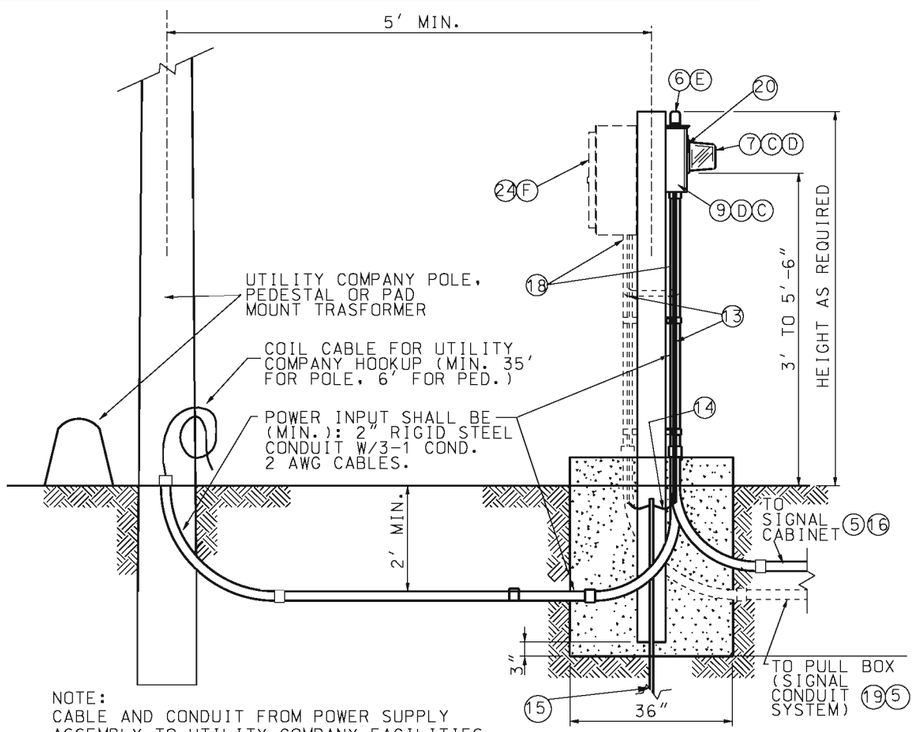
(D) SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.

(E) UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET, IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT CABINET

(F) IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.

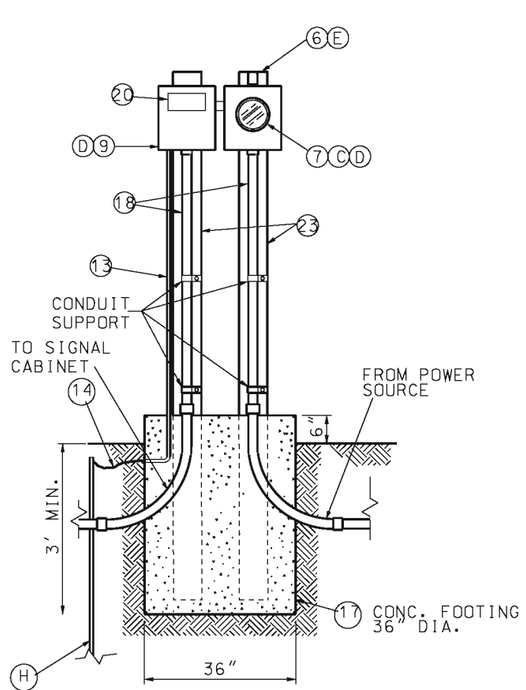
(G) BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.

(H) IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAD WELDED.




SIDE VIEW

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.




FRONT VIEW

## TYPE 2 (PEDESTAL) UNDERGROUND SERVICE

GENERAL NOTES:
FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.

THE TYPE POWER SUPPLY ASSEMBLY IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, OMIT ITEMS NOT REQUIRED.

ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

FOR WIRING DIAGRAM AND LABEL DETAIL SEE SHEET 2 OF 4.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

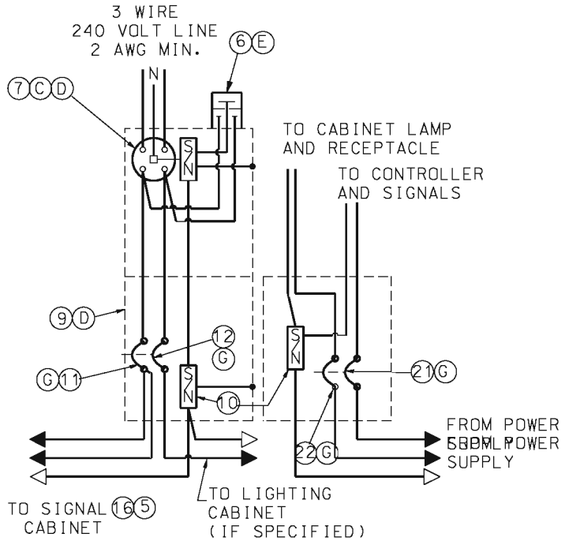
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TRAFFIC SIGNALS
## POWER SUPPLY ASSEMBLY 240/120 VOLT SERVICE

| DATE EFFECTIVE: 07/01/2004 | 902.15K | SHEET NO. |
|---|---|---|
| DATE PREPARED: 8/26/2009 | | 1 OF 3 |

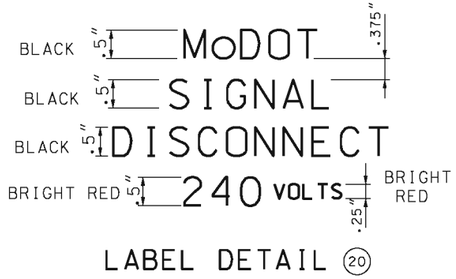
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

| LIST OF MATERIALS | |
|---|---|
| ITEM | DESCRIPTION |
| 1 | SERVICE POLE 30' MIN.,CLASS IV WOOD, CONTRACTOR PROVIDED, MoDOT OWNED ✳ |
| 2 | #8 AWG MIN. CABLE, 600 VOLT ✳ |
| 3 | SERVICE ENTRANCE HEAD |
| 4 | GUY CABLE, AS REQUIRED |
| 5 | 2" MIN. RIGID CONDUIT WITH PREFORMED ELBOWS |
| 6 | LIGHTNING ARRESTOR, VALVE TYPE, 2 POLE, 650 VOLT |
| 7 | METER SOCKET, 200 AMP, FOR SIGNALS |
| 8 | 2" MIN. RIGID CONDUIT |
| 9 | SERVICE DISCONNECT BOX, LOCKING, RAINTIGHT, NEMA 4 |
| 10 | INSULATED, GROUNDABLE NEUTRAL, 200 AMP MINIMUM |
| 11 | SIGNAL BREAKER, SINGLE POLE, 40A MIN, TYPE A OR B ✳ |
| 12 | LIGHTING BREAKER, SINGLE POLE, 40A, TYPE A OR B |
| 13 | METAL CONDUIT, 1/2" |
| 14 | GROUND WIRE, #2 AWG MIN. |
| 15 | GROUND ROD, 3/4" x 8' MIN. |
| 16 | #8 AWG MIN. CABLE, 600 VOLT |
| 17 | CLASS B CONCRETE, 0.92 C.Y. ± |
| 18 | THREADED CONDUIT HUB WITH SEALING WASHERS |
| 19 | LIGHTING CABLES ✳ |
| 20 | WEATHERPROOF ADHESIVE LABEL (SIGNALS) VINYL RAISED LETTERING |
| 21 | TYPE B CONTROLLER AND SIGNAL BREAKER, AS SPECIFIED. |
| 22 | TYPE B AUXILIARY BREAKER, 15 AMP |
| 23 | W6 x 9 OR W6 x 15 GALVANIZED POST |
| 24 | LIGHTING CONTROL CABINET (SEE SHEET 2) |
| 25 | #2 AWG MIN. CABLE, 600 VOLT |
| ✳ | SEE PLANS |

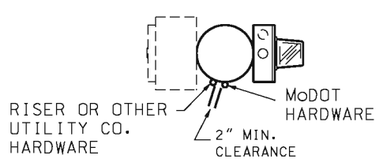



POWER SUPPLY SIGNAL CABINET POWER PANEL

**WIRING DIAGRAM**
**SIGNALS AND/OR LIGHTING**




LABEL DETAIL (20)




SECTION A-A




**TYPE 1 (POLE)**
**OVERHEAD SERVICE**

NOTES

(A) SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.

(B) INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.

(C) SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL, ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAIN-LESS STEEL. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED, AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.

(D) SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.

(E) UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET, IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT CABINET

(F) IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.

(G) BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.

(H) IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAD WELDED.

GENERAL NOTES:

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.

THE TYPE POWER SUPPLY ASSEMBLY IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, OMIT ITEMS NOT REQUIRED.

ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

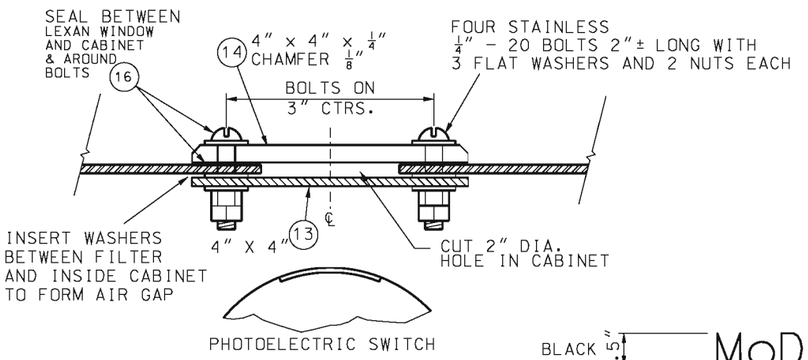
# TRAFFIC SIGNALS
## POWER SUPPLY ASSEMBLY
## 240/120 VOLT SERVICE

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/26/2009

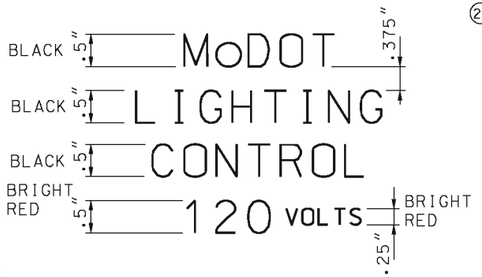
902.15K

SHEET NO. 2 OF 3


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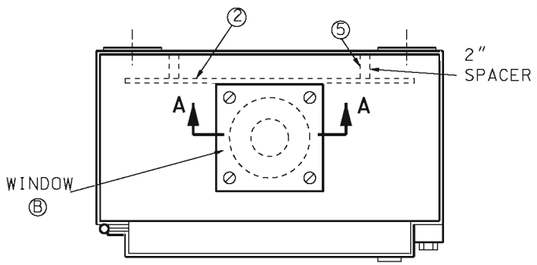



## SECTION A-A WINDOW DETAIL

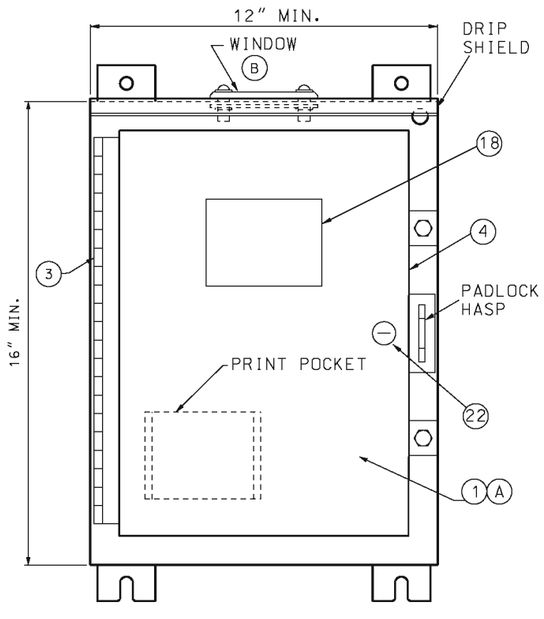



## LABEL DETAIL

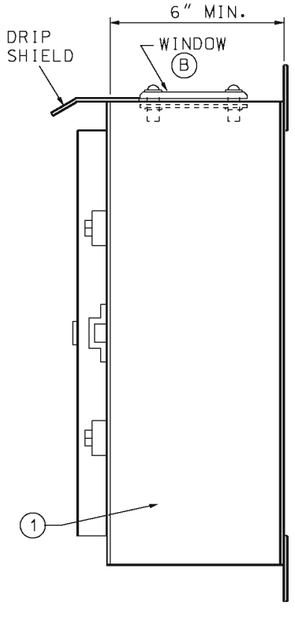
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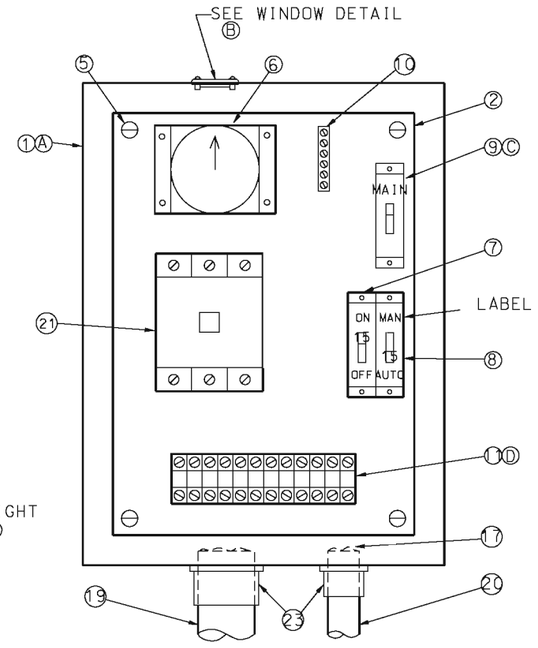

## TOP VIEW



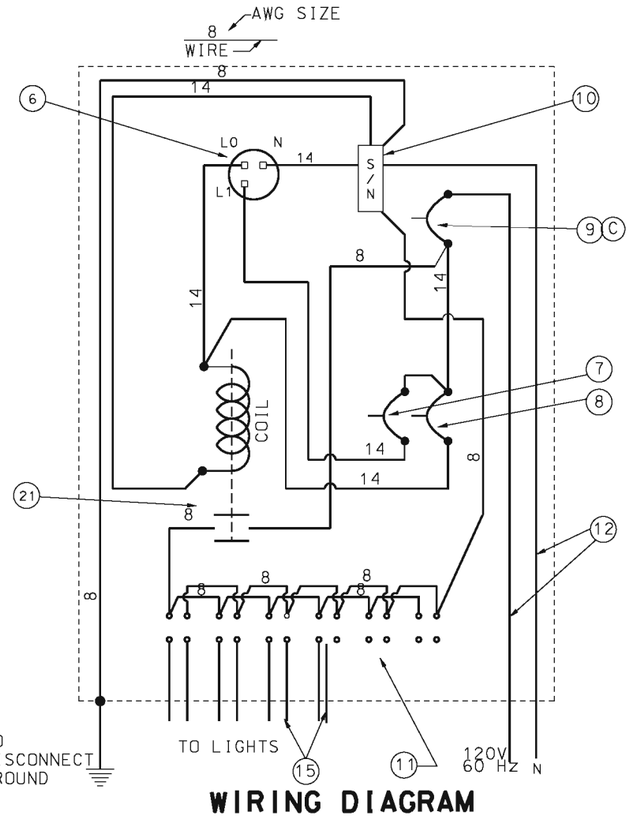

## FRONT VIEW




## SIDE VIEW




## EQUIPMENT LAYOUT




## WIRING DIAGRAM

| ITEM | LIST OF MATERIALS DESCRIPTION |
|---|---|
| 1 | CABINET, WATERTIGHT, NEMA 4, 14 GA MINIMUM THICKNESS |
| 2 | PANEL, 12 GA MINIMUM THICKNESS, ALUMINUM OR STAINLESS STEEL |
| 3 | CONTINUOUS STAINLESS STEEL HINGE |
| 4 | NEOPRENE GASKET DOOR |
| 5 | 3/8" - 16 COLLAR STUD |
| 6 | PHOTOELECTRIC SWITCH AND SOCKET, 105/285 V., 1000 WATT |
| 7 | 15 AMP CONTROL BREAKER, SINGLE POLE, TYPE B |
| 8 | 15 AMP AUTO-MANUAL SWITCH, SINGLE POLE BREAKER, TYPE B,WITH LABEL |
| 9 | MAIN BREAKER, SINGLE POLE, TYPE B * |
| 10 | NEUTRAL TERMINAL STRIP |
| 11 | LIGHTING TERMINAL BLOCK, INSULATED FROM BACK PANEL,12 POSITION (E) |
| 12 | POWER, CABLE, #8 AWG MIN., 600 V. |
| 13 | FILTER, TRANSLUCENT, PLEXIGLASS #W2067, 1 8" THICK |
| 14 | CLEAR, LEXAN #9034 WINDOW, 1/4" THICK MIN. EXCEPT FOR 15A BREAKER; MIN. WIRE SIZE 10 AWG. |
| 15 | CABLE, LIGHTING * |
| 16 | LIFETIME SILICONE CAULK |
| 17 | PLIABLE DUCT SEALANT |
| 18 | LABEL-WEATHERPROOF ADHESIVE-VINYL RAISED LETTERING (OR EQUIV.) (SEE DETAIL) |
| 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 | THREADED CONDUIT HUB WITH SEALING WASHERS |
| * | SEE PLANS |

NOTES:

(A) SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.

(B) PHOTOELECTRIC WITCH BARCKETS MAY VARY, LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.

(C) MAIN BREAKER SIZE:

| TOTAL LUMINAIRE** LOAD (WATTS) | BREAKER SIZE (AMPS) | MIN. AWG |
|---|---|---|
| 0-920 | 15 | 10 |
| 930-1260 | 20 | 8 |
| 1270-1600 | 25 | 8 |
| 1610-1930 | 30 | 8 |

** EXCLUDING BALLAST LOAD

(D) 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.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

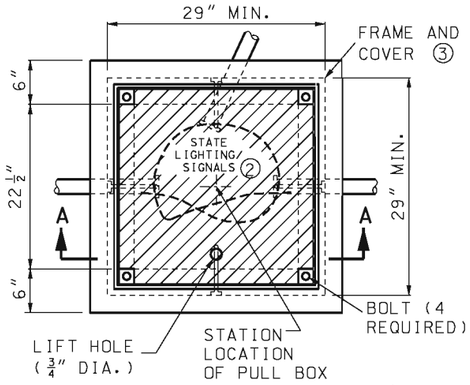
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

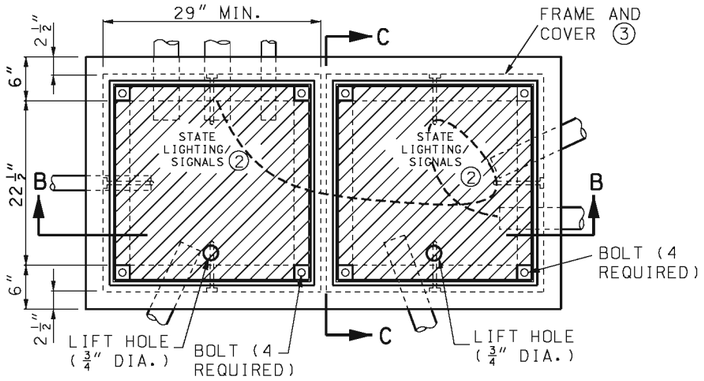
# TRAFFIC SIGNALS
## POWER SUPPLY ASSEMBLY 240/120 VOLT SERVICE

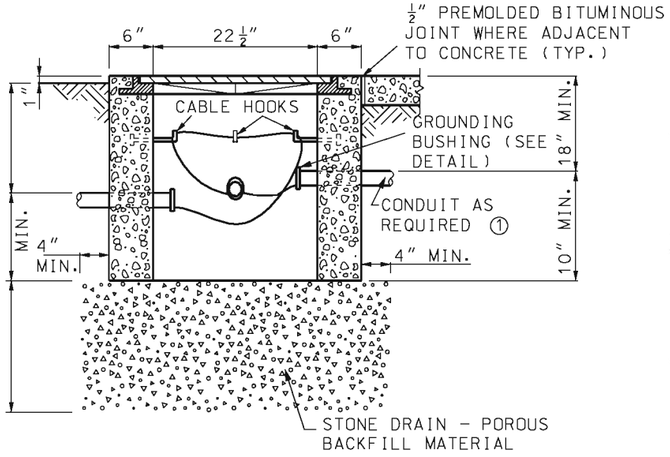
DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/26/2009

902.15K

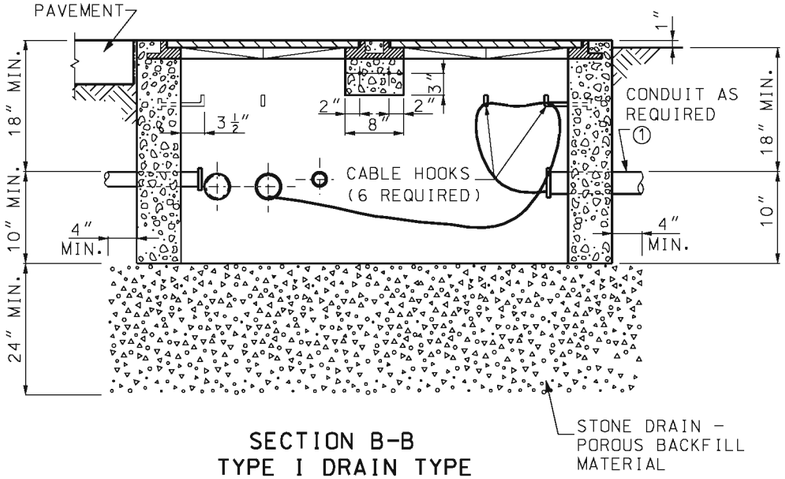
SHEET NO. 3 OF 3



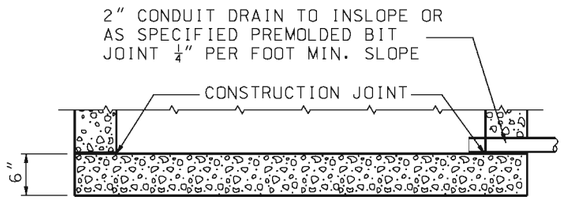

SECTION A-A
TYPE I DRAIN TYPE



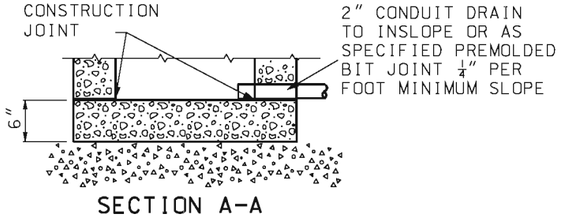

SECTION B-B
TYPE I DRAIN TYPE



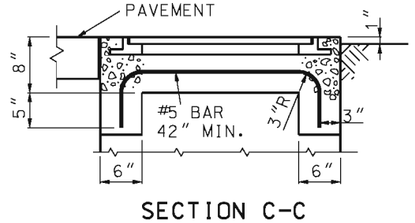

GROUNDING BUSHING (TYP) ①




SECTION B-B
TYPE II DRAIN TYPE
(SEE DRAIN OUTLET DETAILS)
(SECTION ABOVE BREAK APPLICABLE TO TYPE I DRAIN)



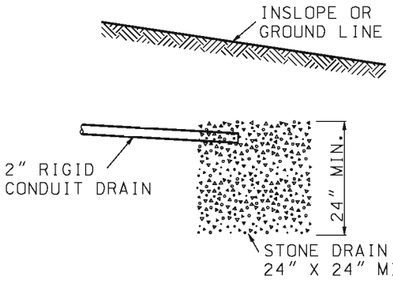

SECTION A-A
TYPE II DRAIN TYPE
(SEE DRAIN OUTLET DETAILS)
(SECTION ABOVE BREAK APPLICABLE TO TYPE I DRAIN)



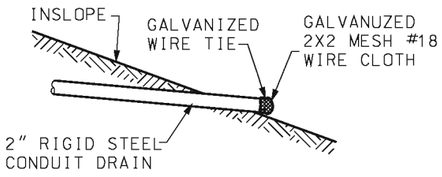

SECTION C-C

## STANDARD CONCRETE PULL BOX

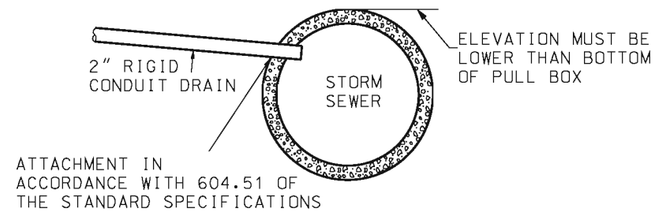
## DOUBLE CONCRETE PULL BOX, TYPE A




POROUS BACKFILL MATERIAL
TYPE A




TYPE B




TYPE C

# TYPE II DRAIN OUTLET DETAILS

① ALL METAL CONDUITS SHALL BE ELECTRICALLY BONDED BY A GROUND BUSHING AND #6 AWG 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: | 29" x 29" |
| FRAME HEIGHT: | 4¼" |
| OPENING SIZE: | 22½" x 22½" |
| FRAME WEIGHT: | 120 LBS. |
| COVER SIZE: | 22⅝" x 22⅝" |
| COVER THICKNESS: | ¾" |
| COVER WEIGHT: | 140 LBS. |

GENERAL NOTES:

ALL DIMENSIONS SHOWN ARE NOMINAL.

BOLT CLEANOUT DETAIL SHALL BE APPROVED BY ENGINEER.

PAVEMENT AND SUBGRADE SHALL BE AS SHOWN ON PLANS.

STONE DRAIN MATERIAL SHALL CONFORM TO SECTION 1009 OF THE STANDARD SPECIFICATIONS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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JEFFERSON CITY, MO 65102
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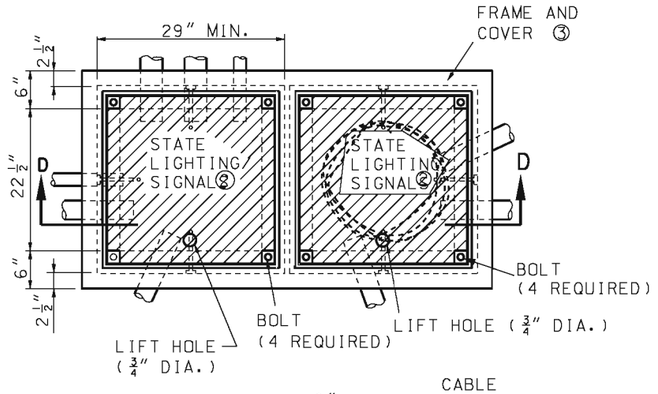
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

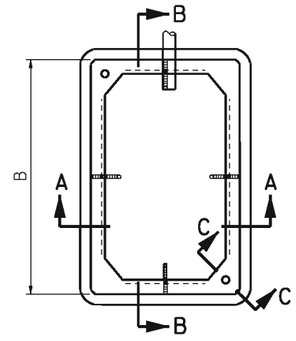
# TRAFFIC SIGNALS
CONCRETE PULL BOXES

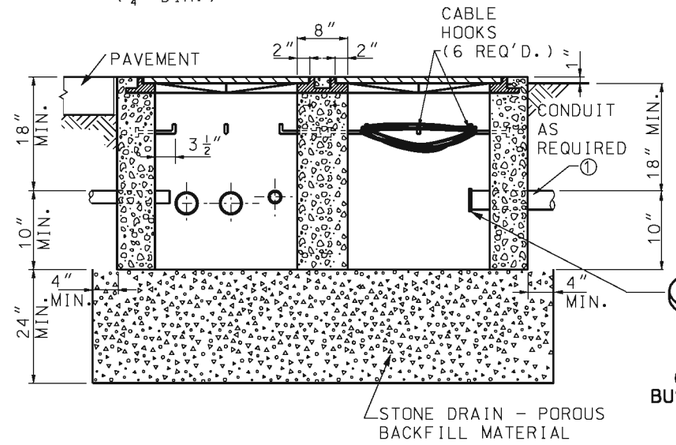
DATE EFFECTIVE: 11/01/2010
DATE PREPARED: 9/3/2010

902.20G

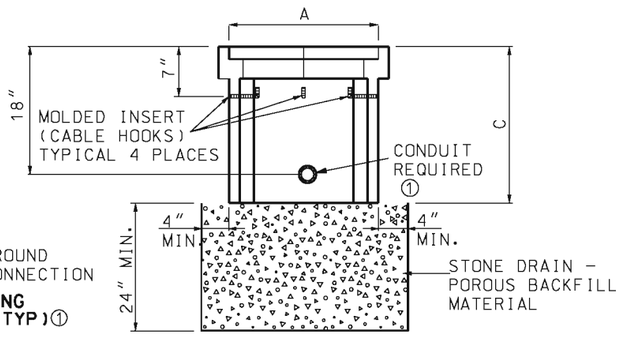
SHEET NO. 1 OF 3



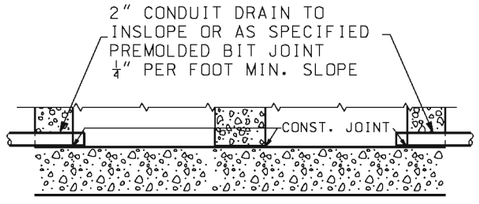




SECTION D-D
TYPE I DRAIN TYPE

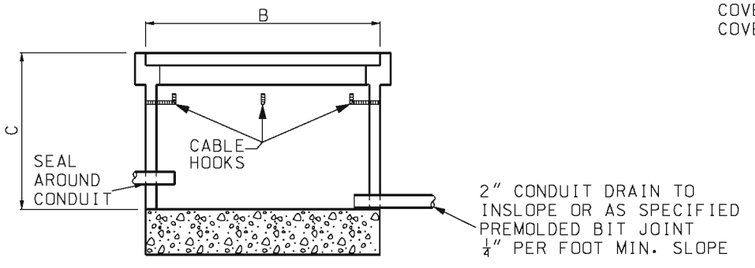



SECTION A-A
TYPE I DRAIN TYPE



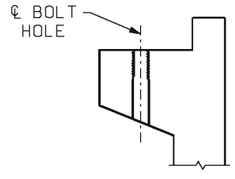

TYPE II DRAIN TYPE
(SEE DRAIN OUTLET DETAILS)
(SECTION ABOVE BREAK APPLICABLE TO TYPE I DRAIN.)

## DOUBLE CONCRETE PULL BOX, TYPE B



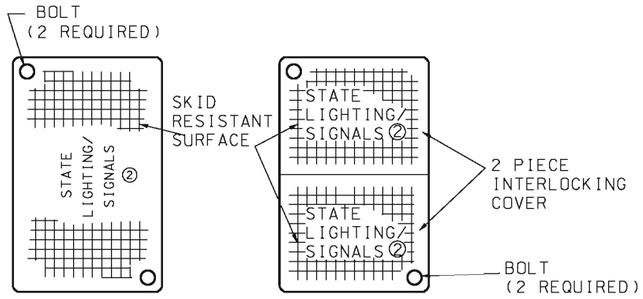

SECTION B-B
TYPE II DRAIN TYPE

## PREFORMED PULL BOX




SECTION C-C

## TYPICAL BOLT CLEANOUT




CLASS 1 OR 2 CLASS 3

## PREFORMED PULL BOX COVER

| NUMBER OF ENTERING CONDUCTORS | CLASS | PREFORMED PULL BOX MINIMUM DIMENSIONS | | |
|---|---|---|---|---|
| | | A | B | C |
| < 23 | 1 | 17" | 30" | 22" |
| 23 – 68 | 2 | 24" | 36" | 24" |
| > 68 | 3 | 30" | 48" | 36" |

① ALL METAL CONDUITS SHALL BE ELECTRICALLY BONDED BY A GROUND BUSHING AND #6 AWG 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: | 29" X 29" |
| FRAME HEIGHT: | 4¼" |
| OPENING SIZE: | 22½" x 22½" |
| FRAME WEIGHT: | 120 LBS. |
| COVER SIZE: | 22⅝" x 22⅝" |
| COVER THICKNESS: | ¾" |
| 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 PREFORMED PULL BOXES ARE SPECIFIED, THE CONTRACTOR MAY USE THE STANDARD CONCRETE PULL BOX IN LIEU OF THE CLASS 1 OR 2 PREFORMED PULL BOX OR THE DOUBLE CONCRETE PULL BOX, TYPE A, IN LIEU OF THE CLASS 3 PREFORMED PULL BOXES.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

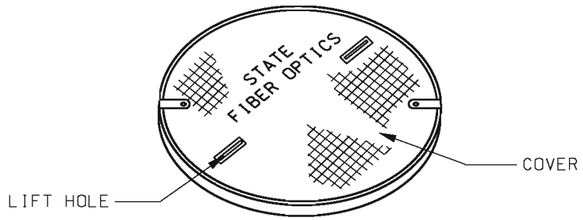
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

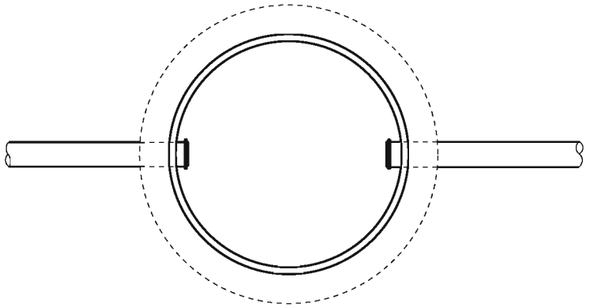
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TRAFFIC SIGNALS
CONCRETE AND PREFORMED PULL BOXES

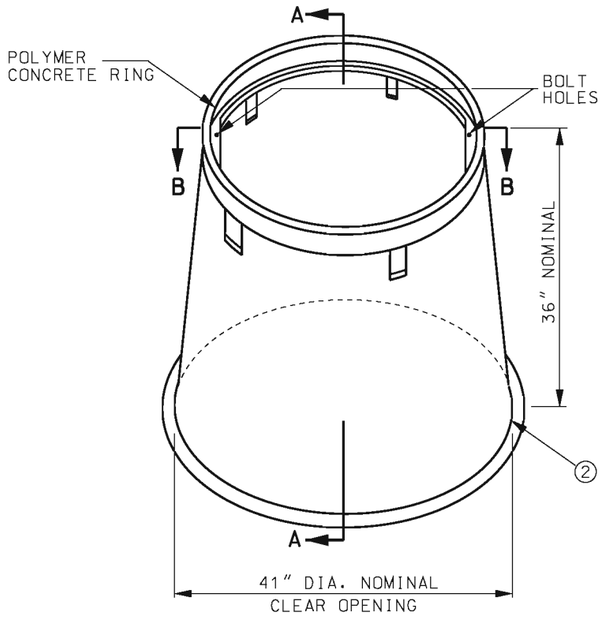
DATE EFFECTIVE: 11/01/2010
DATE PREPARED: 9/3/2010

902.20G

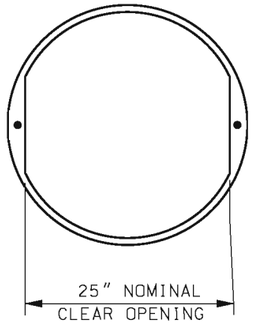


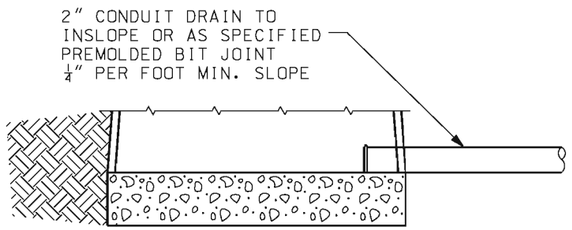
PLAN



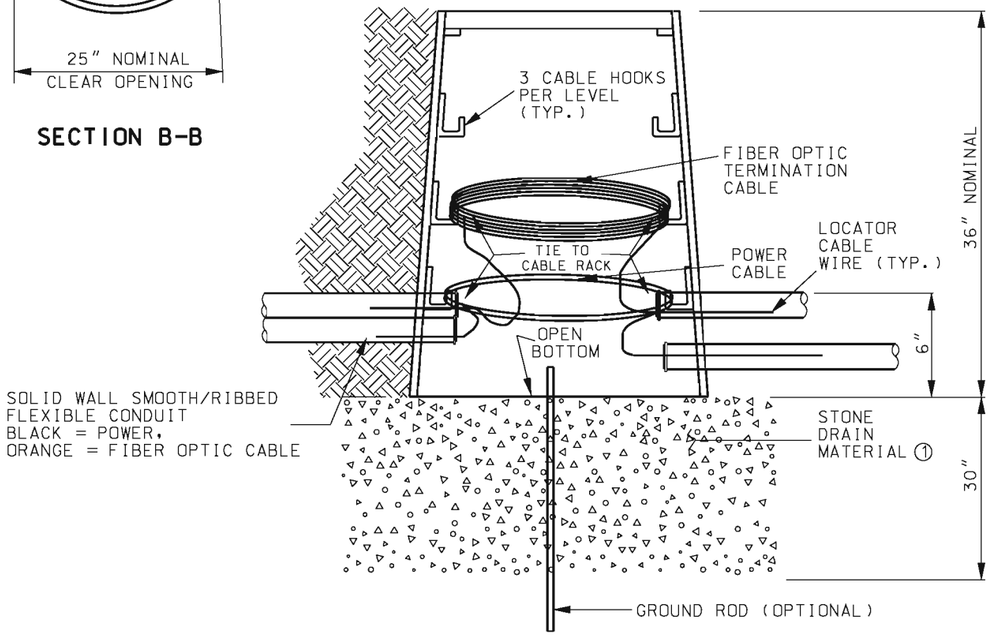

CIRCULAR PULL BOX
CLASS 5




SECTION B-B




TYPE II DRAIN TYPE
(SEE DRAIN OUTLET DETAILS)
(SECTION ABOVE BREAK APPLICABLE TO TYPE I DRAIN.)




SECTION A-A
TYPE I DRAIN TYPE

(1) AGGREGATE SHALL BE TYPE 1 CONFORMING TO SEC 1007.

(2) BOX SHALL BE OF A FLARE DESIGN AND HAVE A LIP FOR STABILIZATION.

GENERAL NOTES:

A MINIMUM OF NINE HOOKS, INSTALLED IN THREE LEVELS, SHALL BE INCLUDED WITH EACH PULL BOX.

IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADWELDED.

THE CIRCULAR PULL BOX COVER SHOULD BE SIZED TO FIT A BOX WITH A CLEAR OPENING OF 25".

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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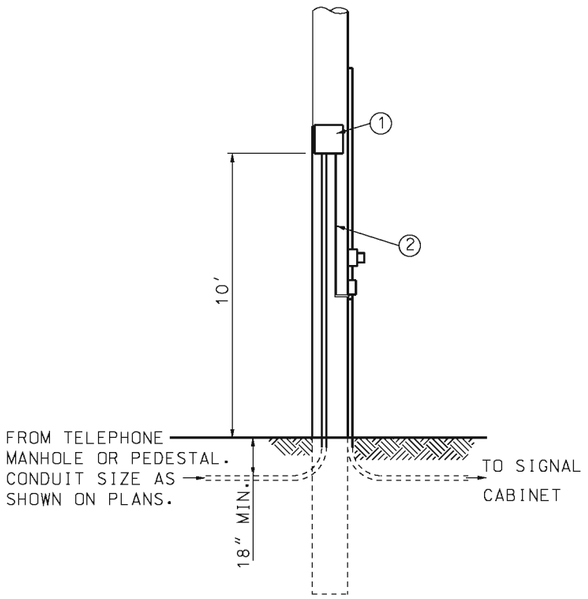
STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TRAFFIC SIGNALS
## CONCRETE AND PREFORMED PULL BOXES

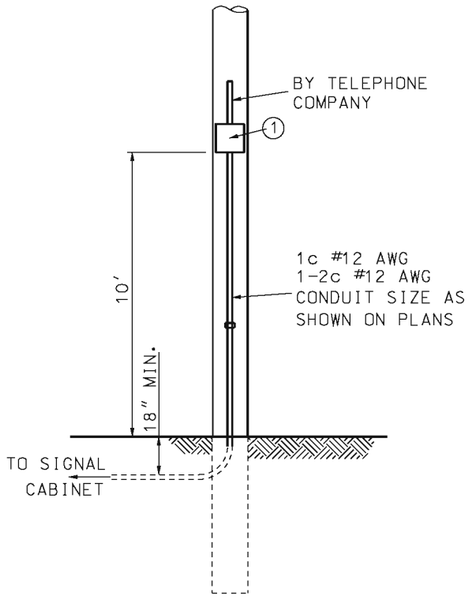
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DATE PREPARED: 9/3/2010

902.20G

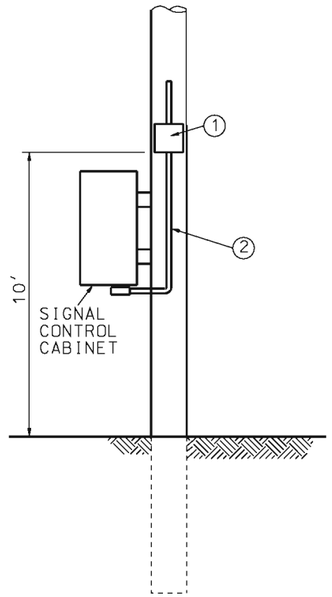
SHEET NO. 3 OF 3



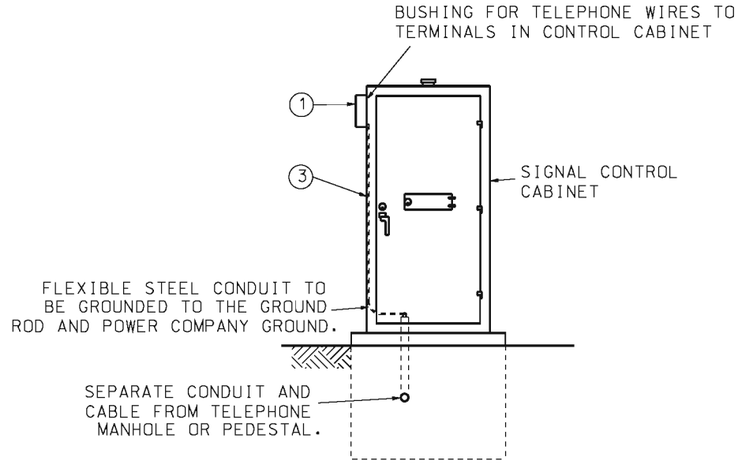

**TYPE 902.10-U**
USE ON EXISTING ONLY




**TYPE TPA**
USE ON NEW OR EXISTING

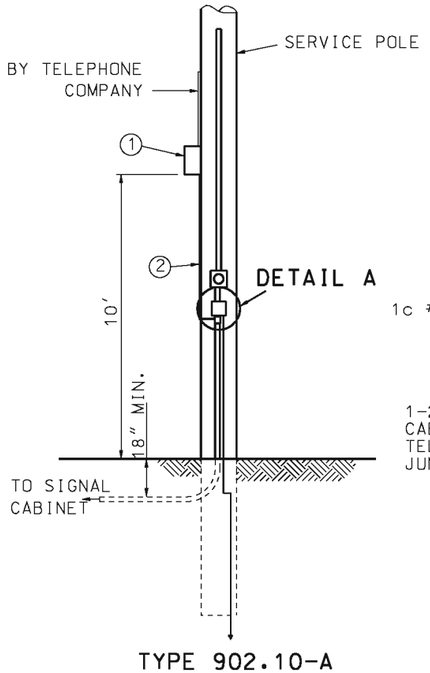



**TYPE SWA**
USE ON NEW OR EXISTING

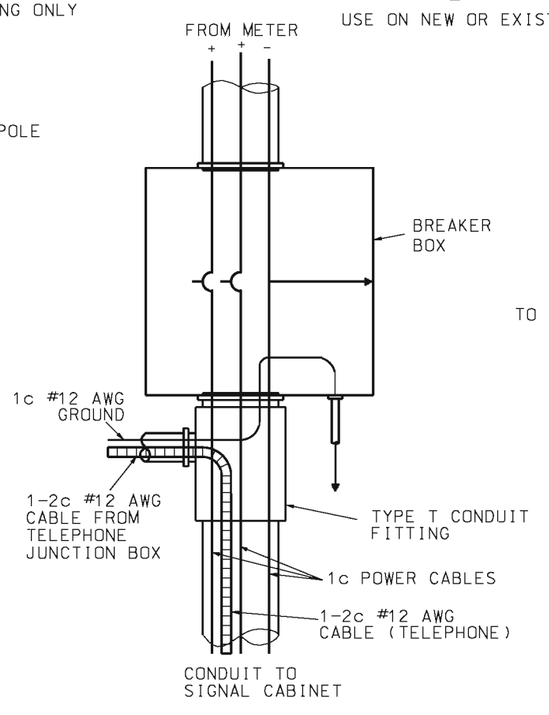



**TYPE CU**
USE ON NEW ONLY

NOTE:
WIRING FROM TELEPHONE COMPANY PEDESTAL OR MANHOLE WILL BE FURNISHED AND INSTALLED BY TELEPHONE COMPANY.

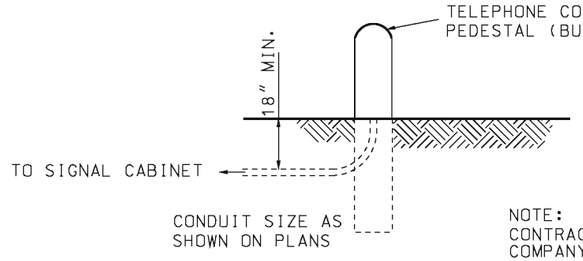



**TYPE 902.10-A**
USE ON EXISTING ONLY



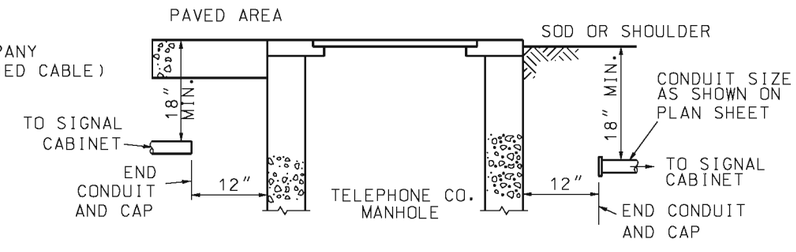

**DETAIL A**

## AERIAL TELEPHONE CONNECTION




**TYPE CP**
USE ON NEW OR EXISTING

NOTE:
CONTRACTOR TO NOTIFY TELEPHONE COMPANY FOR ACCESS AND LOCATION OF CONDUIT INTO PEDESTAL.




CONDUIT TO BE INSTALLED INTO TELEPHONE CO. MANHOLE BY TELEPHONE CO.

**TYPE CM**
USE ON NEW OR EXISTING

## UNDERGROUND TELEPHONE CONNECTION

NOTE:
SCHEMATIC DIAGRAM APPLIES TO STANDARD PLANS 901.80 AND 902.15.

(1) 12" x 12" x 6" JUNCTION BOX WITH $\frac{3}{4}$" TO $1\frac{1}{2}$" KNOCK-OUT IN BOTTOM.
(2) $\frac{3}{4}$" MINIMUM METAL CONDUIT CONTAINING 1-2c #12 AWG AND 1c #12 AWG.
(3) $\frac{3}{4}$" MINIMUM FLEXIBLE CONDUIT CONTAINING 1-2c #12 AWG AND 1c #12 AWG.
ALL ITEMS CONTRACTOR FURNISHED AND INSTALLED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

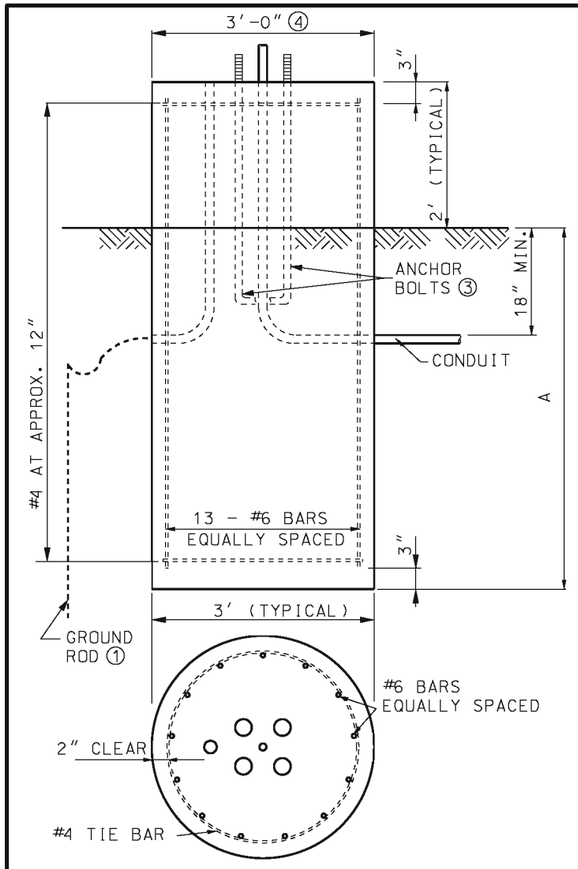
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TELEPHONE INTERCONNECT

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DATE PREPARED: 8/26/2009

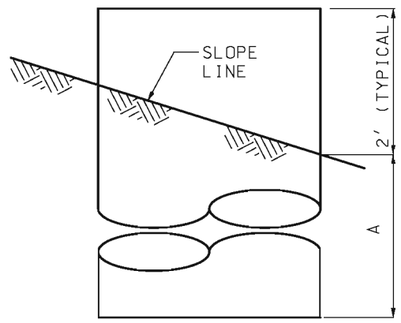
902.21C

SHEET NO. 1 OF 1

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

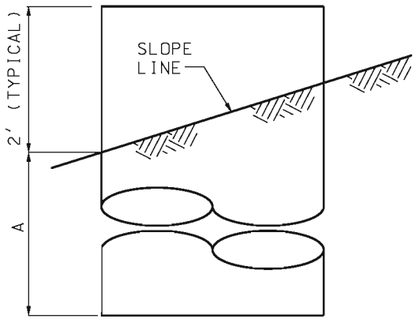



TYPE A (FLAT GROUND)



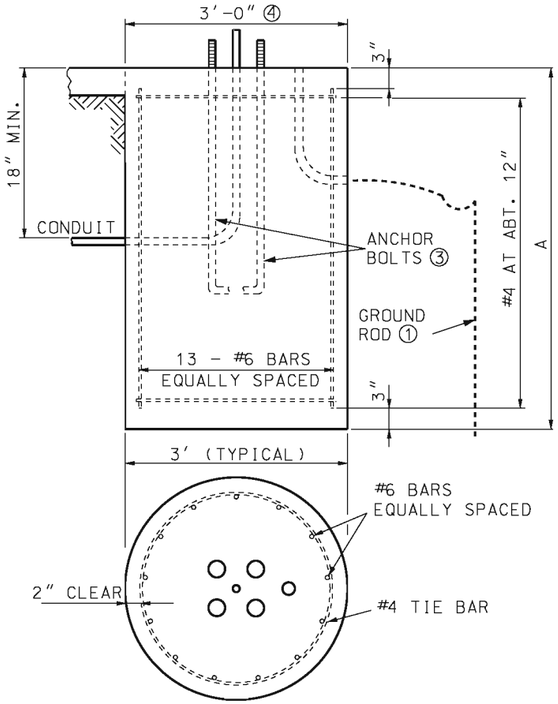

TYPE A (FILL)

(FOR ADDITIONAL DETAILS SEE TYPE A FLAT GROUND)

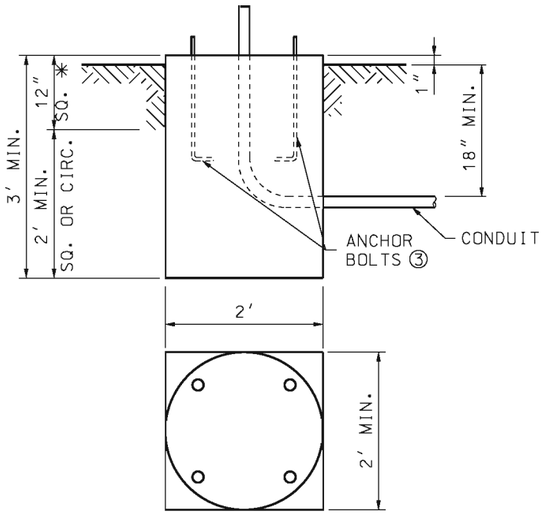



TYPE A (CUT)

(FOR ADDITIONAL DETAILS SEE TYPE A FLAT GROUND)




TYPE F




✳ SURFACE OF BASE TO BE CONSTRUCTED SQUARE FOR A DEPTH OF 12″.

TYPE C

## POST BASES

| POST BASES | | |
|---|---|---|
| POST TYPE | ARM LENGTH (FEET) ⑤ | BASE TYPE ⑥ |
| C OR CL | 15 – 25 | A-9 OR F-9 |
| C OR CL | 30 – 35 | A-9.5 OR F-9.5 |
| C OR CL | 40 – 55 | A-10.5 OR F-10.5 |
| B OR BL | 15 – 25 | A-10 OR F-10 |
| B OR BL | 30 – 35 | A-11 OR F-11 |
| B OR BL | 40 – 55 | A-12 OR F-12 |

| STEEL AND CONCRETE REQUIREMENTS FOR POST BASES ⑨ | | | | |
|---|---|---|---|---|
| BASES | | #6 STEEL BAR | | CONC. |
| TYPE | A ⑦ | LENGTH | WEIGHT LBS. | C.Y. |
| A-9 | 9′-0″ | 10′-6″ | 270 | 2.88 |
| A-9.5 | 9′-6″ | 11′-0″ | 280 | 3.01 |
| A-10 | 10′-0″ | 11′-6″ | 300 | 3.14 |
| A-10.5 | 10′-6″ | 12′-0″ | 310 | 3.27 |
| A-11 | 11′-0″ | 12′-6″ | 320 | 3.40 |
| A-12 | 12′-0″ | 13′-6″ | 350 | 3.67 |
| F-9 | 9′-0″ | 8′-6″ | 230 | 2.36 |
| F-9.5 | 9′-6″ | 9′-0″ | 240 | 2.49 |
| F-10 | 10′-0″ | 9′-0″ | 240 | 2.62 |
| F-10.5 | 10′-6″ | 10′-0″ | 260 | 2.75 |
| F-11 | 11′-0″ | 10′-6″ | 270 | 2.88 |
| F-12 | 12′-0″ | 11′-6″ | 300 | 3.14 |
| C✳ | | | | 0.44 |

✳ SURFACE OF BASE TO BE CONSTRUCTED SQUARE FOR A DEPTH OF 12″.

| BASE EMBEDMENT IN SOLID ROCK | |
|---|---|
| SOLID ROCK ENCOUNTER POINT | REQUIRED EMBEDMENT FOR BASE TYPE A-10 F-10 |
| AT SURFACE | 4′-9″ |
| AT ONE-FOURTH NORMAL DEPTH | 4′-0″ |
| AT ONE-HALF NORMAL DEPTH | 3′-3″ |
| AT THREE-FOURTHS NORMAL DEPTH | 1′-3″ |

1. REQUIRED EMBEDMENT DEPTHS CAN BE INTERPOLATED BETWEEN ENCOUNTER POINTS FOR OTHER SOLID ROCK ENCOUNTER DEPTHS.
2. NORMAL LENGTHS FOR ANCHOR BOLTS AND REINFORCING STEEL WILL BE REQUIRED.
3. CORE DRILL HOLES FOR ANCHOR BOLTS AND REINFORCING STEEL IN SOLID ROCK SHALL BE PROVIDED. CORE DRILL HOLES SHALL BE TWICE THE DIAMETER OF THE ANCHOR BOLT AND REINFORCING STEEL DIAMETER AND TO WITHIN 3 INCHES OF THE NORMAL BASE DEPTH.
4. IF SOIL, SHALE, GRAVEL, FRACTURED ROCK, OR VOIDS ARE ENCOUNTERED DURING CORE DRILLING, THE ROCK SHALL BE REMOVED TO THE POINT OF ENCOUNTER.
5. ANCHOR BOLTS AND REINFORCING STEEL SHALL BE GROUTED IN THE CORE DRILL HOLES WITH NON-SHRINK GROUT HAVING A MINIMUM STRENGTH OF 9,000 POUNDS IN 24 HOURS.
6. STRAIGHT ANCHOR BOLTS OF THE LENGTH SHOWN IN THE ANCHOR BOLT TABLE UNDER THE COLUMN "BOLT LENGTH" ARE ADEQUATE FOR USE IN GROUTED CORE DRILLED HOLES.

① APPLICABLE ONLY WHERE CONTROLLER IS MOUNTED TO A SIGNAL POLE.

② BASE PLATE SHALL STAY WITHIN THE TOP OF THE POST BASE DIAMETER.

③ ANCHOR BOLT DIMENSIONS ARE SHOWN ON THE MANUFACTURER'S APPROVED DRAWINGS.

④ MAXIMUM BOLT CIRCLE DIAMETER IS 26″. BASE PLATE SHALL STAY WITHIN THE TOP OF THE POST BASE DIAMETER.

⑤ ARM LENGTH DETERMINED BY LENGTH OF LONGEST ARM FOR TYPE B & BL SIGNAL POSTS.

⑥ BASE TYPE A OR F DETERMINED BY LOCATION OF POST BASE.

⑦ SOIL DEPTH, NO ROCK.

⑧ INCLUDE #4 TIE BAR.

⑨ WHEN CONCRETE BASE IS LOCATED WITHIN 8″ CONCRETE DIVISIONAL ISLAND, EMBEDMENT LENGTH MAY BE REDUCED BY ½ DIAMETER OF THE DRILLED SHAFT.

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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TRAFFIC SIGNALS

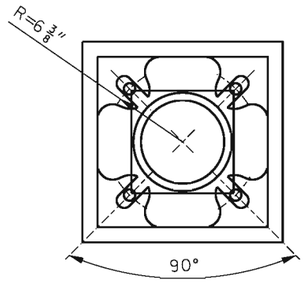
## POST BASES

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DATE PREPARED: 7/19/2012

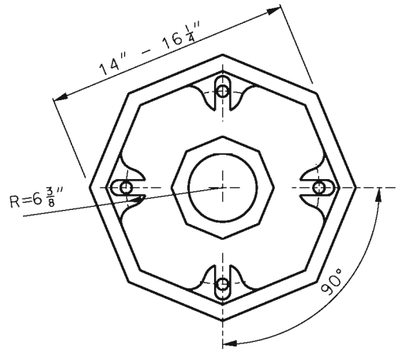
902.30P

SHEET NO. 1 OF 2

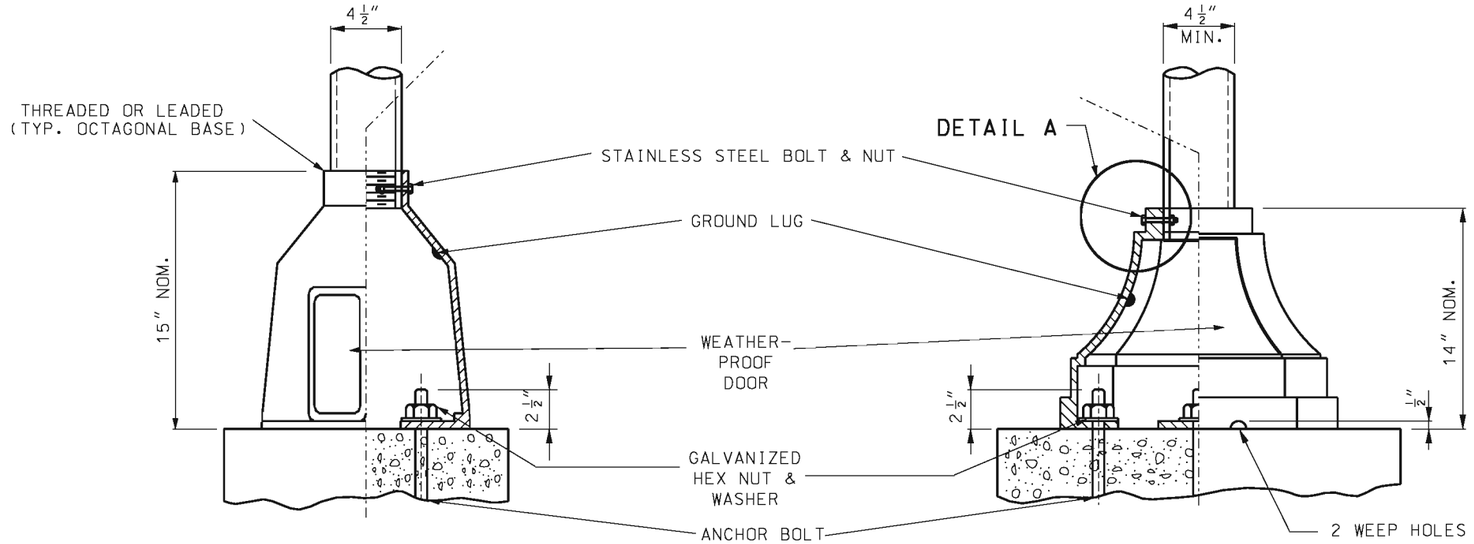
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BOLT CIRCLE



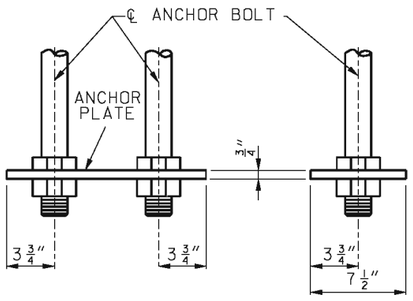

BOLT CIRCLE




SQUARE

OCTAGONAL

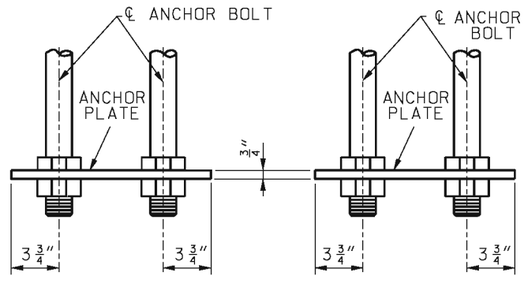
## CAST BASE




SIDE VIEW END VIEW

**TWO BOLTS PER PLATE**

HEX NUT OR 5/16" FILLET WELD ALL AROUND BOTH SIDES

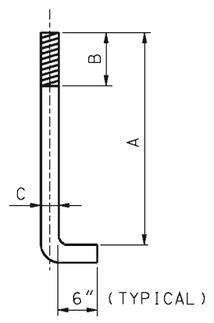



SIDE VIEW END VIEW

**FOUR BOLTS PER PLATE**

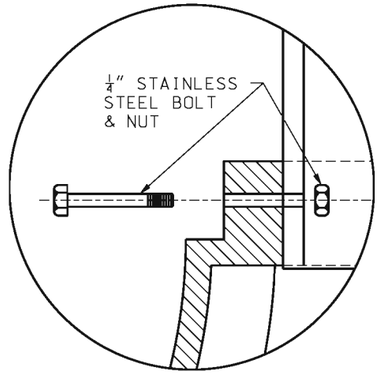
HEX NUT OR 5/16" FILLET WELD ALL AROUND BOTH SIDES

## OPTIONAL STEEL PLATE FOR ANCHOR BOLTS




ANCHOR BOLT

NOTE:
ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED.




DETAIL A

| BOLT LENGTH | VERT. HT. A | THREAD LEN. B | DIA. C |
|---|---|---|---|
| INCHES | INCHES | INCHES | INCHES |
| 19 | 17 | 1.50 | 0.625 |
| 57 | 51 | 7.00 | 1.250 |
| 79 | 73 | 7.50 | 1.500 |
| 94 | 88 | 8.00 | 1.750 |
| 121 | 115 | 8.50 | 2.000 |
| 120 | 114 | 9.00 | 2.250 |
| 146 | 140 | 9.50 | 2.500 |

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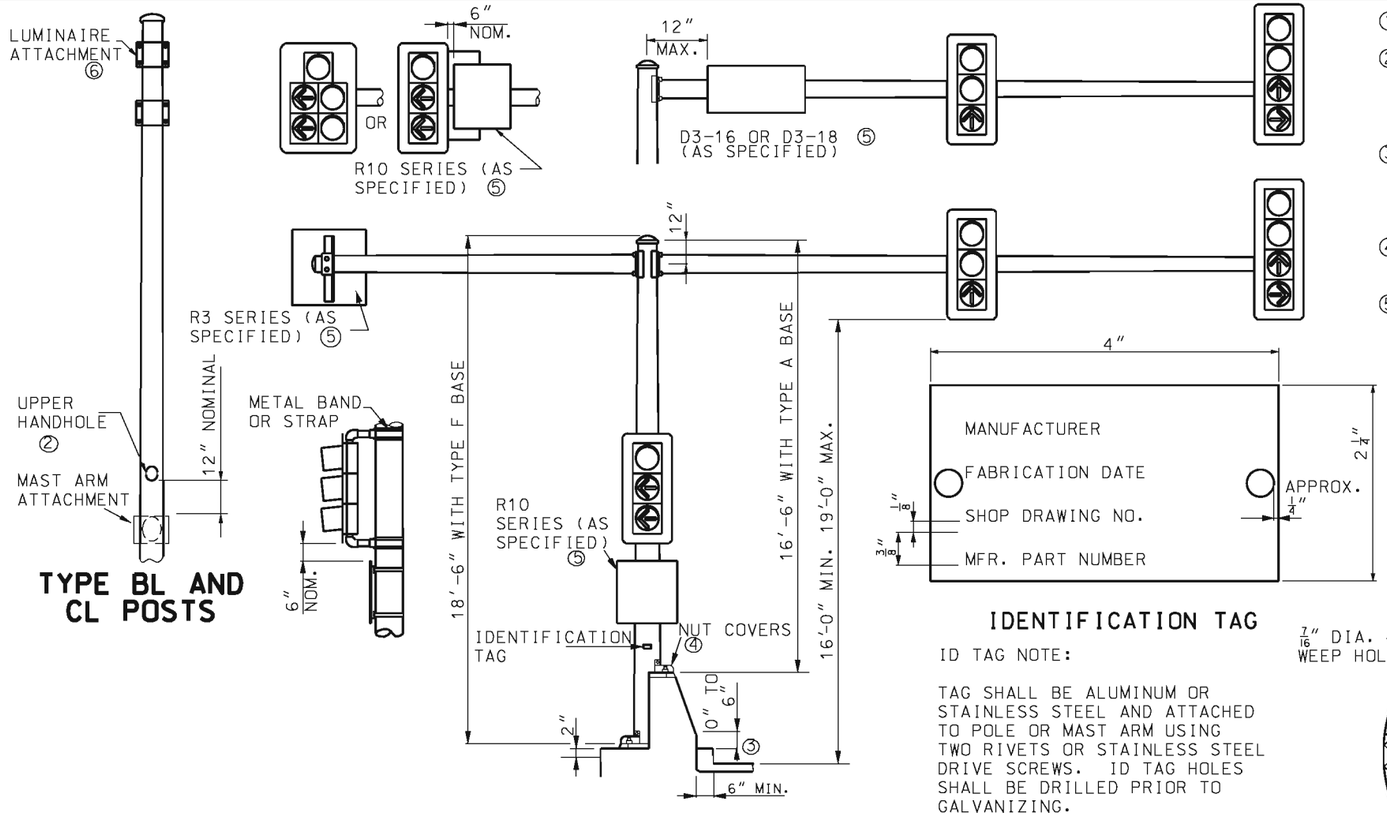
# TRAFFIC SIGNALS

POST BASES

DATE EFFECTIVE: 02/01/2008
DATE PREPARED: 8/26/2009

902.30P

SHEET NO. 2 OF 2



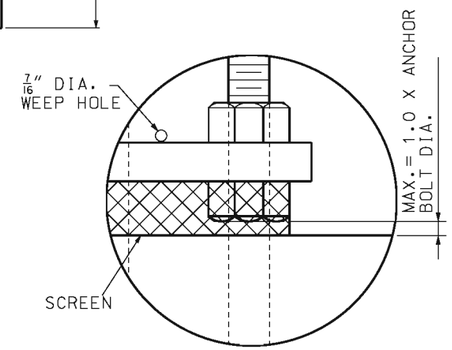

## TYPE BL AND CL POSTS




## IDENTIFICATION TAG

ID TAG NOTE:

TAG SHALL BE ALUMINUM OR STAINLESS STEEL AND ATTACHED TO POLE OR MAST ARM USING TWO RIVETS OR STAINLESS STEEL DRIVE SCREWS. ID TAG HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.




## DETAIL A

① ARM LENGTHS SHALL NOT EXCEED 55 FEET.

② HANDHOLES SHALL BE APPROXIMATELY 4" x 6½". HANDHOLE FRAME SHALL BE REINFORCED SO THAT THE POLE STRENGTH IS NOT REDUCED.

③ 0" TO 6" VARIATION IN BASE HEIGHT IS FOR OBTAINING 16'-0" CLEARANCE. 0.13 C.Y. CONCRETE AND 3 LBS. REINFORCING STEEL PER 6".

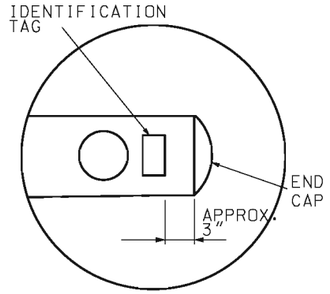
④ POSTS SHALL BE FURNISHED WITH INDIVIDUAL NUT COVERS.

⑤ NO SIGN IN EXCESS OF 15.0 SQUARE FEET SHALL BE INSTALLED ON POSTS OR MAST ARMS. SIGNS EXCEEDING 8.0 SQUARE FEET SHALL BE LOCATED SO THAT THE EDGE OF THE SIGN IS NO MORE THAN 12" FROM THE CENTERLINE OF THE POST. D3 SERIES SIGNS, AS WELL AS SIGNS INSTALLED ON THE POST, SHALL BE MOUNTED WITH A STRAP TYPE SIGN SUPPORT. R10 SERIES SIGNS INSTALLED ON THE MAST ARM SHALL BE MOUNTED WITH A SIGN BRACKET ASSEMBLY.

⑥ SEE DRAWING 901.00 FOR TYPICAL BRACKET ARM MOUNTING FOR TYPE BL AND TYPE CL POSTS.

⑦ A GALVANIZED SCREEN SHALL BE USED BETWEEN THE POST BASE PLATE AND CONCRETE BASE. SCREENS SHALL BE PRESS-FORMED OF 3 OR 4 MESH, 21 GAGE OR HEAVIER, STAINLESS STEEL OR HOT-DIPPED GALVANIZED WIRE SCREEN OR APPROVED EQUIVALENT, THAT WILL PROVIDE A FRICTION-TIGHT FIT WHEN INSTALLED.

⑧ POST SHALL BE GROUNDED FROM GROUND LUG IN POST WITH # 6 AWG BARE COPPER WIRE TO CONDUIT SYSTEM. GROUND LUG SHALL BE 90° OR 180° FROM THE HANDHOLE.




## DETAIL B

GENERAL NOTES:

ARMS SHALL BE RAKED UP 0.25" PER FOOT MINIMUM. ARMS SHALL BE PROVIDED WITH A PERMANENT MARKING INDICATING PROPER ORIENTATION FOR INSTALLATION.

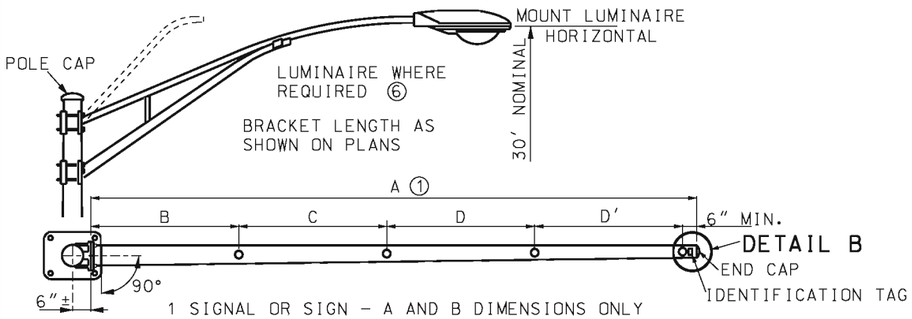
SIGNS AND SIGNALS SHALL BE VERTICAL. SIGNAL HEADS ON MAST ARMS SHALL BE TILTED FORWARD FROM THE TOP 3 TO 7 DEGREES FROM VERTICAL.

IF A SIGN EXCEEDS 42" IN LENGTH, TWO STRAP SUPPORTS ARE REQUIRED: AND IF A SIGN EXCEEDS 96" IN LENGTH, THREE STRAP SUPPORTS ARE REQUIRED.

TO DETERMINE LEFT OR RIGHT ON TYPE B OR C SIGNAL POST, VIEWING POSITION SHALL BE FROM THE CENTER OF THE INTERSECTION BEING CONTROLLED AND FACING THE SIGNAL INVOLVED.

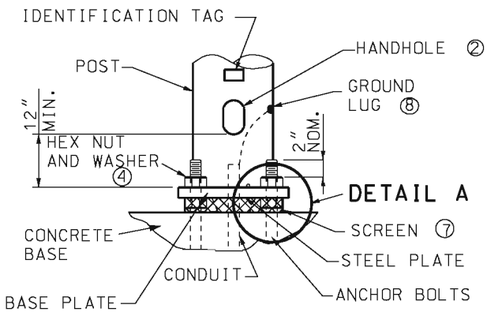
TRAFFIC SIGNALS MOUNTED ON MAST ARMS SHALL BE FURNISHED WITH MOUNTING BRACKETS UTILIZING CABLES.

SEE STANDARD 902.30 FOR FOUNDATION AND ANCHOR BOLT DETAILS.

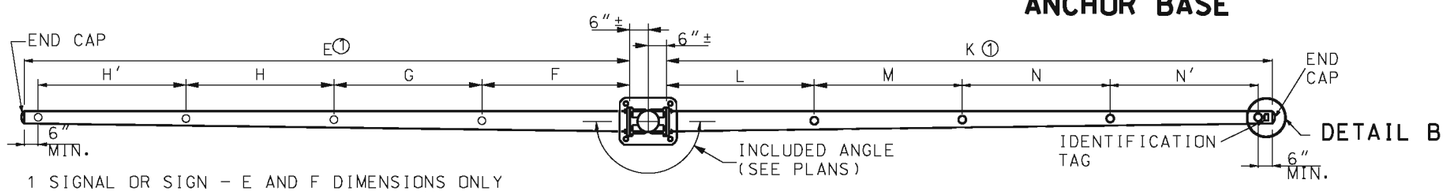



1 SIGNAL OR SIGN – A AND B DIMENSIONS ONLY
2 SIGNALS OR SIGNS – A, B, AND C DIMENSIONS ONLY
3 SIGNALS OR SIGNS – A, B, C AND D DIMENSIONS ONLY
4 SIGNALS OR SIGNS – A, B, C, D AND D' DIMENSIONS
SEE TRAFFIC SIGNAL PLANS FOR DIMENSIONS.

## TYPE C AND TYPE CL (WITH LUMINAIRE)




## STEEL PLATE AND ANCHOR BASE




1 SIGNAL OR SIGN – E AND F DIMENSIONS ONLY
2 SIGNALS OR SIGNS – E, F, AND G DIMENSIONS ONLY
3 SIGNALS OR SIGNS – E, F, G, AND H DIMENSIONS ONLY
4 SIGNALS OR SIGNS – E, F, G, H AND H' DIMENSIONS

## TYPE B AND TYPE BL (WITH LUMINAIRE)

1 SIGNAL OR SIGN – K AND L DIMENSIONS ONLY
2 SIGNALS OR SIGNS – K, L, AND M DIMENSIONS ONLY
3 SIGNALS OR SIGNS – K, L, M, AND N DIMENSIONS ONLY
4 SIGNALS OR SIGNS – K, L, M, N AND N' DIMENSIONS
SEE TRAFFIC SIGNAL PLANS FOR DIMENSIONS

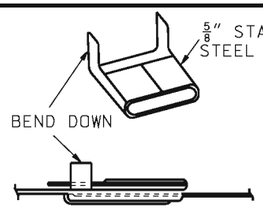
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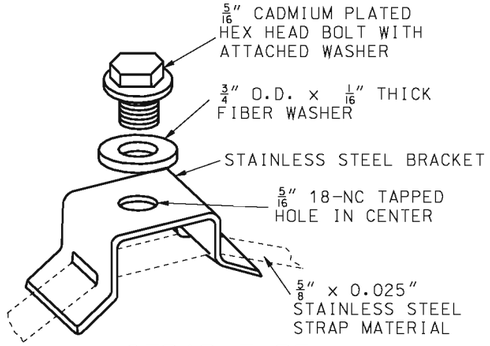
# TRAFFIC SIGNALS
TUBULAR STEEL POSTS

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|---|---|---|---|
| DATE PREPARED: | 8/26/2009 | | 1 OF 3 |

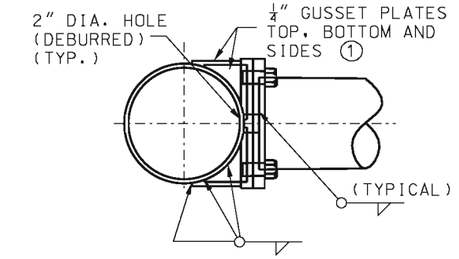


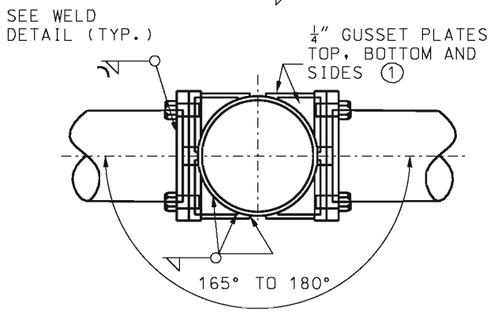

VIEW SHOWING

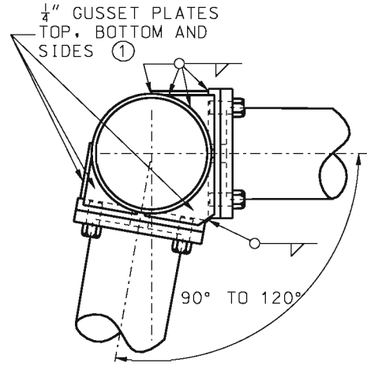
**ENDS OF STRAP CLAMPED IN SEAL**

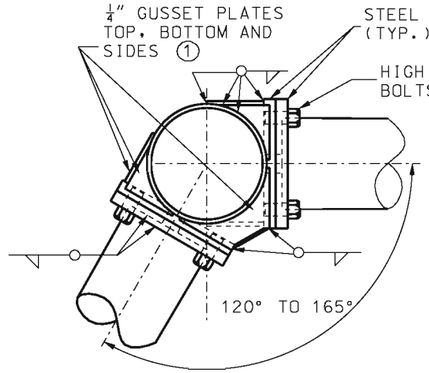



**STRAP TYPE SIGN SUPPORT**



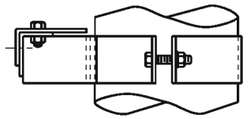



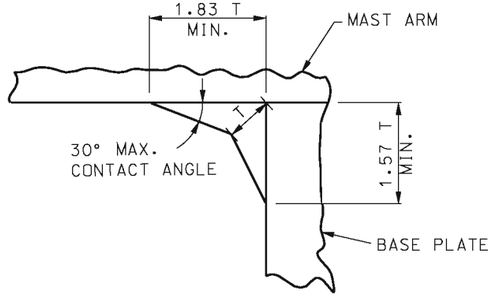

(1) ANY OPENINGS BETWEEN TOP AND SIDE GUSSET PLATES SHALL BE SEALED WITH LIFETIME CAULK AT TIME OF INSTALLATION.

(2) PLATE AND BOLT SIZES SHALL BE SHOWN ON FABRICATORS SHOP DRAWINGS AND SHALL BE SUBJECT TO APPROVAL.

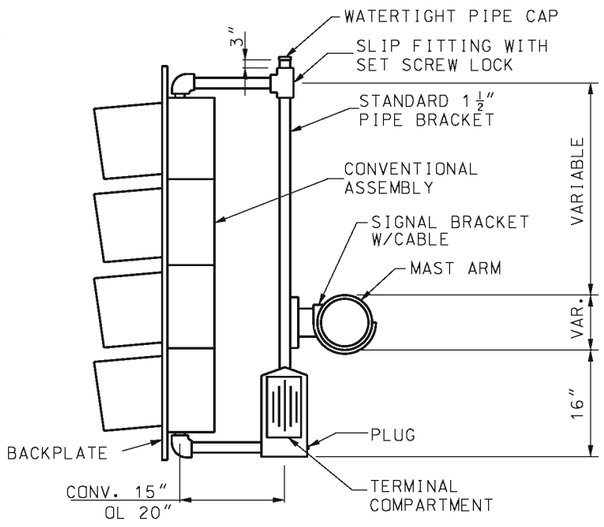
**ARM ATTACHMENTS**



TOP VIEW

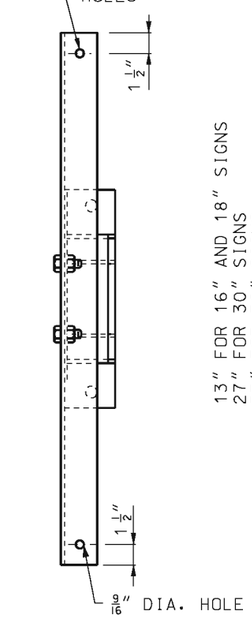



WELD DETAIL

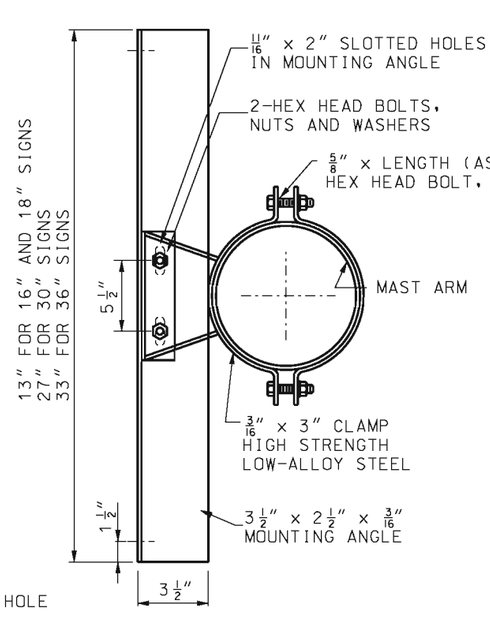



**MAST ARM MOUNTED SIGNAL HEAD**

(SEE STANDARD 902.00)




FRONT VIEW




SIDE VIEW

**SIGN BRACKET ASSEMBLY**

ALTERNATE DESIGN MAY BE PROVIDED AS APPROVED BY ENGINEER

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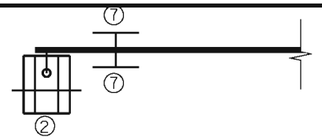
# TRAFFIC SIGNALS

TUBULAR STEEL POSTS

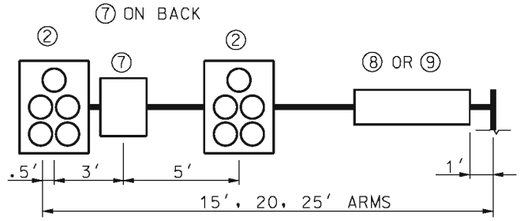
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DATE PREPARED: 1/17/2013

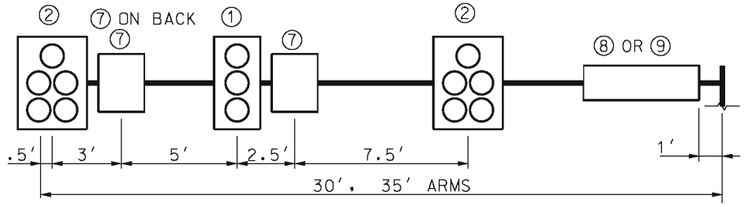
902.400

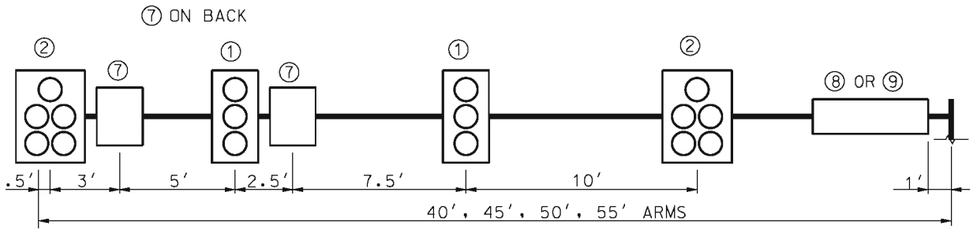
SHEET NO. 2 OF 3



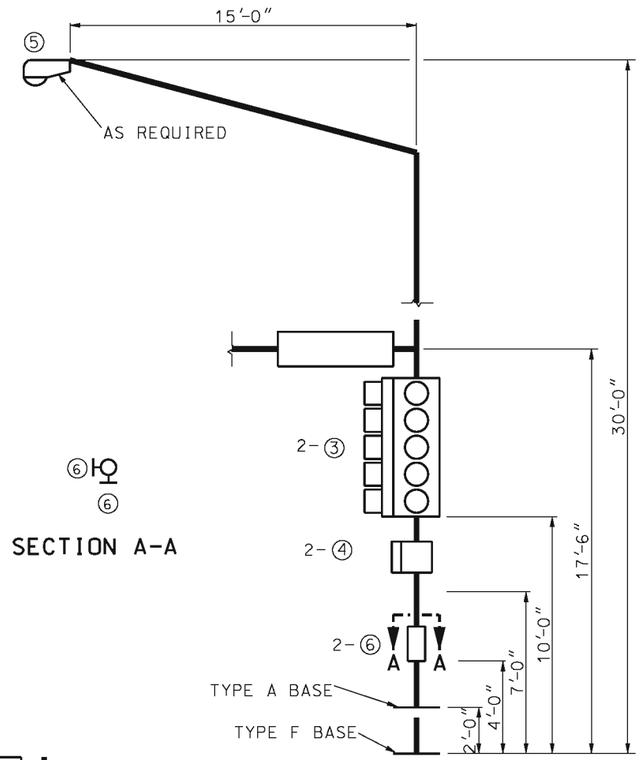

TYPICAL TOP VIEW



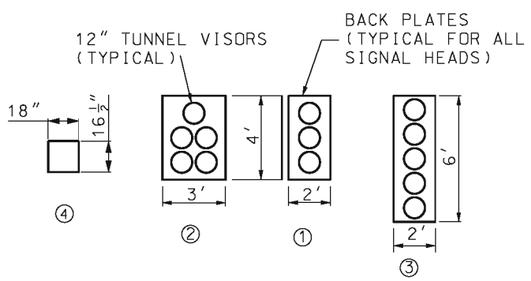

MAST ARM LOADING




⑥
⑥

SECTION A-A

TYPICAL POST LOADING




| ITEM NO. | DESCRIPTION | WEIGHT (LBS.)✳ | PROJ. AREA (SQ.FT.) | SURFACE AREA (SQ.FT.) |
|---|---|---|---|---|
| ① | 3-SECTION OL HEAD | 95.0 | 8.0 | 32.5 |
| ② | 5-SECTION OL HEAD | 173.0 | 12.0 | 47.5 |
| ③ | VERT. 5-SECT. OL HEAD | 100.0 | 12.0 | 50.5 |
| ④ | 1-SECTION PED HEAD | 15.0 | 2.0 | XX.X |
| ⑤ | 150 WATT LUMINAIRE | 30.0 | 1.0 | 3.5 |
| ⑥ | 9″ X 12″ SIGN | 2.0 | 0.8 | N/A |
| ⑦ | 30″ X 36″ SIGN | 13.0 | 7.5 | N/A |
| ⑧ | 120″ X 18″ SIGN | 25.0 | 15.0 | N/A |
| ⑨ | 96″ X 16″ SIGN | 18.0 | 10.7 | N/A |
| | 96″ X 18″ SIGN | 20.0 | 12.0 | N/A |

OL- OPTICALLY LIMITED
✳ MOUNTING HARDWARE INCLUDED

STRUCTURAL DESIGN REQUIREMENTS:

STRUCTURAL SUPPORTS SHALL BE DESIGNED AND FABRICATED TO WITHSTAND THEIR OWN LOADING AND THE ATTACHMENT LOADING SHOWN ON THIS DRAWING OR ON THE PLANS, WHICHEVER IS GREATER. STRUCTURAL MEMBERS INCLUDE POSTS, MAST ARMS AND LUMINAIRE BRACKET ARMS, AS REQUIRED.

DESIGN OF STRUCTURAL SUPPORTS SHALL BE BASED ON AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS, 1994 OR LATEST REVISION, WITH THESE EXCEPTIONS:

MINIMUM DESIGN WIND SPEED OF 90 MPH AT 30 FEET ABOVE GROUND.

GROUP LOADING:

| LOADS | PERCENT OF ALLOWABLE STRESS (ALL MATERIALS) |
|---|---|
| GROUP I - DL | 100 |
| GROUP II - DL + W | 133 |
| GROUP III - DL + ICE + 0.5(W✳✳) | 133 |

✳ NO LOAD REDUCTION FACTORS SHALL BE APPLIED IN CONJUNCTION WITH THESE INCREASED ALLOWABLE STRESSES.
✳✳ W TO BE COMPUTED ON THE BASIS OF THE WIND PRESSURE FORMULA, 25 PSF (1197 Pa) MINIMUM FOR W FOR GROUP III.

FOR TYPE B AND BL POSTS, ICE AND DEAD LOADING SHALL BE BASED ON THE COMBINED EFFECT OF DESIGN LOADING ON EACH ARM. WIND LOADING IS APPLIED AS DESCRIBED IN SECTION 1.2.5(5)(b) OF THE STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS, 1994 REVISION.

GENERAL NOTES:

ATTACHMENT LOCATIONS ARE FOR STRUCTURAL DESIGN PURPOSES ONLY. ACTUAL LOCATIONS ARE SHOWN ON THE PLANS.

## MINIMUM DESIGN LOADING FOR POST AND MAST ARM ATTACHMENTS

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105 WEST CAPITOL
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

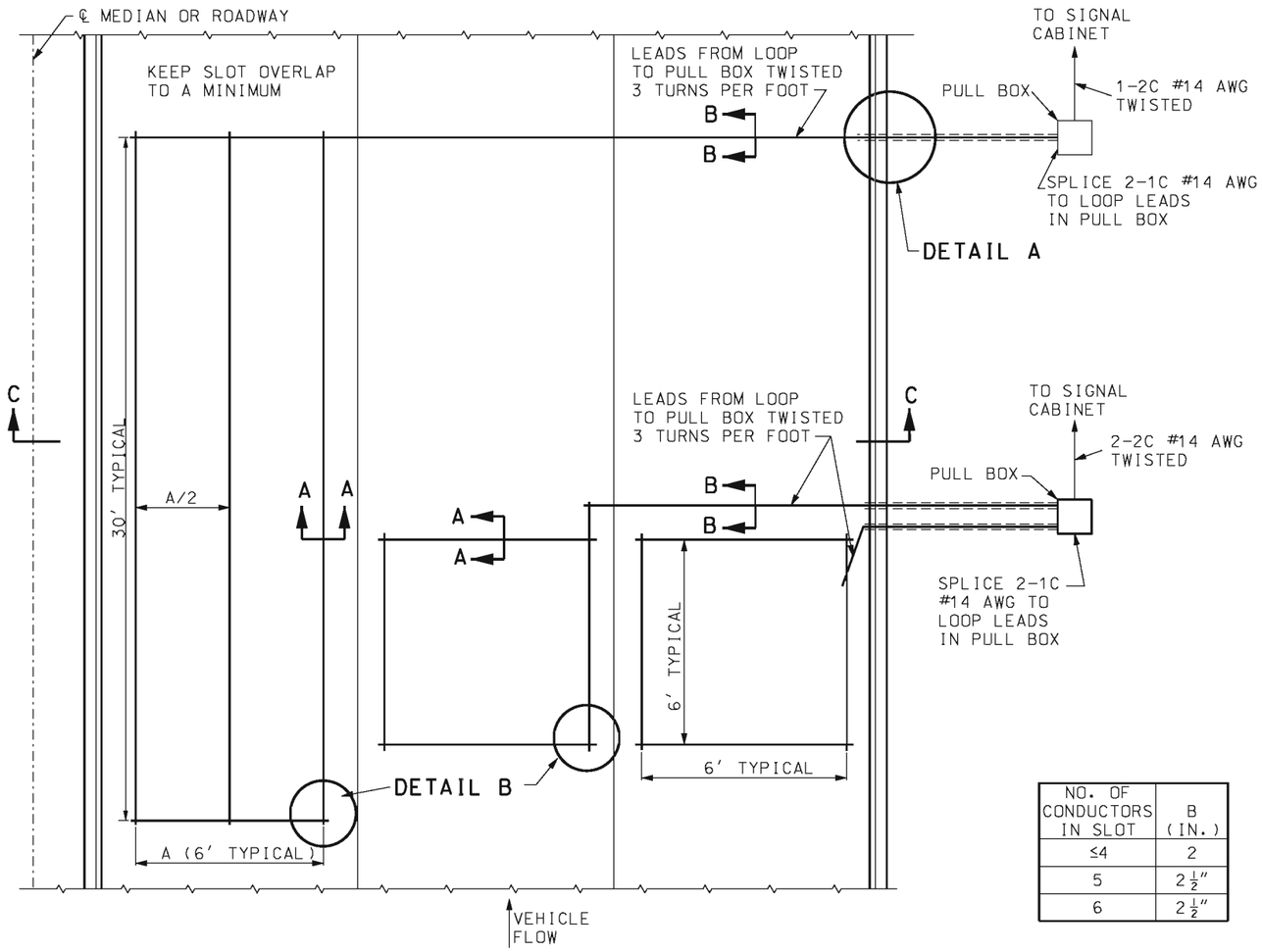
# TRAFFIC SIGNALS
## TUBULAR STEEL POSTS
## DESIGN LOADING REQUIREMENTS

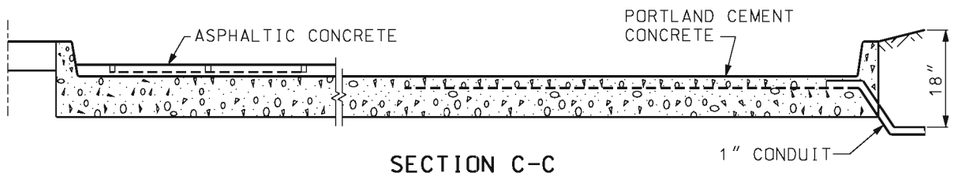
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DATE PREPARED: 8/26/2009

902.400

SHEET NO. 3 OF 3

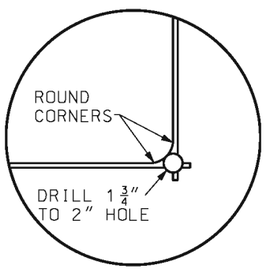
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



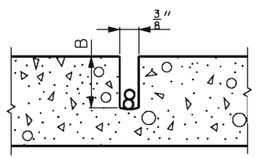

SECTION C-C

## LOOP SLOT DETAIL



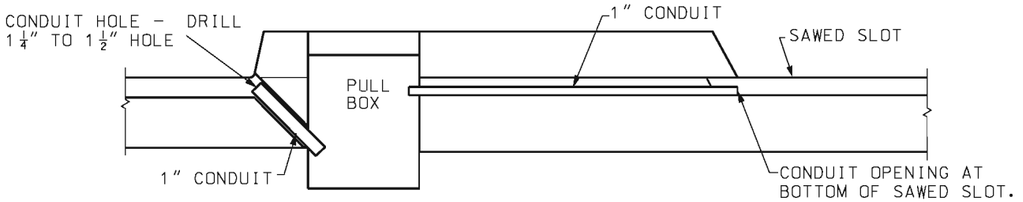

DETAIL B

## TYPICAL LOOP CORNER DETAIL

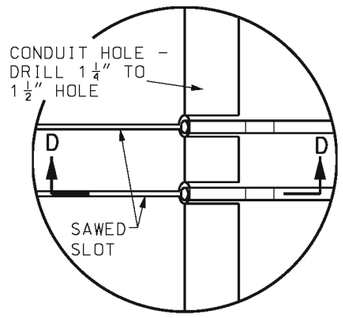



SECTION A-A
LOOP SLOT

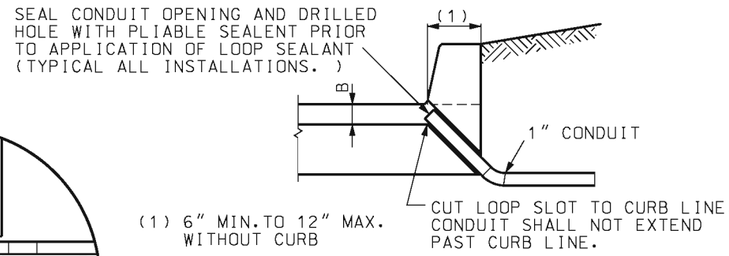
| NO. OF CONDUCTORS IN SLOT | B (IN.) |
|---|---|
| ≤4 | 2 |
| 5 | 2½" |
| 6 | 2½" |



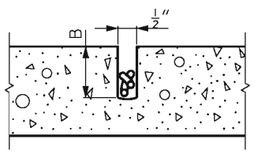

## ALTERNATE SECTION D-D MEDIAN OR ISLAND DETAIL



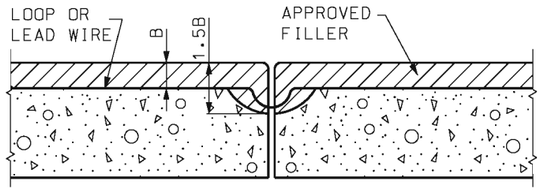

## DETAIL A CONDUIT SLOT DETAIL




## SECTION D-D




SECTION B-B
LEAD SLOT




## DETAIL OF AN "E" JOINT OR OTHER FULL DEPTH JOINT CROSSING

CAUTION:
WIRE SHALL BE PLACED IN SAWED SLOT WITH DEVICE WHICH WILL NOT DAMAGE THE WIRE INSULATION.

GENERAL NOTES:

SENSOR UNIT SHALL BE HOUSED IN CONTROLLER CABINET UNLESS SPECIFIED OTHERWISE.

LOOPS TO BE INSTALLED, WHEN EXISTING PORTLAND CEMENT CONCRETE OR ASPHALTIC CONCRETE PAVEMENT IS BEING RESURFACED, LOOPS SHALL NOT BE PLACED IN SURFACE COURSE OF THE ASPHALTIC CONCRETE.

THE CONDUIT SLOT MAY BE POWER OR MANUALLY CONSTRUCTED, ANY FORMING NEEDED TO SECURE CONDUIT IN SLOT SHALL BE REMOVED.

A SEPARATE CONDUIT SHALL BE INSTALLED BETWEEN THE SAWED LOOP SLOT AND THE FIRST PULL BOX FOR EACH LOOP. THE CONDUIT OPENING AT THE END OF THE LEAD-IN SLOT SHALL BE AT THE BOTTOM OF THE SAWED SLOT.

AFTER CABLE INSTALLATION, THE CONDUIT OPENING AT THE LOOP LEAD ENTRANCE SHALL BE SEALED.

AVOID "E" JOINTS OR OTHER FULL DEPTH JOINTS. MINOR ADJUSTMENTS TO LOOP LOCATION MAY BE MADE.

USE TYPICAL DIMENSIONS UNLESS OTHERWISE SHOWN ON PLANS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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JEFFERSON CITY, MO 65102
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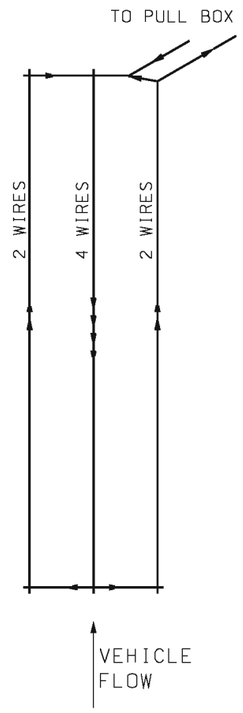
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
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# TRAFFIC SIGNALS
INDUCTION LOOP DETECTORS

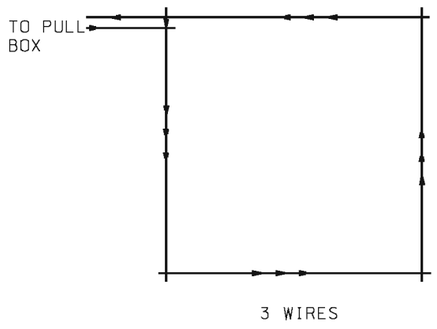
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DATE PREPARED: 4/14/2009

902.50L

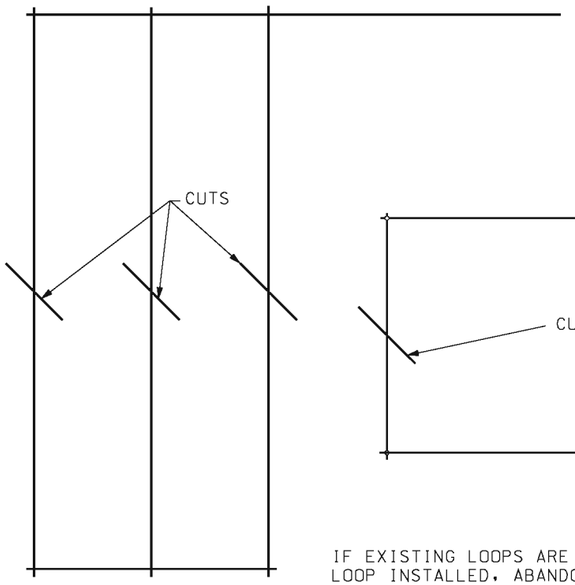
SHEET NO. 1 OF 2




LOOP SHALL BE #14 AWG STRANDED WIRE IN PVC DUCT MADE UP OF 2 NON-TWISTED TURNS IN SINGLE SLOT OR AS RECOMMENDED BY MANUFACTURER OF THE DETECTOR AMPLIFIER. LOOP SHALL BE PLACED IN SAWED SLOTS IN A FIGURE EIGHT MANNER.




## LOOP CONFIGURATION




IF EXISTING LOOPS ARE TO BE ABANDONED AND NEW LOOP INSTALLED, ABANDONED LOOP WIRES SHALL BE REMOVED OR CUT COMPLETELY THROUGH.

## ABANDONED LOOPS

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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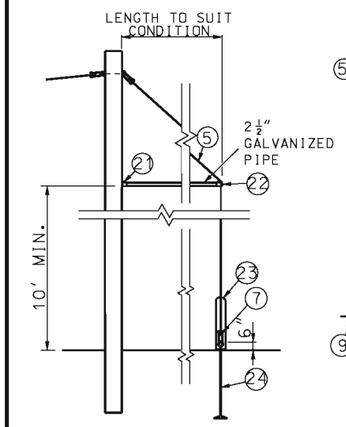
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# TRAFFIC SIGNALS
INDUCTION LOOP DETECTORS

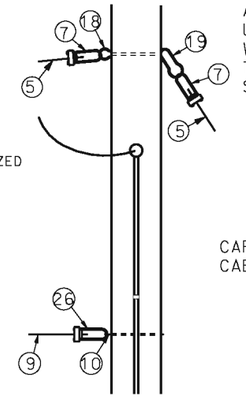
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DATE PREPARED: 4/3/2009

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SHEET NO. 2 OF 2

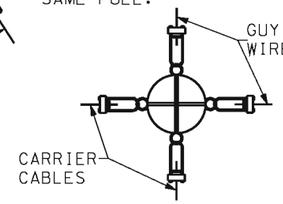



GUY WIRE
LIMITED RIGHT-OF-WAY

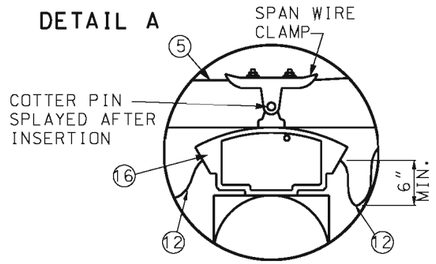


DETAIL A

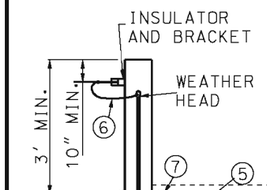
SEPARATE GUY WIRE, BOLT AND THIMBLEYE SHALL BE USED FOR MESSENGER WIRE WHEN SPAN WIRE EXTENDS TWO DIRECTIONS FROM THE SAME POLE.



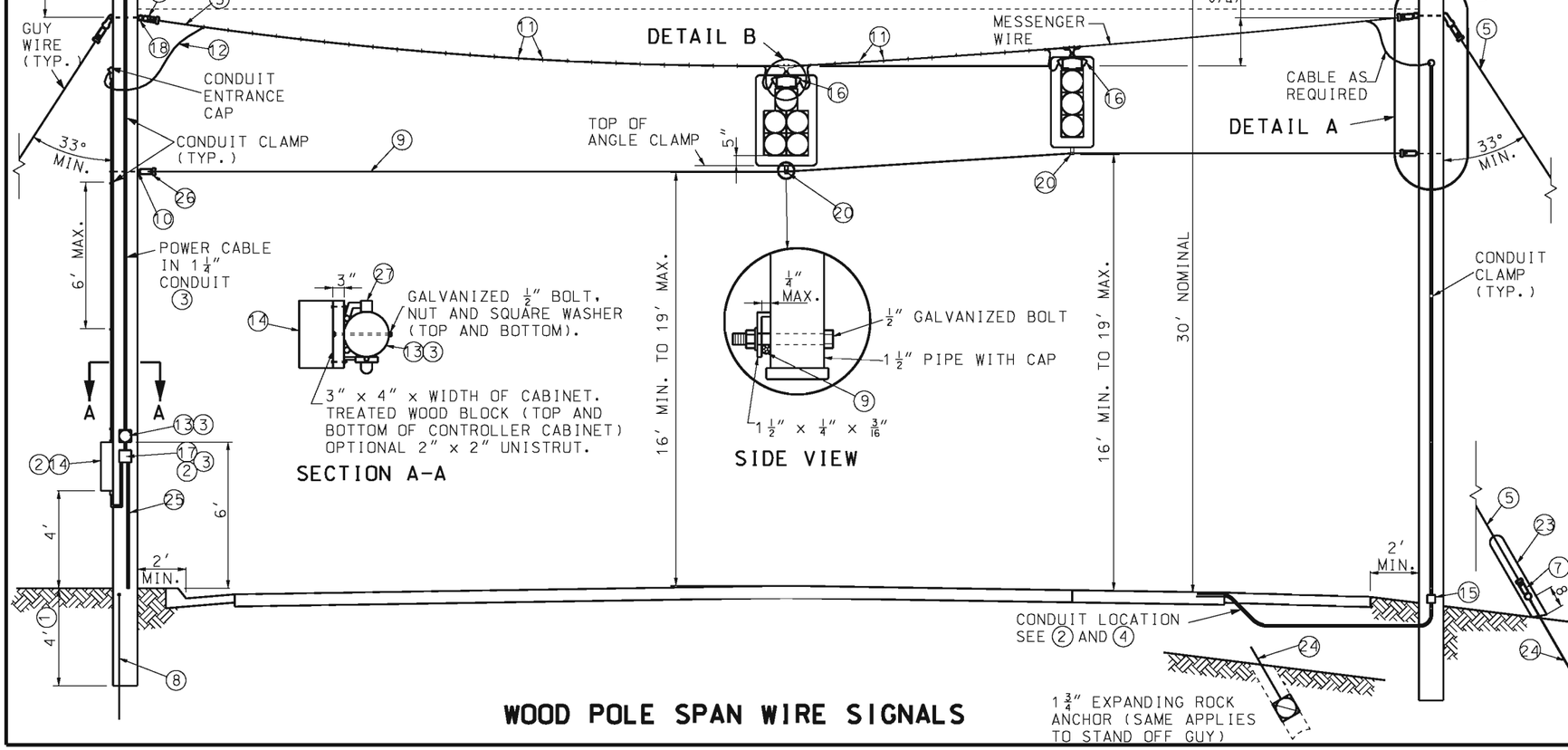

SECTION B-B
(AS REQUIRED)




DETAIL B




1. INCREASE EMBEDMENT 1' FOR EACH 5' INCREMENT IN POLE LENGTH OVER 20'.
2. ITEMS ARE INSTALLED AS REQUIRED (SEE PLANS).
3. ITEMS ARE INSTALLED IF THE POLE IS USED AS A POWER SUPPLY (SEE GENERAL NOTES).
4. THREE OR MORE ENTERING CONDUITS WILL REQUIRE A PULL BOX OR OTHER APPROVED FITTING.
5. DOUBLE GALVANIZED ⅜" (MIN.) STEEL MESSENGER WIRE – 7 STRAND HIGH STRENGTH GRADE. DOUBLE GALVANIZED ½" STEEL GUY WIRE – 7 STRAND HIGH STRENGTH GRADE.
6. SERVICE WIRE AND SPLIT-BOLT OR SLEEVE CONNECTION BY UTILITY COMPANY. WIRE SPACING AS REQUIRED BY THE UTILITY COMPANY.
7. ⅜" AUTOMATIC JAW-TYPE CABLE FITTING WITH SHORT BAIL. 13,860 LBS. MINIMUM HOLDING STRENGTH.
8. ¾" X 8' MIN. COPPER GROUND ROD. 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 CADWELDED.
9. DOUBLE GALVANIZED ¼" STEEL TETHER WIRE – 7 STRAND HIGH STRENGTH GRADE. INSTALL HORIZONTAL OR BELOW HORIZONTAL.
10. ½" GALVANIZED OVAL EYE BOLT.
11. NON-CORROSIVE METAL CABLE HANGERS AT 12" CENTERS.
12. MULTI-CONDUCTOR CABLE (SEE PLANS).
13. METER SOCKET AND CABINET.
14. CONTROLLER CABINET. ALL CONDUITS SHALL ENTER THE BOTTOM OF THE CABINET. NO HOLES SHALL BE MADE IN THE TOP, BACK OR SIDES OF THE CABINET.
15. JUNCTION BOX (NEMA 4).
16. DISCONNECT HANGER (NOT REQUIRED IF TEMPORARY)
17. CIRCUIT BREAKER. SEE STANDARD 902.15 FOR DETAILS.
18. ⅝" GALVANIZED STRAIGHT THIMBLEYE BOLT WITH GALVANIZED NUT AND 2½" GALVANIZED CURVE WASHER.
19. ⅝" GALVANIZED ANGLE THIMBLEYE.
20. TETHER WIRE AND CLAMP WITH QUICK RELEASE PROVISIONS. SEE DETAIL FOR MOUNTING TO POLE AND SIGNAL. OPTIONAL ATTACHMENT PERMITTED WITH APPROVAL OF ENGINEER.
21. 2½" GALVANIZED POST PLATE FASTENED TO POLE WITH ONE ⅝" GALVANIZED MACHINE BOLT & TWO ⅜" x 4" GALVANIZED LAG SCREWS.
22. 2½" GALVANIZED CONNECTOR END FITTING.
23. ALL LOCATIONS REQUIRE GUY WIRE PROTECTOR. (7' MIN.)
24. ¾" x 8' GALVANIZED THIMBLEYE ANCHOR ROD. (30" MIN. LENGTH IN ROCK).
25. #6 AWG BARE COPPER WIRE IN ½" CONDUIT.
26. ¼" AUTOMATIC JAW TYPE CABLE FITTING WITH SHORT BAIL. 5990 LBS. MINIMUM HOLDING STRENGTH.
27. LIGHTING CIRCUIT BREAKER CABINET (IF LUMINARIES ARE SPECIFIED SEE STANDARD 902.15 FOR DETAILS.




## WOOD POLE SPAN WIRE SIGNALS

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 40 POLYETHYLENE OR POLYVINYL CHLORIDE CONDUIT AND WEATHER HEAD SHALL BE USED ON UTILITY COMPANY POLES IN LIEU OF RIGID STEEL CONDUIT.

NO DIRECT PAYMENT WILL BE MADE FOR GUYS, CONDUIT AND JUNCTION BOXES ON POLES, HARDWARE, LIGHTING BRACKET ARMS OR ANY OTHER ITEMS FOR WHICH SEPARATE PAYMENT IS NOT PROVIDED.

ALL GUY WIRES SHALL BE GROUNDED.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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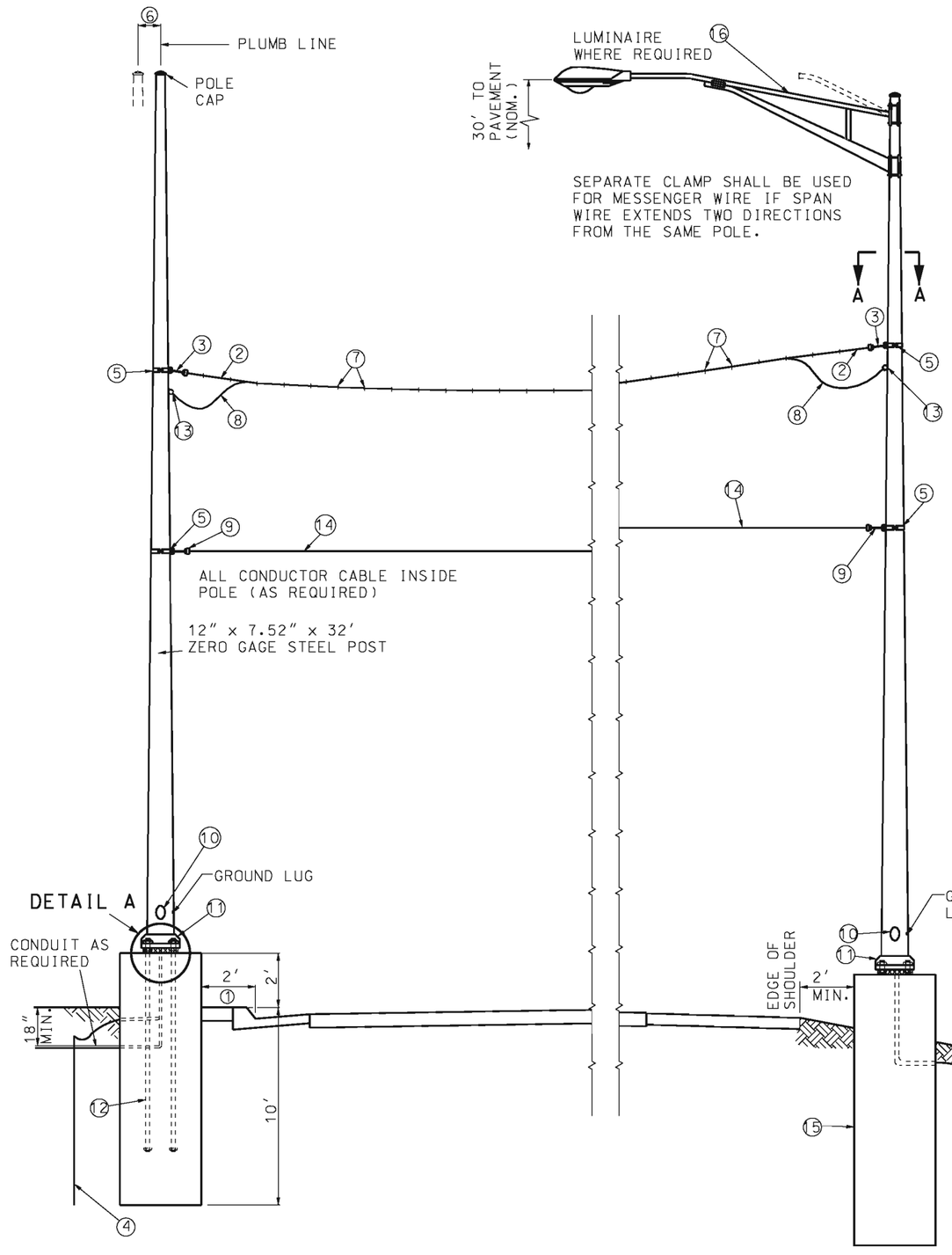
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KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# TRAFFIC SIGNALS
## RIGID SPAN WIRE DETAILS

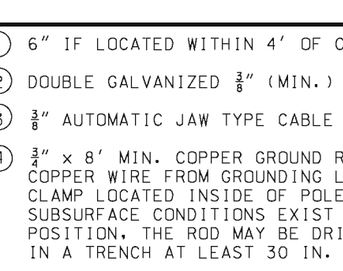
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DATE PREPARED: 8/26/2009

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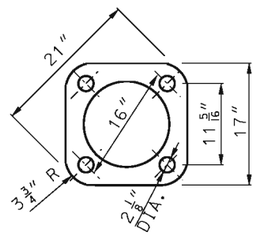
SHEET NO. 1 OF 2



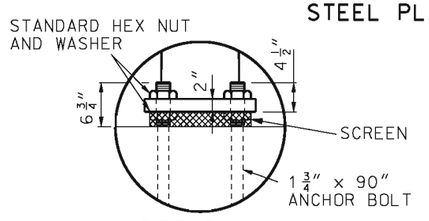

STEEL POST DETAILS




SECTION A-A




STEEL PLATE




DETAIL A
STEEL PLATE ANCHOR BASE

(1) 6" IF LOCATED WITHIN 4' OF CONCRETE MEDIAN.

(2) DOUBLE GALVANIZED 3/8" (MIN.) STEEL MESSENGER WIRE - 7 STRAND HIGH STRENGTH GRADE.

(3) 3/8" AUTOMATIC JAW TYPE CABLE FITTING WITH SHORT BAIL. 13,860 LBS. MINIMUM HOLDING STRENGTH.

(4) 3/4" 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 180° TO HANDHOLE. IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45° FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADWELDED.

(5) GALVANIZED 1/4" STEEL CLEVIS CLAMP TO FASTEN TO THE POLE WITH 5/8" GALVANIZED CARRIAGE BOLTS.

(6) RAKE AS NECESSARY. 10" MAXIMUM.

(7) NON-CORROSIVE METAL CABLE HANGERS AT 12" CENTERS.

(8) MULTI-CONDUCTOR CABLE (AS REQUIRED).

(9) 1/4" AUTOMATIC JAW TYPE CABLE FITTING WITH SHORT BAIL. 5990 LBS. MINIMUM HOLDING STRENGTH.

(10) 4" x 6 1/2" HANDHOLE AND COVER WITH REINFORCED FRAME WELDED TO POLE.

(11) ONE-PIECE OR TWO-PIECE METAL BASE COVER OR INDIVIDUAL NUT COVERS.

(12) FULLY GALVANIZED ANCHOR BOLT WITH BOLT HEAD OR TACK WELDED NUT ON EMBEDDED END.

(13) WIRE ENTRANCE WITH INSULATED WEATHERPROOF BUSHING (AS REQUIRED).

(14) DOUBLE GALVANIZED 1/4" STEEL - 7 STRAND HIGH STRENGTH GRADE TETHER WIRE AND CLAMP WITH QUICK RELEASE PROVISIONS. INSTALL HORIZONTAL OR BELOW HORIZONTAL.

(15) TYPE A-10 BASE. SEE STANDARD 902.30 FOR DETAILS.

(16) 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.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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105 WEST CAPITOL
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STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
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# TRAFFIC SIGNALS
## RIGID SPAN WIRE DETAILS

DATE EFFECTIVE: 02/01/2008
DATE PREPARED: 8/26/2009

902.70P

SHEET NO. 2 OF 2

OPTICALLY LIMITING SIGNAL HEAD WITH BACKPLATE

OPTICALLY LIMITING & CONVENTIONAL SIGNAL HEAD WITH BACKPLATE

OPTICALLY LIMITING & CONVENTIONAL SIGNAL HEAD WITH BACKPLATE

CONVENTIONAL SIGNAL HEAD WITH BACKPLATE

SIGNAL HEAD - PEDESTRIAN

POST MOUNTED SIGNAL HEAD WITH SIGN AND BACKPLATE

STOP LINE

LANE USE

TYPE A BASE

TYPE F BASE

TYPE C BASE

EXISTING POST BASE

WOOD POLE WITH DOWN GUY

STEEL POLE

STEEL POLE WITH DOWN GUY

CONTROLLER WITH PAD

EXISTING CONTROLLER

PULL BOX, TYPE I DRAIN, CONCRETE

PULL BOX, TYPE II DRAIN, CONCRETE

PULL BOX, TYPE I DRAIN, PREFORMED

PULL BOX, TYPE II DRAIN, PREFORMED

DOUBLE PULL BOX, TYPE A, TYPE I DRAIN, CONCRETE

DOUBLE PULL BOX, TYPE A, TYPE II DRAIN, CONCRETE

DOUBLE PULL BOX, TYPE B, TYPE I DRAIN

DOUBLE PULL BOX, TYPE B, TYPE II DRAIN

PULL BOX, CLASS 5, TYPE I DRAIN, PREFORMED

PULL BOX, CLASS 5, TYPE II DRAIN, PREFORMED

EXISTING PULL BOX

SERVICE POLE OR PEDESTAL AND POWER SUPPLY

EXISTING SERVICE POLE

150-WATT HPS LUMINAIRE

SPAN WIRE WITH SIGNAL HEAD

MAST ARM WITH SIGNAL HEADS AND 150 WATT LUMINAIRE

MAST ARM WITH OVERHEAD SIGN

INDUCTION LOOP DETECTOR

V — VIDEO DETECTION ZONE

PUSH BUTTON DETECTOR

CAPPED RIGID CONDUIT

RIGID CONDUIT IN TRENCH

RIGID CONDUIT PUSHED

EXISTING RIGID CONDUIT

B B — RIGID CONDUIT ON BRIDGE

M M — RIGID CONDUIT IN MEDIAN

3" — SIZE OF CONDUIT

3-7c #16 — NUMBER & AWG SIZE OF CABLE

7 — SIGNAL FACE NUMBER

7 — POST NUMBER

7 — DETECTOR NUMBER

7 — PULL BOX NUMBER

PERSON WALKING INTERVAL

25 — FLASHING UPRAISED HAND INTERVAL WITH COUTDOWN

STEADY UPRAISED HAND INTERVAL

| | | |
|---|---|---|
| R | RED LENS (CIRCULAR) | ALL 12 INCH WITH TUNNEL VISOR |
| FR | FLASHING RED (CIRCULAR) | |
| Y | YELLOW LENS (CIRCULAR) | |
| FY | FLASHING YELLOW (CIRCULAR) | |
| FYL | FLASHING YELLOW LEFT ARROW LENS | |
| FYR | FLASHING YELLOW RIGHT ARROW LENS | |
| YL | YELLOW LEFT ARROW LENS | |
| YR† | YELLOW RIGHT ARROW LENS | |
| G | GREEN LENS (CIRCULAR) | |
| S | GREEN STRAIGHT ARROW LENS | |
| L | GREEN LEFT ARROW LENS | |
| R† | GREEN RIGHT ARROW LENS | |
| R | TUNNEL VISOR WITH LOUVER | |

| SIGN | LEGEND |
|---|---|
| R10 - 10L | LEFT TURN SIGNAL |
| R10 - 10R | RIGHT TURN SIGNAL |
| R3 - 5L | LEFT ARROW (SYMBOL) ONLY |
| R3 - 5R | RIGHT ARROW (SYMBOL) ONLY |
| R3 - 5A | STRAIGHT ARROW (SYMBOL) ONLY |
| R3 - 6L | LEFT ARROW - STRAIGHT ARROW (SYMBOL) |
| R3 - 6R | RIGHT ARROW - STRAIGHT ARROW (SYMBOL) |
| R3 - 2 | NO LEFT TURN (SYMBOL) |
| R3 - 1 | NO RIGHT TURN (SYMBOL) |
| R3 - 3 | NO TURNS |
| R10 - 5 | LEFT ONLY ON LEFT ARROW |
| R10 - 12 | LEFT TURN YIELD TO GREEN (SYMBOLIC CIRCULAR GREEN) |
| D3 - 16 | STREET NAME (ONE LINE) |
| D3 - 18 | STREET NAME (TWO LINE) |
| R10 - 3B | CROSSWALK (PEDESTRIAN SYMBOL) |
| R10 - 11A | NO TURN ON RED |
| R10 - 13 | EMERGENCY SIGNAL |

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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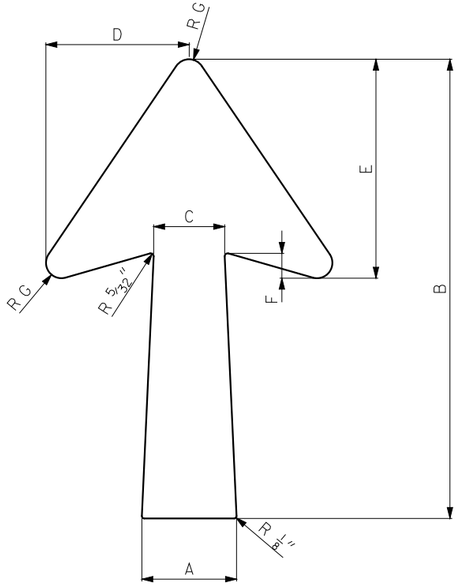
STATE OF MISSOURI
ERIC E. SCHROETER
NUMBER PE-28411
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# TRAFFIC SIGNALS
## TRAFFIC SIGNAL SYMBOLS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 6/1/2015

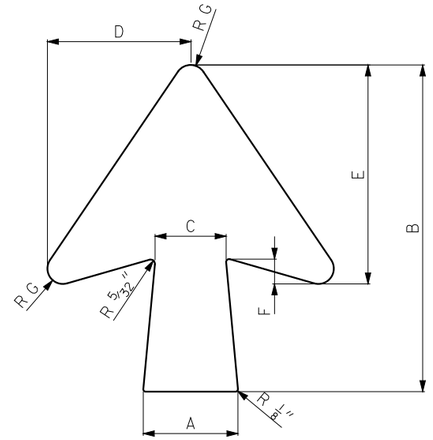
902.80K

SHEET NO. 1 OF 1



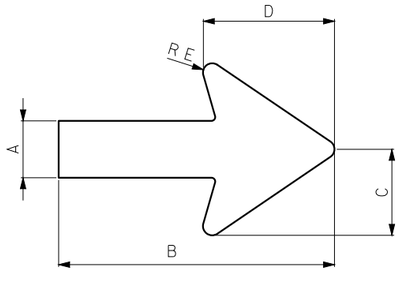

TYPE A

| TYPE A ARROW TABLE | | | | | | | |
|---|---|---|---|---|---|---|---|
| LETTER SIZE | A | B | C | D | E | F | RG |
| 8" U.C. | 5" | 25" | 3 3/4" | 7 9/16" | 11 9/16" | 1 5/16" | 13/16" |
| 10.67" & 13.33" U.C. | 6" | 30" | 4 1/2" | 9 1/8" | 14" | 1 1/2" | 3/4" |
| 16" U.C. | 7 1/8" | 35" | 5 3/8" | 11 1/8" | 17" | 1 3/4" | 1" |




TYPE B

| TYPE B ARROW TABLE | | | | | | | |
|---|---|---|---|---|---|---|---|
| LETTER SIZE | A | B | C | D | E | F | RG |
| 8" - 10.67" U.C. | 5" | 17" | 3 3/4" | 7 9/16" | 11 9/16" | 1 5/16" | 13/16" |
| 13.33" U.C. | 6" | 20" | 4 1/2" | 9 1/8" | 14" | 1 1/2" | 3/4" |
| 16" U.C. | 7 1/8" | 25" | 5 3/8" | 11 1/8" | 17" | 1 3/4" | 1" |

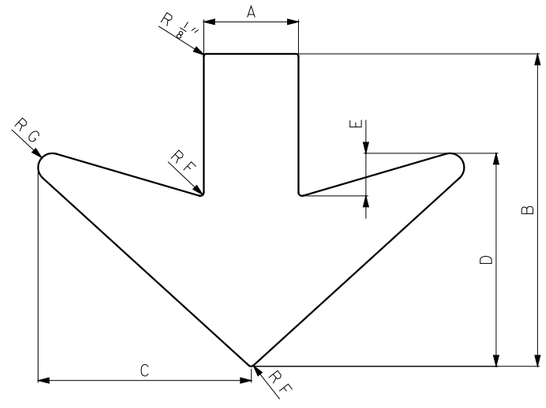



TYPE D

| TYPE D ARROW TABLE | | | | | |
|---|---|---|---|---|---|
| LETTER SIZE | A | B | C | D | RE |
| 6" U.C.* | 2 1/4" | 9" MIN. | 3" | 4 1/2" | 7/16" |
| 8" U.C. | 2 3/4" | 12 1/4" | 3 9/16" | 6 1/8" | 9/16" |
| 10.67" U.C. | 3 1/4" | 14 1/2" | 4 3/8" | 7 1/4" | 5/8" |
| 13.33" U.C. | 3 3/4" | 16 3/4" | 5 1/16" | 8 3/8" | 3/4" |
| 16" U.C. | 4 1/2" | 20" | 6 1/16" | 10" | 7/8" |
| 20" U.C. | 5 1/2" | 24 1/2" | 7 1/2" | 11 1/8" | 1 1/8" |

* FOR HORIZONTAL PLACEMENT UNDER LEGEND, DIMENSION "B" WILL BE EXTENDED, AT 1 FOOT INCREMENTS, TO APPROXIMATELY 50% OF THE MAXIMUM LEGEND WIDTH.

** FOR USE ON SIGNS WITH TYPE L-1 OR L-3 LEGENDS.




TYPE C

| TYPE C OVERHEAD ARROW DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | RF | RG |
| 6 1/2" | 22" | 16" | 16" | 3" | 3/16" | 1" |

GENERAL NOTES:

ARROWS FOR REFERENCE ONLY.

ARROW DETAILS AVAILABLE FROM TRAFFIC AND HIGHWAY SAFETY DIVISION.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

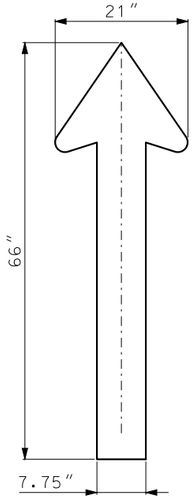
# STANDARD ARROW DETAILS

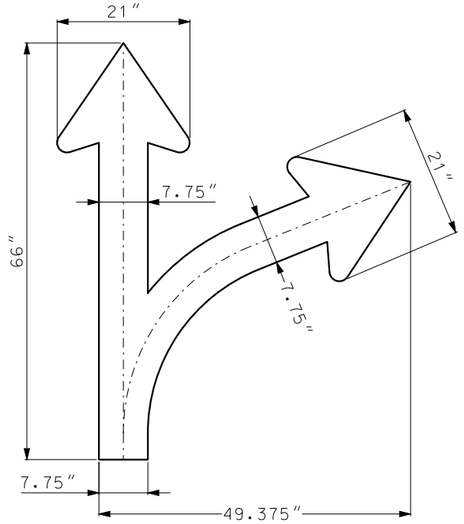
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

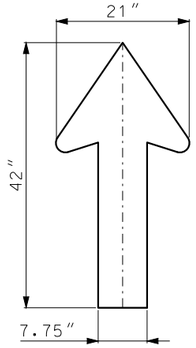
903.01J

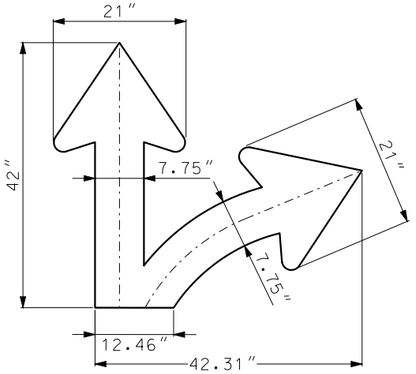
SHEET NO. 1 OF 2

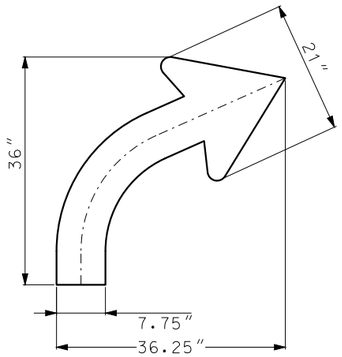

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

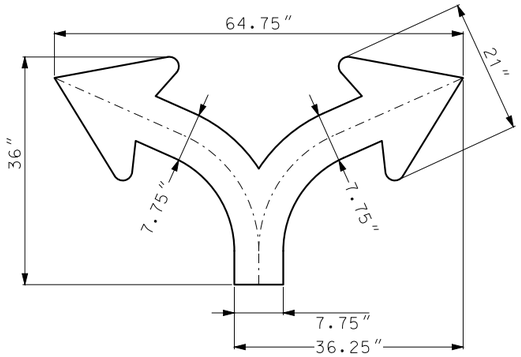


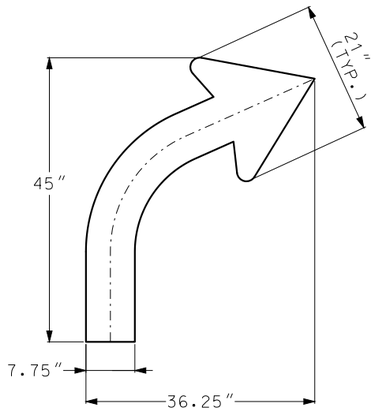



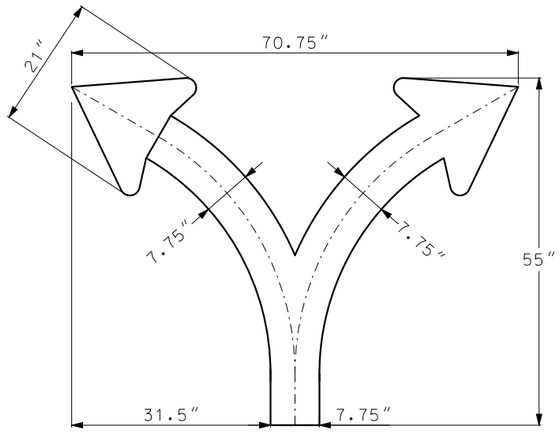




## MUTCD ARROWS

## MODOT ARROWS

GENERAL NOTES:

ARROWS FOR REFERENCE ONLY.

ARROW DETAILS AVAILABLE FROM TRAFFIC AND HIGHWAY SAFETY DIVISION.

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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
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# STANDARD ARROW DETAILS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.01J

SHEET NO. 2 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## STRUCTURAL SIGN DATA

| DESIGNATION | COLOR SCHEME | | SHEETING | |
|---|---|---|---|---|
| | LEGEND | BACKGROUND | LEGEND | BACKGROUND |
| STRUCTURAL (ST) | BLACK | WHITE | OPAQUE BLACK FILM | ASTM TYPE 4 |
| | WHITE | RED | ASTM TYPE 9 OR 11 | ASTM TYPE 4 |
| | WHITE | GREEN | ASTM TYPE 9 OR 11 | ASTM TYPE 4 |
| | WHITE | BLUE | ASTM TYPE 9 OR 11 | ASTM TYPE 4 |
| | WHITE | BROWN | ASTM TYPE 9 OR 11 | ASTM TYPE 4 |
| STRUCTURAL FLUORESCENT (STF) | BLACK | FL YELLOW | OPAQUE BLACK FILM | ASTM TYPE 9 OR 11 |
| | BLACK | FL YELLOW GREEN | OPAQUE BLACK FILM | ASTM TYPE 9 OR 11 |
| | BLACK | FL ORANGE | OPAQUE BLACK FILM | ASTM TYPE 9 OR 11 |

NOTE: WHITE LEGEND IS DIRECT APPLIED UNLESS SPECIFIED OTHERWISE.

## FLAT SHEET SIGN DATA

| DESIGNATION | COLOR SCHEME | | SHEETING |
|---|---|---|---|
| | LEGEND | BACKGROUND | |
| FLAT SHEET (SH) | BLACK ** | WHITE | ASTM TYPE 4 WHITE |
| | WHITE | BLACK ** | ASTM TYPE 4 WHITE |
| | RED | WHITE | ASTM TYPE 4 WHITE |
| | WHITE | RED | ASTM TYPE 4 WHITE |
| | WHITE | GREEN | ASTM TYPE 4 WHITE |
| | GREEN | WHITE | ASTM TYPE 4 WHITE |
| | WHITE | BLUE | ASTM TYPE 4 WHITE |
| | WHITE | BROWN | ASTM TYPE 4 WHITE |
| FLAT SHEET FLUORESCENT (SHF) | BLACK ** | FL YELLOW | ASTM TYPE 9 OR 11 FL YELLOW |
| | BLACK ** | FL YELLOW GREEN | ASTM TYPE 9 OR 11 FL YELLOW GREEN |
| | BLACK ** | FL ORANGE | ASTM TYPE 9 OR 11 FL ORANGE |

** OPAQUE INK OR FILM

NOTE: LEGEND AND BACKGROUND COLORS ARE ACHIEVED THROUGH TRANSLUCENT INKS AND FILMS.

| FLAT SHEET THICKNESS | |
|---|---|
| SIGN SIZE | THICKNESS |
| 9 SF OR LESS | 0.080 IN. |
| OVER 9 SF TO 16 SF | 0.100 IN. |
| 16 SF OR LARGER | 0.125 IN. |

GENERAL NOTES:

GROUND MOUNTED SIGNS GREATER THAN 5 FEET WIDE OR SIGNS GREATER THAN 30 SQUARE FEET SHALL BE STRUCTURAL.

ALL NON STANDARD SIGNS NOT FOUND IN THE MUTCD SHS MANUAL SHALL BE DETAILED BY THE TRAFFIC AND HIGHWAY SAFETY DIVISION OFFICE.

REFER TO STANDARD SPECIFICATION SEC 1042 FOR SHEETING, SUBSTRATE AND FABRICATION DETAILS.

FOR MOUNTING DETAILS, SEE STANDARD PLANS 903.02.

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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# HIGHWAY SIGNING

GENERAL SIGN DATA

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

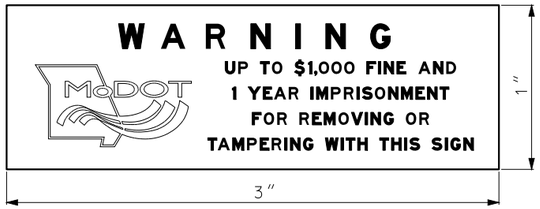
903.02AN

SHEET NO. 1 OF 8

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## MODOT ID LABEL DETAILS

PLACED ON THE SIGN FACE




(1) USED ON SIGNS 9 SF AND LARGER



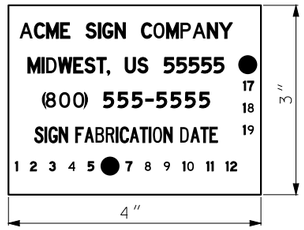

(1) USED ON SIGNS LESS THAN 9 SF

## VENDOR ID LABEL DETAILS

PLACED ON THE BACK OF THE SIGN

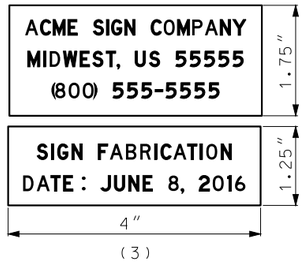



OPTIONAL




(2)

OPTIONAL



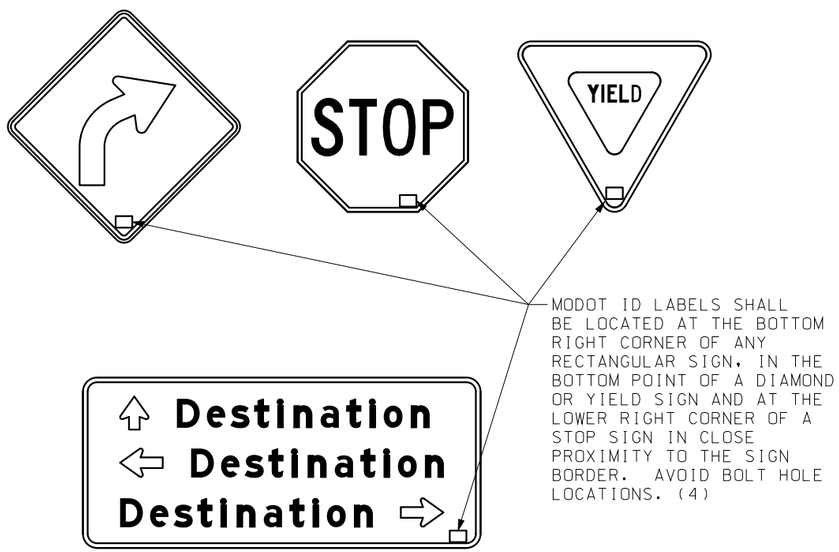

(3)

(1) MODOT ID LABEL DETAILS AVAILABLE FROM TRAFFIC AND HIGHWAY SAFETY DIVISION.

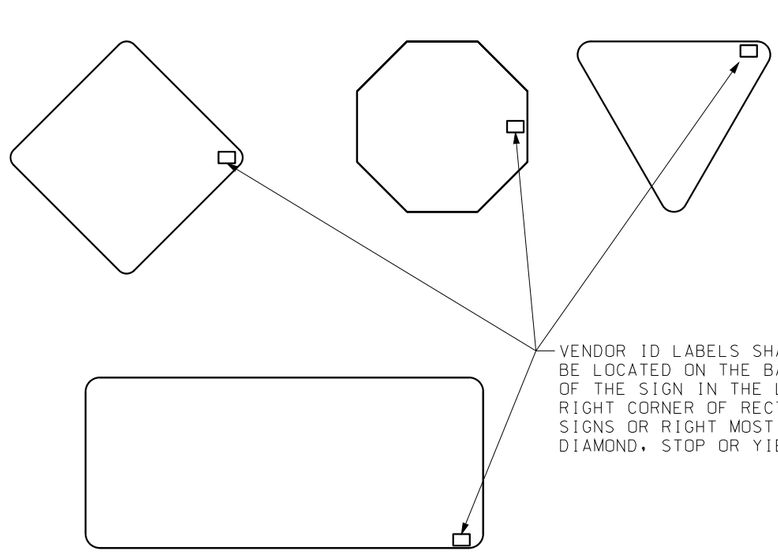
(2) TO FACILITATE MASS PRODUCTION OF LABELS, THE FABRICATION DATE MAY BE INDICATED BY DISPLAYING NUMBERS FOR MONTHS ALONG THE BOTTOM OF THE LABEL AND NUMBERS FOR YEARS ALONG THE RIGHT SIDE OF THE LABEL. THE FABRICATION DATE WOULD BE INDICATED BY HOLE PUNCHING THE APPROPRIATE NUMBERS (OR SOME EQUIVALENT PERMANENT METHOD TO BLOCK OUT OF THE NUMBERS) FOR THE MONTH AND YEAR BEFORE THE LABEL IS APPLIED TO THE SIGN.

(3) INDIVIDUAL DECALS MAY BE USED TO DISPLAY THE VENDOR INFORMATION AND THE FABRICATION DATE. DECALS SHALL BE INSTALLED IN CLOSE VERTICAL PROXIMITY.

(4) THE MODOT ID LABEL MAY BE PLACED ON THE BACK OF THE SIGN ABOVE THE VENDOR ID LABEL IF THERE IS INSUFFICIENT SPACE AVAILABLE TO DISPLAY THE ID LABEL ON THE SIGN FACE WITHOUT INTERFERING WITH THE SIGN LEGEND OR BOARDER.




MODOT ID LABELS SHALL BE LOCATED AT THE BOTTOM RIGHT CORNER OF ANY RECTANGULAR SIGN, IN THE BOTTOM POINT OF A DIAMOND OR YIELD SIGN AND AT THE LOWER RIGHT CORNER OF A STOP SIGN IN CLOSE PROXIMITY TO THE SIGN BORDER. AVOID BOLT HOLE LOCATIONS. (4)



VENDOR ID LABELS SHALL BE LOCATED ON THE BACK OF THE SIGN IN THE LOWER RIGHT CORNER OF RECTANGULAR SIGNS OR RIGHT MOST EDGE OF DIAMOND, STOP OR YIELD SIGNS.

GENERAL NOTES:

ALL DECALS SHALL BE SILK SCREEN PRINTED WITH MATCHED COMPONENT INK AND SHEETING MATERIALS TO PROVIDE A LABEL THAT HAS AN EQUAL LIFE EXPECTANCY AS THE SIGN FACE.

MODOT ID LABELS SHALL BE PRINTED ON CLEAR ELECTROCUT FILM BACKGROUND WITH BLACK INK OR IT MAY BE INCORPORATED INTO THE SILK SCREEN DETAIL AND PRINTED ALONG WITH THE SIGN FACE. IF THE LABEL IS APPLIED IN THIS MANNER THE LEGEND OF THE LABEL SHALL MATCH THE COLOR OF THE SIGN LEGEND IT IS BEING APPLIED TO. THE LABEL SHALL NOT HAVE ANY BACKGROUND COLOR OR BORDER.

VENDOR ID LABEL SHALL CONTAIN THE COMPANY CONTACT INFORMATION (INCLUDING FULL NAME, CITY, STATE, PHONE NUMBER) AND THE SIGN FABRICATION DATE.

VENDOR ID LABEL SHALL BE PRINTED ON A WHITE BACKGROUND WITH BLACK INK AND THE LEGEND SHALL BE A MINIMUM OF 1/4".

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STATE OF MISSOURI
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NUMBER PE-28336
PROFESSIONAL ENGINEER
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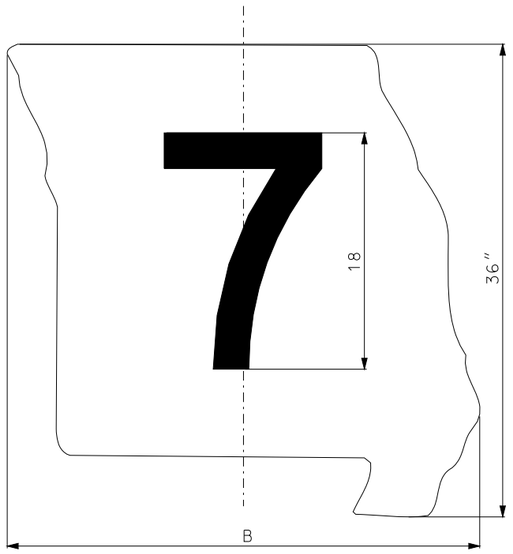
# HIGHWAY SIGNING

GENERAL SIGN DATA

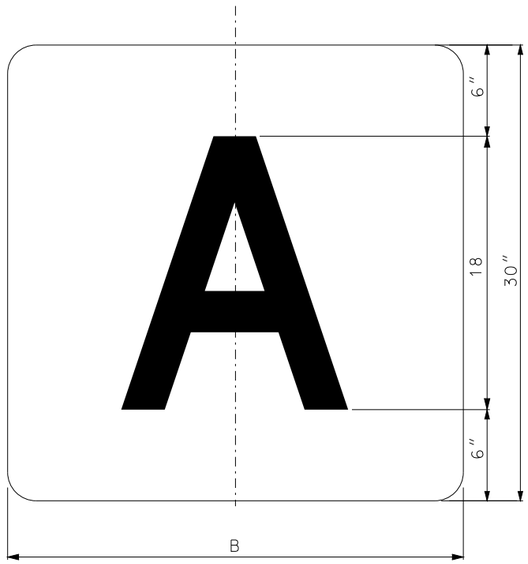
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

903.02AN

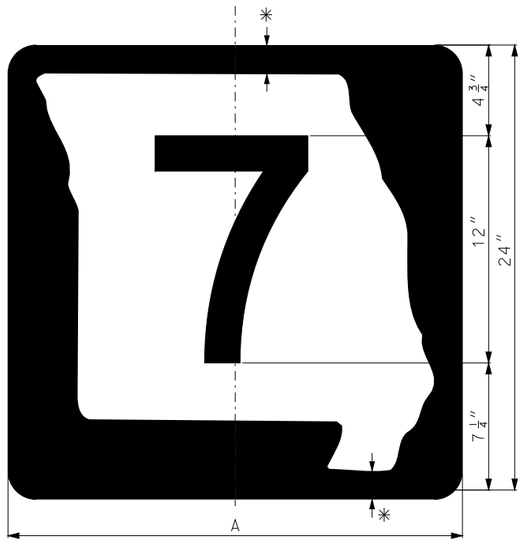
## STATE NUMBER ROUTE SHIELD GUIDE SIGN USE




## STATE LETTER ROUTE SHIELD GUIDE SIGN USE

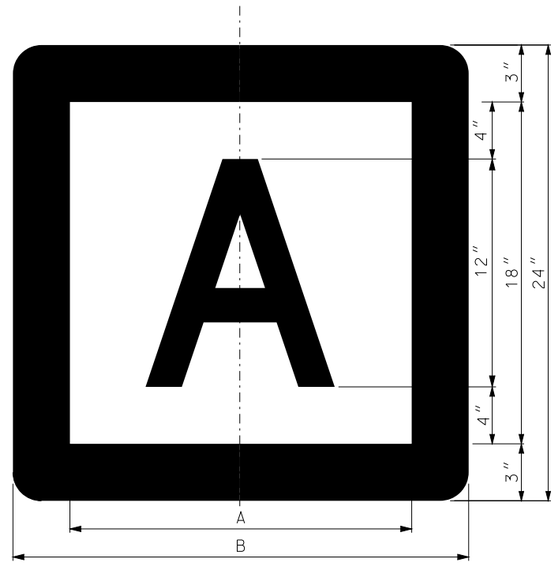



## STATE NUMBER ROUTE SHIELD INDEPENDENT USE




✳ DIMENSIONS SHALL BE EQUAL

## STATE LETTER ROUTE SHIELD INDEPENDENT USE




| LOCATION | NO. OF LETTERS | DIMENSIONS (INCHES) | | LEGEND FONTS |
|---|---|---|---|---|
| | | A | B | |
| INDEPENDENT USE | 1 | 18 | 24 | D |
| INDEPENDENT USE | 2 | 24 | 30 | D |
| GUIDE SIGN USE | 1 | – | 30 | D |
| GUIDE SIGN USE | 2 | – | 36 | D |

## STATE LETTER ROUTE SHIELD

| LOCATION | ROUTE NUMBER | DIMENSIONS (INCHES) | | LEGEND FONTS |
|---|---|---|---|---|
| | | A | B | |
| INDEPENDENT USE | 1 & 2 DIGITS | 24 | 24 | D,C |
| INDEPENDENT USE | 3 DIGITS | 30 | 30 | D,C,B |
| GUIDE SIGN USE | 1 & 2 DIGITS | – | 36 | D,C |
| GUIDE SIGN USE | 3 DIGITS | – | 45 | D,C,B |

## STATE NUMBER ROUTE SHIELD







GENERAL NOTES:

REFER TO STANDARD SPECIFICATION SEC 1042 FOR SHEETING AND SUBSTRATE DETAILS.

FOR HOLE PUNCHING AND MOUNTING DETAILS SEE OTHER DRAWINGS.

FOR GENERAL SIGN DATA DETAILS SEE OTHER DRAWINGS.

THE MISSOURI SHAPE DETAIL MAY BE OBTAINED FROM THE TRAFFIC AND HIGHWAY SAFETY DIVISION OFFICE.

GUIDE SIGN USE SHALL BE DIRECT APPLIED. POST MOUNTED USE SHALL BE APPLIED TO ALUMINUM SUBSTRATE.

FOR NUMBERED ROUTES WITH MORE THAN 1 DIGIT THE LEGEND FONT MAY NEED TO BE REDUCED TO C OR B FONT.

SEE MUTCD SHS FOR DETAILS FOR US AND INTERSTATE ROUTE SHIELDS.

NON-STANDARD SHIELD SIZES MAY BE OBTAINED FROM THE TRAFFIC AND HIGHWAY SAFETY DIVISION OFFICE.

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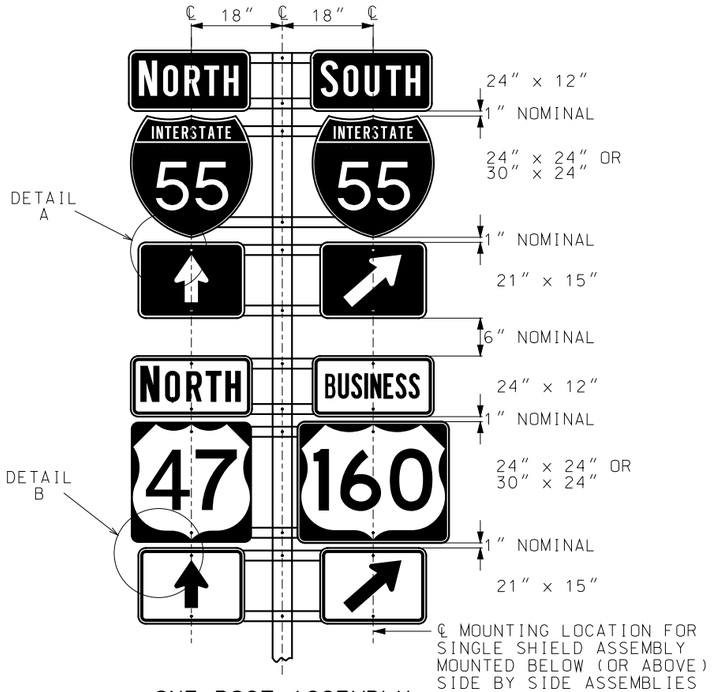
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
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# HIGHWAY SIGNING
STANDARD SHIELDS FOR INDEPENDENT AND GUIDE SIGN USE

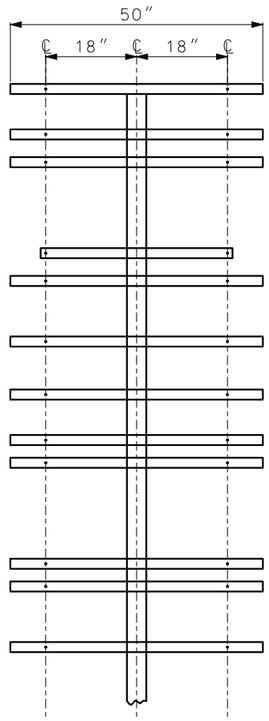
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

903.02AN

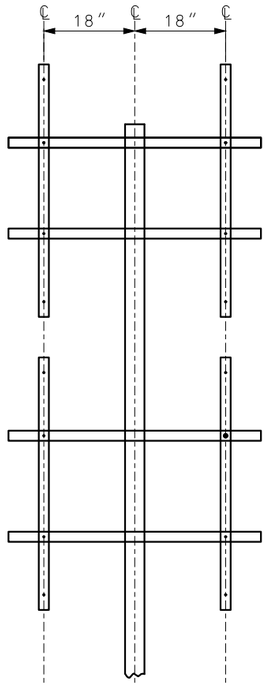



ONE POST ASSEMBLY

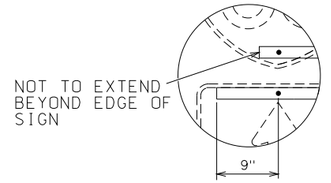
USE TO SUPPORT UP TO 4 ROUTE MARKERS




STANDARD BACKING BAR LAYOUT

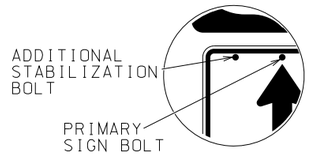



OPTIONAL BACKING BAR LAYOUT



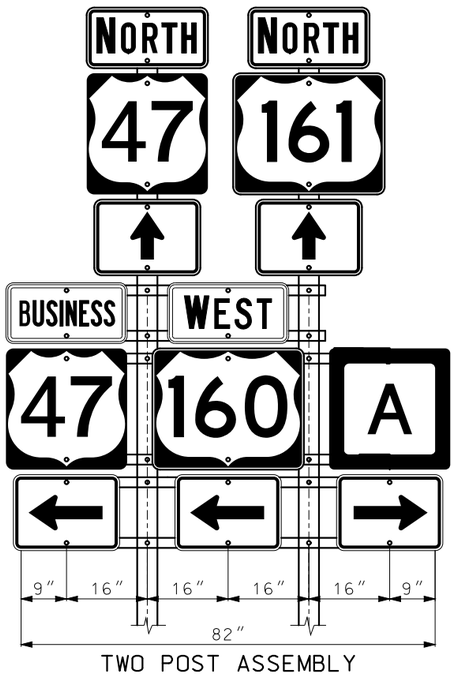

DETAIL A

SEE GENERAL NOTES



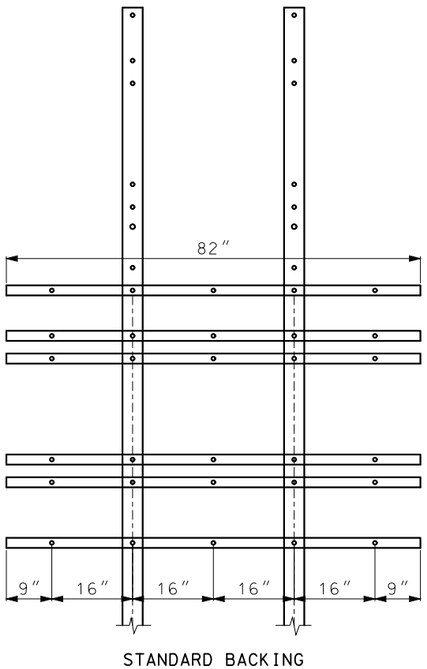

DETAIL B

SEE GENERAL NOTES




TWO POST ASSEMBLY

USE TO SUPPORT 5 OR 6 ROUTE MARKERS




STANDARD BACKING BAR LAYOUT

TWO POST ASSEMBLY NOTE:

OPTIONAL BACKING BAR LAYOUT MAY BE USED WITH TWO POST ASSEMBLY.

FOR 6 ROUTE SHIELD ASSEMBLY ADDITIONAL BACKING BARS ARE REQUIRED.

POST SELECTION

SINGLE POST ASSEMBLIES SHALL USE A 4″ PIPE POST OR A $2\frac{1}{2}$″ PSST POST.

TWO POST ASSEMBLIES SHALL USE TWO 4″ PIPE POSTS OR TWO $2\frac{1}{2}$″ PSST POST WITH $2\frac{1}{4}$″ PSST INSERTS AND BREAKAWAYS. (SEE STANDARD PLAN 903.03)

GENERAL NOTES:

ALL BACKING BARS SHALL BE 2″x $\frac{3}{8}$″ STEEL, GALVANIZED AFTER PUNCHING. WEIGHT = 2.55 LBS. PER FOOT. HOLES IN BARS SHALL BE $\frac{3}{8}$″ AND SHALL BE PUNCHED AS SHOWN ON THIS DRAWING.

DETAIL A – FOR SIGNS INSTALLED ON TWO PARALLEL HORIZONTAL BACKING BARS, ONE ADDITIONAL BOLT SHALL BE ADDED TO THE LEFT SIGN TO KEEP ASSEMBLY SQUARE.

DETAIL B – THE END OF THE HORIZONTAL BACKING BARS SHALL EXTEND MAXIMUM OF 9 INCHES PAST THE SIGN BOLT, BUT SHALL NOT EXTEND PAST THE EDGE OF THE SIGN.

WHEN USING OPTIONAL BACKING BAR LAYOUT, VERTICAL BARS SHALL BE MOUNTED BEHIND HORIZONTAL BARS.

BACKING BARS SHALL MEET MISSOURI STANDARD PLANS OR APPROVED PRODUCTS LIST.

BACKING BARS PAID FOR AS STRUCTURAL STEEL, PER POUND.

ALL SIGNS TO BE INSTALLED ALONG VERTICAL CENTERLINES.

FOR POST AND FOOTING DATA AND DETAILS OF SHIELDS AND PLAQUES, SEE OTHER DRAWINGS.

NOMINAL VERTICAL SPACING INDICATED BETWEEN SIGNS TO BE ACHIEVED BY USING THE CLOSEST AVAILABLE HOLES WHEN USING PSST.

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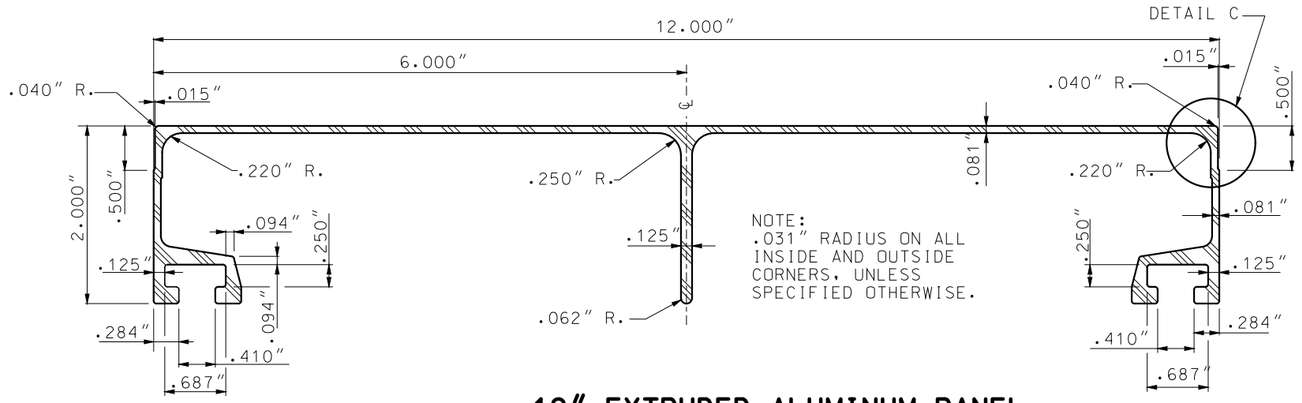
# HIGHWAY SIGNING
## BACKING BARS SHEET SIGN MOUNTING ROUTE SHIELD AND MARKER ASSEMBLIES

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

903.02AN

SHEET NO. 4 OF 8

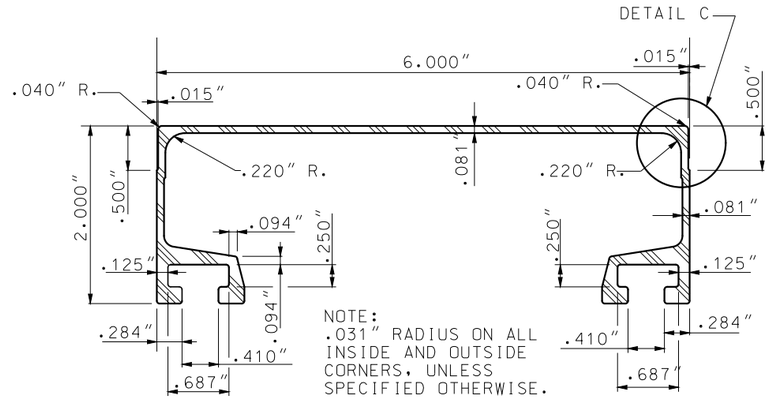
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## 12" EXTRUDED ALUMINUM PANEL

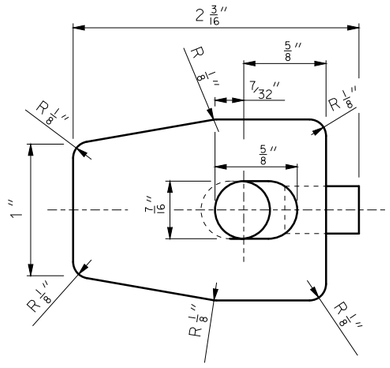
MINIMUM WT. = 2.40 LBS./FT.

NOTE:
MINIMUM WEIGHT AND THICKNESS DIMENSIONS SHOWN.
HEAVIER PANELS MAY BE USED.

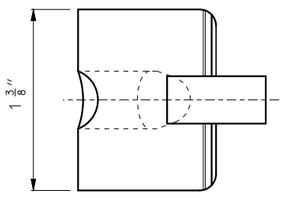



## 6" EXTRUDED ALUMINUM PANEL

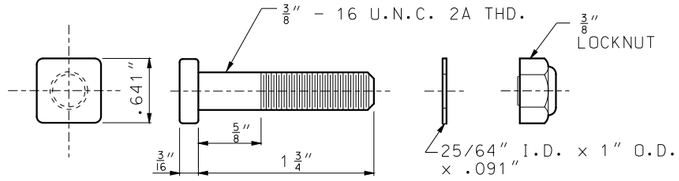
MINIMUM WT. = 2.40 LBS./FT.




PLAN VIEW



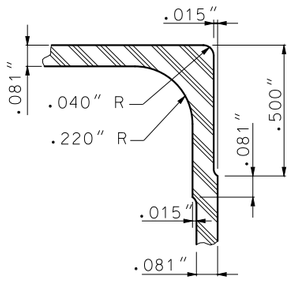

END VIEW



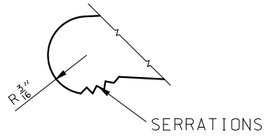

## POST CLIP BOLT
## WITH FLAT WASHER AND LOCKNUT

NOTE:
SQUARE BOLT HEAD SHOWN.
RECTANGULAR BOLT HEAD WITH
LEAST DIMENSION OF .641" MAY
BE USED.

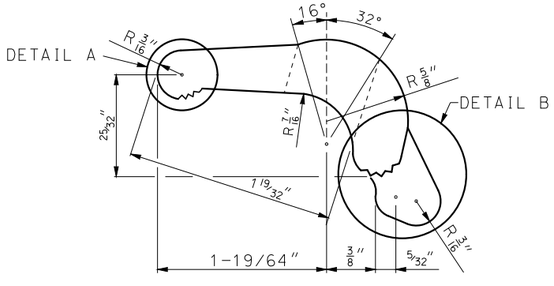
BOLT - 1 3/4 x 3/8 ALUMINUM
HEX LOCKNUT - 3/8" ALUMINUM
WASHER - ALUMINUM



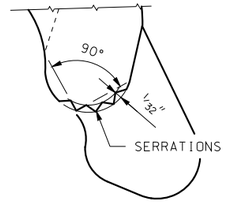

DETAIL C




DETAIL A
ENLARGED VIEW OF
SERRATIONS




ELEVATION VIEW




DETAIL B
ENLARGED DETAIL OF SERRATIONS

## POST CLIP

POST CLIPS SHALL BE ASTM B 108, 356-T6 ALUMINUM ALLOY.

SAW GATING AS SHOWN
(APPROXIMATELY FLAT PERMISSABLE)

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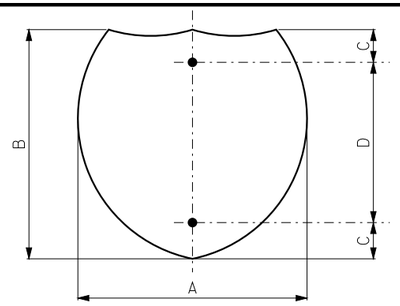
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
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# HIGHWAY SIGNING
EXTRUDED ALUMINUM PANEL DETAILS

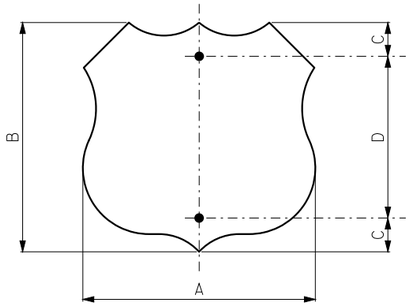
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

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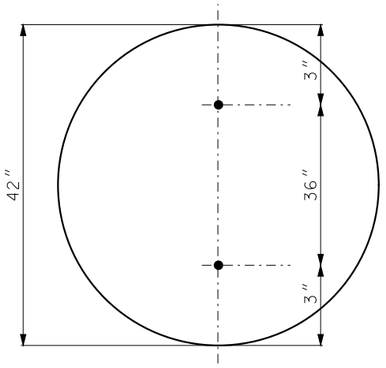
SHEET NO. 5 OF 8

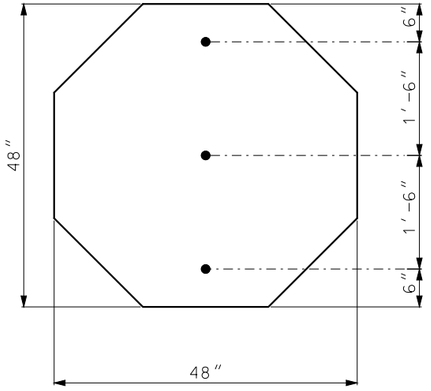


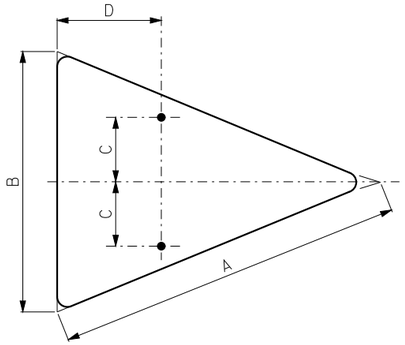

| DIMENSIONS (IN.) | | | |
|---|---|---|---|
| A | B | C | D |
| 24 | 24 | 3 | 18 |
| 30 | 24 | 3 | 18 |
| 36 | 36 | 6 | 24 |
| 45 | 36 | 6 | 24 |



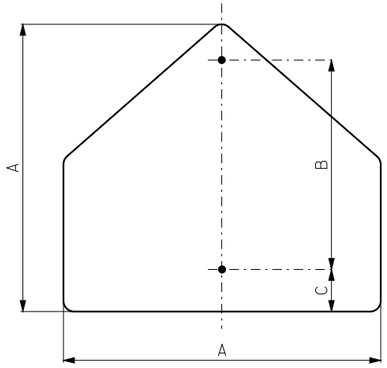

| DIMENSIONS (IN.) | | | |
|---|---|---|---|
| A | B | C | D |
| 24 | 24 | 3 | 18 |
| 30 | 24 | 3 | 18 |
| 36 | 36 | 6 | 24 |
| 45 | 36 | 6 | 24 |



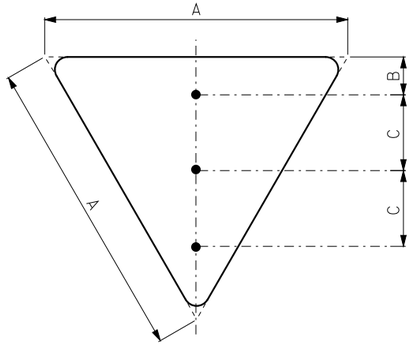



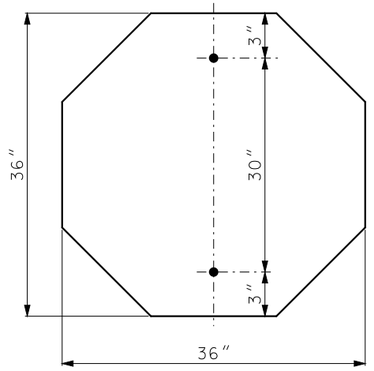

| DIMENSIONS (IN.) | | | | |
|---|---|---|---|---|
| A | B | C | D | RADIUS |
| 40 | 30 | 7.5 | 12 | 1.875 |
| 48 | 36 | 9 | 15 | 2.25 |

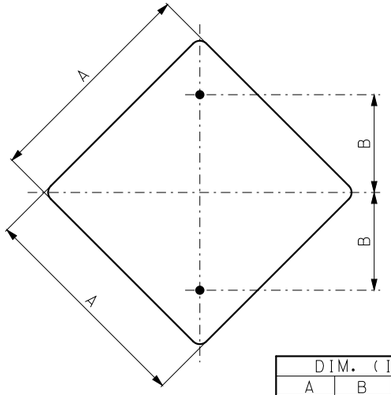



| DIMENSIONS (IN.) | | | |
|---|---|---|---|
| A | B | C | RADIUS |
| 36 | 24 | 3 | 2.25 |

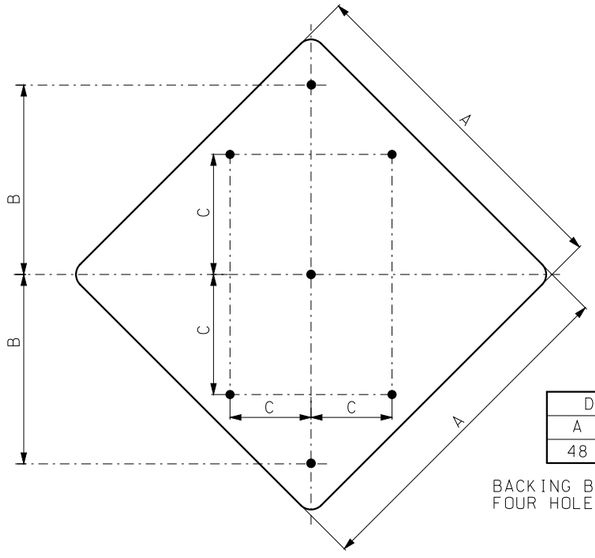



| DIMENSIONS (IN.) | | | |
|---|---|---|---|
| A | B | C | RADIUS |
| 48 | 6 | 12 | 3 |
| 60 | 8 | 15 | 4 |




| DIM. (IN.) | | |
|---|---|---|
| A | B | RADIUS |
| 18 | 9 | 1.5 |
| 24 | 12 | 1.5 |
| 30 | 15 | 1.875 |
| 36 | 18 | 2.25 |




| DIMENSIONS (IN.) | | | |
|---|---|---|---|
| A | B | C | RADIUS |
| 48 | 24 | 15 | 3 |

BACKING BARS ONLY REQUIRED FOR FOUR HOLE PUNCH INSTALLATION.

GENERAL NOTES:

SIGNS WITH FOUR OR MORE HOLES REQUIRE BACKING BARS OR MULTIPLE POSTS.

HOLES IN SIGNS SHALL BE $\frac{3}{8}$" AND PUNCHED AS SHOWN ON THIS DRAWING.

FLAT SHEET FOR SIGNS SHALL BE THE FOLLOWING THICKNESS:

9 SQUARE FEET OR LESS - .080 IN.,

OVER 9 SQUARE FEET BUT LESS THAN 16 SQUARE FEET - .100 IN.,

16 SQUARE FEET OR LARGER - .125 IN.

FOR MOUNTING DETAILS, SEE OTHER DRAWINGS.

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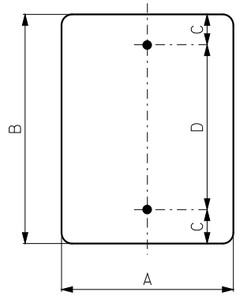

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# HIGHWAY SIGNING

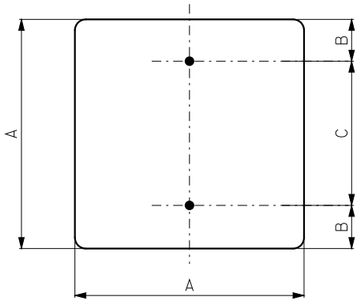
## HOLE PUNCHING

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

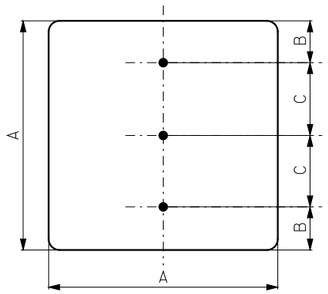
903.02AN



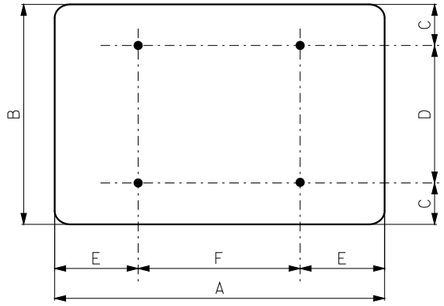

| DIMENSIONS (IN.) | | | | |
|---|---|---|---|---|
| A | B | C | D | RADIUS |
| 4 | 16 | 0.75 | 14.5 | SQ |
| 6 | 12 | 1.5 | 9 | 1 |
| 9 | 12 | 3.5 | 5 | 1.5 |
| 9 | 15 | 3.75 | 7.5 | 1.5 |
| 12 | 18 | 3 | 12 | 1.5 |
| 12 | 24 | 3 | 18 | 1.5 |
| 12 | 36 | 3 | 30 | 1.5 |
| 12 | 48 | 3 | 42 | 1.5 |
| 15 | 21 | 3 | 15 | 1.5 |
| 18 | 24 | 3 | 18 | 1.5 |
| 24 | 30 | 3 | 24 | 1.5 |
| 24 | 36 | 3 | 30 | 1.5 |
| 30 | 36 | 3 | 30 | 1.875 |
| 30 | 42 | 3 | 36 | 1.875 |
| 30 | 48 | 6 | 36 | 1.875 |



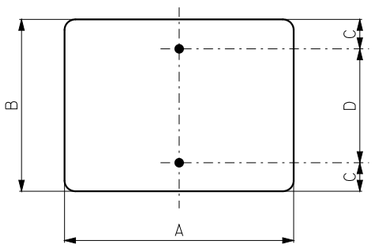

| DIMENSIONS (IN.) | | | |
|---|---|---|---|
| A | B | C | RADIUS |
| 12 | 1.5 | 9 | 1.5 |
| 18 | 3 | 12 | 1.5 |
| 24 | 3 | 18 | 1.5 |
| 30 | 3 | 24 | 1.875 |
| 36 | 6 | 24 | 2.25 |



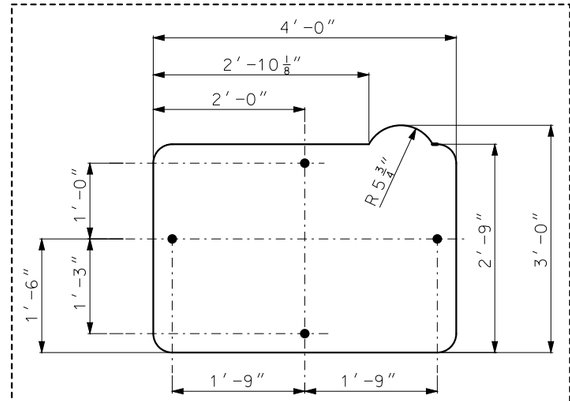

| DIMENSIONS (IN.) | | |
|---|---|---|
| A | B | RADIUS |
| 48 | 6 | 3 |



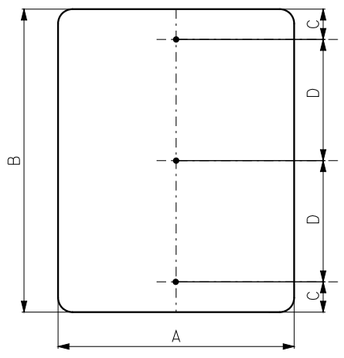

| DIMENSIONS (IN.) | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | F | RADIUS |
| 48 | 12 | 1.5 | 9 | 9 | 30 | 1.5 |
| 48 | 18 | 1.5 | 15 | 9 | 30 | 1.5 |
| 48 | 24 | 3 | 18 | 9 | 30 | 1.5 |
| 48 | 30 | 3 | 24 | 9 | 30 | 1.875 |
| 48 | 36 | 6 | 24 | 9 | 30 | 2.25 |
| 54 | 18 | 1.5 | 15 | 9 | 36 | 1.5 |
| 60 | 12 | 1.5 | 9 | 12 | 36 | 1.5 |
| 60 | 18 | 1.5 | 15 | 12 | 36 | 1.5 |
| 60 | 24 | 3 | 18 | 12 | 36 | 1.5 |
| 60 | 30 | 3 | 24 | 12 | 36 | 1.875 |
| 60 | 36 | 6 | 24 | 12 | 36 | 2.25 |
| 60 | 48 | 6 | 36 | 12 | 36 | 3 |
| 72 | 36 | 6 | 24 | 12 | 48 | 2.25 |
| 72 | 48 | 6 | 36 | 12 | 48 | 3 |



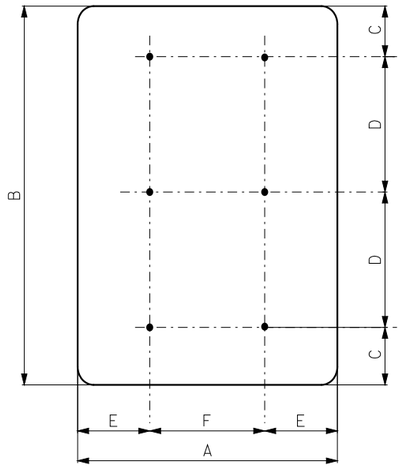

| DIMENSIONS (IN.) | | | | |
|---|---|---|---|---|
| A | B | C | D | RADIUS |
| 4 | 5 | 1.5 | 2 | 1.5 |
| 12 | 9 | 1.5 | 6 | 1.5 |
| 18 | 9 | 1.5 | 6 | 1.5 |
| 18 | 12 | 1.5 | 9 | 1.5 |
| 21 | 15 | 1.5 | 12 | 1.5 |
| 24 | 8 | 1.5 | 5 | 1.5 |
| 24 | 12 | 1.5 | 9 | 1.5 |
| 24 | 18 | 3 | 12 | 1.5 |
| 30 | 8 | 1.5 | 5 | 1.5 |
| 30 | 12 | 1.5 | 9 | 1.5 |
| 30 | 18 | 3 | 12 | 1.5 |
| 30 | 24 | 3 | 18 | 1.5 |
| 36 | 8 | 1.5 | 5 | 1.5 |
| 36 | 12 | 1.5 | 9 | 1.5 |
| 36 | 18 | 3 | 12 | 1.5 |
| 36 | 24 | 3 | 18 | 1.5 |
| 36 | 30 | 3 | 24 | 1.875 |
| 42 | 8 | 1.5 | 5 | 1.5 |
| 42 | 18 | 3 | 12 | 1.5 |
| 42 | 24 | 3 | 18 | 1.5 |
| 42 | 30 | 3 | 24 | 1.875 |
| 42 | 36 | 3 | 30 | 2.25 |
| 48 | 8 | 1.5 | 5 | 1.5 |



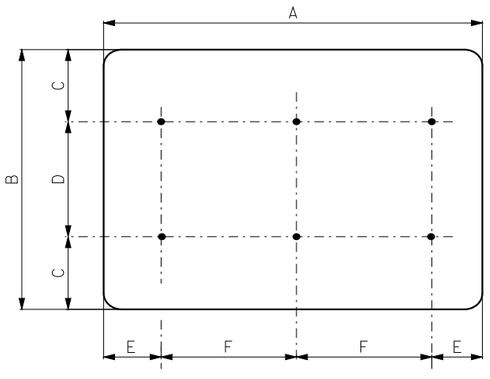

ADOPT A HIGHWAY
PRIMARY SIGN AND
NAME PANEL




| DIMENSIONS (IN.) | | | | |
|---|---|---|---|---|
| A | B | C | D | RADIUS |
| 4 | 72 | 6 | 30 | SQ |
| 12 | 72 | 6 | 30 | 1.5 |
| 18 | 60 | 6 | 24 | 1.5 |
| 24 | 48 | 6 | 18 | 1.5 |
| 36 | 48 | 6 | 18 | 2.25 |
| 36 | 60 | 6 | 24 | 2.25 |
| 36 | 72 | 6 | 30 | 2.25 |

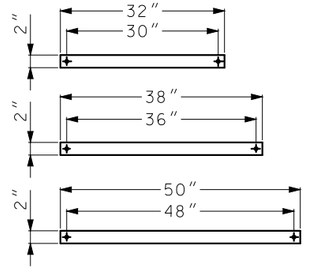



| DIMENSIONS (IN.) | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | F | RADIUS |
| 48 | 60 | 6 | 24 | 9 | 30 | 3 |
| 48 | 72 | 6 | 30 | 9 | 30 | 3 |
| 48 | 84 | 6 | 36 | 9 | 30 | 3 |
| 48 | 96 | 6 | 42 | 9 | 30 | 3 |




| DIMENSIONS (IN.) | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | F | RADIUS |
| 84 | 24 | 3 | 18 | 12 | 30 | 3 |
| 96 | 48 | 6 | 36 | 16 | 32 | 3 |

| DIMENSIONS (IN.) FOR SIGNS REQUIRING NO HOLE PUNCHING | | |
|---|---|---|
| A | B | RADIUS |
| 66 | 18 | 1.5 |
| 72 | 18 | 1.5 |
| 78 | 18 | 1.5 |
| 84 | 18 | 1.5 |
| 90 | 18 | 1.5 |
| 96 | 18 | 1.5 |
| 36 | 78 | 2.25 |




BACKING BARS FOR SINGLE POST SIGNS

GENERAL NOTES:

REFER TO GENERAL NOTES ON SHEET 6 OF 8.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

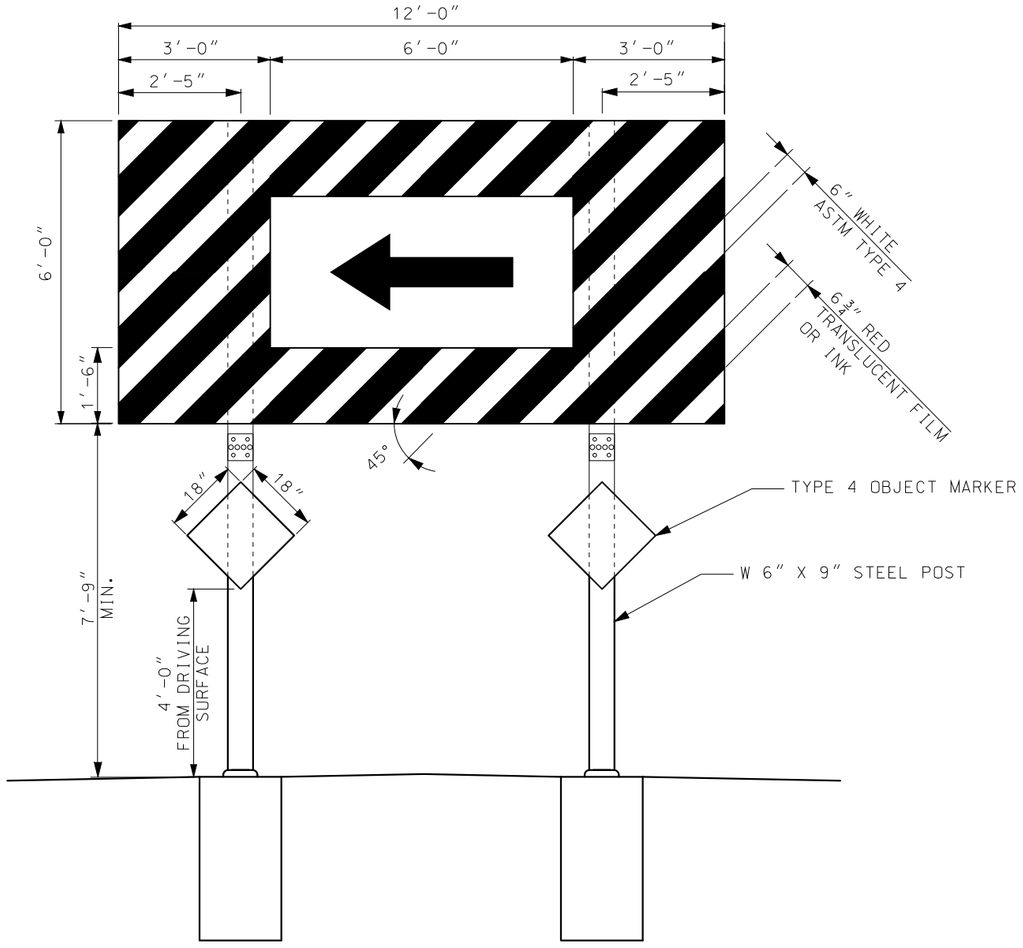
# HIGHWAY SIGNING

HOLE PUNCHING

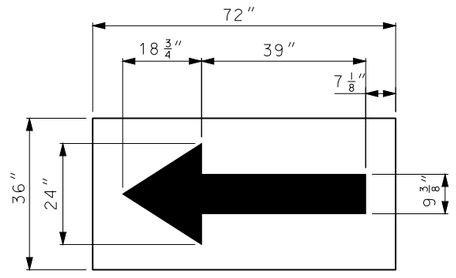
DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

903.02AN

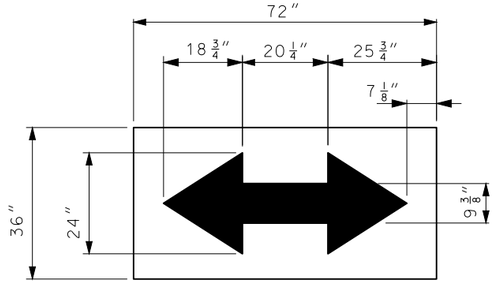
SHEET NO. 7 OF 8



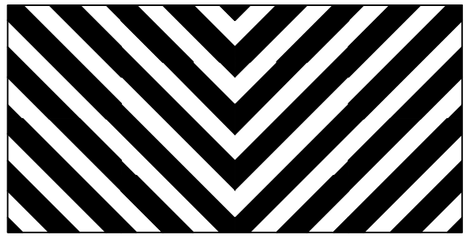

SEE STANDARD PLAN 903.03
FOR MOUNTING HEIGHT ON UNLEVEL GROUND



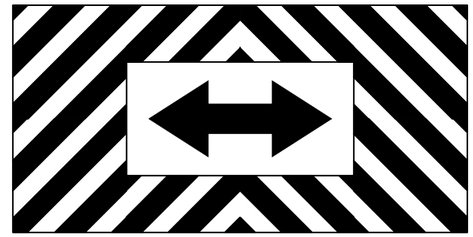

W1-6



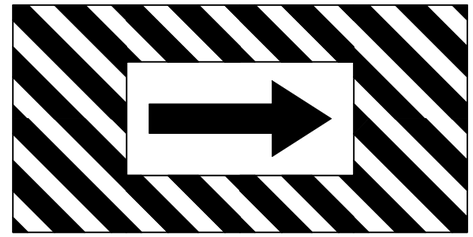

W1-7



DEAD END



T-INTERSECTION



GENERAL NOTES:

SEE STANDARD PLAN 903.03 FOR WIDE FLANGE INSTALLATION.

SIGN BARRICADE SHALL BE CONSTRUCTED AS A STRUCTURAL (ST) SIGN.

DIRECTIONAL ARROWS SHALL BE SHF AND CONSIDERED INCIDENTAL TO THE SIGN.

ALL REFLECTORIZED SURFACES SHALL BE RETROREFLECTIVE SHEETING IN ACCORDANCE WITH SEC 1042.

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# HIGHWAY SIGNING

SIGN BARRICADE

DATE EFFECTIVE: 01/01/2017
DATE PREPARED: 10/28/2016

903.02AN

SHEET NO. 8 OF 8

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## STRUCTUAL STEEL POST FOR GROUND MOUNTED SIGNS

| POST | | BOLT | | | WASHER | | | BASE CONNECTION DATA TABLE (IN.) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DES. NO. | NOM SIZE (IN. X LBS/FT) | DIA IN. | LENGTH IN. | TORQUE IN./LB. | OD IN. | ID IN. | THICK IN. | A | B | C | D | E | F | G | W | R |
| 1 | W6x9 | $\frac{5}{8}$ | $2\frac{3}{4}$ | 345 | $1\frac{5}{16}$ | $\frac{11}{16}$ | $\frac{1}{8}$ | 5 | 2 | $1\frac{1}{4}$ | $2\frac{3}{4}$ | $1\frac{1}{8}$ | $\frac{3}{4}$ | $\frac{1}{2}$ | $\frac{1}{4}$ | $\frac{11}{32}$ |
| 2 | W6x15 | | | | | | | | | | | | | | | |
| 3 | W8x18 | | | | | | | | | | | | | | | |
| 4 | W10x22 | $\frac{3}{4}$ | $3\frac{1}{2}$ | 555 | $1\frac{15}{32}$ | $\frac{13}{16}$ | $\frac{1}{8}$ | 6 | $2\frac{1}{4}$ | $1\frac{3}{8}$ | $3\frac{1}{2}$ | $1\frac{1}{4}$ | 1 | $\frac{3}{4}$ | $\frac{5}{16}$ | $\frac{13}{32}$ |
| 5 | W10x26 | | | | | | | | | | | | | | | |
| 6 | W12x35 | | | | | | | | | | | | | | | |

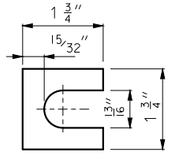
## POST AND FOOTING DATA TABLE

| POST | | | | | FOOTING | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POST DES. NO. | NOM. SIZE | WEIGHT | | STUB LENGTH | DIA. | LEVEL GROUND | | 6:1 GRADE | | 4:1 GRADE | | 3:1 OR 2:1 GRADE | |
| | | LBS/FT | LBS/IN | | | DEPTH | C.Y. | DEPTH | C.Y. | DEPTH | C.Y. | DEPTH | C.Y. |
| 1 | W6 | 9.0 | 0.75 | 3′-0″ | 15″ | 3′-0″ | 0.14 | 3′-2″ | 0.15 | 3′-3″ | 0.16 | 3′-6″ | 0.17 |
| 2 | W6 | 15.0 | 1.25 | 4′-0″ | 24″ | 4′-0″ | 0.47 | 4′-2″ | 0.50 | 4′-3″ | 0.51 | 4′-6″ | 0.54 |
| 3 | W8 | 18.0 | 1.50 | 4′-6″ | 28″ | 4′-6″ | 0.71 | 4′-8″ | 0.73 | 4′-9″ | 0.74 | 5′-0″ | 0.78 |
| 4 | W10 | 22.0 | 1.83 | 5′-0″ | 36″ | 5′-0″ | 1.31 | 5′-2″ | 1.36 | 5′-3″ | 1.39 | 5′-6″ | 1.45 |
| 5 | W10 | 26.0 | 2.17 | 5′-0″ | 36″ | 5′-0″ | 1.31 | 5′-3″ | 1.37 | 5′-5″ | 1.43 | 5′-9″ | 1.52 |
| 6 | W12 | 35.0 | 2.92 | 5′-6″ | 36″ | 5′-6″ | 1.44 | 5′-9″ | 1.52 | 5′-11″ | 1.56 | 6′-3″ | 1.65 |

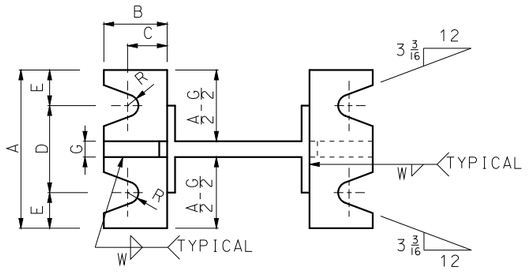
SHEET METAL BOLT RETAINER CUT FROM 30 GAGE GALVANIZED SHEET METAL. PLACE BETWEEN BASE PLATES. SIZE VARIES TO FIT PLATE. BOLT HOLES TO BE $\frac{1}{16}$″ LARGER THAN REQUIRED BOLT SIZE.



BOLT RETAINER

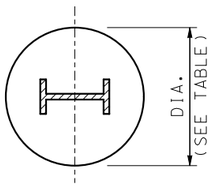



SHIM

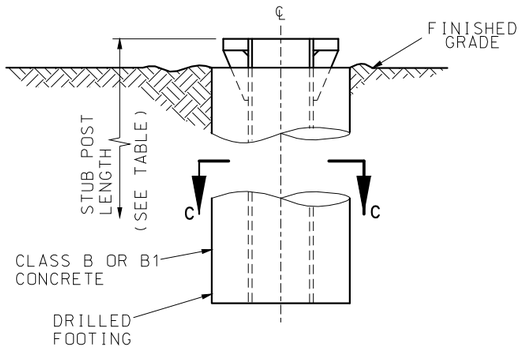



SECTION A-A

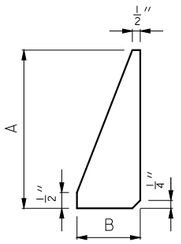
SECTION B-B
POST AND FOOTING



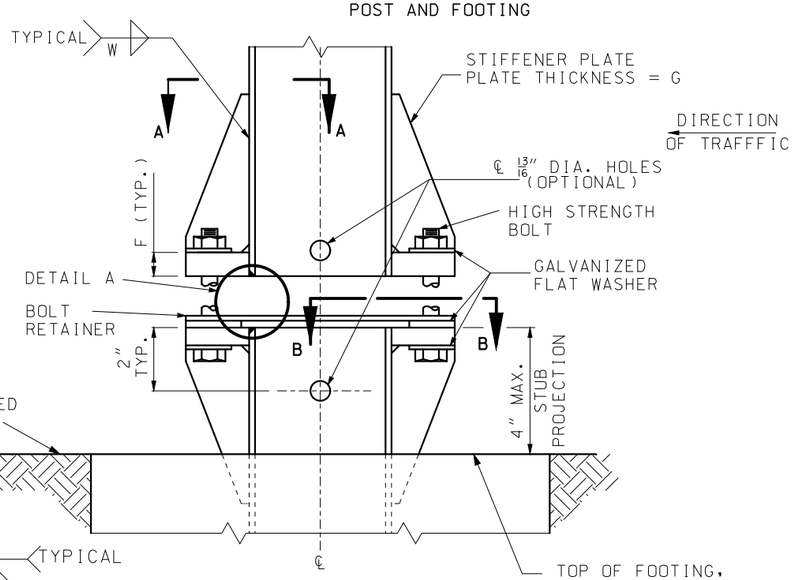

SECTION C-C



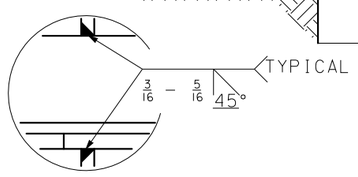

STUB DETAIL



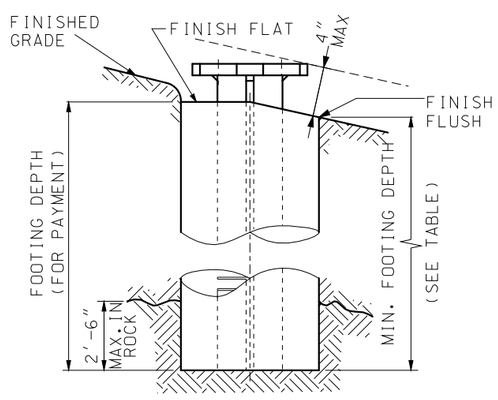

STIFFENER PLATE




ELEVATION




DETAIL A




FOOTING DETAIL

GENERAL NOTES:

DESIGN SPECS: AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS. LUMINAIRES AND TRAFFIC SIGNALS – 1985 (EXCEPT 2001AND LATEST INTERIMS FOR STRUCTURAL STEEL POSTS).

POSTS, PERFORATED FUSE PLATE AND SPLICE PLATE TO BE GALVANIZED AFTER FABRICATION.

METAL PROJECTING BEYOND THE PLANE OF THE PLATE FACE WILL NOT BE ALLOWED.

REMOVE ALL GALVANIZING RUNS OR BEADS IN THE WASHER AREA.

ALL STRUCTURAL STEEL STIFFENER PLATES AND BASE PLATES, FOR GROUND MOUNTED SIGNS SHALL MEET THE REQUIREMENTS OF ASTM A 36 OR AASHTO M 270 GRADE 50, MINIMUM YIELD 50,000 PSI.

IN THE EVENT THE DISTANCE BETWEEN THE TOP OF THE FOOTING AND THE BOTTOM OF THE SIGN IS LESS THAN 7′-9″, THE SIGN HEIGHT AND POST LENGTH IS TO BE INCREASED SUFFICIENTLY TO ACCOMMODATE THIS MINIMUM SPACING.

HINGE PLATES NOT REQUIRED ON SINGLE POST SIGNS OR ANY SIGNS USING PIPE POSTS.

NUTS ON HINGE PLATE BOLTS SHALL BE TIGHTENED TO THE REQUIRED MINIMUM BOLT TENSION VALUES SHOWN IN TABLE 1 SEC. 1080 OF THE STANDARD SPECIFICATIONS.

THE NUT SHALL BE FREE RUNNING. IF THE NUT WILL NOT SPIN ON THE BOLT BECAUSE OF GALVANIZING IRREGULARITIES, A LUBRICANT SHALL BE APPLIED.

ALL BREAKAWAY ASSEMBLY BOLTS SHALL BE TIGHTENED IN A SYSTEMATIC MANNER TO THE PRESCRIBED TORQUE SHOWN ON THIS DRAWING.

EACH BREAKAWAY ASSEMBLY BOLT SHALL BE LOOSENED AND RE-TIGHTENED TO THE REQUIRED TORQUE IN THE SAME ORDER AS THE INITIAL TIGHTENING.

THE THREADS SHALL BE BURRED AT THE NUT USING A CENTER PUNCH TO PREVENT NUT FROM LOOSENING.

POST LENGTH QUANTITY SHOWN ON PLANS INCLUDES STUB.

1″ X $2\frac{1}{2}$″ HIGH STRENGTH BOLTS FOR PIPE POSTS SHALL BE OF THE DESIGNATION AASHTO M 164 OR ASTM A 449. ALL OTHER H.S. BOLTS SHALL BE OF THE DESIGNATION AASHTO M 164.

FURNISH TWO .012″± AND TWO .0032″± THICK SHIMS PER POST FROM BRASS SHIM STOCK OR STRIP, DESIGNATION ASTM B 36. SHIM AS REQUIRED TO PLUMB POST.

HIGH STRENGTH BOLTS WITH HEX NUT AND THREE WASHERS WITH EACH BOLT ARE TO BE GALVANIZED.

OPTIONAL HOLES ($\frac{13}{16}$″ ROUND FOR "I" SHAPE POSTS AND $\frac{9}{16}$″ ROUND FOR PIPE POST BASE PLATES) AS SHOWN IN "ELEVATIONS" ARE TO BE USED AS AID FOR GALVANIZING ONLY.

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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
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NUMBER PE-28336
PROFESSIONAL ENGINEER
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# POST INSTALLATION DETAILS

## POST AND FOOTING DETAILS WIDE FLANGE (WF) POSTS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

SHEET NO. 1 OF 15

## WIDE FLANGE STRUCTURAL STEEL POSTS DESIGN DATA

| POST DES. NO. | NOM. SIZE (IN.) | WEIGHT LB/FT | WEIGHT LB/IN | DEPTH (IN.) | FLANGE WIDTH (IN.) | FLANGE THICK (IN.) | WEB THICK (IN.) |
|---|---|---|---|---|---|---|---|
| 1 | W6 | 9 | 0.75 | 5 7/8 | 4 | 3/16 | 3/16 |
| 2 | W6 | 15 | 1.25 | 6 | 6 | 1/4 | 1/4 |
| 3 | W8 | 18 | 1.50 | 8 1/8 | 5 1/4 | 5/16 | 1/4 |
| 4 | W10 | 22 | 1.83 | 10 1/8 | 5 3/4 | 3/8 | 1/4 |
| 5 | W10 | 26 | 2.17 | 10 3/8 | 5 3/4 | 7/16 | 1/4 |
| 6 | W12 | 35 | 2.92 | 12 1/2 | 6 1/2 | 1/2 | 5/16 |

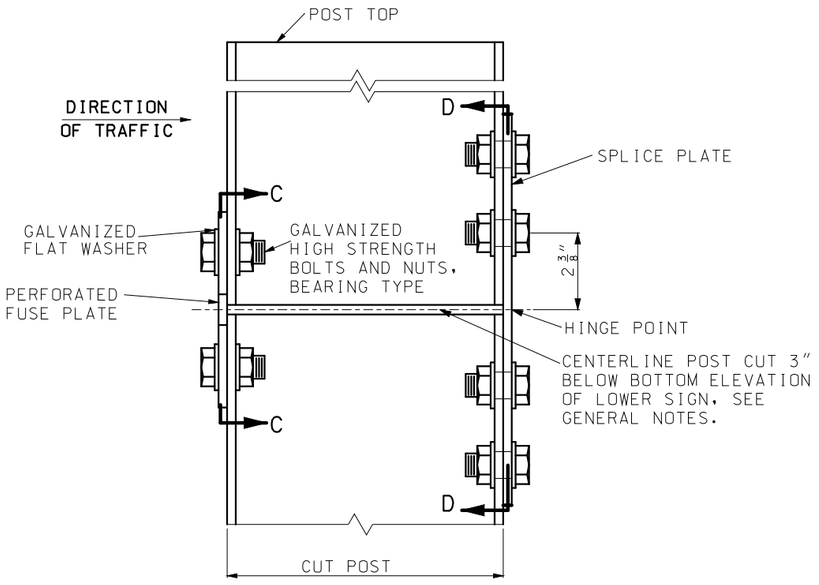
## PERFORATED FUSE PLATE DATA TABLE

| POST DESIGN NO. | F (IN.) | G (IN.) | H (IN.) | J (IN.) | K (IN.) | L (IN.) | M (IN.) | N (IN.) | d1 (IN.) | d2 (IN.) | P (IN.) | BOLT DIA. (IN.) | WT. (EA.) (LBS.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 1/4 | 1 | 1 1/8 | 4 | 2 1/4 | 7/8 | 1 | 1/2 | 9/16 | 3/4 | 3/16 | 1/2 | 0.76 |
| 2 | 5 | 1 1/4 | 1 1/4 | 6 | 3 1/2 | 1 1/4 | 1 1/2 | 3/4 | 11/16 | 1 1/4 | 1/4 | 5/8 | 1.67 |
| 3 | 5 | 1 1/4 | 1 1/4 | 5 1/4 | 2 3/4 | 1 1/4 | 1 1/4 | 3/4 | 11/16 | 1 1/16 | 1/4 | 5/8 | 1.51 |
| 4 | 6 | 1 1/2 | 1 1/2 | 5 3/4 | 2 3/4 | 1 1/2 | 1 3/8 | 13/16 | 13/16 | 1 1/8 | 5/16 | 3/4 | 2.52 |
| 5 | 6 | 1 1/2 | 1 1/2 | 5 3/4 | 2 3/4 | 1 1/2 | 1 3/8 | 13/16 | 13/16 | 1 1/8 | 5/16 | 3/4 | 2.52 |
| 6 | 6 | 1 1/2 | 1 1/2 | 6 1/2 | 3 1/2 | 1 1/2 | 1 5/8 | 13/16 | 13/16 | 1 5/16 | 3/8 | 3/4 | 3.35 |

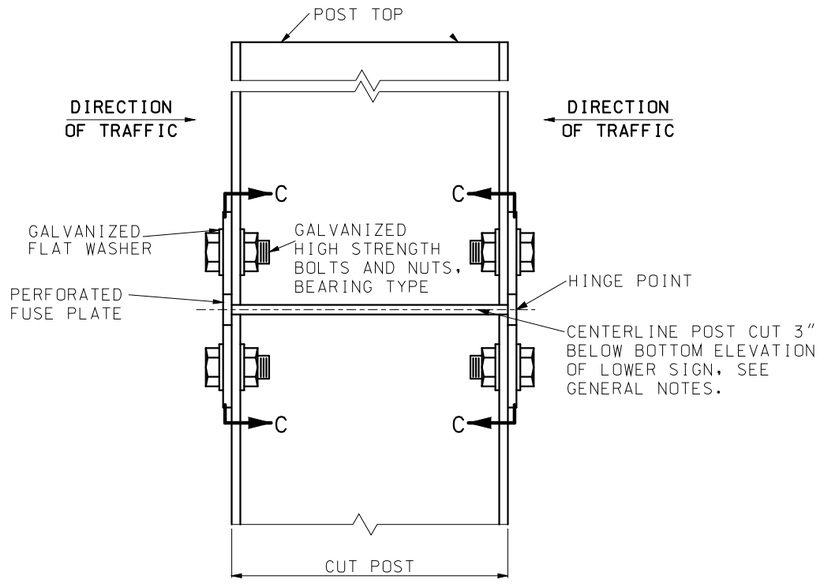
## SPLICE PLATE DATA TABLE

| POST DESIGN NO. | J (IN.) | K (IN.) | L (IN.) | U (IN.) | d1 (IN.) | BOLT DIA. (IN.) | WT. (EA.) (LBS.) | WASHER OD IN. | WASHER ID IN. | WASHER THICK IN. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 2 1/4 | 7/8 | 3/16 | 9/16 | 1/2 | 2.45 | 1 3/16 | 5/8 | 1/8 |
| 2 | 6 | 3 1/2 | 1 1/4 | 1/4 | 11/16 | 5/8 | 4.89 | 1 5/16 | 11/16 | 1/8 |
| 3 | 5 1/4 | 2 3/4 | 1 1/4 | 5/16 | 11/16 | 5/8 | 5.32 | | | |
| 4 | 5 3/4 | 2 3/4 | 1 1/2 | 5/16 | 13/16 | 3/4 | 5.75 | 1 15/32 | 13/16 | 1/8 |
| 5 | 5 3/4 | 2 3/4 | 1 1/2 | 7/16 | 13/16 | 3/4 | 8.04 | | | |
| 6 | 6 1/2 | 3 1/2 | 1 1/2 | 1/2 | 13/16 | 3/4 | 10.47 | | | |

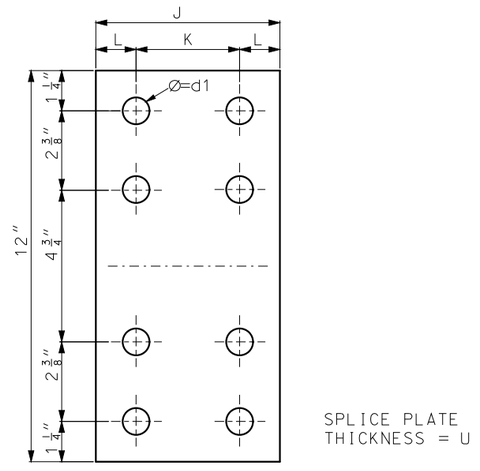
THE WEIGHT OF STRUCTURAL STEEL POSTS SHOWN IN THE CONTRACT HAS BEEN COMPUTED USING THE WEIGHTS SHOWN.




ONE DIRECTION BREAKAWAY

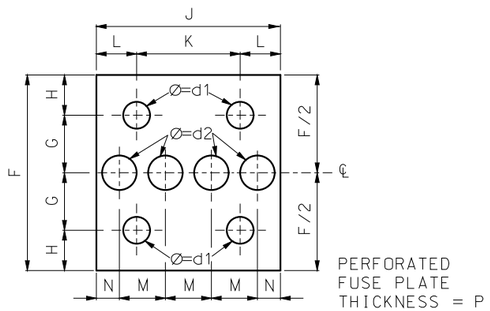



TWO DIRECTION BREAKAWAY




ELEVATION D–D

## PERFORATED FUSE PLATE AND SPLICE PLATE DETAIL




ELEVATION C–C

ALL HOLES SHALL BE DRILLED. ALL PLATE CUTS SHALL PREFERABLY BE SAW CUTS. HOWEVER: FLAME CUTTING WILL BE PERMITTED PROVIDED ALL EDGES ARE GROUND.

PERFORATED FUSE PLATE AND SPICE PLATE SHALL BE FABRICATED FROM ASTM A 36 STRUCTURAL STEEL.

GENERAL NOTES:

REFER TO THE GENERAL NOTES ON SHEET 1.

FOR ROADWAYS WHERE TRAFFIC MAY STRIKE THE BACKSIDE OF THE POST, PERFORATED FUSE PLATES SHALL BE INSTALLED ON BOTH SIDES OF THE POST.


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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
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# POST INSTALLATION DETAILS

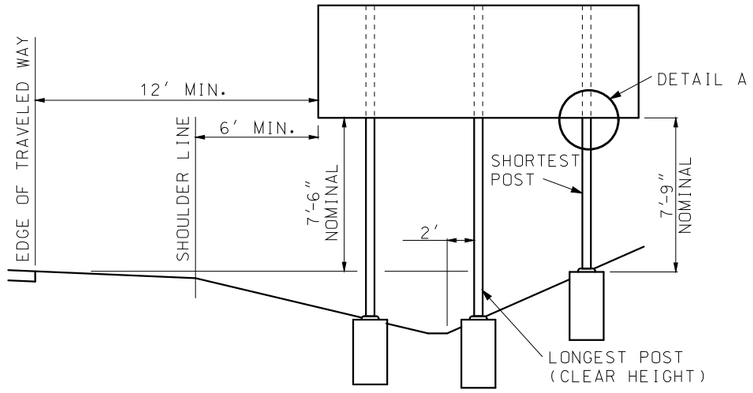
HINGE DETAILS
WIDE FLANGE (WF) POSTS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

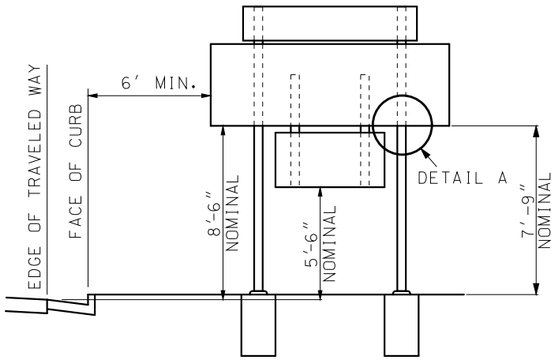
903.03BJ

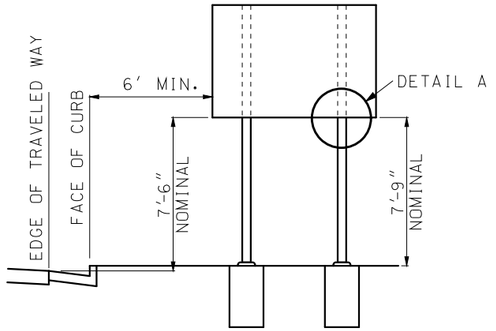
SHEET NO. 2 OF 15

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

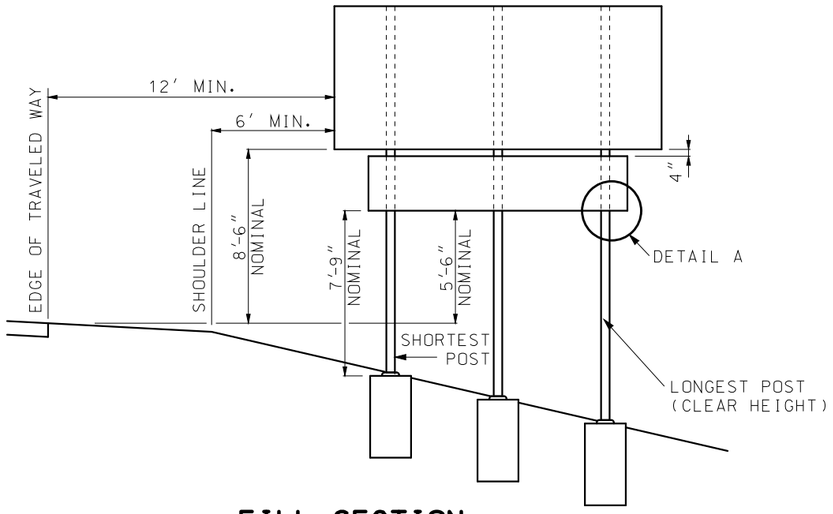



## DITCH SECTION

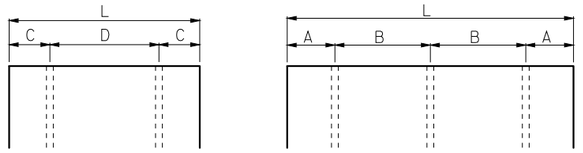



## BARRIER CURB SECTIONS




## FILL SECTION




## POST SPACING

FOR POST DESIGNS NUMBERS 3, 4, 5 AND 6 HAVING WEIGHTS GREATER THAN 18LBS./FT., POSTS SHALL BE SPACED AT LEAST 7′ APART.

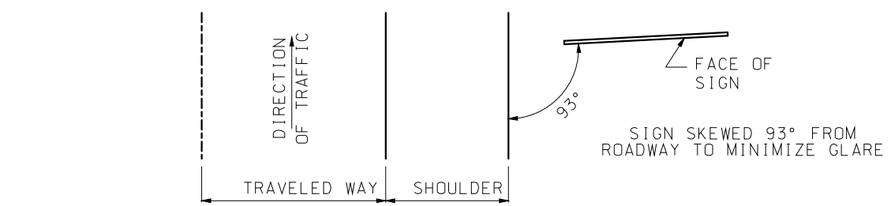
FOR POST DESIGNS NUMBERS 1 AND 2, POSTS MAY BE SPACED LESS THAN 7′ APART.

DO NOT USE THREE NUMBER 1 OR 2 POSTS FOR L LESS THAN 11′.

FOR L GREATER THAN 11′ AND LESS THAN 17′, 3 POSTS MAY BE USED DEPENDING ON SOIL CONDITIONS.

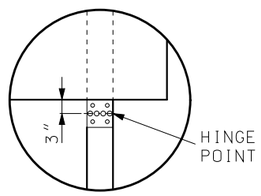
FOR L OF 6′ TO 17′ TYPICALLY USE 2 POSTS.

FOR L GREATER THAN 17′ TYPICALLY USE 3 POSTS.




SIGN SKEWED 93° FROM ROADWAY TO MINIMIZE GLARE

## SIGN ORIENTATION




## DETAIL A

NOTE: SEE SHEET 2 FOR FUSE PLATE DETAILS.

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

VERTICAL CLEARANCE FROM THE ROADWAY SHALL BE MET AND INCREASED ONLY TO MEET THE 7′9″ MINIMUM VERTICAL CLEARANCE FROM THE GROUND.

POST SIZE IS DETERMINED USING SIGN HEIGHT, SIGN WIDTH AND CLEAR HEIGHT. THE CLEAR HEIGHT IS EQUAL TO THE LENGTH OF THE LONGEST POST.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# POST INSTALLATION DETAILS

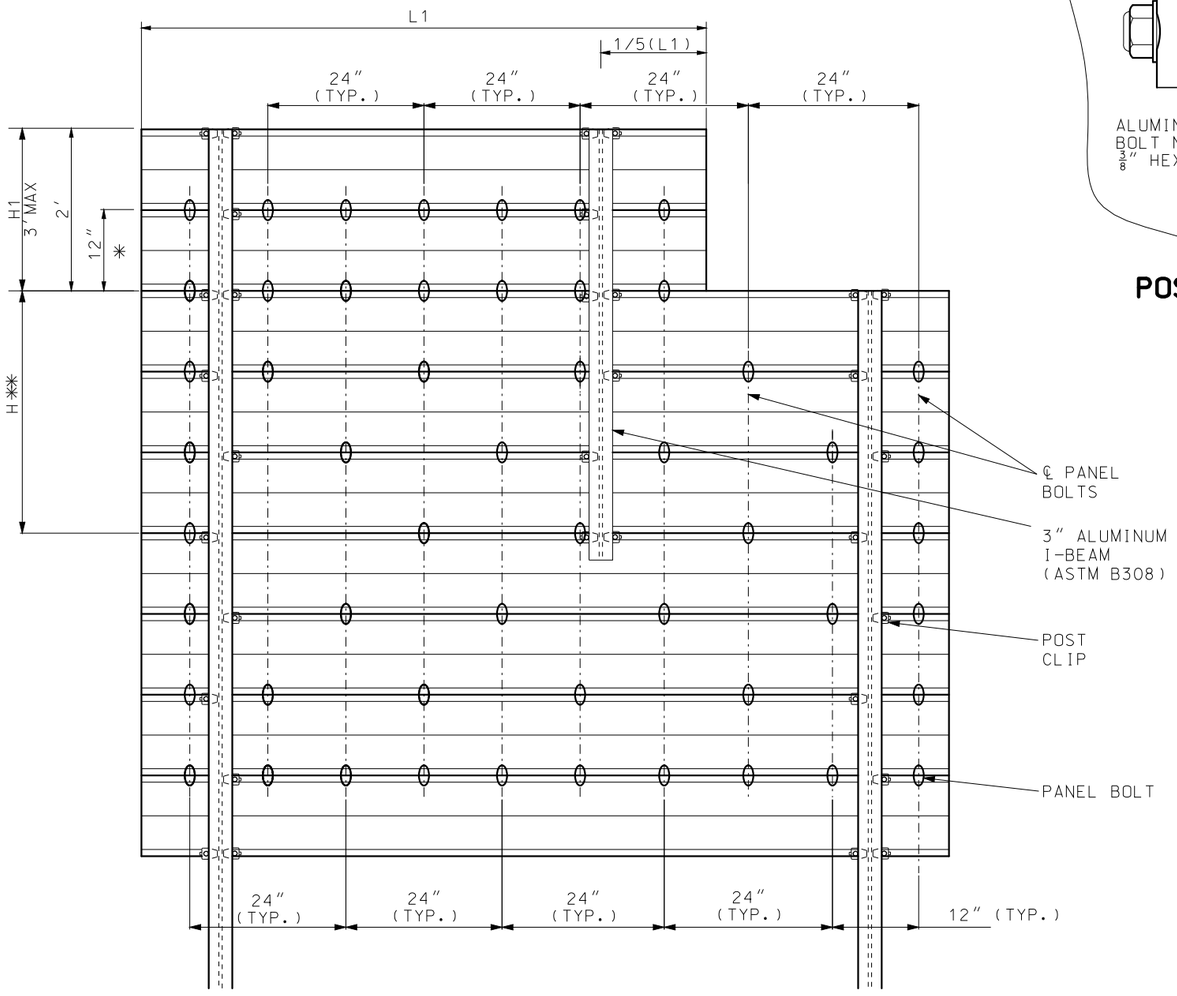
TYPICAL SECTION, MOUNTING HEIGHT AND POST SPACING WIDE FLANGE (WF) POSTS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

SHEET NO. 3 OF 15

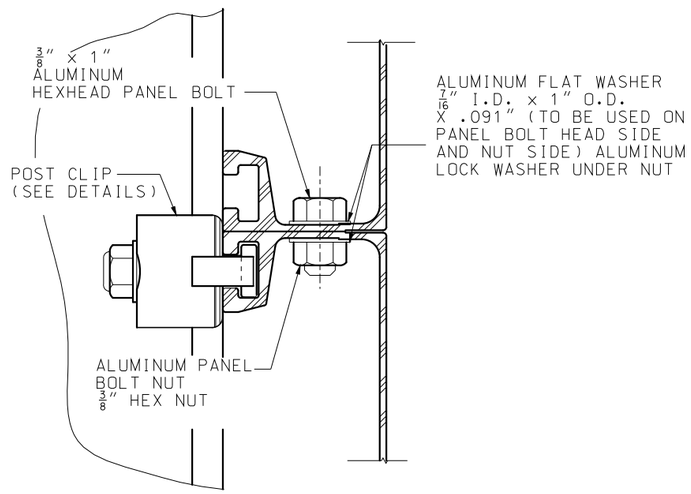
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



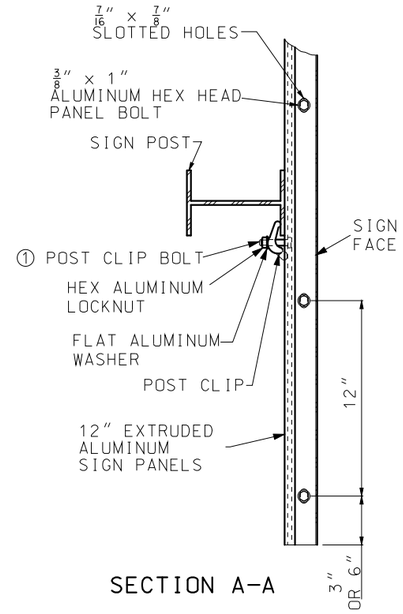

## PANEL BOLT LOCATION

* EXTRUDED ALUMINUM PANEL. SEE OTHER DRAWINGS.

** H = H1 + 12". H APPLIES TO SIGNS SUSPENDED ABOVE OR BELOW THE PRIMARY SIGN IF SECONDARY SIGN IS NOT ATTACHED TO THE MAIN SIGN POSTS.




## POST CLIP DETAIL




## SECTION A-A

① SIGNS SHALL BE FIELD ATTACHED TO POSTS WITH POST CLIPS AND BOLTS, SEE POST CLIP DETAIL. THE SHANK OF THE POST CLIP BOLT SHALL FIT TIGHTLY AGAINST THE POST FLANGE AFTER THE LOCKNUTS ARE TORQUED. LOCKNUTS ON THE POST CLIP BOLTS SHALL BE TORQUED TO 225 INCH-POUNDS WHEN USING DRY, CLEAN, UNLUBRICATED THREADS.

GENERAL NOTE:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

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# SIGN MOUNTING DETAILS

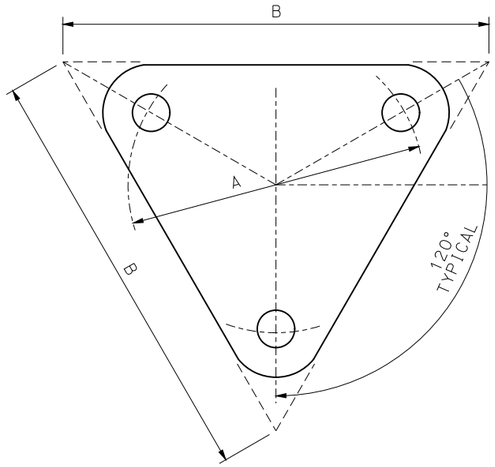
WIDE FLANGE (WF) POSTS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

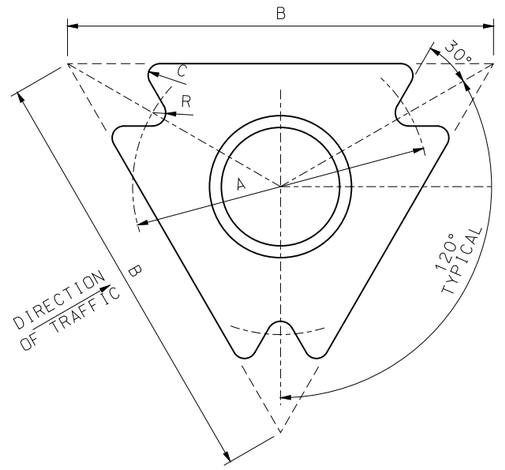
| ROUND PIPE POST FOR GROUND MOUNTED SIGNS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POST | BOLT | | | WASHER | | | BASE CONNECTION DATA TABLE (IN.) | | | | | |
| NOM SIZE (IN.-ID) | DIA | LENGTH | TORQUE | OD | ID | THICK | A | B | C | R | T | W |
| | IN. | IN. | IN./LB. | IN. | IN. | IN. | | | | | | |
| 2 1/2 | 1/2 | 3 1/2 | 140 | 1 1/16 | 17/32 | 1/8 | 6 1/4 | 9 | 1/4 | 9/32 | 1 | 1/4 |
| 3 | | | | | | | | | | | | |
| 4 | 5/8 | 3 3/4 | 345 | 1 5/16 | 11/16 | 1/8 | 7 3/16 | 10 | 1/4 | 3/8 | 1 | 5/16 |

| ROUND PIPE POST AND FOOTING DATA TABLE | | | | | | |
|---|---|---|---|---|---|---|
| NOM. SIZE (IN.) | WEIGHT | | STUB LENGTH | FOOTING | | CONCRETE |
| | LBS/FT | LBS/IN | | DIA. | DEPTH | C.Y. |
| 2 1/2 | 5.79 | 0.48 | 4'- 3 1/2" | 12" | 4'-6" | 0.13 |
| 3 | 7.58 | 0.63 | 4'- 3 1/2" | 12" | 4'-6" | 0.13 |
| 4 | 10.79 | 0.90 | 5'- 3 1/2" | 18" | 5'-6" | 0.36 |




BOLT RETAINER

SHEET METAL BOLT RETAINER CUT FROM 30 GUAGE GALVANIZED SHEET METAL. PLACE BETWEEN BASE PLATES. SIZE VARIES TO FIT PLATE. BOLT HOLES SHALL BE 1/16" LARGER THAN REQUIRED BOLT SIZE.

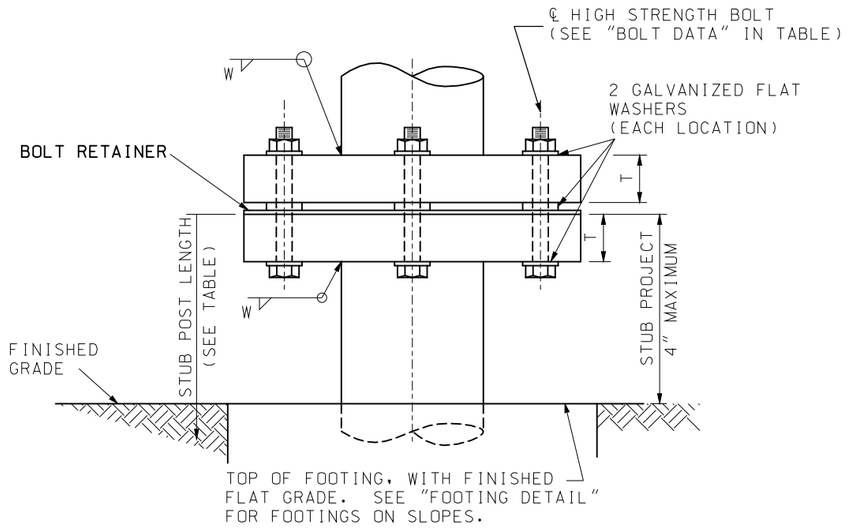



PLAN VIEW

ROLLED CRIMP TO ENGAGE PIPE O.D.

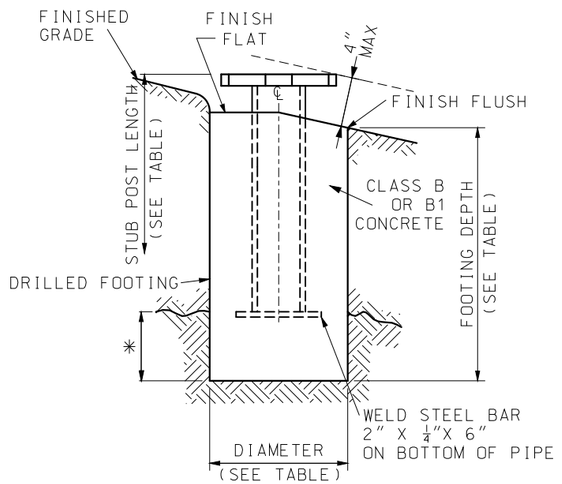



FRICTION CAP




ELEVATION
(STEEL PIPE POST BASE CONNECTION)

## MULTI-DIRECTION SLIP BASE




## FOOTING DETAIL

* PIPE 3" DIA. AND UNDER: 2' MAXIMUM IN ROCK, PIPE OVER 3" DIA.: 3' MAXIMUM IN ROCK

GENERAL NOTE:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE STANDARD PLANS SHEET 10 OF 15.

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# POST INSTALLATION DETAILS

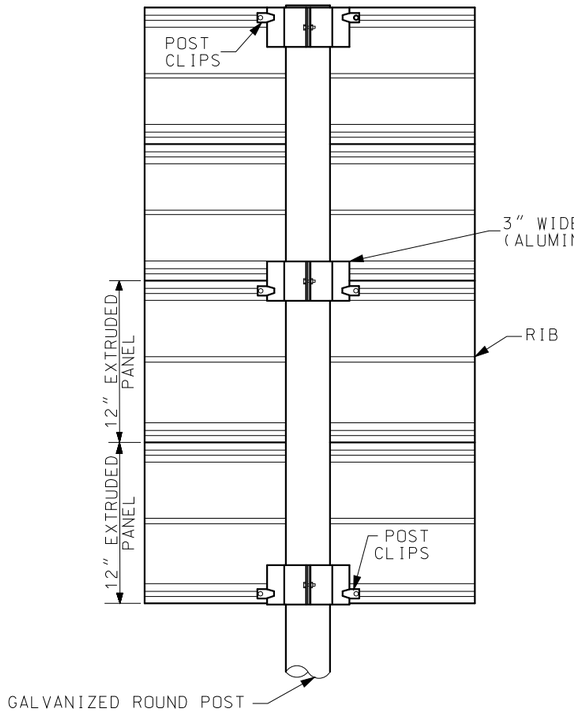
PIPE POST

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

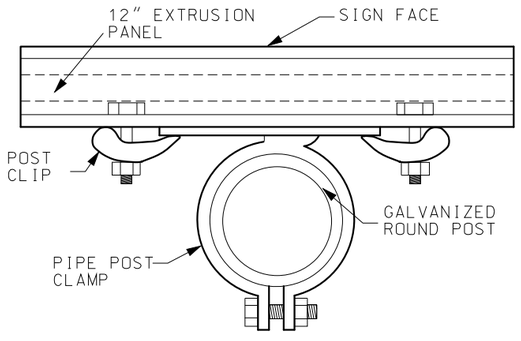
903.03BJ

SHEET NO. 5 OF 15

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

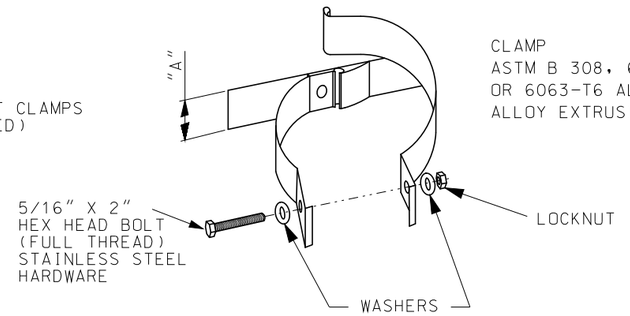



PROFILE VIEW



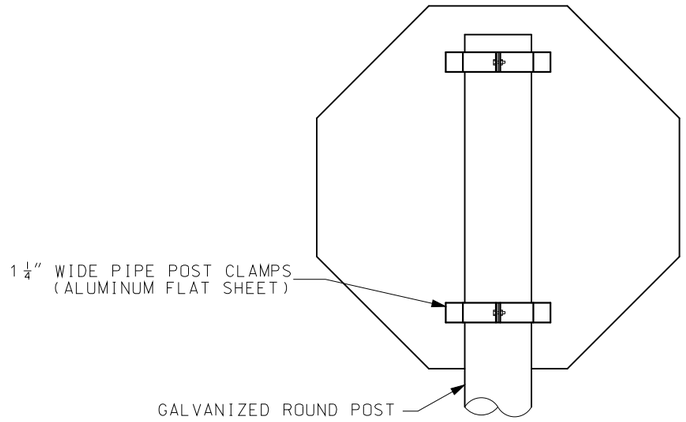

PLAN VIEW

## MOUNTING DETAILS FOR EXTRUDED PANELS ON PIPE POST

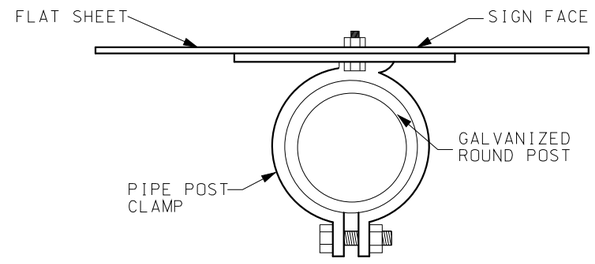



## CLAMP TYPE SIGN SUPPORT FOR PIPE POST

| WIDTH OF PIPE POST CLAMP | |
|---|---|
| SIGN TYPE | MINIMUM "A" |
| FLAT | 1 1/4" |
| STRUCTURAL | 3" |




PROFILE VIEW



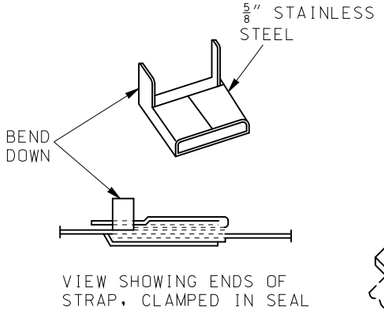

PLAN VIEW

## MOUNTING DETAILS FOR FLAT SHEET ON PIPE POST

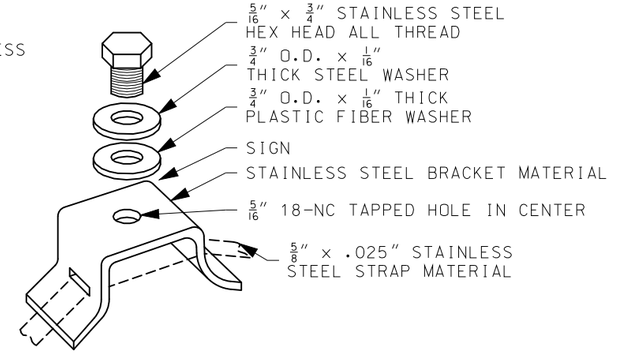
GENERAL NOTES:

FOR GENERAL NOTES, SHEET 1 OF 15.

FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 15




STRAP SEAL




FLARED LEG SIGN BRACKET

## MOUNTING DETAILS FOR FLAT SHEET SIGNS ON ROUND STRUCTURES >4" PIPE POST


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# SIGN MOUNTING DETAILS

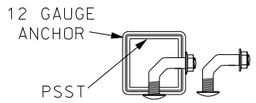
PIPE POST

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

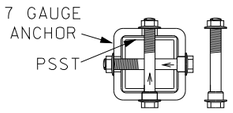
SHEET NO. 6 OF 15

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




$\frac{3}{8}$" CORNER BOLT AND NUT

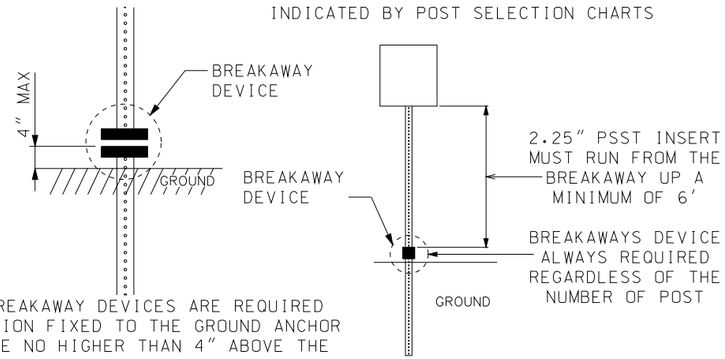
ANCHOR BOLT DETAIL FOR 2" PSST
MINIMUM 1 CORNER BOLT REQUIRED




$\frac{3}{8}$" x 3.5" SHOULDER BOLT AND NUT
ANCHOR BOLT DETAIL FOR
2.5" AND 2"+ 2.5" PSST
2 SHOULDER BOLTS REQUIRED
INSTALLED PERPENDICULAR TO EACH OTHER

## ANCHOR BOLT DETAIL

2.5" + 2.25" POST COMPRISED OF A $2\frac{1}{2}$" PSST POST WITH A 2.25" PIECE OF PSST INSERTED INSIDE TO INCREASE POST CAPACITY, USE AS INDICATED BY POST SELECTION CHARTS




WHEN BREAKAWAY DEVICES ARE REQUIRED THE PORTION FIXED TO THE GROUND ANCHOR SHALL BE NO HIGHER THAN 4" ABOVE THE FINISHED GRADE.

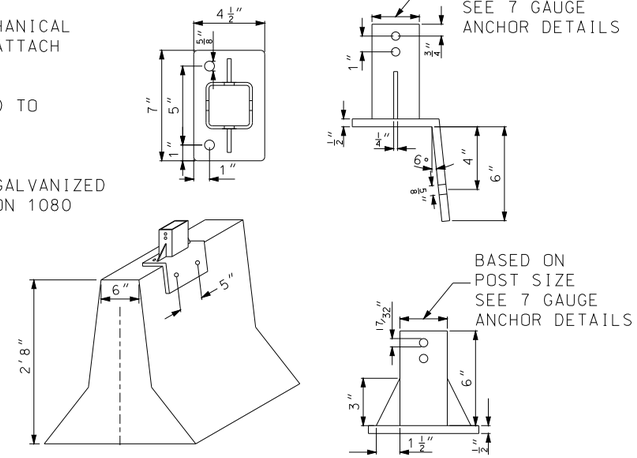
## BREAKAWAY DETAILS
## 2.5" + 2.25" POST DETAIL

ANCHOR TUBE SHALL BE 7 GUAGE

1/2" X 4 1/2"GALVANIZED MECHANICAL FASTENERS SHALL BE USED TO ATTACH ANCHOR TO BARRIER WALL

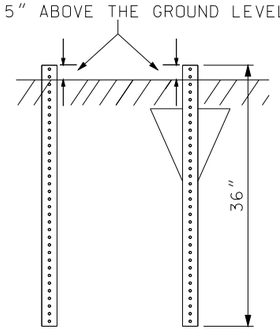
SHOULDER BOLTS SHALL BE USED TO ATTACH PSST POST TO ANCHOR (SEE STANDARD PLAN 903.03)

ANCHOR SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION PER SECTION 1080



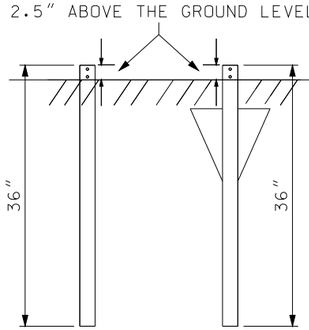

## BARRIER WALL
## MOUNTING DETAIL

THE ANCHOR SHOULD BE A MAXIMUM OF 2.5" ABOVE THE GROUND LEVEL



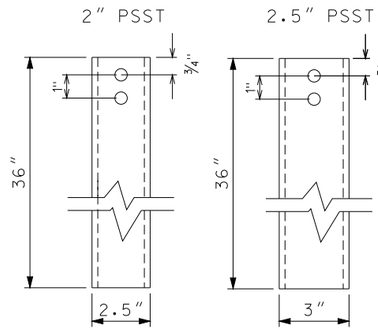

12 GAUGE

THE ANCHOR SHOULD BE A MAXIMUM OF 2.5" ABOVE THE GROUND LEVEL



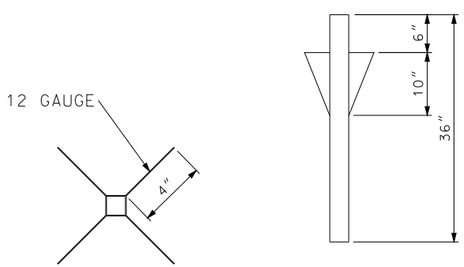

7 GAUGE

## ANCHOR INSTALLATION DETAIL

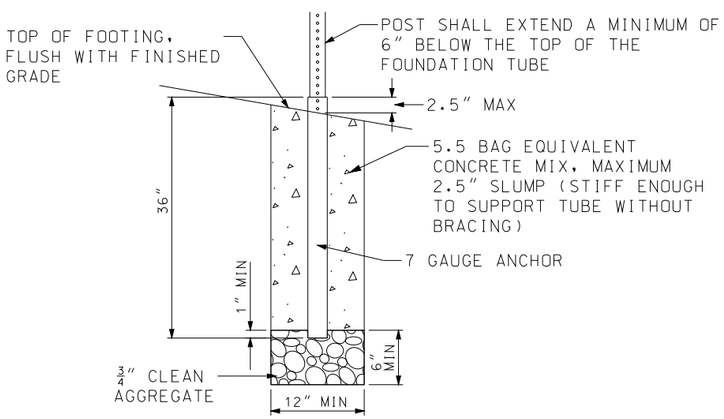



- BOLT HOLE DIAMETER - $\frac{17}{32}$"
- 2 PER SIGN ON ALL 4 SIDES

## 7 GAUGE ANCHOR
## FABRICATION DETAIL




## OMNI-DIRECTIONAL ANCHOR DETAIL
## FOR BOTH 12 AND 7 GAUGE




## CONCRETE FOOTING DETAIL

## POST AND ANCHOR DATA TABLE

| POST | | ANCHOR NORMAL OR OMNI-DIRECTIONAL | | BREAKAWAY NEEDED NUMBER OF POSTS | | |
|---|---|---|---|---|---|---|
| GUAGE | SIZE | GUAGE | SIZE | 1 | 2 | 3 |
| 12 | 2"x2" | 12 | 2.25" X 2.25" X 36" OD | NO | NO | YES |
| | | 7 * | 2.5" X 2.5" X 36" OD | NO | NO | YES |
| 12 | 2.5"x2.5" | 7 * | 3" X 3" X 36" OD | NO | YES | YES |
| 12 | (2.5"x2.5")+(2.25"X2.25") | 7 * | 3" X 3" X 36" OD | YES | YES | YES |

* TO BE USED WITH CONCRETE FOOTINGS OR IS AN OPTION IN ROCK SOIL CONDITIONS

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 15.

ALL BREAKAWAY DEVICES USED ON AN INSTALLATION SHALL BE CERTIFIED NCHRP 350 COMPLIANT.

48" FOOTINGS MAY BE USED WITH 12 GAUGE OR 7 GAUGE ANCHORS.

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PROFESSIONAL ENGINEER
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# POST INSTALLATION DETAILS
PERFORATED SQUARE STEEL TUBE (PSST)

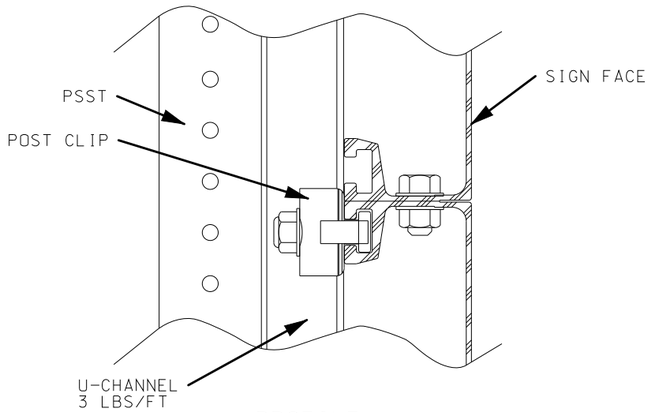
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

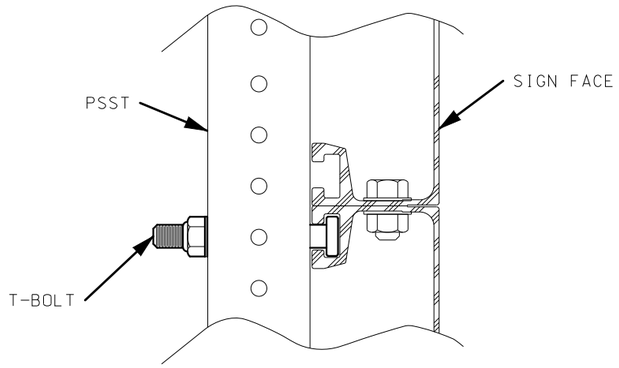
SHEET NO. 7 OF 15

REV.

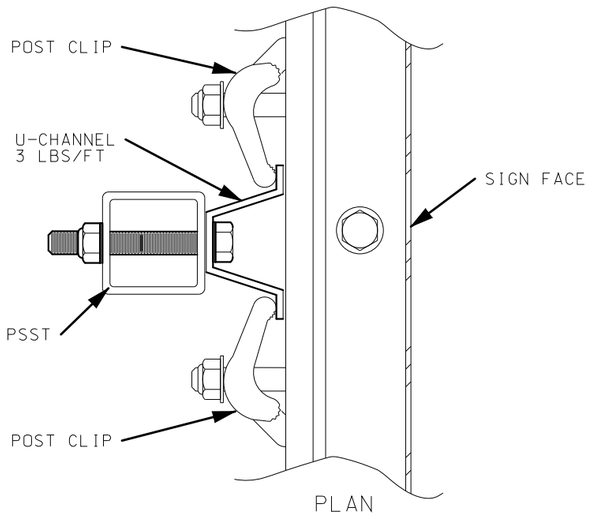
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PROFILE

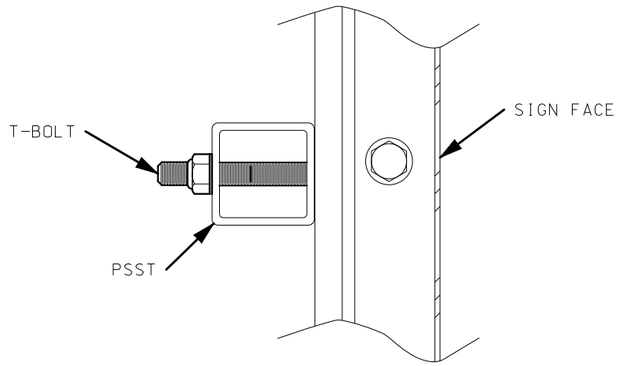



PROFILE




PLAN

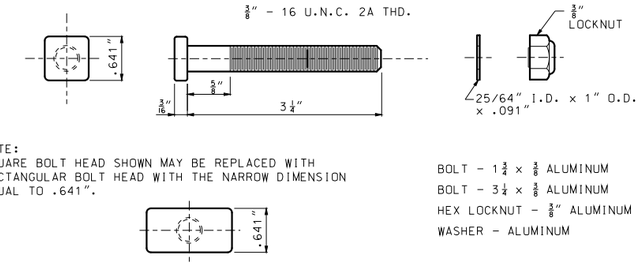
POST CLIP METHOD




PLAN

T-BOLT METHOD

## EXTRUDED PANEL MOUNTING DETAIL




NOTE:
SQUARE BOLT HEAD SHOWN MAY BE REPLACED WITH RECTANGULAR BOLT HEAD WITH THE NARROW DIMENSION EQUAL TO .641".

BOLT - 1¾ x ⅜ ALUMINUM
BOLT - 3¼ x ⅜ ALUMINUM
HEX LOCKNUT - ⅜" ALUMINUM
WASHER - ALUMINUM

## T-BOLT DETAIL

NOTES:
- ALUMINUM BOLTS SHALL BE ASTM B 211, 2024-T4 OR 6061-T6
- ALUMINUM FLAT WASHERS SHALL BE ASTM B 209, ALCLAD 2024-T4 OR 2024-T4
- ALUMINUM LOCK NUTS (NYLON INSERT) SHALL BE ASTM B 211 OR 2017-T4

| NUMBER OF BOLTS TO ATTACH STEEL CHANNEL TO PSST POST | |
|---|---|
| SIGN HEIGHT | NO. OF BOLTS PER PSST POST USED |
| 1' | 2 |
| 2' | 3 |
| 3' | 4 |
| 4' | 5 |
| 5' | 6 |
| 6' | 7 |
| 7' | 8 |

GENERAL NOTES:

FOR THE GENERAL NOTES, SEE SHEET 1 OF 15.

FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 15.

FOR POST CLIP DETAILS, SEE SHEET ? OF 15.

ALTERNATE PSST MOUNTING HARDWARE USE SHALL BE ON APPROVED LIST.

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STATE OF MISSOURI
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NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# SIGN MOUNTING DETAILS

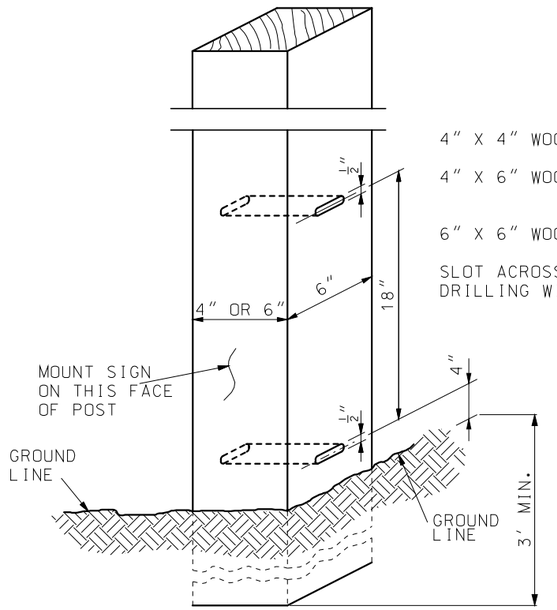
PERFORATED SQUARE STEEL TUBE (PSST)

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

SHEET NO. 8 OF 15

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



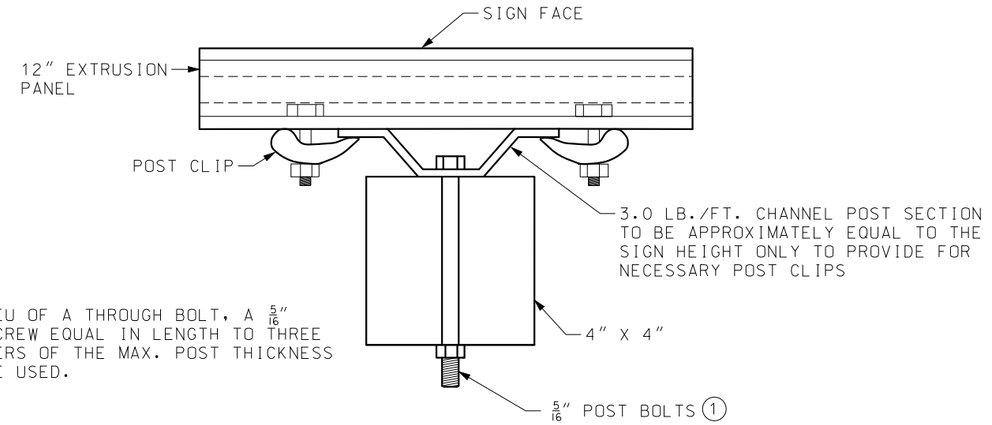

4" X 4" WOOD POST - NO SLOTS OR HOLES REQUIRED

4" X 6" WOOD POST - $1\frac{1}{2}$" X $\frac{1}{2}$" SLOT ON 6" SIDE OR $1\frac{1}{2}$" DIA. HOLE ON 6" SIDE

6" X 6" WOOD POST - 2" X $\frac{1}{2}$" SLOT OR 2" DIA. HOLE

SLOT ACROSS NEUTRAL AXIS FORMED BY SUCCESSIVE DRILLING WITH $\frac{1}{2}$" BIT.

## WOOD POST DETAIL

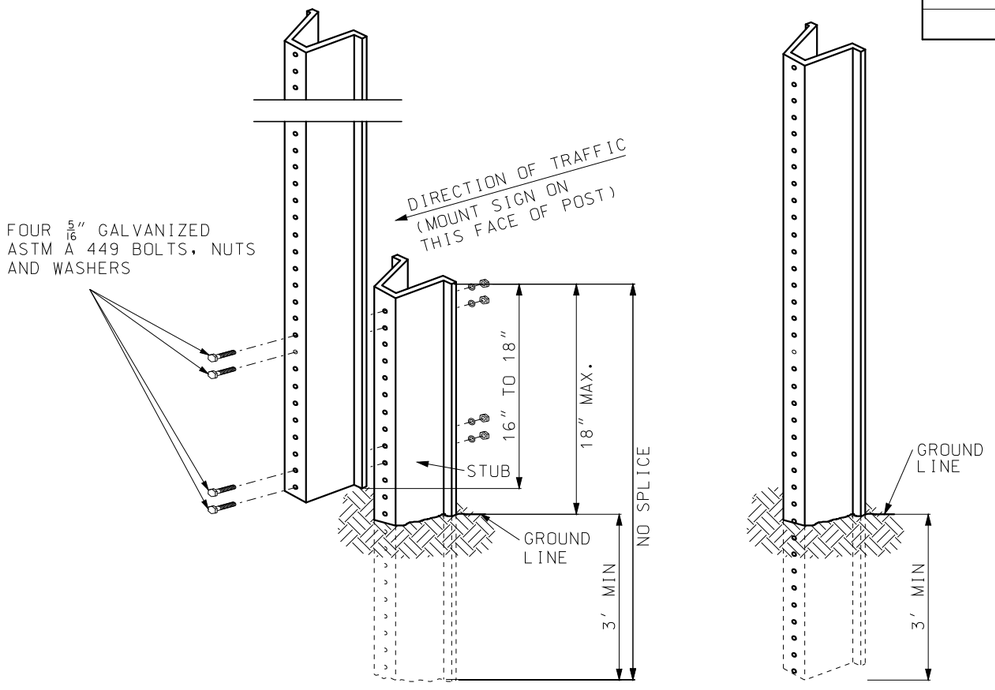



(1) IN LIEU OF A THROUGH BOLT, A $\frac{5}{16}$" LAG SCREW EQUAL IN LENGTH TO THREE QUARTERS OF THE MAX. POST THICKNESS MAY BE USED.

PLAN VIEW

## MOUNTING DETAILS FOR EXTRUDED PANELS ON WOOD POST

| NUMBER OF BOLTS TO ATTACH STEEL CHANNEL TO WOOD POST | |
|---|---|
| SIGN HEIGHT | NO. OF BOLTS PER WOOD POST USED |
| 1' | 2 |
| 2' | 3 |
| 3' | 4 |
| 4' | 5 |
| 5' | 6 |
| 6' | 7 |
| 7' | 8 |




## U-CHANNEL POST DETAIL OPTIONAL INSTALLATION

| SIGN AREA (SQ.FT.) | POST TYPE | |
|---|---|---|
| | U-CHANNEL | WOOD |
| ≤ 10 | 1 - 3.0 LB./FT.* | 1 - 4" X 4"* |
| > 10 ≤ 16 | 2 - 3.0 LB./FT. | 2 - 4" X 4"<br>1 - 4" X 6"* |
| > 16 ≤ 24 | 2 - 3.0 LB./FT. | 2 - 4" X 6" |
| > 24 ≤ 30 | 3 - 3.0 LB./FT. | 2 - 4" X 6" |
| > 30 ≤ 50 | N/A | 2 - 6" X 6" |

* SIGNS GREATER THAN 4 FEET IN WIDTH REQUIRE TWO POSTS, EXCEPT DIAMOND SHAPED WARNING SIGNS, YIELD SIGNS, AND ONE WAY SIGNS.

## POST SIZE REQUIREMENTS

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 3 FEET INTO THE GROUND.

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.

FOR POST SIZING SEE ENGINEERING POLICY GUIDE.

FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 15.

AT THE ENGINEER DISCRETION A FLUORESCENT PAINT SHALL BE APPLIED HEAVILY TO BOTH SIDES OF U-CHANNEL POST STUB FOR A LENGTH OF AT LEAST 6 INCHES BELOW THE TOP OF STUB.

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PROFESSIONAL ENGINEER
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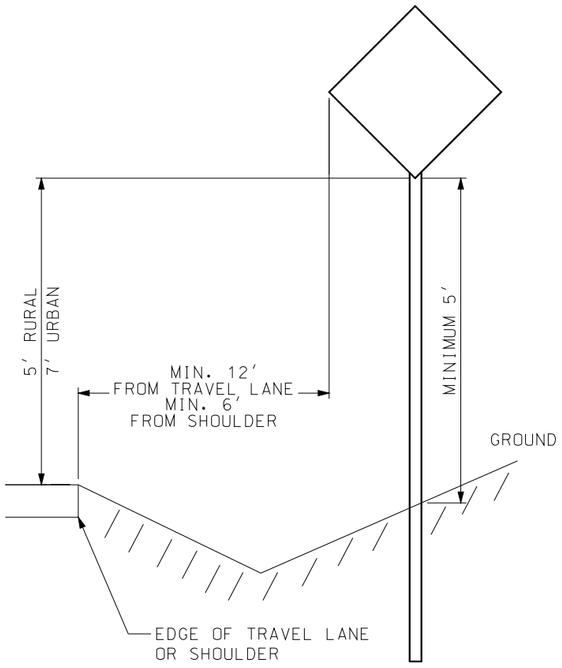
# SIGN MOUNTING DETAILS
WOOD AND U-CHANNEL POST

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

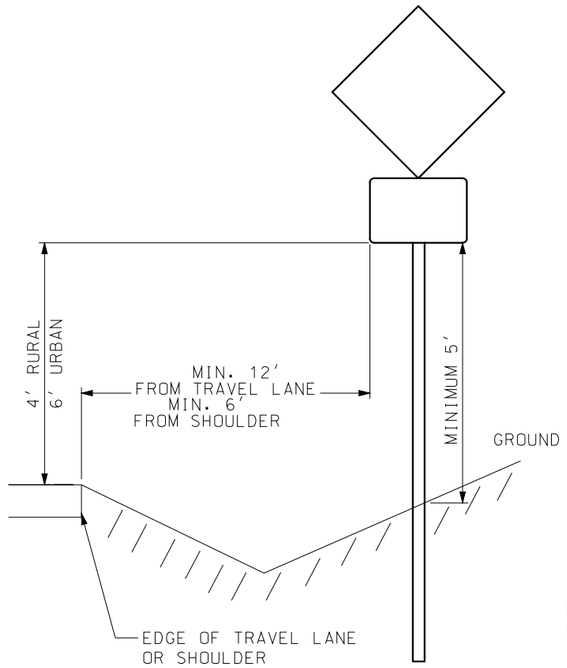
903.03BJ

SHEET NO. 9 OF 15

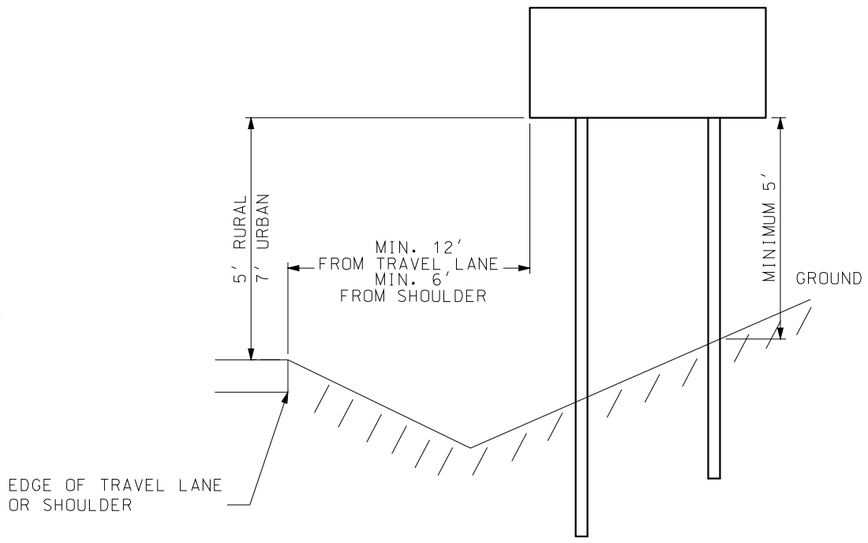
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



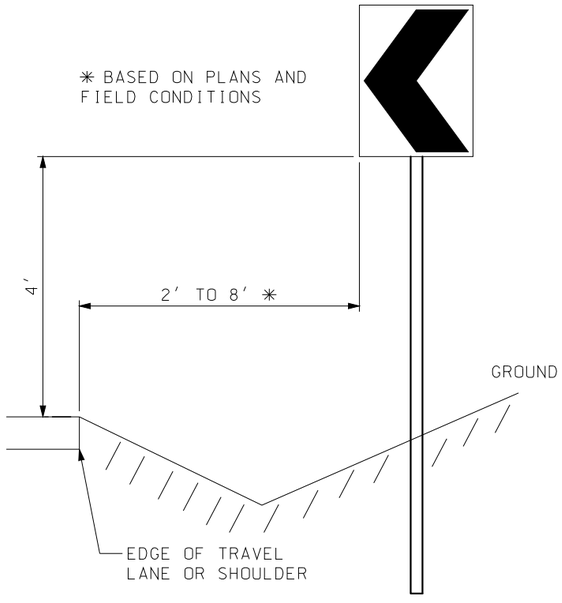

ONE POST – SINGLE SIGN



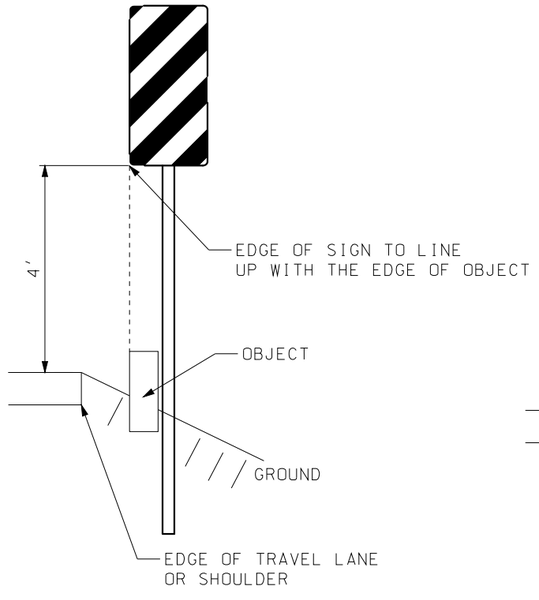

ONE POST – SINGLE SIGN WITH SUPPLEMENTAL PLAGUE



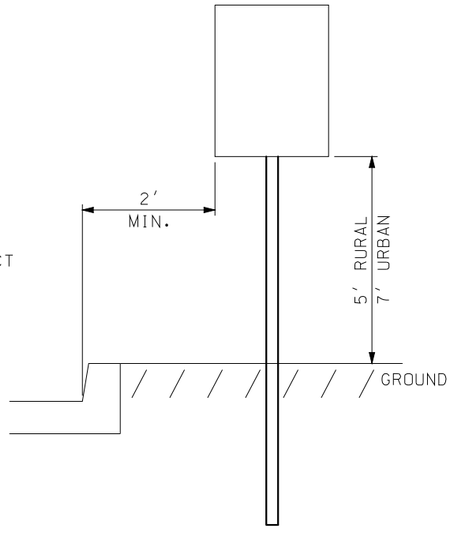

TWO POST




CHEVRON SIGN




TYPE III OBJECT MARKER




ADJACENT TO CURB

GENERAL NOTES:

SIGN MOUNTING BOLTS SHALL BE INSTALLED WITH A NYLON WASHER AGAINST THE SIGN FACE WITH A STEEL WASHER BETWEEN THE NYLON WASHER AND BOLT HEAD.

A LOCKNUT SHALL BE USED TO FASTEN THE SIGN TO THE POST.

VERTICAL CLEARANCE FROM THE ROADWAY SHALL BE MET AND INCREASED ONLY TO MEET THE 5′ MINIMUM VERTICAL CLEARANCE FROM THE GROUND.

HORIZONTAL OFFSET MAY BE ADJUSTED BASED ON FIELD CONDITIONS.

MOUNTING HEIGHT DETAILS

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# SIGN MOUNTING DETAILS

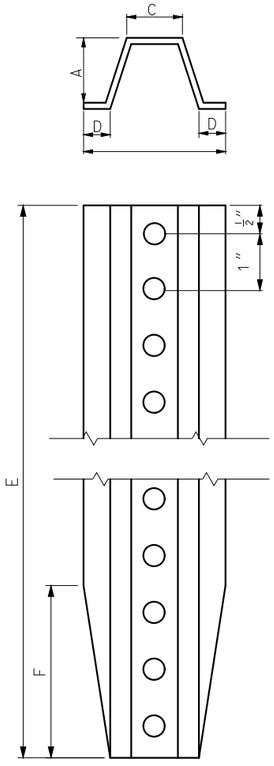
MOUNTING HEIGHT & OFFSET
PIPE POSTS, PSST, WOOD
& U-CHANNEL POSTS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/12/2016

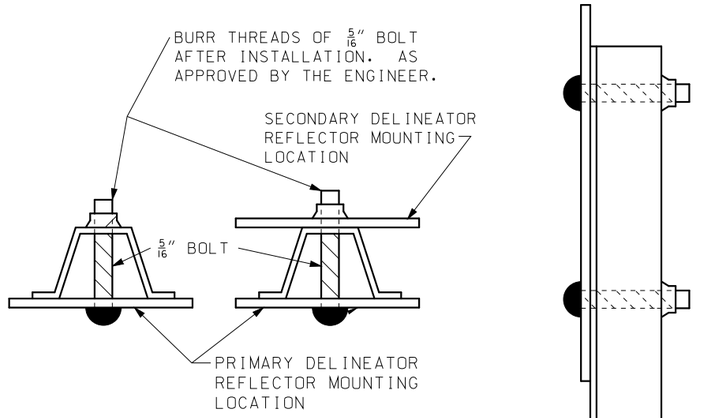
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SHEET NO.
10 OF 15

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GROUND MOUNT
U-CHANNEL



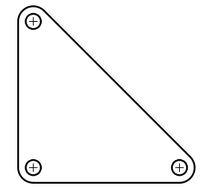

HOLE PUNCHING TO EQUAL 3/8" DIAMETER HOLES, ONE INCH CENTER TO CENTER, BEGINNING ONE-HALF INCH FROM THE END AND CONTINUING THE ENTIRE LENGTH OF THE POST.

| DELINEATOR POST | | | | | | | |
|---|---|---|---|---|---|---|---|
| LIMITS | LBS/FT (2) | DIMENSIONS - INCHES | | | | | |
| | | A | B | C | D | E | F |
| NOMINAL | 1.12 | 1 | 2 1/4 | 7/8 | 3/8 | 84 | 1 |
| TOLERANCE | ± 5% | ±1/8 | ±1/8 | ±1/8 | ±1/8 | ±1 | ±1/4 |

(2) WEIGHT BEFORE GALVANIZING OR PUNCHING.

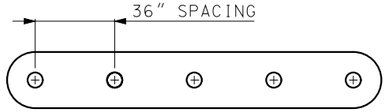
THE CHANNEL POST FOR DELINEATORS SHALL BE MANUFACTURED FROM DUCTILE ASTM A 36 OR ASTM A 1011 GR 60.

## DELINEATOR POST AND FASTENER DETAILS



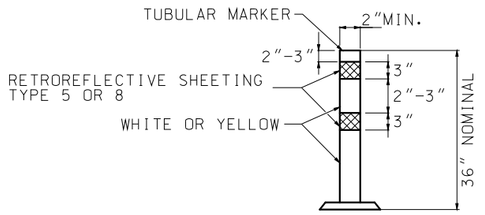
DELINEATOR PLACEMENT LOCATED AT THE RADIUS POINTS

## DELINEATOR PLACEMENT FOR ISLANDS




## DELINEATOR PLACEMENT FOR MEDIAN STRIPS

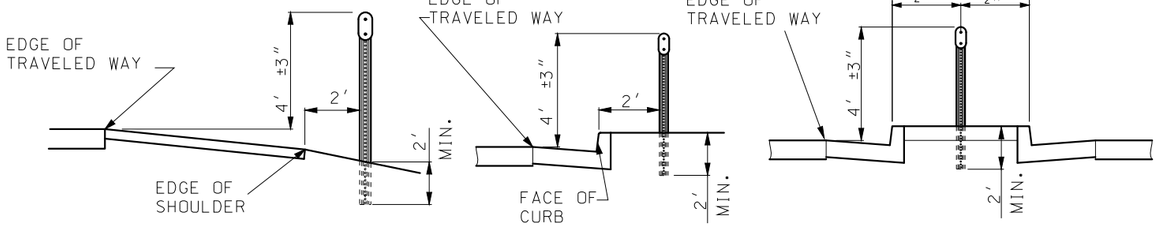
## SURFACE MOUNTED TUBULAR DELINEATOR




## TUBULAR MARKER DETAIL

A PERMANENT INSTALLATION METHOD, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS, SHALL BE USED TO INSTALL THE TUBULAR MARKER TO THE ISLAND SURFACE.

COLOR OF TUBULAR MARKER AND REFLECTIVE SHEETING SHALL MATCH THE COLOR OF THE CLOSEST PAVEMENT MARKING OR CURB MARKING.

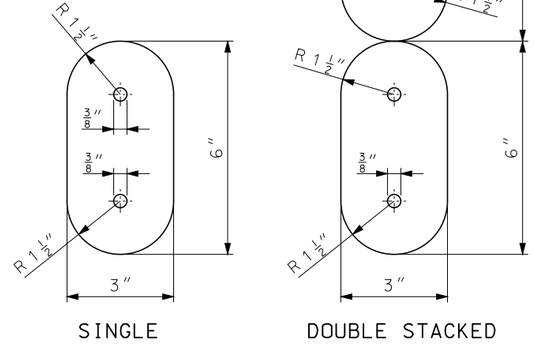



SHOULDER MOUNTED

OUTSIDE BARRIER CURB

NARROW PAVED MEDIAN

## DELINEATOR MOUNTING DETAILS




SINGLE

DOUBLE STACKED

CHANNEL POST
DELINEATOR REFLECTOR

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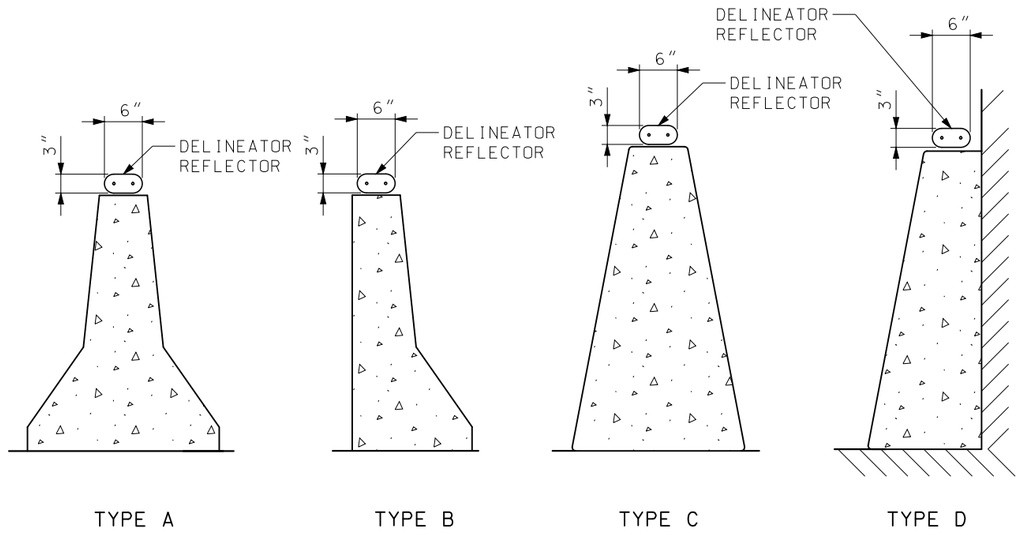
# SIGN MOUNTING DETAILS

DELINEATORS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

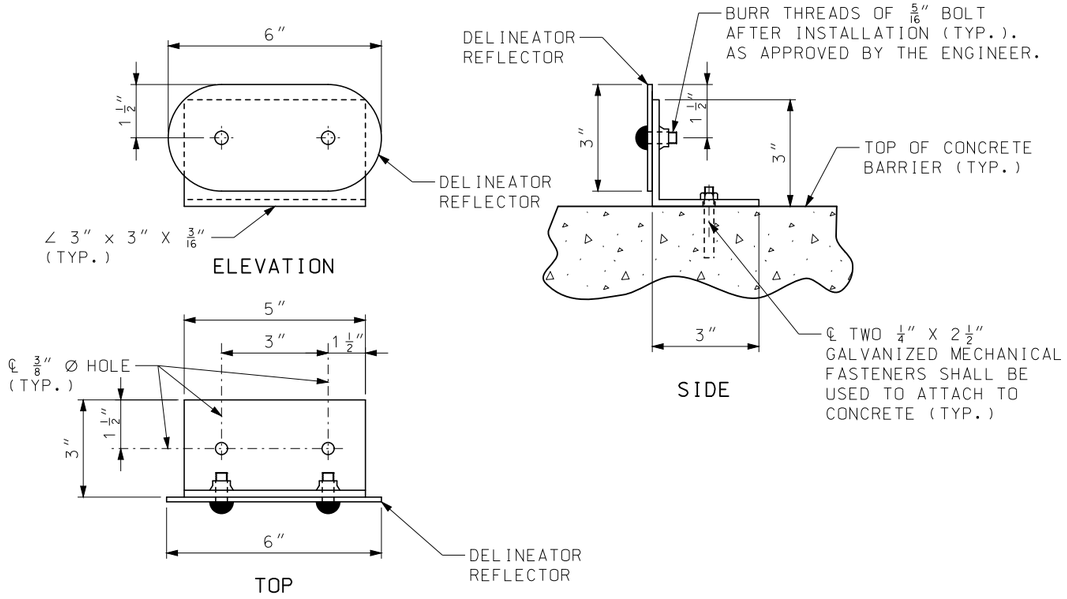
903.03BJ

SHEET NO.
11 OF 15

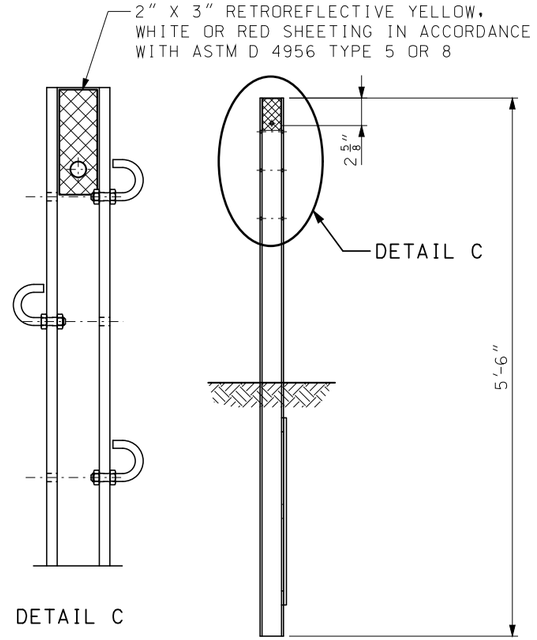



## DELINEATORS ON CONCRETE TRAFFIC BARRIER

FOR CONCRETE BARRIER DETAILS,
SEE STD PLANS 617.10.

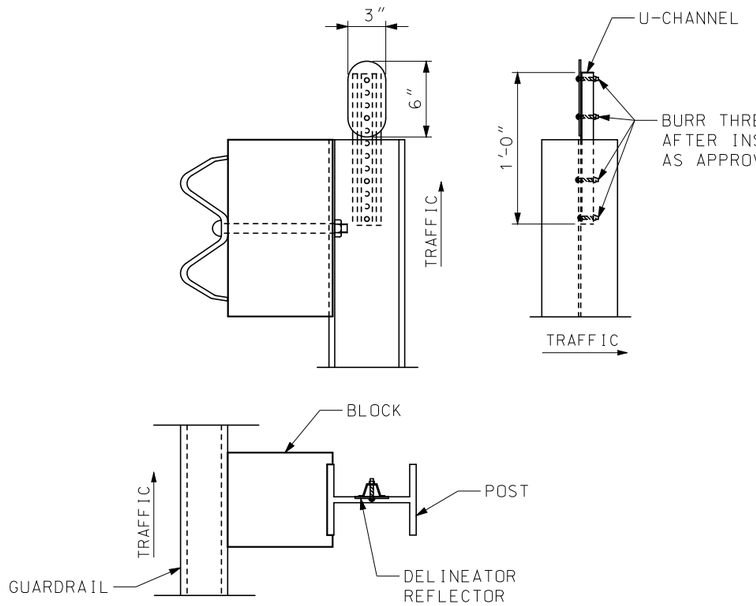



## DELINEATOR CONNECTION ON CONCRETE TRAFFIC BARRIER DETAIL




## DELINEATORS ON THREE-STRAND MEDIAN GUARD CABLE

FOR THREE-STRAND GUARD CABLE DETAILS
SEE STD PLANS 606.41.




## DELINEATORS ON NEW GUARDRAIL

FOR GUARDRAIL DETAILS, SEE STD PLANS 606.00 AND 606.50.

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

RETROREFLECTIVE YELLOW, WHITE OR RED SHEETING IN ACCORDANCE WITH ASTM D 4956 TYPE 5 OR 8 SHALL BE APPLIED TO ONLY ONE SIDE OF THE CHANNEL POST DELINEATOR MOUNTED TOWARDS THE CHANNEL POST.

REFLECTIVE SHEETING SHALL FOLLOW GUIDELINES OUTLINED IN SEC 1042.2.7 FOR CORRECT APPLICATION OF SHEETING TO DELINEATOR BODY. THE COLOR OF THE SHEETING SHALL MATCH THE CLOSEST ADJACENT PAVEMENT MARKING. A DELINEATOR WITH RED SHEETING SHALL BE APPLIED TO THE BACK SIDE OF THE CHANNEL POST WHEN THE DELINEATION IS PLACED ALONG AN INTERCHANGE RAMP AND COULD BE VIEWED BY WRONG WAY TRAFFIC.

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# SIGN MOUNTING DETAILS

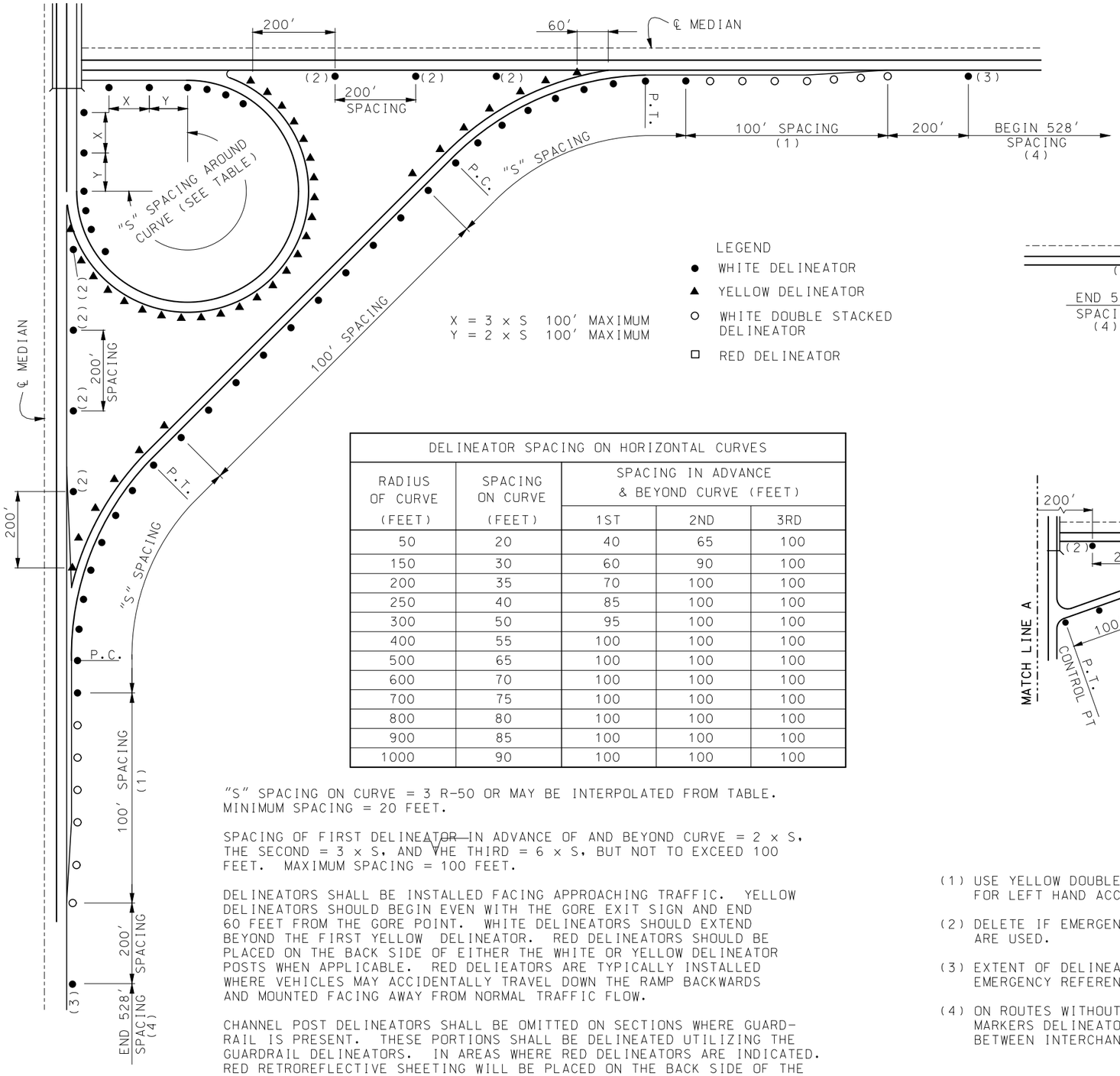
DELINEATORS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

SHEET NO. 12 OF 15

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




LEGEND

- ● WHITE DELINEATOR
- ▲ YELLOW DELINEATOR
- ○ WHITE DOUBLE STACKED DELINEATOR
- □ RED DELINEATOR

X = 3 x S 100′ MAXIMUM
Y = 2 x S 100′ MAXIMUM

| DELINEATOR SPACING ON HORIZONTAL CURVES | | | | |
|---|---|---|---|---|
| RADIUS OF CURVE (FEET) | SPACING ON CURVE (FEET) | SPACING IN ADVANCE & BEYOND CURVE (FEET) | | |
| | | 1ST | 2ND | 3RD |
| 50 | 20 | 40 | 65 | 100 |
| 150 | 30 | 60 | 90 | 100 |
| 200 | 35 | 70 | 100 | 100 |
| 250 | 40 | 85 | 100 | 100 |
| 300 | 50 | 95 | 100 | 100 |
| 400 | 55 | 100 | 100 | 100 |
| 500 | 65 | 100 | 100 | 100 |
| 600 | 70 | 100 | 100 | 100 |
| 700 | 75 | 100 | 100 | 100 |
| 800 | 80 | 100 | 100 | 100 |
| 900 | 85 | 100 | 100 | 100 |
| 1000 | 90 | 100 | 100 | 100 |

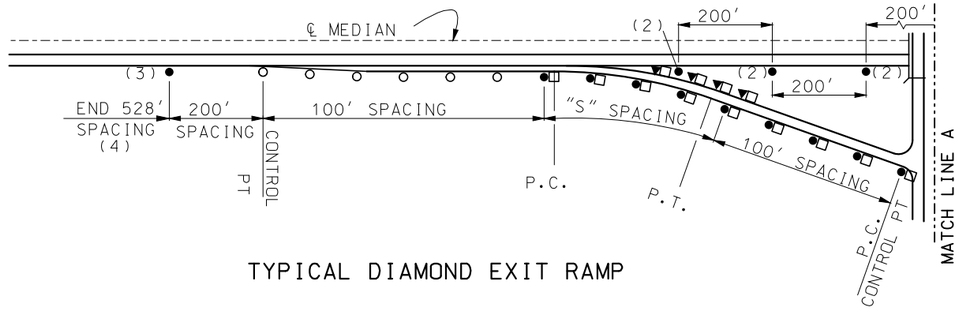
"S" SPACING ON CURVE = 3 R-50 OR MAY BE INTERPOLATED FROM TABLE. MINIMUM SPACING = 20 FEET.

SPACING OF FIRST DELINEATOR IN ADVANCE OF AND BEYOND CURVE = 2 x S, THE SECOND = 3 x S, AND THE THIRD = 6 x S, BUT NOT TO EXCEED 100 FEET. MAXIMUM SPACING = 100 FEET.

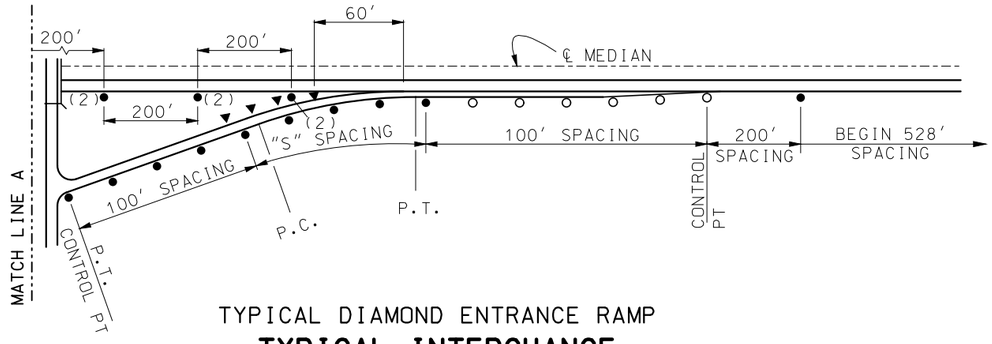
DELINEATORS SHALL BE INSTALLED FACING APPROACHING TRAFFIC. YELLOW DELINEATORS SHOULD BEGIN EVEN WITH THE GORE EXIT SIGN AND END 60 FEET FROM THE GORE POINT. WHITE DELINEATORS SHOULD EXTEND BEYOND THE FIRST YELLOW DELINEATOR. RED DELINEATORS SHOULD BE PLACED ON THE BACK SIDE OF EITHER THE WHITE OR YELLOW DELINEATOR POSTS WHEN APPLICABLE. RED DELIEATORS ARE TYPICALLY INSTALLED WHERE VEHICLES MAY ACCIDENTALLY TRAVEL DOWN THE RAMP BACKWARDS AND MOUNTED FACING AWAY FROM NORMAL TRAFFIC FLOW.

CHANNEL POST DELINEATORS SHALL BE OMITTED ON SECTIONS WHERE GUARD-RAIL IS PRESENT. THESE PORTIONS SHALL BE DELINEATED UTILIZING THE GUARDRAIL DELINEATORS. IN AREAS WHERE RED DELINEATORS ARE INDICATED. RED RETROREFLECTIVE SHEETING WILL BE PLACED ON THE BACK SIDE OF THE GUARDRAIL DELINEATOR.

REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.2.7.3.




TYPICAL DIAMOND EXIT RAMP




TYPICAL DIAMOND ENTRANCE RAMP

## TYPICAL INTERCHANGE

(1) USE YELLOW DOUBLE STACKED DELINEATORS FOR LEFT HAND ACCEL/DECEL LANES.

(2) DELETE IF EMERGENCY REFERENCE MARKERS ARE USED.

(3) EXTENT OF DELINEATION ON ROUTES WITH EMERGENCY REFERENCE MARKERS.

(4) ON ROUTES WITHOUT EMERGENCY REFERENCE MARKERS DELINEATORS SHALL BE INSTALLED BETWEEN INTERCHANGES EVERY 528′.

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

THE CONTRACT UNIT PRICE FOR EACH CHANNEL POST DELINEATOR SHALL INCLUDE THE REFLECTOR, FASTENERS AND POST.

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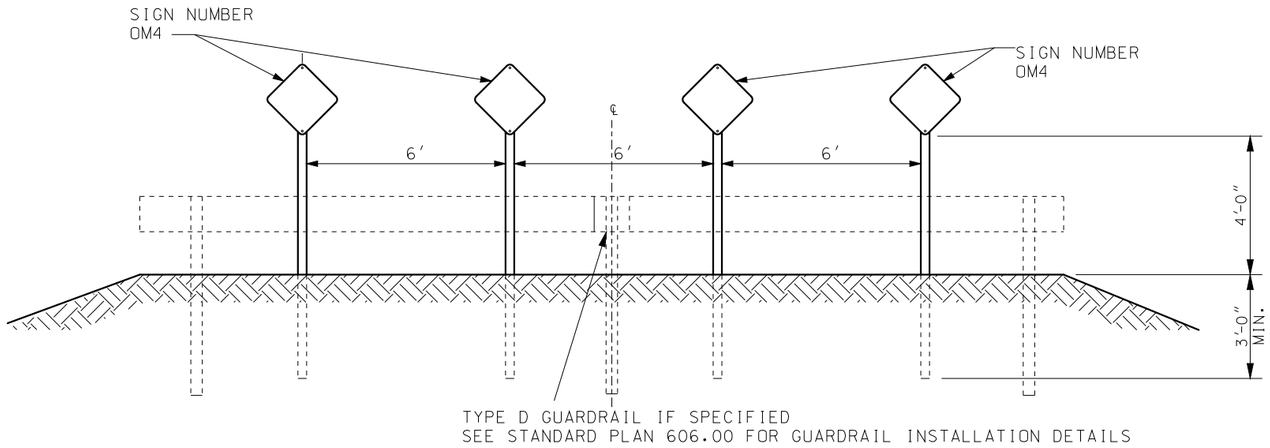
# SIGN MOUNTING DETAILS

INTERCHANGE DELINEATION

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

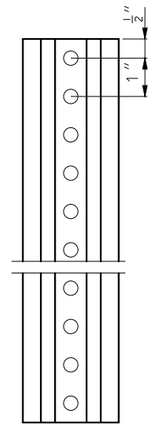
SHEET NO. 13 OF 15

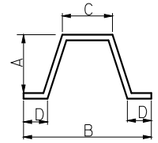


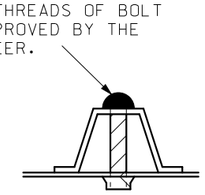

## TYPE 4 OBJECT MARKER INSTALLATION

| STEEL OBJECT MARKER POST | | | | | |
|---|---|---|---|---|---|
| LIMITS | LBS/FT (2) | DIMENSIONS – INCHES | | | |
| | | A | B | C | D |
| MIN. | 2.40 | $1\frac{1}{4}$ | $2\frac{1}{2}$ | 1 | $\frac{1}{2}$ |
| MAX. | 2.80 | $1\frac{5}{8}$ | $3\frac{1}{4}$ | $1\frac{3}{8}$ | $\frac{3}{4}$ |

(2) WEIGHT BEFORE GALVANIZING OR PUNCHING. LIMITS SHOWN ARE ABSOLUTE. NO FURTHER WEIGHT, DIMENSIONAL OR COMMERCIAL TOLERANCE WILL BE ACCEPTABLE.

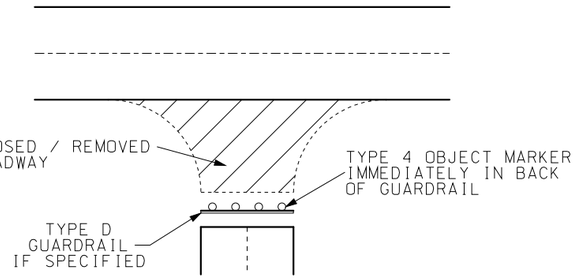


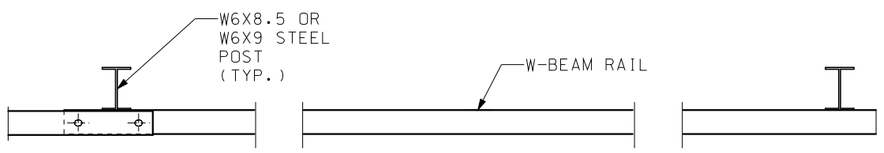




HOLE PUNCHING TO EQUAL $\frac{3}{8}$″ DIAMETER HOLES, ONE INCH CENTER TO CENTER, BEGINNING ONE-HALF INCH FROM THE END AND CONTINUING THE ENTIRE LENGTH OF THE POST.

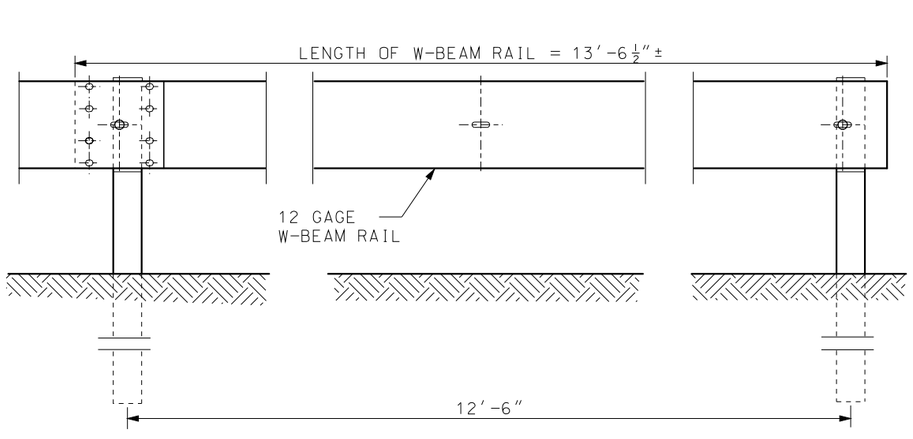
## OBJECT MARKER POST AND FASTENER DETAILS



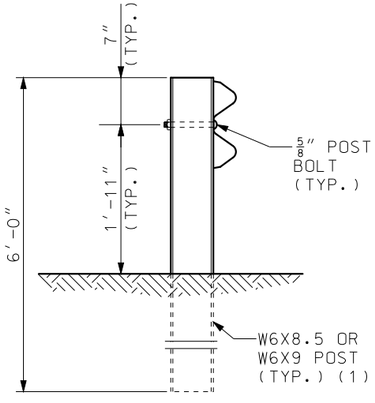

## TYPICAL ROAD CLOSURE




PLAN




ELEVATION




STEEL POST

(1) THE CONTRACTOR MAY FURNISH EQUIVALENT SECTIONS FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH SEC 1040.

## TYPE D GUARDRAIL

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

TYPE D GUARDRAIL IS ACCESS RESTRAINT AND VISUAL TARGET VALUE ONLY. IT HAS NO REDIRECTIVE CAPABILITY.

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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
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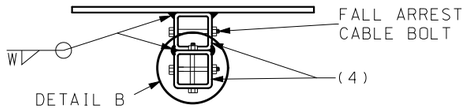
# SIGN MOUNTING DETAILS
OBJECT MARKERS FOR ROAD CLOSURE

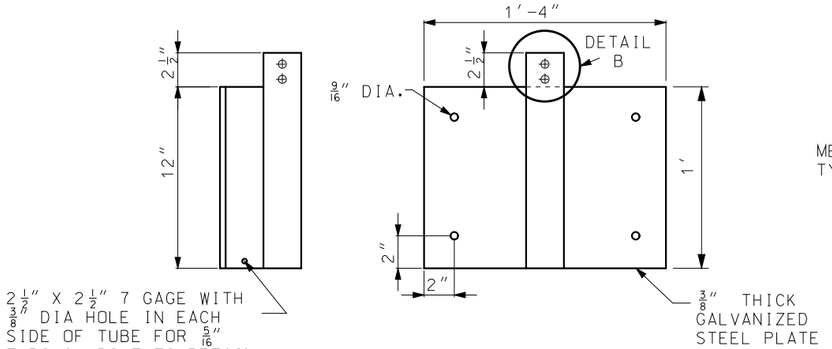
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

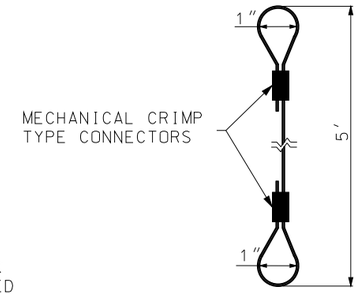
SHEET NO. 14 OF 15

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

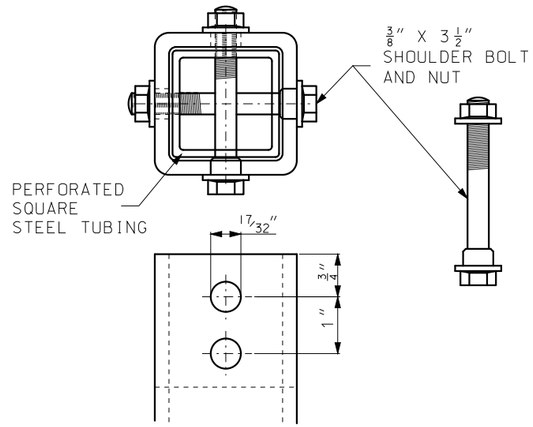


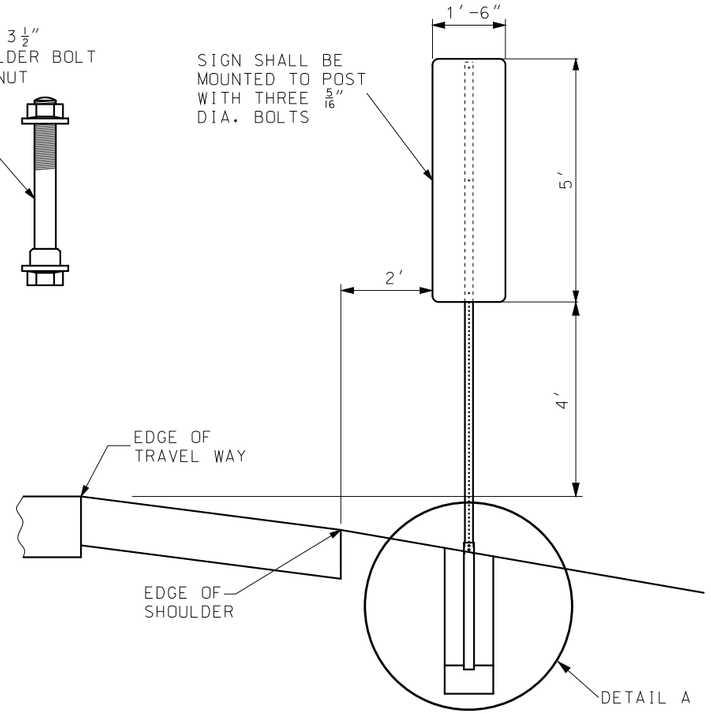

## MOUNTING PLATE DETAIL



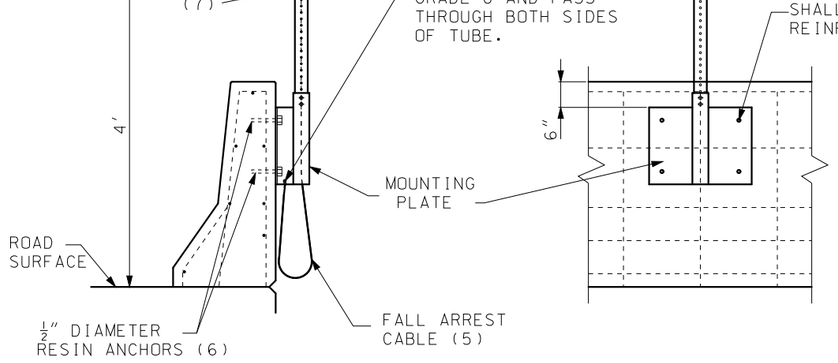

FALL ARREST
CABLE DETAIL




DETAIL B
SHOULDER BOLT




## GROUND INSTALLATION




## BARRIER WALL INSTALLATION

(1) PERFORATED SQUARE STEEL TUBE 2" X 2" (O.D.) 12 GAUGE. TUBE SHALL EXTEND A MINIMUM OF 6" BELOW THE TOP OF THE FOUNDATION TUBE.

(2) TUBE TO EXTEND ABOVE FOUNDATION ONLY ENOUGH TO ALLOW BOLT TO BE INSERTED 2 1/2" MAXIMUM.

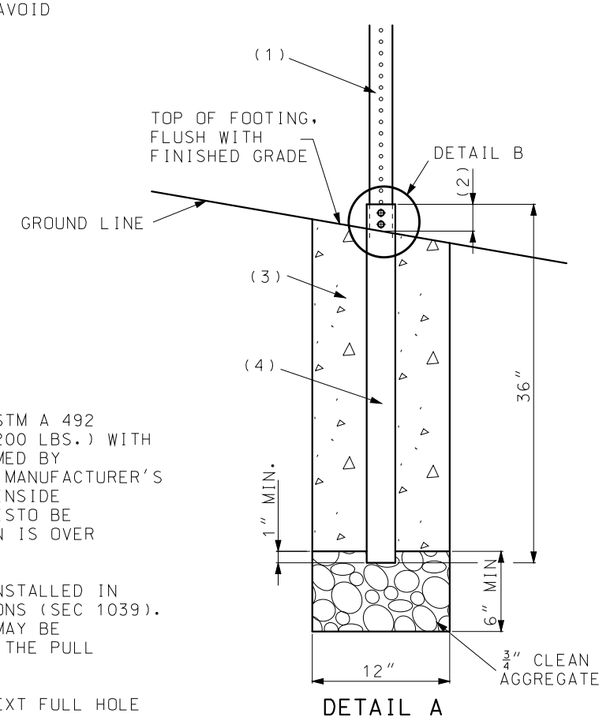
(3) CONCRETE MIX TO HOLD FOUNDATION TUBE PLUMB WITH-OUT BRACING SHALL HAVE A MINIMUM OF 5.5 SACKS OF CEMENT PER CUBIC YARD AND A MAXIMUM SLUMP OF 2 1/2".

(4) 2 1/2" X 2 1/2" (O.D.) SQUARE TUBE GALVANIZED 7 GAGE WITH TWO 17/32" DIAMETER HOLES IN EACH FACE 3/4" BELOW TOP OF TUBE.

(5) 1/8"x 5' LONG STAINLESS STEEL CABLE (ASTM A 492 TYPE 304 MINIMUIM BREAKING STRENGTH 200 LBS.) WITH A 1" DIA. LOOP AT EACH END LOOPS FORMED BY MECHANICAL CRIMP TYPE CONNECTION PER MANUFACTURER'S SPECIFICATIONS. CABLE IS TO BE RUN INSIDE PERFORATED SQUARE STEEL TUBE. CABLE ISTO BE USED ONLY WHEN SIGN MOUNTING LOCATION IS OVER ANOTHER TRAVELWAY.

(6) 1/2" DIAMETER RESIN ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH STANDARD SPECIFICATIONS (SEC 1039). AN APPROVED MAECHANICAL TYPE ANCHOR MAY BE USED IF THE DEVICE EQUALS OR EXCEEDS THE PULL TEST REQUIREMENTS OF SEC. 1039.

(7) FALL ARREST CABLE TO BE SECURED TO NEXT FULL HOLE BELOW SIGN




DETAIL A

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 15.

PERFORATED SQUARE STEEL TUBE SHALL BE SECURED TO FOUNDATION TUBE OR BARRIER WALL MOUNTING PLATE WITH A SHOULDER BOLT PER PERFORATED SQUARE STEEL TUBE MANUFACTURER'S SPECIFICATION.

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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# SIGN MOUNTING DETAILS

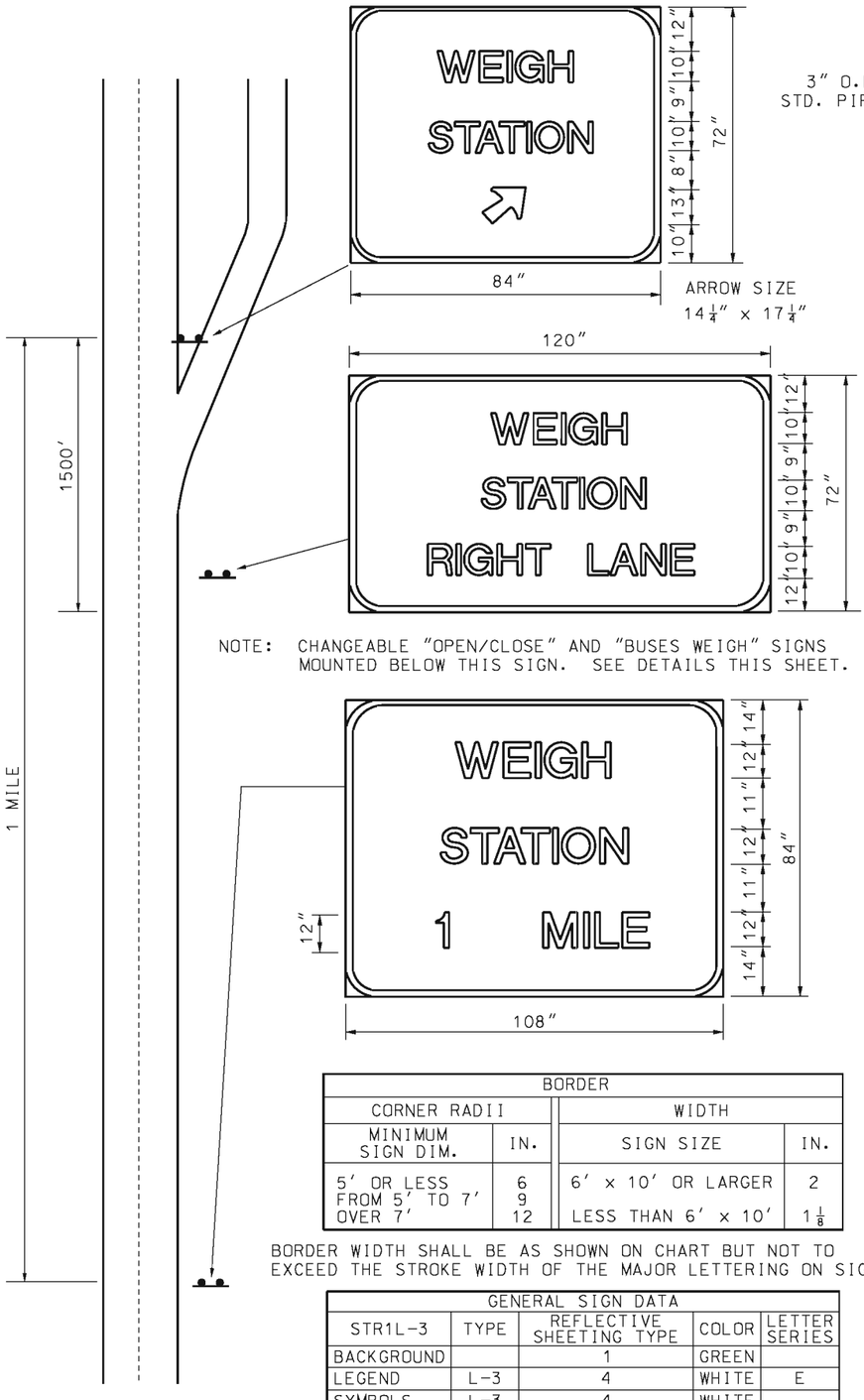
EMERGENCY REFERENCE MARKERS

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.03BJ

SHEET NO. 15 OF 15

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



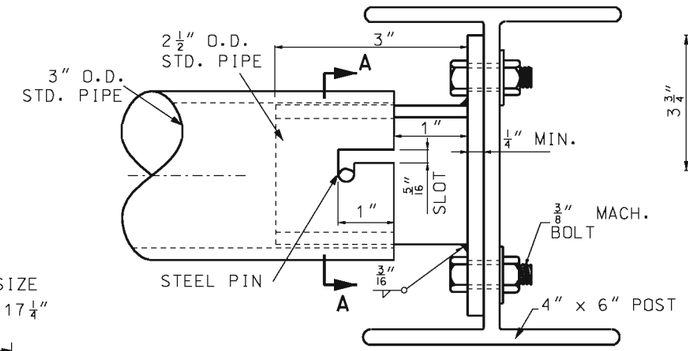

NOTE: CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.

| BORDER | | | |
|---|---|---|---|
| CORNER RADII | | WIDTH | |
| MINIMUM SIGN DIM. | IN. | SIGN SIZE | IN. |
| 5′ OR LESS | 6 | 6′ x 10′ OR LARGER | 2 |
| FROM 5′ TO 7′ | 9 | | |
| OVER 7′ | 12 | LESS THAN 6′ x 10′ | 1⅛ |

BORDER WIDTH SHALL BE AS SHOWN ON CHART BUT NOT TO EXCEED THE STROKE WIDTH OF THE MAJOR LETTERING ON SIGN.

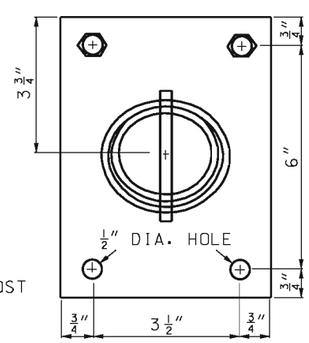
| GENERAL SIGN DATA | | | | |
|---|---|---|---|---|
| STR1L-3 | TYPE | REFLECTIVE SHEETING TYPE | COLOR | LETTER SERIES |
| BACKGROUND | | 1 | GREEN | |
| LEGEND | L-3 | 4 | WHITE | E |
| SYMBOLS | L-3 | 4 | WHITE | |
| BORDER | L-3 | 4 | WHITE | |
| SUBSTRATE | STRUCTURAL | | | |

## GUIDE SIGN DETAIL

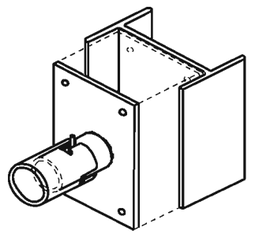



ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION

## PLAN VIEW

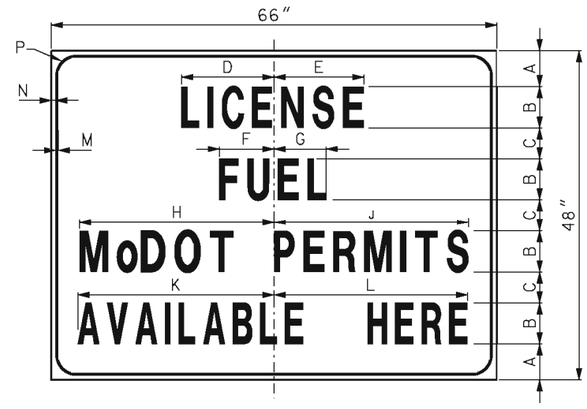



## SECTION A-A



ISOMETRIC VIEW

## BUSES WEIGH MOUNTING ASSEMBLY




| SIGN | A | B | C | D | E | F | G | H | J | K | L | M | N | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R21-1 | 5¼″ | 6″ | 4½″ | 13½″ | 13⅛″ | 8″ | 7⅝″ | 28⅜″ | 28⅜″ | 28⅝″ | 28¼″ | ⅜″ | ⅝″ | 3″ |

| GENERAL SIGN DATA | | | | |
|---|---|---|---|---|
| SHR1L-1 | TYPE | REFLECTIVE SHEETING TYPE | COLOR | LETTER SERIES |
| BACKGROUND | | 1 | WHITE | |
| LEGEND | L-1 | | BLACK | C |
| SYMBOLS | | | | |
| BORDER | L-1 | | BLACK | |
| SUBSTRATE | SHEET | | | |

## PERMIT SIGN DETAIL




FOR OPEN AND CLOSED SIGN SEE SPECIAL PROVISIONS




MAXIMUM HEIGHT FROM BOTTOM OF BUSES WEIGH SIGN TO GROUND SHALL BE 60″.

| GENERAL SIGN DATA | | | | |
|---|---|---|---|---|
| SHR1L-3 | TYPE | REFLECTIVE SHEETING TYPE | COLOR | LETTER SERIES |
| BACKGROUND | | 1 | GREEN | |
| LEGEND | L-3 | 4 | WHITE | E |
| SYMBOLS | | | | |
| BORDER | L-3 | 4 | WHITE | |
| SUBSTRATE | SHEET | | | |

## CHANGEABLE SIGN DETAIL

SUBSTRATE
ST STRUCTURAL
SH SHEET

LEGEND, SYMBOLS, & BORDER
L-1 SCREEN PRINT
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

| MATERIAL LIST | | |
|---|---|---|
| NO. | DESCRIPTION | LB. |
| 2 | ¼″ STEEL PLATE | 2.26 |
| 1 | 3″ STANDARD PIPE | 32.44 |
| 2 | 2-1/2″ STANDARD PIPE | 3.89 |
| 8 | ⅜″ GALV. MACH. BOLT | |
| 8 | GALV. WASHER | |

GENERAL NOTES:

DESIGN SPECS: AASHTO STANDARD SPECIFCATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARES, AND TRAFFIC SIGNALS - 1975.

MATERIALS AND FABRICATION SHALL CONFORM TO THE REQUIREMENTS OF THE STATE HIGHWAY AND TRANSPORTATION COMMISSION STANDARD SPECIFICATIONS AND PROVISIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
KATHRYN PHILLIPS HARVEY
NUMBER PE-23751
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

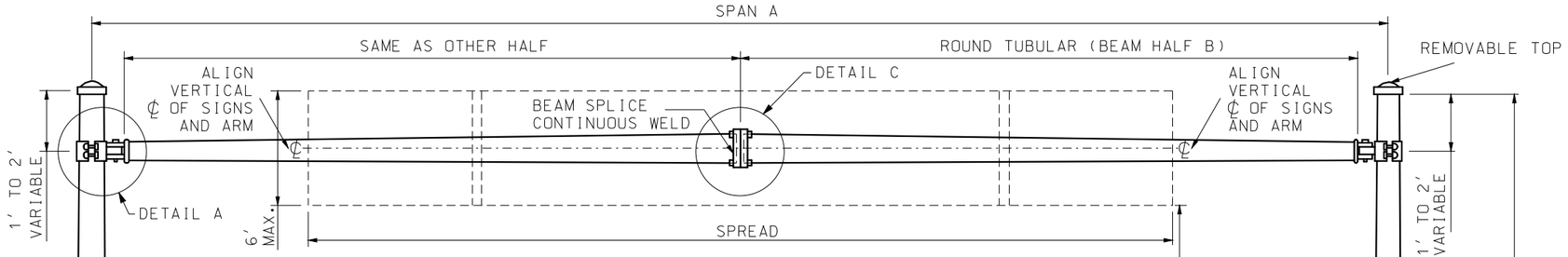
# HIGHWAY SIGNING
## WEIGH STATION

DATE EFFECTIVE: 02/01/2012
DATE PREPARED: 12/19/2011

903.04F

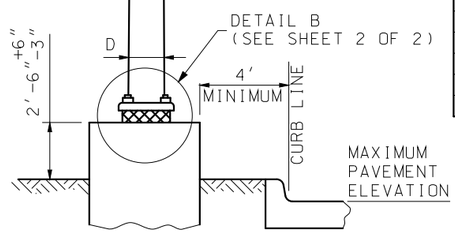
SHEET NO. 1 OF 1

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



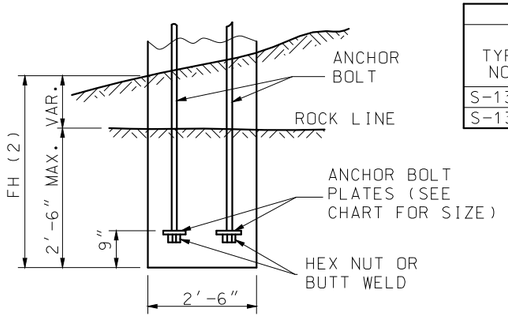

| SPAN A | SPREAD FEET | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| 31'-6" | 143 | 152 | | | MAXIMUM SIGN AREA | | | | | | | |
| 35'-0" | 126 | 138 | 153 | | SQUARE FEET | | | | | | | |
| 41'-3" | 106 | 120 | 130 | 144 | | | | | | | | |
| 41'-6" | 124 | 134 | 144 | 155 | | | | | | | | |
| 45'-0" | 102 | 112 | 121 | 132 | 144 | | | | | | | |
| 51'-3" | 78 | 88 | 98 | 108 | 118 | 129 | | | | | | |
| 51'-6" | 109 | 119 | 129 | 141 | 154 | 168 | | | | | | |
| 55'-0" | 88 | 98 | 108 | 119 | 131 | 142 | 155 | | | | | |
| 61'-3" | 69 | 80 | 91 | 101 | 110 | 121 | 130 | 142 | | | | |
| 61'-6" | | 115 | 124 | 133 | 144 | 157 | 170 | 182 | | | | |
| 65'-0" | | 98 | 107 | 117 | 128 | 140 | 152 | 164 | 176 | | | |
| 71'-3" | | 80 | 89 | 98 | 109 | 121 | 132 | 144 | 156 | 164 | | |
| 71'-6" | | 110 | 121 | 131 | 142 | 152 | 162 | 173 | 184 | 197 | | |
| 75'-0" | | 94 | 104 | 114 | 124 | 139 | 144 | 154 | 165 | 176 | 187 | |
| 81'-3" | | 84 | 94 | 104 | 116 | 126 | 131 | 146 | 157 | 168 | 179 | 190 |

W=40 POUNDS PER SQUARE FOOT.




| TYPE NO. | SPAN A | GA. | DIMENSIONS | END POST GA. | END POST D |
|---|---|---|---|---|---|
| S-1310 | 31'-6" THRU 41'-3" | 3 | 8.8" x 6" x 20' | 3 | 10" |
| S-1310 | 41'-6" THRU 51'-3" | 3 | 9.5" x 6" x 25' | 3 | 10" |
| S-1310 | 51'-6" THRU 61'-3" | 3 | 10.5" x 6.3" x 30' | 3 | 10" |
| S-1312 | 61'-6" THRU 71'-3" | 7 | 14" x 9.1" x 35' | 3 | 12" |
| S-1312 | 71'-6" THRU 81'-3" | 7 | 16" x 10.4" x 40' | 3 | 12" |

NOTES:
DESIGN SPANS IN EVEN 3" INCREMENTS. SPECIFY SPAN A REQUIRED. FOR SPAN LENGTHS LESS THAN MAXIMUM FOR A DESIGNATED RANGE, THE LARGER DIAMETER OF THE CROSS BEAM IS HELD AND THE SMALLER DIAMETER WILL INCREASE AS LENGTH IS REDUCED. DESIGN POSTS IN EVEN 1" INCREMENTS.




REINFORCEMENT PLACED SAME AS STANDARD FOOTING.
CONCRETE TO BE POURED TO EXCAVATED FACE OF ROCK.

## MODIFIED FOOTING IN SOLID ROCK

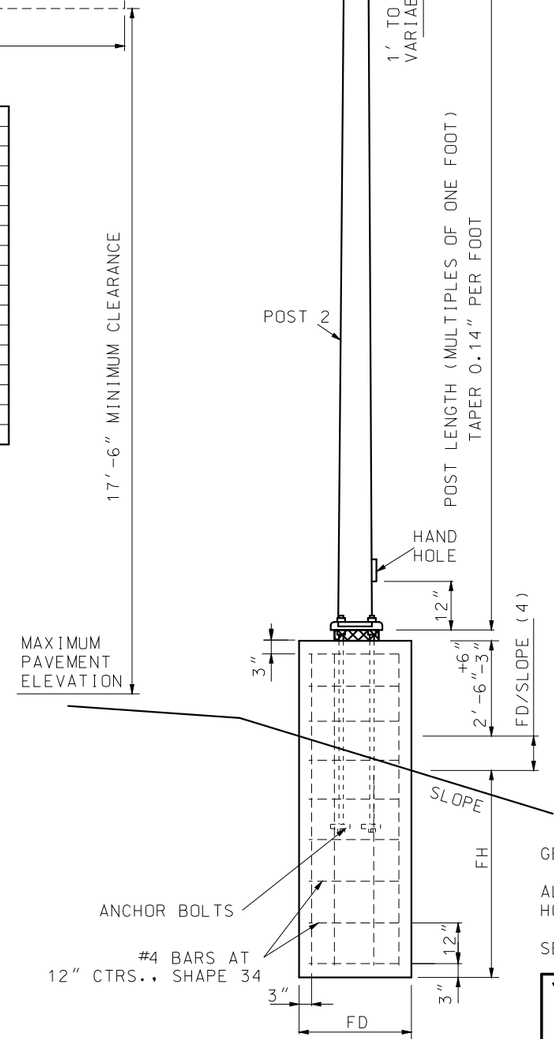
(2) NOT TO EXCEED 5' FOR S-1310,
NOT TO EXCEED 6'-6" FOR S-1312.

| ESTIMATED QUANTITIES FOOTING | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TYPE NO. | DIA. FD | CLASS B CONCRETE 1' DEPTH CU. YD. | CLASS B CONCRETE 1" DEPTH CU. YD. | REINFORCING STEEL #5 NO. | #5 LENGTH | #4 (3) NO. | #4 (3) LENGTH | TOTAL LBS. |
| S-1310 | 2'-6" | 0.1818 | 0.01515 | 6 | 8'-9" | 10 | 7'-2" | 103 |
| S-1312 | 2'-6" | 0.1818 | 0.01515 | 6 | 10'-3" | 12 | 7'-2" | 121 |

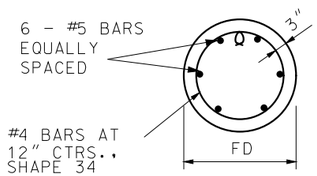
(3) ESTIMATED QUANTITY FOR REINFORCING STEEL IS BASED ON A 1V:2H SLOPE.

| MODIFIED FOOTING IN SOLID ROCK | | |
|---|---|---|
| TYPE NO. | ANCHOR BOLT (1) | ANCHOR BOLT PLATE |
| S-1310 | 1 1/2" DIA. | 3 1/2" x 3 1/2" x 3/4" |
| S-1312 | 1 3/4" DIA. | 3 1/2" x 3 1/2" x 3/4" |

(1) ANCHOR BOLT LENGTH AS REQUIRED




ELEVATION




PLAN
FOOTINGS

(4) EXAMPLE: IF SLOPE IS 1V:6H, THE DENOMINATOR IS 6

GENERAL NOTES:

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE ARM.

SEE SHEET 2 OF 2 FOR DETAILS A, B AND C.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

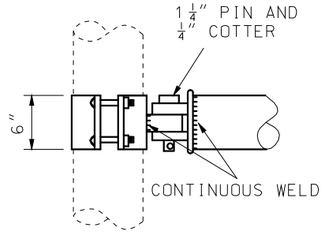
# HIGHWAY SIGNING

TUBULAR SUPPORT STEEL
TYPE S
ONE TUBE

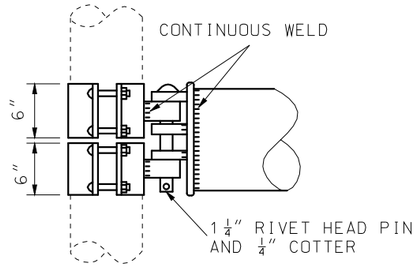
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.05J

SHEET NO. 1 OF 2



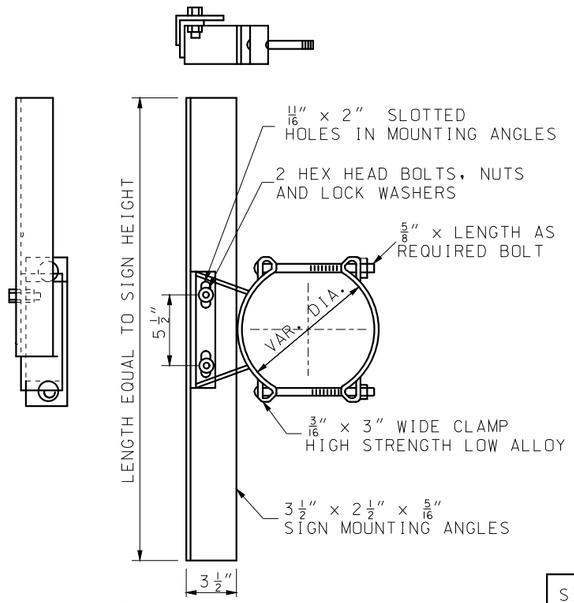

TUBE DIAMETER EQUAL TO
OR LESS THAN 10 1/2"
AT CENTER OF SPAN




TUBE DIAMETER GREATER THAN 10 1/2"
AT CENTER OF SPAN

DETAIL A

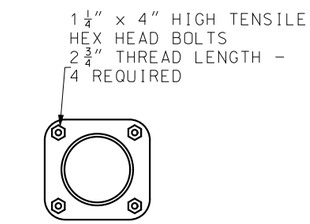
## BEAM CLAMP



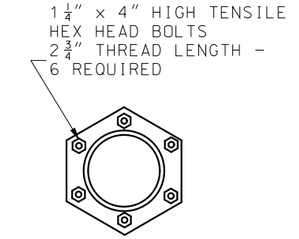

NOTE:
MINIMUM OF TWO BRACKETS ARE REQUIRED
FOR SIGNS OVER 42" IN LENGTH.

## GALVANIZED SIGN BRACKET ASSEMBLY

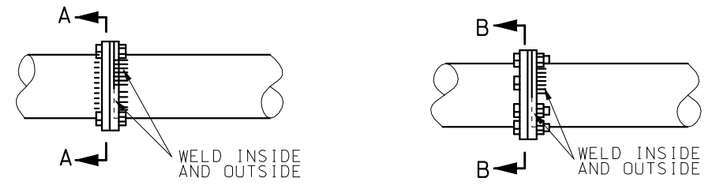
| SIGN HEIGHT (INCHES) | MAXIMUM LIN. FT. OF SIGN WIDTH PER BRACKET |
|---|---|
| 48 & UNDER | 13 |
| 60 | 8 |
| 72 | 5 |




SECTION A-A




SECTION B-B




TUBE DIAMETER 9 1/2"
AND UNDER

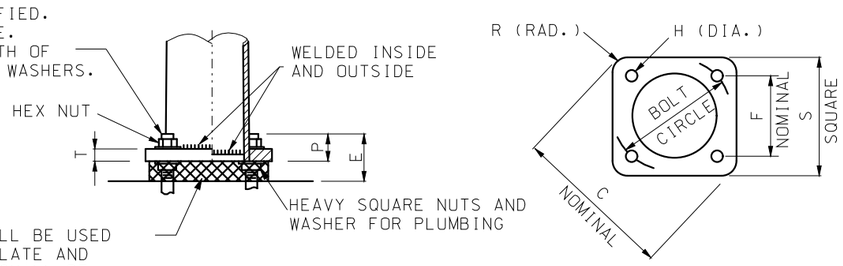
TUBE DIAMETER
OVER 9 1/2"

DETAIL C

## BEAM SPLICE

| POST BASE DIMENSIONS AND DATA | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE NO. | BOLT CIRCLE | C | F | H | S | R | P | T | E | ANCHOR BOLT | FOOTING | |
| | | | | | | | | | | | FH | FD |
| S-1310 | 13 1/2" | 17 1/2" | 9 9/16" | 1 3/4" | 14 1/8" | 3 1/8" | 3 3/4" | 1 1/2" | 7" | 1 1/2" x 60" | 5'-0" | 2'-6" |
| S-1312 | 16" | 21" | 11 5/16" | 2 1/8" | 17" | 3 3/4" | 4 1/2" | 2" | 7 1/2" | 1 3/4" x 90" | 6'-6" | 2'-6" |

ANCHOR BOLTS AS SPECIFIED.
THREAD UPPER PORTION E.
GALVANIZE ENTIRE LENGTH OF
BOLT AND ALL NUTS AND WASHERS.




A GALVANIZED SCREEN SHALL BE USED BETWEEN THE POST BASE PLATE AND CONCRETE BASE. SCREENS SHALL BE PRESS-FORMED OF 3 OR 4 MESH. 21 GAGE OR HEAVIER. STAINLESS STEEL OR HOT-DIPPED GALVANIZED WIRE SCREEN OR APPROVED EQUIVALENT. THAT WILL PROVIDE A FRICTION-TIGHT FIT WHEN INSTALLED.

ELEVATION




PLAN

DETAIL B

## POST BASE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# HIGHWAY SIGNING

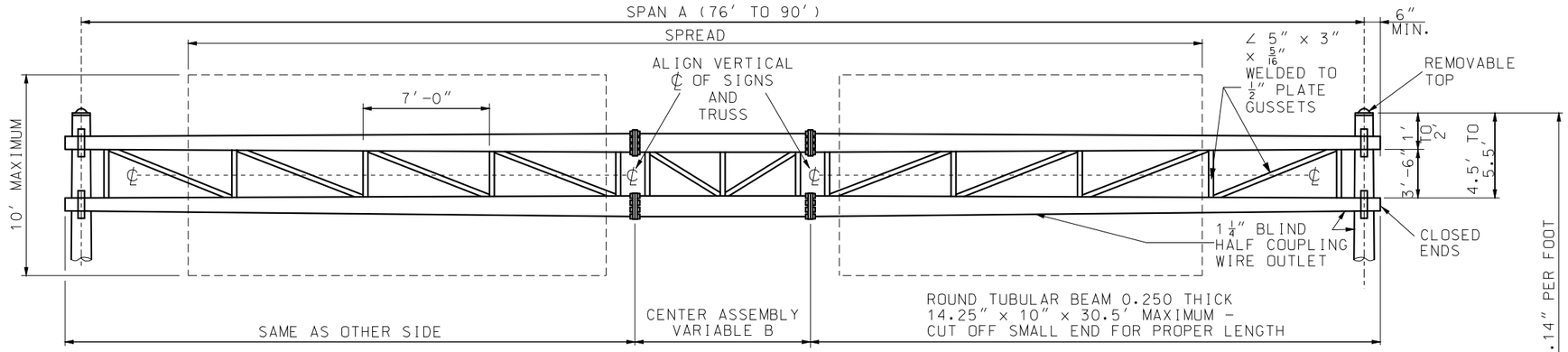
TUBULAR SUPPORT STEEL
TYPE S
ONE TUBE

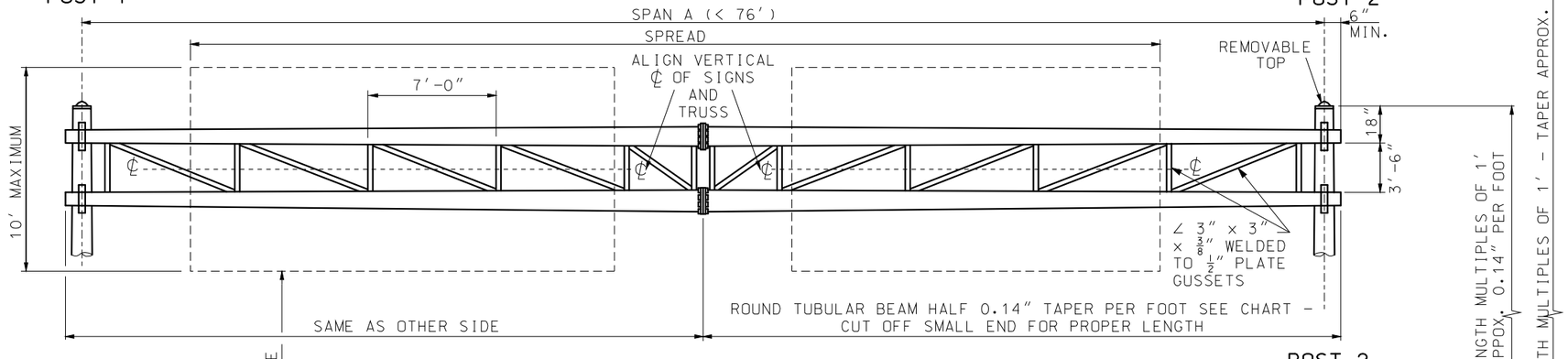
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.05J

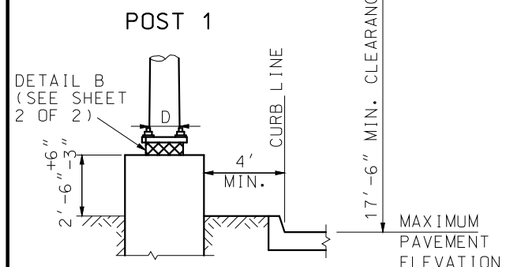
SHEET NO.
2 OF 2

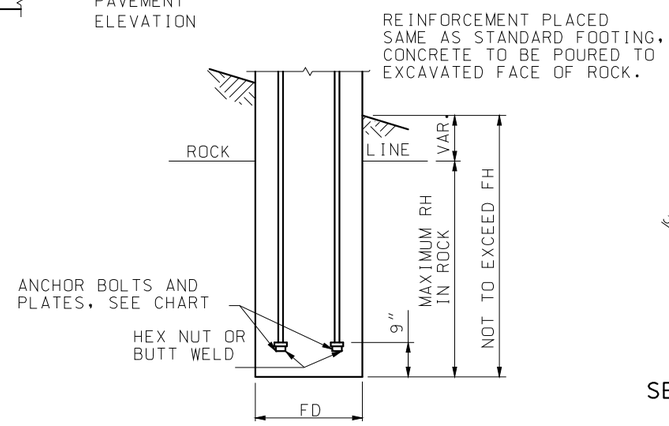
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



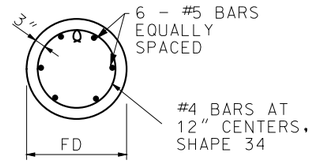




| TWO END POST | | | |
|---|---|---|---|
| TYPE | GA | D INCHES | ALLOWABLE MOMENT-FT-LBS. |
| S-2315 | 3 | 15 | 120 000 |
| S-2316.5 | 3 | 16.5 | 147 000 |
| S-2318 | 3 | 18 | 177 000 |
| S-27716 | 7+7 | 16 | 214 000 |
| S-2018 | 0 | 18 | 222 000 |
| S-27718 | 7+7 | 18 | 255 000 |
| S-23316.5 | 3+3 | 16.5 | 292 000 |
| S-23317 | 3+3 | 17 | 328 000 |
| S-20018 | 0+0 | 18 | 453 000 |

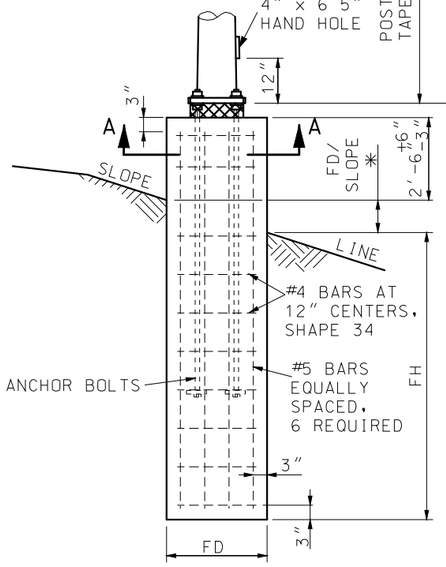



MODIFIED FOOTING IN SOLID ROCK




SECTION A-A




ELEVATION

* EXAMPLE: IF SLOPE IS 1V:6H, THE DENOMINATOR IS 6

GENERAL NOTES:

USE LONGEST POST AND SPAN A (NEXT GREATER IF NOT CHARTED) TO DETERMINE END POSTS AND STRUCTURE DESIGNS. MAXIMUM SIGN AREA FOR GIVEN SPREAD (INTERPOLATE FOR UNCHARTED SPREADS) NOT TO BE EXCEEDED. SUPPORTS DESIGNED BY END POST TYPE AND SPAN A (I.E. S-2315-40 ETC.).

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# HIGHWAY SIGNING

TUBULAR SUPPORT STEEL
TYPE S
TWO TUBES

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.06J

SHEET NO. 1 OF 2

## FOOTINGS

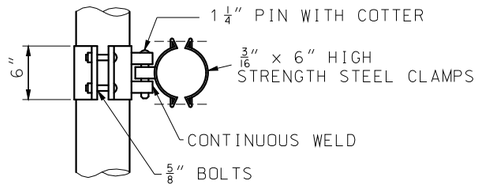
| SPAN A | SPREAD IN FEET | | | | | | | | | | | | | STRUCTURE | | | | | | POSTS FOR MAXIMUM AREA | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | TUBULAR BEAMS | | | CENTER SECTION B | | | LENGTH OF POSTS IN FEET | | | | | | | | |
| FEET | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | GA | LARGE DIA. | MIN. L | THICK-NESS | O.D. | LENGTH | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 40 | 300 | | | | | | | | | | | | | 3 | 9.5" | 20.5' | | | | S-2315 | S-2315 | S-2315 | S-2316.5 | S-2316.5 | S-2316.5 | S-2318 | S-2318 | S-2318 | S-2318 |
| 45 | 264 | 288 | | | | | | | | | | | | 3 | 9.5" | 23.0' | | | | S-2315 | S-2315 | S-2315 | S-2316.5 | S-2316.5 | S-2316.5 | S-2318 | S-2318 | S-2318 | S-2318 |
| 50 | 282 | 308 | 336 | | | | | | | | | | | 3 | 10.5" | 25.5' | | | | S-2315 | S-2316.5 | S-2316.5 | S-2316.5 | S-2318 | S-2318 | S-2318 | S-27716 | S-27716 | S-27716 |
| 55 | 238 | 262 | 284 | 310 | | | | | | | | | | 3 | 10.5" | 28.0' | | | | S-2315 | S-2316.5 | S-2316.5 | S-2316.5 | S-2318 | S-2318 | S-2318 | S-2318 | S-27716 | S-27716 |
| 60 | 266 | 288 | 314 | 340 | 364 | | | | | | | | | 7 | 14.0" | 30.5' | | | | S-2318 | S-27716 | S-27716 | S-27716 | S-2018 | S-27718 | S-27718 | S-27718 | S-23316.5 | S-23316.5 |
| 65 | 234 | 256 | 280 | 304 | 328 | 352 | | | | | | | | 7 | 14.0" | 33.0' | | | | S-2318 | S-27716 | S-27716 | S-27716 | S-27716 | S-27718 | S-27718 | S-27718 | S-23316.5 | S-23316.5 |
| 70 | 262 | 284 | 304 | 324 | 346 | 368 | 394 | | | | | | | 3 | 14.0" | 35.5' | | | | S-27716 | S-27716 | S-27716 | S-27718 | S-27718 | S-27718 | S-23316.5 | S-23316.5 | S-23316.5 | S-23317 |
| 75 | 228 | 248 | 268 | 288 | 308 | 330 | 352 | 374 | | | | | | 3 | 14.0" | 38.0' | | | | S-27716 | S-27716 | S-27716 | S-2018 | S-27718 | S-27718 | S-27718 | S-23316.5 | S-23316.5 | S-23316.5 |
| 76 | 295 | 308 | 326 | 350 | 370 | 397 | 425 | 450 | 472 | 502 | | | | 3 | 14.25" | 30.5' | 312" | 14.238" | 16' | S-27716 | S-27718 | S-27718 | S-27718 | S-23316.5 | S-23316.5 | S-23317 | S-23317 | S-23317 | S-20018 |
| 79 | 310 | 326 | 347 | 366 | 384 | 410 | 432 | 460 | 490 | 520 | | | | 3 | 14.25" | 28.5' | 312" | 14.238" | 23' | S-2018 | S-27718 | S-27718 | S-23316.5 | S-23316.5 | S-23317 | S-23317 | S-23317 | S-20018 | S-20018 |
| 83 | 277 | 288 | 300 | 322 | 340 | 360 | 385 | 412 | 434 | 465 | 498 | | | 3 | 14.25" | 30.5' | 312" | 14.238" | 23' | S-27716 | S-2018 | S-27718 | S-27718 | S-23316.5 | S-23316.5 | S-23316.5 | S-23317 | S-23317 | S-20018 |
| 86 | 297 | 309 | 322 | 337 | 356 | 378 | 402 | 425 | 447 | 473 | 500 | 522 | | 3 | 14.25" | 28.0' | 312" | 14.238" | 30' | S-2018 | S-27718 | S-27718 | S-23316.5 | S-23316.5 | S-23317 | S-23317 | S-23317 | S-20018 | S-20018 |
| 90 | 269 | 280 | 294 | 310 | 327 | 345 | 363 | 385 | 403 | 426 | 446 | 466 | 485 | 3 | 14.25" | 30.5' | 312" | 14.238" | 30' | S-27716 | S-27718 | S-27718 | S-23316.5 | S-23316.5 | S-23316.5 | S-23317 | S-23317 | S-20018 | S-20018 |

MAXIMUM SIGN AREA IN SQ. FEET

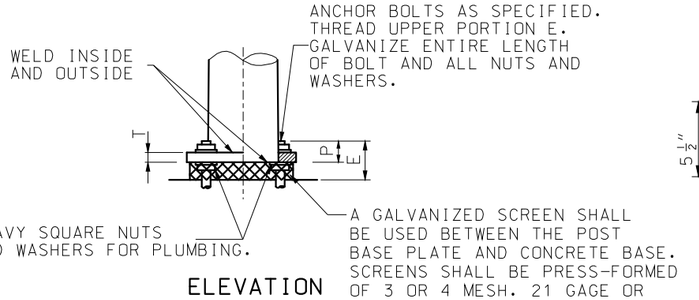
| TYPE NO. | BOLT CIRCLE | C | F | H | P | R | S | T | E | FOOTINGS IN EARTH DIA. FD | FH | ANCHOR BOLTS DIA. | ANCHOR BOLTS LENGTH | FOOTINGS IN SOLID ROCK RH MAX | ANCHOR BOLTS DIA. | ANCHOR BOLTS LENGTH | PLATES | ESTIMATED QUANTITIES OF STANDARD FOOTINGS CLASS B CONC CY/FT | CY/IN | REINFORCING STEEL #5 BARS NO. | #5 BARS LENGTH | #4 BARS * NO. | #4 BARS * LENGTH | TOTAL LBS. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S-2315 | 22" | $28\frac{5}{8}$" | $15\frac{1}{2}$" | $2\frac{3}{8}$" | $4\frac{3}{4}$" | $4\frac{5}{8}$" | 23" | 2" | $8\frac{1}{2}$" | 2'-6" | 8' | 2" | 96" | 3' | 2" | AS REQUIRED SEE ROCK FOOTING | 3.5" x 3.5" x 0.75" | 0.1818 | 0.01515 | 6 | 11'-9" | 13 | 7'-2" | 136 |
| S-2316.5 | $23\frac{1}{2}$" | $30\frac{1}{2}$" | $16\frac{5}{8}$" | $2\frac{3}{8}$" | $4\frac{3}{4}$" | 5" | $24\frac{1}{2}$" | 2" | $8\frac{1}{2}$" | 3'-0" | 10' | 2" | 96" | 3' | 2" | | 3.5" x 3.5" x 0.75" | 0.2618 | 0.0218 | 6 | 14'-0" | 15 | 8'-9" | 176 |
| S-2318 | $25\frac{1}{2}$" | 33" | 18" | $2\frac{3}{8}$" | $4\frac{3}{4}$" | $5\frac{1}{2}$" | $26\frac{1}{2}$" | 2" | $8\frac{1}{2}$" | 3'-0" | 10' | 2" | 96" | 3' | 2" | | 3.5" x 3.5" x 0.75" | 0.2618 | 0.0218 | 6 | 14'-0" | 15 | 8'-9" | 176 |
| S-27716 | $23\frac{1}{2}$" | $30\frac{1}{2}$" | $16\frac{5}{8}$" | $2\frac{5}{8}$" | 5" | $5\frac{1}{2}$" | $24\frac{1}{2}$" | $2\frac{1}{2}$" | $9\frac{1}{2}$" | 3'-0" | 10' | $2\frac{1}{4}$" | 96" | 3' | $2\frac{1}{4}$" | | 4.5" x 4.5" x 0.75" | 0.2618 | 0.0218 | 6 | 14'-0" | 15 | 8'-9" | 176 |
| S-2018 | $25\frac{1}{2}$" | 33" | 18" | $2\frac{5}{8}$" | $5\frac{1}{2}$" | $5\frac{1}{2}$" | $26\frac{1}{2}$" | $2\frac{1}{2}$" | $9\frac{1}{2}$" | 3'-6" | 11' | $2\frac{1}{4}$" | 96" | 4' | $2\frac{1}{4}$" | | 4.5" x 4.5" x 0.75" | 0.3563 | 0.0297 | 6 | 15'-3" | 17 | 10'-4" | 212 |
| S-27718 | $25\frac{1}{2}$" | 33" | 16" | $2\frac{7}{8}$" | 6" | $5\frac{1}{2}$" | $26\frac{1}{2}$" | $2\frac{1}{2}$" | $10\frac{1}{2}$" | 3'-6" | 11' | $2\frac{1}{2}$" | 120" | 4' | $2\frac{1}{2}$" | | 5" x 5" x 1" | 0.3563 | 0.0297 | 6 | 15'-3" | 17 | 10'-4" | 212 |
| S-23316.5 | $23\frac{1}{2}$" | $30\frac{1}{2}$" | $16\frac{5}{8}$" | $3\frac{3}{8}$" | 7" | 5" | $24\frac{1}{2}$" | 3" | 12" | 3'-6" | 12' | 3" | 144" | 4' | 3" | | 5" x 5" x 1" | 0.3563 | 0.0297 | 6 | 16'-3" | 18 | 10'-4" | 226 |
| S-23317 | $25\frac{1}{2}$" | 33" | 18" | $3\frac{3}{8}$" | 7" | $5\frac{1}{2}$" | $26\frac{1}{2}$" | 3" | 12" | 3'-6" | 12' | 3" | 144" | 4' | 3" | | 5" x 5" x 1" | 0.3563 | 0.0297 | 6 | 16'-3" | 18 | 10'-4" | 226 |
| S-20018 | $25\frac{1}{2}$" | 33" | 18" | $3\frac{3}{8}$" | 7" | $5\frac{1}{2}$" | $26\frac{1}{2}$" | 3" | 12" | 4'-0" | 12' | 3" | 144" | 5' | 3" | | 5" x 5" x 1" | 0.4654 | 0.0388 | 6 | 16'-6" | 18 | 11'-10" | 245 |

* ESTIMATED QUANTITY FOR REINFORCING STEEL IS BASED ON A 2:1 (H:V) SLOPE.

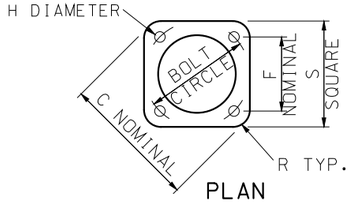
| TUBE DIA. | A | B | NO. OF BOLTS |
|---|---|---|---|
| $9\frac{1}{2}$" | $11\frac{1}{2}$" | $12\frac{1}{2}$" | 4 |
| $10\frac{1}{2}$" | $14\frac{5}{8}$" | 14" | 4 |
| 14.0" | $17\frac{1}{4}$" | 17" | 6 |




BEAM CLAMP DETAIL



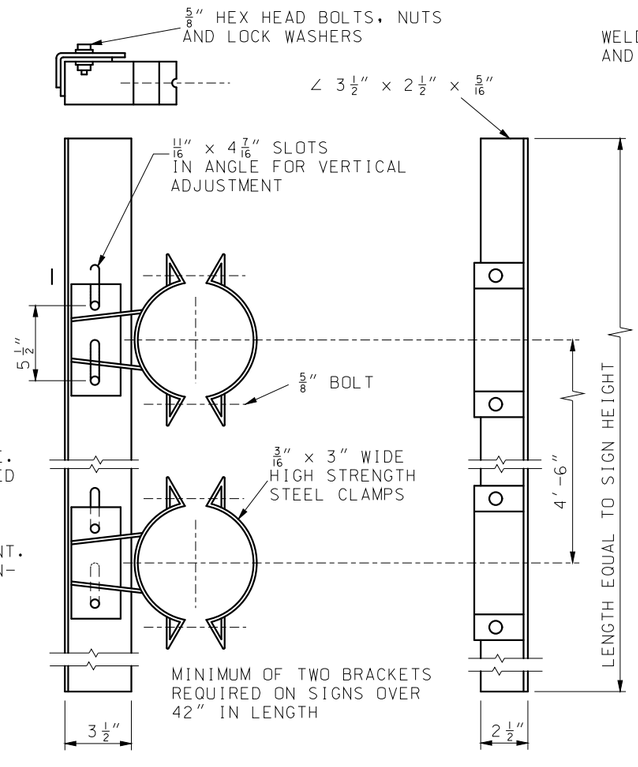

ELEVATION




PLAN

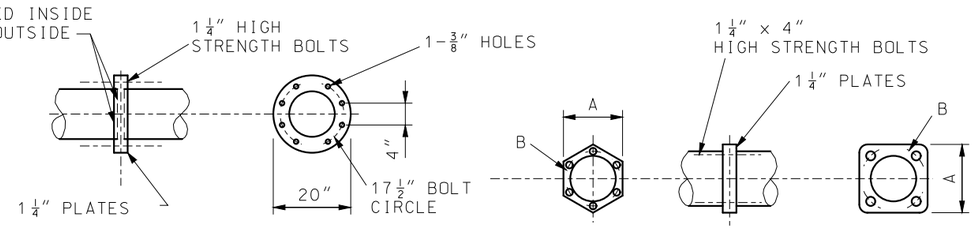
DETAIL B

POST BASE DETAIL




GALVANIZED SIGN BRACKET ASSEMBLY

| SIGN HEIGHT INCHES | MAX. LIN. FT. OF SIGN WIDTH PER BRACKET |
|---|---|
| 48 & UNDER | 16 |
| 60 | 16 |
| 72 | 15 |
| 84 | 11 |
| 96 | 6 |
| 108 | 4 |
| 120 | 3 |




SPANS 76' TO 90'

SPANS UP TO 76'

BEAM SPLICE DETAIL


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# HIGHWAY SIGNING

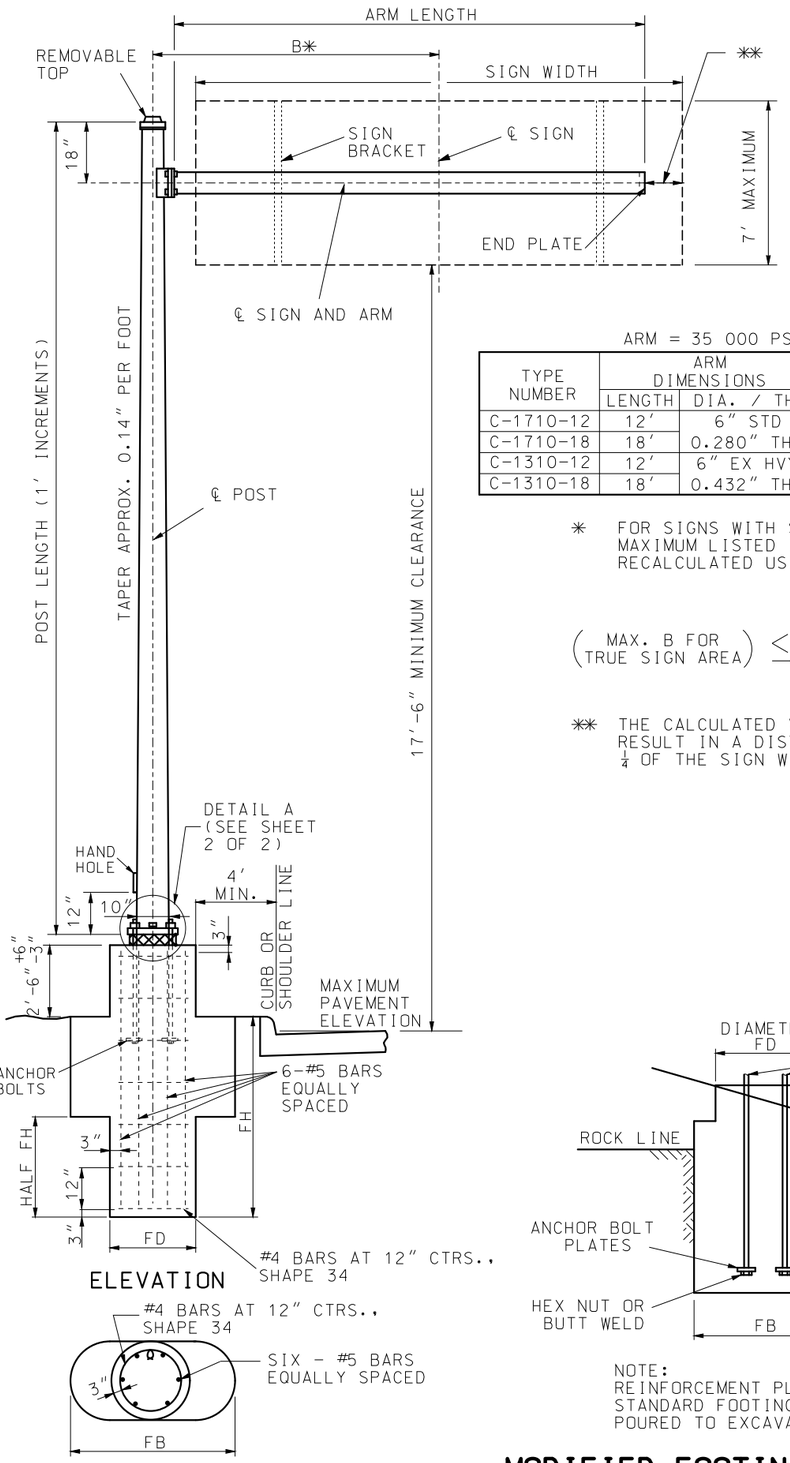
TUBULAR SUPPORT STEEL
TYPE S
TWO TUBES

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.06J

SHEET NO. 2 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




ELEVATION




PLAN

## SINGLE ARM CANTILEVER

| SIGN BRACKETS | |
|---|---|
| SIGN HT. (IN.) | MAX. LIN. FT. OF SIGN WIDTH PER BRACKET |
| | 1 CLAMP TYPE |
| 42 | 16 |
| 48 | 13 |
| 60 | 8 |
| 72 | 5 |
| 84 | 3 |

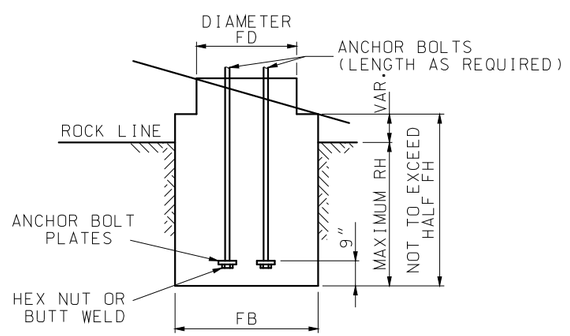
ARM = 35 000 PSI

| TYPE NUMBER | ARM DIMENSIONS | | POST | | MAX SIGN AREA | MAX. B WITH MAX. SIGN AREA |
|---|---|---|---|---|---|---|
| | LENGTH | DIA. / THK | GA | DIA. | SQ. FT. | |
| C-1710-12 | 12' | 6" STD 0.280" THK | 7 | 10" | 41 | 8'-0" |
| C-1710-18 | 18' | | | | | |
| C-1310-12 | 12' | 6" EX HVY 0.432" THK | 3 | 10" | 59 | 8'-9" |
| C-1310-18 | 18' | | | | | |

* FOR SIGNS WITH SIGN AREAS LESS THAN THE MAXIMUM LISTED IN THE TABLE ABOVE, B CAN BE RECALCULATED USING THE FOLLOWING EQUATION:

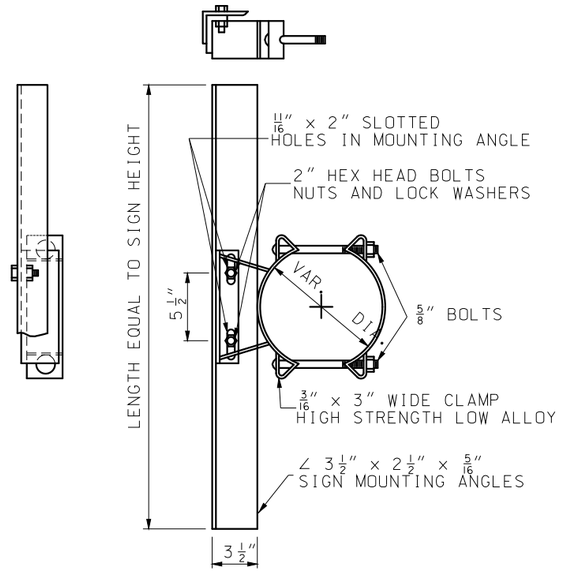
$$\left(\text{MAX. B FOR TRUE SIGN AREA}\right) \leq \frac{\left(\text{MAX SIGN AREA}\right) \times \left(\text{MAX. B WITH MAX. SIGN AREA}\right)}{\left(\text{TRUE SIGN AREA}\right)}$$

** THE CALCULATED VALUE OF B CANNOT RESULT IN A DISTANCE GREATER THAN $\frac{1}{4}$ OF THE SIGN WIDTH




NOTE:
REINFORCEMENT PLACED SAME AS STANDARD FOOTING. CONCRETE TO BE POURED TO EXCAVATED FACE OF ROCK.

## MODIFIED FOOTING IN SOLID ROCK

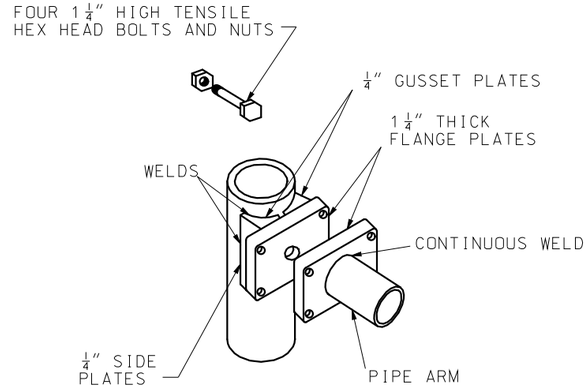



## GALVANIZED SIGN BRACKET ASSEMBLY

| ESTIMATED QUANTITIES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE NUMBER | DIAMETER | | CU YD CLASS B CONCRETE FOOTING | | | | REINFORCING STEEL | | | | |
| | | | FD SECTION | | FB SECTION | | #5 | | #4 (1) | | TOTAL LBS |
| | FD | FB | 1' DEPTH | 1" DEPTH | 1' DEPTH | 1" DEPTH | NO. | FT-IN | NO. | FT-IN | |
| C-1710 | 2' | 4' | 0.11635 | 0.0097 | 0.2645 | 0.0220 | 6 | 7'-6" | 9 | 5'-7" | 81 |
| C-1310 | 2' | 4' | 0.11635 | 0.0097 | 0.2645 | 0.0220 | 6 | 7'-6" | 9 | 5'-7" | 81 |

(1) ESTIMATED QUANTITY FOR REINFORCING STEEL IS BASED ON A 2:1 (H:V) SLOPE.

| MODIFIED FOOTING IN SOLID ROCK | | | | | | | |
|---|---|---|---|---|---|---|---|
| TYPE NUMBER | ANCHOR BOLT DIA. | ANCHOR BOLT PLATE | FOOTING | | | CLASS B CONCRETE FOOTING FB SECTION CU. YD. | |
| | | | RH | FD | FB | 1' DEPTH | 1" DEPTH |
| C-1710 & C-1310 | 1 1/2" | 3 1/2" x 3 1/2" x 3/4" | 2'-6" | 2'-0" | 3'-0" | 1904 | 0159 |
| C-2315 | 2" | 3 1/2" x 3 1/2" x 3/4" | 3'-0" | 3'-0" | 3'-6" | 3173 | 0264 |
| C-2318 | 2" | 3 1/2" x 3 1/2" x 3/4" | 3'-6" | 3'-6" | 3'-6" | 3563 | 0297 |
| C-2018 | 2 1/4" | 4 1/2" x 4 1/2" x 3/4" | 3'-6" | 3'-6" | 3'-6" | 3563 | 0297 |




FOR POLE DIAMETER UNDER 12"
## ARM ATTACHMENT

GENERAL NOTE:

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE ARM.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

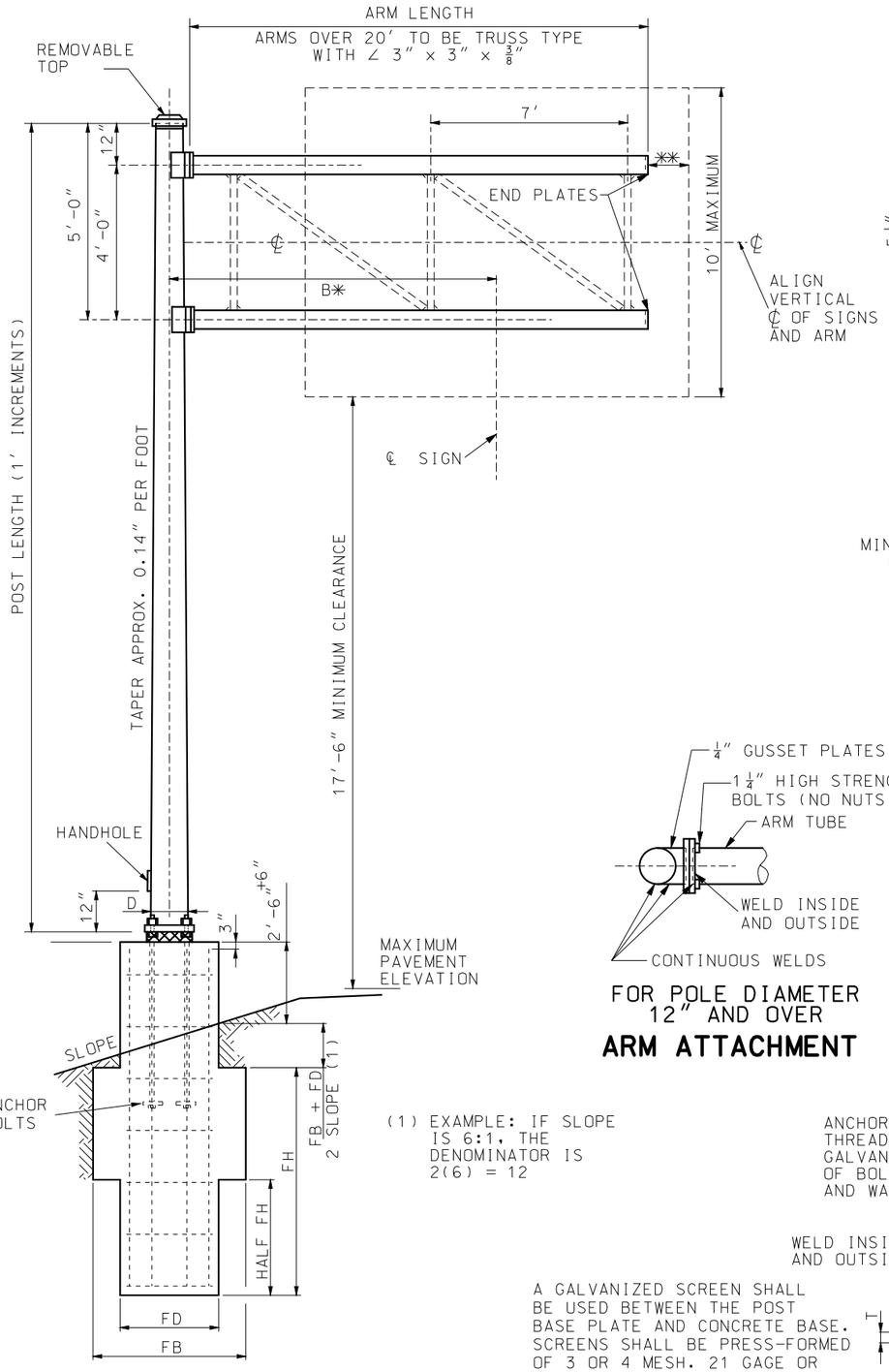
# HIGHWAY SIGNING
TUBULAR SUPPORT STEEL
TYPE C

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.07J

SHEET NO. 1 OF 2

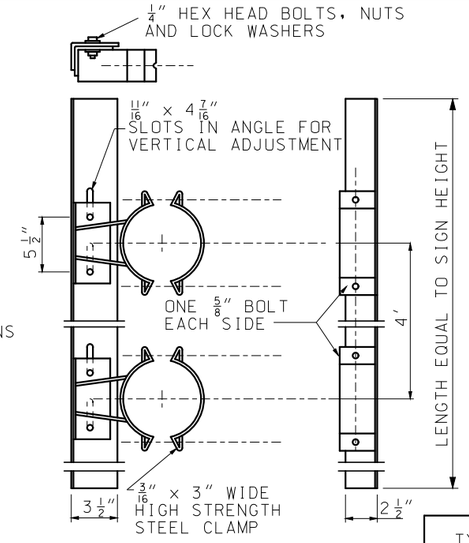
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




ELEVATION

## DOUBLE ARM CANTILEVER

(1) EXAMPLE: IF SLOPE IS 6:1, THE DENOMINATOR IS 2(6) = 12




MINIMUM OF TWO BRACKETS REQUIRED ON SIGNS OVER 42″ IN LENGTH

## GALVANIZED SIGN BRACKET ASSEMBLY

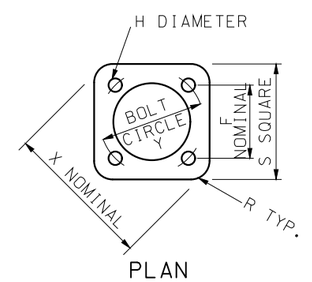



FOR POLE DIAMETER 12″ AND OVER

## ARM ATTACHMENT




DETAIL A
ELEVATION




PLAN

## POST BASE DETAIL

| ESTIMATED QUANTITIES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE NUMBER | DIAMETER | | CU. YD. CLASS B CONCRETE FOOTING | | | | REINFORCING STEEL | | | | |
| | | | FD SECTION | | FB SECTION | | #5 | | #4 (2) | | TOTAL LBS. |
| | FD | FB | 1′ DEPTH | 1″ DEPTH | 1′ DEPTH | 1″ DEPTH | NO. | FT-IN | NO. | FT-IN | |
| C-2315 | 3′ | 4′ | 0.2618 | 0.0218 | 0.3729 | 0.0311 | 6 | 11′-3″ | 13 | 8′-9″ | 146 |
| C-2318 | 3′-6″ | 5′ | 0.3563 | 0.0297 | 0.5507 | 0.0459 | 6 | 12′-2″ | 13 | 10′-4″ | 166 |
| C-2018 | 3′-6″ | 5′ | 0.3563 | 0.0297 | 0.5507 | 0.0459 | 6 | 12′-8″ | 14 | 10′-4″ | 176 |

(2) ESTIMATED QUANTITY FOR REINFORCING STEEL IS BASED ON A 2:1 (H:V) SLOPE.

| TYPE NUMBER | POST | | ARM | | B * | MAX. AREA SQ FT |
|---|---|---|---|---|---|---|
| | GA | DIA. | GA | DIMENSIONS | | |
| C-2315-12 | 3 | 15″ | 7 | 7.5″ x 5.82″ x 12′ | 8′ | 130 |
| C-2315-16 | 3 | 15″ | 7 | 9.0″ x 6.76″ x 16′ | 12′ | 120 |
| C-2315-20 | 3 | 15″ | 3 | 10″ x 7.2″ x 20′ | 16′ | 115 |
| C-2315-24 | 3 | 15″ | 3 | 11″ x 7.64″ x 24′ | 20′ | 100 |
| C-2318-18 | 3 | 18″ | 7 | 9.0″ x 6.48″ x 18′ | 10′ | 145 |
| C-2318-22 | 3 | 18″ | 7 | 11″ x 7.92″ x 22′ | 14′ | 150 |
| C-2318-26 | 3 | 18″ | 7 | 12.5″ x 8.86″ x 26′ | 18′ | 150 |
| C-2018-24 | 0 | 18″ | 7 | 12.5″ x 9.14″ x 24′ | 14′ | 205 |
| C-2018-28 | 0 | 18″ | 3 | 12.5″ x 8.58″ x 28′ | 18′ | 215 |
| C-2018-34 | 0 | 18″ | 0 | 13″ x 8.24″ x 34′ | 24′ | 190 |

| SIGN HT. (IN.) | MAX. LIN. FT. OF SIGN WIDTH PER BRACKET |
|---|---|
| | 2 CLAMP TYPE |
| 42 | 16 |
| 48 | 16 |
| 60 | 16 |
| 72 | 15 |
| 84 | 11 |
| 96 | 6 |
| 108 | 4 |
| 120 | 3 |

* FOR SIGNS WITH SIGN AREAS LESS THAN THE MAXIMUM LISTED IN THE TABLE ABOVE, B CAN BE RECALCULATED USING THE FOLLOWING EQUATION:

$$\left(\text{MAX. B FOR TRUE SIGN AREA}\right) \leq \frac{\left(\text{MAX SIGN AREA}\right) \times \left(\text{MAX. B WITH MAX. SIGN AREA}\right)}{\left(\text{TRUE SIGN AREA}\right)}$$

** THE CALCULATED VALUE OF B CANNOT RESULT IN A DISTANCE GREATER THAN ¼ OF THE SIGN WIDTH

| POST BASE DIMENSIONS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE NUMBER | Y | X | E | F | H | P | R | S | T | ANCHOR BOLTS | FOOTING | | |
| | | | | | | | | | | | FH | FD | FB |
| C-1710 & C-1310 | 13½″ | 17½″ | 7″ | 9 9/16″ | 1¾″ | 3¾″ | 3⅛″ | 14⅛″ | 1½″ | 1½″ x 60″ | 5′ | 2′ | 4′ |
| C-2315 | 22″ | 28⅝″ | 8½″ | 15½″ | 2⅜″ | 4¾″ | 4⅝″ | 23″ | 2″ | 2″ x 96″ | 7′ | 3′ | 4′ |
| C-2318 | 25½″ | 33″ | 8½″ | 18″ | 2⅜″ | 4¾″ | 5½″ | 26½″ | 2″ | 2″ x 96″ | 7′-6″ | 3′-6″ | 5′ |
| C-2018 | 25½″ | 33″ | 9½″ | 18″ | 2⅝″ | 5½″ | 5½″ | 26½″ | 2½″ | 2¼″ x 96″ | 8′ | 3′-6″ | 5′ |


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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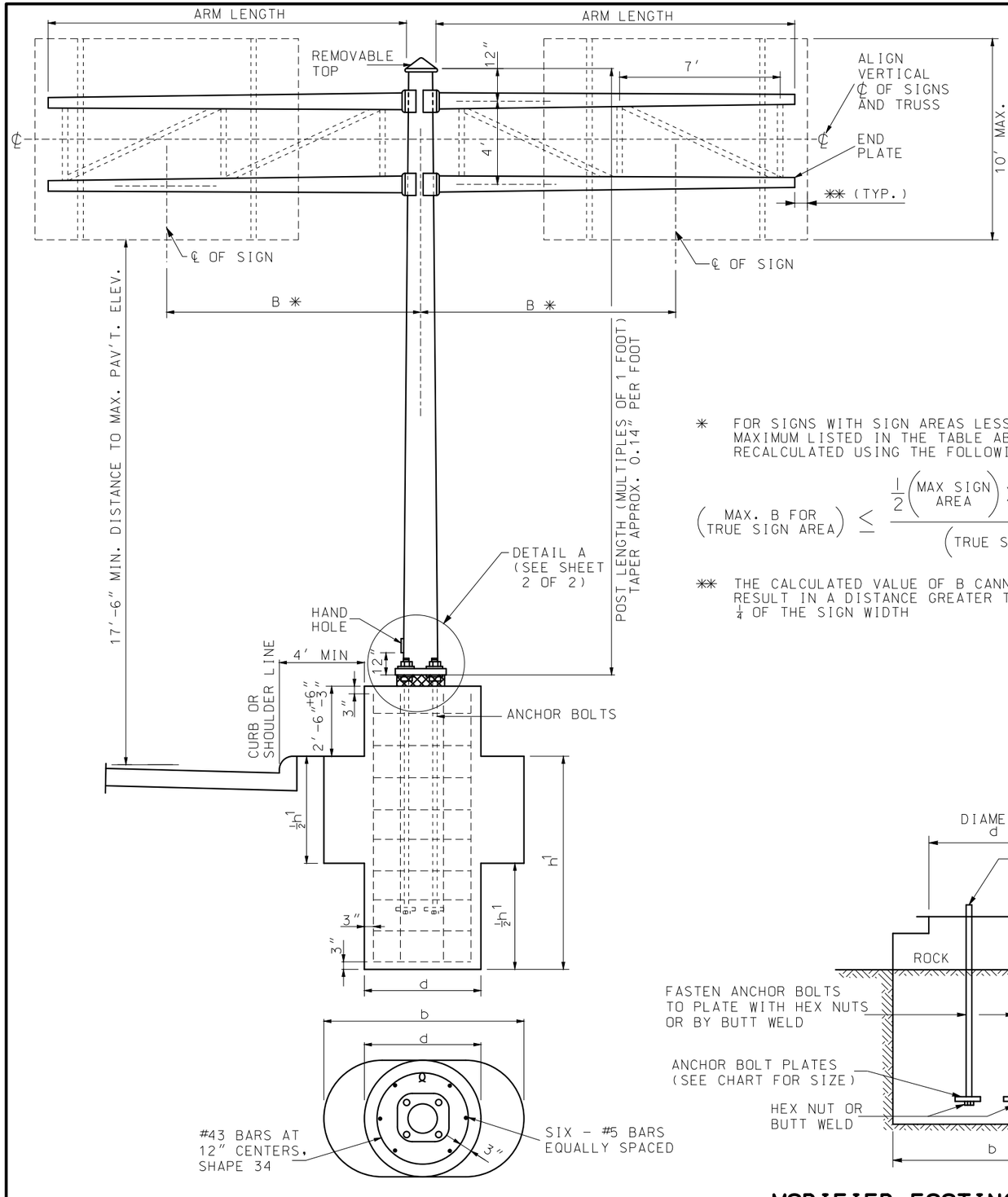
# HIGHWAY SIGNING
TUBULAR SUPPORT STEEL
TYPE C

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.07J

SHEET NO. 2 OF 2

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




PLAN FOOTING

* FOR SIGNS WITH SIGN AREAS LESS THAN THE MAXIMUM LISTED IN THE TABLE ABOVE, B CAN BE RECALCULATED USING THE FOLLOWING EQUATION:

$$\left(\begin{array}{c}\text{MAX. B FOR}\\ \text{TRUE SIGN AREA}\end{array}\right) \leq \frac{\frac{1}{2}\left(\begin{array}{c}\text{MAX SIGN}\\ \text{AREA}\end{array}\right) \times \left(\begin{array}{c}\text{MAX. B}\\ \text{WITH MAX.}\\ \text{SIGN AREA}\end{array}\right)}{\left(\text{TRUE SIGN AREA}\right)}$$

** THE CALCULATED VALUE OF B CANNOT RESULT IN A DISTANCE GREATER THAN $\frac{1}{4}$ OF THE SIGN WIDTH

| TYPE NUMBER | POST | | | ARM | | MAX. AREA (2) SQ. FT. |
|---|---|---|---|---|---|---|
| | GA. | "B"* | DIA. | GA. | DIMENSIONS | |
| B-2018 | 0 | 8' | 18" | 7 | 7.5" x 5.82" x 12' | 260 |
| | 0 | 12' | 18" | 7 | 9.0" x 6.76" x 16' | 240 |
| | 0 | 16' | 18" | 3 | 10.0" x 7.2" x 20' | 230 |
| | 0 | 20' | 18" | 3 | 11.0" x 7.64" x 24' (1) | 200 |
| B-23318 | 3+3 | 10' | 18" | 7 | 9" x 6.48" x 18' | 290 |
| | 3+3 | 14' | 18" | 7 | 11" x 7.92" x 22' (1) | 300 |
| | 3+3 | 18' | 18" | 7 | 12.5" x 8.86" x 26' (1) | 300 |
| B-20018 | 0+0 | 14' | 18" | 7 | 12.5" x 9.14" x 24' (1) | 410 |
| | 0+0 | 18' | 18" | 3 | 12.5" x 8.58" x 28' (1) | 430 |
| | 0+0 | 24' | 18" | 0 | 13" x 24" x 34' (1) | 430 |

NOTES:
(1) ARMS OVER 20' TO BE TRUSS TYPE WITH ∠ 3" x 3" x $\frac{3}{8}$" ANGLES.

(2) MAX SIGN AREA ON EACH SIDE EQUALS HALF THE TOTAL IN CHART.

W = 40# PER SQUARE FOOT

| TYPE NUMBER | DIA. "d" | DIA. "b" | ESTIMATED QUANTITIES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CLASS B CONCRETE FOOTING (C.Y.) | | | | REINFORCING STEEL | | | | |
| | | | "d" SECTION | | "b" SECTION | | #5 | | #4 (3) | | TOTAL LBS. |
| | | | 1' DEPTH | 1" DEPTH | 1' DEPTH | 1" DEPTH | NO. | FT.-IN. | NO. | FT.-IN. | |
| B-2018 | 3'-6" | 6'-0" | 0.3563 | 0.0297 | 0.6800 | 0.0567 | 6 | 10'-0" | 11 | 10'-4" | 139 |
| B-23318 | 3'-6" | 7'-0" | 0.3563 | 0.0297 | 0.8100 | 0.0675 | 6 | 10'-6" | 12 | 10'-4" | 149 |
| B-20018 | 3'-6" | 7'-0" | 0.3563 | 0.0297 | 0.8100 | 0.0675 | 6 | 12'-0" | 13 | 10'-4" | 165 |

(3) ESTIMATED QUANTITY FOR REINFORCING STEEL IS BASED ON A 2:1 (H:V) SLOPE.

| TYPE NUMBER | MODIFIED FOOTING IN SOLID ROCK | | | | | | CLASS B CONCRETE FOOTING CU. YD. | |
|---|---|---|---|---|---|---|---|---|
| | ANCHOR BOLT (4) (DIA.) | ANCHOR BOLT PLATE | FOOTING | | | | "b" SECTION | |
| | | | "h2" | "d" | "b" | | 1' DEPTH | 1" DEPTH |
| B-2018 | 2¼" | 4½" x 4½" x ¾" | 3'-6" | 3'-6" | 3'-6" | | 0.3563 | 0.0297 |
| B-23318 | 3" | 5½" x 5½" x 1" | 4'-0" | 3'-6" | 4'-6" | | 0.4860 | 0.0405 |
| B-20018 | 3" | 5½" x 5½" x 1" | 5'-0" | 3'-6" | 4'-6" | | 0.4860 | 0.0405 |

(4) ANCHOR BOLT LENGTH AS REQUIRED




REINFORCEMENT SAME AS STANDARD FOOTING

CONCRETE TO BE POURED TO EXCAVATED FACE OF ROCK

MODIFIED FOOTINGS IN SOLID ROCK

GENERAL NOTE:

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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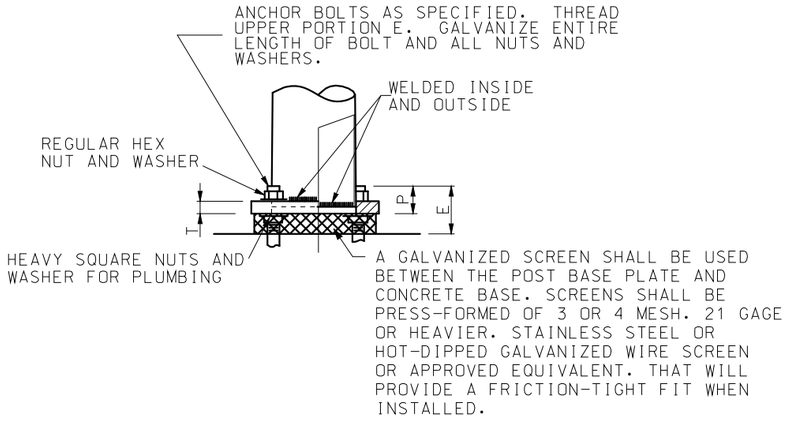
# HIGHWAY SIGNING
## TUBULAR SUPPORT STEEL TYPE B

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.08H

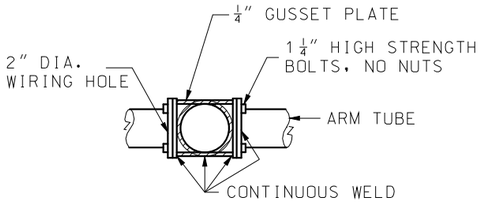
SHEET NO. 1 OF 2

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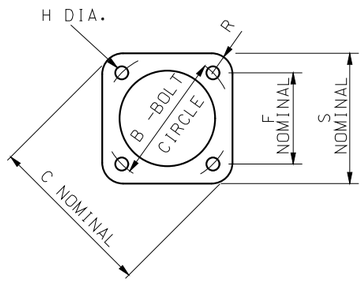



DETAIL A

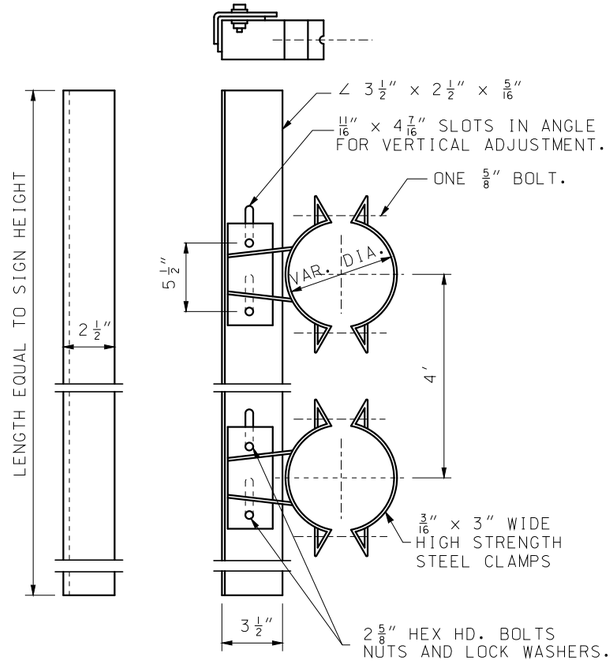
## ELEVATION BASE DETAIL




## ARM ATTACHMENT DETAIL




## PLAN POST BASE DETAIL




## GALVANIZED SIGN BRACKET ASSEMBLY ✳

| SIGN HEIGHT INCHES | MAX. LIN. FT. OF SIGN WIDTH PER BRACKET |
|---|---|
| 48 & UNDER | 16 |
| 60 | 16 |
| 72 | 15 |
| 84 | 11 |
| 96 | 6 |
| 108 | 4 |
| 120 | 3 |

✳ MINIMUM OF TWO BRACKETS REQUIRED ON SIGNS OVER 42" IN LENGTH

| POST BASE DIMENSIONS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TYPE NUMBER | B | C | F | H | S | R | P | T | E | ANCHOR BOLTS | FOOTING "h'" | FOOTING "d" | FOOTING "b" |
| B-2018 | 25 1/2" | 33" | 18" | 2 5/8" | 26 1/2" | 5 1/2" | 5 1/2" | 2 1/2" | 9 1/2" | 2 1/4" x 96" | 7'-6" | 3'-6" | 6'-0" |
| B-23318 | 25 1/2" | 33" | 18" | 3 3/8" | 26 1/2" | 5 1/2" | 7" | 3" | 12" | 3" x 120" | 8'-0" | 3'-6" | 7'-0" |
| B-20018 | 25 1/2" | 33" | 18" | 3 3/8" | 26 1/2" | 5 1/2" | 7" | 3" | 12" | 3" x 120" | 9'-6" | 3'-6" | 7'-0" |

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

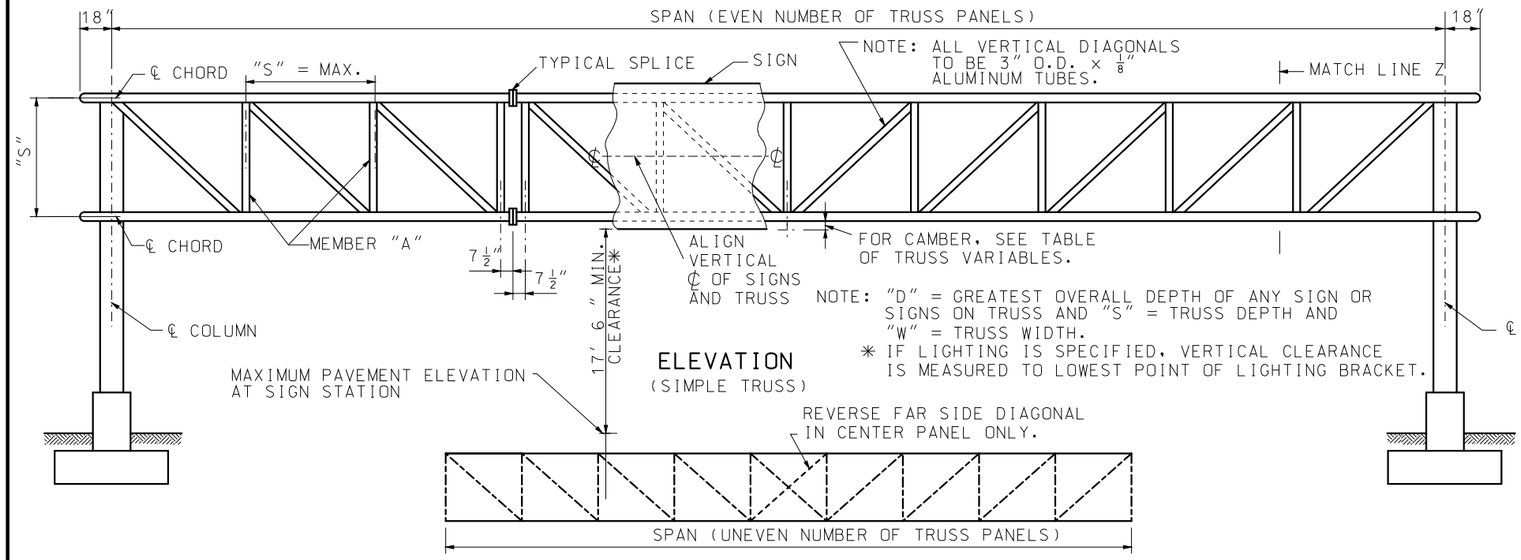
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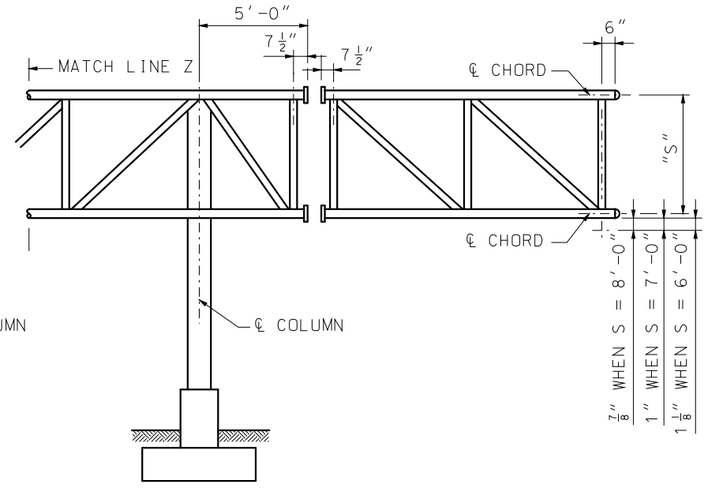
# HIGHWAY SIGNING
TUBULAR SUPPORT STEEL
TYPE B

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

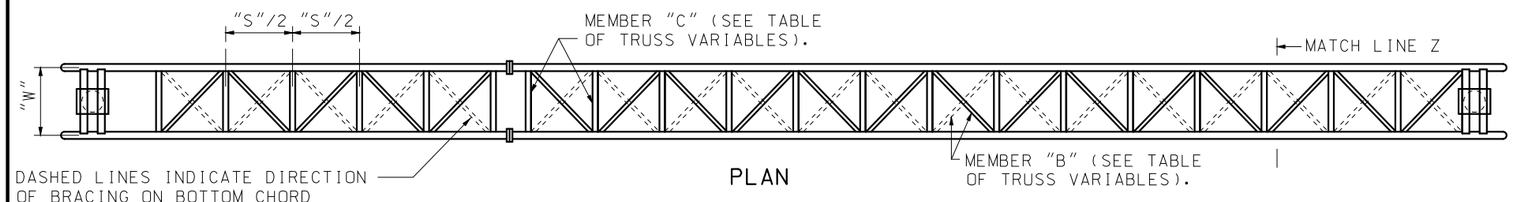
903.08H



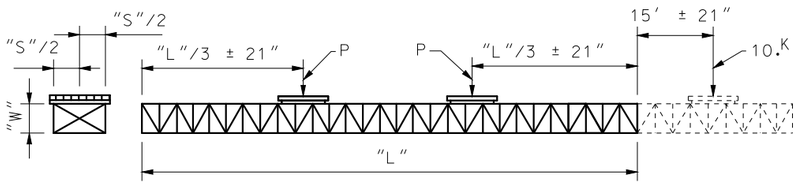

## TRUSS ELEVATION




## ELEVATION
(SIMPLE TRUSS MODIFIED FOR CANTILEVER SPAN)




## PLAN




$$P = \frac{84aW}{L} - 0.02\,L$$

- P = CONCENTRATED LOAD IN KIPS.
- a = AREA OF ONE CHORD TUBE IN SQUARE INCHES. (USE 0.76a FOR 4″ DIA. × 1/4″ AND 4 1/2″ DIA. × 1/4″ CHORDS)
- W = WIDTH OF TRUSS IN FEET.
- L = SPAN LENGTH IN FEET.

SAMPLE, GIVEN: a = 4.123 SQ. IN., W = 6′-0″ AND L = 100′.

SOLUTION: $P = \frac{84 \times 4.123 \times 6.0}{100} - 0.02 \times 100 = 20.8 - 2 = 18.8$

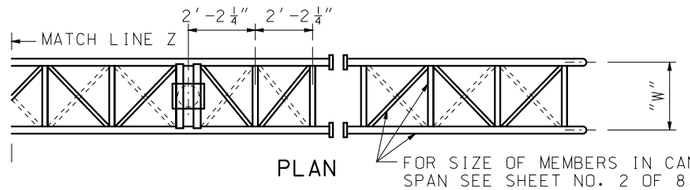
NOTE:
IF CANTILEVERED, REMOVE CONCENTRATED LOAD NEAREST CANTILEVER END AND LOAD CANTILEVER SPAN AS SHOWN ABOVE.

15′ OR LESS CANTILEVER SPANS NEED NOT BE TESTED.

REPEAT ABOVE TESTS BY ROTATING 180° (TO SIMULATE WIND REVERSAL). NO VERTICAL LOAD (D.L.) TEST WILL BE REQUIRED.

LOADS P SHALL NOT BE MORE THAN 16° FOR SPANS LESS THAN 55 FEET AND 20°. FOR ALL OTHERS.

## SIMULATED WIND-SHOP TEST LOADING




## PLAN

FOR SIZE OF MEMBERS IN CANTILEVER SPAN SEE SHEET NO. 2 OF 8.

| TRUSS VARIABLES | | | | | | |
|---|---|---|---|---|---|---|
| SPAN | "S" | "W" | MEMBER "A" | MEMBER "B" | MEMBER "C" | SHOP CAMBER |
| UP TO 70′-6″ | 6′-0″ | 5′-0″ | 2 1/2″ DIA. × 1/8″ | 2 1/2″ DIA. × 1/8″ | 1 3/4″ DIA. × 1/8″ | 3/4″ |
| 71′ TO 80′-6″ | 6′-0″ | 6′-0″ | 2 1/2″ DIA. × 1/8″ | 2 1/2″ DIA. × 1/8″ | 2″ DIA. × 1/8″ | 1 1/4″ |
| 81′ TO 90′-6″ | 6′-0″ | 6′-0″ | 2 1/2″ DIA. × 1/8″ | 2 3/4″ DIA. × 1/8″ | 2″ DIA. × 1/8″ | 1 1/2″ |
| 91′ TO 100′-6″ | 6′-0″ | 6′-0″ | 2 1/2″ DIA. × 1/8″ | 2 3/4″ DIA. × 1/8″ | 2″ DIA. × 1/8″ | 2 1/4″ |
| 101′ TO 110′-6″ | 7′-0″ | 7′-0″ | 2 1/2″ DIA. × 1/8″ | 3″ DIA. × 1/8″ | 2 1/4″ DIA. × 1/8″ | 2 1/2″ |
| 111′ TO 120′-6″ | 7′-0″ | 7′-0″ | 2 1/2″ DIA. × 1/8″ | 3 1/2″ DIA. × 1/8″ | 2 1/4″ DIA. × 1/8″ | 2 3/4″ |
| 121′ TO 130′-6″ | 7′-0″ | 7′-0″ | 3″ DIA. × 1/8″ | 3 1/2″ DIA. × 1/8″ | 2 1/4″ DIA. × 1/8″ | 3 3/4″ |
| 131′ TO 140′-6″ | 8′-0″ | 7′-0″ | 3″ DIA. × 1/8″ | 3 3/4″ DIA. × 1/8″ | 2 1/2″ DIA. × 1/8″ | 3″ |
| 141′ TO 150′-6″ | 8′-0″ | 7′-0″ | 3″ DIA. × 1/8″ | 3 3/4″ DIA. × 1/8″ | 2 3/4″ DIA. × 1/8″ | 3 3/4″ |
| 151′ TO 160′-6″ | 8′-0″ | 7′-0″ | 3″ DIA. × 1/8″ | 3 3/4″ DIA. × 1/8″ | 2 3/4″ DIA. × 1/8″ | 4 1/2″ |

NOTE:
FOR SIZE OF CHORD MEMBERS, SEE DATA SHEET. SHOP CAMBER MAY BE PARABOLIC OR STRAIGHT, BUT SHALL BE SYMMETRICAL ABOUT CENTERLINE OF SPAN.

GENERAL NOTES:

ALL STRUCTURAL STEEL AND COLUMN BASE PLATES ASTM A36.

ALL ANCHOR BOLTS ASTM A307.

PROPOSED FIELD SPLICES SHALL BE SHOWN ON SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.

TRUSSES SHALL BE FABRICATED WITH A MINIMUM OF SPLICING IN TRUSS CHORDS.

FIELD SPLICING WILL NOT BE PERMITTED WITHIN THE MIDDLE ONE-THIRD OF SPAN.

PERMISSIBLE VENT HOLES (MAXIMUM 1/8 DIAMETER) SHALL BE PLACED A MINIMUM OF 3″ FROM WELD ON LOW SIDE OF HORIZONTAL, VERTICAL AND DIAGONAL TUBES.

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.

FOR ADDITIONAL INFORMATION SEE DATA SHEET.


**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
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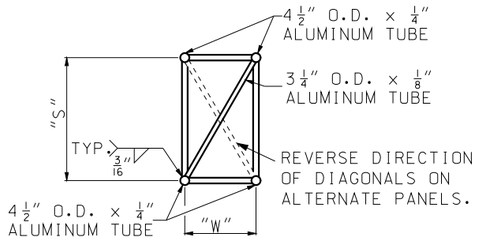
# OVERHEAD SIGN TRUSSES
ALUMINUM

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

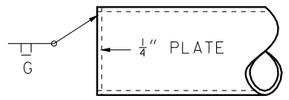
903.10BC

SHEET NO. 1 OF 6


IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

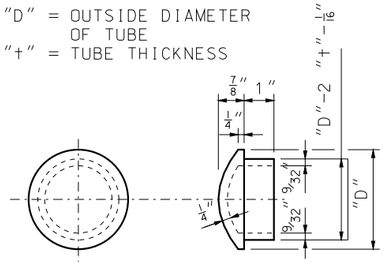



SECTION A-A

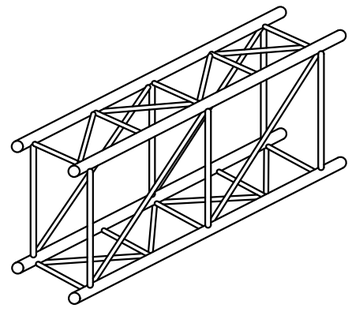



DETAIL OF ALTERNATE END CAP

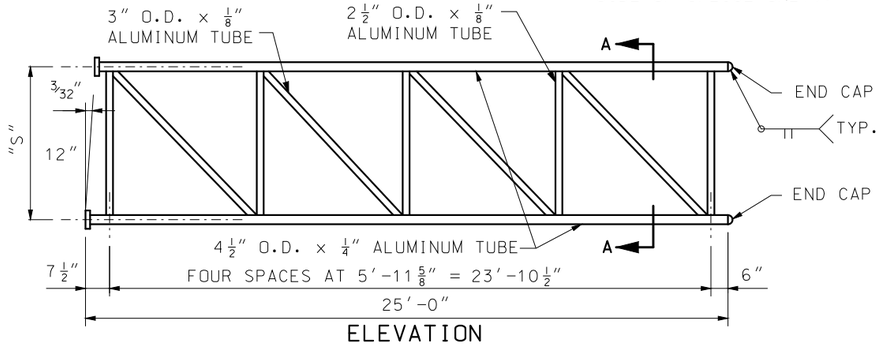
NOTE:
WHEN THE VERTICALS, STRUTS AND SWAYS OBSTRUCT THE PLACING OF BOLTS IN THE FLANGES THESE MEMBERS MAY BE MOVED BACK IN ORDER TO CLEAR THE BOLTS. (ONE SIDE OF SPLICE ONLY).



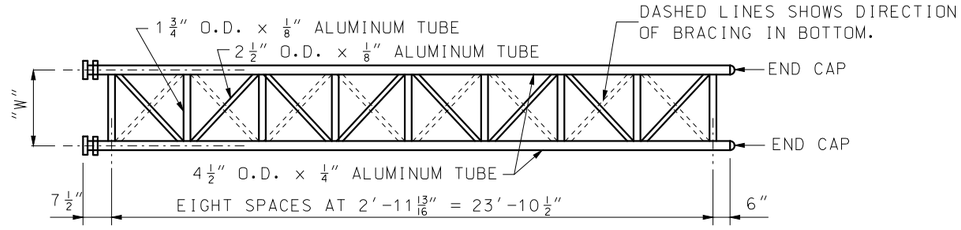

DETAIL OF END CAP CASTING
(DRIVE FIT TYPE)



TYPICAL ISOMETRIC VIEW OF TRUSS

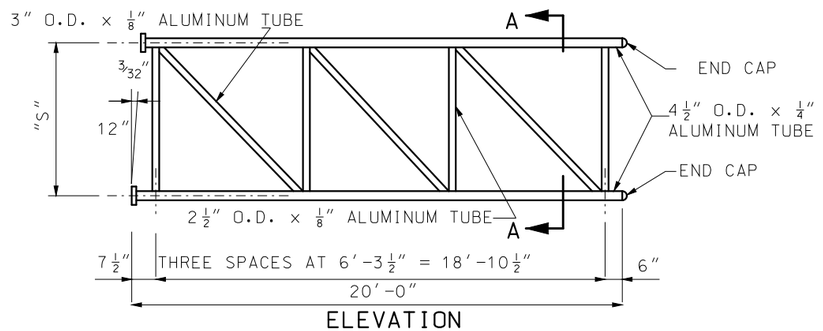



ELEVATION

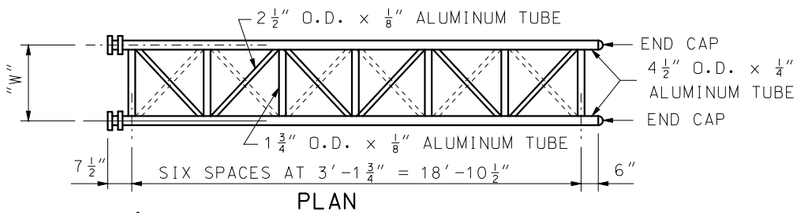



PLAN

## 25' - CANTILEVER SECTIONS

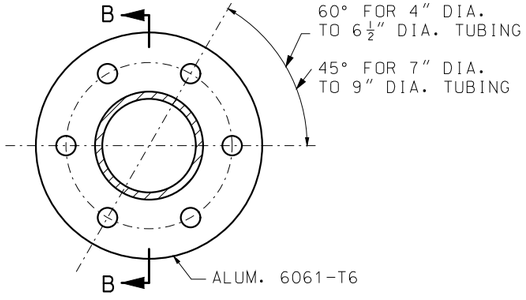



ELEVATION

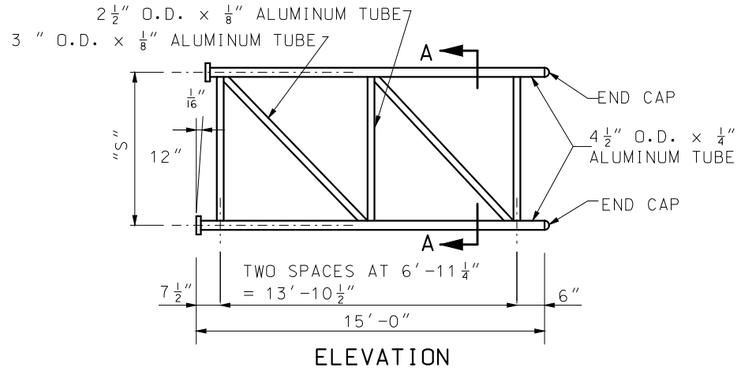



PLAN

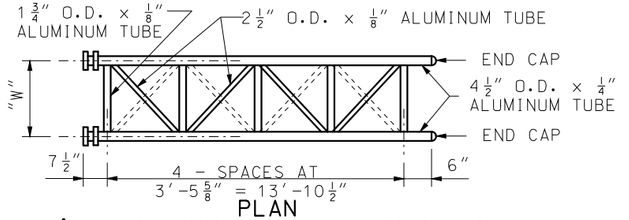
## 20' - CANTILEVER SECTIONS




## PLAN OF FLANGE PLATE

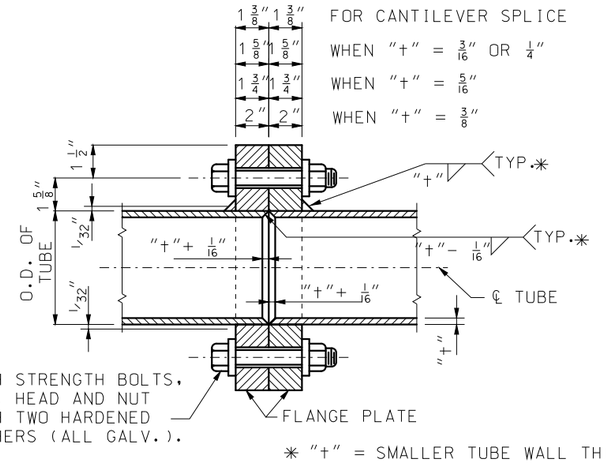



ELEVATION




PLAN

## 15' - CANTILEVER SECTIONS




* "+" = SMALLER TUBE WALL THICKNESS.

SECTION B-B

NOTE:
A WELDING SEQUENCE ASSURING FULL CONTACT OF FLANGE FACES SHALL BE REQUIRED. DRILL OR REAM FLANGE HOLES 1/16" LARGER THAN NORMAL DIAMETER OF BOLTS OR TUBING.

| TUBE SIZE | BOLT NO. AND DIA. | TORQUE |
|---|---|---|
| 4" DIA. TO ALL DIAMETERS | 6- ¾" DIA. | 320 FT.LB. OR ONE-HALF TURN |
| 4½" DIA. THROUGH 6½" DIA. | 6- ¾" DIA. | 320 FT.LB. OR ONE-HALF TURN |
| 7" DIA. THROUGH 7½" DIA. | 8- ¾" DIA. | 320 FT.LB. OR ONE-HALF TURN |
| 8" DIA. THROUGH 9" DIA. | 8- ⅞" DIA. | 470 FT.LB. OR ONE-HALF TURN |


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES

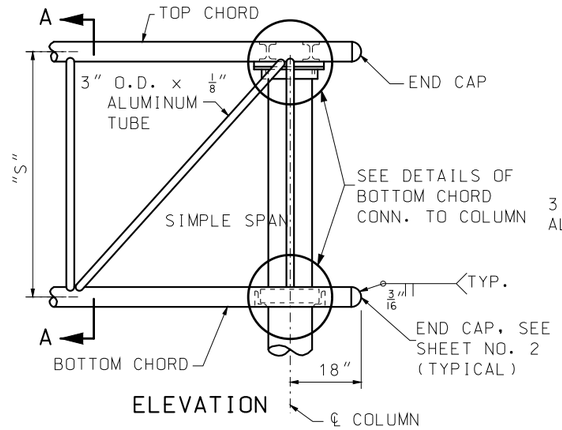
ALUMINUM

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

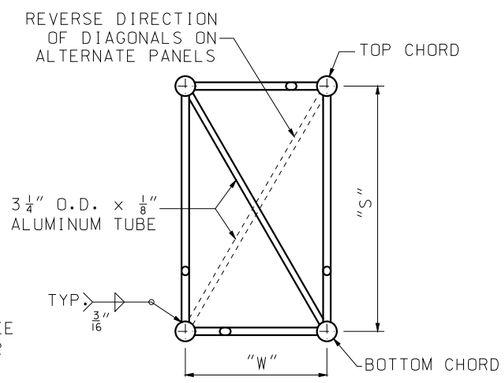
903.10BC

SHEET NO. 2 OF 6

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

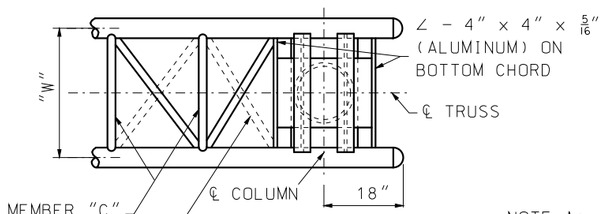



ELEVATION




SECTION A–A

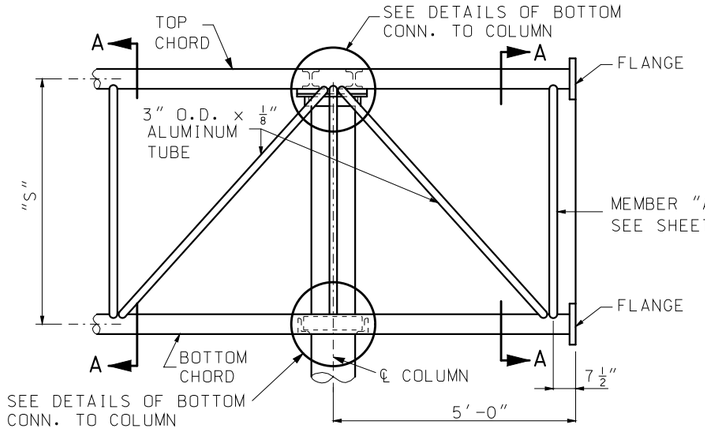
NOTE:
FOR DIMENSIONS "S" AND "W" SEE SHEET NO. 1.



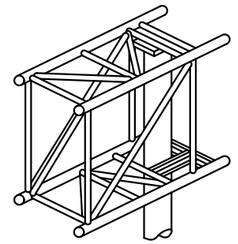

PLAN

## TRUSS END WITHOUT CANTILEVER

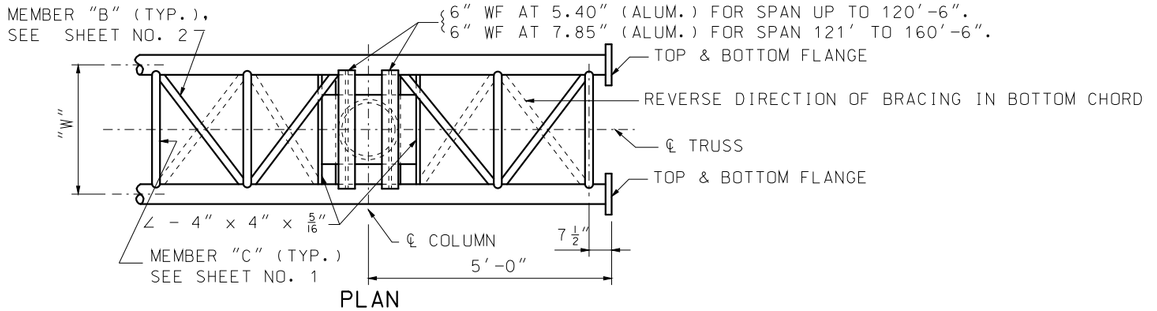
NOTE A:
CONNECTIONS IN WHICH STEEL AND ALUMINUM ARE IN CONTACT SHALL BE PROTECTED AS FOLLOWS:
ONE COAT ZINC CHROMATE ON ALUMINUM SURFACES.
NORMAL CLEANING AND PAINTING ON STEEL SURFACES.
ONE ZINC CHROMATE REQUIRED IF STEEL IS GALVANIZED.




ELEVATION

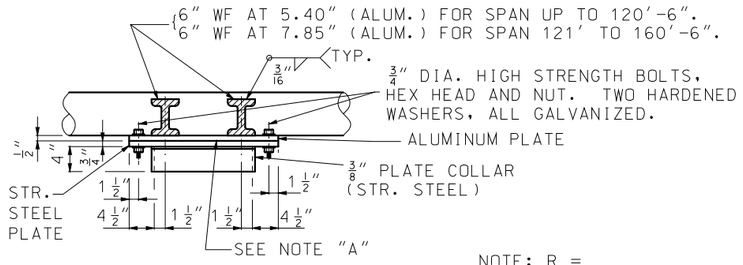


## TYPICAL ISOMETRIC VIEW OF END SECTION



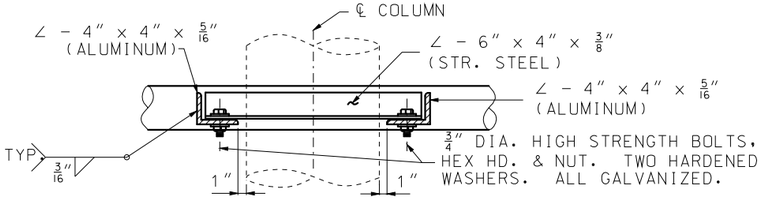

PLAN

## TRUSS END MODIFIED FOR CANTILEVER

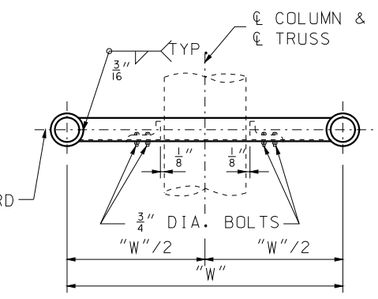



SECTION B–B

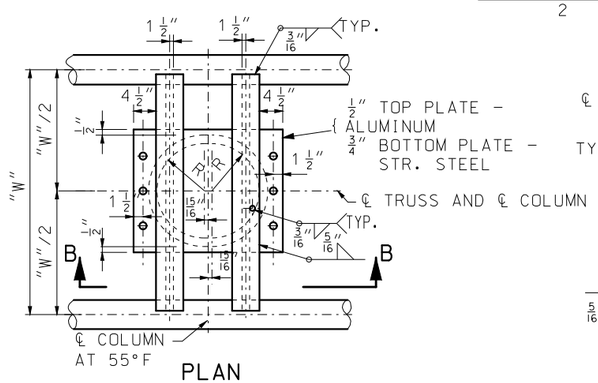
NOTE: R = O.D. PIPE COL. / 2 + 1/16"



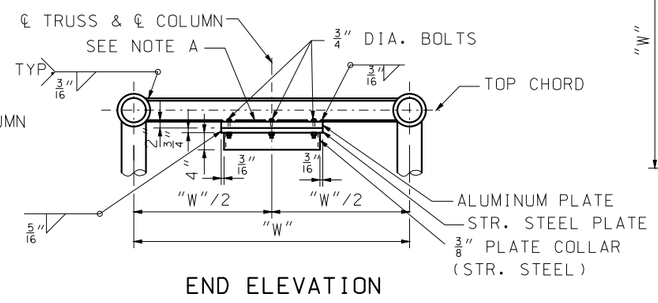

SECTION C–C




END ELEVATION

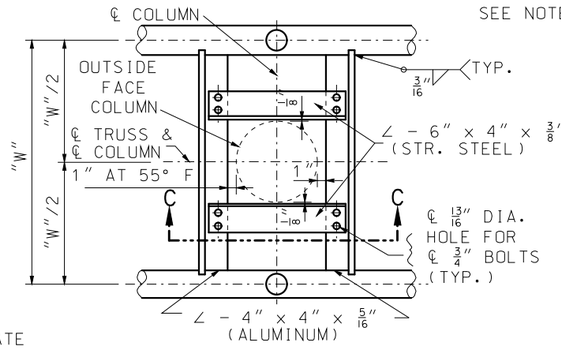



PLAN




END ELEVATION

## DETAIL OF TOP CHORD CONNECTION TO COLUMN




PLAN

## DETAILS OF BOTTOM CHORD CONNECTION TO COLUMN


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES

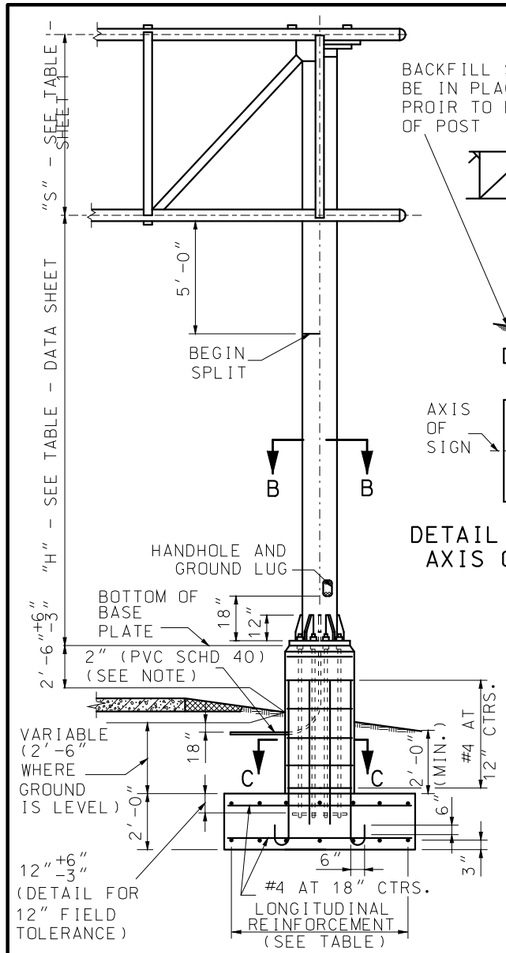
ALUMINUM

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.10BC

SHEET NO. 3 OF 6

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

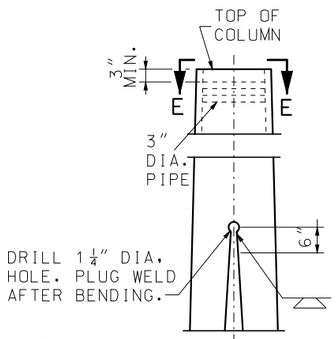


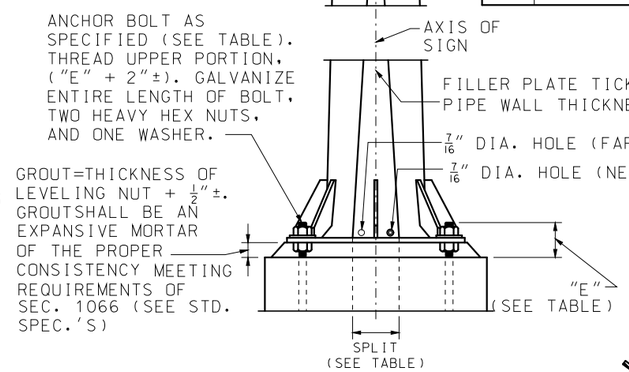

## ELEVATION

NOTE:
THE 2" CONDUIT IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MINUMUM RADIUS BEND OF 9½".




## DETAIL SHOWING AXIS OF SIGN

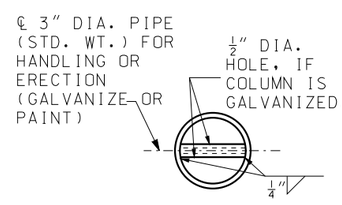


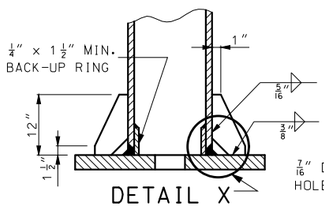

## PART ELEVATION

| POST TYPE | PIPE COLUMN | DIMENSION "E" | SPLIT | BASE PLATE SIZE* | ANCHOR BOLTS DIA. | PEDESTAL SIZE* a | PEDESTAL SIZE* b | FOOTING SIZE* | LONGITUDINAL FOOTING REINFORCEMENT TOP | LONGITUDINAL FOOTING REINFORCEMENT BOTTOM | CONCRETE C.Y. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 12" STD. AT 65.42 | 8½" | 6" | 2'-6"x 23"x 1½" | 6 AT 2¼" | 4'-0" | 2'-11" | 7'-0"x 14'-6" | 7-#5 BARS | 7-#6 BARS | 10.9 |
| II | 14" O.D. AT 72.09 | 8½" | 9½" | 3'-0"x 2'-0"x 1½" | 6 AT 2¼" | 4'-4" | 3'-0" | 8'-0"x 16'-0" | 8-#5 BARS | 9-#6 BARS | 13.2 |
| III | 16" O.D. AT 82.77 | 8¾" | 11½" | 3'-4"x 2'-2"x 1¾" | 6 AT 2¼" | 4'-8" | 3'-2" | 8'-6"x 17'-6" | 9-#5 BARS | 9-#7 BARS | 15.2 |
| IV | 18" O.D. AT 93.45 | 9½" | 12½" | 3'-7"x 2'-4"x 2" | 6 AT 2½" | 5'-1" | 3'-4" | 9'-6"x 19'-0" | 10-#5 BARS | 10-#8 BARS | 18.1 |
| V | 20" O.D. AT 104.13 | 9½" | 13" | 3'-10"x 2'-9"x 2" | 8 AT 2½" | 5'-4" | 3'-9" | 10'-0"x 20'-0" | 10-#5 BARS | 10-#8 BARS | 20.6 |
| VI | 24" O.D. AT 125.49 | 9½" | 10½" | 4'-0"x 3'-3"x 2" | 8 AT 2½" | 5'-6" | 4'-3" | 10'-6"x 21'-0" | 11-#5 BARS | 11-#8 BARS | 23.3 |
| VII | 24" O.D. AT 125.49 | 9½" | 13½" | 4'-3"x 3'-3"x 2" | 8 AT 2½" | 5'-9" | 4'-3" | 11'-0"x 22'-0" | 11-#5 BARS | 11-#9 BARS | 25.1 |

* BASE PLATES, PEDESTAL, AND FOOTINGS, LONGER SIDES SHALL BE NORMAL TO AXIS OF SIGN.

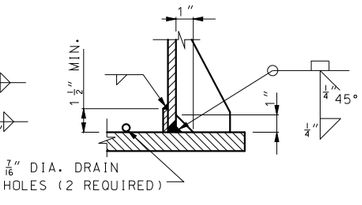



## PART SECTION E-E




## DETAIL X

## PART SECTION A-A




## DETAIL X

GENERAL NOTES:

A TAPERED TUBE OF EQUIVALENT SIZE AND THICKNESS MAY BE SUBSTITUTED FOR PIPE POST.

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 A53. NO OBJECTIONABLE SEAMS WILL BE PERMITTED.

ALL STRUCTURES SHALL BE GROUNDED.

BURR THREADS ON ALL ANCHOR BOLTS.

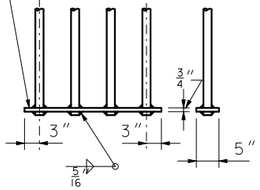
A HORIZONTAL WELDED SPLICE MAY BE FABRICATED IN THE COLUMN BETWEEN THE TOP OF PIPE AND 4'-0" BELOW THE BOTTOM CHORDS OF THE TRUSS WHEN DETAILED ON THE PIPE AND 4'-0" BELOW THE BOTTOM CHORDS OF THE TRUSS WHEN DETAILED ON THE SHOP DRAWINGS AND APPROVED BY THE ENGINEER.

GROUND LUGS SHALL BE LOCATED INSIDE COLUMN NEAR HAND HOLE.

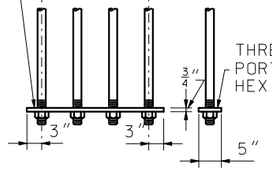
QUANTITIES FOR PEDESTAL, BASED ON NOMINAL HEIGHT OF 5'-0".

QUANTITIES FOR FOOTING, BASED ON NOMINAL DEPTH OF 2'-0".

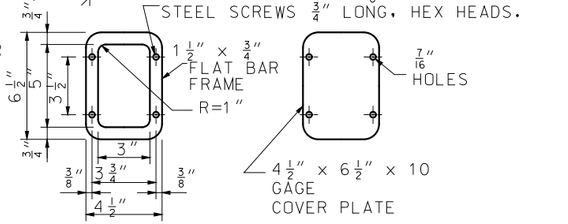
QUANTITIES SHOWN ARE FOR ONE COLUMN ONLY.




## ANCHORAGE DETAIL A

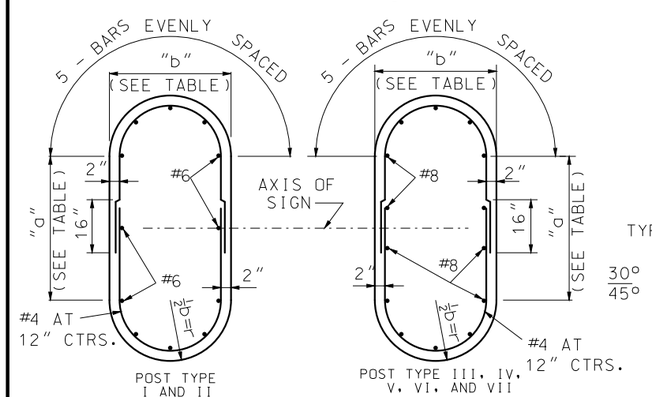



## ANCHORAGE DETAIL B
(OPTIONAL)

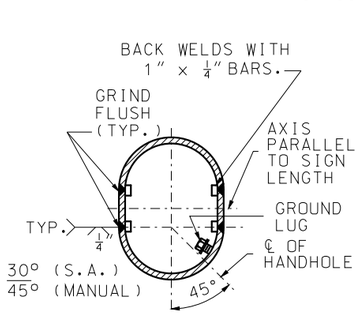



## HANDHOLE AND COVER DETAIL

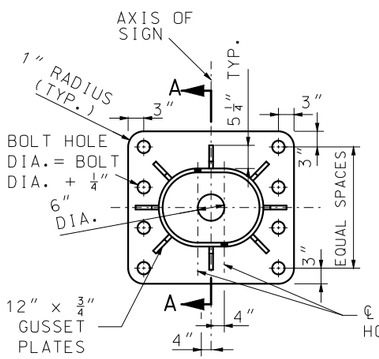
NOTE: HANDHOLE REQUIRED ONLY IN POWER COLUMN.



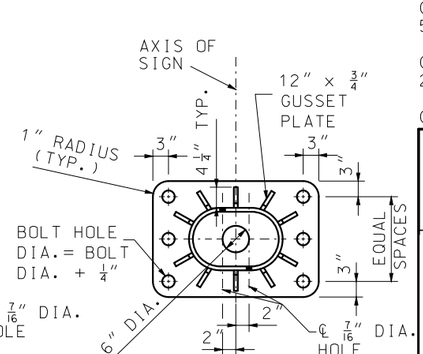

## SECTION C-C
(TYPICAL SECTION SHOWING REINFORCING STEEL)
NOTE: FOR DETAILS OF ALTERNATE PEDESTAL, SEE SHEET NO. 5 OF 6.




## SECTION B-B
(FOR SPLIT COLUMNS ONLY)




## 8 ANCHOR TYPE




## 6 ANCHOR TYPE

## TYPICAL BASE PLATES

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

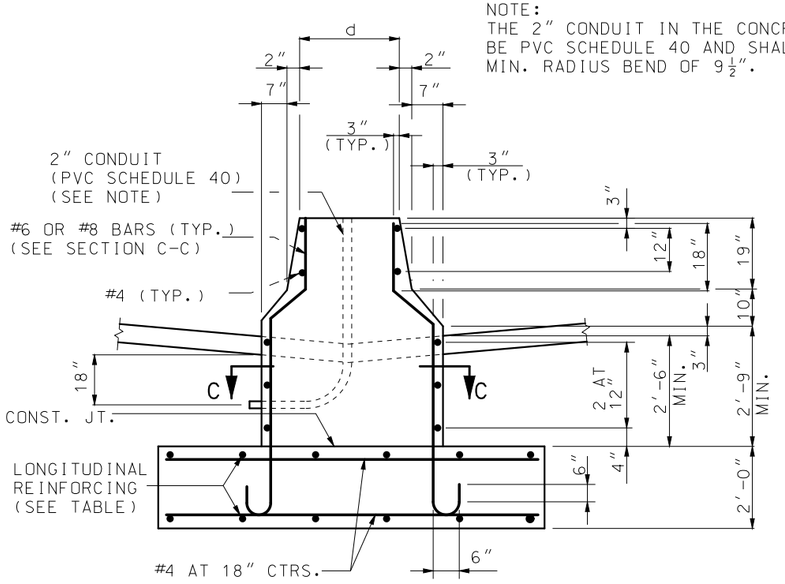
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES
ALUMINUM

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.10BC

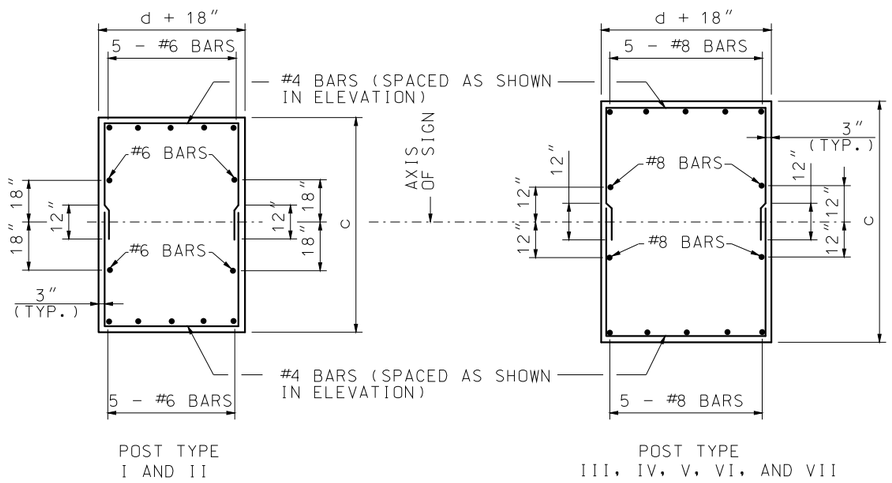
SHEET NO. 4 OF 6




PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

| POST TYPE | PIPE COLUMN | PEDESTAL SIZE ✳ | | FOOTING SIZE ✳ | LONGITUDINAL FOOTING REINFORCEMENT | | CONCRETE C.Y. | |
|---|---|---|---|---|---|---|---|---|
| | | c | d | | TOP | BOTTOM | TYPE A MEDIAN BARRIER | TYPE C MEDIAN BARRIER |
| I | 12" STD. AT 65.42 | 5'-9" | 2'-1" | 7'-0" x 14'-6" | 7 - #5 BARS | 7 - #6 BARS | 10.9 | 11.6 |
| II | 14" O.D. AT 72.09 | 6'-2" | 2'-2" | 8'-0" x 16'-0" | 8 - #5 BARS | 9 - #6 BARS | 13.2 | 14.0 |
| III | 16" O.D. AT 82.77 | 6'-7" | 2'-4" | 8'-6" x 17'-6" | 9 - #5 BARS | 9 - #7 BARS | 15.2 | 16.1 |
| IV | 18" O.D. AT 93.45 | 7'-1" | 2'-6" | 9'-6" x 19'-0" | 10 - #5 BARS | 10 - #8 BARS | 18.1 | 19.1 |
| V | 20" O.D. AT 104.13 | 7'-8" | 2'-11" | 10'-0" x 20'-0" | 10 - #5 BARS | 10 - #8 BARS | 20.6 | 21.7 |
| VI | 24" O.D. AT 125.49 | 8'-3" | 3'-5" | 10'-6" x 21'-0" | 11 - #5 BARS | 11 - #8 BARS | 23.3 | 24.6 |
| VII | 24" O.D. AT 125.49 | 8'-6" | 3'-5" | 11'-0" x 22'-0" | 11 - #5 BARS | 11 - #9 BARS | 25.1 | 26.5 |

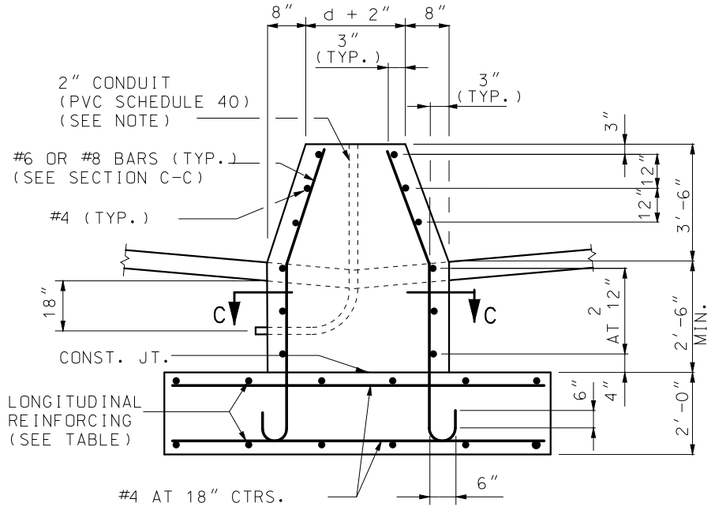
✳ BASE PLATES, PEDESTAL, AND FOOTINGS LONGER SIDES SHALL BE NORMAL TO AXIS OF SIGN.




SECTION C-C

TYPICAL SECTION SHOWING
REINFORCING STEEL

NOTE:
THE 2" CONDUIT IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MIN. RADIUS BEND OF 9½".




PART ELEVATION
(TYPE C CONCRETE TRAFFIC BARRIER)

GENERAL NOTES:

A TAPERED TUBE OF EQUILVALENT SIZE AND THICKNESS MAY BE SUBSTITUTED FOR PIPE POST.

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 A53.

NO OBJECTIONABLE SEAMS WILL BE PERMITTED.

ALL STRUCTURES SHALL BE GROUNDED.

BURR THREADS ON ALL ANCHOR BOLTS.

PIPE COLUMN, BASE PLATE, ANCHOR BOLTS AND NOTES PERTAINING TO THESE ITEMS HAVE BEEN OMITTED FOR CLARITY. REFER TO SHEET NO. 4 OF 6 FOR DETAILS OF THESE ITEMS.

GROUND LUGS SHALL BE LOCATED INSIDE COLUMN NEAR HAND HOLE.

QUANTITIES FOR PEDESTAL, BASED ON NOMINAL HEIGHT OF 5'-2" (TYPE A MEDIAN BARRIER) OR 6'-0" (TYPE C MEDIAN BARRIER).

QUANTITIES FOR FOOTING, BASED ON NOMINAL DEPTH OF 2'-0".

QUANTITIES SHOWN ARE FOR ONE COLUMN ONLY.

## DETAILS OF ALTERNATE PEDESTAL

(TO BE USED ADJACENT TO TYPE "A" OR "C" MEDIAN BARRIER)

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

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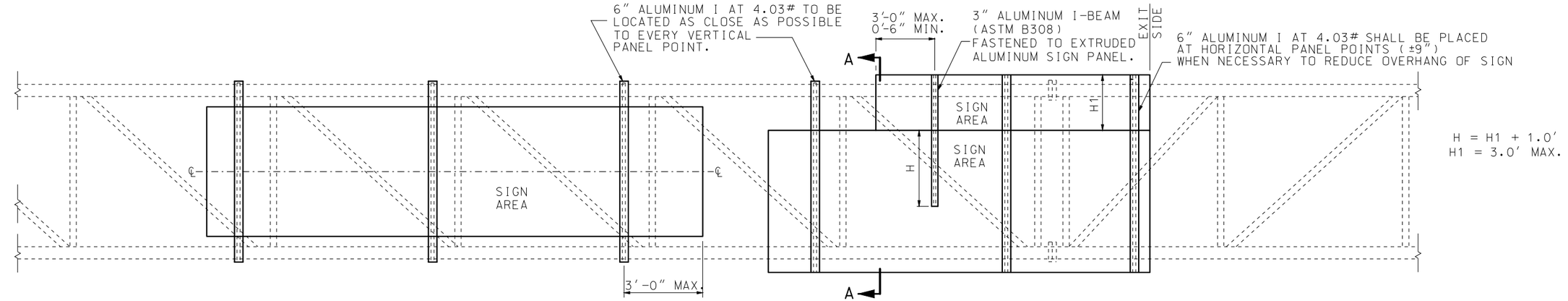
STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES

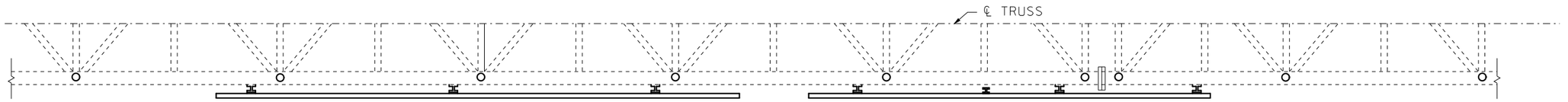
ALUMINUM

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

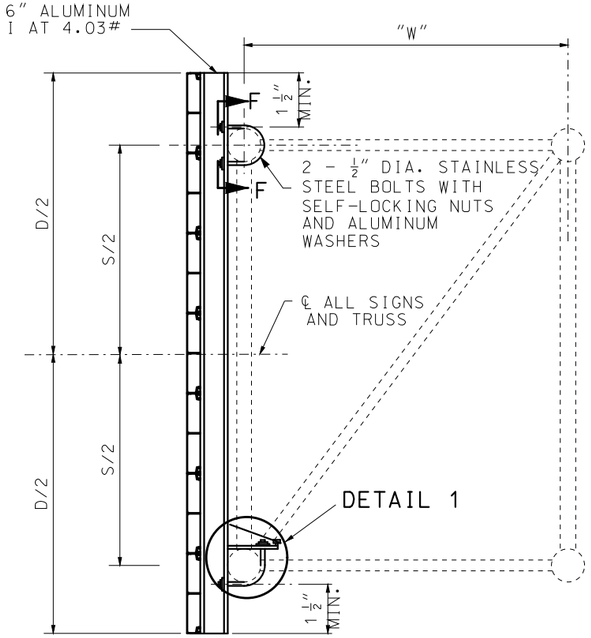
903.10BC




## TYPICAL ELEVATION OF SIGN COMPONENTS

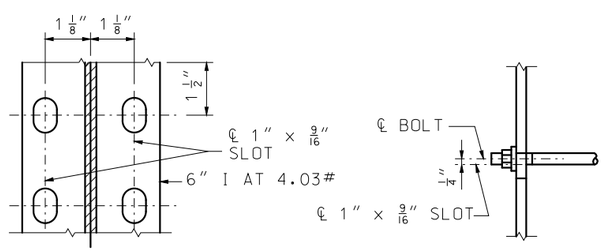



## TYPICAL HALF PLAN OF SIGN COMPONENTS




SECTION A-A

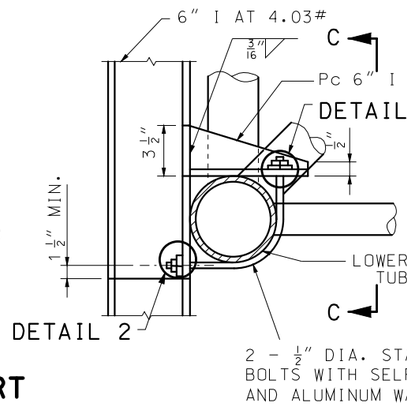
## TYPICAL SECTION OF SIGN SUPPORT



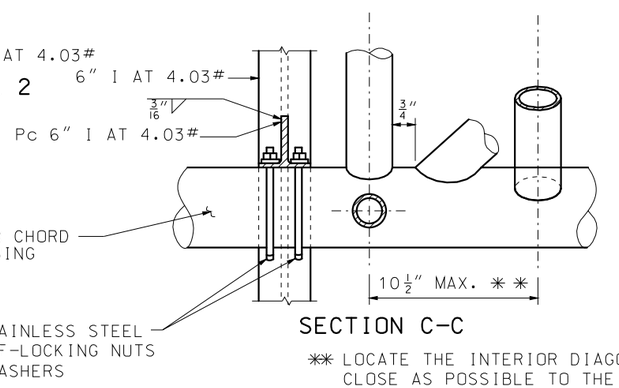

SECTION F-F




DETAIL 2




DETAIL 1




SECTION C-C

** LOCATE THE INTERIOR DIAGONAL AS CLOSE AS POSSIBLE TO THE CENTERLINE OF THE PANEL POINT WITHOUT OVER-LAPPING WELDS.

GENERAL NOTES:

EXIT NO. PANELS SHALL BE MOUNTED FLUSH WITH THE EXIT SIDE OF THE GUIDE SIGN.

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.

SEE STD. PLAN 903.09 FOR LIGHTING DETAILS IF LIGHTING THE SIGN IS NECESSARY.

SEE STD. PLAN 903.03 FOR SIGN MOUNTING DETAILS.

ALL MATERIAL ALUMINUM EXCEPT AS NOTED.


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# OVERHEAD SIGN TRUSSES

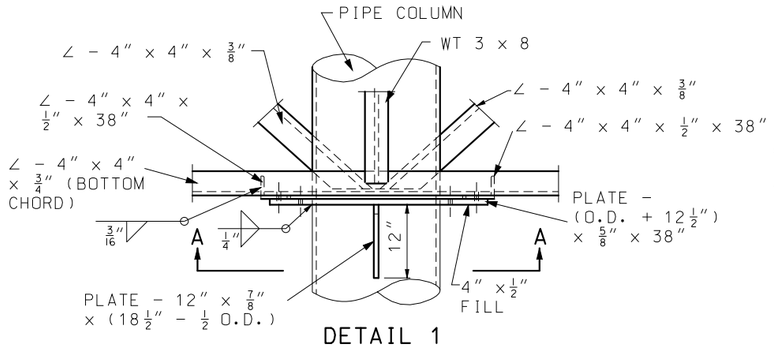
SIGN MOUNTING DETAIL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

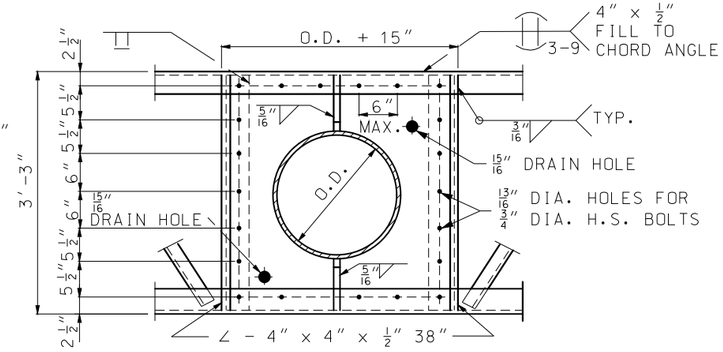
903.10BC

SHEET NO. 6 OF 6

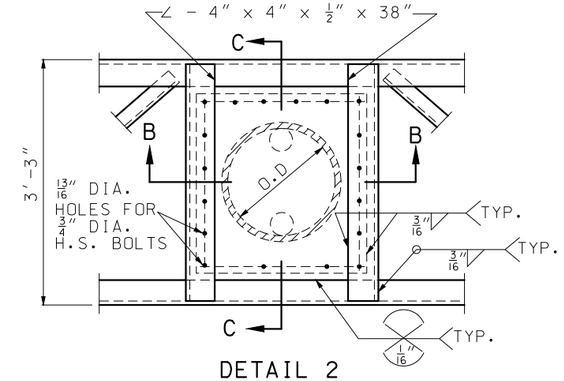
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



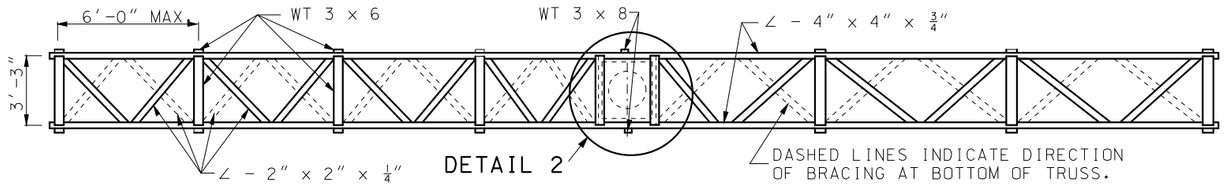

DETAIL 1
TRUSS BOTTOM CONNECTION TO COLUMN




SECTION A–A




DETAIL 2
TRUSS TOP CONNECTION TO COLUMN

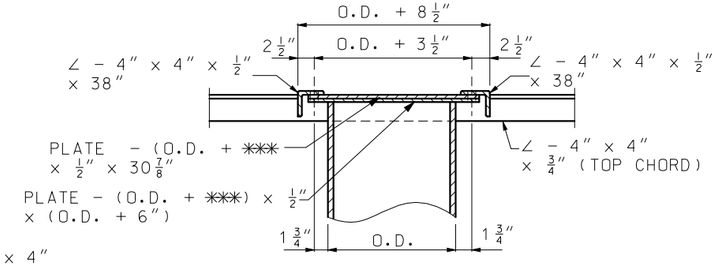



PLAN

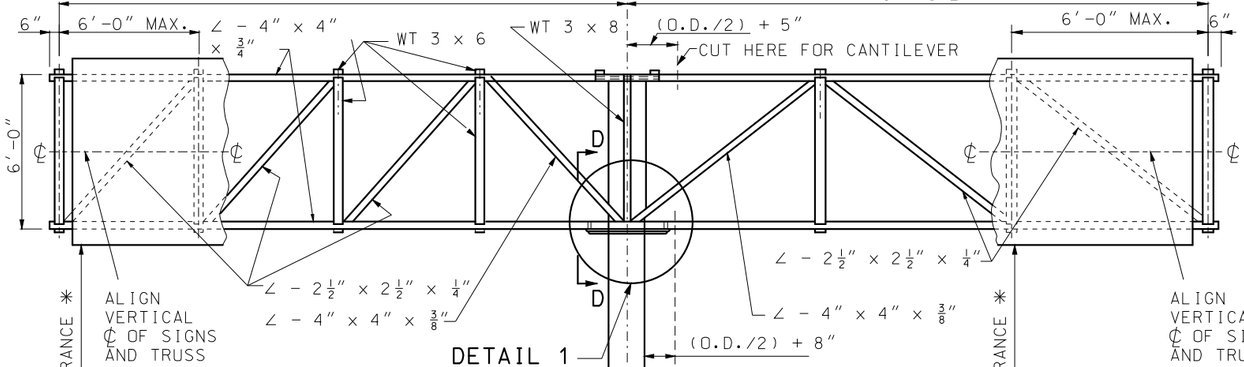
* 1 1/2" FOR POST TYPE VII
1 3/4" FOR ALL OTHER POST TYPES

** 3" FOR POST TYPE VII
3 1/2" FOR ALL OTHER POST TYPES

*** 5 1/2" FOR POST TYPE VII
6" FOR ALL OTHER POST TYPES




SECTION B–B



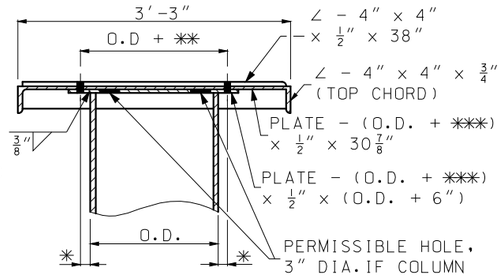

DETAIL 1

* IF LIGHTING IS SPECIFIED, VERTICAL CLEARANCE IS MEASURED TO THE LOWEST POINT OF LIGHTING BRACKET.

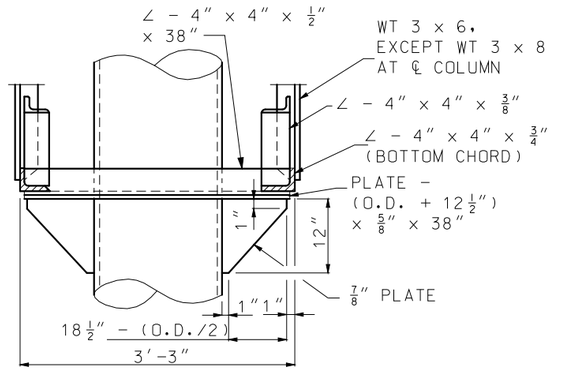
NOTE:
TRUSSES AND COLUMN BASE PLATES: ASTM A36, ANCHOR BOLTS: ASTM A307.
FOR ADDITIONAL INFORMATION, SEE DATA SHEET.

ELEVATION
DRILLED SHAFT OPTION

ELEVATION
SPREAD FOOTING OPTION




SECTION C–C




SECTION D–D

GENERAL NOTES:

ALL FASTENERS SHALL HAVE A HARDENED WASHER UNDER THE NUT OR BOLT HEAD, WHICHEVER IS TURNED IN TIGHTENING.

ZINC CHROMATE PRIMER SHALL MEET THE REQUIREMENTS OF FEDERAL SPECIFICATION TT-P-645 OR TT-P-1757 AND SHALL BE ACCEPTED ON THE BASIS OF THE LABEL SHOWING CONFORMANCE OR A MANUFACTURER'S CERTIFICATION.

DESIGN OF STRUCTURAL SUPPORTS SHALL COMPLY WITH AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS 2001 AND CURRENT INTERIMS.

DESIGN OF SPREAD FOOTINGS SHALL COMPLY WITH 1994 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS.

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.


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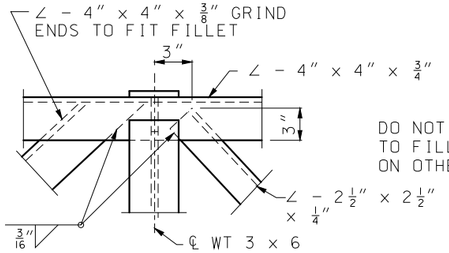
# OVERHEAD SIGN TRUSSES
## BUTTERFLY AND CANTILEVER STRUCTURAL STEEL

DATE EFFECTIVE: 10-01-2016
DATE PREPARED: 8/11/2016

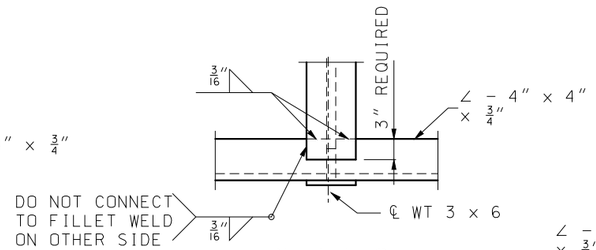
903.12Z

SHEET NO. 1 OF 7

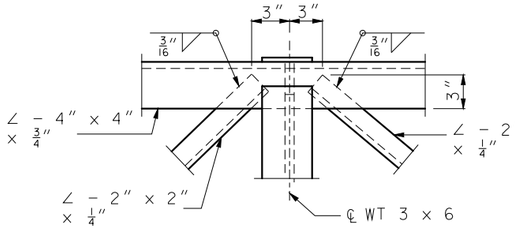
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



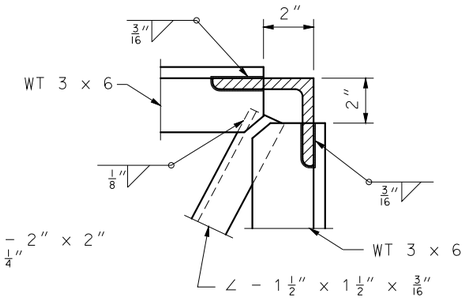

DETAIL 1



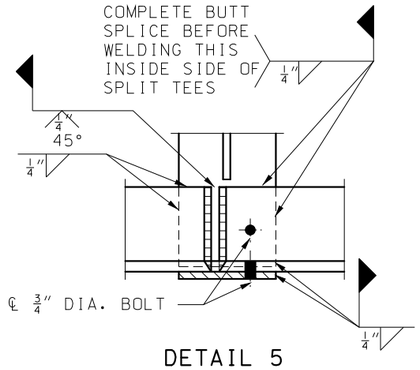

DETAIL 2



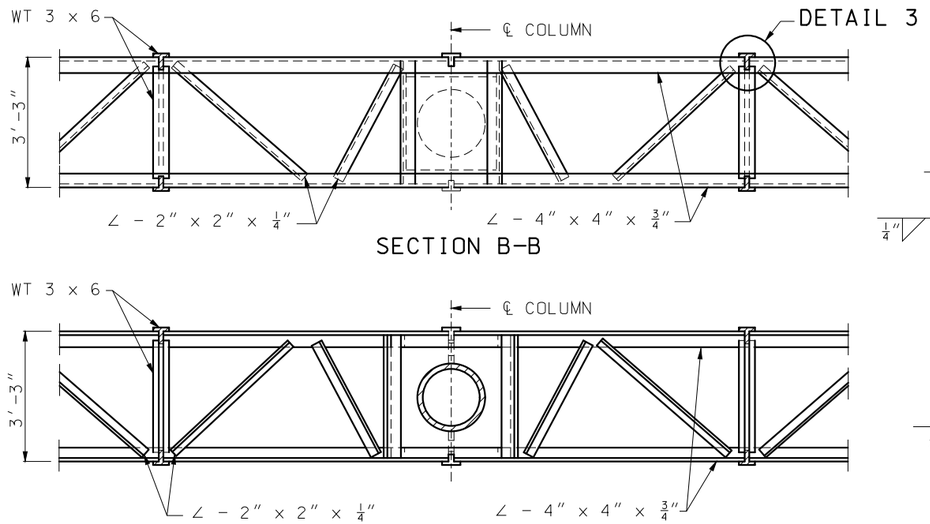

DETAIL 3



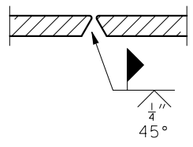

DETAIL 4



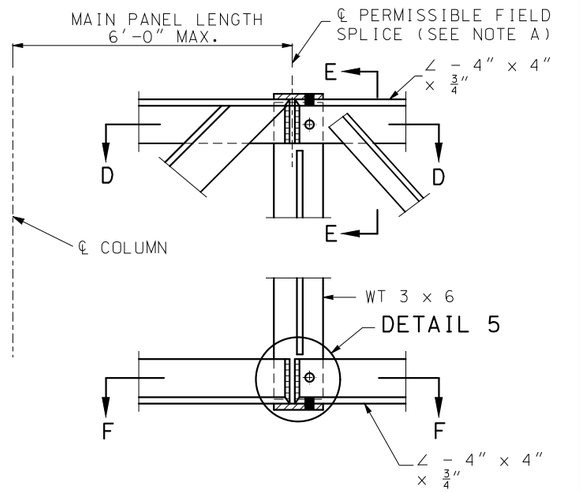

DETAIL 5




SECTION B–B



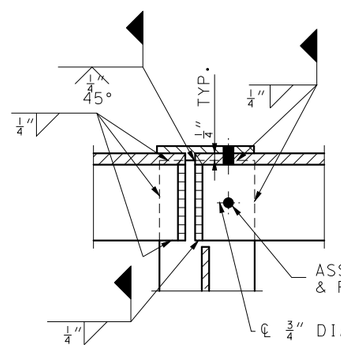

SECTION D–D



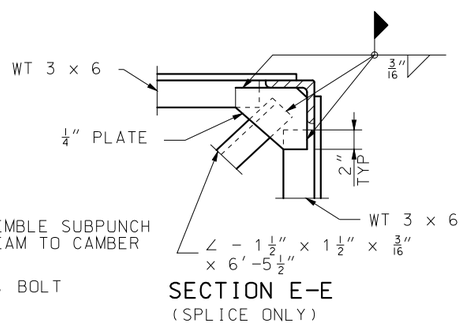

LOCATION OF FIELD SPLICE




SECTION C–C

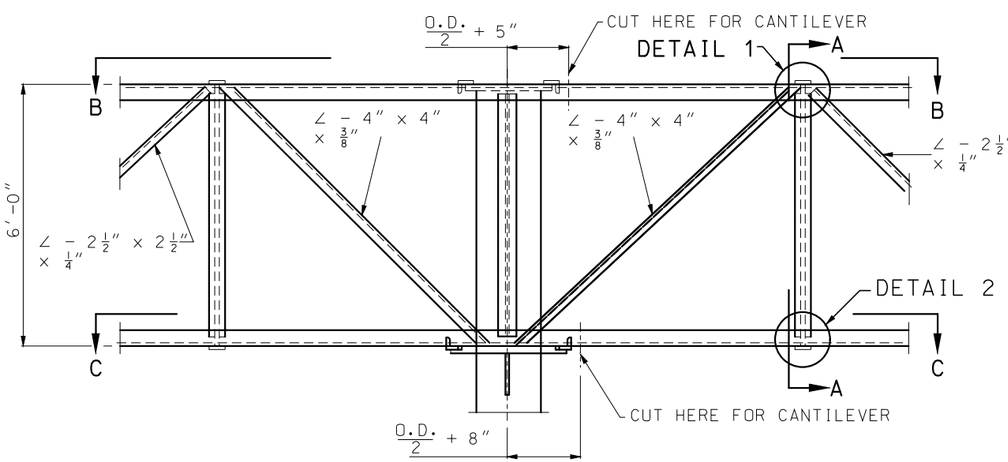



SECTION F–F

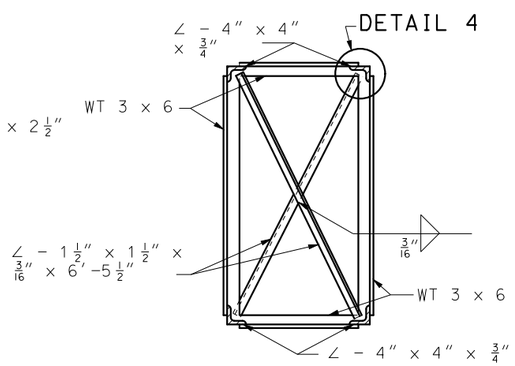



SECTION E–E
(SPLICE ONLY)

NOTE: ¾″ DIA. BOLTS SHALL BE REMOVED AFTER WELDING IS COMPLETE. BOLT HOLES SHALL BE PLUGGED AND THE OUTSIDE FACE GROUND SMOOTH.




PART ELEVATION OF BUTTERFLY TRUSS




SECTION A–A

NOTE: SHRINK ∠ – 1½″ x 1½″ x ⅜″ IF NECESSARY TO TAKE UP DISTORTIONAL SLACK.

NOTE A: SPLICING CHORD ANGLES IN THE SHOP AND THE FIELD SPLICE SHOWN IN THIS SHEET WILL NOT BE ALLOWED WITHOUT SPECIAL PERMISSION. IF PERMISSION IS GRANTED SUCH SPLICES SHALL BE LOCATED AT THE CENTER LINE OF MAIN PANEL POINT NEXT TO COLUMN.


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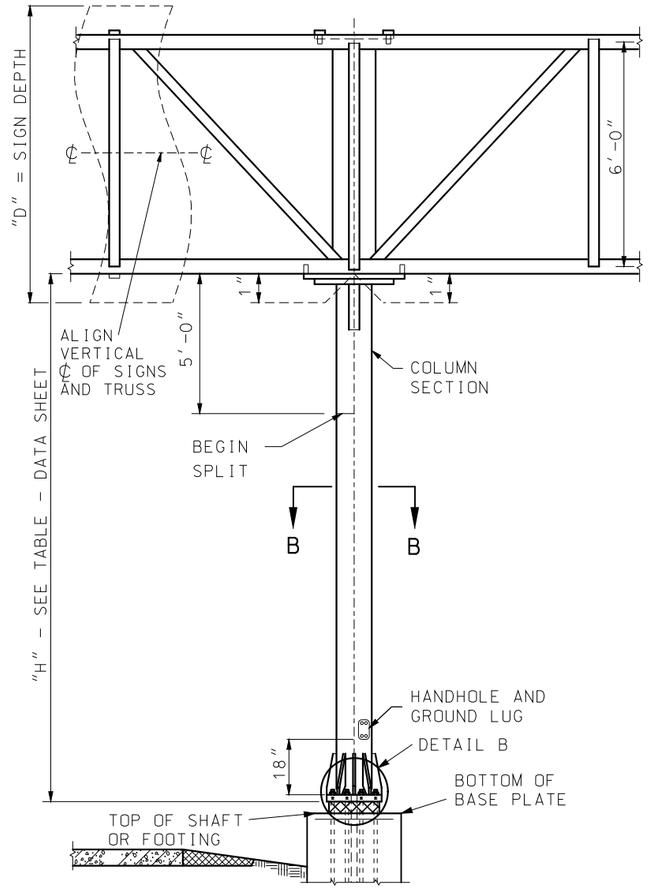
# OVERHEAD SIGN TRUSSES
## BUTTERFLY & CANTILEVER STRUCTURAL STEEL

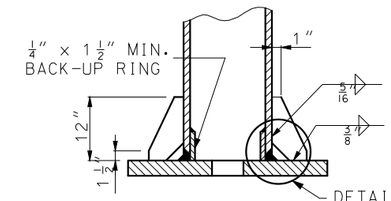
DATE EFFECTIVE: 10-01-2016
DATE PREPARED: 8/11/2016

903.12Z

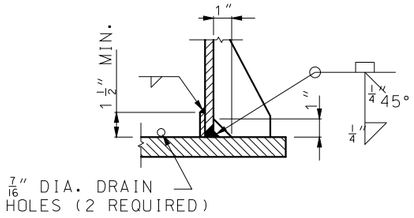
SHEET NO. 2 OF 7

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

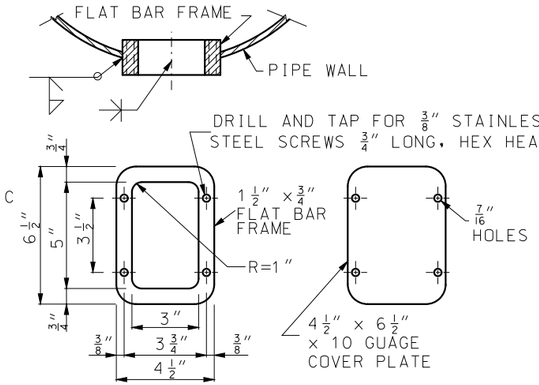



DETAIL B
(SECTION VIEW SHOWN)

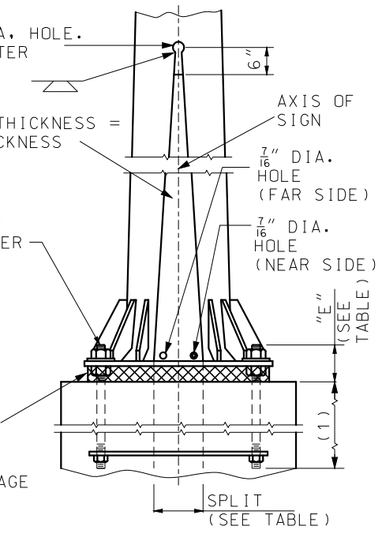



DETAIL C



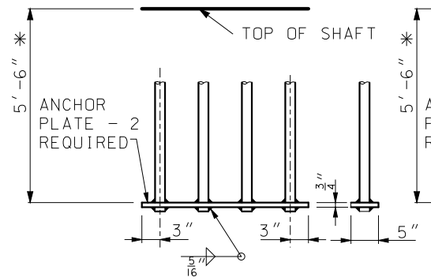

HANDHOLE AND COVER DETAILS

NOTE:
HANDHOLE REQUIRED ONLY IN POWER COLUMN.

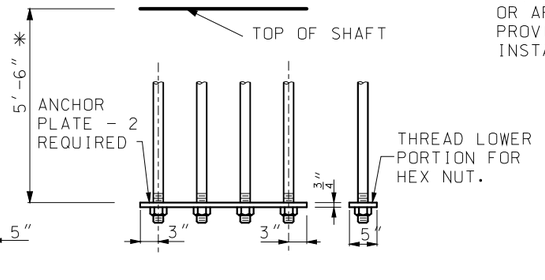



A GALVANIZED SCREEN SHALL BE USED BETWEEN THE POST BASE PLATE AND CONCRETE BASE. SCREENS SHALL BE PRESS-FORMED OF 3 OR 4 MESH. 21 GAGE OR HEAVIER. STAINLESS STEEL OR HOT-DIPPED GALVANIZED WIRE SCREEN OR APPROVED EQUIVALENT. THAT WILL PROVIDE A FRICTION-TIGHT FIT WHEN INSTALLED.

PART ELEVATION




DETAIL A
ANCHORAGE




DETAIL A
OPTIONAL ANCHORAGE

(BOTH DETAILS ARE SHOWN FOR 4 BOLTS - SIMILAR FOR 3 BOLTS)
* DIMENSION SHOWN FOR DRILLED SHAFT OPTION. FOR SPREAD FOOTING OPTION REFER TO SHEET 6 OF 7.

GENERAL NOTES:

SUBSTRUCTURE SHALL BE BACKFILLED PRIOR TO ERECTION OF POST.

ASTM A 106 GRADE B STEEL PIPE OR A TAPERED TUBE OF EQUIVALENT SIZE AND THICKNESS MAY BE SUBSTITUTED FOR PIPE POST.

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 A53.

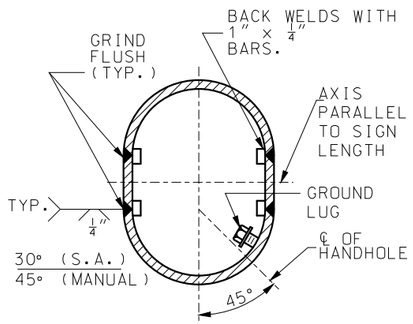
ALL STRUCTURES SHALL BE GROUNDED.

BURR THREADS ON ALL ANCHOR BOLTS.

A HORIZONTAL WELDED SPLICE MAY BE FABRICATED IN THE COLUMN BETWEEN THE TOP OF PIPE AND 4'-0" BELOW THE BOTTOM CHORDS OF THE TRUSS WHEN DETAILED ON THE SHOP DRAWINGS AND APPROVED BY THE ENGINEER.

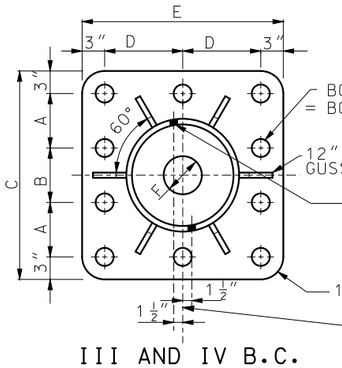
GROUND LUGS SHALL BE LOCATED INSIDE COLUMN NEAR HAND HOLE.

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.

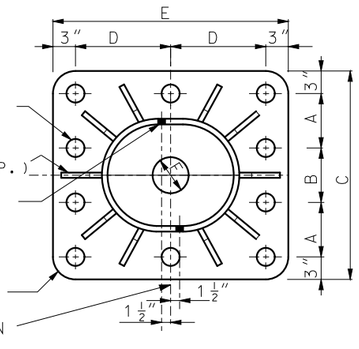



SECTION B-B
(FOR SPLIT COLUMNS ONLY)

| TYPICAL BASE PLATE (10 ANCHOR TYPE) BUTTERFLY AND CANTILEVER (B.C.) | | | | | |
|---|---|---|---|---|---|
| | III | IV | V | VI | VII |
| A | 8" | 9" | 8" | 9" | 10½" |
| B | 10" | 10" | 10" | 10" | 11" |
| C | 32" | 34" | 32" | 34" | 38" |
| D | 13" | 14" | 16½" | 18" | 20" |
| E | 32" | 34" | 39" | 42" | 46" |
| F | 6" | 6" | 6" | 6" | 6" |




III AND IV B.C.




V, VI, AND VII B.C.

TYPICAL BASE PLATES

NOTE:
FOR DETAILS OF OPTIONAL SUBSTRUCTURES, SEE OTHER SHEETS.

ANCHOR BOLTS AND PLATE NOT SHOWN.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSS
## COLUMN AND BASE PLATES

DATE EFFECTIVE: 10-01-2016
DATE PREPARED: 8/11/2016

903.12Z

SHEET NO. 3 OF 7


IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

## DRILLED SHAFT OPTION

| POST TYPE | PIPE COLUMN O.D. | PIPE COLUMN WEIGHT (LBS.) | "E" | SPLIT | BASE PLATE SIZE** | ANCHOR BOLT NO. | ANCHOR BOLT DIA. | C | FA | FB | FC | FD | FH | COLLAR REINFORCEMENT MOMENT-C1 BARS | MOMENT-C1 SPACING | SHEAR-C2 BARS | SHEAR-C2 SPACING | SKIN-C3 BARS | SKIN-C3 SPACING | SHAFT REINFORCEMENT LONGITUDINAL S1 QUANTITY | LONGITUDINAL S1 BARS | SHEAR-S2 BARS | SHEAR-S2 SPACING | REBAR TOTAL (LBS.) | CONCRETE (CU.YDS.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| III | 18" | 93.45 | 8½" | 0" | 2'-8" x 2'-8" x 1¾" | 10 | 2" | 2'-10" | 4'-0" | 7'-6" | 1'-6" | 4'-6" | 14'-0" | #6 | 6" | #4 | 12" | #4 | 12" | 19 | #10 | #5 | 6" | 2126 | 12.4 |
| IV | 20" | 104.13 | 8½" | 0" | 2'-10" x 2'-10" x 2" | 10 | 2¼" | 3'-0" | 4'-0" | 7'-6" | 1'-6" | 4'-6" | 14'-0" | #6 | 6" | #4 | 12" | #4 | 12" | 19 | #10 | #5 | 6" | 2126 | 12.4 |
| V | 18" | 93.45 | 8½" | 7" | 3'-3" x 2'-8" x 2" | 10 | 2¼" | 2'-10" | 5'-0" | 13'-6" | 4'-0" | 5'-6" | 17'-0" | #6 | 6" | #4 | 12" | #4 | 12" | 22 | #11 | #6 | 6" | 3901 | 26.5 |
| VI | 20" | 104.13 | 8½" | 8" | 3'-6' x 2'-10" x 2¼" | 10 | 2¼" | 3'-0" | 5'-0" | 14'-0" | 4'-0" | 6'-0" | 18'-0" | #6 | 6" | #4 | 12" | #4 | 12" | 27 | #11 | #6 | 6" | 4742 | 31.8 |
| VII | 24" | 125.49 | 9" | 8" | 3'-10" x 3'-2" x 2¼" | 10 | 2½" | 3'-4" | 5'-0" | 14'-0" | 4'-0" | 6'-0" | 18'-0" | #6 | 6" | #4 | 12" | #4 | 12" | 27 | #11 | #6 | 6" | 4742 | 31.8 |

## ALTERNATE PEDESTALS

| POST TYPE | REBAR TOTAL (LBS.) TYPE A | REBAR TOTAL (LBS.) TYPE C | CONCRETE (CU.YDS.) TYPE A | CONCRETE (CU.YDS.) TYPE C |
|---|---|---|---|---|
| III | 2066 | 2077 | 13.4 | 14.5 |
| IV | 2066 | 2077 | 13.5 | 14.6 |
| V | 3763 | 3782 | 28.8 | 30.7 |
| VI | 4528 | 4547 | 34.1 | 36.2 |
| VII | 4528 | 4547 | 34.5 | 36.8 |

## SPREAD FOOTING OPTION

| POST TYPE | PIPE COLUMN O.D. | PIPE COLUMN WEIGHT (LBS.) | "E" | SPLIT | BASE PLATE SIZE** | ANCHOR BOLT NO. | ANCHOR BOLT DIA. | PEDESTAL SIZE * a | PEDESTAL SIZE * b | FOOTING SIZE * | LONGITUDINAL FOOTING REINFORCEMENT TOP NO. | TOP BARS | BOTTOM NO. | BOTTOM BARS | PEDESTAL REINFORCEMENT NO. | PEDESTAL REINFORCEMENT BARS | NO. | BARS | REBAR TOTAL (LBS.) | CONCRETE (CU.YDS.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| III | 18" | 93.45 | 8½" | 0" | 2'-8" x 2'-8" x 1¾" | 10 | 2" | 4'-2" | 3'-8" | 10'-0" x 13'-0" | 10 | #5 | 10 | #5 | 10 | #4 | 14 | #8 | 695 | 14.4 |
| IV | 20" | 104.13 | 8½" | 0" | 2'-10" x 2'-10" x 2" | 10 | 2¼" | 4'-4" | 3'-10" | 10'-0' x 14'-0" | 10 | #5 | 10 | #5 | 10 | #4 | 14 | #8 | 733 | 15.6 |
| V | 18" | 93.45 | 8½" | 7" | 3'-3" x 2'-8" x 2" | 10 | 2¼" | 4'-9" | 3'-8" | 9'-0" x 17'-0" | 9 | #5 | 10 | #7 | 10 | #4 | 14 | #8 | 955 | 16.5 |
| VI | 20" | 104.13 | 8½" | 8" | 3'-6' x 2'-10" x 2¼" | 10 | 2¼" | 5'-0" | 3'-10" | 9'-0" x 19'-0" | 9 | #5 | 10 | #7 | 10 | #4 | 14 | #8 | 1028 | 18.4 |
| VII | 24" | 125.49 | 9" | 8" | 3'-10" x 3'-2" x 2¼" | 10 | 2½" | 5'-4" | 4'-2" | 10'-0" x 20'-0" | 9 | #5 | 12 | #7 | 10 | #4 | 14 | #8 | 1196 | 21.5 |

## SPREAD FOOTING OPTION WITH ALTERNATE PEDESTALS

| POST TYPE | PIPE COLUMN O.D. | PIPE COLUMN WEIGHT (LBS.) | "E" | SPLIT | BASE PLATE SIZE** | ANCHOR BOLT NO. | ANCHOR BOLT DIA. | PEDESTAL SIZE * c | PEDESTAL SIZE * d | PEDESTAL SIZE * e | FOOTING SIZE * | TYPE A LONGITUDINAL FOOTING REINFORCEMENT TOP NO. | TOP BARS | BOTTOM NO. | BOTTOM BARS | TYPE A PEDESTAL REINFORCEMENT NO. | NO. | BARS | NO. | BARS | TYPE A REBAR TOTAL (LBS.) | TYPE A CONCRETE (CU.YDS.) | TYPE C LONGITUDINAL FOOTING REINFORCEMENT TOP NO. | TOP BARS | BOTTOM NO. | BOTTOM BARS | TYPE C PEDESTAL REINFORCEMENT NO. | BARS | NO. | BARS | TYPE C REBAR TOTAL (LBS.) | TYPE C CONCRETE (CU.YDS.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| III | 18" | 93.45 | 8½" | 0" | 2'-8" x 2'-8" x 1¾" | 10 | 2" | 2'-10" | 6'-6" | 15" | 10'-0" x 13'-0" | 10 | #5 | 10 | #5 | 10 | #4 | 14 | #8 | 757 | 14.4 | 10 | #4 | 10 | #5 | 12 | #4 | 14 | #8 | 800 | 15.3 |
| IV | 20" | 104.13 | 8½" | 0" | 2'-10" x 2'-10" x 2" | 10 | 2¼" | 3'-0" | 6'-9" | 18" | 10'-0' x 14'-0" | 10 | #5 | 10 | #5 | 10 | #4 | 14 | #8 | 795 | 15.6 | 10 | #4 | 10 | #5 | 12 | #4 | 14 | #8 | 839 | 16.5 |
| V | 18" | 93.45 | 8½" | 7" | 3'-3" x 2'-8" x 2" | 10 | 2¼" | 2'-10" | 7'-0" | 12" | 9'-0" x 17'-0" | 9 | #5 | 10 | #7 | 10 | #4 | 14 | #8 | 1015 | 16.5 | 10 | #4 | 10 | #7 | 12 | #4 | 14 | #8 | 1059 | 17.5 |
| VI | 20" | 104.13 | 8½" | 8" | 3'-6' x 2'-10" x 2¼" | 10 | 2¼" | 3'-0" | 7'-6" | 15" | 9'-0" x 19'-0" | 9 | #5 | 10 | #7 | 10 | #4 | 14 | #8 | 1099 | 18.4 | 10 | #4 | 10 | #7 | 12 | #4 | 14 | #8 | 1134 | 19.5 |
| VII | 24" | 125.49 | 9" | 8" | 3'-10" x 3'-2" x 2¼" | 10 | 2½" | 3'-4" | 7'-10" | 15" | 10'-0" x 20'-0" | 9 | #5 | 12 | #7 | 10 | #4 | 14 | #8 | 1257 | 21.5 | 10 | #4 | 12 | #7 | 12 | #4 | 14 | #8 | 1302 | 22.6 |

* BASE PLATES, PEDESTAL AND FOOTINGS, LONGER SIDES SHALL BE NORMAL TO AXIS OF SIGN.
** BASE PLATES, PEDESTAL AND FOUNDATIONS, LONGER SIDES SHALL BE NORMAL TO AXIS OF SIGN.

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

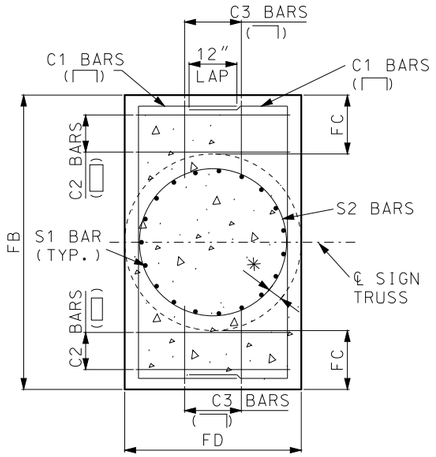

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)


STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES
## OPTIONAL SUBSTRUCTURE DATA

DATE EFFECTIVE: 10-01-2016
DATE PREPARED: 8/11/2016

903.12Z

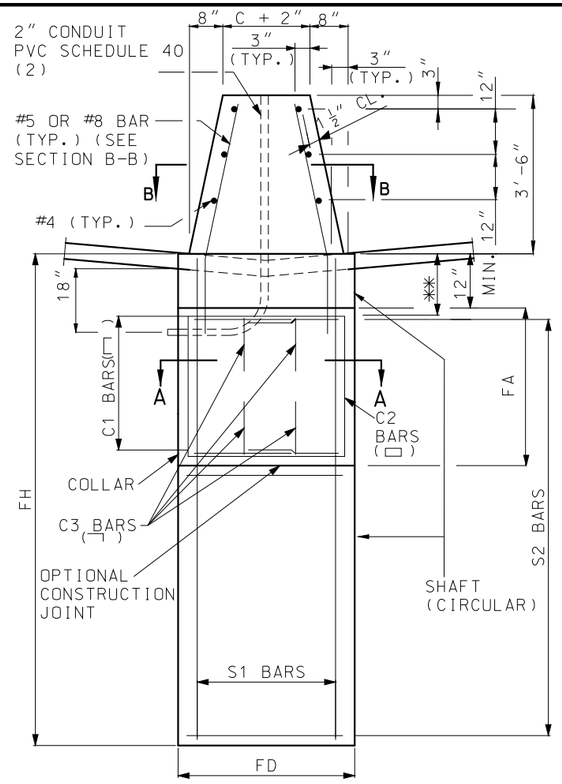



SECTION A-A

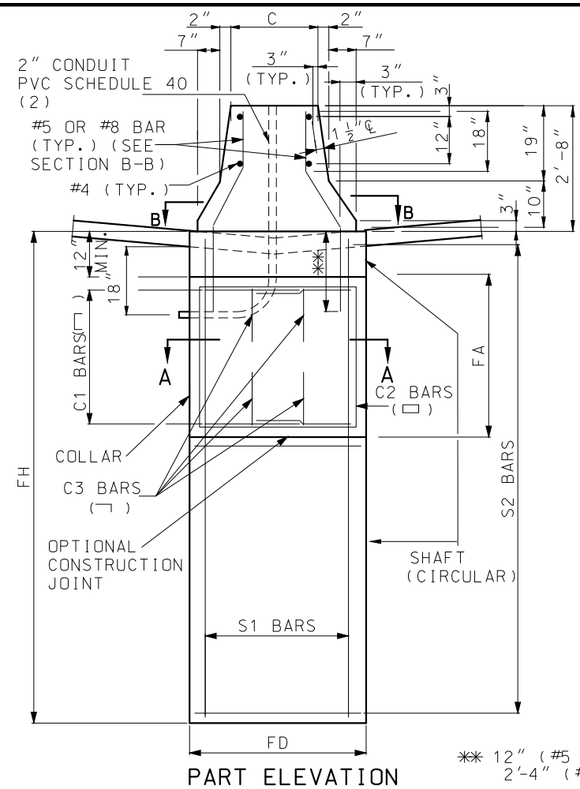
(TYPICAL SECTION SHOWING REINFORCING STEEL)

✳ 4" CLEAR FOR FD = 4'-6"
6" CLEAR FOR FD > 4'-6"

VERTICAL LEG OF C3 SHALL BE PLACED INSIDE SHAFT S2 BARS.

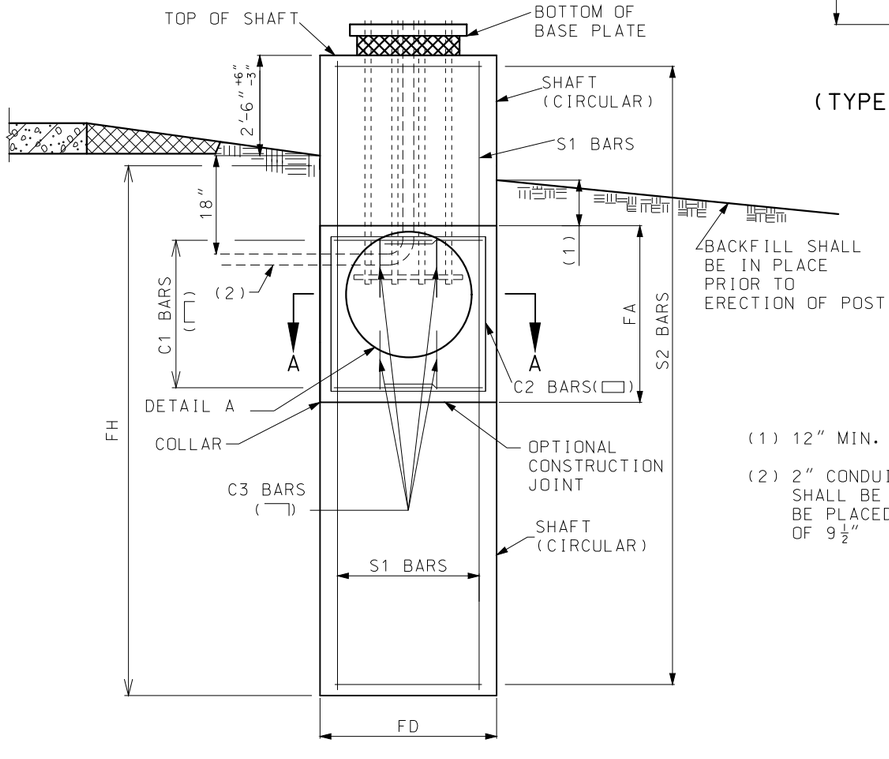



PART ELEVATION
(TYPE C CONCRETE TRAFFIC BARRIER)




PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

✳✳ 12" (#5 BAR)
2'-4" (#8 BAR)



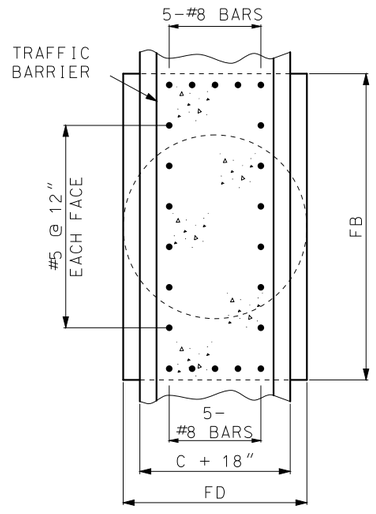

ELEVATION

## DETAILS OF ALTERNATE PEDESTAL

(TO BE USED ADJACENT TO TYPE A OR TYPE C MEDIAN BARRIER)

(1) 12" MIN. TO 24" MAX.

(2) 2" CONDUIT IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MINIMUM BEND RADIUS OF 9½"




SECTION B-B

GENERAL NOTES:

SHAFT AND COLLAR SHALL BE CLASS B (P.C.C.).

MINIMUM CLEARANCE TO REINFORCEMENT IS 3" EXCEPT AS SHOWN.

WHEN ROCK IS ENCOUNTERED AT A DEPTH NOT EXCEEDING "FH"/2 FOR FD > 3'-0" OR "FH"/4 FOR FD ≤ 3'-0", THE DIMENSION "FH" MAY BE ADJUSTED TO A MINIMUM OF 3 X "FD", SUBJECT TO APPROVAL BY THE ENGINEER.

CONTACT THE ENGINEER IF WATER TABLE IS ENCOUNTERED DURING EXCAVATION.

PIPE COLUMN, BASE PLATE, ANCHOR BOLTS AND NOTES PERTAINING TO THESE ITEMS HAVE BEEN OMITTED FOR CLARITY. REFER TO SHEET 3 OF 7 FOR DETAILS OF THESE ITEMS.

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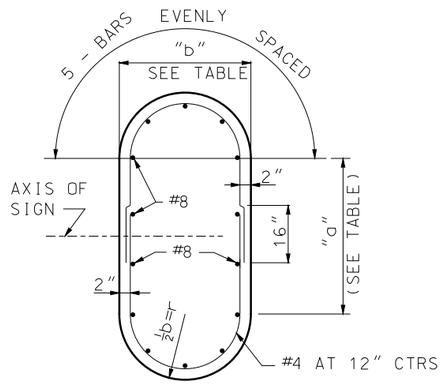
# OVERHEAD SIGN TRUSSES
## DRILLED SHAFT OPTION

DATE EFFECTIVE: 10-01-2016
DATE PREPARED: 8/11/2016

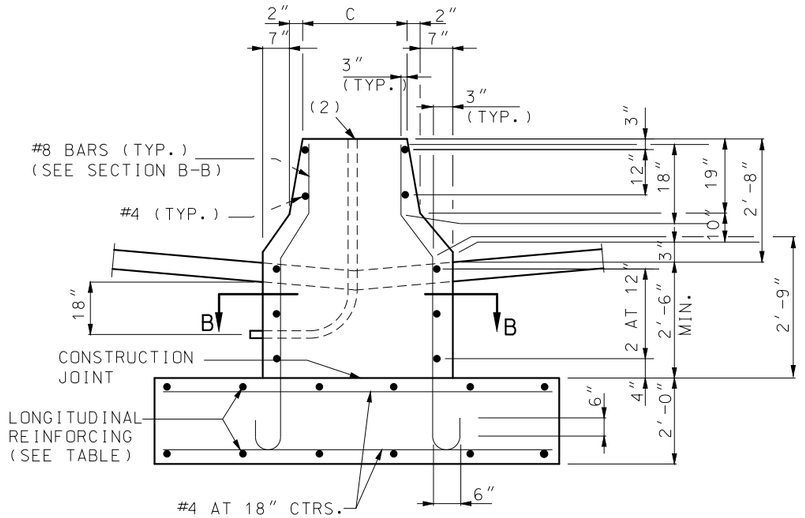
903.12Z

SHEET NO. 5 OF 7

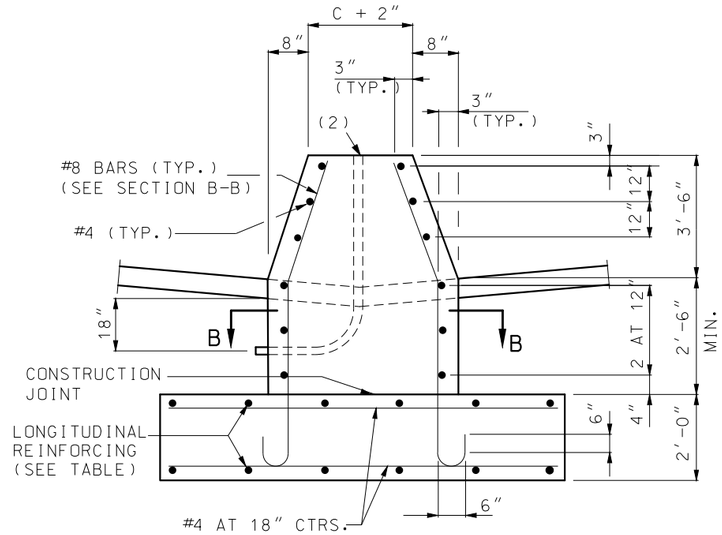
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



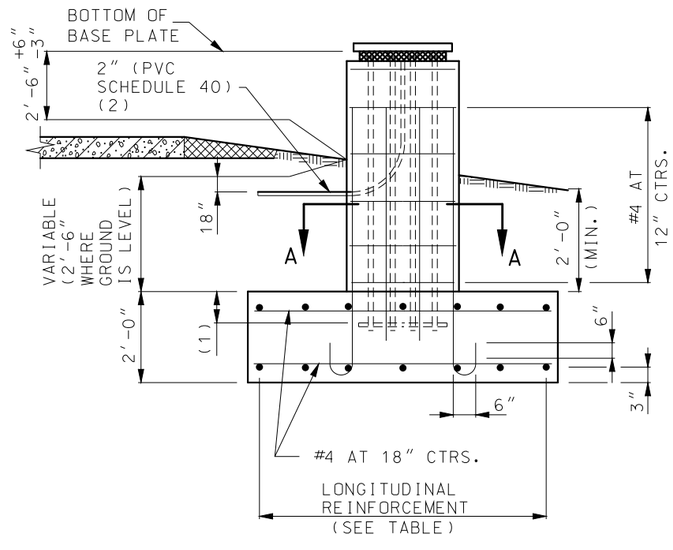

SECTION A-A
(TYPICAL SECTION SHOWING REINFORCING STEEL)



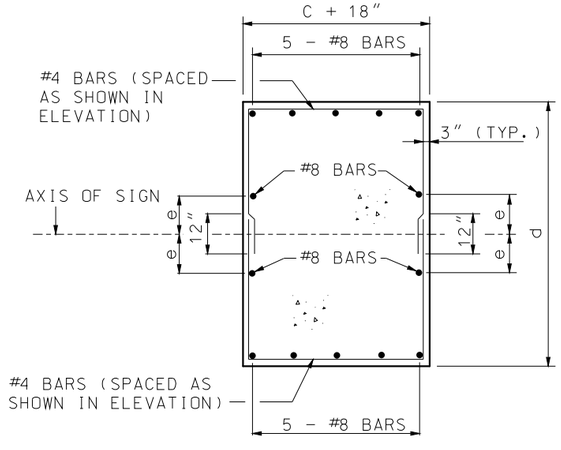

PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)




PART ELEVATION
(TYPE C CONCRETE TRAFFIC BARRIER)




ELEVATION




SECTION B-B
TYPICAL SECTION SHOWING
REINFORCING STEEL

DETAILS OF ALTERNATE PEDESTAL

(1) $12"^{+6"}_{-3"}$ (DETAIL FOR 12" FIELD TOLERANCE)

(2) 2" CONDUIT IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MINUMUM BEND RADIUS OF $9\frac{1}{2}$".

GENERAL NOTES:

PEDESTAL AND FOOTING SHALL BE CLASS B (P.C.C.).

MINIMUM CLEARANCE TO REINFORCEMENT IS 3" EXCEPT AS SHOWN.

CONTACT THE ENGINEER IF WATER TABLE IS ENCOUNTERED DURING EXCAVATION.

PIPE COLUMN, BASE PLATE, ANCHOR BOLTS AND NOTES PETAINING TO THESE ITEMS HAVE BEEN OMITTED FOR CLARITY. REFER TO SHEET 3 OF 7 FOR DETAILS OF THESE ITEMS.

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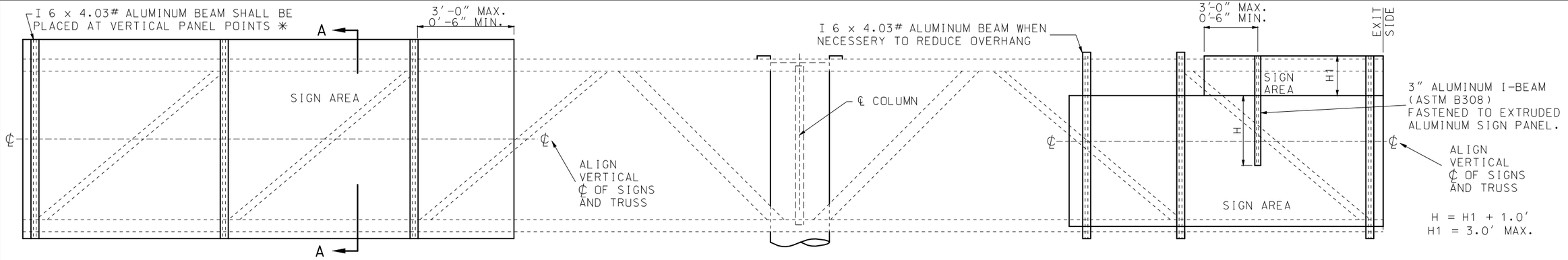
# OVERHEAD SIGN TRUSSES
## SPREAD FOOTING

DATE EFFECTIVE: 10-01-2016
DATE PREPARED: 8/11/2016

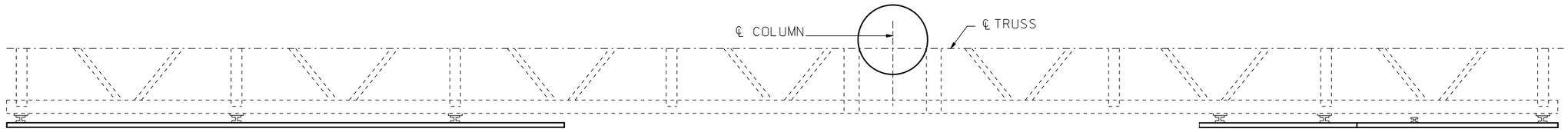
903.12Z

SHEET NO. 6 OF 7

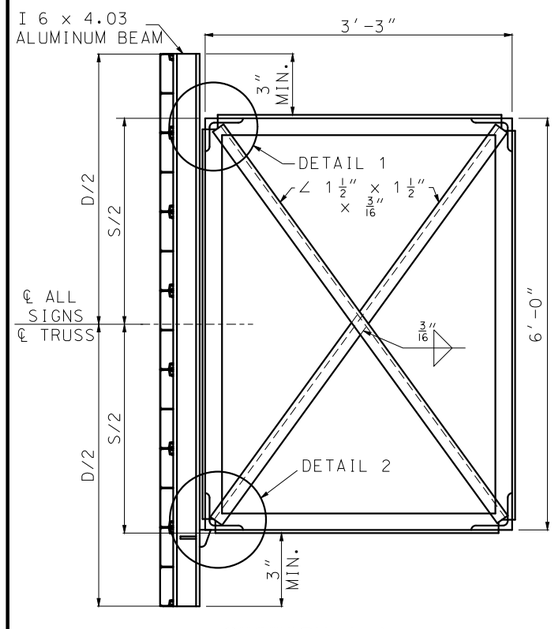
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.




## TYPICAL ELEVATION OF SIGNS COMPONENTS

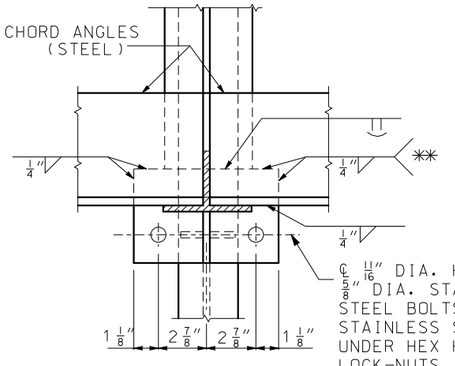



## TYPICAL PLAN OF SIGN COMPONENTS



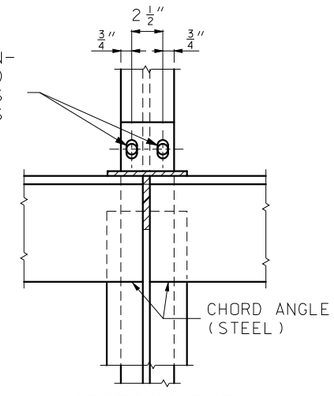

SECTION A-A
TYPICAL SECTION
OF SIGN SUPPORT

NOTE:
"D" = GREATEST OVERALL DEPTH
OF ANY SIGNS ON TRUSSES.

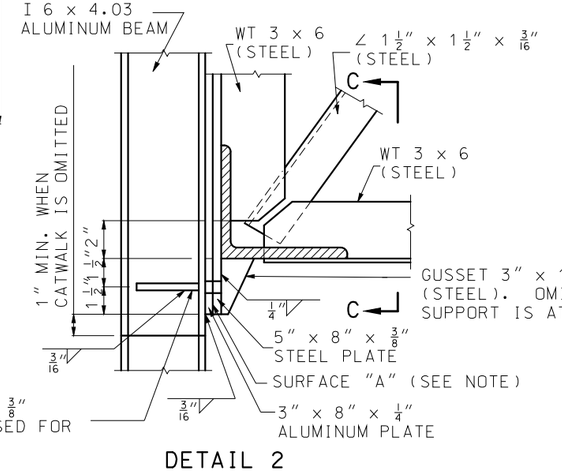



SECTION C-C

9/16" DIA. HOLES IN ALUMINUM FLANGE.
9/16" x 1" SLOT IN 5/8" ℄ FOR ½" DIA. STAINLESS STEEL HEX HEAD BOLTS AND LOCK-NUTS WITH FLAT STAINLESS STEEL WASHERS.

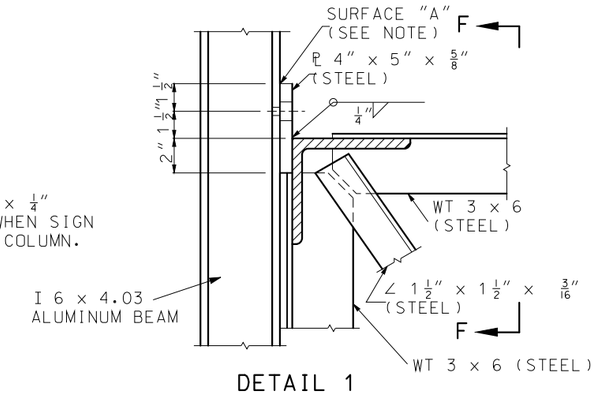



SECTION F-F




TWO - GUSSETS 5" x 1" x 3/8" (ALUM.) OMIT WHEN NOT USED FOR CATWALK SUPPORT.

DETAIL 2




DETAIL 1

NOTE:
SURFACE "A", ZINC CHROMATE ON ALUMINUM SURFACES. NORMAL CLEANING AND PAINTING ON STEEL SURFACES. ZINC CHROMATE IS NOT REQUIRED WHEN STEEL IS GALVANIZED.

✳ FOR SIGN HEIGHTS GREATER THAN 17'-0", BUT LESS THAN OR EQUAL TO 20'-0" USE ADDITIONAL I 6 x 4.03 ALUMINUM BEAMS TO ACHIEVE A MAXIMUM SPACING OF 4'-0" BETWEEN SIGN SUPPORTS.

✳✳ WHEN SIGN SUPPORTS ARE PLACED BETWEEN VERTICAL PANEL POINTS AS ILLUSTRATED IN TYPICAL ELEVATION OF SIGNS COMPONENTS, WELD THE ⅜" STEEL PLATE TO THE BOTTOM CHORD WITH A ¼" FILLET WELD.

GENERAL NOTES:

EXIT NO. PANELS SHALL BE MONTED FLUSH WITH THE EXIT SIDE OF THE GUIDE SIGN.

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.

FOR SIGN MOUNTING DETAILS, SEE STANDARD PLANS 903.03.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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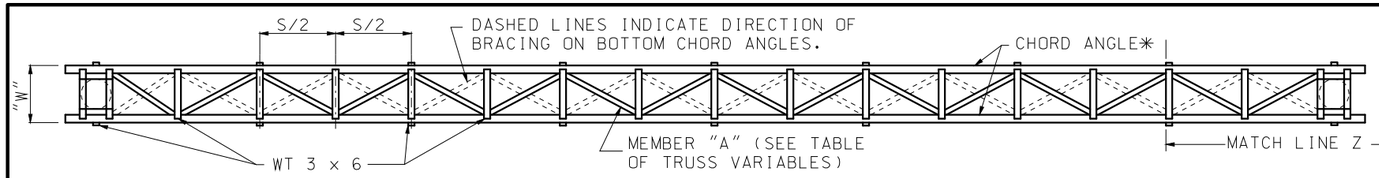
# OVERHEAD SIGN TRUSSES
## STRUCTURAL STEEL BUTTERFLY AND CANTILEVER

DATE EFFECTIVE: 10-01-2016
DATE PREPARED: 8/11/2016

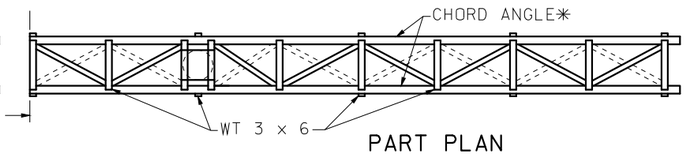
903.12Z

SHEET NO. 7 OF 7

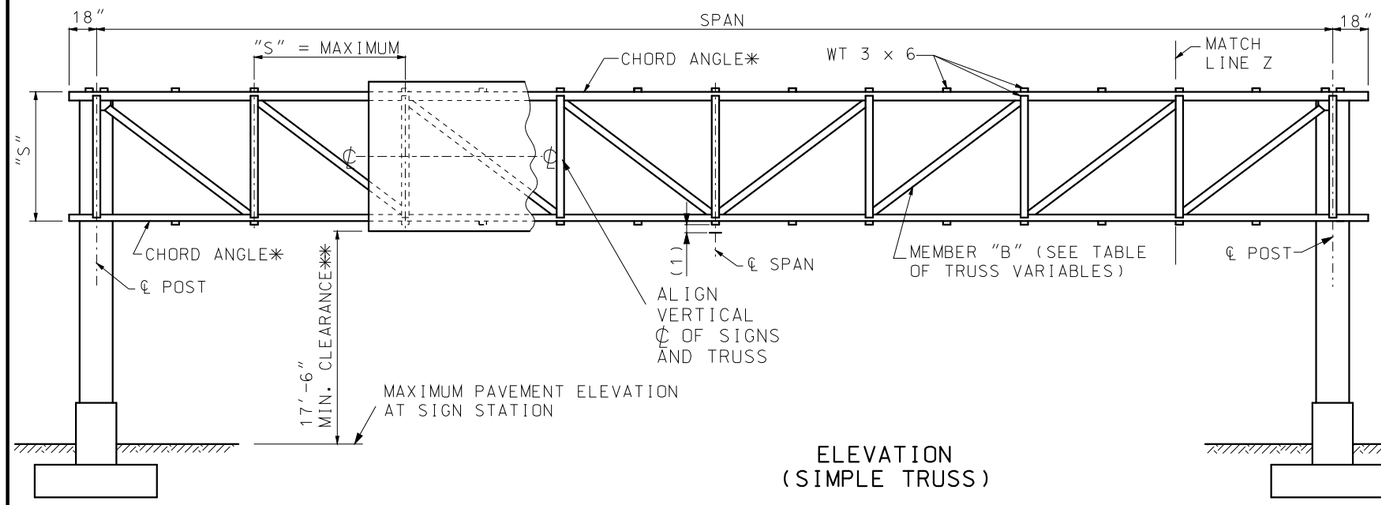
IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.



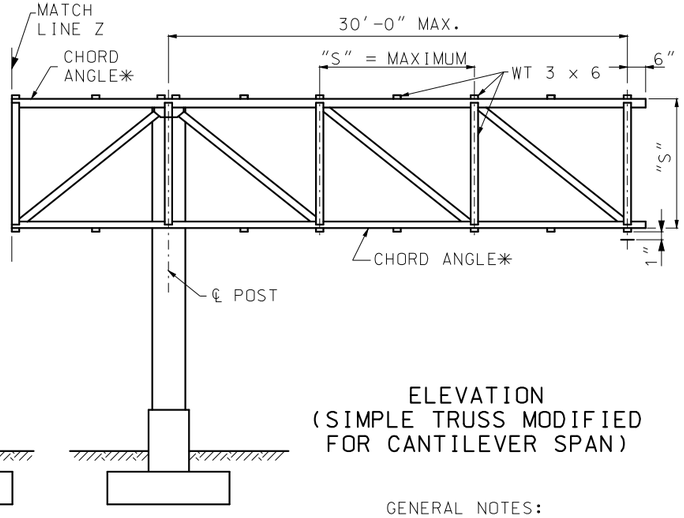

PART PLAN




PART PLAN




ELEVATION
(SIMPLE TRUSS)




ELEVATION
(SIMPLE TRUSS MODIFIED FOR CANTILEVER SPAN)

NOTES:

SHOP SPLICES ON CHORD ANGLES WILL BE ALLOWED ONLY BY SPECIAL PERMISSION. IF PERMISSION IS GRANTED, SUCH SPLICES MUST BE LOCATED AT THE CENTERLINE OF MAIN PANEL POINTS.

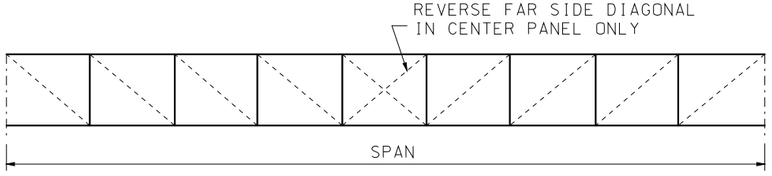
"D" = GREATEST OVERALL DEPTH OF ANY SIGN OR SIGNS ON TRUSS AND "S" = TRUSS DEPTH, AND "W" = TRUSS WIDTH.

$\frac{3}{4}$" DIA. BOLTS SHALL BE REMOVED AFTER WELDING IS COMPLETE. BOLT HOLES SHALL BE PLUGGED AND THE OUTSIDE FACE GROUND SMOOTH.

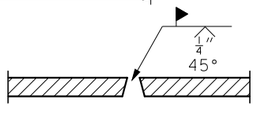
* SEE GENERAL NOTES THIS SHEET FOR CHARPY V-NOTCH REQUIREMENTS.

** IF LIGHTING IS SPECIFIED, VERTICAL CLEARANCE IS MEASURED TO LOWEST POINT OF LIGHTING BRACKET.

(1) FOR PARABOLIC CAMBER SEE TABLE OF TRUSS VARIABLES




TRUSS ELEVATION
(UNEVEN NUMBER OF TRUSS PANELS)




SECTION A-A

| TRUSS VARIABLES | | | | | |
|---|---|---|---|---|---|
| SPAN | "S" | "W" | MEMBER "A" | MEMBER "B" | SHOP CAMBER |
| UP TO 80'-6" | 6'-0" | 4'-0" | L $2\frac{1}{2}$" x $2\frac{1}{2}$" x $\frac{1}{4}$" | L $2\frac{1}{2}$" x $2\frac{1}{2}$" x $\frac{1}{4}$" | 2" |
| 81' TO 100'-6" | 6'-0" | 5'-0" | L 3" x 3" x $\frac{1}{4}$" | L $2\frac{1}{2}$" x $2\frac{1}{2}$" x $\frac{1}{4}$" | $2\frac{1}{2}$" |
| 101' TO 130'-6" | 7'-0" | 6'-0" | L 3" x 3" x $\frac{1}{4}$" | L 3" x 3" x $\frac{1}{4}$" | $3\frac{1}{2}$" |
| 131' TO 150'-6" | 8'-0" | 6'-0" | L $3\frac{1}{2}$" x $3\frac{1}{2}$" x $\frac{5}{16}$" | L $3\frac{1}{2}$" x $3\frac{1}{2}$" x $\frac{5}{16}$" | $4\frac{1}{2}$" |
| 151' TO 160'-6" | 8'-0" | 7'-0" | L $3\frac{1}{2}$" x $3\frac{1}{2}$" x $\frac{5}{16}$" | L $3\frac{1}{2}$" x $3\frac{1}{2}$" x $\frac{5}{16}$" | $5\frac{1}{2}$" |

NOTE: FOR SIZE OF CHORD MEMBERS SEE DATA SHEET.

GENERAL NOTES:

ALL STRUCTURAL STEEL AND COLUMN BASE PLATES ASTM A36, EXCEPT THAT CHORD ANGLES GREATER THAN $\frac{1}{2}$" IN THICKNESS SHALL BE AASHTO M183 WITH SUPPLEMENTAL REQUIREMENTS: S5, CHARPY V-NOTCH IMPACT TEST FOR TEMPERATURE ZONE 2.

ALL ANCHOR BLOTS ASTM A370.

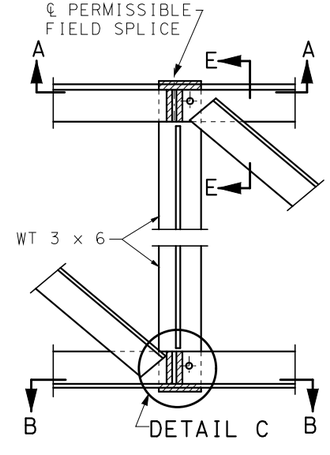
PROPOSED FIELD SPLICES SHALL BE SHOWN ON SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.

TRUSSES SHALL BE FABRICATED WITH A MINIMUM OF SPLICING IN TRUSS CHORDS. FIELD SPLICING WILL NOT BE PERMITTED WITHIN THE MIDDLE ONE-THIRD OF SPAN.

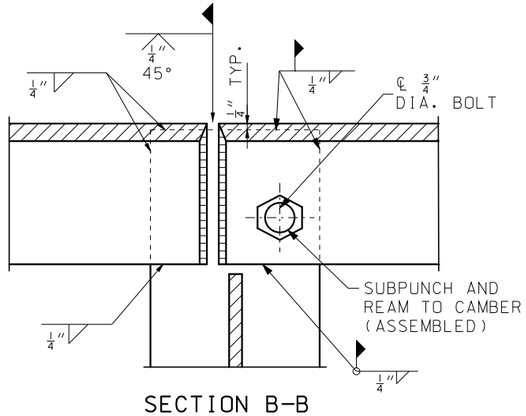
FOR ADDITIONAL INFORMATION SEE DATA SHEET.

ZINC CHROMATE PRIMER SHALL MEET THE REQUIREMENTS OF FEDERAL SPECIFICATIONS TT-P-645 OR TT-P-1757 AND SHALL BE ACCEPTED ON THE BASIS OF THE LABEL SHOWING CONFORMANCE OR A MANUFACTURER'S CERTIFICATION.

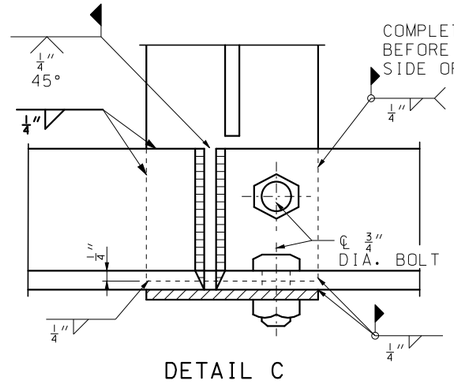
ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.



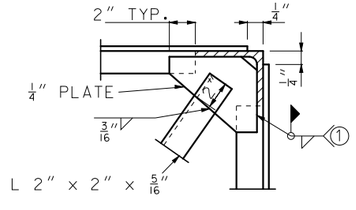

SECTION THROUGH TRUSS LOCATING SPLICES




SECTION B-B




DETAIL C




SECTION E-E
(FIELD SPLICE ONLY)

DETAIL OF FIELD SPLICES
(IF ANY)

① SEE SHEET 2

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES

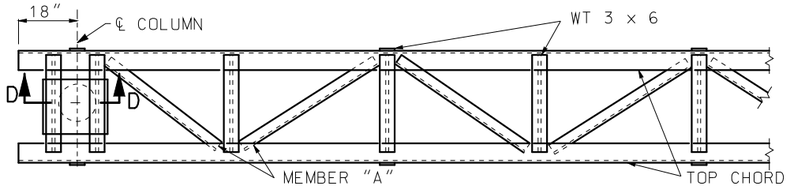
STRUCTURAL STEEL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

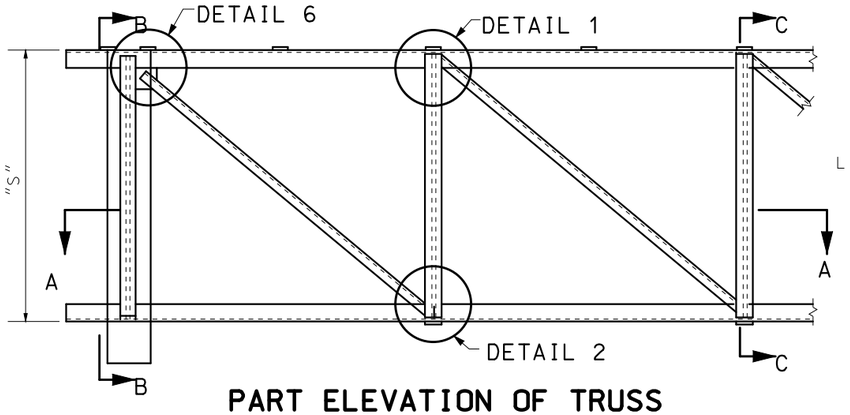
903.60AB

SHEET NO. 1 OF 5

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

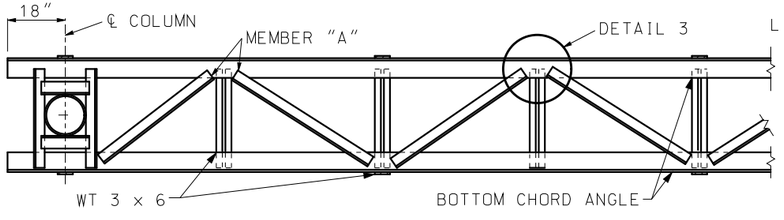



PLAN

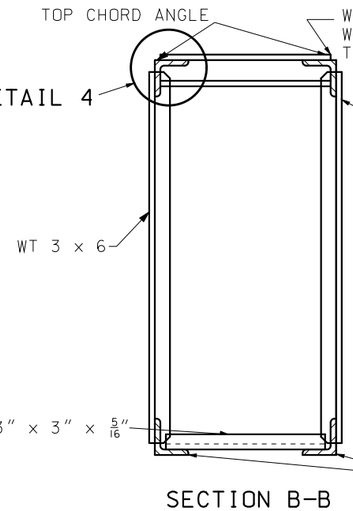



## PART ELEVATION OF TRUSS

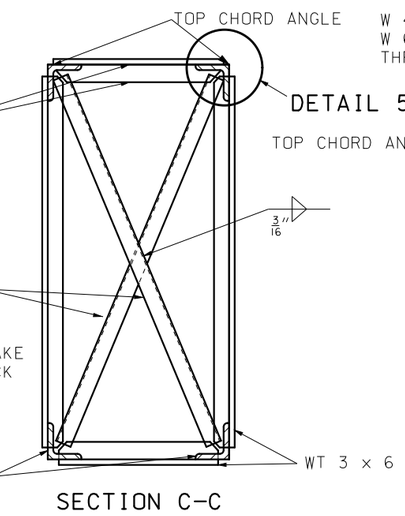
NOTE: FOR SIZE OF MEMBER "A" SEE TABLE OF TRUSS VARIABLES, SHEET NO 1.



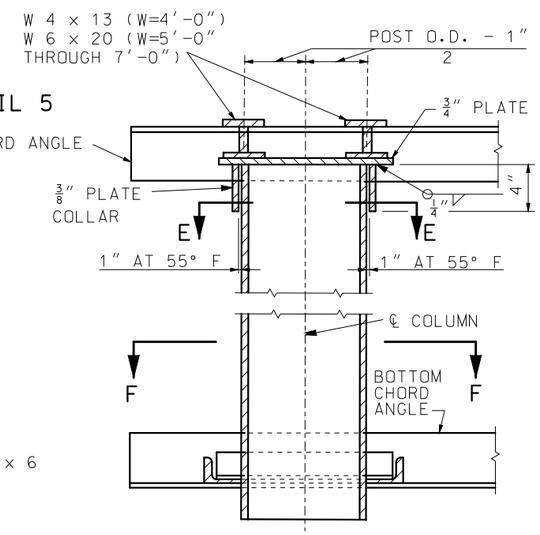

SECTION A-A



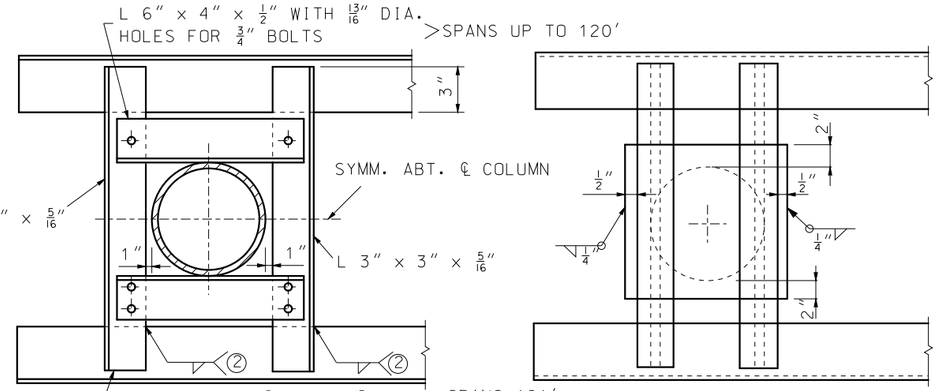

SECTION B-B




SECTION C-C




SECTION D-D

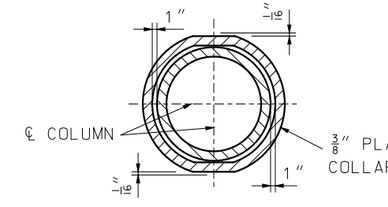



NOTE: BOLTS SHALL BE HIGH STRENGTH STEEL WITH HARDENED WASHERS UNDER HEAD AND NUT.

SECTION F-F

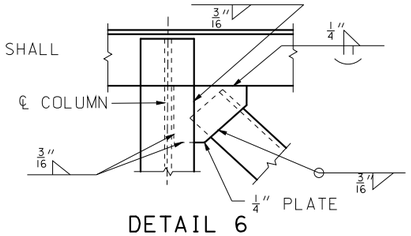
PLAN OF POST

NOTE: FILLET WELD 2 (SHOP OR FIELD) SHALL BE 3/16" WHEN "+" IS 1/2" OR LESS AND 1/4" WHEN "+" IS GREATER THAN 1/2".

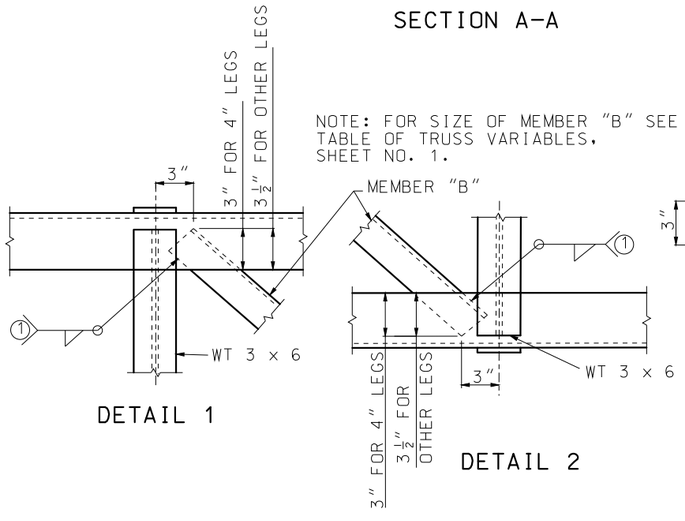



SECTION E-E

NOTE: DETAILS OF CANTILEVER END SECTION ARE SIMILAR TO THOSE SHOWN ON THIS SHEET.




DETAIL 6

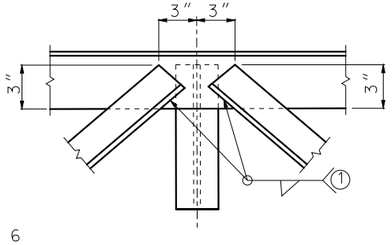



NOTE: FOR SIZE OF MEMBER "B" SEE TABLE OF TRUSS VARIABLES, SHEET NO. 1.

DETAIL 1

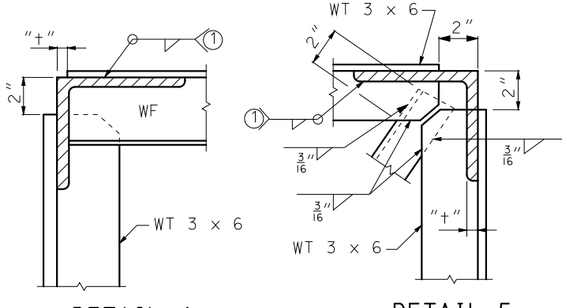
DETAIL 2

IF DESIRED THE OUTSTANDING LEGS OF DIAGONAL ANGLES MAY BE CLIPPED AT 45° TO FACILITATE ASSEMBLY AND WELDING.




DETAIL 3

TYPICAL FOR ALL PANEL POINT FRAMING EXCEPT AT FIELD SPLICES, IF ANY, AND COLUMN SUPPORTS.




DETAIL 4

DETAIL 5

SLOT WEB OF STRUCTURAL TEE'S AND WIDE FLANGES TO RECEIVE LEG OF CHORD ANGLES (TYPICAL).

FILLET WELD 1 SHALL BE 5/16" WHEN "+" IS 1/2" OR LESS AND 1/4" WHEN "+" IS GREATER THAN 1/2".

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES

STRUCTURAL STEEL

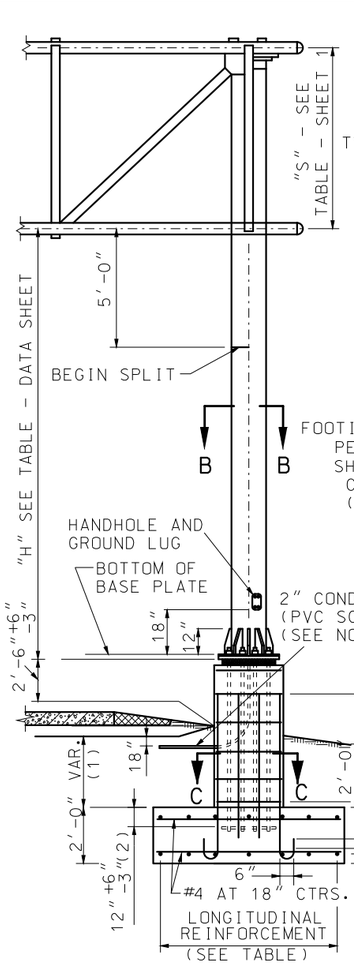
DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.60AB

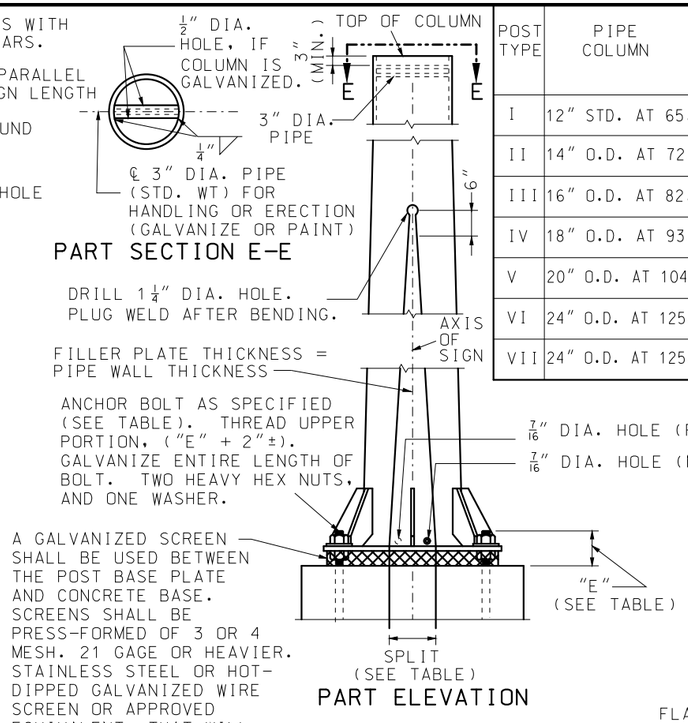
SHEET NO. 2 OF 5

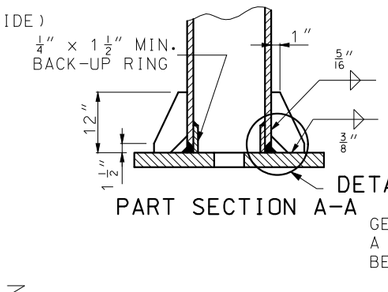
| POST TYPE | PIPE COLUMN | DIMENSION "E" | SPLIT | BASE PLATE SIZE* | ANCHOR BOLTS DIA. | PEDESTAL SIZE* a | PEDESTAL SIZE* b | FOOTING SIZE* | LONGITUDINAL FOOTING REINFORCEMENT TOP | LONGITUDINAL FOOTING REINFORCEMENT BOTTOM | CONCRETE C.Y. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 12" STD. AT 65.42 | 8½" | 6" | 2'-6"x 23"x 1½" | 6 AT 2¼" | 4'-0" | 2'-11" | 7'-0"x 14'-6" | 7-#5 BARS | 7-#6 BARS | 10.9 |
| II | 14" O.D. AT 72.09 | 8½" | 9½" | 3'-0"x 2'-0"x 1½" | 6 AT 2¼" | 4'-4" | 3'-0" | 8'-0"x 16'-0" | 8-#5 BARS | 9-#6 BARS | 13.2 |
| III | 16" O.D. AT 82.77 | 8¾" | 11½" | 3'-4"x 2'-2"x 1¾" | 6 AT 2¼" | 4'-8" | 3'-2" | 8'-6"x 17'-6" | 9-#5 BARS | 9-#7 BARS | 15.2 |
| IV | 18" O.D. AT 93.45 | 9½" | 12½" | 3'-7"x 2'-4"x 2" | 6 AT 2½" | 5'-1" | 3'-4" | 9'-6"x 19'-0" | 10-#5 BARS | 10-#8 BARS | 18.1 |
| V | 20" O.D. AT 104.13 | 9½" | 13" | 3'-10"x 2'-9"x 2" | 8 AT 2½" | 5'-4" | 3'-9" | 10'-0"x 20'-0" | 10-#5 BARS | 10-#8 BARS | 20.6 |
| VI | 24" O.D. AT 125.49 | 9½" | 10½" | 4'-0"x 3'-3"x 2" | 8 AT 2½" | 5'-6" | 4'-3" | 10'-6"x 21'-0" | 11-#5 BARS | 11-#8 BARS | 23.3 |
| VII | 24" O.D. AT 125.49 | 9½" | 13½" | 4'-3"x 3'-3"x 2" | 8 AT 2½" | 5'-9" | 4'-3" | 11'-0"x 22'-0" | 11-#5 BARS | 11-#9 BARS | 25.1 |

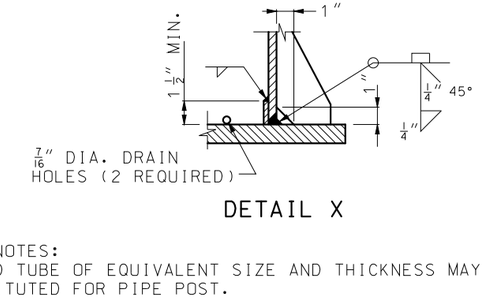
* BASE PLATES, PEDESTAL, AND FOOTINGS, LONGER SIDES SHALL BE NORMAL TO AXIS OF SIGN.




NOTE: THE 2" CONDUIT IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MINUMUM RADIUS BEND OF 9½".




GENERAL NOTES:
A TAPERED TUBE OF EQUIVALENT SIZE AND THICKNESS MAY BE SUBSTITUTED FOR PIPE POST.

ALL STEEL PIPE COLUMNS SHALL BE EITHER GRADE "B" SEAMLESS STEEEL PIPE OR GRADE "B" ELECTRIC RESISTANCE WELDED STEEL PIPE; A.S.T.M. SPECIFICATION A53. NO OBJECTIONABLE SEAMS WILL BE PERMITTED.

ALL STRUCTURES SHALL BE GROUNDED.

BURR THREADS ON ALL ANCHOR BOLTS.

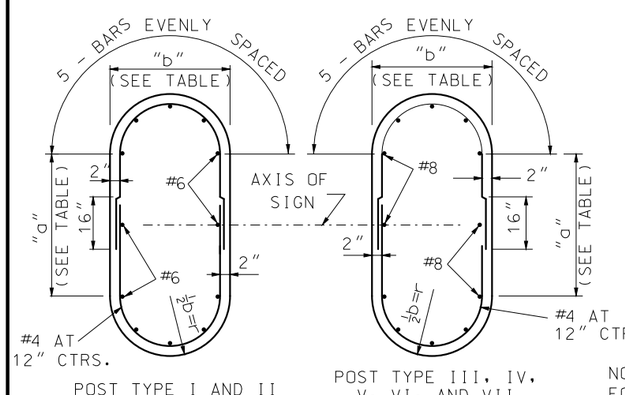
A HORIZONTAL WELDED SPLICE MAY BE FABRICATED IN THE COLUMN BETWEEN THE TOP OF PIPE AND 4'- 0" BELOW THE BOTTOM CHORDS OF THE TRUSS WHEN DETAILED ON THE SHOP DRAWINGS AND APPROVED BY THE ENGINEER.

GROUND LUGS SHALL BE LOCATED INSIDE COLUMN NEAR HAND HOLE.

QUANTITIES FOR PEDESTAL, BASED ON NOMINAL HEIGHT OF 5'- 0".

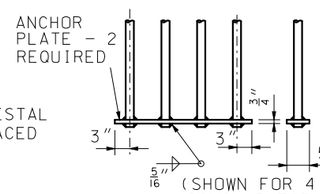
QUANTITIES FOR FOOTING, BASED ON NOMINAL DEPTH OF 2'- 0".

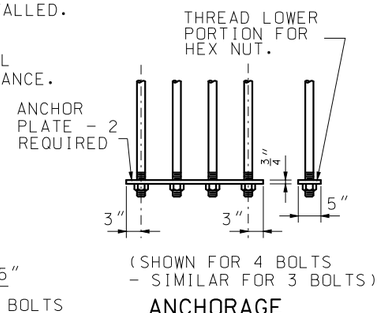
QUANTITIES SHOWN ARE FOR ONE COLUMN ONLY.

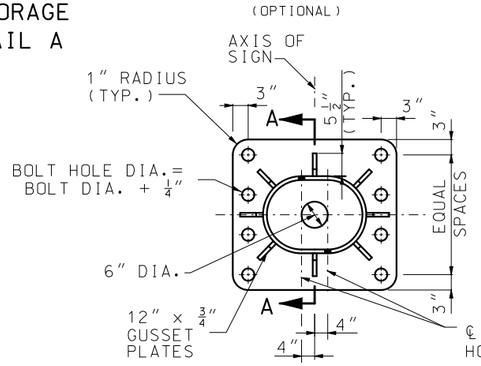


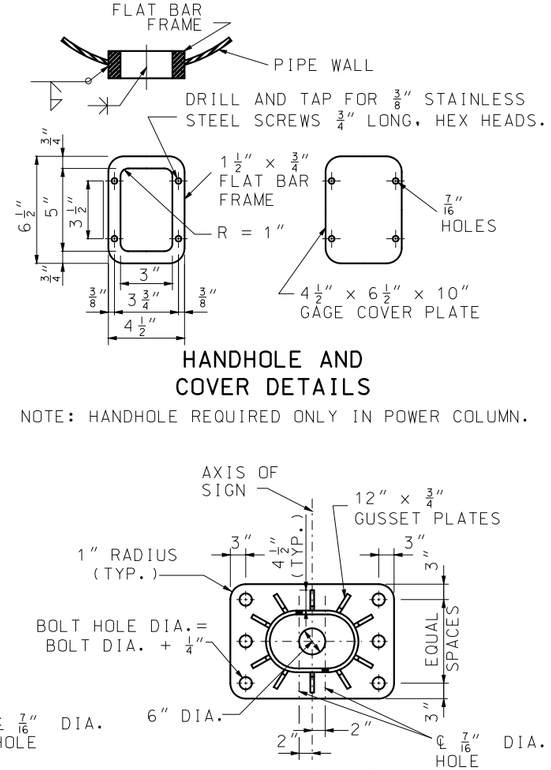

NOTE:
FOR DETAILS OF ALTERNATE PEDESTAL, SEE SHEET NO. 4 OF 5.

(1) 2'-6" WHERE GROUND IS LEVEL
(2) DETAIL FOR 12" FIELD TOLERANCE.




NOTE: HANDHOLE REQUIRED ONLY IN POWER COLUMN.




## TYPICAL BASE PLATES

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.


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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

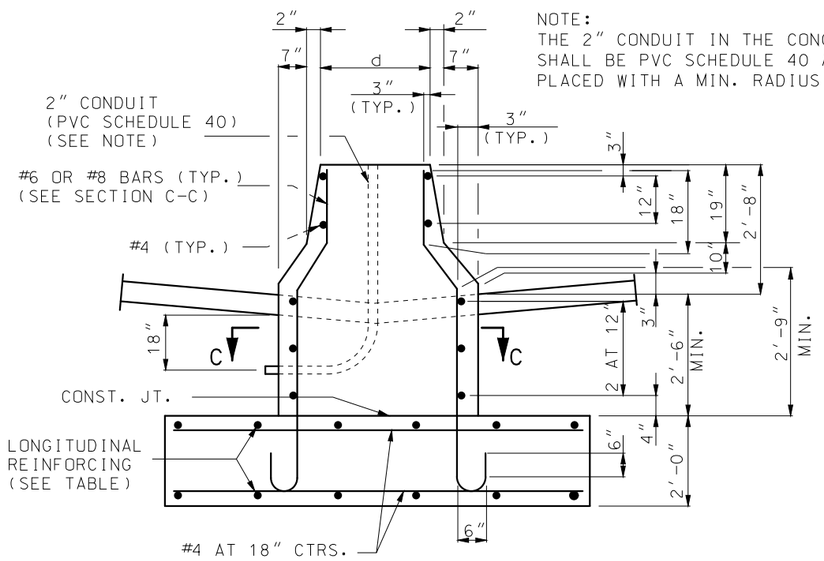

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

# OVERHEAD SIGN TRUSSES

STRUCTURAL STEEL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

903.60AB




NOTE:
THE 2" CONDUIT IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MIN. RADIUS BEND OF 9½".

PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

| POST TYPE | PIPE COLUMN | PEDESTAL SIZE✱ | | FOOTING SIZE✱ | LONGITUDINAL FOOTING REINFORCEMENT | | CONCRETE C.Y. | |
|---|---|---|---|---|---|---|---|---|
| | | c | d | | TOP | BOTTOM | TYPE A MEDIAN BARRIER | TYPE C MEDIAN BARRIER |
| I | 12" STD. AT 65.42 | 5'-9" | 2'-1" | 7'-0"x 14'-6" | 7-#5 BARS | 7-#6 BARS | 10.9 | 11.6 |
| II | 14" O.D. AT 72.09 | 6'-2" | 2'-2" | 8'-0"x 16'-0" | 8-#5 BARS | 9-#6 BARS | 13.2 | 14.0 |
| III | 16" O.D. AT 82.77 | 6'-7" | 2'-4" | 8'-6"x 17'-6" | 9-#5 BARS | 9-#7 BARS | 15.2 | 16.1 |
| IV | 18" O.D. AT 93.45 | 7'-1" | 2'-6" | 9'-6"x 19'-0" | 10-#5 BARS | 10-#8 BARS | 18.1 | 19.1 |
| V | 20" O.D. AT 104.13 | 7'-8" | 2'-11" | 10'-0"x 20'-0" | 10-#5 BARS | 10-#8 BARS | 20.6 | 21.7 |
| VI | 24" O.D. AT 125.49 | 8'-3" | 3'-5" | 10'-6"x 21'-0" | 11-#5 BARS | 11-#8 BARS | 23.3 | 24.6 |
| VII | 24" O.D. AT 125.49 | 8'-6" | 3'-5" | 11'-0"x 22'-0" | 11-#5 BARS | 11-#9 BARS | 25.1 | 26.5 |

✱ BASE PLATES, PEDESTAL, AND FOOTINGS LONGER SIDES SHALL BE NORMAL TO AXIS OF SIGN.

GENERAL NOTES:

A TAPERED TUBE OF EQUILVALENT SIZE AND THICKNESS MAY BE SUBSTITUTED FOR PIPE POST.

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 A53.

NO OBJECTIONABLE SEAMS WILL BE PERMITTED.

ALL STRUCTURES SHALL BE GROUNDED.

BURR THREADS ON ALL ANCHOR BOLTS.

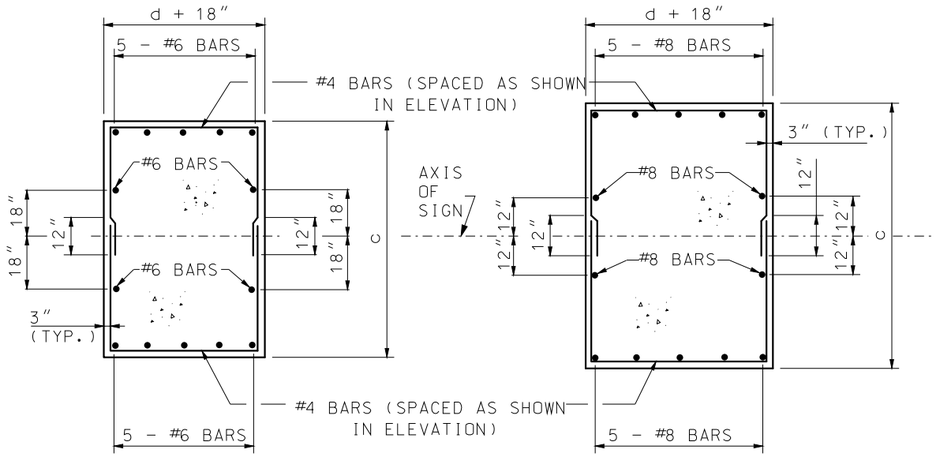
PIPE COLUMN, BASE PLATE, ANCHOR BOLTS AND NOTES PERTAINING TO THESE ITEMS HAVE BEEN OMITTED FOR CLARITY. REFER TO SHEET 3 OF 5 FOR DETAILS OF THESE ITEMS.

GROUND LUGS SHALL BE LOCATED INSIDE COLUMN NEAR HAND HOLE.

QUANTITIES FOR PEDESTAL ARE BASED ON NOMINAL HEIGHT OF 5'-2" (TYPE A MEDIAN BARRIER) OR 6'-0" (TYPE C MEDIAN BARRIER).

QUANTITIES FOR FOOTING ARE BASED ON NOMINAL DEPTH OF 2'-0".

QUANTITIES SHOWN ARE FOR ONE COLUMN ONLY.

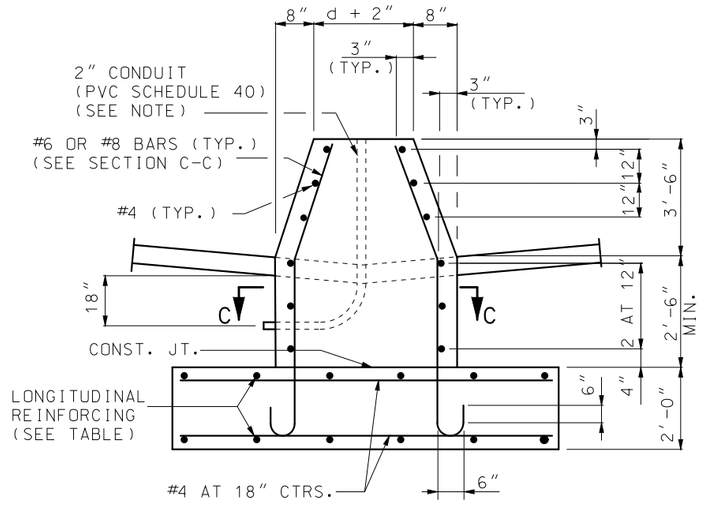



POST TYPE I AND II

POST TYPEIII, IV, V, VI, AND VII

SECTION C-C
TYPICAL SECTION SHOWING
REINFORCING STEEL

NOTE:
THE 2" CONDUIT IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MIN. RADIUS BEND OF 9½".




PART ELEVATION
(TYPE C CONCRETE TRAFFIC BARRIER)

## DETAILS OF ALTERNATE PEDESTAL

(TO BE USED ADJACENT TO TYPE "A" OR "C" MEDIAN BARRIER)

IF A SEAL IS PRESENT ON THIS SHEET IT HAS BEEN ELECTRONICALLY SEALED AND DATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STATE OF MISSOURI
EILEEN H. RACKERS
NUMBER PE-28336
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

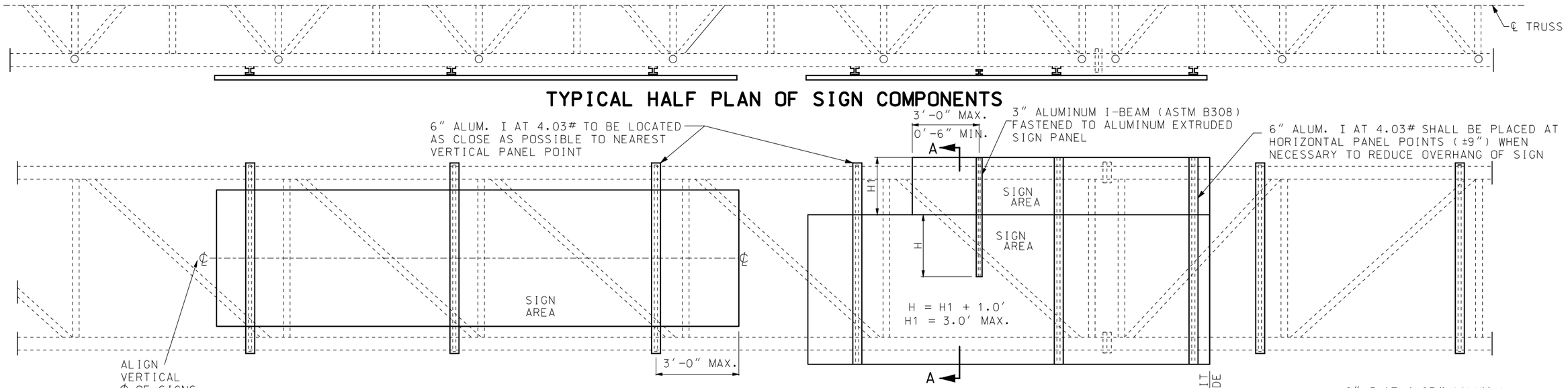
# OVERHEAD SIGN TRUSSES

STRUCTURAL STEEL

DATE EFFECTIVE: 10/01/2016
DATE PREPARED: 8/11/2016

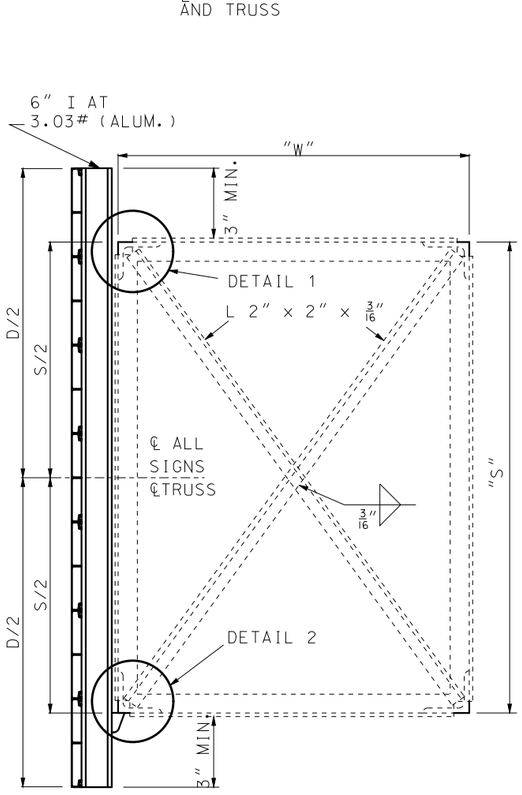
903.60AB

SHEET NO. 4 OF 5

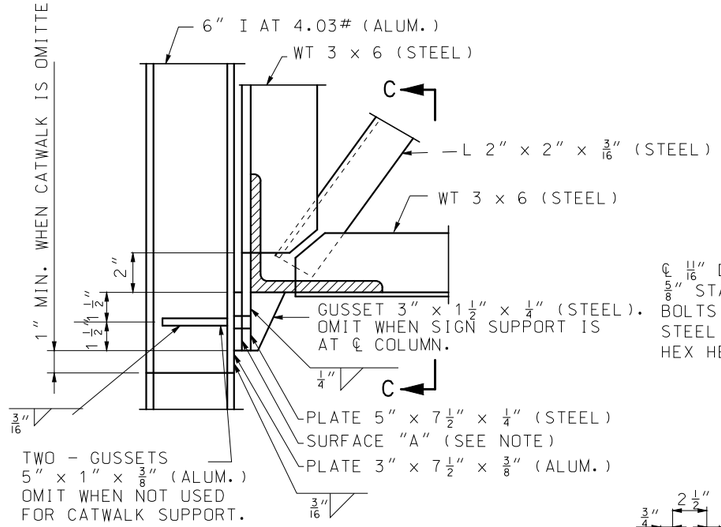



## TYPICAL HALF PLAN OF SIGN COMPONENTS

## TYPICAL ELEVATION OF SIGN COMPONENTS



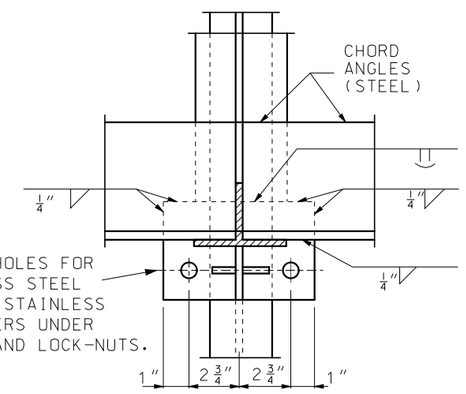

SECTION A-A



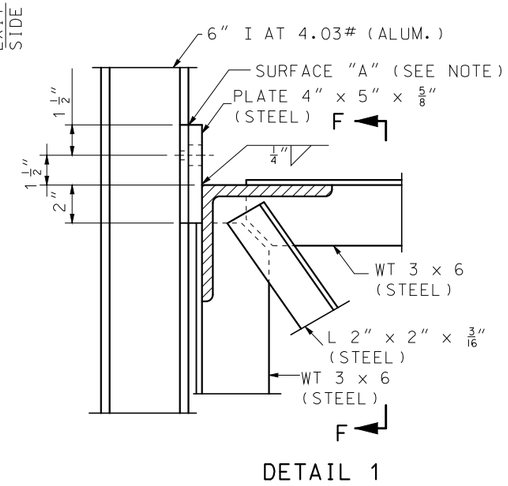

DETAIL 2

## TYPICAL SECTION OF SIGN SUPPORT

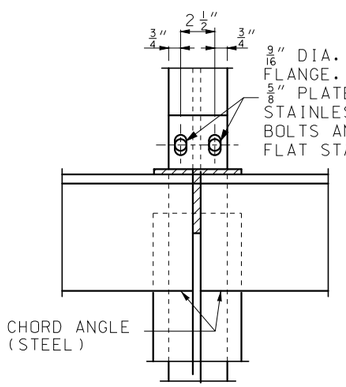
NOTE: "D" = GREATEST OVERALL DEPTH OF ANY SIGN OR SIGNS ON TRUSSES AND "S"= TRUSS DEPTH. SEE SHEET NO. 5 OF 7 FOR LOCATION OF SECTION A-A.




SECTION C-C




DETAIL 1




SECTION F-F

NOTE:
SURFACE "A", ZINC CHROMATE ON ALUMINUM SURFACES. NORMAL CLEANING AND PAINTING ON STEEL SURFACES. ZINC CHROMATE IS NOT REQUIRED WHEN STEEL IS GALVANIZED.

GENERAL NOTES:

EXIT NO. PANELS SHALL BE MOUNTED FLUSH WITH THE EXIT SIDE OF THE GUIDE SIGN.

ALL SIGNS SHALL BE CENTEREDVERTICALLY ABOUT THE HORIZONTAL ℄ OF THE TRUSS.


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STRUCTURAL STEEL

DATE EFFECTIVE: 10/01/2016
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SHEET NO. 5 OF 5

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