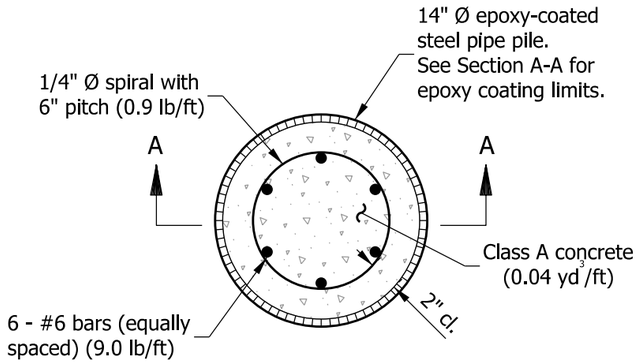
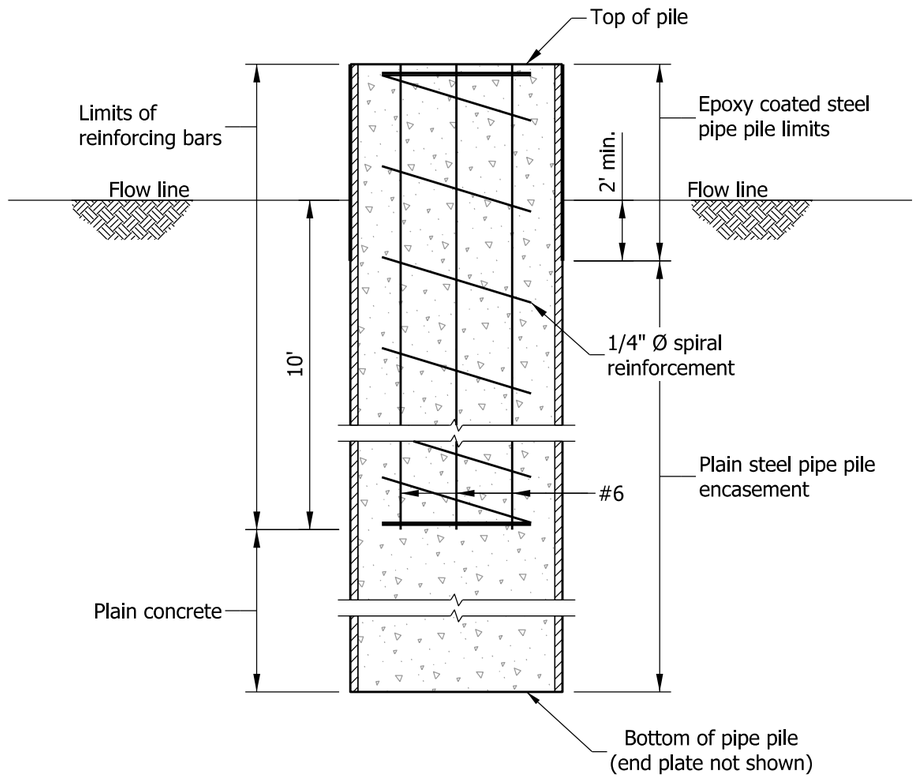
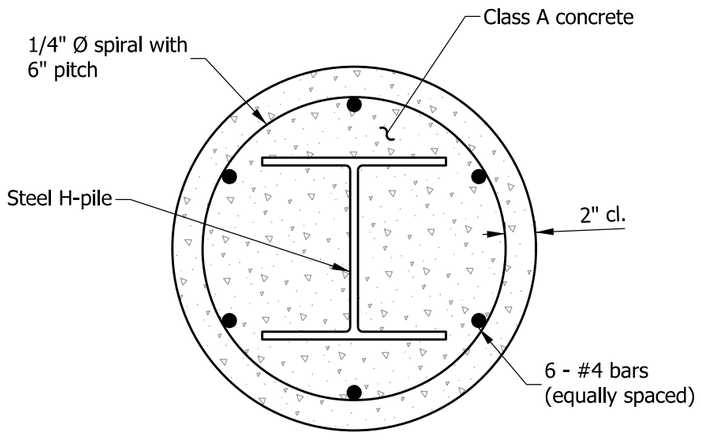


REINFORCED-CONCRETE FILLED EPOXY-COATED STEEL PIPE PILE ENCASEMENT PLAN VIEW



SECTION A-A



STEEL H - PILES
REINFORCED-CONCRETE ENCASEMENT PLAN VIEW

TABLE OF MATERIALS			
Steel H-Pile designation	Minimum pile diameter	Reinforcing bars, lb/ft	Class A concrete, yd³/ft
HP 14	2'-3"	5.8	0.12
HP 12	2'-0"	5.6	0.10
HP 10	1'-9"	5.4	0.08

INDIANA DEPARTMENT OF TRANSPORTATION

REINFORCED-CONCRETE ENCASEMENT FOR PILES

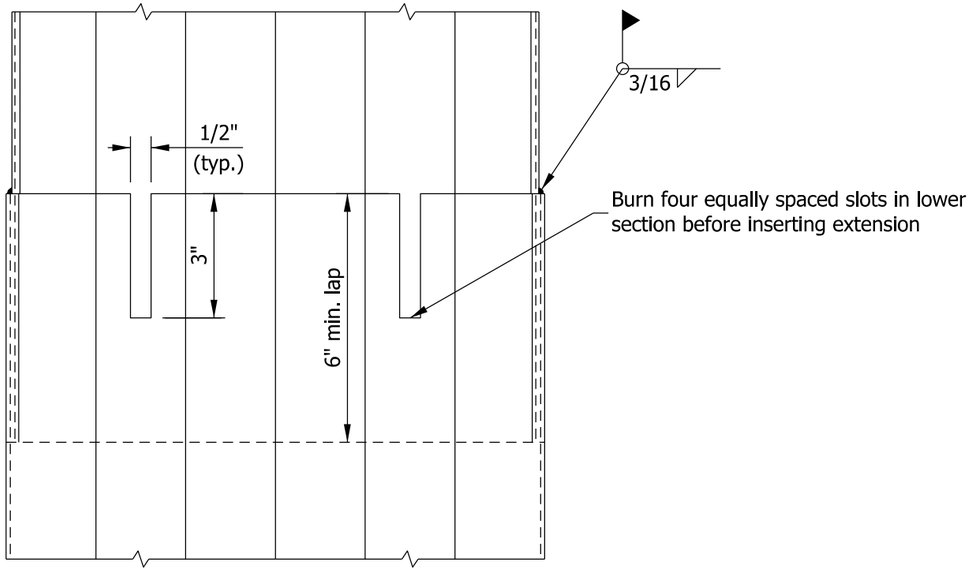
SEPTEMBER 2012

STANDARD DRAWING NO. E 701-BPIL-01

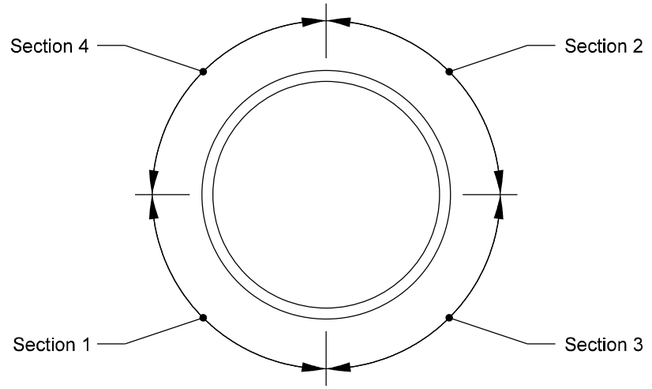
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

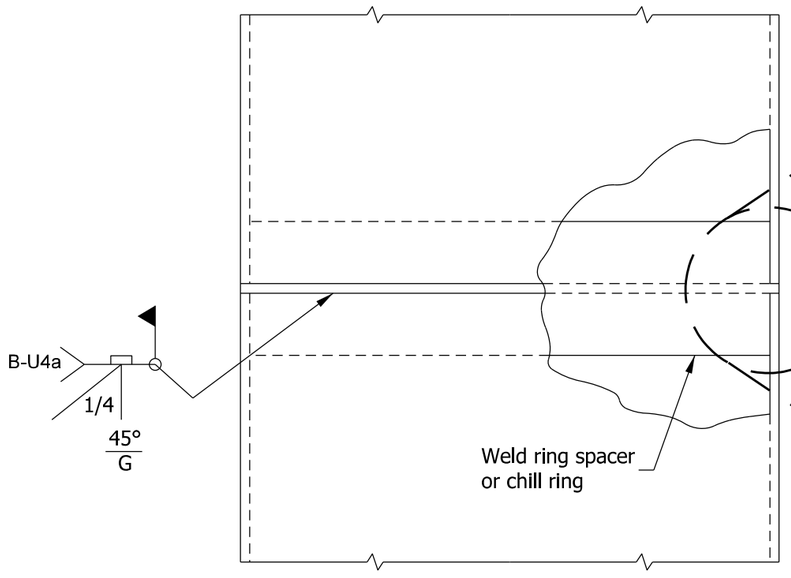
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



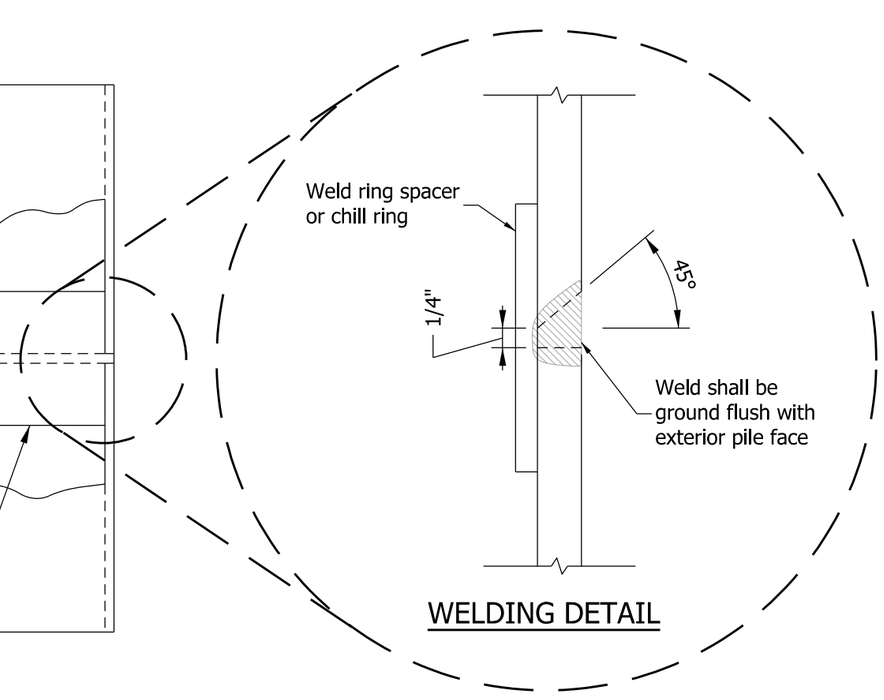
FOR FLUTED PIPE



WELDING SEQUENCE



FOR ROUNDED PIPE



WELDING DETAIL

INDIANA DEPARTMENT OF TRANSPORTATION

FIELD SPLICING PIPE PILES

SEPTEMBER 2012

STANDARD DRAWING NO. E 701-BPIL-02

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

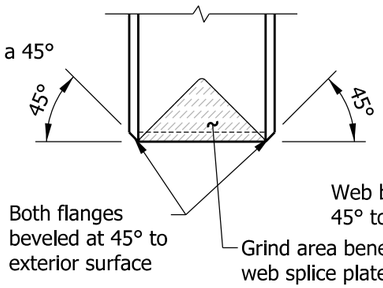
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

PROCEDURE FOR SPLICING PARTIALLY DRIVEN PILING

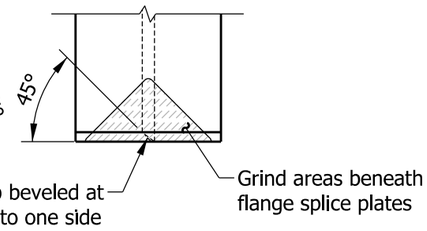
1. Upper Pile Section

Prepare outside of both flanges and one side of web by beveling to a 45° angle. Prepare all surfaces to be welded by grinding.

WEB ELEVATION



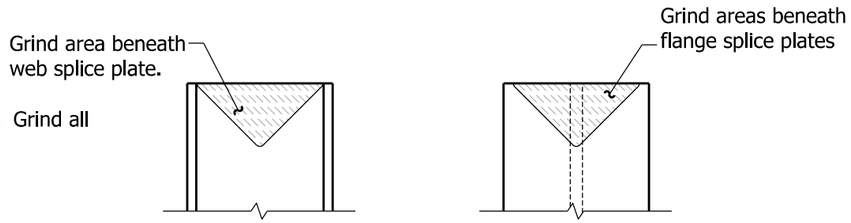
FLANGE ELEVATION



END VIEW

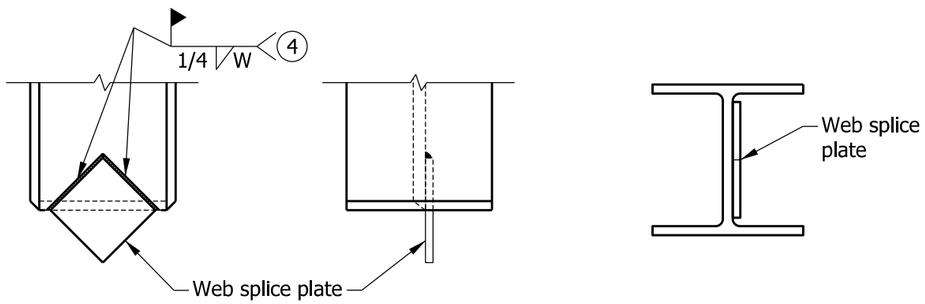
2. Lower Pile Section

Prepare top of pile by restoring it to its original cross section. Grind all surfaces to be welded, extending 1/2" beyond weld area(s).



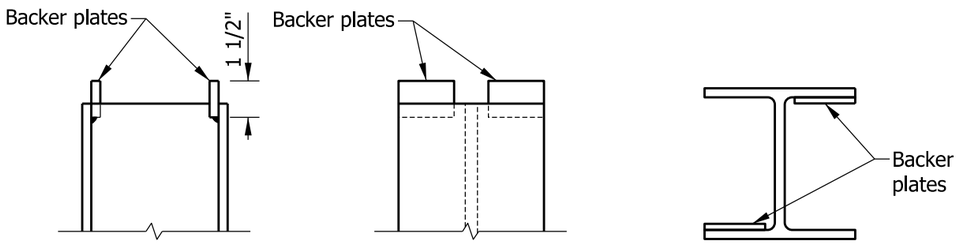
3. Upper Pile Section

Fillet weld web splice plate to upper pile section at two locations.



4. Lower Pile Section

Tack weld two backer plates to inside of flange.

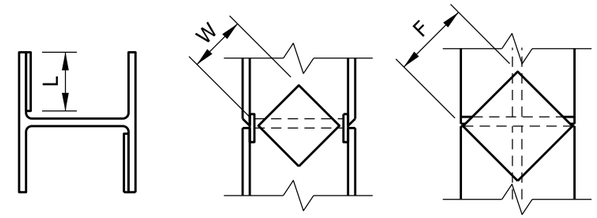


Procedure continued on Standard Drawing E 701-BPIL-04.

NOTES

1. Steel H piling may be spliced in a horizontal position prior to driving, using splice plates and web and flange welds as shown.
2. Two flange splice plates, one web splice plate, and four backer plates will be required per splice.
3. All fillet welds shall be single pass.
4. See table for splice plate dimensions W and F.

SPLICE PLATE AND BACKER PLATE DIMENSIONS



END VIEW | ELEVATION VIEW OF WEB | ELEVATION VIEW OF FLANGE

H-PILE SIZE	HP 10	HP 12	HP 14
Flange Splice Plate, F	7"	8 1/4"	10 1/4"
Web Splice Plate, W	5 3/8"	6 3/4"	8"
Backer Plate Length, L	4 1/8"	5"	6 1/4"

NOTE: Splice plate thickness = 3/8"
Backer plate thickness = 1/4"

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL H-PILE SPLICE

SEPTEMBER 2012

STANDARD DRAWING NO. E 701-BPIL-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

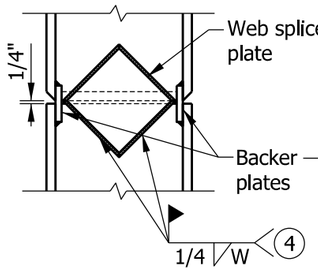
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

PROCEDURE FOR SPLICING PARTIALLY DRIVEN PILING (cont.)

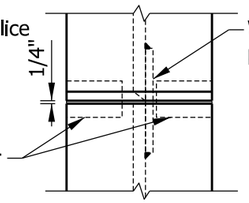
5. Combine Pile Sections

Lift and hold upper pile section into place, maintaining 1/4" gap between upper and lower pile sections by using the remaining two backer plates as a spacing guide. Plumb the pile. Tack weld the untacked side of the two backer plates to the inside upper flange. Remove the backer plate spacers and tack weld them to the inside flange portion of the upper and lower sections of the pile. Fillet weld the remaining two sides of the web splice plate to the lower section.

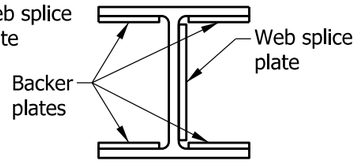
WEB ELEVATION



FLANGE ELEVATION

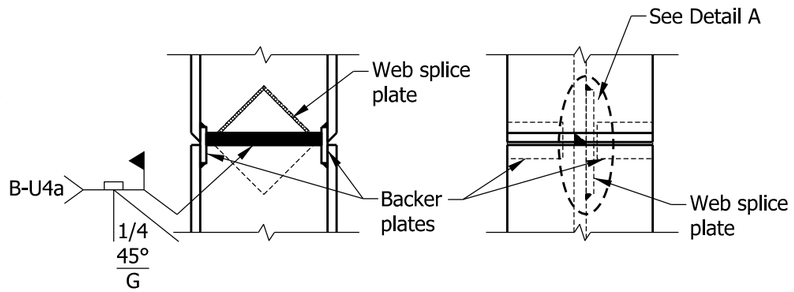


END VIEW



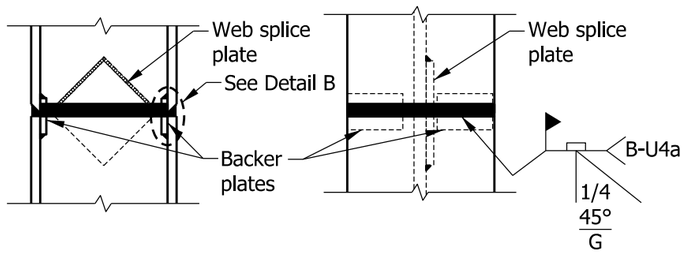
6. Combined Pile Section

Complete Joint Penetration (CJP) weld the web. See Detail A.



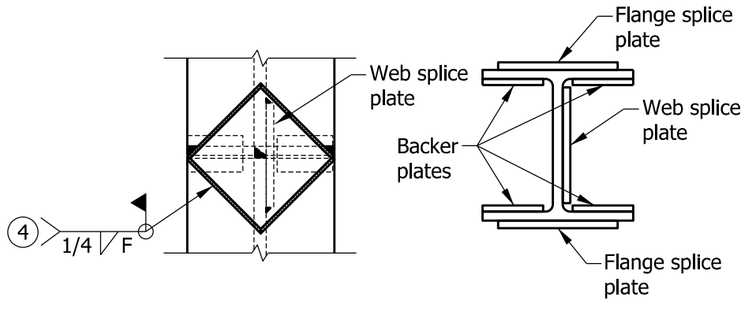
7. Combined Pile Section

Complete Joint Penetration (CJP) weld both flanges. Grind weld smooth with the pile exterior face. See Detail B.



8. Combined Pile Section

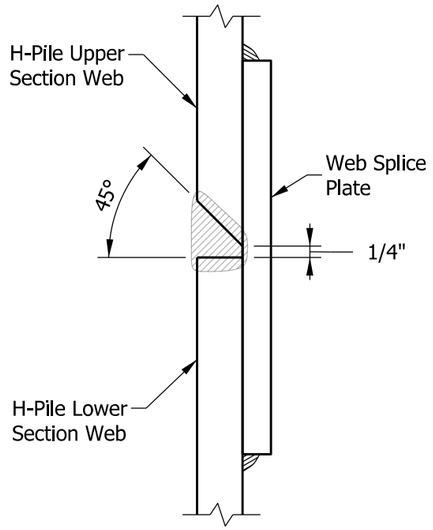
Fillet weld the flange splice plates to the flanges.



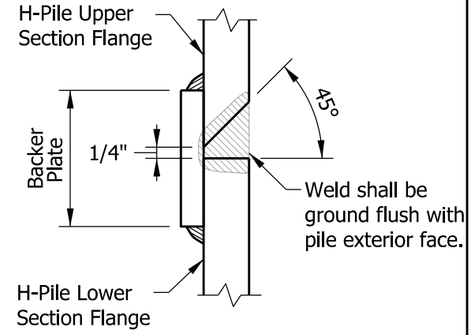
NOTES

1. Steel H piling may be spliced in a horizontal position prior to driving, using splice plates and web and flange welds as shown.
2. Two flange splice plates, one web splice plate, and four backer plates will be required per splice.
3. All fillet welds shall be single pass.

(4) See Standard Drawing E 701-BPIL-03 table for splice plate dimensions W and F.



DETAIL A



DETAIL B

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL H-PILE
SPLICE
(CONTINUED)

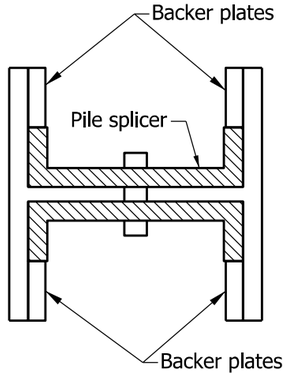
SEPTEMBER 2012

STANDARD DRAWING NO. E 701-BPIL-04

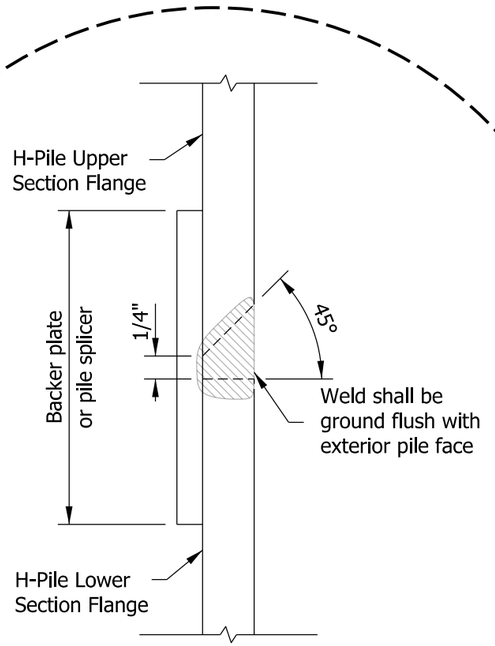
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

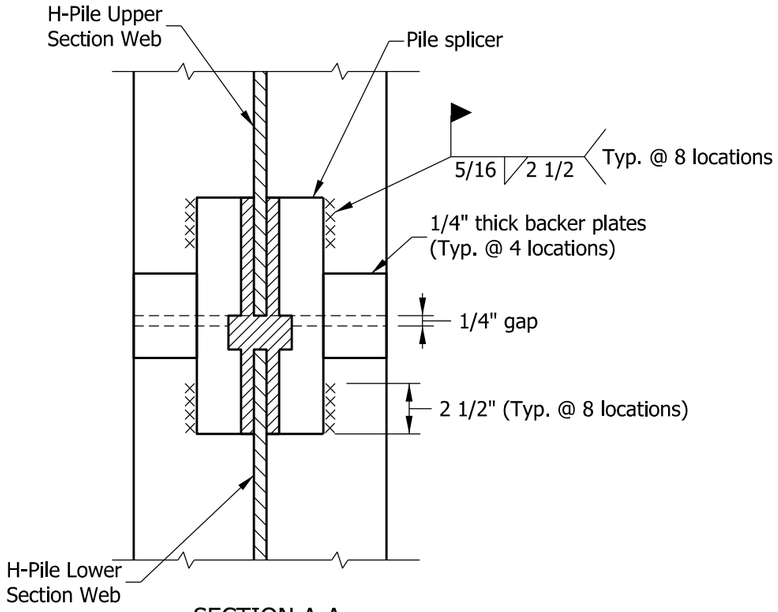
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



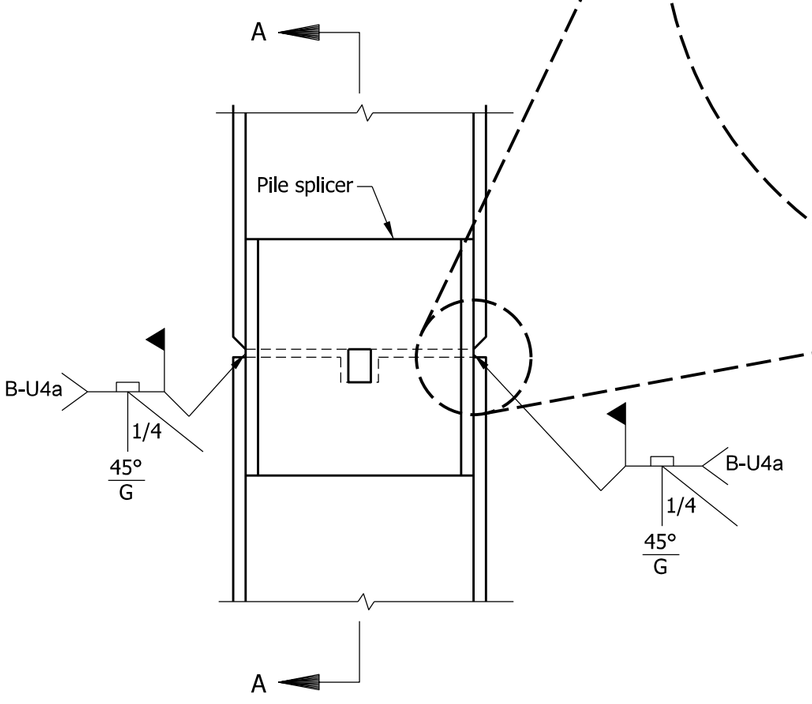
PLAN



WELDING DETAIL



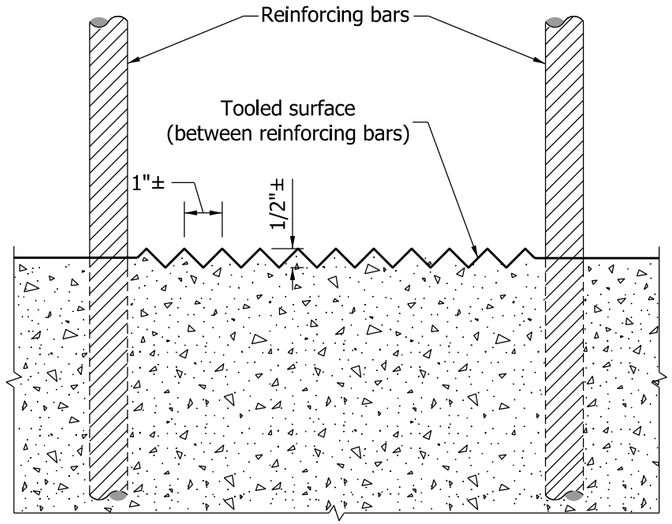
SECTION A-A



ELEVATION

ALTERNATE STEEL H-PILE SPLICE
USING MECHANICAL PILE SPLICER

INDIANA DEPARTMENT OF TRANSPORTATION	
ALTERNATE STEEL H-PILE MECHANICAL SPLICE SEPTEMBER 2012	
STANDARD DRAWING NO. E 701-BPIL-05	
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER	/s/ Richard L. VanCleave 09/04/12 SUPERVISOR, ROADWAY STANDARDS DATE /s/ Mark A. Miller 09/04/12 CHIEF ENGINEER DATE



INDIANA DEPARTMENT OF TRANSPORTATION

TYPE A
CONSTRUCTION JOINT

MARCH 2003

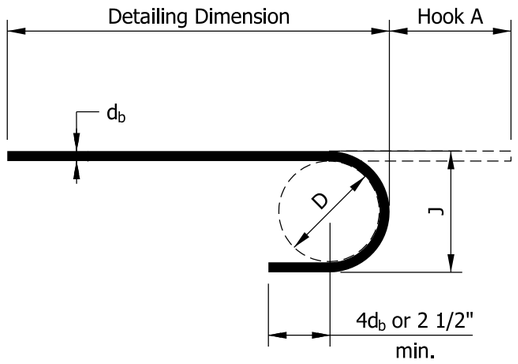
STANDARD DRAWING NO. E 702-CJTA-01

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

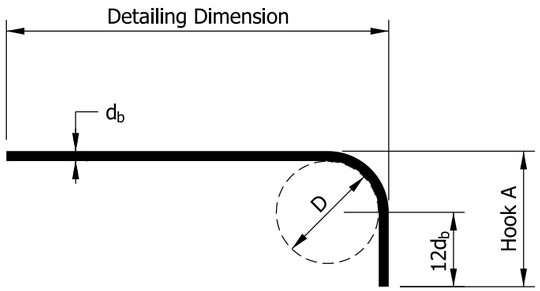
DETAILS PLACED IN THIS FORMAT 09/04/12

/s/ Richard L. Van Cleave *09/04/12*
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller *09/04/12*
CHIEF ENGINEER DATE



180° HOOK



90° HOOK

STANDARD END HOOKS				
		180° HOOK		90° HOOK
BAR SIZE	D	HOOK A	J	HOOK A
#3	2 1/4"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3 3/4"	7"	5"	10"
#6	4 1/2"	8"	6"	1'-0"
#7	5 1/4"	10"	7"	1'-2"
#8	6"	11"	8"	1'-4"
#9	9 1/2"	1'-3"	11 3/4"	1'-7"
#10	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
#11	12"	1'-7"	1'-2 3/4"	2'-0"
#14	18 1/4"	2'-3"	1'-9 3/4"	2'-7"
#18	24"	3'-0"	2'-4 1/2"	3'-5"

NOTES:

1. All dimensions on reinforcing bar bending diagrams shall be measured out-to-out of bars.
2. All dimensions on reinforcing bar details shall be measured on centerlines of bars, except where cover or cl. is indicated.
3. Bent bars will be given a numeric bar mark, e.g., 588. The last two digits, e.g., 88, indicate the mark. The characters preceding the last two digits, e.g., 5, indicate the size of the bar.
4. Bent reinforcing bar marks on standard drawings will consist of the first digit as the bar size; the second digit, 7, indicating that it shall be placed in a bridge railing, or 8, indicating that it shall be placed in a bridge-railing transition, or 9, indicating that it shall be placed elsewhere; and the third and fourth digits as the serial number for that bar size.
5. Straight bars will be designated by size and length.
6. Standard size hooks shown shall be used on all hooked bars unless noted.
7. See the plans for lap and embedment lengths.
8. This drawing is consistent with the ACI 318 and CRSI *Manual of Standard Practice.*

ACI = American Concrete Institute
CRSI = Concrete Reinforcing Steel Institute

INDIANA DEPARTMENT OF TRANSPORTATION

BAR BENDING DETAILS

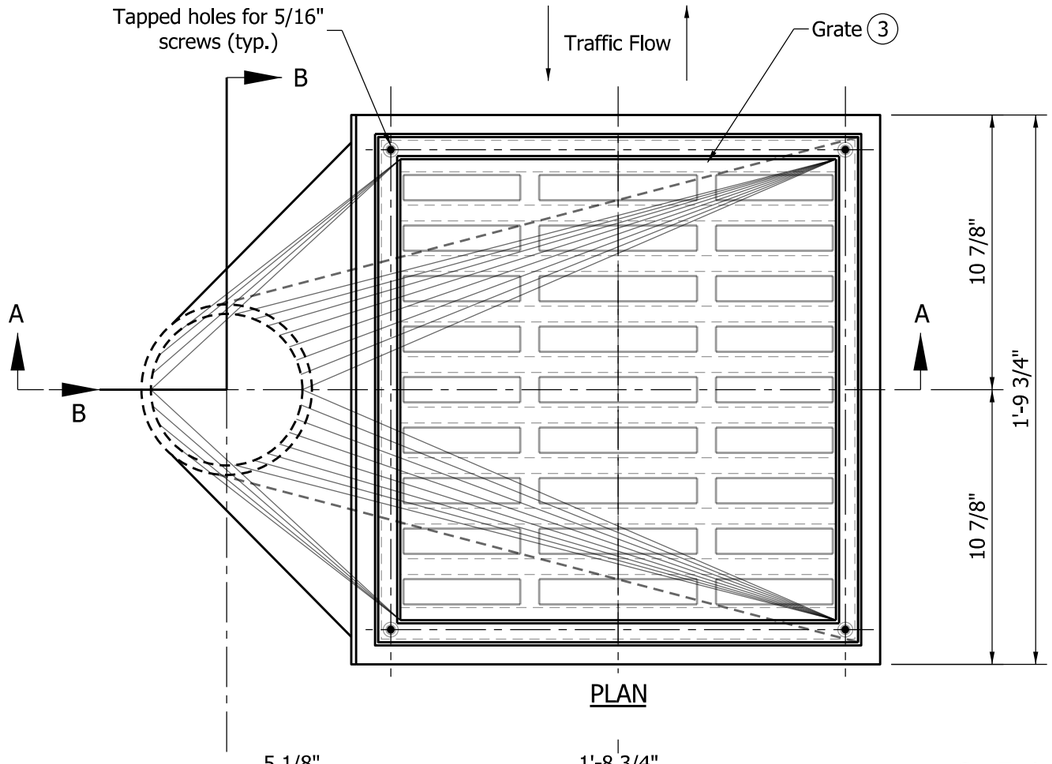
SEPTEMBER 2015

STANDARD DRAWING NO. E 703-BRST-01

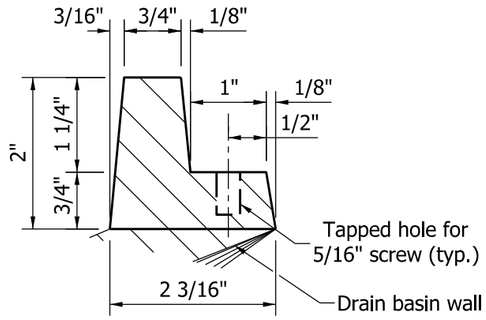
ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 12/31/14
DESIGN STANDARDS ENGINEER DATE

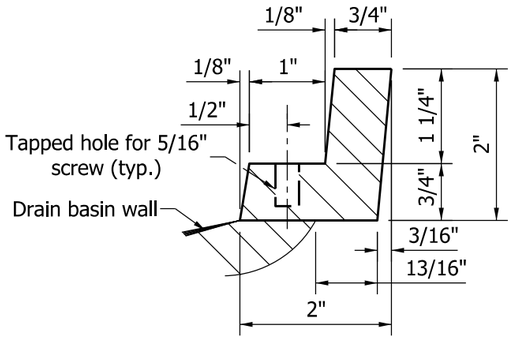
/s/ Mark A. Miller 01/05/15
CHIEF ENGINEER DATE



PLAN



TYPICAL GRATE SHELF PROFILE A
(OUTLET SIDE OF BASIN)

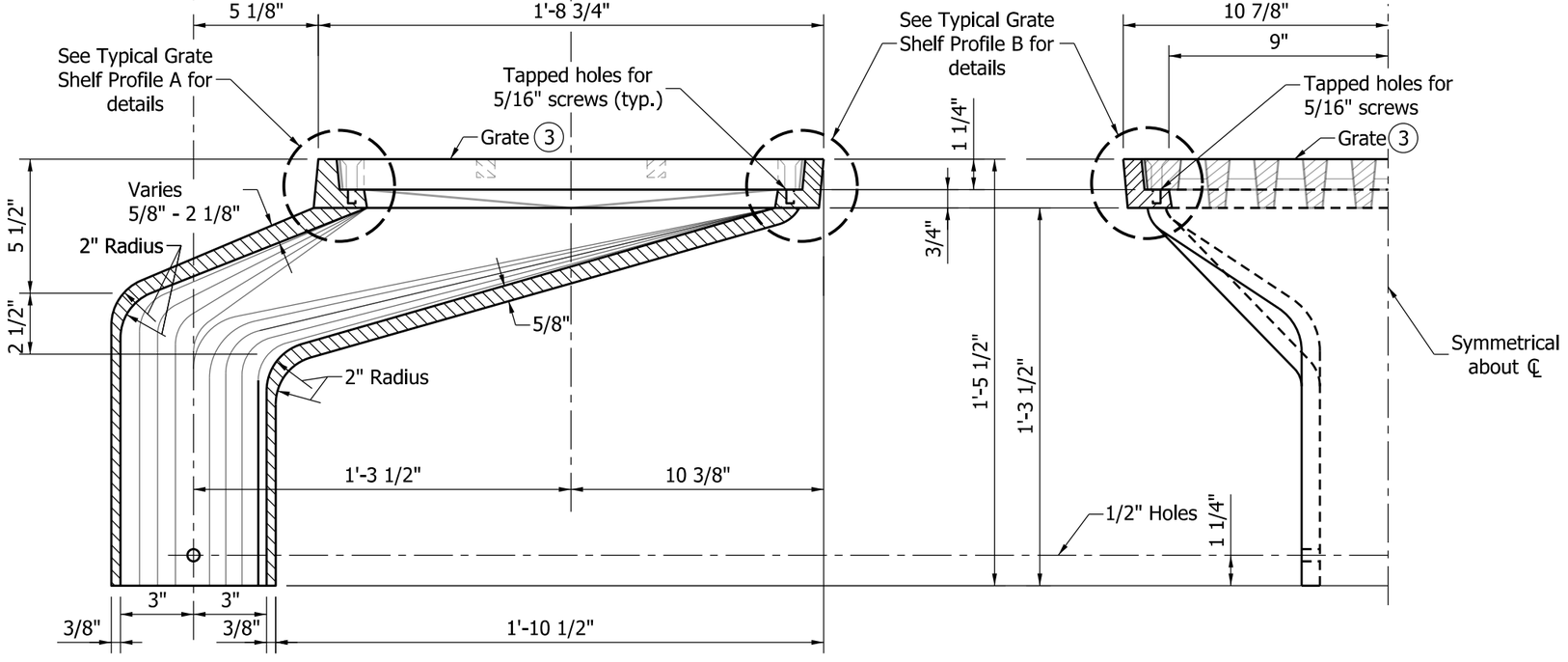


TYPICAL GRATE SHELF PROFILE B
(NON-OUTLET SIDE OF BASIN)

NOTES

1. See Standard Drawing E 715-BDCG-01 for deck drain casting extension pipe details.
2. See Standard Drawing E 704-BDCG-05 for adjusting frame details.

(3) See Standard Drawing E 704-BDCG-02 for grate details.



SECTION A-A

HALF SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

DECK DRAIN
TYPE OS

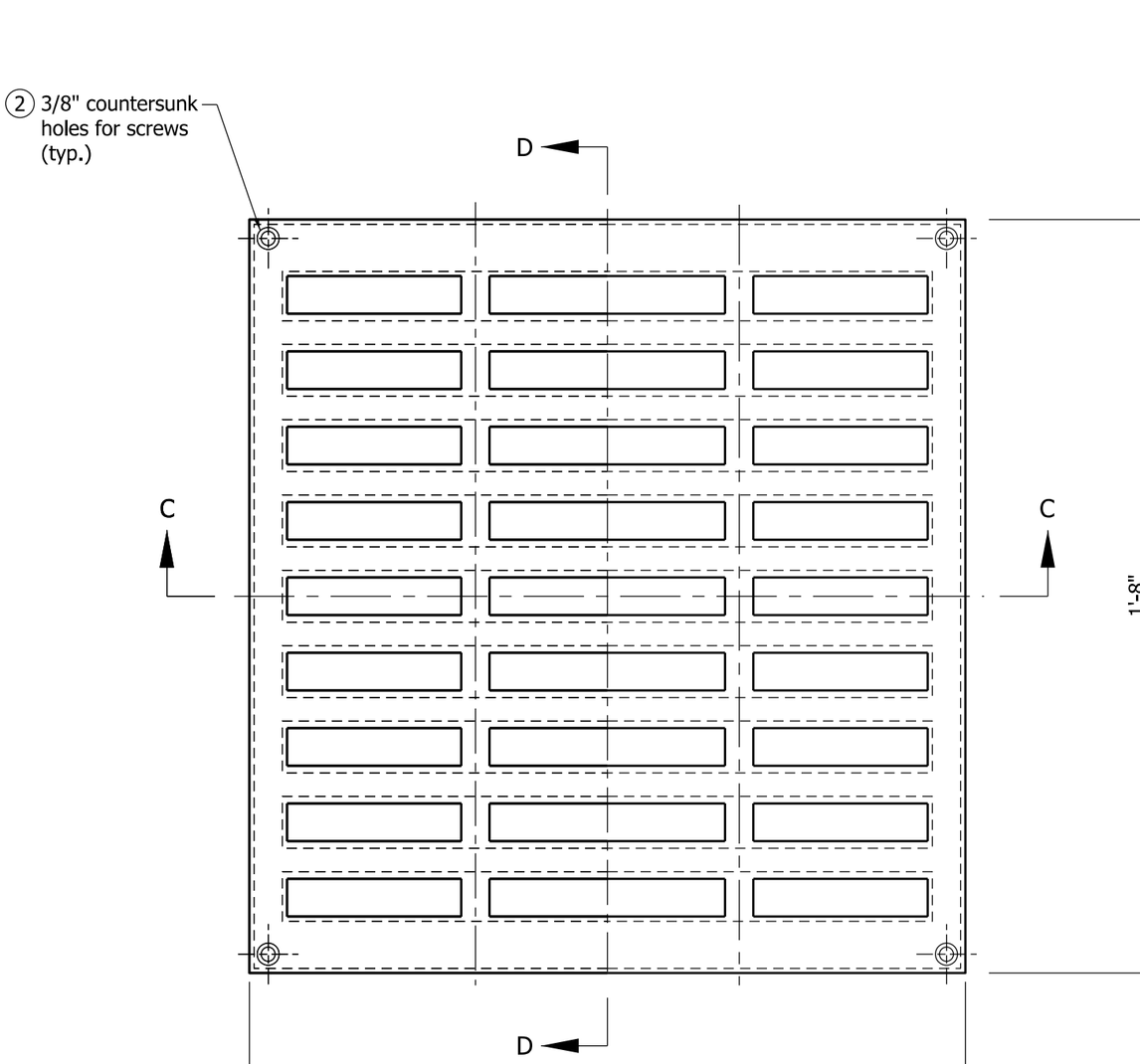
SEPTEMBER 2012

STANDARD DRAWING NO. E 704-BDCG-01

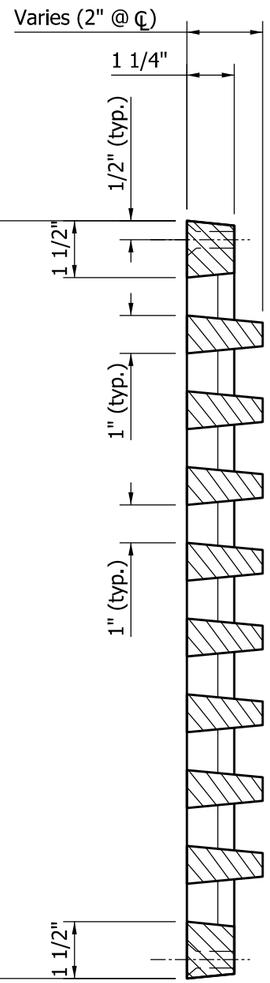
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

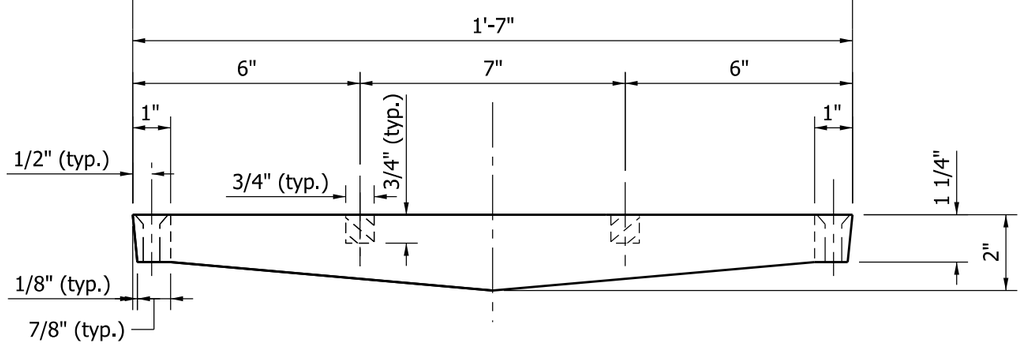
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PLAN



SECTION D-D



SECTION C-C

NOTES

1. This grate used with Type OS deck drain. See Standard Drawing E 704-BDCG-01 for deck drain details.

(2) 4 - 5/16" x 1 3/4" flat-head stainless steel screws required for each grate.

INDIANA DEPARTMENT OF TRANSPORTATION

DECK DRAIN TYPE OS GRATE

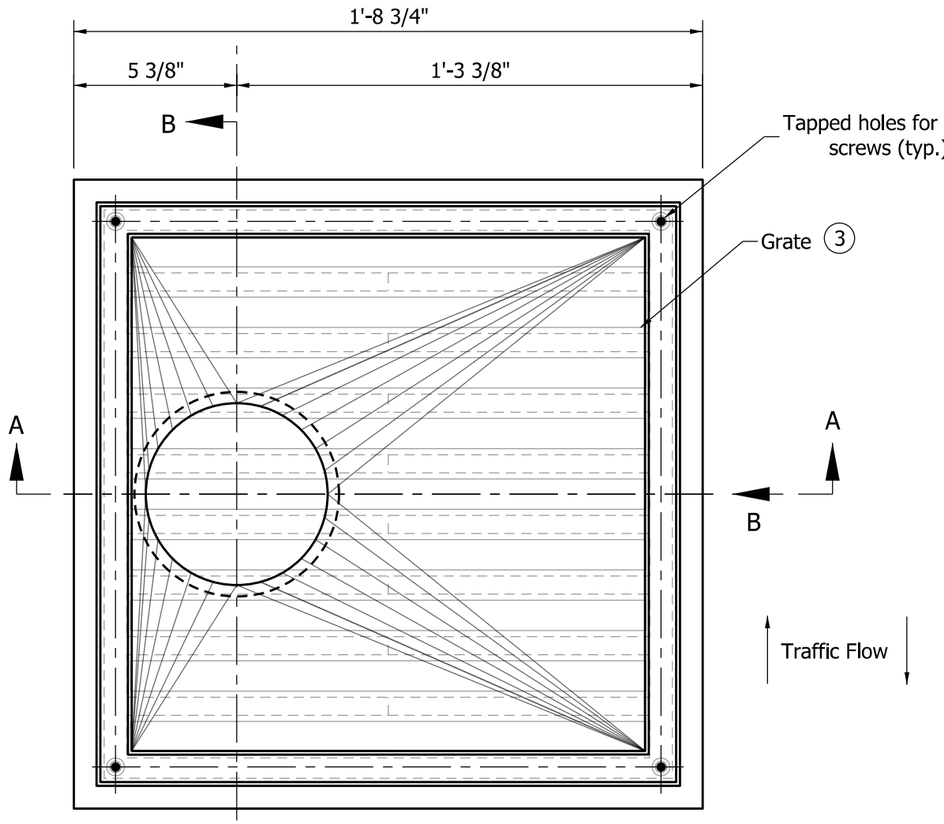
SEPTEMBER 2012

STANDARD DRAWING NO. E 704-BDCG-02

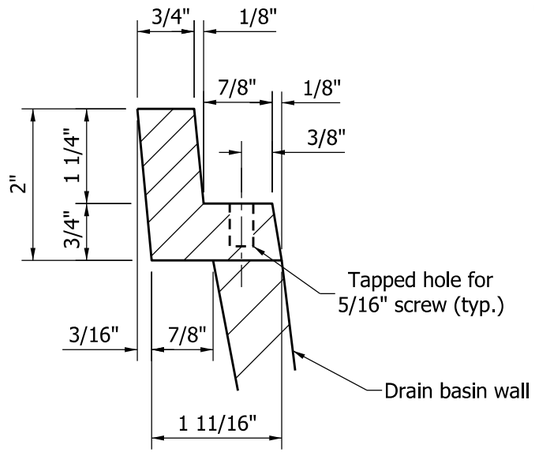
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PLAN

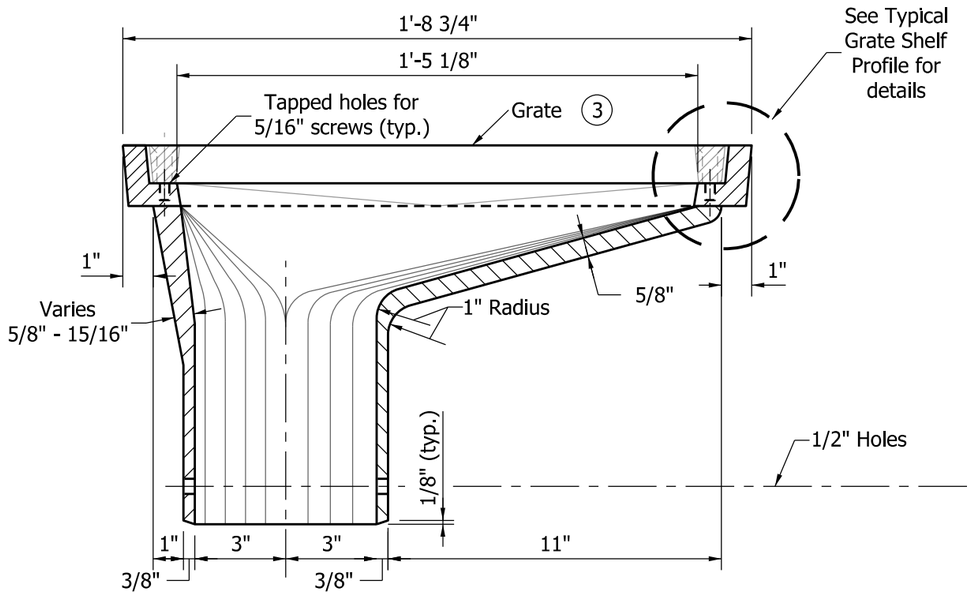


TYPICAL GRATE SHELF PROFILE

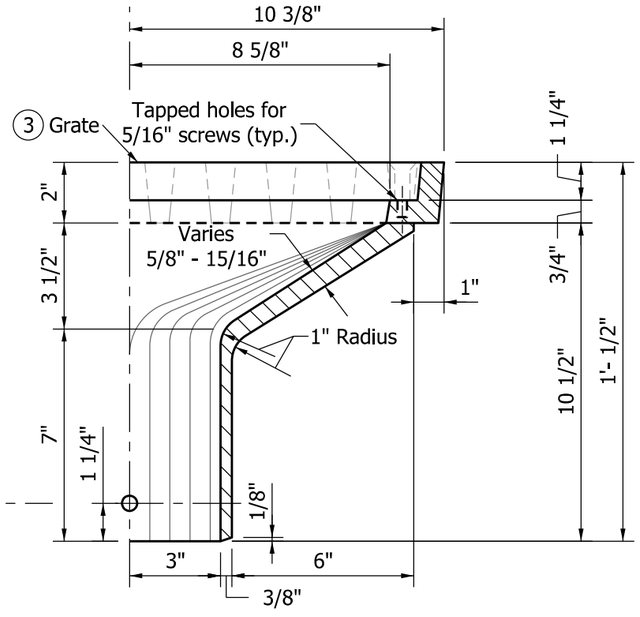
NOTES

1. See Standard Drawing E 715-BDCG-01 for deck drain casting extension pipe details.
2. See Standard Drawing E 704-BDCG-05 for adjusting frame details.

(3) See Standard Drawing E 704-BDCG-04 for grate details.



SECTION A-A



HALF SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

DECK DRAIN
TYPE SQ

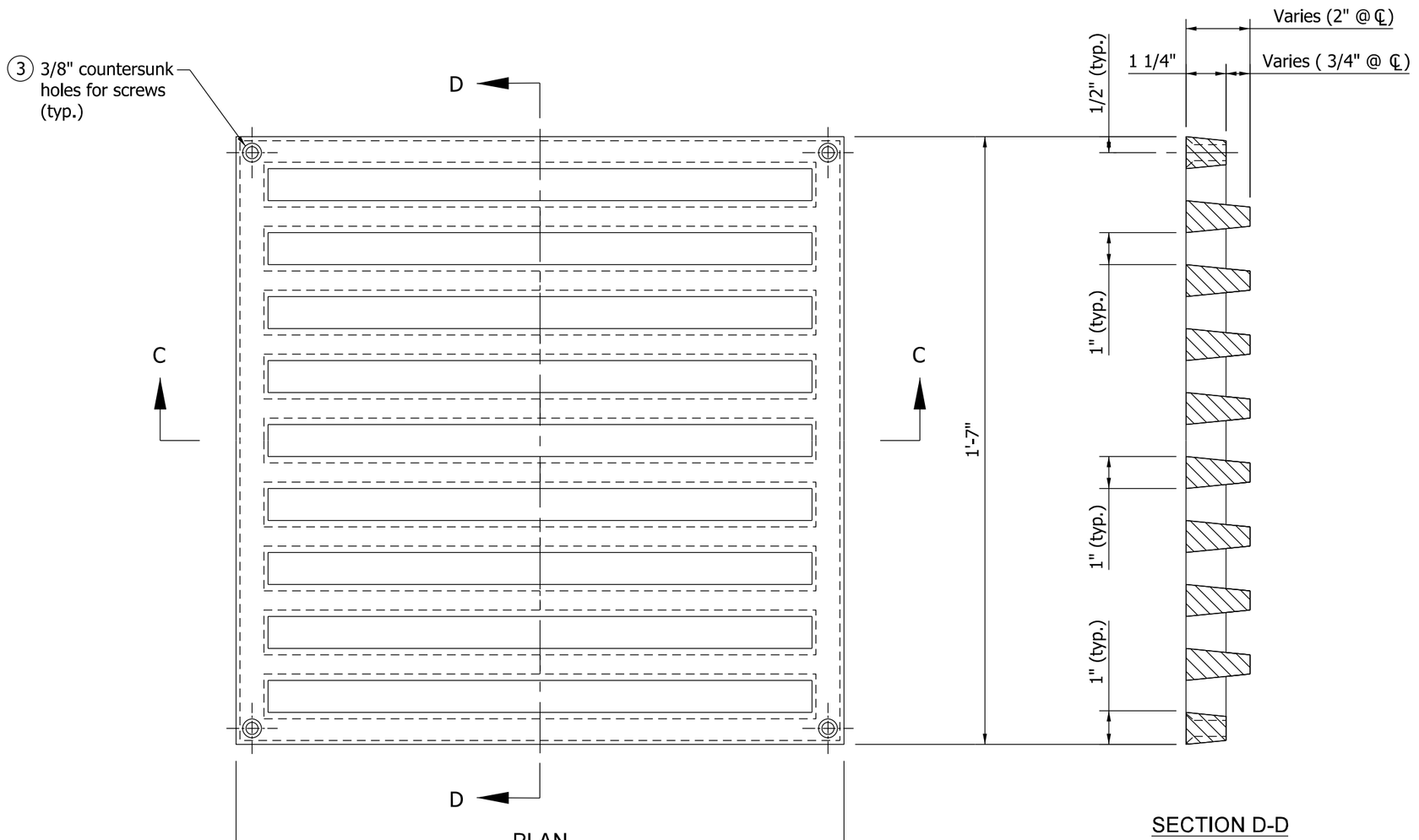
SEPTEMBER 2012

STANDARD DRAWING NO. E 704-BDCG-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

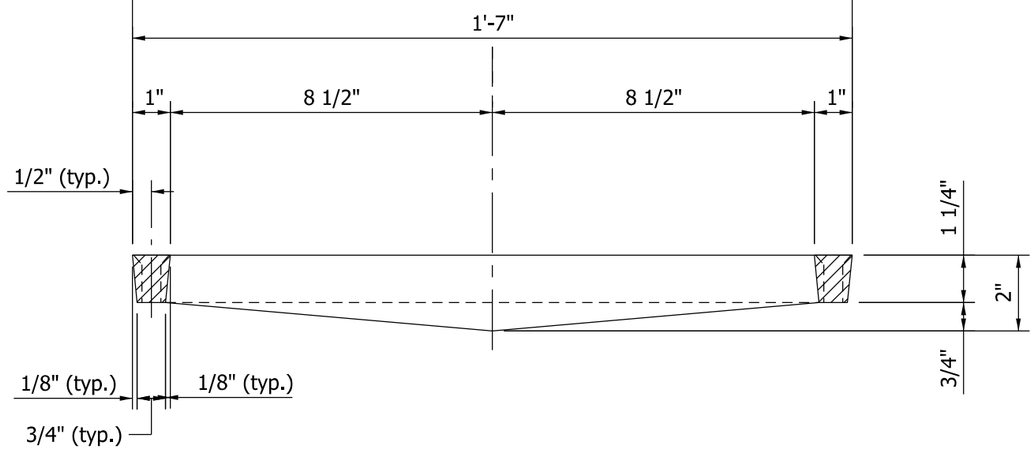
/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PLAN

SECTION D-D



SECTION C-C

NOTES

1. See the floor details on the plans for orientation of the grate.
2. This grate used with Type SQ deck drain. See Standard Drawing E 704-BDCG-03 for deck drain details.

(3) 4 - 5/16" x 1 3/4" flat-head stainless steel screws required for each grate.

INDIANA DEPARTMENT OF TRANSPORTATION

DECK DRAIN TYPE SQ
GRATE

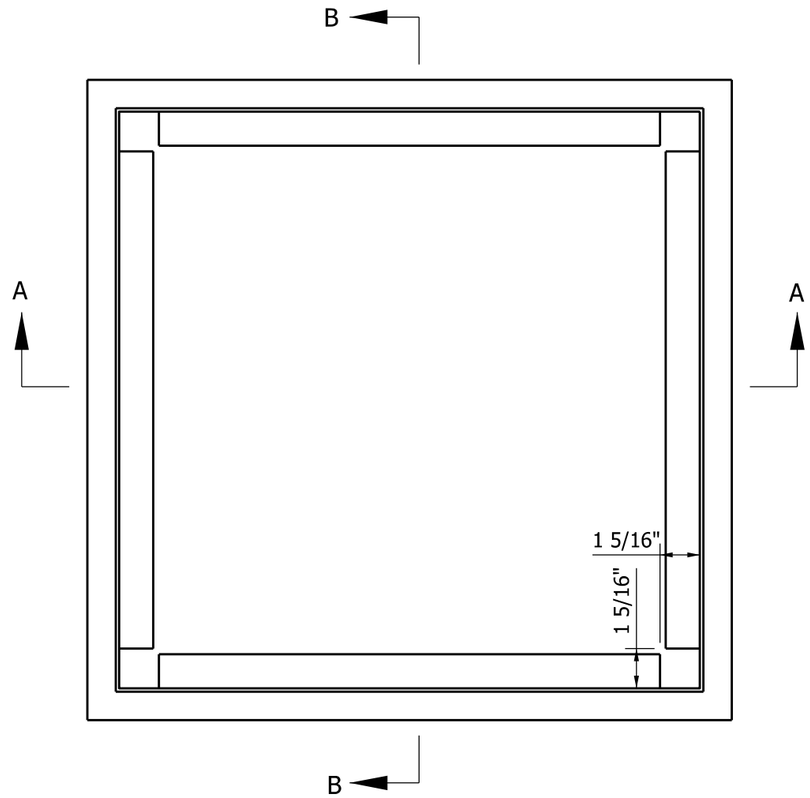
SEPTEMBER 2012

STANDARD DRAWING NO. E 704-BDCG-04

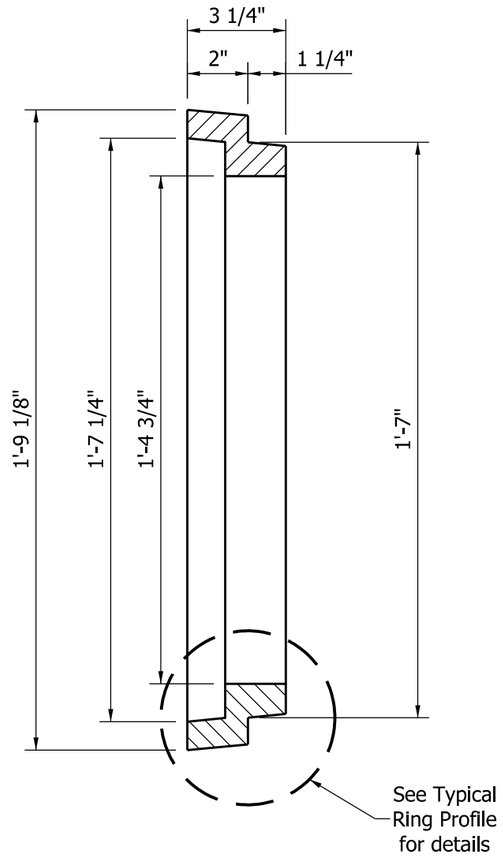
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

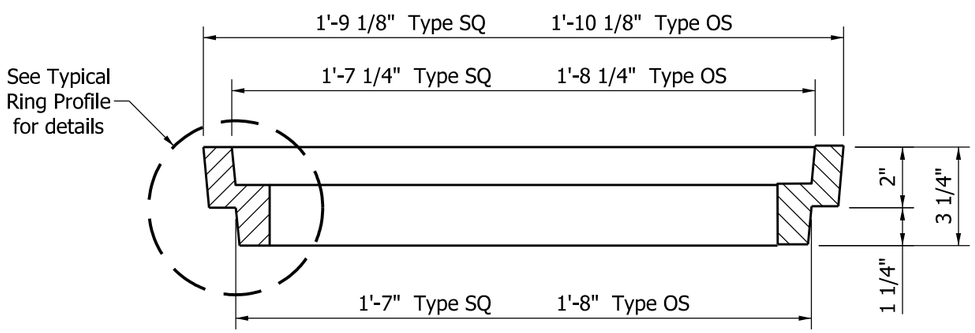
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PLAN VIEW



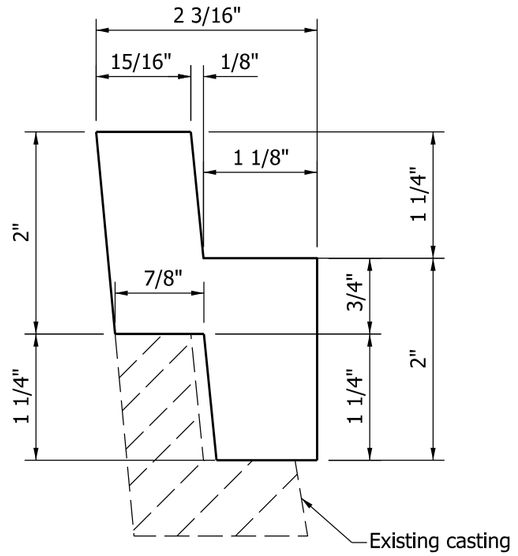
SECTION B-B



SECTION A-A

NOTES

1. 4 - 5/16" x 3 3/4" flat-head stainless steel screws required when frame is used.



TYPICAL RING PROFILE

INDIANA DEPARTMENT OF TRANSPORTATION

DECK DRAIN TYPE OS OR SQ
ADJUSTING FRAME

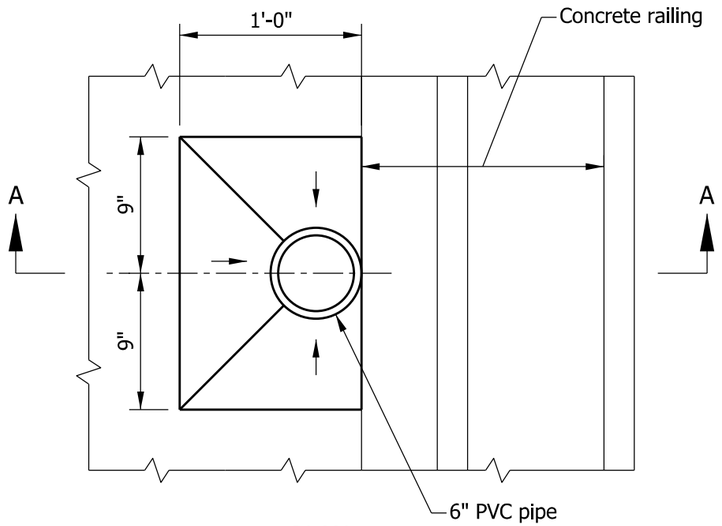
SEPTEMBER 2012

STANDARD DRAWING NO. E 704-BDCG-05

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

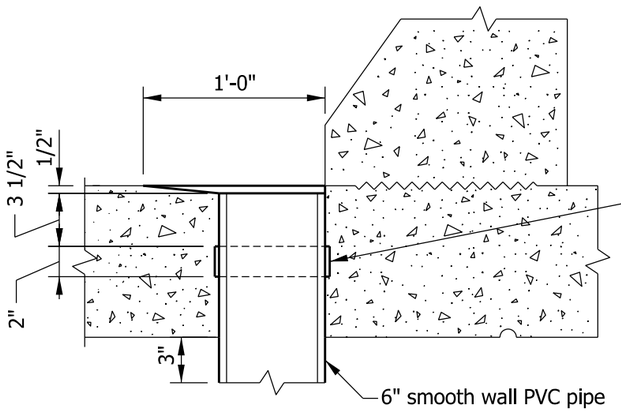
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



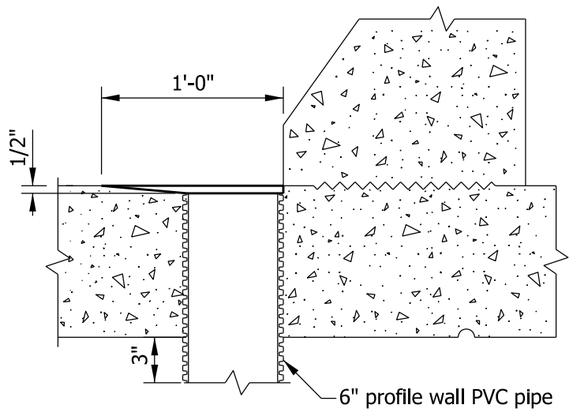
PLAN

NOTE

1. See plans for drain spacing.



6" SMOOTH WALL PVC PIPE



6" PROFILE WALL PVC PIPE

SECTION A-A

INDIANA DEPARTMENT OF TRANSPORTATION

SLAB BRIDGE FLOOR DRAIN
DETAIL

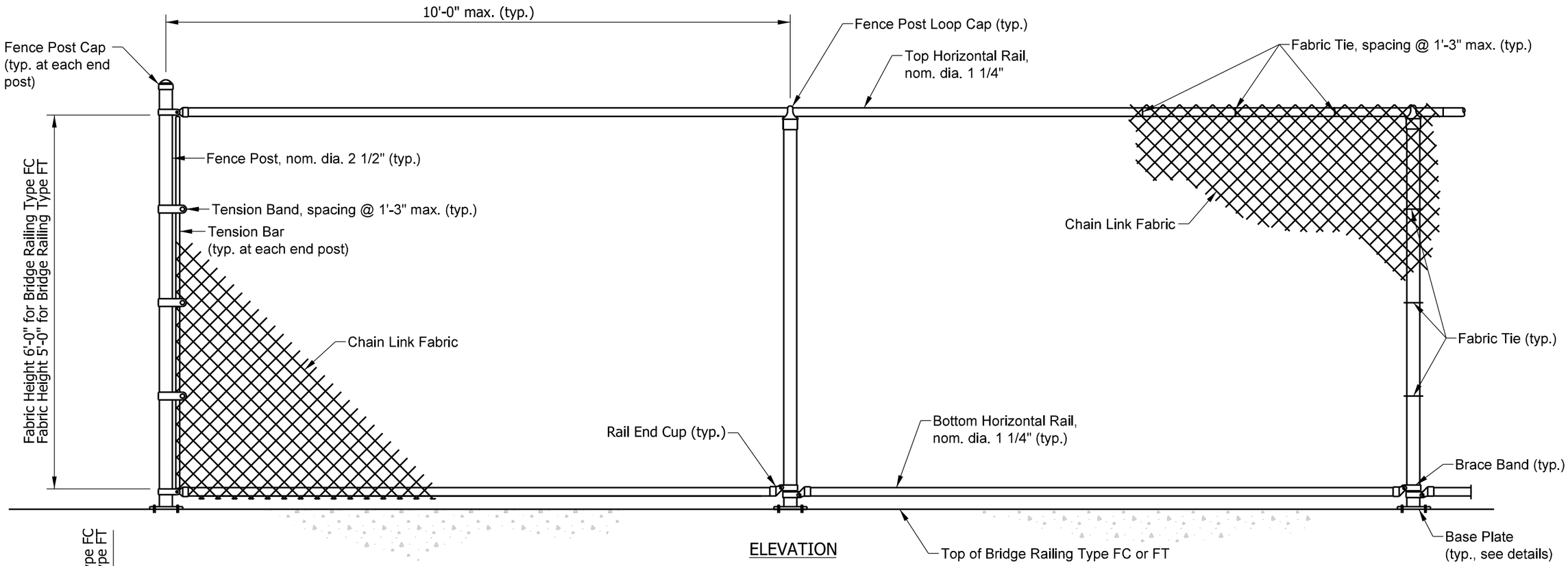
SEPTEMBER 2012

STANDARD DRAWING NO. E 704-SBFD-01

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. Van Cleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



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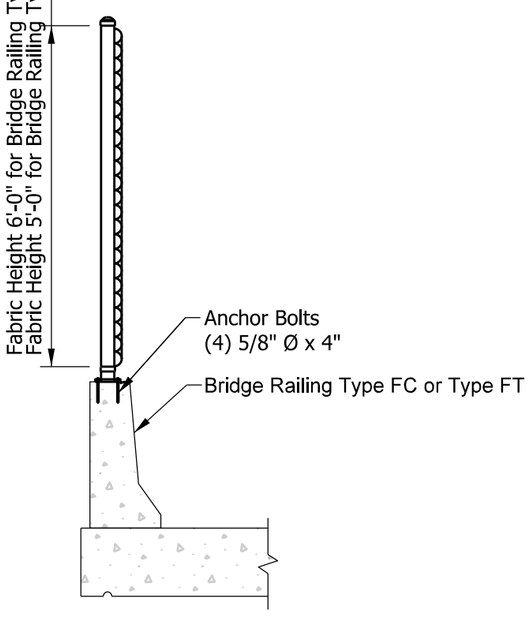
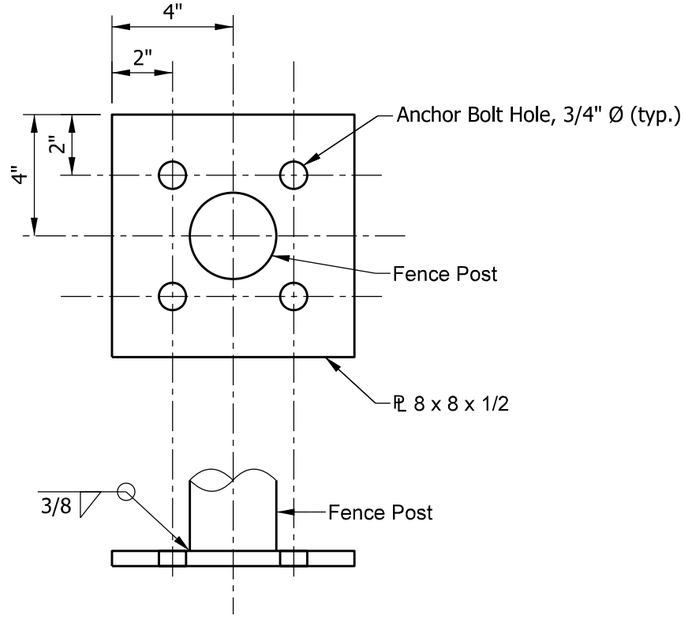


TYPICAL SECTION



BASE PLATE DETAILS

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE RAILING
PEDESTRIAN FENCE

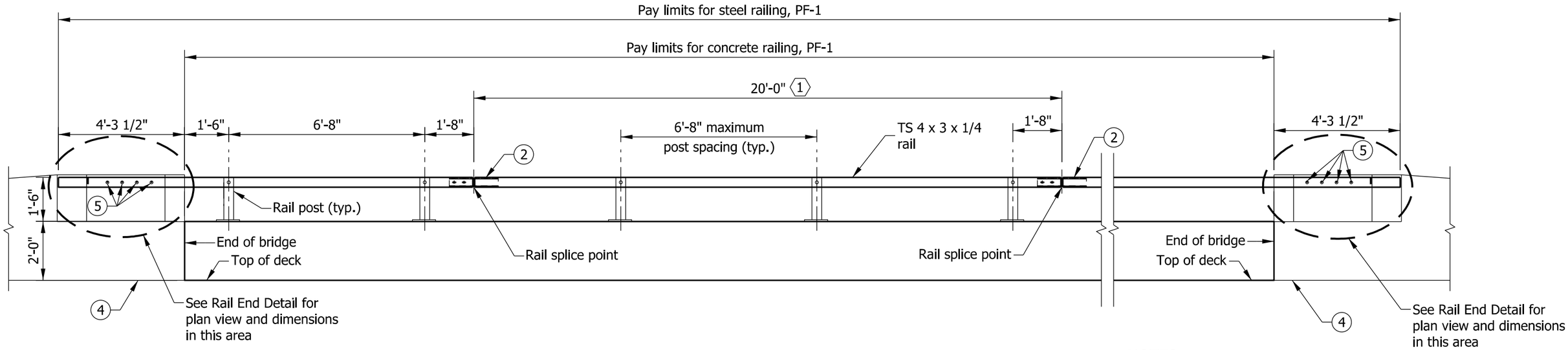
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRPF-01

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. Van Cleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



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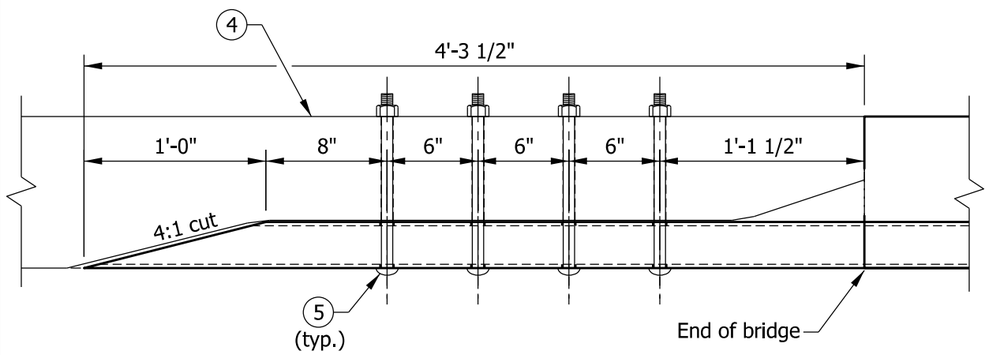
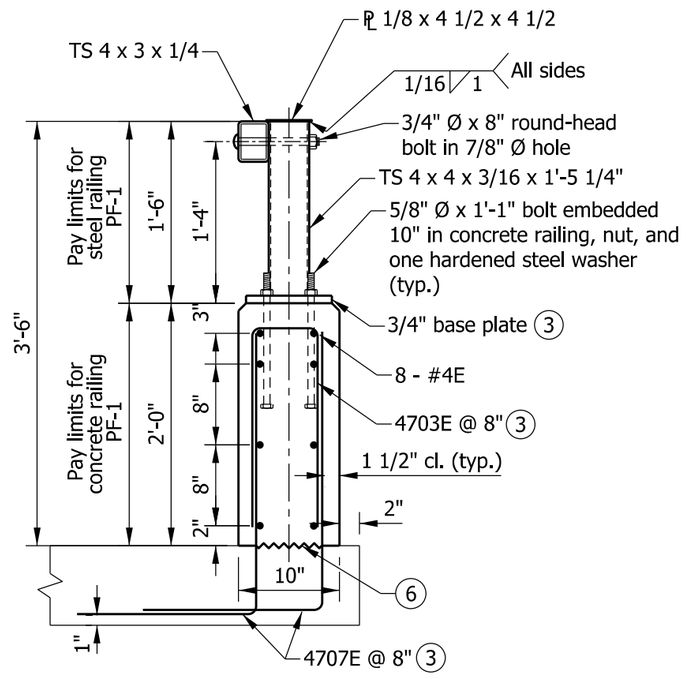


Plan view of TS 4 x 3 x 1/4

RAIL END DETAIL



TYPICAL SECTION

QUANTITIES FOR ONE RUNNING FOOT OF RAILING	
Concrete, class C	1.66 CFT
Reinforcing bars	17.0 LBS

NOTES

1. See Standard Drawing E 706-BRPP-06 for General Notes (1).

(2) See Standard Drawing E 706-BRPP-05 for rail tube details and rail splice details.

(3) See Standard Drawing E 706-BRPP-06 for base plate detail and reinforcing-bar bends.

(4) Concrete bridge railing transition, TPF-1. See Standard Drawings E 706-TTPP-01 and -02 for details.

(5) 3/4" Ø x 11 1/2" round-head bolt in 7/8" Ø hole. Hole shall be slotted as required for expansion.

(6) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, PF-1

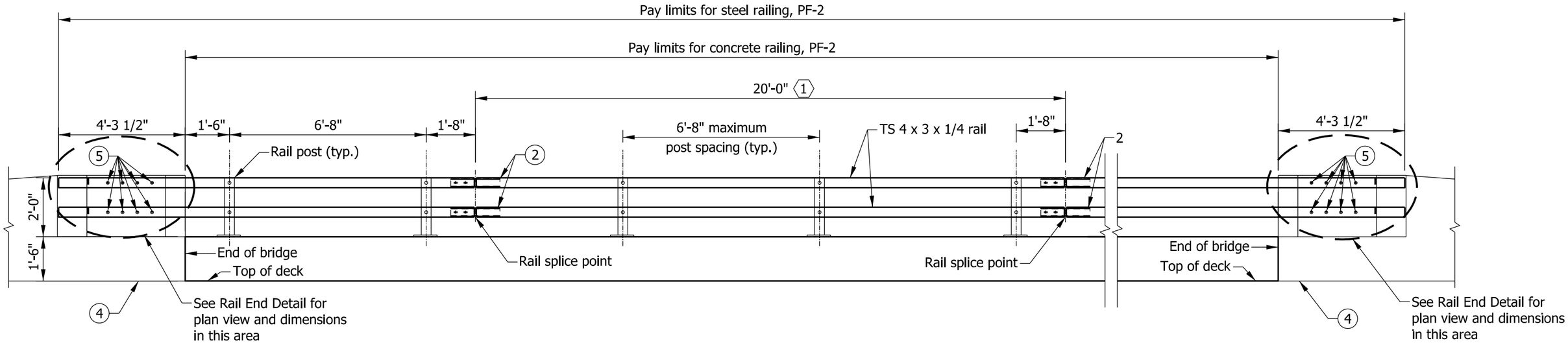
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRPP-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



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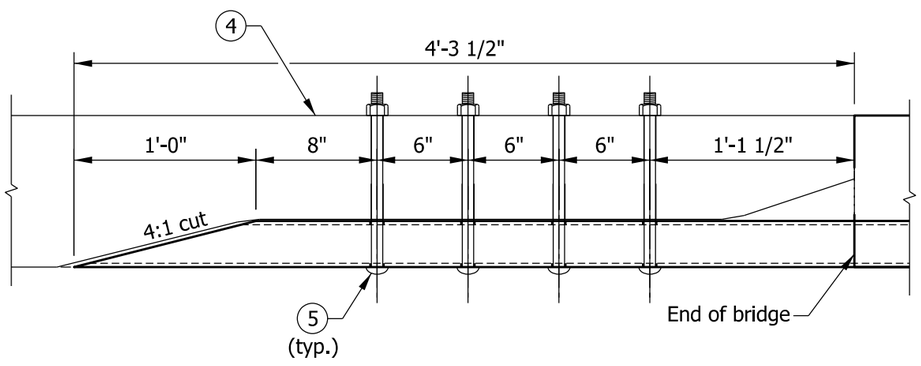
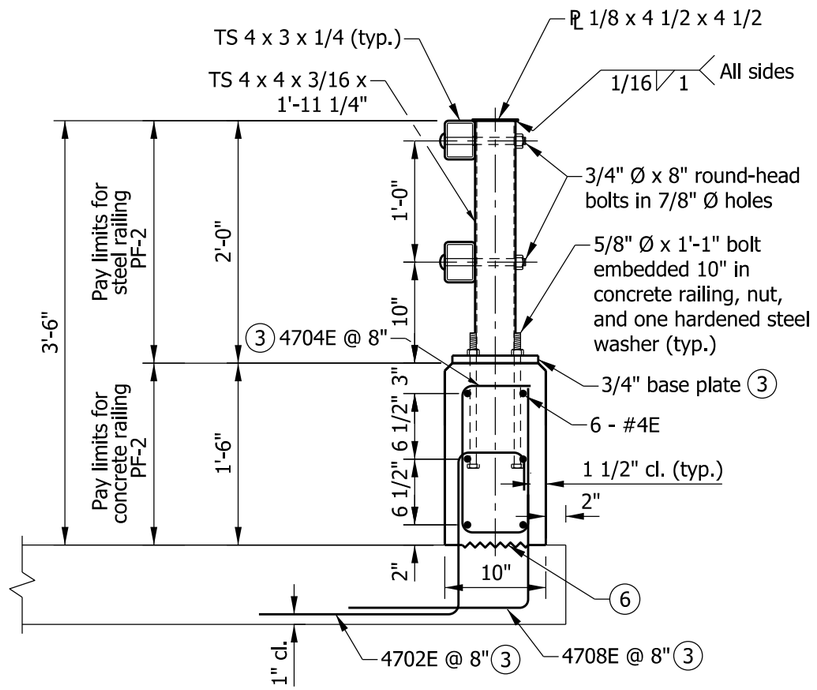


Plan view of TS 4 x 3 x 1/4

RAIL END DETAIL



TYPICAL SECTION

QUANTITIES FOR ONE RUNNING FOOT OF RAILING	
Concrete, class C	1.25 CFT
Reinforcing bars	14.1 LBS

NOTES

1. See Standard Drawing E 706-BRPP-06 for General Notes (hex).
2. See Standard Drawing E 706-BRPP-05 for rail tube details and rail splice details.
3. See Standard Drawing E 706-BRPP-06 for base plate detail and reinforcing-bar bends.
4. Concrete bridge railing transition, TPF-2. See Standard Drawings E 706-TTPP-03 and -04 for details.
5. 3/4" Ø x 11 1/2" round-head bolt in 7/8" Ø hole. Hole shall be slotted as required for expansion.
6. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, PF-2

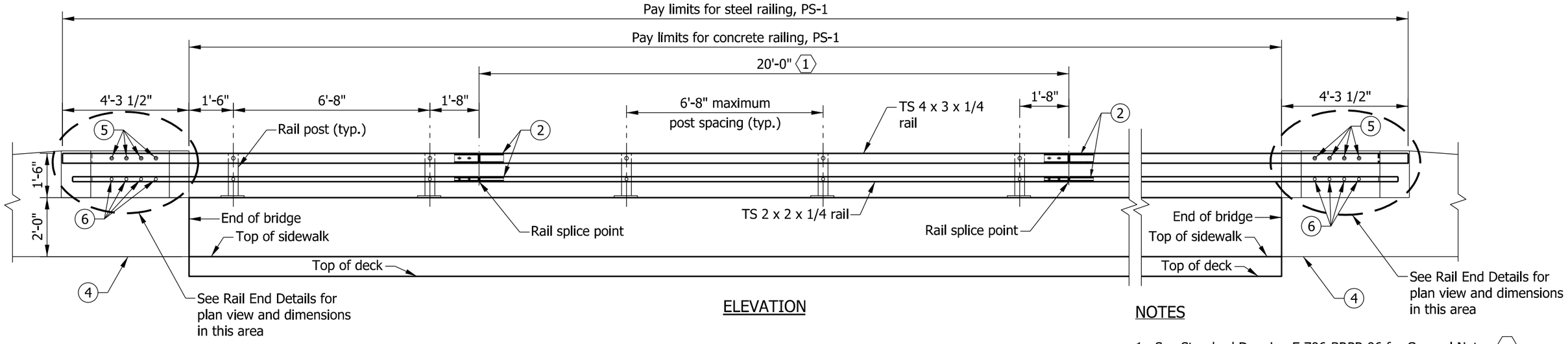
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRPP-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



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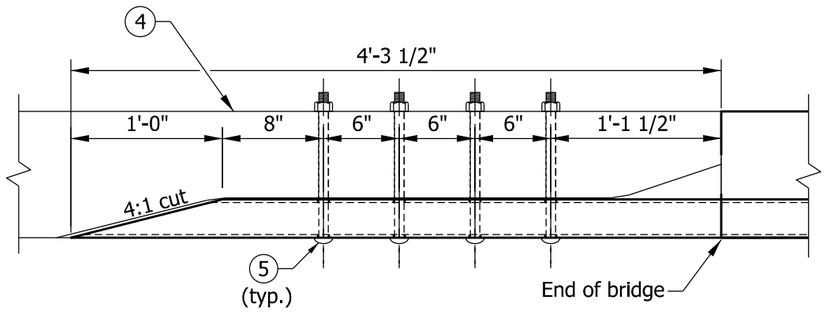
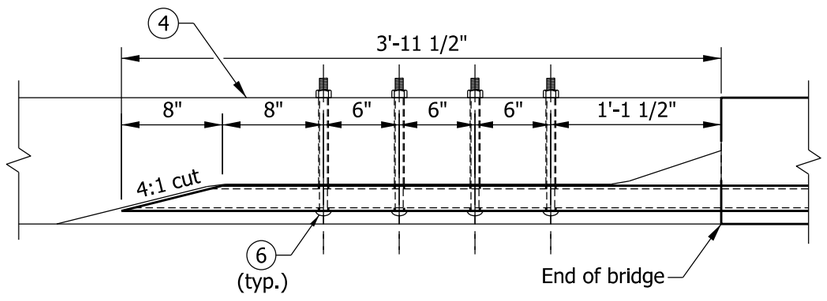


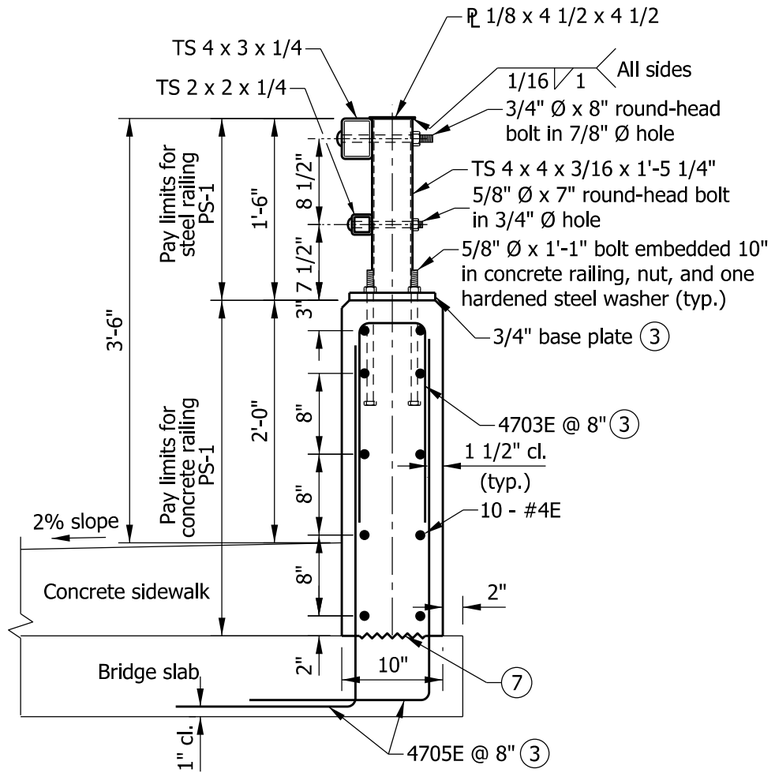
Plan view of TS 4 X 3 X 1/4



Plan view of TS 2 x 2 x 1/4

RAIL END DETAILS

QUANTITIES FOR ONE RUNNING FOOT OF RAILING	
Concrete, class C	2.30 CFT
Reinforcing bars	19.6 LBS



TYPICAL SECTION

NOTES

1. See Standard Drawing E 706-BRPP-06 for General Notes (hex).
2. See Standard Drawing E 706-BRPP-05 for rail tube details and rail splice details.
3. See Standard Drawing E 706-BRPP-06 for base plate detail and reinforcing-bar bends.
4. Concrete bridge railing transition, TPS-1. See Standard Drawings E 706-TTPP-05 and -06 for details.
5. 3/4" Ø x 11 1/2" round-head bolt in 7/8" Ø hole. Hole shall be slotted as required for expansion.
6. 5/8" Ø x 10 1/2" round-head bolt in 3/4" Ø hole. Hole shall be slotted as required for expansion.
7. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, PS-1

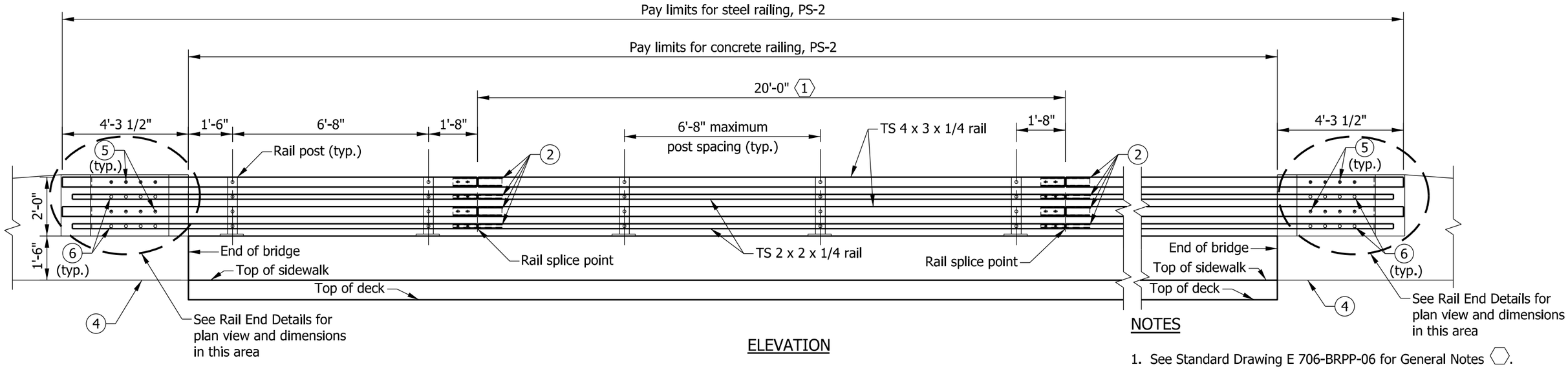
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRPP-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



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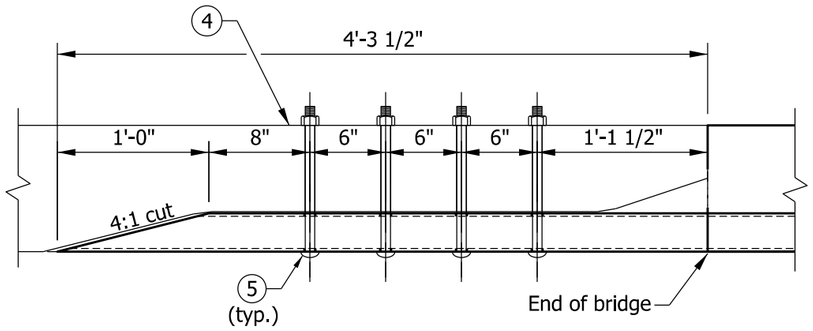
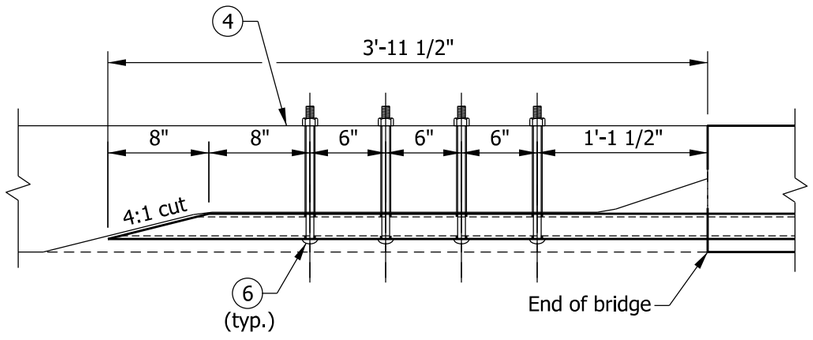


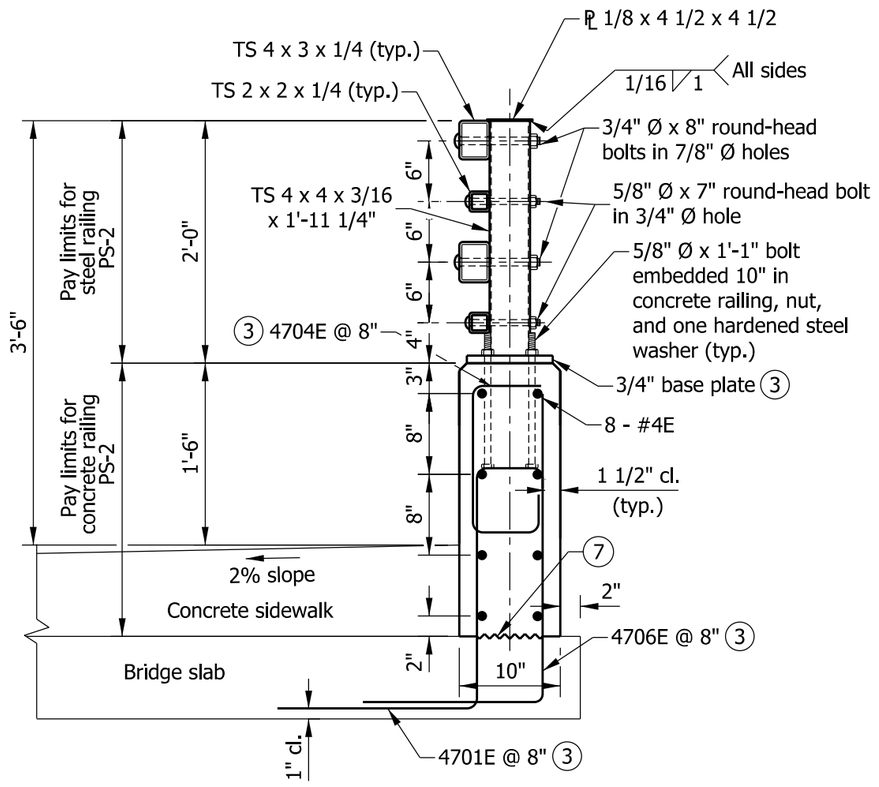
Plan view of TS 4 X 3 X 1/4



Plan view of TS 2 x 2 x 1/4

RAIL END DETAILS

QUANTITIES FOR ONE RUNNING FOOT OF RAILING	
Concrete, class C	1.89 CFT
Reinforcing bars	16.8 LBS



TYPICAL SECTION

NOTES

1. See Standard Drawing E 706-BRPP-06 for General Notes (1).
2. See Standard Drawing E 706-BRPP-05 for rail tube details and rail splice details.
3. See Standard Drawing E 706-BRPP-06 for base plate detail and reinforcing-bar bends.
4. Concrete bridge railing transition, TPS-2. See Standard Drawings E 706-TTPP-07 and -08 for details.
5. 3/4" Ø x 11 1/2" round-head bolt in 7/8" Ø hole. Hole shall be slotted as required for expansion.
6. 5/8" Ø x 10 1/2" round-head bolt in 3/4" Ø hole. Hole shall be slotted as required for expansion.
7. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, PS-2

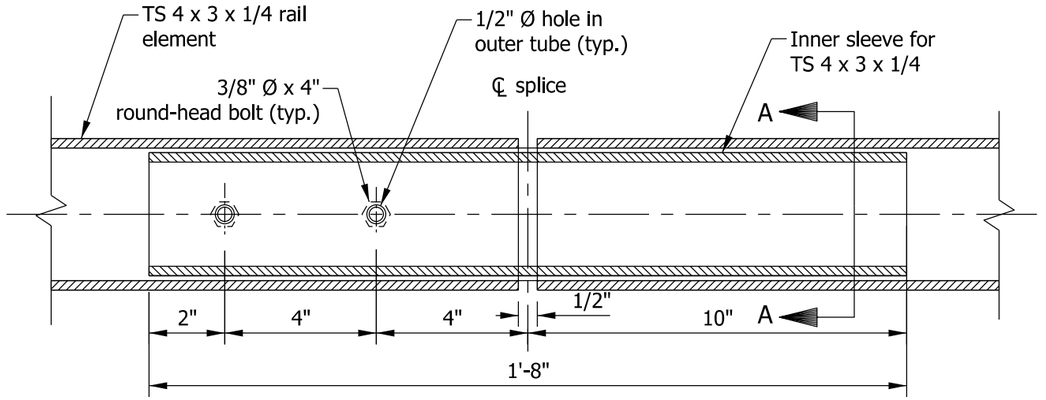
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRPP-04

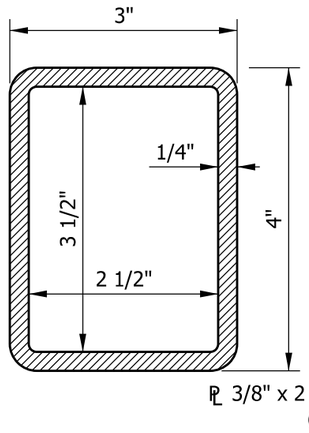
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

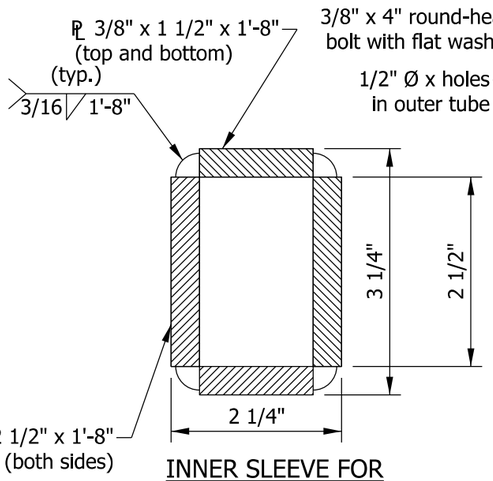
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



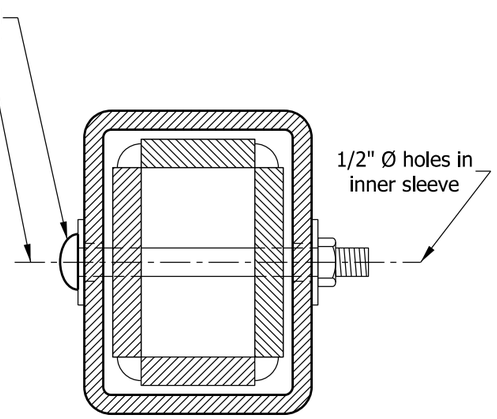
SPLICE ASSEMBLY
FOR TS 4 X 3 X 1/4 RAIL



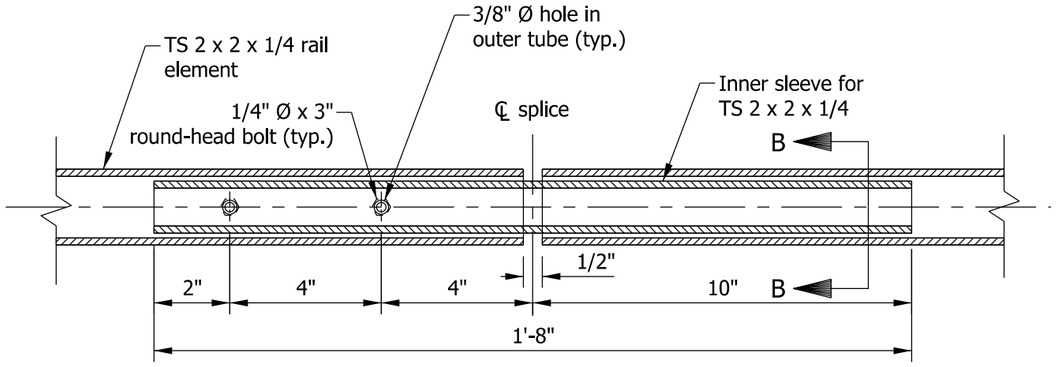
TS 4 x 3 x 1/4



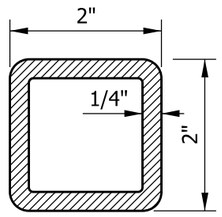
INNER SLEEVE FOR
TS 4 x 3 x 1/4



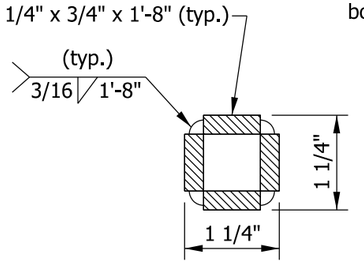
SECTION A-A



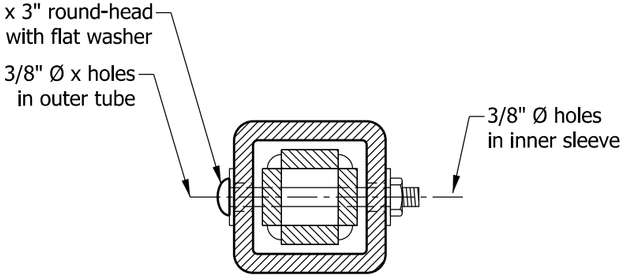
SPLICE ASSEMBLY
FOR TS 2 X 2 X 1/4 RAIL



TS 2 x 2 x 1/4



INNER SLEEVE FOR
TS 2 x 2 x 1/4



SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, PF AND PS
RAIL SPLICE DETAILS

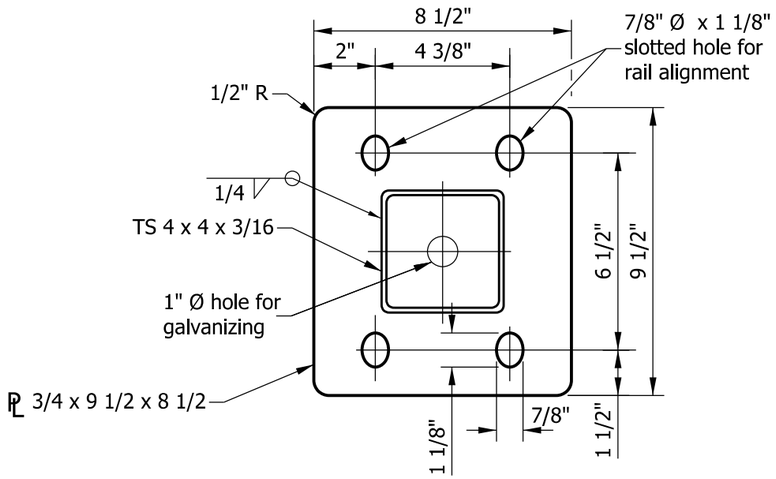
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRPP-05

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

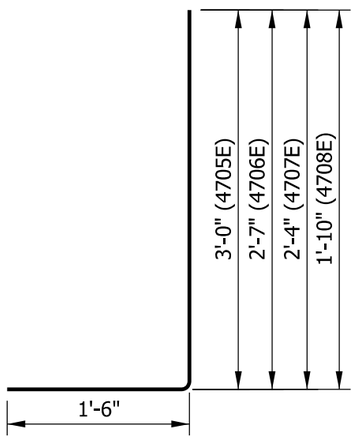
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



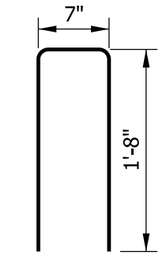
BASE PLATE DETAIL

GENERAL NOTES

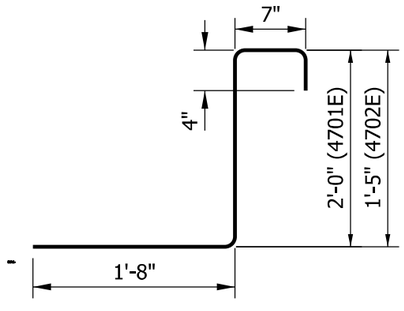
1. Intermediate railing splices shall be placed every 20 ft.
2. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.
3. All chamfered edges shall be 3/4".
4. All reinforcing bars designated E shall be epoxy coated.



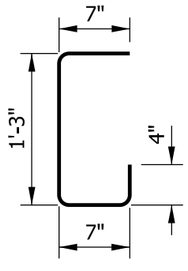
4705E x 4'-6"
4706E x 4'-1"
4707E x 3'-10"
4708E x 3'-4"



4703E x 3'-11"



4701E x 4'-7"
4702E x 4'-0"



4704E x 2'-9"

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, PF & PS
DETAILS

SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRPP-06

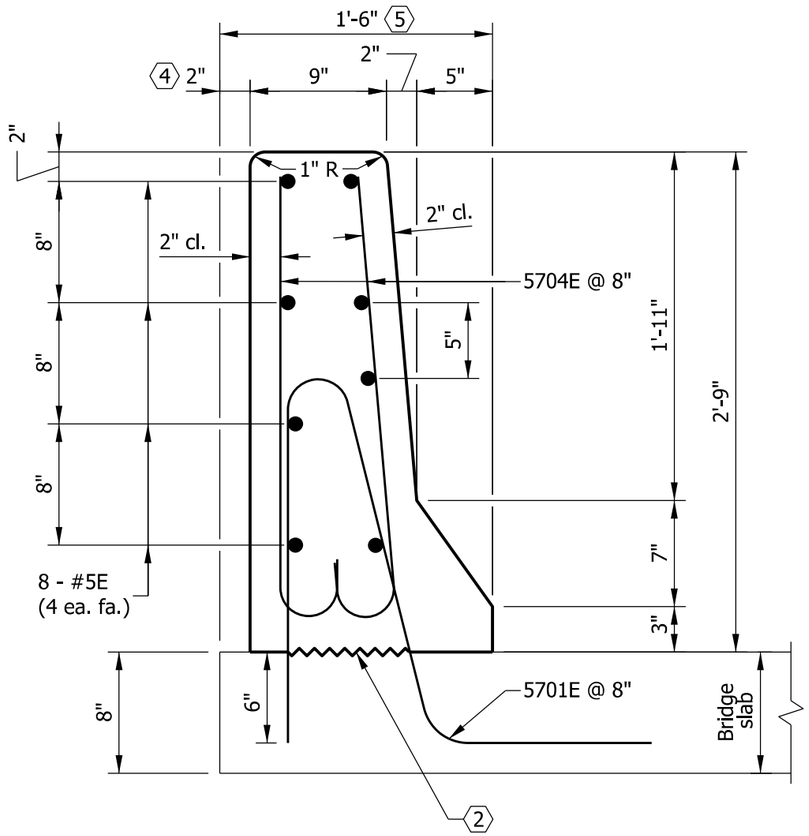
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

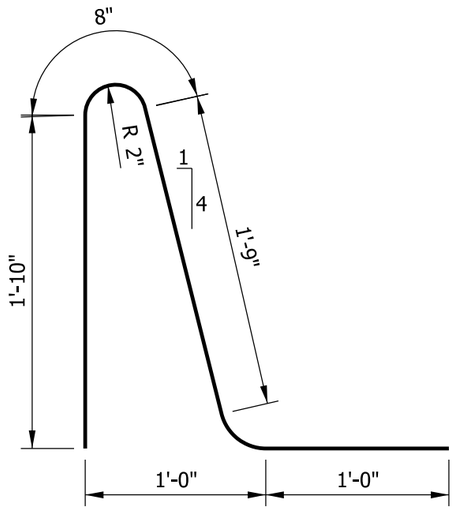
/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

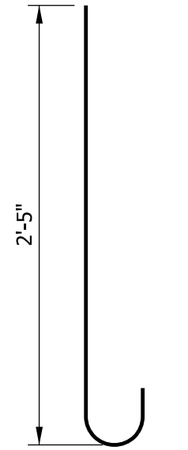
NOTES

1. See Standard Drawing E 706-BRSF-03 for General Notes ⬡.
2. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.





5701E x 5'-6"



5704E x 3'-0"

QUANTITIES FOR ONE RUNNING FOOT OF RAILING	
Concrete, class C	2.58 CFT
Reinforcing bars	26.3 LBS

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE RAILING TYPE FC

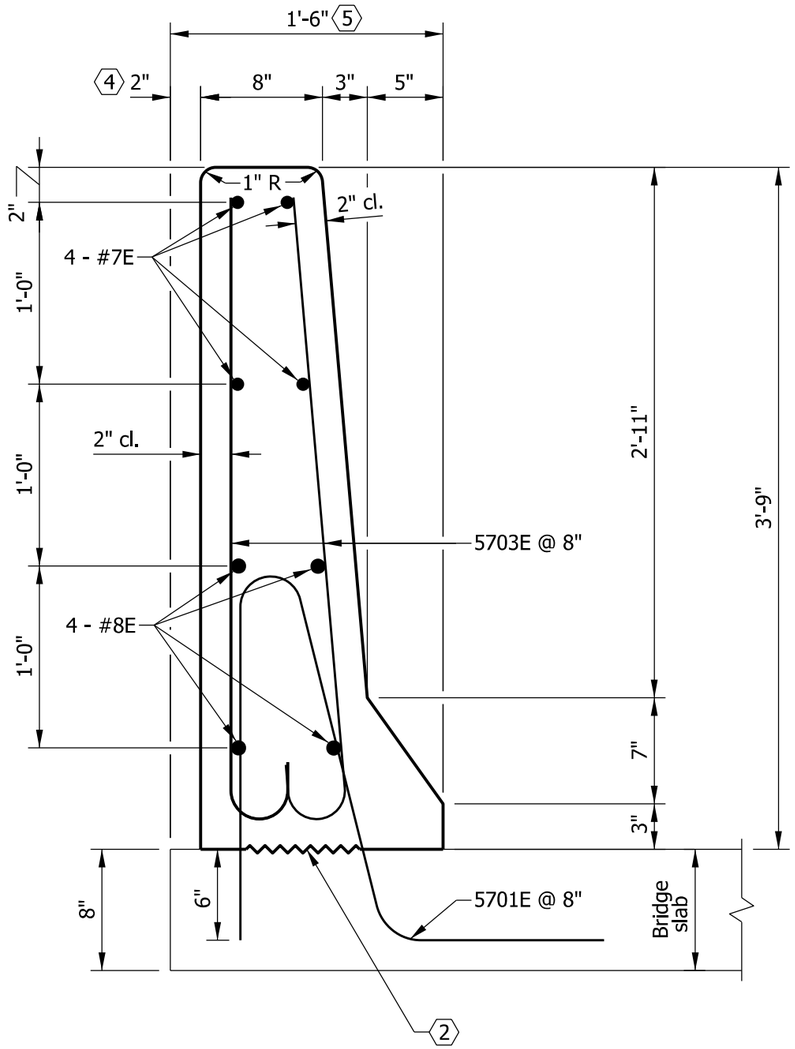
SEPTEMBER 2012

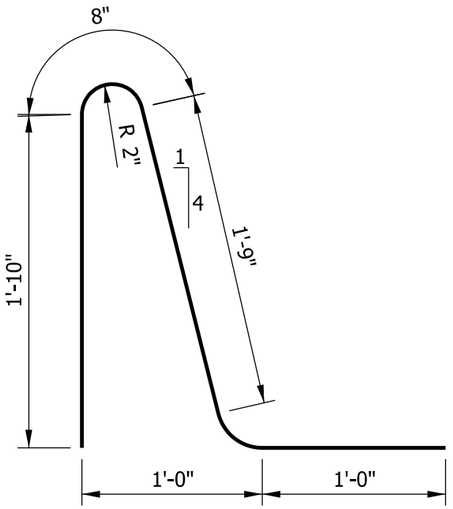
STANDARD DRAWING NO. E 706-BRSF-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

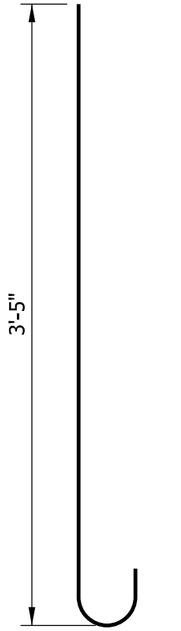
/s/ Richard L. Van Cleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE





5701E x 5'-6"



5703E x 4'-0"

NOTES

1. See Standard Drawing E 706-BRSF-03 for General Notes 5.
2. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

QUANTITIES FOR ONE RUNNING FOOT OF RAILING	
Concrete, class C	3.29 CFT
Reinforcing bars	40.0 LBS

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE RAILING TYPE FT

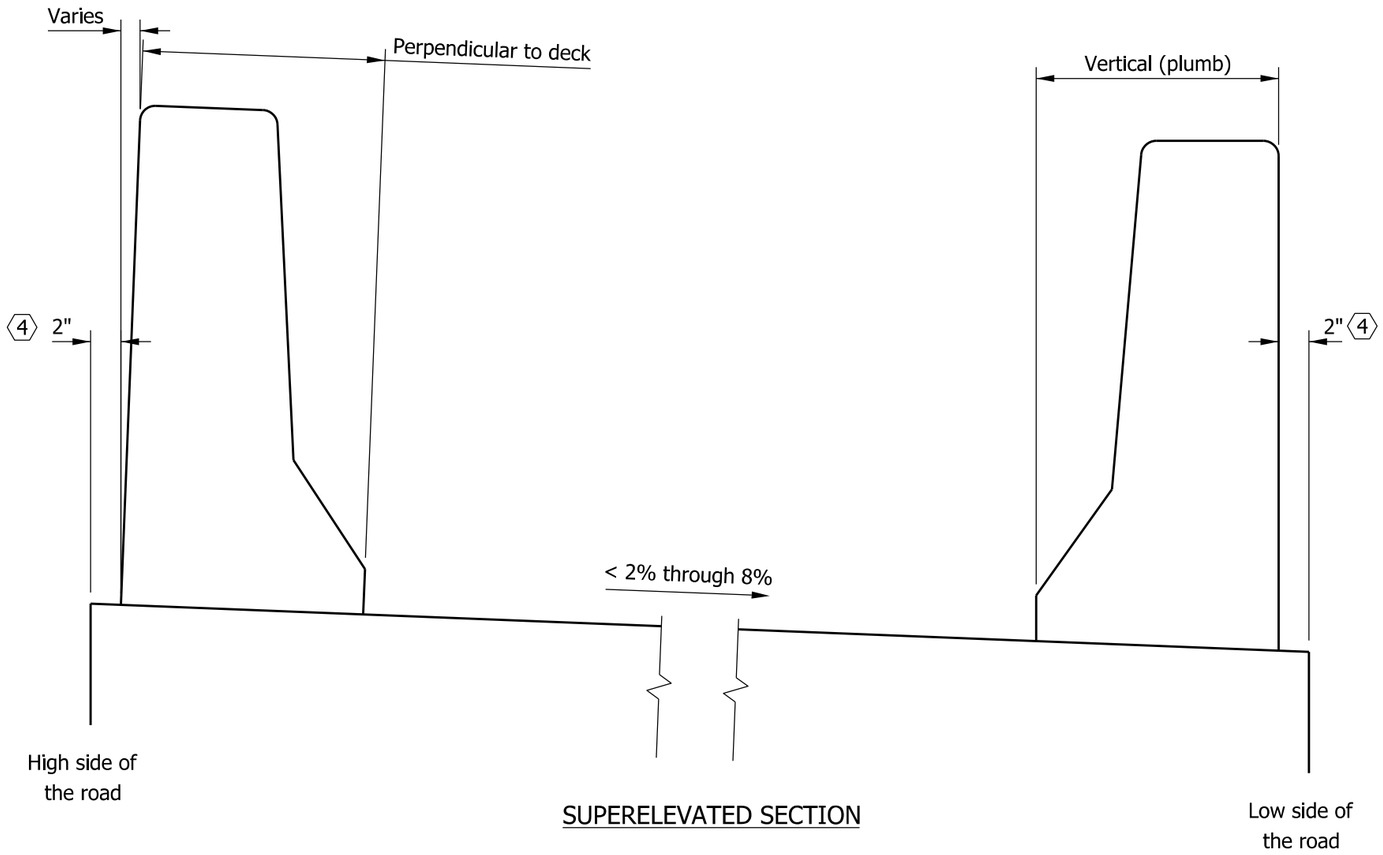
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRSF-02

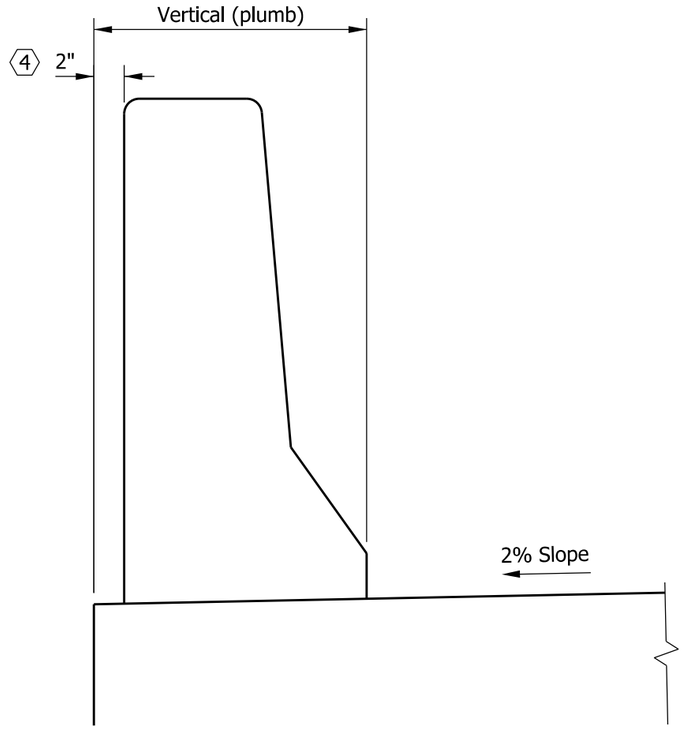
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



SUPERELEVATED SECTION



CROWN SECTION

GENERAL NOTES

1. Minimum lap for #5 bars shall be 1'-11".

〈2〉 Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

3. A joint shall be provided between the bridge railing and railing transition at the end of the bridge slab as shown on Standard Drawing E 706-CBRT-01.

〈4〉 For twin structures or other structures which are placed side by side, this dimension shall be reduced to 0 on the median side.

〈5〉 For twin structures or other structures which are placed side by side, this dimension shall be reduced to 1'-4" on the median side.

6. All reinforcing bars designated E shall be epoxy coated.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING PLACEMENT

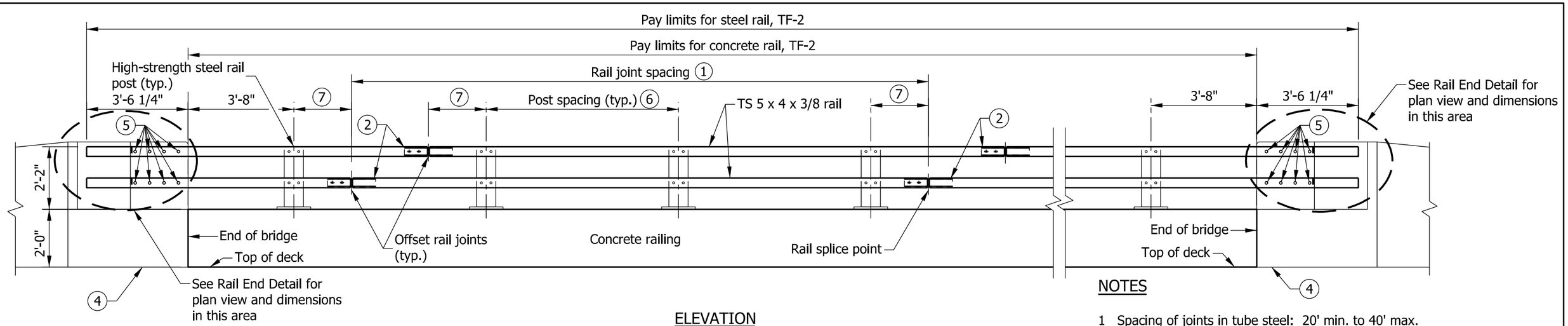
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRSF-03

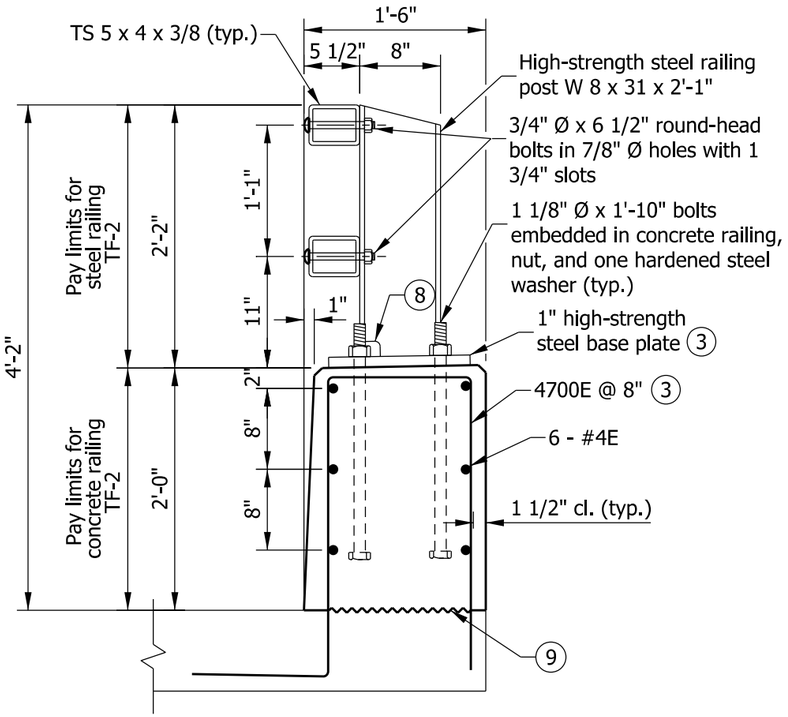
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

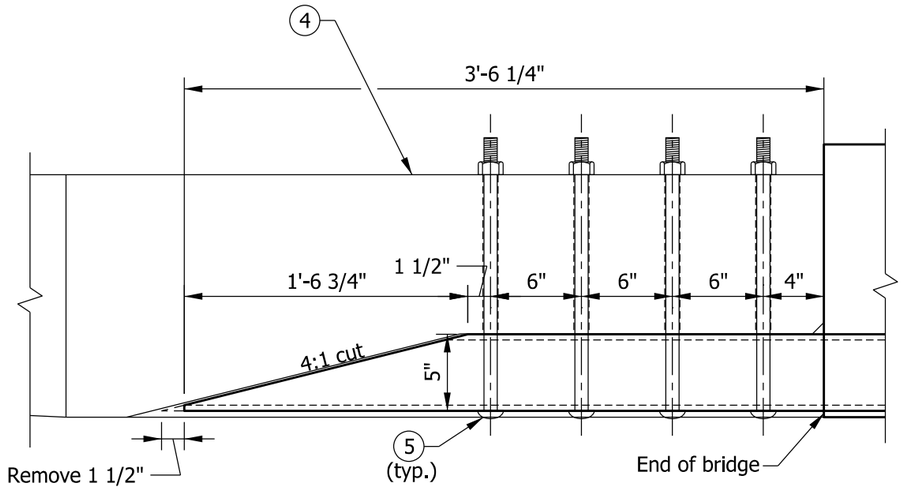
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



TYPICAL SECTION



RAIL END DETAIL
(Plan view of both TS 5 x 4 x 3/8 rails)

QUANTITIES FOR ONE RUNNING FOOT OF RAILING	
Concrete, class C	2.92 CFT
Reinforcing bars	11.0 LBS

NOTES

1 Spacing of joints in tube steel: 20' min. to 40' max.

(2) See Standard Drawing E 706-BRTF-02 for railing tube details and rail splice details.

(3) See Standard Drawing E 706-BRTF-03 for base plate details and reinforcing-bar bends.

(4) Concrete bridge railing transition type TTF-2. See Standard Drawings E 706-TTTF-01 through -04 for details.

(5) 7/8" Ø x 1'-6" round-head bolt in 1" Ø hole. Hole is to be slotted as required for expansion.

(6) Spacing of rail posts: 4'-0" min. to 7'-6" max.

(7) Distance from centerline of rail splice to centerline of rail post: 18" min. to 30" max.

(8) Weld-access hole. See Standard Drawing E 706-BRTF-03 for detail.

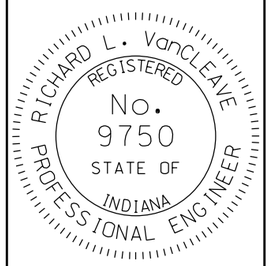
(9) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, TF-2

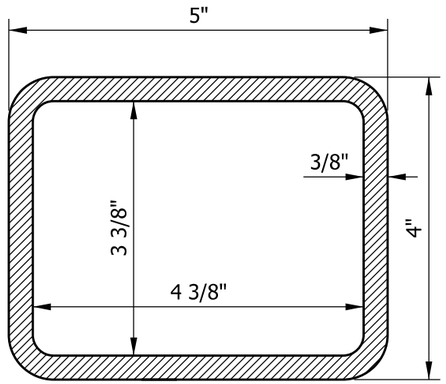
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTF-01

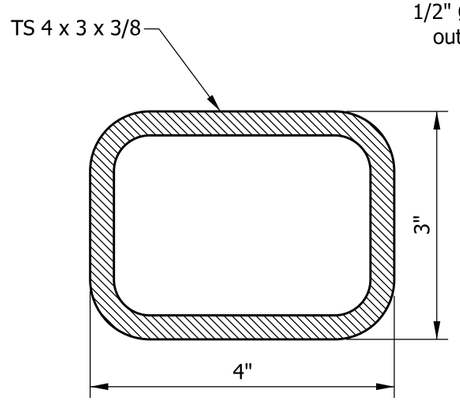


/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

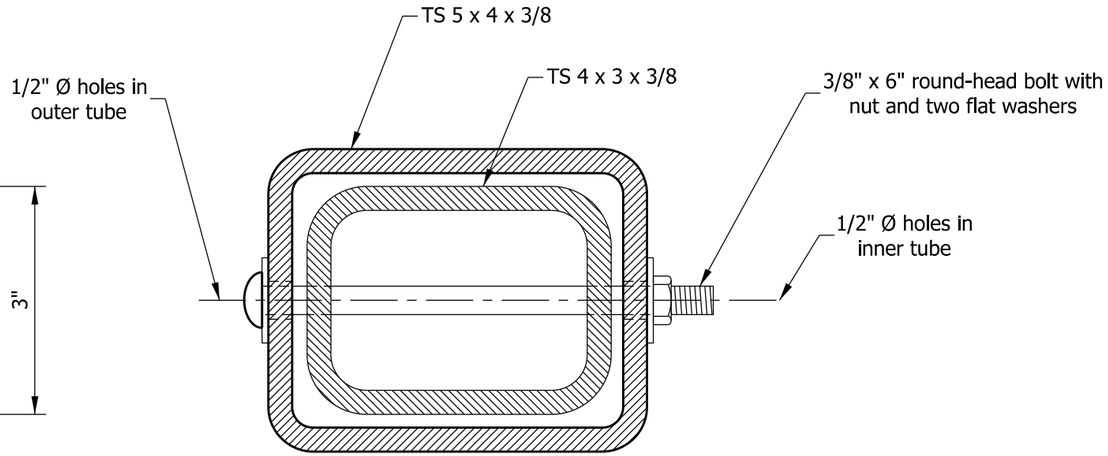
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



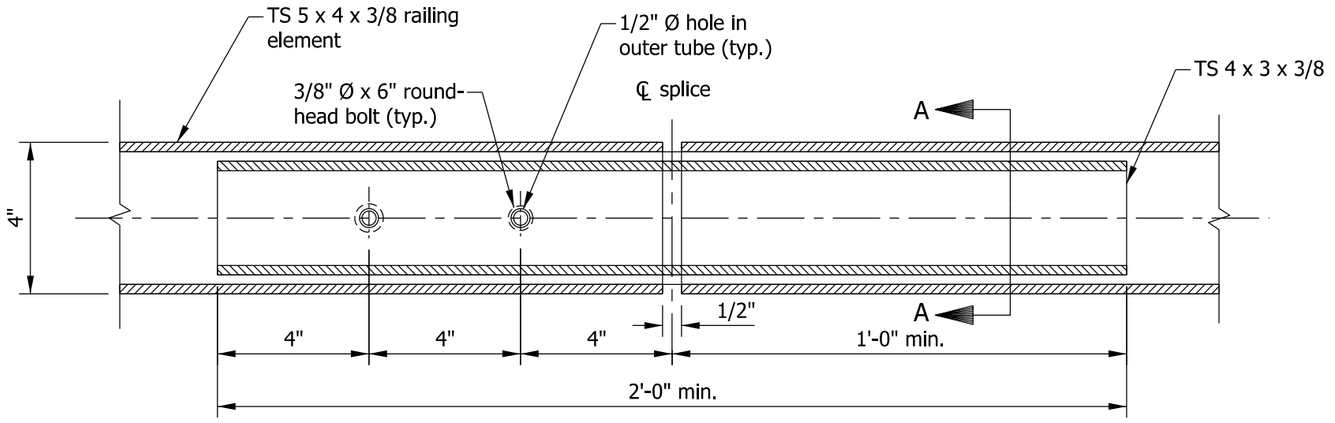
TS 5 x 4 x 3/8



INNER TUBE FOR
TS 5 x 4 x 3/8



SECTION A-A



SPLICE ASSEMBLY
FOR TS 5 X 4 X 3/8 RAIL

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, TF-2
RAIL SPLICE DETAILS

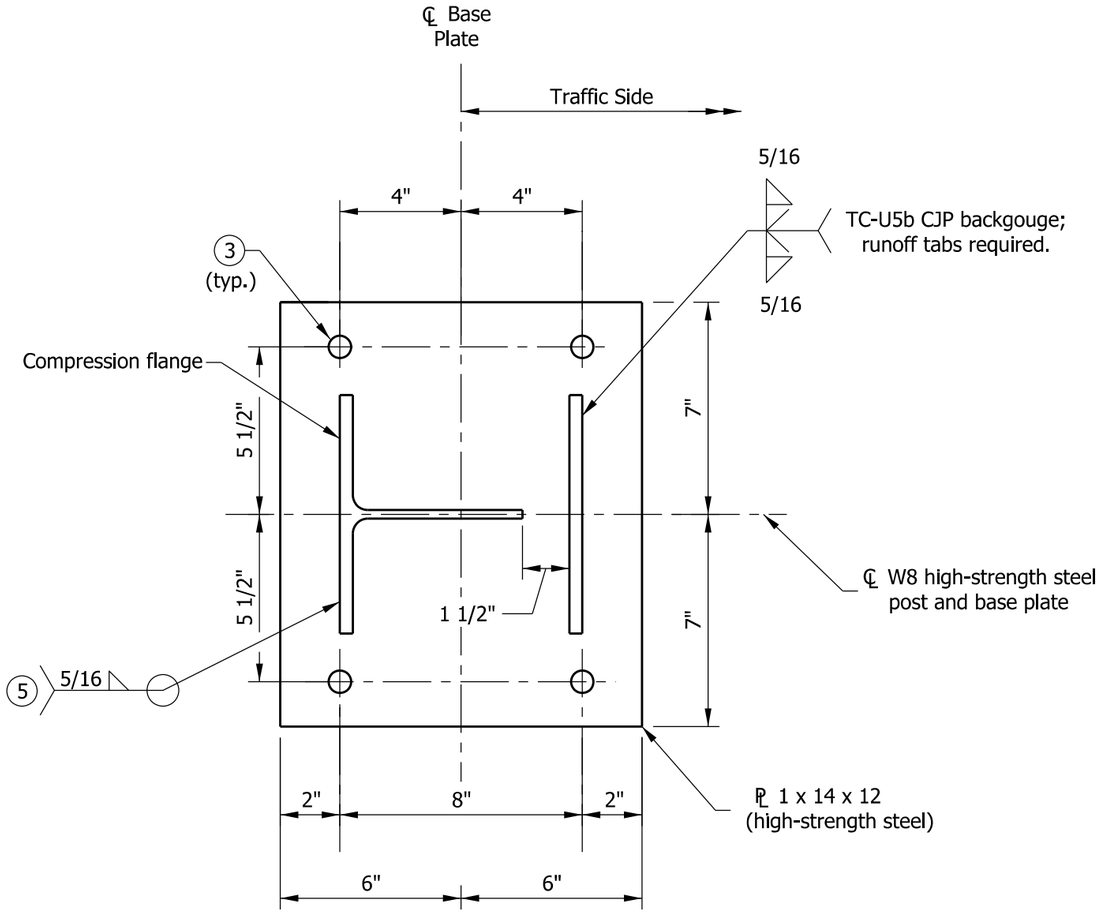
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTF-02

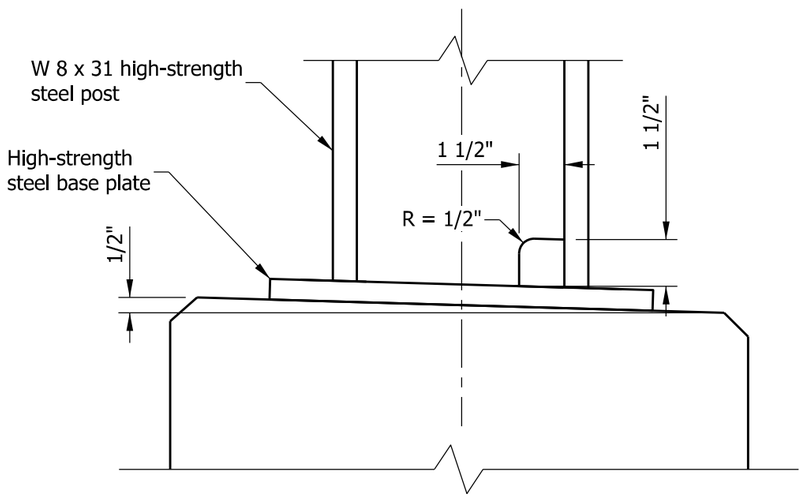
RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



BASE PLATE DETAIL



WELD-ACCESS HOLE DETAIL

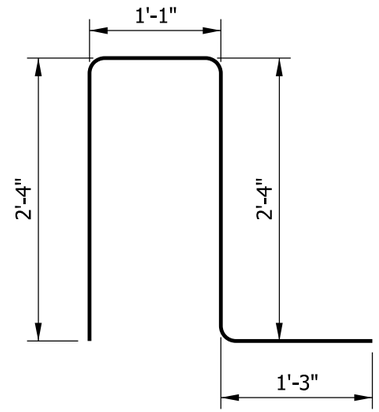
NOTES

1. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.
2. All chamfered edges shall be 3/4".

(3) 1 3/8" Ø holes for 1 1/8" anchor bolts.

4. All reinforcing bars designated E shall be epoxy coated.

(5) Mill to bear flush with base plate prior to welding to ensure that the final position of the post is vertical.



4700E x 7'-0"

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, TF-2
DETAILS

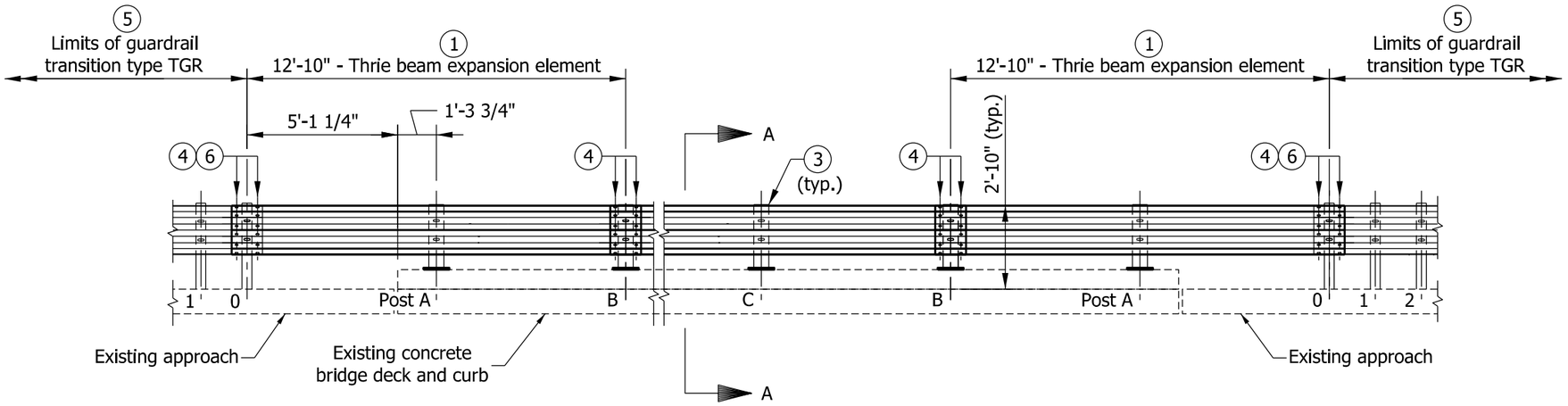
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTF-03

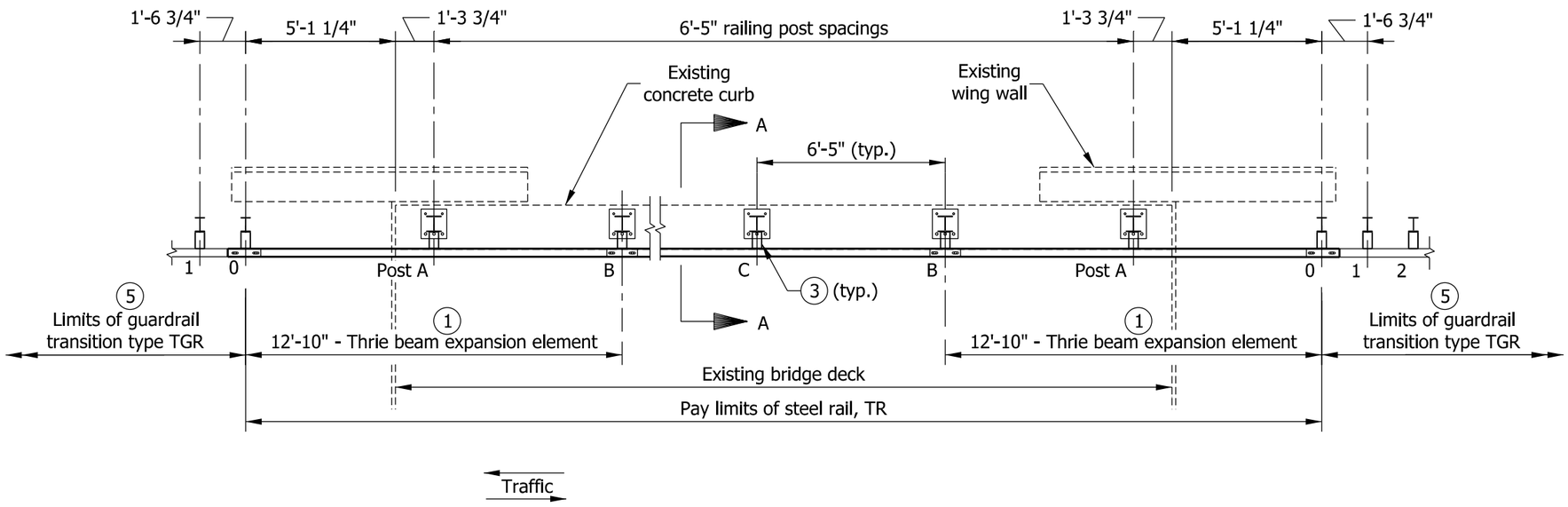
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION VIEW



PLAN VIEW

NOTES

1. See Standard Drawing E 706-BRTR-04 for thrie beam expansion element.
2. See Standard Drawing E 706-BRTR-02 for Section A-A.
3. Bridge railing post/blockout assembly. See Standard Drawing E 706-BRTR-03 for post and blockout details. Attach rail using two 5/8" Ø x 2" std. button head bolts with rectangular plate washers, round washers, and recess nuts.
4. Twelve 5/8" Ø std. button head bolts with round washers and recess nuts.
5. See Standard Drawing E 706-BRTR-05 for thrie beam guardrail transition type TGR.
6. Hand tighten post bolts on thrie beam expansion element and burr bolt threads.

INDIANA DEPARTMENT OF TRANSPORTATION

RETROFIT THRIE BEAM BRIDGE RAILING TR

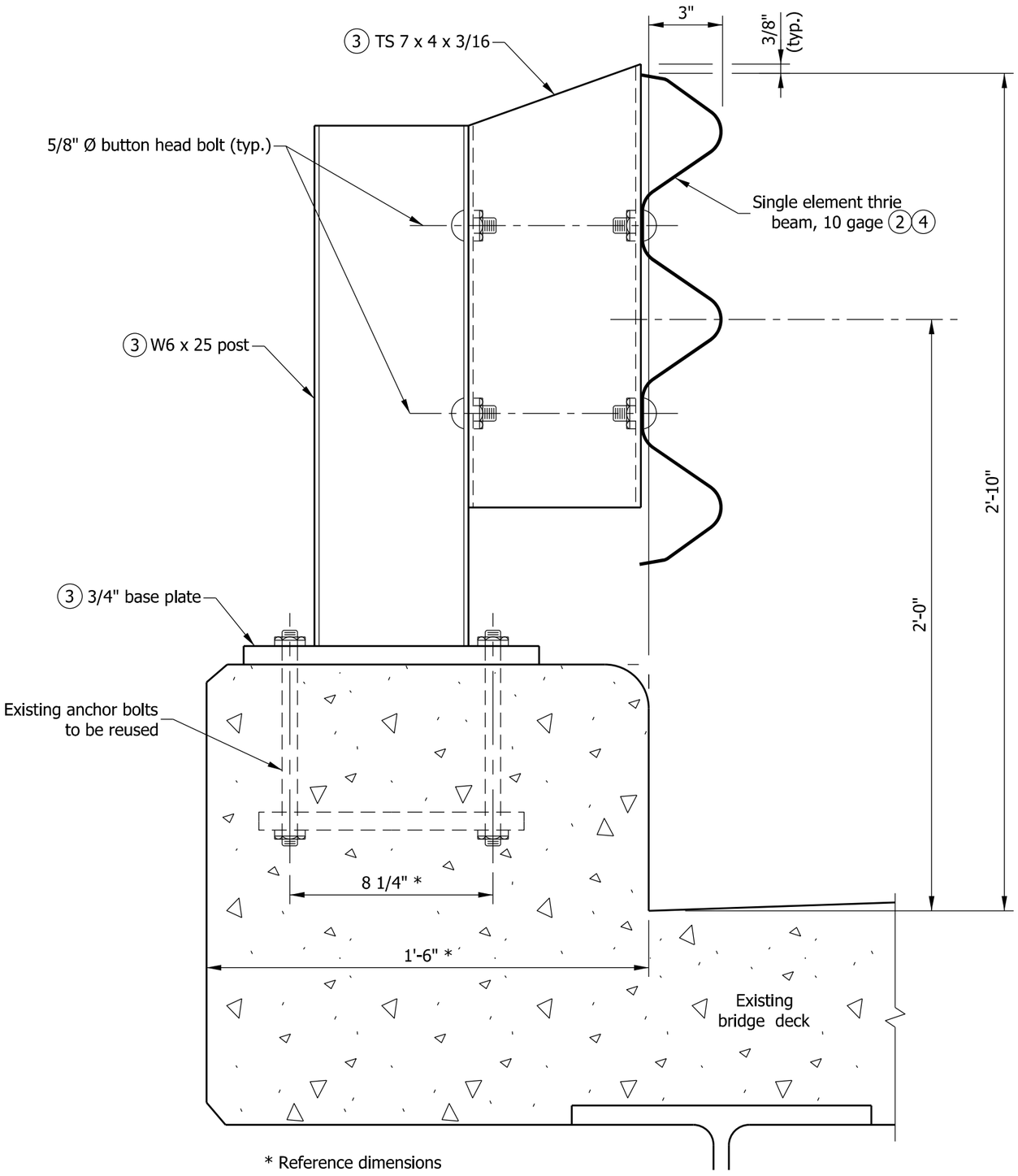
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTR-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



SECTION A-A

NOTES

1. See Standard Drawing E 706-BRTR-01 for plan view.

(2) See Standard Drawing E 601-TBGC-01 for thrie beam section.

(3) See Standard Drawing E 706-BRTR-03 for post, blockout, and base plate details.

(4) See Standard Drawing E 706-BRTR-04 for thrie beam bridge railing elements.

INDIANA DEPARTMENT OF TRANSPORTATION

RETROFIT THRIE BEAM
BRIDGE RAILING TR

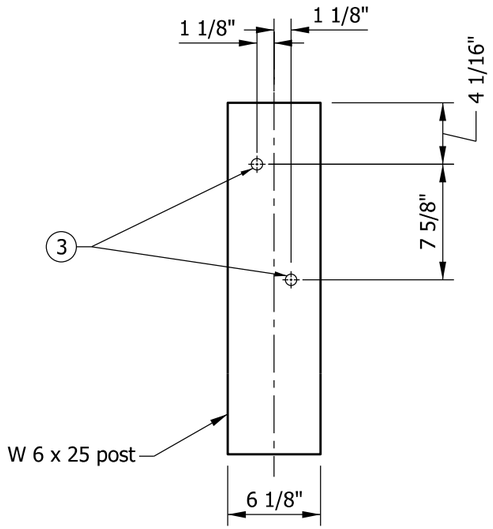
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTR-02

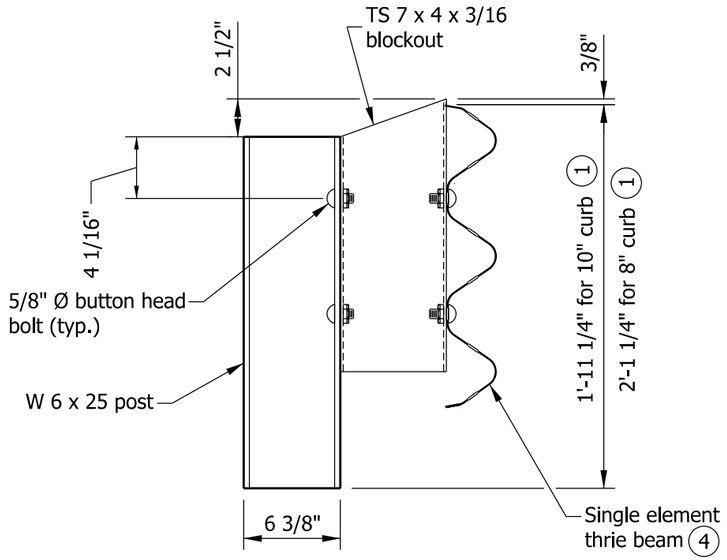
RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



FRONT VIEW

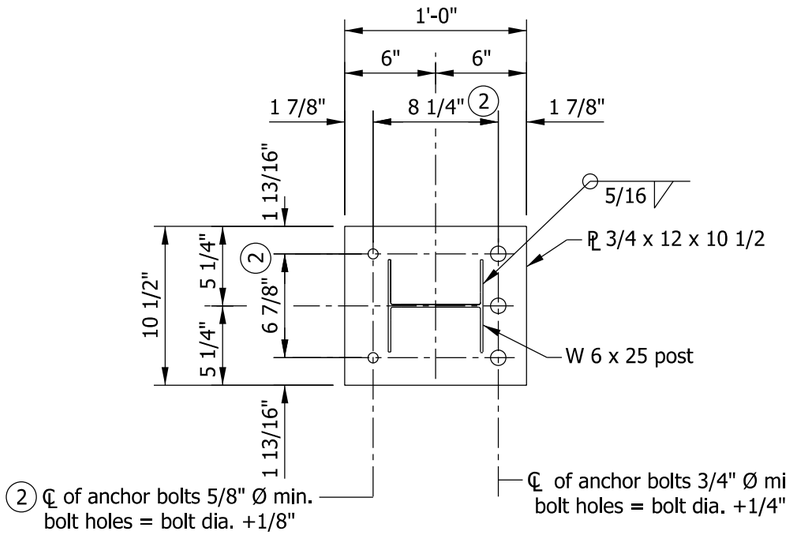


SIDE VIEW

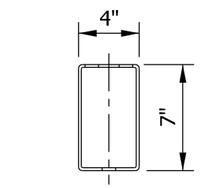
W 6 x 25 POST DETAILS FOR CURB MOUNTED POSTS

NOTES

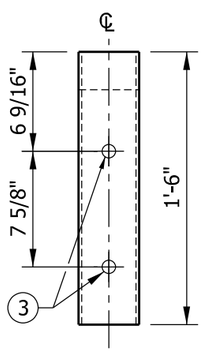
1. Adjust the post length for thrie beam height above the deck.
2. Locations of bolt holes on base plate shall match locations of existing anchor bolts.
3. All holes drilled or punched to 3/4" Ø.
4. See Standard Drawing E 706-BRTR-04 for thrie beam elements. See Standard Drawing E 601-TBGC-01 for thrie beam rail section.



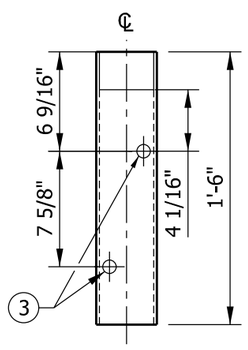
BASE PLATE DETAIL



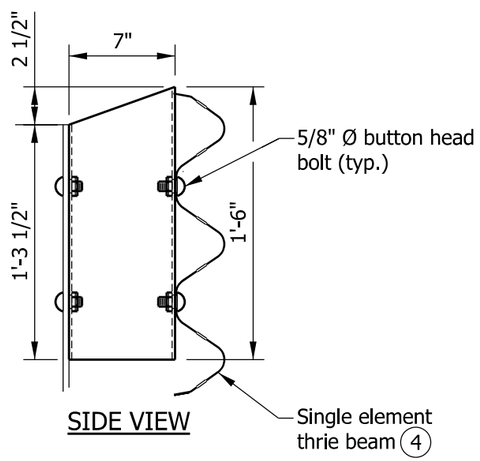
TOP VIEW



FRONT VIEW



BACK VIEW



SIDE VIEW

TS 7 x 4 x 3/16 BLOCKOUT DETAILS FOR CURB MOUNTED POSTS

INDIANA DEPARTMENT OF TRANSPORTATION

RETROFIT THRIE BEAM BRIDGE RAILING TR COMPONENTS

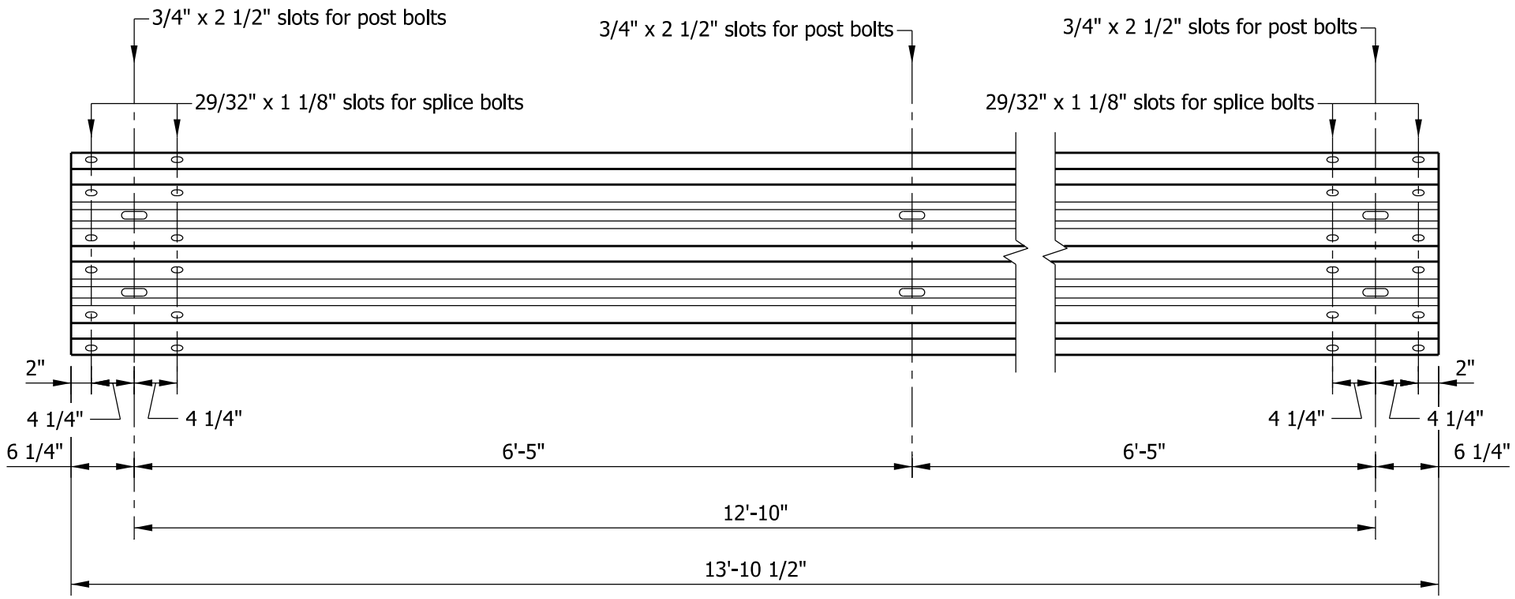
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTR-03

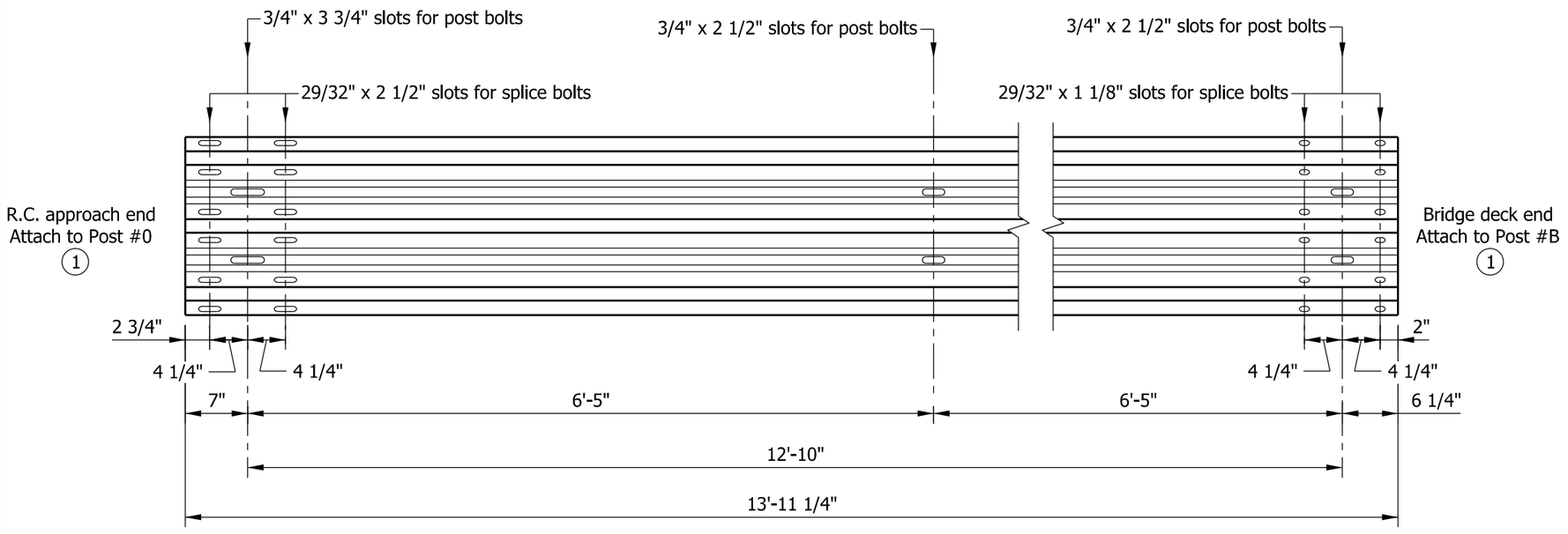
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



THRIE BEAM ELEVATION



THRIE BEAM EXPANSION ELEMENT ELEVATION

NOTES

1. See Standard Drawing E 706-BRTR-01 for post locations.

INDIANA DEPARTMENT OF TRANSPORTATION

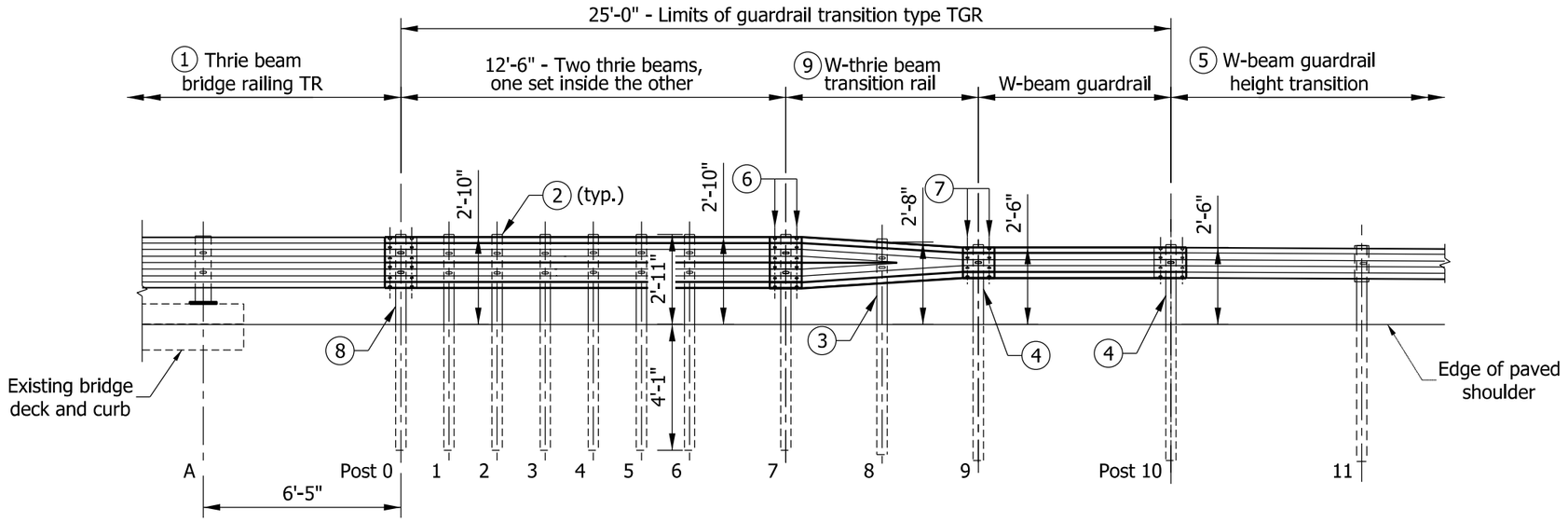
RETROFIT THRIE BEAM
BRIDGE RAILING TR
COMPONENTS
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTR-04

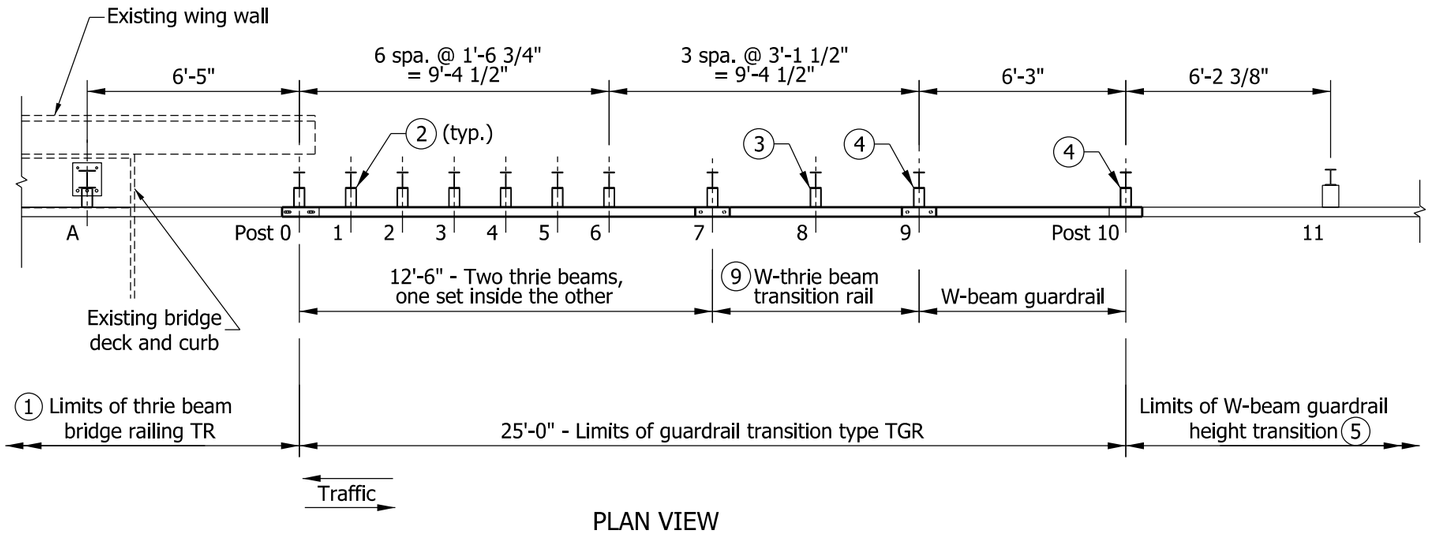
RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN VIEW

NOTES

1. See Standard Drawing E 706-BRTR-01 for thrie beam bridge railing TR.
2. TGB transition post/blockout assembly. See Standard Drawing E 601-TTGB-03 for post and blockout details. Adjust post height to accommodate guardrail heights indicated on this sheet. Attach rail using two 5/8" Ø x 2" std. button head bolts with rectangular plate washers, round washers, and recess nuts.
3. W-thrie beam transition post/blockout assembly. See Standard Drawing E 601-TTGB-04 for post and blockout details. Adjust post height to accommodate guardrail heights indicated on this sheet. Attach rail using two 5/8" Ø x 2" std. button head bolts with rectangular plate washers, round washers, and recess nuts.
4. W-beam post/blockout assembly. See Standard Drawing E 601-TTGB-05 for post and blockout details. Adjust post height to accommodate guardrail heights indicated on this sheet. Attach rail using one 5/8" Ø x 1 1/4" std. button head bolt with rectangular plate washer, round washer, and recess nut.
5. See Standard Drawing E 706-BRTR-06 for W-beam guardrail height transition.
6. Twelve 5/8" Ø x 2" std. button head bolts with round washers and recess nuts, through rail sections.
7. Eight 5/8" Ø x 1 1/4" std. button head bolts with round washers and recess nuts.
8. Hand tighten post bolts on thrie beam expansion element and burr bolt threads.
9. See Standard Drawing E 601-TBGC-01 for W-thrie beam transition rail.

INDIANA DEPARTMENT OF TRANSPORTATION

RETROFIT THRIE BEAM GUARDRAIL TRANSITION TYPE TGR

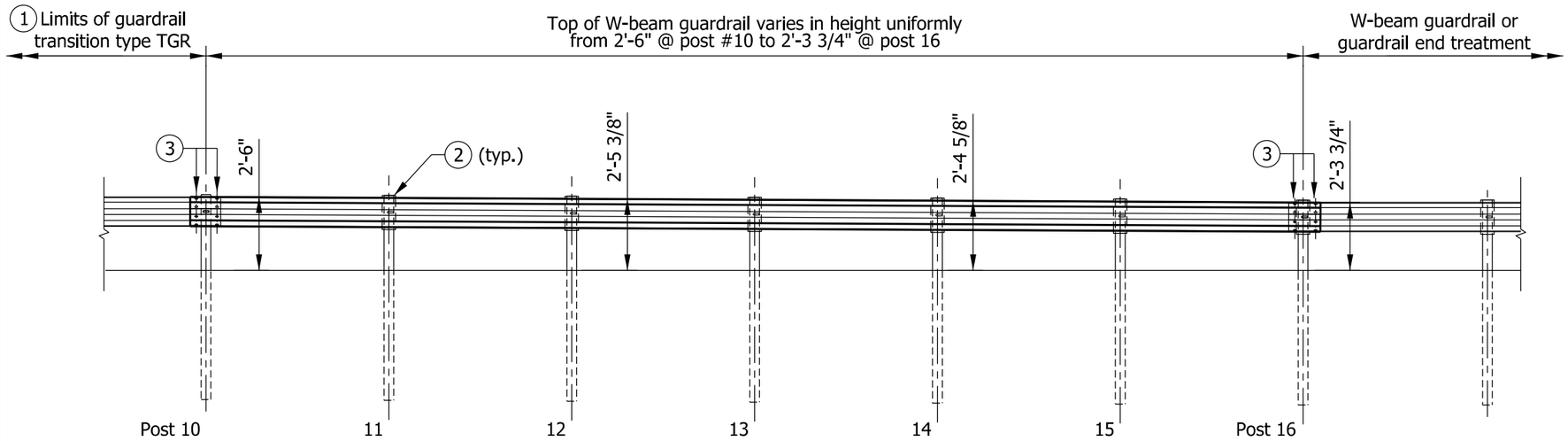
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTR-05

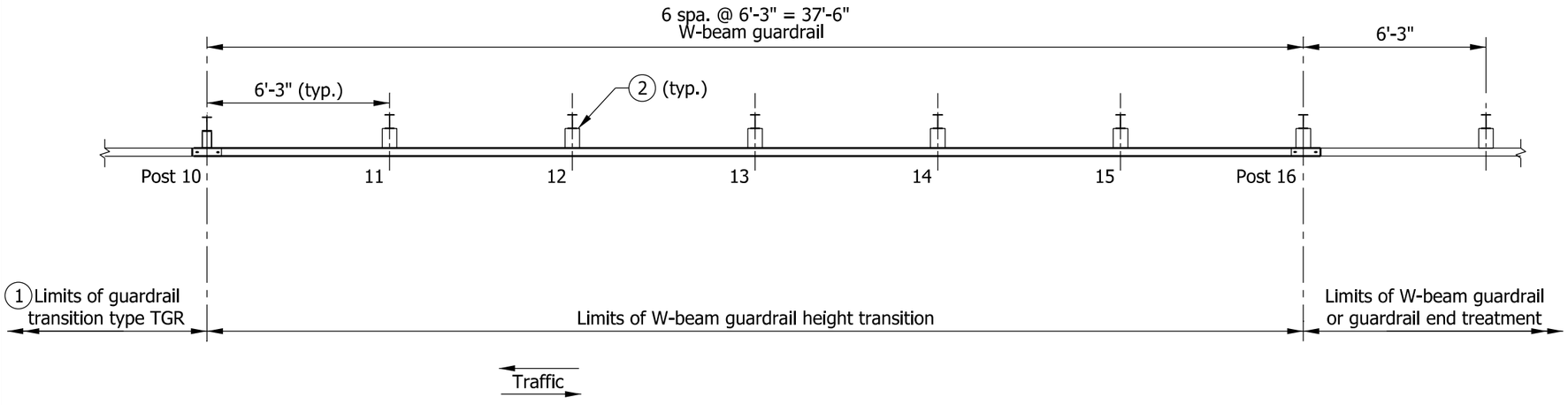
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN VIEW

NOTES

1. See Standard Drawing E 706-BRTR-05 for thrie beam guardrail transition type TGR.
2. W-beam post/blockout assembly. See Standard Drawing E 601-WGBA-01 for post and blockout details. Adjust post height to accommodate guardrail heights indicated on this sheet. Attach rail using one 5/8" Ø x 1 1/4" std. button head bolt with rectangular plate washer, round washer, and recess nut.
3. Eight 5/8" Ø x 1 1/4" std. button head bolts with round washers and recess nuts.

INDIANA DEPARTMENT OF TRANSPORTATION

RETROFIT THRIE BEAM GUARDRAIL HEIGHT TRANSITION

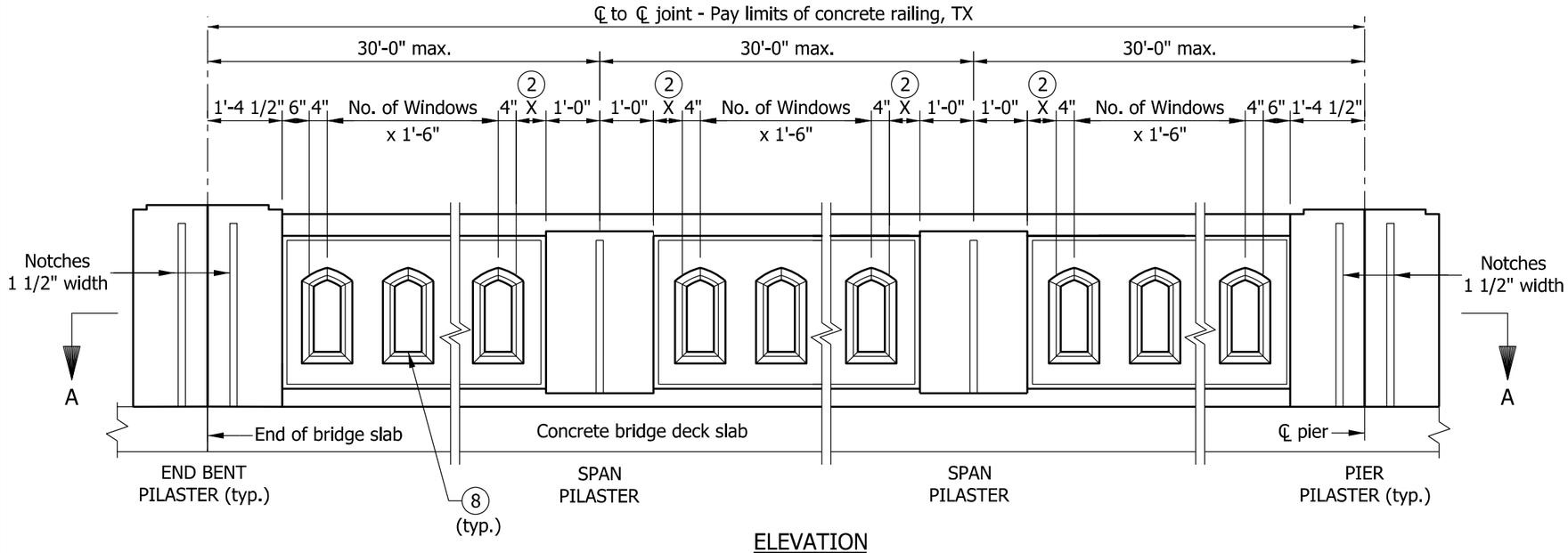
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTR-06

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



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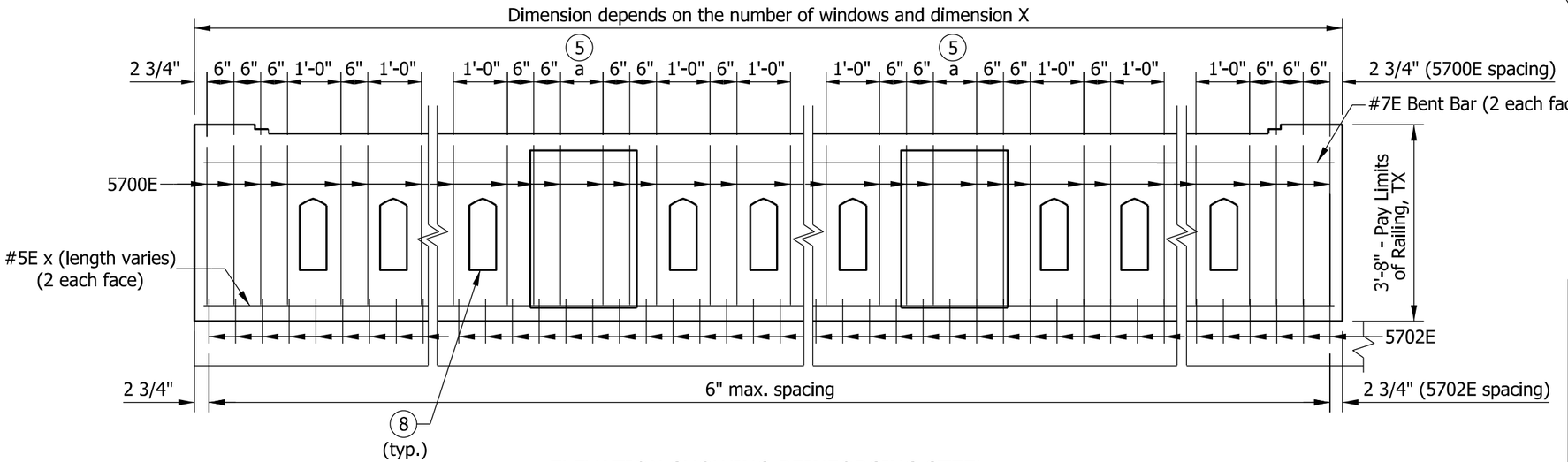
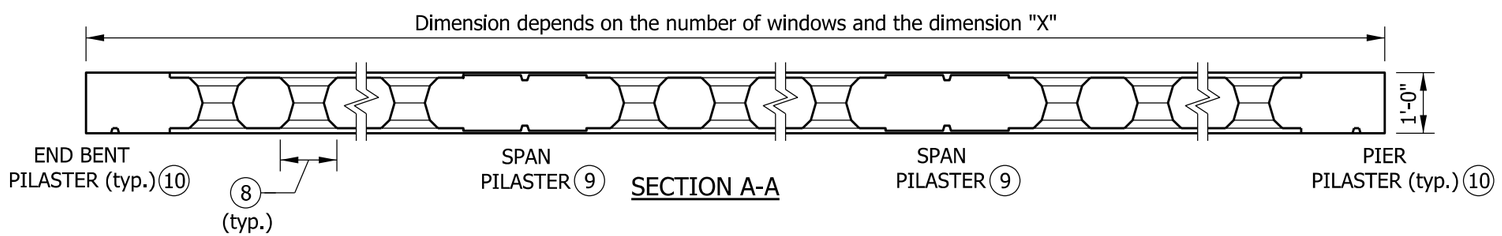


ELEVATION SHOWING REINFORCING STEEL



SECTION A-A

NOTES

1. See Standard Drawing E 706-BRTX-02, -03, and -04 for sections.
2. Select the number of windows and adjust dimension X to fit the span length.
3. Span pilasters may be omitted for a short span with X ≤ 2'-0".
4. Span pilasters are for aesthetic purposes only. Omitting span pilasters does not decrease the integrity of the railing.
5. Dimension a = 2X + 3 1/2". Space bars within dimension a equally ≤ 6".
6. See Standard Drawing E 706-TTTX-01 for Concrete Bridge Railing Transition, TTTX.
7. All reinforcing bars designated E shall be epoxy coated.
8. Window opening. See Standard Drawing E 706-BRTX-02 for details.
9. See Standard Drawing E 706-BRTX-03 for span pilaster details.
10. See Standard Drawing E 706-BRTX-04 for pier and end bent pilaster details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, TX
TYPICAL PANEL

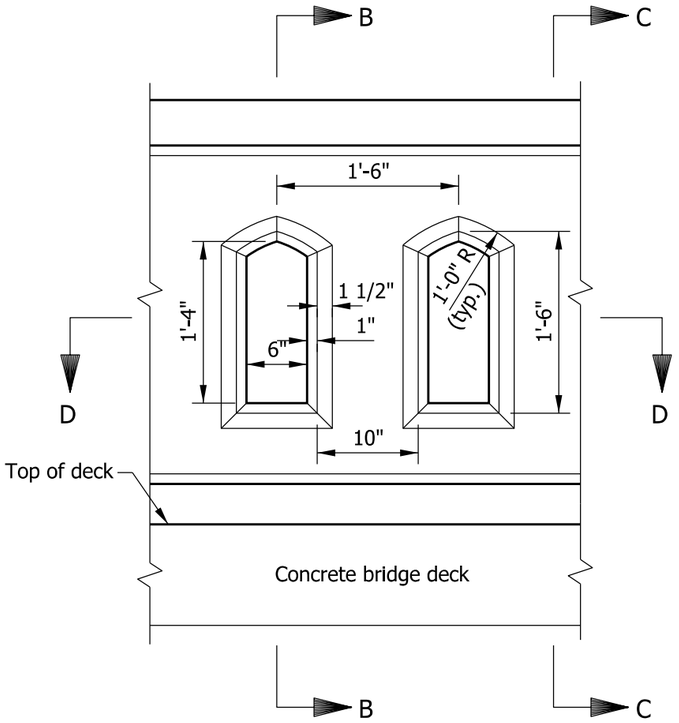
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTX-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



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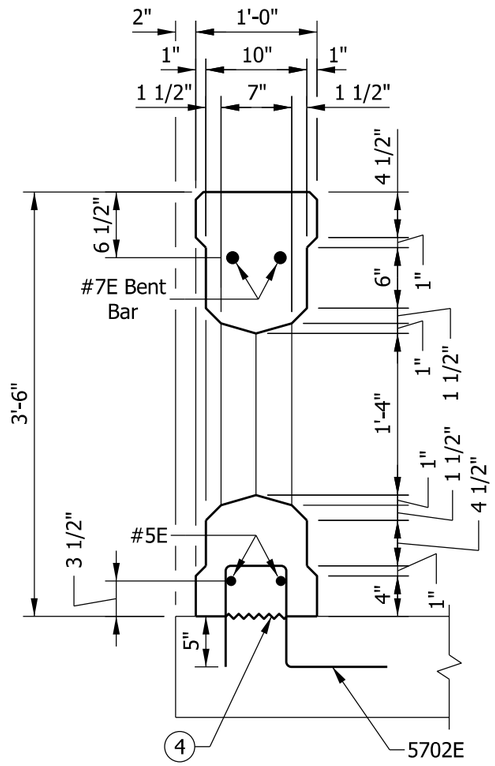
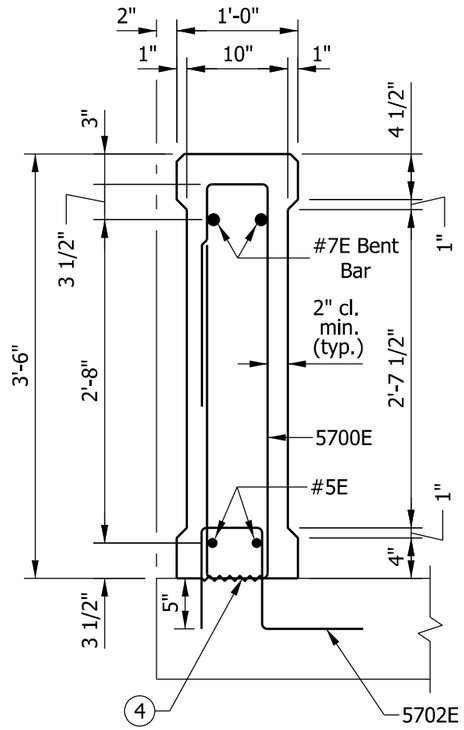


SECTION B-B

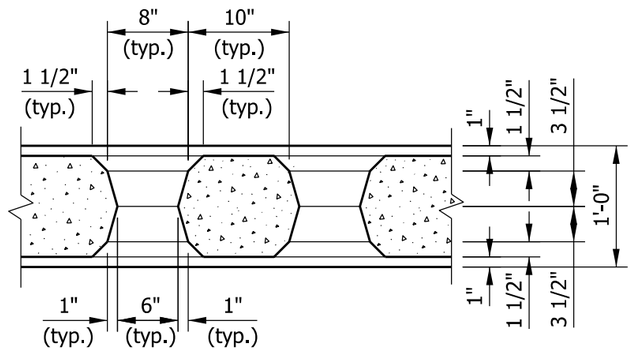


SECTION C-C

NOTES

1. All reinforcing bars designated E shall be epoxy coated.
2. All chamfered edges shall be 3/4".
3. See Standard Drawing E 706-BRTX-04 for reinforcing-bar diagrams.

(4) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.



SECTION D-D

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, TX
WINDOW DETAILS

SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTX-02

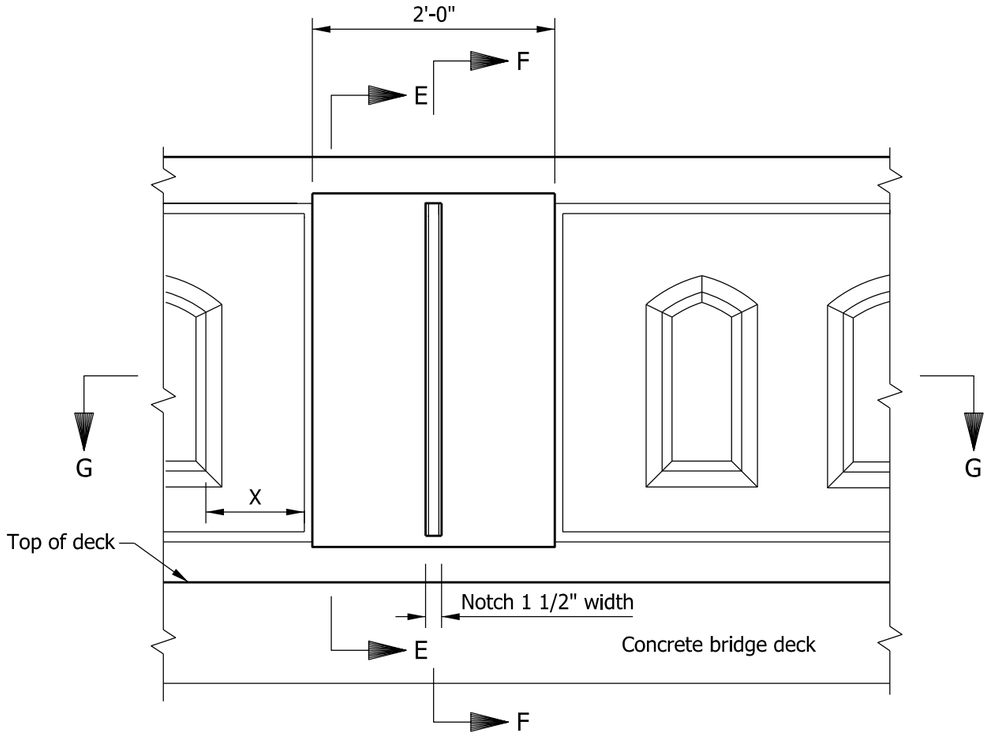
RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

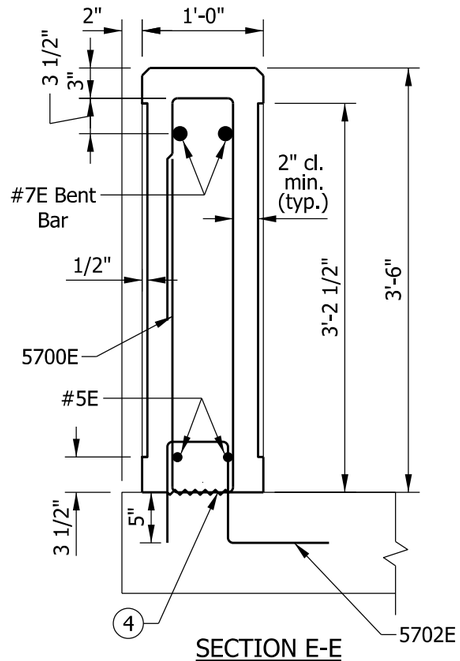
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

NOTES

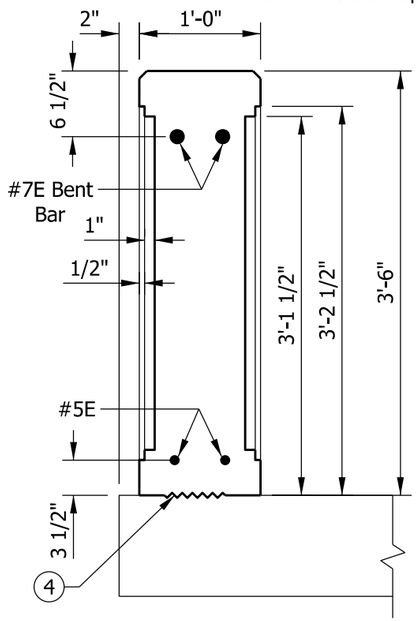
1. All reinforcing bars designated E shall be epoxy coated.
2. All chamfered edges shall be 3/4".
3. See Standard Drawing E 706-BRTX-04 for reinforcing-bar diagrams.
4. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.
5. Adjust dimension X to fit the span length, depending upon the number of window openings.



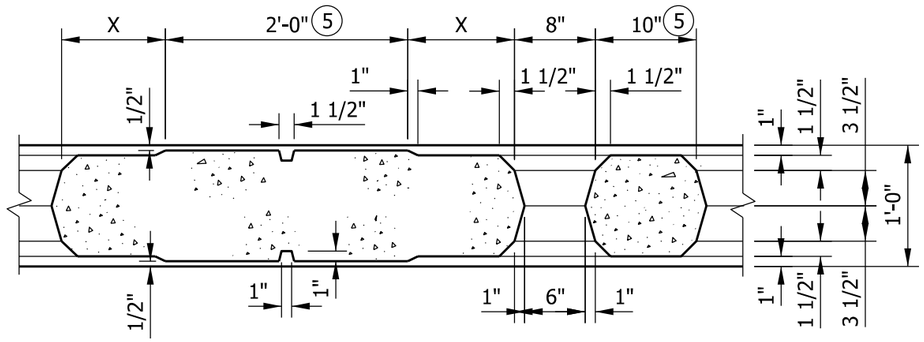
ELEVATION



SECTION E-E

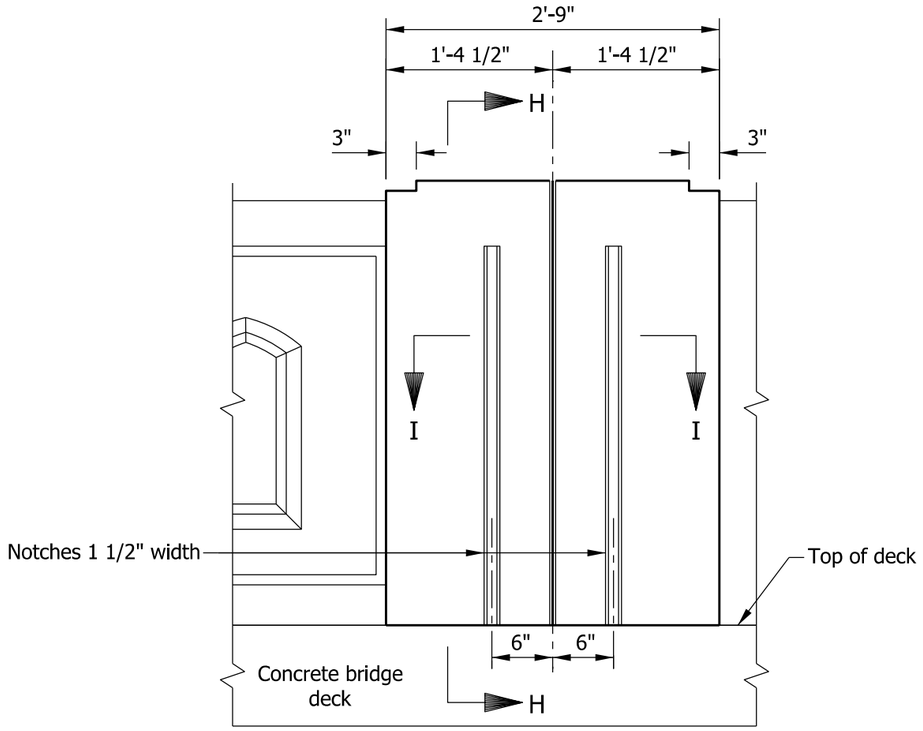


SECTION F-F



SECTION G-G

INDIANA DEPARTMENT OF TRANSPORTATION	
RAILING, TX SPAN PILASTER SEPTEMBER 2012	
STANDARD DRAWING NO. E 706-BRTX-03	
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER	/s/ Richard L. VanCleave 09/04/12 SUPERVISOR, ROADWAY STANDARDS DATE /s/ Mark A. Miller 09/04/12 CHIEF ENGINEER DATE



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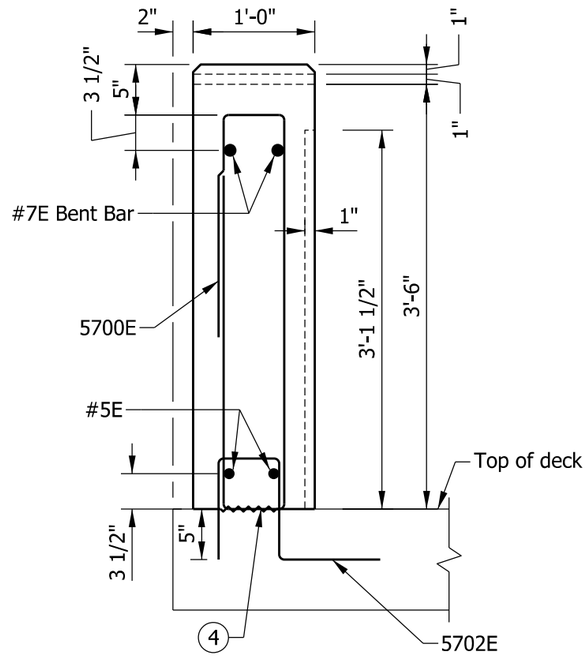
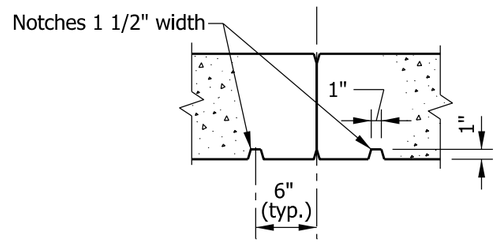


SECTION H-H

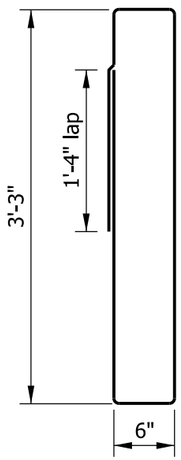


SECTION I-I

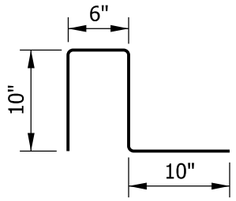
NOTES

1. All reinforcing bars designated E shall be epoxy coated.
2. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.
3. All chamfered edges shall be 3/4".

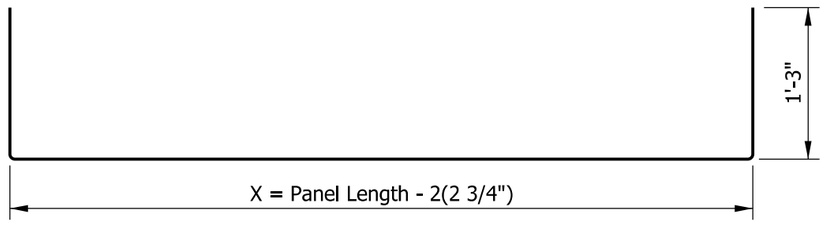
(4) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.



5700E x 8'-10"



5702E x 2'-2"



#7E BENT BAR x (X + 2'-6")

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING, TX
PIER OR END BENT PILASTER

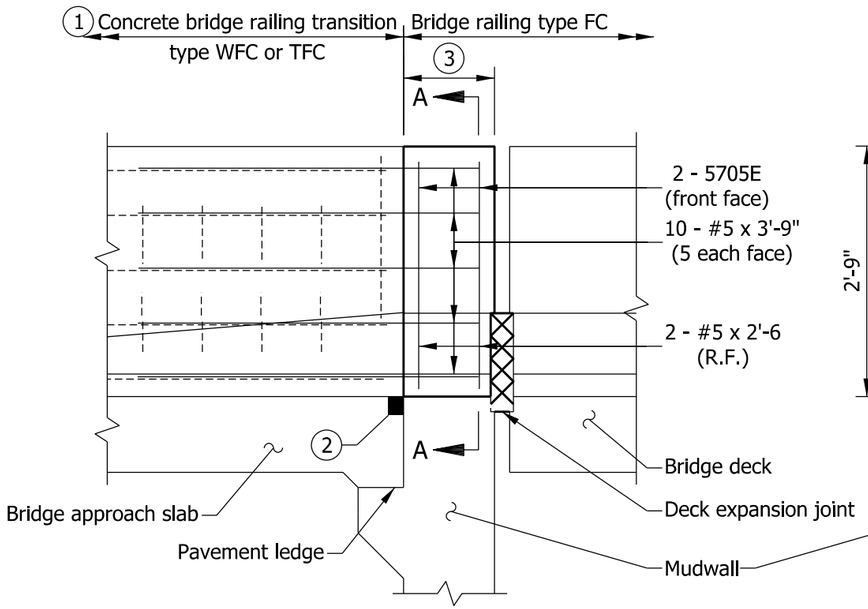
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-BRTX-04

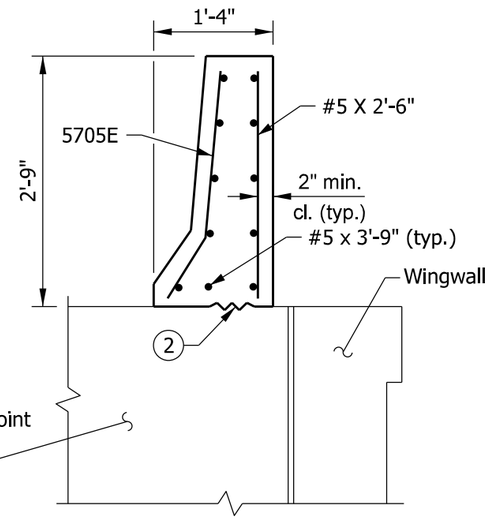
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

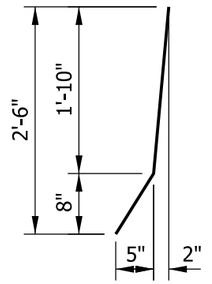
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PART ELEVATION



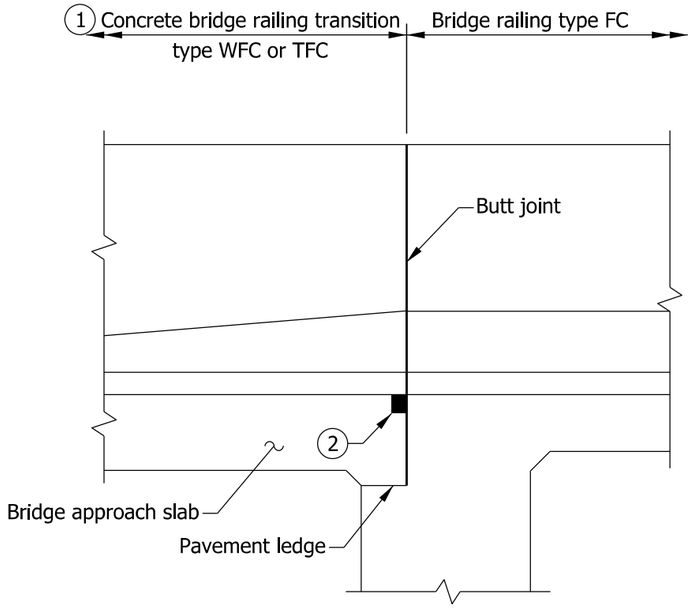
SECTION A-A



5705E x 2'-8"

NOTES

1. See Standard Drawings E 706-TWFC-01 through -03 for concrete bridge railing transition type WFC. See Standard Drawings E 706-TTFC-01 through -03 for concrete bridge railing transition type TFC.
2. See Standard Drawing E 609-BRJT-01 for joint type I-A.
3. This shall be part of the concrete bridge railing, but it shall be poured with the concrete bridge-railing transition. The minimum length shall be equal to the width of the mudwall. See Standard Drawing E 706-BRSF-01 for bridge railing type FC dimensions.
4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.



DETAIL AT INTEGRAL END BENT

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE RAILING TRANSITION WFC OR TFC DETAILS AT END BENT

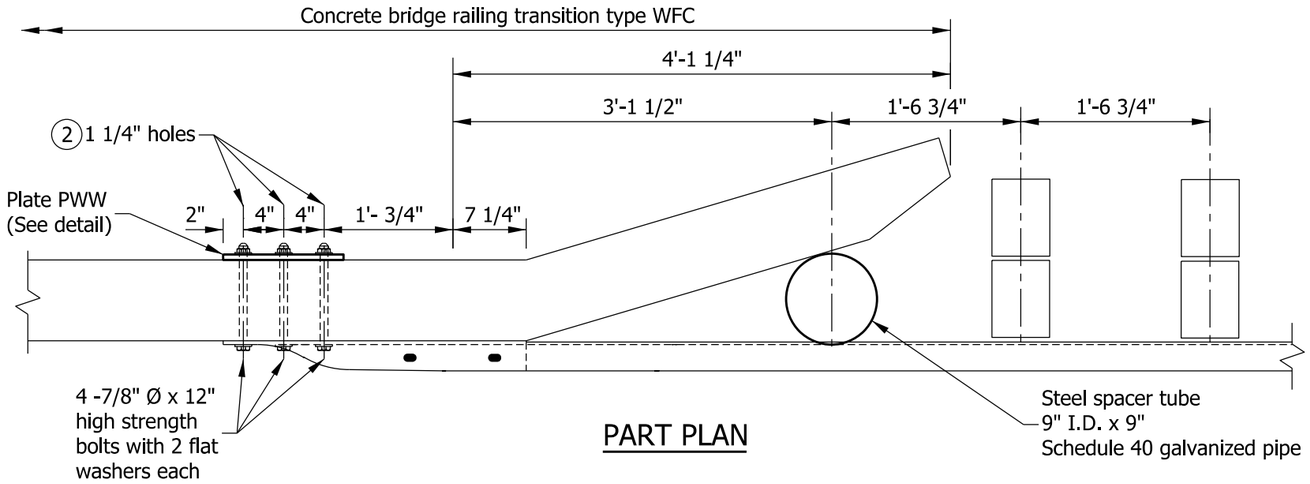
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-CBRT-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PART PLAN

NOTES

1. See Standard Drawing E 706-TWFC-01 through -03 for concrete bridge railing transition type WFC. See Standard Drawings E 601-TWGB-01 through -03 for guardrail transition type WGB .

(2) Preformed holes, for connection of the guardrail transition type WGB to the end of the concrete bridge railing transition type WFC.

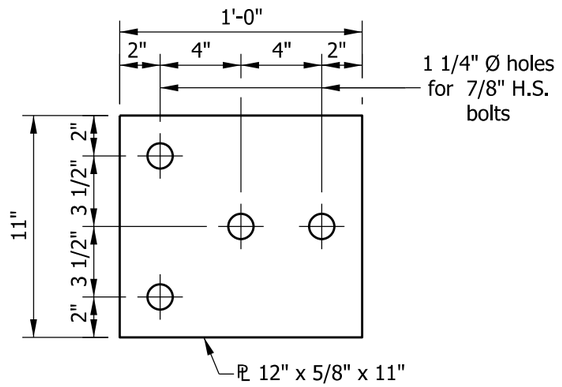
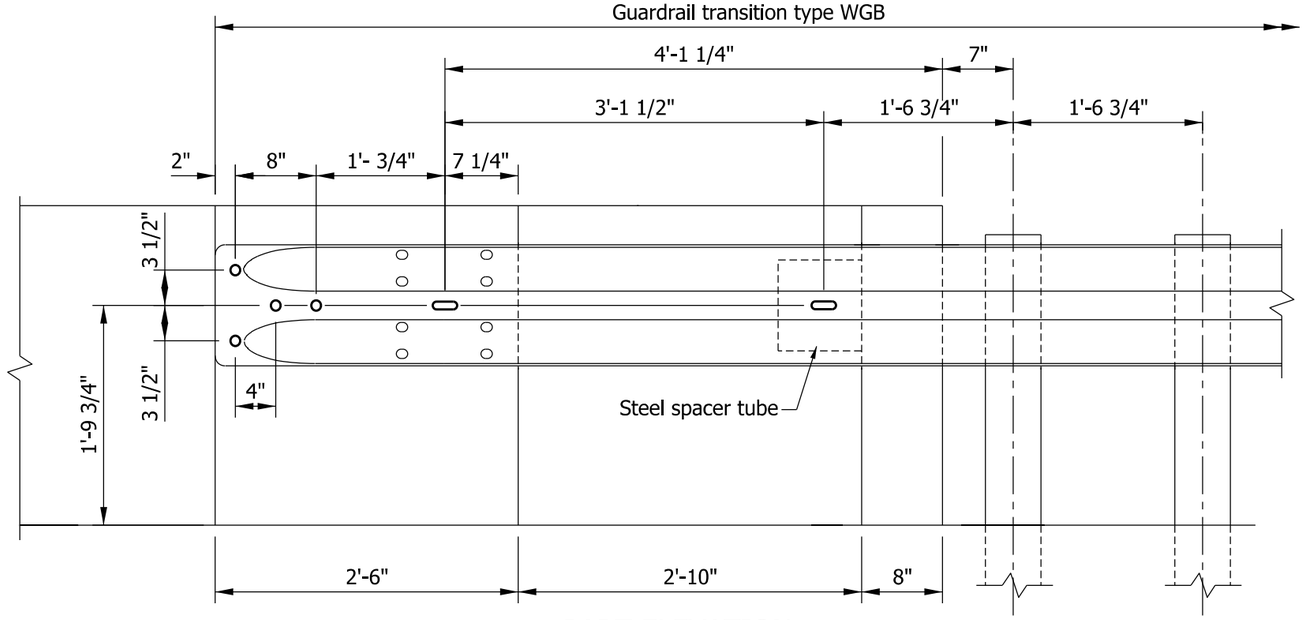


PLATE PWW



PART ELEVATION

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE RAILING TRANSITION WFC
ATTACHMENT OF GUARDRAIL

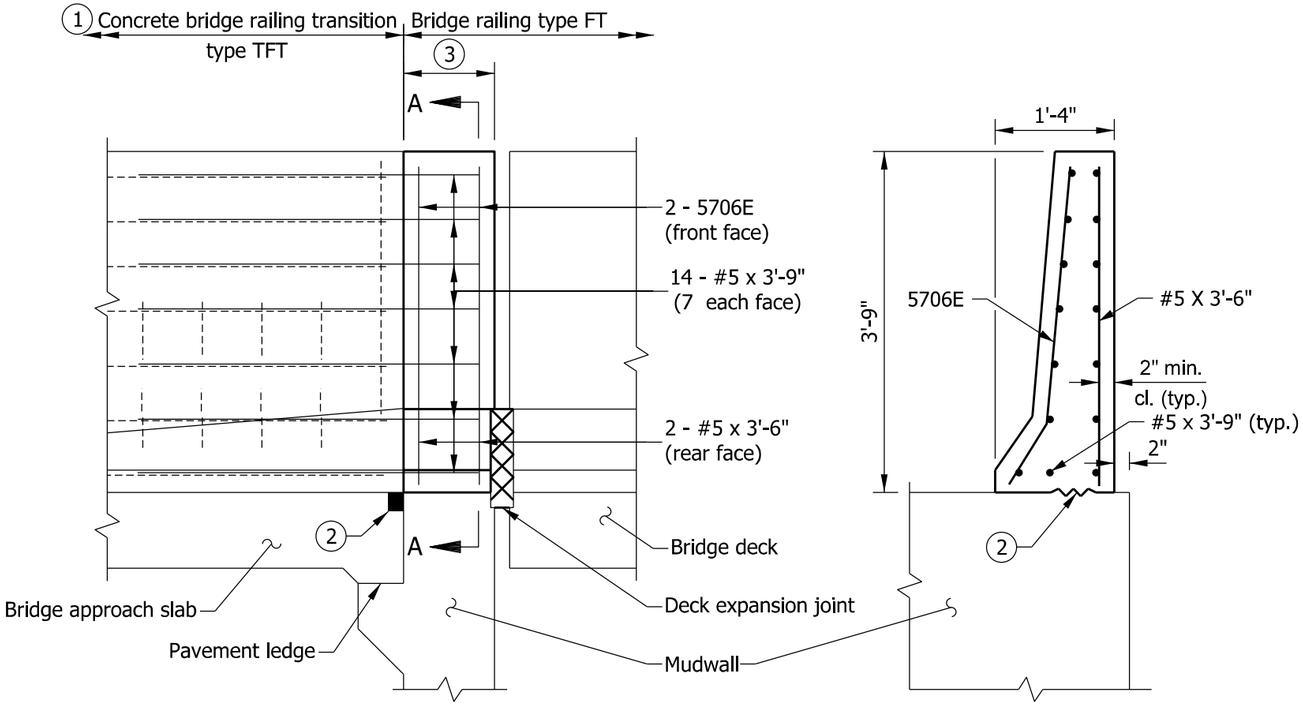
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-CBRT-02

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

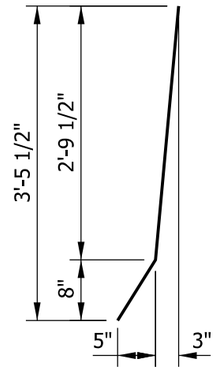
/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PART ELEVATION

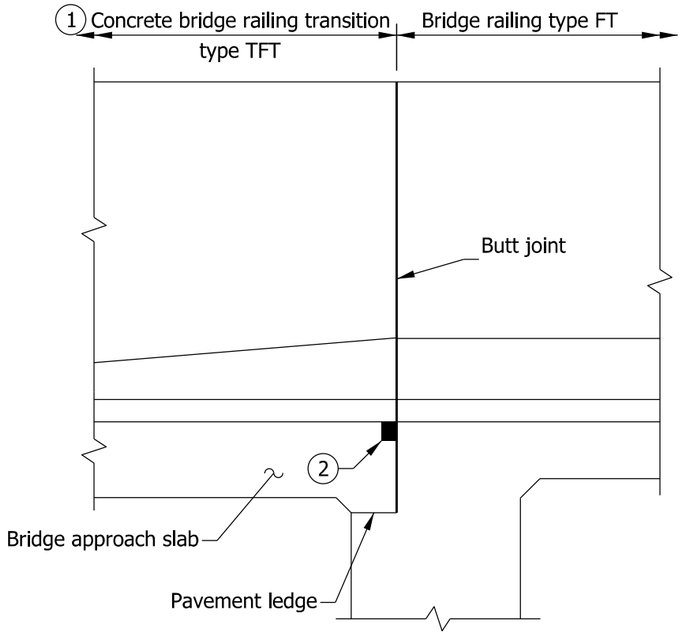
SECTION A-A



5706E x 3'-7"

NOTES

1. See Standard Drawings E 706-TTFT-01 through -03 for concrete bridge railing transition type TFT details.
2. See Standard Drawing E 609-BRJT-01 for joint type I-A.
3. This shall be part of the concrete bridge railing, but it shall be poured with the concrete bridge-railing transition. The minimum length shall be equal to the width of the mudwall. See Standard Drawing E 706-BRSF-02 for bridge railing type FT dimensions.
4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending diagrams and notes.



DETAIL AT INTEGRAL END BENT

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE RAILING TRANSITION TFT
DETAILS AT END BENT

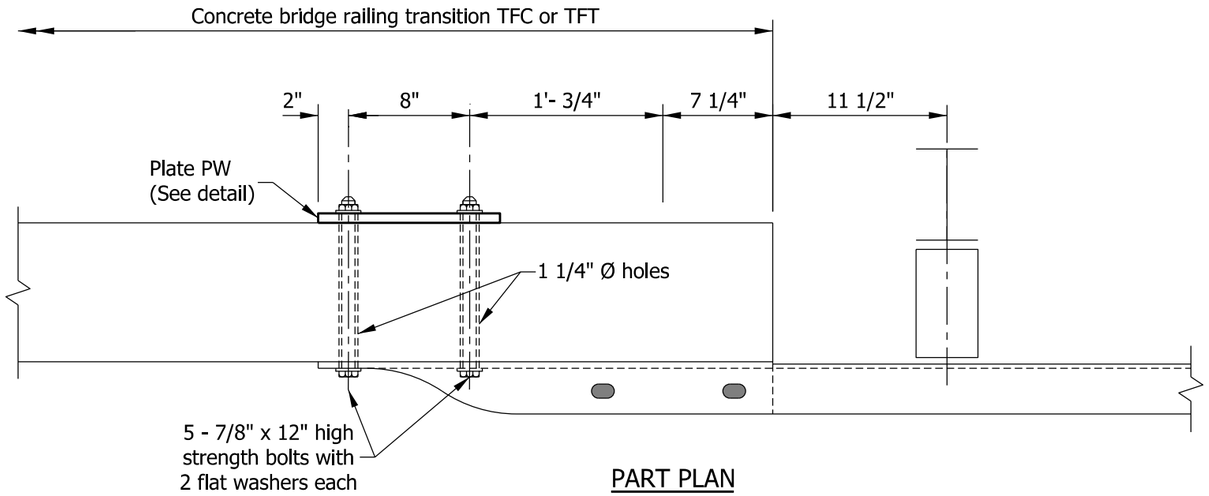
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-CBRT-03

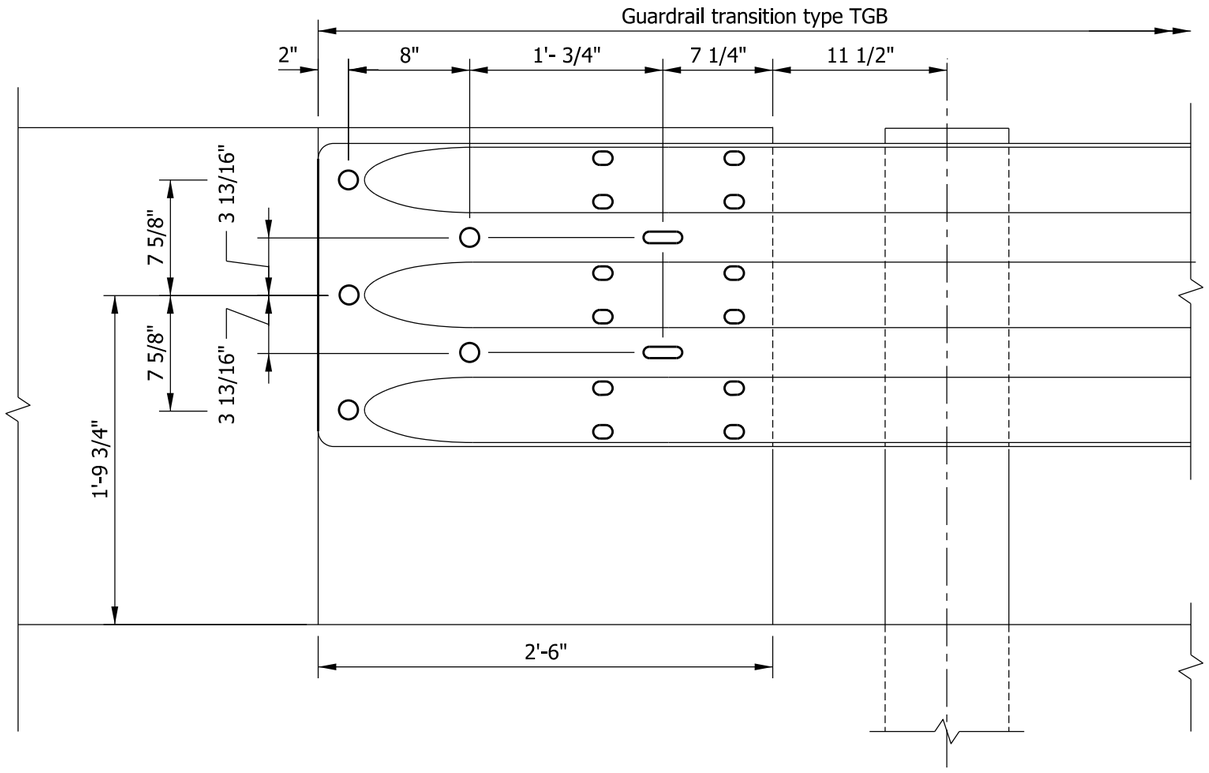
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PART PLAN



PART ELEVATION

NOTES

1. See Standard Drawings E 706-TTFC-01 through -03 for concrete bridge railing transition type TFC. See Standard Drawings E 706-TTFT-01 through -03 for concrete bridge railing transition type TFT. See Standard Drawings E 601-TTGB-01 through -05 for guardrail transition type TGB.

2 Preformed holes, for connection of the guardrail transition type TGB to the end of the concrete bridge railing transition type TFC or TFT.

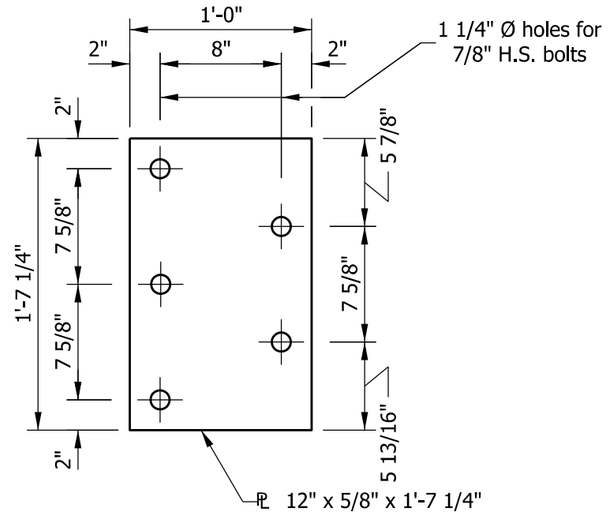


PLATE PW

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE RAILING TRANSITION TFC OR TFT ATTACHMENT OF GUARDRAIL

SEPTEMBER 2012

STANDARD DRAWING NO. E 706-CBRT-04

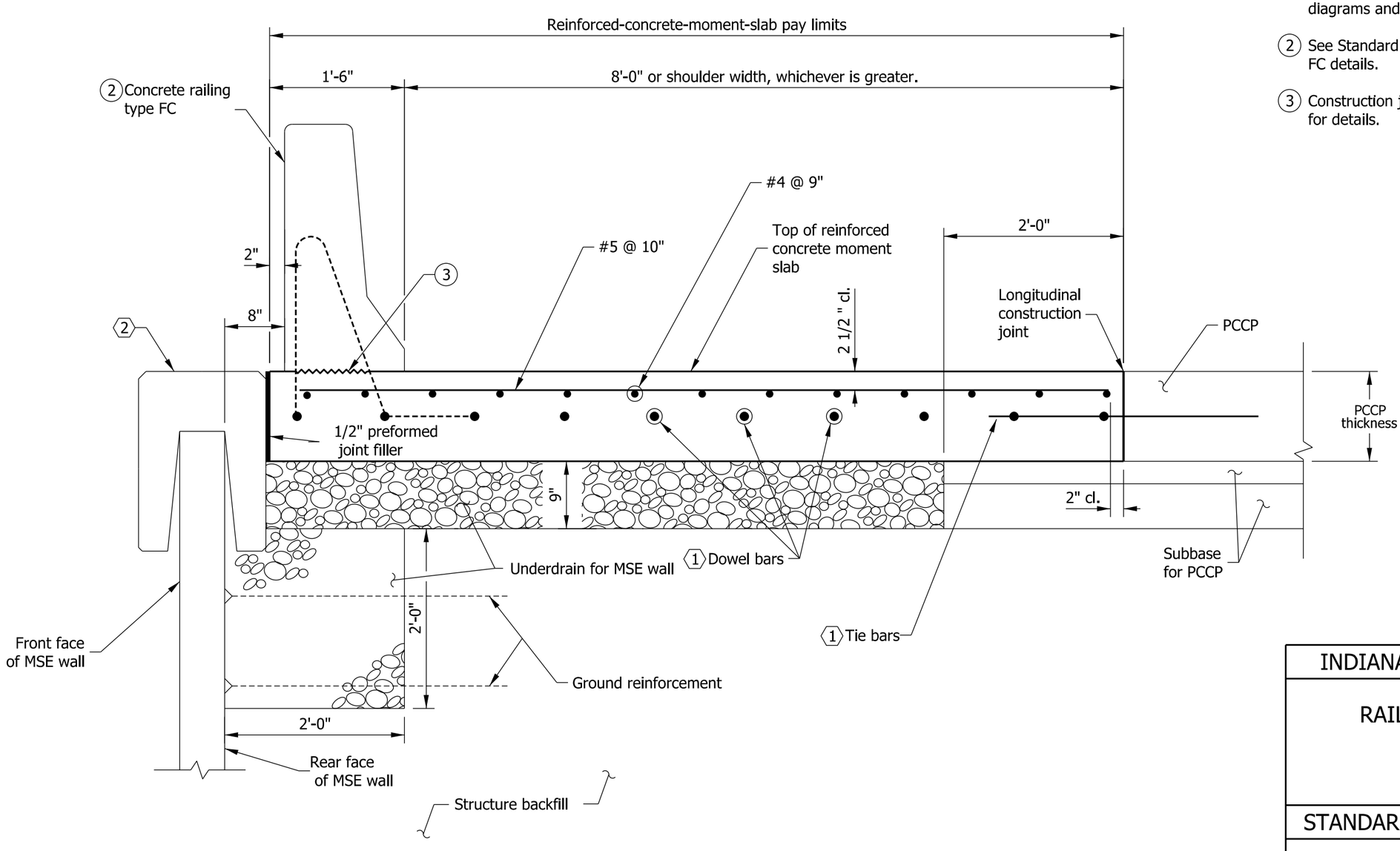
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12

SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12

CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.

(2) See Standard Drawing E 706-BRSF-01 for concrete railing type FC details.

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FC AND MOMENT SLAB ASIDE MSE WALL - PCCP

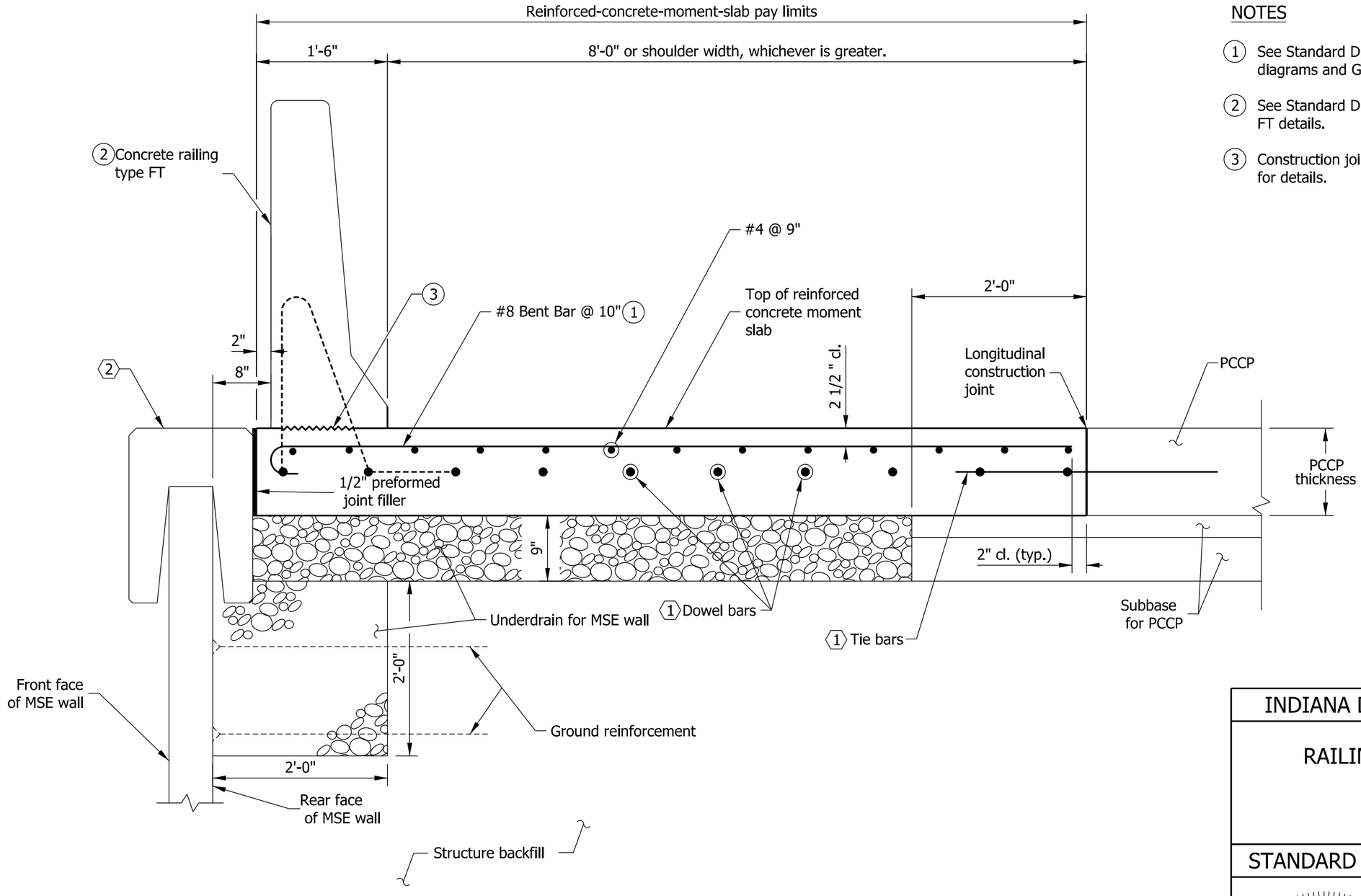
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.
2. See Standard Drawing E 706-BRSF-02 for concrete railing type FT details.
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FT AND MOMENT SLAB ASIDE MSE WALL - PCCP

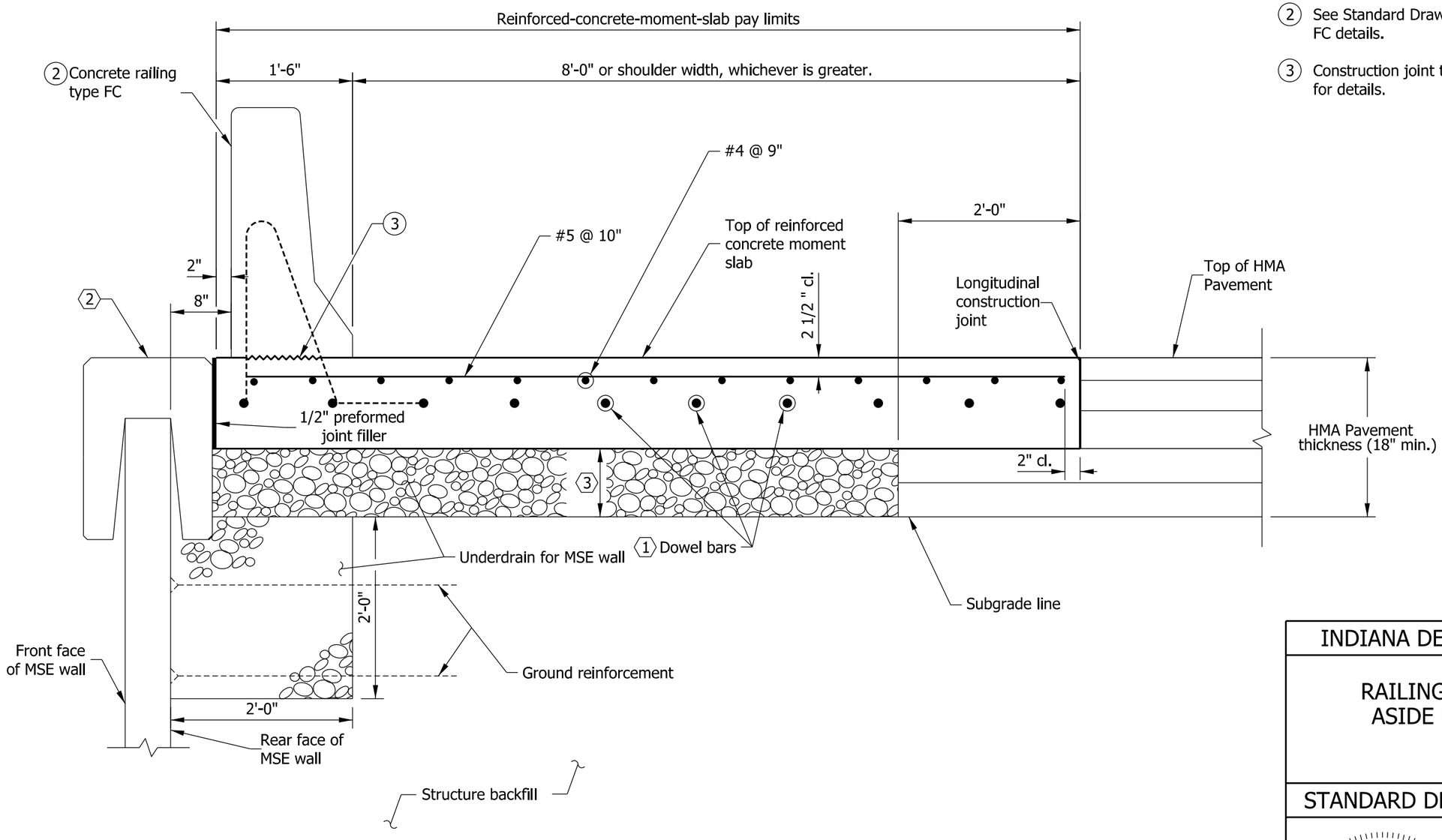
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.

(2) See Standard Drawing E 706-BRSF-01 for concrete railing type FC details.

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FC AND MOMENT SLAB ASIDE MSE WALL - HMA PAVEMENT

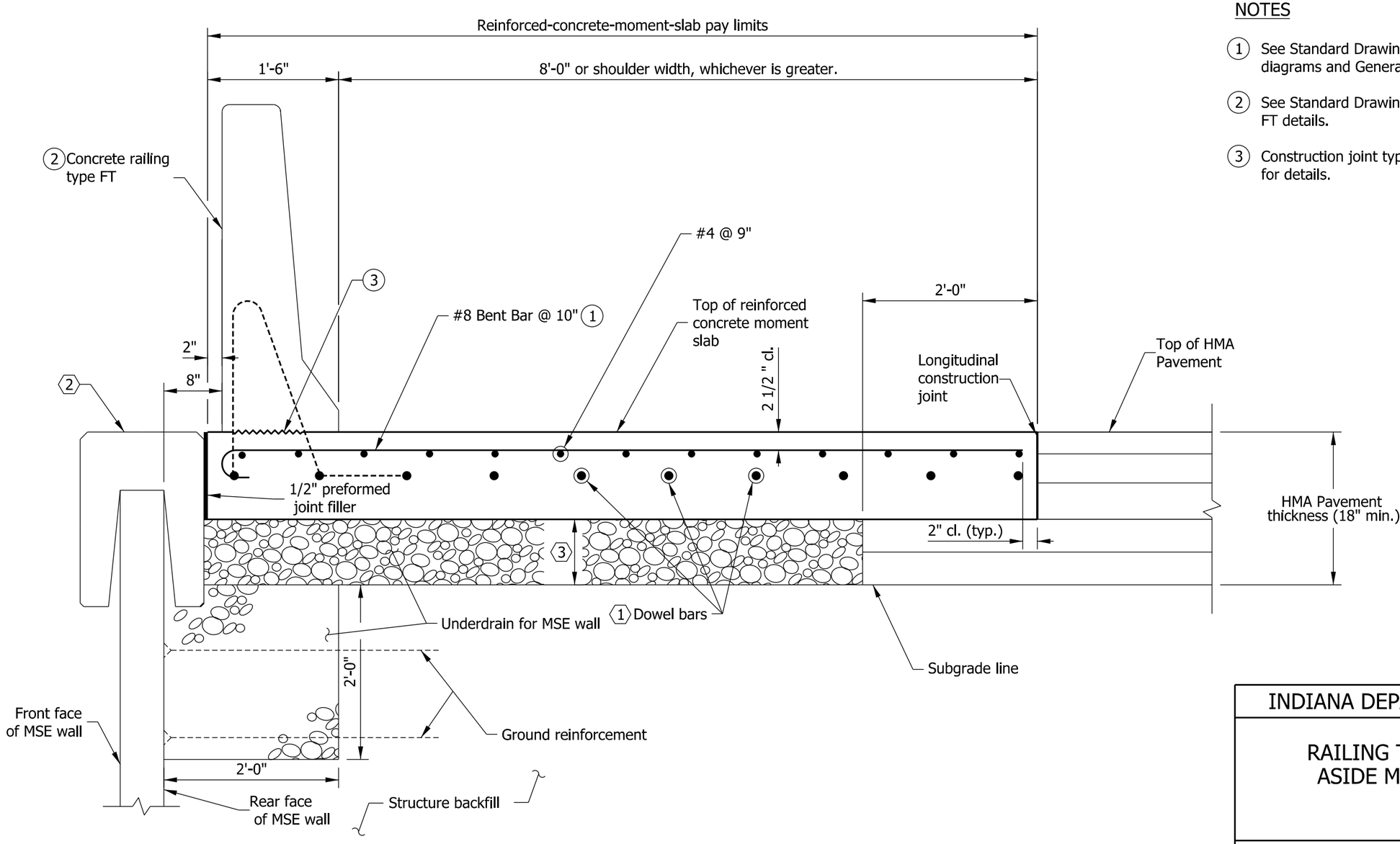
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.
2. See Standard Drawing E 706-BRSF-02 for concrete railing type FT details.
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FT AND MOMENT SLAB ASIDE MSE WALL - HMA PAVEMENT

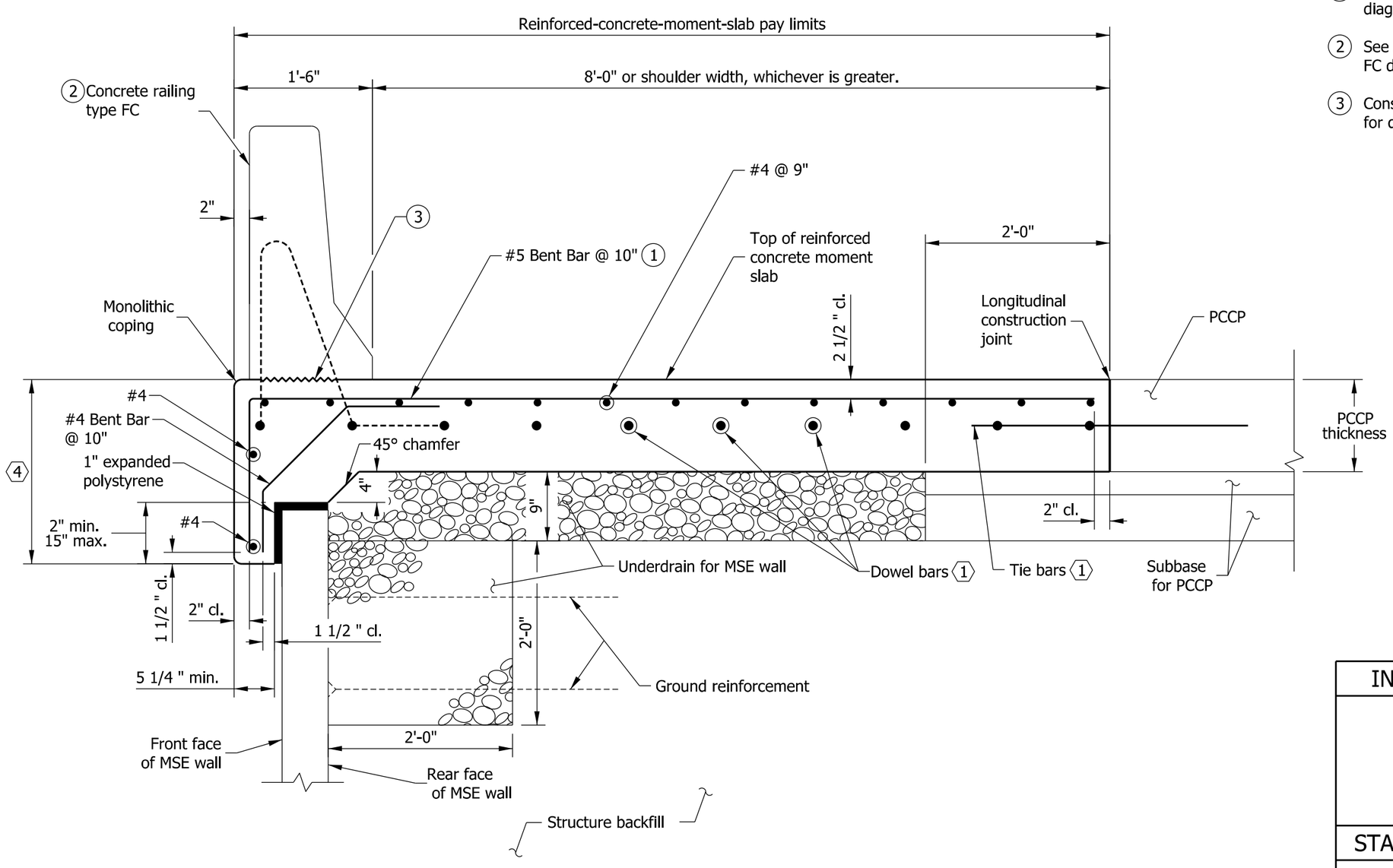
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.
2. See Standard Drawing E 706-BRSF-01 for concrete railing type FC details.
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FC AND MOMENT SLAB ATOP MSE WALL - PCCP

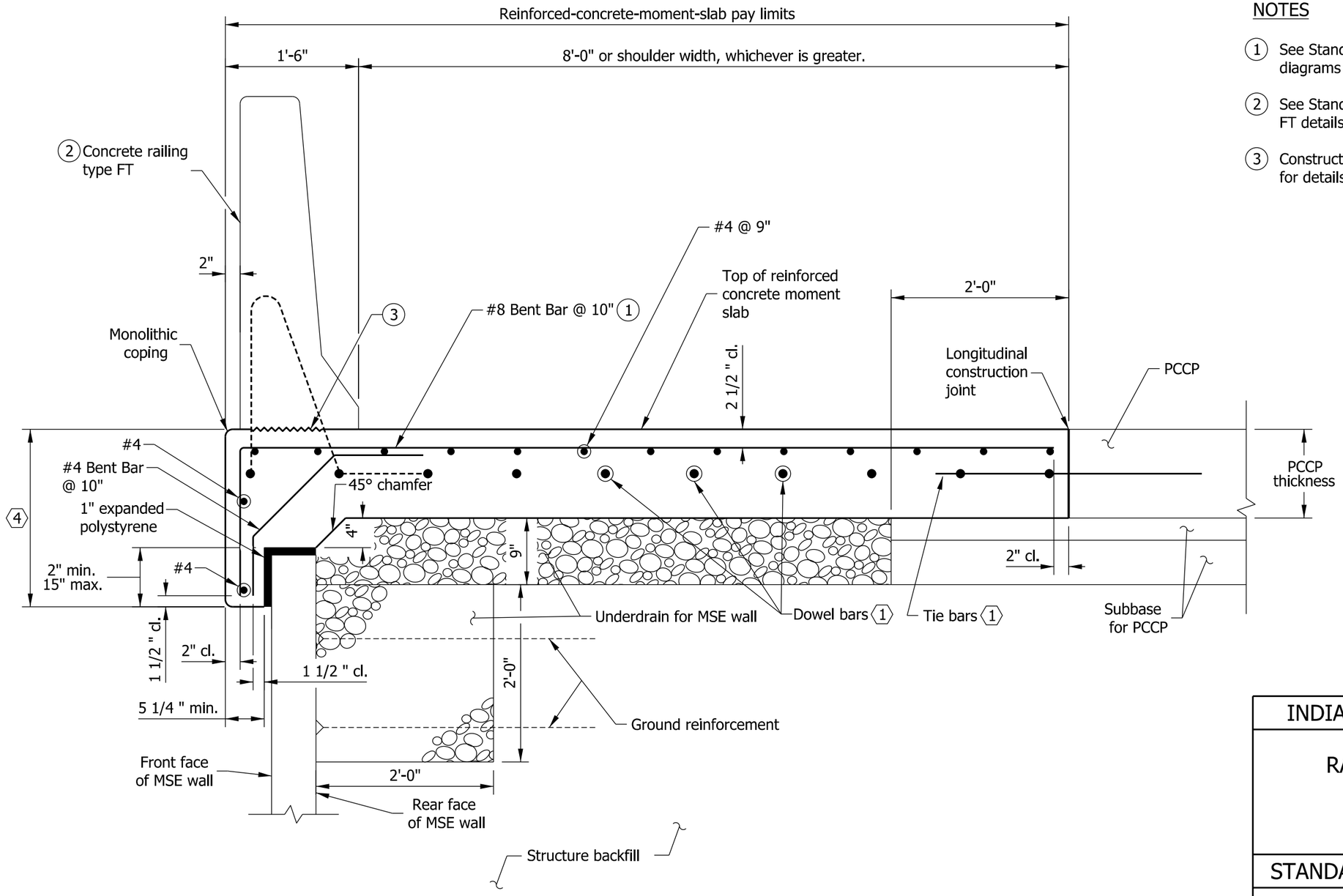
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-05

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.
2. See Standard Drawing E 706-BRSF-02 for concrete railing type FT details.
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FT AND MOMENT SLAB ATOP MSE WALL - PCCP

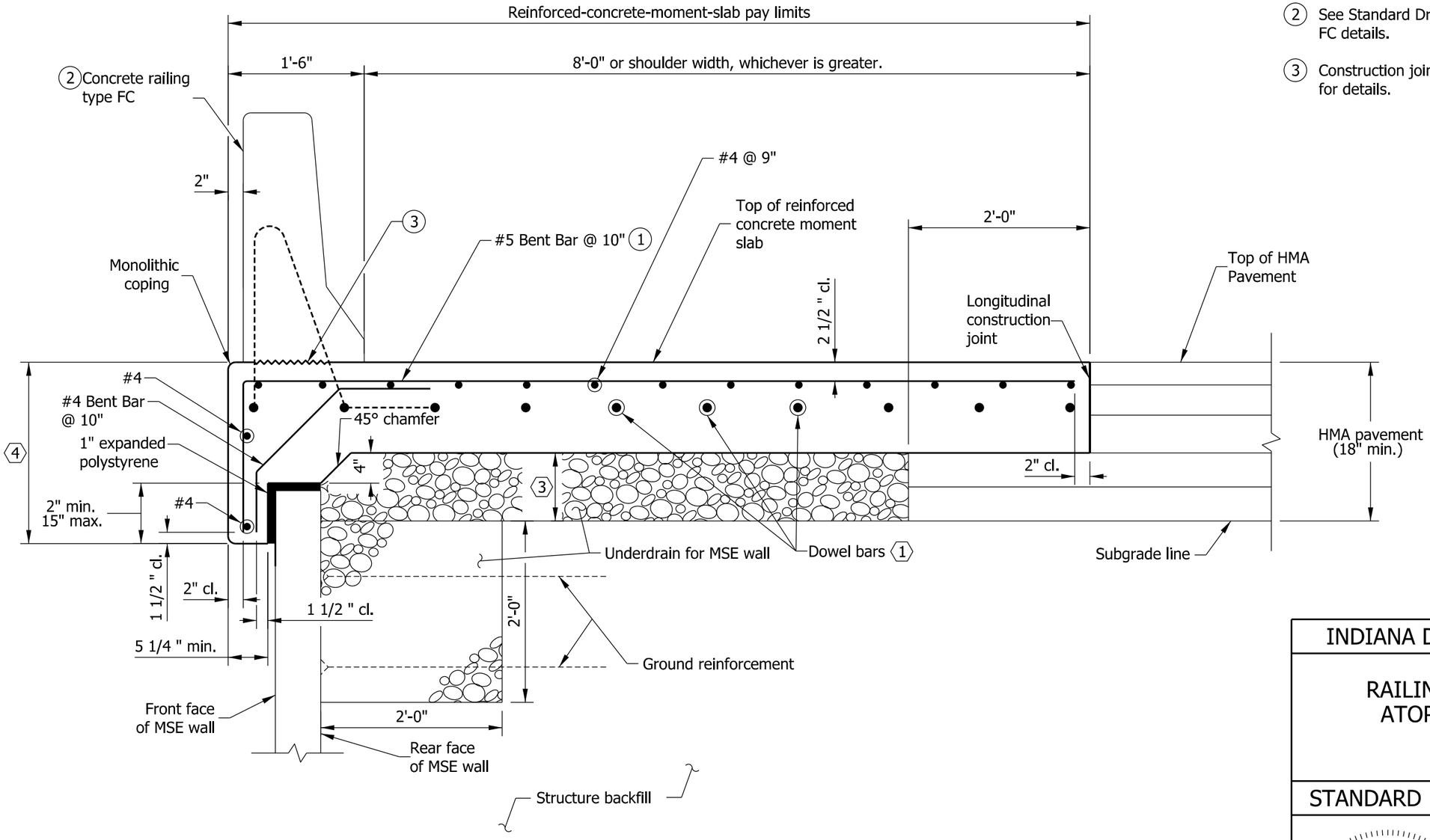
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-06

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.
2. See Standard Drawing E 706-BRSF-01 for concrete railing type FC details.
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FC AND MOMENT SLAB ATOP MSE WALL - HMA PAVEMENT

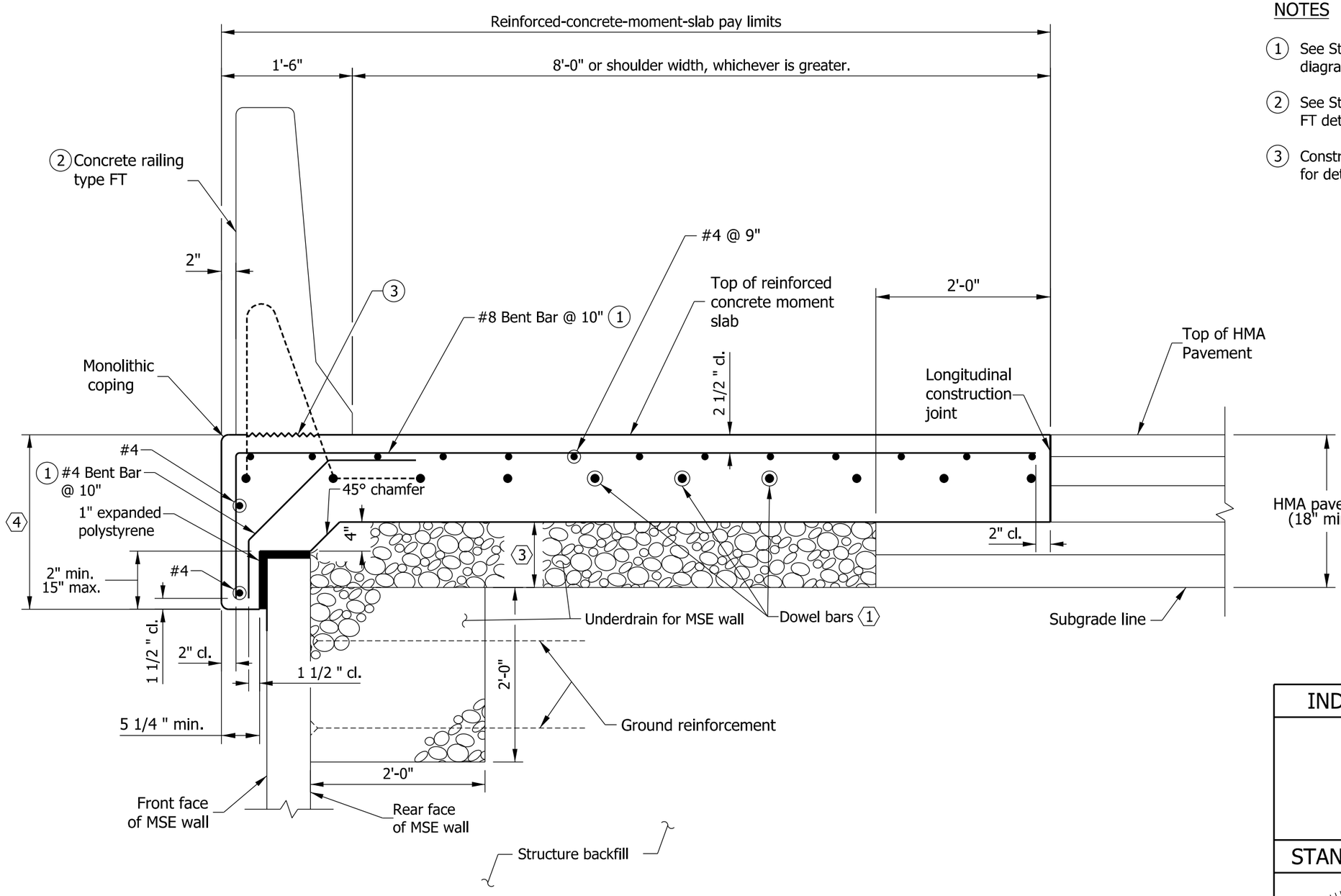
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-07

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



NOTES

1. See Standard Drawing E 706-MSRW-10 for reinforcing-bar diagrams and General Notes ⬡.
2. See Standard Drawing E 706-BRSF-02 for concrete railing type FT details.
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING TYPE FT AND MOMENT SLAB ATOP MSE WALL - HMA PAVEMENT

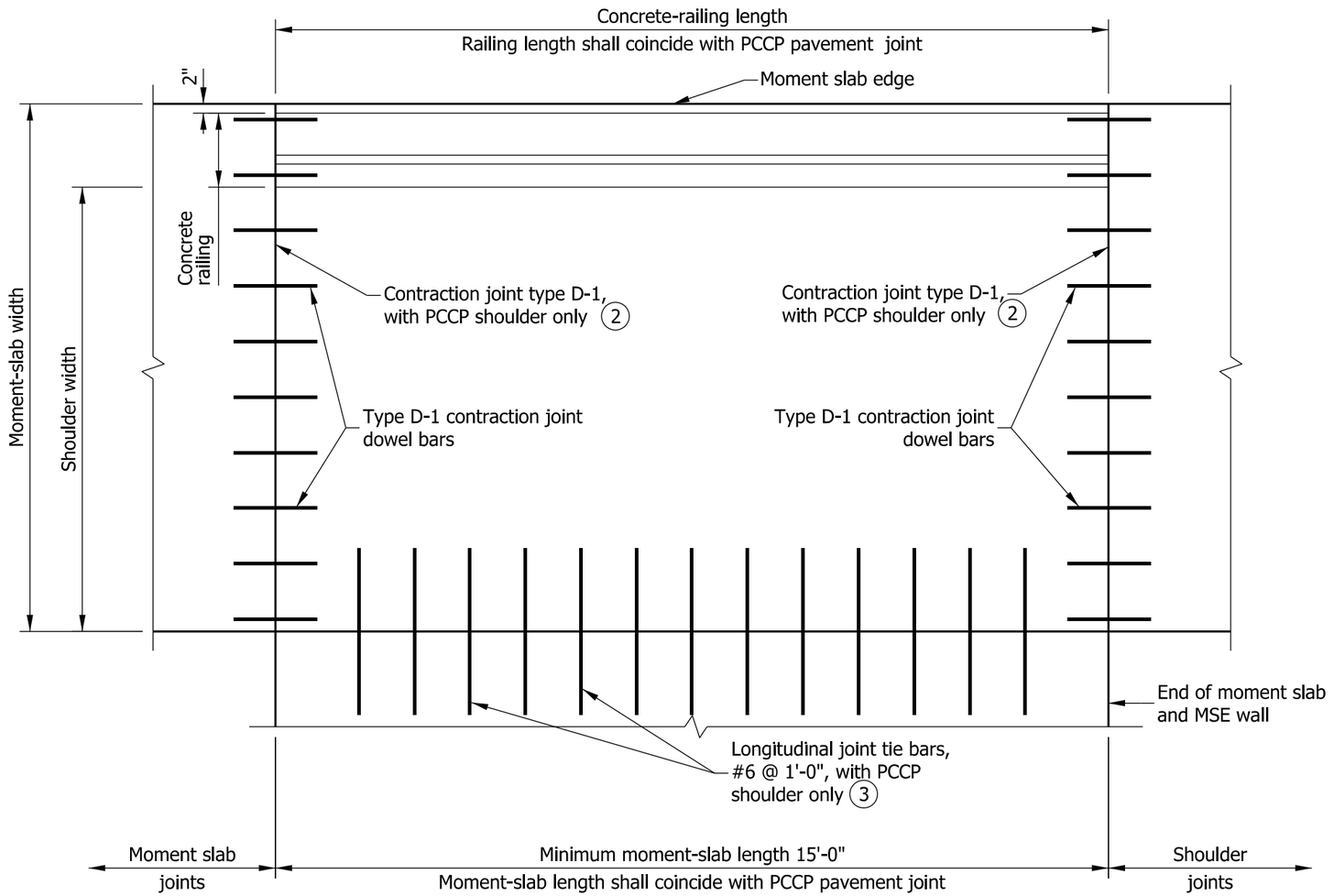
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-08

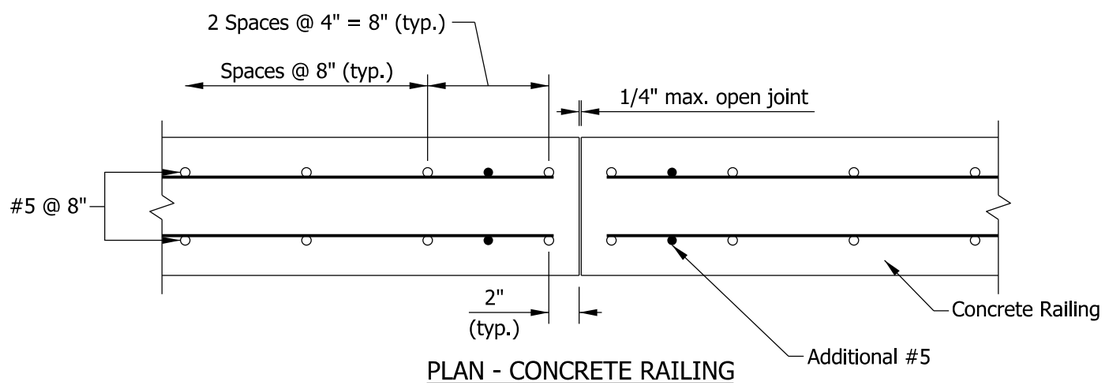
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



PLAN - REINFORCED CONCRETE MOMENT SLAB JOINTS



PLAN - CONCRETE RAILING
ADDITIONAL VERTICAL STEEL

NOTES

1. Where used with HMA mainline pavement, concrete railing and moment-slab lengths shall coincide and be spaced at 18'-0".

(2) See Standard Drawing E 503-CCPJ-01 for contraction joint type D-1 details.

(3) See Standard Drawing E 503-CCPJ-02 for joint tie bars details.

INDIANA DEPARTMENT OF TRANSPORTATION

MOMENT SLAB JOINTS

SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-09

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

GENERAL NOTES

〈1〉 See Standard Drawing E 706-MSRW-09 for plan view and additional reinforcing bars in the railing at the railing joints.

〈2〉 See Standard Drawing E 731-MSEW-01 for coping details.

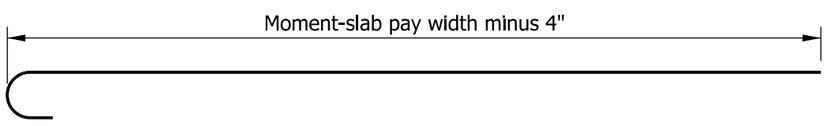
〈3〉 The thickness of the coarse aggregate No. 8 shall be equal to the combined thicknesses of the first two lifts of HMA, but not less than 6 in.

〈4〉 For moment slab thickness ≤ 15 in., this shall be 2'-0".
For moment slab thickness > 15 in., this shall be moment-slab thickness plus 12 in.

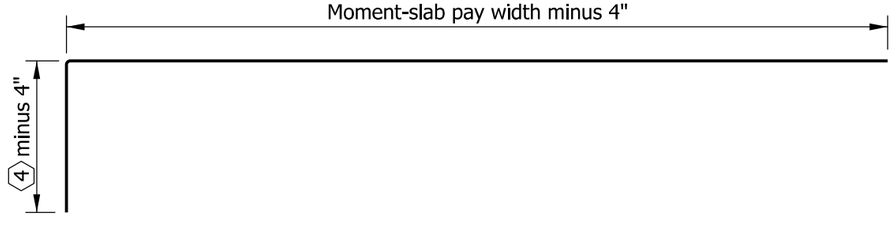
5. The moment slab shall be used only within the limits of the MSE wall.

6. Reinforcing bars in the moment slab shall be epoxy coated.

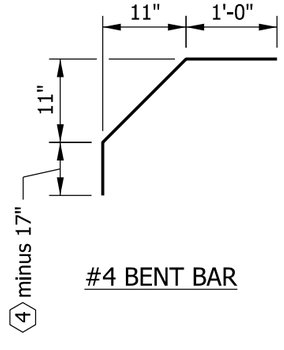
7. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending diagrams and notes.



#8 BENT BAR
WITH STANDARD 180° HOOK



#5 BENT BAR OR #8 BENT BAR
WITH STANDARD 90° BEND



#4 BENT BAR

INDIANA DEPARTMENT OF TRANSPORTATION

RAILING AND MOMENT SLAB
AT MSE WALL

SEPTEMBER 2012

STANDARD DRAWING NO. E 706-MSRW-10

RICHARD L. VanCLEAVE
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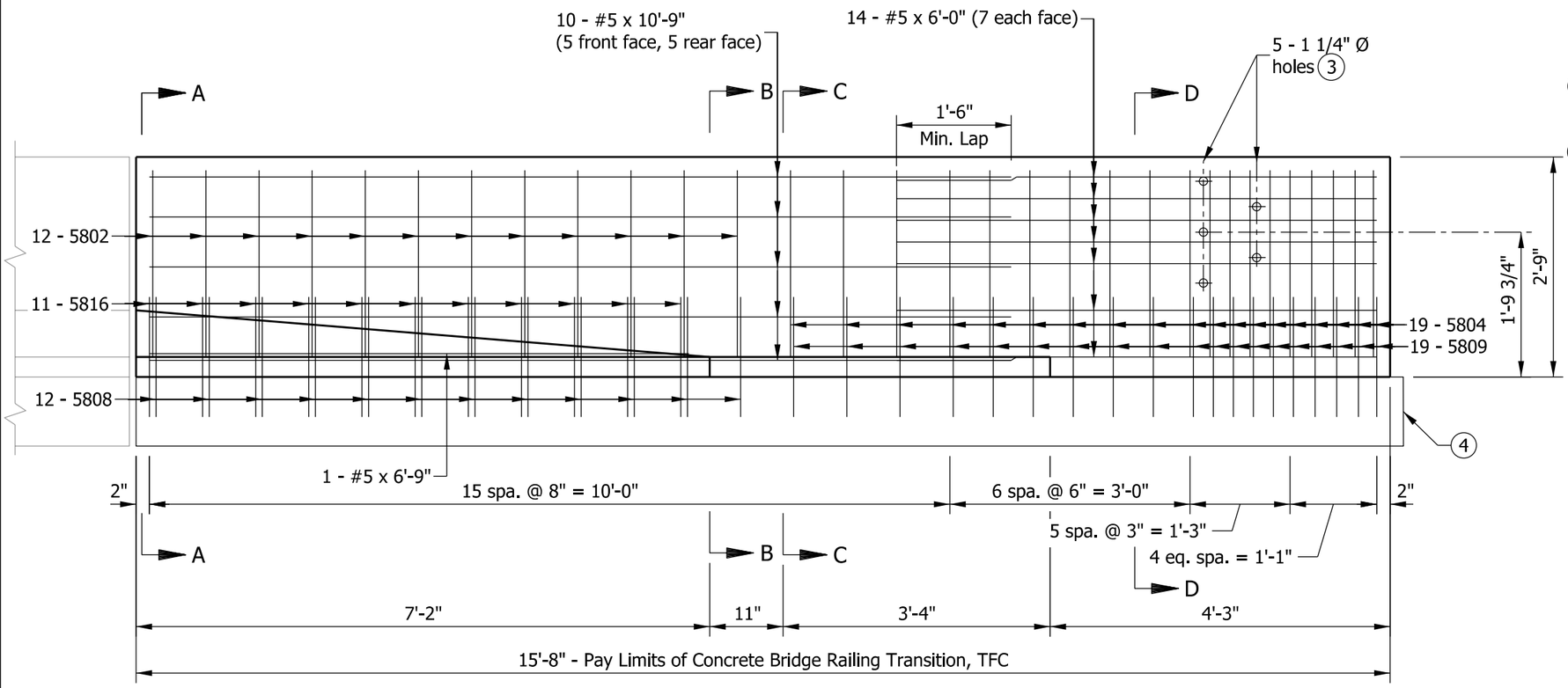
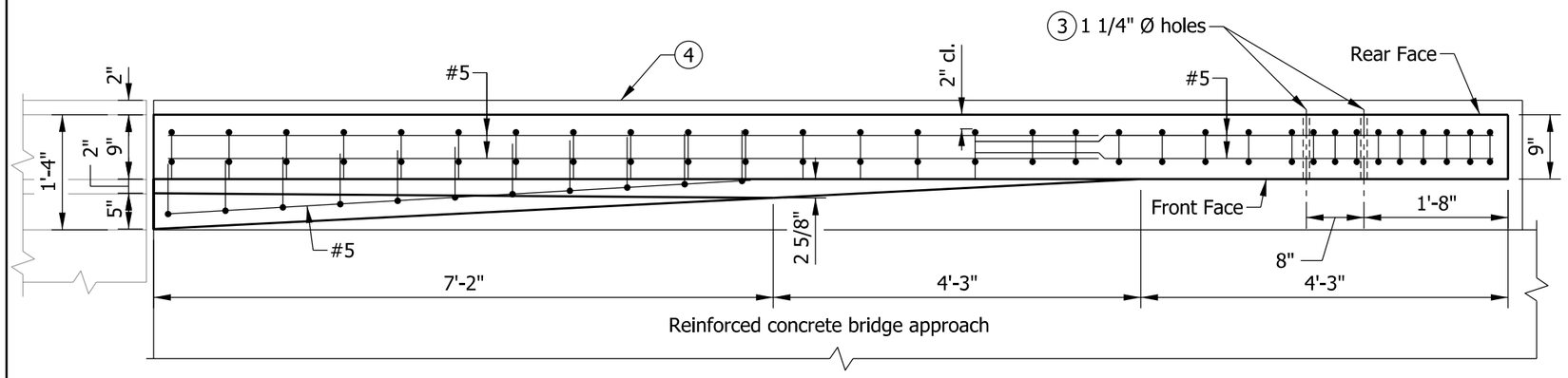
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN

NOTES

1. See Standard Drawing E 706-TTFC-02 for sections.
2. See Standard Drawing E 706-TTFC-03 for reinforcing-bar diagrams and bill of materials.

(3) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 706-CBRT-04 for details.

(4) RCBA extension for bridge railing transition type TFC. See Standard Drawing E 609-TBAE-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

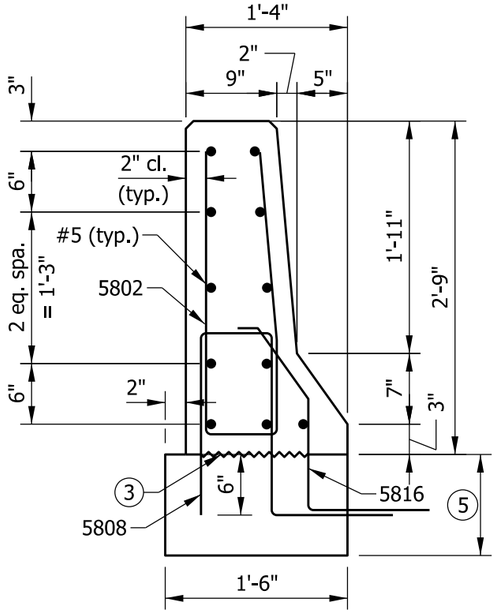
CONCRETE BRIDGE RAILING
TRANSITION TFC
PLAN AND ELEVATION
SEPTEMBER 2013

STANDARD DRAWING NO. E 706-TTFC-01

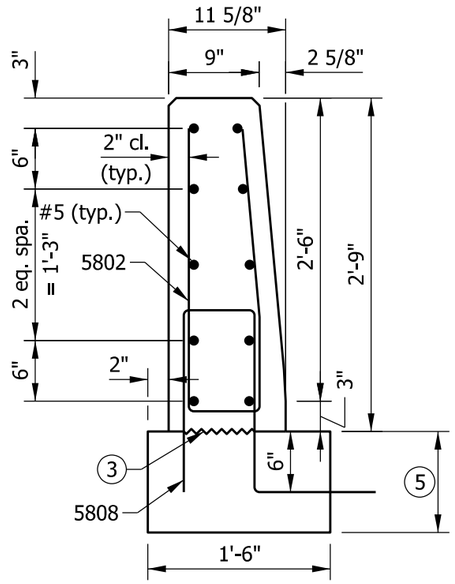
ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 02/04/13
DESIGN STANDARDS ENGINEER DATE

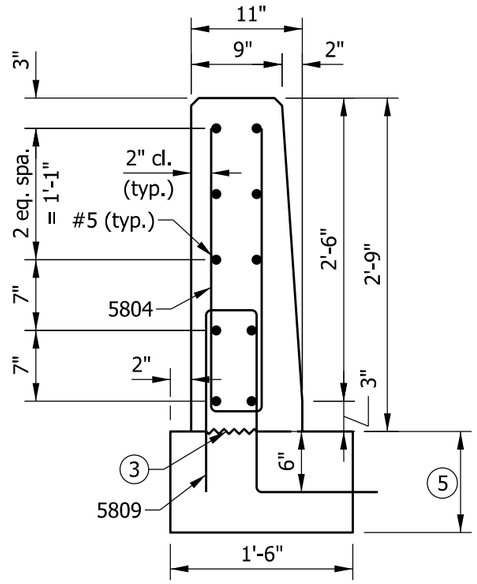
/s/ Mark A. Miller 03/27/13
CHIEF ENGINEER DATE



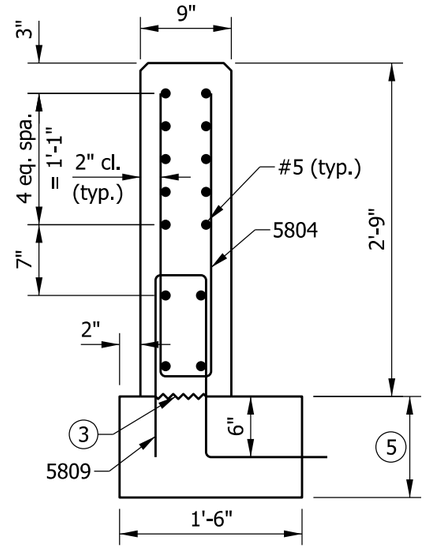
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTES

1. See Standard Drawing E 706-TTFC-01 for elevation and plan.
2. All chamfered edges shall be 3/4".

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

4. See Standard Drawing E 706-TTFC-03 for reinforcing-bar diagrams.

(5) RCBA extension for bridge railing type TFC. See Standard Drawing E 609-TBAE-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING
TRANSITION, TFC
SECTIONS

SEPTEMBER 2013

STANDARD DRAWING NO. E 706-TTFC-02

ELIZABETH W. PHILLIPS
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No.
10200124
STATE OF
INDIANA
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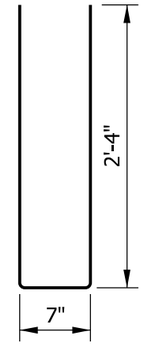
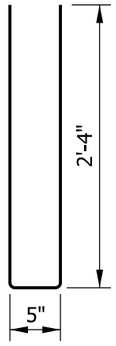
/s/ Elizabeth W. Phillips 02/04/13
DESIGN STANDARDS ENGINEER DATE

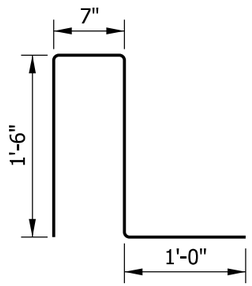
/s/ Mark A. Miller 03/27/13
CHIEF ENGINEER DATE



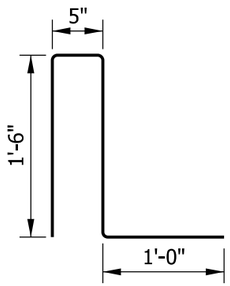
5802 x 5'-3"



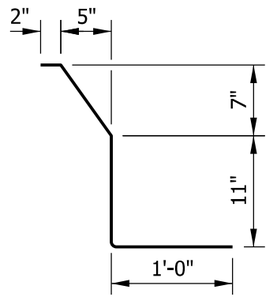
5804 x 5'-1"



5808 x 4'-7"



5809 x 4'-5"



5816 x 2'-10"

NOTE

1. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TFC			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5802	12	5'-3"	
5804	19	5'-1"	
5808	12	4'-7"	
5809	19	4'-5"	
5816	11	2'-10"	
#5	10	10'-9"	
#5	1	6'-9"	
#5	14	6'-0"	
Total Epoxy-Coated Reinforcing Steel			551 LBS
MISCELLANEOUS			
Concrete, Class C			1.2 CYS
Surface Seal			100 SFT

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TFC

SEPTEMBER 2013

STANDARD DRAWING NO. E 706-TTFC-03

ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 02/04/13
DESIGN STANDARDS ENGINEER DATE

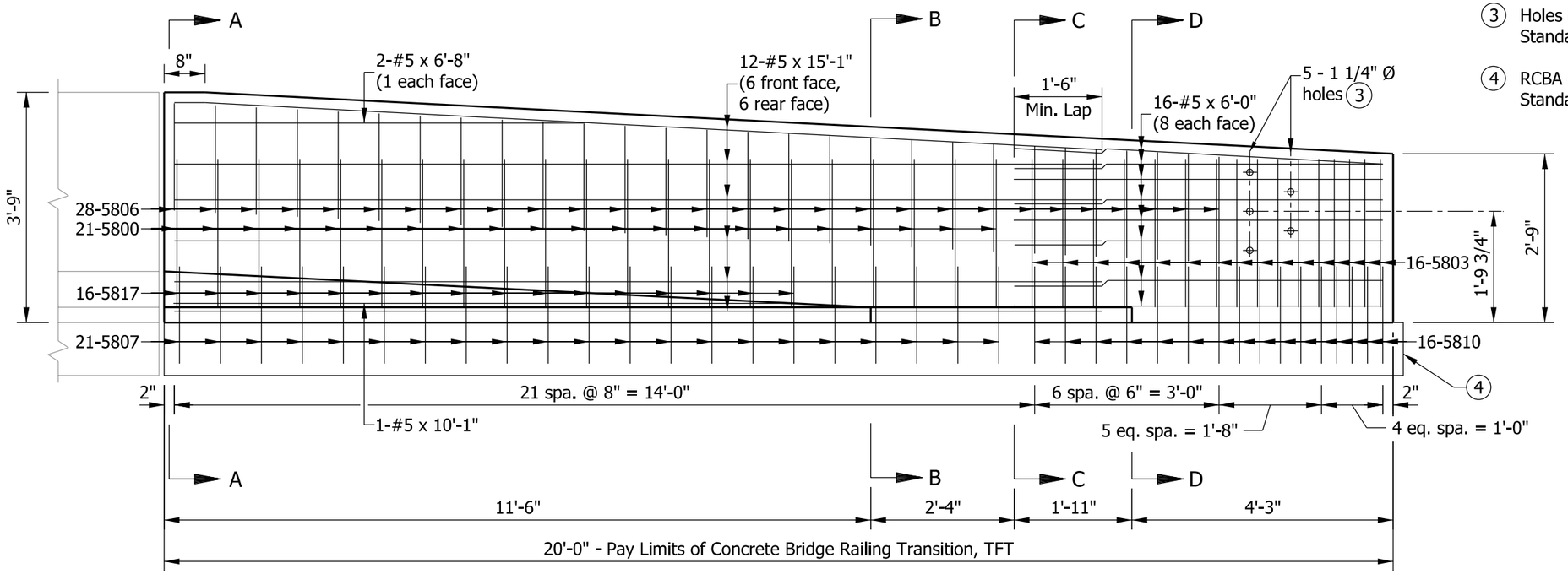
/s/ Mark A. Miller 03/27/13
CHIEF ENGINEER DATE

NOTES

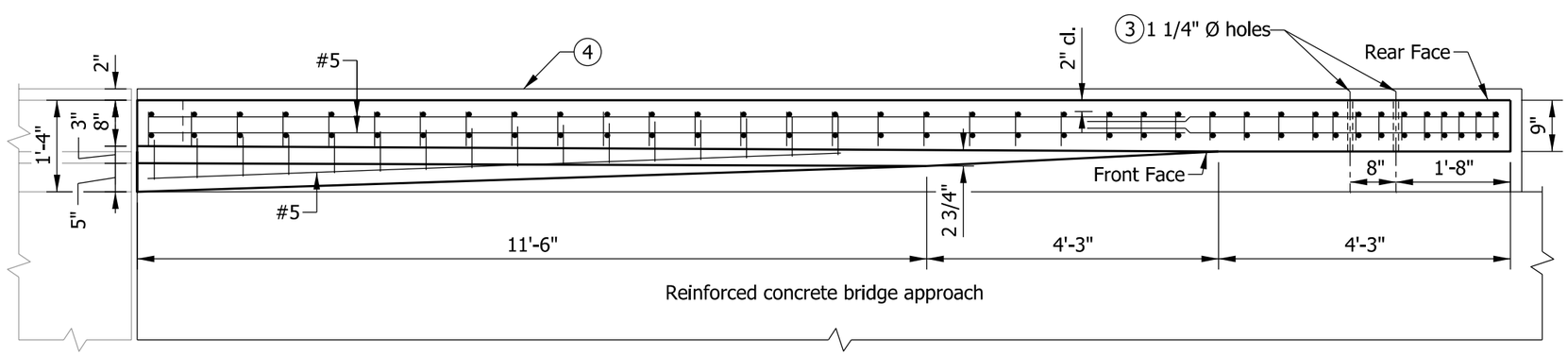
1. See Standard Drawing E 706-TTFT-02 for sections.
2. See Standard Drawing E 706-TTFT-03 for reinforcing-bar diagrams and bill of materials.

(3) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 601-TTGB-01 for details.

(4) RCBA extension for bridge railing transition type TFT. See Standard Drawing E 609-TBAE-02 for details.



ELEVATION



PLAN

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING
TRANSITION TFT
PLAN AND ELEVATION
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTFT-01

RICHARD L. VanCLEAVE
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No. 9750
STATE OF INDIANA
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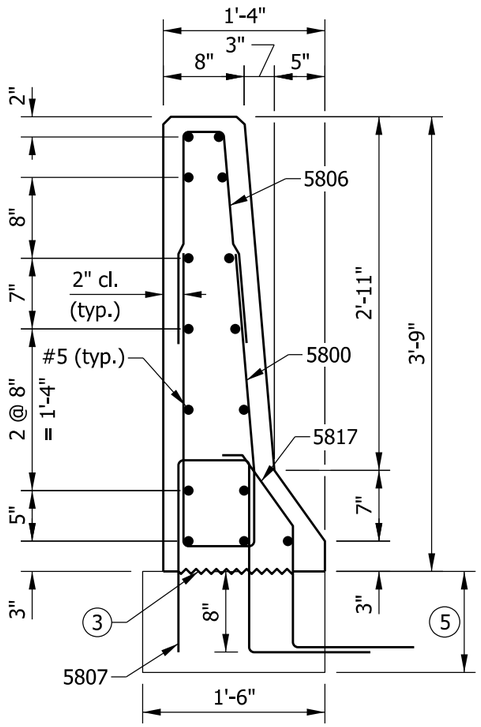
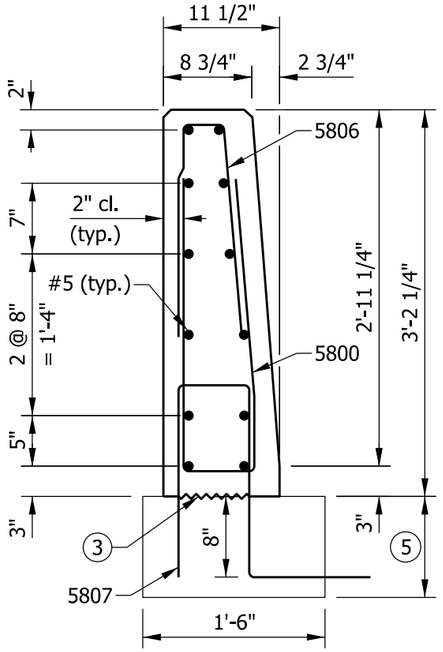
/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

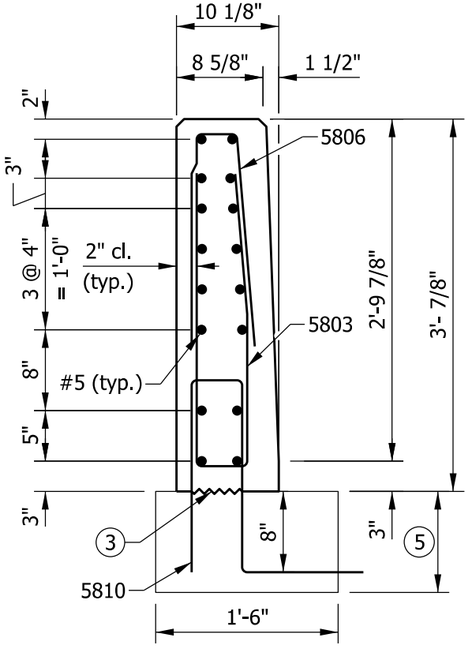
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



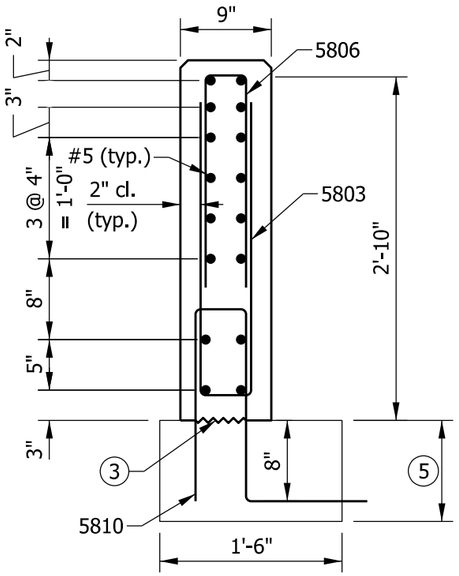
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTES

1. See Standard Drawing E 706-TTFT-01 for elevation and plan.
2. All chamfered edges shall be 3/4".

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

4. See Standard Drawing E 706-TTFT-03 for reinforcing-bar diagrams.

(5) RCBA extension for bridge railing transition type TFT. See Standard Drawing E 609-TBAE-02 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING
TRANSITION, TFT

SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTFT-02

RICHARD L. VanCLEAVE
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No. 9750
STATE OF INDIANA
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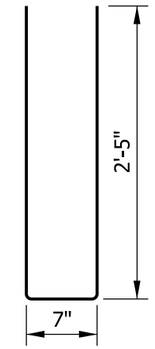
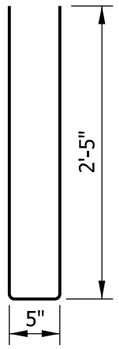
/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

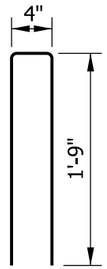
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



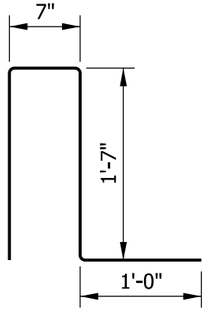
5800 x 5'-5"



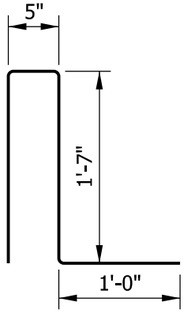
5803 x 5'-3"



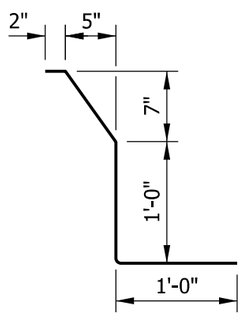
5806 x 3'-10"



5807 x 4'-9"



5810 x 4'-7"



5817 x 3'-0"

NOTE

1. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TFT			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5800	21	5'-5"	
5803	16	5'-3"	
5806	28	3'-10"	
5807	21	4'-9"	
5810	16	4'-7"	
5817	16	3'-0"	
#5	12	15'-1"	
#5	1	10'-1"	
#5	2	6'-8"	
#5	16	6'-0"	
Total Epoxy-Coated Reinforcing Steel			862 LBS
MISCELLANEOUS			
Concrete, Class C			2.0 CYS
Surface Seal			13.4 SYS

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION TYPE TFT

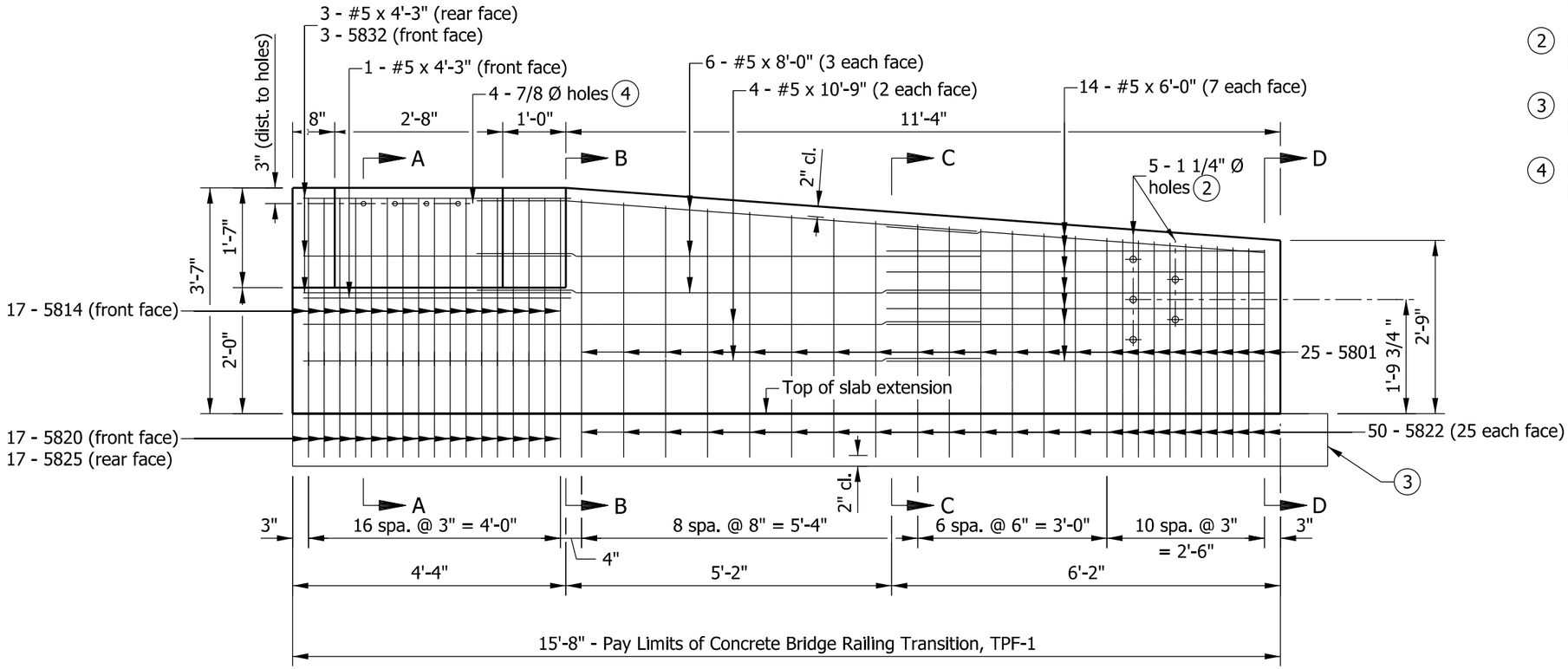
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTFT-03

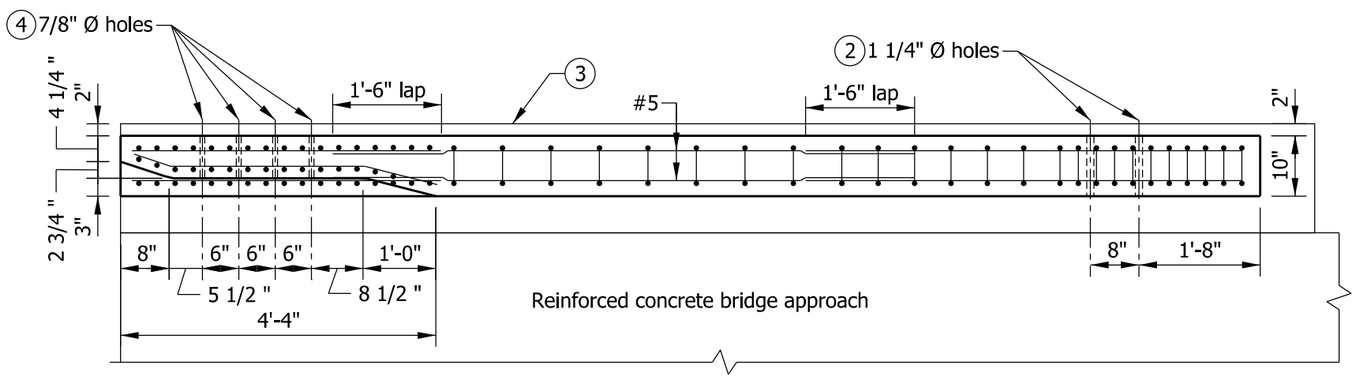
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN

NOTES

1. See Standard Drawing E 706-TTPP-02 for sections and reinforcing bar diagrams.

(2) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 706-CBRT-04 for details.

(3) RCBA extension for bridge railing transition type TPF-1. See Standard Drawing E 609-TBAE-01 for details.

(4) Holes for attachment of steel bridge railing type PF-1. See Standard Drawing E 706-BRPP-01 for details.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TPF-1.			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5801	25	5'-4"	
5814	17	3'-0"	
5820	17	3'-1"	
5822	50	3'-7"	
5825	17	4'-8"	
5832	3	4'-3"	
#5	4	10'-9"	
#5	6	8'-0"	
#5	14	6'-0"	
#5	4	4'-3"	
Total Epoxy-Coated Reinforcing Steel			730 LBS
MISCELLANEOUS			
Concrete, Class C			1.5 CYS
Surface Seal			119 SFT

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TPF-1

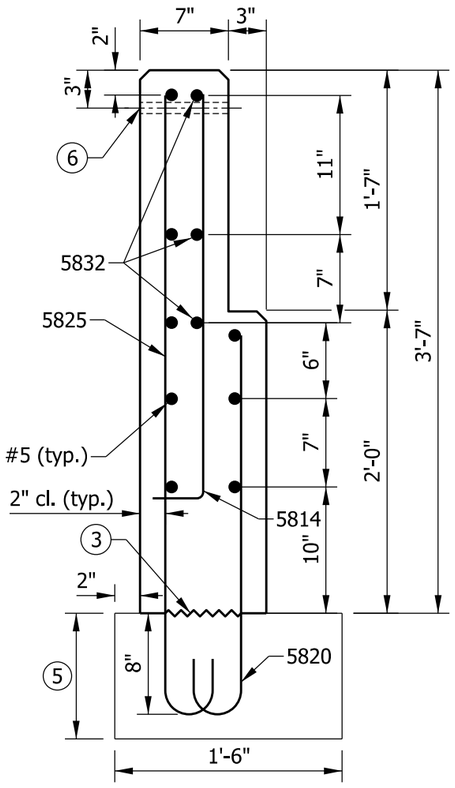
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-01

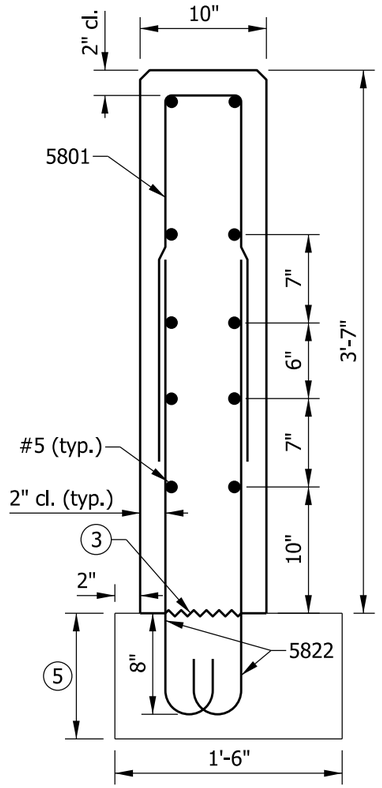
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

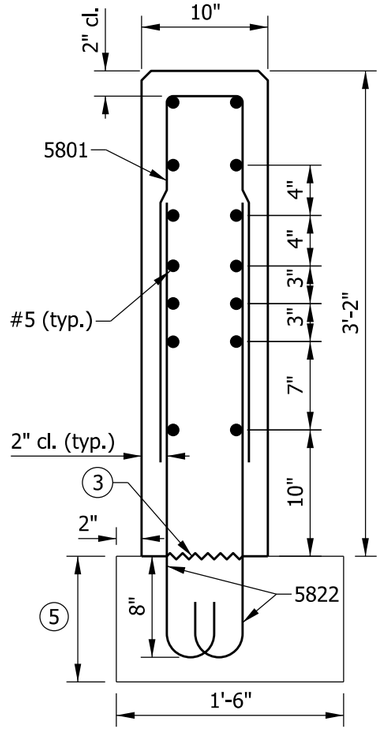
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



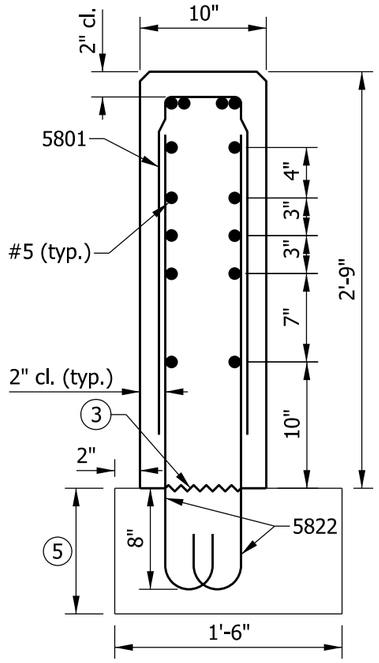
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTES

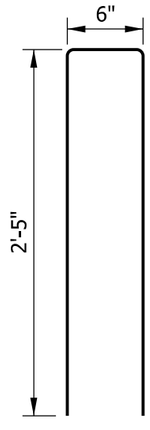
1. See Standard Drawing E 706-TTPP-01 for elevation and plan.
2. All chamfered edges shall be 3/4".

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

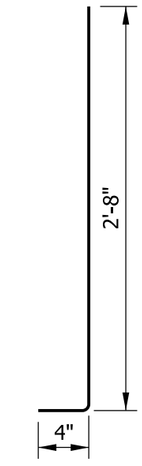
4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

(5) RCBA extension for bridge railing transition type TPF-1. See Standard Drawing E 609-TBAE-01 details.

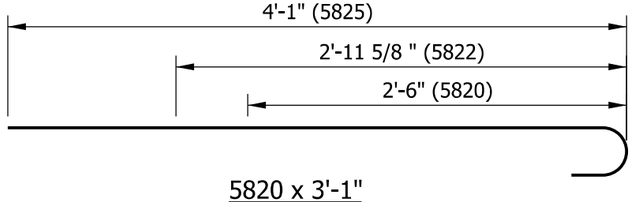
(6) 7/8" Ø hole for attachment of steel bridge railing type PF-1. See Standard Drawing E 706-BRPP-01 for details.



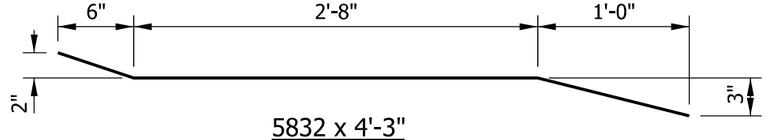
5801 x 5'-4"



5814 x 3'-0"



5820 x 3'-1"
5822 x 3'-7"
5825 x 4'-8"



5832 x 4'-3"

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING
TRANSITION, TPF-1

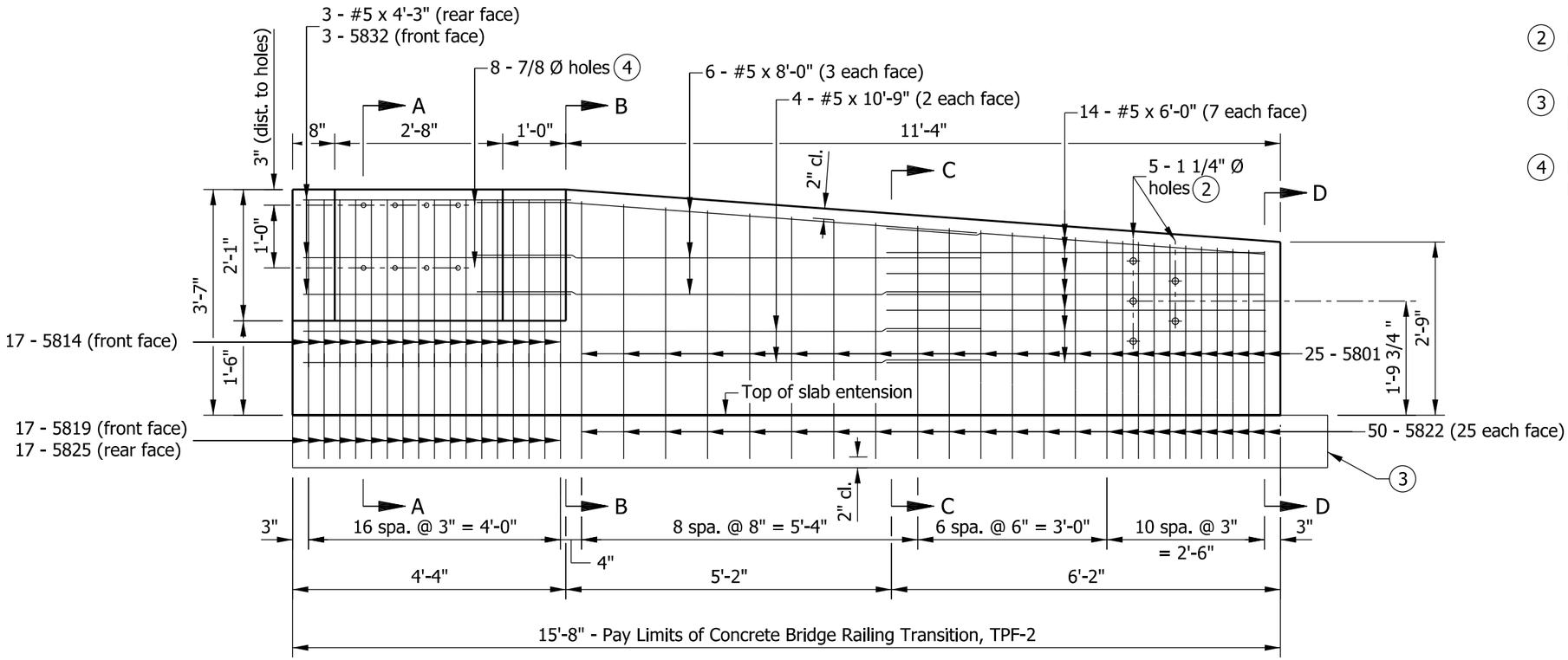
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-02

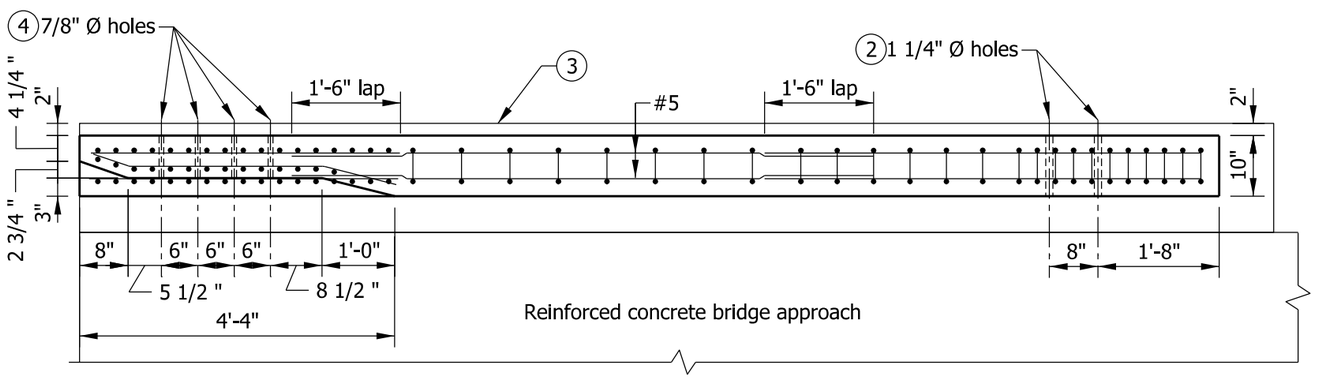
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN

NOTES

1. See Standard Drawing E 706-TTPP-04 for sections and reinforcing bar diagrams.

(2) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 706-CBRT-04 for details.

(3) RCBA extension for bridge railing transition type TPF-2. See Standard Drawing E 609-TBAE-01 for details.

(4) Holes for attachment of steel bridge railing type PF-2. See Standard Drawing E 706-BRPP-02 for details.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TPF-2.			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5801	25	5'-4"	
5814	17	3'-0"	
5819	17	2'-7"	
5822	50	3'-7"	
5825	17	4'-8"	
5832	3	4'-3"	
#5	4	10'-9"	
#5	6	8'-0"	
#5	14	6'-0"	
#5	3	4'-3"	
Total Epoxy-Coated Reinforcing Steel			717 LBS
MISCELLANEOUS			
Concrete, Class C			1.5 CYS
Surface Seal			119 SFT

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TPF-2

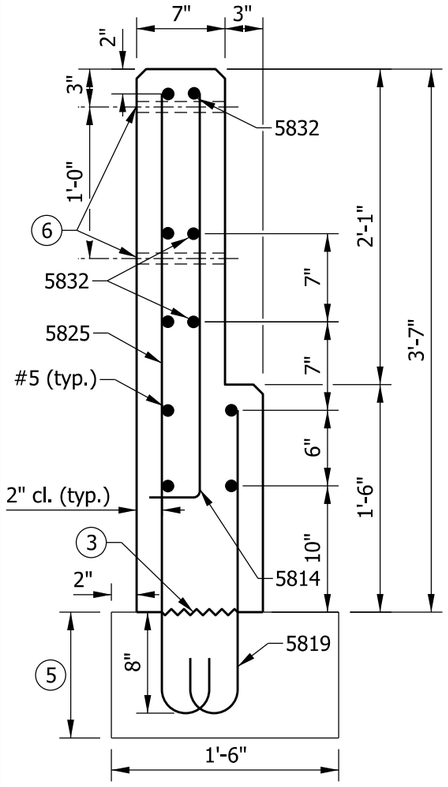
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-03

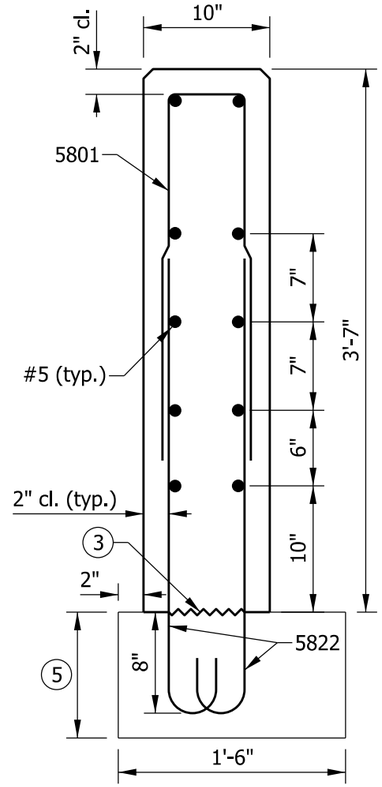
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

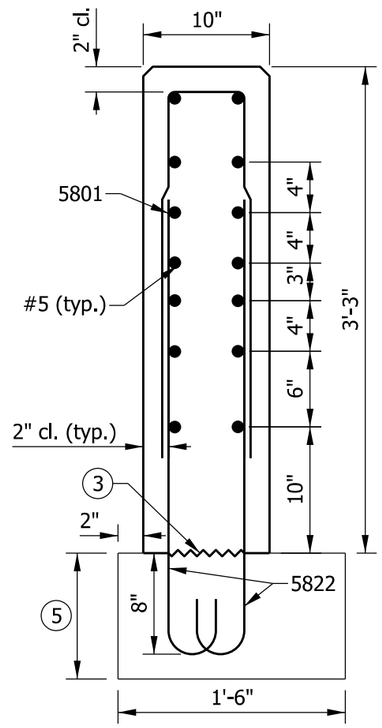
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



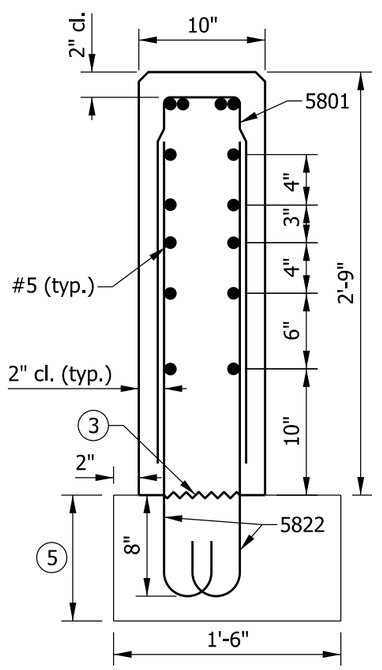
SECTION A-A



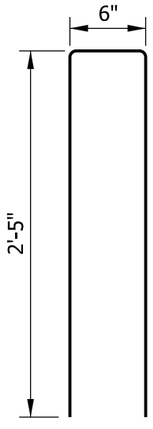
SECTION B-B



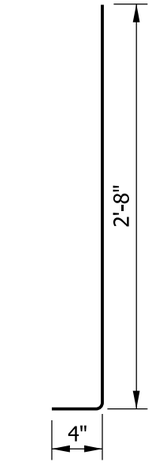
SECTION C-C



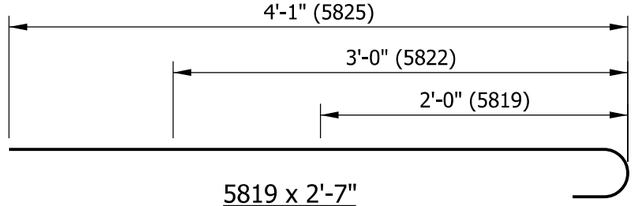
SECTION D-D



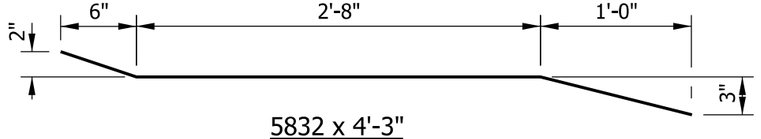
5801 x 5'-4"



5814 x 3'-0"



5819 x 2'-7"
5822 x 3'-7"
5825 x 4'-8"



5832 x 4'-3"

NOTES

1. See Standard Drawing E 706-TTPP-03 for elevation and plan.
2. All chamfered edges shall be 3/4".

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

(5) RCBA extension for bridge railing transition type TPF-2. See Standard Drawing E 609-TBAE-01 for details.

(6) 7/8" Ø hole for attachment of steel bridge railing type PF-2. See Standard Drawing E 706-BRPP-02 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TPF-2

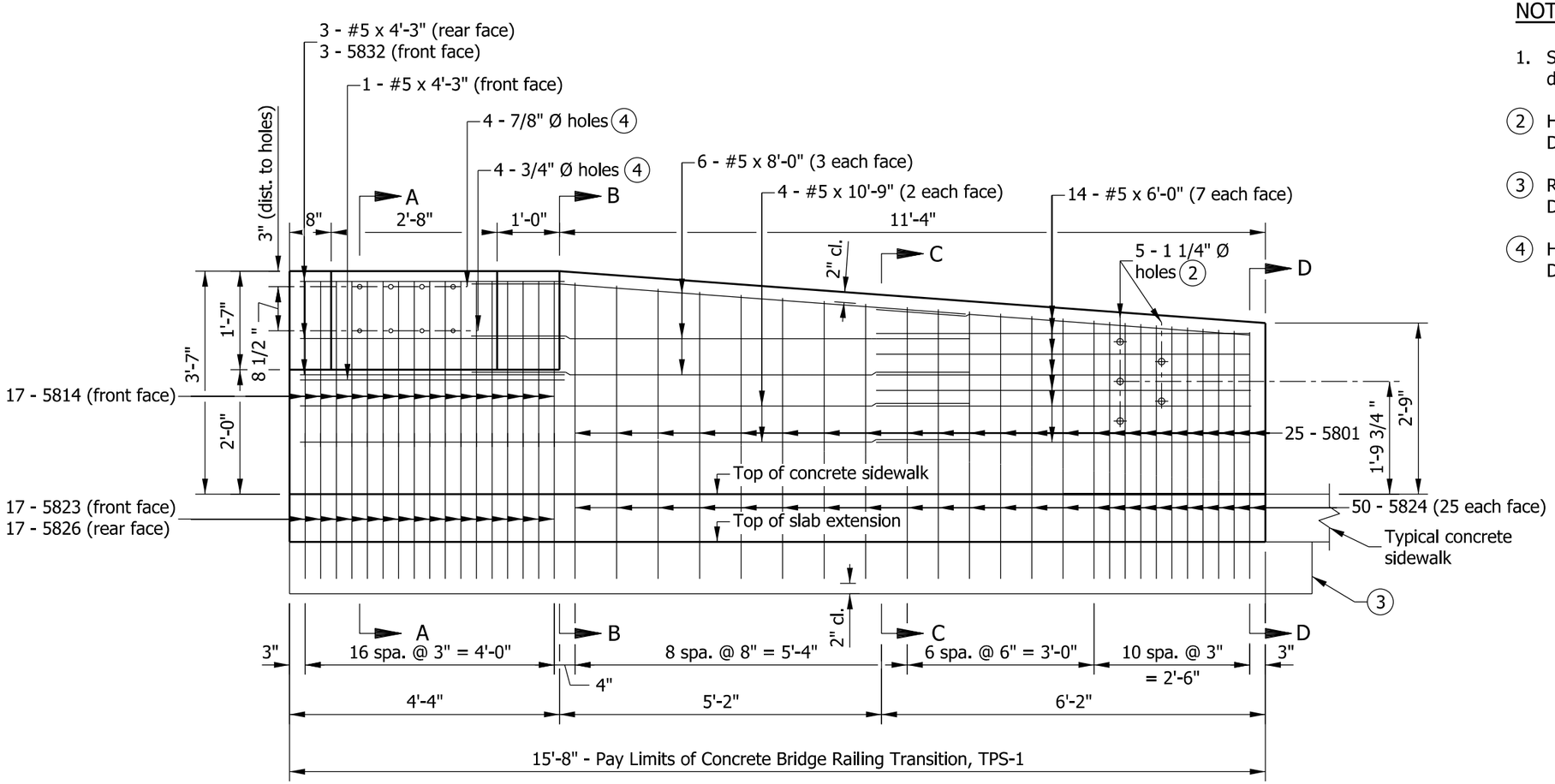
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-04

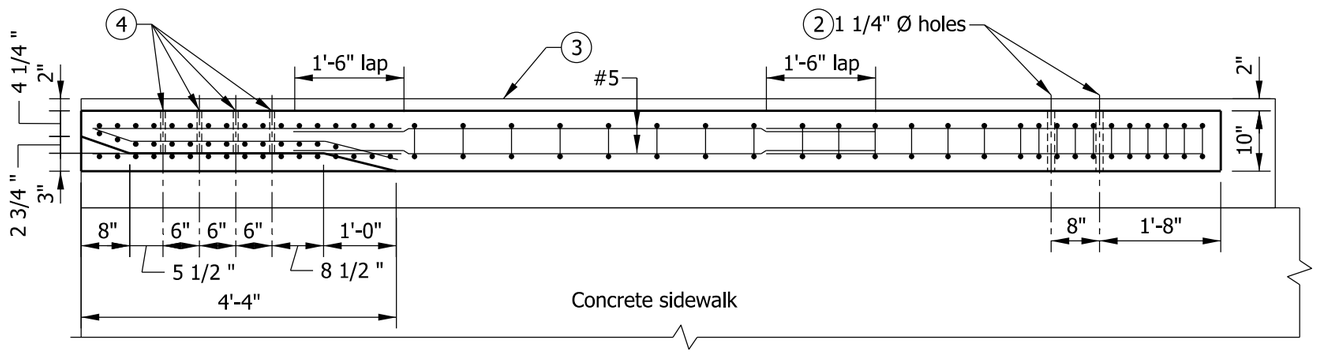
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN

NOTES

1. See Standard Drawing E 706-TTPP-06 for sections and reinforcing bar diagrams.

(2) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 706-CBRT-04 for details.

(3) RCBA extension for bridge railing transition type TPS-1. See Standard Drawing E 609-TBAE-01 for details.

(4) Holes for attachment of steel bridge railing type PS-1. See Standard Drawing E 706-BRPP-03 for details.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TPS-1.			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5801	25	5'-4"	
5814	17	3'-0"	
5823	17	3'-9"	
5824	50	4'-3"	
5826	17	5'-4"	
5832	3	4'-3"	
#5	4	10'-9"	
#5	6	8'-0"	
#5	14	6'-0"	
#5	4	4'-3"	
Total Epoxy-Coated Reinforcing Steel			789 LBS
MISCELLANEOUS			
Concrete, Class C			1.9 CYS
Surface Seal			131 SFT

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TPS-1

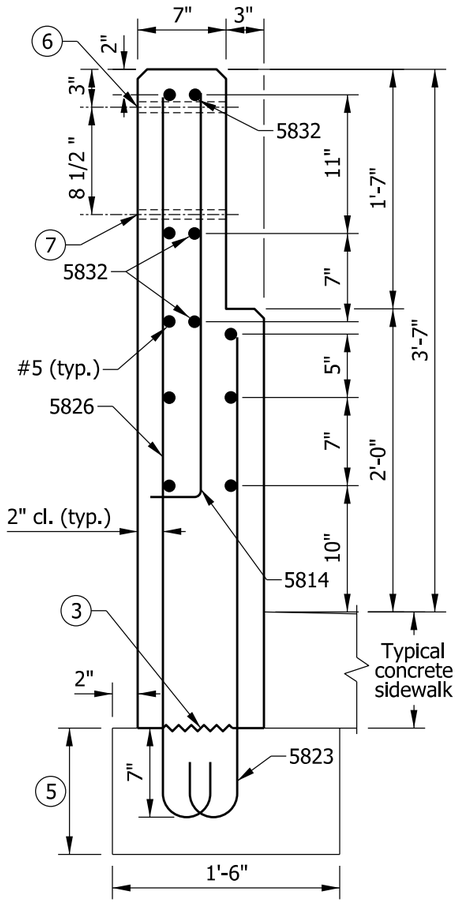
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-05

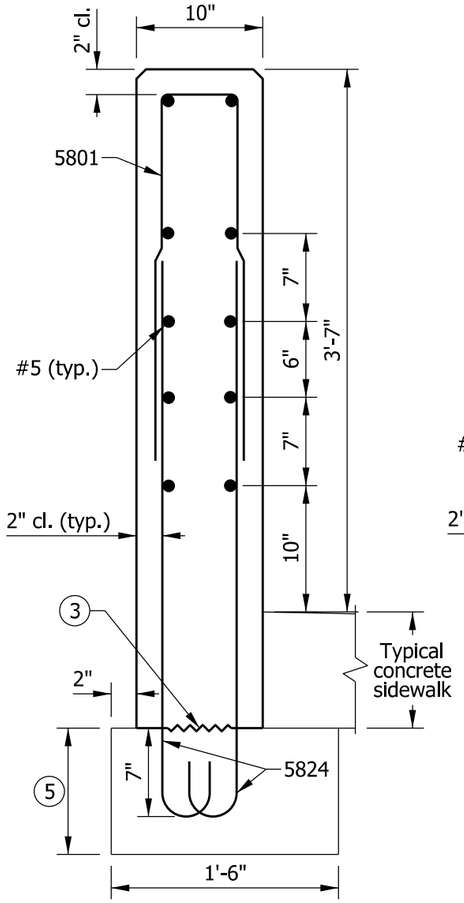
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

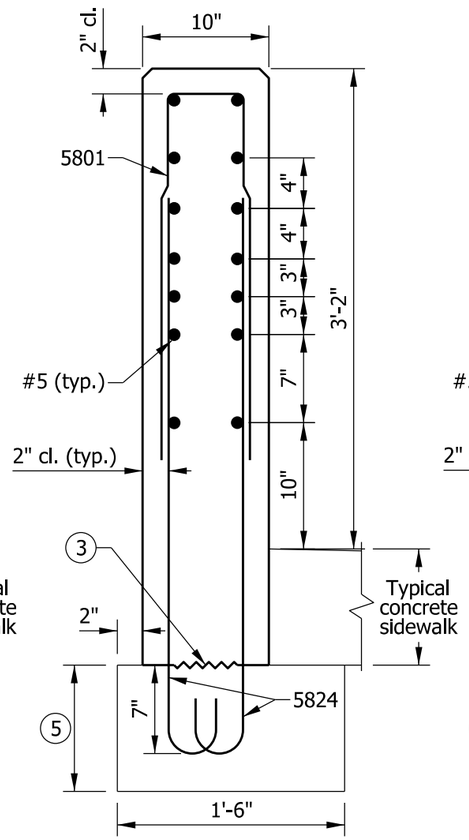
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



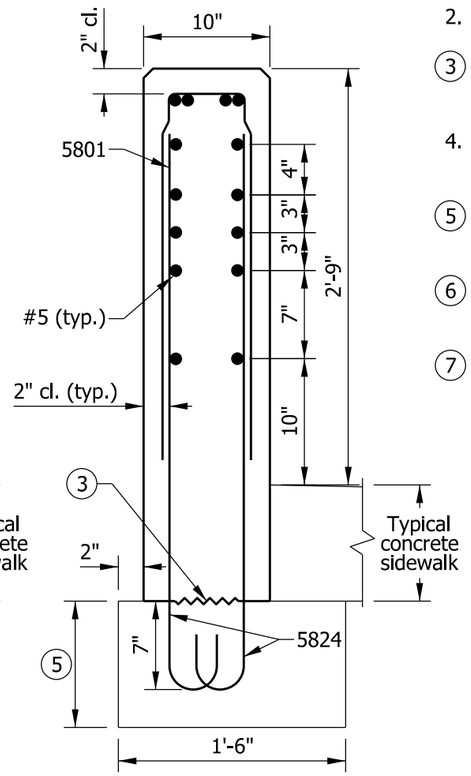
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTES

1. See Standard Drawing E 706-TTPP-05 for elevation and plan.
2. All chamfered edges shall be 3/4".

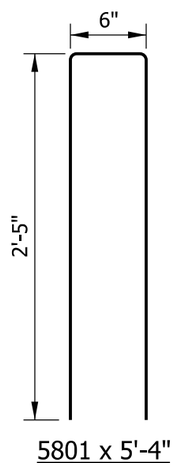
(3) Construction joing type A. See Standard Drawing E 702-CJTA-01 for details.

4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

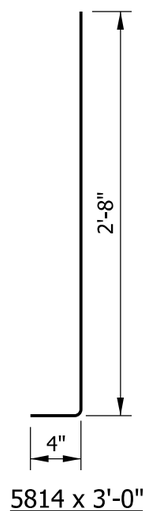
(5) RCBA extension for bridge railing transition type TPS-1. See Standard Drawing E 609-TBAE-01 for details.

(6) 7/8" Ø hole for attachment of steel bridge railing type PS-1, large rail. See Standard Drawing E 706-BRPP-03 for details.

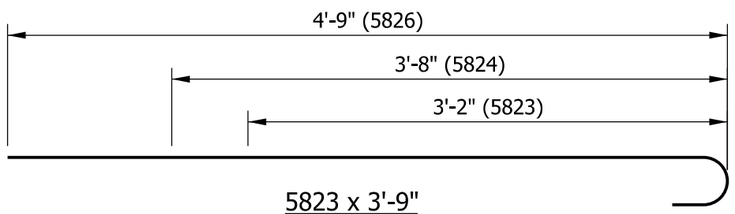
(7) 3/4" Ø hole for attachment of steel bridge railing type PS-1, small rail. See Standard Drawing E 706-BRPP-03 for details.



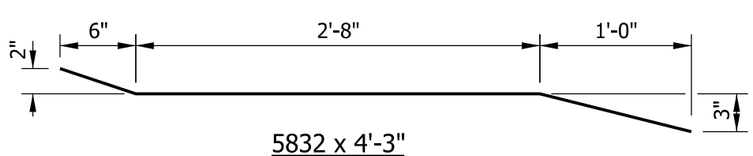
5801 x 5'-4"



5814 x 3'-0"



5823 x 3'-9"
5824 x 4'-3"
5826 x 5'-4"



5832 x 4'-3"

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TPS-1

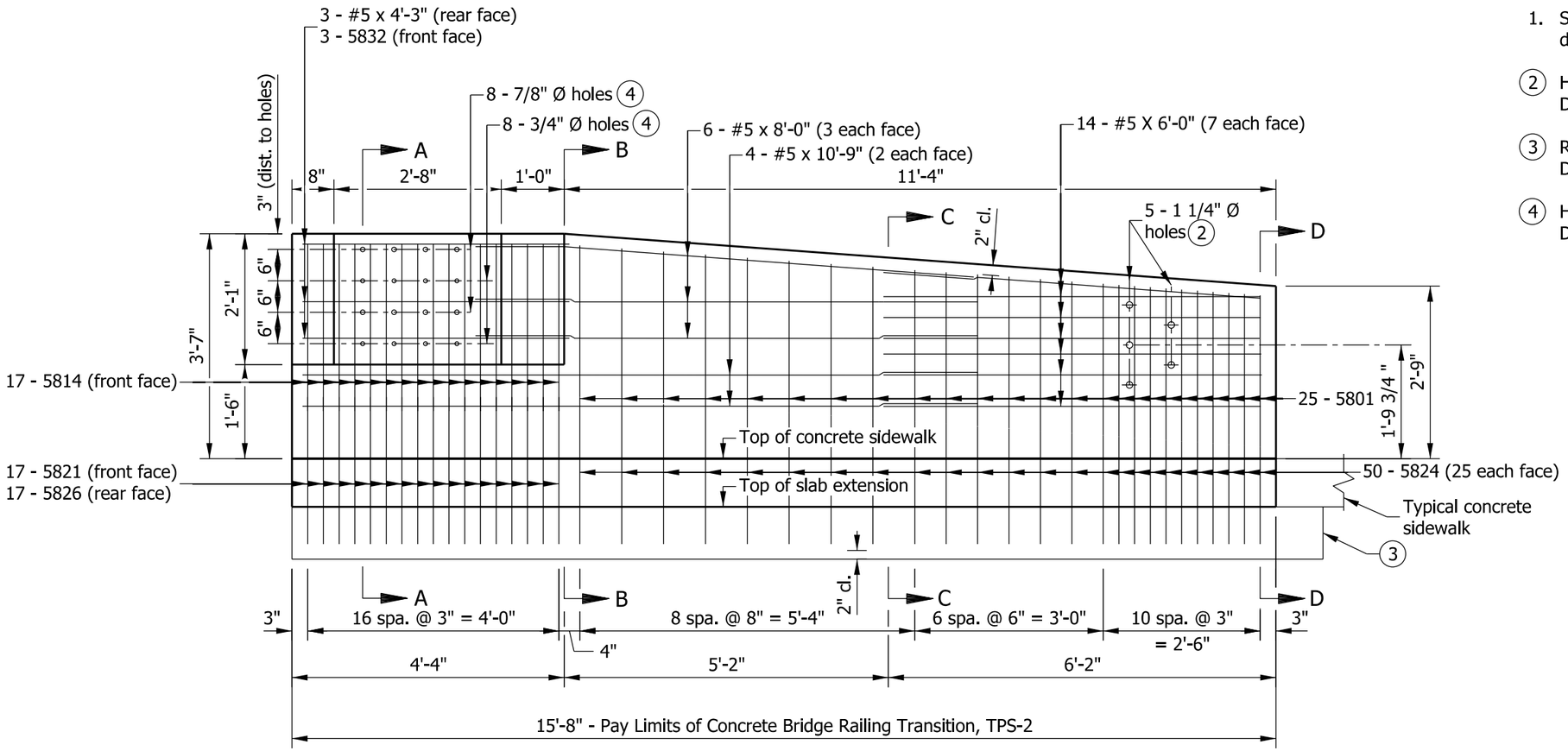
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-06

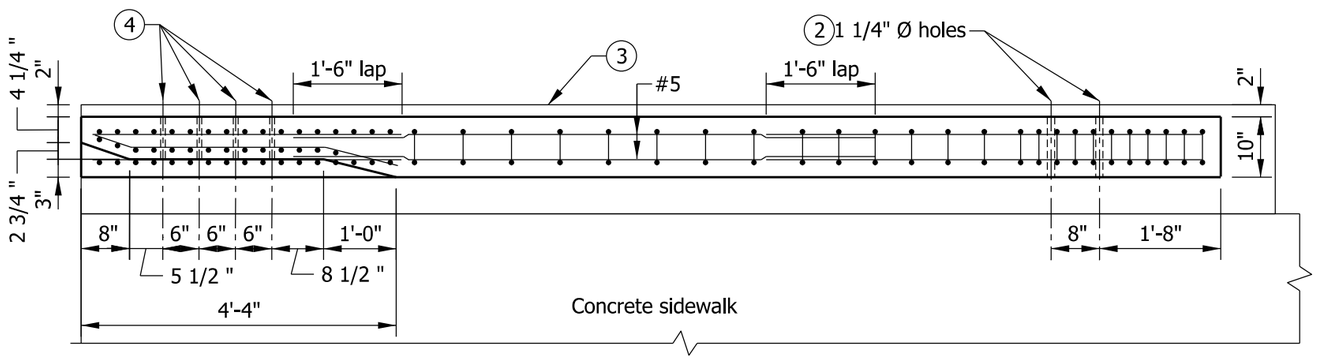
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN

NOTES

1. See Standard Drawing E 706-TTPP-08 for sections and reinforcing bar diagrams.

(2) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 706-CBRT-04 for details.

(3) RCBA extension for bridge railing transition type TPS-2. See Standard Drawing E 609-TBAE-01 for details.

(4) Holes for attachment of steel bridge railing type PS-2. See Standard Drawing E 706-BRPP-04 for details.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TPS-2.			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5801	25	5'-4"	
5814	17	3'-0"	
5821	17	3'-3"	
5824	50	4'-3"	
5826	17	5'-4"	
5832	3	4'-3"	
#5	4	10'-9"	
#5	6	8'-0"	
#5	14	6'-0"	
#5	3	4'-3"	
Total Epoxy-Coated Reinforcing Steel			775 LBS
MISCELLANEOUS			
Concrete, Class C			1.9 CYS
Surface Seal			131 SFT

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TPS-2

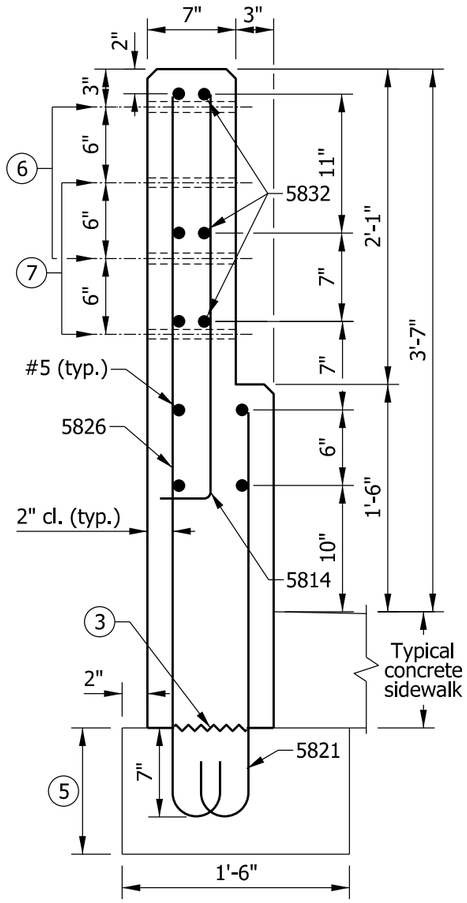
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-07

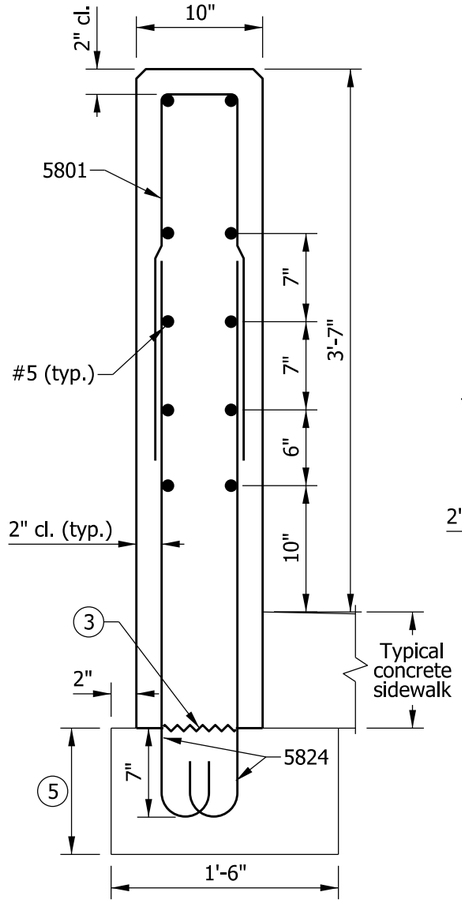
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

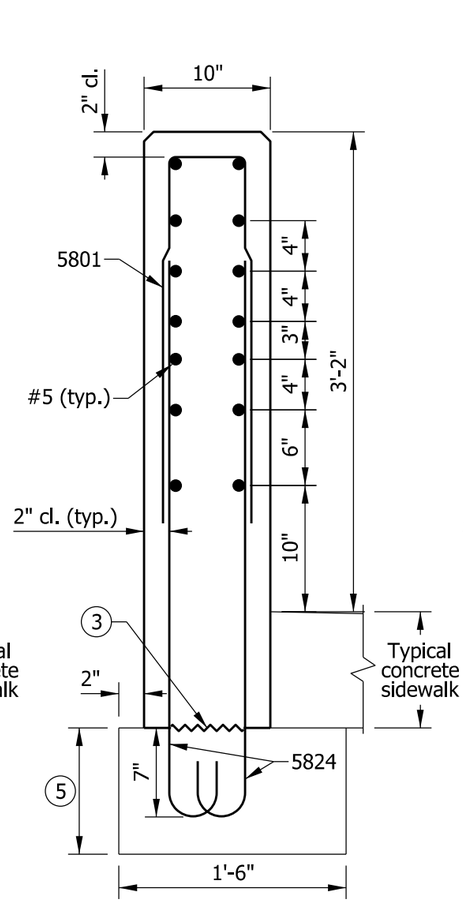
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



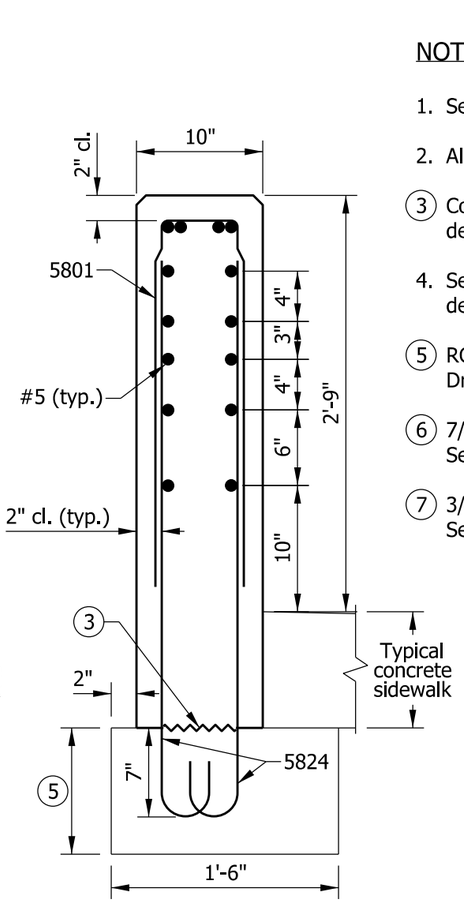
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTES

1. See Standard Drawing E 706-TTPP-07 for elevation and plan.
2. All chamfered edges shall be 3/4".

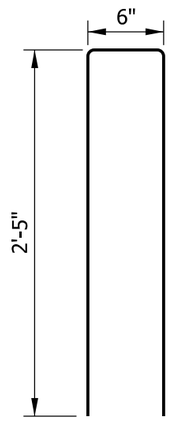
(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

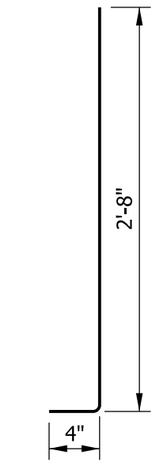
(5) RCBA extension for bridge railing transition type TPS-2. See Standard Drawing E 609-TBAE-01 for details.

(6) 7/8" Ø hole for attachment of steel bridge railing type PS-2, large rail. See Standard Drawing E 706-BRPP-04 for details.

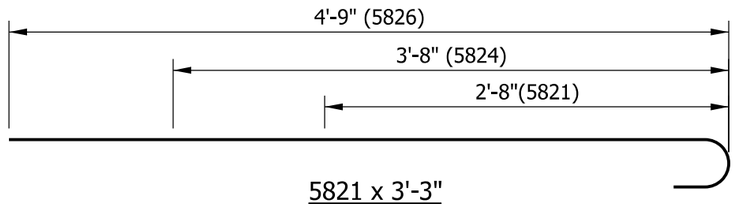
(7) 3/4" Ø hole for attachment of steel bridge railing type PS-2, small rail. See Standard Drawing E 706-BRPP-04 for details.



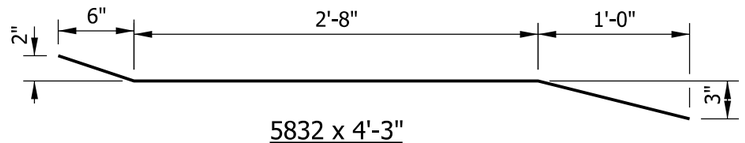
5801 x 5'-4"



5814 x 3'-0"



5821 x 3'-3"
5824 x 4'-3"
5826 x 5'-4"



5832 x 4'-3"

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TPS-2

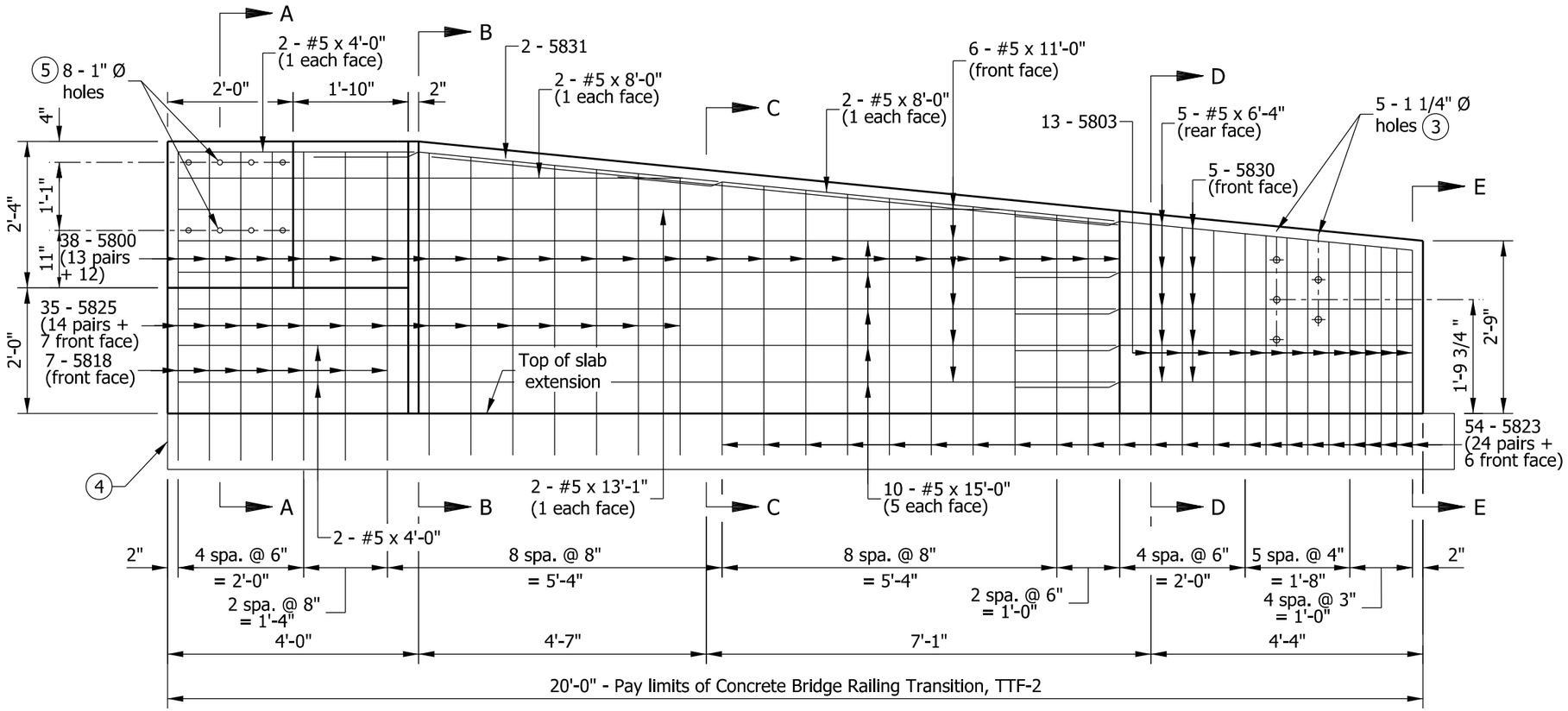
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTPP-08

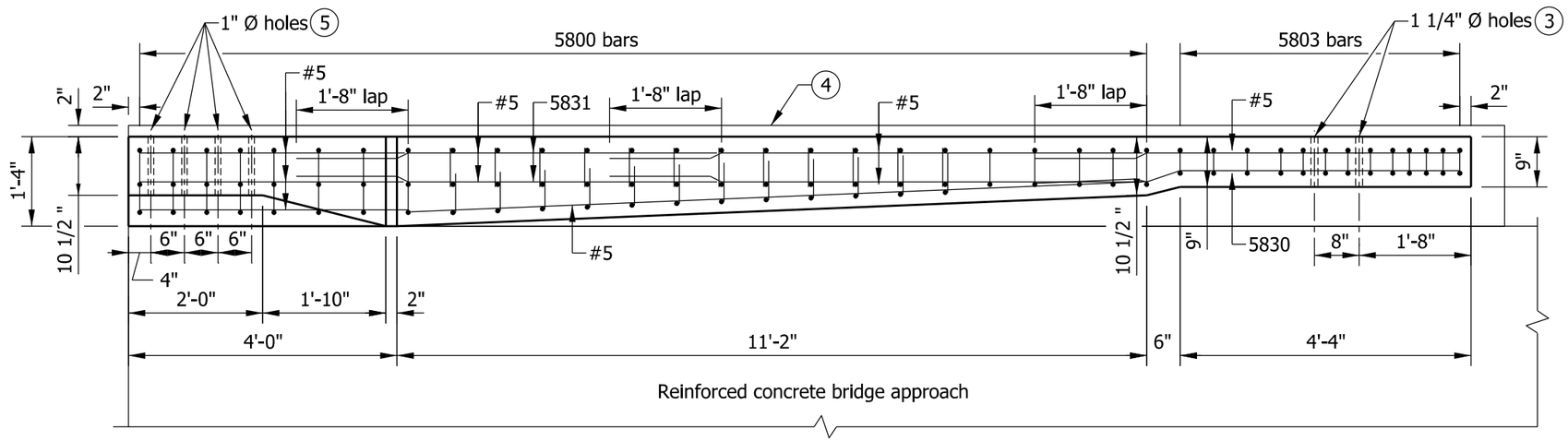
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION VIEW



PLAN VIEW

NOTES

1. See Standard Drawings E 706-TTTF-02 and E 706-TTTF-03 for sections.
2. See Standard Drawing E 706-TTTF-04 for reinforcing-bar diagrams and bill of materials.

(3) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 706-CBRT-04 for details.

(4) RCBA extension for bridge railing transition type TTF-2. See Standard Drawing E 609-TBAE-02 for details.

(5) Holes for attachment of steel bridge railing type TF-2. See Standard Drawing E 706-BRTF-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TTF-2

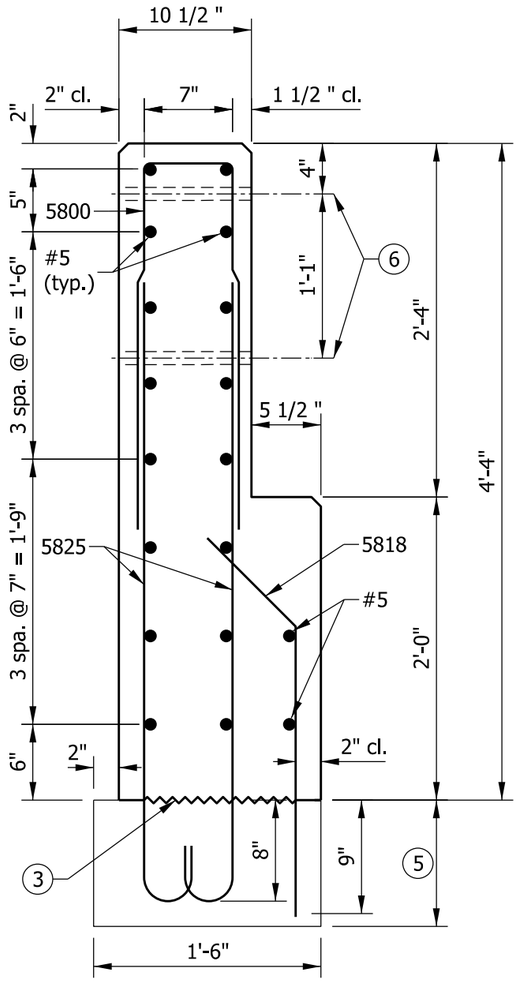
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTTF-01

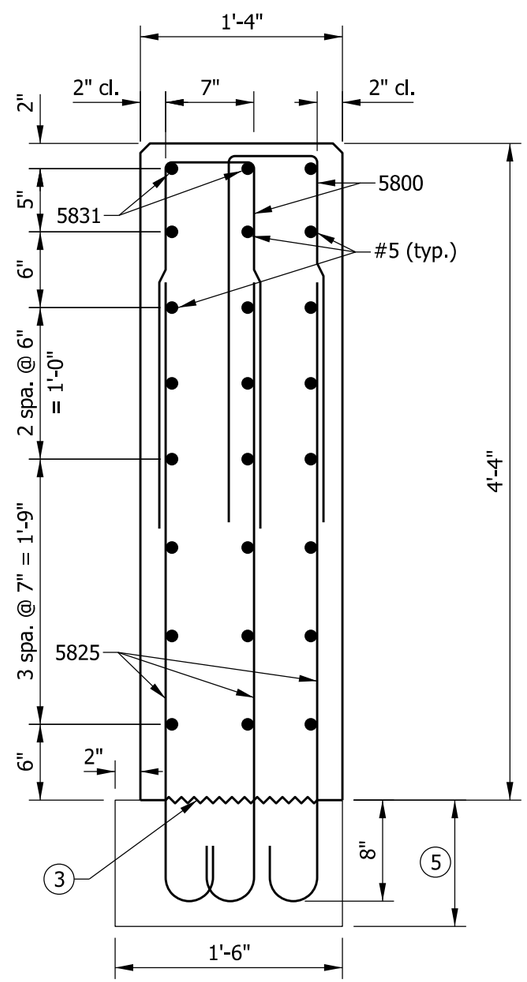
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



SECTION A-A



SECTION B-B

NOTES

1. See Standard Drawing E 706-TTTF-01 for elevation and plan.
2. All chamfered edges shall be 3/4".

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

4. See Standard Drawing E 706-TTTF-04 for reinforcing-bar diagrams.

(5) RCBA extension for bridge railing transition type TTF-2. See Standard Drawing E 609-TBAE-02 for details.

(6) 1" Ø hole for attachment of steel bridge railing type TF-2. See Standard Drawing E 706-BRTF-01 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TTF-2

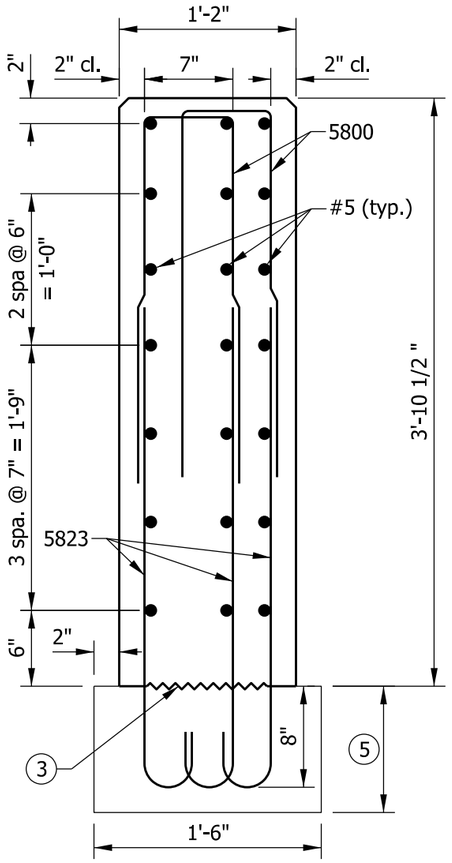
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTTF-02

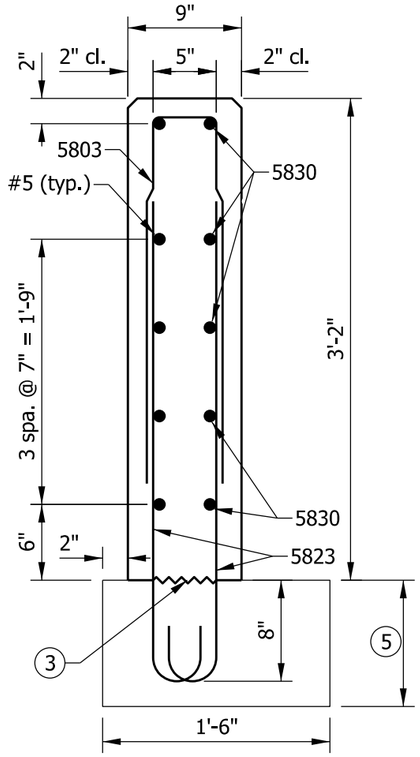
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

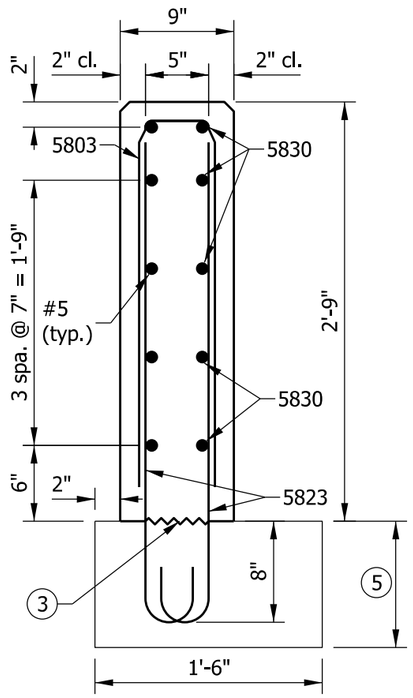
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



SECTION C-C



SECTION D-D



SECTION E-E

NOTES

1. See Standard Drawing E 706-TTTF-01 for elevation and plan.
2. All chamfered edges shall be 3/4".
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.
4. See Standard Drawing E 706-TTTF-04 for reinforcing-bar diagrams.
5. RCBA extension for bridge railing transition type TTF-2. See Standard Drawing E 609-TBAE-02 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TTF-2

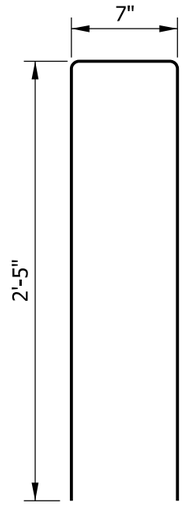
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTTF-03

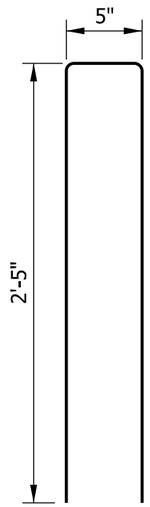
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

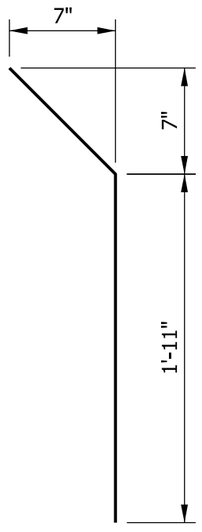
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



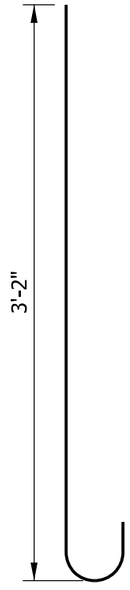
5800 x 5'-5"



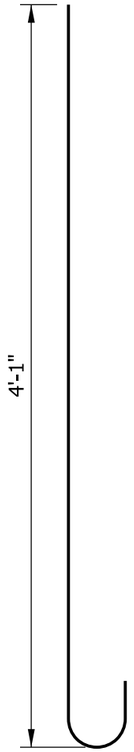
5803 x 5'-3"



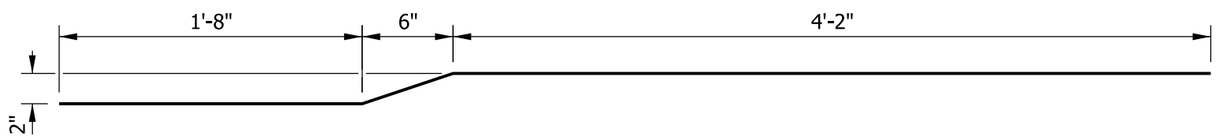
5818 x 2'-9"



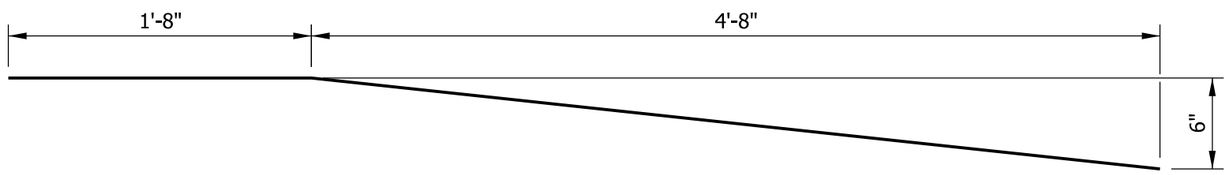
5823 x 3'-9"



5825 x 4'-8"



5830 x 6'-4"



5831 x 6'-4"

NOTE

1. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TTF-2			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5800	38	5'-5"	
5803	13	5'-3"	
5818	7	2'-9"	
5823	54	3'-9"	
5825	35	4'-8"	
5830	5	6'-4"	
5831	2	6'-4"	
#5	10	15'-0"	
#5	2	13'-1"	
#5	6	11'-0"	
#5	4	8'-0"	
#5	5	6'-4"	
#5	4	4'-0"	
Total Epoxy-Coated Reinforcing Steel			1072 LBS
MISCELLANEOUS			
Concrete, Class C			2.9 CYS
Surface Seal			182 SFT

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TTF-2

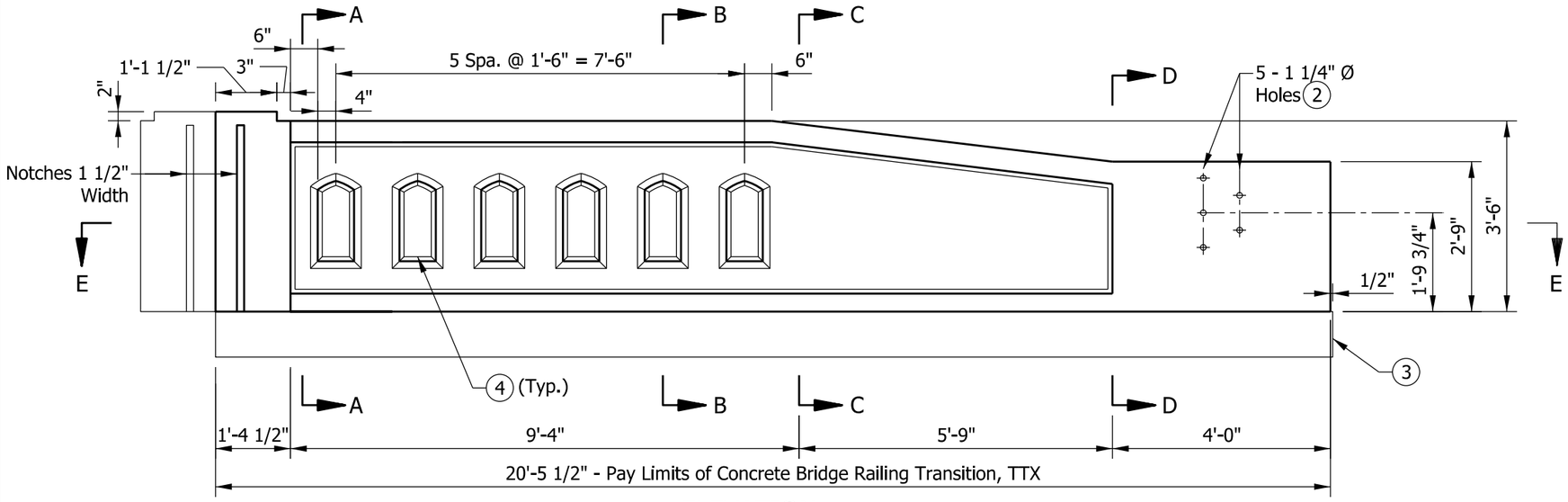
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TTTF-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

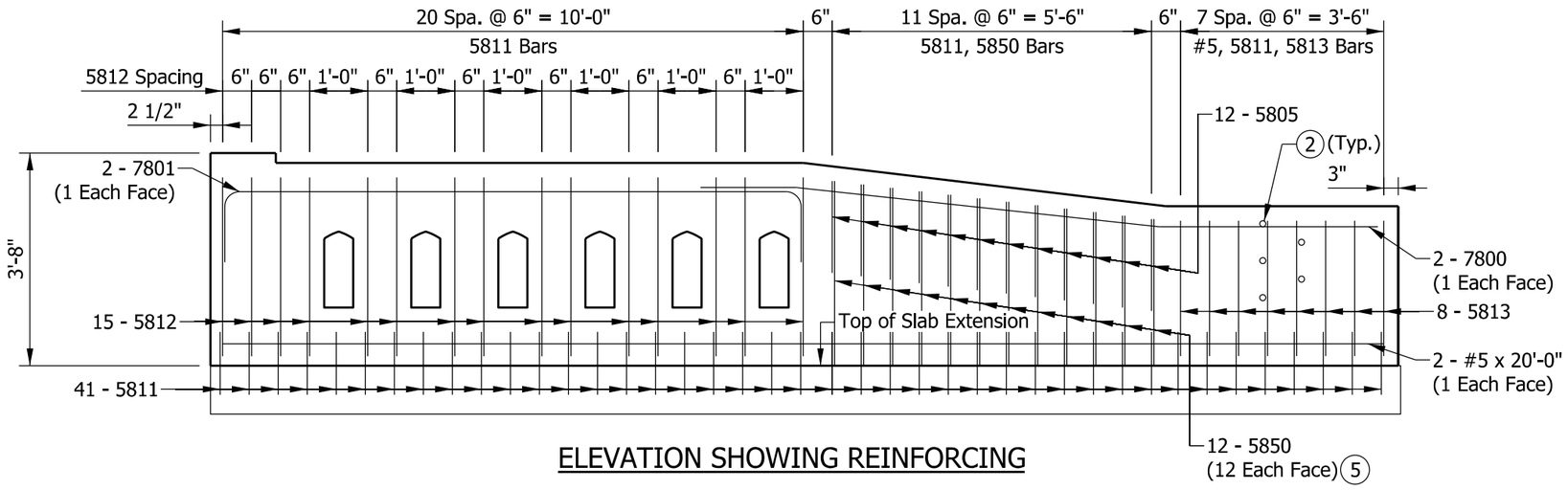
/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

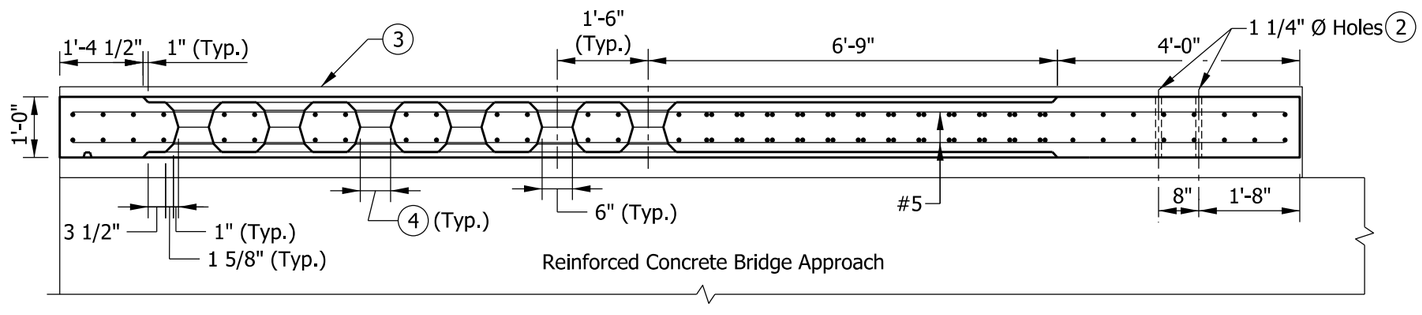


END BENT
PILASTER (Typ.)

ELEVATION



ELEVATION SHOWING REINFORCING



SECTION E-E

NOTES:

1. See Standard Drawing E 706-TTTX-02 for sections and reinforcing-bar diagrams.
2. (2) Holes for attachment of guardrail transition type TGB. See Standard Drawing E 706-CBRT-04 for details.
3. (3) RCBA extension for bridge railing transition type TTX. See Standard Drawing E 609-TBAE-02 for details.
4. (4) Window opening. See Standard Drawing E 706-BRTX-02 for details.
5. (5) See Standard Drawing E 706-TTTX-02 for reinforcing-bar cutting diagram.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type TTX			
EPOXY-COATED REINFORCING BARS			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
7800	2	11'-9"	
7801	2	12'-4"	
Total #7			98 LBS
5805	12	4'-8"	
5811	41	4'-0"	
5812	15	8'-6"	
5813	8	7'-0"	
5850	12	5'-8"	
#5	2	20'-0"	
Total #5			538 LBS
Total Epoxy-Coated Reinforcing Bars			636 LBS
MISCELLANEOUS			
Concrete, Class C			2.0 CYS
Surface Seal			149 SFT

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION, TTX

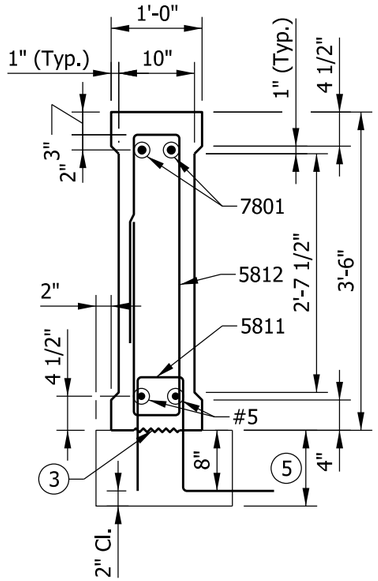
SEPTEMBER 2014

STANDARD DRAWING NO. E 706-TTTX-01

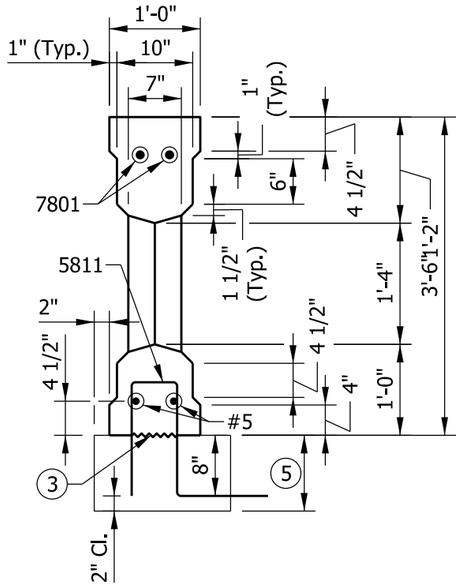
ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 09/23/13
DESIGN STANDARDS ENGINEER DATE

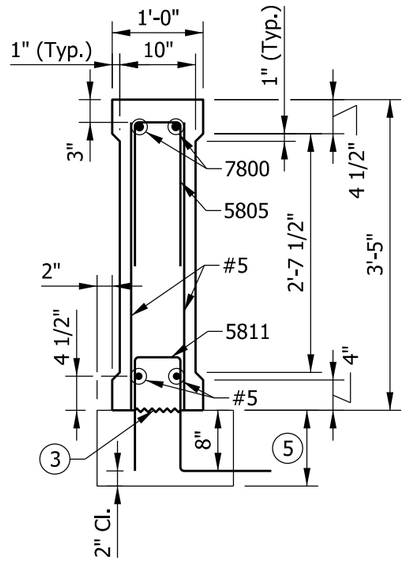
/s/ Mark A. Miller 09/26/13
CHIEF ENGINEER DATE



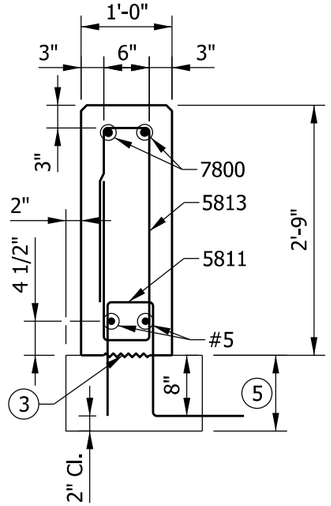
SECTION A-A



SECTION B-B



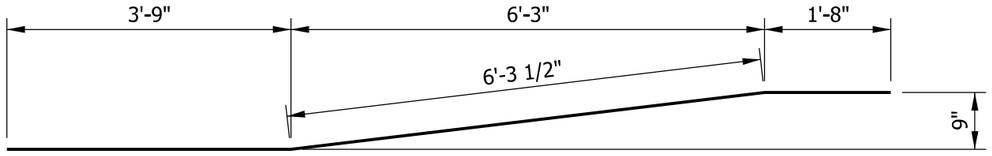
SECTION C-C



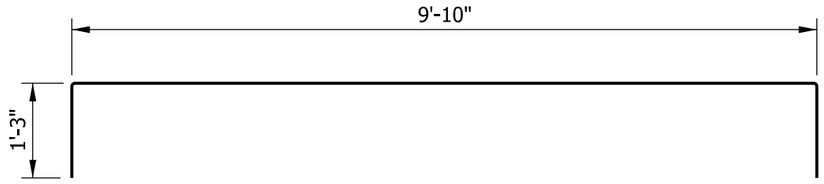
SECTION D-D

NOTES:

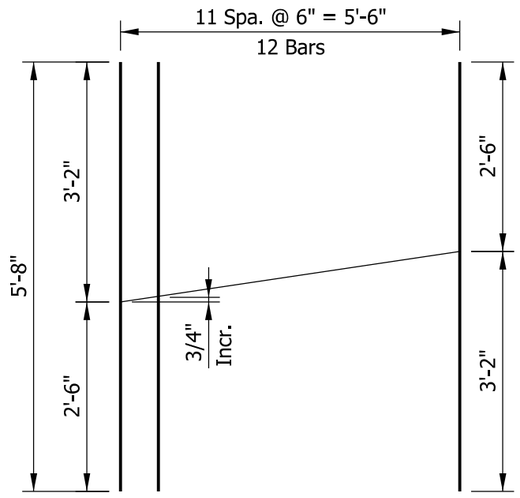
1. See Standard Drawing E 706-TTTX-01 for elevations and plan.
2. All chamfered edges shall be 3/4".
3. Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.
4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.
5. RCBA extension for bridge railing transition type TTX. See Standard Drawing E 609-TBAE-02 for details.



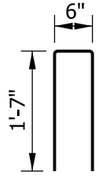
7800 x 11'-9"



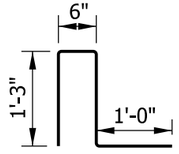
7801 x 12'-4"



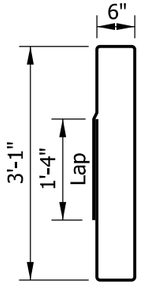
5850 x 5'-8"
(1 Bar Cuts 2)



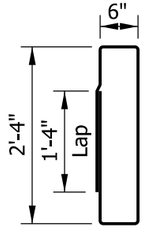
5805 x 4'-8"



5811 x 4'-0"



5812 x 8'-6"



5813 x 7'-0"

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING
TRANSITION, TTX

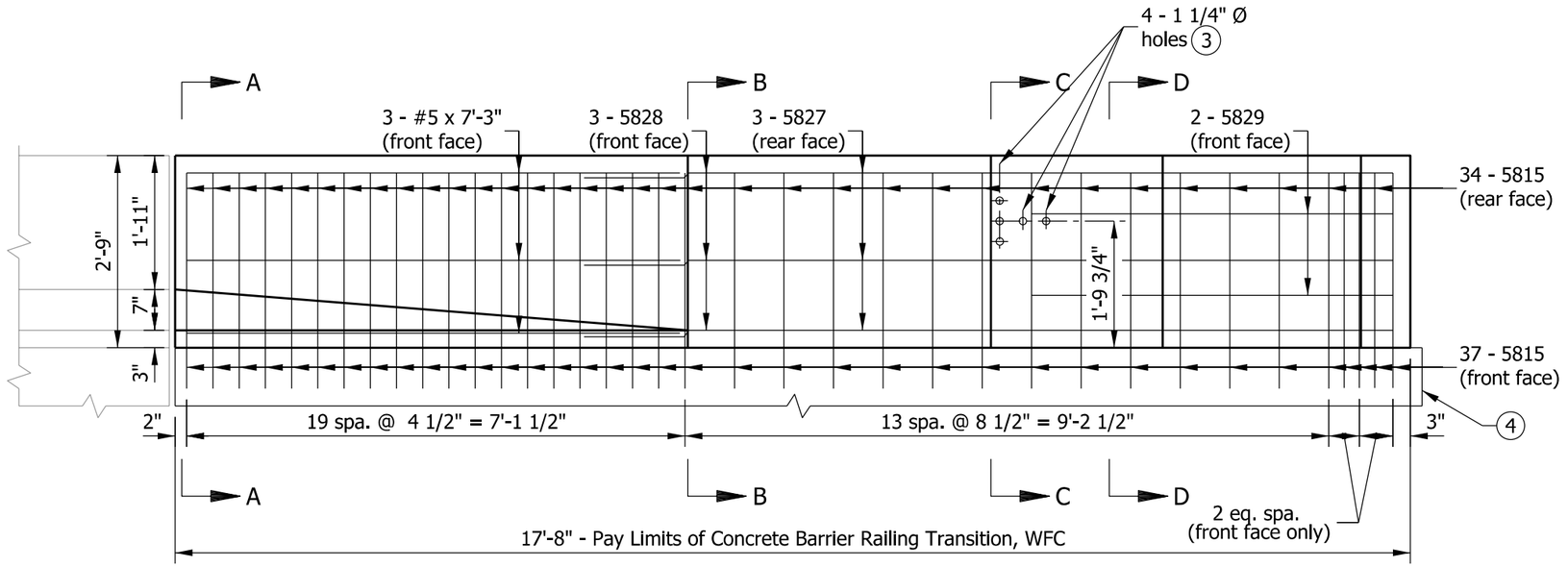
SEPTEMBER 2014

STANDARD DRAWING NO. E 706-TTTX-02

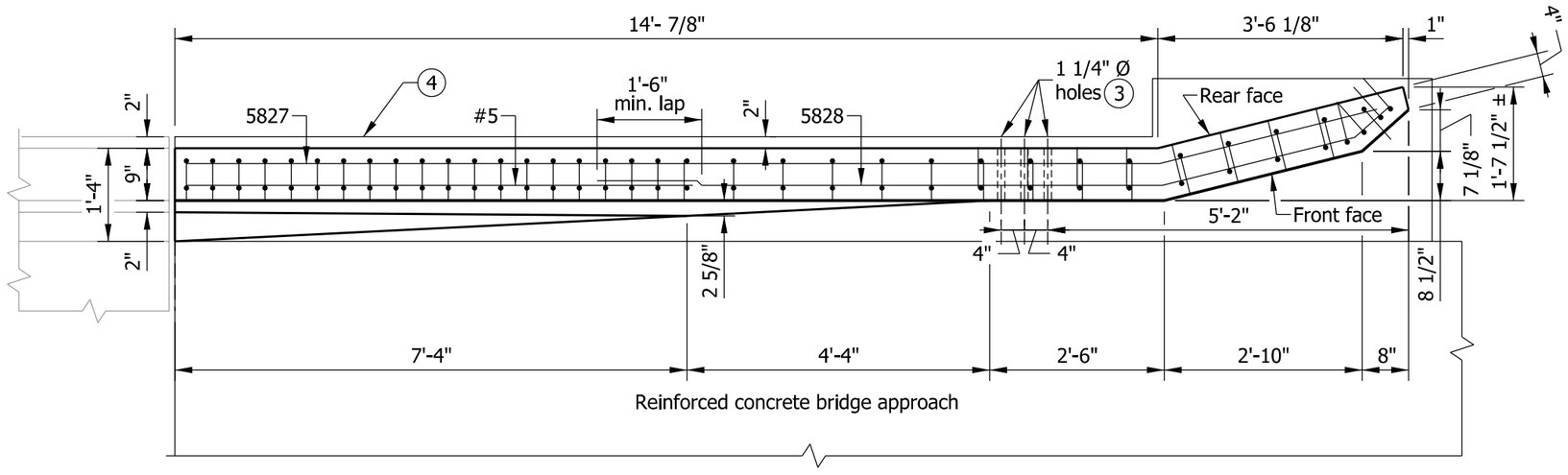
ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 09/23/13
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/26/13
CHIEF ENGINEER DATE



ELEVATION



PLAN

NOTES

1. See Standard Drawing E 706-TWFC-02 for sections.
2. See Standard Drawing E 706-TWFC-03 for reinforcing-bar diagrams and bill of materials.

(3) Holes for attachment of guardrail transition type WGB. See Standard Drawing E 706-CBRT-02 for details.

(4) RCBA extension for bridge railing transition type WFC. See Standard Drawing E 609-TBAE-03 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING
TRANSITION TYPE WFC

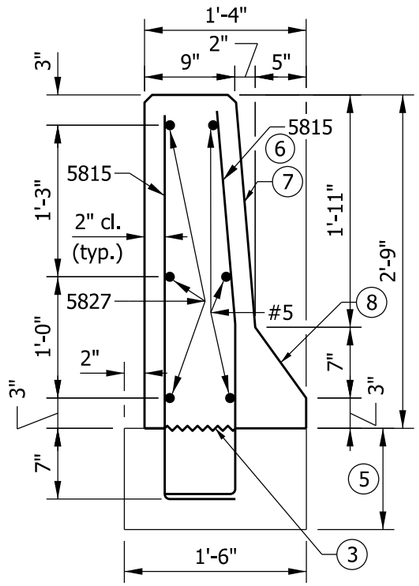
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TWFC-01

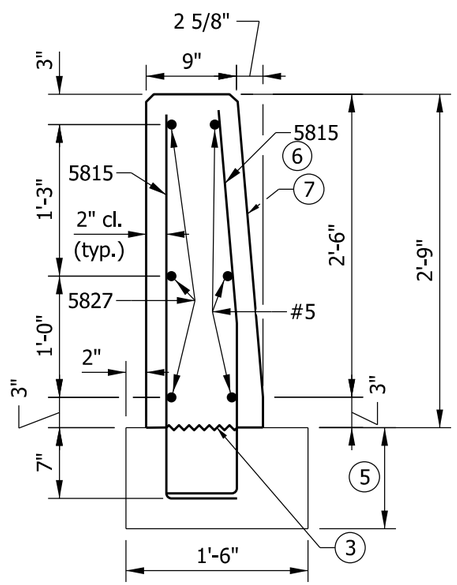
RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

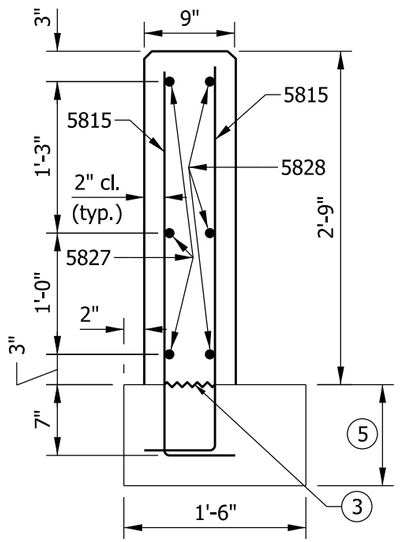
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



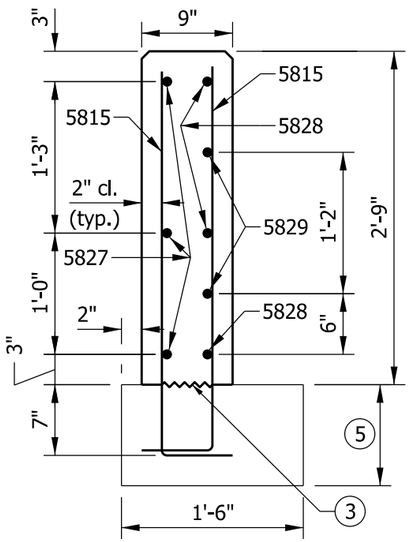
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

NOTES

1. See Standard Drawing E 706-TWFC-01 for elevation and plan.
2. All chamfered edges shall be 3/4".

(3) Construction joint type A. See Standard Drawing E 702-CJTA-01 for details.

4. See Standard Drawing E 706-TWFC-03 for reinforcing-bar diagrams.

(5) RCBA extension for bridge railing transition type WFC. See Standard Drawing E 609-TBAE-03 for details.

(6) These bars shall be field bent to provide 2" clearance along the front face batter.

(7) Constant 1:11 batter.

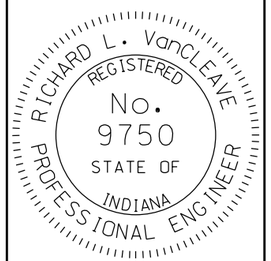
(8) Constant 5:7 batter.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING
TRANSITION TYPE WFC

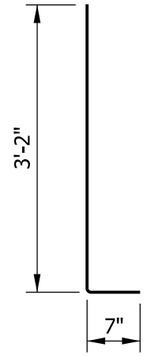
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TWFC-02

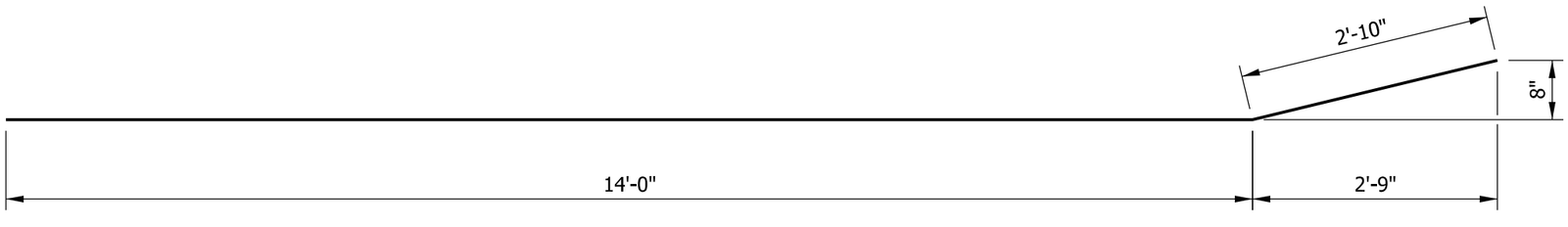


/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

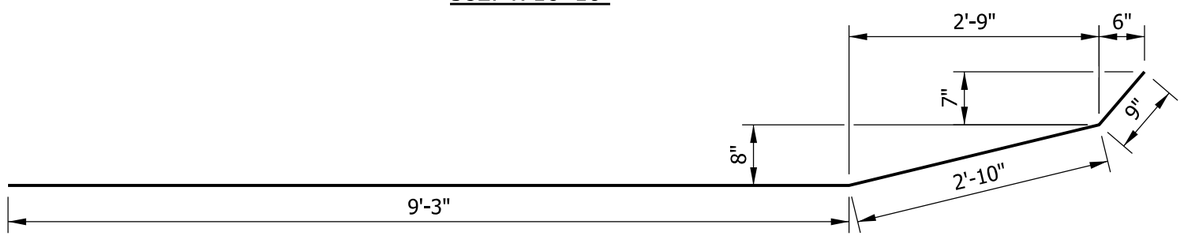
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



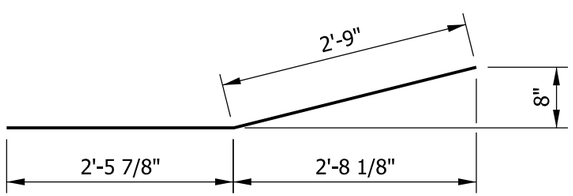
5815 x 3'-9"



5827 x 16'-10"



5828 x 12'-10"



5829 x 5'-3"

NOTE

1. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

BILL OF MATERIALS			
Quantities are for one concrete bridge railing transition type WFC			
EPOXY-COATED REINFORCING STEEL			
MARK OR SIZE	NO. OF BARS	LENGTH	WEIGHT
5815	71	3'-9"	
5827	3	16'-10"	
5828	3	12'-10"	
5829	2	5'-3"	
#5	3	7'-3"	
Total Epoxy-Coated Reinforcing Steel			404 LBS
MISCELLANEOUS			
Concrete, Class C			1.6 CYS
Surface Seal			113 SYS

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE BRIDGE RAILING TRANSITION TYPE WFC

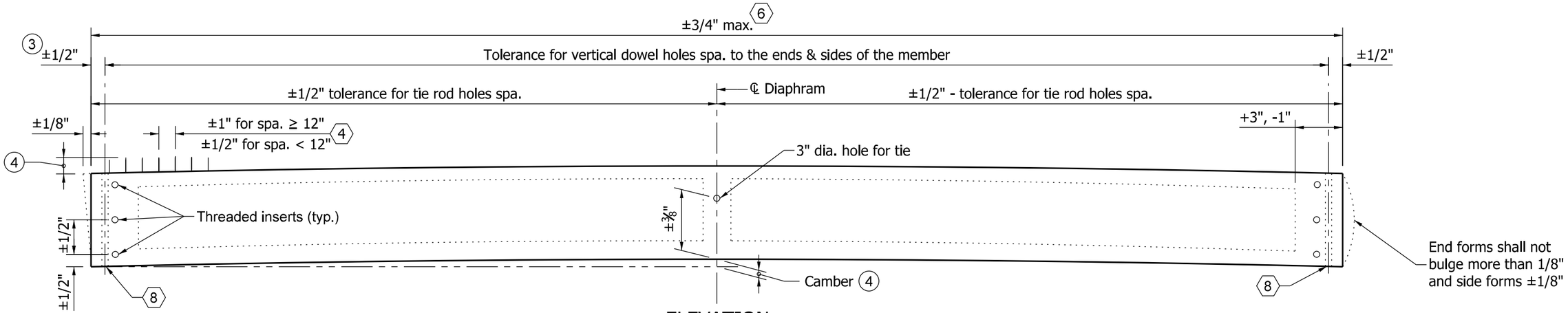
SEPTEMBER 2012

STANDARD DRAWING NO. E 706-TWFC-03

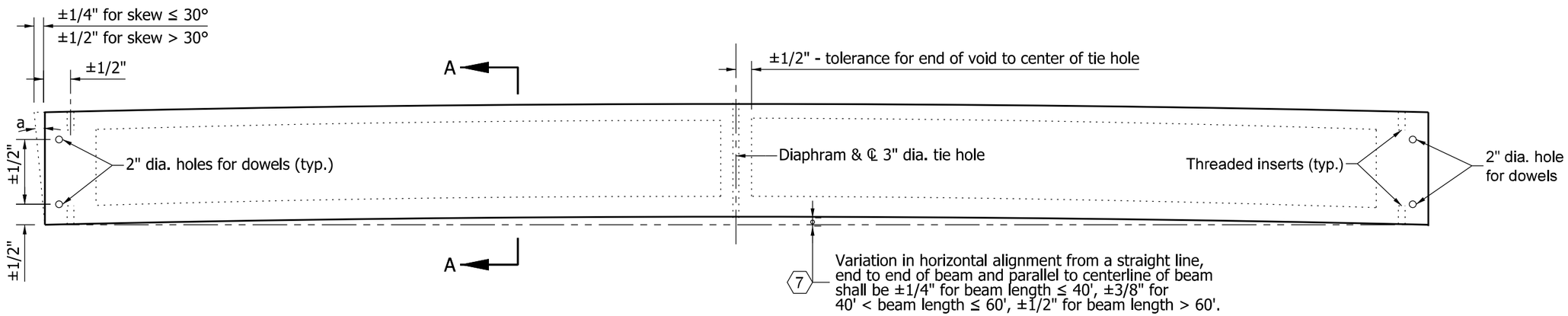
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

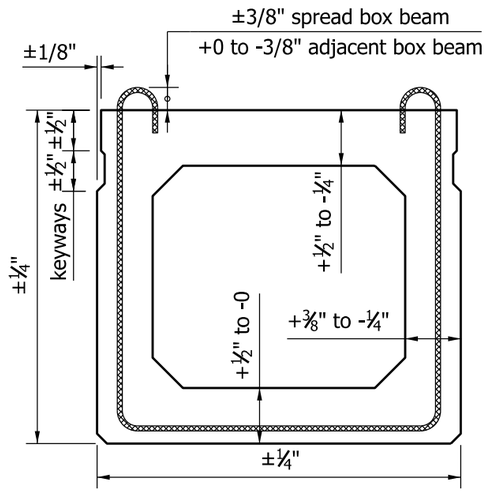
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN



SECTION A-A

NOTES:

1. See Standard Drawing E 707-BPBF-04 for General Notes.
2. The top surface of the beam shall not vary more than 1/8" in 10' as measured from a straightedge.

(3) Tolerance of beam ends for deviation from a true vertical with respect to top and bottom surfaces.

(4) Projection above top of spread box beam shall be ±3/8". Projection above top of adjacent box beam +0 to -3/8".

INDIANA DEPARTMENT OF TRANSPORTATION

FABRICATION TOLERANCES PRESTRESSED BOX BEAM

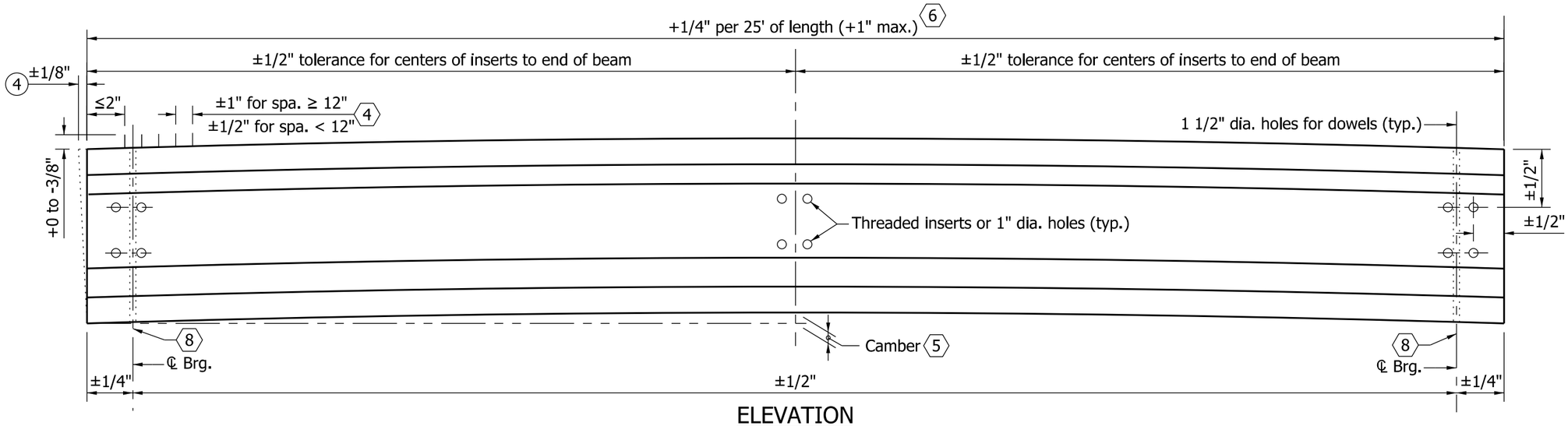
SEPTEMBER 2012

STANDARD DRAWING NO. E 707-BPBF-01

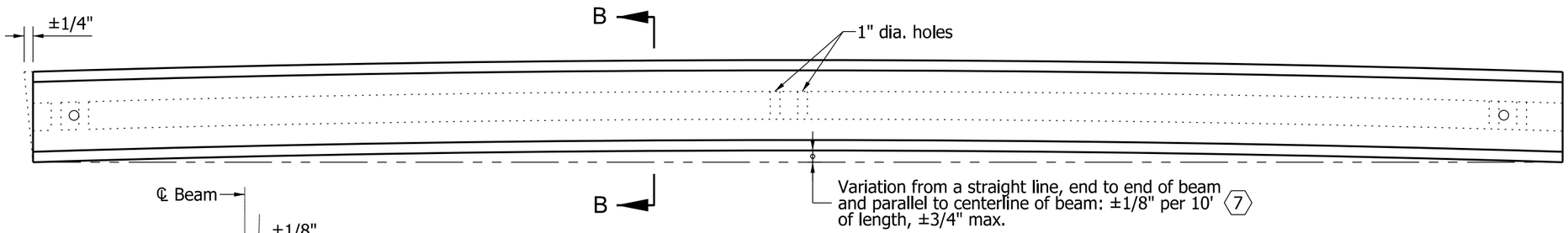
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

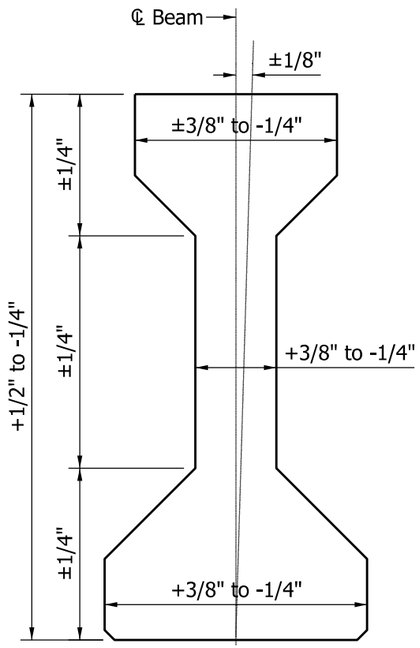
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



ELEVATION



PLAN



SECTION B-B

NOTES:

1. See Standard Drawing E 707-BPBF-04 for General Notes.
2. Center of gravity of depressed-strands group at the end of beam shall not be more than ±1/2".
3. Tolerance of position of post-tensioning duct shall be ±1/4".

(4) Horizontal tolerance of beam ends for deviation from a true vertical with respect to top and bottom sufaces. Vertical tolerance shall be ±1/8" per 12" of beam height.

INDIANA DEPARTMENT OF TRANSPORTATION

FABRICATION TOLERACES
PRESTRESSED I BEAM

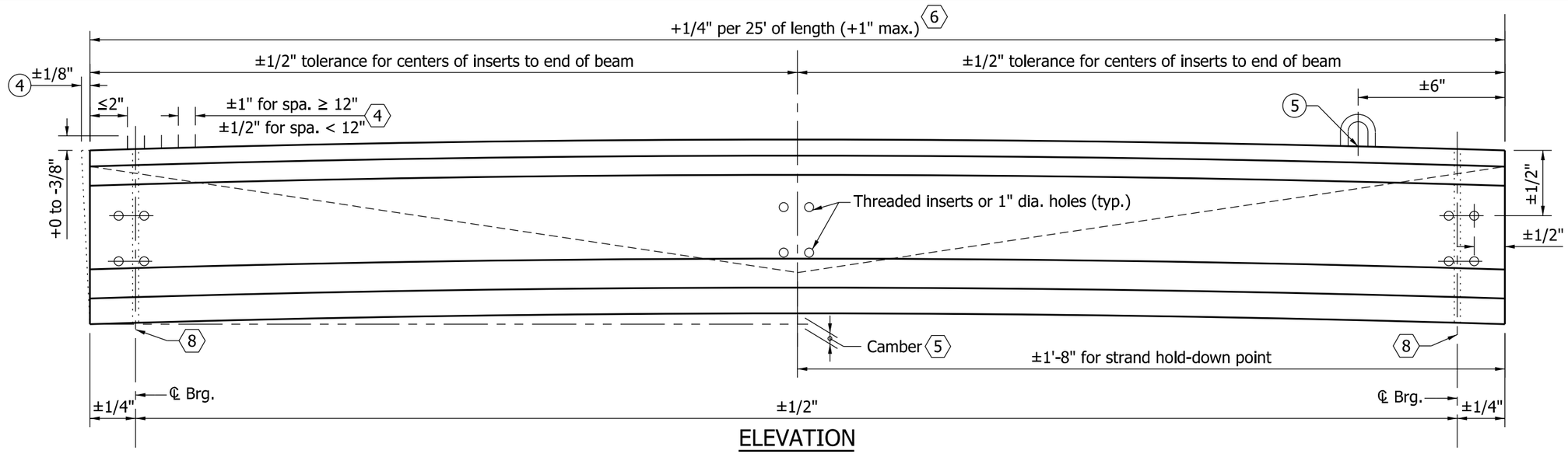
SEPTEMBER 2012

STANDARD DRAWING NO. E 707-BPBF-02

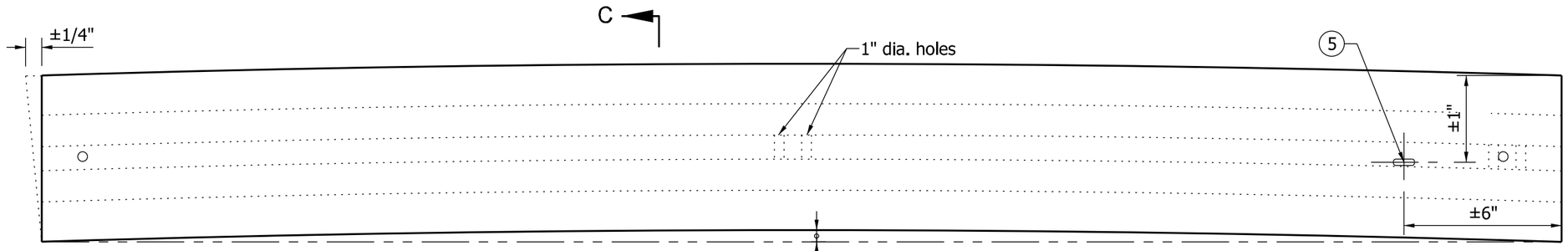
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



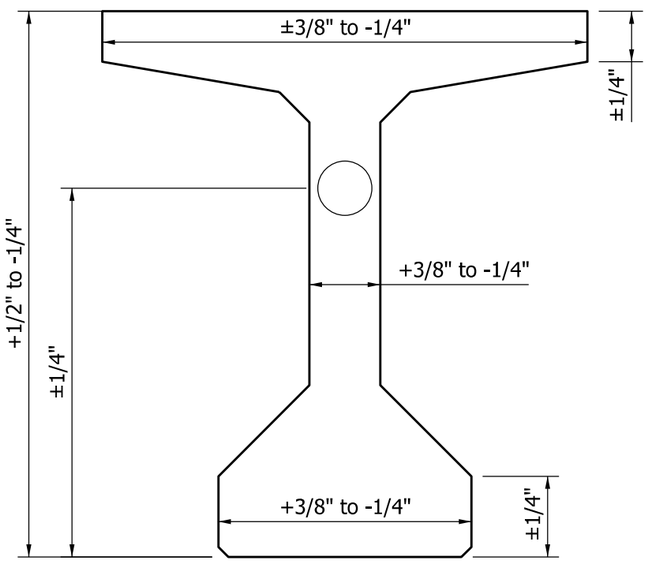
ELEVATION



Variation from a straight line, end to end of beam and parallel to centerline of beam: ±1/8" per 10' of length, ±3/4" max. 7

C

PLAN



SECTION C-C

NOTES:

1. See Standard Drawing E 707-BPBF-04 for General Notes.
2. Center of gravity of depressed-strands group at the end of beam shall not be more than ±1/2".
3. Tolerance of position of post-tensioning duct shall be ±1/4".

(4) Horizontal tolerance of beam ends for deviation from a true vertical with respect to top and bottom sufaces. Vertical tolerance shall be ±1/8" per 12" of beam height.

(5) Location of handling device.

INDIANA DEPARTMENT OF TRANSPORTATION

FABRICATION TOLERACES
PRESTRESSED BULB-TEE BEAM

SEPTEMBER 2012

STANDARD DRAWING NO. E 707-BPBF-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

GENERAL NOTES :

1. Tolerances shown are maximum permissible varations from the dimensions shown on the plans or shop drawings. Tolerances shall not be considered cumulative. Longitudinal tolerances are based on design length. Casting length shall be adjusted to compensate for shrinkage and plastic flow.

2. End stirrup bars shall not be more than 2" from the end of the beam.

3. Mild reinforcing steel concrete cover tolerance shall be 1/8" to +3/8".

4. Tolerances for reinforcing bars for composite beam.

5. Variation of camber shall not be more than 1" on one span nor more than 1/2" between adjacent members to be measured at time of erection.

   Permitted camber variation from design camber is as follows:
   I-beam or bulb-tee beam: ±1/8" per 10'-0" length with ±1/2" maximum for member length of 80'-0" or less
   ±1" maximum for member length of greater than 80'-0"
   Box beam: ±1/8" per 10'-0" length with ±1/2" mm maximum

6. Tolerance in length of beam shall be checked after the final curing phase and within three days prior to shipping.

7. Horizontal-alignment tolerance shall be checked immediately after removal of forms and strand release, and prior to removal from bed.

8. At concrete bearing area, deviation from plane surface when tested in all directions of the plane surface with a steel straightedge shall not be more than ±1/16".

INDIANA DEPARTMENT OF TRANSPORTATION

FABRICATION TOLERANCES GENERAL NOTES

SEPTEMBER 2011

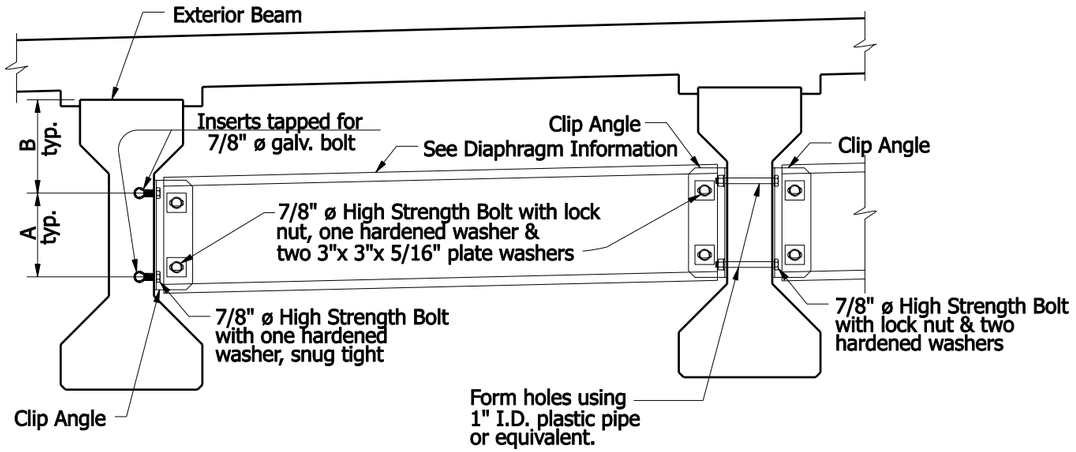
STANDARD DRAWING NO. E 707-BPBF-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

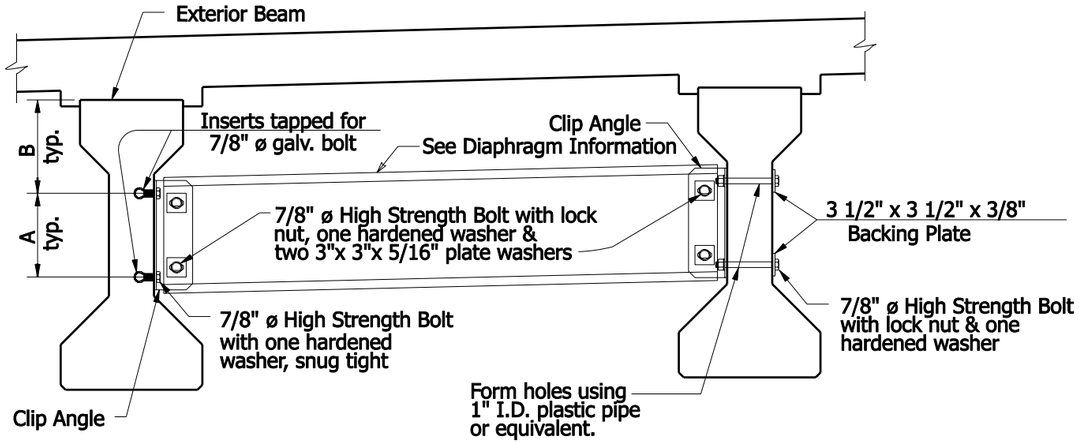
/s/ Richard L.VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE



INTERMEDIATE DIAPHRAGM

Typical for Square Structure



INTERMEDIATE DIAPHRAGM

Typical for Skewed Structure

Diaphragm Information							
Beam Type	Dimension						Channel Type
	A	B	C	D	E	F	
Type II	9"	1'-0"	1'-1"	6"	3 1/2"	3"	C 12 x 20.7
Type III	1'-1"	1'-2 1/2"	1'-5"	10"	3 1/2"	4"	MC 18 x 42.7
Type IV	1'-4"	1'-5 1/2"	1'-8"	10"	5"	4"	MC 18 x 42.7

NOTES:

1. See Standard Drawing E 707-SDPC-02 for connection details.

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS AASHTO I-BEAMS

SEPTEMBER 2007

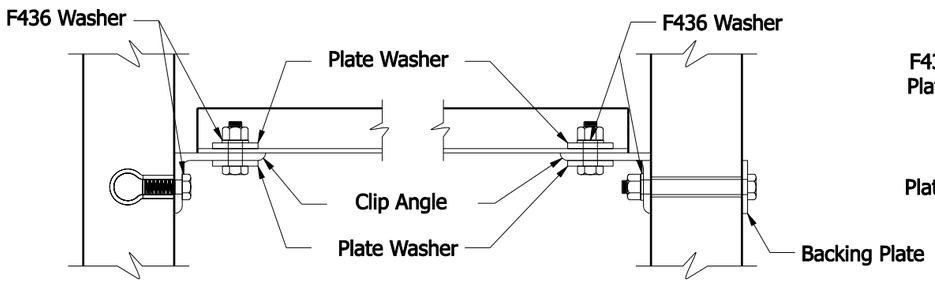
STANDARD DRAWING NO. E 707-SDPC-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

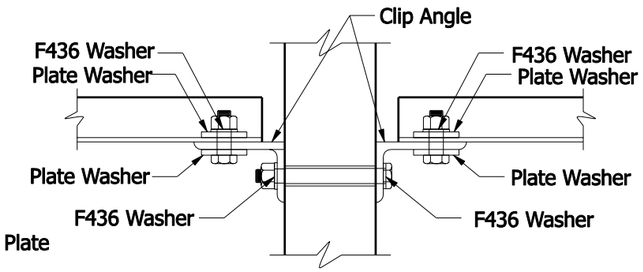
/s/ Richard L. VanCleave 09/04/07
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/04/07
CHIEF HIGHWAY ENGINEER — DATE



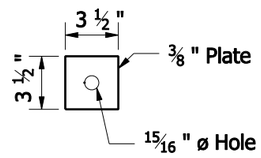
Exterior Beam

Interior Beam, Skewed Structure



Interior Beam, Square Structure

CONNECTION DETAILS



BACKING PLATE

Skewed Structure Only

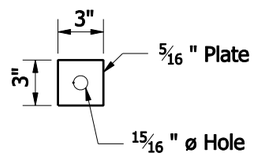
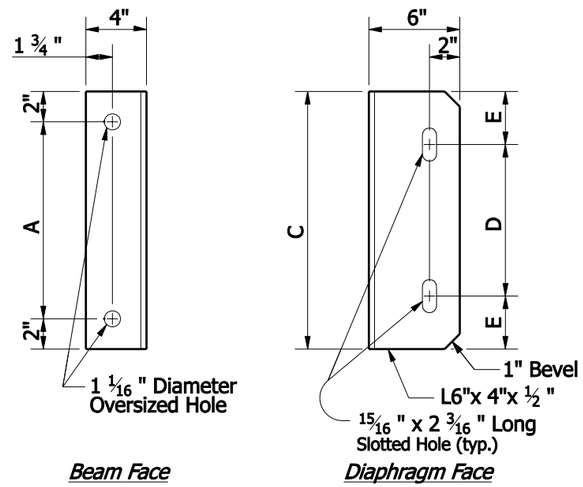


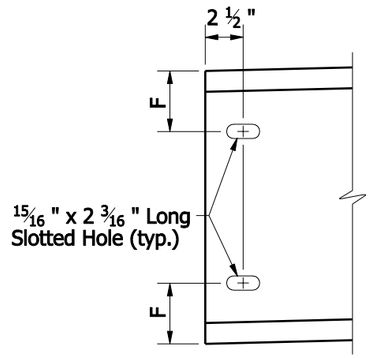
PLATE WASHER



Beam Face

Diaphragm Face

CLIP ANGLE



CHANNEL END

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
AASHTO I-BEAMS

SEPTEMBER 2007

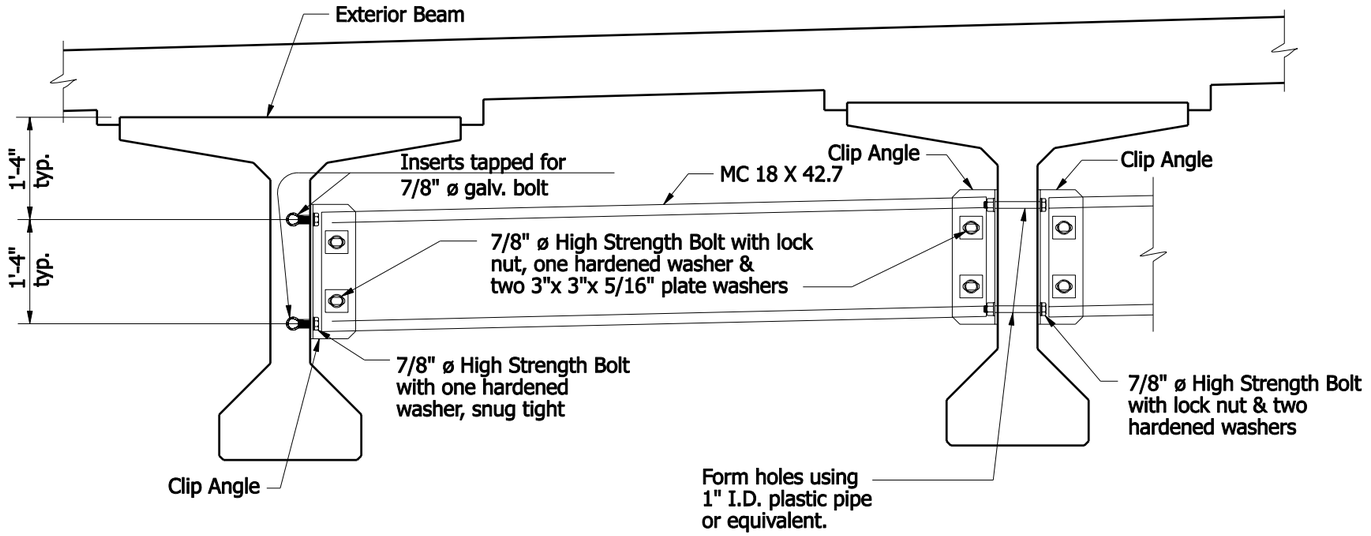
STANDARD DRAWING NO. E 707-SDPC-02

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

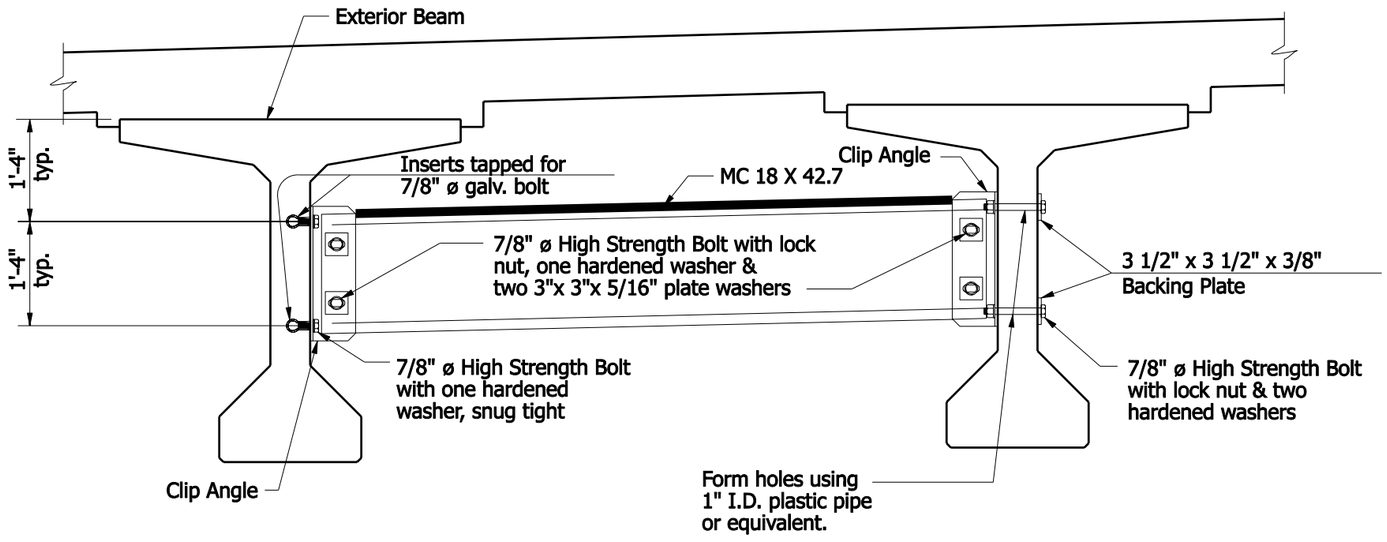
/s/ Richard L. vanCleave *09/04/07*
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark a. Miller *09/04/07*
CHIEF HIGHWAY ENGINEER — DATE



INTERMEDIATE DIAPHRAGM

Typical for Square Structure



INTERMEDIATE DIAPHRAGM

Typical for Skewed Structure

NOTES:

1. See Standard Drawing E 707-SDPC-04 for connection details.

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
INDIANA BULB-TEES, 54-IN. DEPTH

SEPTEMBER 2007

STANDARD DRAWING NO. E 707-SDPC-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

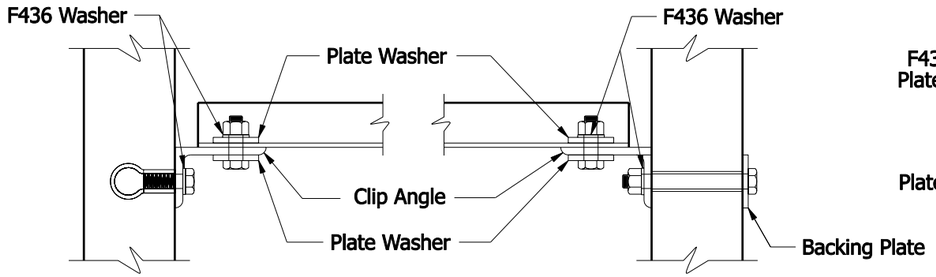
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/04/07

DESIGN STANDARDS ENGINEER — DATE

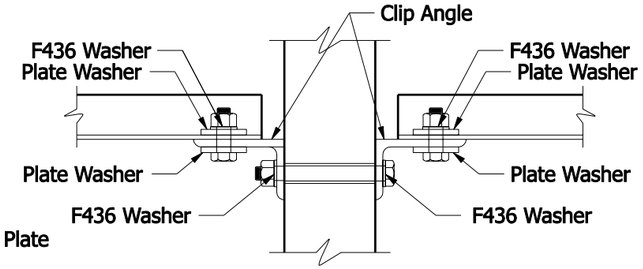
/s/ Mark A. Miller 09/04/07

CHIEF HIGHWAY ENGINEER — DATE



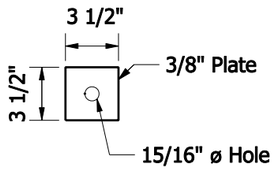
Exterior Beam

Interior Beam, Skewed Structure



Interior Beam, Square Structure

CONNECTION DETAILS



BACKING PLATE
Skewed Structure Only

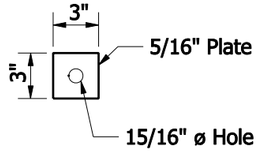
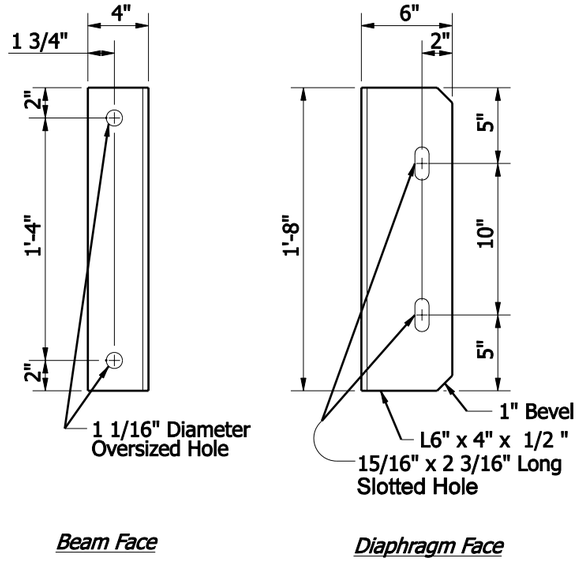
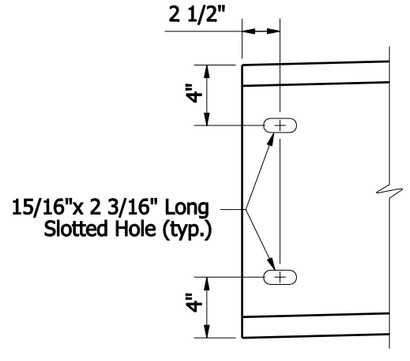


PLATE WASHER



Beam Face *Diaphragm Face*

CLIP ANGLE



CHANNEL END

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
INDIANA BULB-TEES, 54-IN. DEPTH

SEPTEMBER 2007

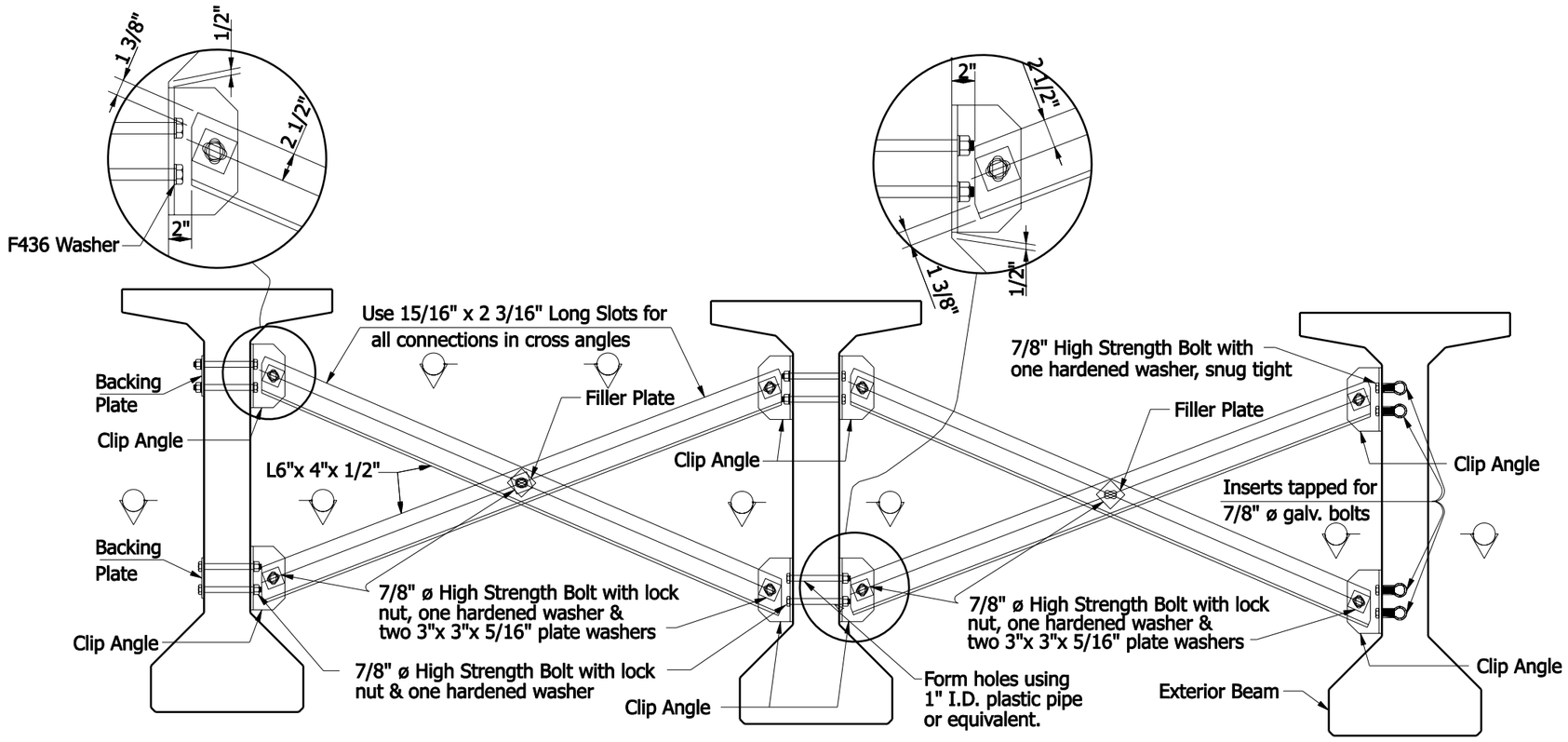
STANDARD DRAWING NO. E 707-SDPC-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/04/07
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/04/07
CHIEF HIGHWAY ENGINEER DATE



NOTES:

1. See Standard Drawing E 707-SDPC-06 for connection details.

INTERMEDIATE DIAPHRAGM DETAILS

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
INDIANA BULB-TEES, 60 IN. OR DEEPER

SEPTEMBER 2007

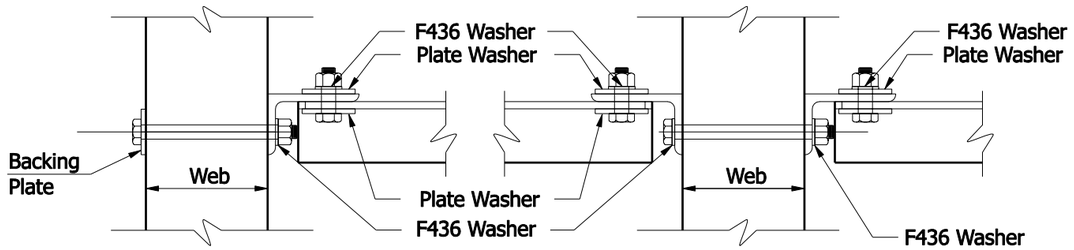
STANDARD DRAWING NO. E 707-SDPC-05

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

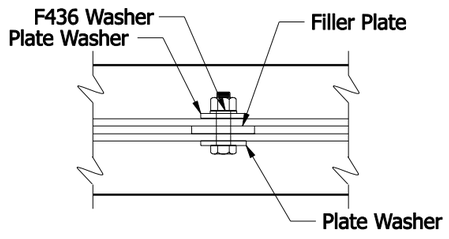
/s/ Richard L. VanCleave 09/04/07
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/04/07
CHIEF HIGHWAY ENGINEER — DATE

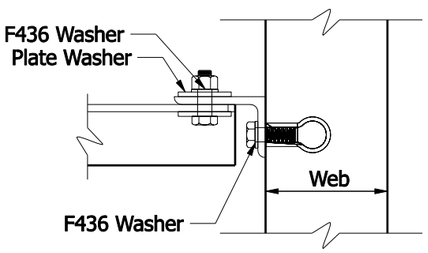


SECTION T-T
Interior Beam, Skewed Structure

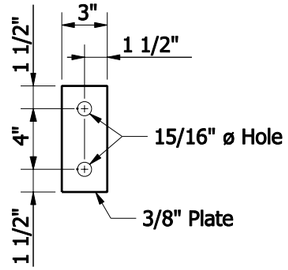
SECTION B-B
Interior Beam, Square Structure



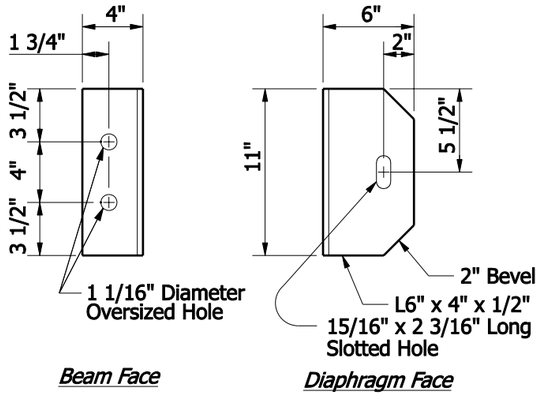
SECTION X-X



SECTION E-E
Exterior Beam



BACKING PLATE



Beam Face *Diaphragm Face*

CLIP ANGLE

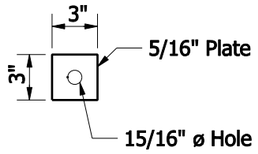
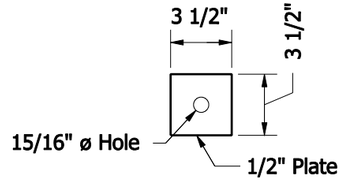


PLATE WASHER



FILLER PLATE

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
INDIANA BULB-TEES, 60 IN. OR DEEPER

SEPTEMBER 2007

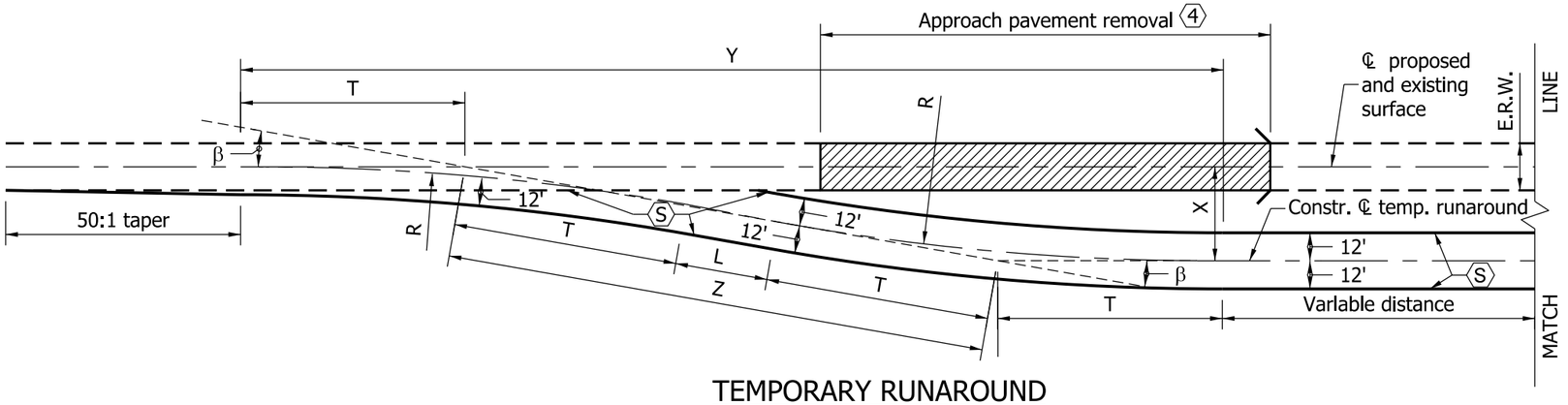
STANDARD DRAWING NO. E 707-SDPC-06

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

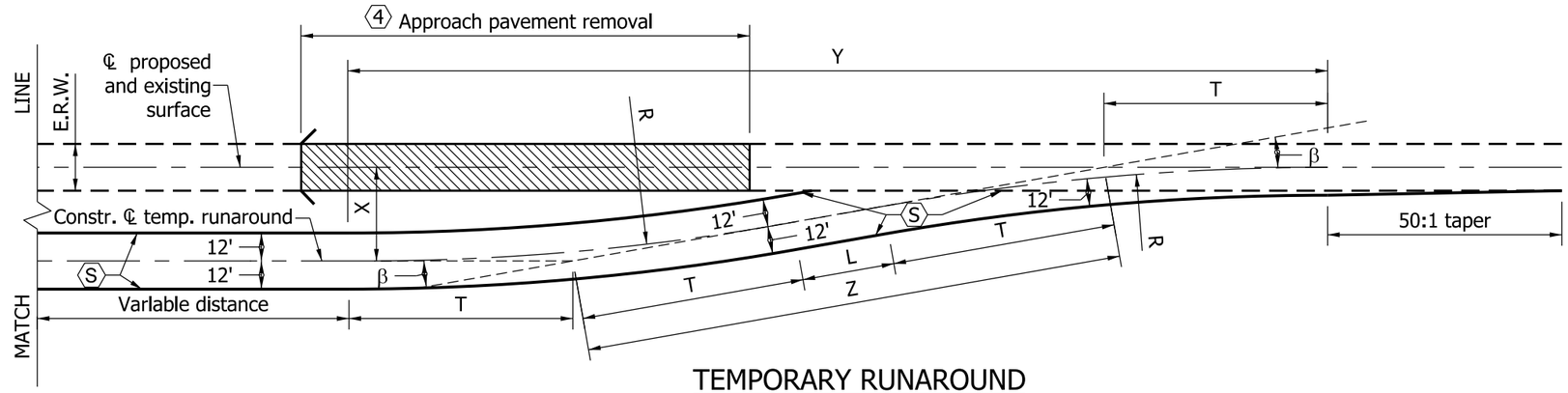
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/04/07
DESIGN STANDARDS ENGINEER — DATE

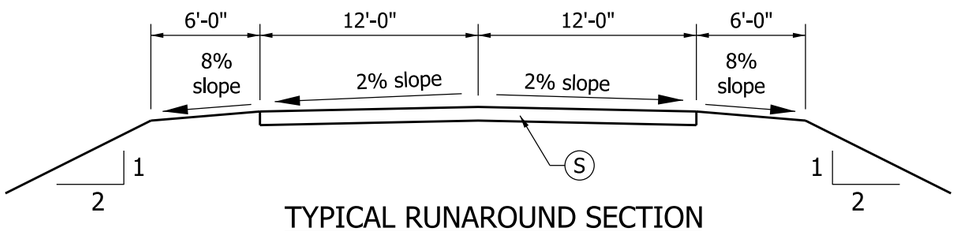
/s/ Mark A. Miller 09/04/07
CHIEF HIGHWAY ENGINEER — DATE



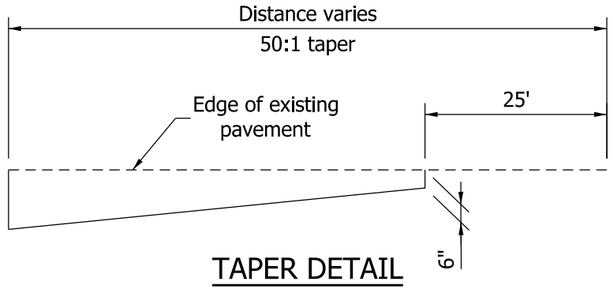
TEMPORARY RUNAROUND



TEMPORARY RUNAROUND



TYPICAL RUNAROUND SECTION



TAPER DETAIL

NOTES:

1. See Standard Drawing E 713-TCTR-04 for general notes with numbered hexagon frame that apply to this sheet.
2. See Standard Drawings E 713-TCTR-02 for runaround geometrics and -02A for surface areas.
3. See Standard Drawing E 801-TCLG-01 for standard notes and legend.

LEGEND:

Work Area

INDIANA DEPARTMENT OF TRANSPORTATION

TEMPORARY RUNAROUND GEOMETRICS

SEPTEMBER 2011

STANDARD DRAWING NO. E 713-TCTR-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 9/1/2011

/s/ Richard L. VanCleave 09/01/11

DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11

CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVAL ON SEPTEMBER 9/1/06

RUNAROUND GEOMETRICS AND SURFACE AREAS

	TYPE A, ≥ 50 MPH						TYPE B, ≤ 45 MPH					
X (ft)	40	45	50	55	60	65	40	45	50	55	60	65
β	10°	10°	10°	10°	10°	10°	13°	13°	13°	13°	13°	13°
Z (ft)	230.35	259.14	287.94	316.73	345.53	374.32	177.82	200.04	222.27	244.50	266.72	288.95
R (ft)	1070	1070	1070	1070	1070	1070	720	720	720	720	720	720
T (ft)	93.61	93.61	93.61	93.61	93.61	93.61	82.03	82.03	82.03	82.03	82.03	82.03
L (ft)	43.13	71.92	100.72	129.51	158.31	187.10	13.76	35.98	58.21	80.44	102.66	124.89
Y (ft)	414.07	442.42	470.79	499.14	527.50	555.85	337.32	358.97	380.63	402.29	423.94	445.60
E.R.W. (ft)	SURFACE AREA OF RUNAROUND IN SYS. (VARIABLE DISTANCE NOT INCLUDED)											
18	1555	1751	1950	2148	2347	2545	1280	1433	1586	1739	1892	2045
20	1493	1691	1890	2088	2287	2585	1225	1378	1531	1684	1837	1990
22	1428	1627	1825	2024	2222	2420	1170	1323	1476	1629	1783	1935
24	1375	1574	1773	1971	2170	2368	1127	1280	1432	1586	1739	1892

ERW - Existing Roadway Width

INDIANA DEPARTMENT OF TRANSPORTATION

TEMPORARY RUNAROUND GEOMETRICS

SEPTEMBER 2011

STANDARD DRAWING NO. E 713-TCTR-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 9/1/2011

/s/ Richard L. VanCleave *09/01/11*

DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller *09/01/11*

CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVAL ON SEPTEMBER 9/1/06

RUNAROUND GEOMETRICS AND SURFACE AREAS						
TYPE C						
X (ft)	40	45	50	55	60	65
β	20°	20°	20°	20°	20°	20°
Z (ft)	116.95	131.57	146.19	160.81	175.43	190.05
R (ft)	280	280	280	280	280	280
T (ft)	49.37	49.37	49.37	49.37	49.37	49.37
L (ft)	18.21	32.83	47.45	62.07	76.69	91.31
Y (ft)	208.64	222.38	236.11	249.85	263.59	277.33
E.R.W. (ft)	RUNAROUND AREA, SYS.					
18	816	916	1017	1117	1218	1320
20	775	875	976	1076	1177	1277
22	734	835	935	1036	1136	1237
24	703	806	907	1007	1108	1208

ERW - Existing Roadway Width

ALLOWABLE RUNAROUND TYPE VS. POSTED SPEED																		
EXISTING POSTED SPEED (mph)	55	50	45		40		35			30			25			20		
ALLOWABLE TYPE	A	A	A	B	A	B	A	B	C	A	B	C	A	B	C	A	B	C
RUNAROUND POSTED SPEED (mph)	45	45	45	35	40	35	35	35	25	30	30	25	25	25	25	20	20	20

INDIANA DEPARTMENT OF TRANSPORTATION

TEMPORARY RUNAROUND GEOMETRICS

SEPTEMBER 2011

STANDARD DRAWING NO. E 713-TCTR-02A

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 9/1/2011

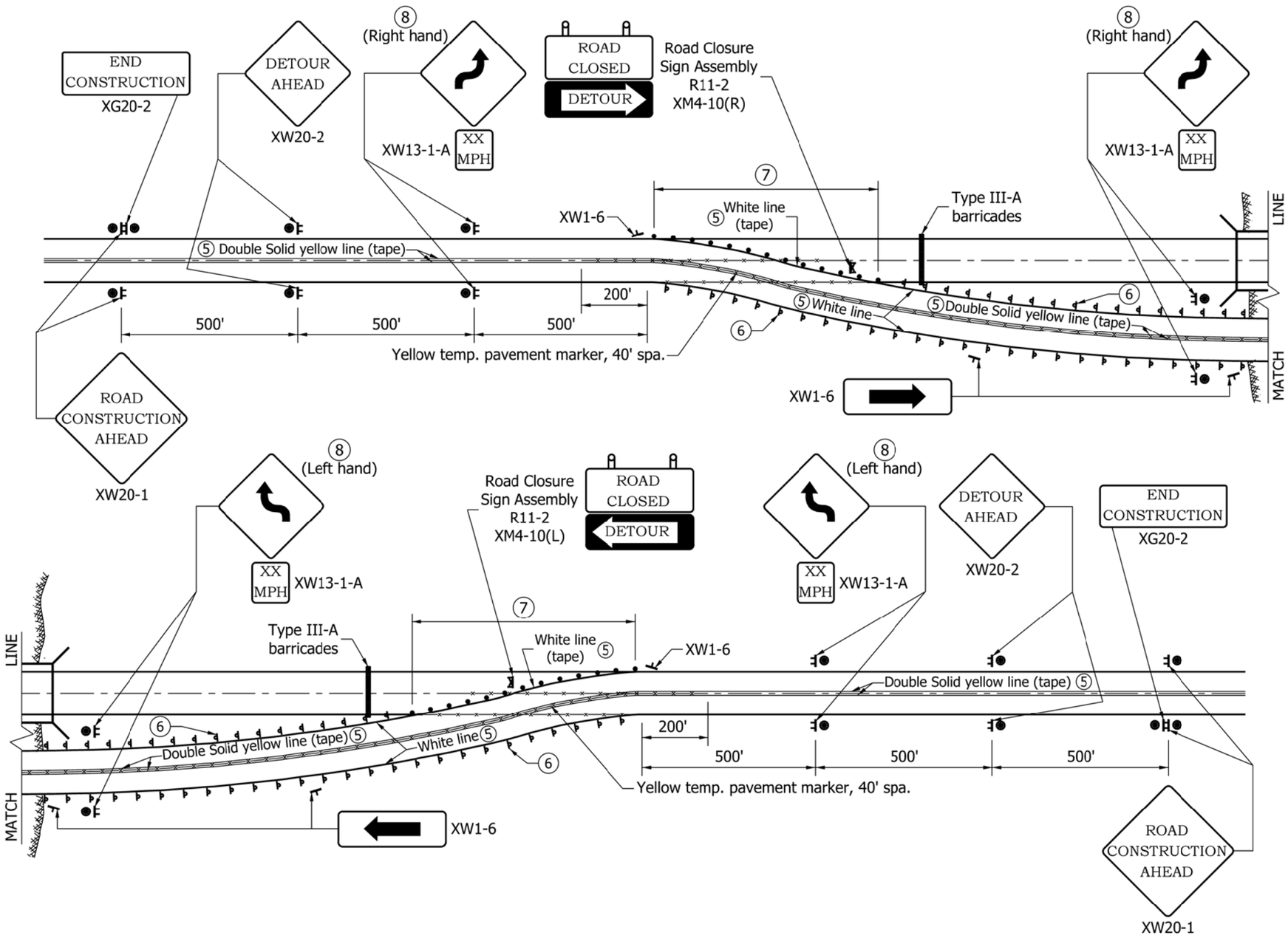
/s/ Richard L. VanCleave 09/01/11

DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11

CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVAL ON SEPTEMBER 9/1/06



NOTES:

1. See Standard Drawing E 713-TCTR-04 for notes that apply to this sheet.
2. See Standard Drawing E 801-TCLG-01 for standard notes and legend.

INDIANA DEPARTMENT OF TRANSPORTATION

TEMPORARY RUNAROUND SIGNING AND MARKING

SEPTEMBER 2011

STANDARD DRAWING NO. E 713-TCTR-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 9/1/2011

/s/ Richard L. VanCleave 9/01/11

DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 9/01/11

CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVAL ON SEPTEMBER 9/1/97

GENERAL NOTES:

1. The pavement section for trucks count exceeding the values shown in (S) in the Legend shall be as shown elsewhere in the plans.

   3. A temporary bridge or temporary pipe shall be used as specified. A 28'-0 clear roadway width shall be provided on a temporary bridge.

(4) The connection of the temporary runaround to the existing pavement shall be outside the limits of the approach pavement removal.

(5) Temporary pavement markings will be required as shown. The contractor shall have the option of using temporary tape or paint for all temporary pavement markings except where otherwise specified.

(6) Delineators type D-2 (white) shall be placed at 30 ft maximum spacing on both sides throughout the length of the temporary runaround, including across the temporary structure. If a temporary bridge is used, type 3 object markers shall be placed at all four corners in accordance with the MUTCD.

(7) Spacing of drums at this location shall be 20 ft.

(8) If the runaround posted speed limit is greater than 30 mph the reverse curve sign, XW1-4 (36" x 36"), shall be used at this location.
If the runaround posted advisory speed limit is 30 mph or less, the reverse turn sign, XW1-3 (36" x 36") shall be used.

LEGEND:

Delineator type D-2 (white)

(S) Pavement section for truck count, AADTT < 500, shall be:

165 #/yd² HMA Surface, Type A, on
275 #/yd² HMA Intermediate, Type A, on
6 in. compacted aggregate, size No. 53, Base, on
Type III Subgrade Treatment
(See Genaral Note #1)

INDIANA DEPARTMENT OF TRANSPORTATION

TEMPORARY RUNAROUND
GENERAL NOTES

SEPTEMBER 2010

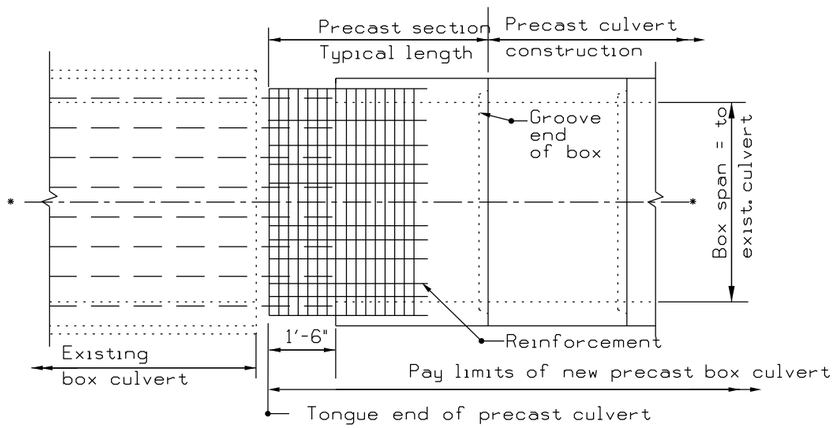
STANDARD DRAWING NO. E 713-TCTR-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

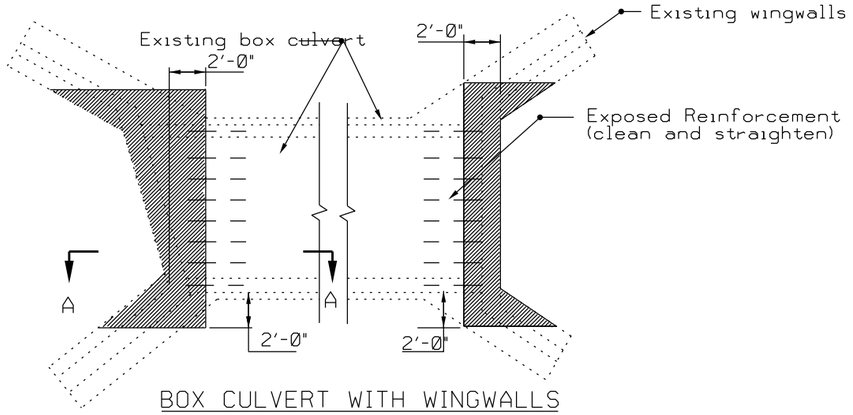
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/01/10
DESIGN STANDARDS ENGINEER DATE

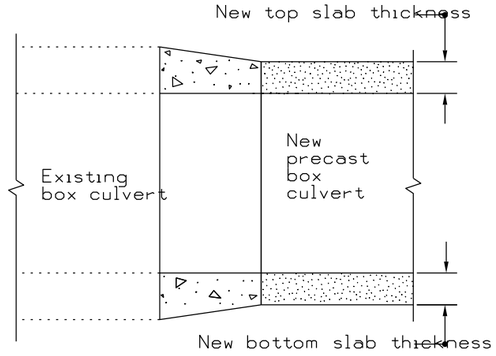
/s/ Mark A. Miller 09/01/10
CHIEF HIGHWAY ENGINEER DATE



SECTION A-A CONNECTION VIEW



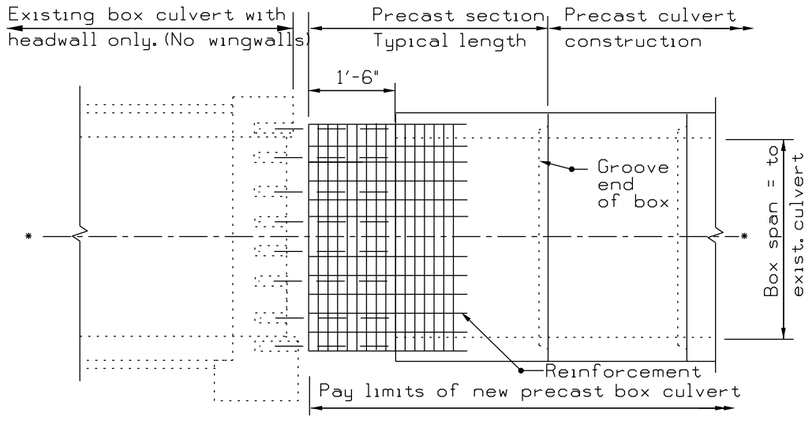
BOX CULVERT WITH WINGWALLS
EXTENSION PREPARATION



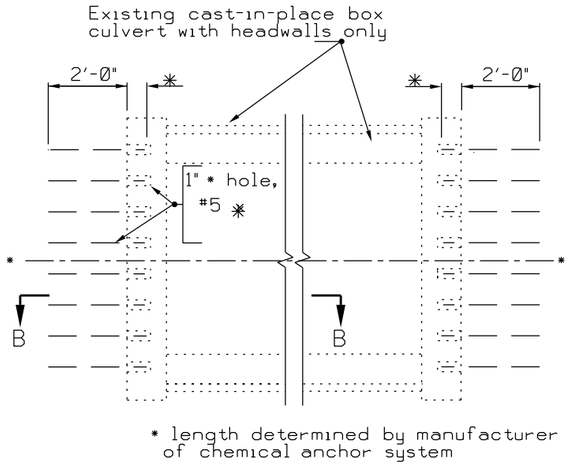
SECTION A-A AND B-B
(Showing cast-in-place section)

LEGEND :

- Removal
- Existing structure
- New element or structure



SECTION B-B CONNECTION VIEW



BOX CULVERT WITH HEADWALLS ONLY
EXTENSION PREPARATION

INDIANA DEPARTMENT OF TRANSPORTATION

PRECAST BOX-CULVERT EXTENSION

SEPTEMBER 2010

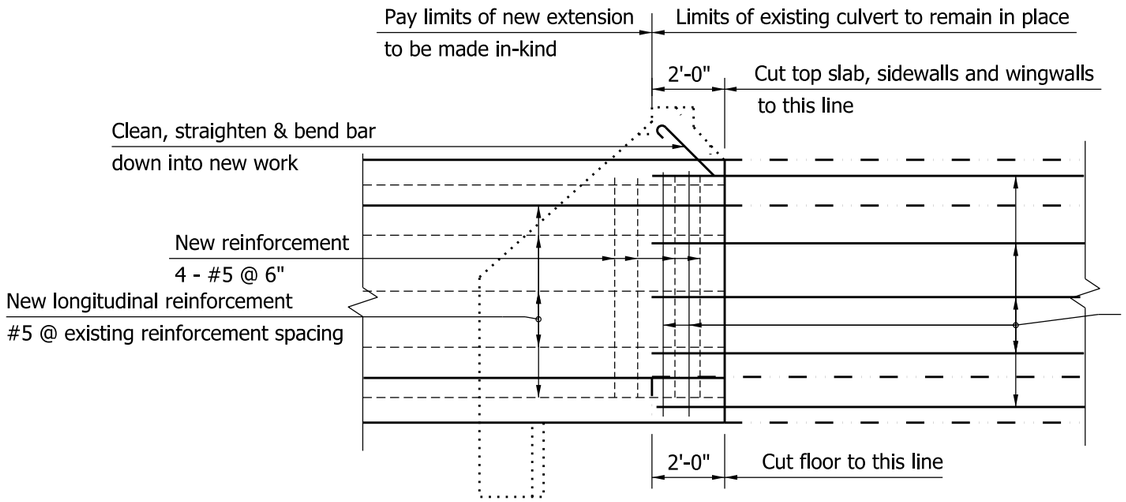
STANDARD DRAWING NO. E 714-BCEX-01

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/10
DESIGN STANDARDS ENGINEER DATE

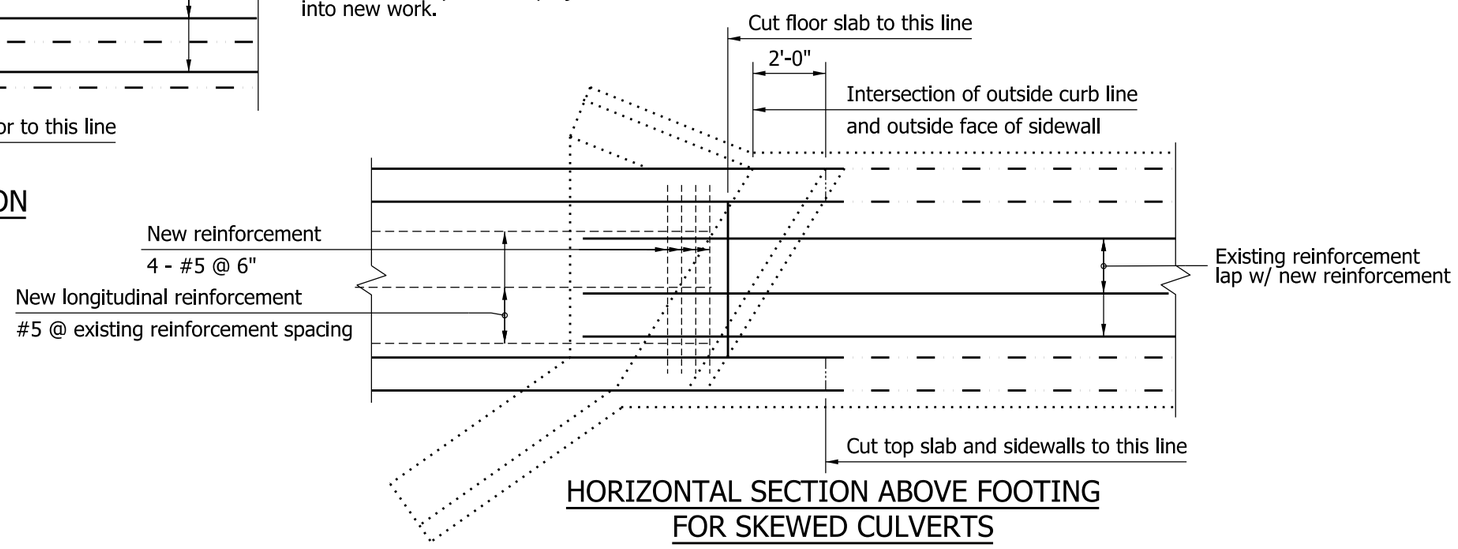
/s/ Mark A. Miller 09/01/10
CHIEF HIGHWAY ENGINEER DATE



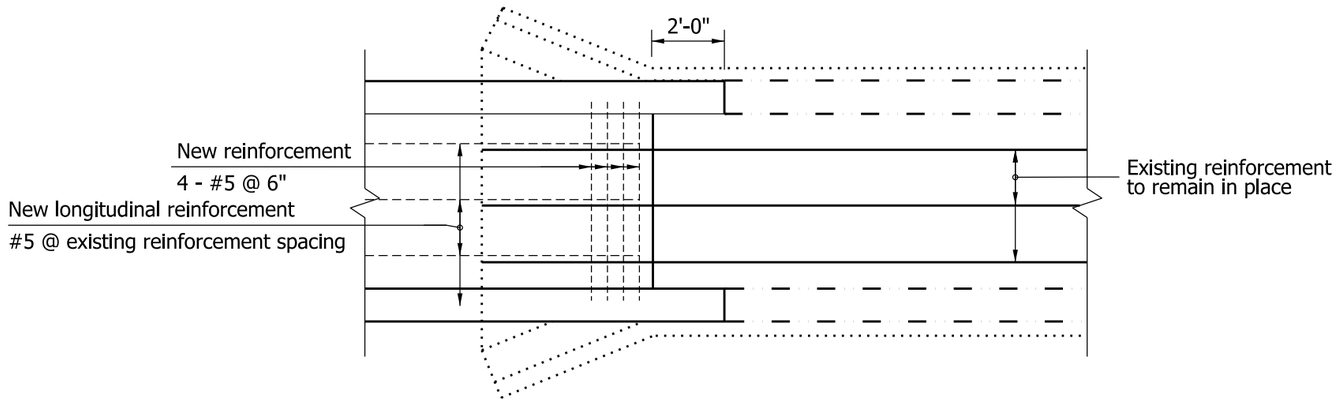
LONGITUDINAL SECTION
FOR ALL CULVERTS

NOTES:

1. Before removing existing concrete, saw around the perimeter of the removal areas on the interior and exterior of the culvert to a depth of 1".
2. New horizontal reinforcement shall be anchored into the culvert walls with bar hooks.



HORIZONTAL SECTION ABOVE FOOTING
FOR SKEWED CULVERTS



HORIZONTAL SECTION ABOVE FOOTING
FOR SQUARE CULVERTS

INDIANA DEPARTMENT OF TRANSPORTATION

CAST-IN-PLACE BOX-CULVERT EXTENSION

SEPTEMBER 2010

STANDARD DRAWING NO. E 714-BCEX-02

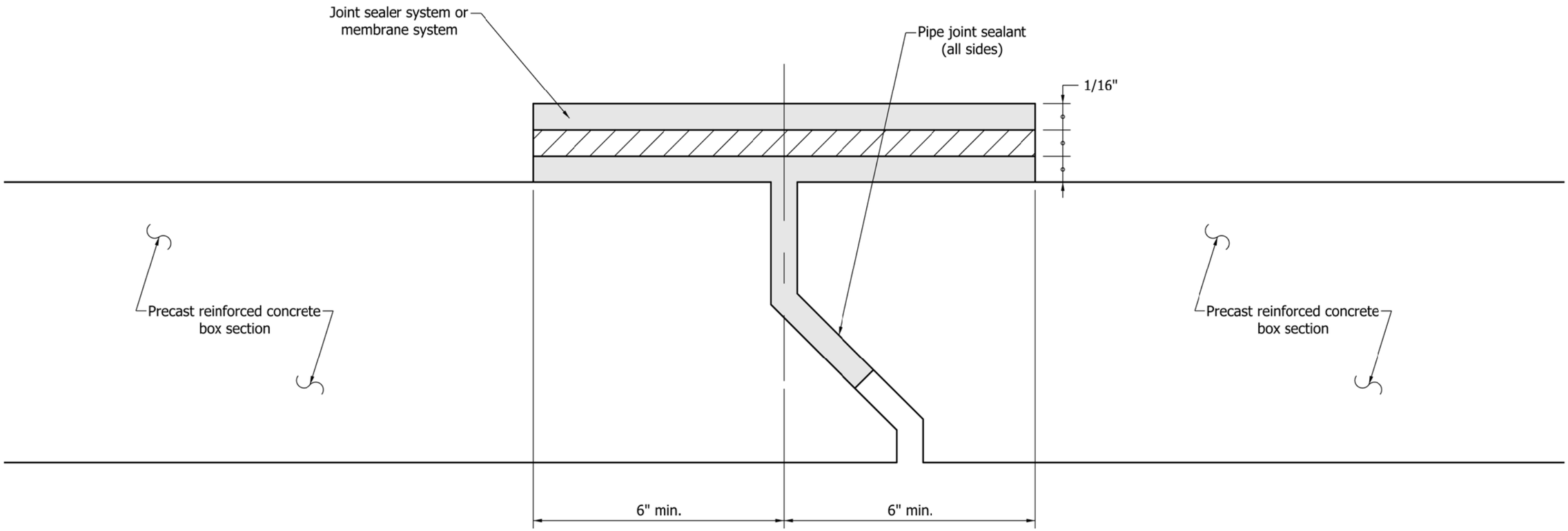
RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/10
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/10
CHIEF HIGHWAY ENGINEER DATE

Top and sides of structure



Inside of structure

INDIANA DEPARTMENT OF TRANSPORTATION

PRECAST REINFORCED CONCRETE BOX SECTION JOINT

SEPTEMBER 2011

STANDARD DRAWING NO. E 714-BCJT-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

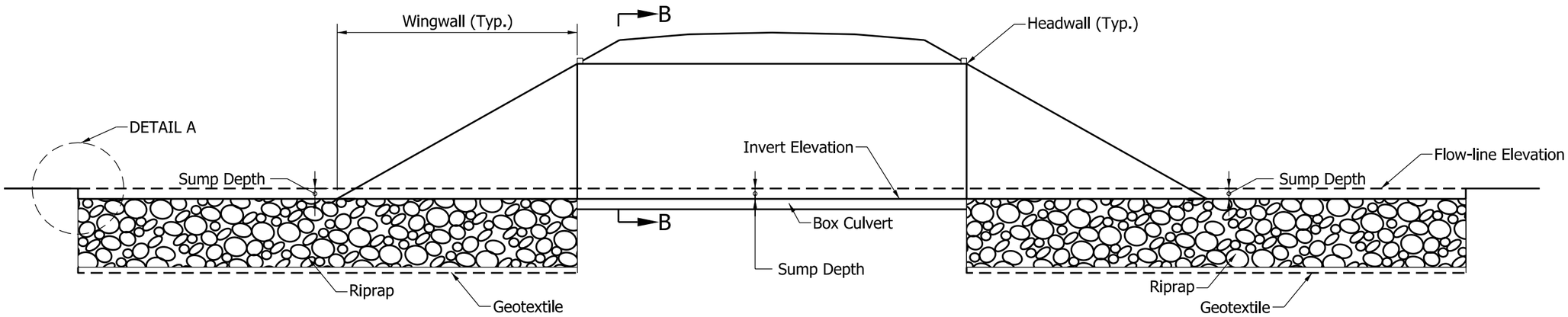
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/01/11

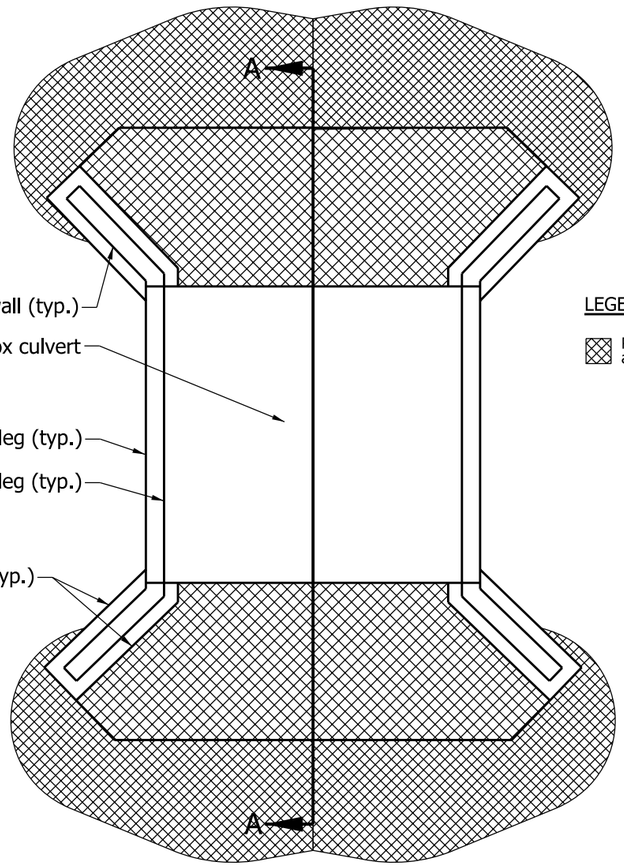
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11

CHIEF HIGHWAY ENGINEER DATE



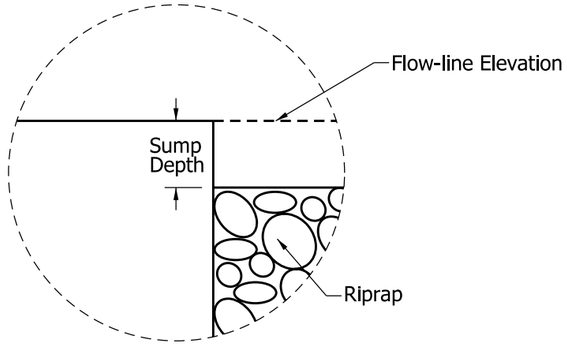
SECTION A-A ELEVATION



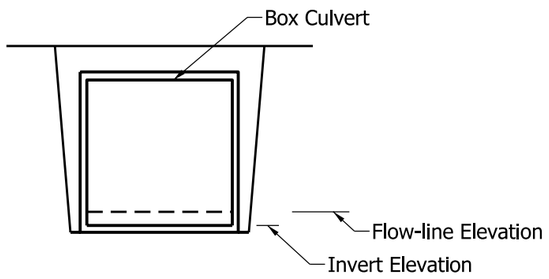
PLAN - WITH WINGWALLS

LEGEND:

Riprap on geotextiles as shown on the plans.



DETAIL A



SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

BOX CULVERT SUMPING AND SCOUR PROTECTION

SEPTEMBER 2011

STANDARD DRAWING NO. E 714-BCSP-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE

REINFORCED CONCRETE PIPE

D	H	R	S	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE	
				G	CU.YDS.CONC. 2 ANCHORS	G	CU.YDS.CONC. 2 ANCHORS	G	CU.YDS.CONC. 2 ANCHORS
42"	3'-3	2'-7½"	6'-3	5'-3	2.5	11'-6	5.5	17'-9	8.6
48"	3'-5	2'-11	6'-10	5'-10	2.8	12'-8	6.2	19'-6	9.6
54"	3'-7	3'-2½"	7'-8	6'-5	3.2	14'-1	7.1	21'-9	11.1
60"	3'-9	3'-6	8'-6	7'-0	3.5	15'-6	8.0	24'-0	12.5
66"	3'-11	3'-9½"	9'-4	7'-7	3.9	16'-11	9.0	26'-3	14.1
72"	4'-1	4'-1	10'-2	8'-2	4.3	18'-4	10.0	28'-6	15.7
78"	4'-3	4'-4½"	11'-0	8'-9	4.7	19'-9	11.0	30'-9	17.3
84"	4'-5	4'-8	11'-10	9'-4	5.1	21'-2	12.1	33'-0	19.0
90"	4'-7	4'-11½"	12'-8	9'-11	5.5	22'-7	13.2	35'-3	20.8
96"	4'-9	5'-3	13'-6	10'-6	6.0	24'-0	14.3	37'-6	22.7
102"	4'-11	5'-6½"	14'-1	11'-1	6.4	25'-2	15.3	39'-3	24.2
108"	5'-1	5'-10	14'-8	11'-8	6.9	26'-4	16.3	41'-0	25.7
114"	5'-3	6'-1½"	15'-3	12'-3	7.4	27'-6	17.3	42'-9	27.3
120"	5'-5	6'-5	15'-10	12'-10	7.8	28'-8	18.4	44'-6	28.9
126"	5'-7	6'-8½"	16'-5	13'-5	8.3	29'-10	19.4	46'-3	30.5
132"	5'-9	7'-0	17'-0	14'-0	8.8	31'-0	20.5	48'-0	32.2
138"	5'-11	7'-3½"	17'-7	14'-7	9.4	32'-2	21.6	49'-9	33.9
144"	6'-1	7'-7	18'-2	15'-2	9.9	33'-4	22.8	51'-6	35.6

CORRUGATED ALUMINUM ALLOY OR STEEL PIPE

D	H	R	S	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE	
				G	CU.YDS.CONC. 2 ANCHORS	G	CU.YDS.CONC. 2 ANCHORS	G	CU.YDS.CONC. 2 ANCHORS
42"	2'-11	2'-4	5'-8	4'-8	2.1	10'-4	4.7	16'-0	7.3
48"	3'-1	2'-7	6'-2	5'-2	2.4	11'-4	5.3	17'-6	8.2
54"	3'-3	2'-10	6'-11	5'-8	2.7	12'-7	6.1	19'-6	9.5
60"	3'-4	3'-1	7'-8	6'-2	3.0	13'-10	6.7	21'-6	10.5
66"	3'-5	3'-4	8'-5	6'-8	3.2	15'-1	7.5	23'-6	11.6
72"	3'-7	3'-7	9'-2	7'-2	3.6	16'-4	8.3	25'-6	13.0
78"	3'-9	3'-10	9'-11	7'-8	3.9	17'-7	9.1	27'-6	14.4
84"	3'-10	4'-1	10'-8	8'-2	4.2	18'-10	9.9	29'-6	15.6
90"	3'-11	4'-4	11'-5	8'-8	4.5	20'-1	10.7	31'-6	16.8
96"	4'-1	4'-7	12'-2	9'-2	4.8	21'-4	11.6	33'-6	18.4
102"	4'-2	4'-10	12'-8	9'-8	5.1	22'-4	12.2	35'-0	19.3
108"	4'-4	5'-1	13'-2	10'-2	5.5	23'-4	13.0	36'-6	20.6
114"	4'-5	5'-4	13'-8	10'-8	5.8	24'-4	13.7	38'-0	21.6
120"	4'-7	5'-7	14'-2	11'-2	6.2	25'-4	14.6	39'-6	22.9
126"	4'-8	5'-10	14'-8	11'-8	6.5	26'-4	15.2	41'-0	23.9
132"	4'-10	6'-1	15'-2	12'-2	6.9	27'-4	16.1	42'-6	25.3
138"	4'-11	6'-4	15'-8	12'-8	7.3	28'-4	16.8	44'-0	26.4
144"	5'-1	6'-7	16'-2	13'-2	7.7	29'-4	17.8	45'-6	27.8

GENERAL NOTES

1. Refer to Standard Drawings E 715-SPCA-01 and E 715-SPCA-02 for single pipe anchor details.
2. Refer to Standard Drawings E 715-MPCA-01 and E 715-MPCA-02 for multiple pipe anchor details.

LEGEND

D – Pipe diameter

H – Anchor height

R – Dimension from anchor edge to ℄ of pipe

S – Dimension between ℄ of adjacent pipes

G – Overall anchor length

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE ANCHOR TABLE

JANUARY 1998

STANDARD DRAWING NO. E 715-ANCH-01

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

REINFORCED CONCRETE HORIZONTAL ELLIPTICAL PIPE

SPAN	RISE	H	R	S	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE	
					G	CU.YDS.CONC., 2 ANCHORS	G	CU.YDS.CONC., 2 ANCHORS	G	CU.YDS.CONC., 2 ANCHORS
45"	29"	3'-0	2'-9	6'-6	5'-6	2.5	12'-0	5.5	18'-6	8.5
49"	32"	3'-1	2'-11½	6'-11	5'-11	2.7	12'-10	5.9	19'-9	9.2
53"	34"	3'-2	3'-1½	7'-6	6'-3	2.9	13'-9	6.4	21'-3	10.0
60"	38"	3'-3	3'-5½	8'-5	6'-11	3.2	13'-4	7.3	23'-9	11.3
68"	43"	3'-5	3'-10	9'-6	7'-8	3.6	17'-2	8.3	26'-8	13.0
76"	48"	3'-7	4'-2½	10'-7	8'-5	4.1	19'-0	9.4	29'-7	14.8
83"	53"	3'-8	4'-6½	11'-7	9'-1	4.5	20'-8	10.5	32'-3	16.5
91"	58"	3'-10	4'-11	12'-8	9'-10	4.9	22'-6	11.7	35'-2	18.4
98"	63"	4'-0	5'-3	13'-6	10'-6	5.3	24'-0	12.7	37'-6	20.1
106"	68"	4'-2	5'-7½	14'-3	11'-3	5.8	25'-6	13.7	39'-9	21.7
113"	72"	4'-3	5'-11½	14'-11	11'-11	6.2	26'-10	14.6	41'-9	23.0
121"	77"	4'-5	6'-4	15'-8	12'-8	6.7	28'-4	15.7	44'-0	24.6
128"	82"	4'-6	6'-8	16'-4	13'-4	7.2	29'-8	16.6	46'-0	26.1
136"	87"	4'-8	7'-0	17'-0	14'-0	7.6	31'-0	17.6	48'-0	27.6
143"	92"	4'-10	7'-4	17'-8	14'-8	8.1	32'-4	18.7	50'-0	29.2
151"	97"	5'-0	7'-8½	18'-5	15'-5	8.7	33'-10	19.9	52'-3	31.0
166"	106"	5'-3	8'-5	19'-10	16'-10	9.7	36'-8	22.0	56'-6	34.4
180"	116"	5'-6	9'-1	21'-2	18'-2	10.8	39'-4	24.3	60'-6	37.8

CORRUGATED ALUMINUM ALLOY OR STEEL PIPE-ARCH

SPAN	RISE	H	R	S	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE	
					G	CU.YDS.CONC., 2 ANCHORS	G	CU.YDS.CONC., 2 ANCHORS	G	CU.YDS.CONC., 2 ANCHORS
49"	33"	3'-0	2'-7	6'-3	5'-2	2.2	11'-5	4.9	17'-8	7.7
57"	38"	3'-1	2'-11	7'-3	5'-10	2.5	13'-1	5.7	20'-4	8.9
64"	43"	3'-3	3'-2½	8'-1	6'-5	2.8	14'-6	6.4	22'-7	10.1
71"	47"	3'-4	3'-6	9'-0	7'-0	3.0	16'-0	7.2	25'-0	11.3
77"	52"	3'-6	3'-9	9'-9	7'-6	3.3	17'-3	7.9	27'-0	12.5
83"	57"	3'-8	4'-0	10'-6	8'-0	3.5	18'-6	8.6	29'-0	13.6
60"	46"	3'-9	3'-1	7'-8	6'-2	2.9	13'-10	6.7	21'-6	10.5
66"	51"	3'-10	3'-4	8'-5	6'-8	3.1	15'-1	7.4	23'-6	11.6
73"	55"	4'-0	3'-7½	9'-4	7'-3	3.4	16'-7	8.3	25'-11	13.1
81"	59"	4'-2	3'-11½	10'-4	7'-11	3.7	18'-3	9.1	28'-7	14.5
87"	63"	4'-2	4'-2½	11'-1	8'-5	4.0	19'-6	9.8	30'-7	15.6
95"	67"	4'-4	4'-6½	12'-1	9'-1	4.3	21'-2	10.8	33'-3	17.2
103"	71"	4'-6	4'-10½	12'-9	9'-9	4.7	22'-6	11.6	35'-3	18.5
112"	75"	4'-8	5'-3	13'-6	10'-6	5.1	24'-0	12.5	37'-6	19.8
117"	79"	4'-9	5-5½	13'-11	10'-11	5.3	24'-10	12.9	38'-9	20.6
128"	83"	5'-0	5-11	14'-10	11'-10	5.8	26'-8	14.1	41'-6	22.4
137"	87"	5'-2	6'-3	15'-7	12'-7	6.1	28'-1	14.8	43'-8	23.5
142"	91"	5'-4	6'-6	16'-0	13'-0	6.5	29'-0	15.7	45'-0	24.9

GENERAL NOTES

1. Refer to Standard Drawings E 715-SPCA-01 and E 715-SPCA-02 for single anchor details.
2. Refer to Standard Drawing E 715-MPCA-02 for multiple anchor details.

LEGEND

H - Anchor height
R - Dimension from anchor edge to ℄ exterior pipe
S - Dimension between ℄ of adjacent pipes
G - Overall anchor length

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE ANCHOR TABLES

JANUARY 1998

STANDARD DRAWING NO. E 715-ANCH-02

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

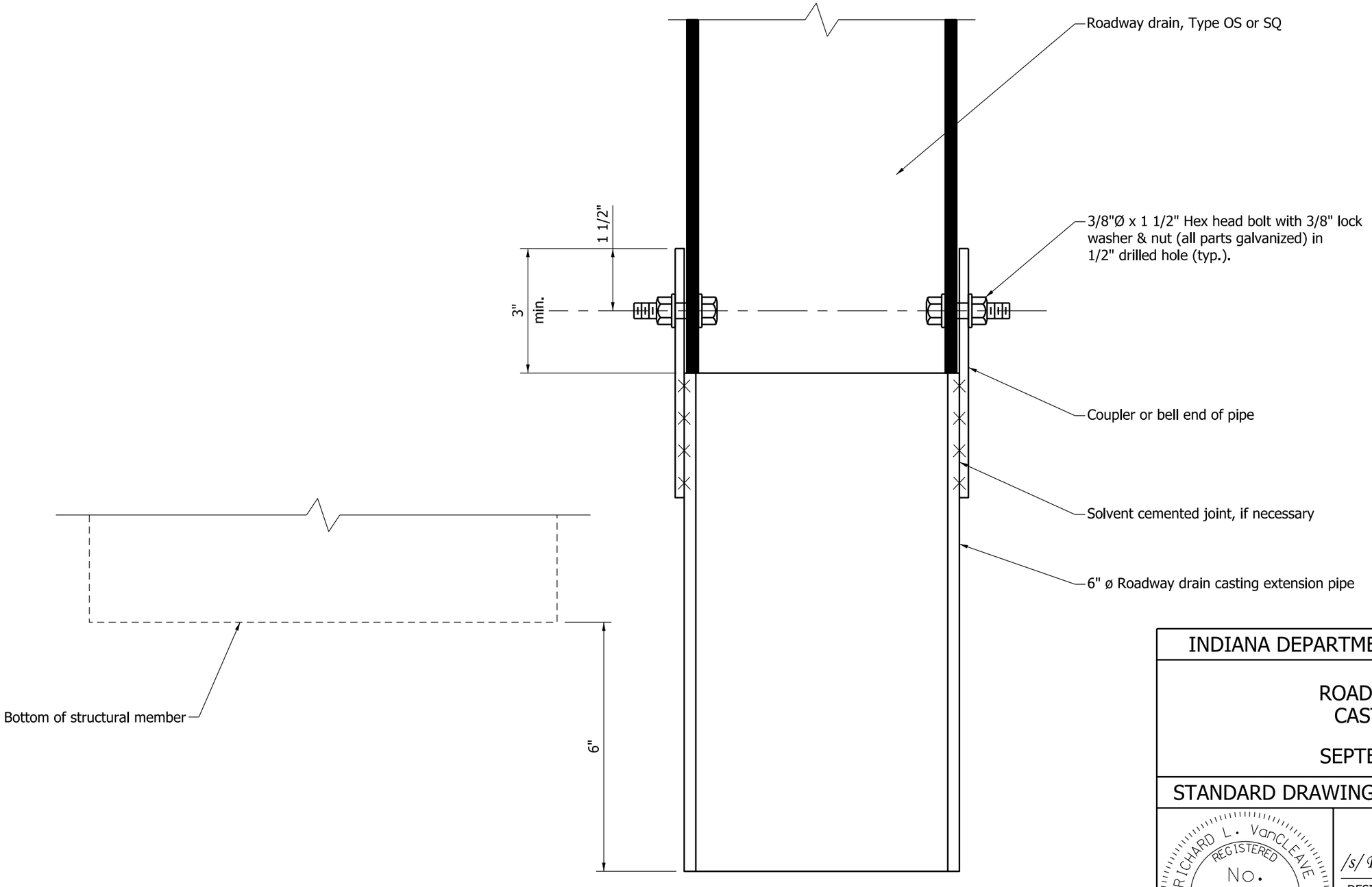
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98



Note: Pipe support brackets not shown for clarity.

INDIANA DEPARTMENT OF TRANSPORTATION

ROADWAY DRAIN
CASTING PIPE

SEPTEMBER 2011

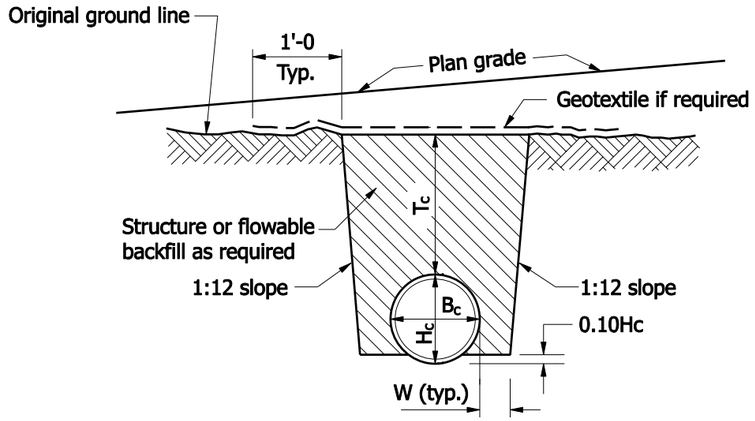
STANDARD DRAWING NO. E 715-BDCG-01

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE



SECTION A-A

LEGEND

H_c = Overall diameter or rise (typ.)

B_c = Overall diameter or span

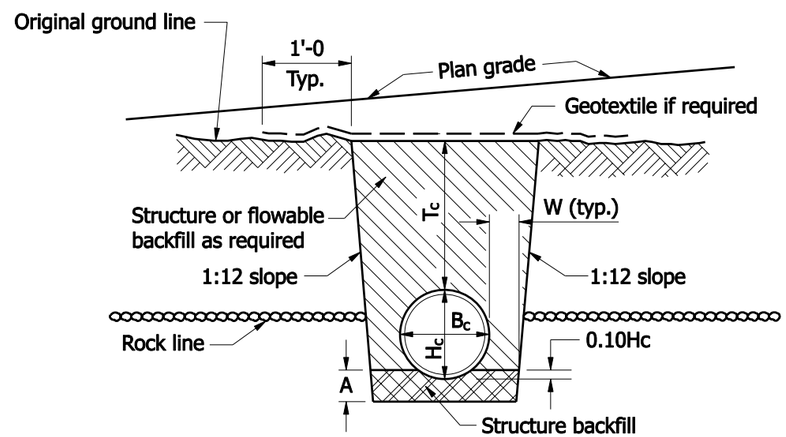
A = 8" min. for fill height less than 16'
= 12" min. for fill height of 16' or more

T_c = Trench cover depth over pipe

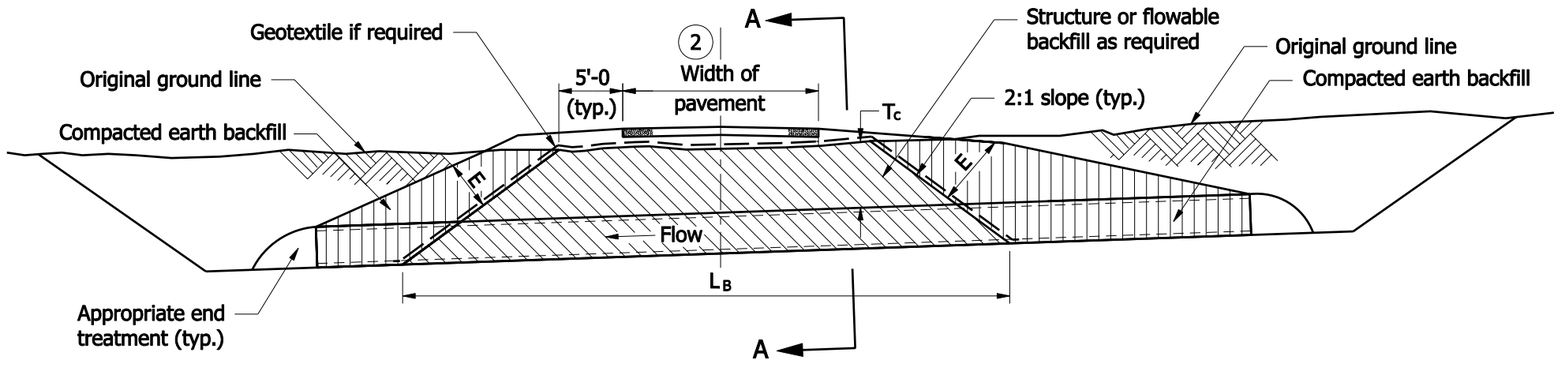
W = 0.3 B_c or 9", whichever is greater

E = Encasement

L_B = Backfill length measured from toe to toe of the 2:1 slopes.



SECTION A-A
ROCK FOUNDATION



ELEVATION

NOTES :

1. Protective cover shall be constructed prior to running heavy equipment over installed pipes. The minimum covers are listed below:
   a.) 1.5' for $B_c \leq 18"$
   b.) 3' for $18" < B_c \leq 54"$
   c.) 4' for $B_c > 54"$
2. For backfill purposes, paved shoulders, curbs, and sidewalks are considered pavement. See Standard Drawing E 715-BKFL-10 for pavement limits when curbs, paved shoulders, or sidewalks are present.
3. Flowable or structure backfill shall be encased by compacted earth backfill. The minimum encasement shall be 2 ft. If necessary, the 2:1 slope between the flowable or structure backfill and the encasement shall be modified to maintain the minimum 2 ft encasement.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 1
NEW ROADWAY, TRENCH

SEPTEMBER 2008

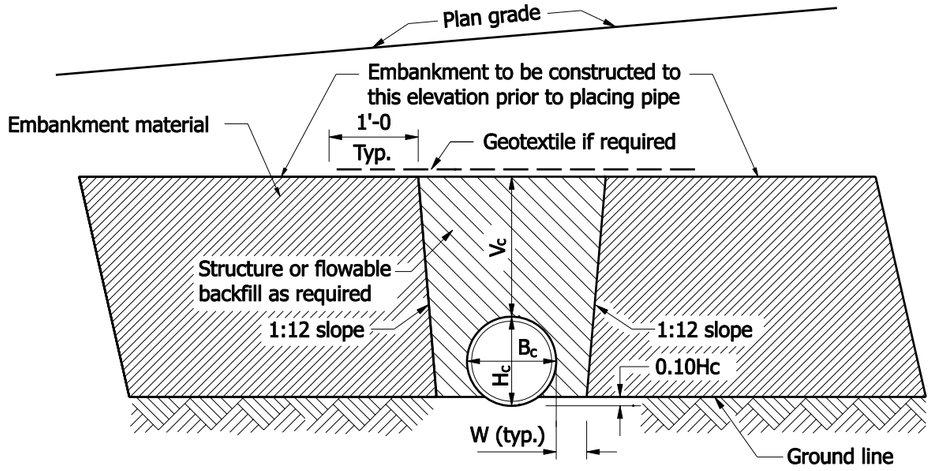
STANDARD DRAWING NO. E 715-BKFL-01

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

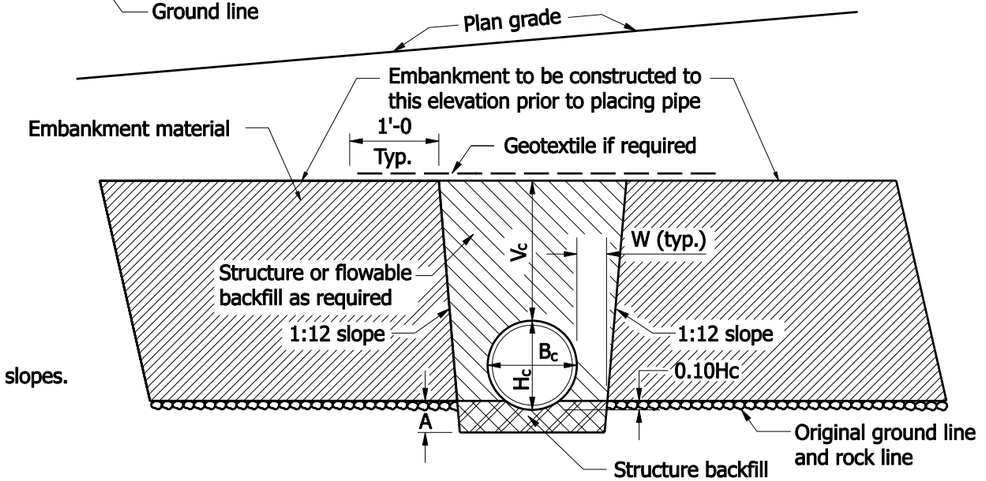
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE



SECTION B-B



SECTION B-B
ROCK FOUNDATION

LEGEND

H_c = Overall diameter or rise (typ.)

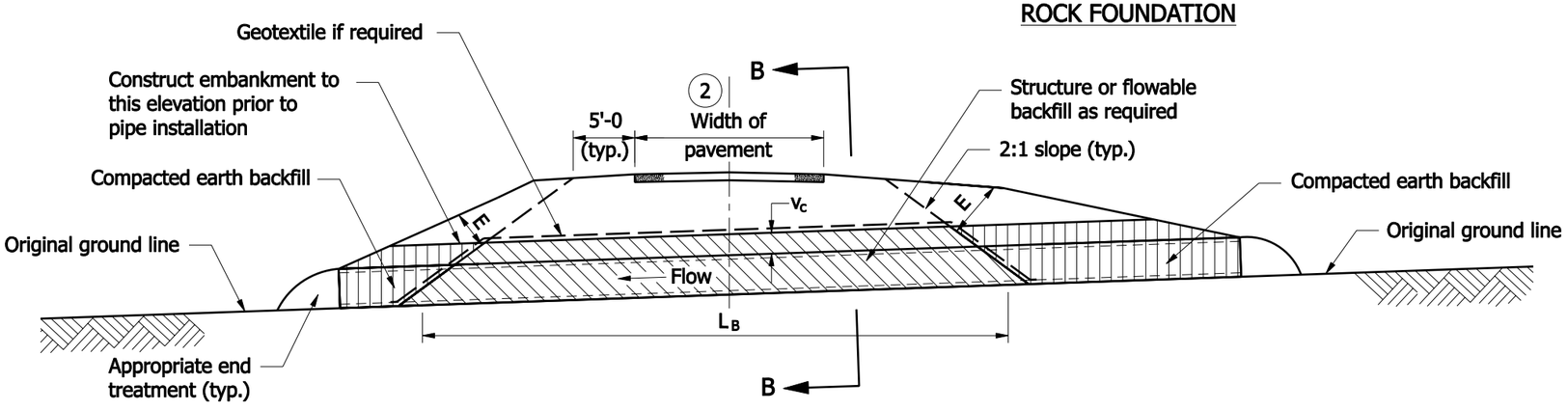
B_c = Overall diameter or span

A = 8" min. for fill height less than 16'
= 12" min. for fill height of 16' or more

V_c = 12" for $B_c \leq 18$"
18" for $B_c > 18$"

W = 0.3 B_c or 9", whichever is greater

L_B = Backfill length measured from toe to toe of the 2:1 slopes.



ELEVATION

NOTES :

1. Protective cover shall be constructed prior to running heavy equipment over installed pipes. The minimum covers are listed below:
   a.) 1.5' for $B_c \leq 18$"
   b.) 3' for 18" < $B_c \leq 54$"
   c.) 4' for $B_c > 54$"
2. For backfill purposes, paved shoulders, curbs, and sidewalks are considered pavement. See Standard Drawing E 715-BKFL-10 for pavement limits when curbs, paved shoulders, or sidewalks are present.
3. Flowable or structure backfill shall be encased by compacted earth backfill. The minimum encasement shall be 2 ft. If necessary, the 2:1 slope between the flowable or structure backfill and the encasement shall be modified to maintain the minimum 2 ft encasement.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 1
NEW ROADWAY, EMBANKMENT

SEPTEMBER 2008

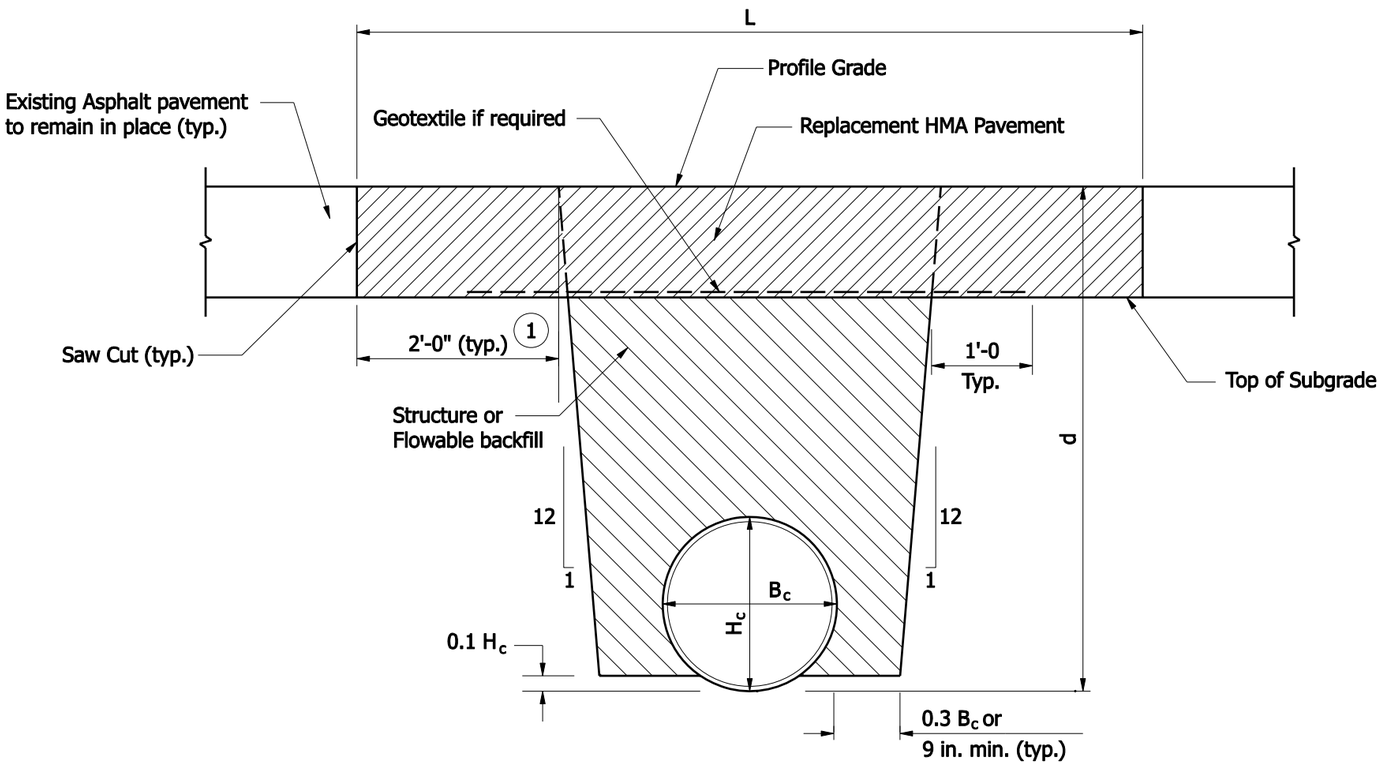
STANDARD DRAWING NO. E 715-BKFL-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER DATE



L = Pay limits of pavement removal and pavement replacement (ft); for cross pipe, measured along roadway centerline; for pipe parallel to roadway centerline, measured prependicular to pipe centerline.

B_C = Overall diameter or span (in.)

H_C = Overall diameter or rise (in.)

d = Vertical distance from flowline to profile grade (ft)

ASPHALT REPLACEMENT PAVEMENT

NOTES :

1. Existing subgrade over this distance shall remain in place.
2. The minimum pavement sections shall be as follows:
   HMA: 165 #/syd HMA Surface, Type A,B,C or D on
   variable HMA Intermediate, Type A, B, C or D
3. If underdrains are present, they shall be perpetuated in accordance with the details shown on Standared Drawing E 718-UNDR-01.
4. See Standard Drawing E 715-BKFL-01 for pipe backfill trench elevation view.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 1
EXISTING ROADWAY, TRENCH

SEPTEMBER 2008

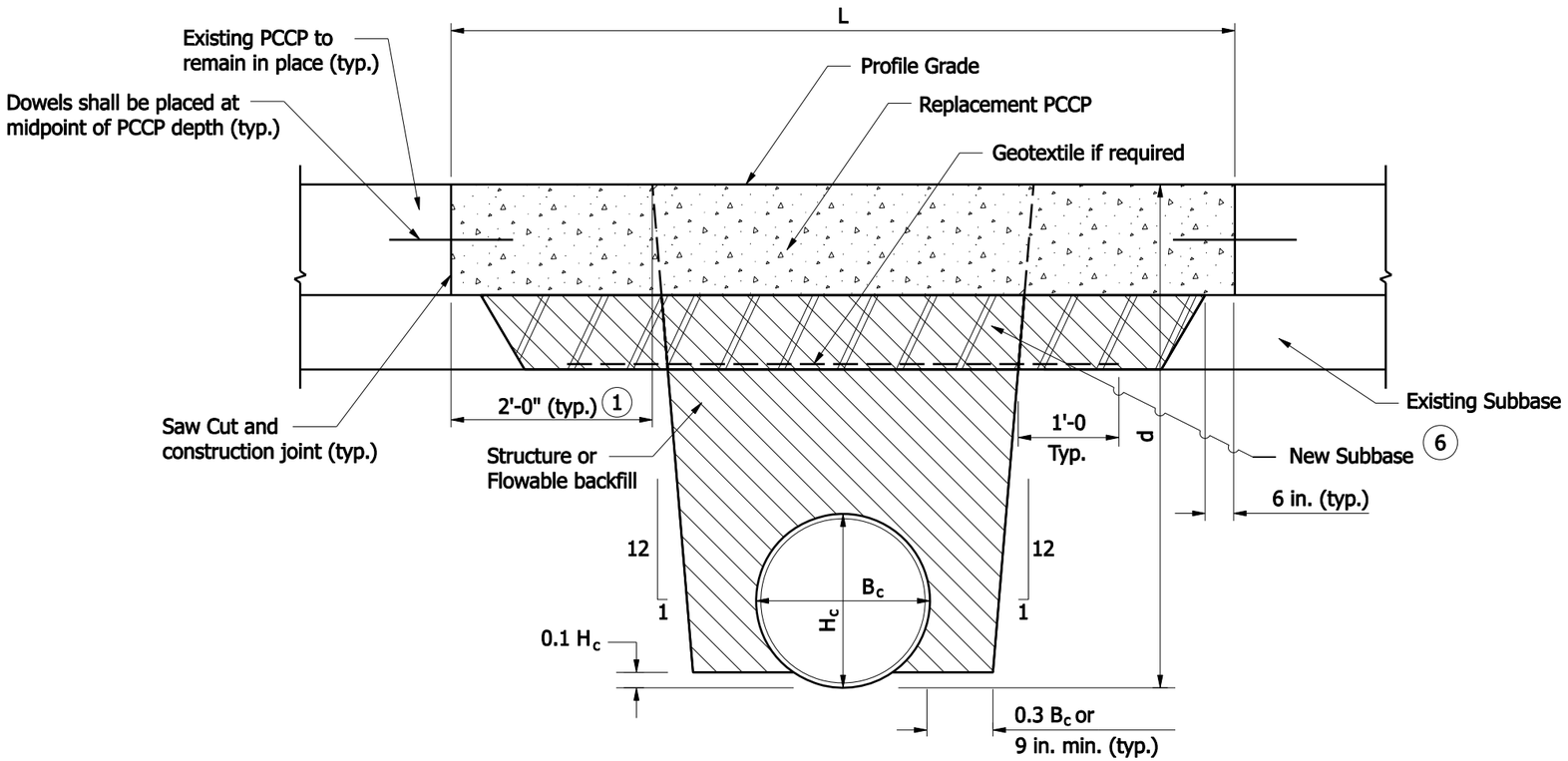
STANDARD DRAWING NO. E 715-BKFL-03

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER DATE



L = Pay limits of pavement removal and pavement replacement (ft); for cross pipe, measured along roadway centerline; for pipe parallel to roadway centerline, measured prependicular to pipe centerline.

B_C = Overall diameter or span (in.)

H_C = Overall diameter or rise (in.)

d = Vertical distance from flowline to profile grade (ft)

PCCP REPLACEMENT PAVEMENT

NOTES :

1. Existing subgrade over this longitudinal distance shall remain in place.
2. The thickness of the replacement PCCP shall match that of the existing concrete pavement.
3. See Standard Drawing E 506-CCPP-01 for subbase, dowels, and construction joint details.
4. If underdrains are present, they shall be perpetuated in accordance with the details shown on Standard Drawing E 718-UNDR-01.
5. See Standard Drawing E 715-BKFL-01 for pipe backfill trench elevation view.
6. New subbase type shall match the existing subbase type and thickness.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 1
EXISTING ROADWAY, TRENCH

SEPTEMBER 2008

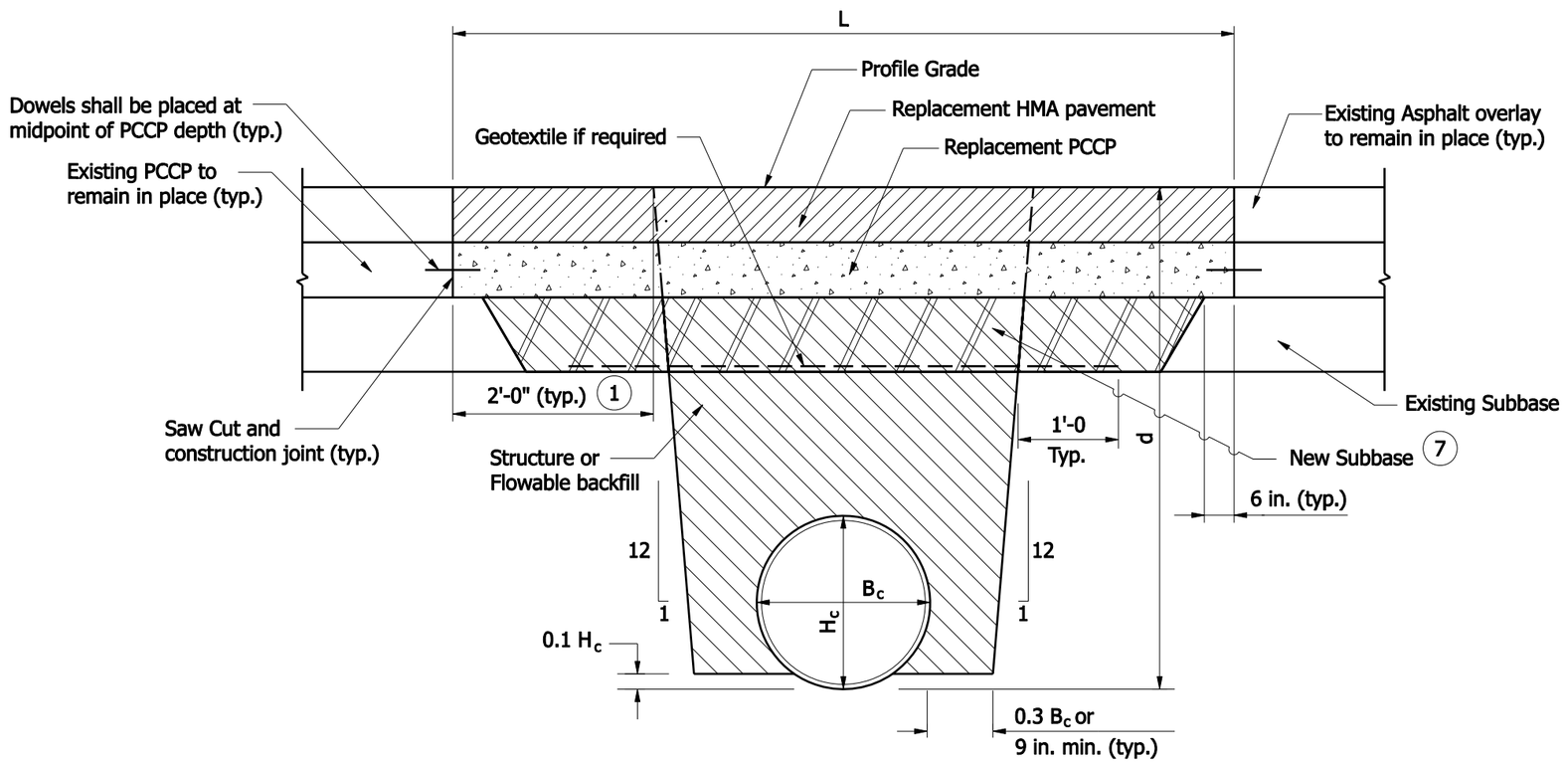
STANDARD DRAWING NO. E 715-BKFL-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER DATE



L = Pay limits of pavement removal and pavement replacement (ft); for cross pipe, measured along roadway centerline; for pipe parallel to roadway centerline, measured prependicular to pipe centerline.

B_C = Overall diameter or span (in.)

H_C = Overall diameter or rise (in.)

d = Vertical distance from flowline to profile grade (ft)

COMPOSITE REPLACEMENT PAVEMENT

NOTES :

1. Existing subgrade over this distance shall remain in place.
2. The thickness of the replacement PCCP shall match that of the existing concrete pavement.
3. The minimum pavement sections shall be as follows:
   HMA: 165 #/syd HMA Surface, Type A,B,C or D on
   variable HMA Intermediate, Type A, B, C or D
4. See Standard Drawing E 506-CCPP-01 for subbase, dowels, and construction joint details.
5. If underdrains are present, they shall be perpetuated in accordance with the details shown on Standard Drawing E 718-UNDR-01.
6. See Standard Drawing E 715-BKFL-01 for pipe backfill trench elevation view.
7. New subbase type shall match the existing subbase type and thickness.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 1
EXISTING ROADWAY, TRENCH

SEPTEMBER 2008

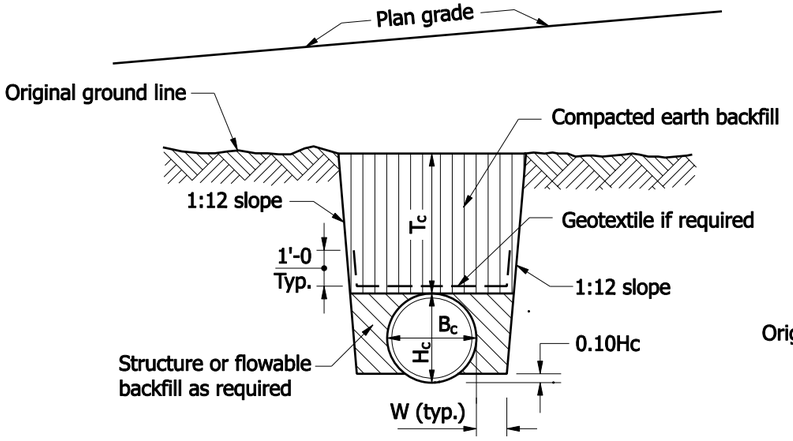
STANDARD DRAWING NO. E 715-BKFL-05

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER DATE

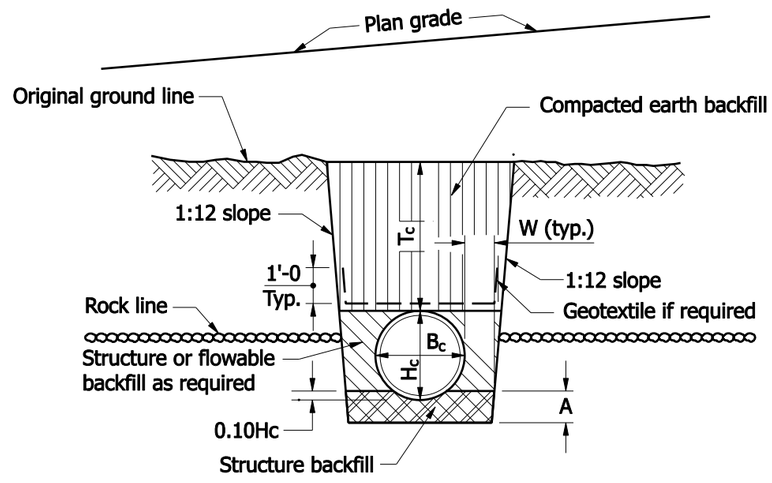
/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER DATE



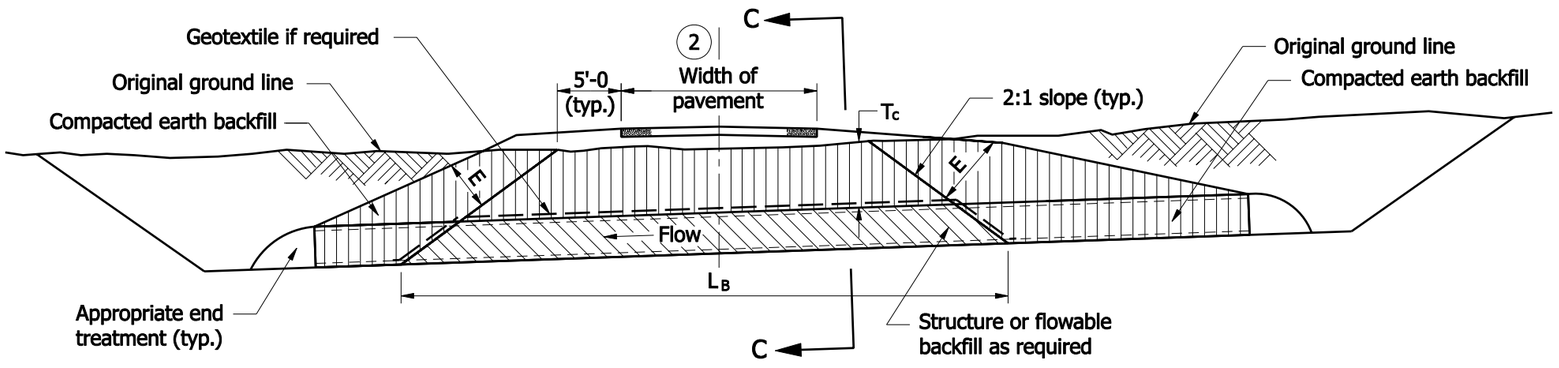
SECTION C-C

LEGEND

- H_c = Overall diameter or rise (typ.)
- B_c = Overall diameter or span
- A = 8" min. for fill height less than 16'
  = 12" min. for fill height of 16' or more
- T_c = Trench cover depth over pipe
- W = 0.3 B_c or 9", whichever is greater
- E = Encasement
- L_B = Backfill length measured from toe to toe of the 2:1 slopes.



SECTION C-C
ROCK FOUNDATION



ELEVATION

NOTES :

1. Protective cover shall be constructed prior to running heavy equipment over installed pipes. The minimum covers are listed below:
   a.) 1.5' for $B_c \leq 18"$
   b.) 3' for $18" < B_c \leq 54"$
   c.) 4' for $B_c > 54"$
2. For backfill purposes, paved shoulders, curbs, and sidewalks are considered pavement. See Standard Drawing E 715-BKFL-10 for pavement limits when curbs, paved shoulders, or sidewalks are present.
3. Flowable or structure backfill shall be encased by compacted earth backfill. The minimum encasement shall be 2 ft. If necessary, the 2:1 slope between the flowable or structure backfill and the encasement shall be modified to maintain the minimum 2 ft encasement.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 2
NEW OR EXISTING DRIVE

SEPTEMBER 2008

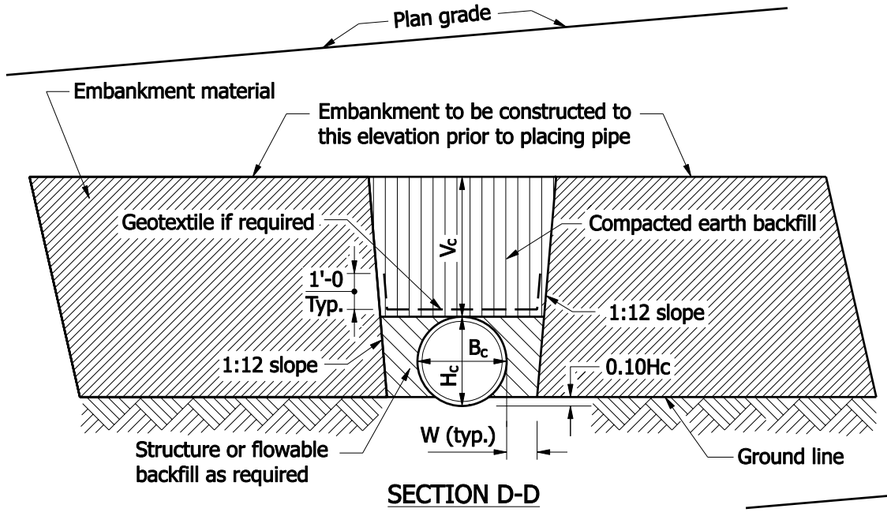
STANDARD DRAWING NO. E 715-BKFL-06

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER DATE



SECTION D-D

LEGEND

H_c = Overall diameter or rise (typ.)

B_c = Overall diameter or span

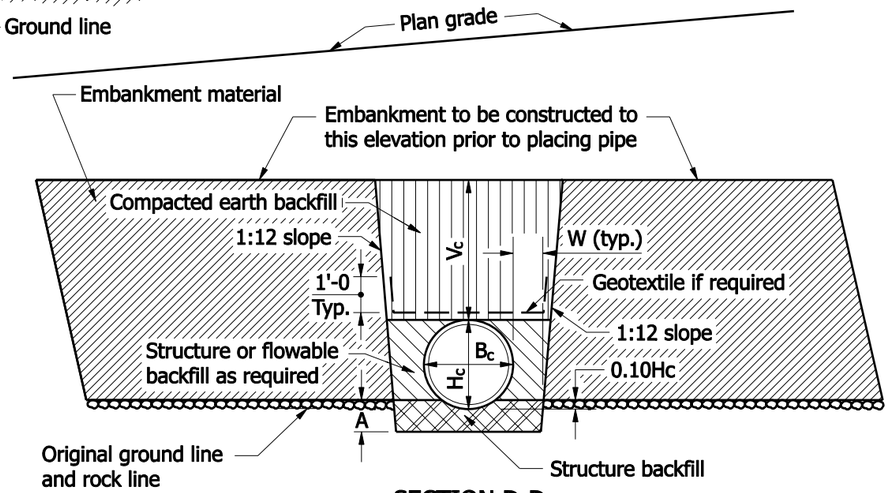
A = 8" min. for fill height less than 16'
= 12" min. for fill height of 16' or more

V_c = 12" for $B_c \leq 18$"
18" for $B_c > 18$"

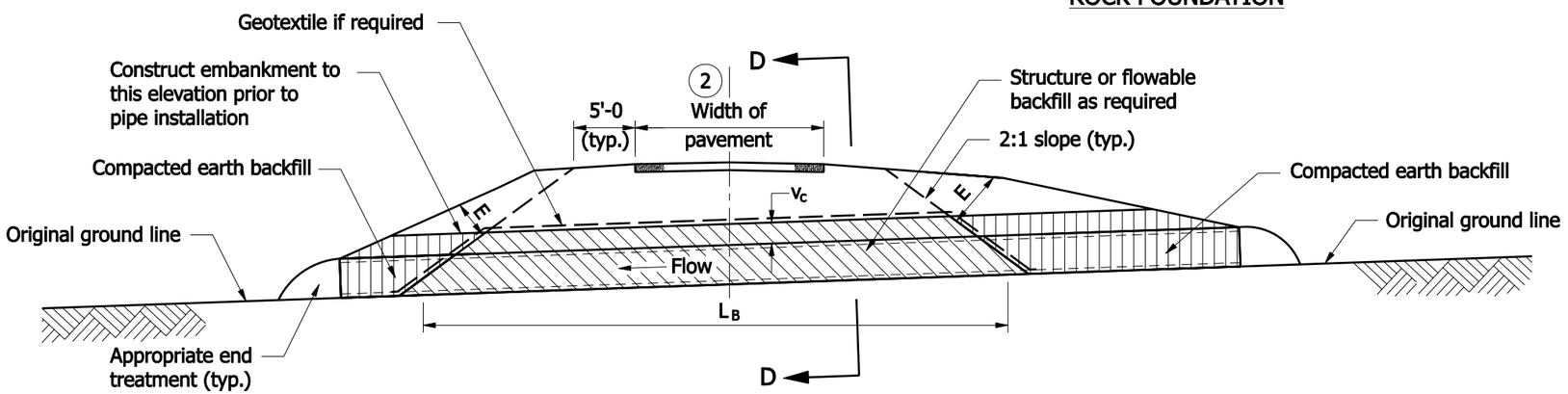
W = 0.3 B_c or 9", whichever is greater

E = Encasement

L_B = Backfill length measured from toe to toe of the 2:1 slopes.



SECTION D-D
ROCK FOUNDATION



ELEVATION

NOTES :

1. Protective cover shall be constructed prior to running heavy equipment over installed pipes. The minimum covers are listed below:
   a.) 1.5' for $B_c \leq 18$"
   b.) 3' for 18" < $B_c \leq 54$"
   c.) 4' for $B_c > 54$"
2. For backfill purposes, paved shoulders, curbs, and sidewalks are considered pavement. See Standard Drawing E 715-BKFL-10 for pavement limits when curbs, paved shoulders, or sidewalks are present.
3. Flowable or structure backfill shall be encased by compacted earth backfill. The minimum encasement shall be 2 ft. If necessary, the 2:1 slope between the flowable or structure backfill and the encasement shall be modified to maintain the minimum 2 ft encasement.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 2
NEW OR EXISTING DRIVE

SEPTEMBER 2008

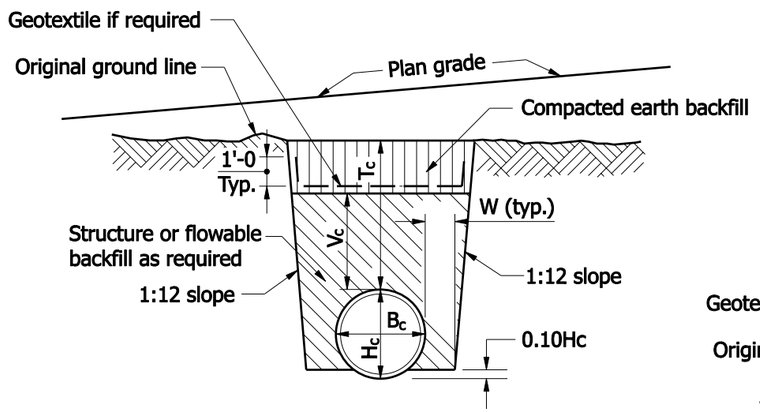
STANDARD DRAWING NO. E 715-BKFL-07

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE



SECTION E-E

LEGEND

H_c = Overall diameter or rise (typ.)

B_c = Overall diameter or span

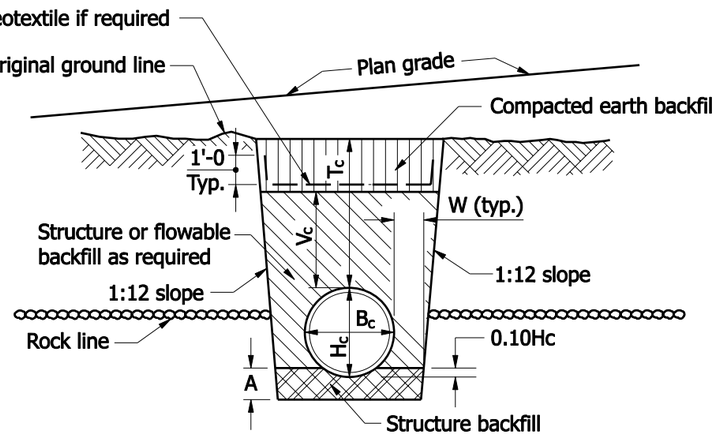
A = 8" min. for fill height less than 16'
= 12" min. for fill height of 16' or more

V_c = 12" for $B_c \leq 18"$
18" for $B_c > 18"$

T_c = Trench cover depth over pipe

W = 0.3 B_c or 9", whichever is greater

L_B = Backfill length measured from toe to toe of the 2:1 slopes.

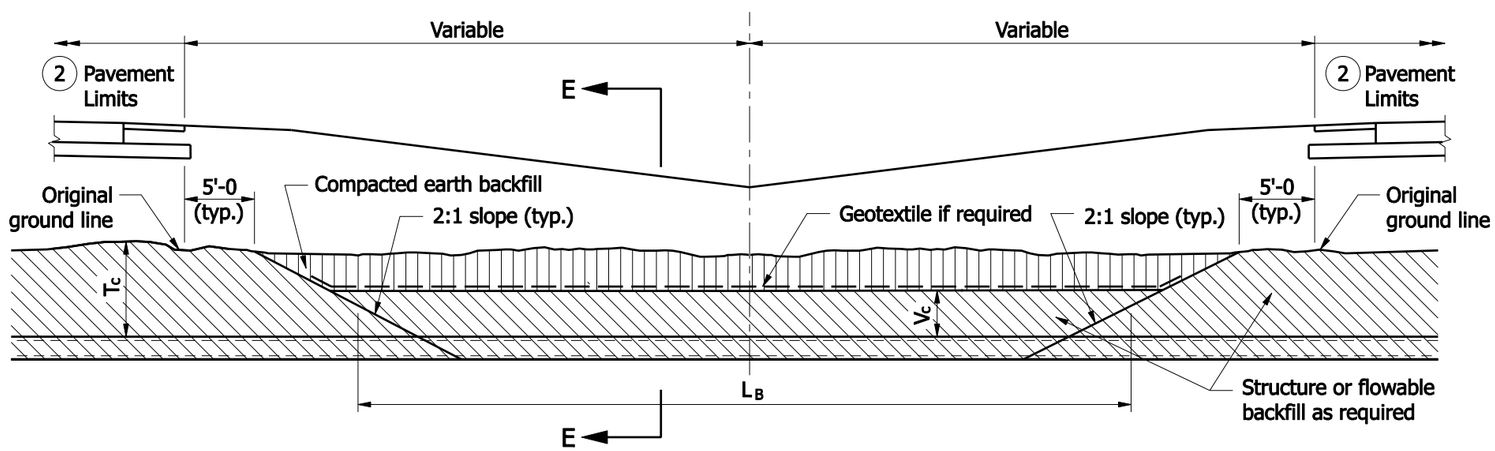


SECTION E-E
ROCK FOUNDATION

NOTES :

1. Protective cover shall be constructed prior to running heavy equipment over installed pipes. The minimum covers are listed below:
   a.) 1.5' for $B_c \leq 18"$
   b.) 3' for $18" < B_c \leq 54"$
   c.) 4' for $B_c > 54"$

(2) For backfill purposes, paved shoulders, curbs, and sidewalks are considered pavement. See Standard Drawing E 715-BKFL-10 for pavement limits when curbs, paved shoulders, or sidewalks are present.



ELEVATION THRU MEDIAN STRIP

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 3
MEDIAN INSTALLATION, TRENCH

SEPTEMBER 2008

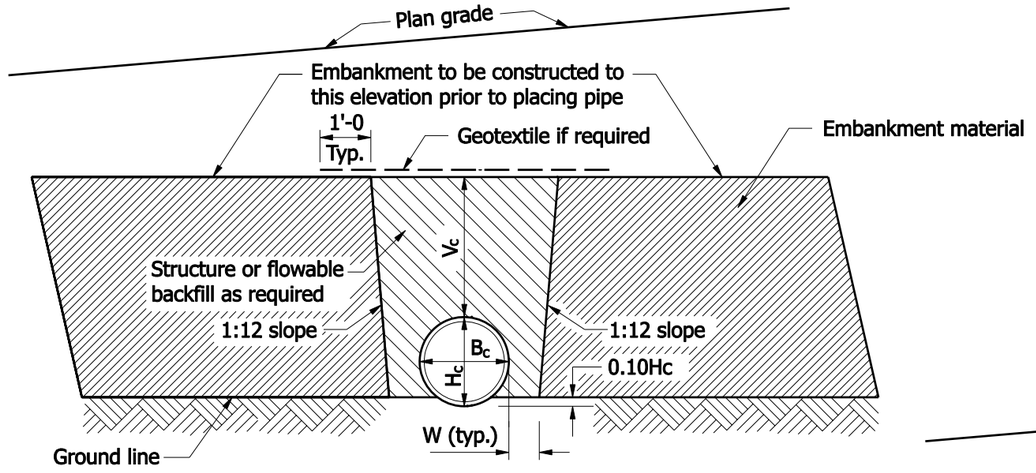
STANDARD DRAWING NO. E 715-BKFL-08

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE



SECTION F-F

LEGEND

H_c = Overall diameter or rise (typ.)

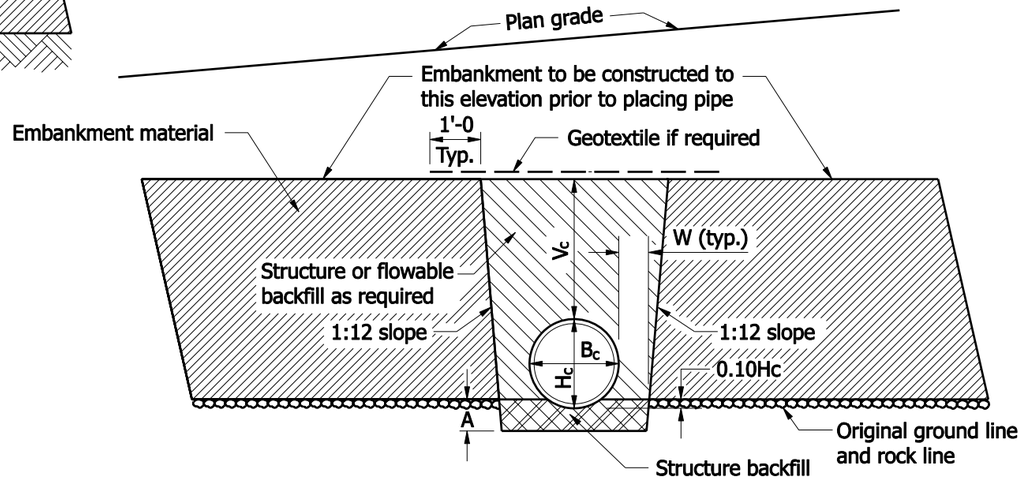
B_c = Overall diameter or span

A = 8" min. for fill height less than 16'
= 12" min. for fill height of 16' or more

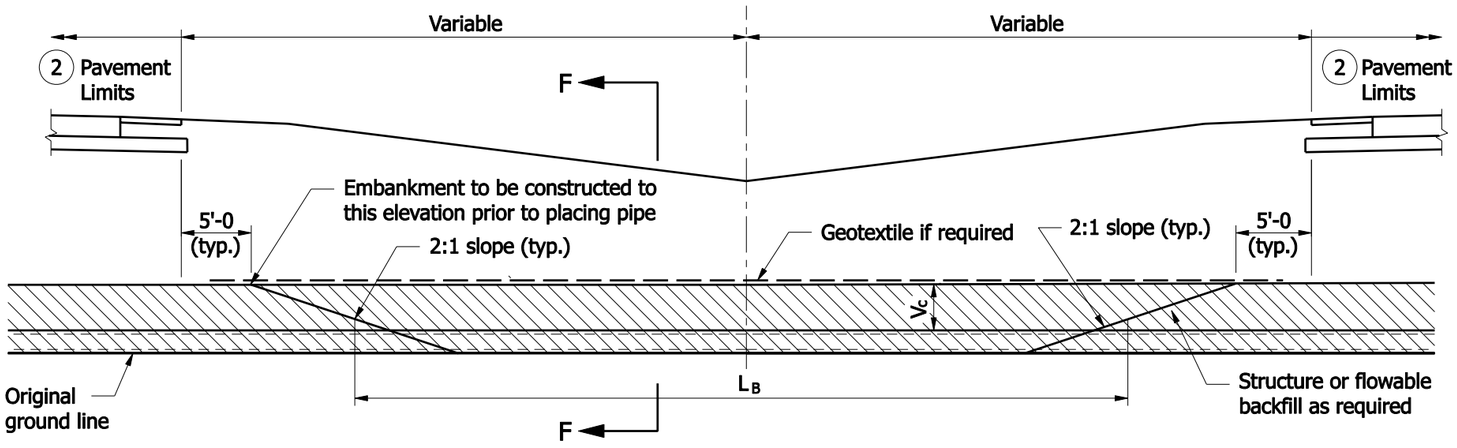
V_c = 12" for $B_c \leq 18"$
18" for $B_c > 18"$

W = 0.3 B_c or 9", whichever is greater

L_B = Backfill length measured from toe to toe of the 2:1 slopes.



SECTION F-F
ROCK FOUNDATION



ELEVATION THRU MEDIAN STRIP

NOTES :

1. Protective cover shall be constructed prior to running heavy equipment over installed pipes. The minimum covers are listed below:
   a.) 1.5' for $B_c \leq 18"$
   b.) 3' for $18" < B_c \leq 54"$
   c.) 4' for $B_c > 54"$

(2) For backfill purposes, paved shoulders, curbs, and sidewalks are considered pavement. See Standard Drawing E 715-BKFL-10 for pavement limits when curbs, paved shoulders, or sidewalks are present.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL METHOD 1
MEDIAN INSTALLATION, EMBANKMENT

SEPTEMBER 2008

STANDARD DRAWING NO. E 715-BKFL-09

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. Van Cleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

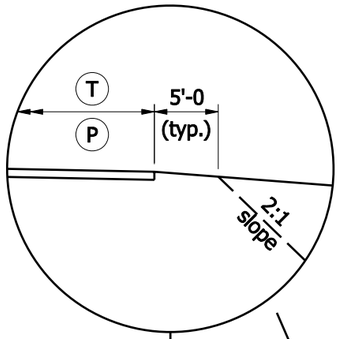
/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE

LEGEND

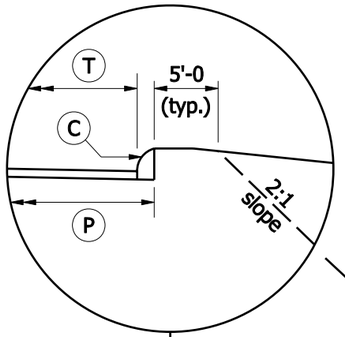
- (C) Curb
- (P) Pavement Limits *
- (S) Sidewalk
- (T) Travel Lane
- (U) Utility Strip
- (V) Paved Shoulder

* For backfill placement and computation

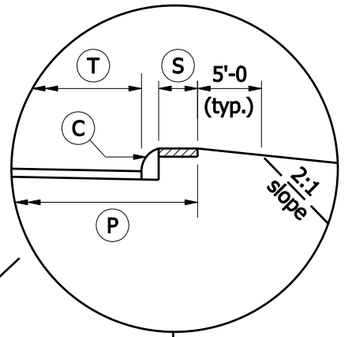
EDGE OF TRAVELWAY



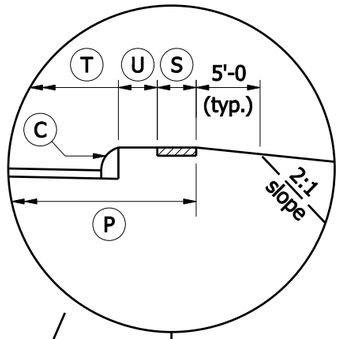
BACK OF CURB



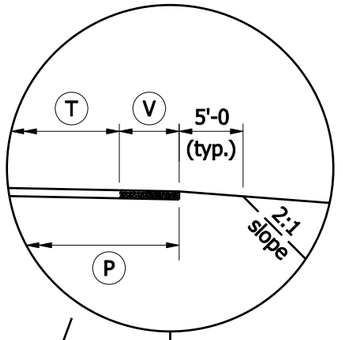
EDGE OF SIDWEWALK
ADJACENT TO CURB



EDGE OF SIDEWALK
ADJACENT TO UTILITY
STRIP



EDGE OF PAVED
SHOULDER

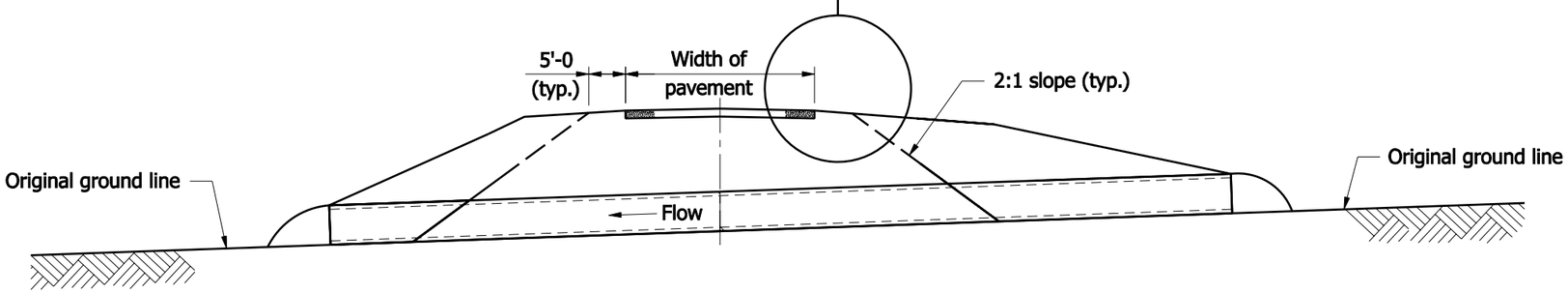


or

or

or

or



ELEVATION

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE BACKFILL
LIMIT DETERMINATION

SEPTEMBER 2007

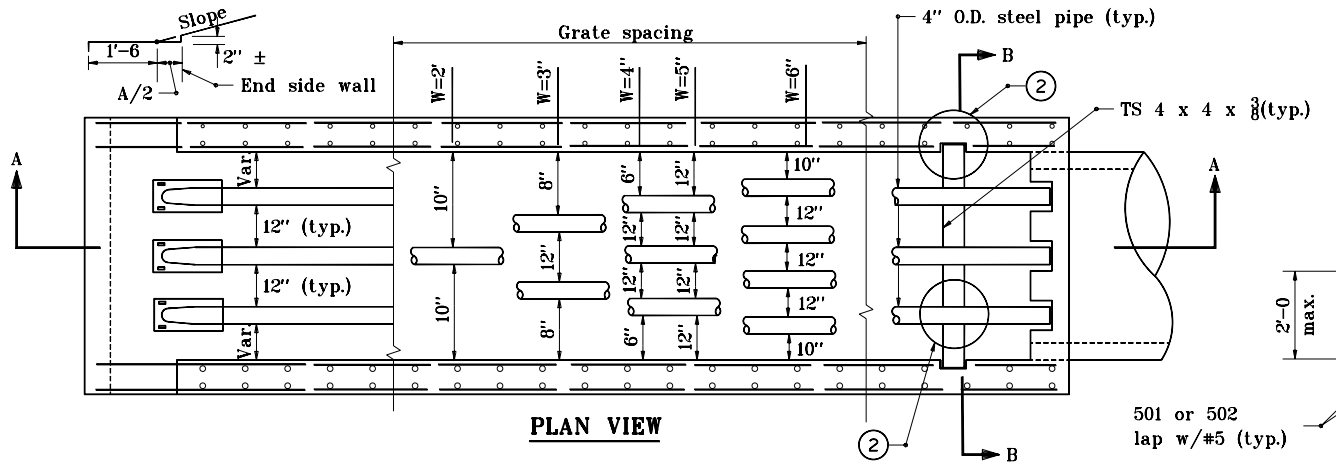
STANDARD DRAWING NO. E 715-BKFL-10

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

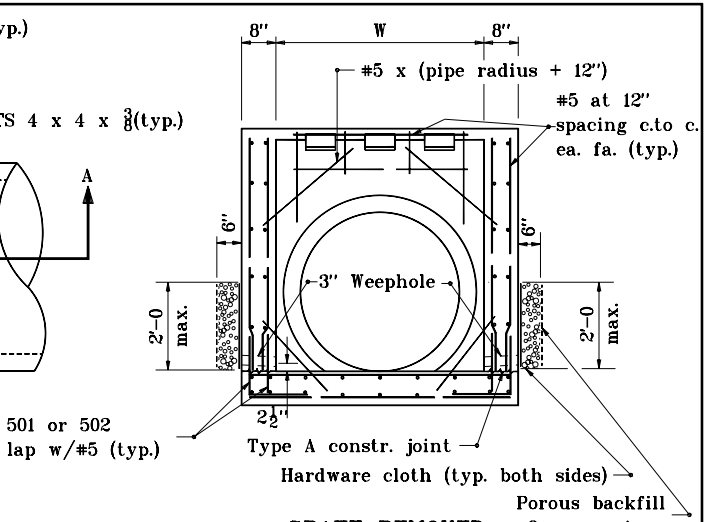
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — 09/04/07
DESIGN STANDARDS ENGINEER — DATE

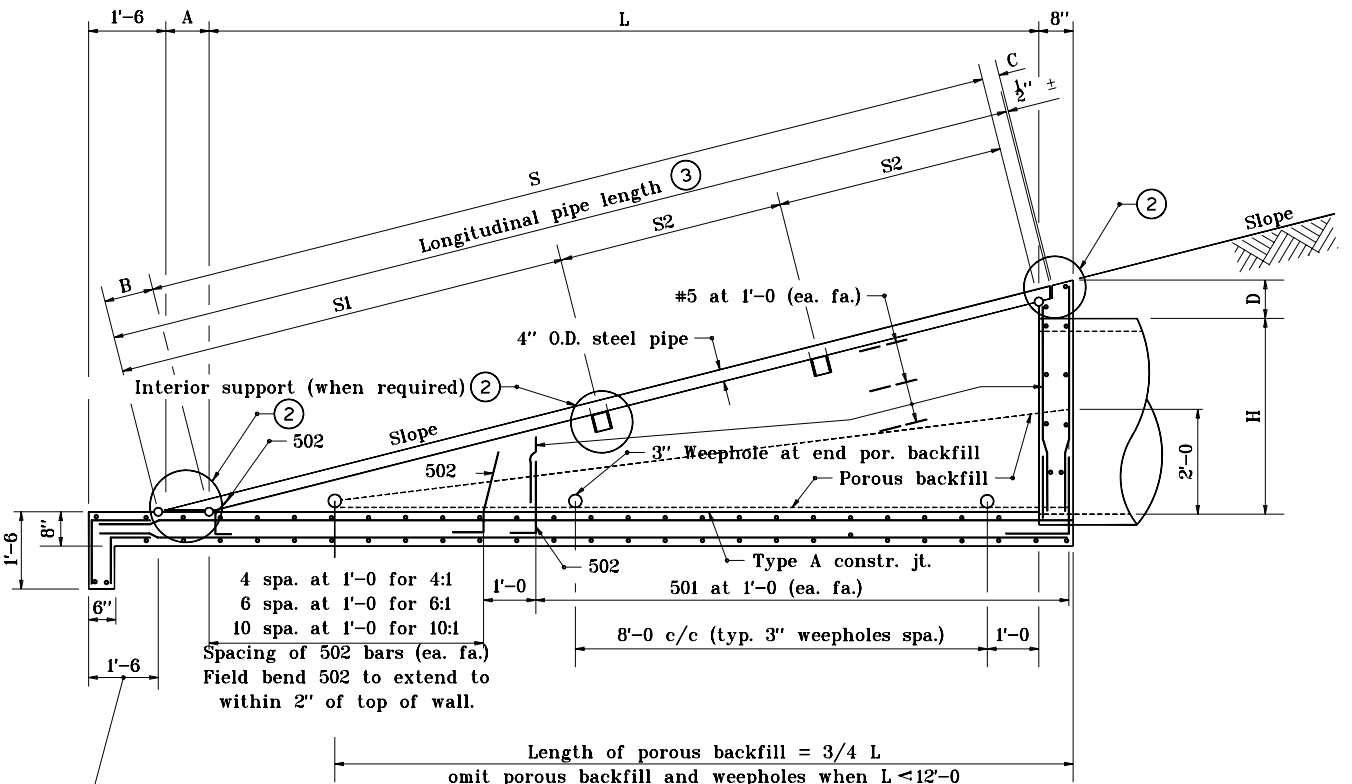
/s/ Mark A. Miller — 09/04/07
CHIEF HIGHWAY ENGINEER — DATE



PLAN VIEW



GRATE REMOVED
SECTION B-B



SECTION A-A

GENERAL NOTES

1. The invert grade of the grated box end section shall be the same as that of the pipe.
2. See Standard Drawing E 715-GBTO-04 for Details A, B, C, and D.
3. See Standard Drawings E 715-GBTO-05 through -08 for tables.
4. Type I grated box end section shall be used for mainline cross-culverts, outlet pipes within the clear zone.
5. See Standard Drawing E 715-GBTO-02 for bending diagrams.

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE I

JANUARY 1999

STANDARD DRAWING NO. **E 715-GBTO-01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

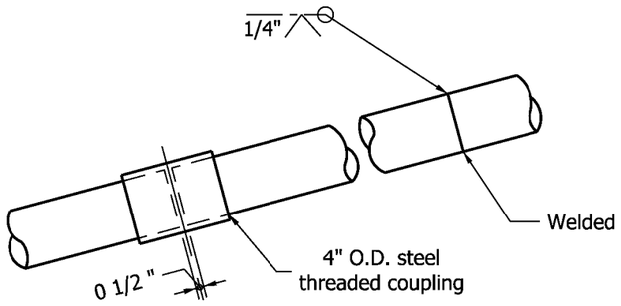
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

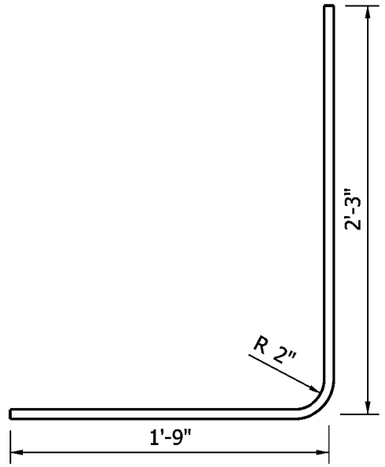
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

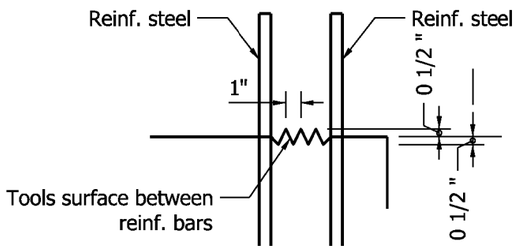
ORIGINALLY APPROVED 1-04-99



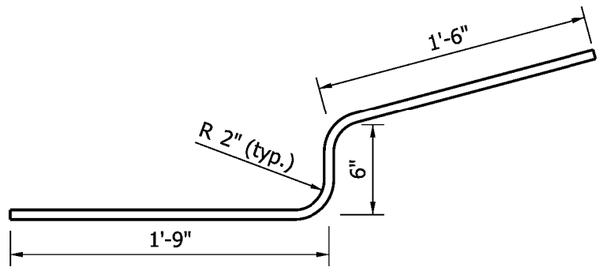
OPTIONAL COUPLING



501 x 4'-0"



TYPE A CONSTRUCTION JOINT



502 x 3'-9"

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION
TYPE 1

SEPTEMBER 2009

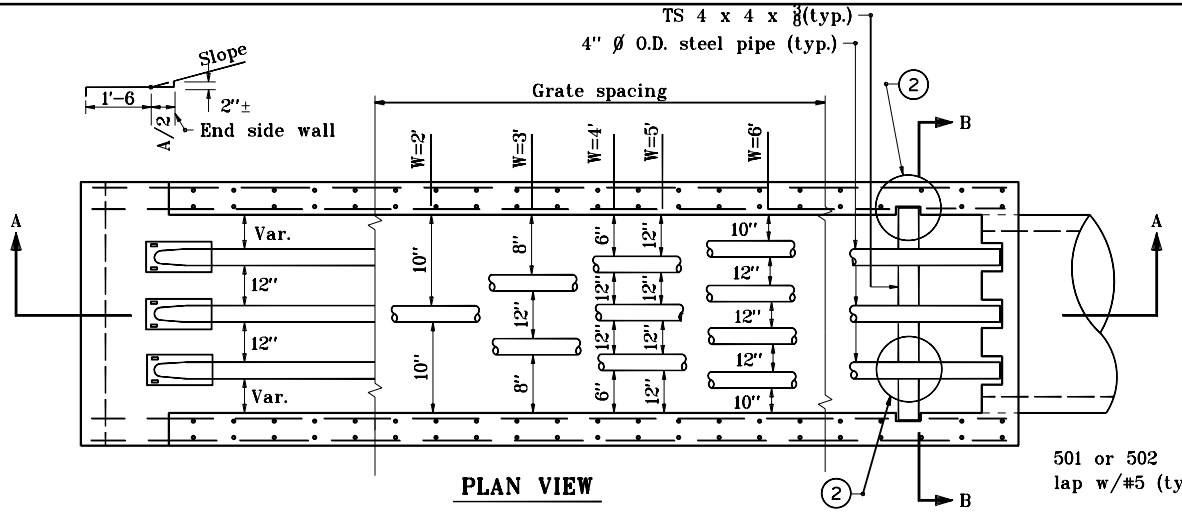
STANDARD DRAWING NO. E 715-GBTO-02

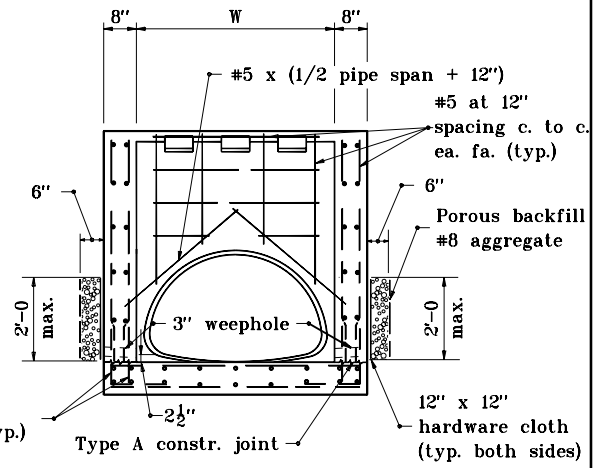
RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

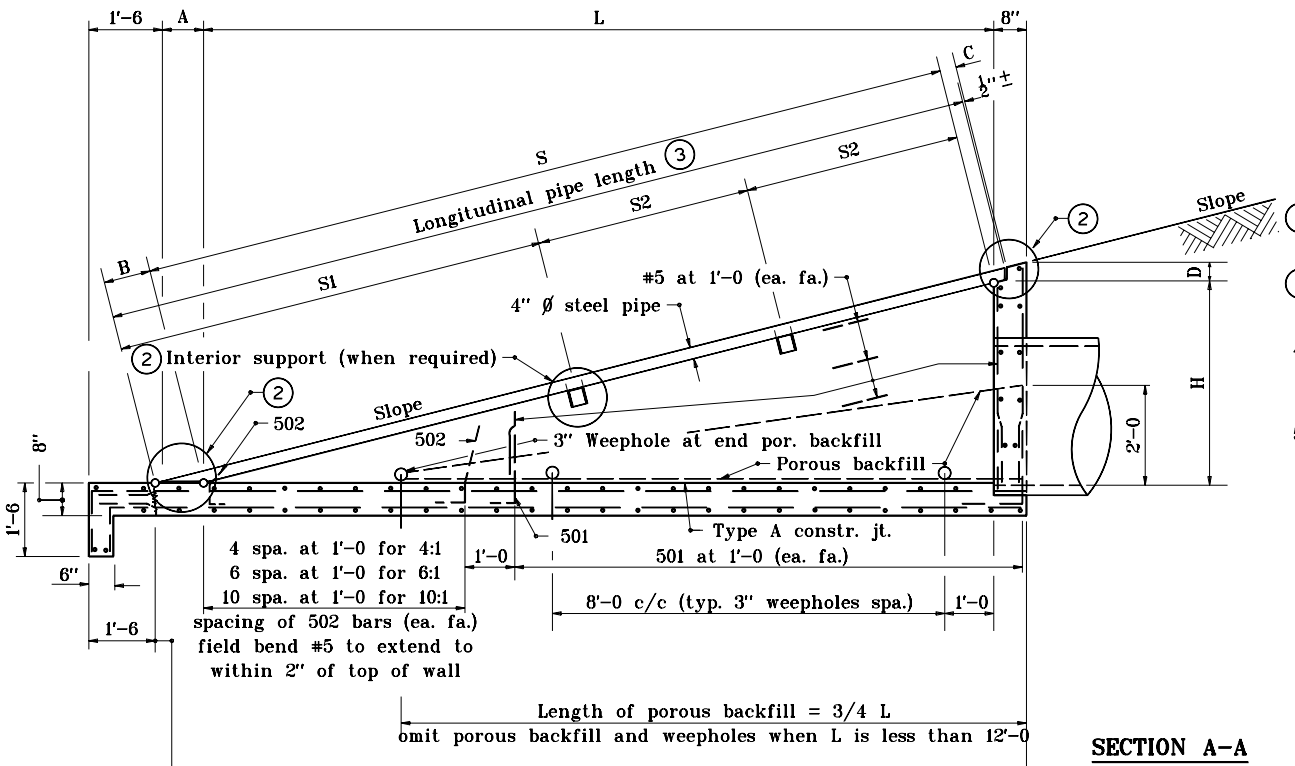
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE







SECTION A-A

GRATE REMOVED
SECTION B-B

GENERAL NOTES

1. The invert grade of the grated box end section shall be the same as that of the pipe.
2. See Standard Drawing E 715-GBTO-04 for Details A, B, C, and D.
3. See Standard Drawings E 715-GBTO-05 through -08 for tables.
4. Type I grated box end sections shall be used for mainline cross-culverts' outlet pipes within the clear zone.
5. See Standard Drawing E 715-GBTO-02 for bending diagrams.

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE I

JANUARY 1999

STANDARD DRAWING NO. E 715-GBTO-03

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

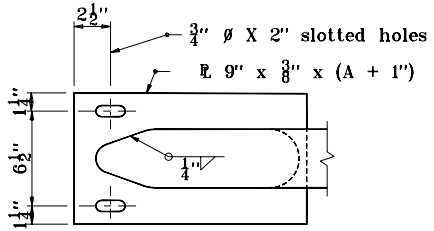
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

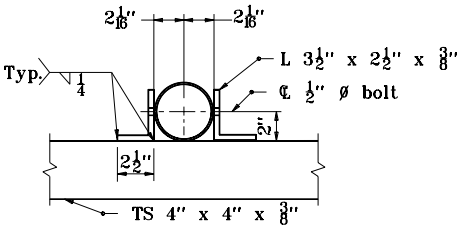
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

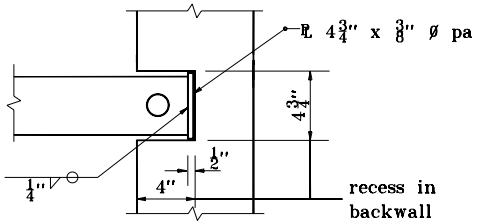
ORIGINALLY APPROVED 1-04-99



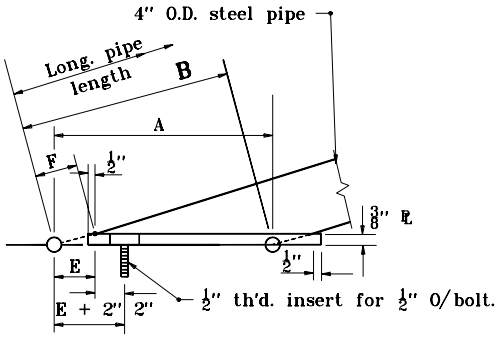
PLAN



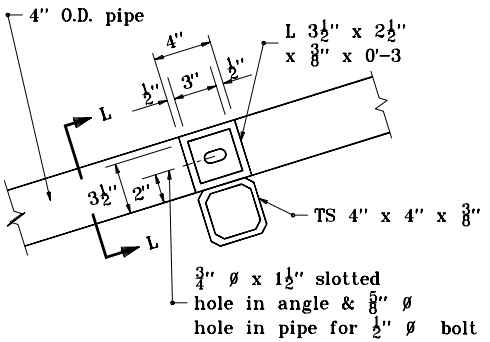
SECTION L–L



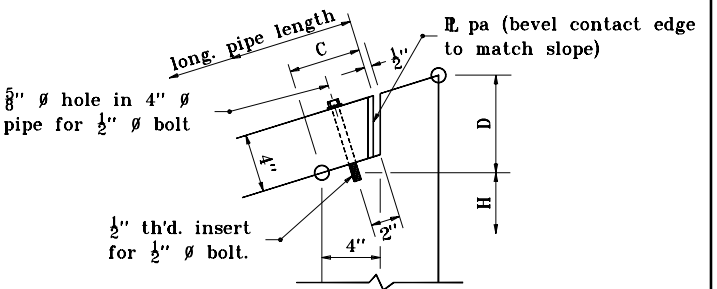
PLAN



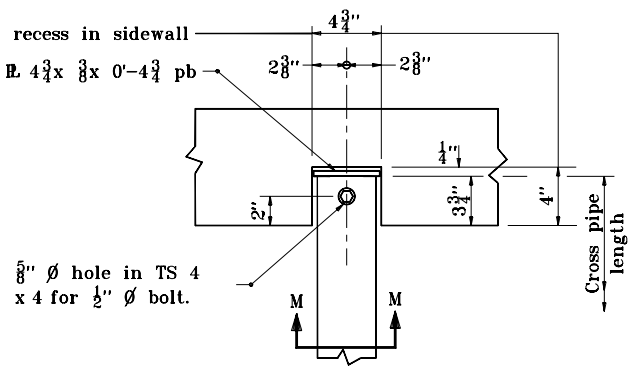
DETAIL A



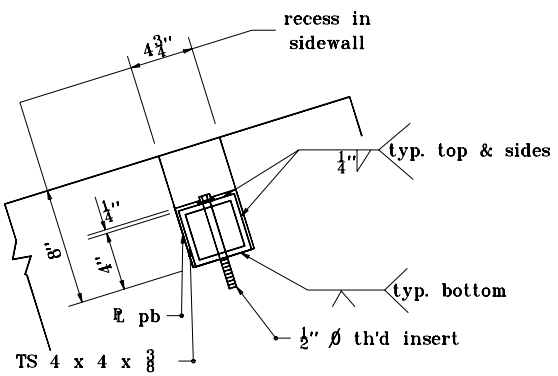
DETAIL B



DETAIL C



DETAIL D



SECTION M–M

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE I

JANUARY 1999

STANDARD DRAWING NO. **E 715-GBTO-04**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich, DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi, CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	1-04-99

2 : 1 SLOPE

CULVERT SIZE	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S1	S2
12	2'–0"	4'–0"	2'–0"	4'–5 5/8"	1	5'–7 5/8"	–	–	5'–1 5/8"	–
15 & 18	2'–6"	5'–0"	2'–0"	5'–7"	1	6'–9"	1	2'–7 1/2"	4'–9 1/8"	1'–6"
21 & 24	3'–0"	6'–0"	3'–0"	6'–8 1/2"	2	7'–10 1/2"	–	–	7'–4 1/2"	–
27 & 30	3'–6"	7'–0"	3'–0"	7'–9 7/8"	2	10'–1 1/4"	–	–	8'–5 7/8"	–
33 & 36	4'–0"	8'–0"	4'–0"	8'–11 3/8"	3	10'–11 3/8"	–	–	9'–7 3/8"	–
42	4'–6"	9'–0"	4'–0"	10'–0 3/4"	3	11'–1 1/4"	–	–	10'–8 3/4"	–
48	5'–0"	10'–0"	5'–0"	11'–2 1/8"	3	12'–4 1/8"	–	–	11"–10 1/8"	–
54	5'–6"	11'–0"	6'–0"	12'–3 3/8"	4	13'–5 1/2"	1	6'–7 1/2"	9'–11 3/8"	3'–0"
60	6'–0"	12'–0"	6'–0"	13'–5"	4	14'–7"	1	6'–7 1/2"	11'–1"	3'–0"

3 : 1 SLOPE

CULVERT SIZE	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S1	S2
12	2'–0"	6'–0"	2'–0"	6'–3 5/8"	1	7'–9"	1	2'–7 1/2"	5'–3 5/8"	2'–0"
15 & 18	2'–6"	7'–6"	2'–0"	7'–10 5/8"	1	9'–3 5/8"	1	2'–7 1/2"	5'–4 5/8"	3'–6"
21 & 24	3'–0"	9'–0"	3'–0"	9'–5 5/8"	2	10'–10 5/8"	1	3'–7 1/2"	6'–11 5/8"	3'–6"
27 & 30	3'–6"	10'–6"	3'–0"	11'–0 3/4"	2	12'–5 1/4"	1	3'–7 1/2"	8'–6 3/4"	3'–6"
33 & 36	4'–0"	12'–0"	4'–0"	12'–7 7/8"	3	14'–0 5/8"	1	4'–7 1/2"	10'–1 1/4"	3'–6"
42	4'–6"	13'–6"	4'–0"	14'–2 3/4"	3	15'–7 3/4"	1	4'–7 1/2"	10'–8 3/4"	4'–6"
48	5'–0"	15'–0"	5'–0"	15'–9 1/2"	3	17'–2 1/2"	1	5'–7 1/2"	12'–3 1/4"	4'–6"
54	5'–6"	16'–6"	6'–0"	17'–4 3/4"	4	18'–9 3/4"	1	6'–7 1/2"	10'–4 3/4"	8'–0"
60	6'–0"	18'–0"	6'–0"	18'–11 3/4"	4	20'–4 3/4"	1	6'–7 1/2"	11'–11 3/4"	8'–0"

4 : 1 SLOPE

CULVERT SIZE	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S1	S2
12	2'–0"	8'–0"	2'–0"	8'–3"	1	9'–11 1/2"	1	2'–7 1/2"	5'–7"	4'–0"
15 &18	2'–6"	10'–0"	2'–0"	10'–3 1/2"	1	12'–0 1/2"	2	2'–7 1/2"	5'–7 1/2"	3'–0"
21 & 24	3'–0"	12'–0"	3'–0"	12'–4 3/8"	2	14'–1"	1	3'–7 1/2"	9'–2 1/2"	4'–6"
27 & 30	3'–6"	14'–0"	3'–0"	14'–5 1/4"	2	16'–1 3/8"	1	3'–7 1/2"	9'–3 1/8"	6'–6"
33 & 36	4'–0"	16'–0"	4'–0"	16'–5 5/8"	3	18'–2 1/2"	1	4'–7 1/2"	11'–3 5/8"	6'–6"
42	4'–6"	18'–0"	4'–0"	18'–6 3/8"	3	20'–3 1/4"	1	4'–7 1/2"	12'–4 3/8"	7'–6"
48	5'–0"	20'–0"	5'–0"	20'–7 3/8"	3	22'–4"	1	5'–7 1/2"	11'–5 3/8"	10'–6"
54	5'–6"	22'–0"	6'–0"	22'–8 1/8"	4	24'–4 3/4"		6'–7 1/2"	12'–6 1/8"	11'–6"
60	6'–0"	24'–0"	6'–0"	24'–8 5/8"	4	26'–5 1/2"	2	6'–7 1/2"	12'–6 5/8"	6'–9"

5 : 1 SLOPE

CULVERT SIZE	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S1	S2
12	2'–0"	10'–0"	2'–0"	10'–2 3/8"	1	12–2 3/4"	2	2'–7 1/2"	6'–2 3/8"	2'–10"
15 & 18	2'–6"	12'–6"	2'–0"	12'–9"	1	14'–9 3/8"	2	2'–7 1/2"	5'–11"	4'–3"
21 & 24	3'–0"	15'–0"	3'–0"	15'–3 1/2"	2	17'–4"	1	3'–7 1/2"	9'–2 1/2"	7'–9"
27 & 30	3'–6"	17'–6"	3'–0"	17'–10 1/2"	2	19'–10 1/2"	2	3'–7 1/2"	9'–6 1/8"	5'–0"
33 & 36	4'–0"	20'–0"	4'–0"	20'–4 1/2"	3	22'–5 1/4"	1	4'–7 1/2"	13'–0 3/4"	9'–0"
42	4'–6"	22'–6"	4'–0"	22'–11 3/8"	3	24'–11 1/4"	1	4'–7 1/2"	13'–1 3/8"	11'–6"
48	5'–0"	25'–0"	5'–0"	25'–6"	3	27'–6 1/4"	2	5'–7 1/2"	13'–2"	7'–0"
54	5'–6"	27'–6"	6'–0"	28'–0 1/2"	4	30'–0 5/8"	2	6'–7 1/2"	13'–2 1/2"	8'–3"
60	6'–0"	30'–0"	6'–0"	30'–7 1/8"	4	32'–7 1/2"	2	6'–7 1/2"	11'–9 1/8"	10'–3"

6 : 1 SLOPE

CULVERT SIZE	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S1	S2
12	2'–0"	12'–0"	2'–0"	12'–2"	1	14'–6 1/4"	2	2'–7 1/2"	6'–2"	4'–0"
15 & 18	2'–6"	15'–0"	2'–0"	15'–2 1/2"	1	17'–6 1/2"	2	2'–7 1/2"	6'–8 1/2"	5'–3"
21 & 24	3'–0"	18'–0"	3'–0"	18'–3"	2	20'–7 1/4"	2	3'–7 1/2"	9'–9"	5'–3"
27 & 30	3'–6"	21'–0"	3'–0"	21'–3 1/2"	2	23'–7 3/4"	2	3'–7 1/2"	9'–9 1/2"	6'–9"
33 & 36	4'–0"	24'–0"	4'–0"	24'–4"	3	26'–8 1/4"	2	4'–7 1/2"	13'–4"	6'–6"
42	4'–6"	27'–0"	4'–0"	27'–4 1/2"	3	29'–8 3/4"	2	4'–7 1/2"	13'–4 1/2"	8'–0"
48	5'–0"	30'–0"	5'–0"	30'–5"	3	32'–9 1/4"	2	5'–7 1/2"	13'–5"	9'–6"
54	5'–6"	33'–0"	6'–0"	33'–5 1/2"	4	35'–9 3/4"	2	6'–7 1/2"	12'–11 1/2"	11'–3"
60	6'–0"	36'–0"	6'–0"	36'–6"	4	38'–10 1/8"	3	6'–7 1/2"	13'–0"	8'–6"

APPROXIMATE QUANTITIES

PIPE DIAMETER	2 : 1 SLOPE				3 : 1 SLOPE				4 : 1 SLOPE				5 : 1 SLOPE				6 : 1 SLOPE			
	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.
	Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe		
12	1.1	1.1	290	80	1.4	1.4	375	160	1.7	1.7	465	195	2.1	2.1	555	275	2.4	2.4	645	305
15 & 18	1.3	1.3	345	145	1.8	1.8	460	180	2.2	2.2	575	270	2.8	2.8	690	305	3.0	3.0	805	345
21 & 24	1.9	1.9	460	215	2.5	2.5	620	370	3.1	3.1	775	460	3.7	3.8	935	545	4.3	4.4	1090	705
27 & 30	2.1	2.2	525	245	2.9	3.0	715	410	3.6	3.7	905	510	4.4	4.5	1095	680	5.2	5.3	1285	780
33 & 36	2.8	2.9	670	410	3.8	3.9	910	660	4.8	4.9	1150	825	5.9	6.0	1395	995	6.9	7.0	1640	1255
42	3.2	3.3	745	450	4.4	4.5	1025	720	5.6	5.7	1305	905	6.8	8.9	1585	1090	8.0	8.1	1870	1370
48	4.0	4.1	1.1	910	5.5	5.6	1250	80	8.5	8.7	1940	1310	10.1	10.2	1940	1310	10.1	10.2	2285	1515
54	4.9	5.1	1090	845	6.8	6.9	1500	1125	8.6	8.8	1915	1415	10.5	10.7	2330	1845	12.4	12.6	2745	2145
60	5.4	5.8	1180	900	7.8	7.7	1640	1205	9.8	9.8	2105	1850	11.7	11.9	2570	1970	13.8	14.0	3035	2425

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE I DIMENSIONS AND QUANTITIES

JANUARY 1999

STANDARD DRAWING NO. E 715–GBTO–05

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER — DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER — DATE

ORIGNALLY APPROVED 1-04-99

2:1 SLOPE

Pipe Size	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S 1	S 2
17 x 13	1'–9"	3'–6"	2'–0"	3'–11"	1	5'–0 7/8"	–	–	4'–7"	–
21 x 15	1'–11"	3'–10"	2'–0"	4'–3 1/2"	1	5'–5 3/8"	–	–	4'–11 3/8"	–
24 x 18	2'–2"	4'–4"	3'–0"	4'–10 1/8"	2	6'–0 1/8"	–	–	5'–6 1/8"	–
28 x 20	2'–4"	4'–8"	3'–0"	5'–2 1/2"	2	6'–4 3/8"	–	–	5'–10 3/8"	–
35 x 24	2'–8"	5'–4"	4'–0"	5'–11 1/2"	3	7'–1 1/2"	–	–	6'–7 1/2"	–
42 x 29	3'–1"	6'–2"	4'–0"	6'–10 3/4"	3	8'–0 3/4"	–	–	7'–6 3/4"	–
49 x 33	3'–5"	6'–10"	5'–0"	7'–7 5/8"	3	8'–9 5/8"	–	–	8'–3 5/8"	–
57 x 38	3'–10"	7'–8"	5'–0"	8'–6 7/8"	3	9'–8 7/8"	–	–	9'–2 7/8"	–
64 x 43	4'–3"	8'–6"	6'–0"	9'–6"	4	10'–8"	–	–	10'–2"	–
71 x 47	4'–7"	9'–2"	6'–0"	10–3"	4	11'–5"	–	–	10'–11"	–

3:1 SLOPE

Pipe Size	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S 1	S 2
17 x 13	1'–9"	5'–3"	2'–0"	5'–6 3/8"	1	6'–11 1/2"	1	2'–7 1/2"	5'–0 3/8"	1'–6"
21 x 15	1'–11"	5'–9"	2'–0"	6'–0 3/4"	1	7'–5 3/4"	1	2'–7 1/2"	5'–0 3/4"	2'–0"
24 x 18	2'–2"	6'–6"	3'–0"	6'–10 1/4"	2	8'–3 1/4"	–	–	7'–10 1/4"	–
28 x 20	2'–4"	7'–0"	3'–0"	7'–4 1/2"	2	8'–9 5/8"	–	–	8'–4 1/2"	–
35 x 24	2'–8"	8'–0"	4'–0"	8'–5 1/4"	3	9'–10 1/4"	–	–	9'–5 1/4"	–
42 x 29	3'–1"	9'–3"	4'–0"	9'–9"	3	11'–2"	–	–	10'–9"	–
49 x 33	3'–5"	10'–3"	5'–0"	10'–9 5/8"	3	12'–2 3/4"	–	–	11'–9 5/8"	–
57 x 38	3'–10"	11'–6"	5'–0"	12'–1 1/2"	3	13'–6 1/2"	1	5'–7 1/2"	10'–1 1/2"	3'–0"
64 x 43	4'–3"	12'–9"	6'–0"	13'–5 1/4"	4	14'–10 3/8"	1	6'–7 1/2"	11'–5 1/4"	3'–0"
71 x 47	4'–7"	13'–9"	6'–0"	14'–5 7/8"	4	15'–11"	1	6'–7 1/2"	12'–5 7/8"	3'–0"

4:1 SLOPE

Pipe Size	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S 1	S 2
17 x 13	1'–9"	7'–0"	2'–0"	7'–2 5/8"	1	8'–11 1/4"	1	2'–7 1/2"	5'–9 5/8"	2'–9"
21 x 15	1'–11"	7'–8"	2'–0"	7'–10 7/8"	1	9'–7 1/2"	1	2'–7 1/2"	5'–8 7/8"	3'–6"
24 x 18	2'–2"	8'–8"	3'–0"	8'–11 1/4"	2	10'–7 7/8"	1	3'–7 1/2"	8'–3 1/4"	2'–0"
28 x 20	2'–4"	9'–4"	3'–0"	9'–7 1/2"	2	11'–4"	1	3'–7 1/2"	8'–11 1/2"	2'–0"
35 x 24	2'–8"	10'–8"	4'–0"	11'–0"	3	12'–8 1/2"	–	–	12'–4"	–
42 x 29	3'–1"	12'–4"	4'–0"	12'–8 1/2"	3	14'–5 3/8"	1	4'–7 1/2"	11'–0 1/2"	3'–0"
49 x 33	3'–5"	13'–8"	5'–0"	14'–1"	3	15'–9 5/8"	1	5'–7 1/2"	12'–5"	3'–0"
57 x 38	3'–10"	15'–4"	5'–0"	15'–9 5/8"	3	17'–6 1/4"	1	5'–7 1/2"	12'–7 5/8"	4'–6"
64 x 43	4'–3"	17'–0"	6'–0"	17'–6 1/4"	4	19'–2 7/8"	1	6'–7 1/2"	12'–4 1/4"	6'–6"
71 x 47	4'–7"	18'–4"	6'–0"	18'–10 3/4"	4	20'–7 7/8"	1	6'–7 1/2"	12'–8 3/4"	7'–6"

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE I DIMENSIONS

JANUARY 1999

STANDARD DRAWING NO. E 715-GBTO-06

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-04-99

5:1 SLOPE										
Pipe Size	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S 1	S 2
17 x 13	1'–9"	8'–9"	2'–0"	8'–11 1/8"	1	10'–11 1/2"	1	2'–7 1/2"	6'–1 1/8"	4'–6"
21 x 15	1'–11"	9'–7"	2'–0"	9'–9 1/4"	1	11'–9 3/8"	1	2'–7 1/2"	6'–8 1/4"	4'–9"
24 x 18	2'–2"	10'–10"	3'–0"	11–0 5/8"	2	13'–1"	1	3'–7 1/2"	8'–8 3/8"	4'–0"
28 x 20	2'–4"	11'–6"	3'–0"	11–0 3/4"	2	13'–11 1/8"	1	3'–7 1/2"	9'–6 3/4"	4'–0"
35 x 24	2'–8"	13'–4"	4'–0"	13'–7 1/8"	3	15'–7 1/2"	1	4'–7 1/2"	12'–3 5/8"	3'–0"
42 x 29	3'–1"	15'–5"	4'–0"	15'–8 3/8"	3	17'–9"	1	4'–7 1/2"	12'–10 5/8"	4'–6"
49 x 33	3'–5"	17'–1"	5'–0"	17'–5"	3	19'–5 1/2"	1	5'–7 1/2"	13'–1"	6'–0"
57 x 38	3'–10"	19'–2"	5'–0"	19'–6 1/2"	3	21'–6 7/8"	1	5'–7 1/2"	13'–2 1/2"	8'–0"
64 x 43	4'–3"	21'–3"	6'–0"	21'–8"	4	23'–8 3/8"	1	6'–7 1/2"	12'–10"	10'–6"
71 x 47	4'–7"	22'–11"	6'–0"	23'–4 3/8"	4	25'–4 3/4"	1	6'–7 1/2"	13'–6 3/8"	11'–6"

6:1 SLOPE										
Pipe Size	H	L	W	Longitudinal Pipe			Cross Tube			
				S	No.	Length	No.	Length	S 1	S 2
17 x 13	1'–9"	10'–6"	2'–0"	10'–7 3/4"	1	13'–0"	2	2'–7 1/2"	6'–7 3/4"	3'–0"
21 x 15	1'–11"	11'–6"	2'–0"	11'–7 7/8"	1	14'–0 1/8"	2	2'–7 1/2"	6'–1 1/8"	3'–9"
24 x 18	2'–2"	13'–0"	3'–0"	13'–2 1/8"	2	15'–6 3/8"	1	3'–7 1/2"	9'–8 1/8"	5'–6"
28 x 20	2'–4"	14'–0"	3'–0"	14'–2 1/4"	2	16'–6 1/2"	1	3'–7 1/2"	9'–8 1/4"	6'–6"
35 x 24	2'–5"	16'–0"	4'–0"	16'–2 5/8"	3	18'–6 7/8"	1	4'–7 1/2"	13'–2 5/8"	5'–0"
42 x 29	3'–1"	18'–6"	4'–0"	18'–9"	3	21'–1 1/4"	1	4'–7 1/2"	13'–6"	7'–3"
49 x 33	3'–5"	20'–6"	5'–0"	20'–9 3/8"	3	23'–1 5/8"	1	5'–7 1/2"	13'–3 3/8"	9'–6"
57 x 38	3'–10"	23'–0"	5'–0"	23'–3 3/4"	3	25'–8"	1	5'–7 1/2"	13'–9 1/4"	11'–6"
64 x 43	4'–3"	25'–6"	6'–0"	25'–10 1/4"	4	28'–2 1/2"	2	6'–7 1/2"	13'–4 1/4"	7'–3"
71 x 47	4'–7"	27'–6"	6'–0"	27'–10 1/2"	4	30'–2 3/4"	2	6'–7 1/2"	13'–4 1/2"	8'–3"

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION
TYPE I DIMENSIONS

JANUARY 1999

STANDARD DRAWING NO. E 715-GBTO-07

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-04-99

APPROXIMATE QUANTITIES

PIPE SIZE	2:1 SLOPE				3:1 SLOPE				4:1 SLOPE				5:1 SLOPE				6:1 SLOPE			
	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.	Concrete, Cu. Yds.		Reinf. Steel, lb.	Str. Steel, lb.
	Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe		
17 x 13	–	1.0	260	75	–	1.2	335	150	–	1.5	415	180	–	1.8	490	210	–	2.1	565	290
21 x 15	–	1.1	280	80	–	1.3	360	160	–	1.6	445	190	–	1.9	530	220	–	2.3	615	300
24 x 18	–	1.4	360	170	–	1.8	465	235	–	2.2	570	370	–	2.6	680	440	–	3.1	790	505
28 x 20	–	1.5	375	180	–	1.9	495	245	–	2.4	610	390	–	2.8	730	460	–	3.3	845	530
35 x 24	–	2.0	475	300	–	2.6	625	410	–	3.2	775	525	–	3.8	925	740	–	4.4	1075	860
42 x 29	–	2.2	535	335	–	2.9	710	460	–	3.6	885	685	–	4.4	1060	820	–	5.1	1240	955
49 x 33	–	2.8	645	360	–	3.7	860	500	–	4.6	1075	750	–	5.5	1290	900	–	6.4	1505	1045
57 x 38	–	3.0	710	395	–	4.1	955	655	–	5.2	1205	815	–	6.2	1450	980	–	7.3	1700	1140
64 x 43	–	3.8	855	575	–	5.1	1155	925	–	6.4	1450	1160	–	7.8	1755	1400	–	9.1	2055	1760
71 x 47	–	4.0	910	610	–	5.5	1235	980	–	7.0	1565	1225	–	8.4	1895	1480	–	9.9	2225	1865

DIMENSIONS

Slope	A	B	C	D	E	F
2:1	0′–9″	0′–8″	0′–6 1/2″	0′–8 1/2″	0′–0 3/4″	0′–0 7/8″
3:1	1′–0 5/8″	1′–0″	0′–5 1/2″	0′–6 7/8″	0′–1 1/8″	0′–1 1/8″
4:1	1′–4 1/2″	1′–4″	0′–5 1/8″	0′–6 1/8″	0′–1 1/2″	0′–1 1/2″
5:1	1′–8 3/8″	1′–8″	0′–4 5/8″	0′–5 3/8″	0′–1 7/8″	0′–1 7/8″
6:1	2′–0 3/8″	2′–0″	0′–4 1/4″	0′–5 3/8″	0′–2 1/4″	0′–2 1/4″

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE I DIMENSIONS AND QUANTITIES

JANUARY 1999

STANDARD DRAWING NO. E 715-GBTO-08

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

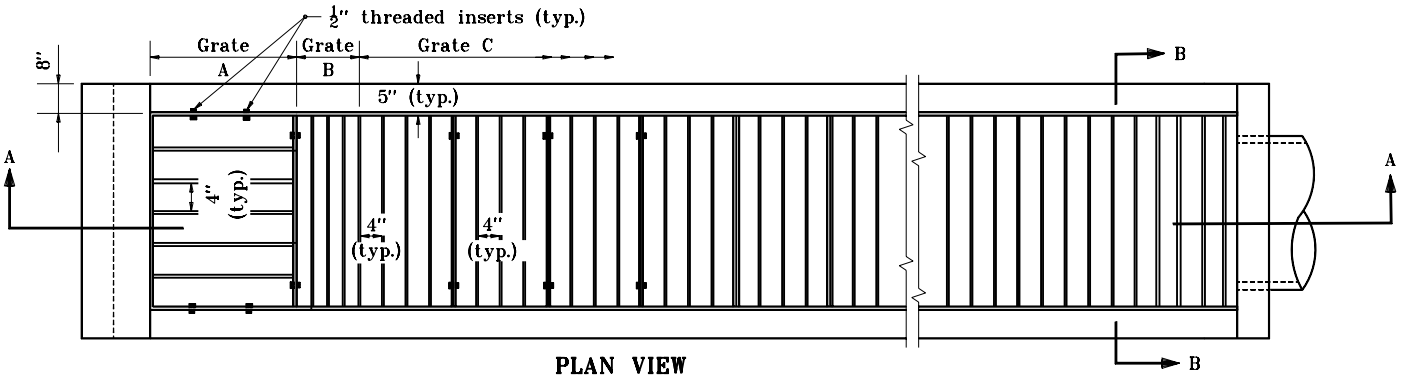
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

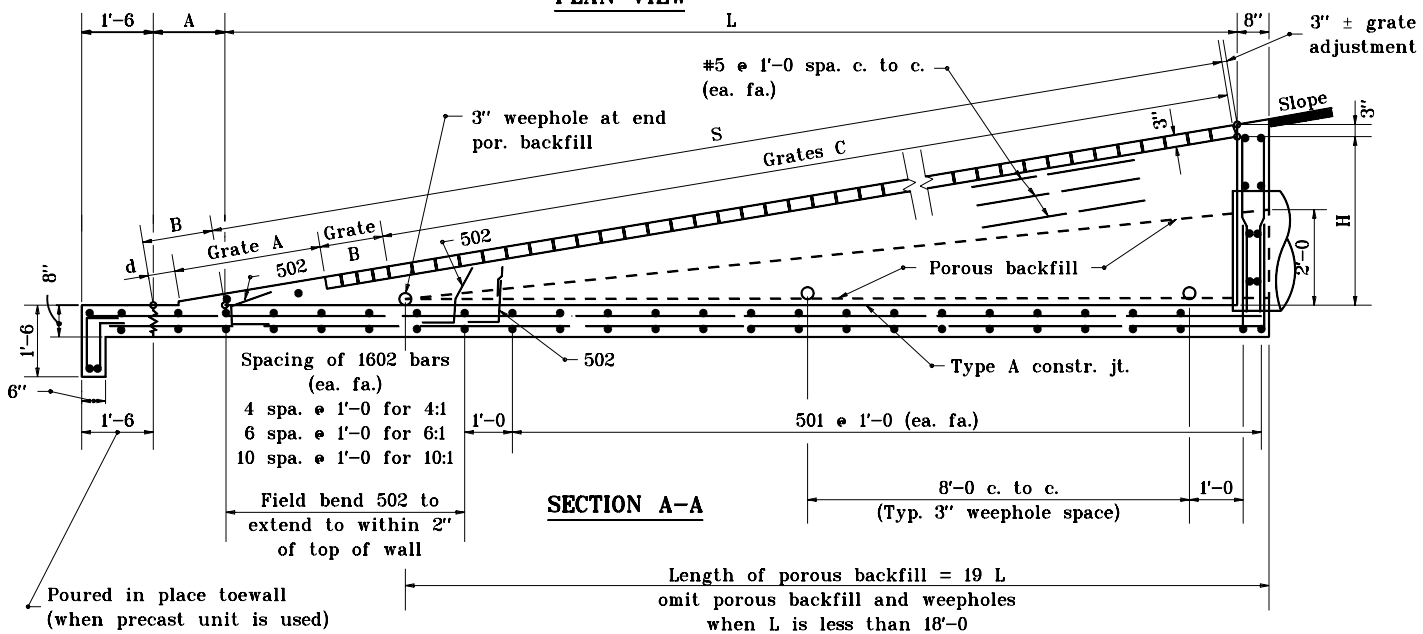
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

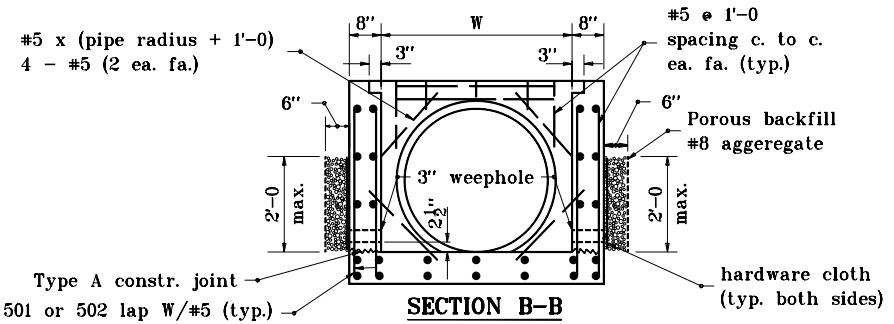
ORIGINALLY APPROVED 1-04-99



PLAN VIEW



SECTION A-A



SECTION B-B

GENERAL NOTES

1. The invert grade of the grated box end section shall be the same as that of the pipe.
2. See Standard Drawings E 715-GBTT-05 and -06 for dimensions tables.
3. Type II grated box end sections shall be used for culverts parallel to the mainline within the clear zone.
4. See Standard Drawing E 715-GBTT-02 for bending diagrams.

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE II

JANUARY 1999

STANDARD DRAWING NO. E 715-GBTT-01

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

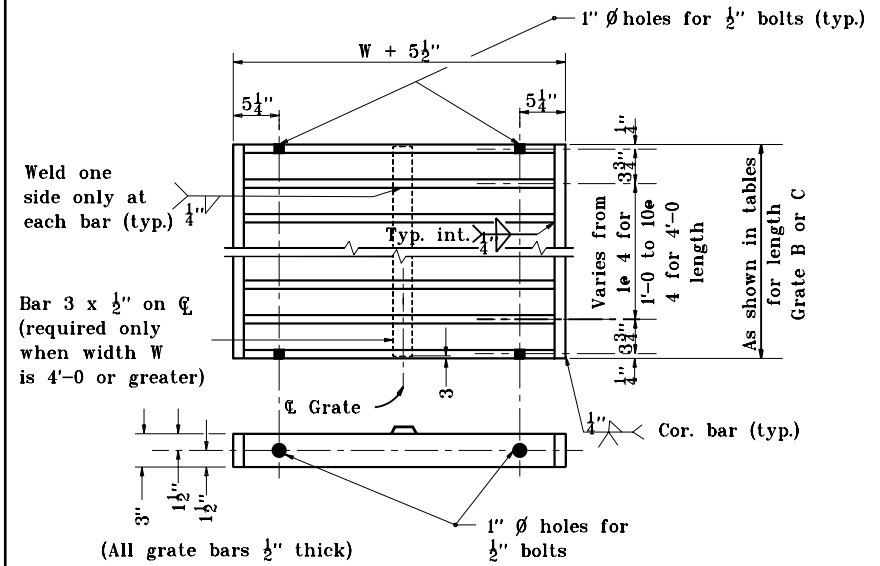
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

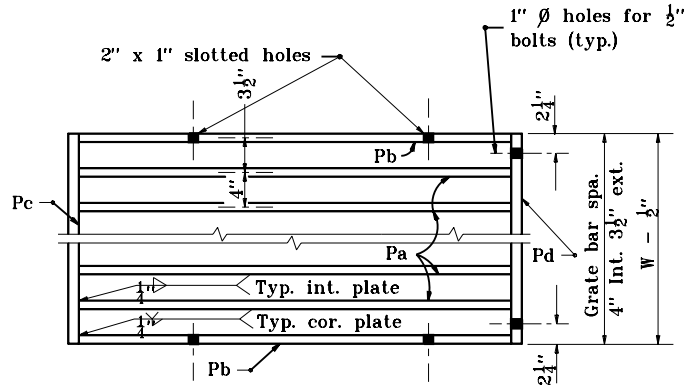
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

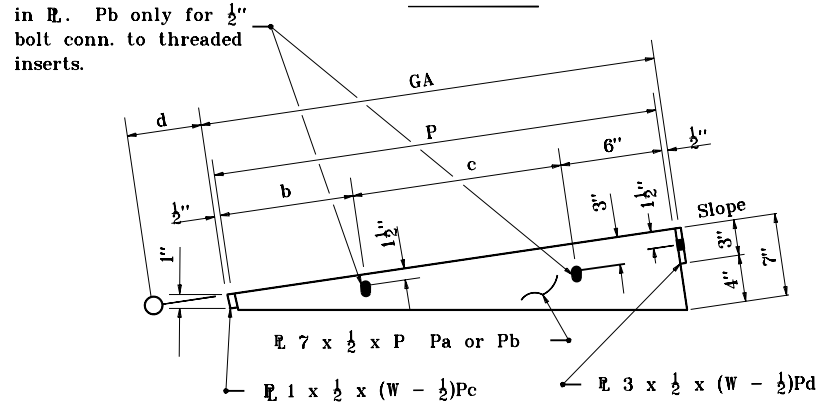
ORIGINALLY APPROVED 1-04-99



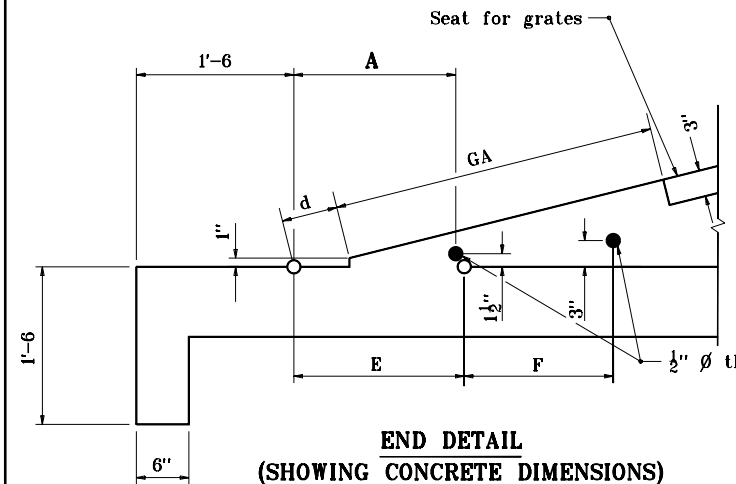
GRATE B & C



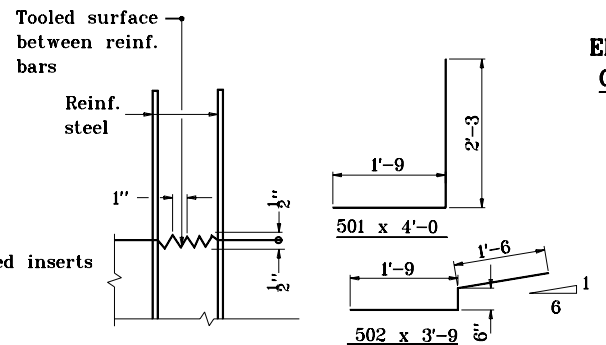
PLAN VIEW



ELEVATION GRATE A



END DETAIL (SHOWING CONCRETE DIMENSIONS)



TYPE A CONSTR. JOINT

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE II

JANUARY 1999

STANDARD DRAWING NO. E 715-GBTT-02

DETAILS PLACED IN THIS FORMAT 11-15-99

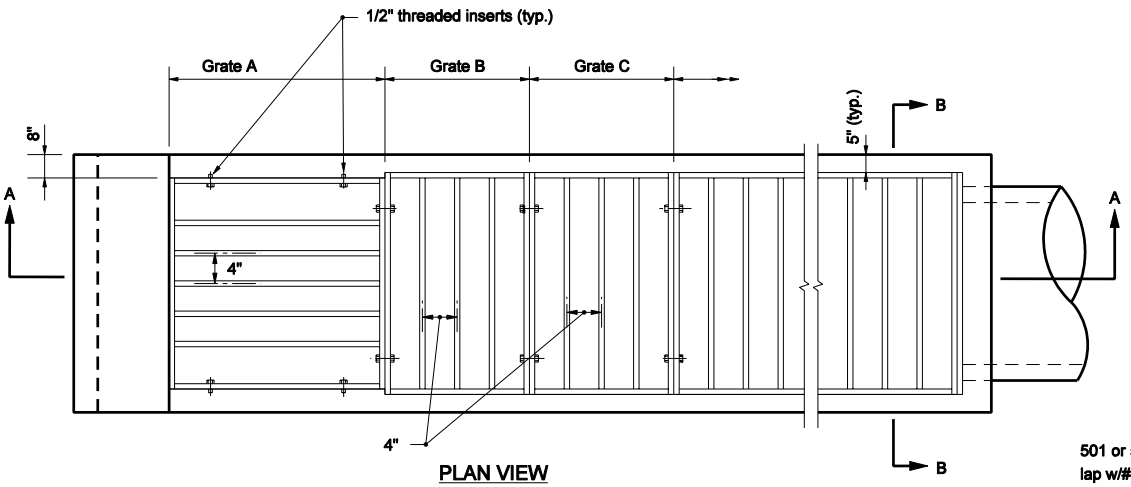
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

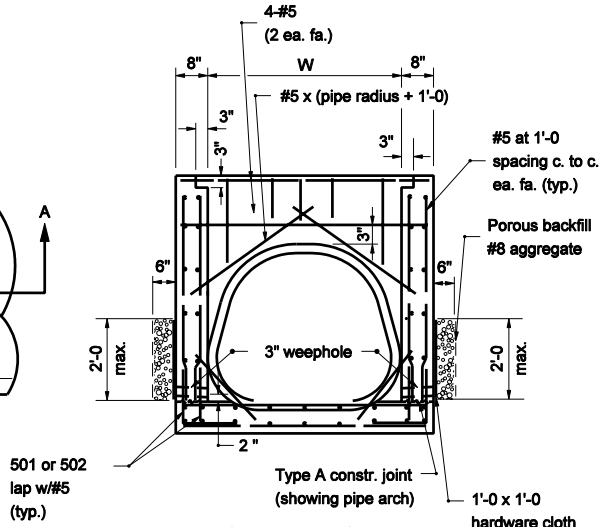
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

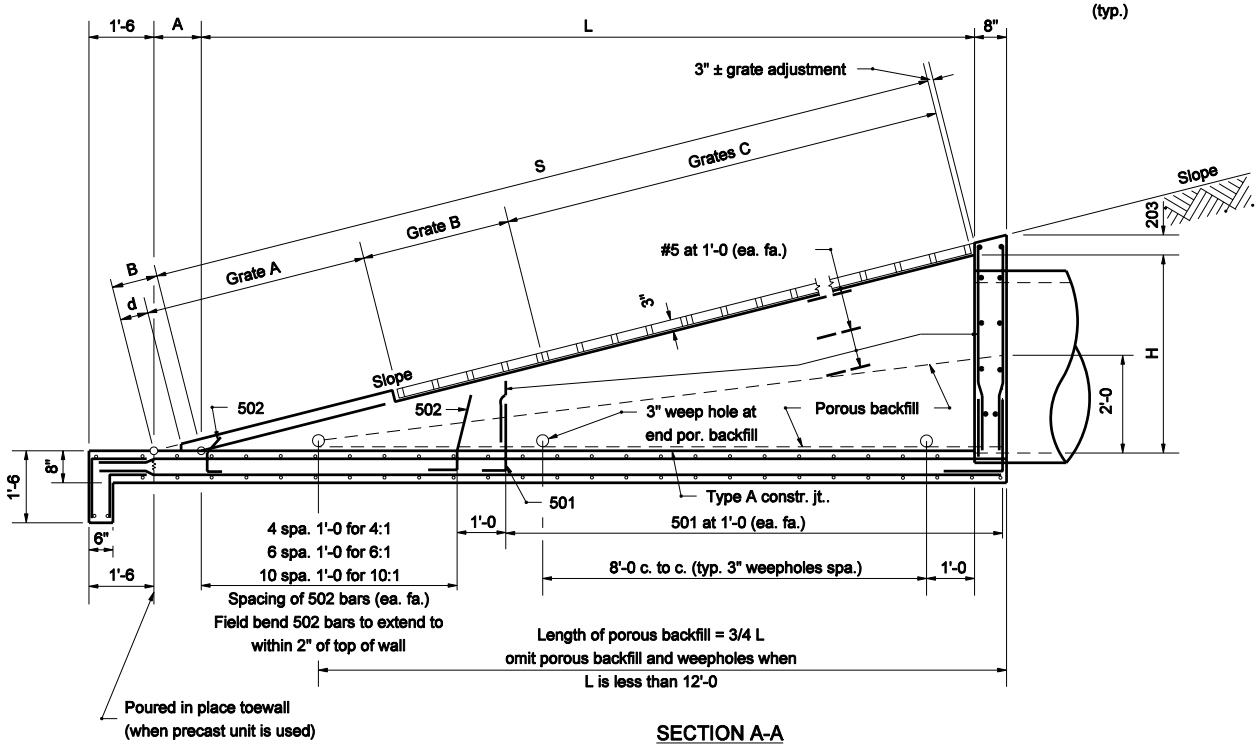
ORGINALLY APPROVED 1-04-99



PLAN VIEW



GRATE REMOVED
SECTION B-B



SECTION A-A

GENERAL NOTES

1. The invert grade of the grated box end section shall be the same as that of the pipe.
2. See Standard Drawings E 715-GBTT-05 and -06 for dimensions tables.
3. See Standard Drawing E 715-GBTT-02 for bending diagrams.
4. Type II grated box end sections shall be used for culverts parallel to the mainline within the clear zone.

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE II

MARCH 2006

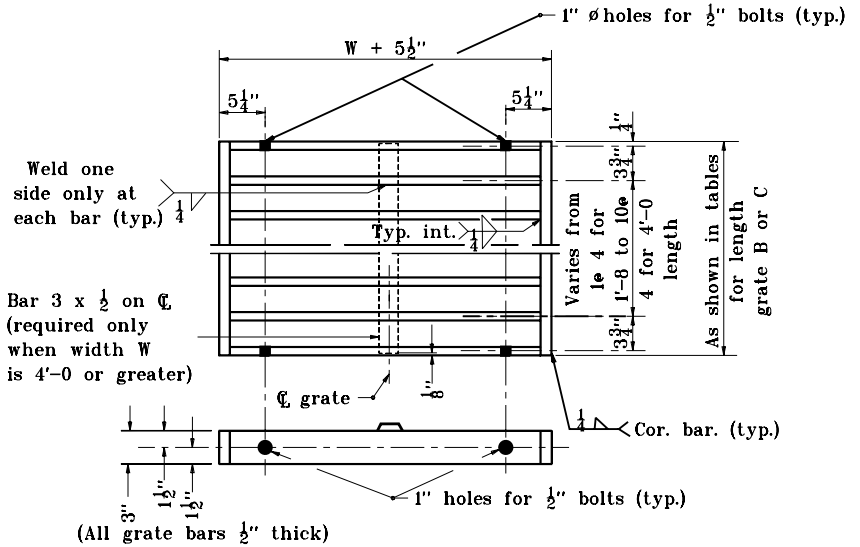
STANDARD DRAWING NO. E 715-GBTT-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

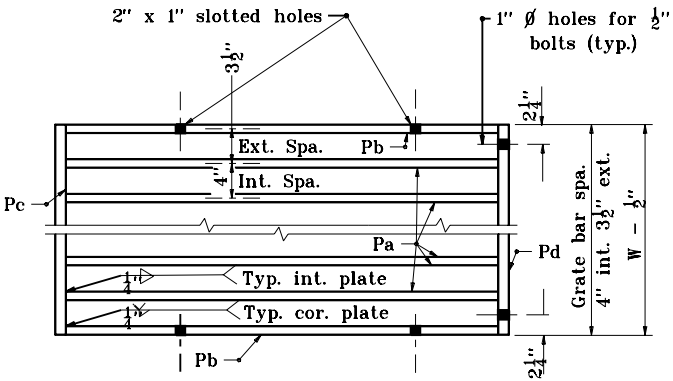
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 3-01-06
DESIGN STANDARDS ENGINEER DATE

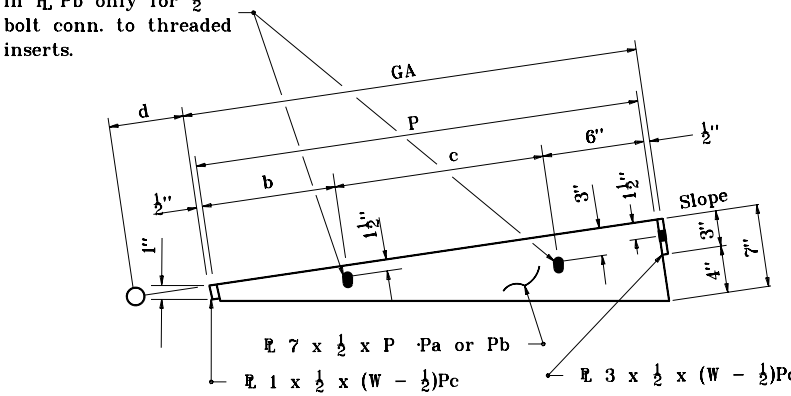
/s/ Richard K. Smutzer 3-01-06
CHIEF HIGHWAY ENGINEER DATE



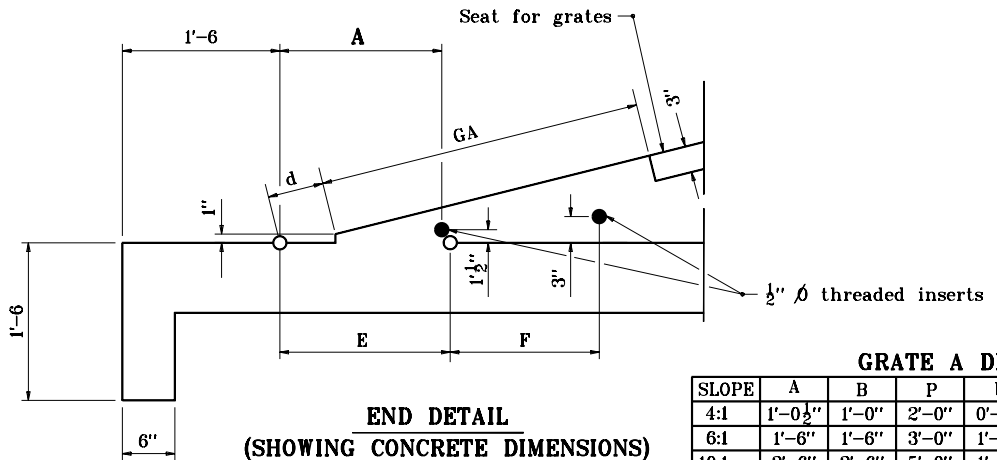
GRATE B & C



PLAN VIEW



ELEVATION
GRATE A



END DETAIL
(SHOWING CONCRETE DIMENSIONS)

GRATE A DIMENSIONS TABLE

SLOPE	A	B	P	b	c	d	E	F	G
4:1	1'-0½"	1'-0"	2'-0"	0'-8"	0'-10"	4"	1'-0½"	0'-10"	2'-1"
6:1	1'-6"	1'-6"	3'-0"	1'-0"	1'-6"	6"	1'-6½"	1'-6"	3'-1"
10:1	2'-6"	2'-6"	5'-0"	1'-8"	2'-10"	10"	2'-6½"	2'-10"	5'-1"

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE II

JANUARY 1999

STANDARD DRAWING NO. **E 715-GBTT-04**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-04-99

4:1 Slope							
Pipe Diameter	H	L	W	S	Grate C		Grate B
					NO.	Length	Length
12	1'–5	5'–8	2'–0	5'–9	1	3'–4	1'–0
15 & 18	2'–0	8'–0	2'–0	8'–1	1	4'–0	2'–8
21 & 24	2'–6	10'–0	3'–0	10'–1	2	3'–0	2'–8
27 & 30	3'–1	12'–4	3'–0	12'–5	3	3'–0	2'–0
33 & 36	3'–7	14'–4	4'–0	14'–5	5	2'–4	1'–4
42	4'–2	16'–5	4'–0	17'–1	6	2'–4	1'–8
48	4'–8	18'–8	5'–0	19'–1	8	2'–0	1'–8
54	5'–3	21'–0	6'–0	21'–5	12	1'–8	–
60	5'–9	23'–0	6'–0	23'–5	12	1'–8	2'–0

10:1 Slope							
Pipe Diameter	H	L	W	S	Grate C		Grate B
					No.	Length	Length
12	1'–5	14'–2	2'–0	14'–1	2	4'–0	2'–8
15 & 18	2'–0	20'–0	2'–0	19'–9	4	3–8	1'–8
21 & 24	2'–6	25'–0	3'–0	24'–9	8	2'–8	–
27 & 30	3'–1	30'–10	3'–0	30'–5	9	3'–0	–
33 & 36	3'–7	35'–10	4'–0	35'–9	13	2'–4	2'–0
42	4'–2	41'–8	4'–0	41'–9	16	2'–4	1'–0
48	4'–8	46'–8	5'–0	46'–9	21	2'–0	1'–4
54	5'–3	52'–6	6'–0	52'–5	36	1'–4	1'–0
60	5'–9	57'–6	6'–0	57'–9	40	1'–4	1'–0

6:1 Slope							
Pipe Diameter	H	L	W	S	Grate C		Grate B
					No.	Length	Length
12	1'–5	8'–6	2'–0	8'–5	1	4'–0	2'–4
15 & 18	2'–0	12'–0	2'–0	11'–9	2	4'–0	1'–8
21 & 24	2'–6	15'–0	3'–0	15'–1	4	3'–0	1'–0
27 & 30	3'–1	18'–6	3'–0	18'–5	5	3'–0	1'–4
33 & 36	3'–7	21'–6	4'–0	21'–5	9	2'–0	1'–4
42	4'–2	25'–0	4'–0	25'–1	9	2'–4	2'–0
48	4'–8	28'–0	5'–0	28'–1	13	2'–0	–
54	5'–3	31'–6	6'–0	31'–9	17	1'–8	1'–4
60	5'–9	34'–6	6'–0	34'–9	19	1'–8	1'–0

GRATE A DIMENSIONS TABLE									
Slope	A	B	P	b	c	d	E	F	GA
4:1	1'–0½"	1'–0	2'–0	0'–8	0'–10	4"	1'–0½"	0'–10	2'–1
6:1	1'–6	1'–6	3'–0	1'–0	1'–6	6"	1'–6½"	1'–6	3'–1
10:1	2'–6	2'–6	5'–0	1'–8	2'–10	10"	2'–6½"	2'–10	5'–1

APPROXIMATE QUANTITIES												
Pipe Diameter	4:1 Slope				6:1 Slope				10:1 Slope			
	Conc., cys		Reinf. Steel, lb.	Str. Steel, lb.	Conc., cys		Reinf. Steel, lb.	Str. Steel, lb.	Conc., cys		Reinf. Steel, lb.	Str. Steel, lb.
	Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe			Conc. Pipe	C.M. Pipe		
12	1.1	1.1	295	335	1.5	1.5	400	480	2.3	2.4	605	790
15 & 18	1.6	1.6	395	445	2.2	2.2	550	645	3.4	3.4	865	1080
21 & 24	2.4	2.4	565	750	3.3	3.3	790	1130	5.2	5.2	1245	1830
27 & 30	2.9	3.0	695	910	4.2	4.3	980	1345	6.6	6.7	1580	2195
33 & 36	4.0	4.1	910	1415	5.7	5.8	1290	2115	9.1	9.2	2075	3455
42	4.8	4.9	1085	1655	6.9	7.0	1545	2415	11.0	11.2	2490	4015
48	6.2	6.3	1350	2230	8.8	9.0	1925	3265	14.2	14.4	3100	5425
54	7.8	8.0	1665	2955	11.3	11.4	2400	4375	18.1	18.3	3855	7440
60	8.7	8.9	1850	3215	12.6	12.8	2675	4780	20.4	20.4	4310	8175

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION DIMENSIONS & QUANTITIES TYPE II

JANUARY 1999

STANDARD DRAWING NO. E 715–GBTT–05

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-04-99

4:1 SLOPE							
PIPE SIZE	H	L	W	S	GRATE C		GRATE B
					No.	LENGTH	LENGTH
17 x 13	1'–6	6'–0	2'–0	6'–1	1	3'–8	1'–0
21 x 15	1'–8	6'–8	2'–0	6'–9	1	4'–0	1'–4
24 x 18	1'–11	7'–8	3'–0	7'–9	2	2'–8	1'–0
28 x 20	2'–1	8'–4	3'–0	8'–5	2	3'–0	1'–0
35 x 24	2'–5	9'–8	4'–0	9'–9	3	2'–4	1'–4
42 x 29	2'–10	11'–4	4'–0	11'–5	5	2'–0	–
49 x 33	3'–2	12'–8	5'–0	12'–9	5	2'–0	1'–4
57 x 38	3'–7	14'–4	5'–0	14'–5	6	2'–0	1'–0
64 x 43	4'–0	16'–0	6'–0	16'–5	9	1'–8	–
71 x 47	4'–4	17'–4	6'–0	17'–9	9	1'–8	1'–4

10:1 SLOPE							
PIPE SIZE	H	L	W	S	GRATE C		GRATE B
					No.	LENGTH	LENGTH
17 x 13	1'–6	15'–0	2'–0	14'–9	2	4'–0	3'–4
21 x 15	1'–8	16'–8	2'–0	16'–5	3	4'–0	1'–0
24 x 18	1'–11	19'–2	3'–0	19'–1	5	2'–6	2'–4
28 x 20	2'–1	20'–10	3'–0	20'–9	5	3'–0	2'–4
35 x 24	2'–5	24'–2	4'–0	24'–1	8	2'–4	2'–0
42 x 29	2'–10	28'–4	4'–0	28'–1	10	2'–4	1'–4
49 x 33	3'–2	31'–8	5'–0	31'–9	17	1'–8	–
57 x 38	3'–7	35'–10	5'–0	35'–9	23	1'–4	1'–8
64 x 43	4'–0	40'–0	6'–0	40'–1	22	1'–8	–
71 x 47	4'–4	43'–4	6'–0	43'–5	24	1'–8	–

6:1 SLOPE							
PIPE SIZE	H	L	W	S	GRATE C		GRATE B
					No.	LENGTH	LENGTH
17 x 13	1'–6	9'–0	2'–0	8'–9	1	4'–0	2'–8
21 x 15	1'–8	10'–0	2'–0	9'–9	1	4'–0	3'–8
24 x 18	1'–11	11'–6	3'–0	11'–5	3	2'–8	1'–4
28 x 20	2'–1	12'–6	3'–0	12'–5	3	3'–0	1'–4
35 x 24	2'–5	14'–6	4'–0	14'–5	5	2'–0	2'–4
42 x 29	2'–10	17'–0	4'–0	17'–1	7	2'–0	1'–0
49 x 33	3'–2	19'–0	5'–0	19'–1	8	2'–0	1'–0
57 x 38	3'–7	21'–6	5'–0	21'–5	9	2'–0	1'–4
64 x 43	4'–0	24'–0	6'–0	24'–1	12	1'–8	2'–0
71 x 47	4'–4	26'–0	6'–0	26'–1	18	1'–4	–

APPROXIMATE QUANTITIES									
PIPE Size	4:1 SLOPE			6:1 SLOPE			10:1 SLOPE		
	Str. Steel, lb.	Conc., cys	Reinf. Steel, lb.	Str. Steel, lb.	Conc., cys	Reinf. Steel, lb.	Str. Steel, lb.	Conc., cys	Reinf. Steel, lb.
17 x 13	355	1.2	305	495	1.6	415	820	2.5	640
21 x 15	385	1.3	335	540	1.8	460	910	2.8	715
24 x 18	605	1.8	440	875	2.5	610	1445	3.9	935
28 x 20	645	2.0	465	940	2.7	645	1545	4.2	1020
35 x 24	975	2.7	615	1435	3.7	855	2375	5.8	1325
42 x 29	1145	3.1	700	1710	4.4	995	2750	6.9	1570
49 x 33	1520	4.0	880	2270	5.6	1230	3825	8.9	1960
57 x 38	1715	4.5	985	2525	6.4	1400	4400	10.2	2245
64 x 43	2295	5.7	1210	3335	8.1	1725	5560	12.9	2755
71 x 47	2470	6.2	1310	3735	8.9	1880	6005	14.2	3015

INDIANA DEPARTMENT OF TRANSPORTATION

GRATED BOX END SECTION TYPE II DIMENSIONS AND QUANTITIES

JANUARY 1999

STANDARD DRAWING NO. **E 715–GBTT–06**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

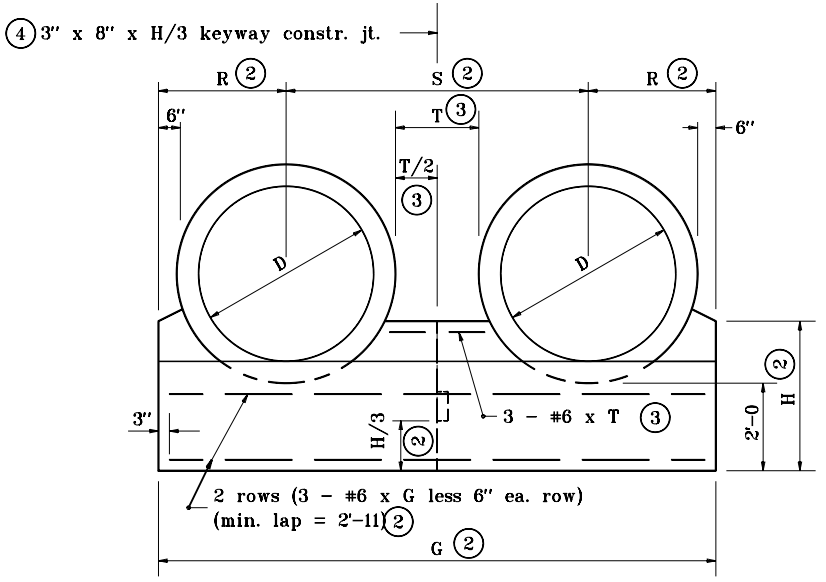
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

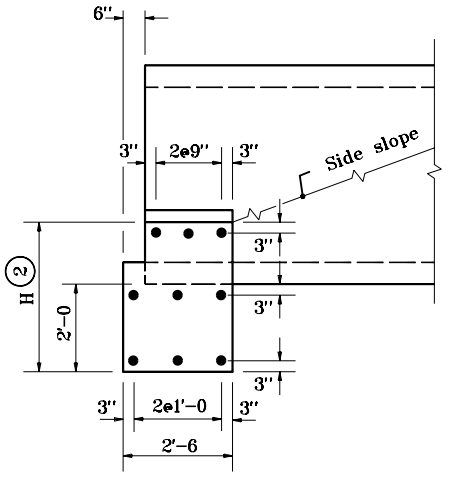
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-04-99



ANCHOR FOR DOUBLE PIPE INSTALLATION
FRONT ELEVATION



SECTION THROUGH ANCHOR

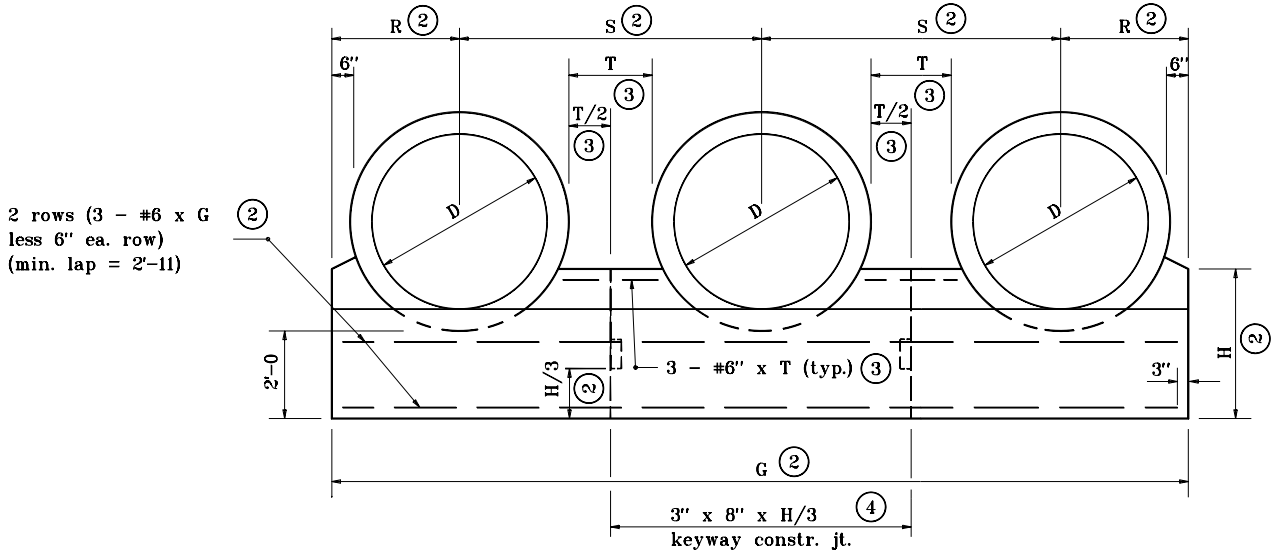
GENERAL NOTES

1. Circular reinforced concrete pipes shown. For details of other pipe alternates, see partial elevations on Standard Drawing E 715-MPCA-02.

(2) For dimension enter chart on Standard Drawing E 715-ANCH-01 with known dimension D.

(3) T = Clear distance between pipes.
For D less than 48", T = 2'-0.
For D of 48" to 96", T = 1/2 D
For D greater than 96", T = 4'-0.

(4) No joint required if G is less than or equal to 30'. One joint required if G is greater than 30' but less than or equal to 42'. Two joints required if G is greater than 42'.



ANCHOR FOR TRIPLE PIPE INSTALLATION
FRONT ELEVATION

INDIANA DEPARTMENT OF TRANSPORTATION

MULTIPLE PIPE CONCRETE ANCHORS

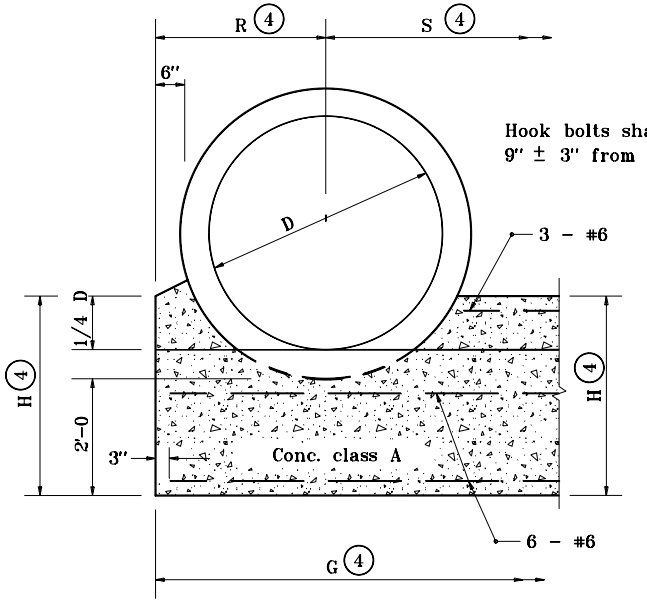
JANUARY 1998

STANDARD DRAWING NO. **E 715-MPCA-01**

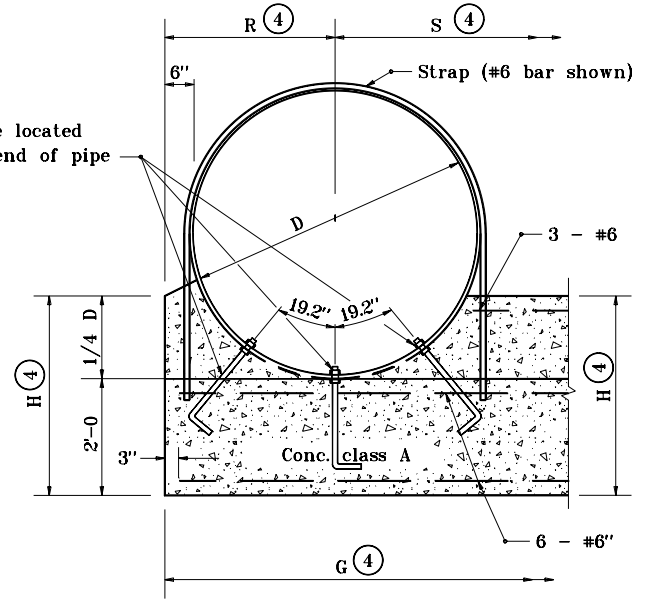
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	7-27-99
/s/ Anthony L. Uremovich, DESIGN STANDARDS ENGINEER	7-27-99
/s/ Firooz Zandi, CHIEF HIGHWAY ENGINEER	7-27-99
ORIGINALLY APPROVED	1-02-98



ANCHOR FOR
REINFORCED CONCRETE PIPE
PARTIAL ELEVATION



ANCHOR FOR
CORRUGATED METAL PIPE
PARTIAL ELEVATION

GENERAL NOTES

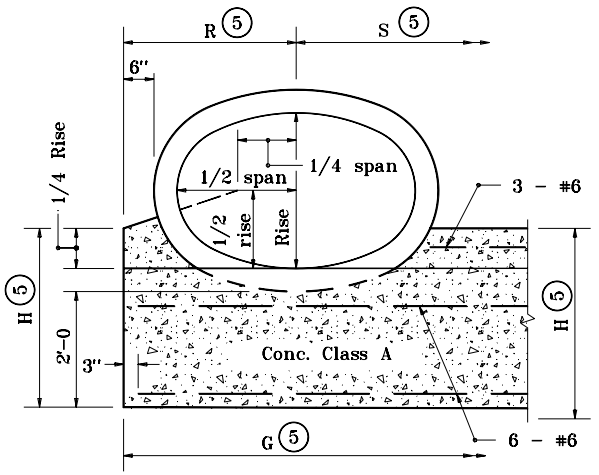
1. Anchor straps shall be used at both upstream and downstream ends of all C.M. pipes with a diameter or span of 42" or greater.
2. Hook bolts and anchor straps shall be used for all C.M. pipes with a diameter or span of 84" or greater.
3. Riprap shall be placed at the ends of pipe structures when shown on the plans.

(4) For dimension, enter chart on Standard Drawing E 715-ANCH-01 with known dimension D.

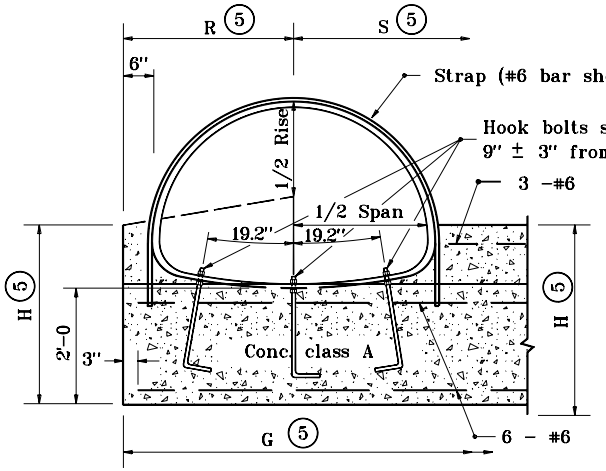
(5) For dimension, enter chart on Standard Drawing E 715-ANCH-02 with known span and rise.

LEGEND

C.M. = Corrugated Metal



ANCHOR FOR
REINFORCED CONCRETE HORIZONTAL ELLIPTICAL PIPE
PARTIAL ELEVATION



ANCHOR FOR CORRUGATED METAL PIPE-ARCH
PARTIAL ELEVATION

INDIANA DEPARTMENT OF TRANSPORTATION

MULTIPLE PIPE CONCRETE ANCHOR

JANUARY 1998

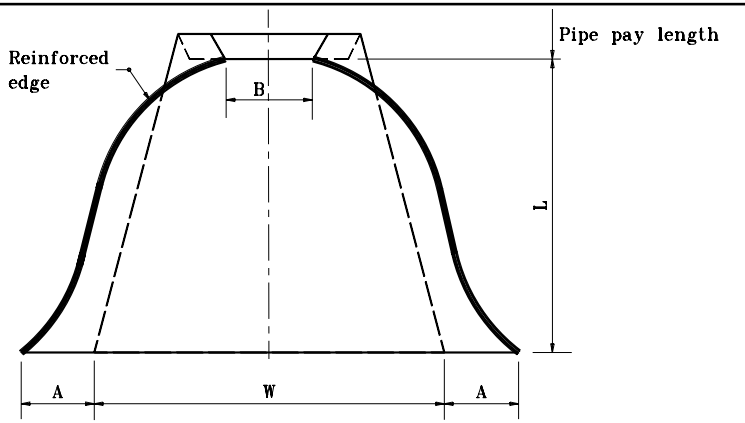
STANDARD DRAWING NO. **E 715-MPCA-02**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

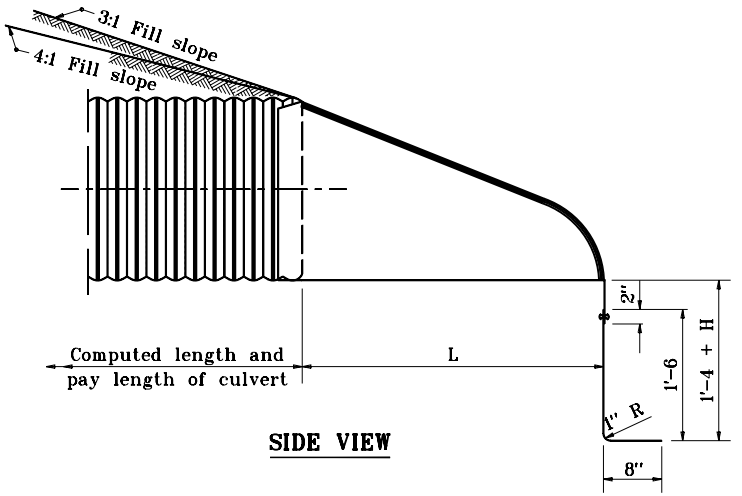
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	7-27-99
/s/ Anthony L. Uremovich, DESIGN STANDARDS ENGINEER	7-27-99 DATE
/s/ Firooz Zandi, CHIEF HIGHWAY ENGINEER	7-27-99 DATE
ORIGINALLY APPROVED	1-02-98

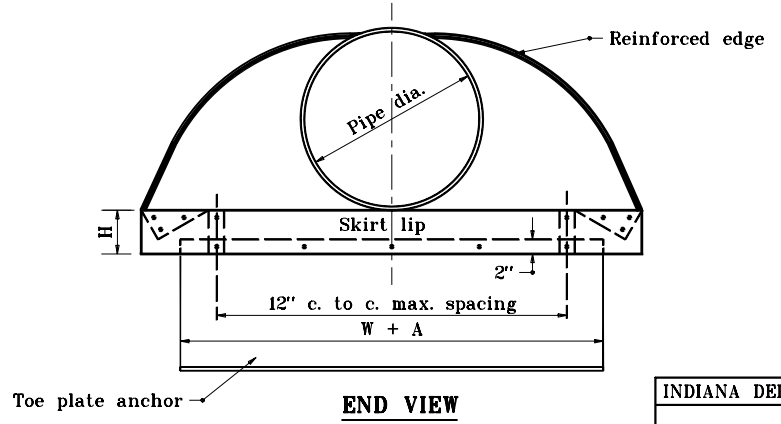
PIPE DIA.	END SECTION THICK. (in.)	DIMENSIONS					APPROX. SLOPE	BODY
		A (±1")	B (Max.)	H (±1")	L (±1½")	W (±2")		
12	.064	6	6	6	21	24	2½:1	1 Pc.
15	.064	7	8	6	26	30	2½:1	1 Pc.
18	.064	8	10	6	31	36	2½:1	1 Pc.
21	.064	9	12	6	36	42	2½:1	1 Pc.
24	.064	10	13	6	41	48	2½:1	1 Pc.
30	.079	12	16	8	51	60	2½:1	1 Pc.
36	.079	14	19	9	60	72	2½:1	2 Pc.



PLAN VIEW



SIDE VIEW



END VIEW

INDIANA DEPARTMENT OF TRANSPORTATION

METAL PIPE END SECTION

JANUARY 1998

STANDARD DRAWING NO. E 715-MPES-01

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

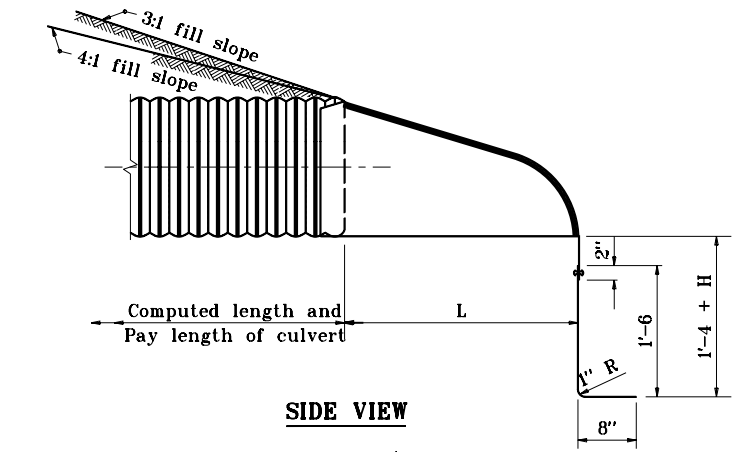
DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

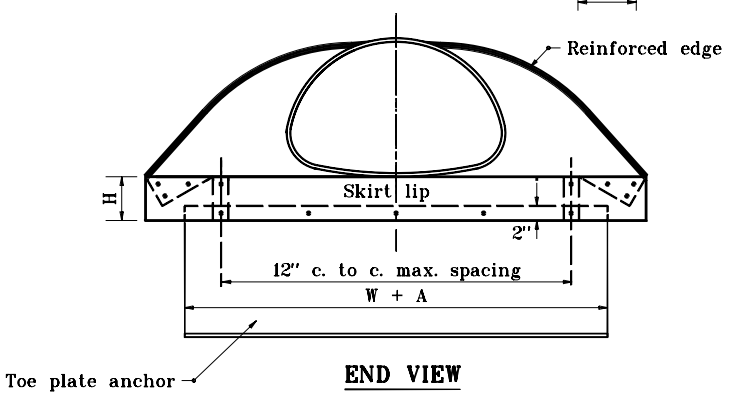
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

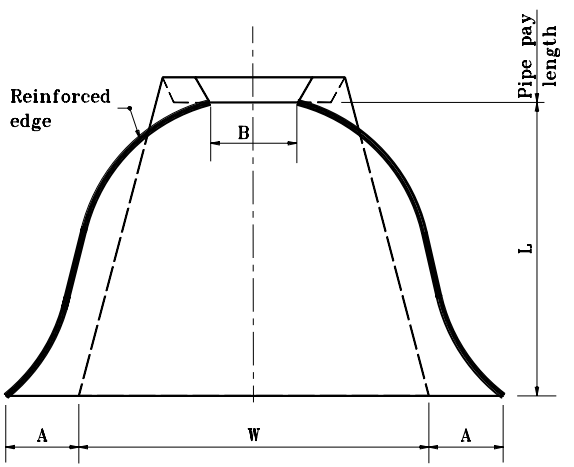
PIPE-ARCH DIMENSIONS		END SECTION THICK. (in.)	DIMENSIONS					APPROX. SLOPE	BODY
			A	B	H	L	W		
SPAN	RISE		(±1")	(Max.)	(± 1")	(±1½")	(±2")		
17	13	.064	7	9	6	19	30	2½:1	1 Pc.
21	15	.064	7	10	6	23	36	2½:1	1 Pc.
24	18	.064	8	12	6	28	42	2½:1	1 Pc.
28	20	.064	9	14	6	32	48	2½:1	1 Pc.
35	24	.079	10	16	8	39	60	2½:1	1 Pc.
42	29	.079	12	18	9	46	75	2½:1	1 Pc.



SIDE VIEW



END VIEW



PLAN VIEW

INDIANA DEPARTMENT OF TRANSPORTATION

METAL PIPE ARCH END SECTION

JANUARY 1998

STANDARD DRAWING NO. E 715-MPES-02

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

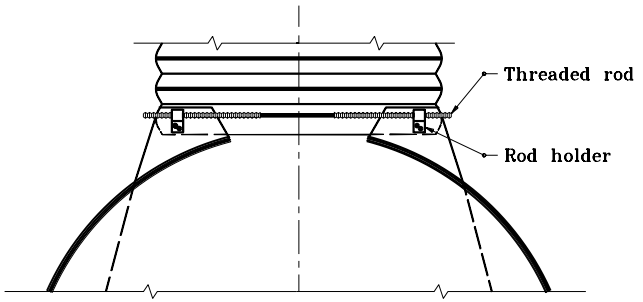
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

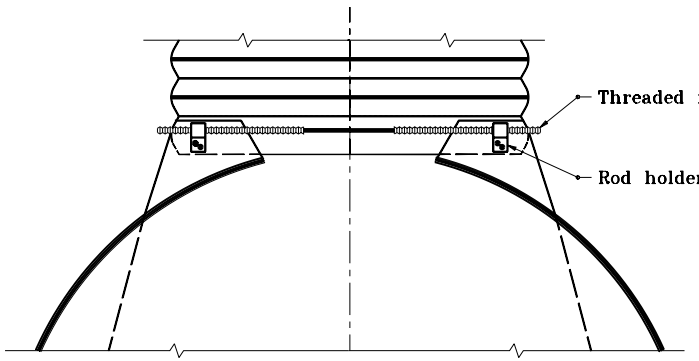
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

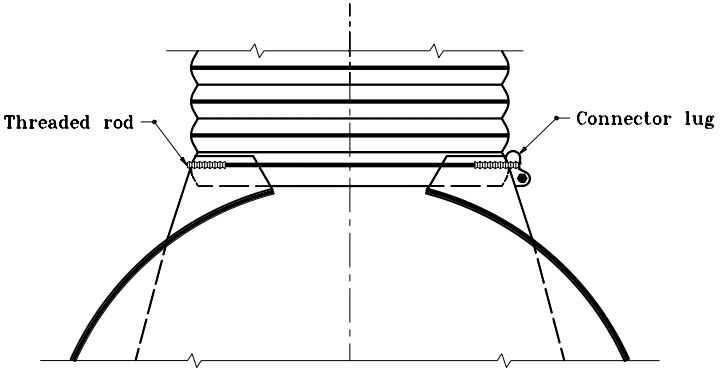
ORIGINALLY APPROVED 1-02-98



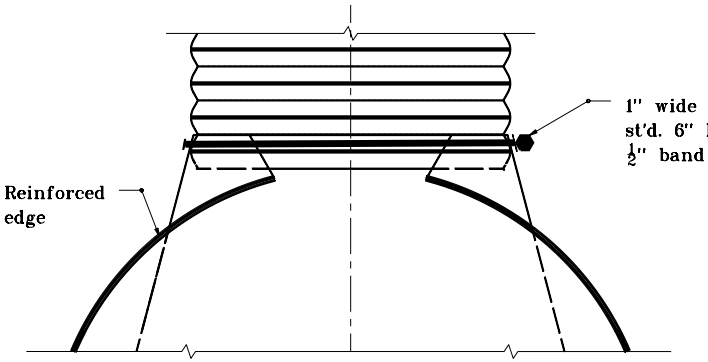
TYPE 1
FOR 17" x 13" THROUGH 42" x 29" ONLY



TYPE 4
FOR 30" THROUGH 36" ONLY



TYPE 3
FOR 12" THROUGH 24" ONLY



ALTERNATE TYPE 3
FOR 12" THROUGH 24" ONLY

INDIANA DEPARTMENT OF TRANSPORTATION

METAL PIPE
END SECTION CONNECTIONS

JANUARY 1998

STANDARD DRAWING NO. **E 715-MPES-03**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

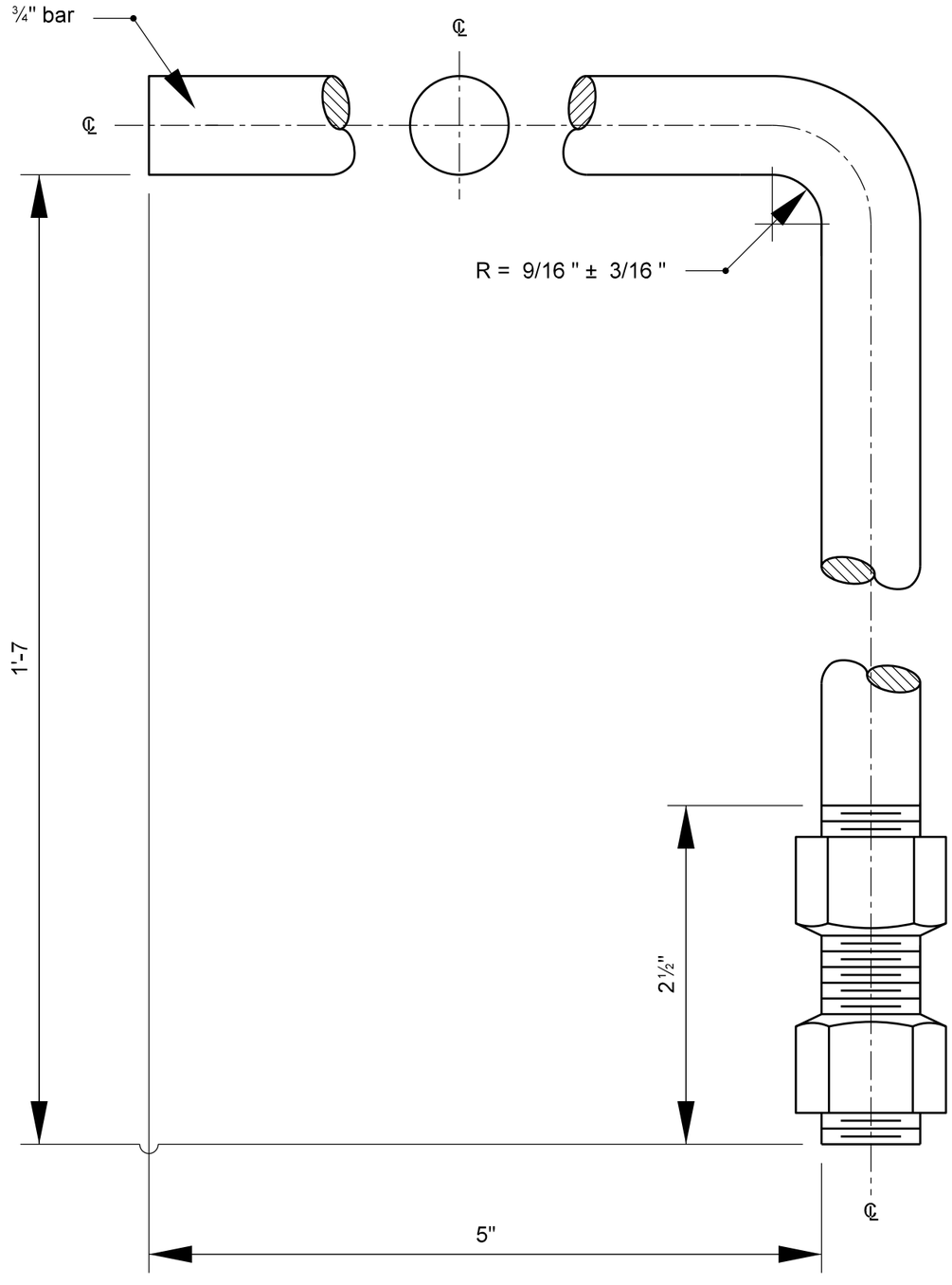
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

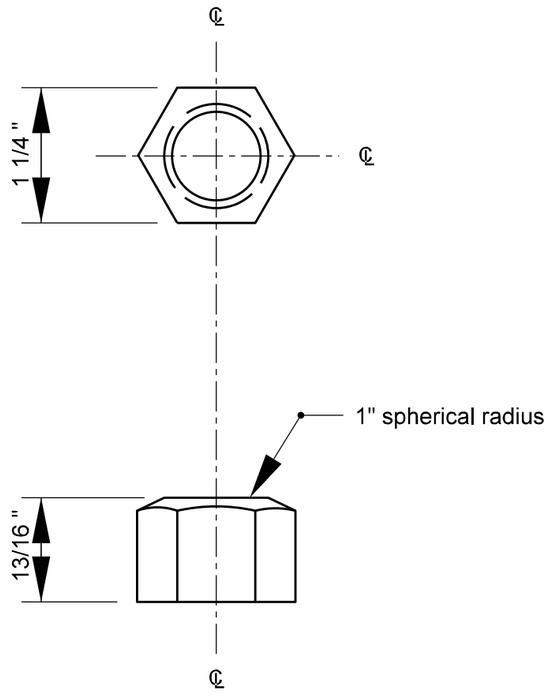
/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98



GALVANIZED
HOOK BOLT AND NUTS



GENERAL NOTES

1. Hook bolts and anchor straps shall be used at both upstream and downstream ends of all C.A., C.S., and structural plate pipes and pipe diameter or span of 84" or greater.
2. See Standard Drawing E 715-PASD-01 for anchor strap details.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE ANCHOR HOOK
BOLT DETAILS

STANDARD DRAWING NO. E 715-PAHB-01

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

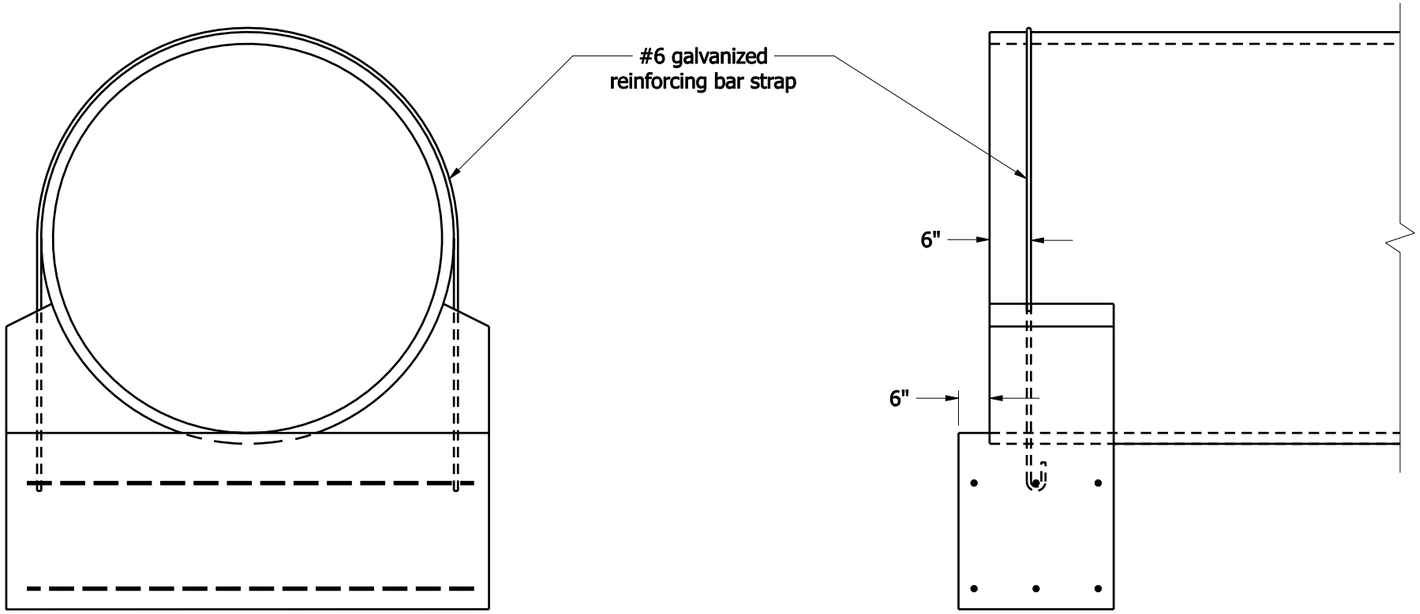
APRIL 1995

DETAILS PLACED IN THIS FORMAT ON 7-27-95

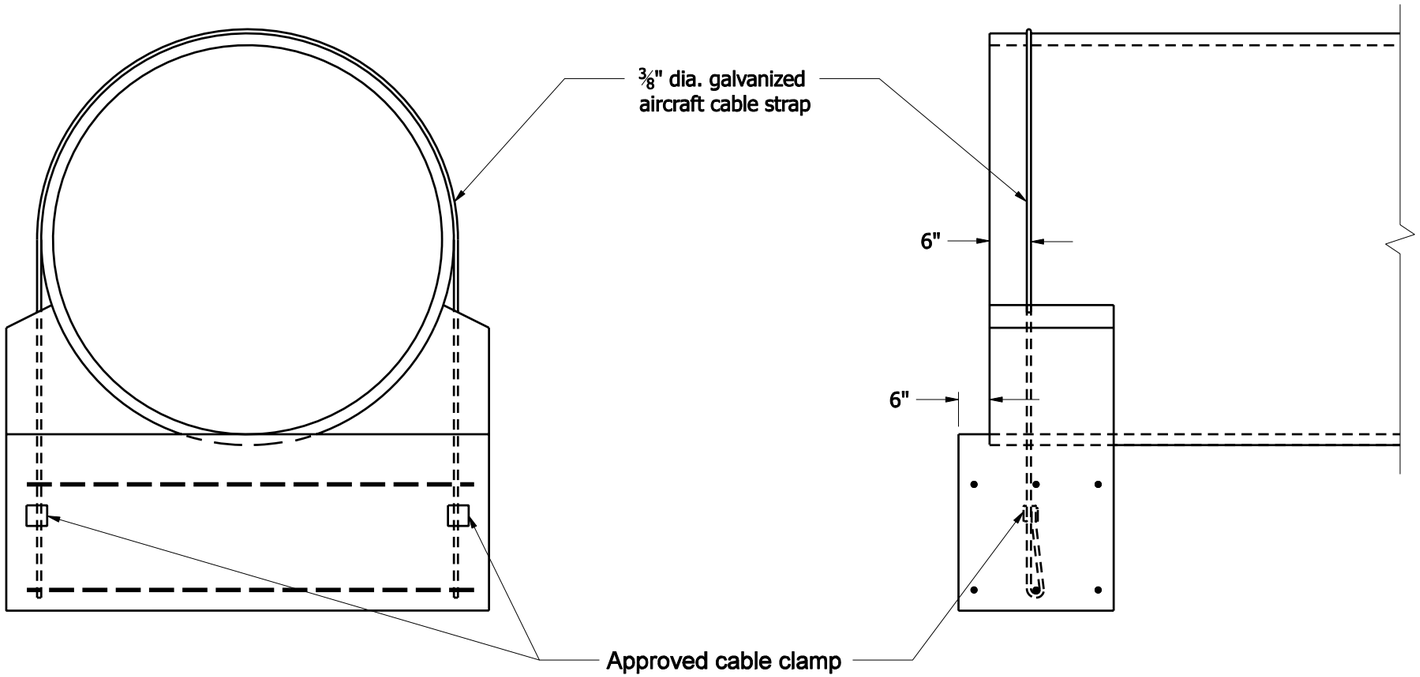
/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 4-01-95



#6 REINFORCING BAR STRAP DETAILS



3/8" AIRCRAFT CABLE STRAP DETAILS

GENERAL NOTES

1. See Standard Drawing E 715-PAHB-01 for hook bolt details.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE ANCHOR STRAP DETAILS

SEPTEMBER 2008

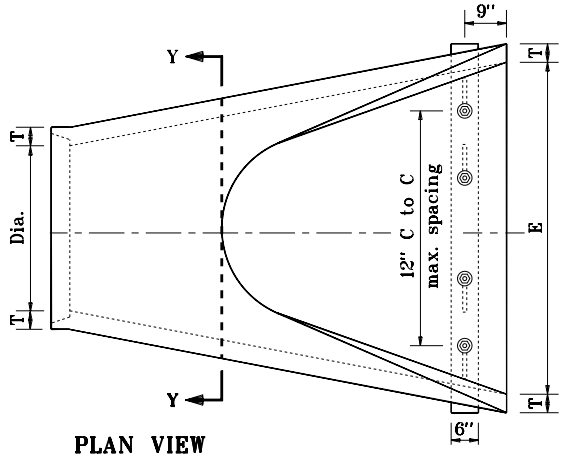
STANDARD DRAWING NO. E 715- PASD-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

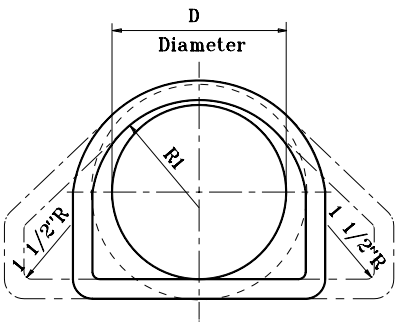
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

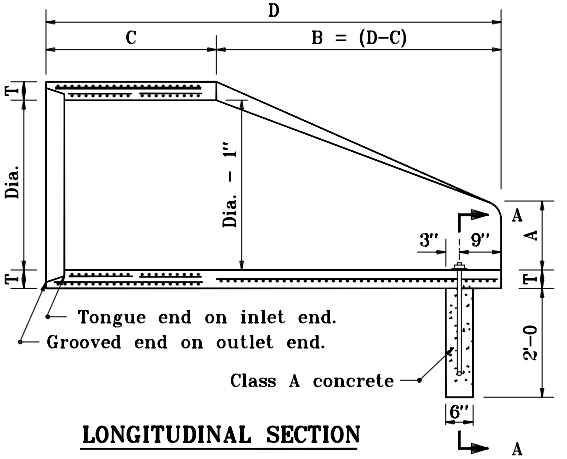
/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE



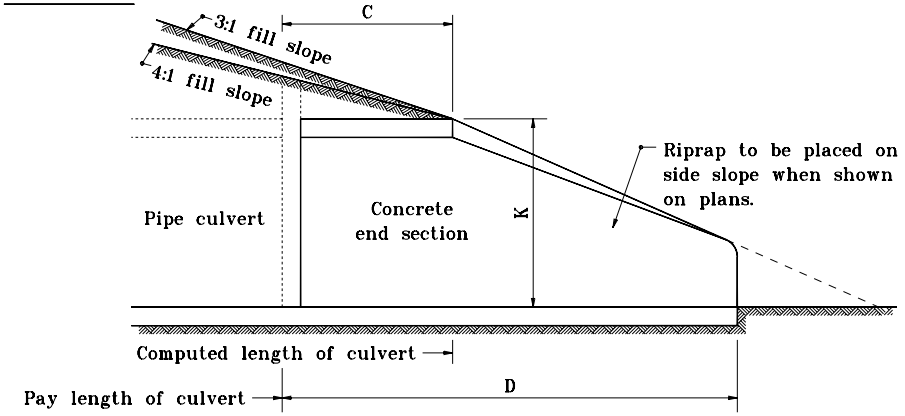
PLAN VIEW



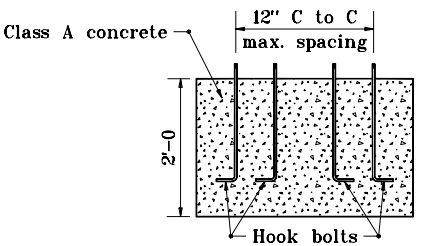
SECTION Y-Y



LONGITUDINAL SECTION



SLOPE DETAIL



SECTION A-A

Concrete Pipe Toe Anchor

TABLE OF DIMENSIONS

DIA.	T (min.)	A (±1")	C (±1")	D (±1")	E (±1")	K	R1	R2	APPROX. WEIGHT, lb.
12"	2"	5"	4'-3	6'-2	2'-0	1.3	10 1/8"	9"	800
15"	2 1/4"	7"	4'-0	6'-3	2'-6	1.5	12 1/2"	11"	1100
18"	2 1/2"	11"	4'-1	6'-2	3'-0	1.8	15 1/2"	12"	1300
21"	2 3/4"	11"	3'-6	6'-3	3'-6	2.1	16 1/8"	13"	1500
24"	3"	1'-0	2'-8	6'-3	4'-0	2.3	16 3/16"	14"	1800
27"	3 1/4"	1'-1	2'-5	6'-3	4'-6	2.6	18 3/16"	14 1/2"	2100
30"	3 1/2"	1'-2	1'-10	6'-3	5'-0	2.9	18 1/2"	15"	2400
33"	3 3/4"	1'-3	3'-6	8'-3	5'-6	3.1	23 3/4"	17 1/2"	4100
36"	4"	1'-5	3'-1	8'-3	6'-0	3.4	24 5/16"	20"	4200

INDIANA DEPARTMENT OF TRANSPORTATION

PRECAST CONCRETE END SECTION

MAY 1998

STANDARD DRAWING NO. E 715-PCES-01

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

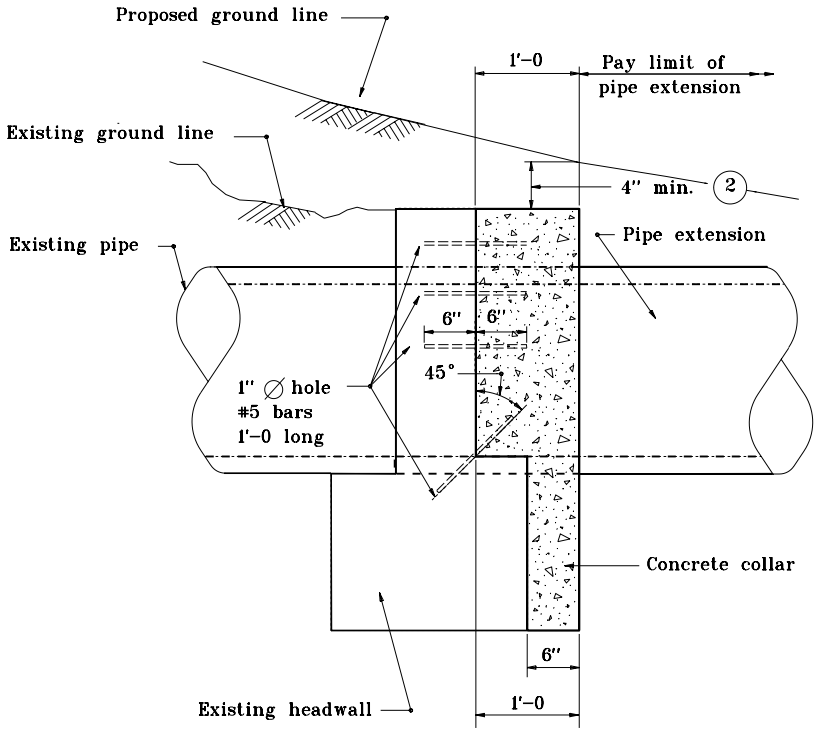
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

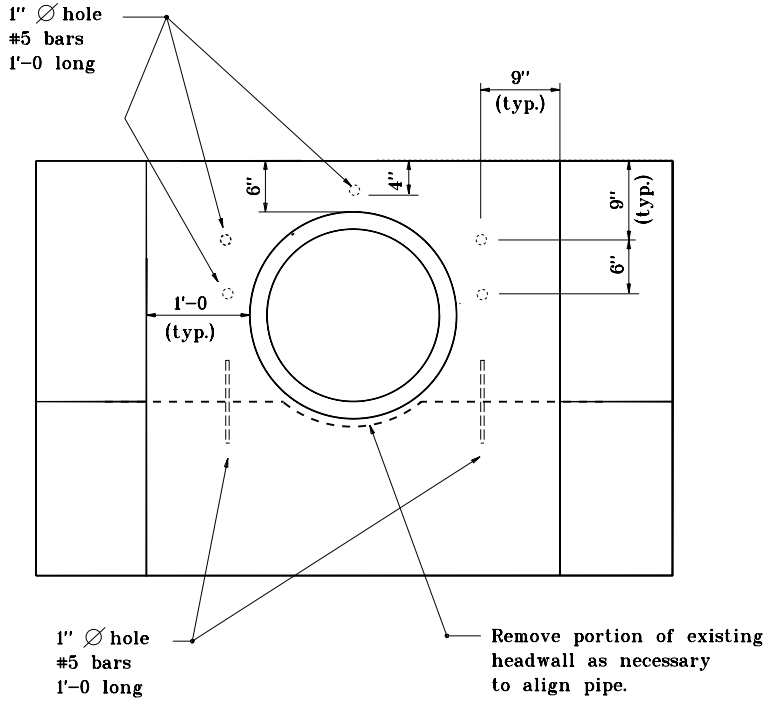
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 5-01-98



SIDE VIEW



END VIEW

NOTES:

1. For other types of pipe end structures and pipes larger then 33" ∅, collar details are shown on the plans.

(2) Remove portions of existing headwall if required to maintain 4" ground cover.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE COLLAR FOR PIPE EXTENSION

JANUARY 1998

STANDARD DRAWING NO. **E 715-PCEX-01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

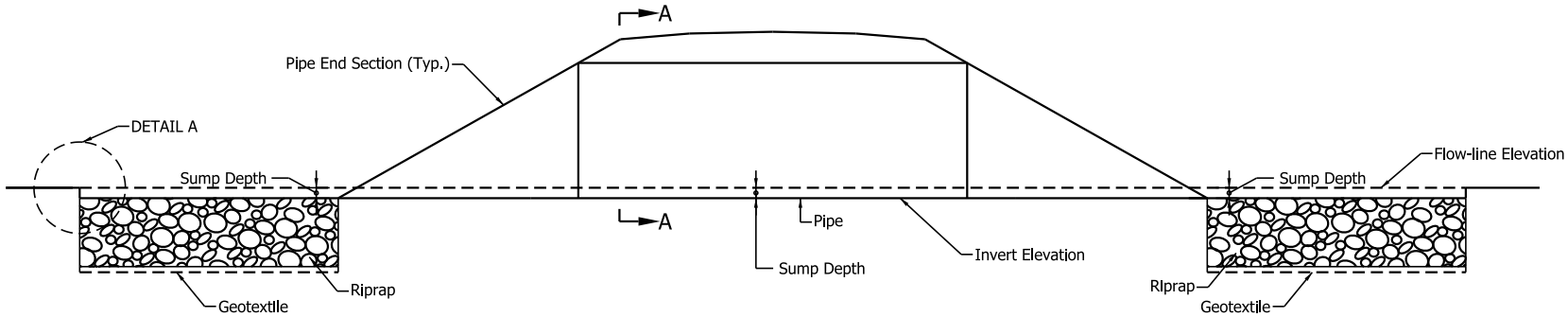
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

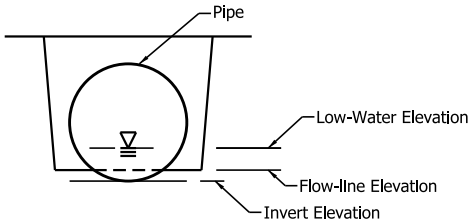
/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

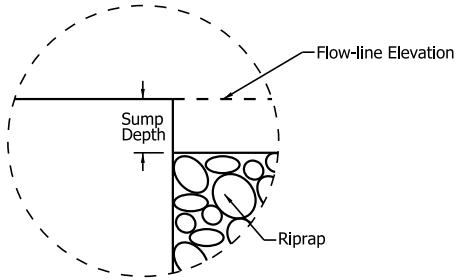
ORIGINALLY APPROVED 1-02-98



ELEVATION



SECTION A-A



DETAIL A

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SUMPING PROTECTION

SEPTEMBER 2011

STANDARD DRAWING NO. E 715-PCSP-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11

DESIGN STANDARDS ENGINEER DATE

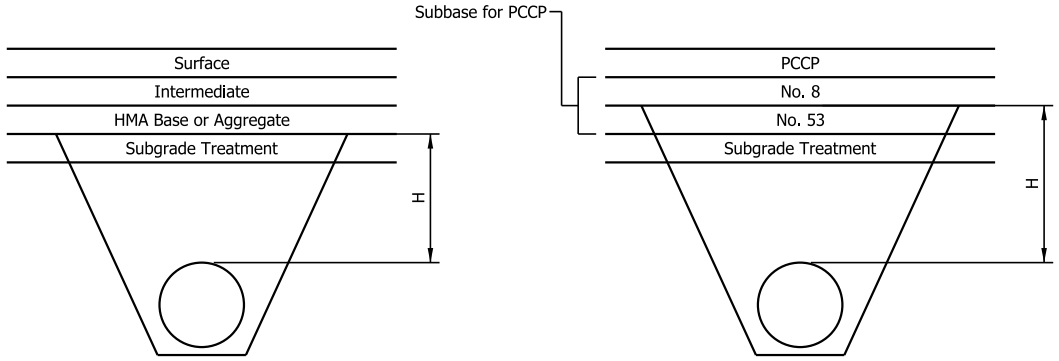
/s/ Mark A. Miller 09/01/11

CHIEF HIGHWAY ENGINEER DATE

INDEX	
SHEET NO.	SUBJECT
01	Pipe Height of Cover Drawing Index and General Notes
02-04	2 2/3" x 1/2" Corrugated Aluminum Alloy Pipe and Pipe Arch Height of Cover Limits
05-07	3" x 1" Corrugated Aluminum Alloy Pipe and Pipe Arch Height of Cover Limits
08-09	6" x 1" Corrugated Aluminum Alloy Pipe Height of Cover Limits
10-12	2 2/3" x 1/2" Corrugated Steel Pipe and Pipe Arch Height of Cover Limits
13-15	3" x 1" Corrugated Steel Pipe and Pipe Arch Height of Cover Limits
16-17	5" x 1" Corrugated Steel Pipe and Pipe Arch Height of Cover Limits
18	3/4" x 3/4" x 7 1/2" Spiral Rib Steel Pipe Height of Cover Limits
19	Non-Reinforced Concrete Pipe Class 3 Height of Cover Limits
20-21	Polyethylene Pipe Height of Cover Limits
22	Polyvinyl Chloride and Polypropylene Pipe Height of Cover Limits
23	Vitrified Clay Pipe Height of Cover Limits
24-25	Reinforced Concrete Pipe Height of Cover Limits

GENERAL NOTE:

1. The tabulated cover depth H shall be measured from the top of the pipe to the bottom of the drainage No. 8 layer for PCCP and from the top of the pipe to the top of the subgrade treatment for HMA pavement.



HMA PCCP

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS
DRAWING INDEX AND
GENERAL NOTES

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-01

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

2 2/3" x 1/2" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

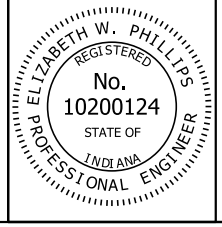
AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0.8	12	1.0	100.0	1.0	100.0	1.0	100.0				
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	88.5	1.0	100.0	1.0	100.0				
3.1	24	1.0	77.5	1.0	96.8	1.0	100.0	1.0	100.0		
4.0	27	1.0	68.8	1.0	86.0	1.0	100.0	1.0	100.0		
4.9	30	1.0	62.0	1.0	77.4	1.0	100.0	1.0	100.0		
5.9	33			1.0	64.5	1.0	90.4	1.0	100.0		
7.1	36			1.0	64.5	1.0	90.4	1.0	100.0		
9.6	42					1.0	77.4	1.0	99.7		
12.6	48					1.0	66.7	1.0	86.6	1.0	100.0
15.9	54					1.0	54.4	1.0	70.8	1.0	87.6
19.6	60							1.0	57.6	1.0	71.6
23.8	66									1.0	57.7
28.3	72									1.0	45.5

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-02



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

2 2/3" x 1/2" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

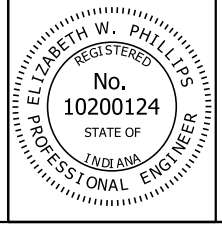
AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0.8	12	1.0	50.0	1.0	50.0	1.0	86.6				
1.2	15	1.0	40.0	1.0	40.0	1.0	69.3				
1.8	18	1.0	33.3	1.0	33.3	1.0	57.7				
2.4	21	1.0	28.5	1.0	28.5	1.0	49.5				
3.1	24	1.0	25.0	1.0	25.0	1.0	43.3	1.0	45.0		
4.0	27	1.0	22.2	1.0	22.2	1.0	38.5	1.0	40.0		
4.9	30	1.1	20.0	1.1	20.0	1.0	34.6	1.0	36.0		
5.9	33			1.2	16.6	1.0	28.8	1.0	30.0		
7.1	36			1.2	16.6	1.0	28.8	1.0	30.0		
9.6	42					1.0	50.0	1.0	52.3		
12.6	48					1.0	43.7	1.0	45.8	1.0	47.2
15.9	54					1.0	38.8	1.0	40.7	1.0	41.9
19.6	60							1.0	36.6	1.0	37.7
23.8	66									1.0	34.3
28.3	72									1.0	31.4

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-03



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

2 2/3" x 1/2" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3 (Min.) 3 1/2 (Typ.)	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
3 (Min.) 4 1/8 (Typ.)	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
3 (Min.) 4 7/8 (Typ.)	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
3 (Min.) 5 1/2 (Typ.)	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
3 (Min.) 6 7/8 (Typ.)	35	24	4.5			1.6	13.0	1.6	13.0	1.6	13.0		
3 1/2 (Min.) 8 1/4 (Typ.)	42	29	6.5			1.6	13.0	1.6	13.0	1.6	13.0		
4 (Min.) 9 5/8 (Typ.)	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0		
5 (Min.) 11 (Typ.)	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
6 (Min.) 12 3/8 (Typ.)	64	43	14.7							1.6	12.8	1.6	12.8
7 (Min.) 13 3/4 (Typ.)	71	47	18.1									1.6	12.9

NOTES:

1. Dual entries in the "Corner Radius" column such as 3 (Min.), 3 1/2 (Typ.), represent the following:
   3 (Min.) = Minimum corner radius allowed by AASHTO M 196
   3 1/2 (Typ.) = Corner radius typically available

2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-04

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
4.9	30	1.0	71.2	1.0	89.4	1.0	100.0	1.0	100.0		
5.9	33	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
7.1	36	1.0	59.3	1.0	74.5	1.0	100.0	1.0	100.0		
9.6	42	1.0	50.8	1.0	63.8	1.0	89.1	1.0	100.0		
12.6	48	1.0	44.5	1.0	55.9	1.0	78.0	1.0	100.0	1.0	100.0
15.9	54	1.0	39.5	1.0	49.6	1.0	69.3	1.0	92.8	1.0	90.7
19.6	60	1.0	35.6	1.0	44.7	1.0	62.4	1.0	83.5	1.0	81.6
23.8	66	1.0	32.3	1.0	40.6	1.0	56.7	1.0	75.9	1.0	74.2
28.3	72			1.0	37.2	1.0	52.0	1.0	69.6	1.0	68.0
33.2	78			1.0	34.4	1.0	48.0	1.0	64.2	1.0	62.8
38.5	84					1.0	44.5	1.0	59.6	1.0	58.3
44.2	90					1.0	41.6	1.0	55.6	1.0	54.4
50.3	96					1.0	38.1	1.0	51.3	1.0	51.0
56.7	102							1.1	46.3	1.1	48.0
63.6	108							1.1	41.8	1.1	45.3
70.9	114									1.2	42.9
78.5	120									1.3	40.1

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-05

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

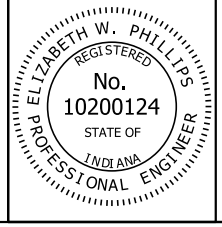
AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
4.9	30	1.0	36.6	1.0	45.5	1.0	62.2	1.0	93.3		
5.9	33	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
7.1	36	1.0	30.5	1.0	37.9	1.0	51.8	1.0	77.7		
9.6	42	1.0	26.1	1.0	32.5	1.0	44.4	1.0	66.6		
12.6	48	1.0	22.9	1.0	28.4	1.0	38.8	1.0	58.3	1.0	75.6
15.9	54	1.1	20.3	1.0	25.3	1.0	34.5	1.0	51.8	1.0	67.2
19.6	60	1.1	18.3	1.0	22.7	1.0	31.1	1.0	46.6	1.0	60.5
23.8	66	1.2	16.6	1.1	20.7	1.0	28.2	1.0	42.4	1.0	55.0
28.3	72			1.1	18.9	1.0	25.9	1.0	38.8	1.0	50.4
33.2	78			1.2	17.5	1.0	23.9	1.0	35.8	1.0	46.5
38.5	84					1.0	22.2	1.0	33.3	1.0	43.2
44.2	90					1.1	20.7	1.0	31.1	1.0	40.3
50.3	96					1.1	19.4	1.0	29.1	1.0	37.8
56.7	102							1.1	27.4	1.1	35.6
63.6	108							1.1	25.9	1.1	33.6
70.9	114									1.2	31.8
78.5	120									1.3	30.2

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-06



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

3" x 1" CORRUGATED ALUMINUM ALLOY PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.060		0.075		0.105		0.135		0.164	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8 (Min.) 18 3/4 (Typ.)	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9 (Min.) 20 3/4 (Typ.)	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12 (Min.) 22 7/8 (Typ.)	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14 (Min.) 20 7/8 (Typ.)	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14 (Min.) 22 5/8 (Typ.)	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16 (Min.) 24 3/8 (Typ.)	95	67	37.0							1.2	17.1	1.2	17.1
16 (Min.) 26 1/8 (Typ.)	103	71	42.4							1.2	16.9	1.2	16.9
18 (Min.) 27 3/4 (Typ.)	112	75	48.0									1.3	16.5

NOTES:

1. Dual entries in the "Corner Radius" column such as 8 (Min.), 18 3/4 (Typ.), represent the following:
   8 (Min.) = Minimum corner radius allowed by AASHTO M 196
   18 3/4 (Typ.) = Corner radius typically available

2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-07

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

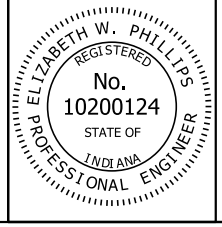
AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12.6	48	1.0	38.7	1.0	48.4	1.0	67.8	1.0	87.2	1.0	100.0
15.9	54	1.0	34.4	1.0	43.0	1.0	60.2	1.0	77.5	1.0	94.8
19.6	60	1.0	31.0	1.0	38.7	1.0	54.2	1.0	69.7	1.0	85.3
23.8	66	1.0	28.1	1.0	35.2	1.0	49.3	1.0	63.4	1.0	77.5
28.3	72			1.0	32.2	1.0	45.2	1.0	58.1	1.0	71.1
33.2	78			1.0	29.7	1.0	41.7	1.0	53.6	1.0	65.6
38.5	84					1.0	38.7	1.0	49.8	1.0	60.9
44.2	90					1.0	36.1	1.0	46.5	1.0	56.8
50.3	96							1.0	43.6	1.0	53.3
56.7	102							1.1	40.0	1.1	49.0
63.6	108									1.1	44.5
70.9	114									1.2	40.3

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-08



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

6" x 1" CORRUGATED ALUMINUM ALLOY PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.060		0.075		0.105		0.135		0.164	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12.6	48	1.0	22.2	1.0	26.3	1.0	38.7	1.0	49.8	1.0	60.4
15.9	54	1.1	19.7	1.0	23.4	1.0	34.4	1.0	44.3	1.0	53.7
19.6	60	1.2	17.7	1.1	21.1	1.0	31.0	1.0	39.8	1.0	48.3
23.8	66	1.3	16.1	1.1	19.1	1.0	28.1	1.0	36.2	1.0	43.9
28.3	72			1.2	17.5	1.0	25.8	1.0	33.2	1.0	40.2
33.2	78			1.3	16.2	1.0	23.8	1.0	30.6	1.0	37.1
38.5	84					1.0	22.1	1.0	28.4	1.0	34.5
44.2	90					1.1	20.6	1.0	26.5	1.0	32.2
50.3	96							1.0	24.9	1.0	30.2
56.7	102							1.1	23.4	1.1	28.4
63.6	108									1.1	26.8
70.9	114									1.2	25.4

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-09

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

2 2/3" x 1/2" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

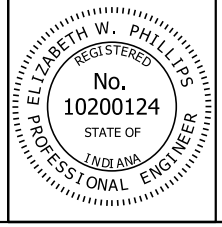
AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.064		0.079		0.109		0.138		0.168	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0.8	12	1.0	100.0	1.0	100.0						
1.2	15	1.0	100.0	1.0	100.0	1.0	100.0				
1.8	18	1.0	100.0	1.0	100.0	1.0	100.0				
2.4	21	1.0	100.0	1.0	100.0	1.0	100.0				
3.1	24	1.0	100.0	1.0	100.0	1.0	100.0				
4.0	27	1.0	94.7	1.0	100.0	1.0	100.0				
4.9	30	1.0	85.2	1.0	100.0	1.0	100.0	1.0	100.0		
5.9	33	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0		
7.1	36	1.0	71.0	1.0	88.7	1.0	100.0	1.0	100.0	1.0	100.0
9.6	42	1.0	60.8	1.0	76.0	1.0	100.0	1.0	100.0	1.0	100.0
12.6	48	1.0	53.2	1.0	66.5	1.0	93.2	1.0	100.0	1.0	100.0
15.9	54			1.0	59.1	1.0	82.8	1.0	100.0	1.0	100.0
19.6	60					1.0	87.8	1.0	95.9	1.0	100.0
23.8	66							1.0	87.2	1.0	100.0
28.3	72							1.0	79.9	1.0	97.0
33.2	78									1.0	86.7
38.5	84									1.0	75.1

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-10



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

2 2/3" x 1/2" CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

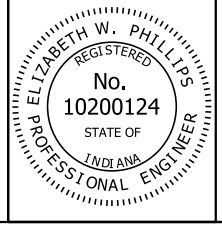
AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.064		0.079		0.109		0.138		0.168	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
0.8	12	1.0	92.7	1.0	100.0						
1.2	15	1.0	74.2	1.0	80.8	1.0	100.0				
1.8	18	1.0	61.8	1.0	67.4	1.0	86.6				
2.4	21	1.0	53.0	1.0	57.7	1.0	74.2				
3.1	24	1.0	46.3	1.0	50.5	1.0	65.0				
4.0	27	1.0	41.2	1.0	44.9	1.0	57.7				
4.9	30	1.0	37.1	1.0	40.4	1.0	52.0	1.0	54.4		
5.9	33	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3		
7.1	36	1.0	30.9	1.0	33.7	1.0	43.3	1.0	45.3	1.0	47.4
9.6	42	1.0	34.2	1.0	47.3	1.0	74.2	1.0	77.7	1.0	81.4
12.6	48	1.0	30.0	1.0	41.3	1.0	65.0	1.0	68.0	1.0	71.2
15.9	54			1.0	36.7	1.0	57.7	1.0	60.4	1.0	63.3
19.6	60					1.0	52.0	1.0	54.4	1.0	57.0
23.8	66							1.0	49.4	1.0	51.8
28.3	72							1.0	45.3	1.0	47.5
33.2	78									1.0	43.8
38.5	84									1.0	40.7

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-11



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

2 2/3" x 1/2" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.138		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
3 (Min.) 3 1/2 (Typ.)	17	13	1.1	1.5	13.7	1.5	13.7	1.5	13.7				
3 (Min.) 4 1/8 (Typ.)	21	15	1.6	1.6	13.0	1.6	13.0	1.6	13.0				
3 (Min.) 4 7/8 (Typ.)	24	18	2.2	1.5	13.5	1.5	13.5	1.5	13.5				
3 (Min.) 5 1/2 (Typ.)	28	20	2.9	1.6	13.0	1.6	13.0	1.6	13.0				
3 (Min.) 6 7/8 (Typ.)	35	24	4.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0		
3 1/2 (Min.) 8 1/4 (Typ.)	42	29	6.5	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
4 (Min.) 9 5/8 (Typ.)	49	33	8.9			1.6	13.0	1.6	13.0	1.6	13.0	1.6	13.0
5 (Min.) 11 (Typ.)	57	38	11.6					1.6	12.8	1.6	12.8	1.6	12.8
6 (Min.) 12 3/8 (Typ.)	64	43	14.7					1.6	12.8	1.6	12.8	1.6	12.8
7 (Min.) 13 3/4 (Typ.)	71	47	18.1							1.6	12.9	1.6	12.9
8 (Min.) 15 1/8 (Typ.)	77	52	21.9									1.6	13.0
9 (Min.) 16 1/2 (Typ.)	83	57	26.0									1.5	13.2

NOTES:

1. Dual entries in the "Corner Radius" column such as 3 (Min.), 3 1/2 (Typ.), represent the following:
   3 (Min.) = Minimum corner radius allowed by AASHTO M 196
   3 1/2 (Typ.) = Corner radius typically available

2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-12

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

3" x 1" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.064		0.079		0.109		0.138		0.168	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
7.1	36	1.0	81.5								
9.6	42	1.0	69.9	1.0	87.4	1.0	100.0	1.0	100.0		
12.6	48	1.0	61.1	1.0	76.5	1.0	100.0	1.0	100.0		
15.9	54	1.0	54.3	1.0	68.0	1.0	95.3	1.0	100.0	1.0	100.0
19.6	60	1.0	48.9	1.0	61.2	1.0	85.8	1.0	100.0	1.0	100.0
23.8	66	1.0	44.5	1.0	55.6	1.0	78.0	1.0	100.0	1.0	100.0
28.3	72	1.0	40.7	1.0	51.0	1.0	71.5	1.0	92.0	1.0	100.0
33.2	78	1.0	37.6	1.0	47.0	1.0	66.0	1.0	84.9	1.0	100.0
38.5	84	1.0	34.9	1.0	43.7	1.0	61.2	1.0	78.8	1.0	96.5
44.2	90	1.0	32.6	1.0	40.8	1.0	57.2	1.0	73.6	1.0	90.1
50.3	96			1.0	38.2	1.0	53.6	1.0	69.0	1.0	84.4
56.7	102			1.1	36.0	1.1	50.4	1.1	64.9	1.1	79.5
63.6	108					1.1	47.6	1.1	61.3	1.1	75.1
70.9	114					1.2	45.1	1.2	58.1	1.2	71.1
78.5	120					1.3	42.9	1.3	55.2	1.3	67.5
86.6	126							1.3	52.5	1.3	64.3
95.0	132							1.4	50.2	1.4	61.4
103.9	138							1.4	48.0	1.4	58.7
113.1	144									1.5	56.3

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-13

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

3" x 1" CORRUGATED STEEL PIPE (RIVETED)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.064		0.079		0.109		0.138		0.168	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
7.1	36	1.0	53.1								
9.6	42	1.0	45.5	1.0	56.6	1.0	84.1	1.0	100.0		
12.6	48	1.0	39.8	1.0	49.5	1.0	73.6	1.0	88.4		
15.9	54	1.0	35.4	1.0	44.0	1.0	65.4	1.0	78.6	1.0	87.2
19.6	60	1.0	31.8	1.0	39.6	1.0	58.8	1.0	70.7	1.0	78.5
23.8	66	1.0	28.9	1.0	36.0	1.0	53.5	1.0	64.3	1.0	71.4
28.3	72	1.0	26.5	1.0	33.0	1.0	49.0	1.0	58.9	1.0	65.4
33.2	78	1.0	24.5	1.0	30.5	1.0	45.2	1.0	54.4	1.0	60.4
38.5	84	1.0	22.7	1.0	28.3	1.0	42.0	1.0	50.5	1.0	56.1
44.2	90	1.1	21.2	1.0	26.4	1.0	39.2	1.0	47.1	1.0	52.3
50.3	96			1.0	24.7	1.0	36.8	1.0	44.2	1.0	49.0
56.7	102			1.1	23.3	1.1	34.6	1.1	41.6	1.1	46.2
63.6	108					1.1	32.7	1.1	39.3	1.1	43.6
70.9	114					1.2	30.9	1.2	37.2	1.2	41.3
78.5	120					1.3	29.4	1.3	35.3	1.3	39.2
86.6	126							1.3	33.7	1.3	37.4
95.0	132							1.4	32.1	1.4	35.7
103.9	138							1.4	30.7	1.4	34.1
113.1	144									1.5	32.7

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-14

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

3" x 1" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.138		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8 (Min.) 18 3/4 (Typ.)	60	46	15.6			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
9 (Min.) 20 3/4 (Typ.)	66	51	19.3			1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
12 (Min.) 22 7/8 (Typ.)	73	55	23.2			1.1	20.8	1.1	20.8	1.1	20.8	1.1	20.8
14 (Min.) 20 7/8 (Typ.)	81	59	27.4			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
14 (Min.) 22 5/8 (Typ.)	87	63	32.1			1.2	17.3	1.2	17.3	1.2	17.3	1.2	17.3
16 (Min.) 24 3/8 (Typ.)	95	67	37.0			1.2	17.1	1.2	17.1	1.2	17.1	1.2	17.1
16 (Min.) 26 1/8 (Typ.)	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9
18 (Min.) 27 3/4 (Typ.)	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5
18 (Min.) 29 1/2 (Typ.)	117	79	59.2					1.2	16.8	1.2	16.8	1.2	16.8
18 (Min.) 31 1/4 (Typ.)	128	83	60.5							1.3	16.2	1.3	16.2
18 (Min.) 33 (Typ.)	137	87	67.4							1.3	16.0	1.3	16.0
18 (Min.) 34 3/4 (Typ.)	142	91	74.5									1.3	16.3

NOTES:

1. Dual entries in the "Corner Radius" column such as 8 (Min.), 18 3/4 (Typ.), represent the following:
   8 (Min.) = Minimum corner radius allowed by AASHTO M 196
   18 3/4 (Typ.) = Corner radius typically available

2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-15

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

5" x 1" CORRUGATED STEEL PIPE (LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)									
		0.064		0.079		0.109		0.138		0.168	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
7.1	36			1.0	90.9	1.0	100.0				
9.6	42			1.0	77.9	1.0	100.0				
12.6	48	1.0	54.5	1.0	68.2	1.0	95.5	1.0	100.0		
15.9	54	1.0	48.5	1.0	60.6	1.0	84.9	1.0	100.0		
19.6	60	1.0	43.6	1.0	54.5	1.0	76.4	1.0	98.3		
23.8	66	1.0	39.7	1.0	49.6	1.0	69.5	1.0	89.4		
28.3	72	1.0	36.3	1.0	45.4	1.0	63.7	1.0	81.9	1.0	100.0
33.2	78	1.0	33.5	1.0	41.9	1.0	58.8	1.0	75.6	1.0	92.4
38.5	84	1.0	31.1	1.0	38.9	1.0	54.6	1.0	70.2	1.0	85.8
44.2	90	1.0	29.1	1.0	36.3	1.0	50.9	1.0	65.5	1.0	80.1
50.3	96			1.0	34.1	1.0	47.7	1.0	61.4	1.0	75.1
56.7	102			1.1	32.0	1.1	44.9	1.1	57.8	1.1	70.7
63.6	108					1.1	42.4	1.1	54.6	1.1	66.7
70.9	114					1.2	40.2	1.2	51.7	1.2	63.2
78.5	120					1.3	38.2	1.3	49.1	1.3	60.1
86.6	126							1.3	46.8	1.3	57.2
95.0	132							1.4	44.7	1.4	54.6
103.9	138							1.4	42.7	1.4	52.2
113.1	144									1.5	50.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-16

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

5" x 1" CORRUGATED STEEL PIPE-ARCH (RIVETED OR LOCK SEAM)
HEIGHT OF COVER LIMITS (ft)

CORNER RADIUS (in.)	SPAN (in.)	RISE (in.)	AREA (sft)	THICKNESS (in.)									
				0.064		0.079		0.109		0.138		0.168	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8 (Min.) 18 3/4 (Typ.)	60	46	15.6					1.1	20.8	1.1	20.8		
9 (Min.) 20 3/4 (Typ.)	66	51	19.3					1.1	20.9	1.1	20.9		
12 (Min.) 22 7/8 (Typ.)	73	55	23.2					1.1	20.8	1.1	20.8		
14 (Min.) 20 7/8 (Typ.)	81	59	27.4					1.2	17.1	1.2	17.1	1.2	17.1
14 (Min.) 22 5/8 (Typ.)	87	63	32.1					1.2	17.3	1.2	17.3	1.2	17.3
16 (Min.) 24 3/8 (Typ.)	95	67	37.0					1.2	17.1	1.2	17.1	1.2	17.1
16 (Min.) 26 1/8 (Typ.)	103	71	42.4					1.2	16.9	1.2	16.9	1.2	16.9
18 (Min.) 27 3/4 (Typ.)	112	75	48.0					1.3	16.5	1.3	16.5	1.3	16.5
18 (Min.) 29 1/2 (Typ.)	117	79	54.2					1.2	16.8	1.2	16.8	1.2	16.8
18 (Min.) 31 1/4 (Typ.)	128	83	60.5							1.3	16.2	1.3	16.2
18 (Min.) 33 (Typ.)	137	87	67.4							1.3	16.0	1.3	16.0
18 (Min.) 34 3/4 (Typ.)	142	91	74.5									1.3	16.3

NOTES:

1. Dual entries in the "Corner Radius" column such as 8 (Min.), 18 3/4 (Typ.), represent the following:
   8 = Minimum corner radius allowed by AASHTO M 196
   18 3/4 = Corner radius typically available
2. The tabulated cover heights reflect pipe-arches with typically available corner radii. If a pipe-arch with corner radii other than what is typically available is to be used, a specific design shall be performed to verify structural adequacy.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-17

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

3/4" x 3/4" x 7 1/2" SPIRAL RIB STEEL PIPE
HEIGHT OF COVER LIMITS (ft)

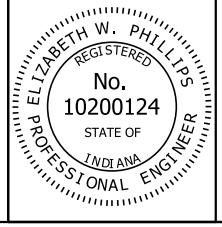
DIAMETER (in.)	THICKNESS (in.)					
	0.064		0.079		0.109	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	1.3	100.0	1.3	100.0	1.3	100.0
15	1.3	100.0	1.3	100.0	1.3	100.0
18	1.3	68.0	1.3	72.0	1.3	100.0
21	1.3	58.0	1.3	62.0	1.3	100.0
24	1.3	51.0	1.3	60.0	1.3	100.0
30	1.3	41.0	1.3	58.0	1.3	97.0
36	1.3	34.0	1.3	48.0	1.3	81.0
42	1.3	29.0	1.3	41.0	1.3	69.0
48	1.3	26.0	1.3	36.0	1.3	61.0
54	1.3	23.0	1.3	32.0	1.3	54.0
60			1.3	29.0	1.3	49.0
66			1.3	26.0	1.3	44.0
72			1.3	24.0	1.3	40.0
78					1.3	37.0
84					1.3	35.0
90					2.3	32.0
96					2.3	30.0
102					2.8	29.0
108					2.8	27.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-18



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

NON-REINFORCED CONCRETE PIPE CLASS 3 HEIGHT OF COVER LIMITS (ft)		
DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	1.3	14.1
15	1.4	13.1
18	1.5	12.8
21	1.5	13.4
24	1.5	13.5
27	1.6	12.1
30	1.8	10.7
33	1.9	9.8
36	2.1	9.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-19

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

CORRUGATED POLYETHYLENE PIPE TYPE S HEIGHT OF COVER LIMITS (ft)			
PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	12	2.0	22.0
15	15	2.0	22.0
18	18	2.0	20.0
21	21	2.0	19.0
24	24	2.0	19.0
30	30	2.0	17.0
36	36	2.0	17.0
42	42	2.0	17.0
48	48	2.0	15.0

SMOOTH WALL POLYETHYLENE PIPE HEIGHT OF COVER LIMITS (ft)									
PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	DIMENSION RATIO (NOMINAL DIAMETER / WALL THICKNESS)							
		26		21		17		11	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	13	2.0	40.0	2.0	57.0				
12	14					2.0	81.0		
15	18	2.0	40.0	2.0	57.0	2.0	81.0		
18	20	2.0	40.0	2.0	57.0	2.0	81.0		
18	22					2.0	81.0	2.0	100.0
21	24	2.0	40.0	2.0	57.0	2.0	81.0		
24	28	2.0	40.0	2.0	57.0	2.0	81.0		
27	32	2.0	40.0	2.0	57.0	2.0	81.0		
30	34	2.0	40.0	2.0	57.0	2.0	81.0		
36	42	2.0	40.0	2.0	57.0	2.0	81.0		

NOTES:

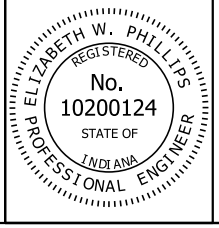
1. The pay item diameter reflects the minimum required inside diameter.
2. Because the nominal size of smooth wall polyethylene pipe is based on the outside diameter, different dimension ratios may require different nominal diameters to satisfy the pay item diameter requirements.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-20



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

NOTES:

1. The pay item diameter reflects the minimum required inside diameter.

PROFILE WALL (RIBBED) POLYETHYLENE PIPE HEIGHT OF COVER LIMITS (ft)			
PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
18	18	2.0	18.0
21	21	2.0	22.0
24	24	2.0	21.0
27	27	2.0	24.0
30	30	2.0	22.0
33	33	2.0	23.0
36	36	2.0	25.0

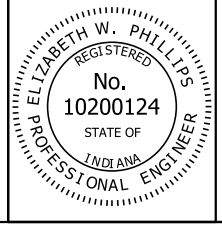
PROFILE WALL (CLOSED) POLYETHYLENE PIPE HEIGHT OF COVER LIMITS (ft)			
PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
18	18	2.0	47.0
21	21	2.0	38.0
24	24	2.0	42.0
27	27	2.0	40.0
30	23	2.2	38.0
33	33	2.4	45.0
36	36	2.6	30.0
42	42	3.0	29.0
48	48	3.5	30.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-21



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

PROFILE WALL POLYVINYL CHLORIDE PIPE HEIGHT OF COVER LIMITS (ft)		
DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	2.0	20.0
15	2.0	20.0
18	2.0	20.0
21	2.0	20.0
24	2.0	20.0
30	2.0	18.0
36	2.0	18.0
42	2.0	17.0
48	2.0	15.0

CORRUGATED POLYPROPYLENE PIPE HEIGHT OF COVER LIMITS (ft)		
DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	2.0	28.0
15	2.0	28.0
18	2.0	25.0
21	2.0	23.0
24	2.0	23.0
30	2.2	19.0
36	2.6	23.0
42	3.1	22.0
48	3.5	21.0

SMOOTH WALL POLYVINYL CHLORIDE PIPE HEIGHT OF COVER LIMITS (ft)			
PAY ITEM DIAMETER (in.)	NOMINAL DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	12	2.0	64.0
15	15	2.0	64.0
18	18	2.0	61.0
21	21	2.0	61.0
24	24	2.0	61.0
27	27	2.0	61.0

NOTE:

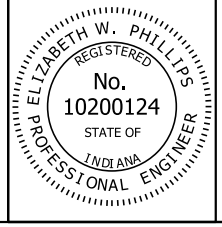
1. The pay item diameter reflects the minimum required inside diameter.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-22



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

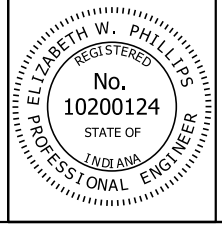
VITRIFIED CLAY PIPE, EXTRA STRENGTH HEIGHT OF COVER LIMITS (ft)		
DIAMETER (in.)	MINIMUM (ft)	MAXIMUM (ft)
12	1.2	16.0
15	1.4	14.0
18	1.4	13.0
21	1.4	14.0
24	1.4	15.0
27	1.5	14.0
30	1.6	13.0
33	1.5	13.0
36	1.5	14.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-23



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

REINFORCED CONCRETE CIRCULAR PIPE
HEIGHT OF COVER LIMITS (ft)

DIAMETER (in.)	STRENGTH CLASS / D-LOAD RATING							
	CLASS II: $D_{0.01}$ = 1000		CLASS III: $D_{0.01}$ = 1350		CLASS IV: $D_{0.01}$ = 2000		CLASS V: $D_{0.01}$ = 3000	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
12	1.0	12.0	1.0	17.0	1.0	25.0	1.0	38.0
15	1.0	13.0	1.0	17.0	1.0	26.0	1.0	39.0
18	1.0	13.0	1.0	17.0	1.0	26.0	1.0	40.0
21	1.0	13.0	1.0	17.0	1.0	26.0	1.0	40.0
24	1.0	13.0	1.0	17.0	1.0	26.0	1.0	40.0
27	1.0	13.0	1.0	17.0	1.0	26.0	1.0	40.0
30	1.0	13.0	1.0	17.0	1.0	26.0	1.0	40.0
33	1.0	12.0	1.0	17.0	1.0	26.0	1.0	40.0
36	1.0	12.0	1.0	17.0	1.0	26.0	1.0	40.0
42	1.0	12.0	1.0	17.0	1.0	26.0	1.0	40.0
48	1.0	12.0	1.0	17.0	1.0	26.0	1.0	40.0
54	1.0	12.0	1.0	17.0	1.0	26.0	1.0	40.0
60	1.0	12.0	1.0	17.0	1.0	26.0	1.0	40.0
66	1.0	12.0	1.0	17.0	1.0	26.0	1.0	39.0
72	1.0	12.0	1.0	17.0	1.0	25.0	1.0	39.0
78	1.0	12.0	1.0	17.0	1.0	25.0	1.0	39.0
84	1.0	12.0	1.0	16.0	1.0	25.0	1.0	39.0
90	1.0	12.0	1.0	16.0	1.0	25.0	1.0	39.0
96	1.0	11.0	1.0	16.0	1.0	25.0	1.0	39.0
102	1.0	9.0	1.0	16.0	1.0	25.0	1.0	39.0
108	1.0	9.0	1.0	16.0	1.0	25.0	1.0	39.0
114	1.0	9.0	1.0	16.0	1.0	25.0	1.0	39.0
120	1.0	9.0	1.0	16.0	1.0	25.0	1.0	39.0
126	1.0	9.0	1.0	16.0	1.0	25.0	1.0	39.0
132	1.0	9.0	1.0	16.0	1.0	25.0	1.0	39.0
138	1.0	9.0	1.0	16.0	1.0	25.0	1.0	39.0
144	1.0	9.0	1.0	15.0	1.0	25.0	1.0	39.0

NOTES:

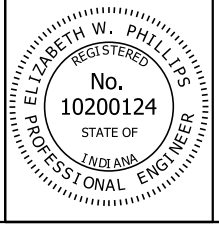
1. A special design in accordance with AASHTO LRFD Bridge Design Specifications, Section 12, is required for pipe diameters and heights of cover beyond those shown.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-24



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

REINFORCED CONCRETE HORIZONTAL ELLIPTICAL PIPE
HEIGHT OF COVER LIMITS (ft)

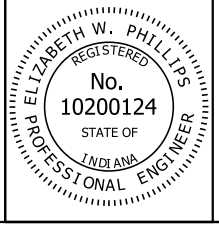
SPAN (in.)	RISE (in.)	AREA (sft)	STRENGTH CLASS / D-LOAD RATING									
			CLASS HE-A: $D_{0.01}$ = 600		CLASS HE-I: $D_{0.01}$ = 800		CLASS HE-II: $D_{0.01}$ = 1000		CLASS HE-III: $D_{0.01}$ = 1350		CLASS HE-IV: $D_{0.01}$ = 2000	
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
23	14	1.8	1.3	4.0	1.0	8.0	1.0	11.0	1.0	20.0	1.0	100.0
30	19	3.3	1.1	5.0	1.0	7.0	1.0	10.0	1.0	16.0	1.0	47.0
34	22	4.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	17.0	1.0	48.0
38	24	5.1	1.0	5.0	1.0	8.0	1.0	11.0	1.0	18.0	1.0	49.0
42	27	6.3	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	50.0
45	29	7.4	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
49	32	8.8	1.0	6.0	1.0	9.0	1.0	12.0	1.0	19.0	1.0	45.0
53	34	10.2	1.0	6.0	1.0	9.0	1.0	12.0	1.0	20.0	1.0	44.0
60	38	12.9	1.0	5.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	26.0
68	43	16.6	1.0	6.0	1.0	8.0	1.0	10.0	1.0	15.0	1.0	27.0
76	48	20.5	1.0	6.0	1.0	8.0	1.0	11.0	1.0	16.0	1.0	28.0
83	53	24.8	1.0	6.0	1.0	9.0	1.0	11.0	1.0	16.0	1.0	29.0
91	58	29.5	1.0	6.0	1.0	9.0	1.0	12.0	1.0	17.0	1.0	29.0
98	63	34.6	1.1	6.0	1.1	9.0	1.1	12.0	1.1	17.0	1.1	29.0
106	68	40.1	1.2	6.0	1.2	9.0	1.2	12.0	1.2	17.0	1.2	30.0
113	72	46.1	1.2	7.0	1.2	9.0	1.2	12.0	1.2	18.0	1.2	30.0
121	77	52.4	1.3	7.0	1.3	9.0	1.3	12.0	1.3	18.0	1.3	30.0
128	82	59.2	1.4	7.0	1.4	10.0	1.4	13.0	1.4	18.0	1.4	30.0
136	87	66.4	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
143	92	74.0	1.5	7.0	1.5	10.0	1.5	13.0	1.5	18.0	1.5	31.0
151	97	82.0	1.6	7.0	1.6	10.0	1.6	13.0	1.6	19.0	1.6	31.0
166	106	99.2	1.7	7.0	1.8	10.0	1.8	13.0	1.8	19.0	1.8	31.0
180	116	118.6	1.8	7.0	1.9	10.0	1.9	13.0	1.9	19.0	1.9	31.0

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PHCL-25



/s/ Elizabeth W. Phillips 03/27/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

Material	Pipe Type				
	1	2	3	4	5
Non-Reinforced Concrete Pipe, Class 3 (S)	x	x	x		
Non-Reinforced Concrete Pipe				x	
Reinforced Concrete Pipe (S)	x	x	x		
Reinforced Concrete Horizontal Elliptical Pipe (S)	x	x	x		
Corrugated Steel Pipe (C)	x		x		x
Polymer Precoated Galvanized Corrugated Steel Pipe (C)	x		x		x
Polymer Precoated Galvanized Corrugated Steel Pipe Type IA (S)	x	x	x		x
Fully Bituminous Coated and Lined Corrugated Steel Pipe (S)		x			x
Corrugated Steel Pipe-Arch (C)	x		x		x
Polymer Precoated Galvanized Corr. Steel Pipe Arch Type IIA (S)	x	x	x		x
Fully Bituminous Coated and Lined Corrugated Steel Pipe-Arch (S)		x			x
Polymer Precoated Galvanized Corrugated Steel Pipe-Arch (C)	x		x		x
Corrugated Aluminum Alloy Pipe (C)	x		x		x
Corrugated Aluminum Alloy Pipe-Arch (C)	x		x		x
Structural Plate Steel Pipe (C)	x		x		
Structural Plate Steel Pipe-Arch (C)	x		x		
Structural Plate Aluminum Alloy Pipe (C)	x		x		
Structural Plate Aluminum Alloy Pipe-Arch (C)	x		x		
Spiral Rib Steel Pipe (SS)	x		x		x
Clay Pipe, Extra Strength (S)	x	x	x		
Clay Pipe				x	
Perforated Clay Pipe				x	
Concrete Drain Tile				x	
Clay Drain Tile				x	
Corrugated Polyethylene Pipe, Type SP				x	
Corrugated Polyethylene Pipe, Type (S)	x	x	x	x	x
Profile Wall (Ribbed) Polyethylene Pipe (S)	x	x	x		x
Profile Wall (Closed) Polyethylene Pipe (S)	x	x	x		x
Smooth Wall Polyethylene Pipe (S)	x	x	x		x
Corrugated Polyethylene Drainage Tubing				x	
Corrugated Polypropylene Pipe (S)	x	x	x		x
Perforated PVC Semicircular Pipe				x	
Profile Wall PVC Pipe (S)	x	x	x	x	x
Smooth Wall PVC Pipe (S)	x	x	x		x

NOTES:

1. The prescribed uses for the pipe types are as follows.
   a. Type 1 Pipe - Culverts under mainline pavement and public road approaches.
   b. Type 2 Pipe - Storm sewer pipe.
   c. Type 3 Pipe - Culverts under driveways and field entrances.
   d. Type 4 Pipe - Drain tile and longitudinal underdrains.
   e. Type 5 Pipe - Broken back and other installations requiring coupled pipe.

2. See to Standard Drawings E 715-PHCL-01 through E 715-PHCL-25 and E 717-PHCL-01 through E 717-PHCL-10 for allowable heights of cover for various pipe materials except Type 4 pipes.

3. See to Standard Drawings E 715-PSLC-01 through E 715-PSLC-03 for required pipe service life criteria.

4. Any pipe material which is in accordance with the designated pipe type, acceptable for height of cover conditions, and conforms to service life criteria may be installed.

LEGEND:

(C)- Corrugated Interior Culvert Pipe

(S)- Smooth Interior Culvert or Storm Sewer Pipe

(SS)- Semi-Smooth Interior Culvert Pipe

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE CLASSIFICATION TABLES

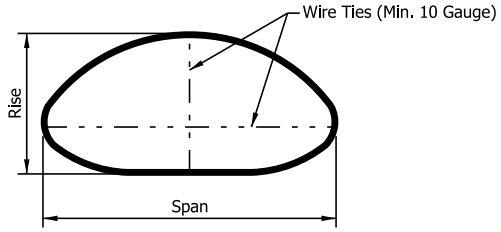
SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PIPE-01

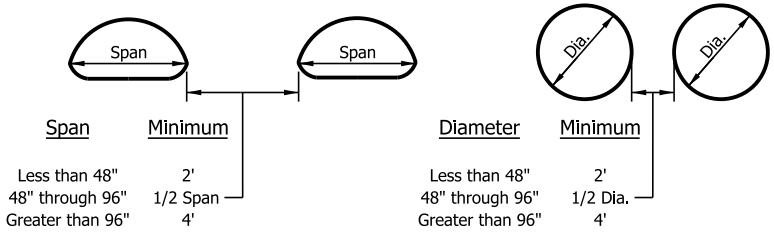
ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/22/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE



STEEL PIPE-ARCH SECTIONS
END STABILIZATION OF 3" x 1" CORRUGATED (1)

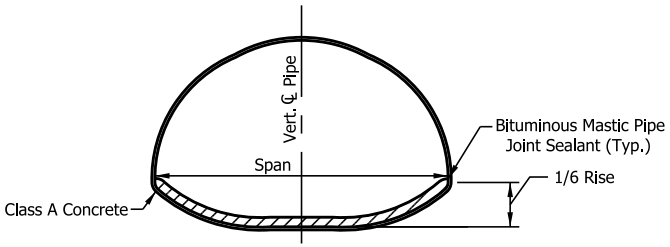


MULTIPLE INSTALLATION

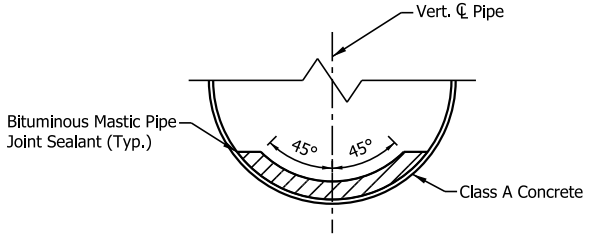
NOTES:

(1) In order to maintain their manufactured shape, all 3" x 1" corrugated steel pipe-arch sections shall have wire ties attached at each end as shown in the detail. The wire ties shall be attached across the largest vertical and horizontal dimension of the pipe-arch. the wire ties shall be installed by the manufacturer and shall remain in place until the on-site installation is complete.

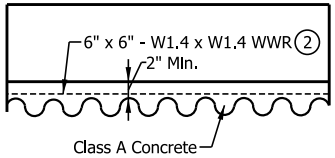
(2) WWR shall be wired to every second circumferential bolt and every twelfth longitudinal bolt.



STRUCTURAL PLATE
PIPE-ARCH CULVERT
ELEVATION



STRUCTURAL PLATE
PIPE CULVERT



TYPICAL LONGITUDINAL SECTION

CONCRETE FIELD PAVED INVERT DETAILS

INDIANA DEPARTMENT OF TRANSPORTATION

MISCELLANEOUS PIPE
DETAILS

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PIPE-02

ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/22/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

REQUIREMENTS FOR CORRUGATED STEEL PIPE THICKNESS AND PROTECTION AT NON-ABRASIVE SITES

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	≥7.0	Steel Conduit Type
Thickness required for 50-year Design Service Life				0.168	0.168	0.138	0.109	Zinc-Coated Corrugated Steel Pipe Zinc-Coated Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Zinc-Coated Corrugated and Steel Pipe w/Paved Invert Zinc-Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous-Coated and Lined Corrugated Steel Pipe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Aluminum-Coated Type 2 Corrugated Steel Pipe Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch
	0.109	0.109	0.079	0.064	0.064	0.064	0.064	Polymer Precoated Galvanized Corrugated Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
	0.111*	0.111*	0.111*	0.170	0.111	0.111	0.111	Structural Plate Steel Pipe Structural Plate Steel Pipe-Arch
							0.109	Zinc-Coated Spiral Ribbed Steel Pipe
				0.109	0.109	0.079	0.064	Zinc-Coated Sprial Ribbed Steel Pipe w/ Paved Invert
				0.109	0.109	0.079	0.064	Aluminum-Coated Type 2 Spiral Ribbed Steel Pipe
	0.109	0.109	0.079	0.064	0.064	0.064	0.064	Polymer Precoated Galvanized Spiral Ribbed Steel Pipe

* Concrete field paving required.

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	≥7.0	Steel Conduit Type
Thickness required for 75-year Design Service Life						0.168	0.138	Zinc-Coated Corrugated and Spiral Ribbed Steel Pipe Zinc-Coated Corrugated Steel Pipe-Arch
				0.168	0.168	0.138	0.109	Zinc-Coated Corrugated Steel Pipe w/Paved Invert ZInc-Coated Corrugated Steel PIpe-Arch w/Paved Invert Fully BitumInous-Coated and LIned Corrugated Steel PIpe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
						0.138	0.109	Aluminum-Coated Type 2 Corrugated Steel Pipe Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch
				0.138	0.138	0.109	0.109	Polymer Precoated Galvanized Corrugated Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
	0.111*	0.111*	0.111*	0.218	0.111	0.111	0.111	Structural Plate Steel Pipe Structural Plate Steel Pipe-Arch
							0.109	Zinc-Coated Sprial Ribbed Steel Pipe w/ Paved Invert
							0.109	Aluminum-Coated Type 2 Spiral Ribbed Steel Pipe
						0.109	0.109	Polymer Precoated Galvanized Spiral Ribbed Steel Pipe

* Concrete field paving required.

NOTE:

1. See Standard Drawing E 715-PSLC-03 for General Notes.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE LIFE CRITERIA
NON-ABRASIVE SITES

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PSLC-01

ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/31/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

REQUIREMENTS FOR CORRUGATED STEEL PIPE THICKNESS AND PROTECTION AT ABRASIVE SITES

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	≥7.0	Steel Conduit Type
Thickness required for 50-year Design Service Life				0.168	0.168	0.138	0.109	Zinc-Coated Corrugated Steel Pipe w/Paved Invert Zinc-Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous-Coated and Lined Corrugated Steel Pipe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
			0.138	0.109	0.109	0.079	0.064	Aluminum-Coated Type 2 Corrugated Steel w/Paved Invert Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch w/Paved Invert
	0.109	0.109	0.079	0.064	0.064	0.064	0.064	Polymer Precoated Galvanized Corrugated Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
				0.170	0.111	0.111	0.111	Structural Plate Steel Pipe w/Concrete Field Paving Structural Plate Steel Pipe-Arch w/Concrete Field Paving
							0.109	Zinc-Coated Sprial Ribbed Steel Pipe w/ Paved Invert
				0.109	0.109	0.079	0.064	Aluminum-Coated Type 2 Spiral Ribbed Pipe w/ Paved Invert
	0.109	0.109	0.079	0.064	0.064	0.064	0.064	Polymer Precoated Galvanized Spiral Ribbed Steel Pipe

pH	≤ 4.0	4.5	5.0	5.5	6.0	6.5	≥7.0	Steel Conduit Type
Thickness required for 75-year Design Service Life						0.168	0.138	Zinc-Coated Corrugated Steel Pipe w/Paved Invert Zinc-Coated Corrugated Steel Pipe-Arch w/Paved Invert Fully Bituminous-Coated and Lined Corrugated Steel Pipe Fully Bituminous-Coated and Lined Corrugated Steel Pipe-Arch
						0.138	0.109	Aluminum-Coated Type 2 Corrugated Steel Pipe w/Paved Invert Aluminum-Coated Type 2 Corrugated Steel Pipe-Arch w/Paved Invert
				0.138	0.138	0.109	0.109	Polymer Precoated Galvanized Corrugated and Steel Pipe Polymer Precoated Galvanized Corrugated Steel Pipe-Arch
				0.218	0.111	0.111	0.111	Structural Plate Steel Pipe w/Concrete Field Paving Structural Plate Steel Pipe-Arch w/Concrete Field Paving
							0.109	Aluminum-Coated Type 2 Spiral Ribbed Pipe w/ Paved Invert
						0.109	0.109	Polymer Precoated Galvanized Spiral Ribbed Steel Pipe

NOTE:

1. See Standard Drawing E 715-PSLC-03 for General Notes.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE LIFE CRITERIA
ABRASIVE SITES

SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PSLC-02

ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 03/31/17
DESIGN STANDARDS ENGINEER DATE

/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE

GENERAL NOTES:

1. "X" entries in the table indicate that a thickness which satisfies the required design service life is not available.
2. The tabulated plate thickness for structural plate steel pipe and pipe-arches reflects the required thickness for the top and side plates. If the tabulated plate thickness is less than 0.280 in. the bottom plates shall be of the next greater available thickness.
3. Corrugated aluminum alloy pipe and pipe-arches and aluminum alloy structural plate pipe and pipe-arches are acceptable with the minimum thickness required to satisfy cover conditions for all non-abrasive sites with a structure pH ≥ 5.0.
4. Corrugated aluminum alloy pipe and pipe-arches with bituminous paved invert and aluminum alloy structural plate pipe and pipe-arches with concrete field paving are acceptable with the minimum thickness required to satisfy cover conditions for all abrasive sites with a structure pH ≥ 5.0.
5. Service life criteria apply only to reinforced concrete, corrugated metal, and structural plate metal pipe. Other materials which conform to the designated pipe type and height of cover parameters are acceptable for installation.
6. Service life criteria do not apply to Type 4 pipe.

REQUIREMENTS FOR REINFORCED CONCRETE PIPE PROTECTION

Pipe Slope	Minimum pH to Attain Design Service Life	
	50 Year	75 Year
Less than 3%	4.0	4.5
3% to 10%	4.5	5.0
Greater than 10%	5.0	5.5

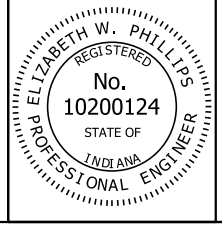
For a structure pH lower than the minimums listed above, reinforced concrete pipe shall not be used.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE SERVICE
LIFE CRITERIA

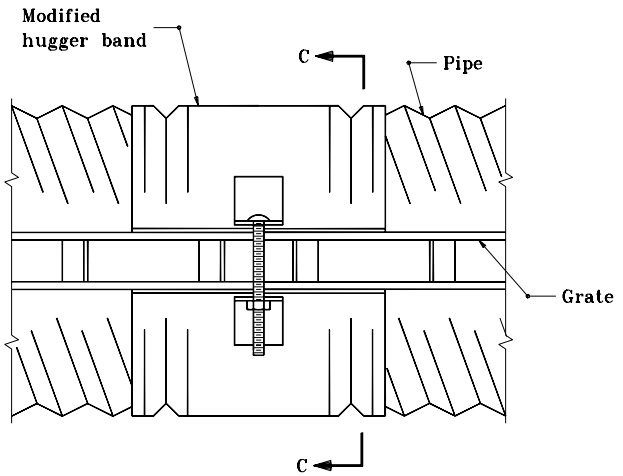
SEPTEMBER 2017

STANDARD DRAWING NO. E 715-PSLC-03

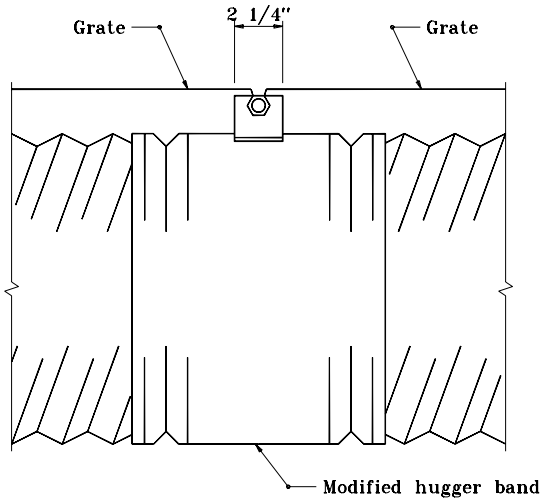


/s/ Elizabeth W. Phillips 03/31/17
DESIGN STANDARDS ENGINEER DATE

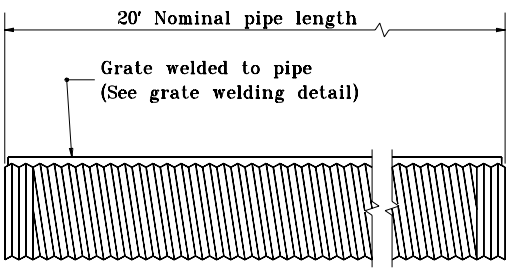
/s/ John Leckie 04/10/17
CHIEF ENGINEER DATE



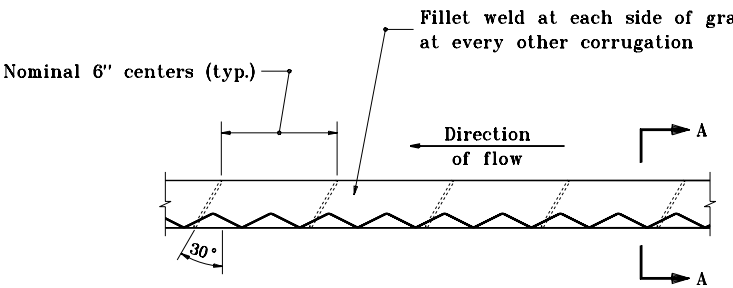
MODIFIED HUGGER BAND
TOP VIEW



MODIFIED HUGGER BAND
SIDE VIEW



TYPICAL PIPE SECTION



GRATE WELDING DETAIL

INDIANA DEPARTMENT OF TRANSPORTATION

SLOTTED DRAIN PIPE

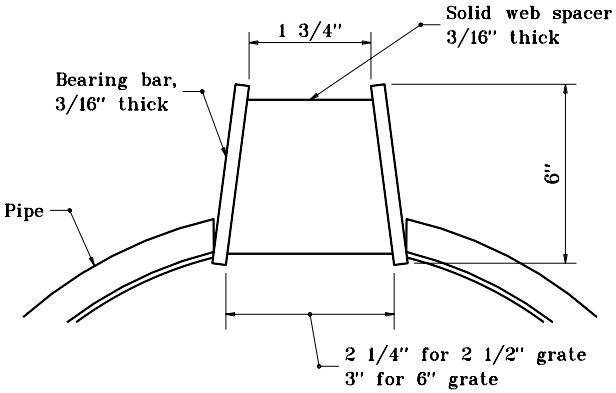
APRIL 1995

STANDARD DRAWING NO. **E 715-SDLR-01**

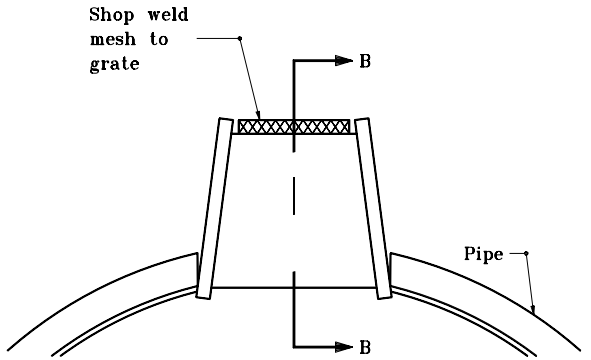
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

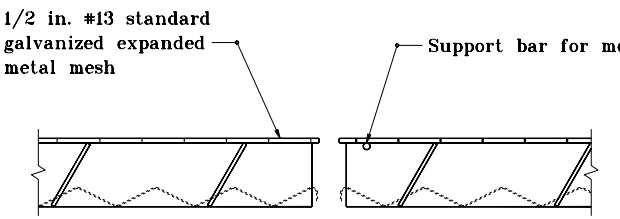
DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	4-04-95



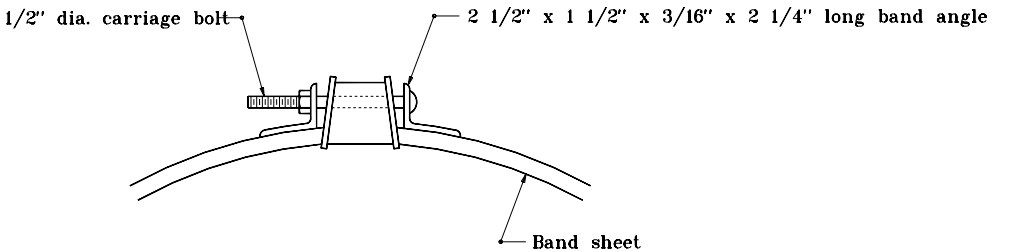
SECTION A–A
STANDARD GRATE DETAIL



SECTION A–A
GRATE DETAIL WITH MESH



SECTION B–B



SECTION C–C

STANDARD SIZES						
PIPE THICK-NESS (IN.)	DIAMETER OF PIPE (IN.)					
	12	15	18	24	30	36
0.064	X	X	X	X	X	X
0.079	X	X	X	X	X	X
0.109	N.A.	N.A.	N.A.	N.A.	X	X

X – Size available for designated thickness

N.A. – Size not available for designated thickness

INDIANA DEPARTMENT OF TRANSPORTATION

SLOTTED DRAIN PIPE

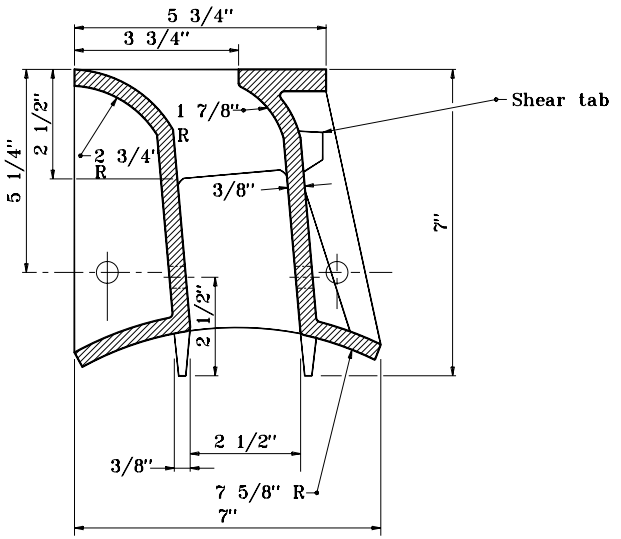
JANUARY 1998

STANDARD DRAWING NO. **E 715-SLDR-02**

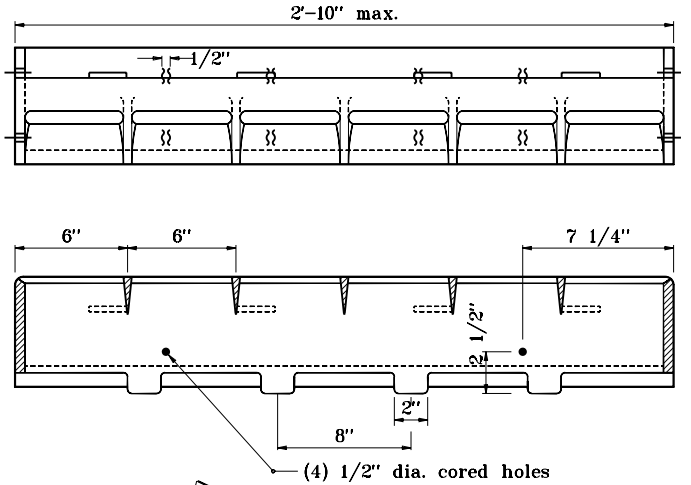
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

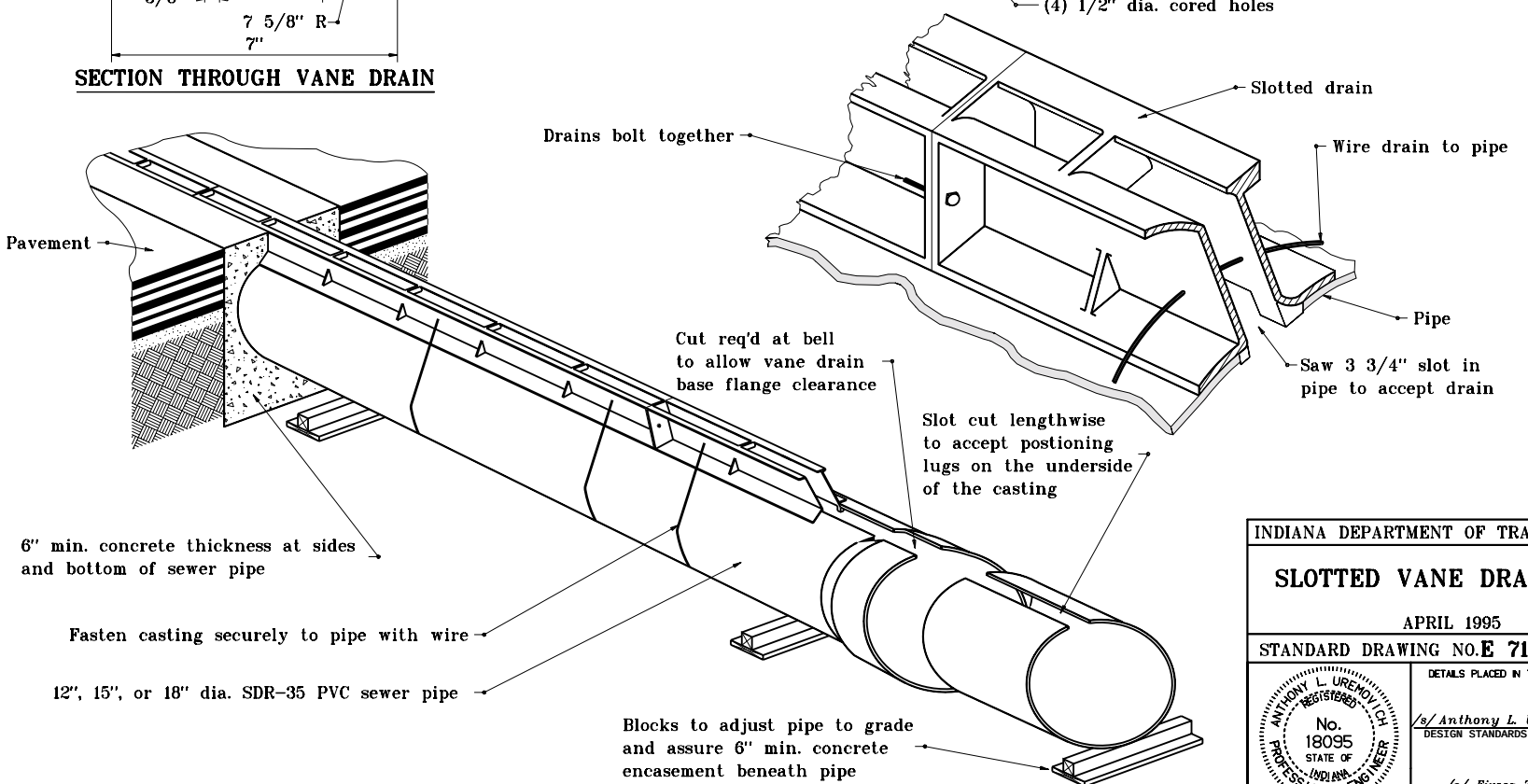
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	1-02-98



SECTION THROUGH VANE DRAIN





INDIANA DEPARTMENT OF TRANSPORTATION

SLOTTED VANE DRAIN PIPE

APRIL 1995

STANDARD DRAWING NO. **E 715-SLDR-03**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

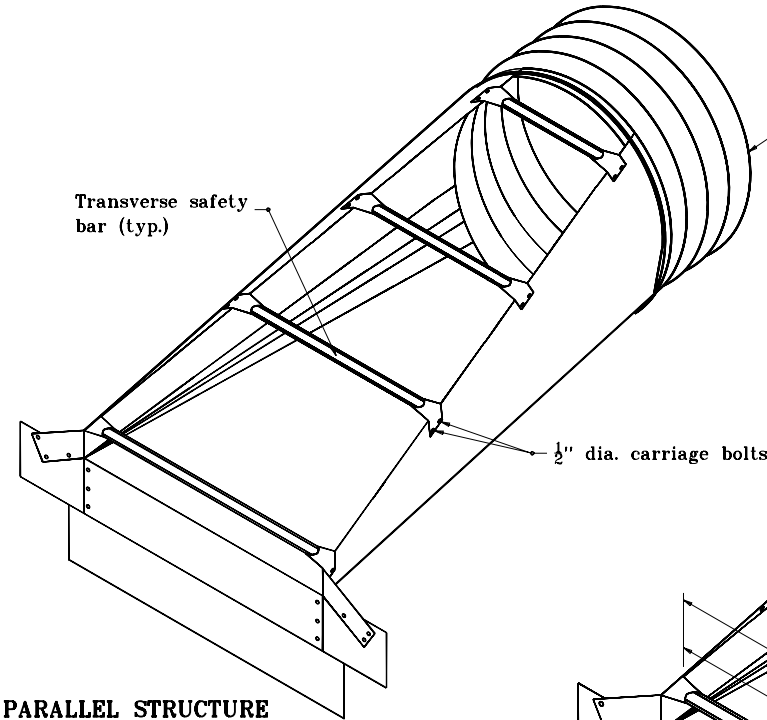
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	4-03-95

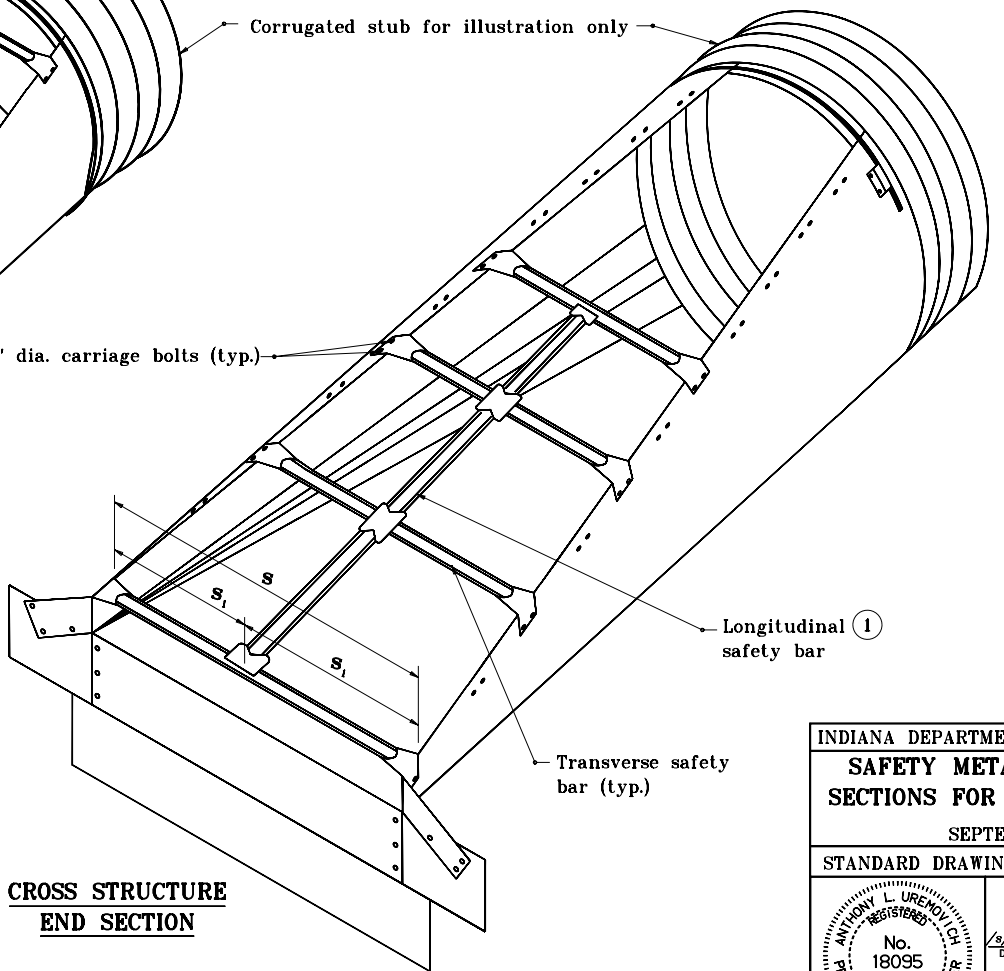
GENERAL NOTES

(1) Longitudinal safety bar shall be welded to transverse bars. For cross structure and section, if S ⟨ 2'–6, no longitudinal safety bar is required. If S ⟩ 2'–6, longitudinal safety bar(s) shall be provided so S_1 ⟨ 2'–6.

2. Bolts shall be oriented with threads to inside of end section.



PARALLEL STRUCTURE END SECTION



CROSS STRUCTURE END SECTION

LEGEND

s – Overall span

s_1 – Span between end section edge and longitudinal safety bar or between longitudinal safety bars.

$$s_1 = \frac{s}{n + 1}$$

where n = Number of longitudinal safety bars

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR CORRUGATED PIPE

SEPTEMBER 2000

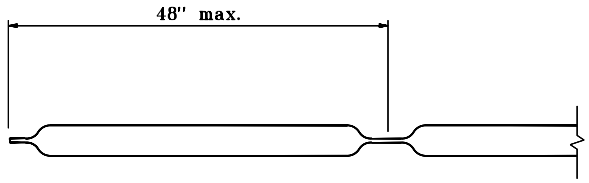
STANDARD DRAWING NO. **E 715–SMES–01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

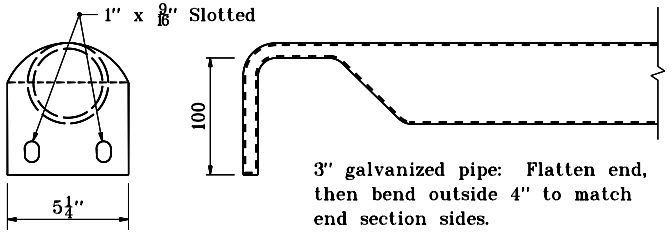
DESIGN STANDARDS ENGINEER

/s/ Anthony L. Uremovich 9–01–00
DESIGN STANDARDS ENGINEER — DATE

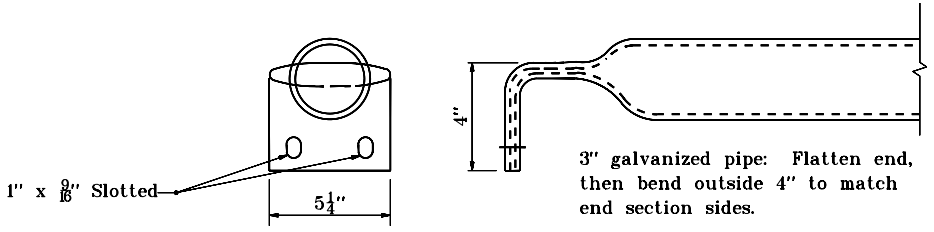
/s/ Firooz Zandi 9–01–00
CHIEF HIGHWAY ENGINEER — DATE



LONGITUDINAL SAFETY BAR DETAIL



OR



TRANSVERSE SAFETY BAR DETAILS

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR CORRUGATED PIPE

JANUARY 1998

STANDARD DRAWING NO. **E 715-SMES-02**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

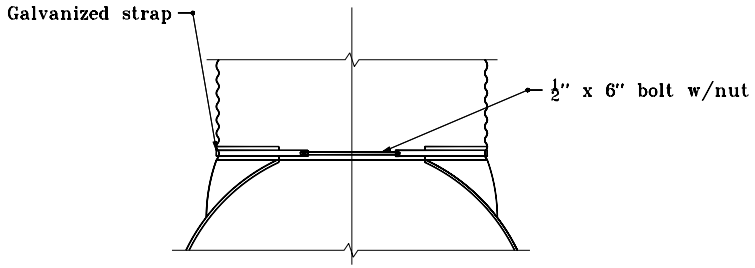
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

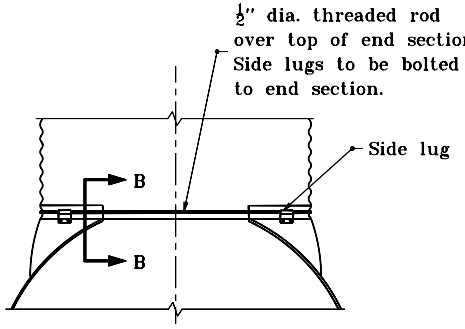
/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98



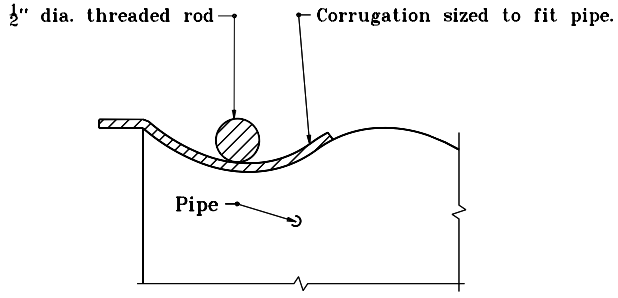
TYPE 1 CONNECTOR DETAIL

Through 24" dia.



TYPE 2 CONNECTOR DETAIL

For all circular pipes larger than 24"
and all pipe-arches



SECTION B-B

GENERAL NOTES

1. For circular pipe diameters through 24", attach end section to pipe with type 1 connector. For all other sizes, attach end section to pipe with type 2 connector.

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR CORRUGATED PIPE

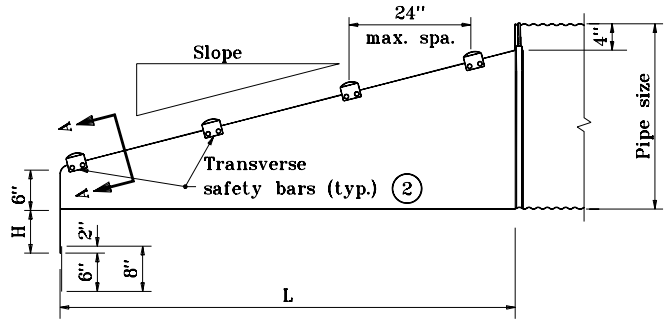
JANUARY 1998

STANDARD DRAWING NO. **E 715-SMES-03**

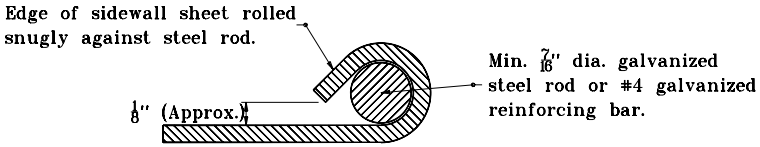
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

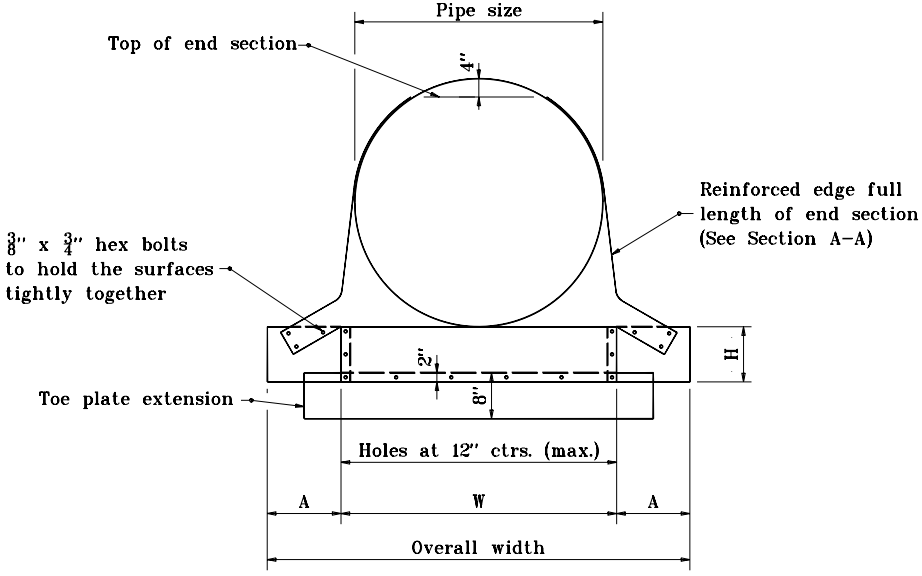
DETAILS PLACED IN THIS FORMAT	7-27-99
/s/ Anthony L. Uremovich, DESIGN STANDARDS ENGINEER	7-27-99 DATE
/s/ Firooz Zandi, CHIEF HIGHWAY ENGINEER	7-27-99 DATE
ORIGINALLY APPROVED	1-02-98



SIDE ELEVATION OF PARALLEL STRUCTURE END SECTION



SECTION A–A



FRONT VIEW

GENERAL NOTES

1. See Standard Drawing E 715–SMES–06 for variable dimensions.

(2) Transverse safety bars shall be schedule 40 galvanized steel pipe. Pipe shall be galvanized after forming. Number of bars required will vary depending on the length of the end sections.

3. The toe plate extension shall be the same thickness as the end section. The dimension shall be the end section overall width less 6".

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR CORRUGATED PIPE

JANUARY 1998

STANDARD DRAWING NO. **E 715–SMES–04**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

GENERAL NOTES

(1) Toe plate extension shall be the same thickness as the end section. Dimension shall be overall width less 6".

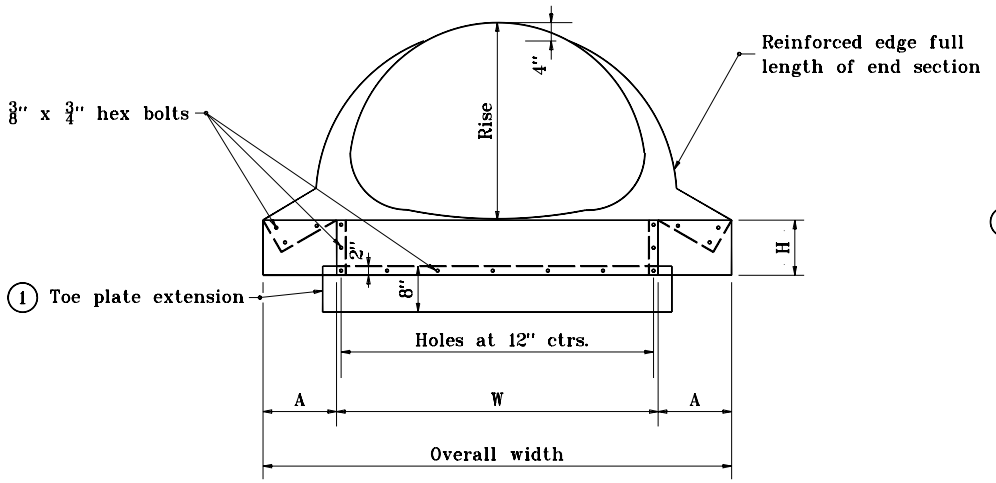
(2) Transverse safety bars shall be Schedule 40 galvanized steel pipe. Pipe shall be galvanized after forming. Number of bars required will vary depending on the length of the end sections.

3. Slotted holes for safety bar attachment shall be provided for all end sections.

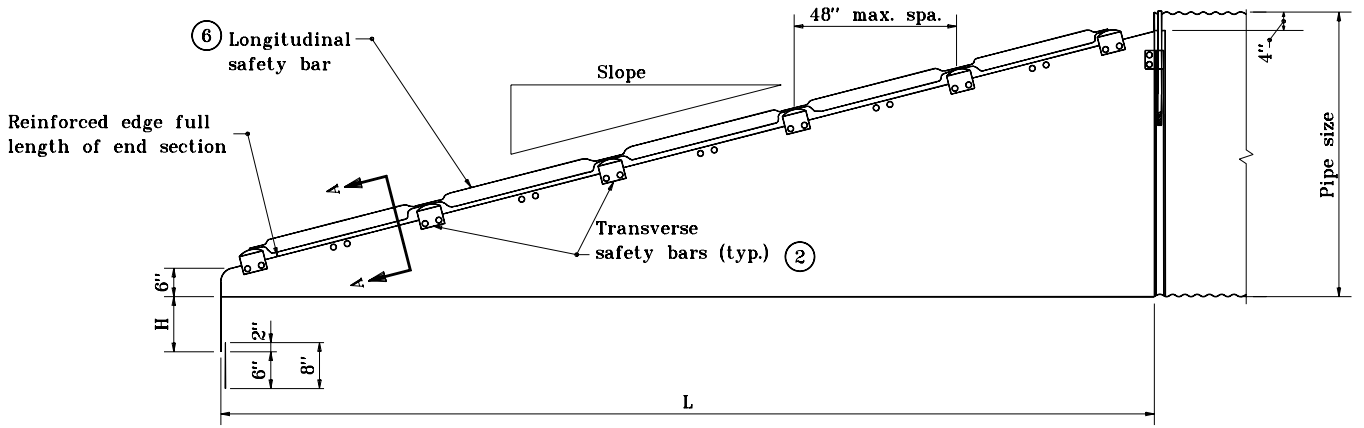
4. See Standard Drawing E 715-SMES-04 for Section A-A.

5. See Standard Drawing E 715-SMES-06 for variable dimensions.

(6) See Standard Drawing E 715-SMES-01 for warrant of longitudinal saftey bar.



FRONT VIEW



SIDE ELEVATION FOR CROSS STRUCTURE END SECTION

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR CORRUGATED PIPE

JANUARY 1998

STANDARD DRAWING NO. **E 715-SMES-05**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

METAL END SECTIONS FOR CIRCULAR PIPES									
Pipe Dia.	Min. Thick.	Dimensions, in.				L Dimensions			
		A	H	W	Overall Width	Slope	Length (in.)	Slope	Length (in.)
15	.064	8	6	37	37	4:1	20	6:1	30
18	.064	8	6	40	40	4:1	32	6:1	48
21	.064	8	6	43	43	4:1	44	6:1	66
24	.064	8	6	46	46	4:1	56	6:1	84
30	.109	12	9	60	60	4:1	80	6:1	120
36	.109	12	9	66	66	4:1	104	6:1	156
42	.109	16	12	80	80	4:1	128	6:1	192
48	.109	16	12	86	86	4:1	152	6:1	228
54	.109	16	12	92	92	4:1	176	6:1	264
60	.109	16	12	66	98	4:1	200	6:1	300

SAFETY METAL END SECTIONS FOR PIPE-ARCHES											
Equiv. Dia. (in.)	(inches)		Min. Thick.	Dimensions, in.				L Dimensions			
	Span	Rise	in.	A	H	W	Overall Width	Slope	Length (in.)	Slope	Length (in.)
18	21	15	.064	8	6	27	43	4:1	20	6:1	30
21	24	18	.064	8	6	30	46	4:1	32	6:1	48
24	28	20	.064	8	6	34	50	4:1	40	6:1	60
30	35	24	.079	12	9	41	65	4:1	56	6:1	84
36	42	29	.109	12	9	48	72	4:1	76	6:1	114
42	49	33	.109	16	12	55	87	4:1	92	6:1	138
48	57	38	.109	16	12	63	95	4:1	112	6:1	168
54	64	43	.109	16	12	70	102	4:1	132	6:1	198
60	71	47	.109	16	12	77	109	4:1	148	6:1	222
72	83	57	.109	16	12	89	121	4:1	188	6:1	282

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR CORRUGATED PIPE

JANUARY 1998

STANDARD DRAWING NO. E 715-SMES-06

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

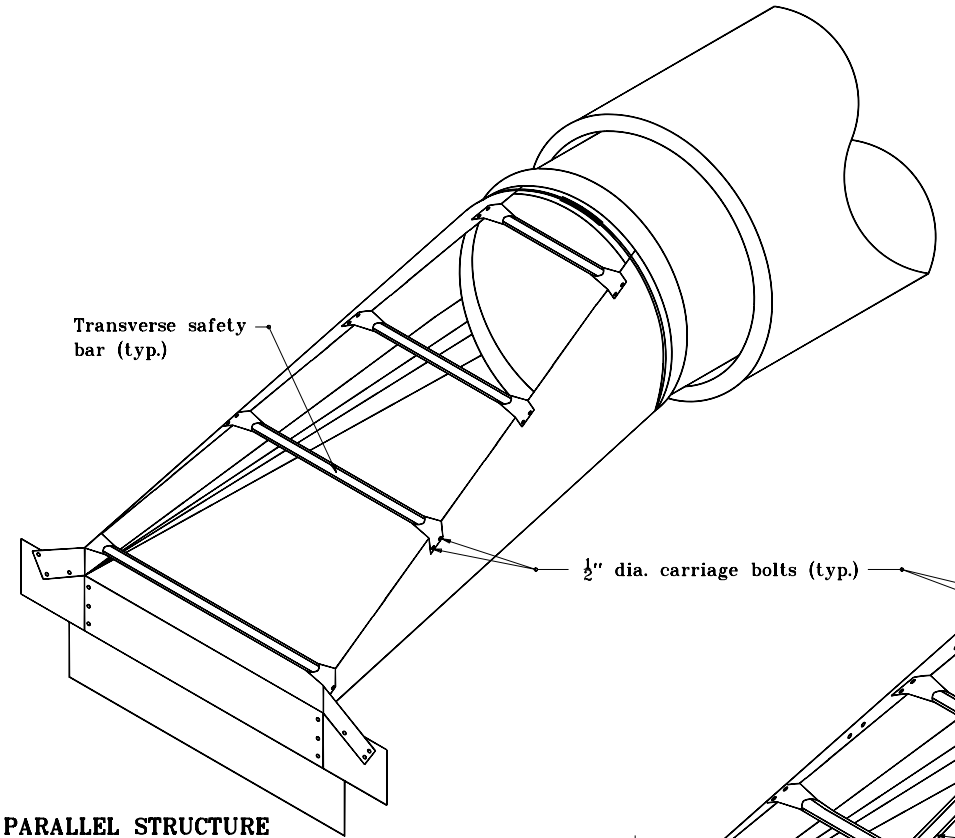
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

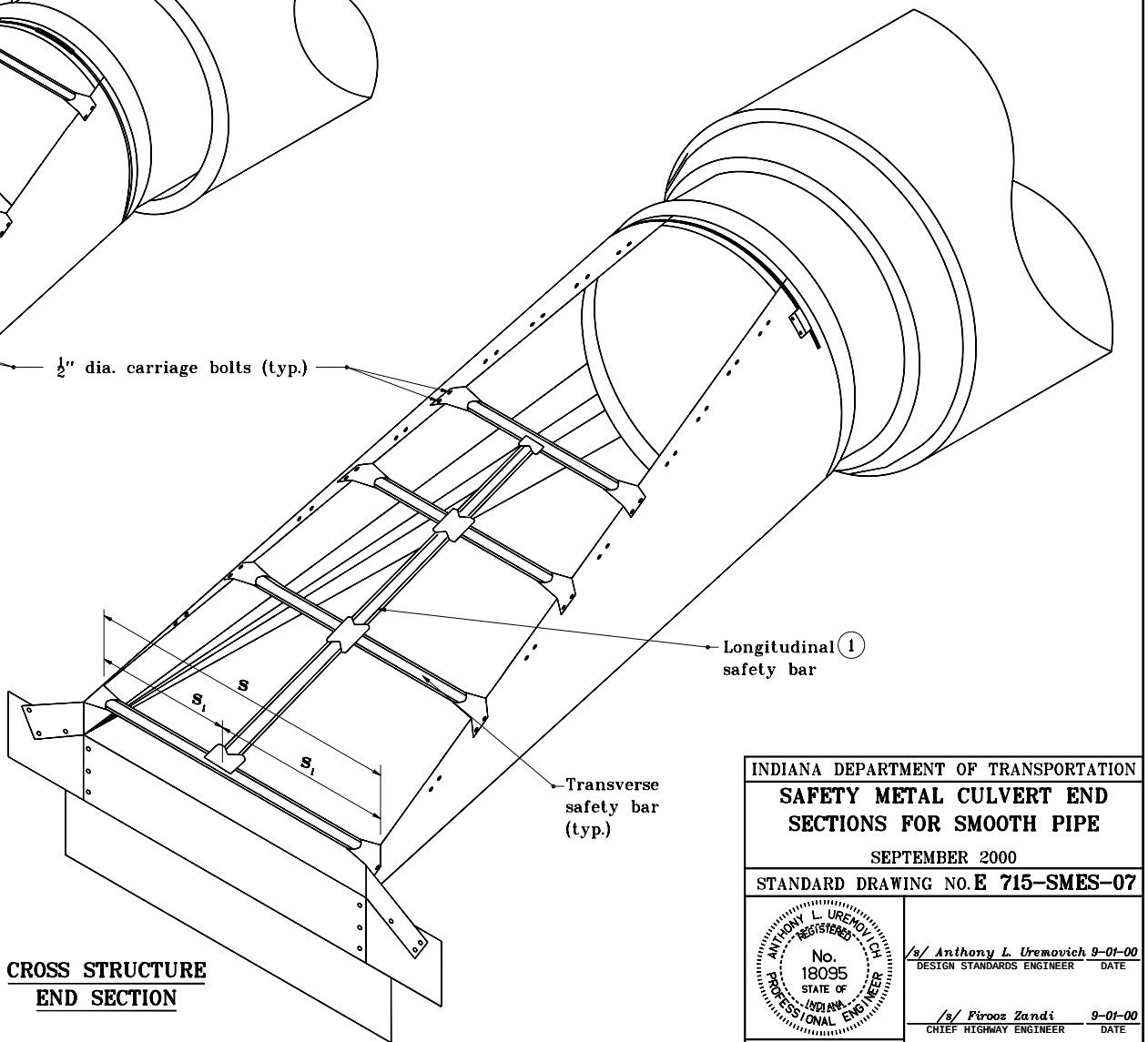
GENERAL NOTES

1. Longitudinal safety bar shall be welded to transverse bars. For cross structure and section, if S < 2'–6, no longitudinal safety bar is required. If S > 2'–6, longitudinal safety bar(s) shall be provided so S_1 < 2'–6.

2. Bolts shall be oriented with threads to inside of end section.



PARALLEL STRUCTURE END SECTION



CROSS STRUCTURE END SECTION

LEGEND

s – Overall span

s_1 Span between end section edge and longitudinal safety bar or between longitudinal safety bars.

$$s_1 = \frac{s}{n+1}$$

where n = Number of longitudinal safety bars

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE

SEPTEMBER 2000

STANDARD DRAWING NO. **E 715–SMES–07**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

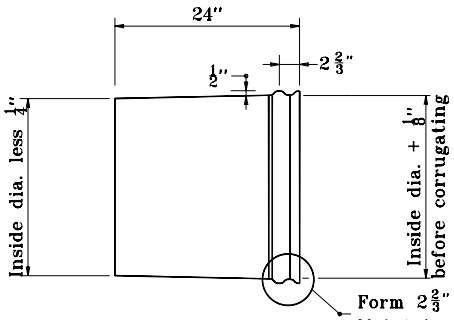
DESIGN STANDARDS ENGINEER

/s/ Anthony L. Uremovich 9–01–00
DESIGN STANDARDS ENGINEER — DATE

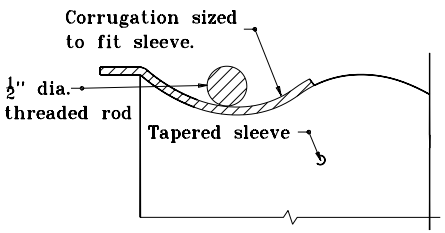
/s/ Firooz Zandi 9–01–00
CHIEF HIGHWAY ENGINEER — DATE

GENERAL NOTES

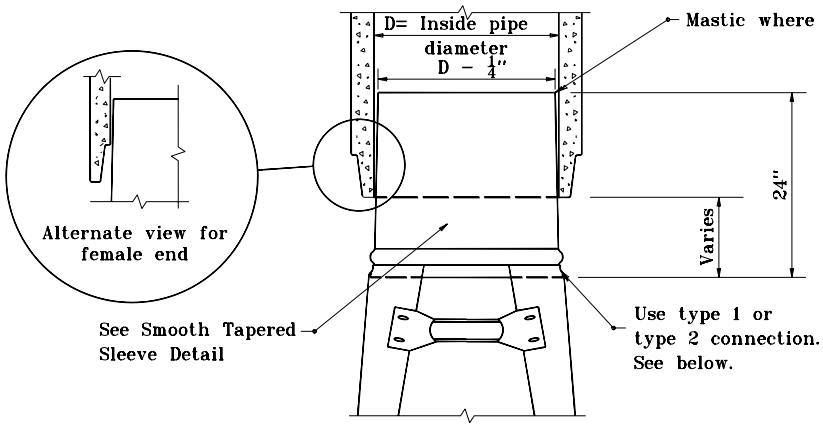
1. For circular pipe diameters through 24", attach end section to pipe with type 1 connector. For all other sizes, attach end section to pipe with type 2 connector.



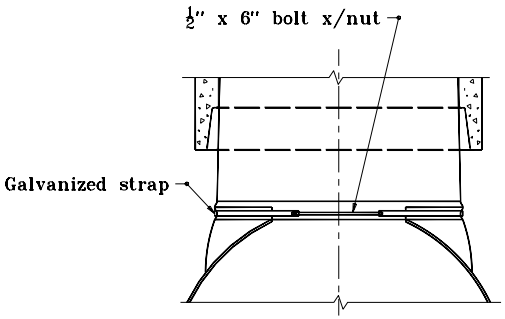
SMOOTH TAPERED SLEEVE DETAIL



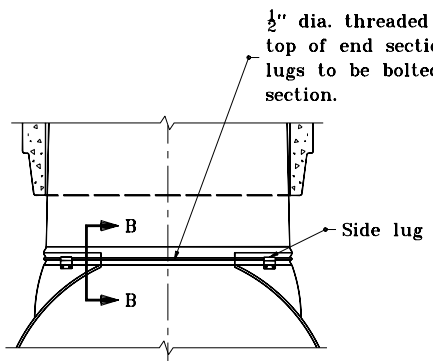
SECTION B–B



TAPERED SLEEVE FOR ATTACHING STEEL END SECTION TO SMOOTH INTERIOR PIPE



TYPE 1 CONNECTOR DETAIL
for all circular pipes through 24"



TYPE 2 CONNECTOR DETAIL
all circular pipes larger than 24" and all horizontal elliptical pipes

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE

JANUARY 1998

STANDARD DRAWING NO. **E 715-SMES-08**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

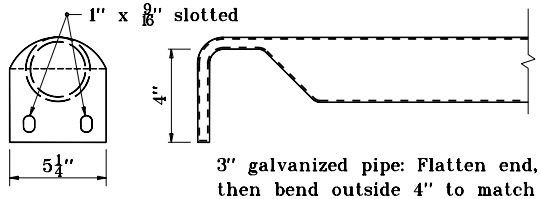
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

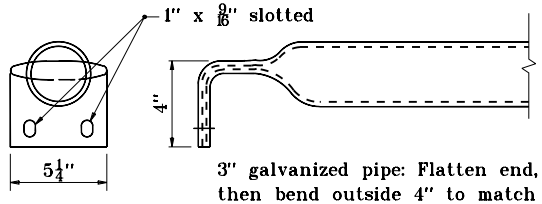
/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98



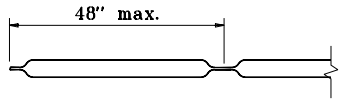
3" galvanized pipe: Flatten end, then bend outside 4" to match end section sides.

OR



3" galvanized pipe: Flatten end, then bend outside 4" to match end section sides.

TRANSVERSE SAFETY BAR DETAILS



LONGITUDINAL SAFETY BAR DETAIL

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE

JANUARY 1998

STANDARD DRAWING NO. E 715-SMES-09

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

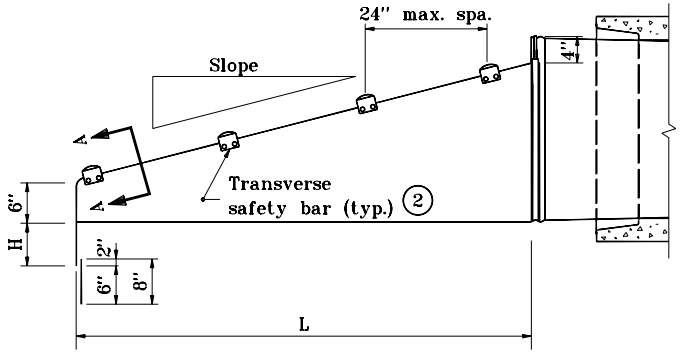
GENERAL NOTES

(1) Toe plate extension is to be the same thickness as the end section. Dimension shall be end section overall width less 6".

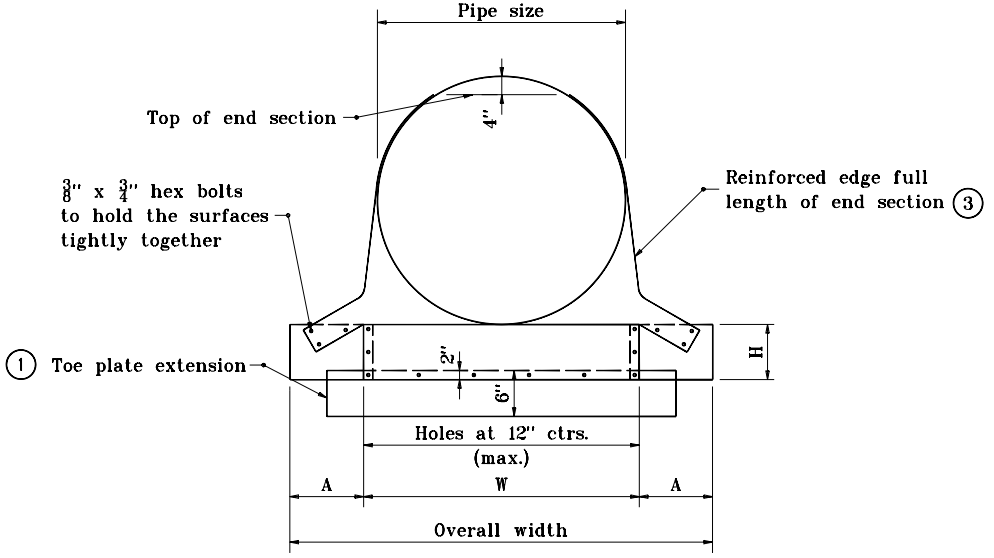
(2) Transverse safety bars shall be Schedule 40 galvanized steel pipe. Pipe to be galvanized after forming. Number of bars req'd will vary depending on the length of the end section.

(3) See Standard Drawing E 715-SMES-11 for Section A-A.

4. See Standard Drawing E 715-SMES-12 for variable dimensions.



SIDE ELEVATION OF PARALLEL STRUCTURE END SECTION



FRONT VIEW

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE

JANUARY 1998

STANDARD DRAWING NO. **E 715-SMES-10**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

GENERAL NOTES

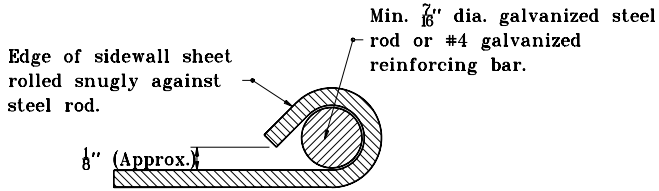
(1) Toe plate extension is to be the same thickness as the end section. Dimensions shall be overall width less 6", by 8" high.

(2) Transverse safety bars shall be Schedule 40 galvanized steel pipe. Pipe to be galvanized after forming. Number of bars req'd. will vary depending on the length of the end section.

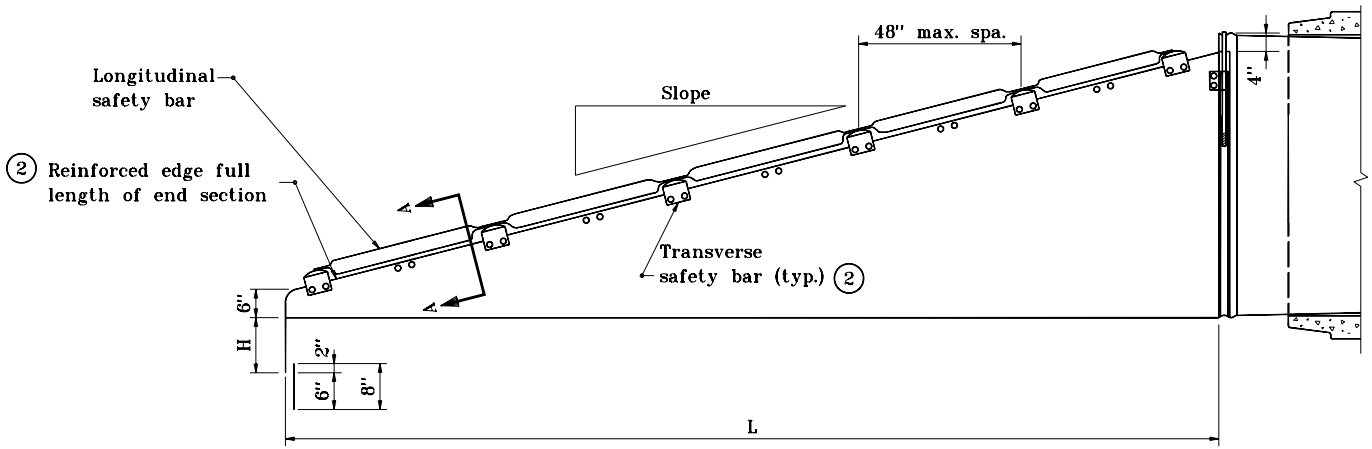
3. Slotted holes for safety bar attachment shall be provided for all end sections.

4. See Standard Drawing E 715-SMES-12 for variable dimensions.

(5) See Standard Drawing E 715-SMES-07 for warrant of longitudinal safety bar.



SECTION A-A



SIDE ELEVATION FOR CROSS STRUCTURE END SECTION

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE

JANUARY 1998

STANDARD DRAWING NO. **E 715-SMES-11**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

SAFETY METAL END SECTIONS FOR CIRCULAR PIPES									
Pipe Dia. (in.)	Min. Thick.	Dimensions, in.				L Dimensions			
		A	H	W	Overall Width	Slope	Length (in.)	Slope	Length (in.)
15	.064	8	6	21	37	4:1	20	6:1	30
18	.064	8	6	24	40	4:1	32	6:1	48
21	.064	8	6	27	43	4:1	44	6:1	66
24	.064	8	6	30	46	4:1	56	6:1	84
27	.109	12	9	33	57	4:1	68	6:1	102
30	.109	12	9	36	60	4:1	80	6:1	120
33	.109	12	9	39	63	4:1	92	6:1	138
36	.109	12	9	42	66	4:1	104	6:1	156
42	.109	16	12	48	80	4:1	128	6:1	192
48	.109	16	12	54	86	4:1	152	6:1	228
54	.109	16	12	60	92	4:1	176	6:1	264
60	.109	16	12	66	98	4:1	200	6:1	300

SAFETY METAL END SECTIONS FOR HORIZONTAL ELLIPTICAL PIPE											
Equiv. Dia. (in.)	(inches)		Min. Thick.	Dimensions (inches)				L Dimension			
	Span	Rise	in.	A	H	W	Overall Width	Slope	Length (in.)	Slope	Length (in.)
18	23	14	.064	8	6	29	45	4:1	16	6:1	24
24	30	19	.064	8	6	36	52	4:1	36	6:1	54
27	34	22	.079	12	9	40	64	4:1	48	6:1	72
30	38	24	.079	12	9	44	68	4:1	56	6:1	84
33	42	27	.109	12	9	48	72	4:1	68	6:1	102
36	45	29	.109	16	12	51	83	4:1	76	6:1	114
42	53	34	.109	16	12	59	91	4:1	96	6:1	144
48	60	38	.109	16	12	66	98	4:1	112	6:1	168
54	68	43	.109	16	12	74	106	4:1	132	6:1	198
60	76	48	.109	16	12	80	112	4:1	152	6:1	228

INDIANA DEPARTMENT OF TRANSPORTATION

SAFETY METAL CULVERT END SECTIONS FOR SMOOTH PIPE

JANUARY 1998

STANDARD DRAWING NO. **E 715-SMES-12**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

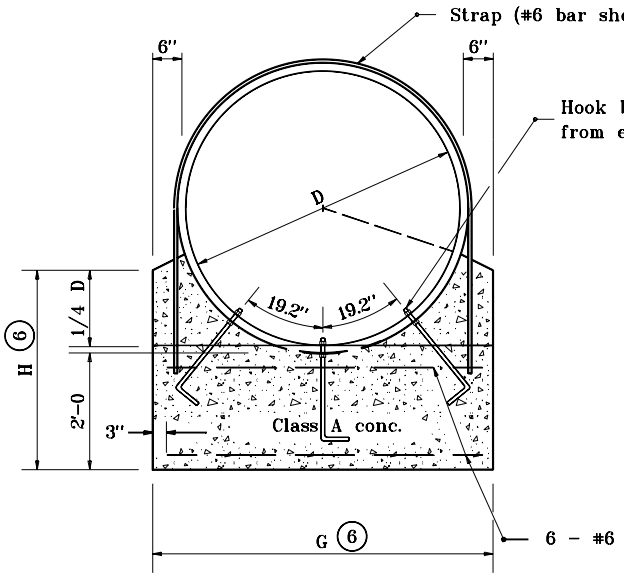
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

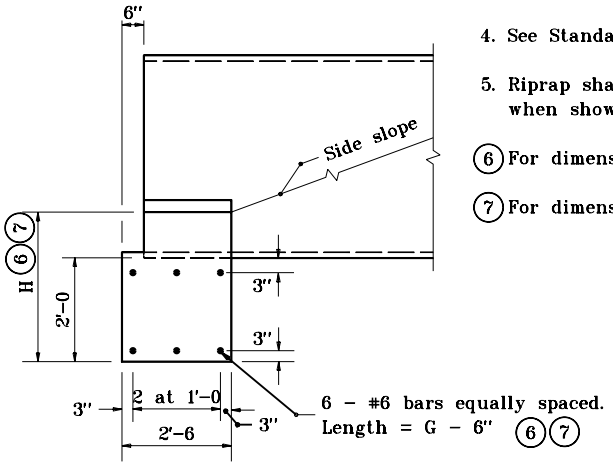
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

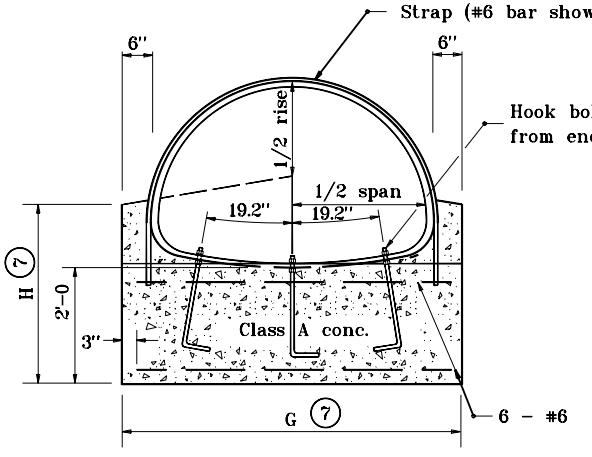
ORIGINALLY APPROVED 1-02-98



ANCHOR FOR CIRCULAR CORRUGATED METAL PIPE
FRONT ELEVATION



SIDE ELEVATION



ANCHOR FOR CORRUGATED METAL PIPE-ARCH
FRONT ELEVATION

GENERAL NOTES

1. Anchor straps shall be used at both upstream and downstream ends of all C.M. pipes with a diameter or span of 42" or greater.
2. See Standard Drawing E 715-PASD-01 for anchor strap details.
3. Hook bolts and anchor straps shall be used for all C.M. pipes with a diameter or span of 84" or greater.
4. See Standard Drawing E 715-PAHB-01 for hook bolt details.
5. Riprap shall be placed at the ends of pipe structures when shown on plans.

(6) For dimension chart see Standard Drawing E 715-ANCH-01.

(7) For dimension chart see Standard Drawing E 715-ANCH-02.

LEGEND

C.M. = Corrugated Metal

INDIANA DEPARTMENT OF TRANSPORTATION

SINGLE PIPE CONCRETE ANCHOR

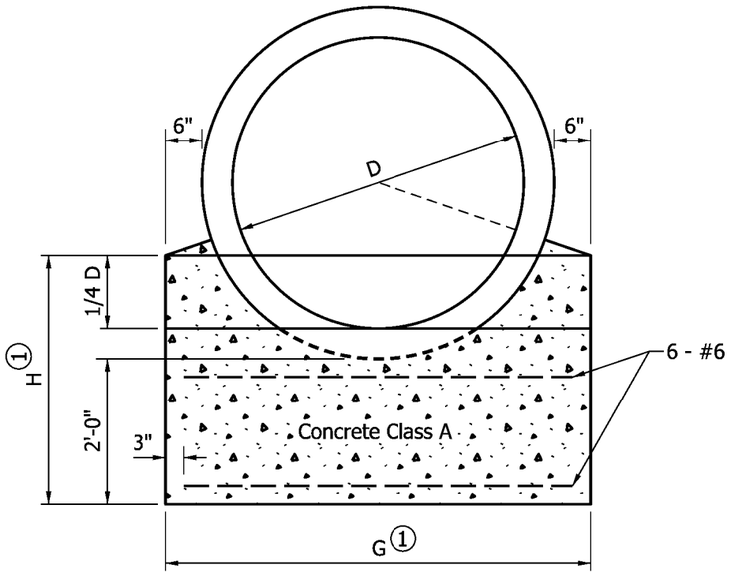
JANUARY 1998

STANDARD DRAWING NO. **E 715-SPCA-01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

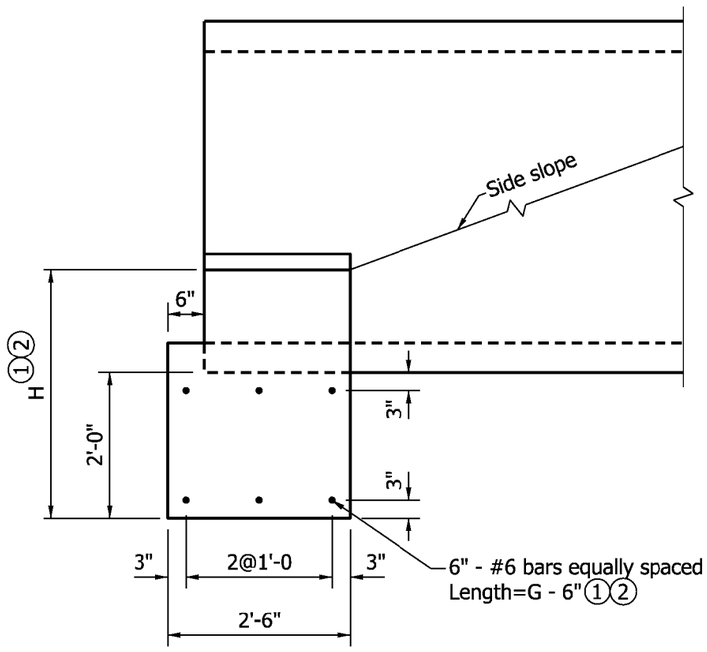
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	7-27-99
/s/ Anthony L. Uremovich, DESIGN STANDARDS ENGINEER	7-27-99
/s/ Firooz Zandi, CHIEF HIGHWAY ENGINEER	7-27-99
ORIGINALLY APPROVED	1-02-98

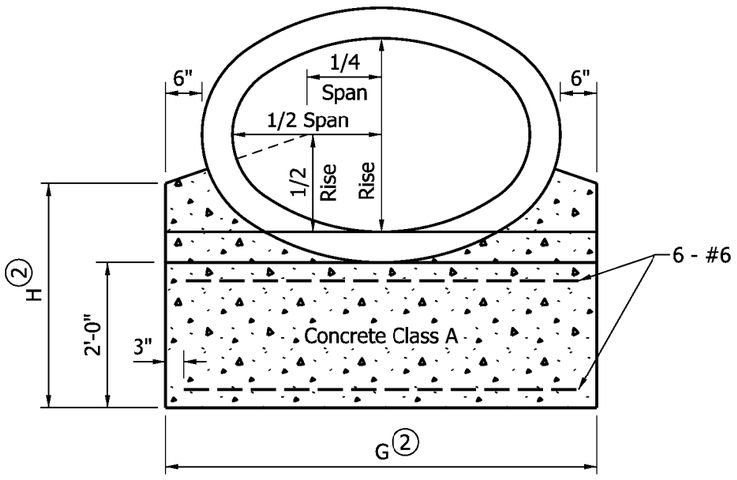


ANCHOR FOR
REINFORCED CONCRETE PIPE

FRONT ELEVATION



SIDE ELEVATION



ANCHOR FOR
REINFORCED CONCRETE HORIZONTAL ELLIPTICAL PIPE

FRONT ELEVATION

GENERAL NOTES

(1) For dimension, enter chart on Standard Drawing E 715-ANCH-01 with known dimension D.

(2) For dimension enter chart on Standard Drawing E 715-ANCH-02 with known span and rise.

3. Riprap shall be placed at the ends of pipe structures when shown on plans.

INDIANA DEPARTMENT OF TRANSPORTATION

SINGLE PIPE
CONCRETE ANCHOR

SEPTEMBER 2009

STANDARD DRAWING NO. E 715-SPCA-02

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE

STEEL STRUCTURAL PLATE PIPE-ARCH

SPAN	RISE	H	R	S	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE	
					G	CU.YDS. CONC. 2 ANCHORS	G	CU.YDS. CONC. 2 ANCHORS	G	CU.YDS. CONC. 2 ANCHORS
6'-1	4'-7	3'-11	3'-7½	9'-6	7'-5	3.5	16'-11	8.4	26'-5	13.3
6'-4	4'-9	3'-11	3'-10	9'-10	7'-8	3.6	17'-5	8.6	27'-4	13.6
6'-9	4'-11	4'-0	4'-0½	10'-6	8'-1	3.8	18'-7	9.3	29'-1	14.8
7'-0	5'-1	4'-0	4'-2	10'-10	8'-4	3.9	19'-2	9.5	30'-0	15.1
7'-3	5'-3	3'-11	4'-3½	11'-3	8'-7	4.0	19'-10	9.7	31'-1	15.4
7'-8	5'-5	4'-0	4'-6	11'-10	9'-0	4.2	20'-10	10.4	32'-8	16.5
7'-11	5'-7	4'-0	4'-7½	12'-3	9'-3	4.3	21'-6	10.6	33'-9	16.9
8'-2	5'-9	3'-11	4'-9	12'-6	9'-6	4.4	22'-0	10.7	34'-6	17.0
8'-7	5'-11	4'-1	4'-11½	12'-11	9'-11	4.6	22'-10	11.3	35'-9	18.0
8'-10	6'-1	4'-0	5'-1	13'-2	10'-2	4.7	23'-4	11.4	36'-6	18.1
9'-4	6'-3	4'-2	5'-4	13'-8	10'-8	5.0	24'-4	12.1	38'-0	19.3
9'-6	6'-5	4'-1	5'-5	13'-10	10'-10	5.0	24'-8	12.1	38'-6	19.2
9'-9	6'-7	4'-0	5'-6½	14'-1	11'-1	5.1	25'-2	12.1	39'-3	19.2
10'-3	6'-9	4'-2	5'-9½	14'-7	11'-7	5.4	26'-2	12.9	40'-9	20.4
10'-8	6'-11	4'-4	6'-0	15'-0	12'-0	5.8	27'-0	13.7	42'-0	21.6
10'-11	7'-1	4'-3	6'-1½	15'-3	12'-3	5.8	27'-6	13.7	42'-9	21.6
11'-5	7'-3	4'-6	6'-4½	15'-9	12'-9	6.2	28'-6	14.6	44'-3	23.0
11'-7	7'-5	4'-5	6'-5½	15'-11	12'-11	6.2	28'-10	14.5	44'-9	22.9
11'-10	7'-7	4'-3	6'-7	16'-2	13'-2	6.2	29'-4	14.5	45'-6	22.8
12'-4	7'-9	4'-6	6'-10	16'-8	13'-8	6.6	30'-4	15.4	47'-0	24.3
12'-6	7'-11	4'-4	6'-11	16'-10	13'-10	6.6	30'-8	15.3	47'-6	24.0
12'-8	8'-1	4'-3	7'-0	17'-0	14'-0	6.5	31'-0	15.2	48'-0	23.8
12'-10	8'-4	4'-2	7'-1	17'-2	14'-2	6.5	31'-4	15.1	48'-6	23.7
13'-3	9'-4	5'-0	7'-3½	17'-7	14'-7	7.3	32'-2	17.1	49'-9	26.9
13'-6	9'-6	5'-0	7'-5	17'-10	14'-10	7.4	32'-8	17.2	50'-6	27.0
14'-0	9'-8	5'-0	7'-8	18'-4	15'-4	7.7	33'-8	17.9	52'-0	28.1
14'-2	9'-10	5'-0	7'-9	18'-6	15'-6	7.7	34'-0	17.9	52'-6	28.1
14'-5	10'-0	5'-0	7'-10½	18'-9	15'-9	7.8	34'-6	18.0	53'-3	28.2
14'-11	10'-2	5'-2	8'-1½	19'-3	16'-3	8.2	35'-6	18.9	54'-9	29.6
15'-4	10'-4	5'-2	8'-4	19'-8	16'-8	8.6	36'-4	19.6	56'-0	30.7
15'-7	10'-6	5'-2	8'-5½	19'-11	16'-11	8.6	36'-10	19.7	56'-9	30.8
15'-10	10'-8	5'-2	8'-7	20'-2	17'-2	8.6	37'-4	19.7	57'-6	30.9
16'-3	10'-10	5'-2	8'-9½	20'-7	17'-7	9.0	38'-2	20.5	58'-9	32.0
16'-6	11'-0	5'-5	8'-11	20'-10	17'-10	9.1	38'-8	20.7	59'-6	32.4
17'-0	11'-2	5'-5	9'-2	21'-4	18'-4	9.5	39'-8	21.6	61'-0	33.7
17'-2	11'-4	5'-5	9'-3	21'-6	18'-6	9.5	40'-0	21.5	61'-6	33.6
17'-5	11'-6	5'-5	9'-4½	21'-9	18'-9	9.5	40'-6	21.6	62'-3	33.7
17'-11	11'-8	5'-5	9'-7½	22'-3	19'-3	9.9	41'-6	22.5	63'-9	35.0
18'-1	11'-10	5'-6	9'-8½"	22'-5	19'-5	9.9	41'-10	22.7	64'-3	35.4
18'-7	12'-0	5'-6	9'-11½"	22'-11	19'-11	10.3	42'-10	23.4	65'-9	36.7
18'-9	12'-2	5'-6	10'-0½"	23'-1	20'-1	10.3	43'-2	23.6	66'-3	36.7
19'-3	12'-4	5'-6	10'-3½"	23'-7	20'-7	10.8	44'-2	24.6	67'-9	38.8
19'-6	12'-6	5'-6	10'-5	23'-10	20'-10	10.8	44'-8	24.6	68'-6	38.2
19'-8	12'-8	5'-6	10'-6	24'-0	21'-0	10.7	45'-0	24.4	69'-0	37.9
19'-11	12'-10	5'-6	10'-7½"	24'-3	21'-3	10.7	45'-6	24.2	69'-9	37.7
20'-5	13'-0	5'-6	10'-10½"	24'-9	21'-9	11.2	46'-5	25.4	71'-3	39.4
20'-7	13'-2	5'-6	10'-11½"	24'-11	21'-11	11.1	46'-10	25.3	71'-9	39.5

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE ANCHOR TABLES

JANUARY 1998

STANDARD DRAWING NO. E 717-ANCH-01

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

STEEL OR ALUMINUM ALLOY STRUCTURAL PLATE PIPE

D	H	R	S	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE	
				G	CU.YDS. CONC. 2 ANCHORS	G	CU.YDS. CONC. 2 ANCHORS	G	CU.YDS. CONC. 2 ANCHORS
5'-0	3'-5	3'-2	7'-10	6'-4	3.1	14'-2	7.1	22'-0	11.0
5'-6	3'-7	3'-5	8'-7	6'-10	3.4	15'-5	7.9	24'-0	12.4
6'-0	3'-8	3'-8	9'-4	7'-4	3.7	16'-8	8.6	26'-0	13.6
6'-6	3'-10	3'-11	10'-1	7'-10	4.1	17'-11	9.5	28'-0	15.0
7'-0	3'-11	4'-2	10'-10	8'-4	4.3	19'-2	10.3	30'-0	16.2
7'-6	4'-1	4'-5	11'-7	8'-10	4.7	20'-5	11.3	32'-0	17.8
8'-0	4'-2	4'-8	12'-4	9'-4	5.0	21'-8	12.1	34'-0	19.1
8'-6	4'-4	4'-11	12'-10	9'-10	5.4	22'-8	12.9	35'-6	20.4
9'-0	4'-5	5'-2	13'-4	10'-4	5.7	23'-8	13.5	37'-0	21.4
9'-6	4'-7	5'-5	13'-10	10'-10	6.1	24'-8	14.4	38'-6	22.7
10'-0	4'-8	5'-8	14'-4	11'-4	6.4	25'-8	15.1	40'-0	23.7
10'-6	4'-10	5'-11	14'-10	11'-10	6.8	26'-8	16.0	41'-6	25.2
11'-0	4'-11	6'-2	15'-4	12'-4	7.2	27'-8	16.7	43'-0	26.2
11'-6	5'-1	6'-5	15'-10	12'-10	7.6	28'-8	17.6	44'-6	27.7
12'-0	5'-2	6'-8	16'-4	13'-4	7.9	29'-8	18.3	46'-0	28.7
12'-6	5'-4	6'-11	16'-10	13'-10	8.4	30'-8	19.3	47'-6	30.3
13'-0	5'-5	7'-2	17'-4	14'-4	8.7	31'-8	20.0	49'-0	31.3
13'-6	5'-7	7'-5	17'-10	14'-10	9.2	32'-8	21.1	50'-6	32.9
14'-0	5'-8	7'-8	18'-4	15'-4	9.6	33'-8	21.8	52'-0	34.0
14'-6	5'-10	7'-11	18'-10	15'-10	10.1	34'-8	22.9	53'-6	35.7
15'-0	5'-11	8'-2	19'-4	16'-4	10.4	35'-8	23.6	55'-0	36.8
15'-6	6'-1	8'-5	19'-10	16'-10	10.9	36'-8	24.7	56'-6	38.5
16'-0	6'-2	8'-8	20'-4	17'-4	11.3	37'-8	25.5	58'-0	39.7
16'-6	6'-4	8'-11	20'-10	17'-10	11.9	38'-8	26.7	59'-0	41.5
17'-0	6'-5	9'-2	21'-4	18'-4	12.3	39'-8	27.5	61'-0	42.7
17'-6	6'-7	9'-5	21'-10	18'-10	12.8	40'-8	28.6	62'-6	44.5
18'-0	6'-8	9'-8	22'-4	19'-4	13.2	41'-8	29.5	64'-0	45.7
18'-6	6'-10	9'-11	22'-10	19'-10	13.8	42'-8	30.7	65'-6	47.6
19'-0	6'-11	10'-2	23'-4	20'-4	14.2	43'-8	31.5	67'-0	48.8
19'-6	7'-1	10'-5	23'-10	20'-10	14.8	44'-8	32.8	68'-6	50.8
20'-0	7'-2	10'-8	24'-4	21'-4	15.2	45'-8	33.6	70'-0	52.1
20'-6	7'-4	10'-11	24'-10	21'-10	15.8	46'-8	34.9	71'-6	54.2
21'-0	7'-5	11'-2	25'-4	22'-4	16.2	47'-8	35.8	73'-0	55.6

GENERAL NOTES

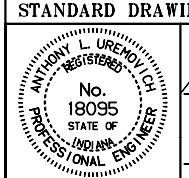
1. Refer to Standard Drawing E 717-SPCA-01 for single pipe anchor details.
2. Refer to Standard Drawings E 717-MPCA-01 and E 717-MPCA-02 for multiple pipe anchor details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE ANCHOR TABLES

JANUARY 1998

STANDARD DRAWING NO. **E 717-ANCH-02**



DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

ALUMINUM ALLOY STRUCTURAL PLATE PIPE-ARCH

SPAN	RISE	H	R	S	SINGLE PIPE		DOUBLE PIPE		TRIPLE PIPE	
					G	CU.YDS. CONC. 2 ANCHORS	G	m^3 CONC., 2 ANCHORS	G	m^3 CONC., 2 ANCHORS
6'-7	5'-8	5'-0	4'-0	10'-4	8'-0	4.2	18'-4	10.3	28'-8	16.4
6'-11	5'-9	5'-0	4'-2	10'-10	8'-4	4.3	19'-2	10.7	30'-0	17.1
7'-3	5'-11	5'-0	4'-4	11'-4	8'-8	4.4	20'-0	11.1	31'-4	17.7
7'-9	6'-0	5'-0	4'-7	12'-1	9'-2	4.8	21'-3	11.9	33'-4	19.1
8'-1	6'-1	5'-0	4'-9	12'-6	9'-6	4.9	22'-0	12.2	34'-6	19.6
8'-5	6'-3	5'-2	4'-11	12'-10	9'-10	5.0	22'-8	12.6	35'-6	20.1
8'-10	6'-4	5'-2	5'-1½	13'-3	10'-3	5.3	23'-6	13.2	36'-9	21.1
9'-3	6'-5	5'-2	5'-4	13'-8	10'-8	5.5	24'-4	13.5	38'-0	21.6
9'-7	6'-6	5'-2	5'-6	14'-0	11'-0	5.6	25'-0	13.7	39'-0	21.9
9'-11	6'-8	5'-2	5'-8	14'-4	11'-4	5.7	25'-8	13.9	40'-0	22.2
10'-3	6'-9	5'-2	5'-10	14'-8	11'-8	5.8	26'-4	14.1	41'-0	22.4
10'-9	6'-10	5'-5	6'-1	15'-2	12'-2	6.3	27'-4	15.2	42'-6	24.2
11'-1	7'-0	5'-5	6'-3	15'-6	12'-6	6.4	28'-0	15.4	43'-6	24.4
11'-5	7'-1	5'-5	6'-5	15'-10	12'-10	6.4	28'-8	15.5	44'-6	24.6
11'-9	7'-2	5'-5	6'-7	16'-2	13'-2	6.5	29'-4	15.7	45'-6	24.8
12'-3	7'-3	5'-6	6'-10	16'-8	13'-8	7.1	30'-4	16.8	47'-0	26.6
12'-7	7'-5	5'-6	7'-0	17'-0	14'-0	7.1	31'-0	16.9	48'-0	26.8
12'-11	7'-6	5'-6	7'-2	17'-4	14'-4	7.2	31'-8	17.1	49'-0	26.9
13'-1	8'-2	5'-6	7'-3	17'-6	14'-6	7.7	32'-0	18.1	49'-6	28.5
13'-1	8'-4	5'-6	7'-3	17'-6	14'-6	7.2	32'-0	17.1	49'-6	26.9
13'-11	8'-5	5'-9	7'-8	18'-4	15'-4	8.5	33'-8	19.7	52'-0	31.0
14'-0	8'-7	5'-9	7'-8½	18'-5	15'-5	7.9	33'-10	18.7	52'-3	29.4
13'-11	9'-5	5'-9	7'-8	18'-4	15'-4	8.2	33'-8	19.2	52'-0	30.2
14'-3	9'-7	5'-9	7'-10	18'-8	15'-8	8.3	34'-4	19.4	53'-0	30.5
14'-8	9'-8	5'-9	8'-0½	19'-1	16'-1	8.6	35'-2	20.1	54'-3	31.5
14'-11	9'-10	5'-9	8'-2	19'-4	16'-4	8.7	35'-8	20.2	55'-0	31.7
15'-4	10'-0	6'-0	8'-4½	19'-9	16'-9	9.1	36'-6	21.1	56'-3	33.1
15'-7	10'-2	6'-0	8'-6	20'-0	17'-0	9.1	37'-0	21.2	57'-0	33.2
16'-1	10'-4	6'-0	8'-9	20'-6	17'-6	9.6	38'-0	22.1	58'-6	34.5
16'-4	10'-6	6'-0	8'-10½	20'-9	17'-9	9.6	38'-6	22.1	59'-3	34.6
16'-9	10'-8	6'-0	9'-1	21'-2	18'-2	10.0	39'-4	22.9	60'-6	35.8
17'-0	10'-10	6'-0	9'-2½	21'-5	18'-5	10.0	39'-10	22.9	61'-3	35.9
17'-3	11'-0	6'-0	9'-4	21'-8	18'-8	10.0	40'-4	23.0	62'-0	35.9
17'-9	11'-2	6'-0	9'-7	22'-2	19'-2	10.5	41'-4	24.1	63'-6	37.7
18'-0	11'-4	6'-3	9'-8½"	22'-5	19'-5	10.6	41'-10	24.3	64'-3	38.0
18'-5	11'-6	6'-3	9'-11	22'-10	19'-10	11.0	42'-8	25.2	65'-6	39.5
18'-8	11'-8	6'-3	10'-0½"	23'-1	20'-1	11.0	43'-2	25.2	66'-3	39.4
19'-2	11'-9	6'-3	10'-3½"	23'-7	20'-7	11.5	44'-2	26.1	67'-9	40.7
19'-5	11'-11	6'-3	10'-5	23'-10	20'-10	11.5	44'-8	26.2	68'-6	40.9
19'-10	12'-1	6'-3	10'-7½"	24'-3	21'-3	12.0	45'-6	27.2	69'-9	42.5
20'-1	12'-3	6'-3	10'-9	24'-6	21'-6	12.0	46'-0	27.1	70'-6	42.3
20'-1	12'-6	6'-3	10'-9	24'-6	21'-6	11.4	46'-0	25.8	70'-6	40.1
20'-10	12'-7	6'-6	11'-1½"	25'-3	22'-3	12.5	47'-6	28.3	72'-9	44.0
21'-1	12'-9	6'-6	11'-3	25'-6	22'-6	12.5	48'-0	28.1	73'-6	43.8
21'-6	12'-11	6'-6	11'-5½"	25'-11	22'-11	13.0	48'-10	29.4	74'-9	45.9

GENERAL NOTES

1. Refer to Standard Drawing E 717-SPCA-01 for single pipe anchor details.

2. Refer to Standard Drawings E 717-MPCA-01 and E 717-MPCA-02 for multiple pipe anchor details.

INDIANA DEPARTMENT OF TRANSPORTATION

CONCRETE ANCHOR TABLES

JANUARY 1998

STANDARD DRAWING NO. **E 717-ANCH-03**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

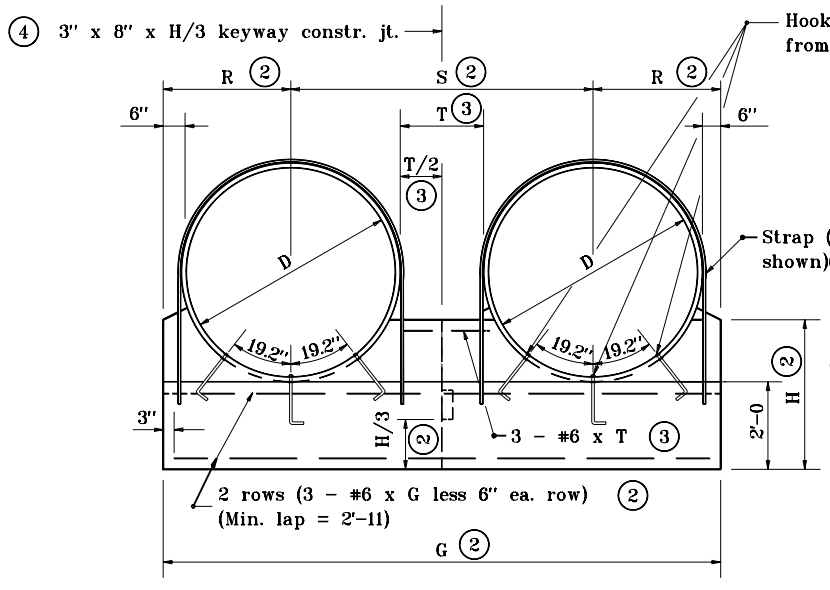
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

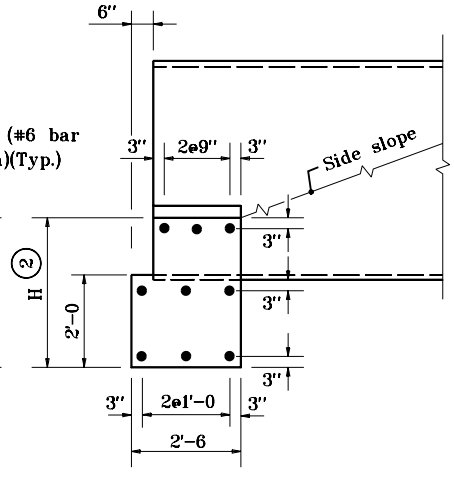
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98



ANCHOR FOR DOUBLE PIPE INSTALLATION
FRONT ELEVATION



SECTION THROUGH ANCHOR

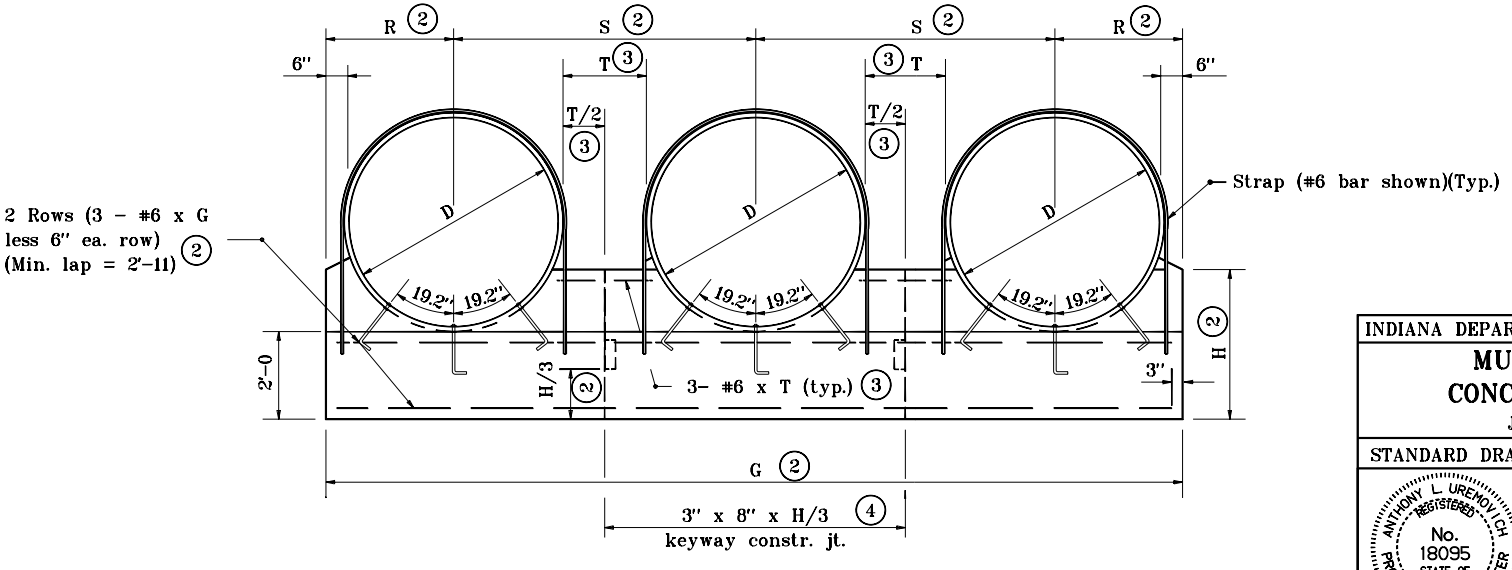
GENERAL NOTES

1. Circular pipes shown. For details of structural plate pipe-arches alternates, see partial elevations on Standard Drawing E 717-MPCA-02.

(2) For dimension, enter chart on Standard Drawing E 717-ANCH-01 with known dimension D.

(3) T = Clear distance between pipes.
For D less than 48", T = 2'-0.
For D of 48" to 96" T = 1/2 D
For D greater than 96", T = 4'-0.

(4) No joint required if G is less than or equal to 30'. One joint required if G is greater than 30' but less than or equal to 42'. Two joints required if G is greater than 42'.



ANCHOR FOR TRIPLE PIPE INSTALLATION
FRONT ELEVATION

INDIANA DEPARTMENT OF TRANSPORTATION

MULTIPLE PIPE CONCRETE ANCHOR

JANUARY 1998

STANDARD DRAWING NO. **E 717-MPCA-01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

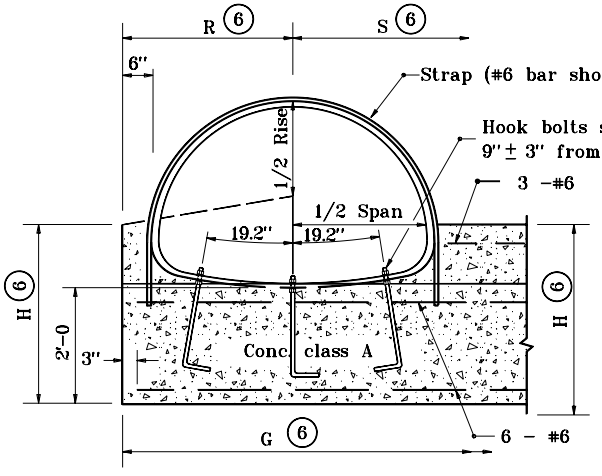
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER — DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER — DATE

ORIGINALLY APPROVED 1-02-98



ANCHOR FOR STRUCTURAL PLATE PIPE-ARCH
PARTIAL ELEVATION

GENERAL NOTES

1. Anchor straps shall be used at both upstream and downstream ends of all structural plate pipes and pipe-arches.
2. See Standard Drawing E 715-PASD-01 for anchor strap details.
3. Hook bolts and anchor straps shall be used for all structural plate pipes and pipe-arches with a diameter or span of 84" or greater.
4. See Standard Drawing E 715-PAHB-01 for hook bolt details.
5. Riprap shall be placed at the ends of pipe structures when shown on the plans.

(6) For dimension, enter chart on Standard Drawings E 717-ANCH-01 or E 717-ANCH-02 with known dimension D or span and rise.

INDIANA DEPARTMENT OF TRANSPORTATION

MULTIPLE PIPE CONCRETE ANCHOR

JANUARY 1998

STANDARD DRAWING NO. **E 717-MPCA-02**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

9" x 2½" STRUCTURAL PLATE ALUMINUM ALLOY PIPE (STEEL BOLTED)
HEIGHT OF COVER LIMITS (ft.)

	AREA (sft)	DIAMETER (in.)	THICKNESS (in.)										
			0.100		0.125		0.150		0.175		0.200		
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
	19.6	60	1.0	31.1	1.0	45.5	1.0	60.1	1.0	70.7	1.0	81.5	
	23.8	66	1.0	28.2	1.0	41.4	1.0	54.6	1.0	64.3	1.0	74.1	
	28.3	72	1.0	25.9	1.0	37.9	1.0	50.0	1.0	58.9	1.0	67.9	
	33.2	78	1.0	23.9	1.0	35.0	1.0	46.2	1.0	54.4	1.0	62.7	
	38.5	84	1.0	22.2	1.0	32.5	1.0	42.9	1.0	50.5	1.0	58.2	
	44.2	90	1.1	20.7	1.0	30.3	1.0	40.0	1.0	47.1	1.0	54.3	
	50.3	96	1.1	19.4	1.0	28.4	1.0	37.5	1.0	44.2	1.0	50.9	
	56.7	102	1.1	18.3	1.1	26.7	1.1	35.3	1.1	41.6	1.1	47.9	
	63.6	108	1.2	17.2	1.1	25.3	1.1	33.3	1.1	39.3	1.1	45.3	
	70.9	114	1.3	16.3	1.2	23.9	1.2	31.6	1.2	37.2	1.2	42.9	
	78.5	120	1.3	15.5	1.3	22.7	1.3	30.0	1.3	35.3	1.3	40.7	
	86.6	126	1.4	14.8	1.3	21.6	1.3	28.6	1.3	33.7	1.3	38.8	
	95.0	132	1.4	14.1	1.4	20.7	1.4	27.3	1.4	32.1	1.4	37.0	
	103.9	138	1.5	13.5	1.4	19.8	1.4	26.1	1.4	30.7	1.4	35.4	
	113.1	144	1.6	12.9	1.5	18.9	1.5	25.0	1.5	29.4	1.5	33.9	
	122.7	150			1.6	18.2	1.6	24.0	1.6	28.3	1.6	32.6	
	132.7	156			1.6	17.5	1.6	23.1	1.6	27.2	1.6	31.3	
	143.1	162					1.7	22.2	1.7	26.2	1.7	30.2	
	153.9	168					1.8	21.4	1.8	25.2	1.8	29.1	
	165.1	174					1.8	20.7	1.8	24.4	1.8	28.1	
	176.7	180							1.9	23.5	1.9	27.1	
	188.7	186							1.9	22.8	1.9	26.3	
	201.1	192									2.0	25.4	
	213.8	198									2.1	24.7	
	227.0	204									2.1	23.9	
	240.5	210											
	254.5	216											
	268.8	222											
	283.5	228											

NOTE:

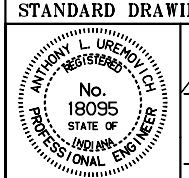
1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-01**



DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

9" x 2½" STRUCTURAL PLATE ALUMINUM ALLOY PIPE (STEEL BOLTED)
HEIGHT OF COVER LIMITS (ft.)

	AREA (sft.)	DIAMETER (in.)	THICKNESS (in.)										
			0.225		0.250								
			MIN.	MAX.	MIN.	MAX.							
	19.6	60	1.0	92.4	1.0	100.0							
	23.8	66	1.0	84.0	1.0	94.0							
	28.3	72	1.0	77.0	1.0	86.2							
	33.2	78	1.0	71.1	1.0	79.5							
	38.5	84	1.0	66.0	1.0	73.8							
	44.2	90	1.0	61.6	1.0	68.9							
	50.3	96	1.0	57.7	1.0	64.6							
	56.7	102	1.1	54.3	1.1	60.8							
	63.6	108	1.1	51.3	1.1	57.4							
	70.9	114	1.2	48.6	1.2	54.4							
	78.5	120	1.3	46.2	1.3	51.7							
	86.6	126	1.3	44.0	1.3	49.2							
	95.0	132	1.4	42.0	1.4	47.0							
	103.9	138	1.4	40.1	1.4	44.9							
	113.1	144	1.5	38.5	1.5	43.1							
	122.7	150	1.6	36.9	1.6	41.3							
	132.7	156	1.6	35.5	1.6	39.7							
	143.1	162	1.7	34.2	1.7	38.3							
	153.9	168	1.8	33.0	1.8	36.9							
	165.1	174	1.8	31.8	1.8	35.6							
	176.7	180	1.9	30.8	1.9	34.4							
	188.7	186	1.9	29.8	1.9	33.3							
	201.1	192	2.0	28.8	2.0	32.3							
	213.8	198	2.1	28.0	2.1	31.3							
	227.0	204	2.1	27.1	2.1	30.4							
	240.5	210	2.2	26.4	2.2	29.5							
	254.5	216	2.3	25.6	2.3	28.7							
	268.8	222			2.3	27.9							
	283.5	228			2.4	27.2							

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-02**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

9" x 2½" STRUCTURAL PLATE ALUMINUM ALLOY PIPE-ARCH (STEEL BOLTED)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (ft.-in.)	RISE (ft.-in.)	AREA (sft.)	THICKNESS (in.)									
				0.100		0.125		0.150		0.175		0.200	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
31.75	6'-7	5'-8	29	1.0	23.6	1.0	26.7	1.0	26.7	1.0	26.7	1.0	26.7
31.75	6'-11	5'-9	31	1.0	22.4	1.0	25.4	1.0	25.4	1.0	25.4	1.0	25.4
31.75	7'-3	5'-11	34	1.1	21.4	1.0	24.2	1.0	24.2	1.0	24.2	1.0	24.2
31.75	7'-9	6'-0	36	1.1	20.0	1.0	22.7	1.0	22.7	1.0	22.7	1.0	22.7
31.75	8'-1	6'-1	39	1.1	19.2	1.1	21.7	1.1	21.7	1.1	21.7	1.1	21.7
31.75	8'-5	6'-3	41	1.1	18.4	1.1	20.9	1.1	20.9	1.1	20.9	1.1	20.9
31.75	8'-10	6'-4	44	1.2	17.6	1.1	19.9	1.1	19.9	1.1	19.9	1.1	19.9
31.75	9'-3	6'-5	47	1.2	16.8	1.2	19.0	1.2	19.0	1.2	19.0	1.2	19.0
31.75	9'-7	6'-6	49	1.3	16.2	1.2	18.3	1.2	18.3	1.2	18.3	1.2	18.3
31.75	9'-11	6'-8	52	1.3	15.6	1.2	17.7	1.2	17.7	1.2	17.7	1.2	17.7
31.75	10'-3	6'-9	55	1.3	15.1	1.3	17.1	1.3	17.1	1.3	17.1	1.3	17.1
31.75	10'-9	6'-10	58	1.4	14.4	1.3	16.3	1.3	16.3	1.3	16.3	1.3	16.3
31.75	11'-1	7'-0	61	1.5	14.0	1.4	15.8	1.4	15.8	1.4	15.8	1.4	15.8
31.75	11'-5	7'-1	64	1.5	13.6	1.4	15.4	1.4	15.4	1.4	15.4	1.4	15.4
31.75	11'-9	7'-2	67	1.5	13.2	1.5	14.9	1.5	14.9	1.5	14.9	1.5	14.9
31.75	12'-3	7'-3	70	1.6	12.6	1.5	14.3	1.5	14.3	1.5	14.3	1.5	14.3
31.75	12'-7	7'-5	73	1.7	11.7	1.6	13.9	1.6	13.9	1.6	13.9	1.6	13.9
31.75	12'-11	7'-6	77	1.7	11.3	1.6	13.6	1.6	13.6	1.6	13.6	1.6	13.6
31.75	13'-1	8'-2	83	1.7	11.2	1.6	13.4	1.6	13.4	1.6	13.4	1.6	13.4
31.75	13'-1	8'-4	86	1.7	11.2	1.6	13.4	1.6	13.4	1.6	13.4	1.6	13.4
31.75	13'-11	8'-5	90	1.9	10.4	1.7	12.0	1.7	12.0	1.7	12.0	1.7	12.0
31.75	14'-0	8'-7	94	1.9	10.3	1.8	11.9	1.8	11.9	1.8	11.9	1.8	11.9
31.75	13'-11	9'-5	101	1.9	10.4	1.7	12.0	1.7	12.0	1.7	12.0	1.7	12.0
31.75	14'-3	9'-7	105	1.9	10.1	1.8	11.7	1.8	11.7	1.8	11.7	1.8	11.7
31.75	14'-8	9'-8	109			1.8	11.3	1.8	11.3	1.8	11.3	1.8	11.3
31.75	14'-11	9'-10	114			1.9	11.1	1.9	11.1	1.9	11.1	1.9	11.1

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. A specific design shall be performed for structures with corner radii other than those tabulated above to determine the appropriate cover depth limits.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-03**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

9" x 2½" STRUCTURAL PLATE ALUMINUM ALLOY PIPE-ARCH (STEEL BOLTED)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	RISE (ft.-in.)	RISE (ft.-in.)	AREA (sft.)	THICKNESS (in.)									
				0.225		0.250							
				MIN.	MAX.	MIN.	MAX.						
31.75	6'-7	5'-8	29	1.0	26.7	1.0	26.7						
31.75	6'-11	5'-9	31	1.0	25.4	1.0	25.4						
31.75	7'-3	5'-11	34	1.0	24.2	1.0	24.2						
31.75	7'-9	6'-0	36	1.0	22.7	1.0	22.7						
31.75	8'-1	6'-1	39	1.1	21.7	1.1	21.7						
31.75	8'-5	6'-3	41	1.1	20.9	1.1	20.9						
31.75	8'-10	6'-4	44	1.1	19.9	1.1	19.9						
31.75	9'-3	6'-5	47	1.2	19.0	1.2	19.0						
31.75	9'-7	6'-6	49	1.2	18.3	1.2	18.3						
31.75	9'-11	6'-8	52	1.2	17.7	1.2	17.7						
31.75	10'-3	6'-9	55	1.3	17.1	1.3	17.1						
31.75	10'-9	6'-10	58	1.3	16.3	1.3	16.3						
31.75	11'-1	7'-0	61	1.4	15.8	1.4	15.8						
31.75	11'-5	7'-1	64	1.4	15.4	1.4	15.4						
31.75	11'-9	7'-2	67	1.5	14.9	1.5	14.9						
31.75	12'-3	7'-3	70	1.5	14.3	1.5	14.3						
31.75	12'-7	7'-5	73	1.6	13.9	1.6	13.9						
31.75	12'-11	7'-6	77	1.6	13.6	1.6	13.6						
31.75	13'-1	8'-2	83	1.6	13.4	1.6	13.4						
31.75	13'-1	8'-4	86	1.6	13.4	1.6	13.4						
31.75	13'-11	8'-5	90	1.7	12.0	1.7	12.0						
31.75	14'-0	8'-7	94	1.8	11.9	1.8	11.9						
31.75	13'-11	9'-5	101	1.7	12.0	1.7	12.0						
31.75	14'-3	9'-7	105	1.8	11.7	1.8	11.7						
31.75	14'-8	9'-8	109	1.8	11.3	1.8	11.3						
31.75	14'-11	9'-10	114	1.9	11.1	1.9	11.1						

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. A specific design shall be performed for structures with corner radii other than those tabulated above to determine the appropriate cover depth limits.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-04**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

9" x 2½" STRUCTURAL PLATE ALUMINUM ALLOY PIPE-ARCH (STEEL BOLTED)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (ft.-in.)	RISE (ft.-in.)	AREA (sft)	THICKNESS (in.)									
				0.100		0.125		0.150		0.175		0.200	
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
31.75	15-4	10-0	118			1.9	10.7	1.9	10.7	1.9	10.7	1.9	10.7
31.75	15-7	10-2	123			2.0	10.5	2.0	10.5	2.0	10.5	2.0	10.5
31.75	16-1	10-4	127			2.0	10.1	2.0	10.1	2.0	10.1	2.0	10.1
31.75	16-4	10-6	132					2.0	9.9	2.0	9.9	2.0	9.9
31.75	16-9	10-8	136					2.1	9.6	2.1	9.6	2.1	9.6
31.75	17-0	10-10	141					2.1	9.5	2.1	9.5	2.1	9.5
31.75	17-3	11-0	146					2.2	9.3	2.2	9.3	2.2	9.3
31.75	17-9	11-2	151							2.2	8.9	2.2	8.9
31.75	18-0	11-4	156							2.3	8.8	2.3	8.8
31.75	18-5	11-6	161							2.3	8.5	2.3	8.5
31.75	18-8	11-8	167							2.3	8.4	2.3	8.4
31.75	19-2	11-9	172									2.4	8.0
31.75	19-5	11-11	177									2.4	7.9
31.75	19-10	12-1	182									2.5	7.7
31.75	20-1	12-3	188									2.5	7.5
31.75	20-1	12-6	194										
31.75	20-10	12-7	199										
31.75	21-1	12-9	205										
31.75	21-6	12-11	211										
47.00	20-1	13-11	216										
47.00	20-7	14-3	224										
47.00	21-5	14-7	241										
47.00	21-11	14-11	254										
47.00	22-8	15-3	267										

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. A specific design shall be performed for structures with corner radii other than those tabulated above to determine the appropriate cover depth limits.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-05**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

9" x 2½" STRUCTURAL PLATE ALUMINUM ALLOY PIPE-ARCH (STEEL BOLTED)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (ft.-in.)	RISE (ft.-in.)	AREA (sft)	THICKNESS (in.)									
				0.225		0.250							
				MIN.	MAX.	MIN.	MAX.						
31.75	15-4	10-0	118	1.9	10.7	1.9	10.7						
31.75	15-7	10-2	123	2.0	10.5	2.0	10.5						
31.75	16-1	10-4	127	2.0	10.1	2.0	10.1						
31.75	16-4	10-6	132	2.0	9.9	2.0	9.9						
31.75	16-9	10-8	136	2.1	9.6	2.1	9.6						
31.75	17-0	10-10	141	2.1	9.5	2.1	9.5						
31.75	17-3	11-0	146	2.2	9.3	2.2	9.3						
31.75	17-9	11-2	151	2.2	8.9	2.2	8.9						
31.75	18-0	11-4	156	2.3	8.8	2.3	8.8						
31.75	18-5	11-6	161	2.3	8.5	2.3	8.5						
31.75	18-8	11-8	167	2.3	8.4	2.3	8.4						
31.75	19-2	11-9	172	2.4	8.0	2.4	8.0						
31.75	19-5	11-11	177	2.4	7.9	2.4	7.9						
31.75	19-10	12-1	182	2.5	7.7	2.5	7.7						
31.75	20-1	12-3	188	2.5	7.5	2.5	7.5						
31.75	20-1	12-6	194	2.5	7.5	2.5	7.5						
31.75	20-10	12-7	199	2.6	7.1	2.6	7.1						
31.75	21-1	12-9	205	2.6	7.0	2.6	7.0						
31.75	21-6	12-11	211	2.7	6.7	2.7	6.7						
47.00	20-1	13-11	216			2.5	12.4						
47.00	20-7	14-3	224			2.6	12.1						
47.00	21-5	14-7	241			2.7	11.5						
47.00	21-11	14-11	254			2.7	11.2						
47.00	22-8	15-3	267			2.8	10.8						

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. A specific design shall be performed for structures with corner radii other than those tabulated above to determine the appropriate cover depth limits.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-06**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

6" x 2" STRUCTURAL PLATE STEEL PIPE (BOLTED)
HEIGHT OF COVER LIMITS (ft)

	AREA (sft)	DIAMETER (in.)	THICKNESS (in.)										
			0.111		0.140		0.170						
			MIN.	MAX.	MIN.	MAX.	MIN.	MAX.					
	19.6	60	1.0	47.7	1.0	68.8	1.0	90.0					
	23.8	66	1.0	43.4	1.0	62.6	1.0	81.8					
	28.3	72	1.0	39.8	1.0	57.4	1.0	75.0					
	33.2	78	1.0	36.7	1.0	52.9	1.0	69.2					
	38.5	84	1.0	34.1	1.0	49.2	1.0	64.2					
	44.2	90	1.0	31.8	1.0	45.9	1.0	60.0					
	50.3	96	1.0	29.8	1.0	43.0	1.0	56.2					
	56.7	102	1.1	28.1	1.1	40.5	1.1	52.9					
	63.6	108	1.1	26.5	1.1	38.2	1.1	50.0					
	70.9	114	1.2	25.1	1.2	36.2	1.2	47.3					
	78.5	120	1.3	23.8	1.3	34.4	1.3	45.0					
	86.6	126	1.3	22.7	1.3	32.8	1.3	42.8					
	95.0	132	1.4	21.7	1.4	31.3	1.4	40.9					
	103.9	138	1.4	20.7	1.4	29.9	1.4	39.1					
	113.1	144	1.5	19.9	1.5	28.7	1.5	37.5					
	122.7	150	1.6	19.1	1.6	27.5	1.6	36.0					
	132.7	156	1.6	18.3	1.6	26.4	1.6	34.6					
	143.1	162	1.7	17.6	1.7	25.5	1.7	33.3					
	153.9	168	1.8	17.0	1.8	24.6	1.8	32.1					
	165.1	174	1.8	16.4	1.8	23.7	1.8	31.0					
	176.7	180	1.9	15.9	1.9	22.9	1.9	30.0					
	188.7	186	1.9	15.4	1.9	22.2	1.9	29.0					
	201.1	192			2.0	21.5	2.0	28.1					
	213.8	198			2.1	20.8	2.1	27.2					
	227.0	204			2.1	20.2	2.1	26.4					
	240.5	210			2.2	19.6	2.2	25.7					
	254.5	216					2.3	25.0					
	268.8	222					2.3	24.3					
	283.5	228					2.4	23.0					
	298.6	234					2.4	7.0					
	314.2	240											
	330.1	246											
	346.4	252											

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. The tabulated plate thickness reflects the required thickness for top and side plates. Refer to 908.09 (a) for the required bottom plate thickness.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-07**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

6" x 2" STRUCTURAL PLATE STEEL PIPE (BOLTED)
HEIGHT OF COVER LIMITS (in.)

AREA (sft)	DIAMETER (in.)	THICKNESS (in.)							
		0.188		0.218		0.249		0.280	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
19.6	60	1.0	100.0	1.0	100.0	1.0	100.0	1.0	100.0
23.8	66	1.0	93.9	1.0	100.0	1.0	100.0	1.0	100.0
28.3	72	1.0	86.1	1.0	100.0	1.0	100.0	1.0	100.0
33.2	78	1.0	79.4	1.0	95.7	1.0	100.0	1.0	100.0
38.5	84	1.0	73.8	1.0	88.8	1.0	100.0	1.0	100.0
44.2	90	1.0	68.8	1.0	82.9	1.0	97.7	1.0	100.0
50.3	96	1.0	64.5	1.0	77.7	1.0	91.6	1.0	100.0
56.7	102	1.1	60.7	1.1	73.2	1.1	86.2	1.1	94.1
63.6	108	1.1	57.4	1.1	69.1	1.1	84.1	1.1	88.8
70.9	114	1.2	54.3	1.2	65.4	1.2	77.1	1.2	84.2
78.5	120	1.3	51.6	1.3	62.2	1.3	73.3	1.3	80.0
86.6	126	1.3	49.2	1.3	59.2	1.3	69.8	1.3	76.1
95.0	132	1.4	46.9	1.4	56.5	1.4	66.6	1.4	72.7
103.9	138	1.4	44.9	1.4	54.1	1.4	63.7	1.4	69.5
113.1	144	1.5	43.0	1.5	51.8	1.5	61.1	1.5	66.6
122.7	150	1.6	41.3	1.6	49.7	1.6	58.6	1.6	64.0
132.7	156	1.6	39.7	1.6	47.8	1.6	56.4	1.6	61.5
143.1	162	1.7	38.2	1.7	46.0	1.7	54.3	1.7	59.2
153.9	168	1.8	36.9	1.8	44.4	1.8	52.3	1.8	57.1
165.1	174	1.8	35.6	1.8	42.9	1.8	50.5	1.8	55.1
176.7	180	1.9	34.4	1.9	41.4	1.9	48.8	1.9	53.3
188.7	186	1.9	33.3	1.9	40.1	1.9	47.3	1.9	51.6
210.1	192	2.0	32.2	2.0	38.8	2.0	45.8	2.0	50.0
213.8	198	2.1	31.3	2.1	37.7	2.1	44.4	2.1	48.4
227.0	204	2.1	30.3	2.1	36.6	2.1	43.1	2.1	47.0
240.5	210	2.1	29.5	2.1	35.5	2.1	41.9	2.1	45.7
254.5	216	2.3	28.7	2.3	34.5	2.3	40.7	2.3	44.4
268.8	222	2.3	27.9	2.3	33.6	2.3	39.6	2.3	43.2
283.5	228	2.4	27.1	2.4	32.7	2.4	38.5	2.4	42.1
298.6	234	2.4	26.4	2.4	31.9	2.4	37.6	2.4	41.0
314.2	240	2.5	25.8	2.5	31.1	2.5	36.6	2.5	40.0
330.1	246	2.5	25.2	2.6	30.3	2.6	35.7	2.6	39.0
346.4	252			2.6	28.8	2.6	34.0	2.6	38.0

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pevement to the top of the pipe.

2. The tabulated thickness reflects the required thickness for top and side plates. Refer to 908.08 (a) for the required bottom plate thickness.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-08**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

6" x 2" STRUCTURAL PLATE STEEL PIPE-ARCH (BOLTED)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (ft.-in.)	RISE (ft.-in.)	AREA (sft)	THICKNESS (in.)									
				0.111		0.140 thru 0.280							
				MIN.	MAX.	MIN.	MAX.						
18	6-1	4-7	22	1.3	16.4	1.3	16.4						
18	6'-4	4-9	24	1.3	15.7	1.3	15.7						
18	6-9	4-11	26	1.4	14.8	1.4	14.8						
18	7-0	5-1	28	1.4	14.2	1.4	14.2						
18	7-3	5-3	31	1.5	13.7	1.5	13.7						
18	7-8	5-5	33	1.6	13.0	1.6	13.0						
18	7-11	5-7	35	1.6	12.6	1.6	12.6						
18	8-2	5-9	38	1.7	12.2	1.7	12.2						
18	8-7	5-11	40	1.8	11.6	1.8	11.6						
18	8-10	6-1	43	1.8	11.3	1.8	11.3						
18	9-4	6-3	46	2.0	10.7	2.0	10.7						
18	9-6	6-5	49	2.0	10.5	2.0	10.5						
18	9-9	6-7	52	2.1	10.2	2.1	10.2						
18	10-3	6-9	55	2.1	8.7	2.1	8.7						
18	10-8	6-11	58	2.1	8.3	2.1	8.3						
18	10-11	7-1	61	2.2	8.0	2.2	8.0						
18	11-5	7-3	64	2.3	7.5	2.3	7.5						
18	11-7	7-5	67	2.4	7.3	2.4	7.3						
18	11-10	7-7	71	2.5	7.1	2.5	7.1						
18	12-4	7-9	74	2.6	6.6	2.6	6.6						
18	12-6	7-11	78	2.7	6.5	2.7	6.5						
18	12-8	8-1	81	2.8	6.3	2.8	6.3						
18	12-10	8-4	85	2.8	6.2	2.8	6.2						
31	13-3	9-4	97	1.7	12.4	1.7	12.4						
31	13-6	9-6	102	1.7	12.1	1.7	12.1						
31	14-0	9-8	105	1.8	11.6	1.8	11.6						
31	14-2	9-10	109	1.8	11.5	1.8	11.5						
31	14-5	10-0	114	1.8	11.2	1.8	11.2						
31	14-11	10-2	118	1.9	10.8	1.9	10.8						

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. A specific design shall be performed for structures with corner radii other than those tabulated above to determine the appropriate cover depth limits.

3. The tabulated plate thickness reflects the required thickness for top and side plates. Refer to 908.09 (a) for the required bottom plate thickness.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-09**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98

6" x 2" STRUCTURAL PLATE STEEL PIPE-ARCH (BOLTED)
HEIGHT OF COVER LIMITS (ft.)

Rc (in.)	SPAN (ft.-in.)	RISE (ft.-in.)	AREA (sft)	THICKNESS (in.)									
				0.111		0.140 thru 0.280							
				MIN.	MAX.	MIN.	MAX.						
31	15-4	10-4	123	1.9	10.5	1.9	10.5						
31	15-7	10-6	127	2.0	10.3	2.0	10.3						
31	15-10	10-8	132	2.0	10.1	2.0	10.1						
31	16-3	10-10	137	2.0	9.7	2.0	9.7						
31	16-6	11-11	142	2.1	9.5	2.1	9.5						
31	17-0	11-2	146	2.1	9.2	2.1	9.2						
31	17-2	11-4	151	2.2	9.1	2.2	9.1						
31	17-5	11-6	157	2.2	8.9	2.2	8.9						
31	17-6	11-8	161	2.2	8.6	2.2	8.6						
31	18-1	11-10	167	2.3	8.5	2.3	8.5						
31	18-7	12-0	172	2.3	8.2	2.3	8.2						
31	18-9	12-2	177	2.3	8.0	2.3	8.0						
31	19-3	12-4	182			2.4	7.7						
31	19-6	12-6	188			2.4	7.6						
31	19-8	12-8	194			2.5	7.5						
31	19-11	12-10	200			2.5	7.4						
31	20-5	13-0	205			2.6	7.1						
31	20-7	13-2	211			2.6	7.0						

NOTE:

1. The tabulated cover depths shall be measured from the bottom of the asphalt or concrete pavement to the top of the pipe.

2. A specific design shall be performed for structures with corner radii other than those tabulated above to determine the appropriate cover depth limits.

3. The tabulated plate thickness reflects the required thickness for top and side plates. Refer to 908.09 (a) for the required bottom plate thickness.

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE HEIGHT OF COVER LIMITS

JANUARY 1998

STANDARD DRAWING NO. **E 717-PHCL-10**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

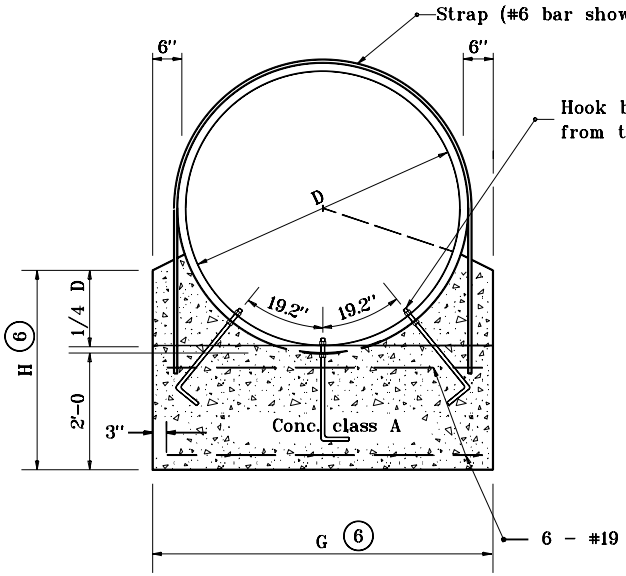
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

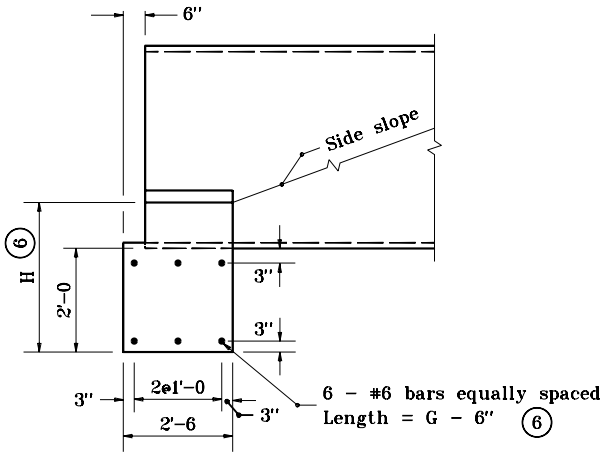
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

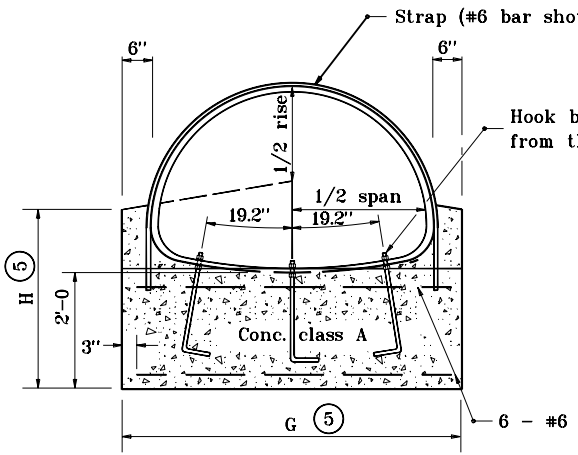
ORIGINALLY APPROVED 1-02-98



ANCHOR FOR STRUCTURAL PLATE PIPE
FRONT ELEVATION



SIDE ELEVATION



ANCHOR FOR STRUCTURAL
PLATE PIPE-ARCH
FRONT ELEVATION

GENERAL NOTES

1. Anchor straps shall be used at both upsteam and downstream ends of all structural plate pipes and pipe-arches.
2. See Standard Drawing E 715-PASD-01 for anchor strap details.
3. Hook bolts, and anchor straps shall be used at all structural plate pipes and pipe arches with a diameter or span of 84" or greater.
4. See Standard Drawing E 715-PAHB-01 for hook bolt details.

(5) For dimension, enter chart on Standard Drawing E 717-ANCH-01 or E 717-ANCH-03 with known span and rise.

(6) For dimension, enter chart on Standard Drawing E 717-ANCH-02 with known dimension D.

INDIANA DEPARTMENT OF TRANSPORTATION

SINGLE STRUCTURAL PLATE PIPE CONCRETE ANCHOR

JANUARY 1998

STANDARD DRAWING NO. **E 717-SPCA-01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 7-27-99

/s/ Anthony L. Uremovich 7-27-99
DESIGN STANDARDS ENGINEER — DATE

/s/ Firooz Zandi 7-27-99
CHIEF HIGHWAY ENGINEER — DATE

ORIGINALLY APPROVED 1-02-98

INDEX	
SHEET NO.	SUBJECT
1	Underdrain Drawing Index and General Notes
2	Underdrain Details
3	Underdrain Details
4	Outlet Protector, Type 1
5	Outlet Protector, Type 2
6	Outlet Protector, Type 3
7	Outlet Protector Rodent Screen

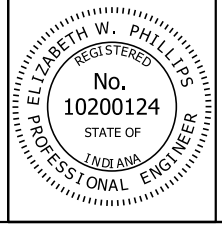
APPROXIMATE OUTLET PROTECTOR QUANTITIES			
TYPE	CONCRETE, CLASS A (cys)	REINFORCING BARS (lb)	SODDING (sys)
1	0.8	29	4.9
2	0.6	25	4.0
3	0.3	22	3.2

INDIANA DEPARTMENT OF TRANSPORTATION

UNDERDRAIN DRAWING INDEX
AND GENERAL NOTES

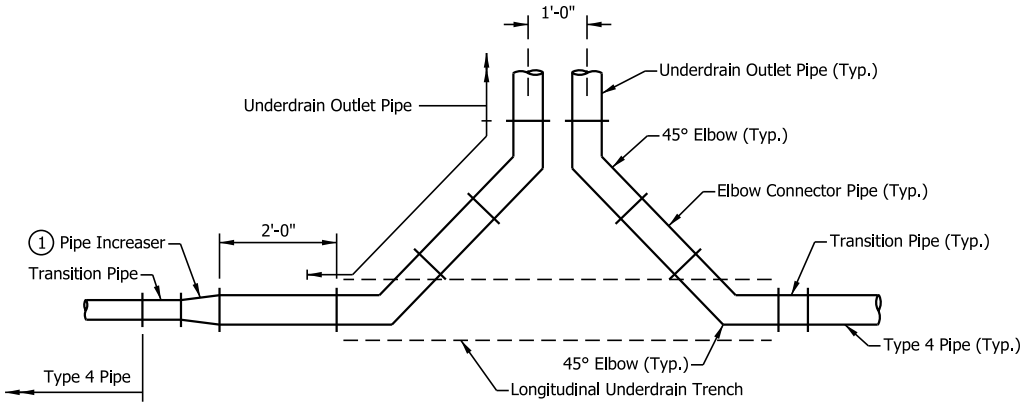
SEPTEMBER 2017

STANDARD DRAWING NO. E 718-UNDR-01



/s/ Elizabeth W. Phillips 08/26/16
DESIGN STANDARDS ENGINEER DATE

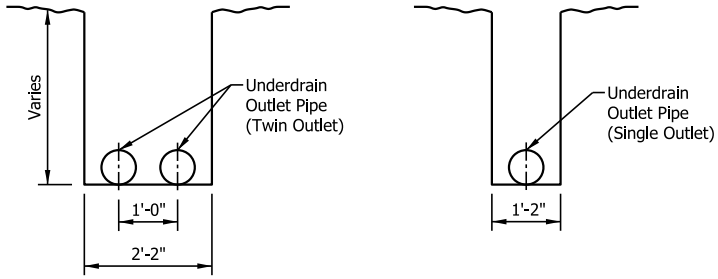
/s/ Mark A. Miller 09/19/16
CHIEF ENGINEER DATE



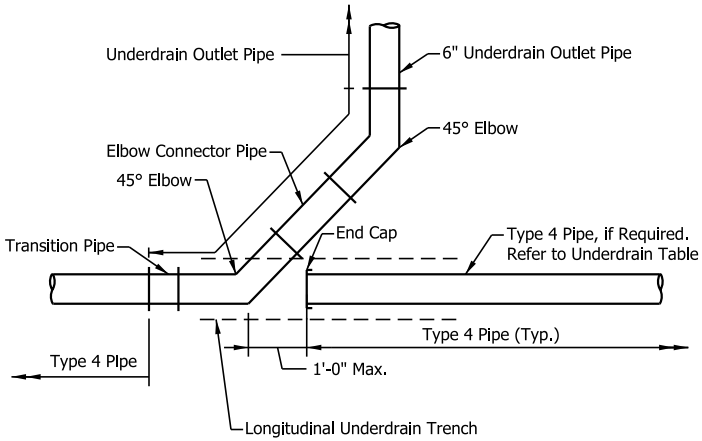
TWIN OUTLET DETAIL-PLAN VIEW

NOTE:

1 If the underdrain pipe and the outlet pipe are of different sizes an increaser of the same material as the outlet pipe shall be installed 2 ft from the transition pipe and the 45° elbow.



OUTLET TRENCH DETAILS



SINGLE OUTLET DETAIL-PLAN VIEW

INDIANA DEPARTMENT OF TRANSPORTATION

UNDERDRAIN DETAILS

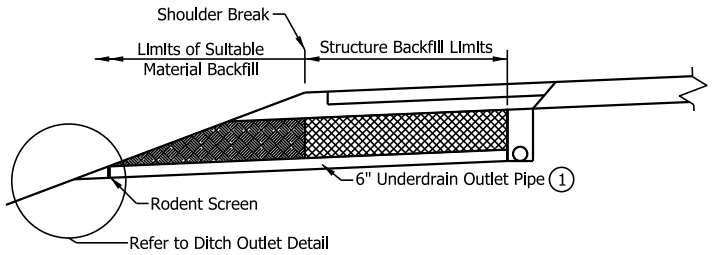
SEPTEMBER 2017

STANDARD DRAWING NO. E 718-UNDR-02

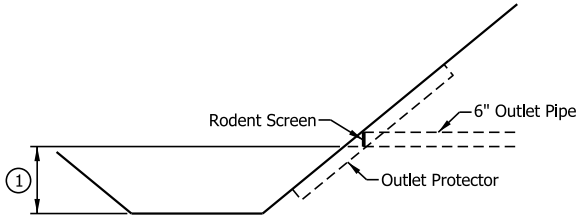
ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 08/26/16
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/19/16
CHIEF ENGINEER DATE



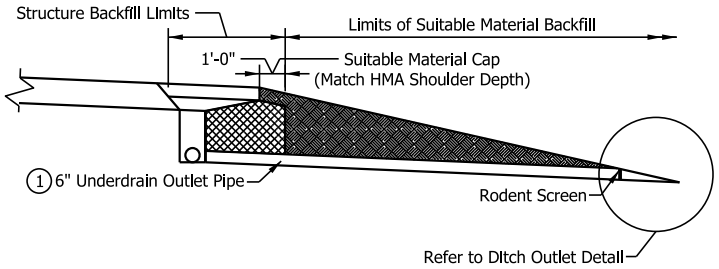
OUTSIDE SHOULDER INSTALLATION



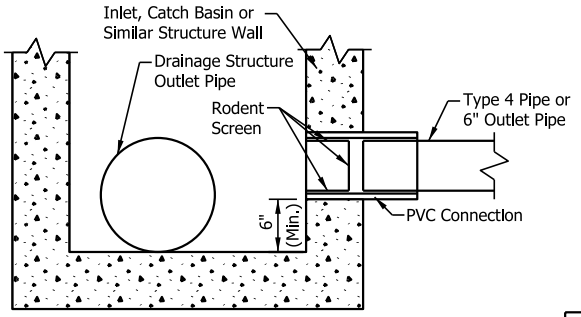
DITCH OUTLET DETAIL

NOTE:

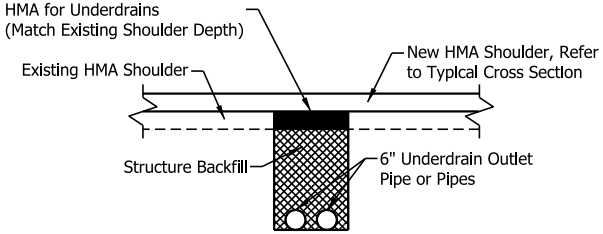
(1) If underdrain outlet pipe elevations are not shown on Underdrain Table, the minimum outlet pipe slope shall be 0.3%. The minimum freeboard between the outlet pipe outfall and the ditch line shall be 1'-0" for median ditches and 2'-0" for side ditches.



MEDIAN SHOULDER INSTALLATION



DRAINAGE STRUCTURE OUTLET DETAIL



RETROFIT UNDERDRAIN OUTLET DETAIL (UNDER PAVED SHOULDER)

INDIANA DEPARTMENT OF TRANSPORTATION

UNDERDRAIN DETAILS

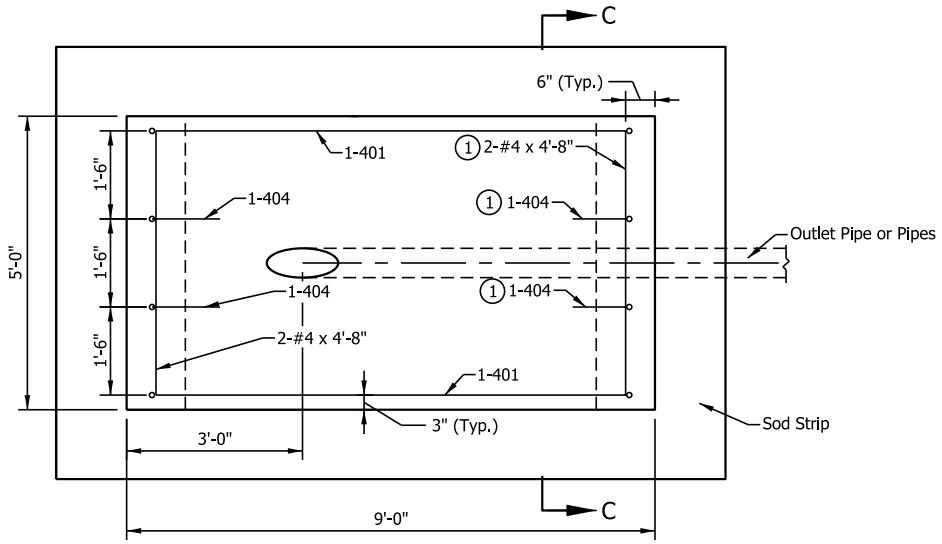
SEPTEMBER 2017

STANDARD DRAWING NO. E 718-UNDR-03

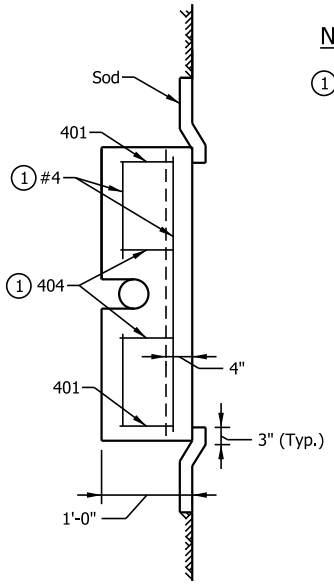
ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 08/26/16
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/19/16
CHIEF ENGINEER DATE



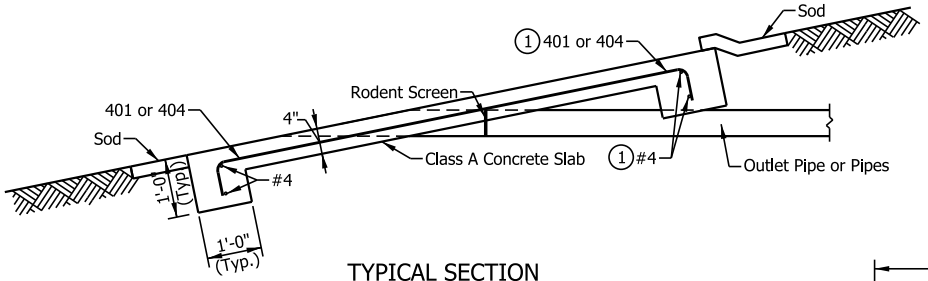
PLAN VIEW



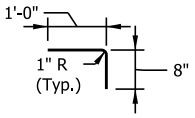
SECTION C-C

NOTE:

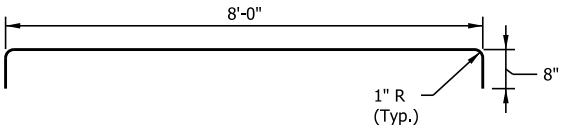
1 The #4 transverse bars in the upslope lug may be field cut to accommodate the outlet pipe or pipes. The 404 bars in the upslope lug may be moved to accommodate the outlet pipe or pipes.



TYPICAL SECTION



404 x 1'-8"



401 X 9'-4"

INDIANA DEPARTMENT OF TRANSPORTATION

OUTLET PROTECTOR, TYPE 1

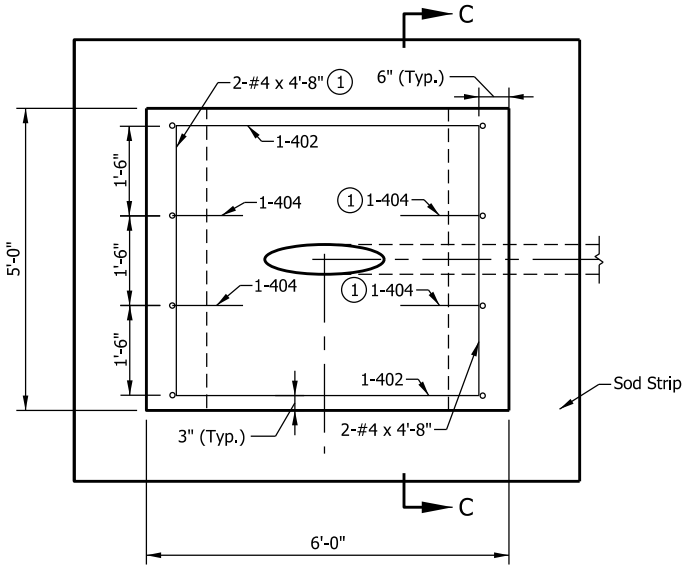
SEPTEMBER 2017

STANDARD DRAWING NO. E 718-UNDR-04

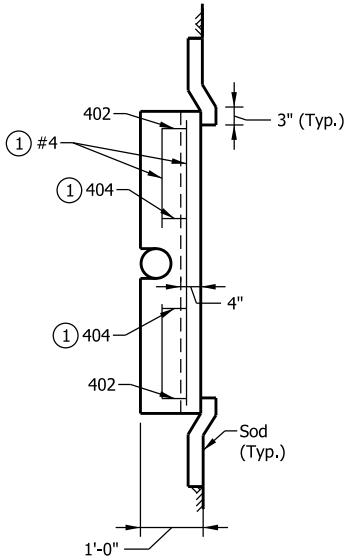
ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 08/26/16
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/19/16
CHIEF ENGINEER DATE



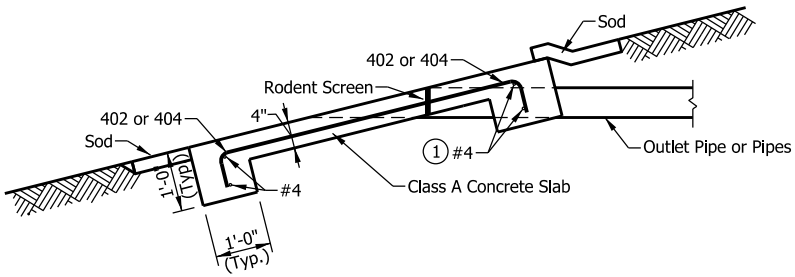
PLAN VIEW



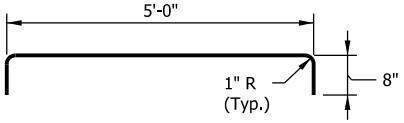
SECTION C-C

NOTE:

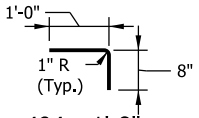
(1) The #4 transverse bars in the upslope lug may be field cut to accommodate the outlet pipe or pipes. The 404 bars in the upslope lug may be moved to accommodate the outlet pipe or pipes.



TYPICAL SECTION



402 X 6'-4"



404 x 1'-8"

INDIANA DEPARTMENT OF TRANSPORTATION

OUTLET PROTECTOR, TYPE 2

SEPTEMBER 2017

STANDARD DRAWING NO. E 718-UNDR-05

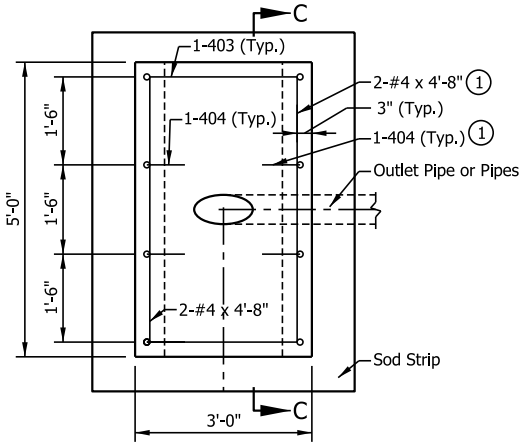
ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 08/26/16
DESIGN STANDARDS ENGINEER DATE

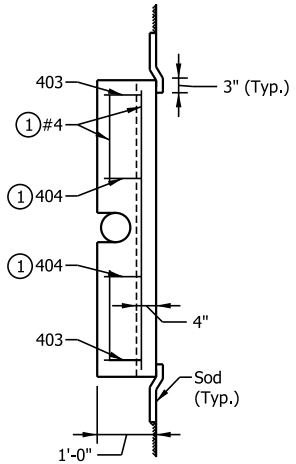
/s/ Mark A. Miller 09/19/16
CHIEF ENGINEER DATE

NOTE:

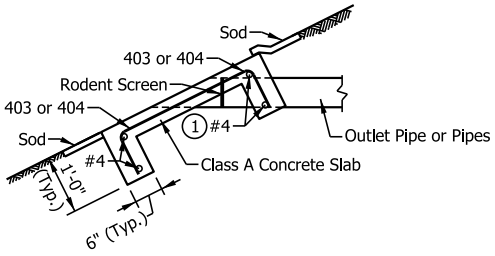
(1) The #4 transverse bars in the upslope lug may be field cut to accommodate the outlet pipe or pipes. The 404 bars in the upslope lug may be moved to accommodate the outlet pipe or pipes.



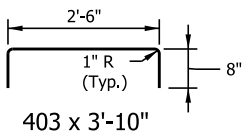
PLAN VIEW



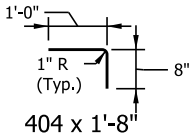
SECTION C-C



TYPICAL SECTION



403 x 3'-10"



404 x 1'-8"

INDIANA DEPARTMENT OF TRANSPORTATION

OUTLET PROTECTOR, TYPE 3

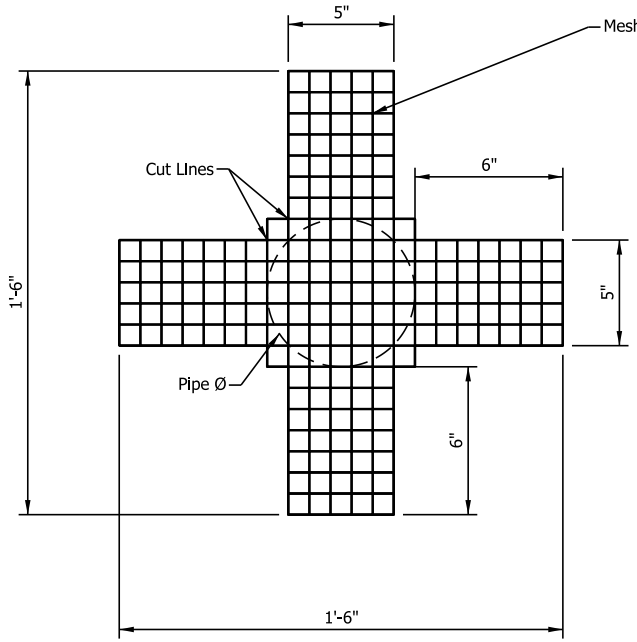
SEPTEMBER 2017

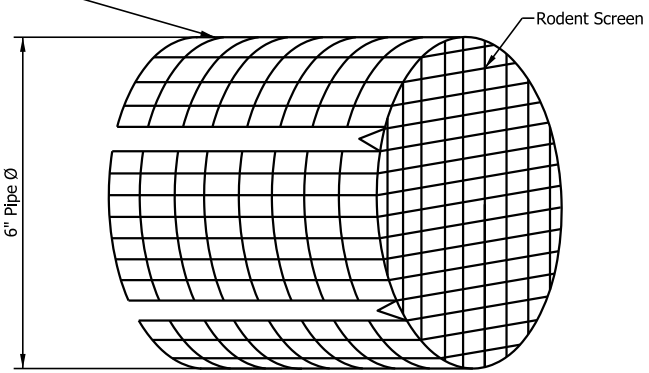
STANDARD DRAWING NO. E 718-UNDR-06

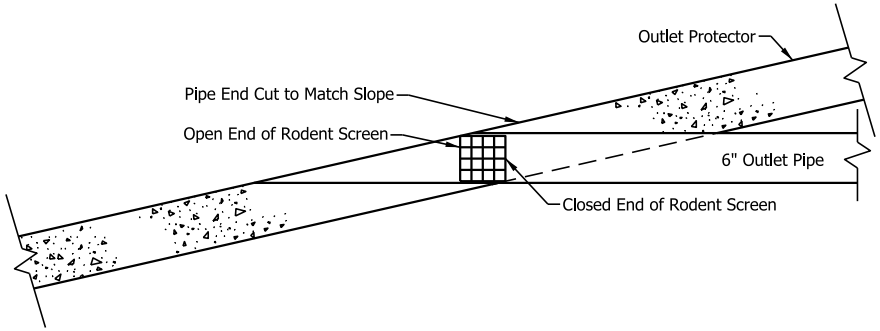
ELIZABETH W. PHILLIPS REGISTERED No. 10200124 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 08/26/16
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/19/16
CHIEF ENGINEER DATE







INDIANA DEPARTMENT OF TRANSPORTATION

OUTLET PROTECTOR
RODENT SCREEN

SEPTEMBER 2017

STANDARD DRAWING NO. E 718-UNDR-07

ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 08/26/16
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/19/16
CHIEF ENGINEER DATE

EXTRA–QUALITY

COVER (ft.)	3		4		5		6		7		8		9		10		11		12	
SIZE	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.
6"													X	X	X	X	X	X	X	X
8"									X	X	X	X	X	X						
10"							X	X	X	X	X	X								
12"					X	X	X	X												
15"		X	X	X	X	X														
18"	X	X	X	X	X	X														
21"	X	X	X	X	X	X		X												
24"	X	X	X	X	X	X		X												
27"	X		X		X															
30"	X		X		X		X													

EXTRA–DUTY EXTRA–QUALITY

COVER (ft.)	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
SIZE	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.	CLAY	CONC.
6"					X	X	X	X	X	X	X	X	X	X	X	X
8"			X	X	X	X	X	X	X	X	X	X	X	X	X	X
10"		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12"	X	X	X	X	X	X	X	X	X	X	X	X	X			
15"	X	X	X	X	X	X	X	X	X	X	X	X				
18"	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
21"	X	X	X	X	X	X	X	X	X							
24"	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
27"	X	X	X	X	X	X	X	X								
30"	X	X	X	X	X	X	X	X	X	X	X					

SPECIAL–QUALITY

COVER (ft.)	UP TO 5	UP TO 6	UP TO 7	UP TO 8	UP TO 9	UP TO 15
SIZE	CONC.	CONC.	CONC.	CONC.	CONC.	CONC.
6"	X	X	X	X	X	X
8"	X	X	X	X	X	
10"	X	X	X	X	X	
12"	X	X				
15"	X					
18"	X					
21"	X	X				
24"	X	X				

INDIANA DEPARTMENT OF TRANSPORTATION

DRAINTILE CLASSES

JANUARY 1998

STANDARD DRAWING NO. **E 719–DTCL–01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

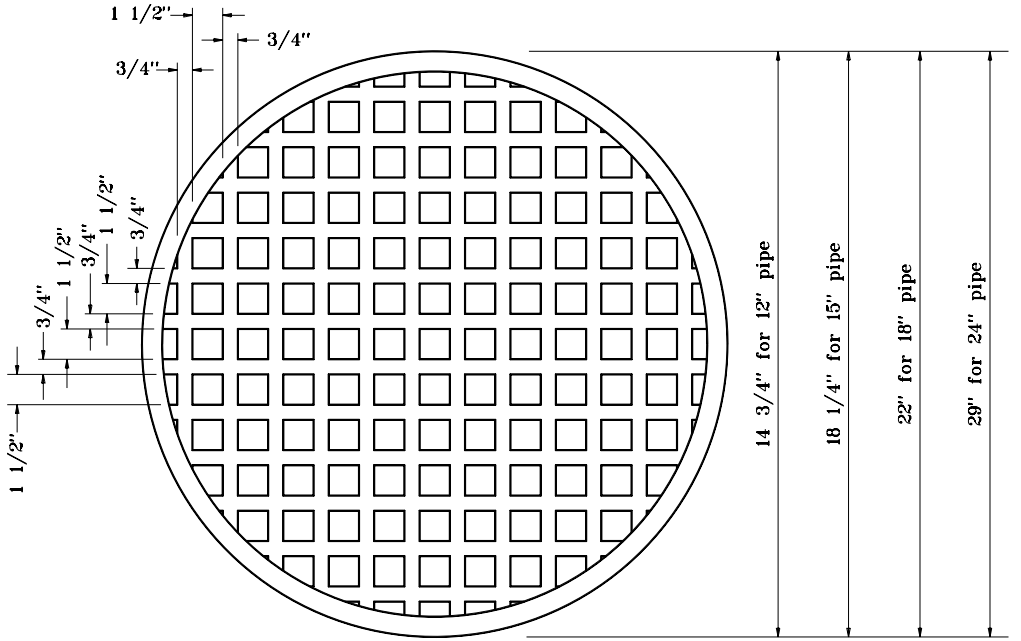
DESIGN STANDARDS ENGINEER

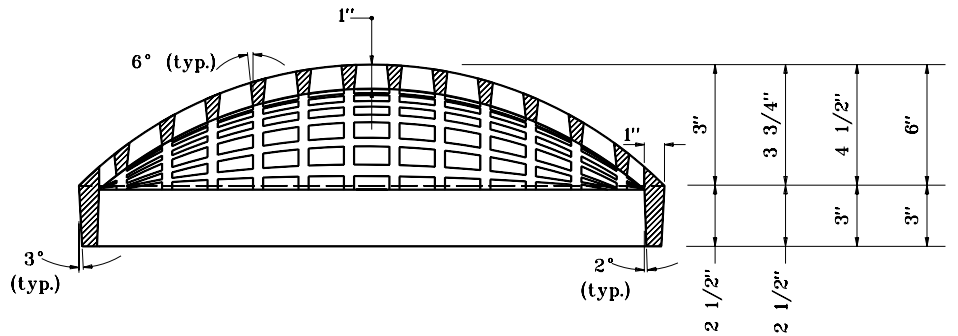
DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 1-02-98





PIPE CATCH BASIN CASTING

INDIANA DEPARTMENT OF TRANSPORTATION

PIPE CATCH BASIN CASTING

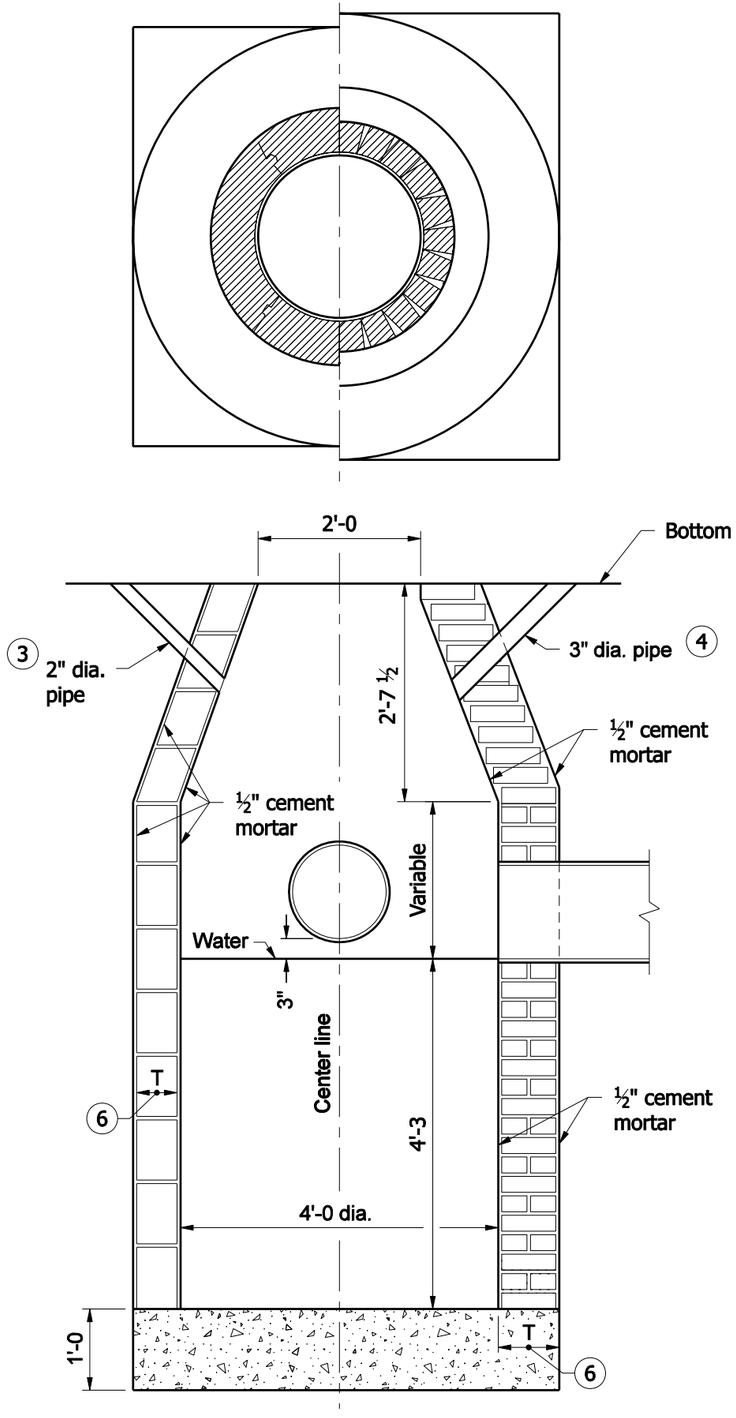
APRIL 1995

STANDARD DRAWING NO. **E 720-CBCA-01**

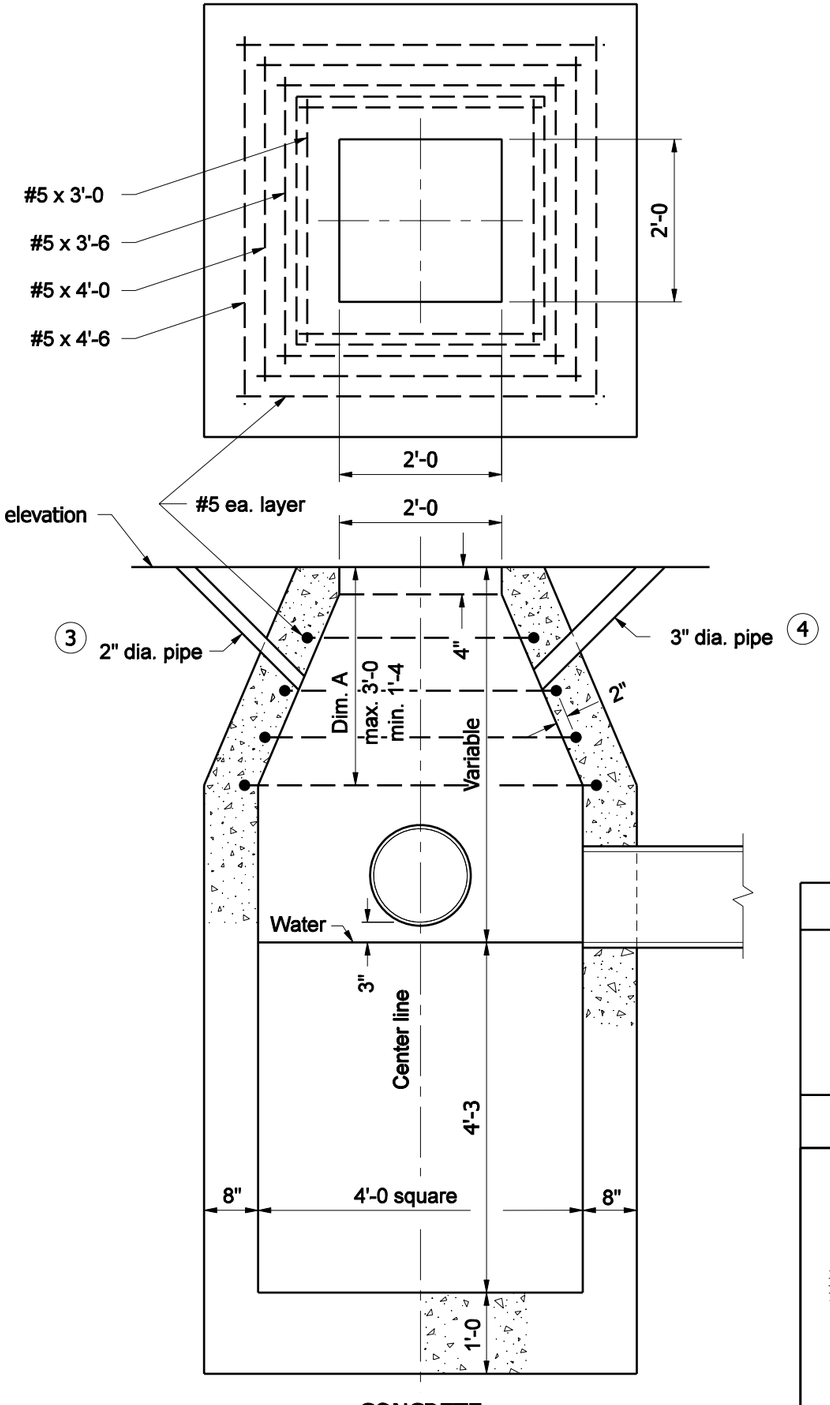
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	4-03-95



BRICK OR BLOCK



CONCRETE

GENERAL NOTES

1. Brick, block, or concrete may be used.
2. Precast catch basin type W may be substituted for catch basin type A.

(3) 2" dia. pipe drain from bottom of curb to inlet. Aggregate to be placed around inlet end of pipe.

(4) 3" dia. pipe to be kept open for drainage of subgrade or base until surface is placed.

5. Reinforcement required if Dim. A < 2'-6. Reinforcement not required if Dim. A ≥ 2'-6.

(6) T = 8" for brick structure
T = 6" for segmental block structure

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN TYPE A

SEPTEMBER 2008

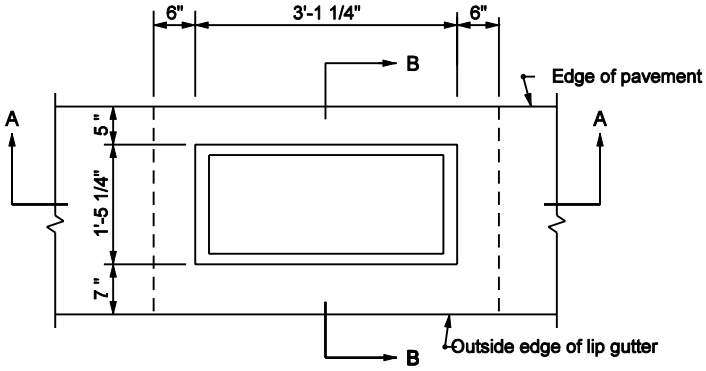
STANDARD DRAWING NO. E 720- CBST-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER DATE

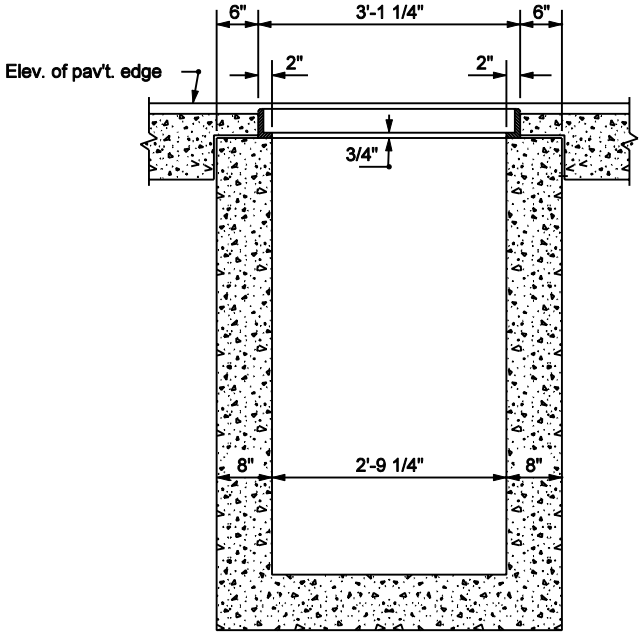
/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER DATE



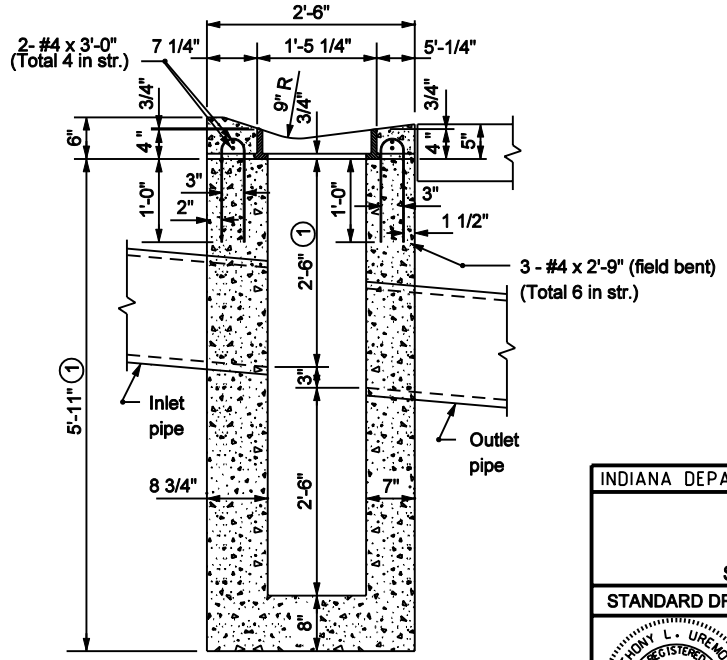
PLAN

NOTES

① These dimensions may be increased or decreased by 1'-0", as directed.



SECTION A-A



SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN
TYPE D

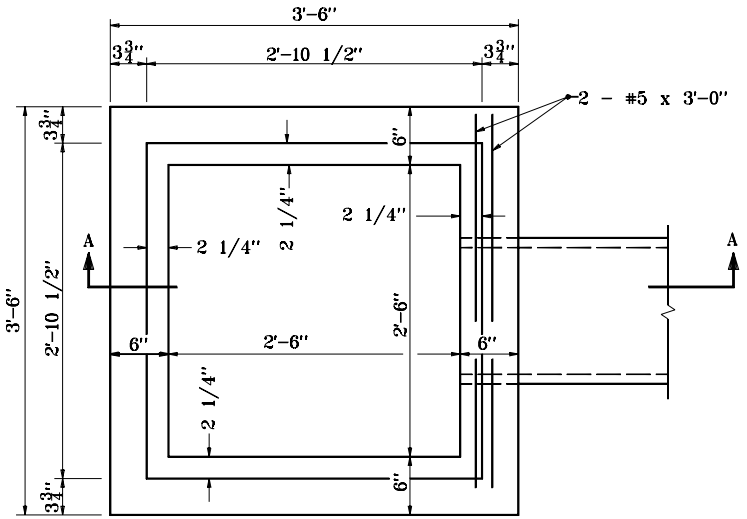
SEPTEMBER 2003

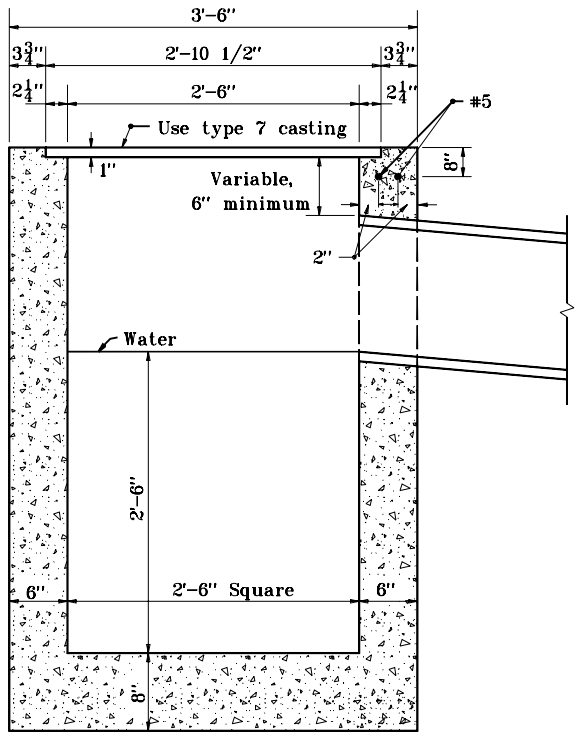
STANDARD DRAWING NO. E 720-CBST-02

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER

/s/ Anthony L.Uremovich 3-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K.Smutzer 3-02-03
CHIEF HIGHWAY ENGINEER DATE





SECTION A-A

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN
TYPE E

SEPTEMBER 1997

STANDARD DRAWING NO. **E 720-CBST-03**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

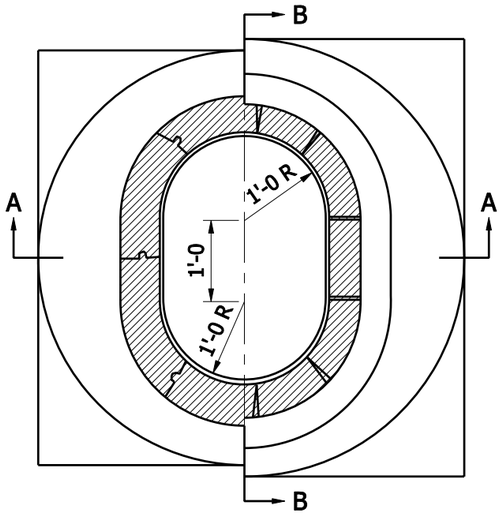
DESIGN STANDARDS ENGINEER

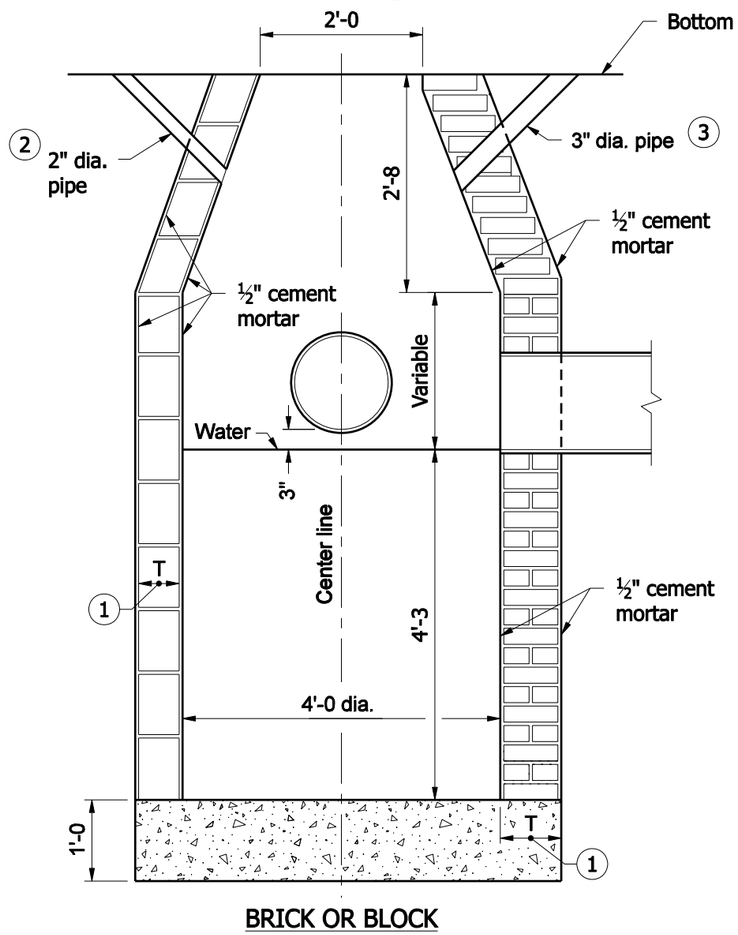
DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

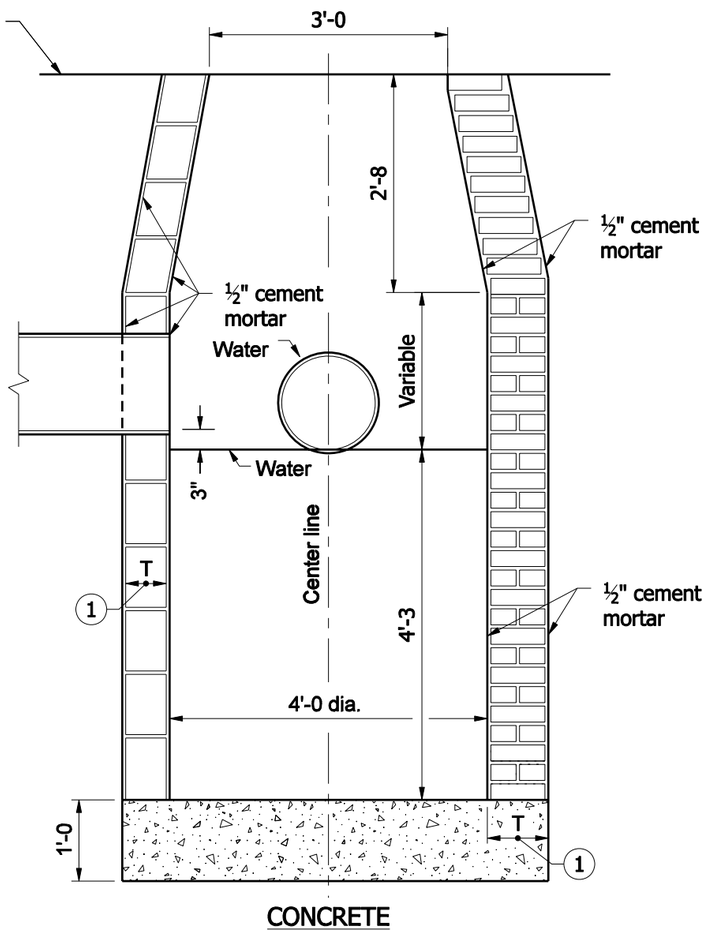
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 9-01-97





BRICK OR BLOCK



CONCRETE

GENERAL NOTES

1. T = 8" for brick structure
   T = 6" for segmental block structure
2. 2" pipe drain from bottom of curb to inlet. Aggregate to be placed around inlet end of pipe.
3. 3" min. dia. pipe to be kept open for drainage of subgrade or base until surface is placed.

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN
TYPE J

SEPTEMBER 2008

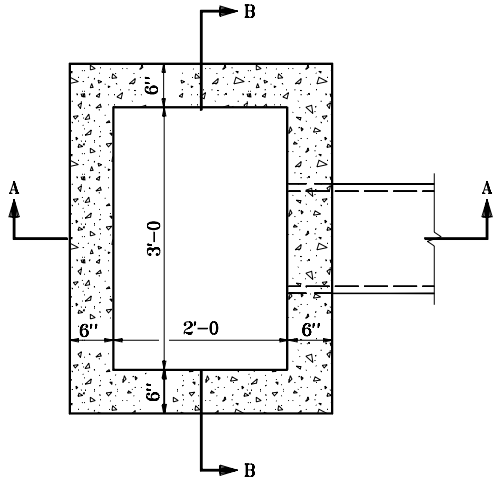
STANDARD DRAWING NO. E 720- CBST-04

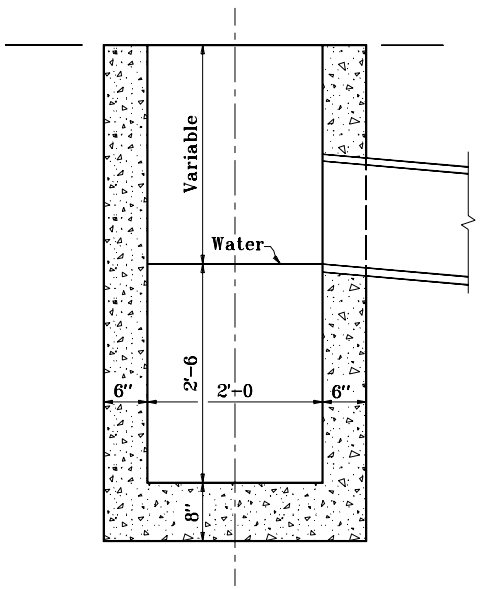
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

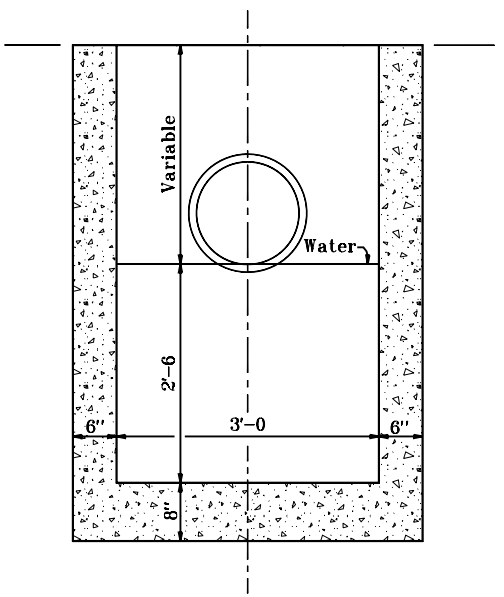
/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE





SECTION A-A



SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN
TYPE K

APRIL 1995

STANDARD DRAWING NO. **E 720-CBST-05**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

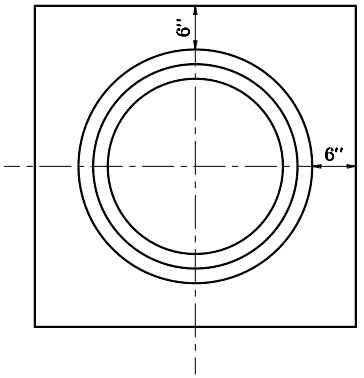
DESIGN STANDARDS ENGINEER

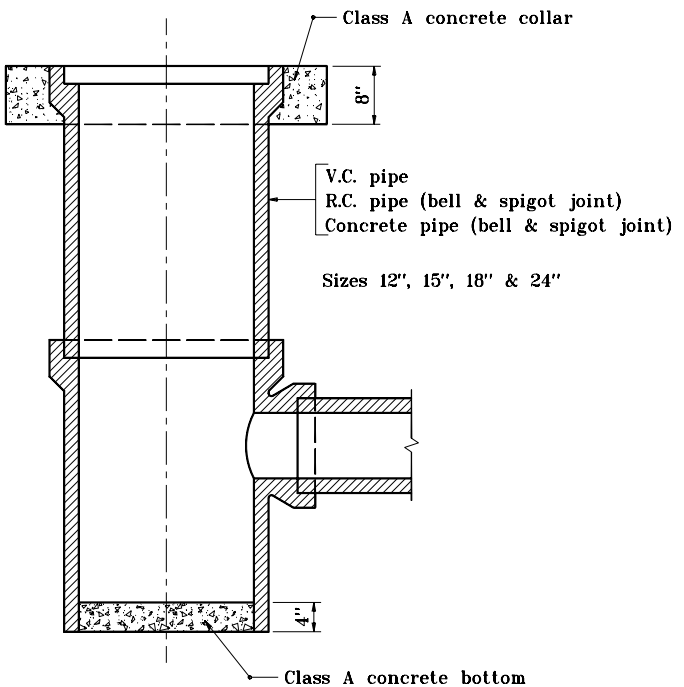
DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 4-03-95





INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN
PIPE

APRIL 1995

STANDARD DRAWING NO. **E 720-CBST-06**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

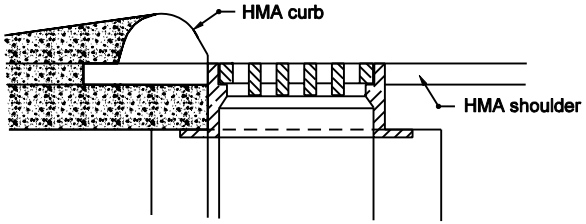
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

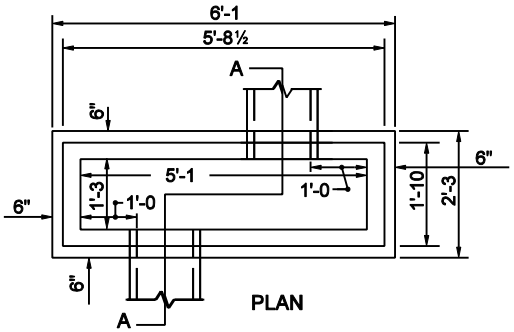
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

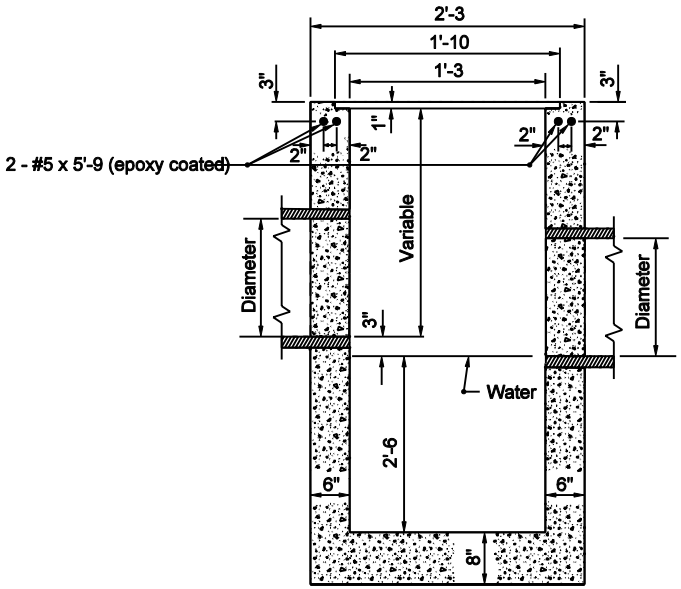
ORIGINALLY APPROVED 4-03-95



PLACEMENT DETAIL FOR CASTING



CATCH BASIN TYPE S



SECTION A-A

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN
TYPE S

SEPTEMBER 2003

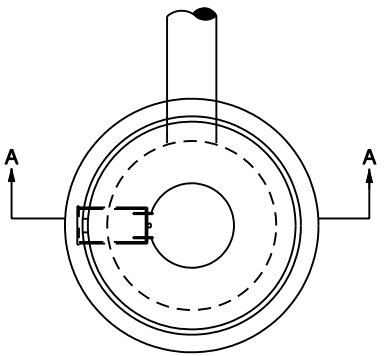
STANDARD DRAWING NO. E 720-CBST-07

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

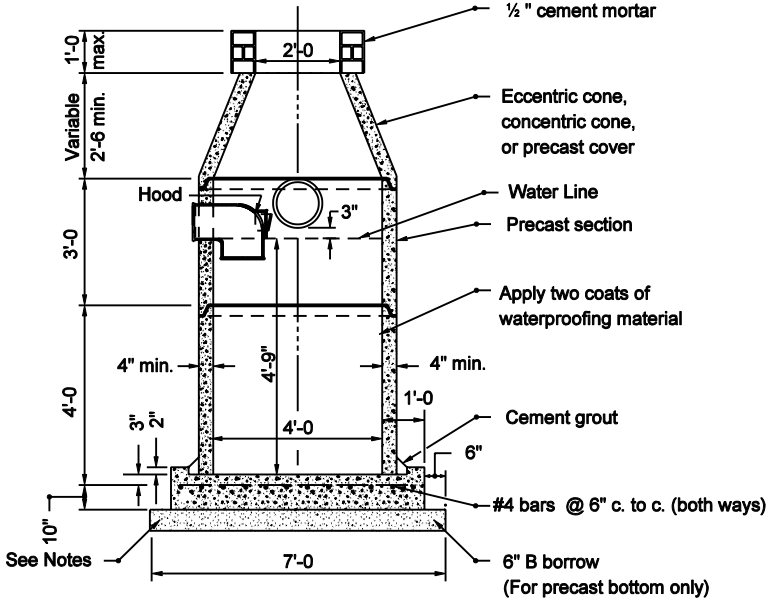
/s/ Richard L. VanCleave — 9-02-03
DESIGN STANDARDS ENGINEER — DATE

/s/ Richard K. Smutzer — 9-02-03
CHIEF HIGHWAY ENGINEER — DATE



NOTES:

1. Concentric concrete section will not be permited on any manhole that will be under the jurisdiction of the Indianapolis Sanitary District
2. The contractor will be premitted to substitute precast catch basin type "W" for catch basin type "A".



SECTION A-A

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN TYPE W

SEPTEMBER 2003

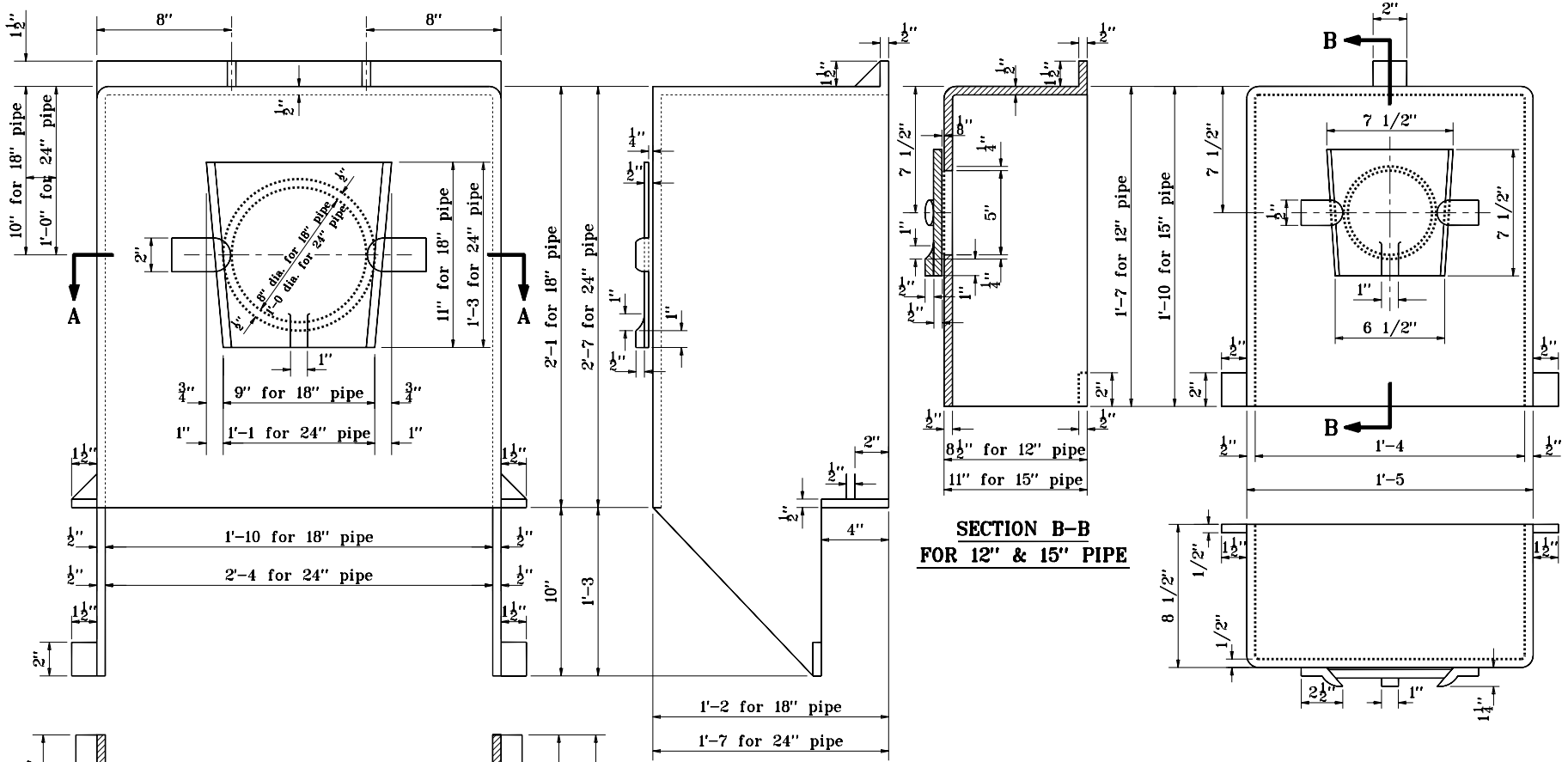
STANDARD DRAWING NO. E 720-CBST-08

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE



GENERAL NOTES

1. Hoods may be cast in one piece or may be built up of electrically welded 1/2" steel plates. All hoods shall be gas tight. Steel hoods shall be painted with waterproofing asphalt.

2. Hoods shall be omitted on earth ditch type catch basin unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

CATCH BASIN HOOD

MAY 1998

STANDARD DRAWING NO. E 720-CBST-09

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 5-01-98

Str.	Type	Casting Types												
		2	3	4	5	6	7	8	10	12	12A	13	14	15
Catch Basins	A	X	X					X						
	D					X								
	E						X							
	J								X					
	K								X					
	S												X	
	W①	X	X					X						
Inlets	A	X	X					X						
	B													X
	C													X
	D					X								
	E						X							
	F						X							
	G						X							
	H, HA				X									
	J								X					
	M								X					
	N									X				
	P										X			
	R											X		
	S												X	
	T												X	
Manholes	A	X		X				X						
	B	X		X				X						
	C②	X		X				X						
	D	X		X				X						
	E	X		X				X						
	F	X		X				X						
	G	X		X				X						
	H	X		X				X						
	J	X		X				X						
	K	X		X				X						
	L	X		X				X						
	M	X		X				X						
	N	X		X				X						

NOTES

① May be substituted for catch basin type A.

② May be substituted for manhole type A or B.

INDIANA DEPARTMENT OF TRANSPORTATION

COMPATIBILITY OF DRAINAGE STRUCTURES AND CASTINGS

SEPTEMBER 2006

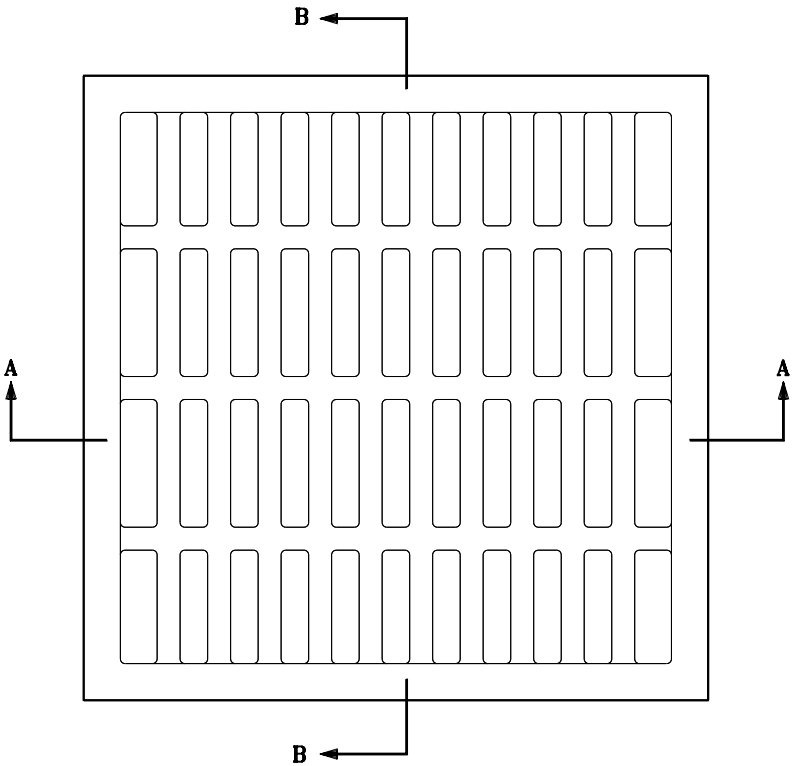
STANDARD DRAWING NO. E 720-CDSC-01

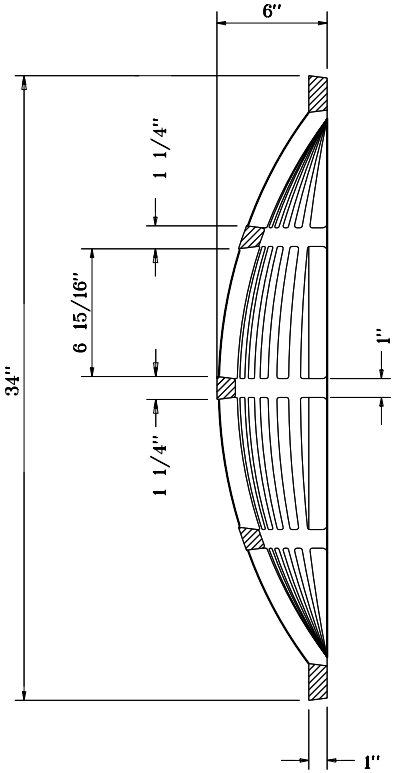
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

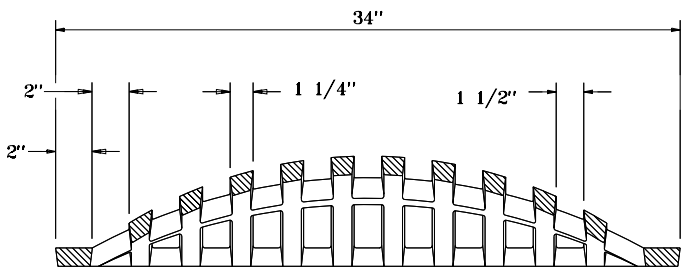
/s/ Richard L. VanCleave 9-01-06
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-01-06
CHIEF HIGHWAY ENGINEER DATE





SECTION B–B



SECTION A–A

EARTH DITCH CASTING TYPE 7

INDIANA DEPARTMENT OF TRANSPORTATION

EARTH DITCH CASTING TYPE 7

SEPTEMBER 1998

STANDARD DRAWING NO. E 720-EDCA-01

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

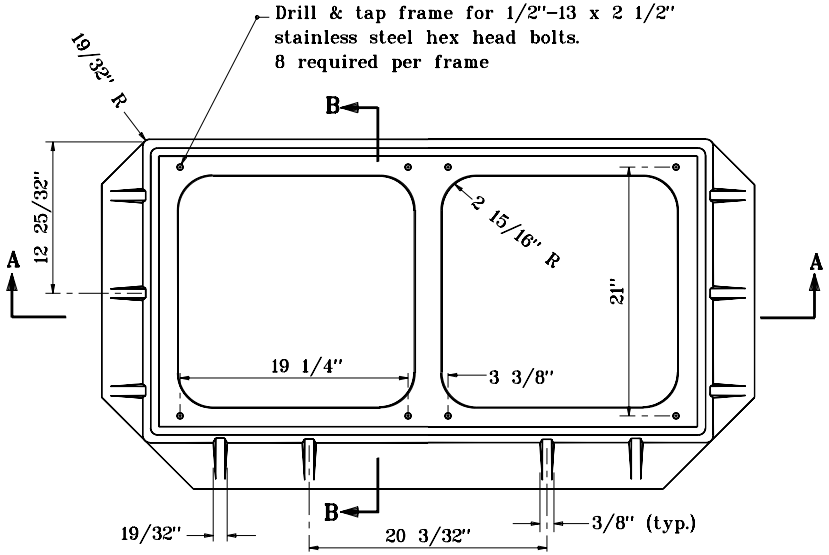
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

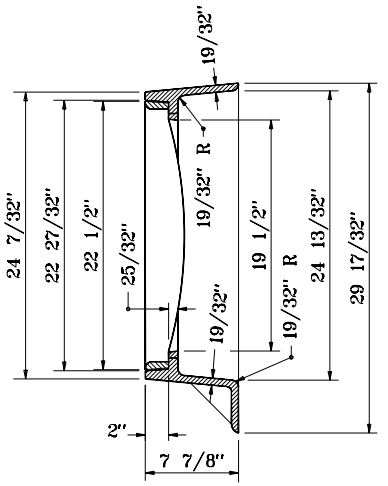
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

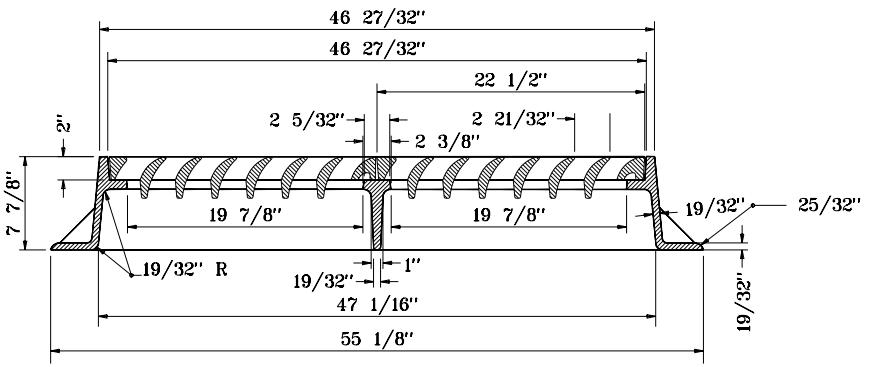
ORIGINALLY APPROVED 9-01-98



PLAN



SECTION B–B



SECTION A–A

FRAME
CASTING TYPE 5

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 5
FRAME

SEPTEMBER 2001

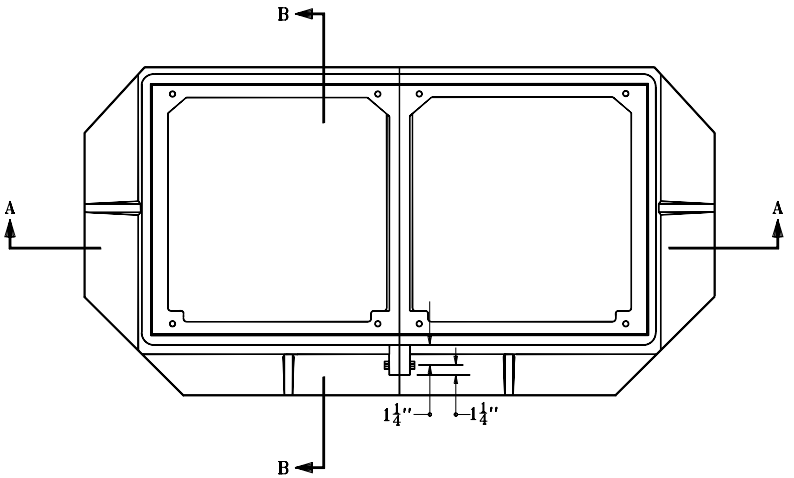
STANDARD DRAWING NO. **E 720-ICCA-01**

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

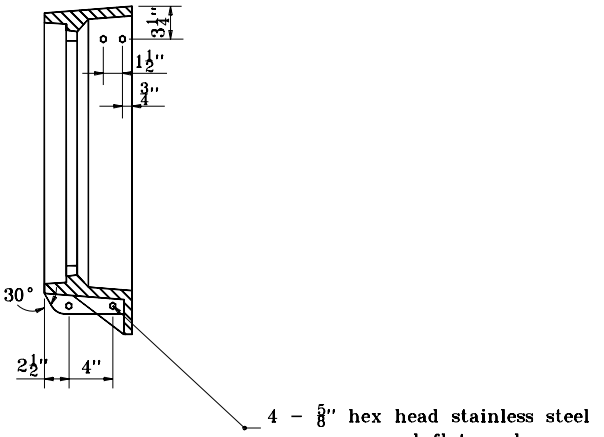
DESIGN STANDARDS ENGINEER

/s/ Anthony L. Uremovich 9-04-01
DESIGN STANDARDS ENGINEER — DATE

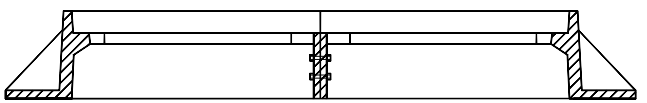
/s/ Firooz Zandi 9-04-01
CHIEF HIGHWAY ENGINEER — DATE



PLAN



SECTION B–B



SECTION A–A

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 5
ALTERNATE BOLTED FRAME

SEPTEMBER 2001

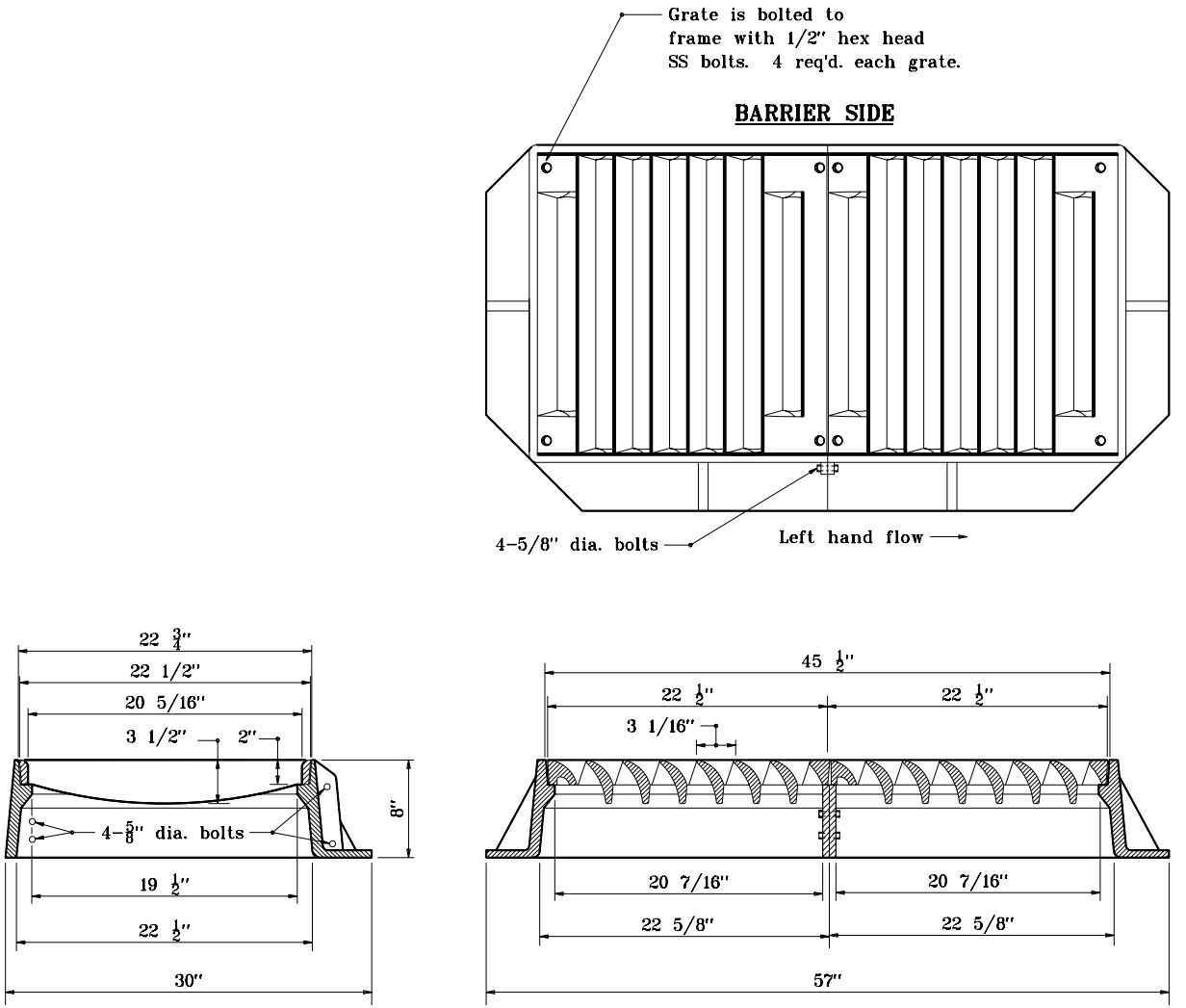
STANDARD DRAWING NO. **E 720–ICCA–02**

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Anthony L. Uremovich 9–04–01
DESIGN STANDARDS ENGINEER — DATE

/s/ Firooz Zandi 9–04–01
CHIEF HIGHWAY ENGINEER — DATE



FRAME AND GRATE
CASTING TYPE 5 (ALTERNATE)

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 5 (ALTERNATE) FRAME AND GRATE

SEPTEMBER 2001

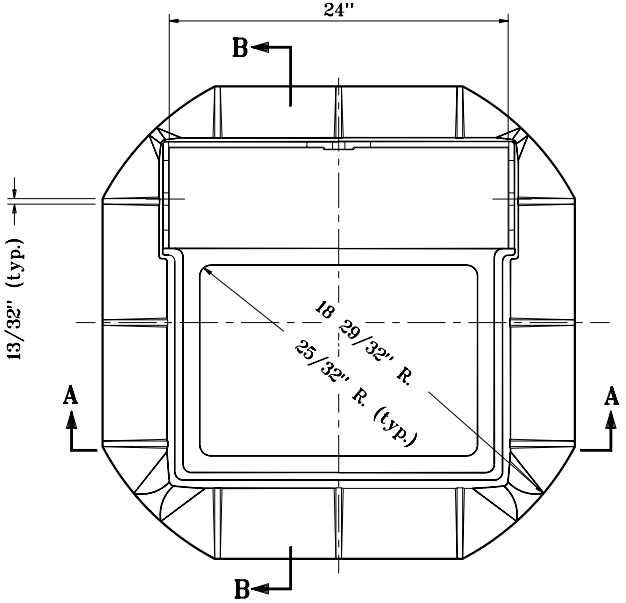
STANDARD DRAWING NO. **E 720-ICCA-03**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Anthony L. Uremovich 9-04-01
DESIGN STANDARDS ENGINEER — DATE

/s/ Firooz Zandi 9-04-01
CHIEF HIGHWAY ENGINEER — DATE



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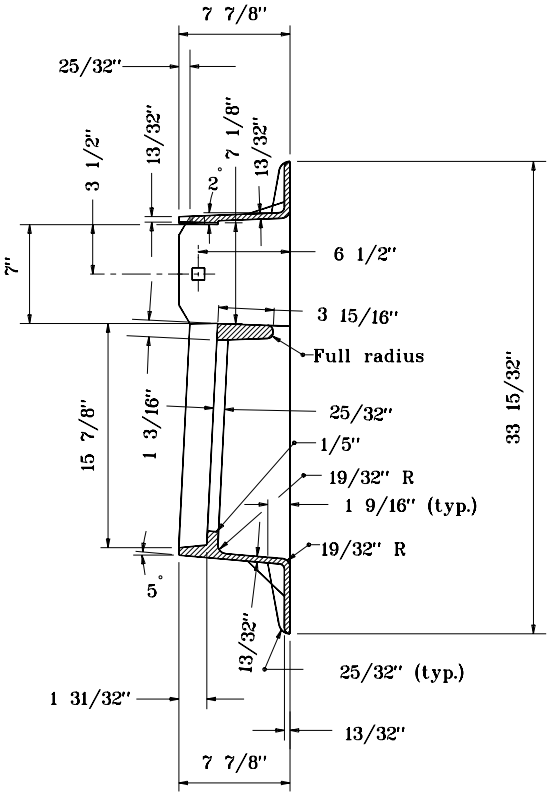
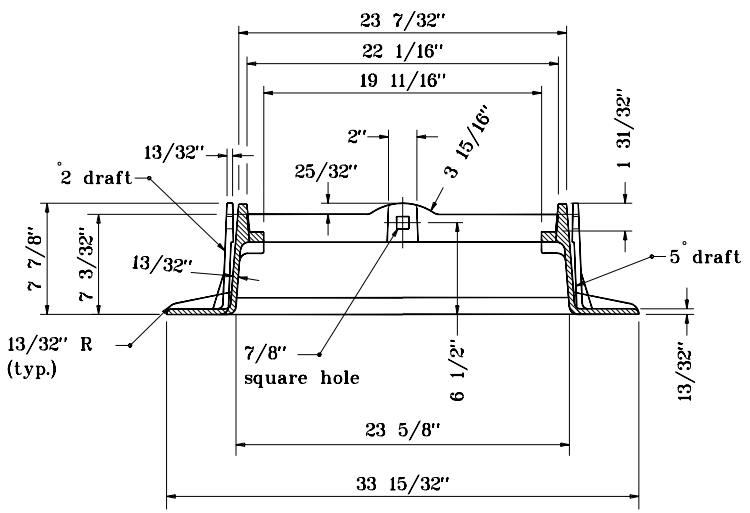


SECTION B–B



SECTION A–A

FRAME
CASTING TYPE 8

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 8
FRAME
SEPTEMBER 1998

STANDARD DRAWING NO. **E 720-ICCA-04**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

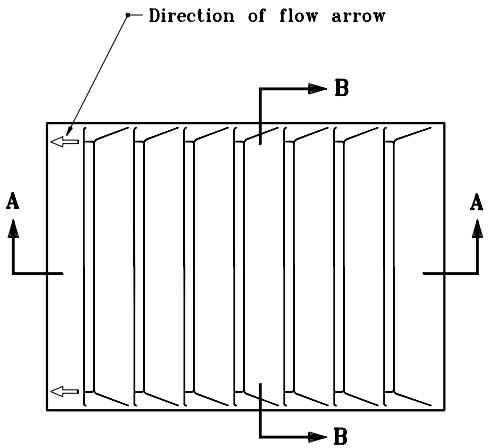
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 9-01-98



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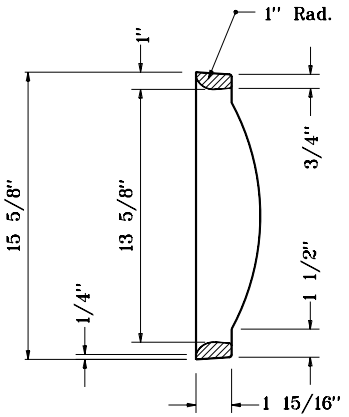
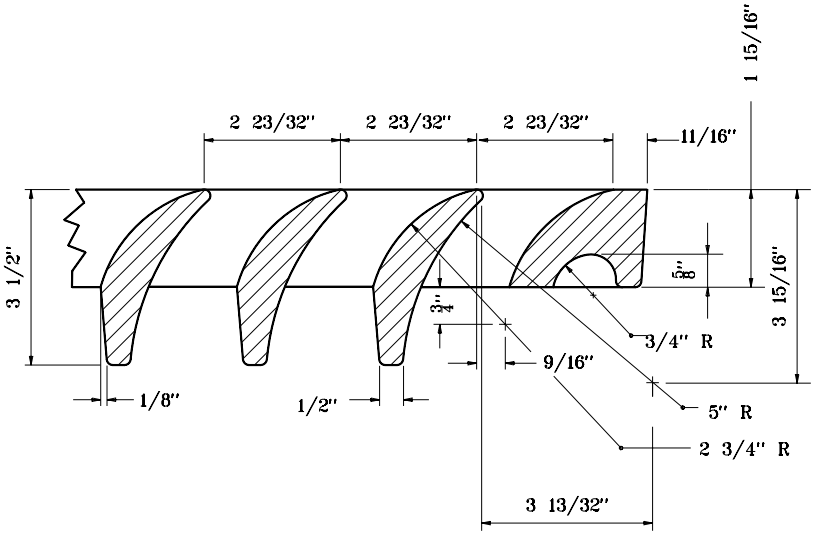


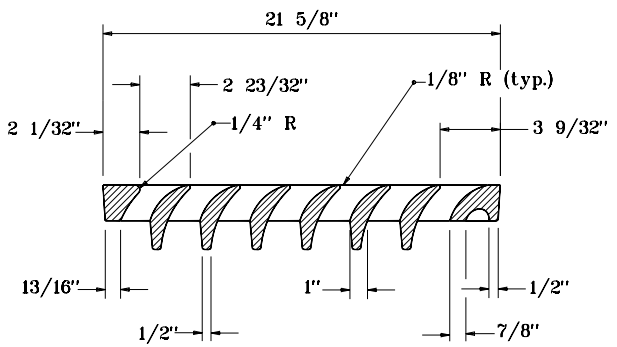
SECTION B–B



DETAIL OF SECTION A–A

GRATE

CASTING TYPE 8



SECTION A–A

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 8
GRATE

SEPTEMBER 1998

STANDARD DRAWING NO. E 720-ICCA-05

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

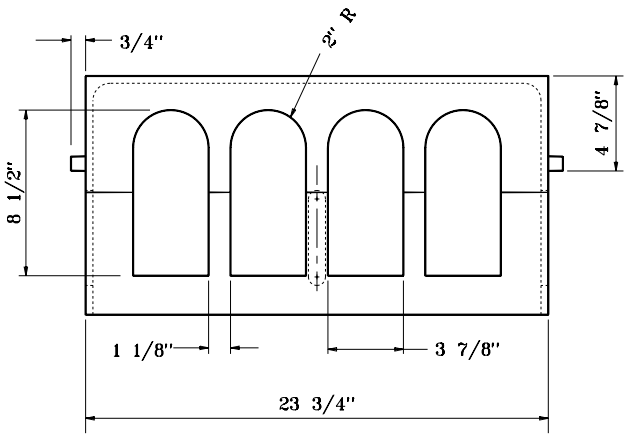
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

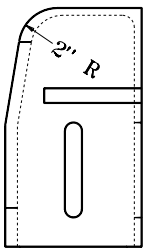
ORIGINALLY APPROVED 9-01-98

GENERAL NOTES

1. Curb box adjustable from $5\frac{1}{4}$" to $8\frac{3}{4}$".



FRONT



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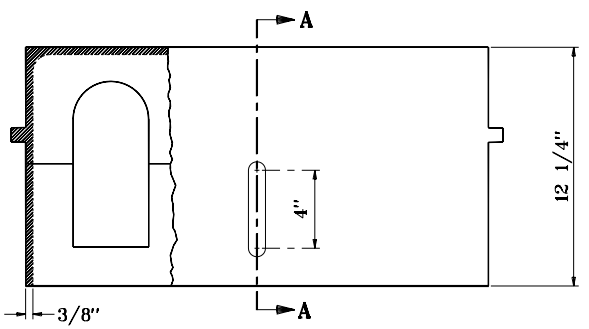
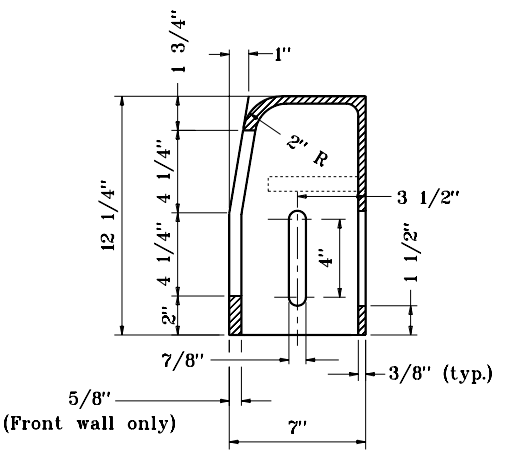


BACK

CURB BOX
CASTING TYPE 8



SECTION A-A

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 8
CURB BOX

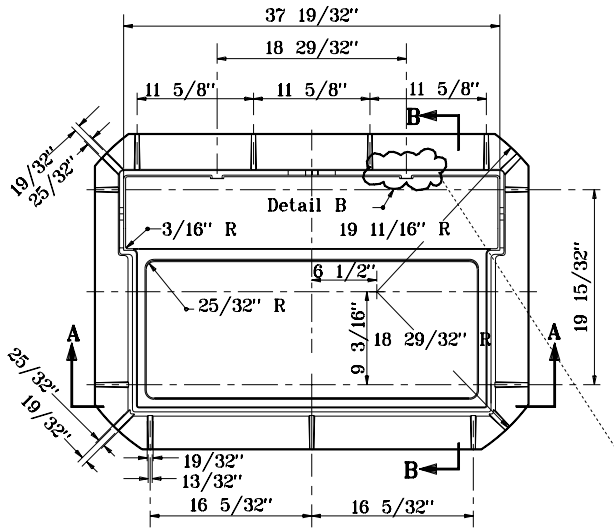
SEPTEMBER 1998

STANDARD DRAWING NO. E 720-ICCA-06

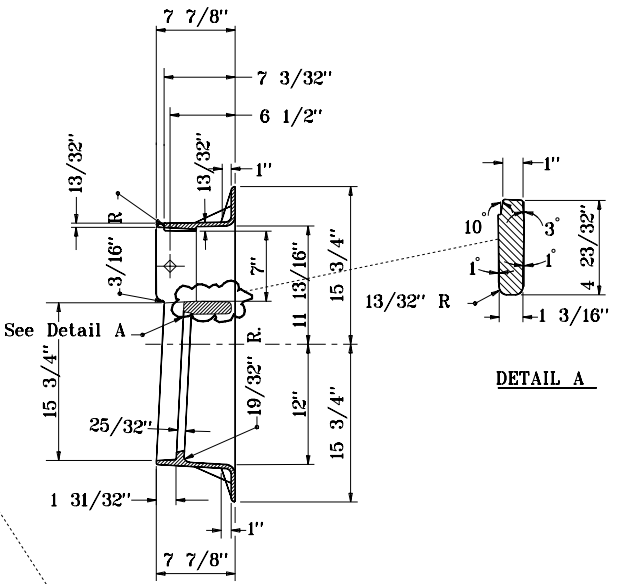
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	9-01-98

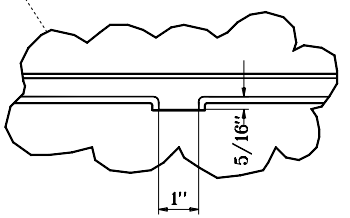


PLAN

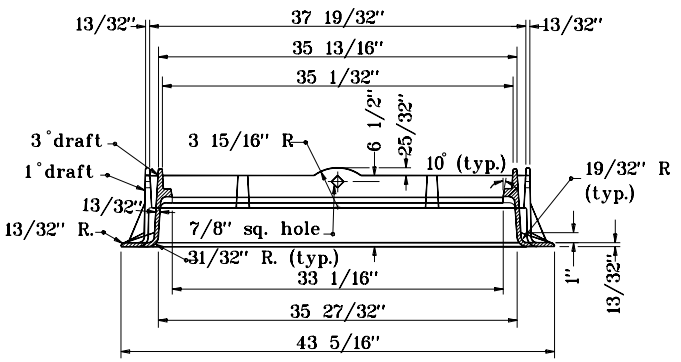


SECTION B–B

DETAIL A



DETAIL B



SECTION A–A

FRAME
CASTING TYPE 10

INDIANA DEPARTMENT OF TRANSPORTATION

CASTINGS TYPE 10
FRAME

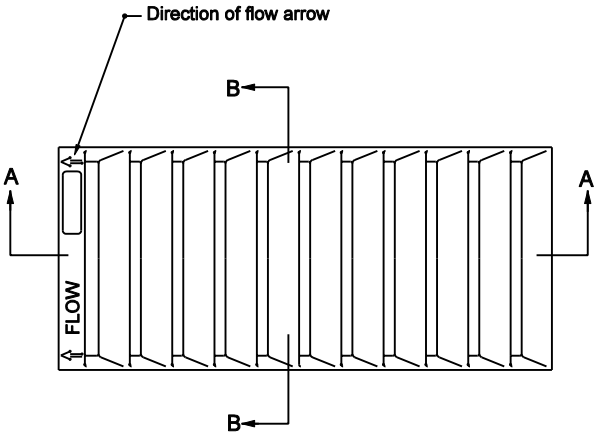
SEPTEMBER 1998

STANDARD DRAWING NO. **E 720-ICCA-08**

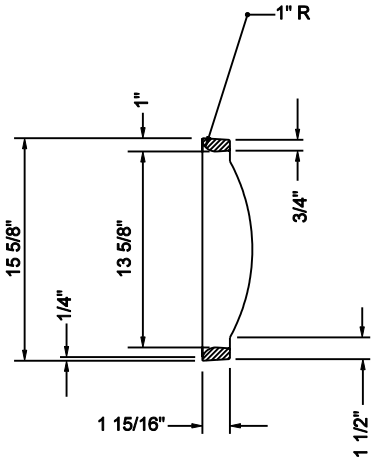
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

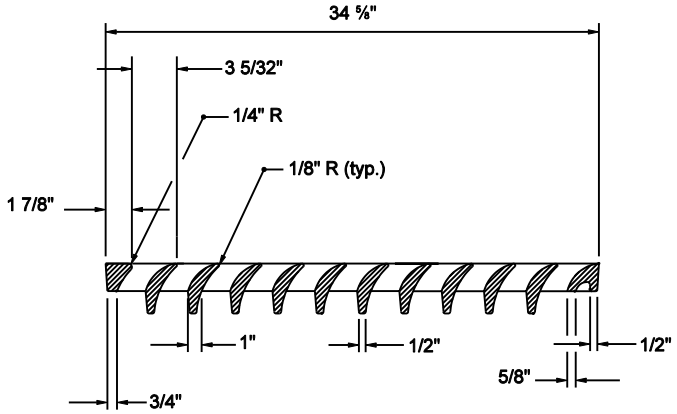
DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-01-98



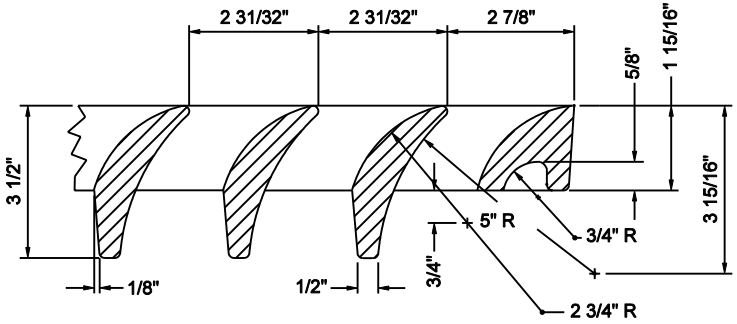
PLAN



SECTION B-B



SECTION A-A



DETAIL OF SECTION A-A

GRATE
CASTING TYPE 10

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 10
GRATE

SEPTEMBER 2003

STANDARD DRAWING NO. E 720-ICCA-09

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

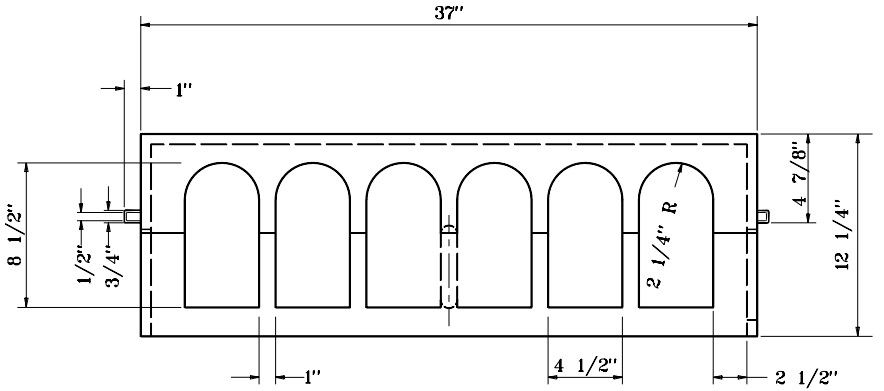
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE

GENERAL NOTES

1. Curb box adjustable 5 1/4" t0 8 3/4".



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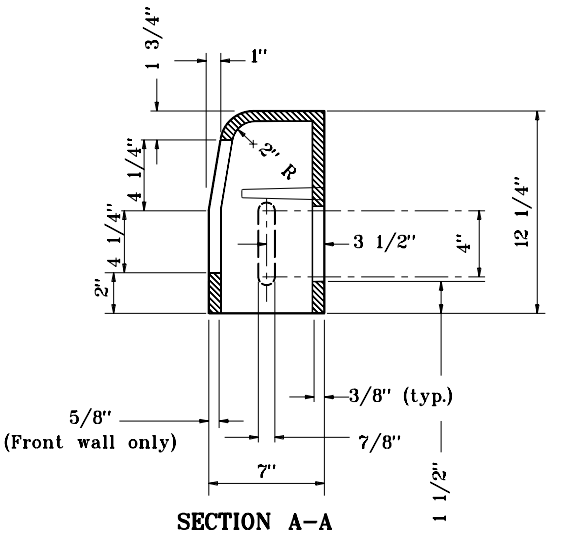
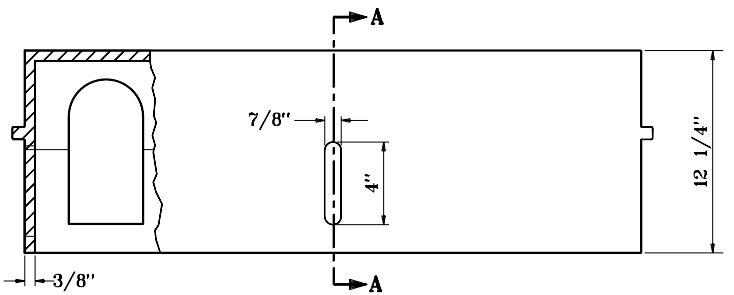


SECTION A-A



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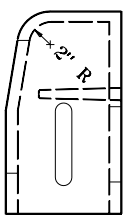


SIDE

CURB BOX
CASTING 10

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 10
CURB BOX

SEPTEMBER 1998

STANDARD DRAWING NO. E 720-ICCA-09A

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

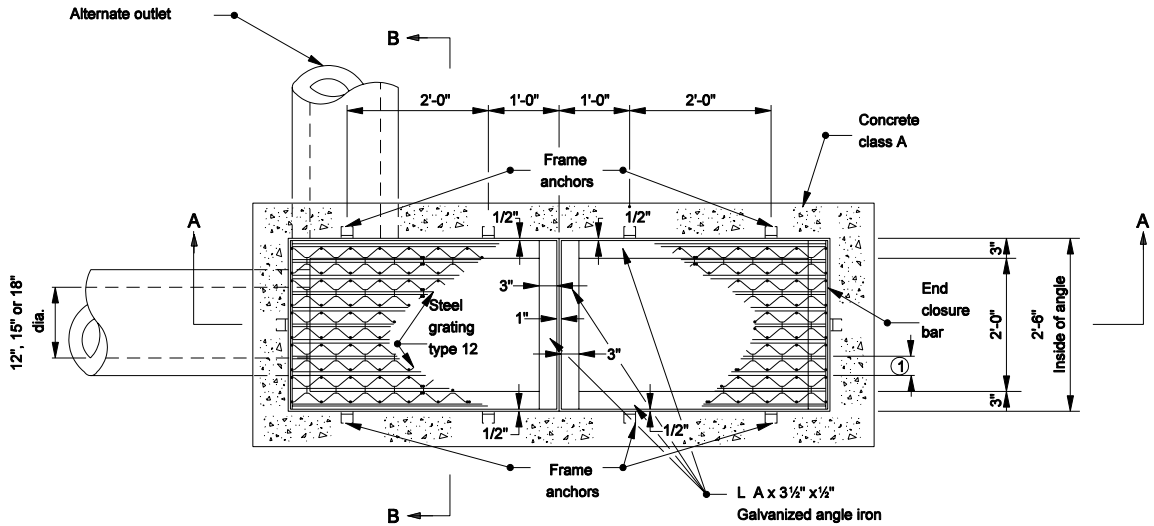
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

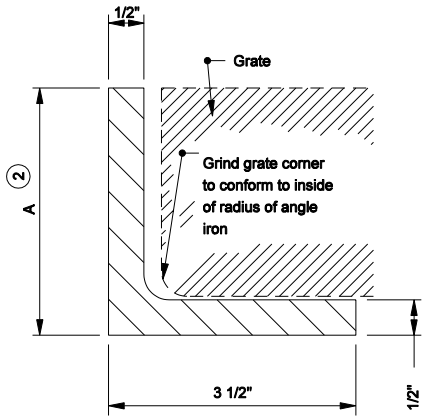
ORIGINALLY APPROVED 9-01-98

NOTES

1. Bar spacing shall be 1 ⅞" c. to c. minimum and 2 ⅜" c. to c. maximum.
2. The dimensions of the angle iron frame shall be as shown except that the A dimension may vary according to type of grating used.
3. For Section A-A, Section B-B see Standard Drawing E 720-INST-08.



PLAN



ANGLE IRON FRAME DETAIL

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL GRATING TYPE 12 FRAME AND GRATE

SEPTEMBER 2005

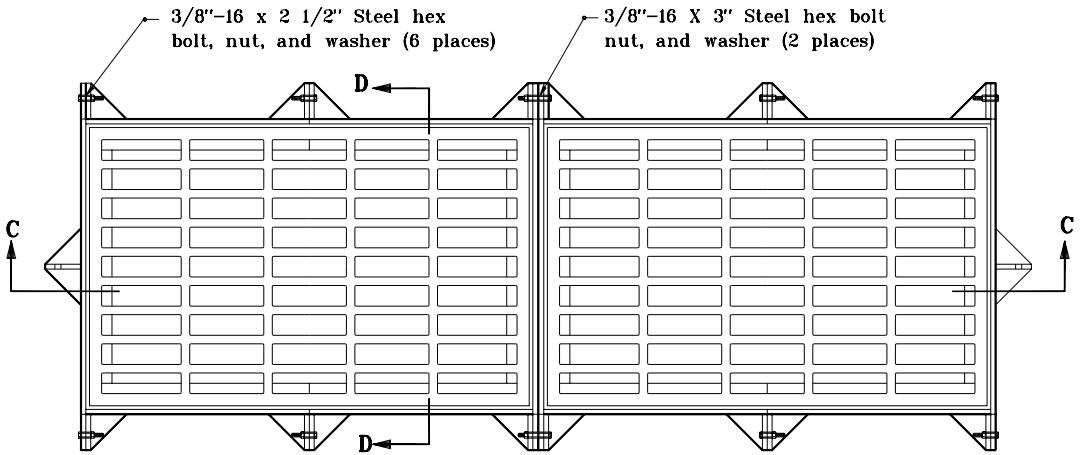
STANDARD DRAWING NO. E 720-ICCA-10

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

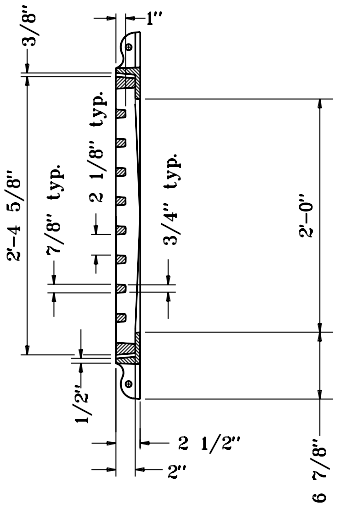
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-01-05
DESIGN STANDARDS ENGINEER DATE

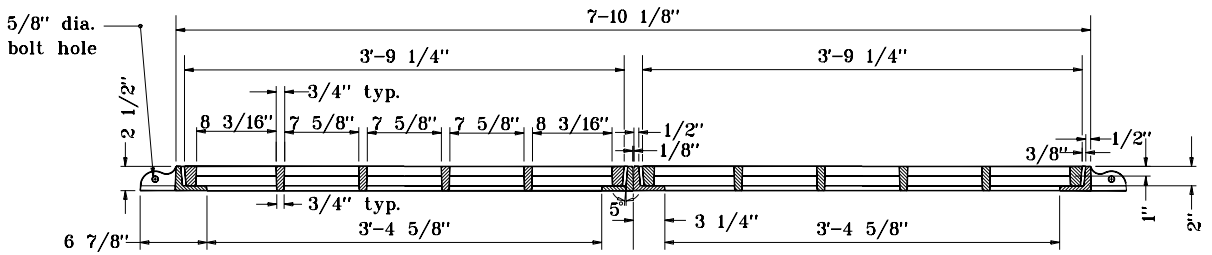
/s/ Richard K. Smutzer 9-01-05
CHIEF HIGHWAY ENGINEER DATE



PLAN



SECTION D-D



SECTION A-A

GRATE AND FRAME CASTING
ALTERNATE TYPE 12

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 12 (ALTERNATE) FRAME AND GRATE

SEPTEMBER 1998

STANDARD DRAWING NO. E 720-ICCA-11

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

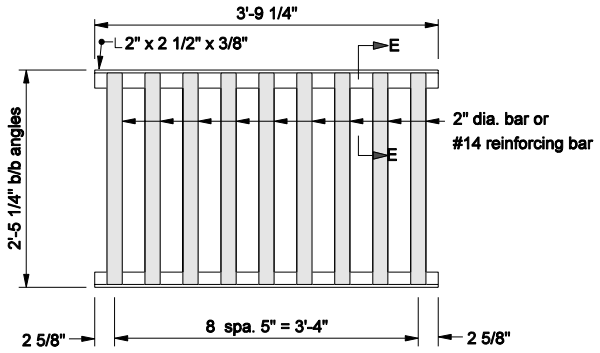
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

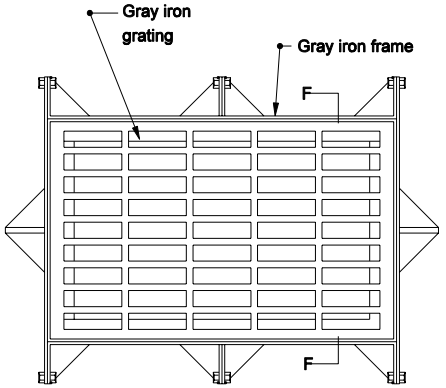
ORIGINALLY APPROVED 9-01-98

GENERAL NOTES

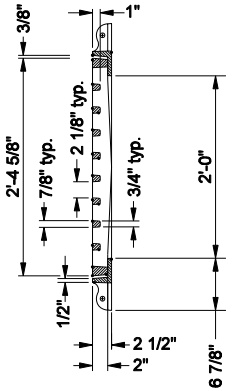
1. Spacing shall be $1\frac{7}{8}$" c. to c. min., and $2\frac{3}{8}$" c. to c. max.
2. The dimensions of the angle iron frame shall be as shown except that the A dimension may vary according to type of grating used.



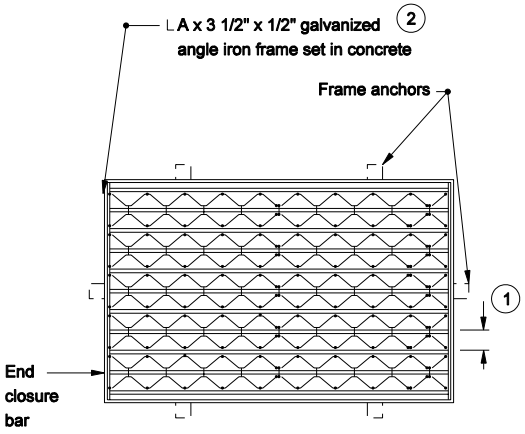
ALTERNATE STEEL GRATING
(To be used with steel frame type 12A)



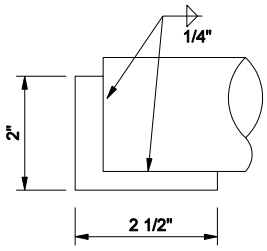
GRATE AND FRAME CASTING
ALTERNATE TYPE 12A



SECTION F-F



STEEL GRATING AND FRAME
TYPE 12A



SECTION E-E

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL GRATING TYPE 12A
FRAME AND GRATE

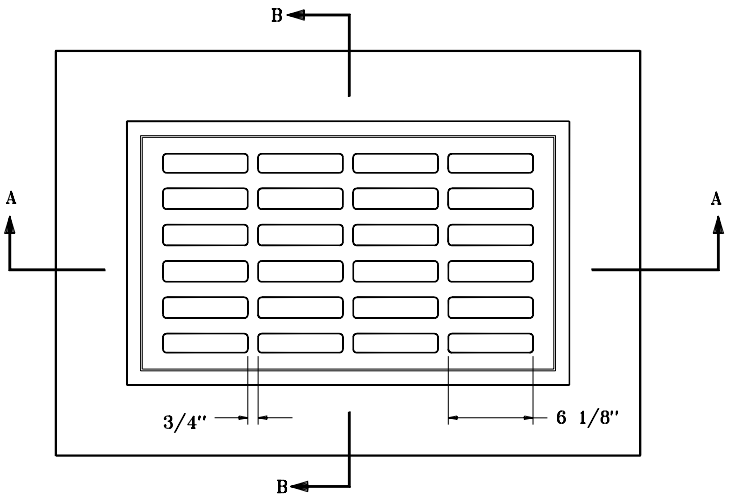
SEPTEMBER 2005

STANDARD DRAWING NO. E 720-ICCA-12

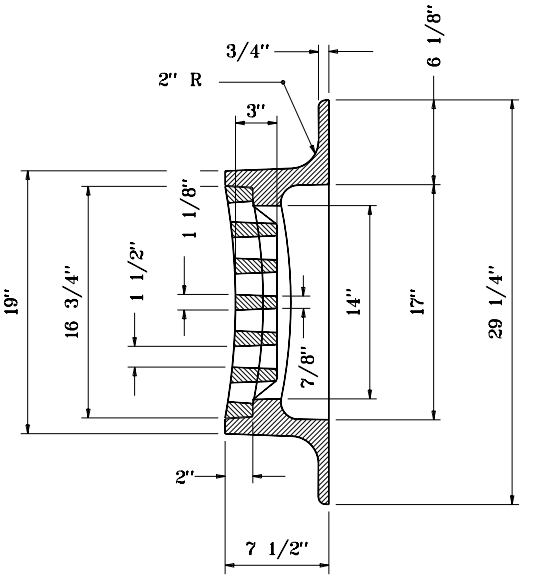
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-01-05
DESIGN STANDARDS ENGINEER DATE

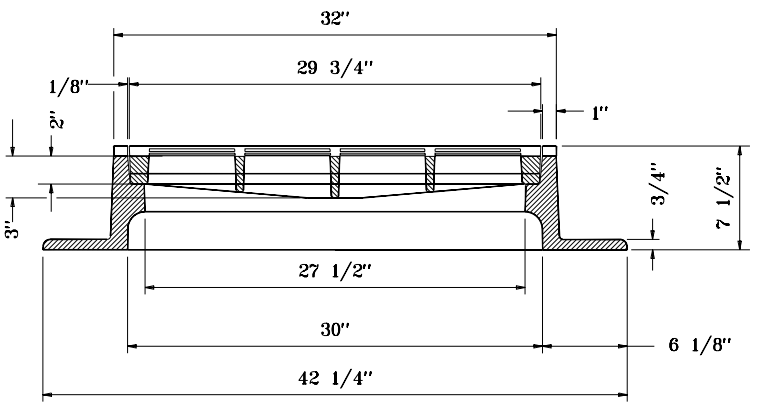
/s/ Richard K. Smutzer 9-01-05
CHIEF HIGHWAY ENGINEER DATE



PLAN



SECTION B–B



SECTION A–A

FRAME AND GRATE
CASTING TYPE 13

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 13
FRAME & GRATE

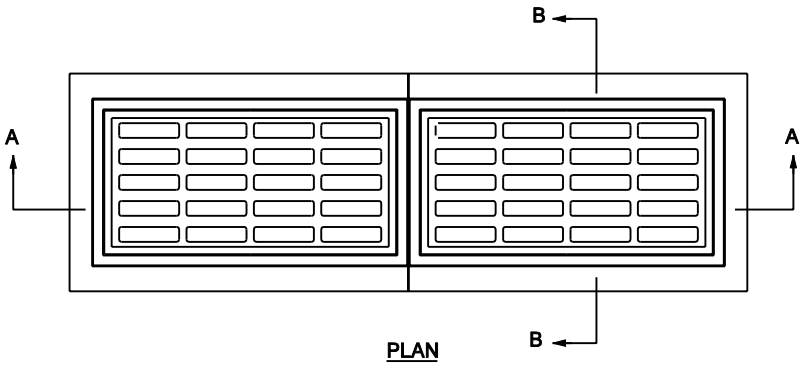
SEPTEMBER 1998

STANDARD DRAWING NO. **E 720-ICCA-13**

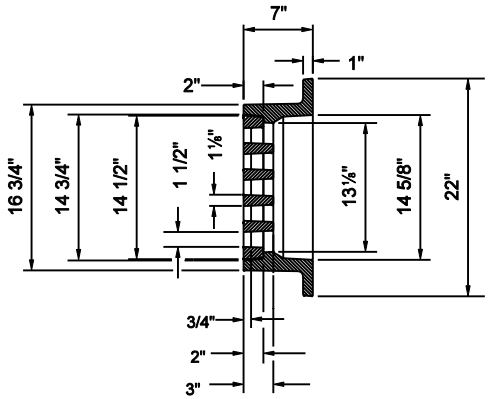
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

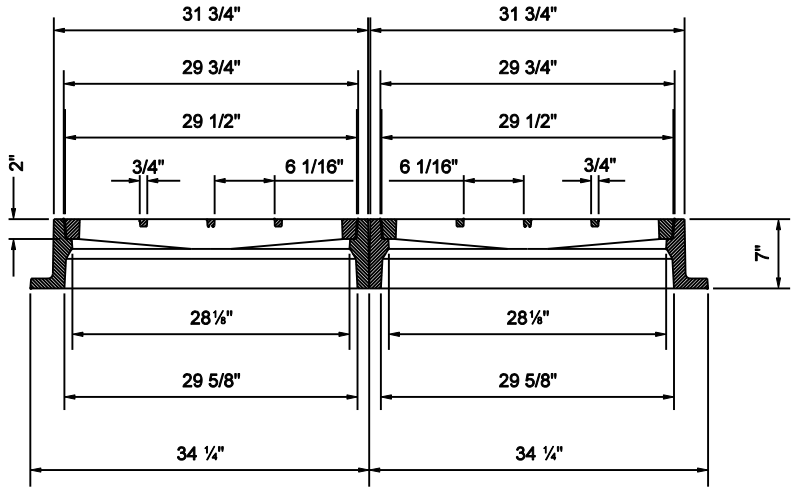
DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-01-98



PLAN



SECTION B-B



SECTION A-A

FRAME AND GRATE
CASTING TYPE 14

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 14
FRAME AND GRATE

SEPTEMBER 2003

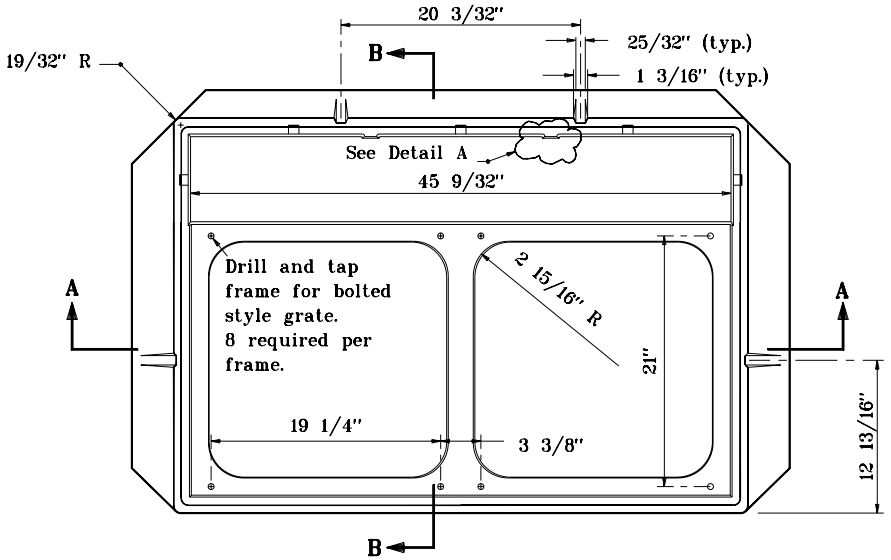
STANDARD DRAWING NO. E 720-ICCA-15

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

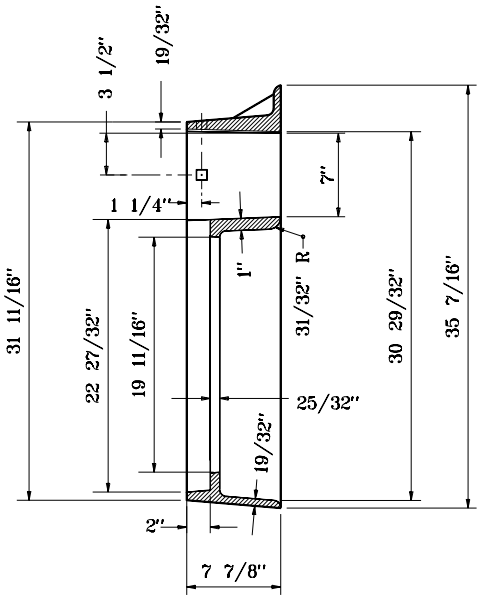
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — 9-02-03
DESIGN STANDARDS ENGINEER — DATE

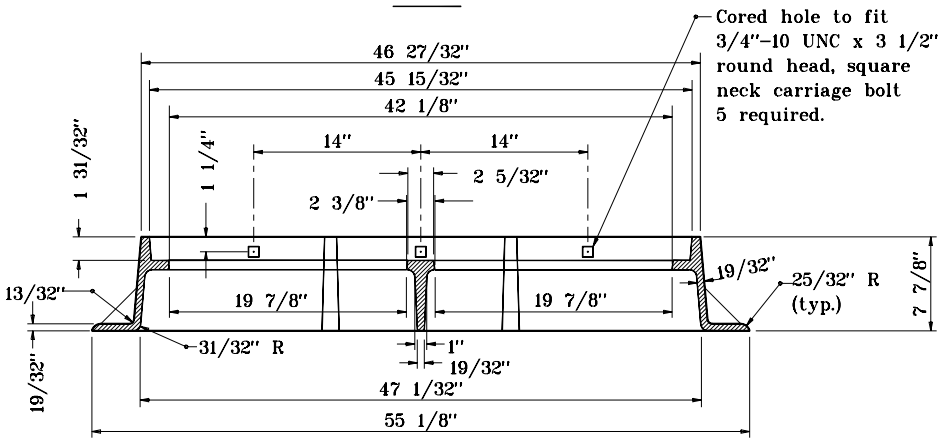
/s/ Richard K. Smutzer — 9-02-03
CHIEF HIGHWAY ENGINEER — DATE



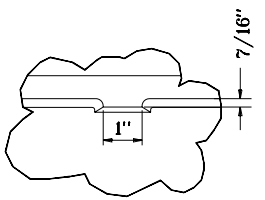
PLAN



SECTION B–B



SECTION A–A



DETAIL A

FRAME
CASTING TYPE 15

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 15
FRAME

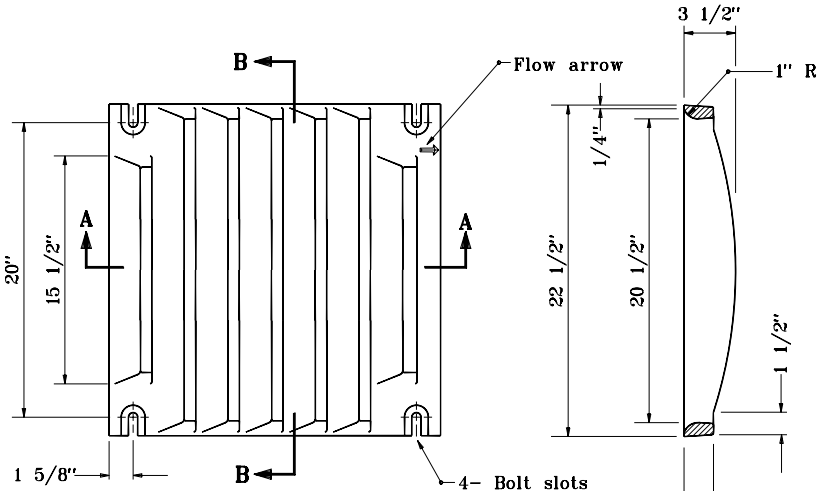
SEPTEMBER 1998

STANDARD DRAWING NO. **E 720-ICCA-16**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

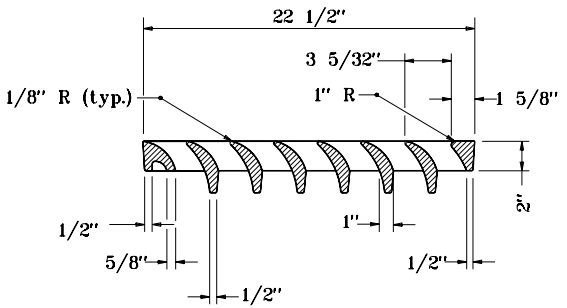
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-01-98

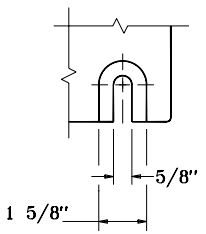


PLAN

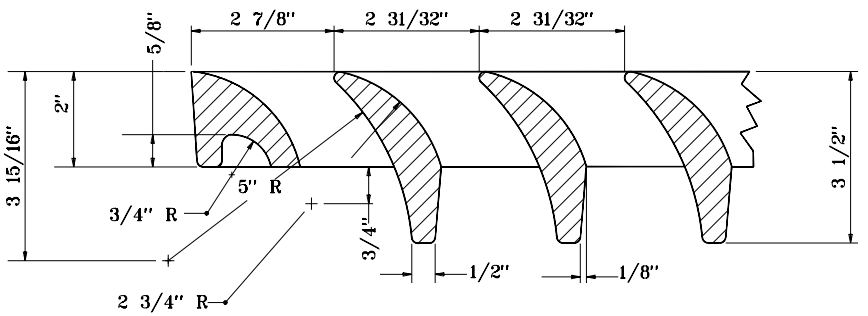
SECTION B-B



SECTION A-A



BOLT SLOT DETAIL



INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 15 GRATE

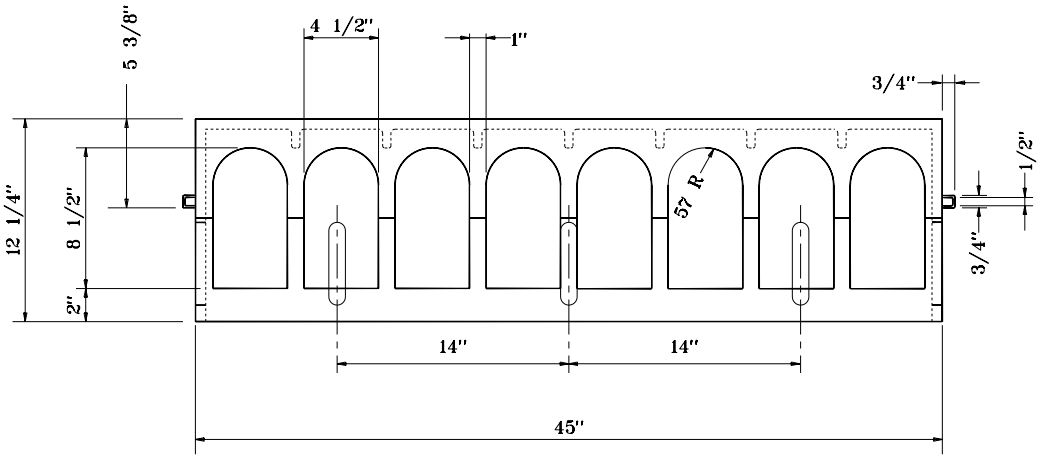
SEPTEMBER 1998

STANDARD DRAWING NO. E 720-ICCA-17

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-01-98



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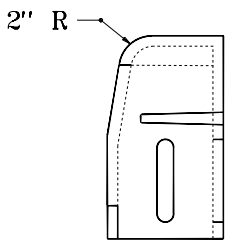
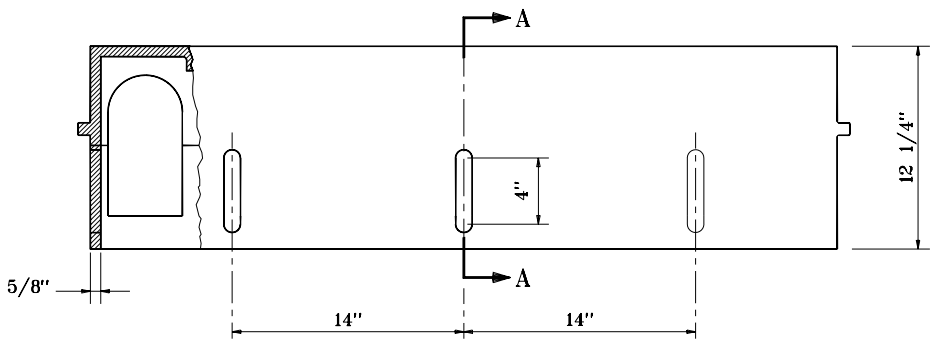
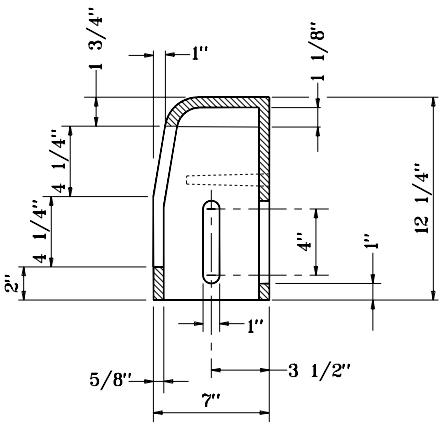


SIDE



BACK



SECTION A-A

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 15
CURB BOX

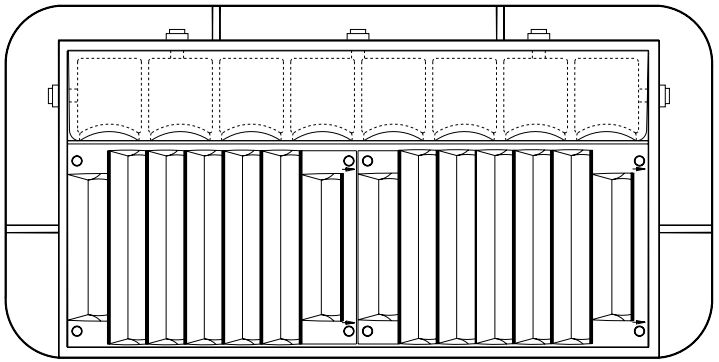
SEPTEMBER 1998

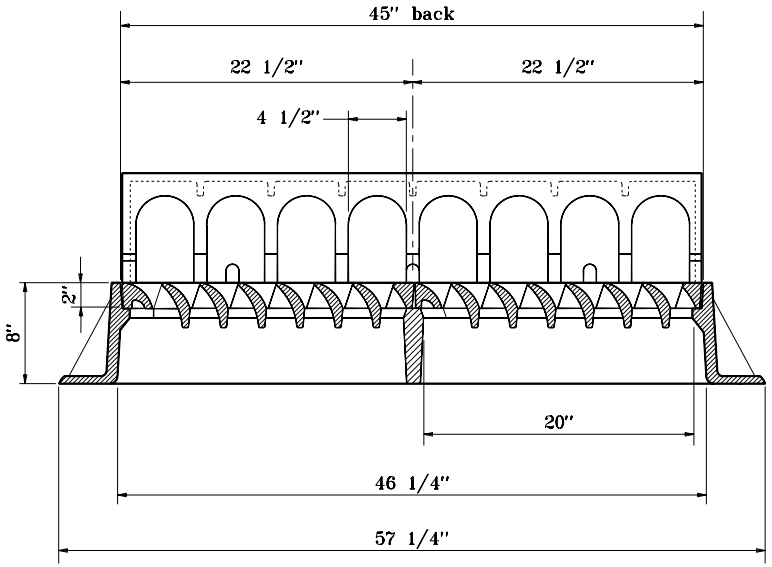
STANDARD DRAWING NO. **E 720-ICCA-18**

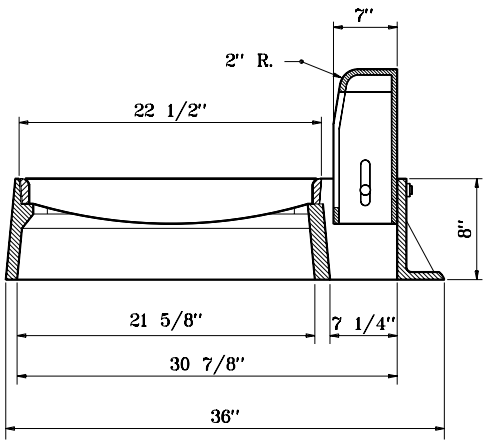
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	9-01-98







GENERAL NOTES

1. Curb adjustment $5\frac{1}{2}$" to $9\frac{1}{2}$".

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE 15 (ALTERNATE) FRAME, GRATE, AND CURB BOX

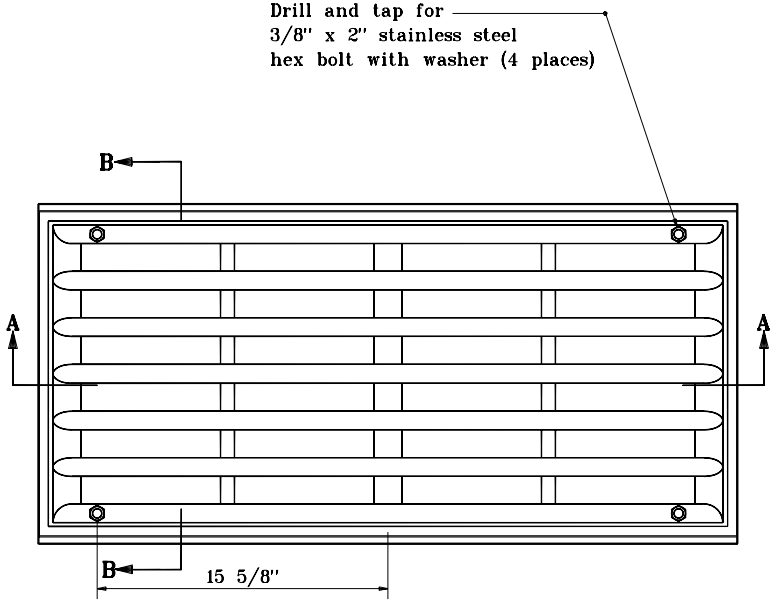
SEPTEMBER 1998

STANDARD DRAWING NO. **E 720-ICCA-19**

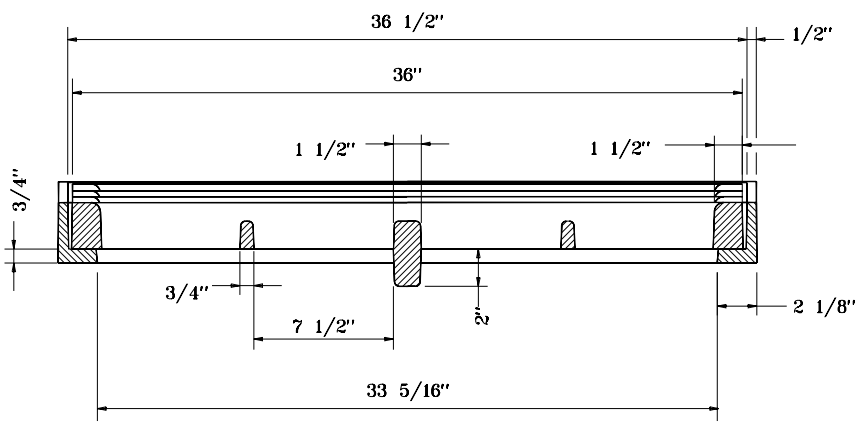
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

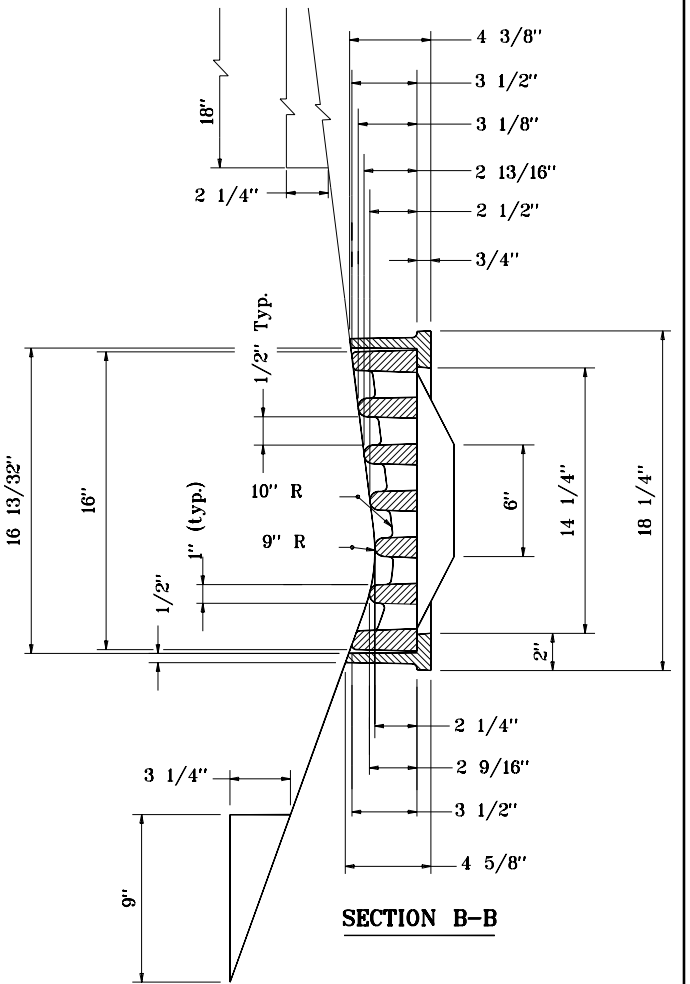
DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-01-98



PLAN



SECTION A–A



SECTION B–B

INDIANA DEPARTMENT OF TRANSPORTATION

INLET CASTING
TYPE 6

SEPTEMBER 1998

STANDARD DRAWING NO. E 720-INCA-01

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

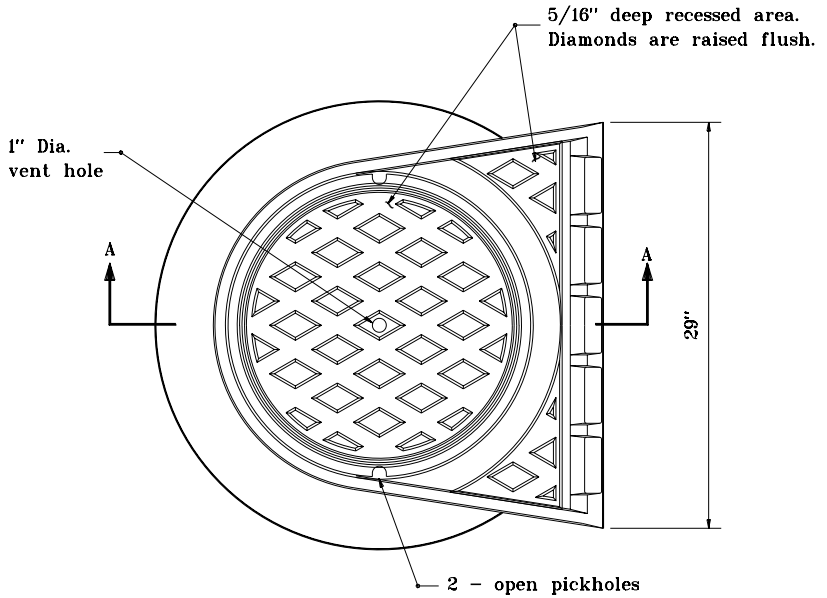
DESIGN STANDARDS ENGINEER

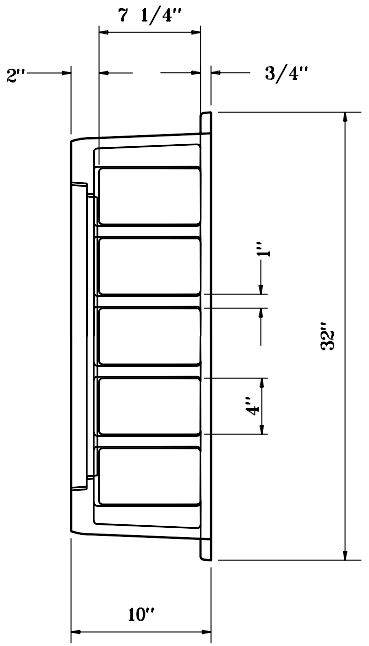
DETAILS PLACED IN THIS FORMAT 11-15-99

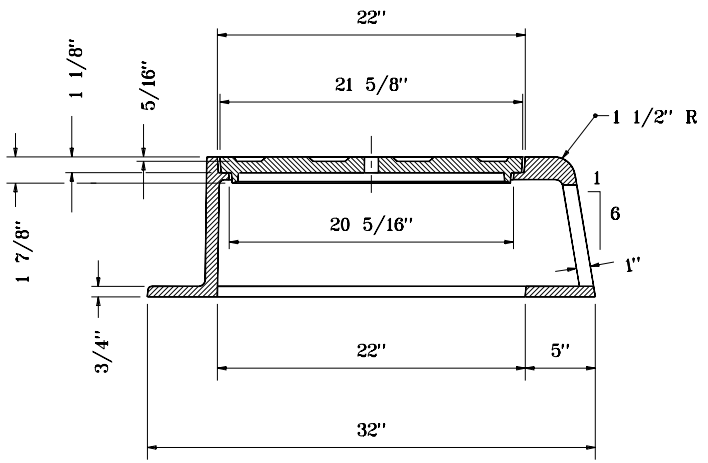
/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 9-01-98







SECTION A-A

CURB CASTING TYPE 3

INDIANA DEPARTMENT OF TRANSPORTATION

CURB INLET CASTING TYPE 3

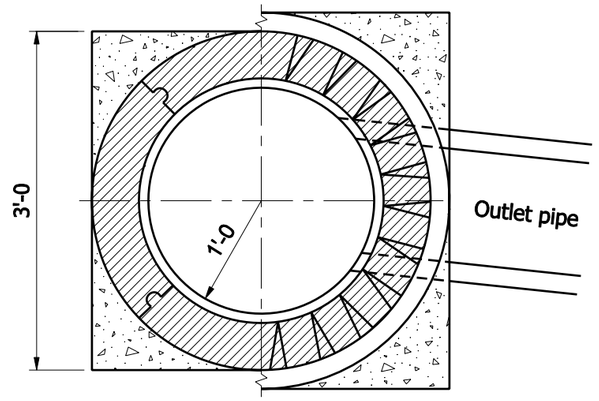
SEPTEMBER 1998

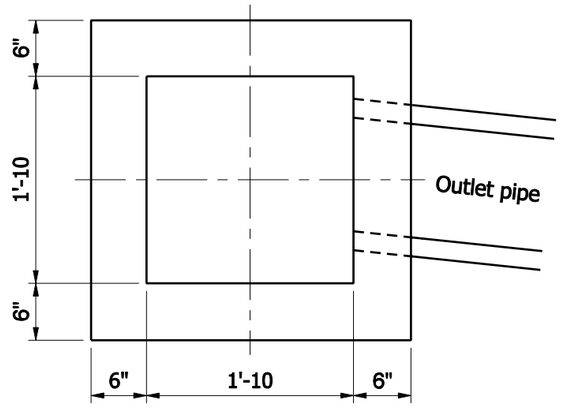
STANDARD DRAWING NO. **E 720-INCA-02**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

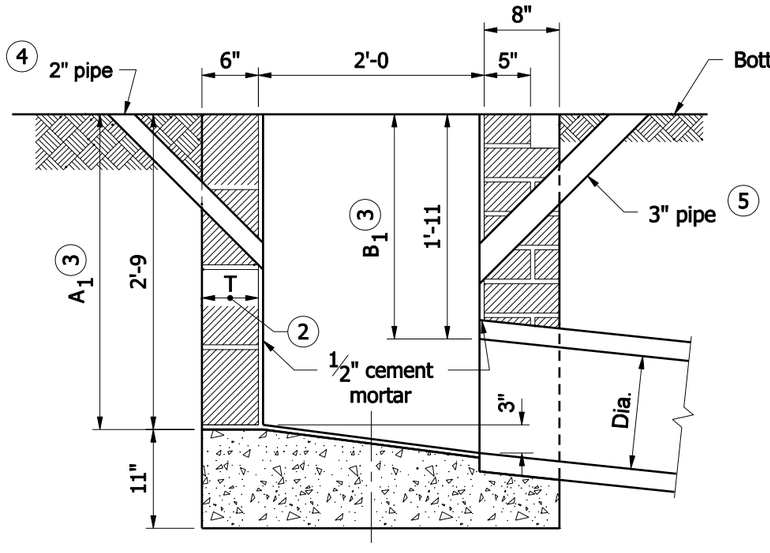
DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	9-01-98



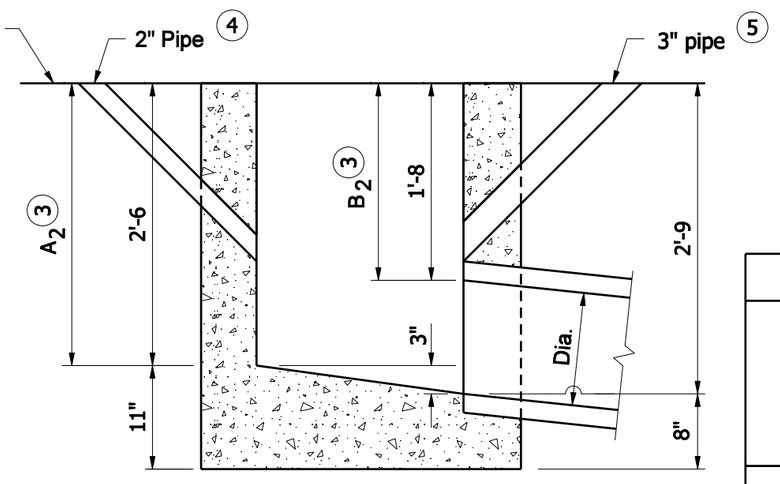


GENERAL NOTES

1. Brick, block, or concrete may be used.
2. T = 8" for brick structure
   T = 6" for segmental block structure
3. In special cases or where inlet pipe is required, A_1, B_1, A_2, and B_2 shall be increased or decreased 1'-0, as directed.
4. 2" dia. pipe drain from bottom of curb to inlet. Aggregate to be placed around inlet end of pipe.
5. 3" dia. pipe to be kept open for drainage of subgrade or base until surface is placed.



BRICK OR BLOCK



CONCRETE

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE A

SEPTEMBER 2008

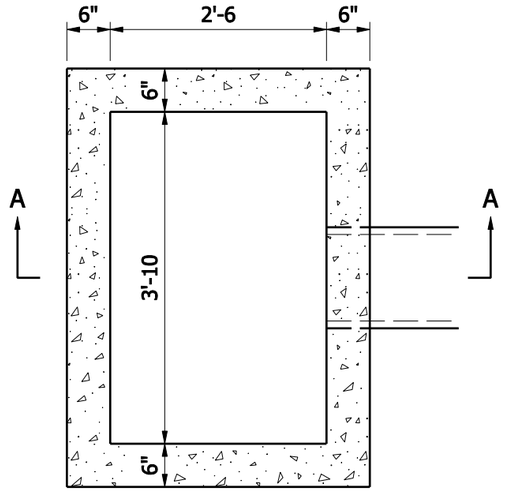
STANDARD DRAWING NO. E 720- INST-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

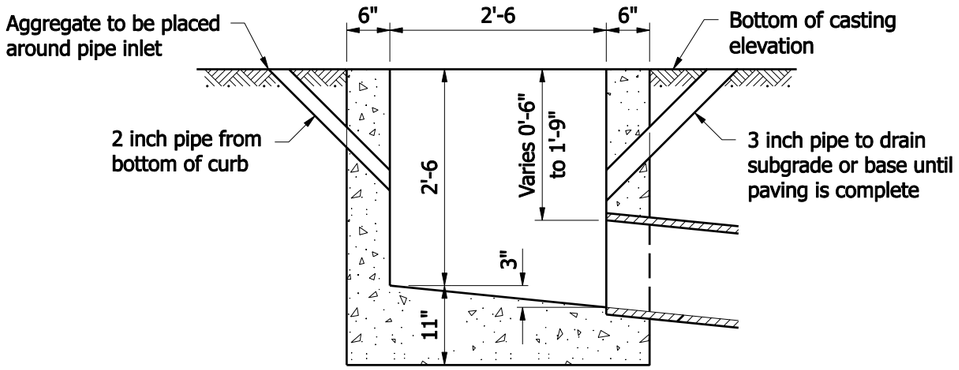
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE

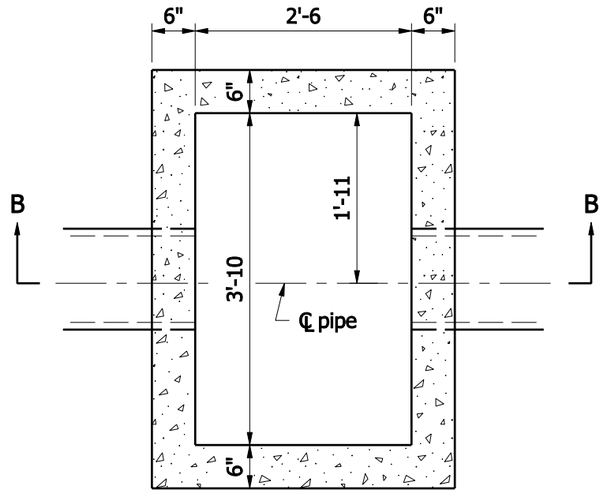


PLAN

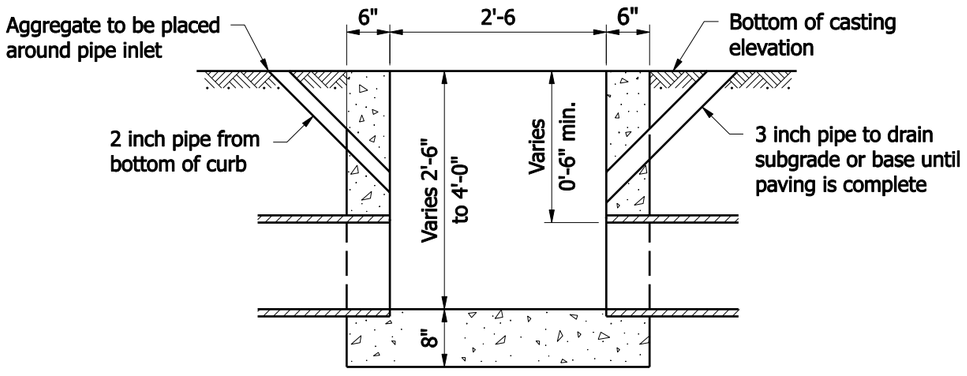


SECTION A-A

INLET-TYPE B



PLAN



SECTION B-B

INLET-TYPE C

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE B AND C

SEPTEMBER 2008

STANDARD DRAWING NO. E 720- INST-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08

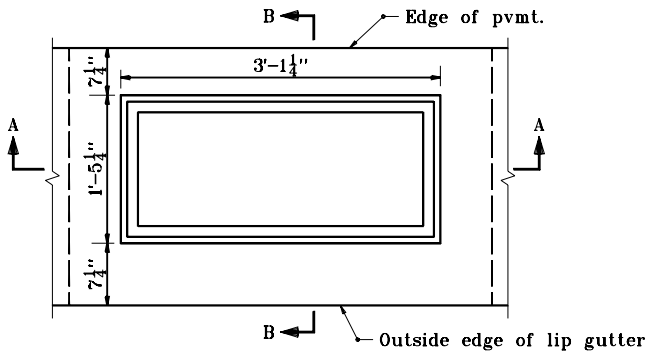
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/02/08

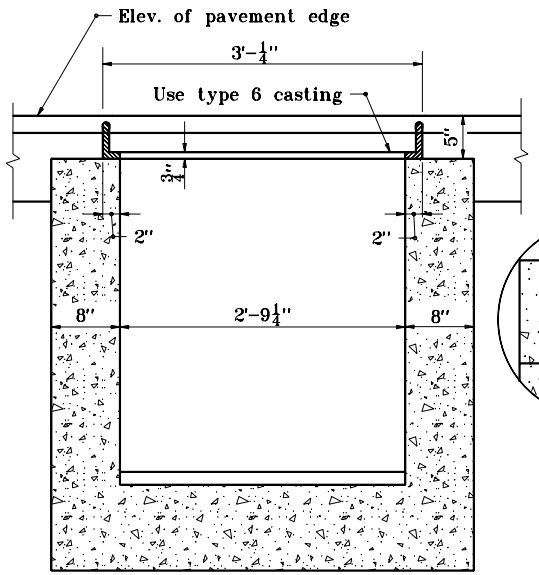
CHIEF HIGHWAY ENGINEER — DATE

GENERAL NOTES

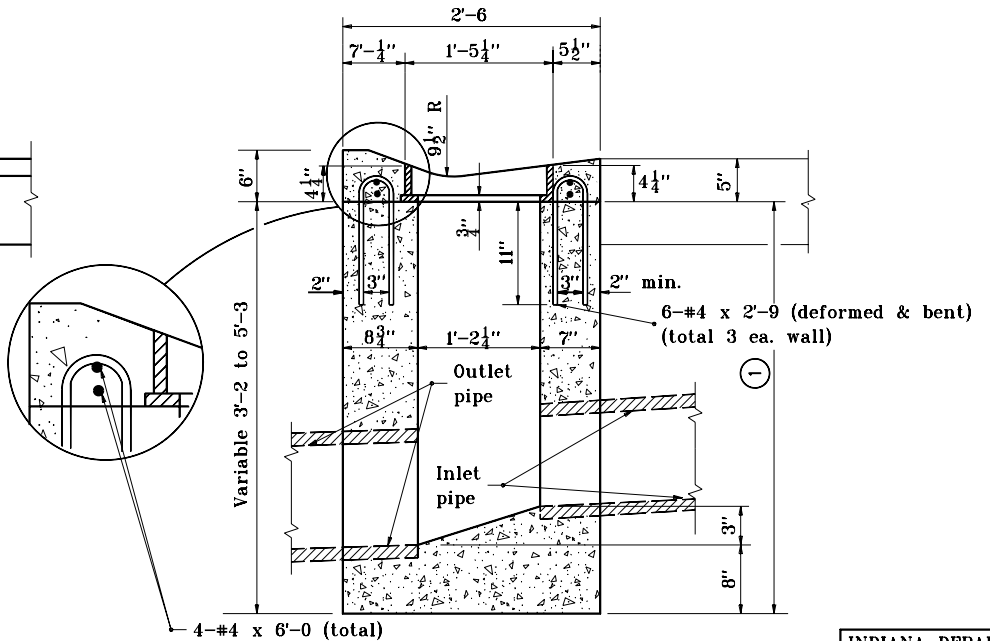
(1) If inlet pipe is required, this dimension shall be increased or decreased 1'–0 as directed.



PLAN



SECTION A–A



SECTION B–B

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE D

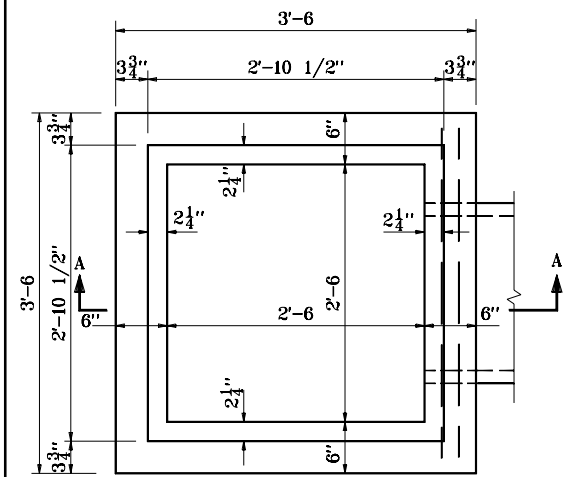
SEPTEMBER 1997

STANDARD DRAWING NO. E 720–INST–03

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	9-01-97



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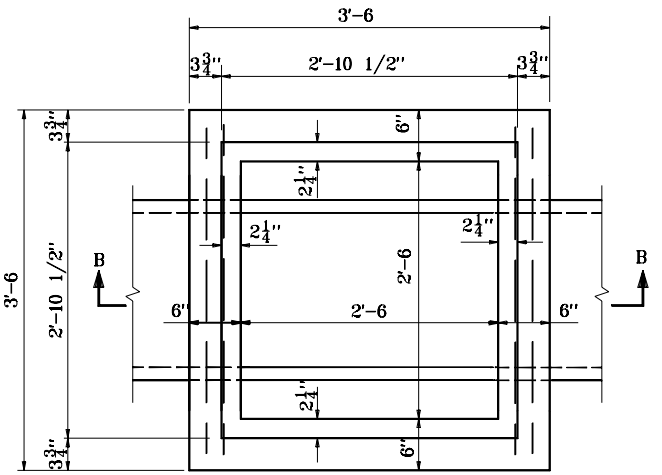

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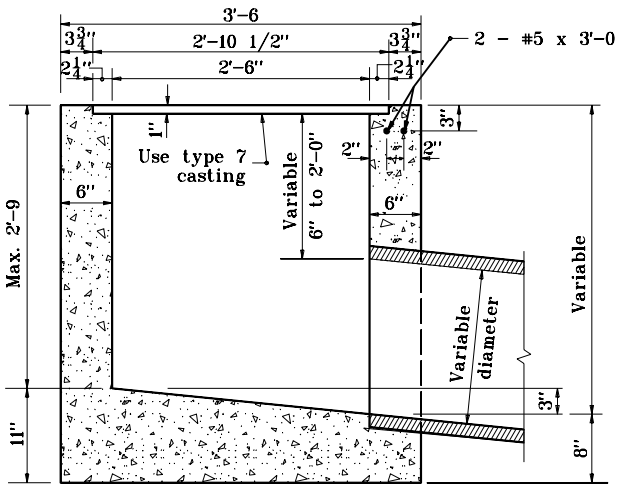
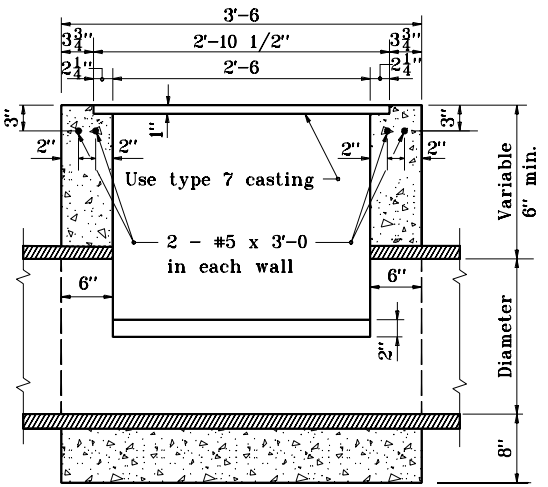


SECTION A-A

INLET TYPE E (CONC.)



SECTION B-B

INLET TYPE F (CONC.)

INDIANA DEPARTMENT OF TRANSPORTATION

INLETS TYPE E AND F

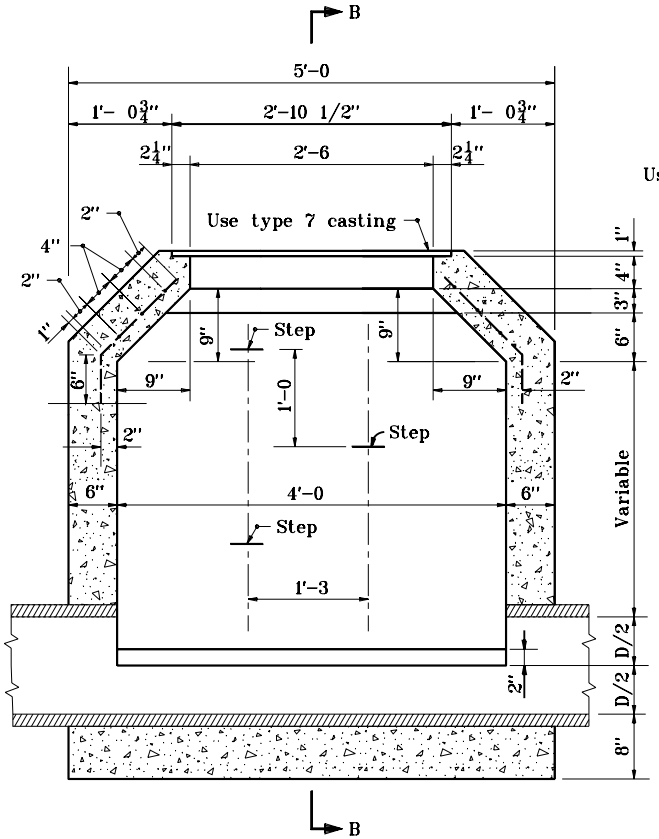
SEPTEMBER 1997

STANDARD DRAWING NO. **E 720-INST-04**

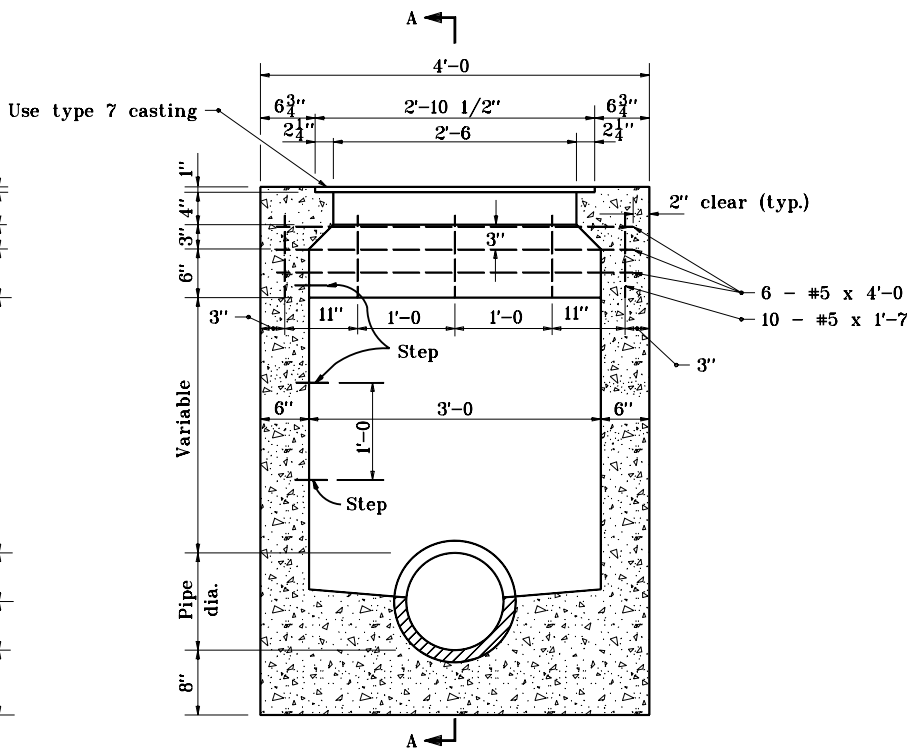
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-02-97



SECTION A-A



SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE G

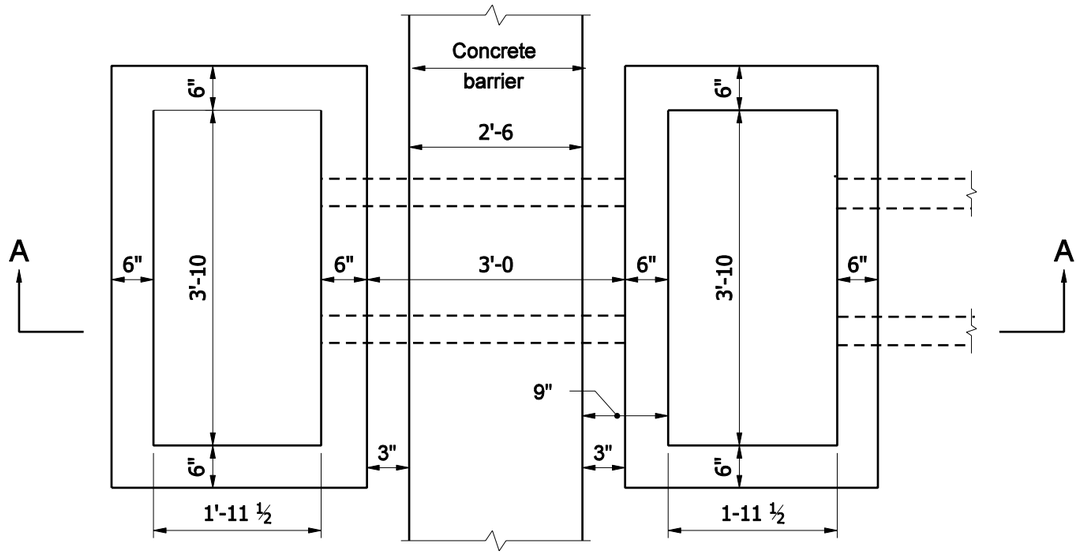
SEPTEMBER 1997

STANDARD DRAWING NO. E 720-INST-05

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich, DESIGN STANDARDS ENGINEER	11-15-99
/s/ Firooz Zandi, CHIEF HIGHWAY ENGINEER	11-15-99
ORIGINALLY APPROVED	9-01-97



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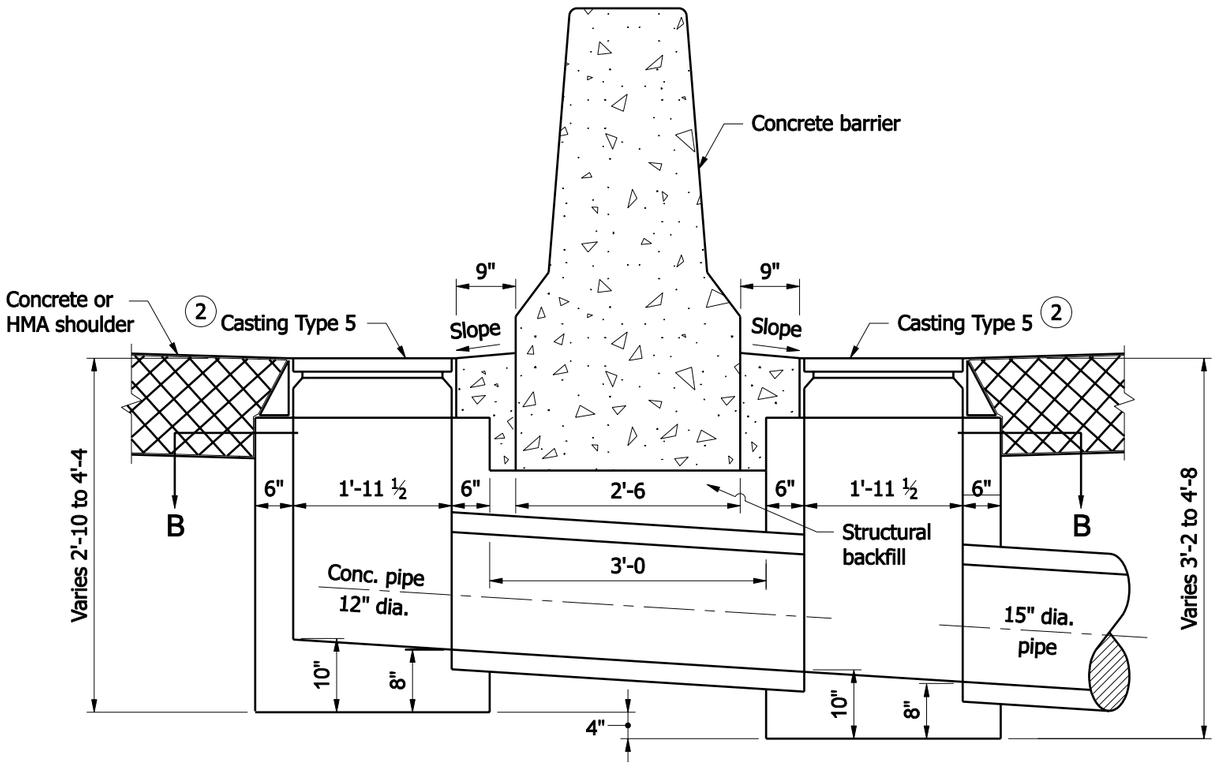


SECTION A-A

NOTES

1. Each inlet Type H includes two boxes and the connector pipe between the inlet boxes.
2. See Standard Drawing E 720-ICCA-01 thru -03 for casting type 5 details.

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE H

SEPTEMBER 2008

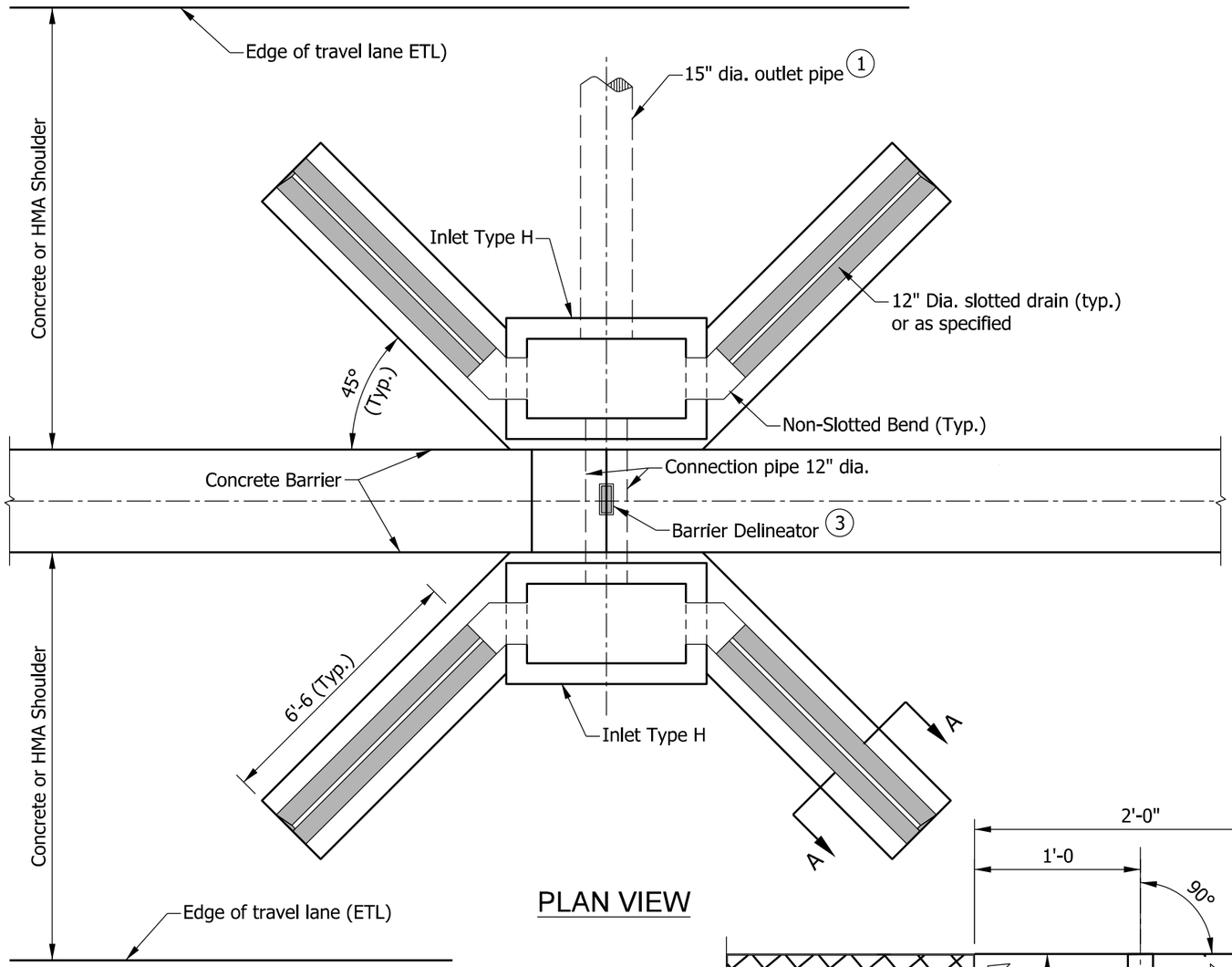
STANDARD DRAWING NO. E 720- INST-05A

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

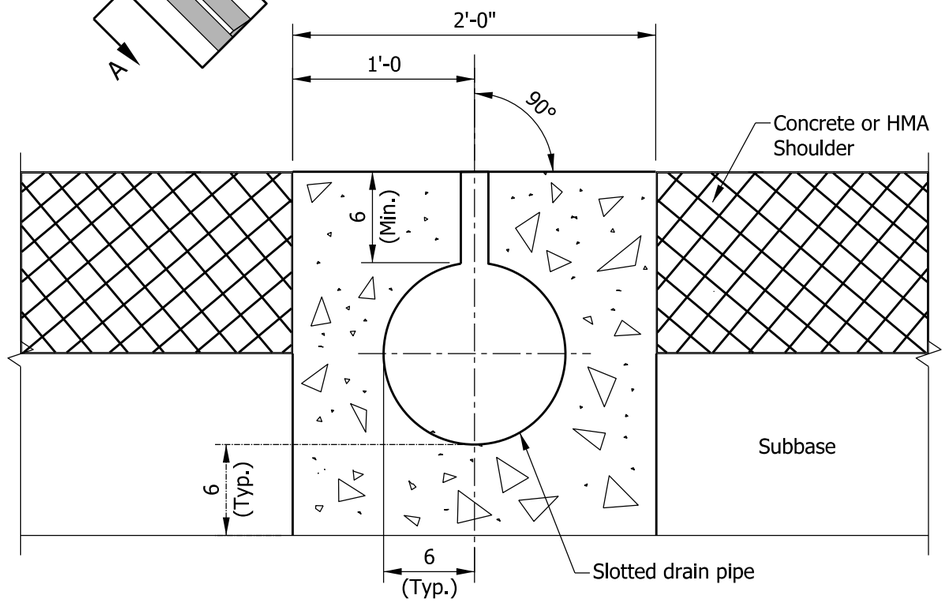
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER — DATE



PLAN VIEW



SECTION A-A

NOTES:

(1) Inlet and outlet pipe orientation to meet site conditions.

2. See Standard Drawing E 720-INST-05A for inlet Type H placement and details.

(3) Barrier delineators provided to indicate the location of the inlets and shall be centered on top of concrete barrier at the inlets.

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE H WITH SLOTTED DRAIN PIPE

MARCH 2003

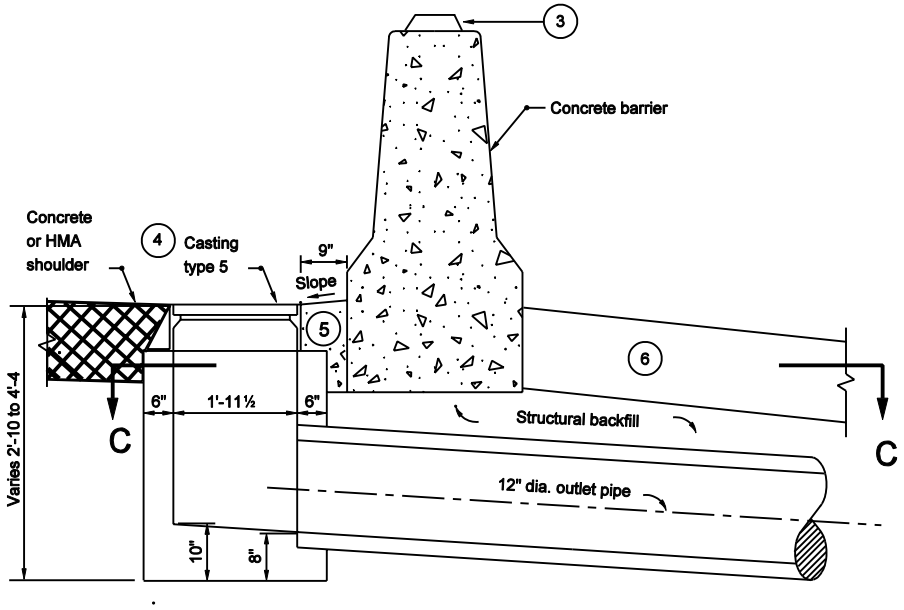
STANDARD DRAWING NO. E 720-INST-05B

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

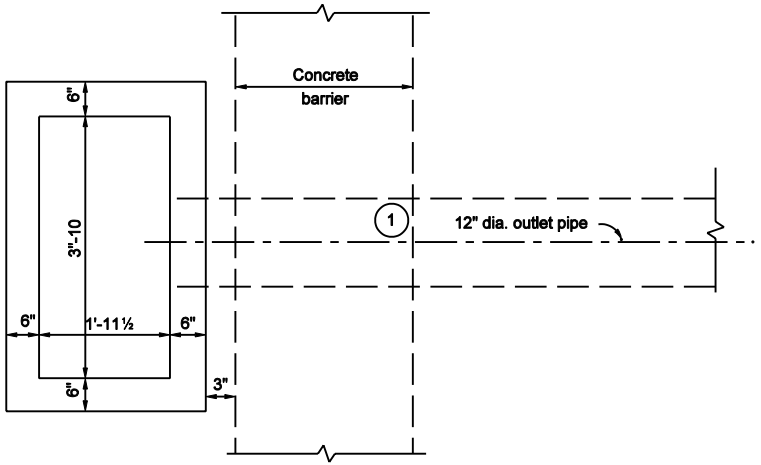
DETAILS PLACED IN THIS FORMAT mm/dd/yy

/s/ Richard L. VanCleave *03/03/03*
DESIGN STANDARDS ENGINEER DATE

/s/ Richard Smutzer *03/03/03*
CHIEF ENGINEER DATE



SECTION B-B



SECTION C-C

NOTES :

1. Outlet pipe orientation to meet site conditions.
2. See Standard Drawing E 720-INST-05D for Type HA inlet with slotted drain pipe placement.
3. All barrier delineator assemblies shall be centered on top of concrete barrier at the inlets.
4. See Standard Drawing E 720-ICCA-01 to -03 for casting type 5 details.
5. Concrete shoulder or pavement between type 5 casting and concrete barrier wall.
6. Concrete, HMA or earth shoulder as appropriate at site.

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE HA
SECTION B-B

MARCH 2003

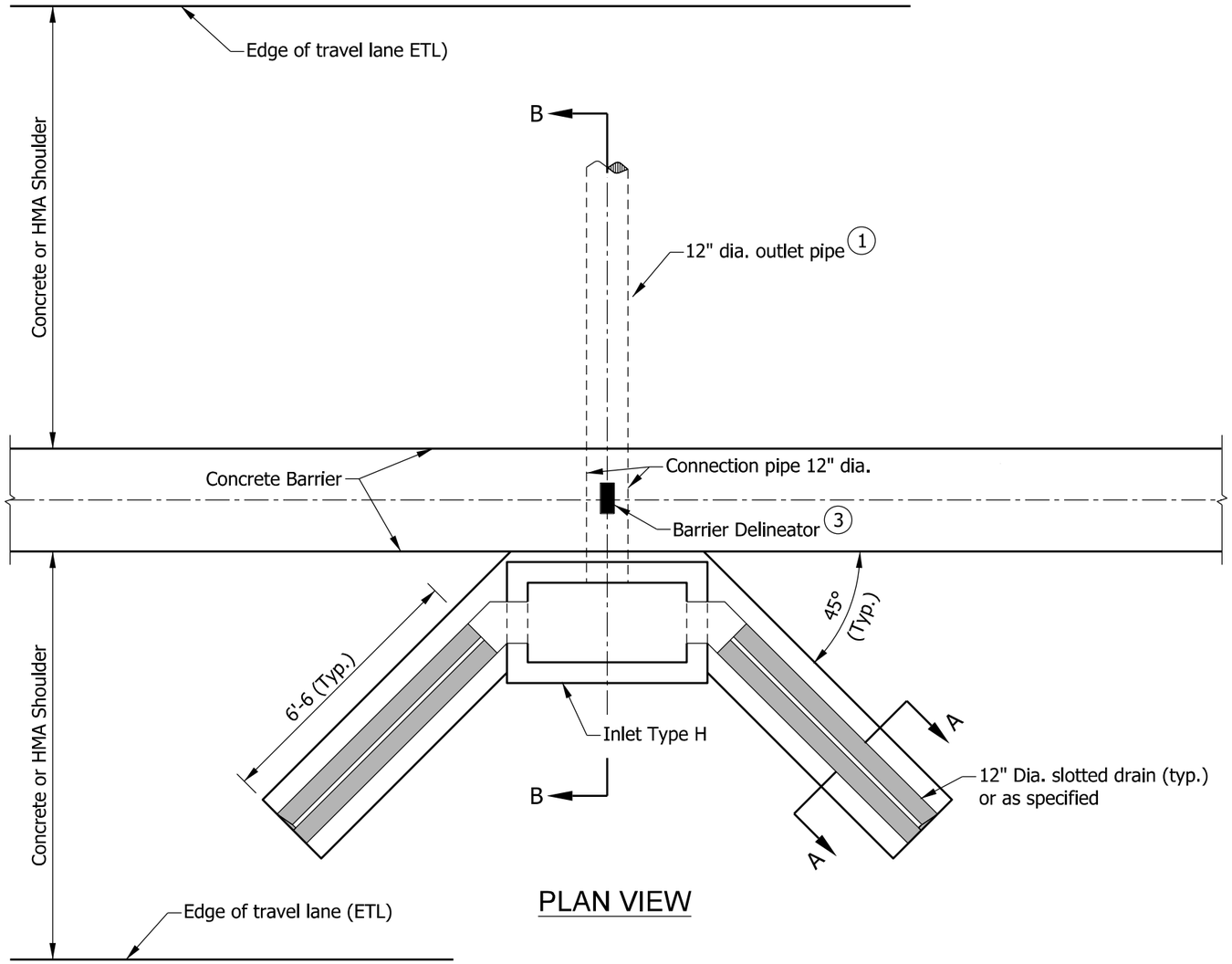
STANDARD DRAWING NO. E 720-INST-05C

RICHARD L. VANCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — DESIGN STANDARDS ENGINEER — 3-03-03 DATE

/s/ Richard K. Smutzer — CHIEF HIGHWAY ENGINEER — 3-03-03 DATE



PLAN VIEW

NOTES:

1. Inlet and outlet pipe orientation to meet site conditions.
2. See Standard Drawing E 720-INST-05B for section A-A.
3. All barrier delineators assemblies shall be centered on top of concrete barrier at the inlets.
4. See Standard Drawing E 720-INST-05C for section B-B.

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE HA WITH SLOTTED DRAIN PIPE

MARCH 2003

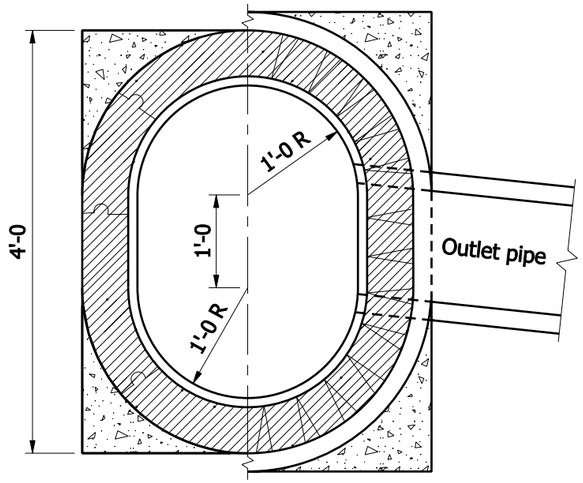
STANDARD DRAWING NO. E 720-INST-05D

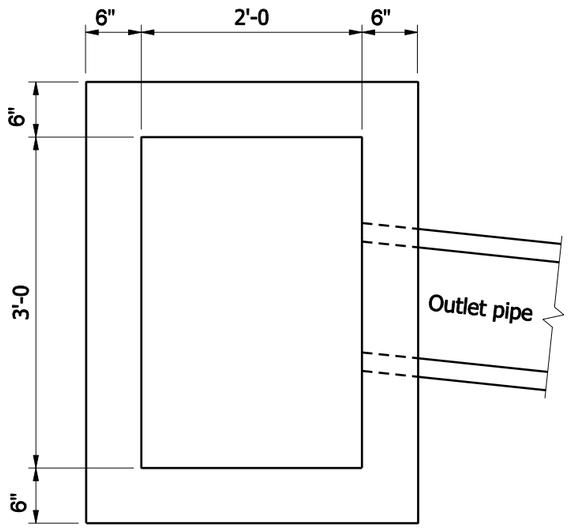
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DETAILS PLACED IN THIS FORMAT mm/dd/yy

/s/ Richard L. VanCleave 03/03/03
DESIGN STANDARDS ENGINEER DATE

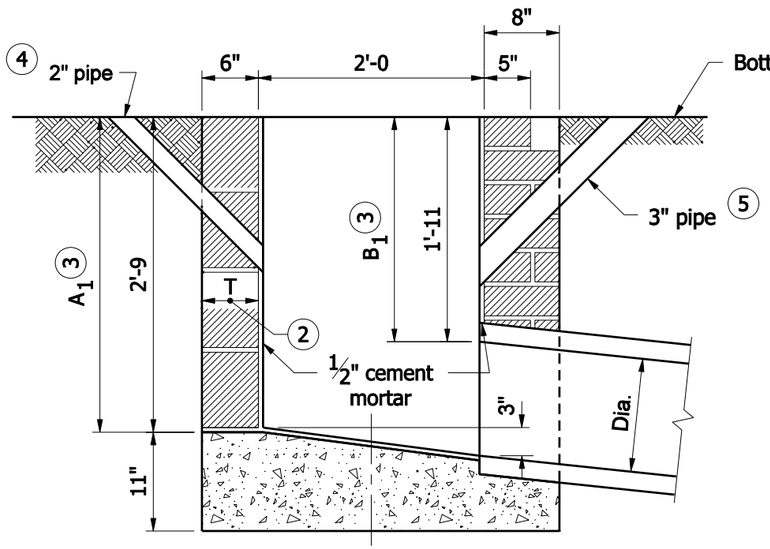
/s/ Richard Smutzer 03/03/03
CHIEF ENGINEER DATE



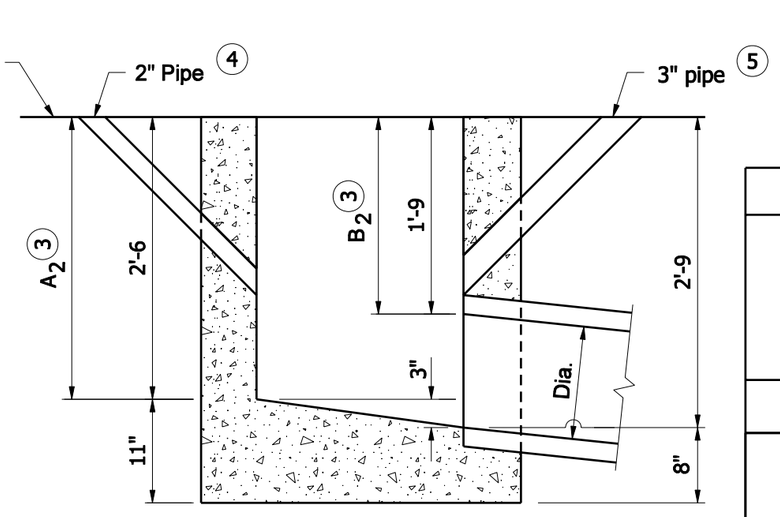


GENERAL NOTES

1. Brick, block, or concrete may be used.
2. T = 8" for brick structure
   T = 6" for segmental block structure
3. In special cases or where inlet pipe is required, A_1, B_1, A_2, and B_2 shall be increased or decreased 1'-0, as directed.
4. 2" dia. pipe drain from bottom of curb to inlet. Aggregate to be placed around inlet end of pipe.
5. 3" dia. pipe to be kept open for drainage of subgrade or base until surface is placed.



BRICK OR BLOCK



CONCRETE

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE J

SEPTEMBER 2008

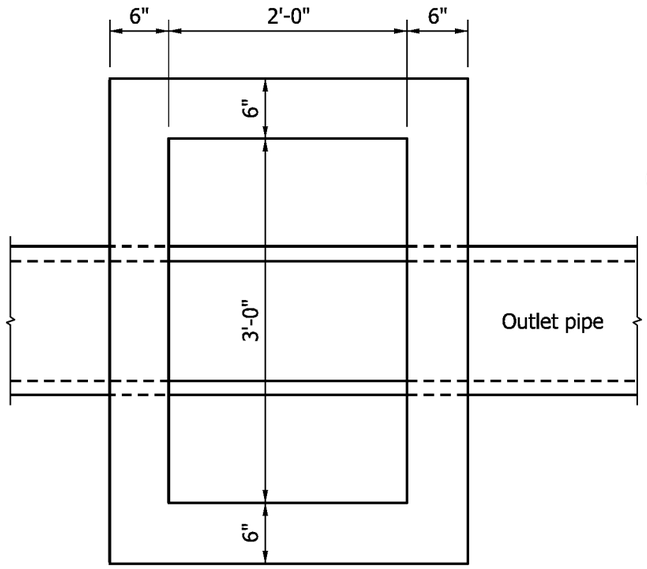
STANDARD DRAWING NO. E 720- INST-06

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

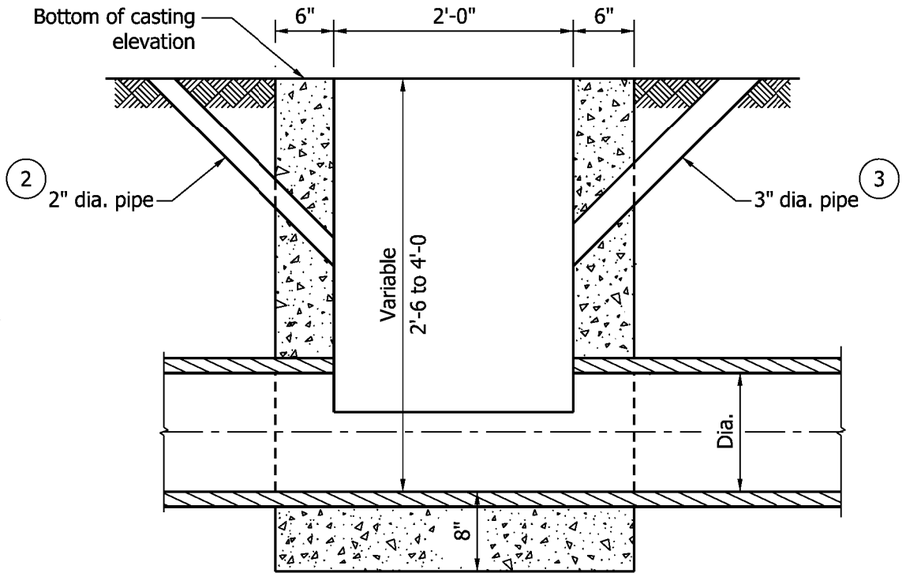
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/02/08
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/02/08
CHIEF HIGHWAY ENGINEER DATE

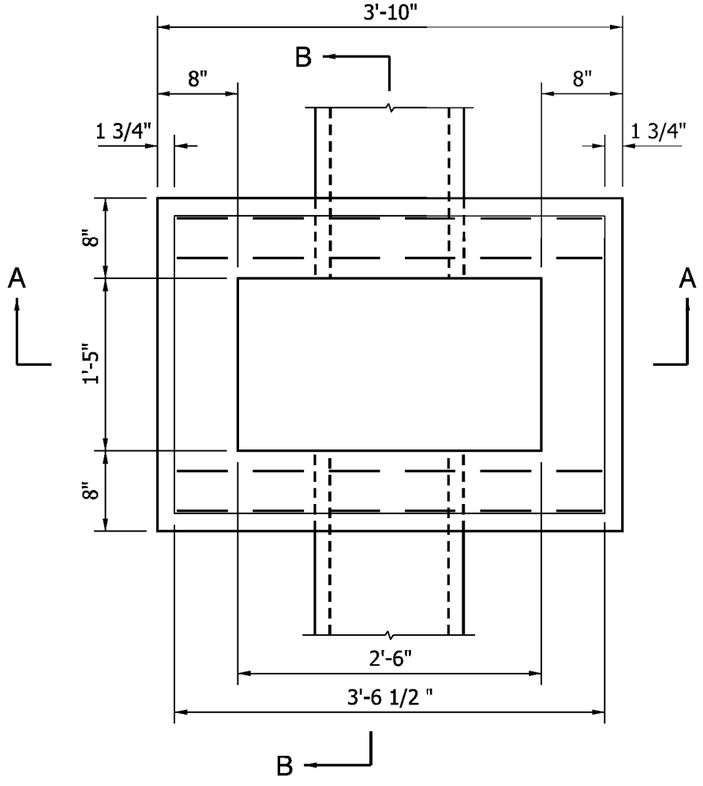


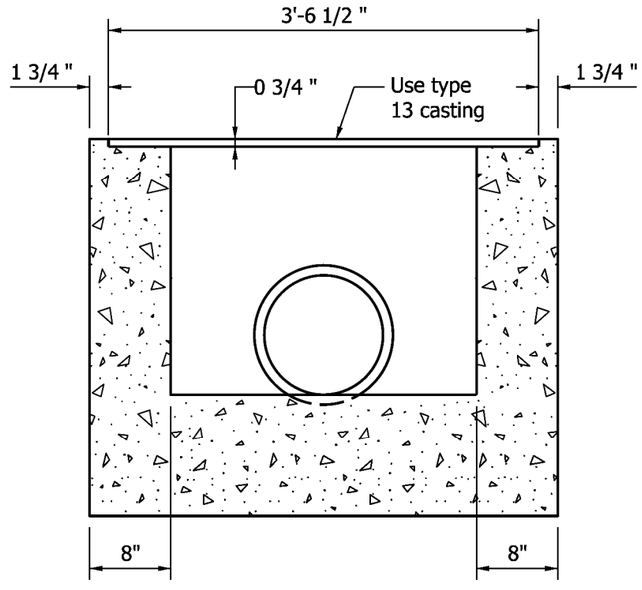
PLAN



SECTION

INLET TYPE M (CONC)

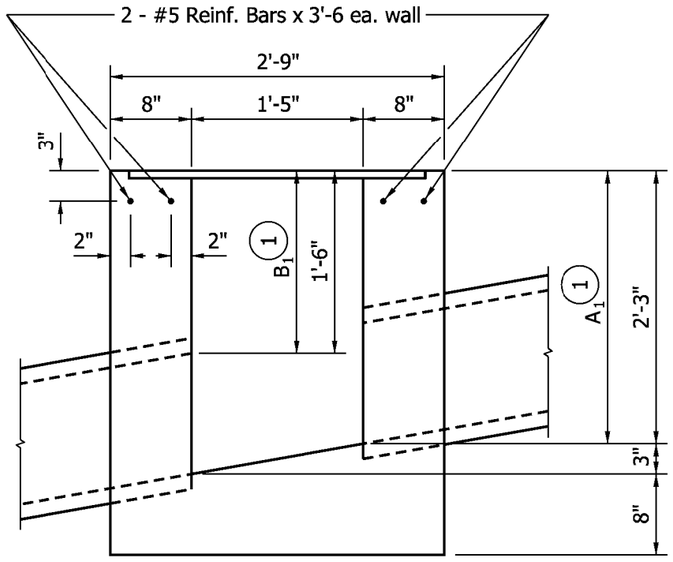




SECTION A-A
INLET TYPE R (Conc.)

GENERAL NOTES

1. If inlet pipe is required, A_1 and B_1 shall be increased or decreased 1'-0 as directed.
2. 2" dia. drain from bottom of curb to inlet. Aggregate to be placed around inlet end of pipe.
3. 3" min. dia. pipe to be kept open for drainage of subgrade or base until surface is placed.



SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE M & R

SEPTEMBER 2009

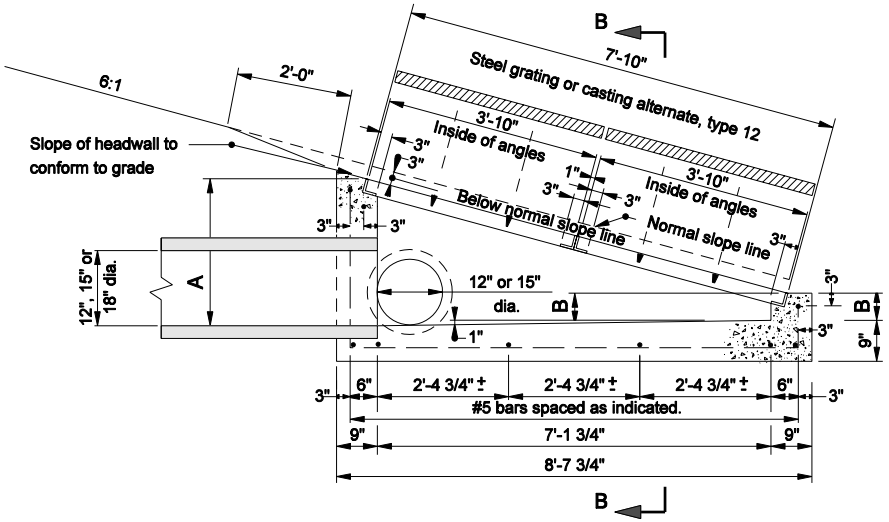
STANDARD DRAWING NO. E 720 INST-07

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

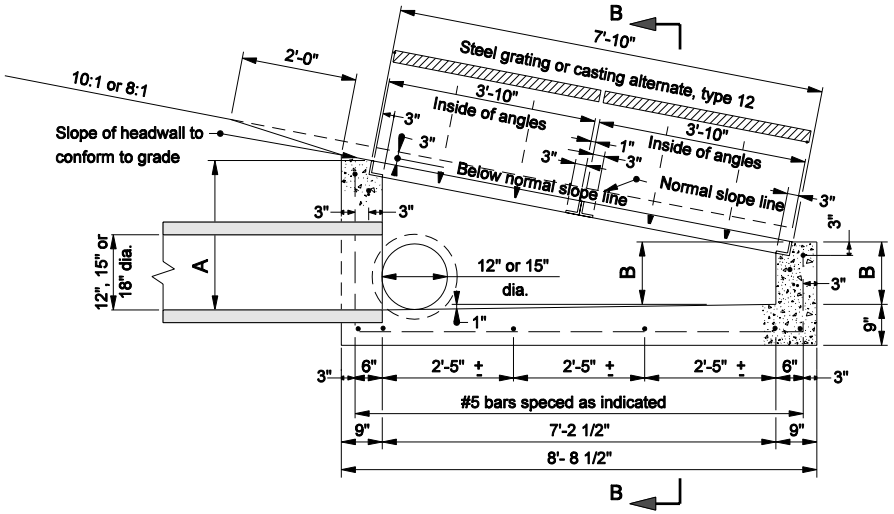
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave *09/01/09*
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller *09/01/09*
CHIEF HIGHWAY ENGINEER — DATE

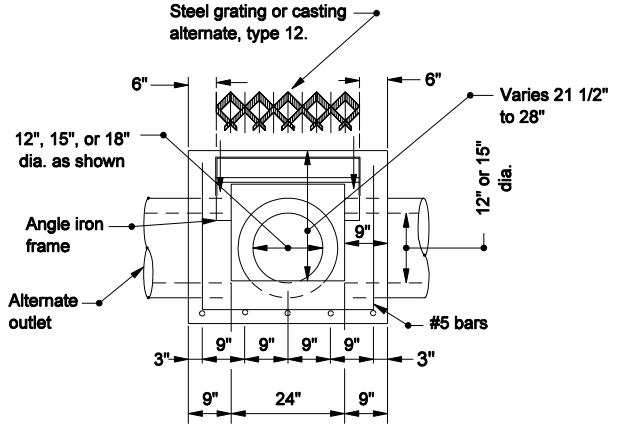


SECTION A-A
Showing Grate Slope of 6:1



SECTION A-A
Showing Grate Slope of 8:1 or 10:1

TYPE N INLET						
PIPE	6:1		8:1		10:1	
SIZE	A	B	A	B	A	B
12"	21 1/2"	5"	21 1/2"	8 7/8"	21 1/2"	11 1/8"
15"	24 3/4"	8 1/4"	24 3/4"	12 1/8"	24 3/4"	14 3/8"
18"	28"	11 1/2"	28"	15 3/8"	28"	17 5/8"



SECTION B-B

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE N

SEPTEMBER 2005

STANDARD DRAWING NO. E 720-INST-08

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

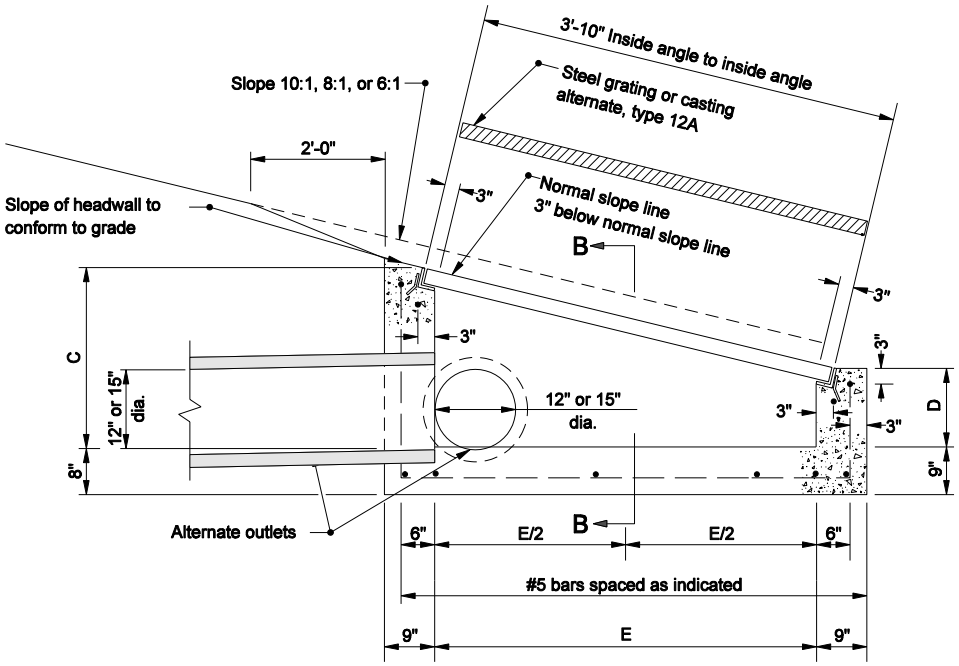
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-01-05
DESIGN STANDARDS ENGINEER DATE

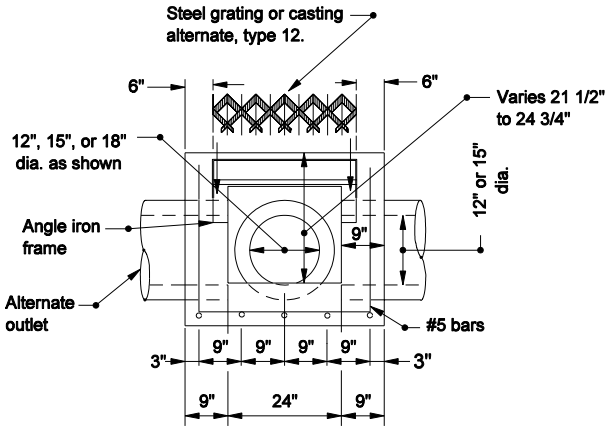
/s/ Richard K. Smutzer 9-01-05
CHIEF HIGHWAY ENGINEER DATE

NOTE:

1. See Standard Drawing E 720-ICCA-10 for steel grating Type 12 or E 720-ICCA-11 for castion Type 12 Alternate.



TYPE P INLET



SECTION B-B

TYPE P INLET									
PIPE SIZE	6:1			8:1			10:1		
	C	D	E	C	D	E	C	D	E
12"	21 1/2"	13"	3'-3 1/4"	21 1/2"	14 1/2"	3'-3 3/4"	21 1/2"	15 7/8"	3'-3 3/4"
15"	24 3/4"	16 1/4"	3'-3 1/4"	24 3/4"	18"	3'-3 3/4"	24 3/4"	19 1/8"	3'-3 3/4"

INDIANA DEPARTMENT OF TRANSPORTATION

INLET TYPE P

SEPTEMBER 2005

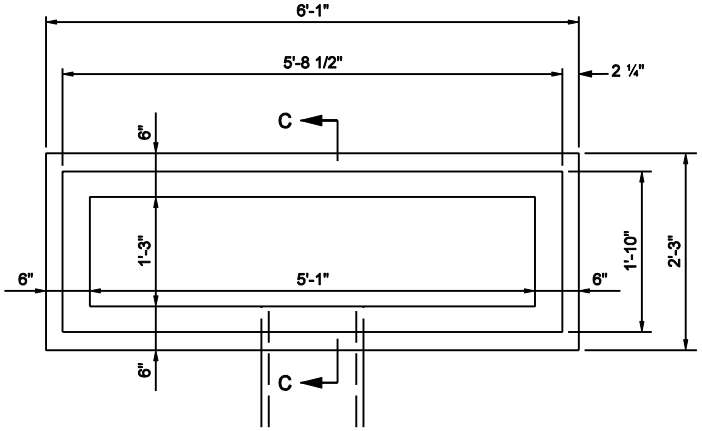
STANDARD DRAWING NO. E 720-INST-09

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

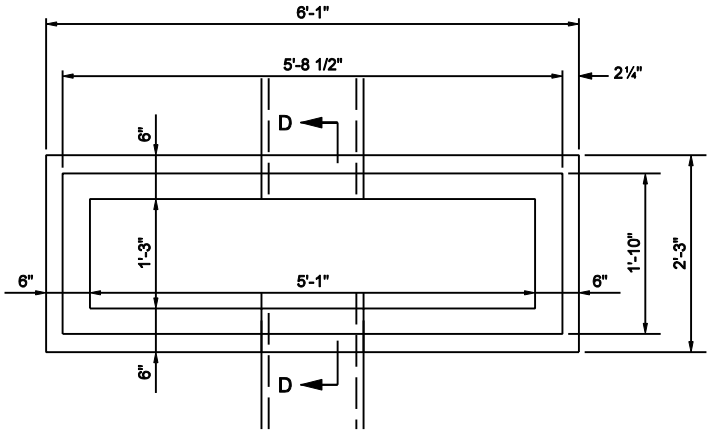
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-01-05
DESIGN STANDARDS ENGINEER DATE

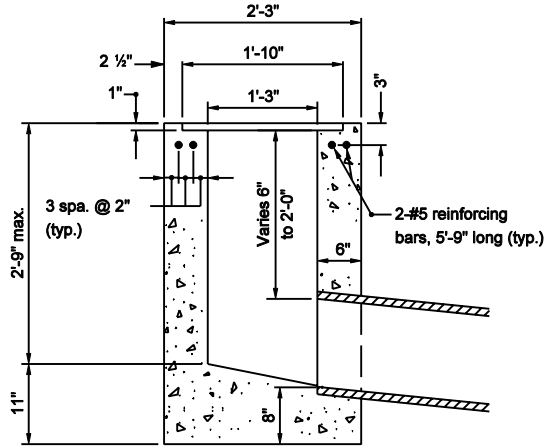
/s/ Richard K. Smutzer 9-01-05
CHIEF HIGHWAY ENGINEER DATE



PLAN

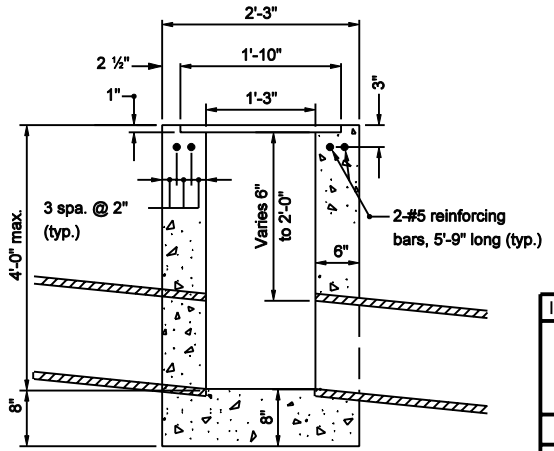


PLAN



SECTION C-C

TYPE S



SECTION D-D

TYPE T

INDIANA DEPARTMENT OF TRANSPORTATION

INLETS TYPE S AND T

SEPTEMBER 2003

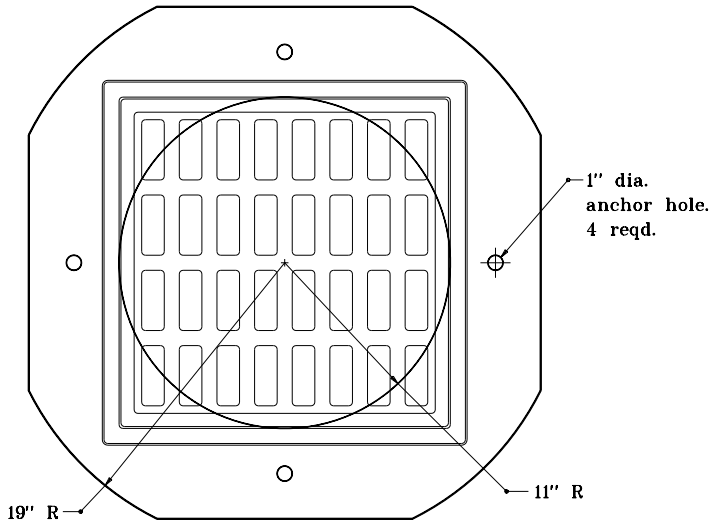
STANDARD DRAWING NO. E 720-INST-10

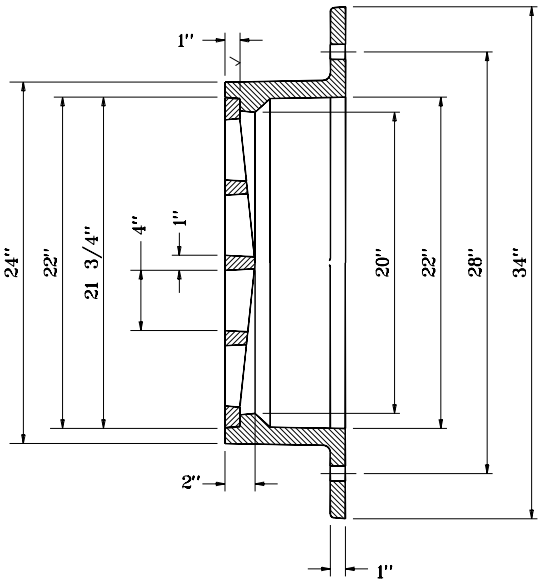
RICHARD L. VANCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

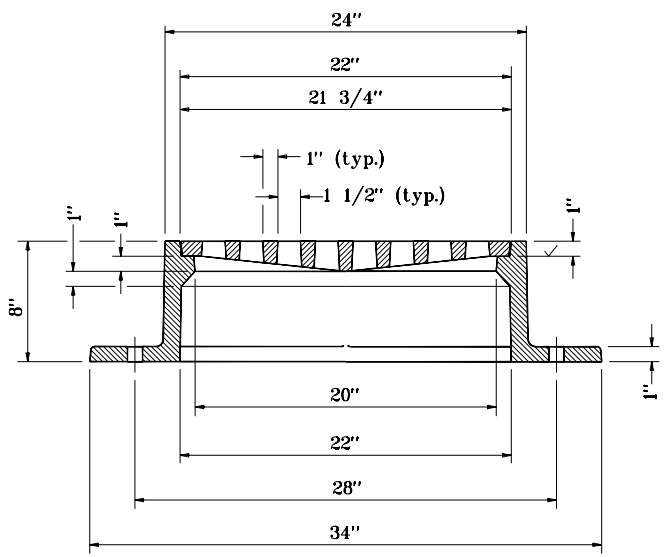
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — 9-02-03
DESIGN STANDARDS ENGINEER — DATE

/s/ Richard K. Smutzer — 9-02-03
CHIEF HIGHWAY ENGINEER — DATE







INDIANA DEPARTMENT OF TRANSPORTATION

FLAT TOP GRATE CASTING
TYPE 2

SEPTEMBER 1998

STANDARD DRAWING NO. **E 720-MHCA-01**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

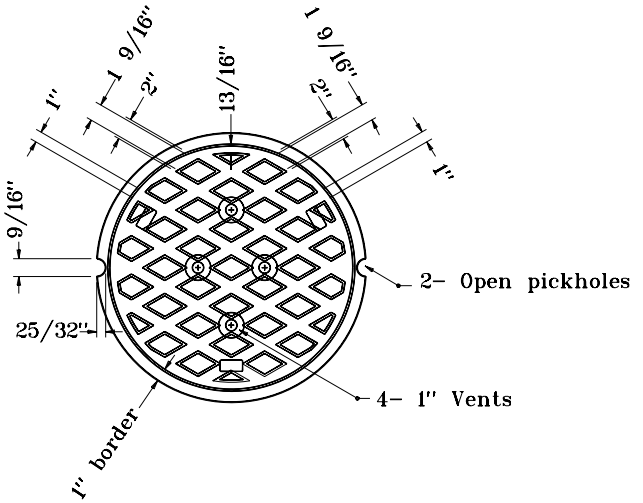
DESIGN STANDARDS ENGINEER

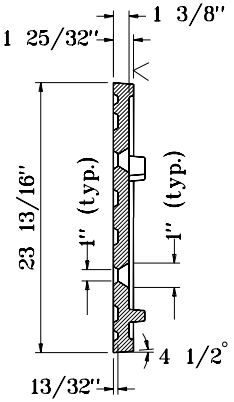
DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

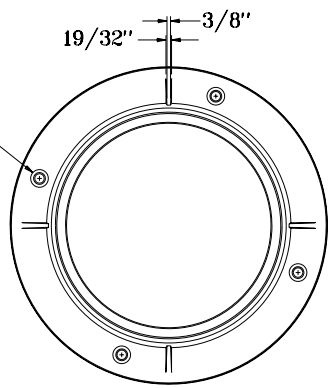
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

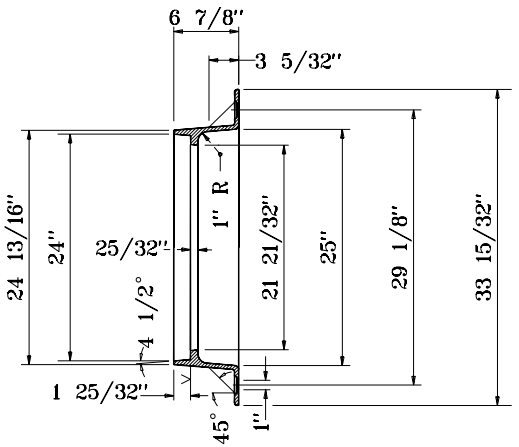
ORIGINALLY APPROVED 9-01-98





1" dia. anchor bolt holes on a 29 1/8" dia. b.c. 4 reqd.





INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLE CASTING
TYPE 4 RING AND COVER

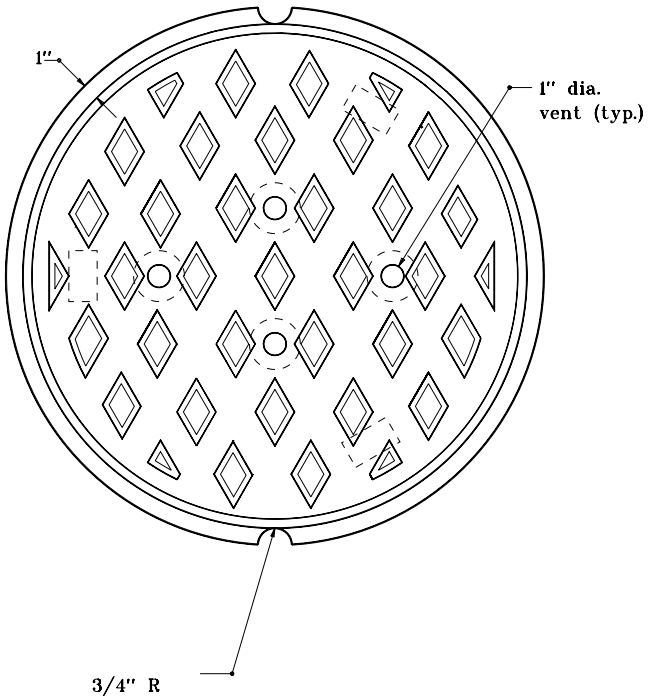
SEPTEMBER 1998

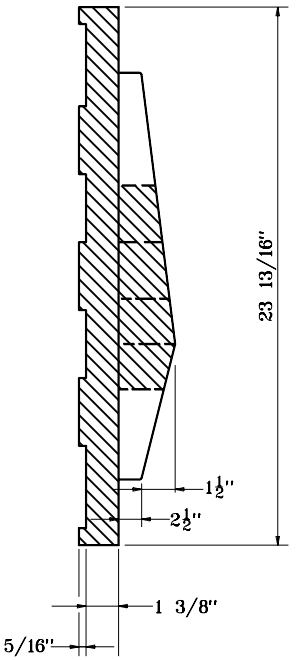
STANDARD DRAWING NO **E 720-MHCA-02**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-01-98





INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLE CASTING TYPE 4 ALTERNATE COVER

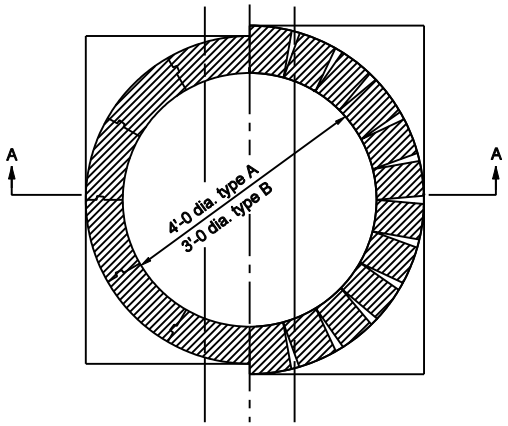
SEPTEMBER 1998

STANDARD DRAWING NO. **E 720-MHCA-03**

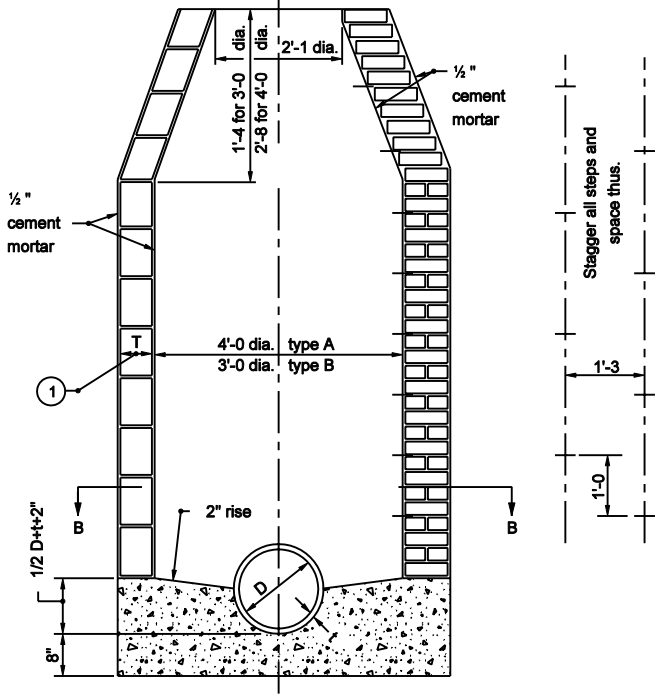
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	9-01-98



SECTION B-B



SECTION A-A

TYPE A
Dia. = 4'-0"

TYPE B
Dia. = 3'-0

NOTES

1. T = 8" for brick structure
   T = 6" for segmental block structure

INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLES TYPE A AND B

SEPTEMBER 2003

STANDARD DRAWING NO. E 720-MHST-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

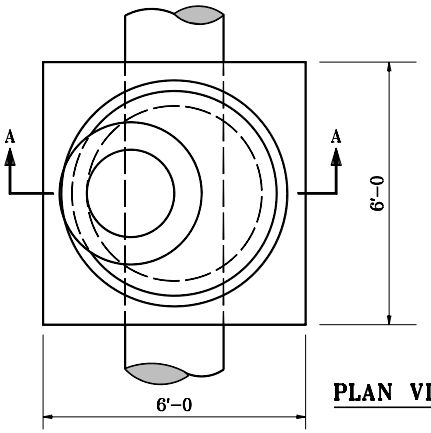
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — 9-02-03
DESIGN STANDARDS ENGINEER — DATE

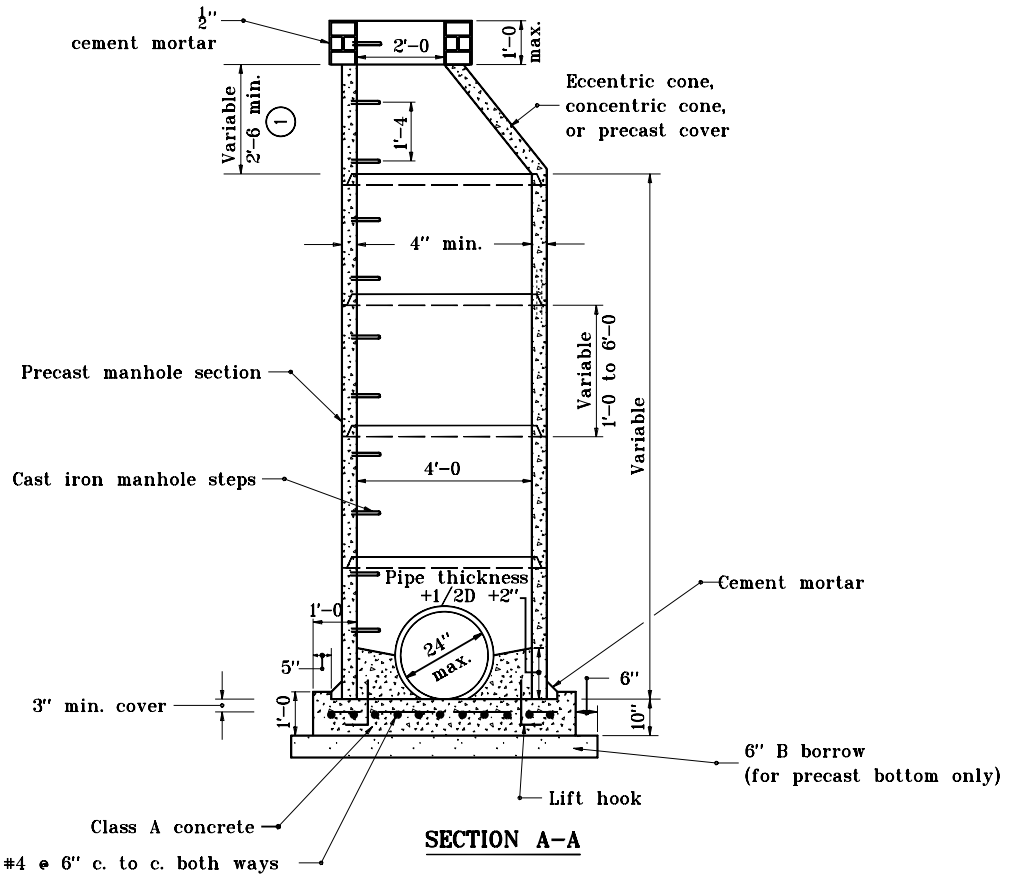
/s/ Richard K. Smutzer — 9-02-03
CHIEF HIGHWAY ENGINEER — DATE

GENERAL NOTES

(1) For eccentric and concentric cone heights see cone heights table on Standard Drawing E 720-MHST-08.



PLAN VIEW



SECTION A-A

INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLE TYPE C

SEPTEMBER 1997

STANDARD DRAWING NO. **E 720-MHST-02**

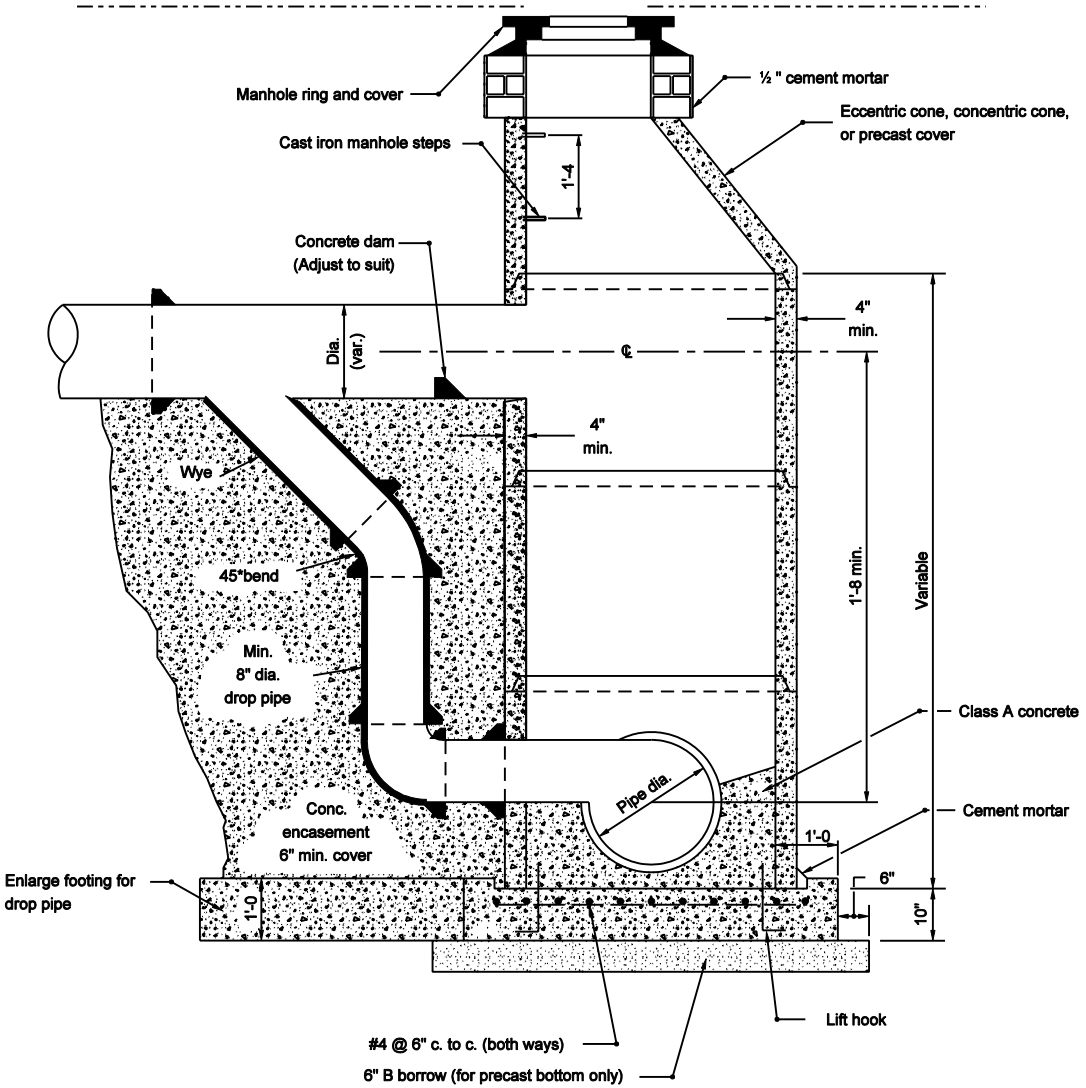
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	9-02-97

NOTES

1. Drop pipe may be used with manhole type D, E, F, or G. Such manhole shall be referred to as drop manhole type D, E, F, or G.



SECTION

INDIANA DEPARTMENT OF TRANSPORTATION

DROP MANHOLE TYPE C

SEPTEMBER 2003

STANDARD DRAWING NO. E 720-MHST-03

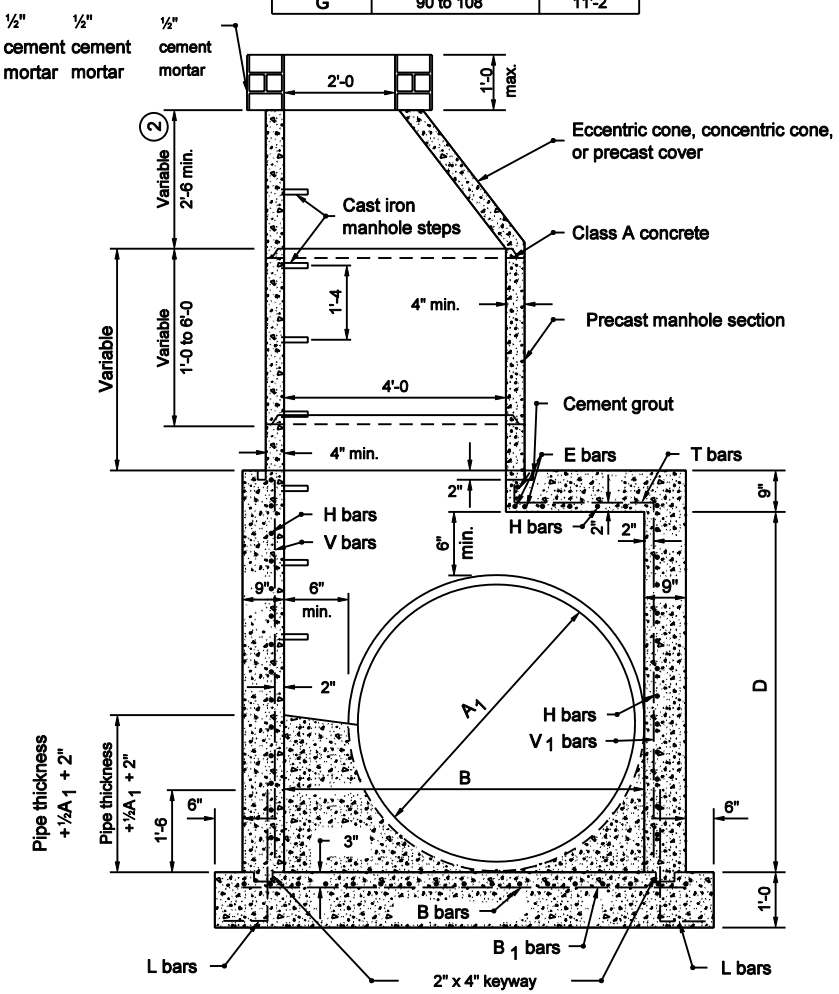
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

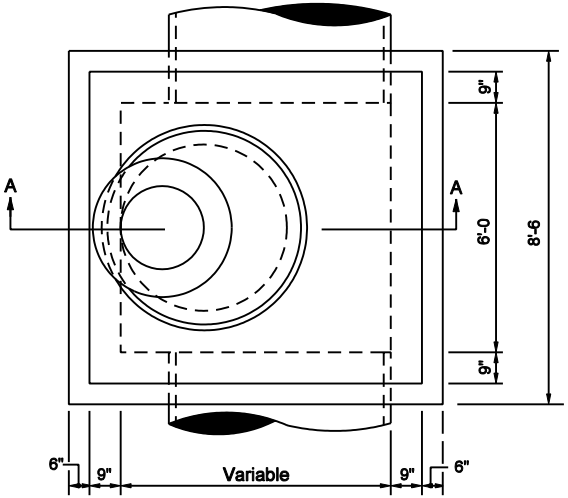
/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE

MANHOLE DIMENSIONS		
TYPE	A-1 PIPE SIZE DIA. (in)	B AND D
D	27 to 42	4'-9
E	48 to 60	6'-6
F	66 to 84	8'-10
G	90 to 108	11'-2



SECTION A-A



PLAN VIEW

NOTES

1. Manhole type H, J, K, L, M, or N, may be substituted for manhole type C, D, E, or F for comparable pipe sizes. See Standard Drawing E 720-MHST-05 for manholes type H, J, K, L, M, and N details.

(2) For eccentric and concentric cone heights see Cone Heights Table on Standard Drawing 720-MHST-08.

3. See Standard Drawing 720-MHST-10 for Reinforcing Steel for Manholes table.

INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLES TYPE D, E, F, AND G

SEPTEMBER 2003

STANDARD DRAWING NO. E 720-MHST-04

RICHARD L. VANCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

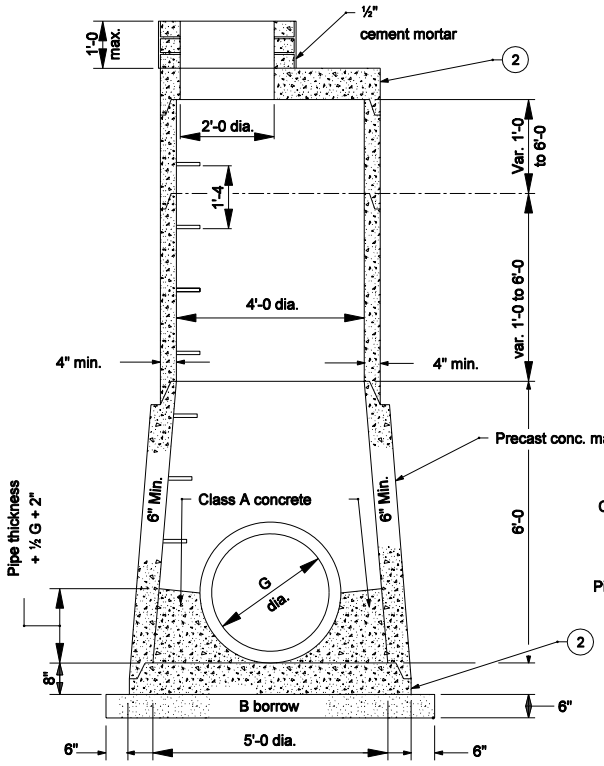
/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE

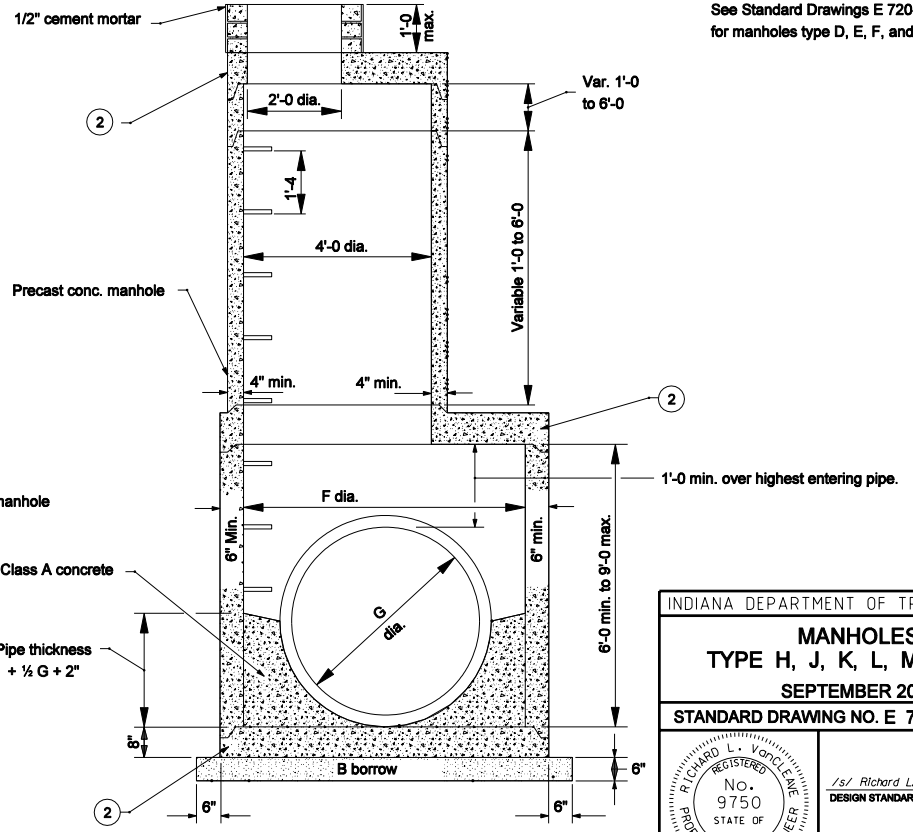
MANHOLE PIPE SIZES				
Type	G (in.)	F (ft. in.)	Maximum Pipe Size Rt. ∠ to Mainline (in.)	Maximum Pipe Size for Mainline (in.)
H	24 to 36	——	30	36
J	24 to 36	5'-0	30	36
K	36 to 48	6'-0	36	48
L	48 to 54	8'-0	48	54
M	54 to 72	8'-6	66	72
N	72 to 84	9'-0	72	84

NOTES

1. Drop pipe may be used with manholes Type H, J, K, L, M, or N. Such manhole shall be referred to as drop manholes type H, J, K, L, M, or N. For details of construction see Standard Drawing E 720-MHST-03.
2. See Standard Drawing E 720-MHST-06 for Details A, B, and C.
3. Manholes type C, D, E, or F. may be substituted for manholes type H, J, K, L, M, or N. for comparable pipe sizes. See Standard Drawings E 720-MHST-02 and -04 for manholes type D, E, F, and G details..



MANHOLE TYPE H



MANHOLE TYPE J,K,L,M & N

INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLES TYPE H, J, K, L, M, AND N

SEPTEMBER 2006

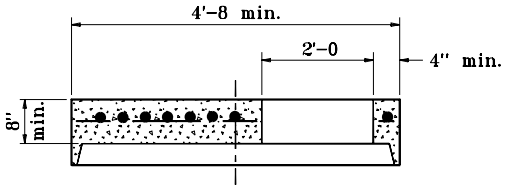
STANDARD DRAWING NO. E 720-MHST-05

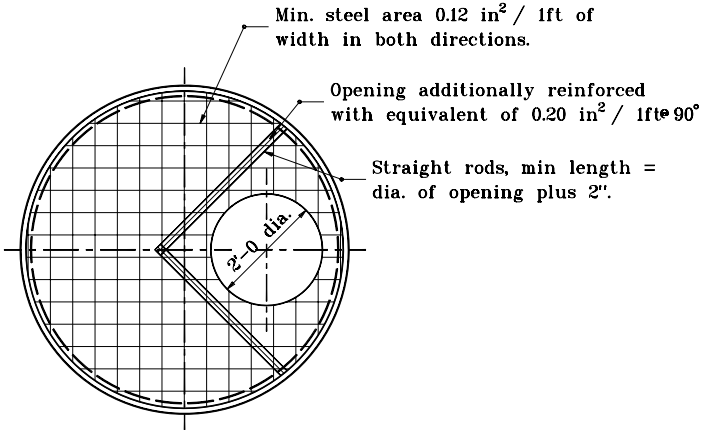
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-01-06
DESIGN STANDARDS ENGINEER DATE

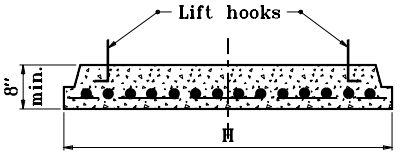
/s/ Richard K. Smutzer 9-01-06
CHIEF HIGHWAY ENGINEER DATE

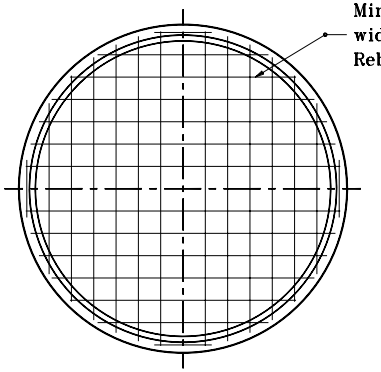




DETAIL A

COVER CAP FOR PRECAST CONCRETE MANHOLE SECTION

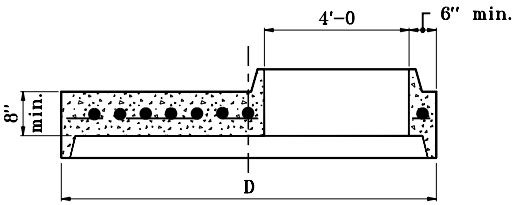


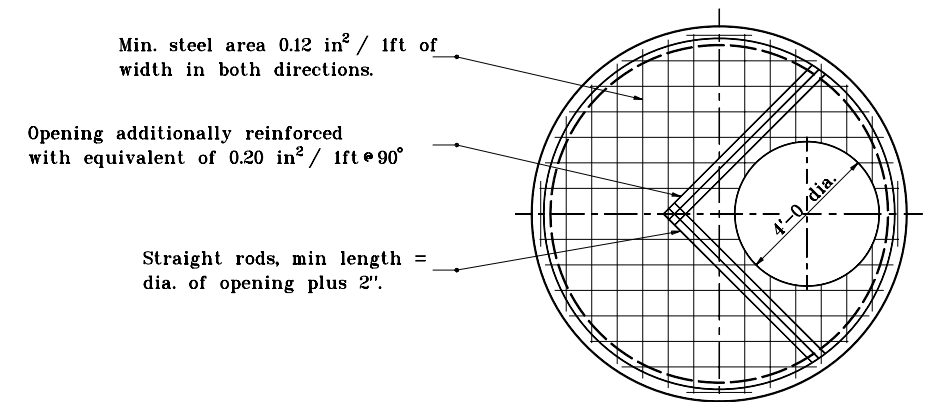


DETAIL C

BASE FOR PRECAST CONCRETE MANHOLE SECTIONS (5'-0 to 9'-0 DIA.)

Section Dia.	H
5'-0	6'-0
6'-0	7'-2
8'-0	9'-6
8'-6	10'-0
9'-0	10'-8





DETAIL B

REDUCER CAP FOR PRECAST MANHOLE SECTION (5'-0 to 9'-0 DIA.)

Section Dia.	D
5'-0	6'-0
6'-0	7'-2
8'-0	9'-6
8'-6	10'-0
9'-0	10'-8

INDIANA DEPARTMENT OF TRANSPORTATION

PRECAST CONCRETE MANHOLE SECTIONS

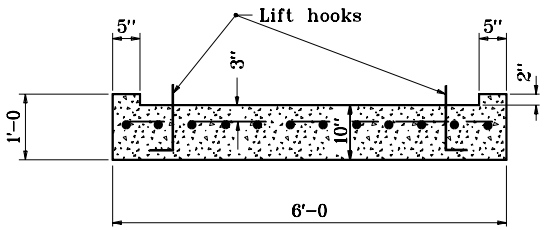
APRIL 1995

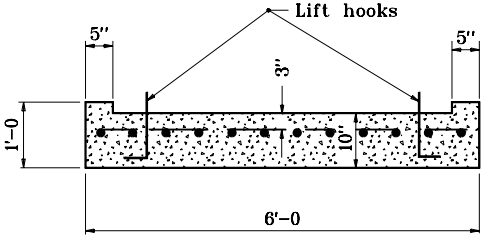
STANDARD DRAWING NO. **E 720-MHST-06**

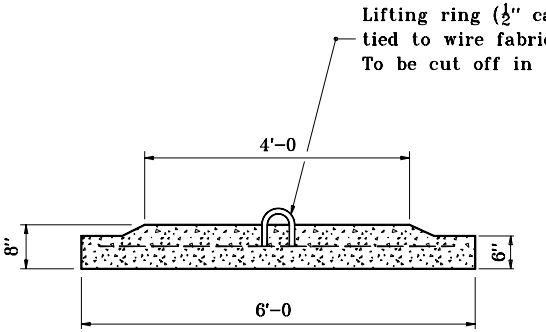
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

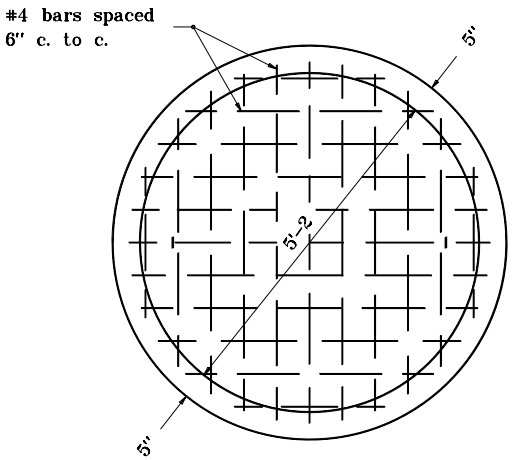
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich — DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi — CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	4-03-95

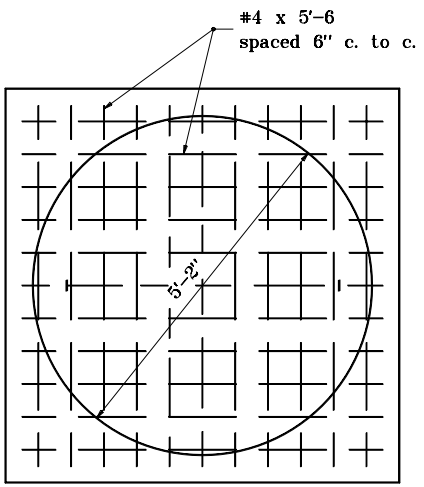




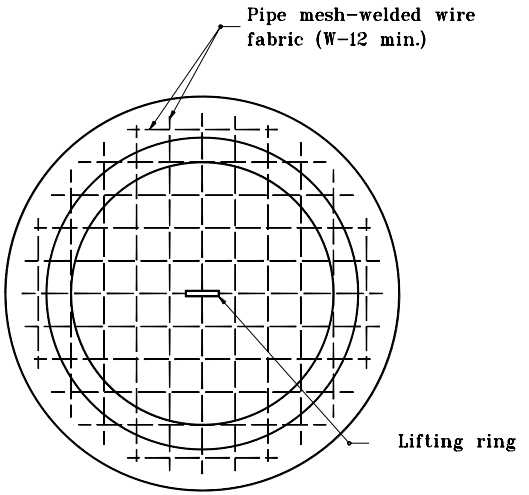




ROUND



SQUARE



ROUND ALTERNATE

INDIANA DEPARTMENT OF TRANSPORTATION

PRECAST MANHOLE BOTTOM SECTION

SEPTEMBER 1997

STANDARD DRAWING NO. **E 720-MHST-07**

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

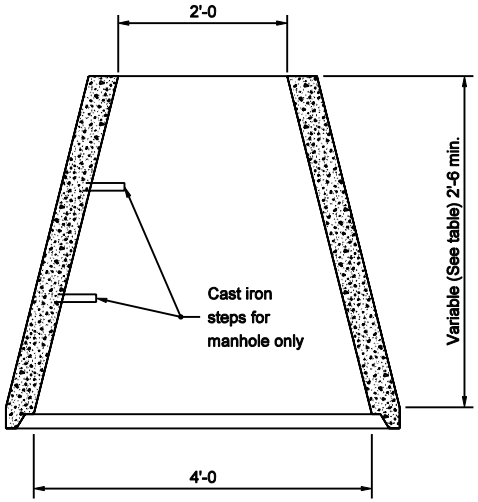
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	9-01-97

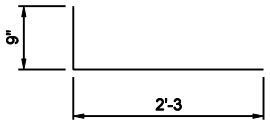
NOTES

1. The concentric concrete section will not be permitted for manholes which are under the jurisdiction of the Indianapolis Sanitary District.

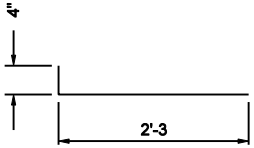
CONE HEIGHTS	
ECCENTRIC	CONCENTRIC
2'-6	2'-6
3'-0	3'-0
3'-2	3'-2
3'-6	4'-0



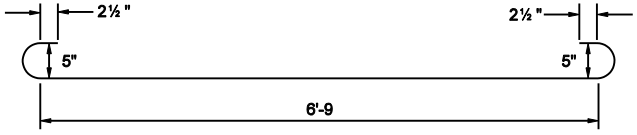
CONCENTRIC CONE



L BARS



T BARS



H BARS

INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLE BARS AND CONECNTRIC CONE

SEPTEMBER 2003

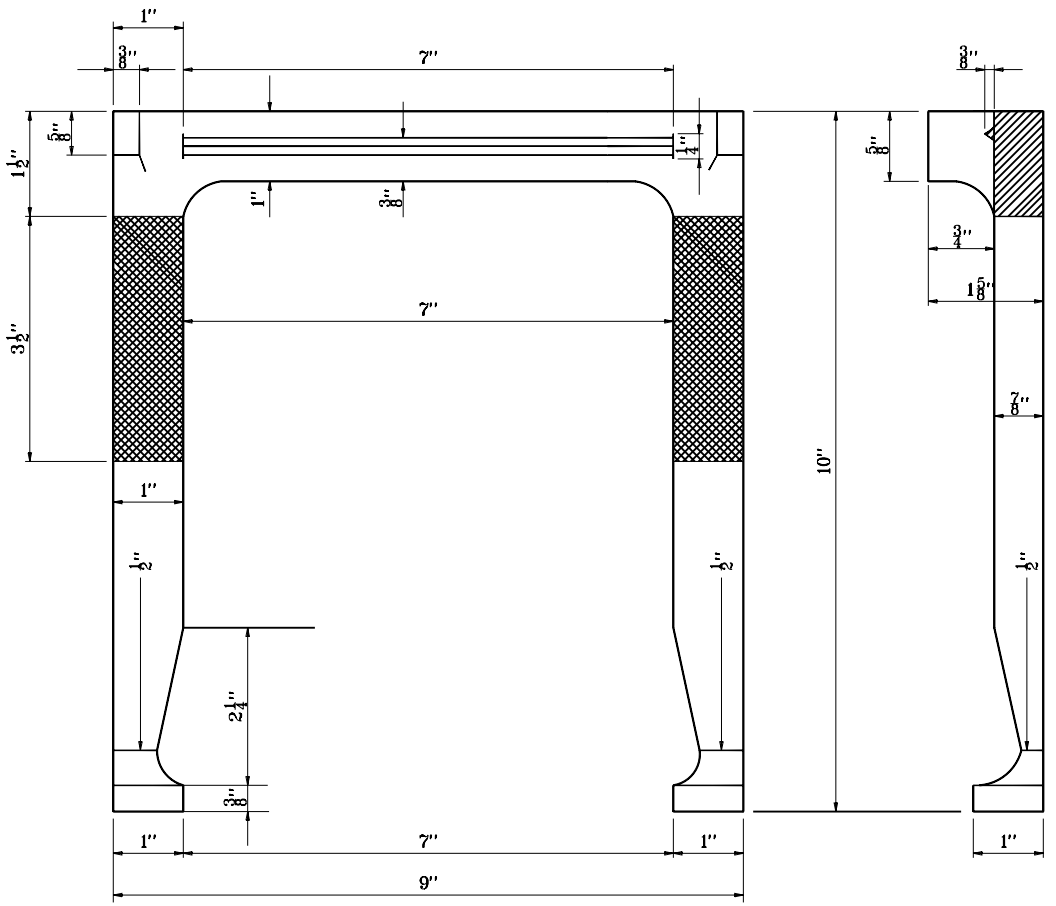
STANDARD DRAWING NO. E 720-MHST-08

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE



INDIANA DEPARTMENT OF TRANSPORTATION

MANHOLE STEP

APRIL 1995

STANDARD DRAWING NO. **E 720-MHST-09**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	4-03-95

REINFORCING STEEL FOR MANHOLES																
	Manhole Type D				Manhole Type E				Manhole Type F				Manhole Type G			
Bars	Length	No.	Spa.	Size	Length	No.	Spa.	Size	Length	No.	Spa.	Size	Length	No.	Spa.	Size
B	8'–0	10	9"	#5	8'–0	12	9"	#5	8'–0	16	9"	#5	8'–0	19	9"	#5
B_1	6'–9	12	9"	#5	8'–6	12	9"	#5	11'–0	12	9"	#5	13'–3	12	9"	#5
E	7'–3	3	2"	#5	7'–3	3	2"	#5	7'–3	3	2"	#5	7'–3	3	2"	#5
H	8'–6	22	6"	#5	8'–6	33	6"	#5	8'–6	41	6"	#5	8'–6	58	6"	#5
L	3'–0	16	12"	#5	3'–0	16	12"	#5	3'–0	16	12"	#5	3'–0	16	12"	#5
T	1'–3	16	6"	#5	3'–0	16	6"	#5	5'–3	16	6"	#5	7'–6	16	6"	#5
V	5'–0	16	6"	#5	6'–9	16	6"	#5	9'–0	16	6"	#5	11'–6	16	6"	#5
V_1	4'–9	16	6"	#5	6'–6	16	6"	#5	8'–9	16	6"	#5	11'–3	16	6"	#5

INDIANA DEPARTMENT OF TRANSPORTATION

TABLE OF REINFORCING STEEL FOR MANHOLES

SEPTEMBER 1997

STANDARD DRAWING NO. **E 720–MHST–10**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 9-02-97

GENERAL NOTES

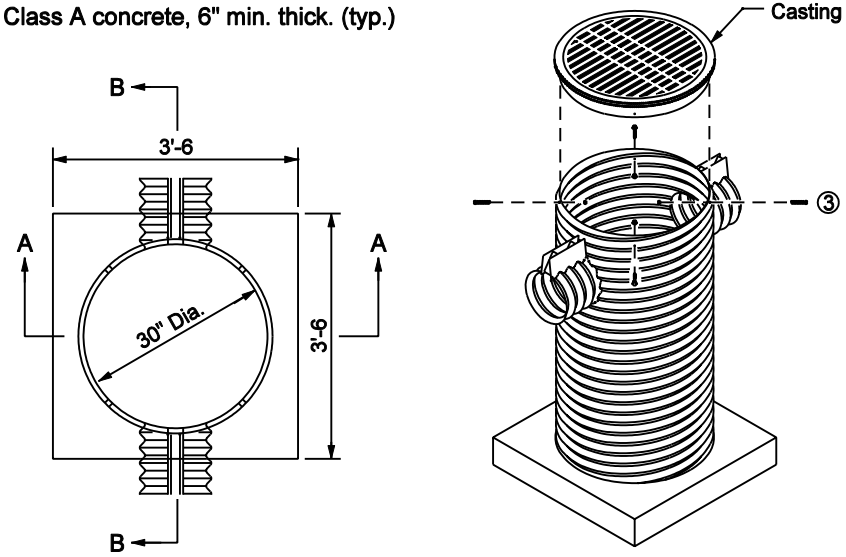
① See Standard Drawing E 720-SDCP-02 for casting details.

② See Standard Drawing E 720-SDCP-03 for casting details.

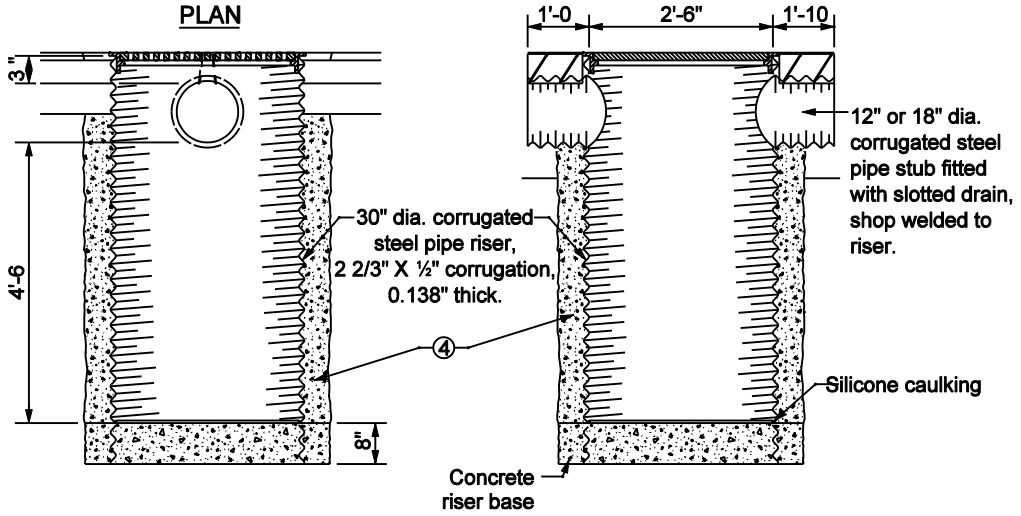
③ ⅜" x 1½" stainless steel nonthreaded hex head bolt with locknut washer. (typ.)

④ Class A concrete, 6" min. thick. (typ.)

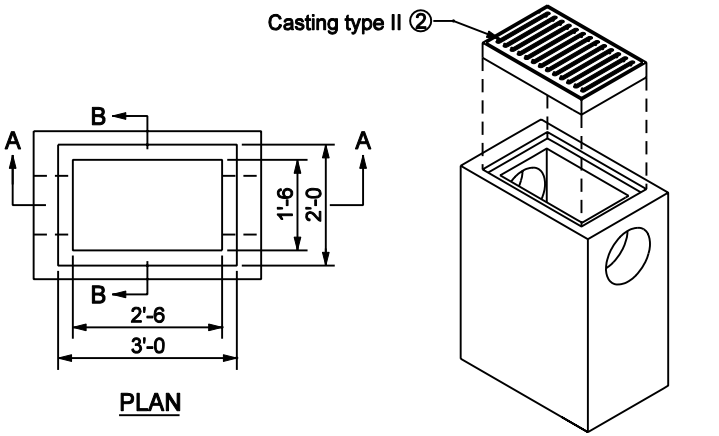
5. Cleanout ports shall be spaced at 250 ft or as shown on plans.



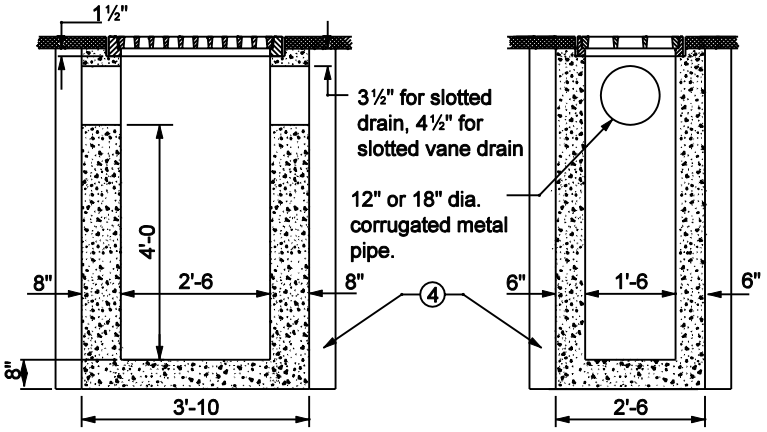
PLAN



TYPE I
STEEL PIPE PORT



PLAN



SECTION A-A

SECTION B-B

TYPE II
CONCRETE BOX PORT

INDIANA DEPARTMENT OF TRANSPORTATION

SLOTTED DRAIN PIPE CLEANOUT PORT

MARCH 2003

STANDARD DRAWING NO. E 720-SDCP-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

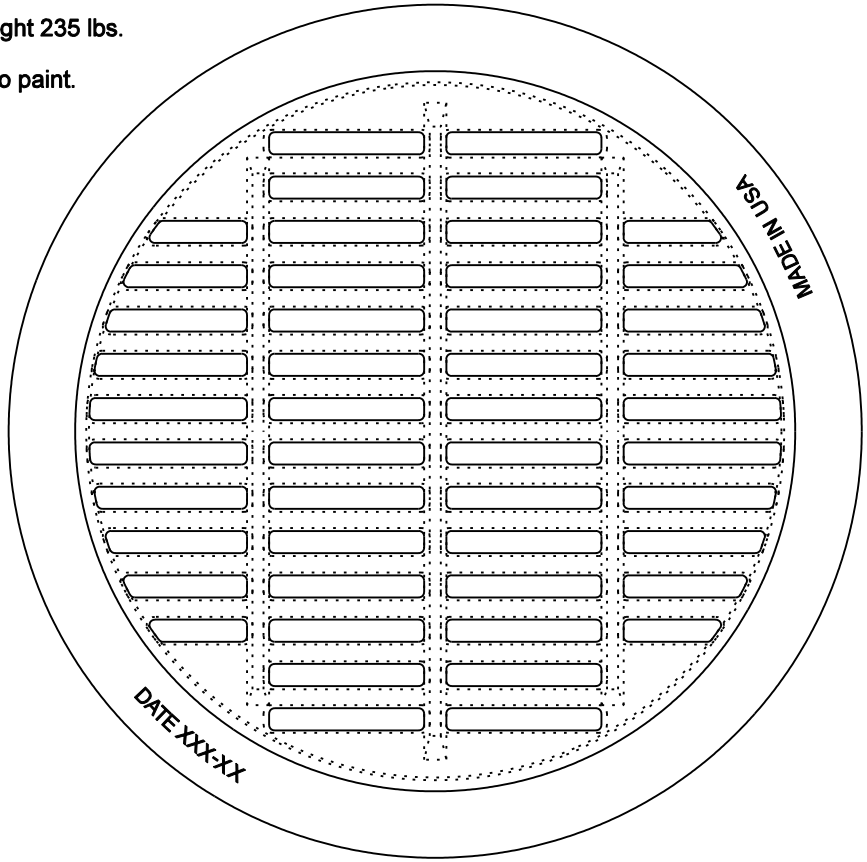
DESIGN STANDARDS ENGINEER

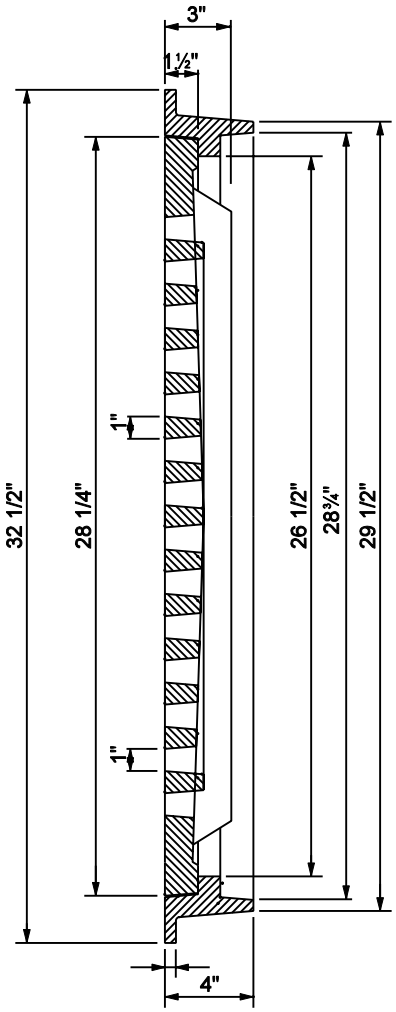
/s/ Richard L. VanCleave 3-03-03
DESIGN STANDARDS ENGINEER DATE

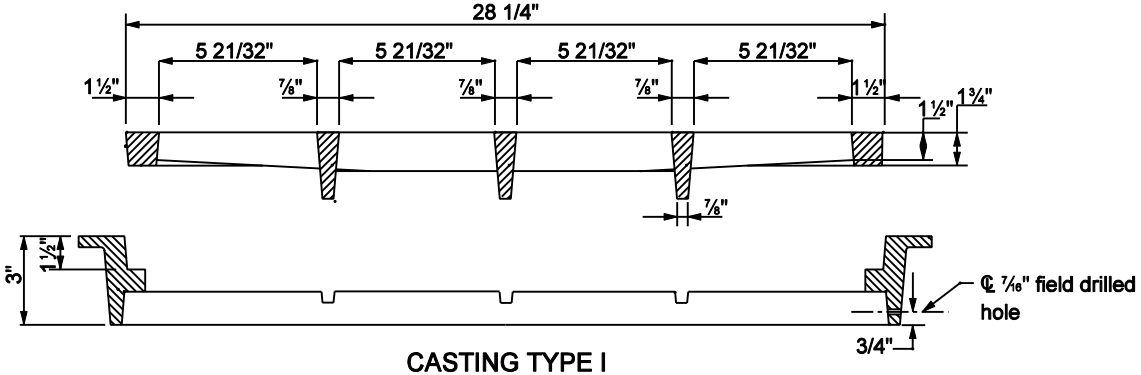
/s/ Richard K. Smutzer 3-03-03
CHIEF HIGHWAY ENGINEER DATE

GENERAL NOTES

1. Casting total weight 235 lbs.
2. Casting finish: no paint.







CASTING TYPE I

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE I FRAME AND GRATE

MARCH 2003

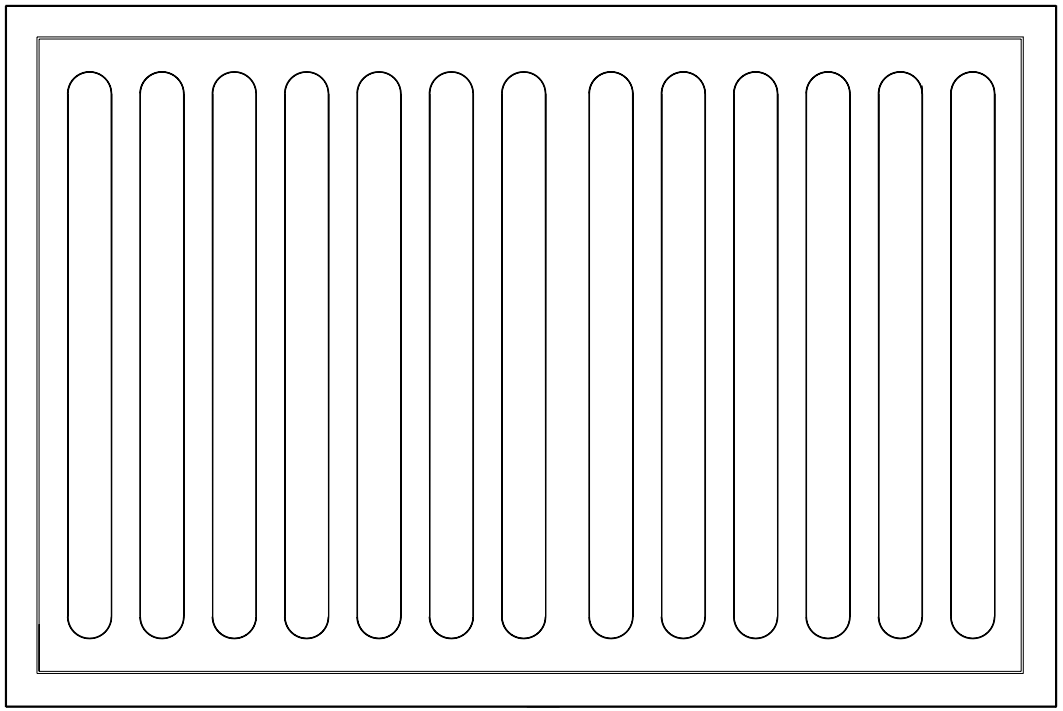
STANDARD DRAWING NO. E 720-SDCP-02

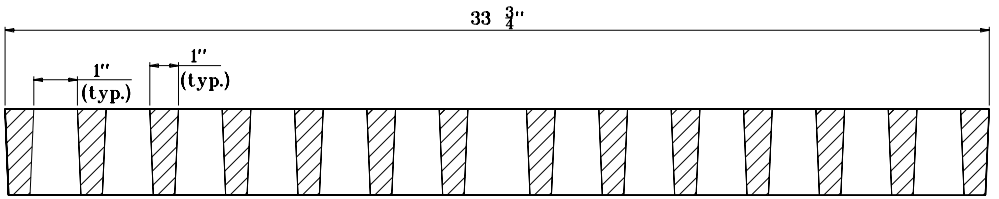
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

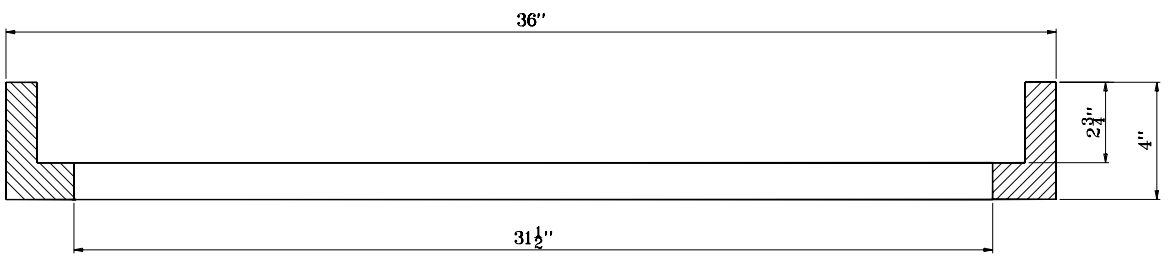
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 3-03-03
DESIGN STANDARDS ENGINEER DATE

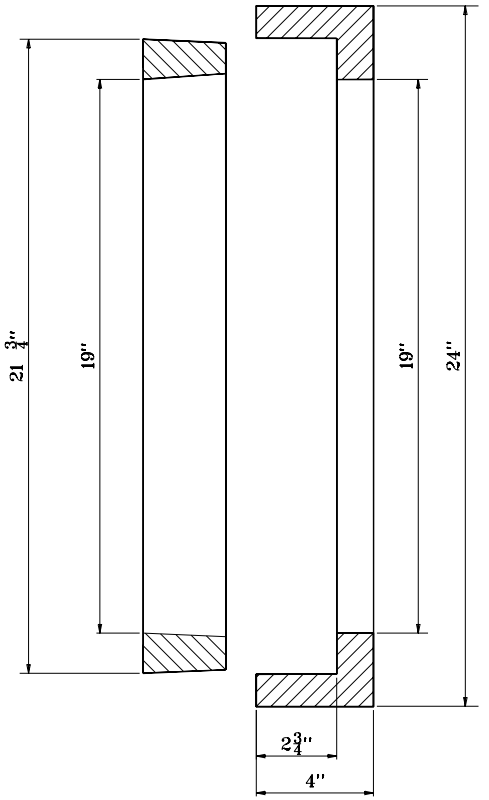
/s/ Richard K. Smutzer 3-03-03
CHIEF HIGHWAY ENGINEER DATE







CASTING TYPE II



GENERAL NOTES

1. Casting total weight 440 lb.

2. Casting finish: no paint.

INDIANA DEPARTMENT OF TRANSPORTATION

CASTING TYPE II
FRAME AND GRATE

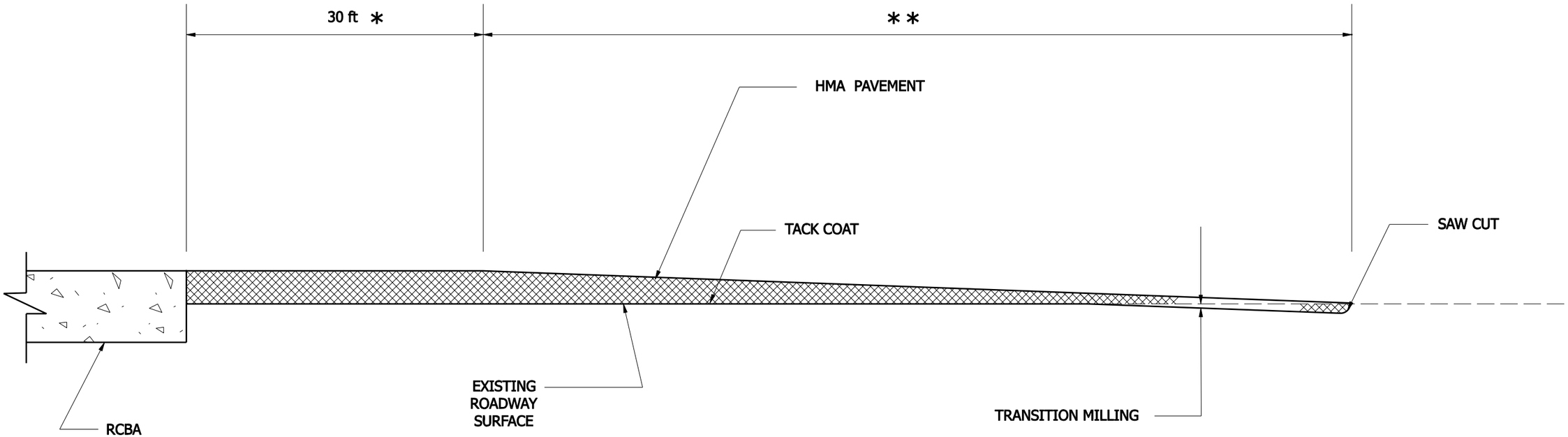
JANUARY 1999

STANDARD DRAWING NO. E 720-SDCP-03

ANTHONY L. URENOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich	11-15-99
DESIGN STANDARDS ENGINEER	DATE
/s/ Firooz Zandi	11-15-99
CHIEF HIGHWAY ENGINEER	DATE
ORIGINALLY APPROVED	1-04-99



* WEDGE TO BE A CONTINUATION OF BRIDGE DECK PROFILE.

* * WEDGE AND TRANSITION MILLING LIMITS PER STANDARD DRAWING E 306-TMPT-01.

INDIANA DEPARTMENT OF TRANSPORTATION

HMA PAVEMENT WEDGE AT RCBA

SEPTEMBER 2007

STANDARD DRAWING NO. E 722-HMAW-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

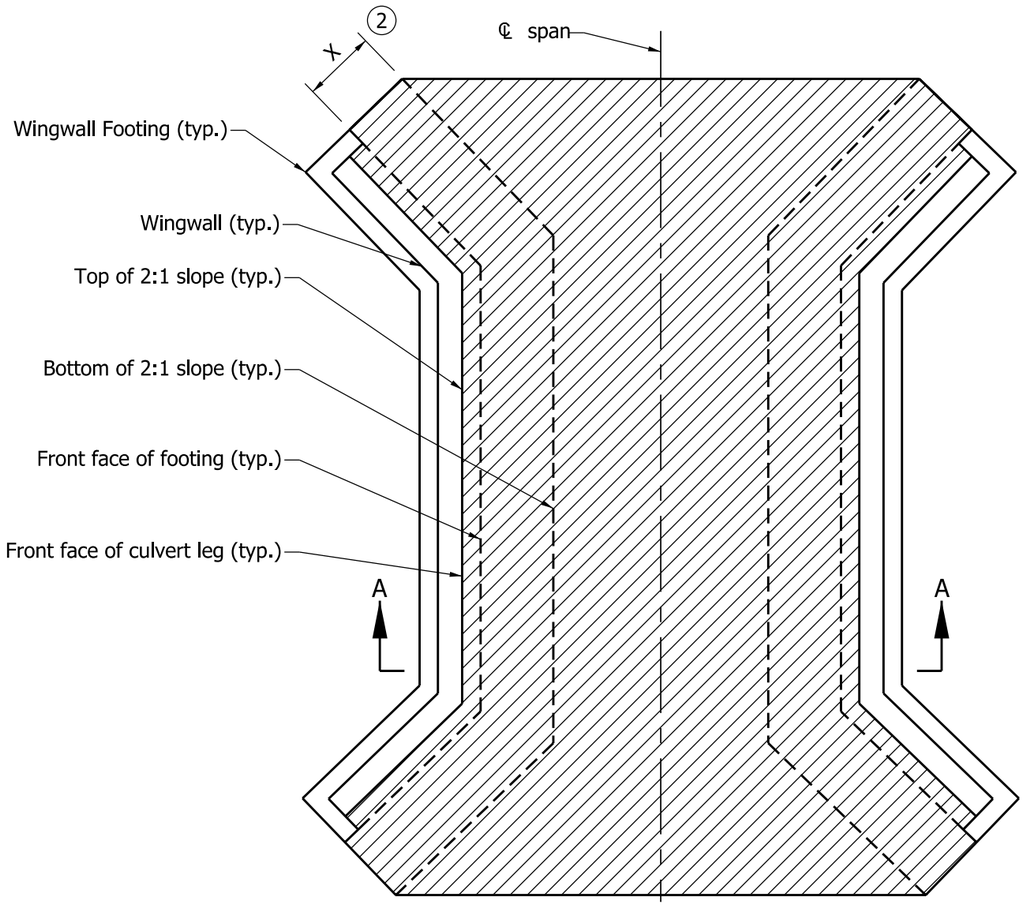
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/04/07

DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/04/07

CHIEF HIGHWAY ENGINEER — DATE



RIPRAP METHOD

PLAN - WITH WINGWALLS

NOTES:

1. See Standard Drawing E 723-CCSP-02 for Section A-A.
2. Distance X is equal to two times the sump depth shown on plans.

LEGEND:

Riprap on geotextiles as shown on the plans.

INDIANA DEPARTMENT OF TRANSPORTATION

THREE-SIDED CONCRETE CULVERT
SCOUR PROTECTION
10'-0" ≤ SPAN WIDTH < 20'-0"

SEPTEMBER 2011

STANDARD DRAWING NO. E 723-CCSP-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

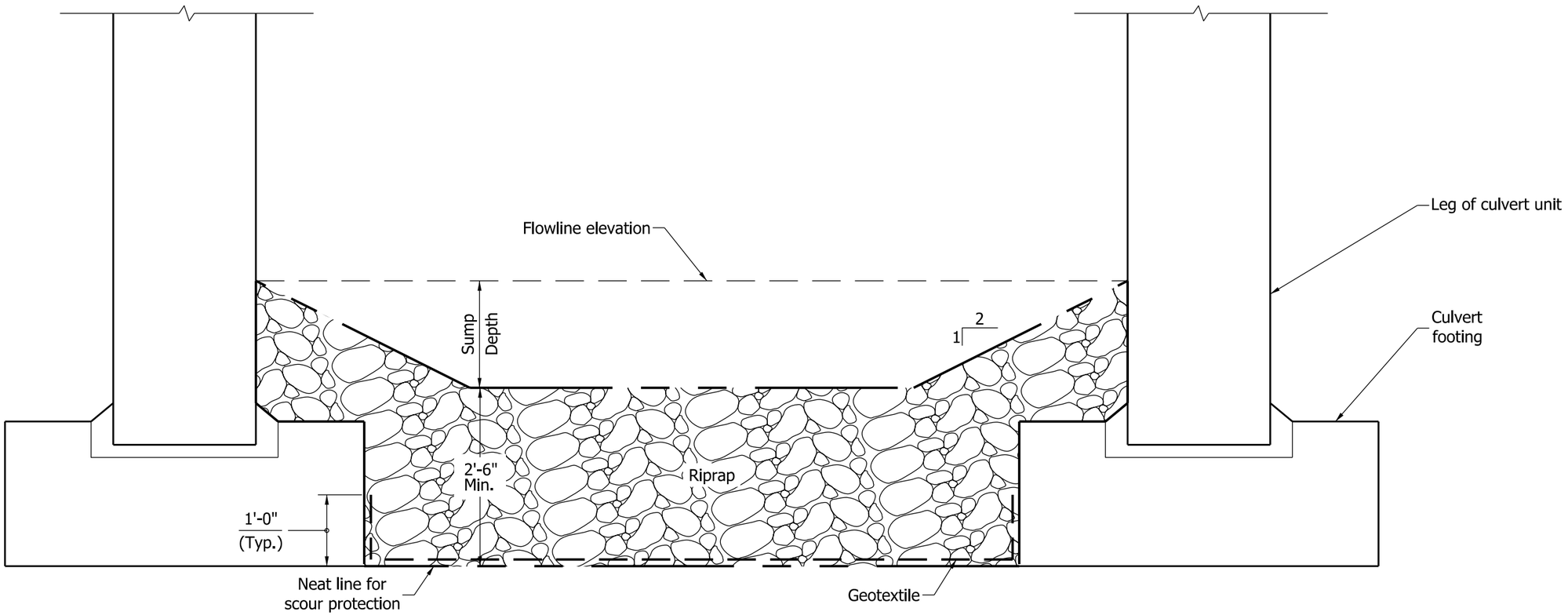
DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE

NOTES:

1. See Standard Drawing E 723-CCSP-01 for plan view of Section A-A.



SECTION A-A

RIPRAP METHOD

INDIANA DEPARTMENT OF TRANSPORTATION

THREE-SIDED CONCRETE CULVERT
SCOUR PROTECTION, SECTION,
10'-0" ≤ SPAN WIDTH < 20'-0"

SEPTEMBER 2011

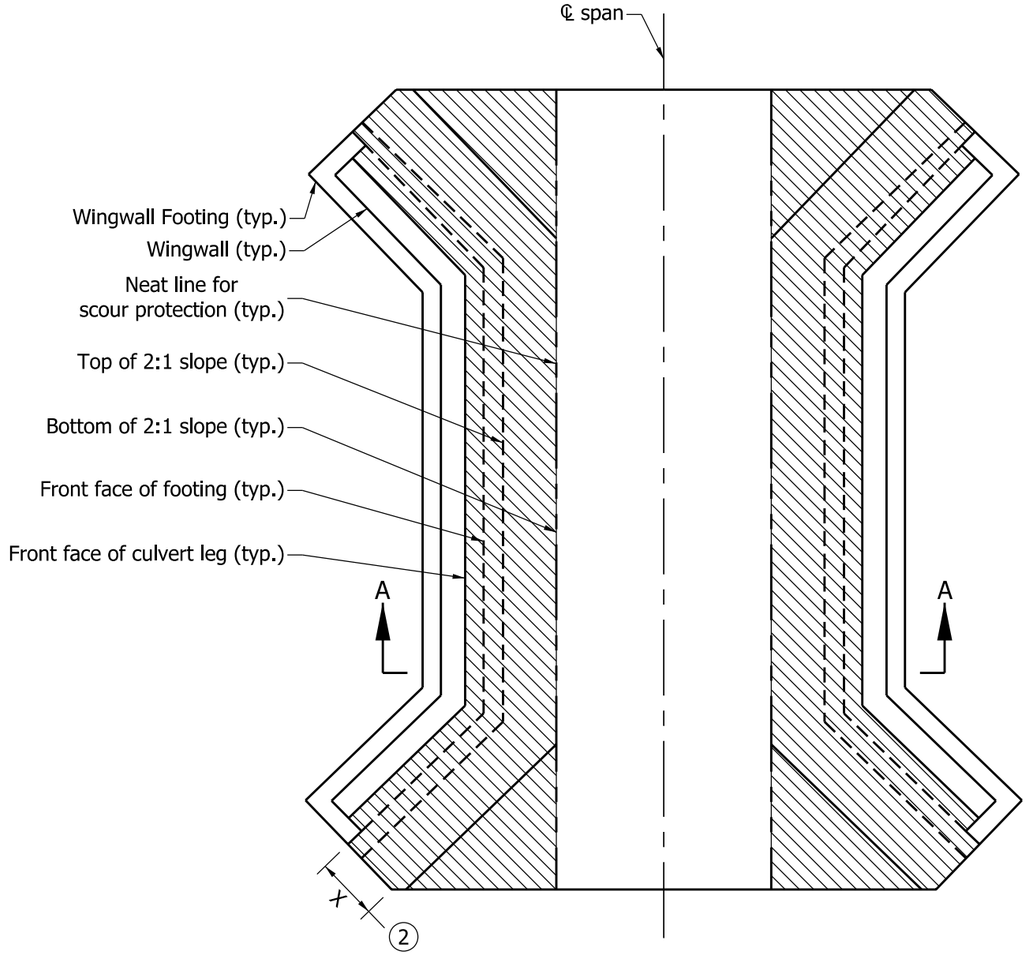
STANDARD DRAWING NO. E 723-CCSP-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE



PLAN - WITH WINGWALLS

RIPRAP METHOD

NOTES:

1. See Standard Drawing E723-CCSP-04 for Section A-A.

(2) Distance X is equal to two times the sump depth shown on the plans or 6'-0", whichever is greater.

LEGEND:

Riprap on geotextiles as shown on the plans.

INDIANA DEPARTMENT OF TRANSPORTATION

THREE-SIDED CONCRETE STRUCTURE
SCOUR PROTECTION, PLAN,
SPAN WIDTH ≥ 20'-0"
SEPTEMBER 2011

STANDARD DRAWING NO. E 723-CCSP-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

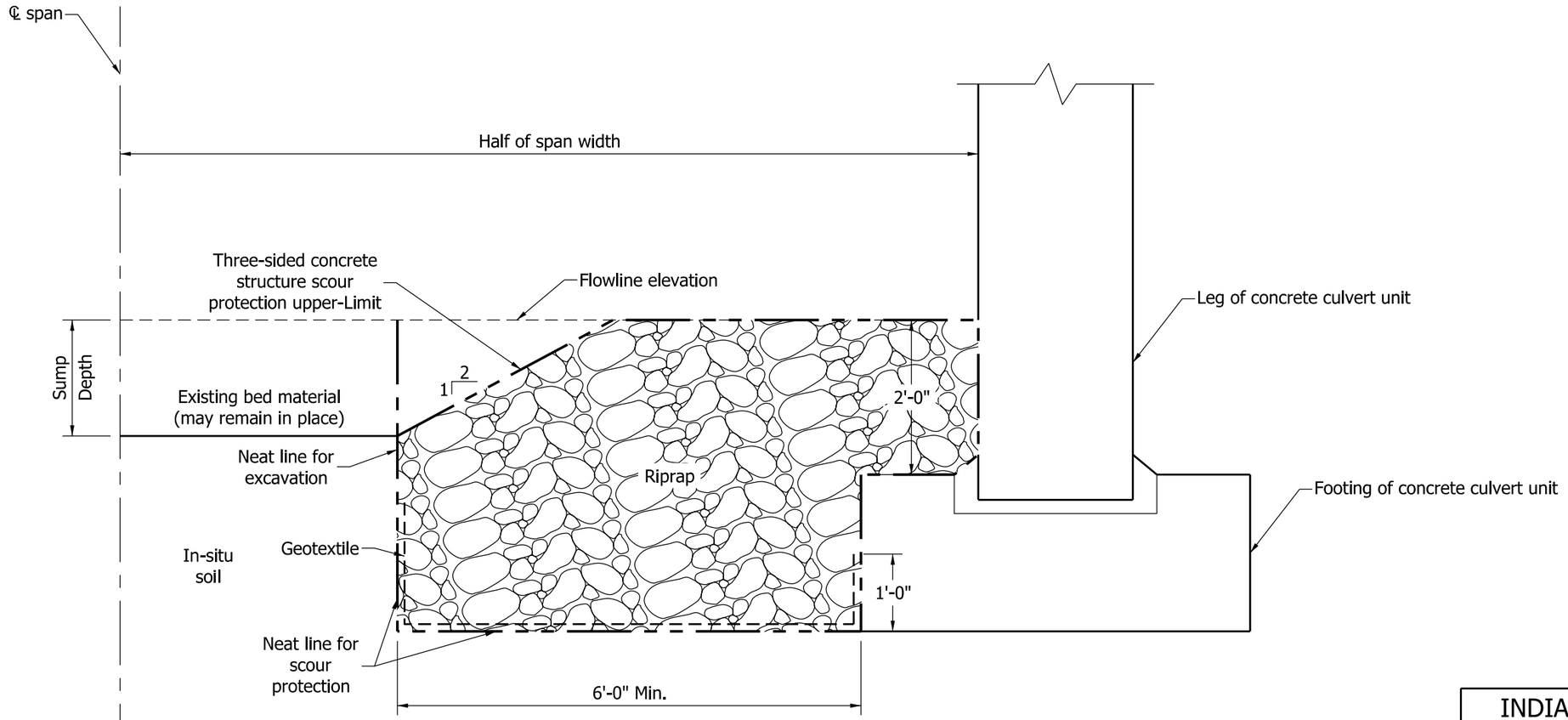
DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE

NOTES:

1. See Standard Drawing E 723-CCSP-03 for plan view of Section A-A.



SECTION A-A

RIPRAP METHOD

INDIANA DEPARTMENT OF TRANSPORTATION

THREE-SIDED CONCRETE STRUCTURE
SCOUR PROTECTION, SECTION,
SPAN WIDTH ≥ 20'-0"

SEPTEMBER 2011

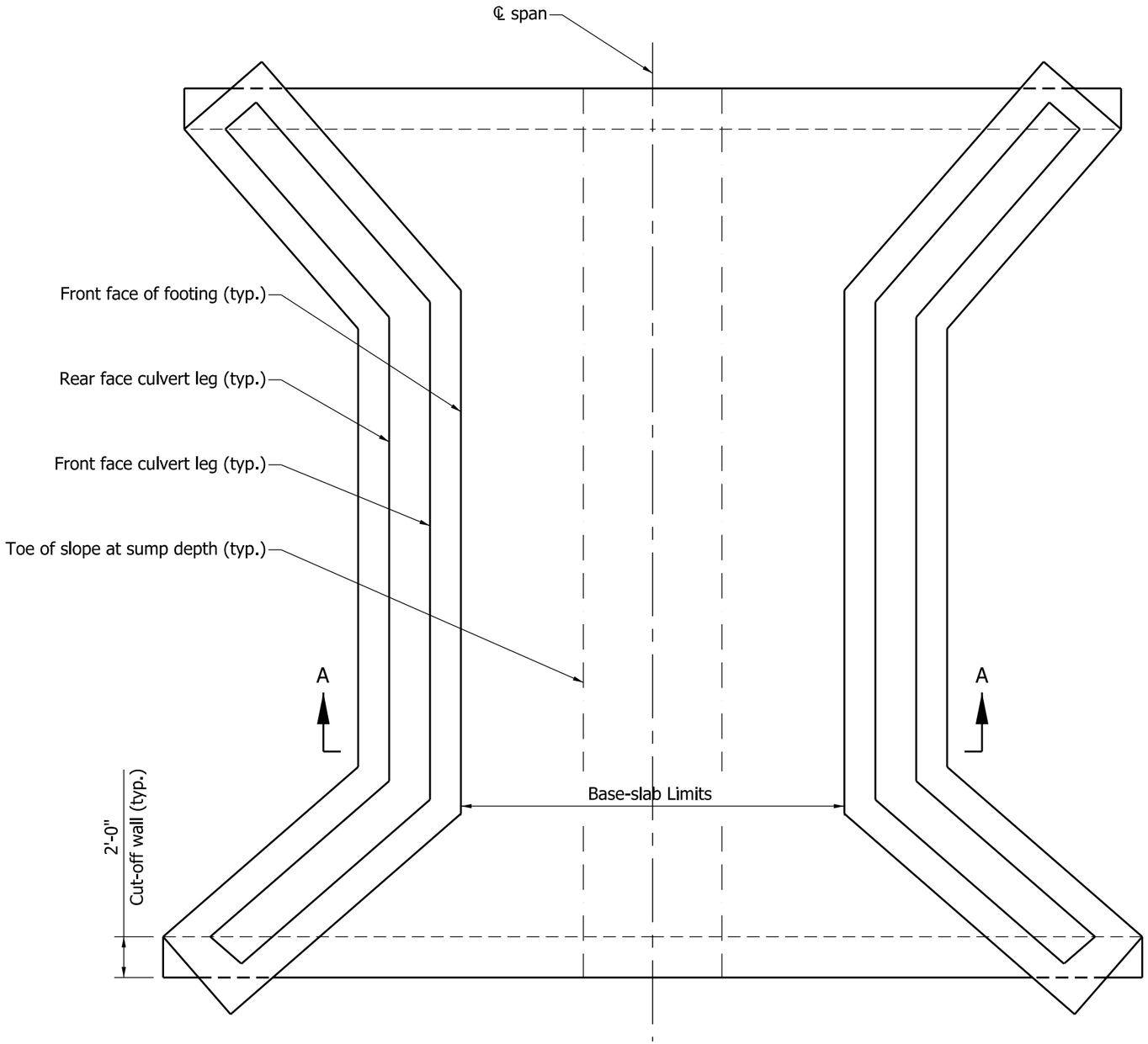
STANDARD DRAWING NO. E 723-CCSP-04

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE



PLAN - WITH WINGWALLS

BASE SLAB METHOD

NOTES:

1. See Standard Drawing E 723-CCSP-06 for Section A-A.

INDIANA DEPARTMENT OF TRANSPORTATION

THREE-SIDED CONCRETE CULVERT
SCOUR PROTECTION, PLAN,
BASE-SLAB METHOD

SEPTEMBER 2011

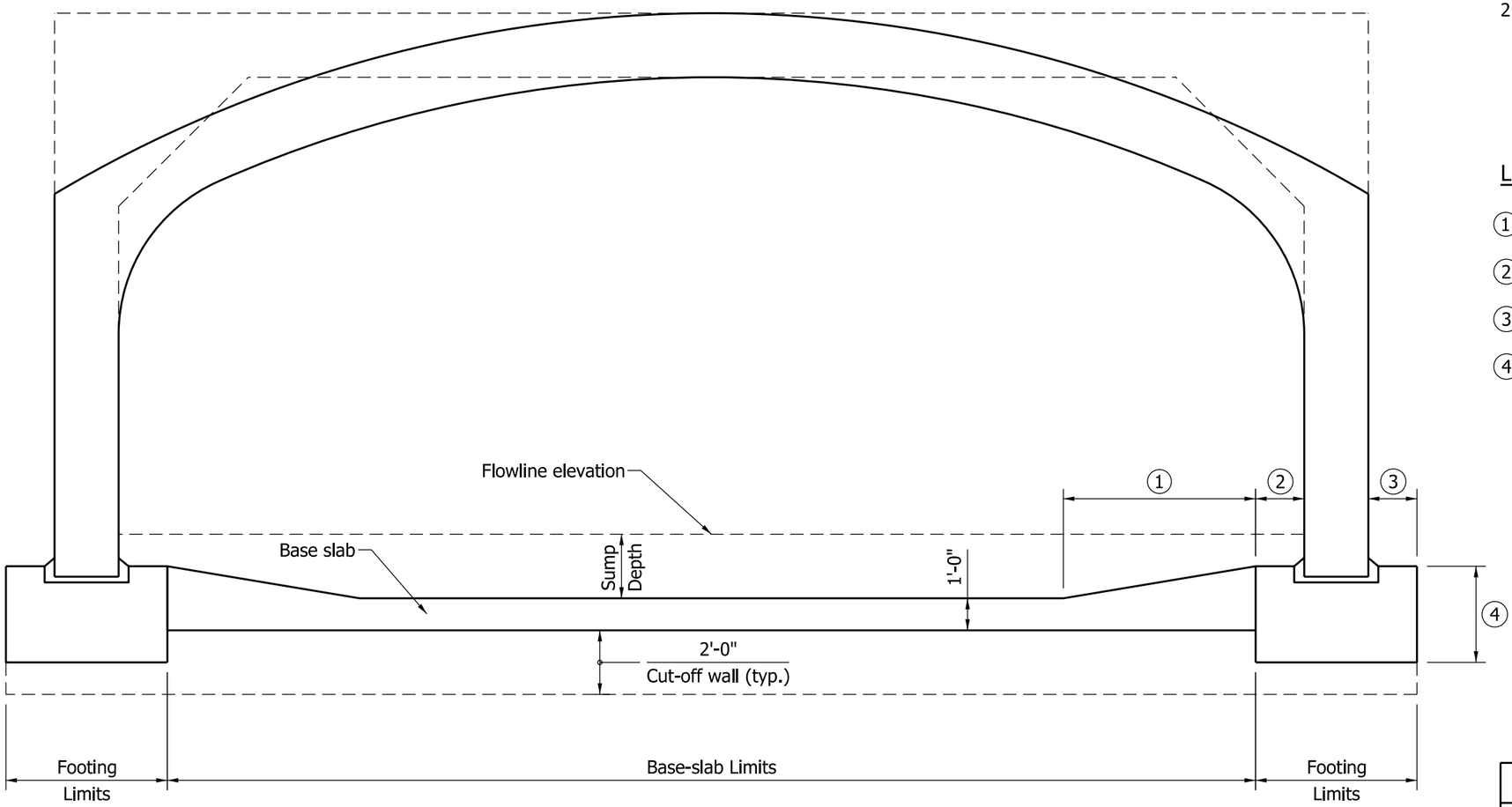
STANDARD DRAWING NO. E 723-CCSP-05

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11
CHIEF HIGHWAY ENGINEER DATE



SECTION A-A

BASE SLAB METHOD

NOTES:

1. See the working drawings for dimension (1) through (4).
2. See Standard Drawing E 723-CCSP-05 for plan view of Section A-A

LEGEND:

(1) Taper length

(2) Inside-footing width

(3) Outside-footing width

(4) Footing depth

INDIANA DEPARTMENT OF TRANSPORTATION

THREE-SIDED CONCRETE CULVERT SCOUR PROTECTION, SECTION, BASE-SLAB METHOD

SEPTEMBER 2011

STANDARD DRAWING NO. E 723-CCSP-06

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

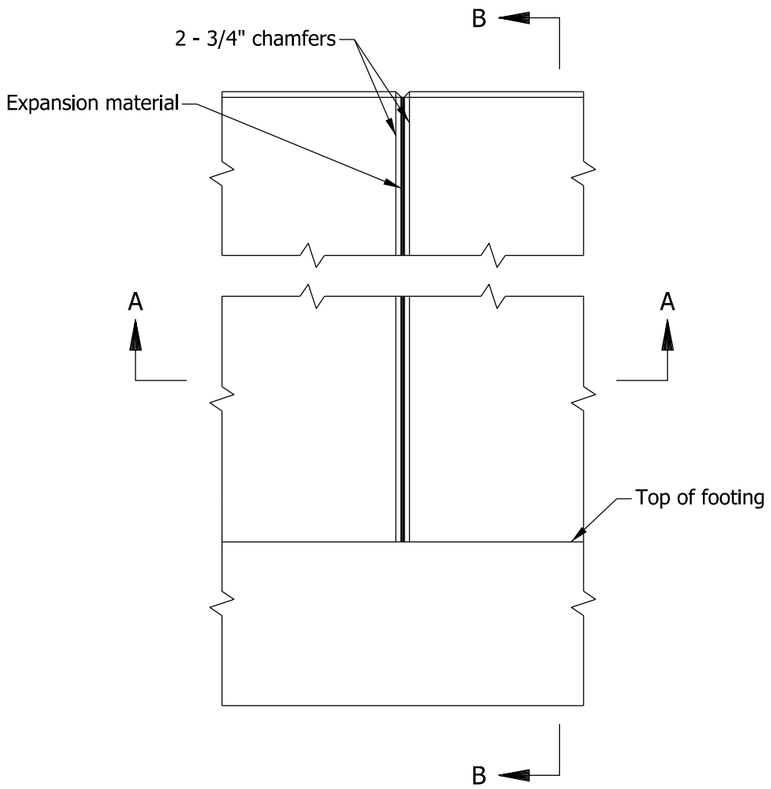
DESIGN STANDARDS ENGINEER

/s/ Richard L.VanCleave 09/01/11

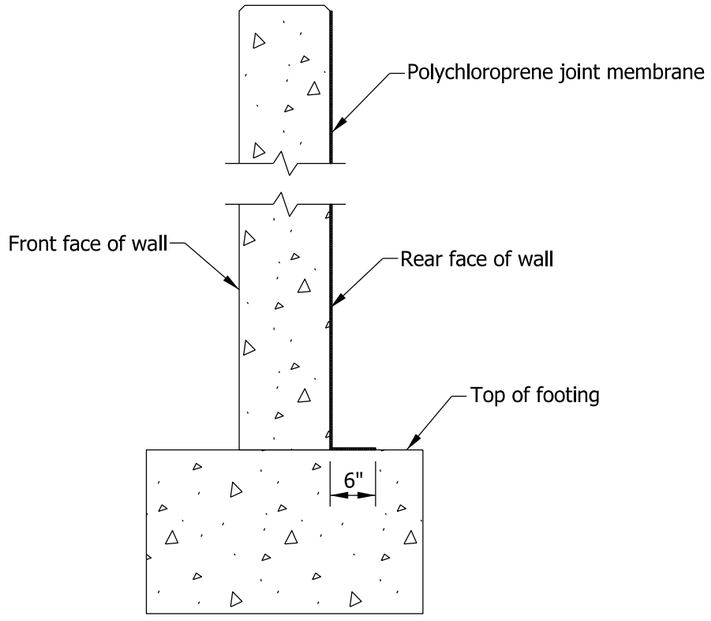
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/11

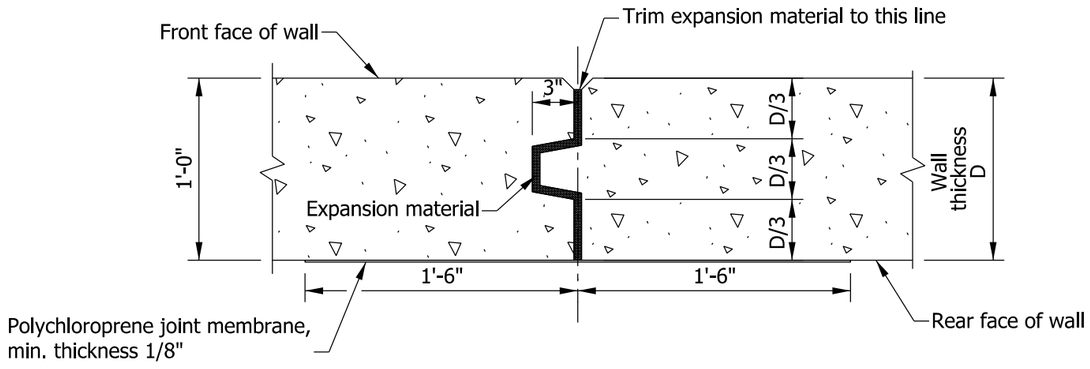
CHIEF HIGHWAY ENGINEER DATE



WALL FRONT FACE



SECTION B-B



SECTION A-A

NOTES

1. Expansion material in joints shall be preformed joint filler.
2. All chamfered edges shall be 3/4".

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINT

SEPTEMBER 2012

STANDARD DRAWING NO. E 724-BJTS-01

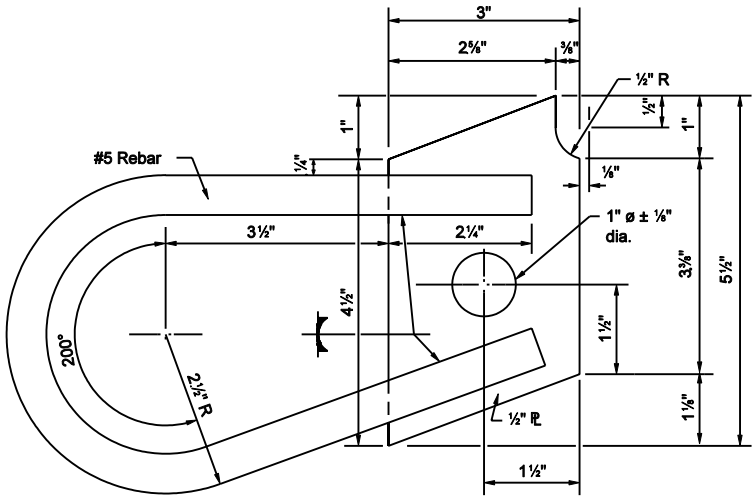
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. Van Cleave 09/04/12

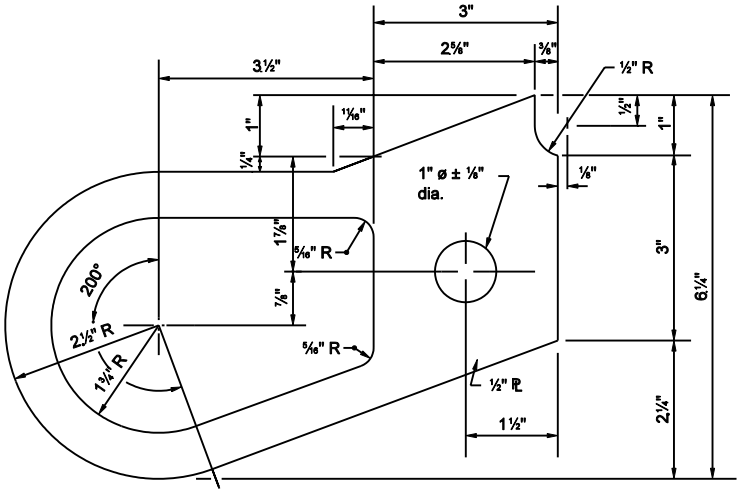
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12

CHIEF ENGINEER DATE



ANCHOR PLATE ALTERNATE A-1



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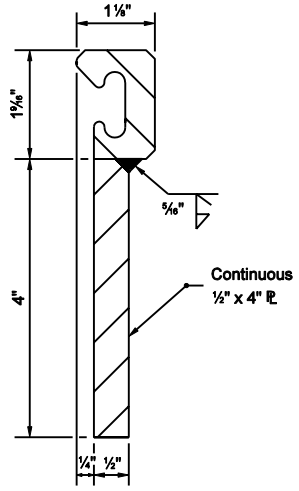
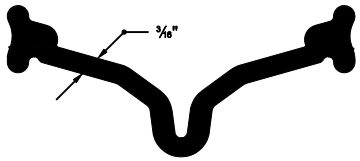


EXTRUSION & PLATE
ASSEMBLY DETAIL



STRIP SEAL

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS
CLASS SS (ALTERNATE A)

SEPTEMBER 2003

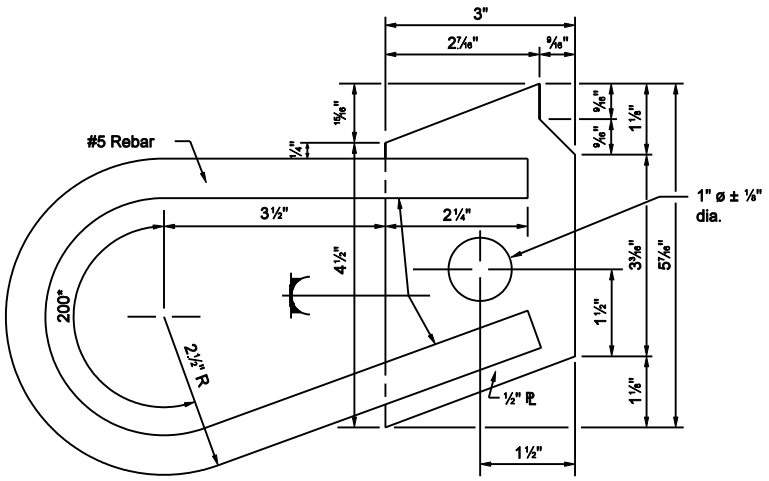
STANDARD DRAWING NO. E 724-BSSJ -01

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — 9-02-03
DESIGN STANDARDS ENGINEER — DATE

/s/ Richard K. Smutzer — 9-02-03
CHIEF HIGHWAY ENGINEER — DATE



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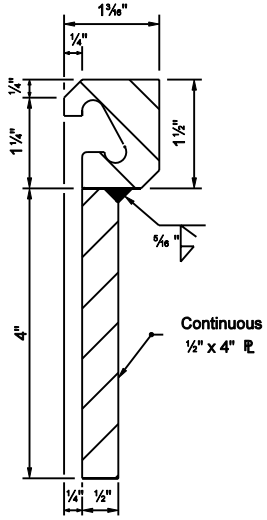
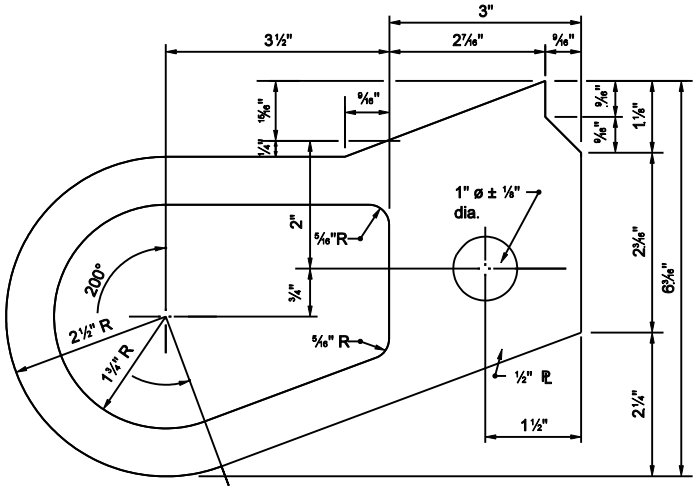


EXTRUSION & PLATE
ASSEMBLY DETAIL



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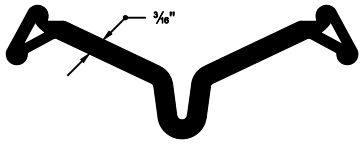


STRIP SEAL

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS
CLASS SS (ALTERNATE B)

SEPTEMBER 2003

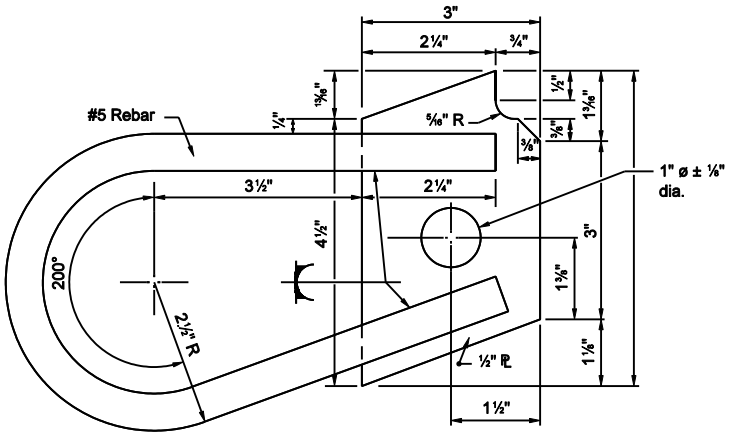
STANDARD DRAWING NO. E 724-BSSJ -02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE



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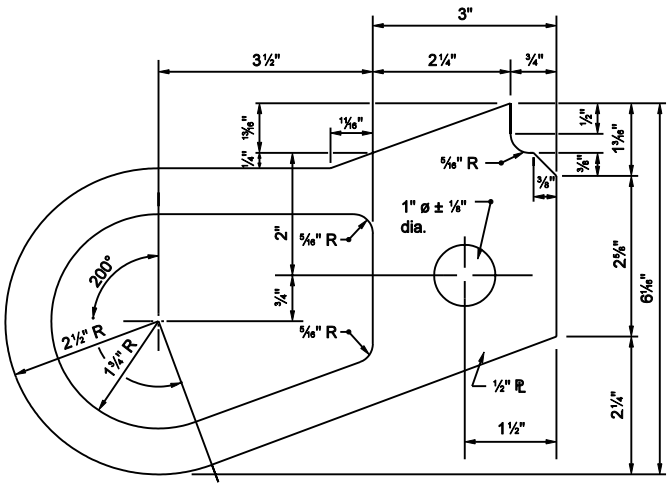

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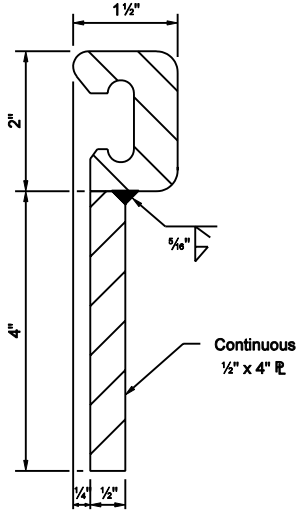
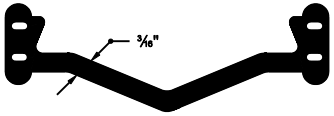


EXTRUSION & PLATE
ASSEMBLY DETAIL



STRIP SEAL

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS
CLASS SS (ALTERNATE C)

SEPTEMBER 2003

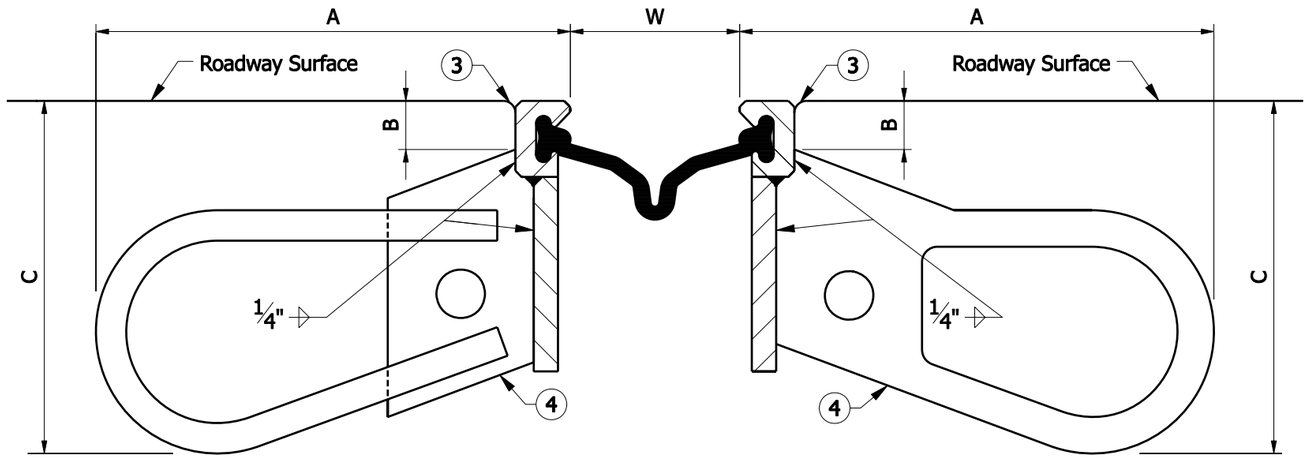
STANDARD DRAWING NO. E 724-BSSJ-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE



INSTALLATION DETAIL

GENERAL NOTES

1. This sheet shall be used in conjunction with Standard Drawing Nos. E 724-BSSJ-05 through 09.
2. Allowable expansion lengths shall not be increased for skewed structures.

(3) Tool concrete edges to 1/4" to 3/8" radius.

(4) Anchors shall be spaced at 9 in.

DIMENSIONS			
ALTERNATES	A	B	C
A-1	9 3/4"	1"	7 1/4"
A-2			
B-1	9 3/4"	15/16"	7 1/8"
B-2			
C-1	9 3/4"	1 13/16"	7 1/4"
C-2			
D-1	9 3/4"	1"	7 5/16"
D-2			

JOINT SETTING TABLE			
Ambient Temperature °F	DIMENSION "W" Expansion Length		
	100'-200'	200'-300'	300'-400'
120°	2 1/8"	1 5/16"	1/2"
100°	2 7/8"	1 3/4"	1 1/8"
80°	2 11/16"	2 3/16"	1 11/16"
60°	3"	2 5/8"	2 1/4"
40°	3 5/16"	3 1/16"	2 13/16"
20°	3 9/16"	3 1/2"	3 3/8"
0°	3 7/8"	3 5/16"	4"

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS CLASS SS

SEPTEMBER 2007

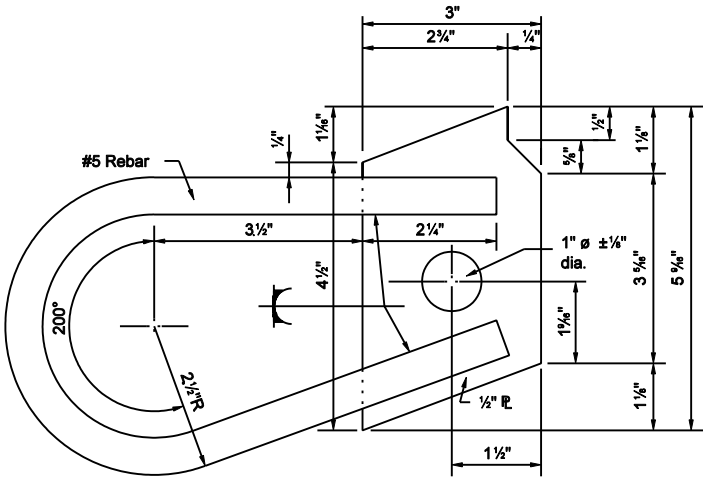
STANDARD DRAWING NO. E 724-BSSJ-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

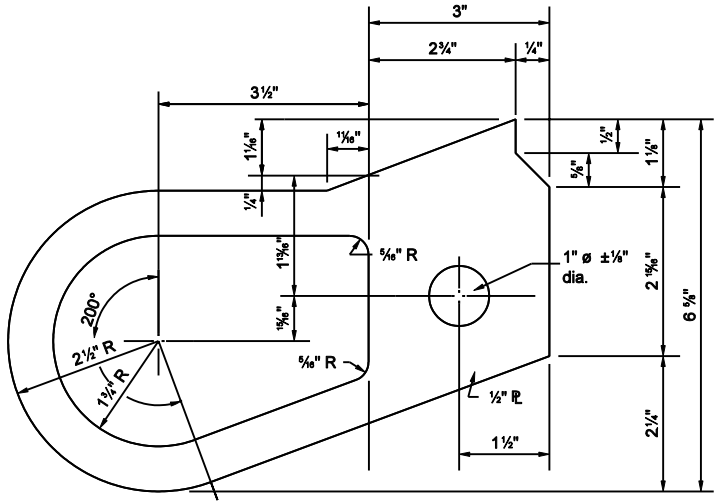
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/04/07
DESIGN STANDARDS ENGINEER — DATE

/s/ Mark A. Miller 09/04/07
CHIEF HIGHWAY ENGINEER — DATE



ANCHOR PLATE ALTERNATE D-1



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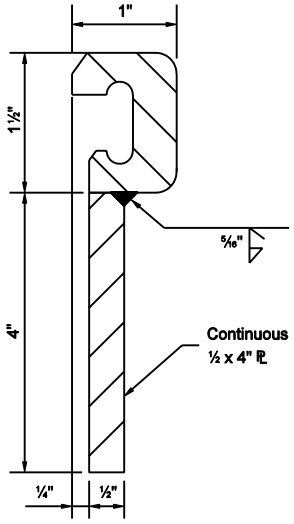
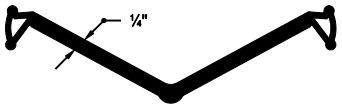


EXTRUSION & PLATE
ASSEMBLY DETAIL



RJ-400 STRIP
SEAL GLAND

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS
CLASS SS (ALTERNATE D)

SEPTEMBER 2003

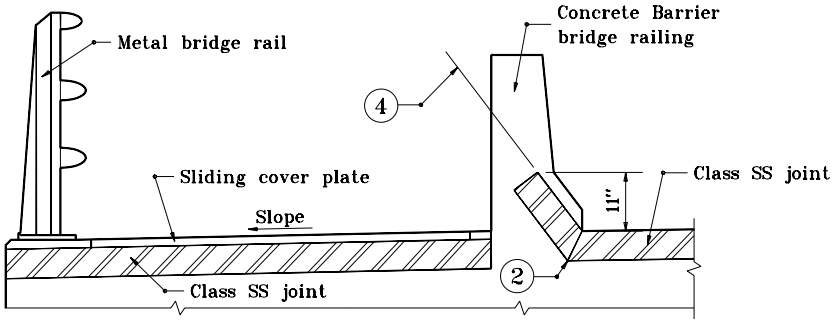
STANDARD DRAWING NO. E 724-BSSJ-04A

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

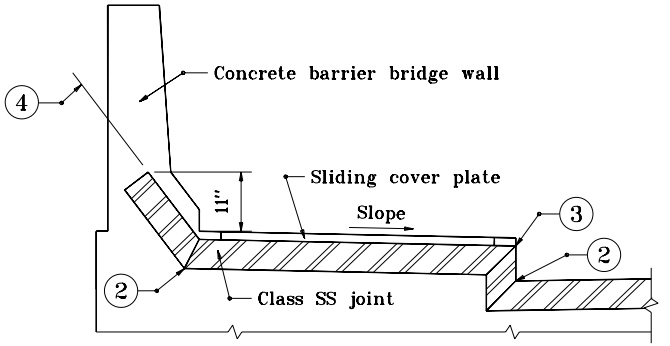
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — 9-02-03
DESIGN STANDARDS ENGINEER — DATE

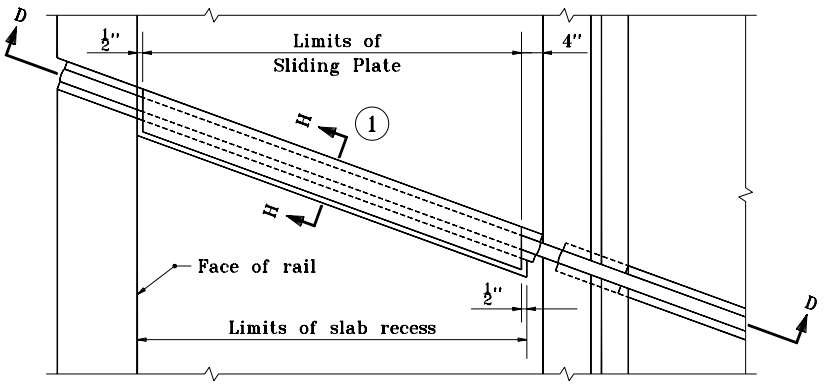
/s/ Richard K. Smutzer — 9-02-03
CHIEF HIGHWAY ENGINEER — DATE



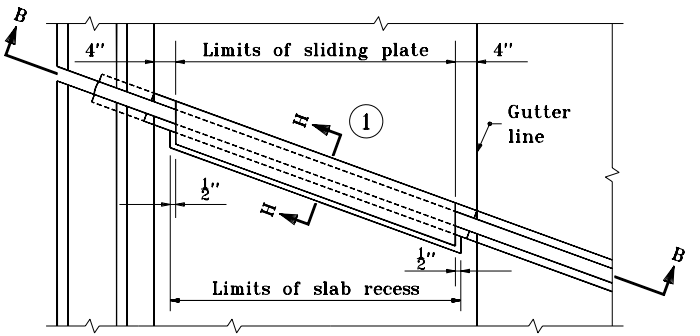
SECTION D–D



SECTION B–B



PLAN



PLAN

SIDEWALKS

(1) For section H–H see sheet number E 724-BSSJ-08.

(2) The extrusion and plate assemblies with anchors shall be miter cut and shop spliced at this location. A miter cut, vulcanized shop splice will be require in the strip seal at this location.

(3) The extrusion and plate assemblies with anchors shall be shop prepared for field welding at this location. A miter cut vulcanized shop splice will be require in the strip seal at this location.

(4) The joint shall be placed parallel to the lower sloped face of the rail with a maximum 3 in. depth to the top of the extrusion.

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS CLASS SS

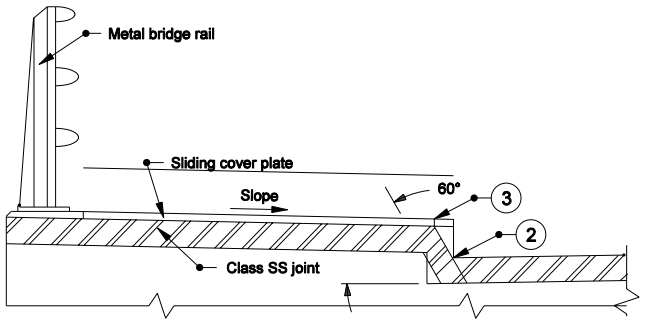
SEPTEMBER 1994

STANDARD DRAWING NO. **E 724-BSSJ-05**

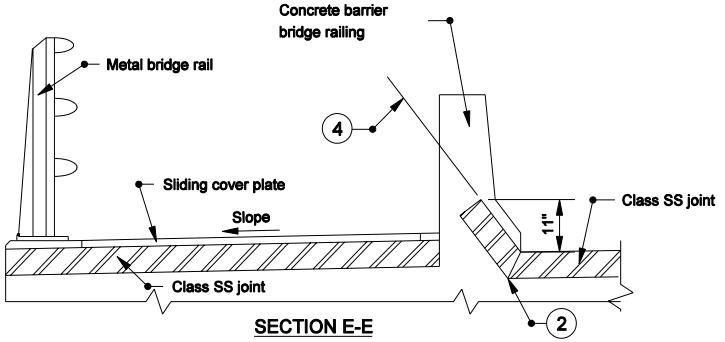
ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

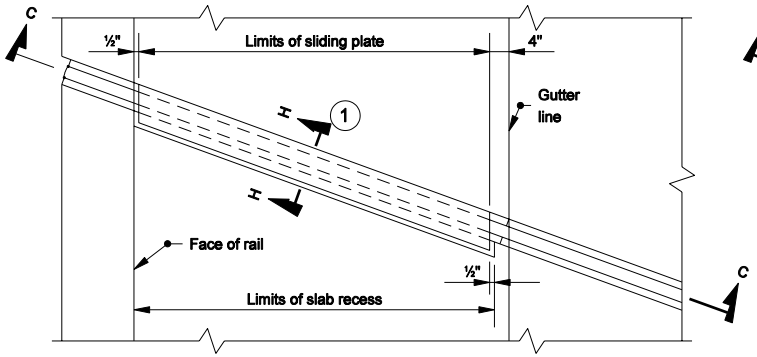
DETAILS PLACED IN THIS FORMAT	11-15-99
/s/ Anthony L. Uremovich DESIGN STANDARDS ENGINEER	11-15-99 DATE
/s/ Firooz Zandi CHIEF HIGHWAY ENGINEER	11-15-99 DATE
ORIGINALLY APPROVED	9-30-94



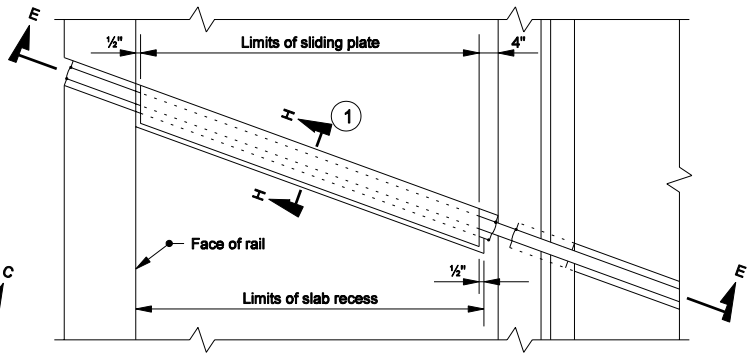
SECTION C-C



SECTION E-E



PLAN



PLAN

SIDEWALKS

(1) For section H-H see sheet number E 724-BSSJ-08.

(2) The extrusion and plate assemblies with anchors shall be miter cut and shop spliced at this location. A miter cut, vulcanized shop splice will be required in the strip seal at this location.

(3) The extrusion and plate assemblies with anchors shall be shop prepared for field welding at this location. A miter cut vulcanized shop splice will be required in the strip seal at this location.

(4) The joint shall be placed parallel to the lower sloped face of the rail with a maximum 3 in. depth to the top of the extrusion.

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS
CLASS SS

MARCH 2005

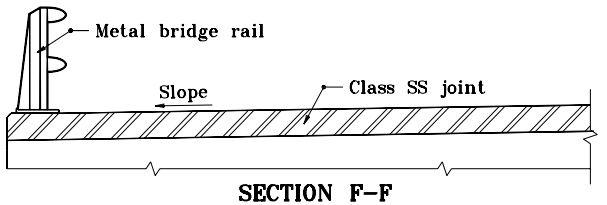
STANDARD DRAWING NO. E 724-BSSJ-06

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 3-01-05
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 3-01-05
CHIEF HIGHWAY ENGINEER DATE



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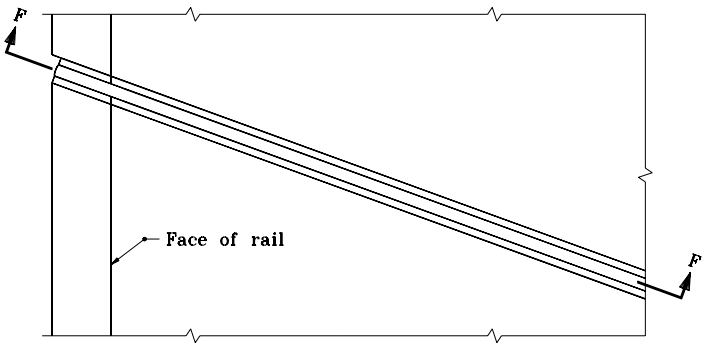
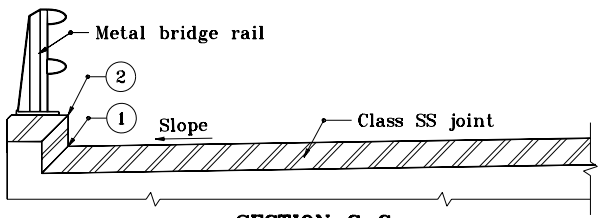
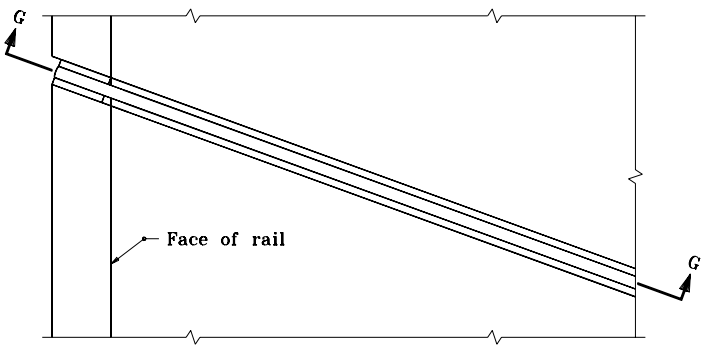


PLAN



SECTION G-G



PLAN

METAL RAILING WITHOUT SIDEWALK

(1) The extrusion and plate assemblies with anchors shall be miter cut and shop spliced at this location. A miter cut, vulcanized shop spliced will be required in the strip seal at the location.

(2) The extrusion and plate assemblies with anchors shall be shop prepared for field welding at this location. A miter cut, vulcanized shop splice will be required in the strip seal at this location.

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS CLASS SS

SEPTEMBER 1994

STANDARD DRAWING NO. **E 724-BSSJ-07**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

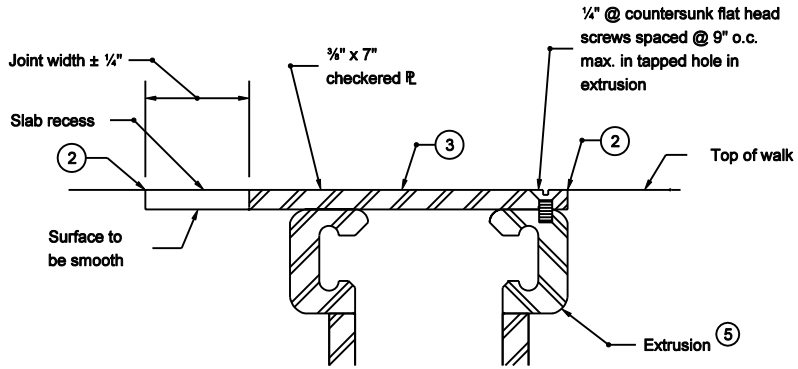
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

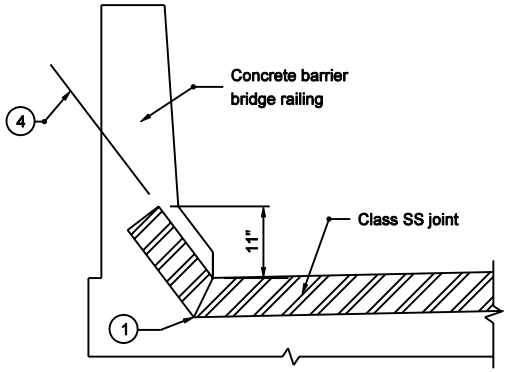
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 9-30-94

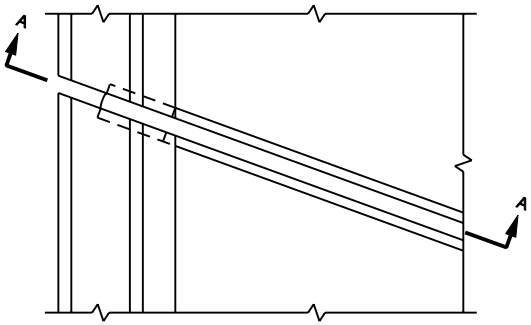


SECTION H-H

SLIDING COVER PLATE DETAIL



SECTION A-A



PLAN

CONCRETE BARRIER BRIDGE RAILING

(1) The extrusion and plate assemblies with anchors shall be miter cut and shop spliced at this location. A miter cut, vulcanized shop splice will be required in the strip seal at this location.

(2) Tool concrete edges to ¼" to ⅜" radius.

(3) The length of the sliding cover plate, measured along the centerline of the Class SS Joint, shall be ⅜" shorter at each end than the limits of the recess as shown on these details.

(4) The joint shall be placed parallel to the lower sloped face of the rail with a maximum 3 " depth to the top of the extrusion.

(5) See Standard Drawings E 724-BSSJ-03 and -04 for details.

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS
CLASS SS

SEPTEMBER 2003

STANDARD DRAWING NO. E 724-BSSJ-08

RICHARD L. VANCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-02-03
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-02-03
CHIEF HIGHWAY ENGINEER DATE

GENERAL NOTES

1. Standard Drawing Nos. E 724-BSSJ-05 through 09 shall be used in conjunction with Standard Drawing Nos. E 724-BSSJ-01 through 04.

2. The details shown on Standard Drawing Nos. E 724-BSSJ-05 through 09 are the only approved methods of placing Class SS Joints in curbs, sidewalks, concrete bridge railing and under metal bridge railing.

3. The locations of the anchor plates in sidewalks and in the concrete barrier bridge rail shall be as shown on the approved shop drawings but in no case shall the spacing exceed 9 in.

INDIANA DEPARTMENT OF TRANSPORTATION

EXPANSION JOINTS CLASS SS

SEPTEMBER 1994

STANDARD DRAWING NO. **E 724-BSSJ-09**

ANTHONY L. UREMOVICH REGISTERED No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER

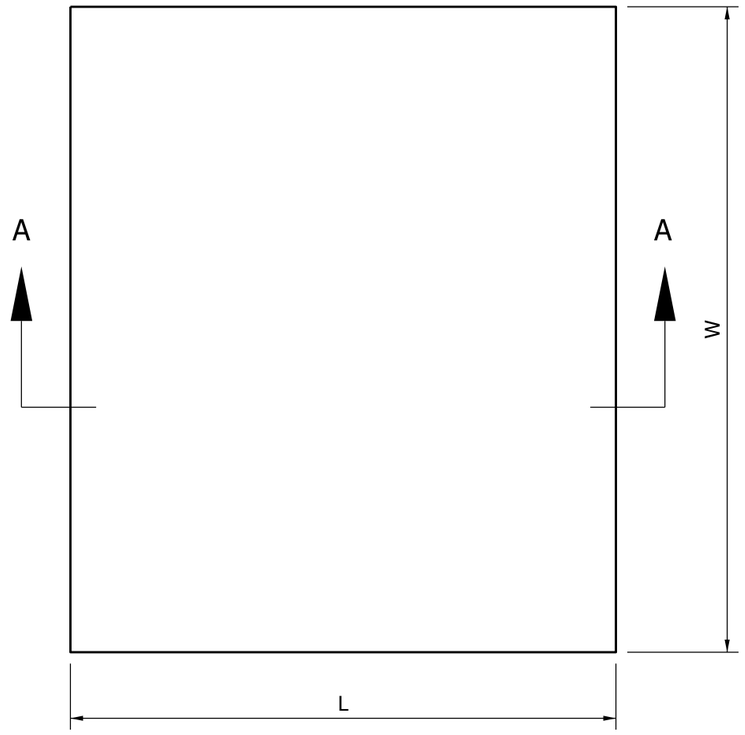
DESIGN STANDARDS ENGINEER

DETAILS PLACED IN THIS FORMAT 11-15-99

/s/ Anthony L. Uremovich 11-15-99
DESIGN STANDARDS ENGINEER DATE

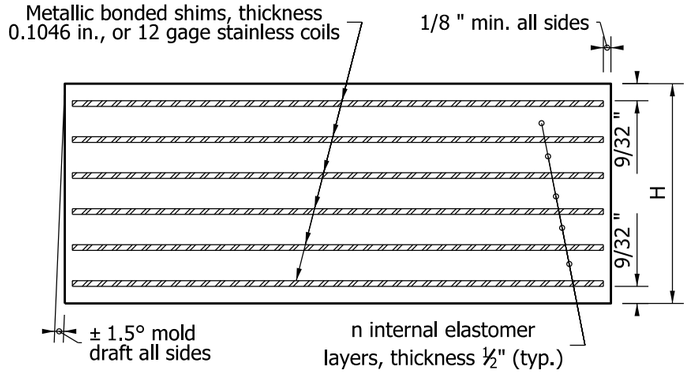
/s/ Firooz Zandi 11-15-99
CHIEF HIGHWAY ENGINEER DATE

ORIGINALLY APPROVED 9-30-94



ELASTOMERIC BEARING PAD

PLAN



SECTION A - A

NOTES:

1. The rectangular Elastomeric Bearing Pad shall be placed with L dimension parallel to longitudinal bridge axis.

2. h_{rt} is defined as the summation of all internal elastomer thickness plus the two external layers thickness.

TABLE OF DIMENSIONS

Bearing Designation	Bearing Width W	Bearing Length L	Number of Internal Elastomer Layers n	h_{rt}	Number of Steel Shims n_s	Bearing Total Thickness H
TYPE 1	14"	10 ½"	3	2 1/16"	4	2 15/32"
TYPE 2	14"	11 ½"	4	2 9/16"	5	3 3/32"
TYPE 3	18"	11"	4	2 9/16"	5	3 3/32"
TYPE 4	24"	12"	5	3 1/16"	6	3 11/16"
TYPE 5A	22"	11"	4	2 9/16"	5	3 3/32"
TYPE 6A	22"	10"	4	2 9/16"	5	3 3/32"
TYPE 7A	22"	9"	3	2 1/16"	4	2 15/32"
TYPE 5B	12"	12"	4	2 9/16"	5	3 3/32"
TYPE 6B	12"	11"	4	2 9/16"	5	3 3/32"
TYPE 7B	12"	10"	3	2 1/16"	4	2 15/32"

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE ELASTOMERIC BEARING PADS TYPE 1 to 7 FOR PRESTRESSED I-BEAMS & BOX BEAMS

SEPTEMBER 2009

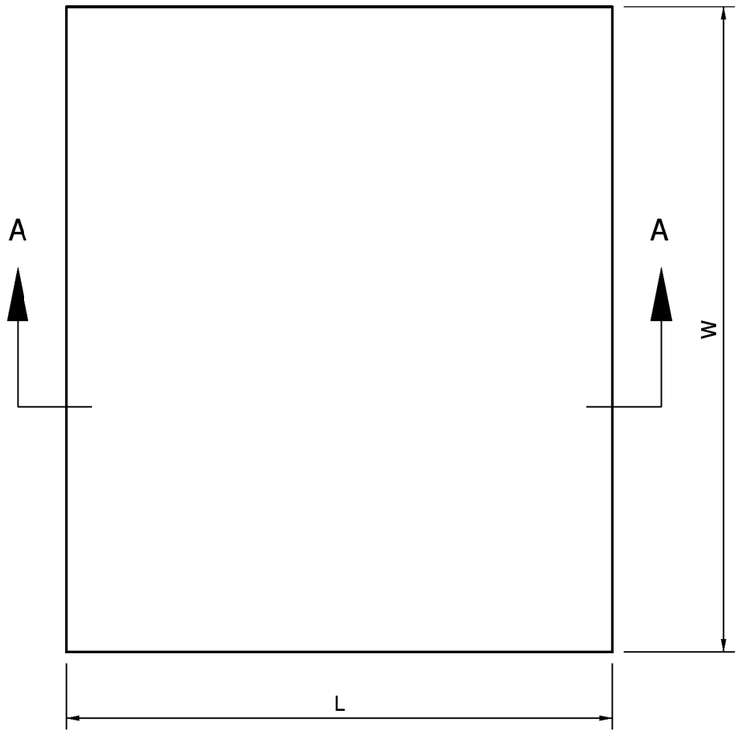
STANDARD DRAWING NO. E 726-BEBP-01

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

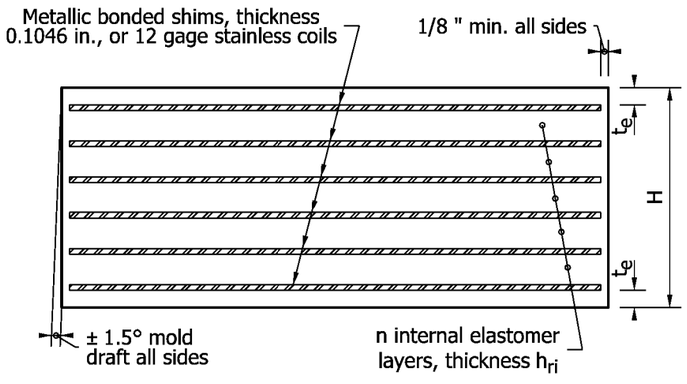
/s/ Richard L.VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE



ELASTOMERIC BEARING PAD

PLAN



SECTION A - A

NOTES:

1. The rectangular Elastomeric Bearing Pad shall be placed with L dimension parallel to longitudinal bridge axis.
2. h_{rt} is defined as the summation of all internal elastomer thickness plus the two external layers thickness.

TABLE OF DIMENSIONS

Bearing Designation	Bearing Width W	Bearing Length L	Internal Elastomer Thickness h_{ri}	Number of Internal Elastomer Layers n	External Elastomer Thickness t_e	h_{rt}	Number of Steel Shims n_s	Bearing Total Thickness H
T1	23"	12"	½"	5	9/32"	3 1/16"	6	3 11/16"
T2	23"	14"	½"	6	9/32"	3 9/16"	7	4 5/16"
T3	23"	17"	19/32"	7	5/16"	4 25/32"	8	5 5/8"
T4	24"	19"	19/32"	8	5/16"	5 3/8"	9	6 5/16"

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE ELASTOMERIC BEARING PADS TYPE T-1 to T-4 FOR PRESTRESSED BULB-TEE BEAMS SEPTEMBER 2009

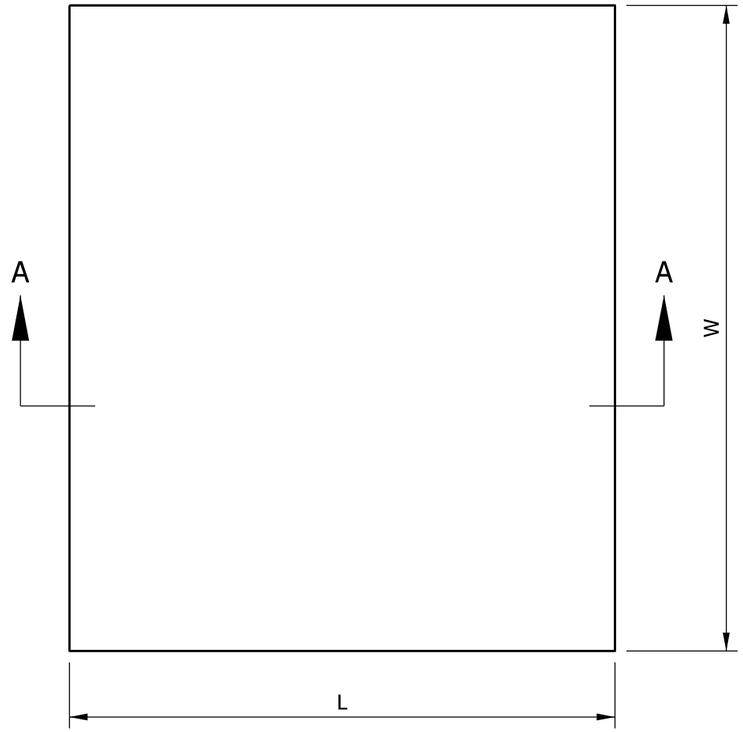
STANDARD DRAWING NO. E 726-BEBP-02

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

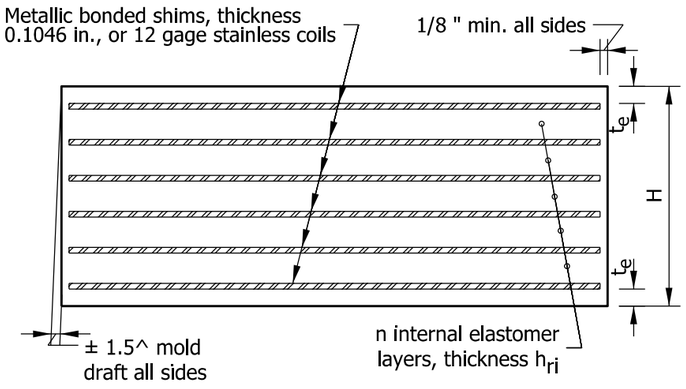
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 09/01/09
DESIGN STANDARDS ENGINEER DATE

/s/ Mark A. Miller 09/01/09
CHIEF HIGHWAY ENGINEER DATE



ELASTOMERIC BEARING PAD
PLAN



SECTION A - A

NOTES:

1. The rectangular Elastomeric Bearing Pad shall be placed with L dimension parallel to longitudinal bridge axis.
2. h_{rt} is defined as the summation of all internal elastomer thickness plus the two external layers thickness.
3. The Contractor shall check that the bearing seat is level. Grinding may be required to obtain a level seat.
4. The bridge seat shall be finished level at the time concrete is placed. Finished concrete shall be ground if necessary to ensure full and level contact between the seat and the bearing pads when the beams are set.

TABLE OF DIMENSIONS

Bearing Designation	Bearing Width W	Bearing Length L	Internal Elastomer Thickness h_{ri}	Number of Internal Elastomer Layers n	External Elastomer Thickness t_e	h_{rt}	Number of Steel Shims n_s	Bearing Total Thickness H
TH1	36"	12"	1/2"	5	9/32"	3 1/16"	6	3 11/16"
TH2	36"	14"	1/2"	6	9/32"	3 9/16"	7	4 5/16"
TH3	36"	17"	19/32"	7	5/16"	4 25/32"	8	5 5/8"
TH4	36"	19"	19/32"	8	5/16"	5 3/8"	9	6 5/16"

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE ELASTOMERIC BEARING PADS
TYPE TH1 - TH4 FOR PRESTRESSED
WIDE-FLANGE BULB-TEE BEAMS

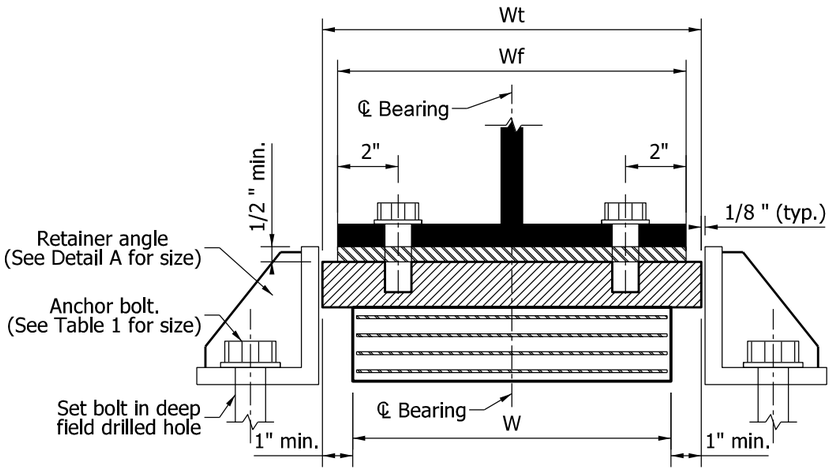
SEPTEMBER 2012

STANDARD DRAWING NO. E 726-BEBP-03

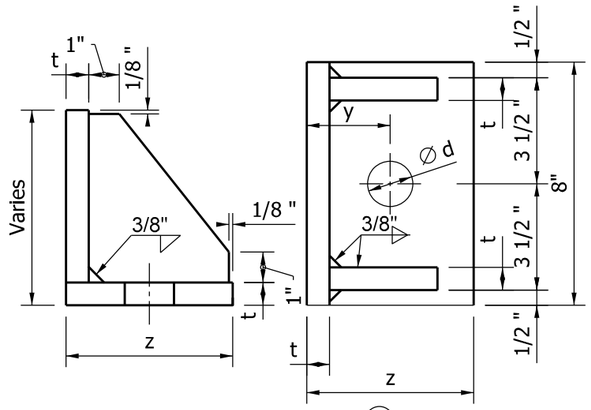
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



CROSS SECTION THROUGH ASSEMBLY



DETAIL A (3)

NOTES:

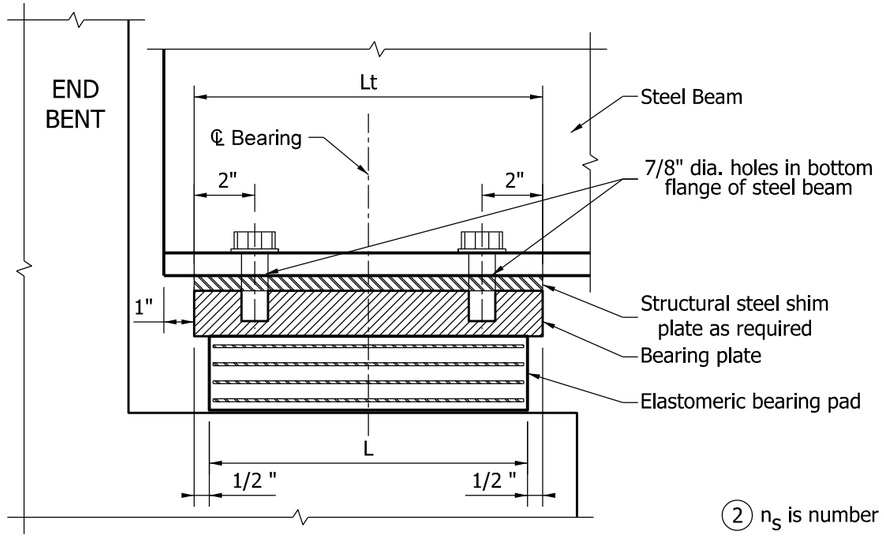
1. The bearing plate size shall be calculated as follows:
   Lt = L + 1" Wt = Wf + 2" or Wt = W + 2" whichever is greater.
2. The shim thickness is 0.1046 in., which corresponds to 12 gage stainless coils.
3. Equivalent rolled angle shape with stiffeners may be used in lieu of welded plates.
4. Minimum dimension required is 1 1/2 " + flange thickness + 1/3" (for shim plate).
5. Minimum thickness 1 1/2"
6. See standard drawing E 726-BEBP-05 for Table of Dimensions.

TABLE 1

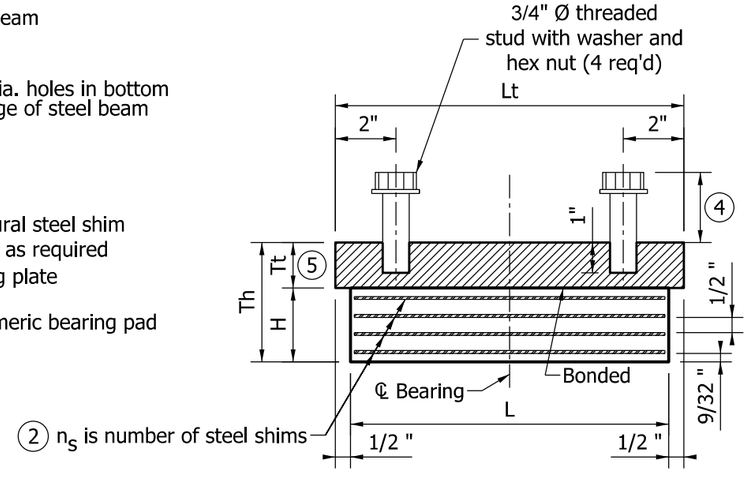
ANCHOR BOLT SIZE		
BEARING SIZE		BOLT SIZE
S1	11" x 8"	1" x 12"
S2	12" x 9"	1" x 12"
S3	13" x 10"	1" x 12"
S4	15" x 11"	1 1/4" x 15"
S5	16" x 12"	1 1/4" x 15"
S6	20" x 13"	1 1/2" x 18"
S7	20" x 15"	1 1/2" x 18"

TABLE 2

BOLT DIA.	y	z	t	d
1"	2 1/8"	4"	1/2"	1 1/8"
1 1/4"	2 1/4"	4 3/4"	1/2"	1 3/8"
1 1/2"	2 3/4"	5 1/2"	3/4"	1 5/8"



LONGITUDINAL SECTION THROUGH ASSEMBLY



BEARING ASSEMBLY

INDIANA DEPARTMENT OF TRANSPORTATION

BRIDGE ELASTOMERIC BEARING PADS
TYPE S - FOR STEEL BEAMS

SEPTEMBER 2012

STANDARD DRAWING NO. E 726-BEBP-04

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE

TABLE OF DIMENSIONS - TYPE S BEARINGS FOR STEEL BEAMS

Bearing Designation	Bearing Width W	Bearing Length L	Number of Internal Elastomer Layers n	hrt (1)	Number of Steel Shims ns	Bearing Total Thickness H
S1-A	11"	8"	2	1 9/16"	3	1 27/32"
S1-B	11"	8"	3	2 1/16"	4	2 7/16"
S2-A	12"	9"	2	1 9/16"	3	1 27/32"
S2-B	12"	9"	3	2 1/16"	4	2 7/16"
S3-A	13"	10"	3	2 1/16"	4	2 7/16"
S3-B	13"	10"	4	2 9/16"	5	3 1/32"
S4-A	15"	11"	4	2 9/16"	5	3 1/32"
S4-B	15"	11"	5	3 1/16"	6	3 5/8"
S5-A	16"	12"	4	2 9/16"	5	3 1/32"
S5-B	16"	12"	5	3 1/16"	6	3 5/8"
S6-A	20"	13"	5	3 1/16"	6	3 5/8"
S6-B	20"	13"	6	3 9/16"	7	4 7/32"
S7-A	20"	15"	6	3 9/16"	7	4 7/32"
S7-B	20"	15"	7	4 1/16"	8	4 13/16"

NOTES

(1) h_{rt} is defined as the summation of all internal elastomer thicknesses plus the external elastomer thicknesses.

2. See Standard Drawing E 726-BEBP-04 for Type S bearing assembly details.

INDIANA DEPARTMENT OF TRANSPORTATION

ELASTOMERIC BEARING PADS
TYPE S

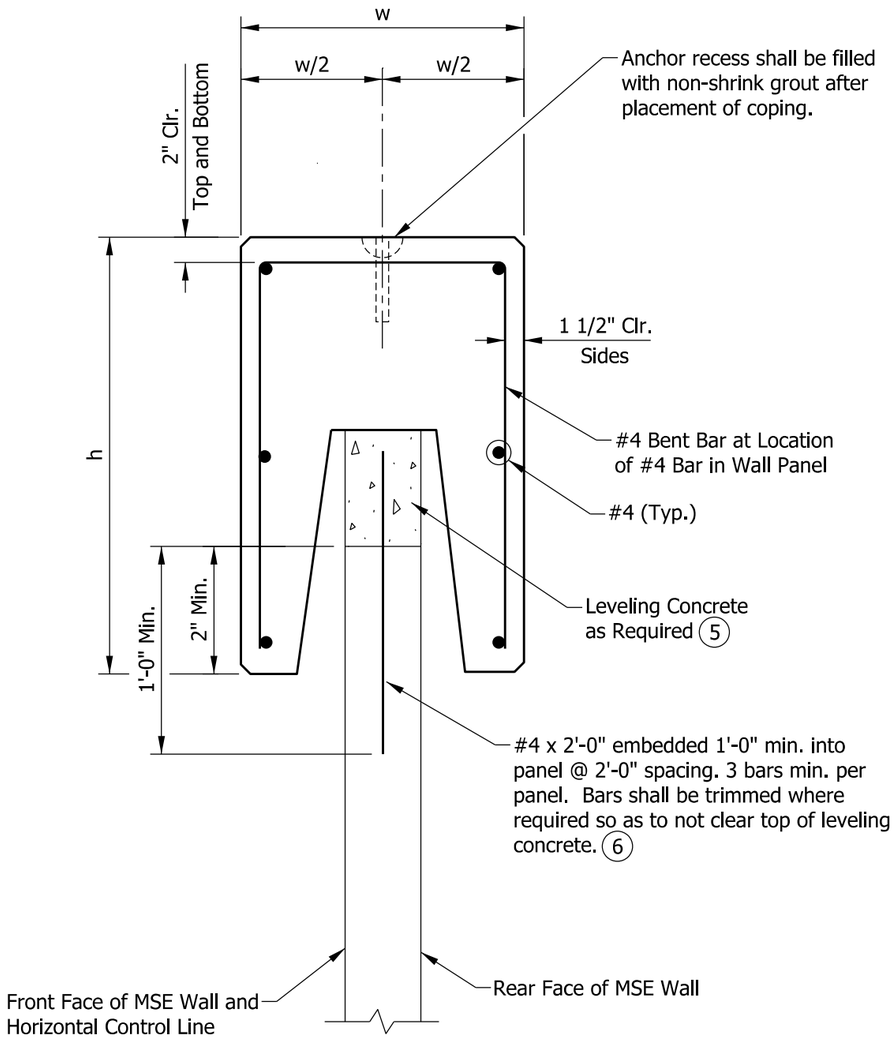
SEPTEMBER 2012

STANDARD DRAWING NO. E 726-BEBP-05

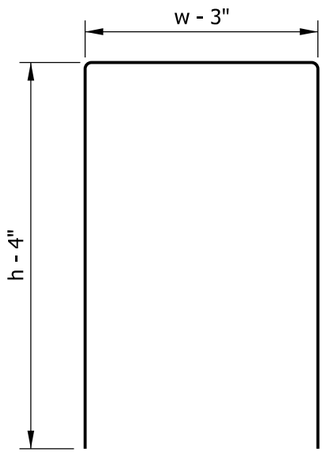
RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



TYPICAL SECTION



#4 BENT BAR

NOTES:

1. Precast coping unit length shall be 10'-0".
2. Reinforcing bar size, length, and spacing shall be determined by the manufacturer.
3. All chamfered edges shall be 3/4".
4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.

(5) Leveling concrete is required when adjacent top panels do not provide a continuous surface on which to place the precast coping, e.g., stepped panels or rectangular panels on a sloping grade. Leveling concrete is not required when custom top panels provide a surface parallel to the finished grade.

(6) Use only when leveling concrete is required.

INDIANA DEPARTMENT OF TRANSPORTATION

MSE WALL
PRECAST CONCRETE COPING

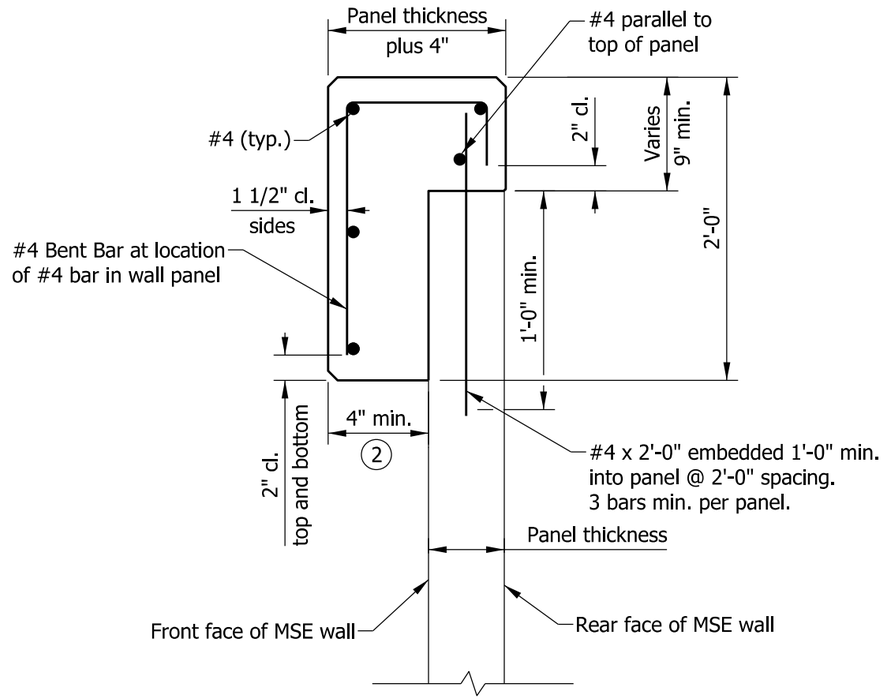
SEPTEMBER 2013

STANDARD DRAWING NO. E 731-MSEW-01

ELIZABETH W. PHILLIPS
REGISTERED
No. 10200124
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Elizabeth W. Phillips 02/22/13
DESIGN STANDARDS ENGINEER DATE

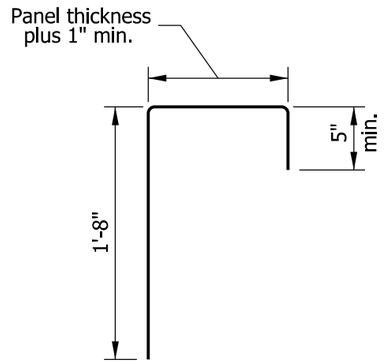
/s/ Mark A. Miller 03/27/13
CHIEF ENGINEER DATE



TYPICAL SECTION

NOTES

1. Coping joints shall coincide approximately with the panel joints. Reinforcing bars' ends shall be 2" short of near side of each joint.
2. The front face of a cast-in-place coping shall match the front face of a precast coping where used in conjunction.
3. All chamfered edges shall be 3/4".
4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.



#4 BENT BAR

INDIANA DEPARTMENT OF TRANSPORTATION

MSE WALL
CAST-IN-PLACE CONCRETE COPING

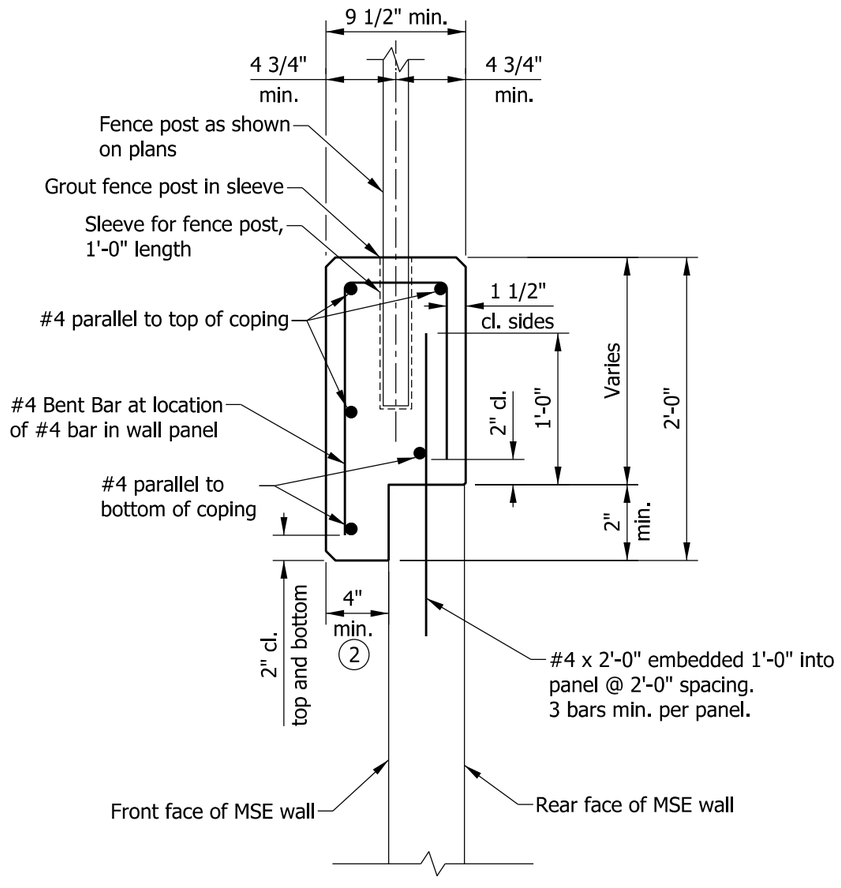
SEPTEMBER 2012

STANDARD DRAWING NO. E 731-MSEW-02

RICHARD L. VanCLEAVE
REGISTERED
No. 9750
STATE OF INDIANA
PROFESSIONAL ENGINEER

/s/ Richard L. VanCleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

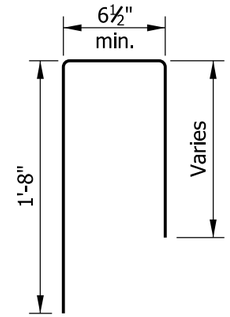
/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE



TYPICAL SECTION

NOTES

1. Coping joints shall coincide approximately with the panel joints. Reinforcing bars' ends shall be 2" short of near side of each joint.
2. The front face of a cast-in-place coping shall match the front face of a precast coping where used in conjunction.
3. All chamfered edges shall be 3/4".
4. See Standard Drawing E 703-BRST-01 for reinforcing-bar bending details and notes.



#4 BENT BAR

INDIANA DEPARTMENT OF TRANSPORTATION

MSE WALL
CAST-IN-PLACE CONCRETE COPING
WITH PEDESTRIAN FENCE

SEPTEMBER 2012

STANDARD DRAWING NO. E 731-MSEW-03

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

/s/ Richard L. Van Cleave 09/04/12
SUPERVISOR, ROADWAY STANDARDS DATE

/s/ Mark A. Miller 09/04/12
CHIEF ENGINEER DATE