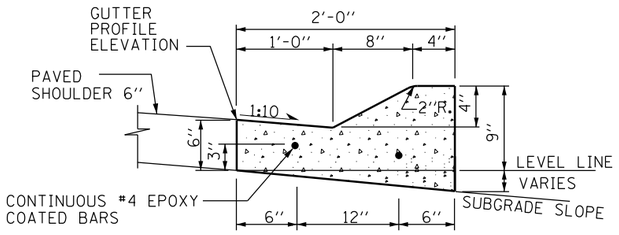
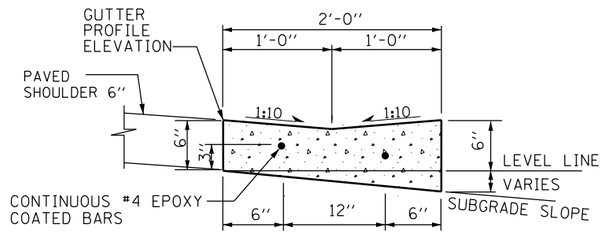
Tollway Standard Drawing Revisions

Section B	Drainage Structures, Curbs, Curbs & Gutter and Ditches	
	Standard	**Modification Summary** **Effective 11/1/2012**
	B1	**Gutter and Curb Details**
	Sheet 1	Added Concrete Gutter Overlay Detail
		Added Note 8
	Sheet 2	Changed Gutter Crack Control Joint Spacing from 25' to 15' cts.
	B8	**Catch Basins Type G**
		Added Type G-2 Modified Frame & Grate
		Modified pipe bell detail-Mortar & Grout
		Added Note 11
		Renumbered Notes 11 to 12, 12 to 13
	B24	**Pipe Underdrains**
		Deleted Previous Note 12
		Renumbered Note 13 to 12
		Modified placement of filter fabric envelope- without gutter detail.
		Revised minimum subgrade slope to 2%.
		Effective 2/1/2013
	B12	**Trench Drain Detail**
		Revised mainline shoulder grade from 4% to 3%.

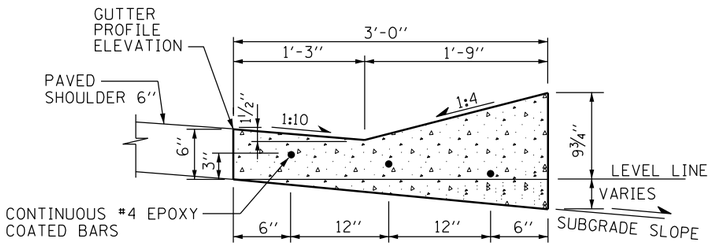
New Sheet



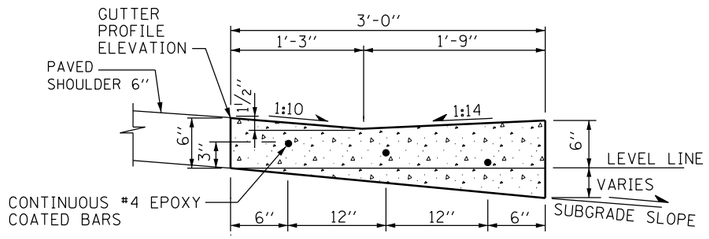
TYPE G-2 GUTTER



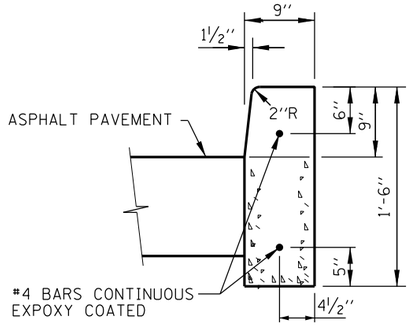
TYPE G-2, MODIFIED GUTTER



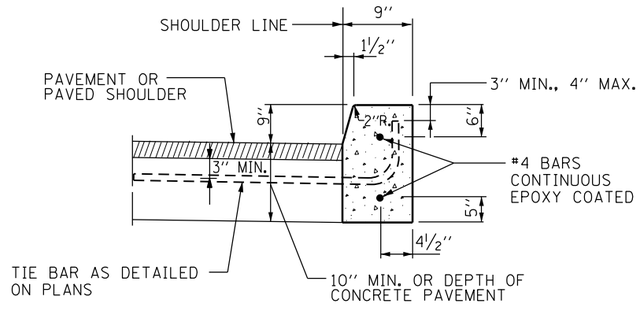
TYPE G-3 GUTTER



TYPE G-3, MODIFIED GUTTER



ADJACENT TO FLEXIBLE PAVEMENT



ADJACENT TO PCC PAVEMENT

TYPE "C" CURB

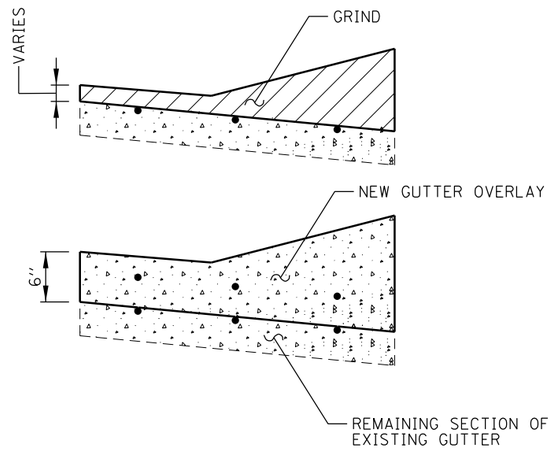
(RAMP TOLL PLAZAS ONLY)

NOTES:

1. FOR TYPE C CURB TRANSITIONS, THE LEADING ENDS OF CURB IN THE DIRECTION OF TRAFFIC SHALL BEGIN FLUSH WITH ADJACENT PAVEMENT OR SHOULDER SURFACE AND TRANSITION TO FULL HEIGHT AT THE RATE OF ONE INCH VERTICAL TO ONE FOOT HORIZONTAL.
2.

GUTTER TRANSITION DETAILS	STANDARD DRAWING
TRAFFIC BARRIER TERMINAL TYPE T1 (SPECIAL)	B-28
TRAFFIC BARRIER TERMINAL TYPE T1-A (SPECIAL)	B-29
TRAFFIC BARRIER TERMINAL TYPE T5 AND T10	B-2
TRAFFIC BARRIER TERMINAL TYPE T6	B-3

3. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
4. REINFORCEMENT STEEL SHALL BE ACCURATELY PLACED AND FIRMLY HELD IN THE POSITION SPECIFIED USING EPOXY COATED STEEL CHAIRS. CHAIR SPACING SHALL NOT EXCEED. 4'-0".
5. GUTTER REINFORCEMENT SHALL BE PLACED 3" ABOVE BOTTOM OF GUTTER FOLLOWING THE SUBGRADE SLOPE.
6. OTHER GUTTER AND CURB TRANSITION DETAILS WILL BE SHOWN ON THE PLANS.
7. CONTINUOUS #4 BARS SHALL BE LAPPED A MINIMUM OF 2'-0" IN ACCORDANCE WITH THE LATEST IDOT-BRIDGE MANUAL.
8. FOR CONCRETE GUTTER OVERLAYS, CRACK CONTROL JOINTS SHALL BE PLACED AT LOCATIONS OF UNDERLYING JOINTS AND WORKING CRACKS.



CONCRETE GUTTER OVERLAY

SHEET 1 OF 2

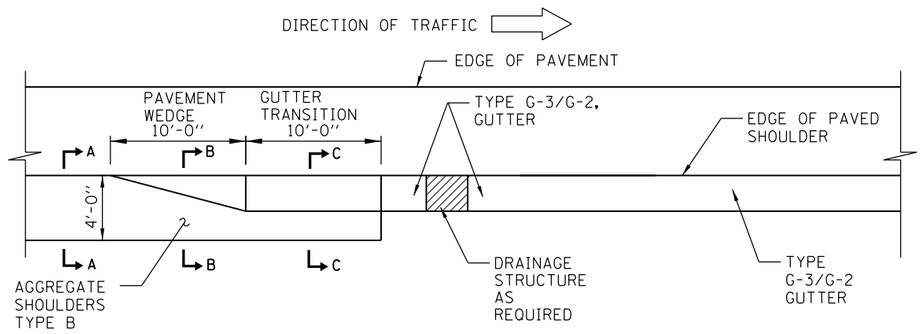
Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

DATE	REVISIONS
2-7-2012	REVISED NOTES
11-1-2012	ADDED CONCRETE GUTTER OVERLAY
	MODIFIED GUTTER CONTROL JOINT SPACING

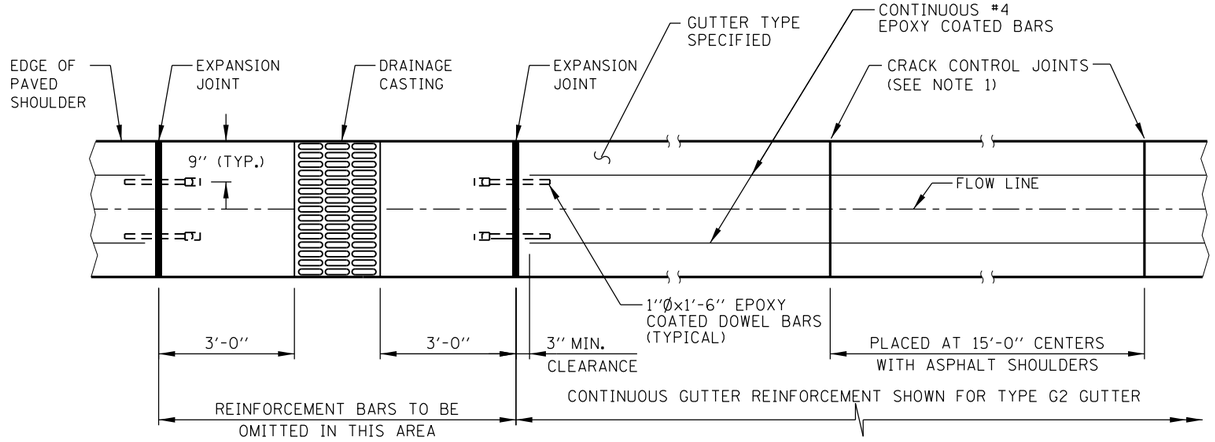
Illinois Tollway
Open Roads for a Faster Future

GUTTER AND CURB DETAILS

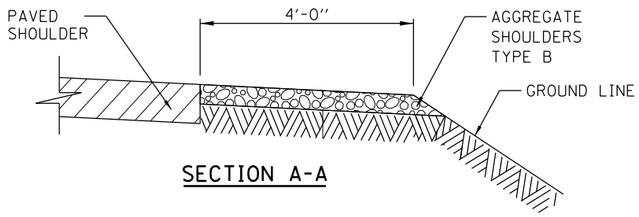
STANDARD B1-05



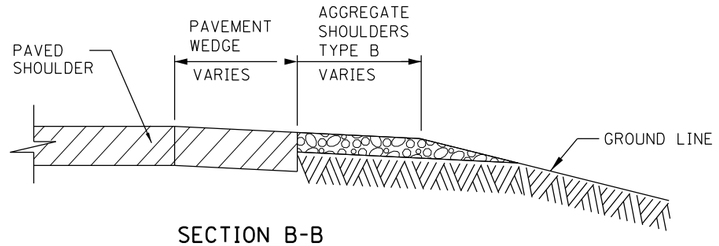
GUTTER TRANSITION TERMINATION



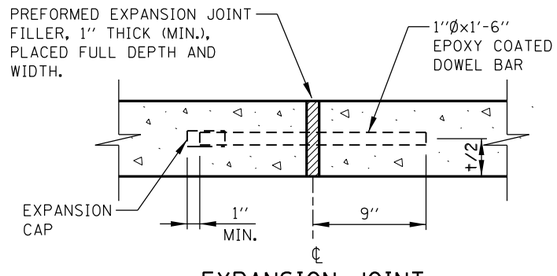
GUTTER PLAN



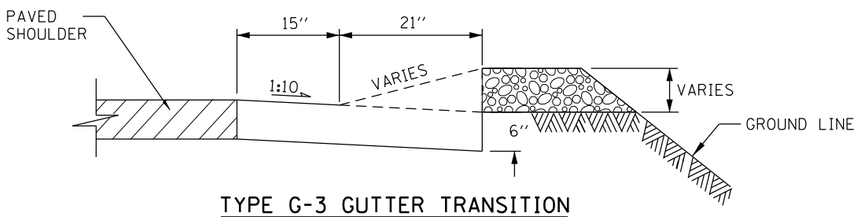
SECTION A-A



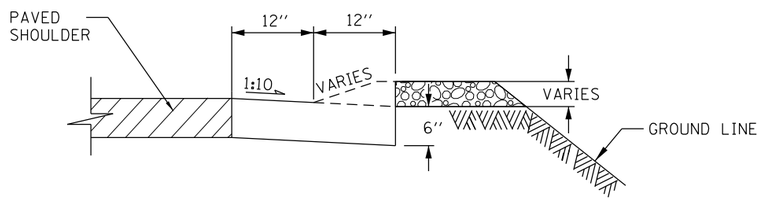
SECTION B-B
ASPHALT SHOULDER TRANSITION



EXPANSION JOINT

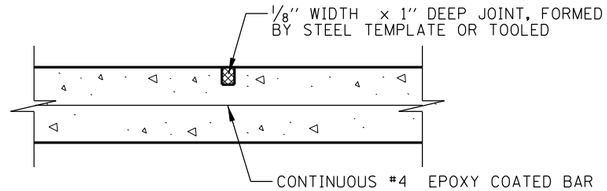


TYPE G-3 GUTTER TRANSITION



TYPE G-2 GUTTER TRANSITION

SECTION C-C



CRACK CONTROL JOINT

EXPANSION-CRACK CONTROL JOINTS
TYPE G-3/G-2 GUTTER

NOTES:

1. GUTTER CRACK CONTROL JOINTS TO ALIGN IN PROLONGATION WITH PCC SHOULDER JOINTS WHERE EXISTING.
2. SEE SHEET 1 OF THIS SERIES FOR NOTES.

Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

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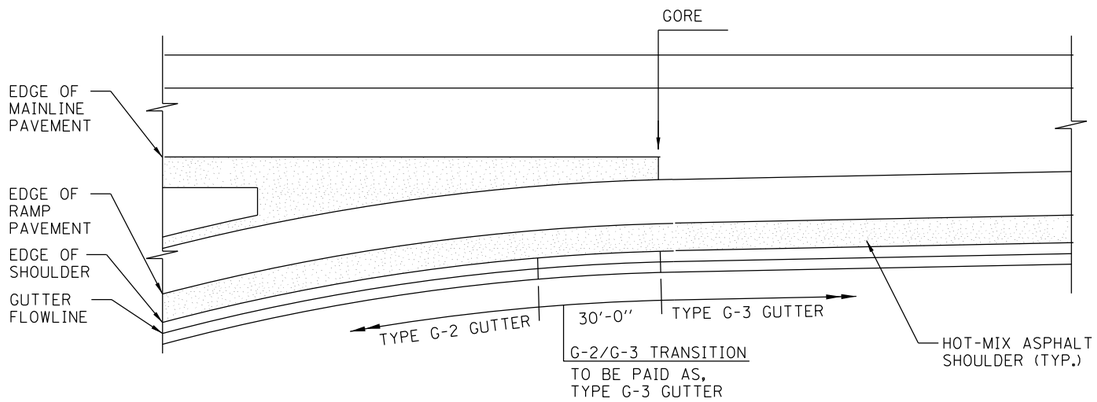
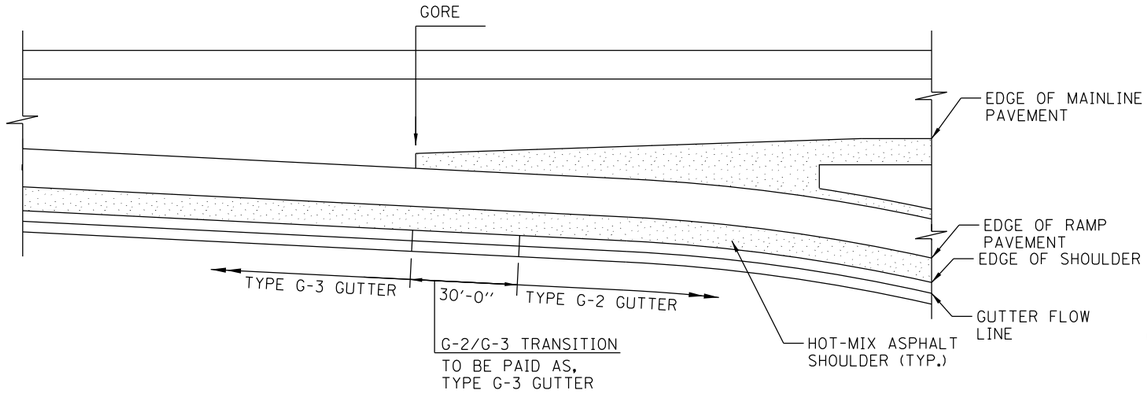
GUTTER AND CURB DETAILS

STANDARD B1-05



GUTTER TRANSITION AT ENTRANCE RAMP TERMINALS



GUTTER TRANSITION AT EXIT RAMP TERMINALS

GUTTER TRANSITION NOTES:

1. PROVIDE 1" EXPANSION JOINT WITH PREFORMED JOINT FILLER BETWEEN TRANSITION SECTION AND WINGWALL.
2. SEE STANDARD B3 FOR GUTTER TRANSITIONS AT BRIDGE APPROACH.
3. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
4. REINFORCEMENT STEEL SHALL BE ACCURATELY PLACED AND FIRMLY HELD AT THE POSITION USING EPOXY COATED CHAIRS. CHAIR SPACING SHALL NOT EXCEED 4'-0".
5. GUTTER REINFORCEMENT SHALL BE PLACED 3" ABOVE BOTTOM OF GUTTER FOLLOWING SUBGRADE SLOPE.
6. CONTINUOUS #4 BARS SHALL BE LAPPED A MINIMUM OF 2'-0" IN ACCORDANCE WITH THE LATEST IDOT MANUAL.

DATE	REVISIONS
6-1-2009	REVISED NOTES, MODIFIED G2/G3 GUTTER TRANSITIONS
9-1-2009	ADDED GUTTER TRANSITION TERMINAL DETAIL REVISED NOTES
3-1-2010	RELOCATED GUTTER TRANSITION DETAIL TO STANDARD B28, REVISED NOTES REVISED TYPE G-3, G-2 GUTTER AT BRIDGE APPROACH
2-7-2012	REVISED NOTES

Illinois Tollway
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TYPE G-2 AND G-3
GUTTER TRANSITIONS

STANDARD B2-04

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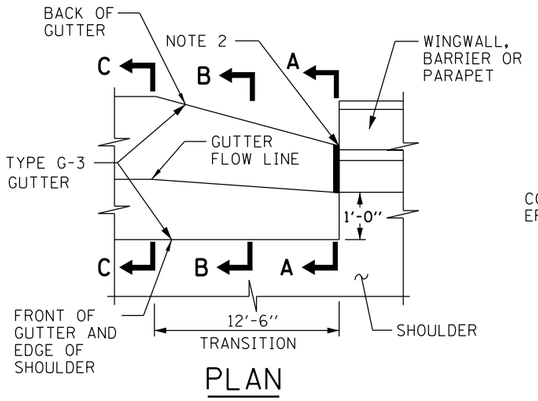
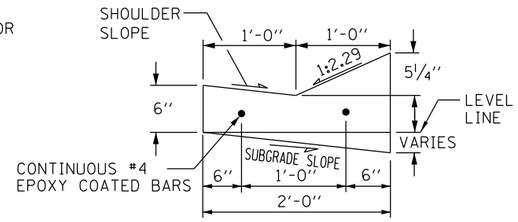
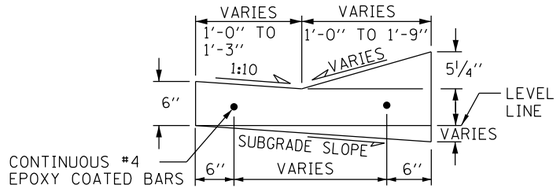
APPROVED . . . . . DATE 2-7-2012
CHIEF ENGINEER



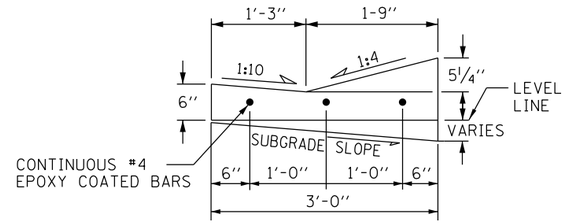
PLAN



SECTION A-A



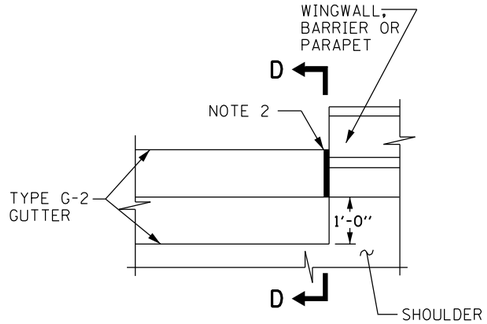
SECTION B-B



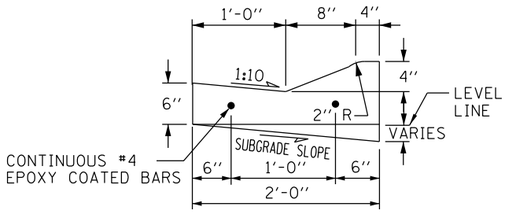
SECTION C-C

NORMAL TYPE G-3 GUTTER

TYPE G-3 GUTTER TRANSITION AT BRIDGE DEPARTURE



PLAN



SECTION D-D

NORMAL TYPE G-2 GUTTER

TYPE G-2 GUTTER AT BRIDGE DEPARTURE

NOTE:

SEE SHEET 1 OF THIS SERIES FOR NOTES.

Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

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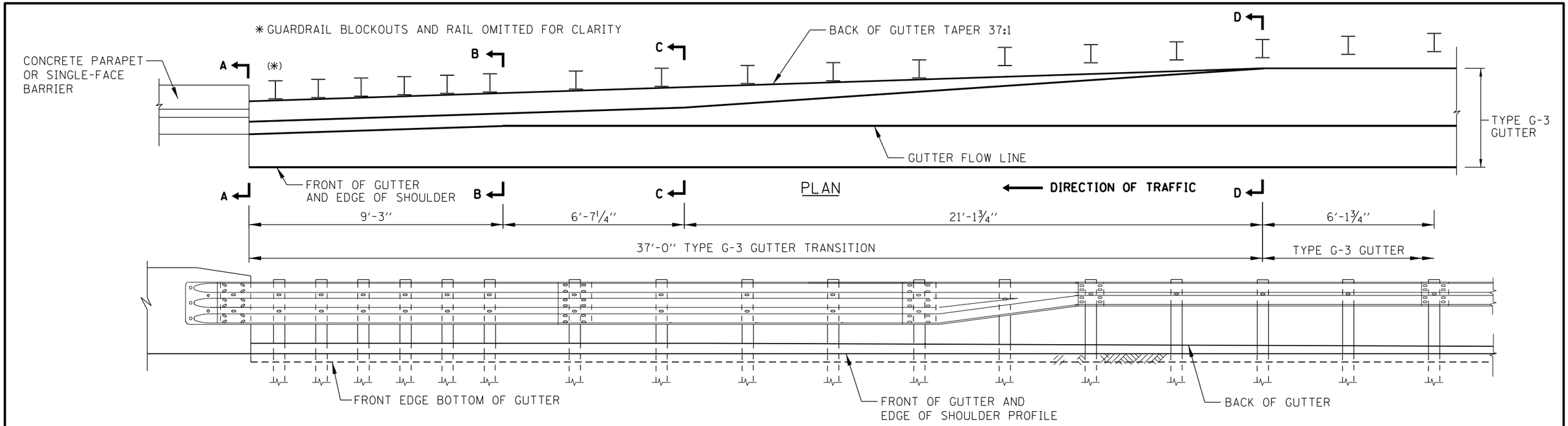
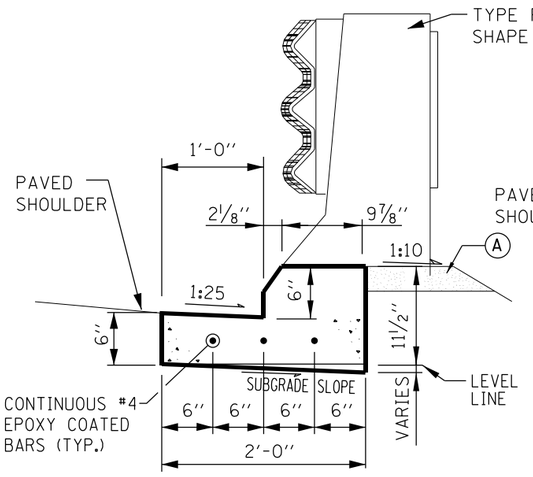
TYPE G-2 AND G-3 GUTTER TRANSITIONS

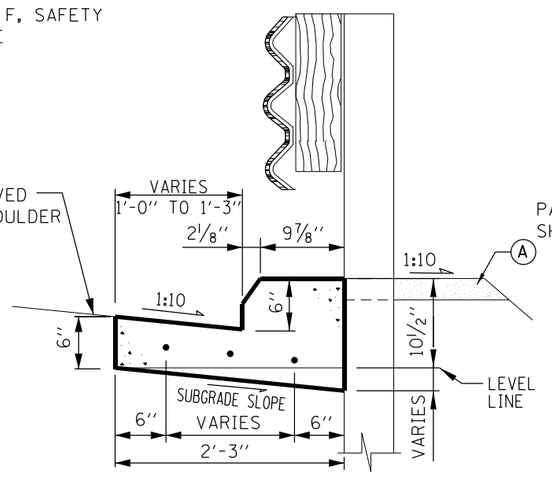
STANDARD B2-04





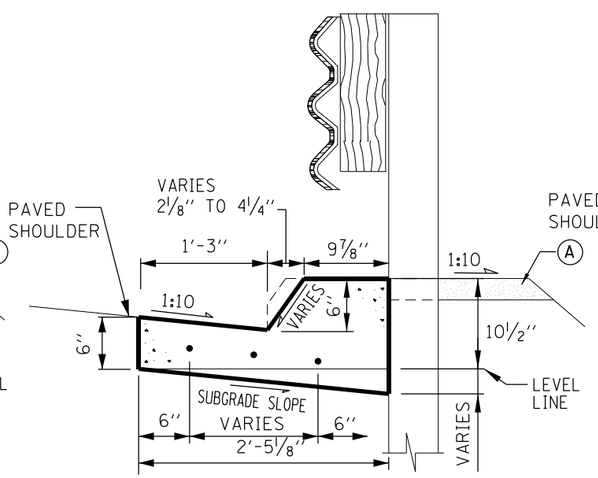
G-3 SECTION A-A

AT CONCRETE PARAPET (SEE NOTE 8)



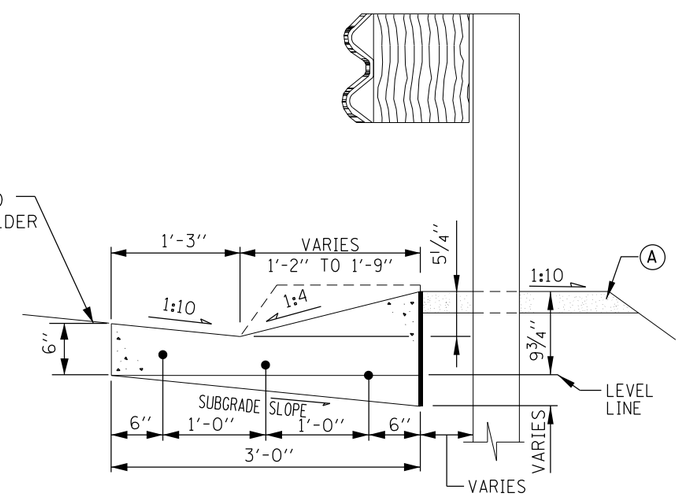
G-3 SECTION B-B

9'-3" FROM PARAPET



G-3 SECTION C-C

15'-10¼" FROM PARAPET



G-3 SECTION D-D

37'-0" FROM PARAPET

LEGEND

(A) AGGREGATE SHOULDERS SPECIAL, TYPE C

GUTTER TRANSITION NOTES:

1. SLOPE TO MATCH ADJACENT SHOULDER SLOPE (TYPICALLY 4%).
2. THE TYPE G-3 GUTTER TRANSITION SHALL BE PAID FOR PER FOOT FOR CONCRETE GUTTER TYPE G-3.
3. PROVIDE 1" EXPANSION JOINT WITH PREFORMED JOINT FILLER BETWEEN TRANSITION SECTION AND WINGWALL OR BARRIER WALL.
4. INSTALLATION ON CURVED WINGWALLS SIMILAR.
5. FOR DETAILS OF ANCHOR INSTALLATION TYPE T6 SEE TOLLWAY STANDARD C9 (TRAFFIC BARRIER TERMINAL, TYPE T6).
6. GUTTER TRANSITIONS SHALL BE CONSTRUCTED TO FIT THE STANDARD LOCATION OF THE ANCHOR INSTALLATION TYPE T6.
7. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
8. GUTTER SECTION SHOWN AT BARRIER WALL TO MATCH VERTICAL PROFILE OF TYPE F SAFETY SHAPE. MODIFY GUTTER FACE TO MATCH OTHER PARAPET PROFILES.
9. CONTINUOUS #4 BARS SHALL BE LAPPED A MINIMUM OF 2'-0" IN ACCORDANCE WITH THE LATEST IDOT BRIDGE MANUAL.

Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

TYPE G-3 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T6

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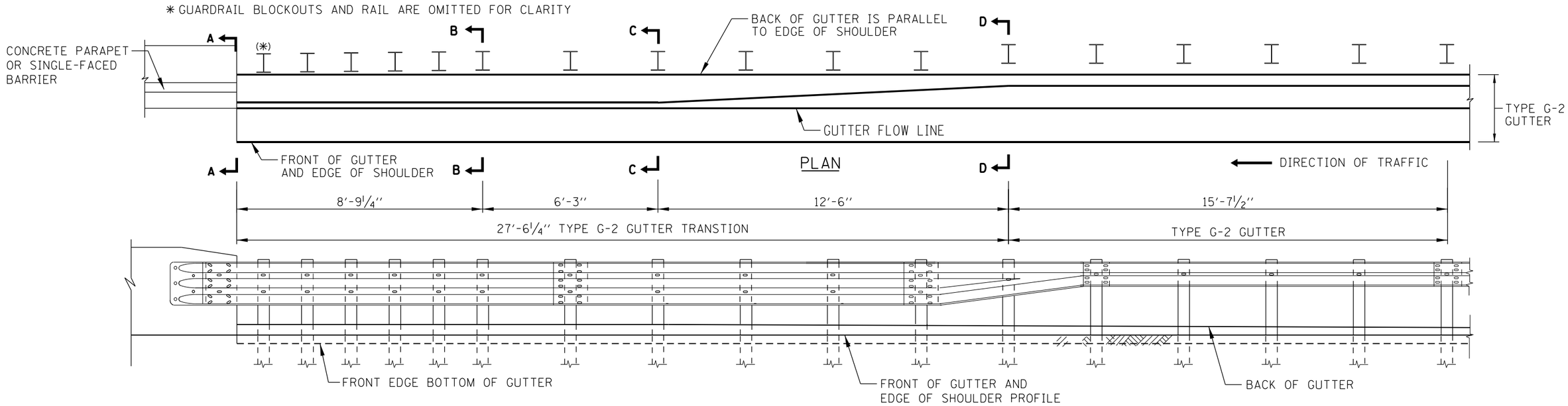
Open Roads for a Faster Future

DATE	REVISIONS
6-1-2009	MODIFIED BARRIER TERMINAL DETAILS
	REVISED NOTES
3-1-2010	REVISED G-2/G-3 GUTTER TRANSITION
	DETAILS, REVISED NOTES
1-1-2011	REVISED NOTE 8
2-7-2012	REVISED GUTTER

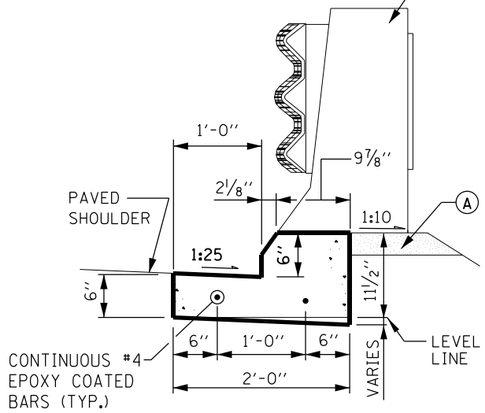
TYPE G-2/G-3 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T6

STANDARD B3-04



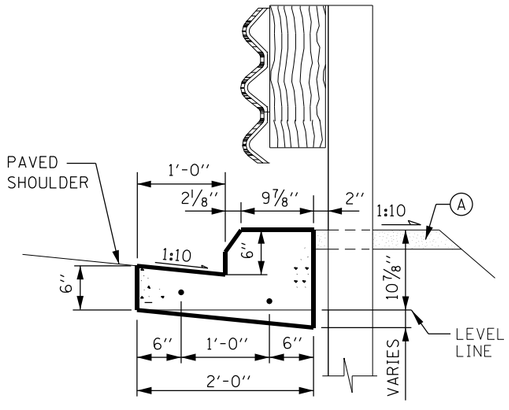
PLAN

ELEVATION

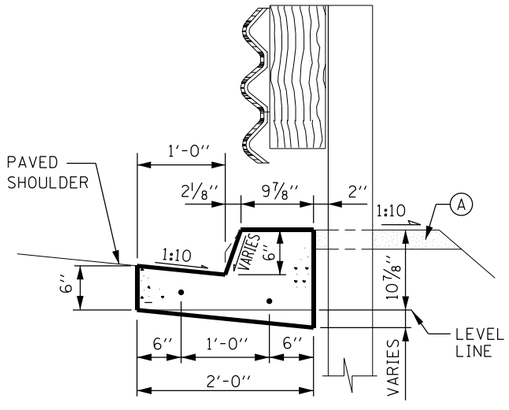


G-2 SECTION A-A
AT CONCRETE PARAPET

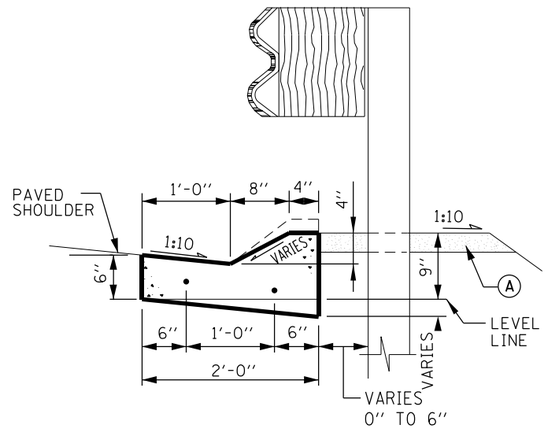
(SEE NOTE 8)



G-2 SECTION B-B
8′-9¼″ FROM PARAPET



G-2 SECTION C-C
15′-0¼″ FROM PARAPET



G-2 SECTION D-D
27′-6¼″ FROM PARAPET

NOTES:

1. SEE SHEET 1 OF THIS SERIES FOR GUTTER TRANSITION NOTES.
2. THE TYPE G-2 GUTTER TRANSITION SHALL BE PAID PER FOOT FOR CONCRETE GUTTER TYPE G-2.

LEGEND

Ⓐ AGGREGATE SHOULDERS SPECIAL, TYPE C

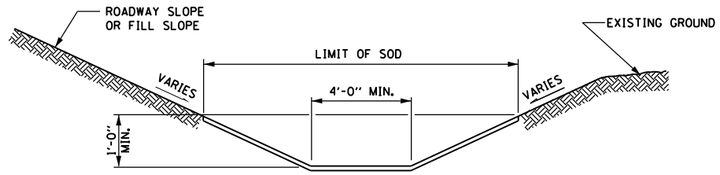
TYPE G-2 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T6

Paul Kovacs
APPROVED ..... CHIEF ENGINEER
DATE 2-7-2012

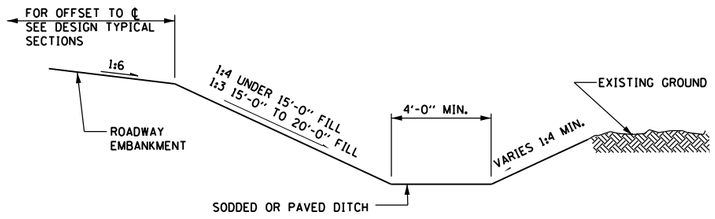
Illinois Tollway
Open Roads for a Faster Future

TYPE G-2/G-3 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T6

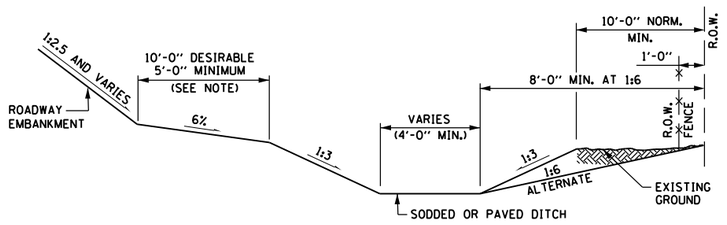
STANDARD B3-04



SODDED DITCH



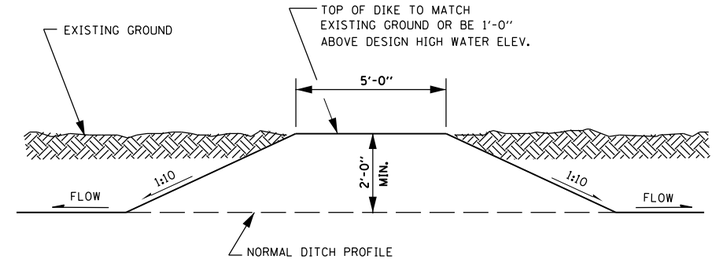
EMBANKMENT UNDER 20 FEET IN HEIGHT
TOE OF EMBANKMENT DITCHES



EMBANKMENT
OVER 20 FEET IN HEIGHT

NOTES FOR EMBANKMENT DITCHES:

1. WIDTH AND SLOPE MAY VARY DEPENDING ON SOIL CONDITION OR R.O.W. REQUIREMENTS.
2. THESE SECTIONS APPLY TO A DESIRABLE SECTION FOR NEW CONSTRUCTION. HOWEVER, THE WIDTH AND SLOPES MAY VARY DEPENDING ON SOIL CONDITIONS OR R.O.W. CONSTRAINTS.
3. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).



SIDE DITCH DIKE

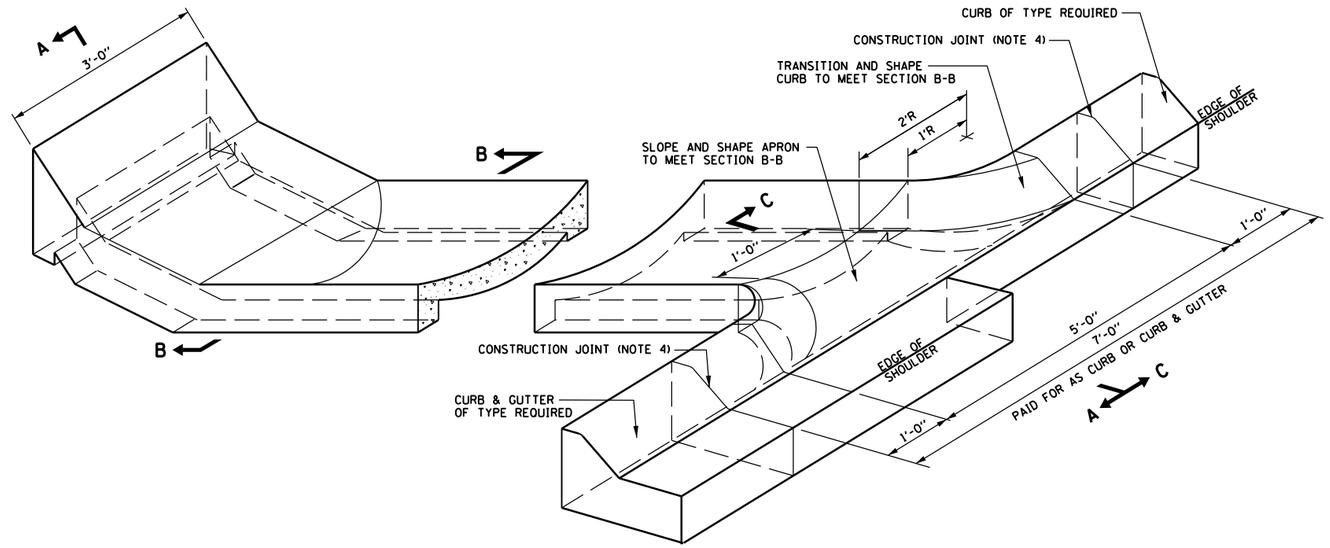
Paul Kovacs
APPROVED
CHIEF ENGINEER
DATE 6-1-2009

Illinois Tollway
Open Roads for a Faster Future

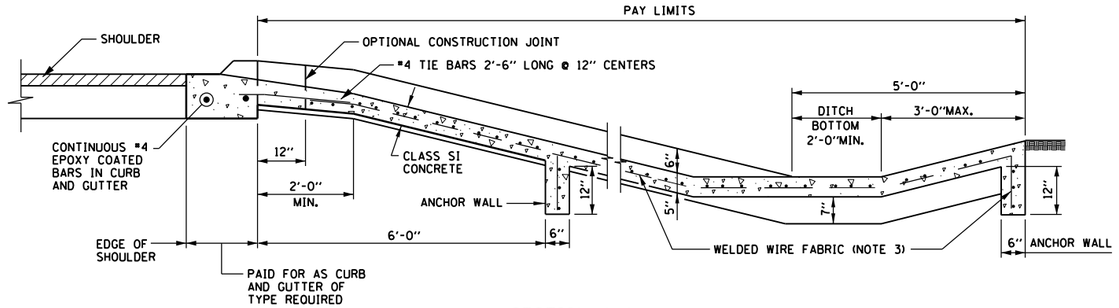
DATE	REVISIONS
6-1-2009	REVISED NOTES

DITCHES AND DITCH DIKE

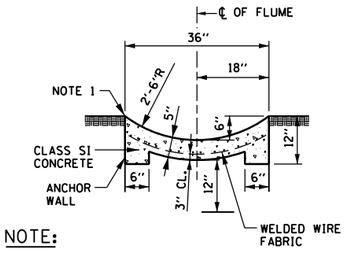
STANDARD B4-01



HALF PLAN



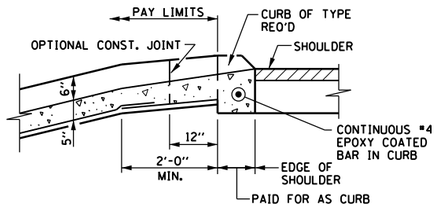
SECTION A-A
ADJACENT TO CURB & GUTTER



NOTE:

0.62 C.Y. CONCRETE / L.F.

SECTION B-B



SECTION C-C
ADJACENT TO CURB

CONCRETE FLUME

NOTES:

1. CONCRETE FLUMES SHALL BE CONSTRUCTED FLUSH WITH THE ADJACENT EXISTING OR PROPOSED SURFACES.
2. CLASS SI CONCRETE SHALL BE USED THROUGHOUT.
3. WELDED WIRE FABRIC SHALL BE EPOXY COATED 6x6 W4xW4, 58 LBS. PER 100 SQ. FT.
4. #4 EPOXY COATED TIE BARS 2'-6" LONG AT 12" O/C SHALL BE PROVIDED AT ALL CONSTRUCTION JOINTS.
5. EPOXY COATED EXPANDED METAL FABRIC OF EQUIVALENT STRENGTH MAY BE USED IN LIEU OF WELDED WIRE FABRIC SUBJECT TO ENGINEER'S APPROVAL.
6. THE LOCATION OF THE ANCHOR WALL MAY BE ADJUSTED AS DIRECTED BY THE ENGINEER.
7. THE MATERIALS AND CONSTRUCTION OF THE CONCRETE FLUME SHALL CONFORM TO THE APPLICABLE PORTIONS OF THE STANDARD SPECIFICATIONS.
8. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT.

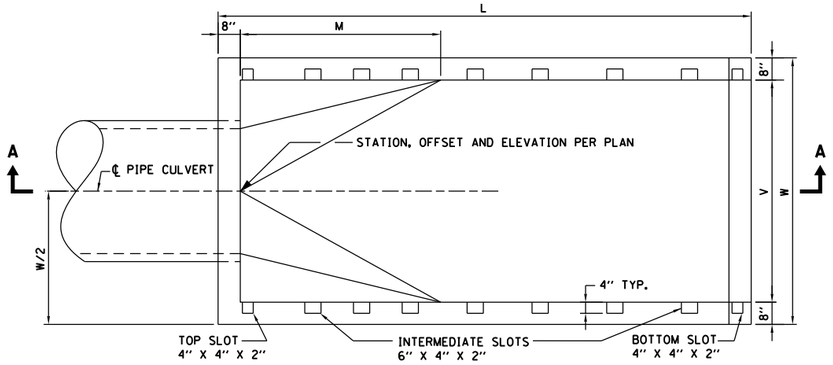
Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
2-7-2012	REVISED NOTES

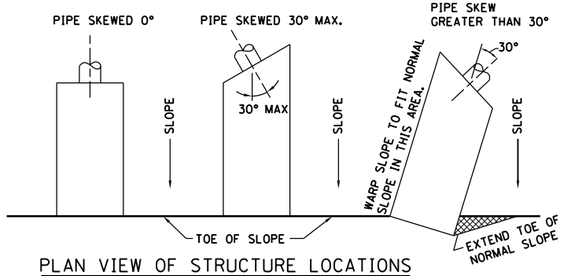
Paul Kovacs
APPROVED . . . . . DATE 2-7-2012
CHIEF ENGINEER

CONCRETE FLUME DETAILS

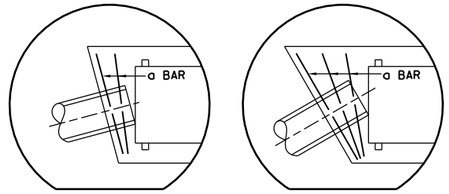
STANDARD B5-01



PLAN



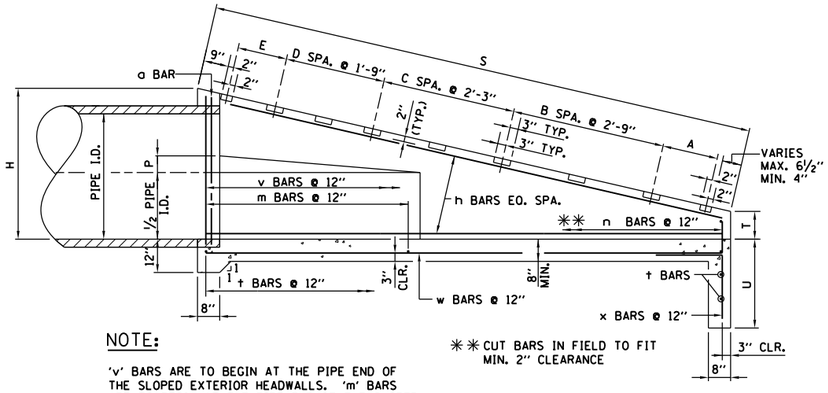
PLAN VIEW OF STRUCTURE LOCATIONS



NOTES:

ADDITIONAL 'A' BARS SHALL BE FURNISHED AND PLACED BY THE CONTRACTOR. THE ADDITIONAL BARS ARE NOT INCLUDED IN THE LISTED QUANTITIES BUT WILL BE PAID FOR AS REINFORCING STEEL. (EPOXY COATED)

1 ADDITIONAL BAR REQUIRED FOR EACH 15° SKEW OR FRACTION THEREOF.

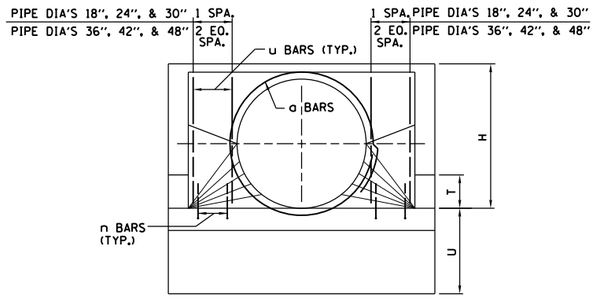


NOTE:

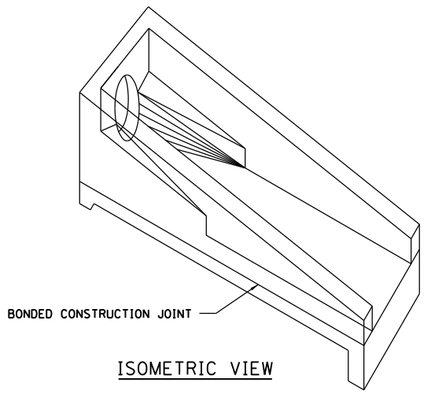
'v' BARS ARE TO BEGIN AT THE PIPE END OF THE SLOPED EXTERIOR HEADWALLS. 'm' BARS ARE TO BEGIN AT THE PIPE END OF THE SLOPED INTERIOR HEADWALLS.

** CUT BARS IN FIELD TO FIT MIN. 2" CLEARANCE

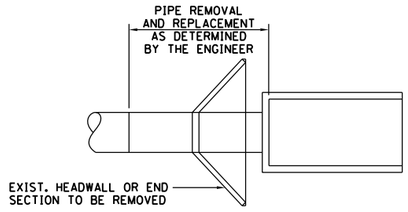
SECTION A-A



FRONT ELEVATION



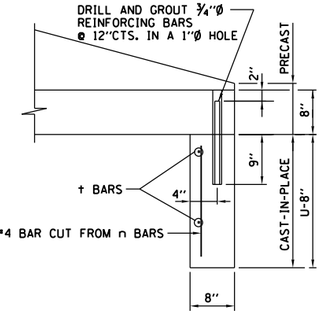
ISOMETRIC VIEW



INSTALLATION DETAIL

NOTES:

1. SLOPED HEADWALL TYPE III SHALL BE CONSTRUCTED FLUSH WITH EXISTING OR PROPOSED SLOPE.
2. CLASS SI CONCRETE SHALL BE USED THROUGHOUT.
3. ALL REINFORCEMENT BARS SHOWN SHALL BE EPOXY COATED.
4. BAR BENDING DETAILS ARE DIMENSIONED OUT TO OUT OF BARS.
5. ALL EXPOSED EDGES SHALL HAVE A ¾" - 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW THE FINISHED GROUND LINE.
6. COVER FROM THE FACE OF CONCRETE TO FACE OF REINFORCEMENT BAR SHALL BE 3" FOR SURFACES FORMED AGAINST EARTH AND 2" FOR ALL OTHER SURFACES UNLESS OTHERWISE SHOWN.
7. CARE SHALL BE EXERCISED IN REMOVING ANY LENGTH OF EXISTING PIPE SO THE REMAINING PIPE IS UNDAMAGED AND FULLY FUNCTIONING.
8. FOR DIMENSIONS AND QUANTITIES FOR ONE HEADWALL SEE SHEET 2 (OF 3) IN THIS SERIES.
9. FOR STEEL GRATING DETAILS SEE SHEET 3 (OF 3) IN THIS SERIES.
10. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT.



PRECAST CONNECTION DETAIL

SHEET 1 OF 3

Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
1-1-2011	REVISED NOTES
2-7-2012	DELETED TWIN PIPE DETAILS, DELETED PIPE DIA. 18", 24", 30" FOR 1:4 AND 1:6 SLOPES, DELETED SIDE PIPE DESIGN

HEADWALL TYPE III
18"-24"-30"-36"-42"-48"
FOR 1:4, 1:6, AND 1:10 SLOPES

STANDARD B6-03

Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

DIMENSIONS AND QUANTITIES IN ONE HEADWALL TYPE III 1:4 SLOPE

PIPE DIA	DIMENSIONS											NO. OF SPACES			CONCRETE CLASS SI CU. YD.	REINF. STEEL LBS.
	H	L	M	P	S	T	U	V	W	A	E	B	C	D		
36"	3'-10"	14'-8"	4'-3"	4"	15'-1½"	2"	2'-8"	6'-0"	7'-4"	2'-2"	2'-0"	-	3	1	5.9	360
42"	4'-5"	17'-0"	4'-8"	6"	17'-6¼"	2"	3'-2"	6'-6"	7'-10"	2'-6"	2'-6"	4	-	-	7.6	450
48"	5'-0"	19'-4"	5'-0"	6"	19'-11"	2"	3'-2"	7'-0"	8'-4"	2'-6"	2'-6"	-	6	-	9.3	450

DIMENSIONS AND QUANTITIES IN ONE HEADWALL TYPE III 1:6 SLOPE

PIPE DIA	DIMENSIONS											NO. OF SPACES			CONCRETE CLASS SI CU. YD.	REINF. STEEL LBS.
	H	L	M	P	S	T	U	V	W	A	E	B	C	D		
36"	3'-10"	22'-0"	4'-3"	4"	22'-3½"	2"	2'-8"	6'-0"	7'-4"	2'-8"	2'-4"	-	7	-	7.9	510
42"	4'-5"	25'-6"	4'-8"	6"	25'-10"	2"	3'-2"	6'-6"	7'-10"	2'-8"	2'-2"	5	-	4	10.2	640
48"	5'-0"	29'-0"	5'-0"	6"	29'-4¾"	2"	3'-2"	7'-0"	8'-4"	2'-8"	2'-2"	7	1	-	12.6	760

DIMENSIONS AND QUANTITIES IN ONE HEADWALL TYPE III 1:10 SLOPE

PIPE DIA	DIMENSIONS											NO. OF SPACES			CONCRETE CLASS SI CU. YD.	REINF. STEEL LBS.
	H	L	M	P	S	T	U	V	W	A	E	B	C	D		
18"	2'-3"	20'-10"	2'-3"	2"	20'-11"	2"	2'-8"	3'-0"	4'-4"	2'-2"	2'-0"	-	6	1	4.0	310
24"	2'-9"	25'-10"	3'-0"	3"	25'-11½"	2"	2'-8"	4'-0"	5'-4"	2'-4"	2'-4"	-	8	1	6.1	440
30"	3'-4"	31'-8"	3'-6"	4"	31'-10"	2"	2'-8"	5'-0"	6'-4"	2'-2"	1'-8"	-	11	1	8.9	640
36"	3'-10"	36'-8"	4'-3"	4"	36'-10¼"	2"	2'-8"	6'-0"	7'-4"	2'-2"	2'-2"	-	13	1	12.1	810
42"	4'-5"	42'-6"	4'-8"	6"	42'-8½"	2"	3'-2"	6'-6"	7'-10"	2'-2"	1'-8"	-	12	6	15.4	1010
48"	5'-0"	48'-4"	5'-0"	6"	48'-7"	2"	3'-2"	7'-0"	8'-4"	2'-4"	2'-4"	-	15	4	19.0	1220

REINFORCING BAR SCHEDULE FOR ONE HEADWALL

TYPE III 1:4 SLOPE

PIPE DIA	NO. 4 REINFORCING BARS					
	MARK	TYPE	NO. REQ'D.	LENGTH	a	b
36"	a36	1	1	13'-10"	4'-1"	-
	n36	2	36	2'-3"	1'-6"	9"
	h36	STR.	8	14'-6"	-	-
	x36	2	8	3'-0"	2'-0"	1'-0"
	t36	STR.	17	7'-0"	-	-
	u36	STR.	6	3'-8"	-	-
	v36	3	10	4'-9"	1'-3"	3'-6"
	w36	STR.	8	14'-2"	-	-
42"	a42	1	1	15'-11"	4'-9"	
	n42	2	40	2'-3"	1'-6"	9"
	h42	STR.	10	17'-0"	-	-
	x42	2	8	3'-6"	2'-6"	1'-0"
	t42	STR.	19	7'-6"	-	-
	u42	STR.	6	4'-2"	-	-
	v42	3	12	5'-4"	1'-3"	4'-1"
	w42	STR.	8	16'-6"	-	-
48"		1	1	17'-9"	5'-4"	
	d48	2	46	2'-3"	1'-6"	9"
		STR.	10	19'-4"	-	-
	n48	2	9	3'-6"	2'-6"	1'-0"
	t48	STR.	22	8'-0"	-	-
	u48	STR.	6	4'-9"	-	-
	v48	3	14	5'-10"	1'-3"	4'-7"
	w48	STR.	9	18'-10"	-	-

REINFORCING BAR SCHEDULE FOR ONE HEADWALL

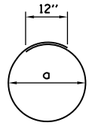
TYPE III 1:6 SLOPE

PIPE DIA	NO. 4 REINFORCING BARS					
	MARK	TYPE	NO. REQ'D.	LENGTH	a	b
36"	a36	1	1	13'-10"	4'-1"	-
	n36	2	50	2'-3"	1'-6"	9"
	h36	STR.	8	21'-8"	-	-
	x36	2	8	3'-0"	2'-0"	1'-0"
	t36	STR.	24	7'-0"	-	-
	u36	STR.	6	3'-8"	-	-
	v36	3	14	4'-9"	1'-3"	3'-6"
	w36	STR.	8	21'-6"	-	-
42"	a42	1	1	15'-11"	4'-9"	-
	n42	2	58	2'-3"	1'-6"	9"
	h42	STR.	10	25'-4"	-	-
	x42	2	8	3'-6"	2'-6"	1'-0"
	t42	STR.	28	7'-6"	-	-
	u42	STR.	6	4'-2"	-	-
	v42	3	17	5'-4"	1'-3"	4'-1"
	w42	STR.	8	25'-0"	-	-
48"	a48	1	1	17'-9"	5'-4"	-
	n48	2	66	2'-3"	1'-6"	9"
	h48	STR.	10	28'-8"	-	-
	x48	2	9	3'-6"	2'-6"	1'-0"
	t48	STR.	31	8'-0"	-	-
	u48	STR.	6	4'-9"	-	-
	v48	3	20	5'-10"	1'-3"	4'-7"
	w48	STR.	9	28'-6"	-	-

REINFORCING BAR SCHEDULE FOR ONE HEADWALL

TYPE III 1:10 SLOPE

PIPE DIA	NO. 4 REINFORCING BARS					
	MARK	TYPE	NO. REQ'D.	LENGTH	a	b
18"	a18	1	1	8'-7"	2'-5"	-
	n18	2	46	2'-6"	1'-9"	9"
	h18	STR.	6	20'-4"	-	-
	x18	2	5	3'-0"	2'-0"	1'-0"
	t18	STR.	23	4'-0"	-	-
	u18	STR.	4	2'-0"	-	-
	w18	STR.	5	20'-4"	-	-
24"	a24	1	1	10'-5"	3'-0"	-
	n24	2	56	2'-3"	1'-6"	9"
	h24	STR.	6	25'-4"	-	-
	x24	2	6	3'-0"	2'-0"	1'-0"
	t24	STR.	28	5'-0"	-	-
	u24	STR.	4	2'-6"	-	-
	v24	3	13	3'-9"	1'-3"	2'-6"
	w24	STR.	6	25'-4"	-	-
30"	a30	1	1	12'-3"	3'-7"	-
	n30	2	68	2'-3"	1'-6"	9"
	h30	STR.	8	31'-2"	-	-
	x30	2	7	3'-0"	2'-0"	1'-0"
	t30	STR.	34	6'-0"	-	-
	u30	STR.	4	3'-0"	-	-
	v30	3	18	4'-3"	1'-3"	3'-0"
	w30	STR.	7	31'-2"	-	-
36"	a36	1	1	13'-10"	4'-1"	-
	n36	2	80	2'-3"	1'-6"	9"
	h36	STR.	8	36'-2"	-	-
	x36	2	8	3'-0"	2'-0"	1'-0"
	t36	STR.	39	7'-0"	-	-
	u36	STR.	6	3'-8"	-	-
	v36	3	23	4'-9"	1'-3"	3'-6"
	w36	STR.	8	36'-2"	-	-
42"	a42	1	1	15'-11"	4'-9"	-
	n42	2	92	2'-3"	1'-6"	9"
	h42	STR.	10	42'-0"	-	-
	x42	2	8	3'-6"	2'-6"	1'-0"
	t42	STR.	45	7'-6"	-	-
	u42	STR.	6	4'-2"	-	-
	v42	3	27	5'-4"	1'-3"	4'-1"
	w42	STR.	8	42'-0"	-	-
48"	a48	1	1	17'-9"	5'-4"	-
	n48	2	104	2'-3"	1'-6"	9"
	h48	STR.	10	48'-0"	-	-
	x48	2	9	3'-6"	2'-6"	1'-0"
	t48	STR.	52	8'-0"	-	-
	u48	STR.	6	4'-9"	-	-
	v48	3	32	5'-10"	1'-3"	4'-7"
	w48	STR.	9	47'-10"	-	-



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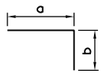

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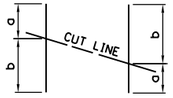


TYPE 3

NOTES:

1. THE 'v' BARS, TYPE 3, SHALL BE ORDERED FULL LENGTH AND CUT IN THE FIELD. THE REMAINING PORTION OF THE 'v' BARS SHALL BE USED IN THE OTHER WALL.
2. THE LONG LEG OF THE 'd' AND 'n' BARS SHALL BE VERTICAL.
3. QUANTITIES ON THIS DRAWING ARE BASED ON THE CAST-IN-PLACE DESIGN.
4. "STR." = STRAIGHT BAR.
5. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).

Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

HEADWALL TYPE III
18"-24"-30"-42"-48"
FOR 1:4, 1:6, AND 1:10 SLOPES

STANDARD B6-03

GRATE DIMENSIONS AND QUANTITIES IN ONE HEADWALL TYPE III END ENTRANCE 1:4 SLOPE

INSIDE PIPE DIAMETER	GRATES		BARS FOR ONE GRATE				HEADWALL GRATES (LBS.)	
	NUMBER REQUIRED	TYPE REQ'D.	BAR NO. 1		BAR NO. 2			
			BARS REQ'D.	LENGTH	BARS REQ'D.	LENGTH	EACH GRATE	TOTAL
36"	6	B	2	6'-7"	11	1'-10½"	103	608
	-	-	-	-	-	-	-	
42"	6	A	2	7'-1"	12	2'-4½"	121	705
	-	-	-	-	-	-	-	
48"	2	A	2	7'-7"	13	2'-4½"	119	941
	6	B	2	7'-7"	13	1'-10½"	108	

GRATE DIMENSIONS AND QUANTITIES IN ONE HEADWALL TYPE III END ENTRANCE 1:6 SLOPE

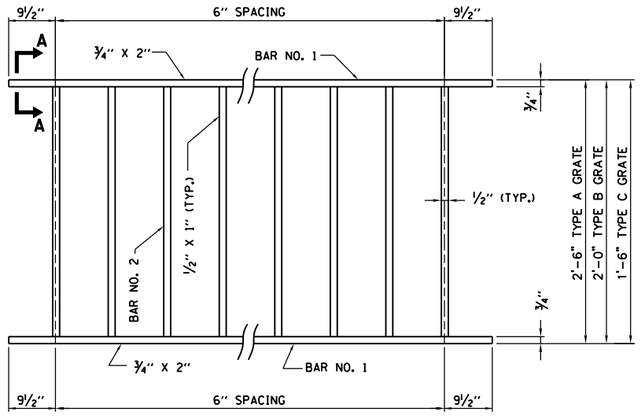
INSIDE PIPE DIAMETER	GRATES		BARS FOR ONE GRATE				HEADWALL GRATES (LBS.)	
	NUMBER REQUIRED	TYPE REQ'D.	BAR NO. 1		BAR NO. 2			
			BARS REQ'D.	LENGTH	BARS REQ'D.	LENGTH	EACH GRATE	TOTAL
36"	2	A	2	6'-7"	11	2'-4½"	112	860
	7	B	2	6'-7"	11	1'-10½"	103	
42"	6	A	2	7'-1"	12	2'-4½"	121	1126
	5	B	2	7'-1"	12	1'-10½"	100	
48"	8	A	2	7'-7"	13	2'-4½"	130	1278
	2	B	2	7'-7"	13	1'-10½"	119	

GRATE DIMENSIONS AND QUANTITIES IN ONE HEADWALL TYPE III END ENTRANCE 1:10 SLOPE

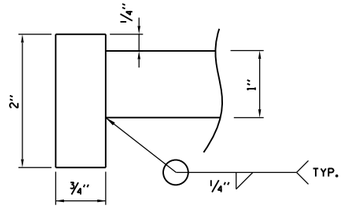
INSIDE PIPE DIAMETER	GRATES		BARS FOR ONE GRATE				HEADWALL GRATES (LBS.)	
	NUMBER REQUIRED	TYPE REQ'D.	BAR NO. 1		BAR NO. 2			
			BARS REQ'D.	LENGTH	BARS REQ'D.	LENGTH	EACH GRATE	TOTAL
18"	8	B	2	3'-7"	5	1'-10½"	53	414
	1	C	2	3'-7"	5	1'-4½"	48	
24"	9	B	2	4'-7"	7	1'-10½"	69	747
	2	A	2	4'-7"	7	2'-4½"	63	
30"	12	B	2	5'-7"	9	1'-10½"	86	1110
	2	C	2	5'-7"	9	1'-4½"	78	
36"	16	B	2	6'-7"	11	1'-10½"	103	1535
	-	-	-	-	-	-	-	
42"	13	B	2	7'-1"	12	1'-10½"	111	2043
	7	C	2	7'-1"	12	1'-4½"	100	
48"	19	B	2	7'-7"	13	1'-10½"	119	2443
	2	A	2	7'-7"	13	2'-4½"	108	

NOTES:

1. ALL STRUCTURAL STEEL SHALL BE AASHTO M270, GRADE 36.
2. GALVANIZING SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
3. FOR PLACEMENT OF GRATES, SEE SHEET 1 (OF 3) IN THIS SERIES.
4. ALL TABLE DIMENSIONS AND QUANTITIES ARE FOR SINGLE PIPE CULVERT HEADWALLS.
5. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).



TYPICAL GRATE



SECTION A-A

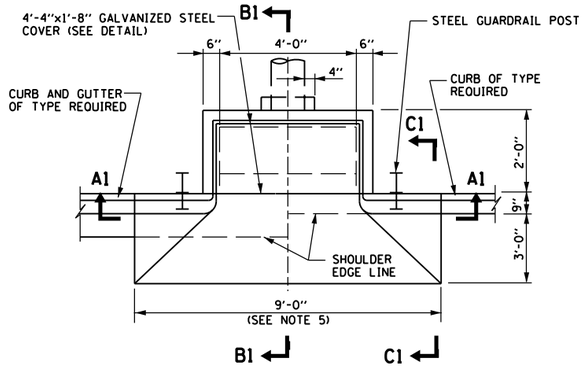
SHEET 3 OF 3

Paul Kovacs
APPROVED . . . . . DATE 2-7-2012
CHIEF ENGINEER

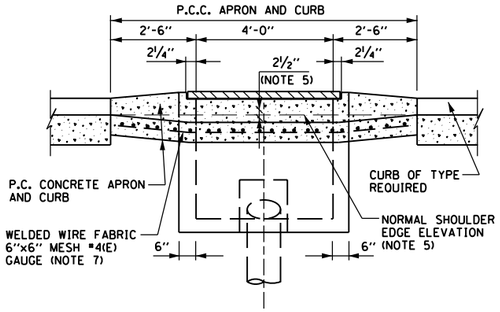
Illinois Tollway
Open Roads for a Faster Future

HEADWALL TYPE III
18"-24"-30"-36"-42"-48"
FOR 1:4, 1:6, AND 1:10 SLOPES

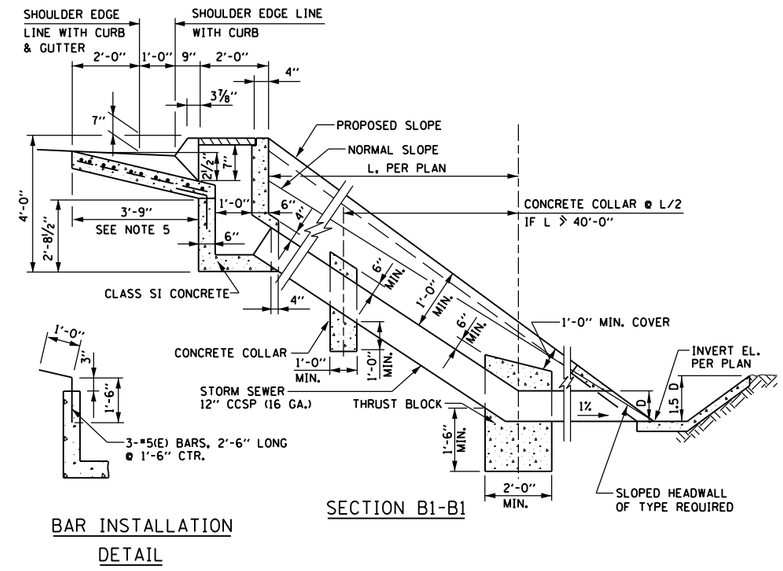
STANDARD B6-03



PLAN



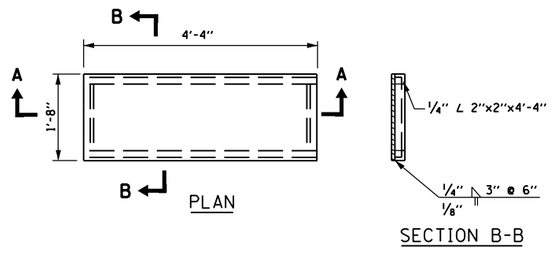
SECTION A1-A1

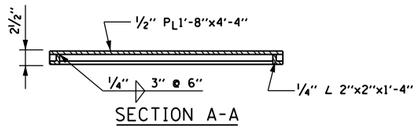


BAR INSTALLATION DETAIL

SECTION B1-B1

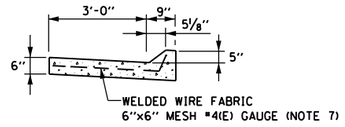
SLOPE DRAIN INLET



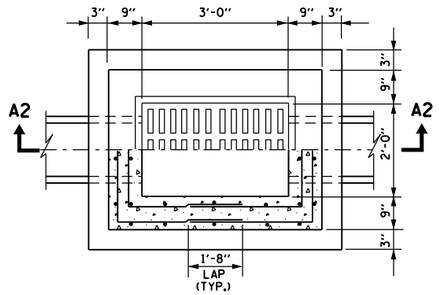


SECTION A-A

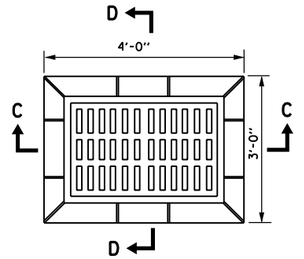
GALVANIZED STEEL COVER DETAIL



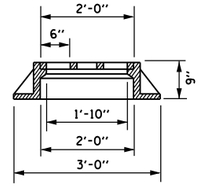
SECTION C1-C1



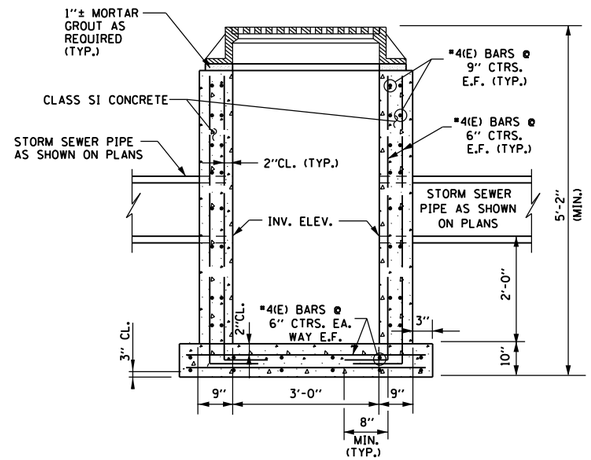
HALF PLAN



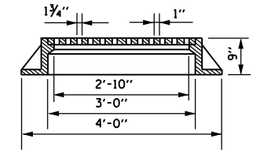
PLAN



SECTION D-D

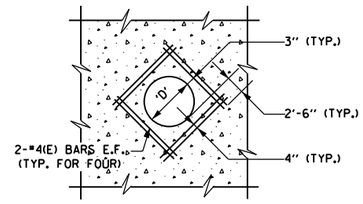


SECTION A2-A2



SECTION C-C

FRAME AND GRATE DETAIL



TYPICAL REINFORCEMENT AROUND STORM SEWER PIPE

CATCH BASIN TYPE B

NOTES FOR SLOPE DRAIN INLET:

1. THE LOCATION OF THE SLOPE DRAIN INLET SHALL BE AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THE INLET MUST BE LOCATED IN THE FIELD TO CLEAR THE POST SPACING OF EXISTING OR PROPOSED GUARDRAIL. WHERE CONDITIONS REQUIRE THAT THE SLOPE DRAIN INLET BE LOCATED ADJACENT TO A GUARDRAIL ANCHOR INSTALLATION, THE SLOPED DRAIN INLET MUST BE CONSTRUCTED OUTSIDE THE LIMIT OF THE ANCHOR INSTALLATION.
2. INLET CONSTRUCTION EXCLUSIVE OF P.C.C. APRON SHALL BE COMPLETED PRIOR TO SHOULDER OVERLAY. CONSTRUCTION OF P.C.C. APRON SHALL FOLLOW SHOULDER OVERLAY.
3. THE MATERIALS AND CONSTRUCTION OF THE INLET SHALL CONFORM TO THE APPLICABLE PORTIONS OF THE STANDARD SPECIFICATIONS AND THE SPECIAL PROVISIONS.
4. THE CONCRETE CURB WITHIN THE P.C.C. APRON WILL TRANSITION TO MATCH THE SHAPE OF ABUTTING CURBS.
5. INCREASE NORMAL SHOULDER SLOPE WITHIN LIMITS OF P.C.C. APRON AND SHAPE TO DRAIN INTO INLET OPENING. THE INLET OPENING SHALL BE 2½" BELOW THE NORMAL SHOULDER EDGE ELEVATION.
6. GALVANIZED STEEL COVER PLATE SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS. GALVANIZING SHALL BE IN ACCORDANCE WITH ASTM A123 (AASHTO M111).
7. EXPANDED METAL FABRIC OF EQUAL STRENGTH MAY BE USED IN LIEU OF WELDED WIRE FABRIC SUBJECT TO ENGINEER'S APPROVAL.
8. PRECAST CONCRETE UNITS FOR SLOPE DRAIN INLET WILL BE ACCEPTABLE PROVIDED THEY MEET ALL THE REQUIREMENTS SHOWN ON THIS DRAWING. FABRICATION DRAWINGS SHOWING PIPE OPENINGS, REINFORCEMENT AND OTHER PERTINENT DIMENSIONS WILL BE REQUIRED FOR EACH UNIT, FOR APPROVAL BY THE ENGINEER PRIOR TO FABRICATION.
9. REINFORCEMENT BARS AND WELDED WIRE FABRIC DESIGNATED (E) SHALL BE EPOXY COATED.

NOTES FOR CATCH BASIN TYPE B:

1. THE LOCATION OF THE CATCH BASIN SHALL BE AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
2. FOR MATERIALS AND CONSTRUCTION REQUIREMENTS OF THE CATCH BASIN, REFER TO THE STANDARD SPECIFICATIONS.
3. FRAME AND GRATE FOR CATCH BASIN TYPE B SHALL BE NEENAH FOUNDRY COMPANY TYPE R-3455C OR APPROVED EQUAL.
4. AT LOCATIONS WHERE EXISTING UNDERDRAINS AND/OR STORM SEWER PIPES ARE TO BE CONNECTED TO THE NEW CATCH BASIN, THE REMOVAL OF EXISTING PIPES, FURNISHING OF NEW PIPE SECTIONS OF THE SAME SIZE AND OTHER MATERIALS NECESSARY FOR THE CONNECTIONS SHALL BE INCIDENTAL TO THE COST OF CATCH BASIN TYPE B.
5. PRECAST CONCRETE UNITS FOR CATCH BASIN WILL BE ACCEPTABLE PROVIDED THEY MEET ALL THE REQUIREMENTS AS SHOWN ON THIS DRAWING. BASE EXTENSION OF 3" NOT REQUIRED FOR PRECAST UNITS. FABRICATION DRAWINGS SHOWING PIPE OPENINGS, REINFORCEMENT AND OTHER PERTINENT DIMENSIONS WILL BE REQUIRED FOR EACH UNIT, FOR APPROVAL BY THE ENGINEER PRIOR TO FABRICATION.
6. REINFORCEMENT BARS DESIGNATED (E) SHALL BE EPOXY COATED.

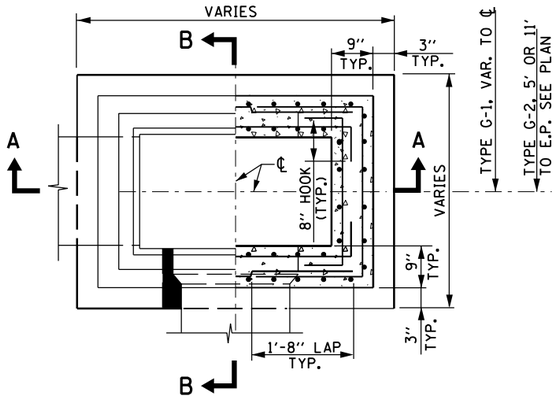
Paul Kovacs
APPROVED CHIEF ENGINEER DATE 2-7-2012

Illinois Tollway
Open Roads for a Faster Future

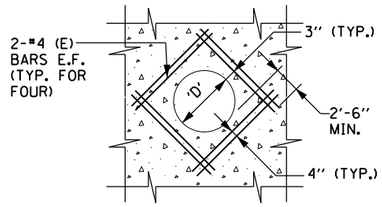
DATE	REVISIONS
2-7-2012	REVISED REINFORCEMENT BARS

CATCH BASIN TYPE B AND SLOPE DRAIN INLET

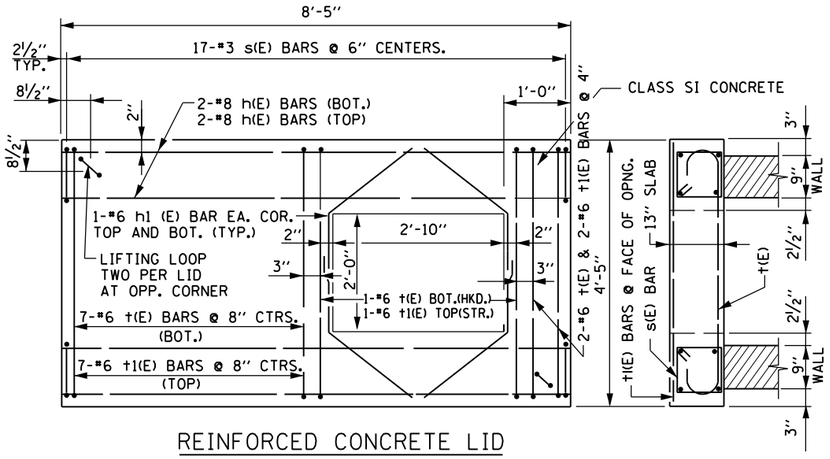
STANDARD B7-01



HALF PLAN

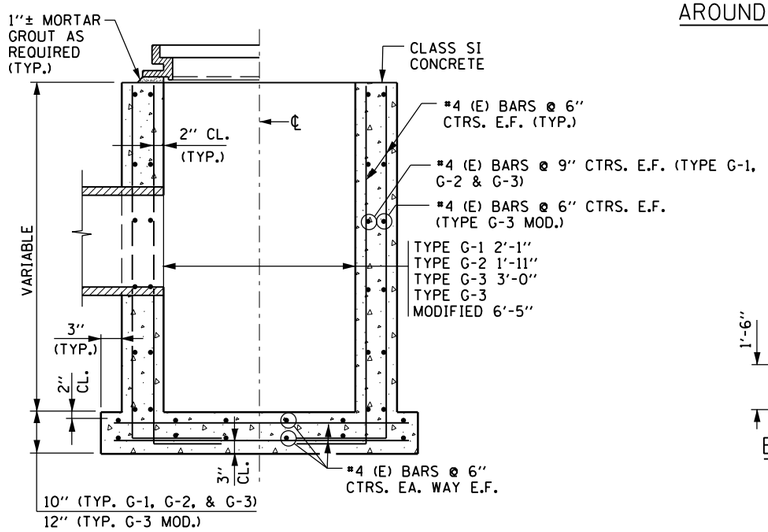


TYPICAL REINFORCEMENT AROUND STORM SEWER PIPE

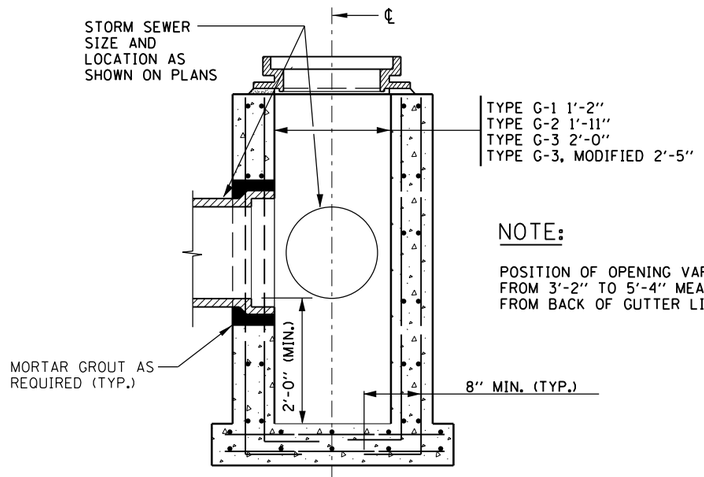


REINFORCED CONCRETE LID

DRAINAGE STRUCTURE TYPE G-3, MODIFIED



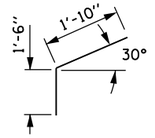
SECTION A-A



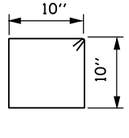
SECTION B-B

NOTE:

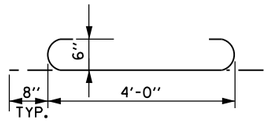
POSITION OF OPENING VARIES FROM 3'-2" TO 5'-4" MEASURED FROM BACK OF GUTTER LINE



BAR h1(E)

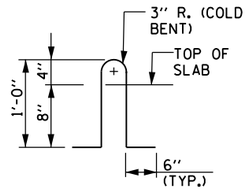


BAR s(E)



BAR t(E)

LIFTING LOOP TO BE ½"Ø x 270 KSI STRANDS TO BE BURNED AFTER PRECAST CONCRETE LID IS SET IN PLACE



LIFTING LOOP DETAIL

NOTES:

1. PRECAST CONCRETE UNITS WILL BE ACCEPTABLE PROVIDED THEY MEET ALL THE REQUIREMENTS AS SHOWN ON THIS DRAWING. BASE EXTENSION OF 3" NOT REQUIRED FOR PRECAST UNITS. FABRICATION DRAWINGS SHOWING PIPE OPENINGS, REINFORCEMENT AND OTHER PERTINENT DIMENSIONS WILL BE REQUIRED FOR EACH UNIT, FOR APPROVAL BY THE ENGINEER PRIOR TO FABRICATION.
2. CATCH BASINS TYPE G-SERIES SHALL BE USED IN THE SWALE ON THE HIGH SIDE OF SUPERELEVATED PAVEMENT.
3. CATCH BASINS TYPE G-2 SHALL BE USED ALONG RAMPS WHERE G-2 GUTTER IS PROVIDED.
4. CATCH BASINS TYPE G-3 SHALL BE USED WHERE G-3 GUTTER IS PROVIDED.
5. CATCH BASINS TYPE G-3 MODIFIED SHALL BE USED IN PAVEMENT SECTIONS AND ON THE LOW SIDE OF SUPERELEVATED PAVEMENT.
6. CATCH BASINS TYPE G-3 MODIFIED SHALL BE PROVIDED WITH A REINFORCED CONCRETE SLAB TOP AS DETAILED ON THIS DRAWING.
7. TYPE S FRAME AND GRATE SHALL BE NEENAH R-3338-F MODIFIED BY THE ADDITION OF THE FOURTH SIDE OF THE FRAME, OR APPROVED EQUAL.
8. TYPE G-2 FRAME AND GRATE SHALL BE NEENAH R-3508-A2 OR APPROVED EQUAL.
9. TYPE G-3 FRAME AND GRATE SHALL BE NEENAH INLET FOR ROLLTYPE CURB R-3501-U OR EAST JORDAN IRON WORKS 10004 OR APPROVED EQUAL.
10. TYPE G-3, MODIFIED FRAME AND GRATE SHALL BE NEENAH INLET FOR ROLL TYPE CURB SPECIAL R-3501-U1 OR APPROVED EQUAL.
11. TYPE G-2, MODIFIED FRAME AND GRATE FOR ROLL TYPE CURB R-3508-B2 OR APPROVED EQUAL.
12. MORTAR OR SEALER SHALL BE USED WHEN A PRECAST REINFORCED CONCRETE LID IS USED.
13. REINFORCEMENT BARS DESIGNATED (E) SHALL BE EPOXY COATED.

Paul Kovacs
APPROVED CHIEF ENGINEER
DATE 6-1-2009

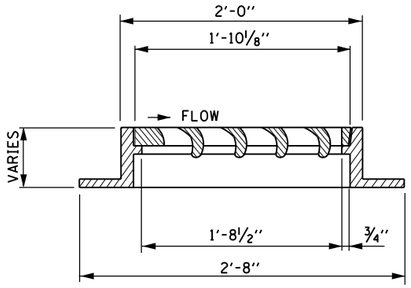
CATCH BASIN TYPE "G" SERIES

Illinois Tollway
Open Roads for a Faster Future

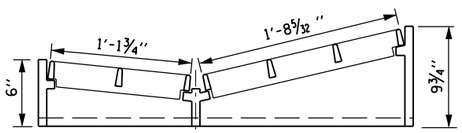
DATE	REVISIONS
6-1-2009	DELETE REINF. CONC. LID TYPE S FRAME & GRATE
2-7-2012	REVISED REINFORCEMENT BARS
11-01-2012	ADDED TYPE G-2, MODIFIED FRAME AND GRATE
	MODIFIED PIPE BELL DETAIL

CATCH BASINS TYPES G AND TYPE G MODIFIED, FRAMES AND GRATES TYPE G-2, G-3 & G-3 MODIFIED

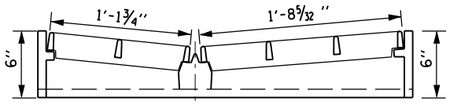
STANDARD B8-03



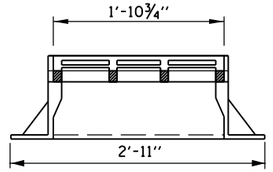
SECTION T-T



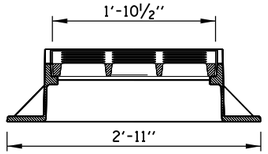
SECTION U-U



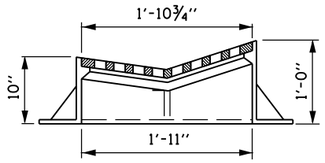
SECTION W-W



SECTION Y-Y



SECTION S-S



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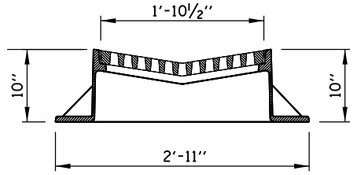
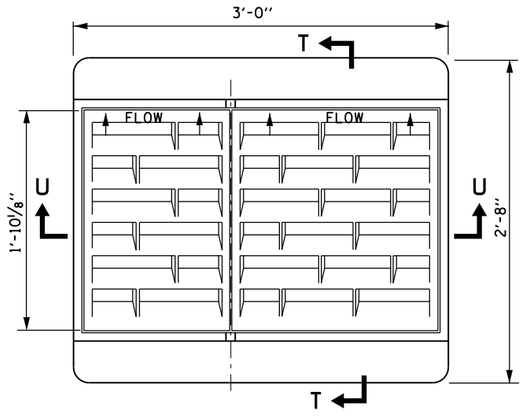
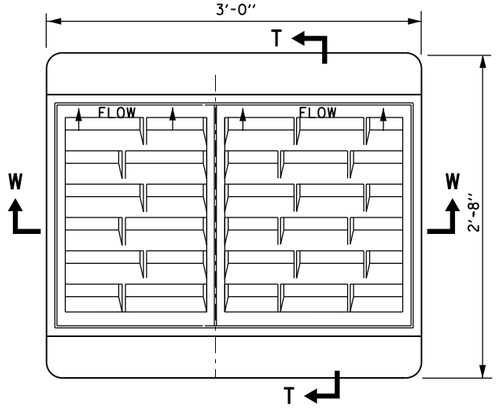


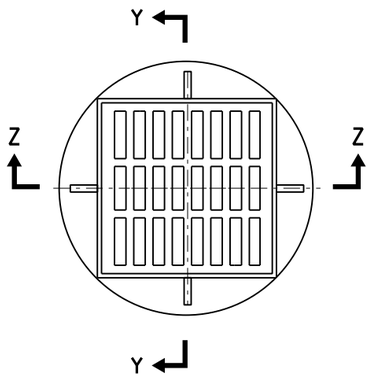
SECTION V-V



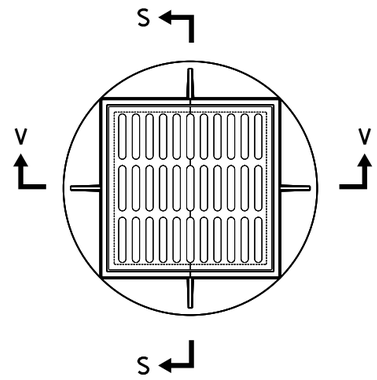
TYPE G-3 FRAME & GRATE



TYPE G-3, MODIFIED
FRAME & GRATE



TYPE G-2 FRAME & GRATE



TYPE G-2 MODIFIED
FRAME & GRATE

NOTE:

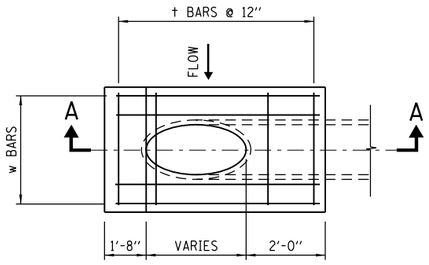
SEE SHEET 1 OF THIS SERIES FOR NOTES.

Paul Kovacs
APPROVED ..... DATE 6-1-2009
CHIEF ENGINEER

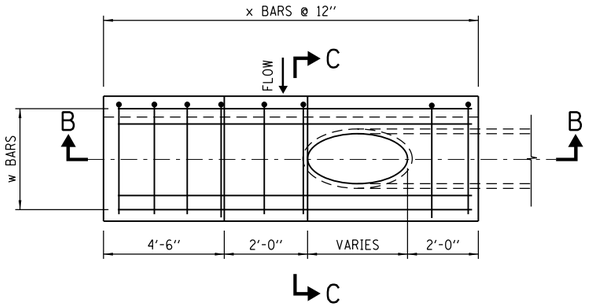
Illinois Tollway
Open Roads for a Faster Future

CATCH BASINS TYPES G AND TYPE G MODIFIED, FRAMES AND GRATES TYPE G-2, G-3 & G-3 MODIFIED

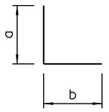
STANDARD B8-03



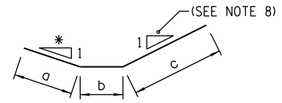
PLAN



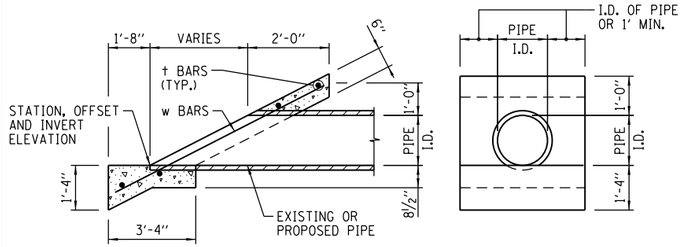
PLAN



x - BARS

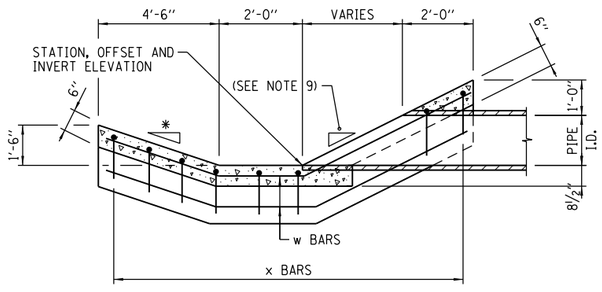


w - BARS



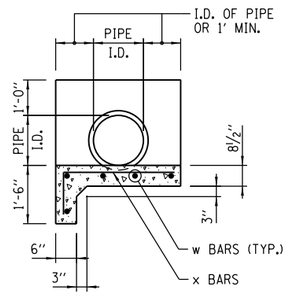
SECTION A-A

ELEVATION



SECTION B-B

* MATCH EXISTING OR PROPOSED SLOPE



SECTION C-C

NOTES:

1. SLOPED HEADWALL TYPES I AND II SHALL BE CONSTRUCTED FLUSH WITH EXISTING OR PROPOSED SLOPE.
2. CLASS SI CONCRETE SHALL BE USED THROUGHOUT.
3. ALL REINFORCEMENT BARS SHOWN SHALL BE EPOXY COATED.
4. BAR BENDING DETAILS ARE DIMENSIONED OUT TO OUT OF BARS.
5. ALL EXPOSED EDGES SHALL HAVE A ¾''-45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW THE FINISHED GROUND LINE.
6. COVER FROM THE FACE OF CONCRETE TO FACE OF REINFORCEMENT BARS SHALL BE 3'' FOR SURFACES FORMED AGAINST EARTH AND 2'' FOR ALL OTHER SURFACES UNLESS OTHERWISE SHOWN.
7. CARE SHALL BE EXERCISED IN REMOVING ANY LENGTH OF EXISTING PIPE SO THE REMAINING PIPE IS UNDAMAGED AND FULLY FUNCTIONING.
8. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT.
9. TYPES I AND II SLOPED HEADWALLS TO BE USED ONLY FOR SLOPES STEEPER THAN 1:3. DIMENSIONS AND QUANTITIES SHOWN ARE BASED ON A 1:2 SLOPE.
10. I.D. DENOTES INSIDE DIAMETER OF PIPE. O.D. DENOTES OUTSIDE DIAMETER OF PIPE.

TABLES FOR REINFORCEMENT AND QUANTITIES FOR ONE HEADWALL TYPE I

PIPE I.D.	REINFORCING BARS		
	MARK	NO. & SIZE	LENGTH
6''	†6	4-#4	2'-0''
	w6	4-#4	4'-9''
12''	†12	4-#4	2'-6''
	w12	4-#4	5'-10''
15''	†15	4-#4	3'-3''
	w15	4-#4	6'-5''
18''	†18	4-#4	4'-0''
	w18	4-#4	7'-0''

DESIGN NO.	INSIDE DIA. OF PIPE	CONC. 1 HDWL.	REINF. BARS. 1 HDWL.
F-6-2	6''	0.4 C.Y.	20 #
F-12-2	12''	0.5 C.Y.	25 #
F-15-2	15''	0.6 C.Y.	25 #
F-18-2	18''	0.7 C.Y.	25 #

SLOPED HEADWALL TYPE I

TABLES FOR REINFORCEMENT AND QUANTITIES FOR ONE HEADWALL TYPE II

PIPE I.D.	REINFORCING BARS					
	MARK	NO. & SIZE	LENGTH	a	b	c
12''	†12	8-#4	3'-6''	2'-6''	1'-0''	---
	w12	4-#4	10'-3''	4'-3''	2'-0''	4'-0''
15''	†15	8-#4	4'-3''	3'-3''	1'-0''	---
	w15	4-#4	10'-9''	4'-3''	2'-0''	4'-6''
18''	†18	8-#4	5'-0''	4'-0''	1'-0''	---
	w18	4-#4	11'-3''	4'-3''	2'-0''	5'-0''

DESIGN NO.	INSIDE DIA. OF PIPE	CONC. 1 HDWL.	REINF. BARS. 1 HDWL.
E-12-2	12''	1.1 C.Y.	45 #
E-15-2	15''	1.2 C.Y.	50 #
E-18-2	18''	1.3 C.Y.	55 #

SLOPED HEADWALL TYPE II

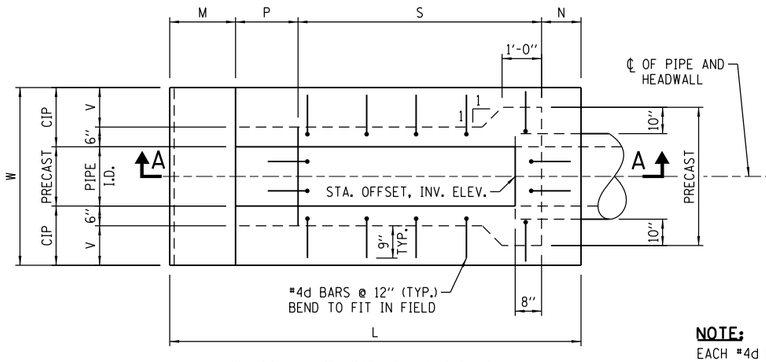
Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

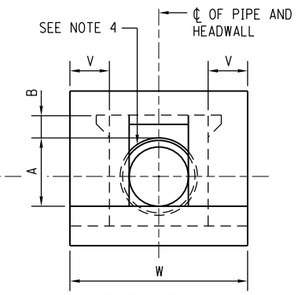
DATE	REVISIONS
2-7-2012	REVISED REINFORCEMENT BARS, TABLES

SLOPED HEADWALLS
TYPE I AND TYPE II

STANDARD B9-01

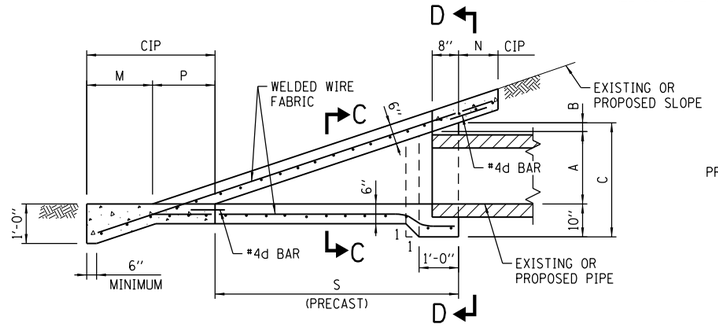


PLAN - SLOPED HEADWALL

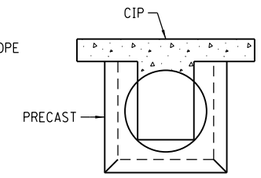


ELEVATION

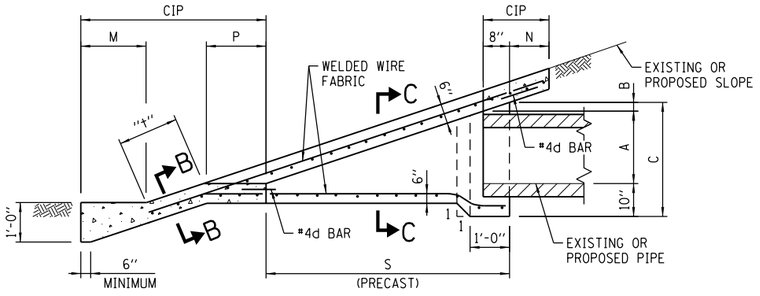
NOTE:
EACH #4d BAR SHALL BE PLACED SUCH THAT IT WILL PROJECT 9" INTO THE CAST IN PLACE (CIP) CONCRETE AND IT SHALL BE 3" BELOW THE TOP SURFACE. HOOKS IN THE PRECAST SECTION SHALL BE TIPPED TO CLEAR ALL CONCRETE SURFACES A MIN. OF 2".



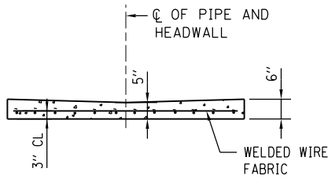
SECTION A-A
(FOR PIPE AT DITCH FLOW LINE)



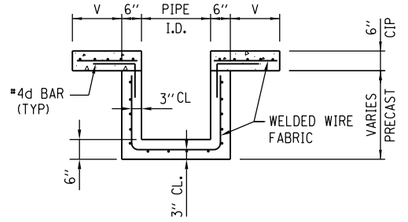
SECTION D-D



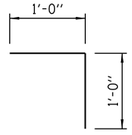
SECTION A-A
(FOR PIPE ABOVE DITCH FLOW LINE)



SECTION B-B



SECTION C-C



BAR #4d

DIMENSIONS AND QUANTITIES FOR ONE SLOPED HEADWALL TYPE III

	PIPE I.D.	DIMENSIONS										PRE CAST CONC. CU. YD.	CAST-IN-PLACE CU. YD.	WELDED WIRE FABRIC SQ. YD.	REINF. STEEL				
		A	B	C	N	M	P	S	L	V	W				MARK	SIZE	NO.	LENGTH	LBS.
1 TO 3 SLOPE	6"	9"	2¾"	1'-9¾"	1'-0"	1'-8"	1'-6¾"	2'-11¼"	7'-2"	1'-0"	3'-6"	.19	.51	2.67	d6	#4	12	2'-0"	16
	12"	1'-3½"	2¾"	2'-4¼"	1'-0"	1'-8"	1'-6¾"	4'-6¾"	8'-9½"	1'-0"	4'-0"	.36	.65	3.80	d12	#4	14	2'-0"	19
	15"	1'-6½"	2¾"	2'-7¼"	1'-0"	1'-8"	1'-6¾"	5'-3¾"	9'-6½"	1'-0"	4'-3"	.47	.73	5.13	d15	#4	16	2'-0"	21
	18"	1'-10"	2¾"	2'-10¾"	1'-0"	1'-8"	1'-6¾"	6'-2¼"	10'-5"	1'-0"	4'-6"	.61	.80	5.65	d18	#4	18	2'-0"	24
	21"	2'-1"	2¾"	3'-1¾"	1'-0"	1'-9"	1'-6¾"	6'-11¼"	11'-3"	1'-3"	5'-3"	.74	1.0	7.42	d21	#4	22	2'-0"	29
	24"	2'-4½"	2¾"	3'-5¼"	1'-0"	2'-0"	1'-6¾"	7'-9¾"	12'-4½"	1'-6"	6'-0"	.86	1.24	8.80	d24	#4	24	2'-0"	32
	27"	2'-7½"	2¾"	3'-8¼"	1'-1½"	2'-3"	1'-6¾"	8'-6¾"	13'-6"	1'-9"	6'-9"	1.03	1.53	12.35	d27	#4	24	2'-0"	32
	30"	2'-11"	2¾"	3'-11¾"	1'-3"	2'-6"	1'-6¾"	9'-5¼"	14'-9"	2'-0"	7'-6"	1.22	2.00	15.08	d30	#4	26	2'-0"	35

	PIPE I.D.	DIMENSIONS										PRE CAST CONC. CU. YD.	CAST-IN-PLACE CU. YD.	WELDED WIRE FABRIC SQ. YD.	REINF. STEEL				
		A	B	C	N	M	P	S	L	V	W				MARK	SIZE	NO.	LENGTH	LBS.
1 TO 4 SLOPE	6"	9"	2"	1'-9"	1'-0"	1'-8"	2'-1"	3'-8"	8'-5"	1'-0"	3'-6"	.21	.57	3.27	d6	#4	12	2'-0"	16
	12"	1'-3½"	2"	2'-3½"	1'-0"	1'-8"	2'-1"	5'-10"	10'-7"	1'-0"	4'-0"	.44	.75	4.58	d12	#4	16	2'-0"	21
	15"	1'-6½"	2"	2'-6½"	1'-0"	1'-8"	2'-1"	6'-10"	11'-7"	1'-0"	4'-3"	.57	.83	5.66	d15	#4	18	2'-0"	24
	18"	1'-10"	2"	2'-10"	1'-0"	1'-8"	2'-1"	8'-0"	12'-11"	1'-0"	4'-6"	.73	.93	7.57	d18	#4	22	2'-0"	29
	21"	2'-1"	2"	3'-1"	1'-0"	1'-9"	2'-1"	9'-0"	13'-10"	1'-3"	5'-3"	.89	1.16	9.83	d21	#4	24	2'-0"	32
	24"	2'-4½"	2"	3'-4½"	1'-0"	2'-0"	2'-1"	10'-2"	15'-3"	1'-6"	6'-0"	1.12	1.45	12.51	d24	#4	28	2'-0"	37
	27"	2'-7½"	2"	3'-7½"	1'-1½"	2'-3"	2'-1"	11'-2"	16'-7"	1'-9"	6'-9"	1.32	1.77	13.28	d27	#4	30	2'-0"	40
	30"	2'-11"	2"	3'-11"	1'-3"	2'-6"	2'-1"	12'-4"	18'-2"	2'-0"	7'-6"	1.58	2.14	18.77	d30	#4	32	2'-0"	43

	PIPE I.D.	DIMENSIONS										PRE CAST CONC. CU. YD.	CAST-IN-PLACE CU. YD.	WELDED WIRE FABRIC SQ. YD.	REINF. STEEL				
		A	B	C	N	M	P	S	L	V	W				MARK	SIZE	NO.	LENGTH	LBS.
1 TO 6 SLOPE	6"	9"	1½"	1'-8½"	1'-0"	1'-8"	3'-0"	5'-3"	10'-11"	1'-0"	3'-6"	.29	.71	4.11	d6	#4	16	2'-0"	21
	12"	1'-3½"	1½"	2'-3"	1'-0"	1'-8"	3'-0"	8'-6"	14'-2"	1'-0"	4'-0"	.60	.96	7.27	d12	#4	22	2'-0"	29
	15"	1'-6½"	1½"	2'-6"	1'-0"	1'-8"	3'-0"	10'-0"	15'-8"	1'-0"	4'-3"	.79	1.07	8.91	d15	#4	26	2'-0"	35
	18"	1'-10"	1½"	2'-9½"	1'-0"	1'-8"	3'-0"	11'-9"	17'-5"	1'-0"	4'-6"	1.03	1.20	10.95	d18	#4	28	2'-0"	37
	21"	2'-1"	1½"	3'-0½"	1'-0"	1'-9"	3'-0"	13'-3"	19'-0"	1'-3"	5'-3"	1.29	1.51	14.00	d21	#4	34	2'-0"	45
	24"	2'-4½"	1½"	3'-4"	1'-0"	2'-0"	3'-0"	15'-0"	21'-0"	1'-6"	6'-0"	1.59	1.89	15.49	d24	#4	38	2'-0"	51
	27"	2'-7½"	1½"	3'-7"	1'-1½"	2'-3"	3'-0"	16'-6"	22-10½"	1'-9"	6'-9"	1.90	2.30	21.82	d27	#4	40	2'-0"	53
	30"	2'-11"	1½"	3'-10½"	1'-3"	2'-6"	3'-0"	18'-3"	25'-0"	2'-0"	7'-6"	2.27	2.79	26.60	d30	#4	44	2'-0"	59

NOTES:

1. THE CAST IN PLACE (CIP) SLOPED HEADWALL SHALL BE CONSTRUCTED FLUSH WITH EXISTING OR PROPOSED SLOPE.
2. CLASS SI CONCRETE SHALL BE USED THROUGHOUT.
3. WELDED WIRE FABRIC SHALL BE EPOXY COATED 6x6-W4xW4, 58 LBS. PER 100 SQ.FT.
4. ALL REINFORCEMENT BARS SHOWN SHALL BE EPOXY COATED.
5. BAR BENDING DETAILS ARE DIMENSIONED OUT TO OUT OF BARS.
6. COVER FROM FACE OF CONCRETE TO FACE OF REINFORCEMENT BAR SHALL BE 3" FOR SURFACES FORMED AGAINST EARTH AND 2" FOR ALL OTHER SURFACES UNLESS OTHERWISE SHOWN.
7. PRECAST UNIT USE IS OPTIONAL. THE ENTIRE STRUCTURE MAY BE CAST IN PLACE.
8. AFTER THE PRECAST SLOPED HEADWALL HAS BEEN PLACED, THE SPACE BETWEEN THE HEADWALL AND PIPE SHALL BE COMPLETELY FILLED WITH AN APPROVED NON-SHRINK GROUT WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 5000 PSI. THE COST FOR FURNISHING AND PLACING THE GROUT SHALL BE INCIDENTAL TO SLOPED HEADWALLS.
9. THE SLOPED HEADWALL DETAILS SHOWN ON THIS DRAWING ARE FOR USE ONLY WITH PIPES HAVING DIAMETER OR SPAN OF 30" OR LESS.
10. QUANTITIES FOR CONCRETE, WELDED WIRE FABRIC, AND REINFORCING STEEL SHOWN IN THE SCHEDULES OF QUANTITIES ARE BASED ON A "t" DIMENSION OF 0'-0" AND A 1:2 SLOPE.
11. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
12. I.D. DENOTES INSIDE DIAMETER OF PIPE.
O.D. DENOTES OUTSIDE DIAMETER OF PIPE.

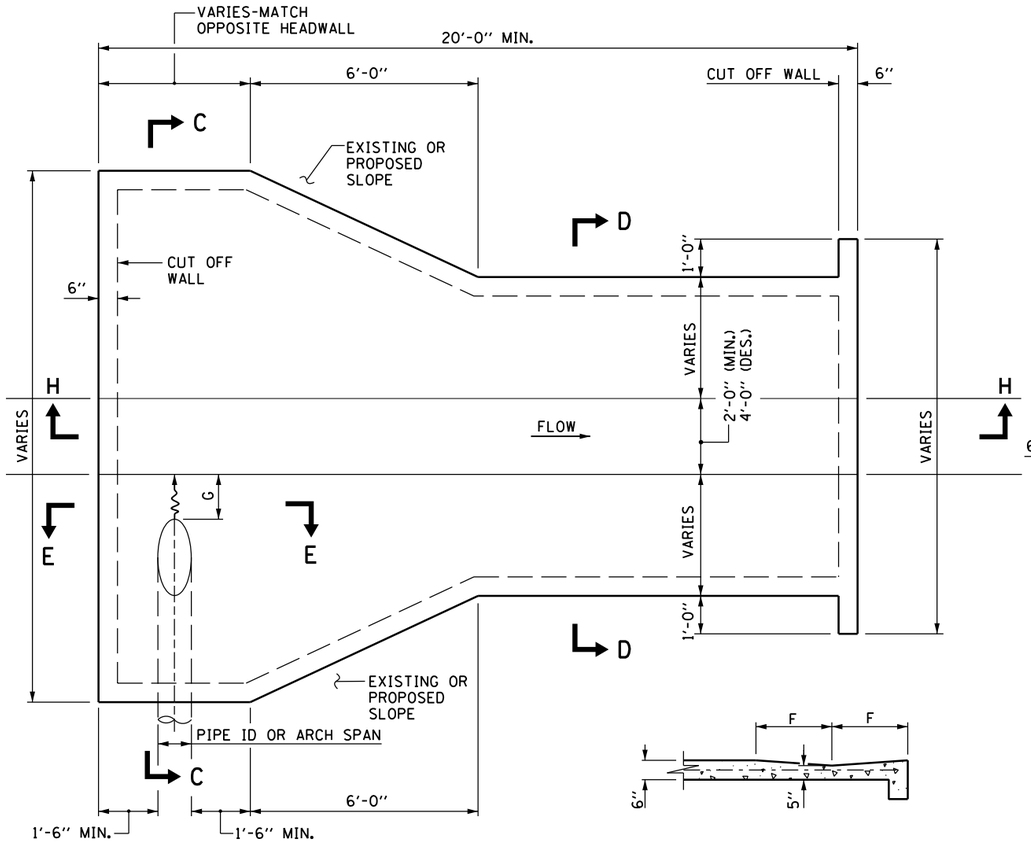
Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

DATE	REVISIONS
6-1-2009	ADDED TABLE INFORMATION
	ADDED DIMENSION NOTATIONS
	TO SLOPED HEADWALL
3-1-2010	REVISED NOTES
1-1-2011	REVISED NOTES
2-7-2012	REVISED NOTES

Illinois Tollway
Open Roads for a Faster Future

SLOPED HEADWALLS
TYPE III DETAILS

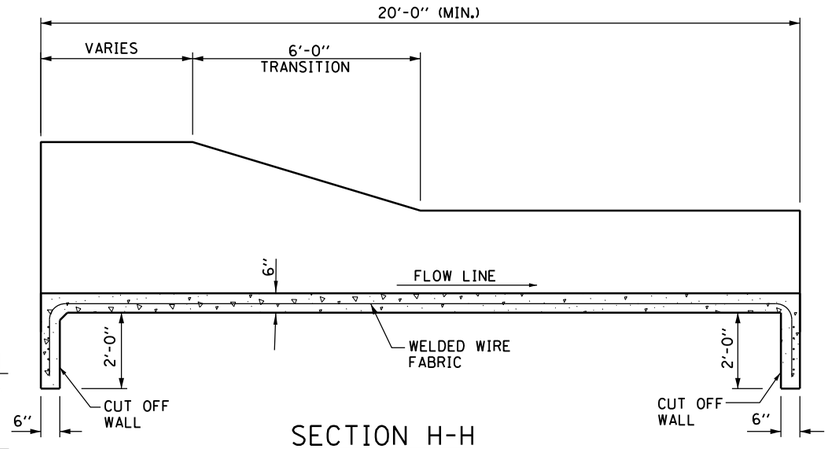
STANDARD B10-05



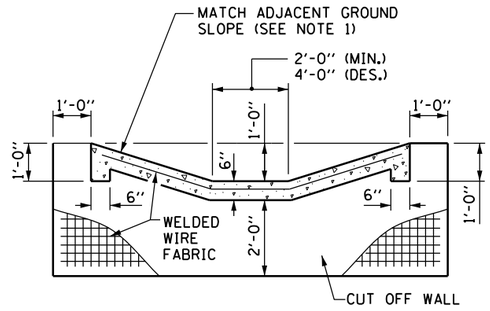
PLAN

SECTION E-E

F = ½" (PIPE ID OR ARCH SPAN) + 1'-6" (MIN.)



SECTION H-H



SECTION D-D

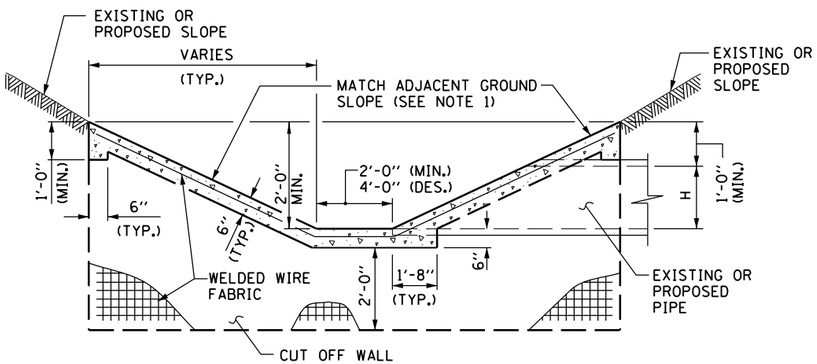
NOTES:

1. THE SLOPED HEADWALL TYPE IV SHALL BE CONSTRUCTED FLUSH WITH EXISTING OR PROPOSED SLOPE.
2. THE SLOPED HEADWALL DETAILS SHOWN IN THIS DRAWING ARE FOR USE ONLY WITH PIPES HAVING AN INSIDE DIAMETER OR ARCH SPAN OF 18" OR LESS.
3. CLASS SI CONCRETE SHALL BE USED THROUGHOUT.
4. WELDED WIRE FABRIC SHALL BE EPOXY COATED 6"x6" W4xW4, 58 LBS. PER 100 SQ. FT.
5. QUANTITIES FOR CONCRETE HEADWALLS (CLASS SI) AND WELDED WIRE FABRIC SHOWN IN THE SCHEDULES OF QUANTITIES ARE BASED ON THE FOLLOWING:
   - A. DIMENSION "G" IS 0'-0".
   - B. DIMENSION "H" IS PIPE I.D. OR ARCH SPAN.
   - C. PAVED DITCH LENGTH IS 20'-0".
   - D. PAVED DITCH BOTTOM SHALL MATCH EXISTING OR PROPOSED DITCH (2'-0" OR 4'-0").
   - E. BACKSLOPE AND FORESLOPE ARE THE SAME. ADJUSTMENT TO QUANTITIES FOR HEADWALLS WITH DIMENSIONS OR BACKSLOPE/ FORESLOPE COMBINATIONS OTHER THAN ABOVE SHALL BE INDICATED ON THE PLANS.
   - F. THE QUANTITIES ARE SHOWN FOR INFORMATION ONLY.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT.

QUANTITIES FOR SLOPED HEADWALLS TYPE IV

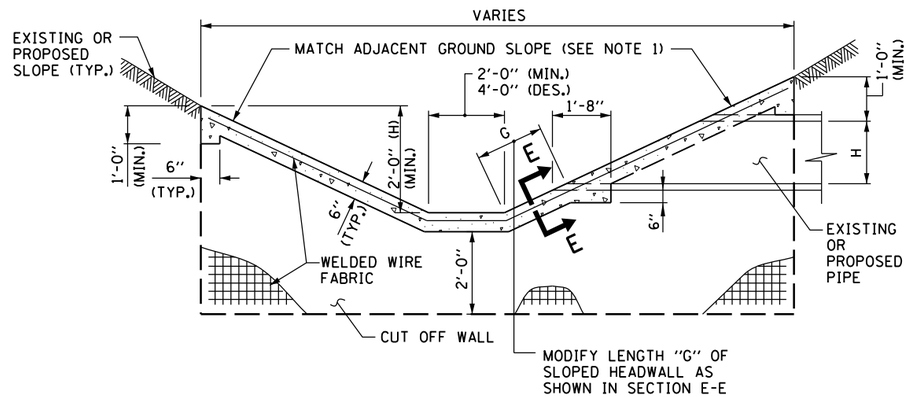
(SEE NOTE 5)

SLOPE	PIPE DIA.	CONCRETE HEADWALLS (CLASS SI) (CUBIC YARDS) 2'-0" BOTTOM	CONCRETE HEADWALLS (CLASS SI) (CUBIC YARDS) 4'-0" BOTTOM	WELDED WIRE FABRIC (SQUARE FEET) 2'-0" BOT.	WELDED WIRE FABRIC (SQUARE FEET) 4'-0" BOT.
1:3	6"	5.41	6.45	239	295
	12"	5.61	6.64	251	307
	15"	5.80	6.84	262	318
	18"	6.01	7.05	274	330
1:4	6"	6.68	7.03	297	353
	12"	6.93	7.97	312	368
	15"	7.19	8.23	327	383
	18"	7.47	8.51	343	399
1:6	6"	9.26	10.30	414	470
	12"	9.63	10.67	437	493
	15"	10.02	11.05	459	515
	18"	10.42	11.46	483	539



SECTION C-C

DETAIL FOR PIPE AT DITCH FLOW LINE



SECTION C-C

DETAIL FOR PIPE ABOVE DITCH FLOW LINE

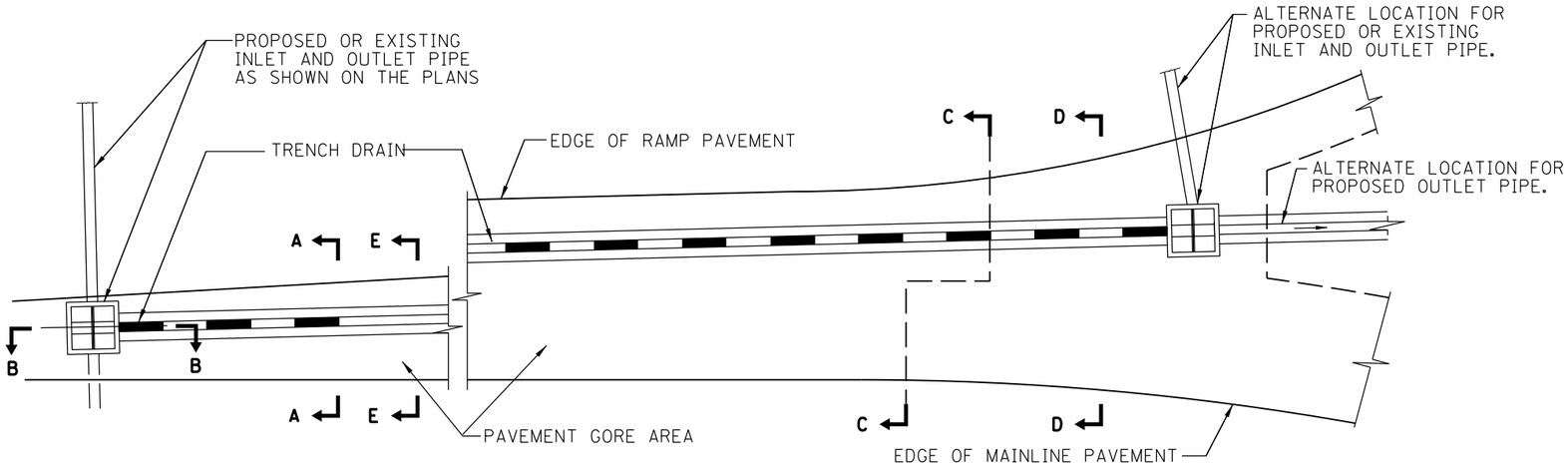
Paul Kovacs
APPROVED ..... CHIEF ENGINEER
DATE 1-1-2011

Illinois Tollway
Open Roads for a Faster Future

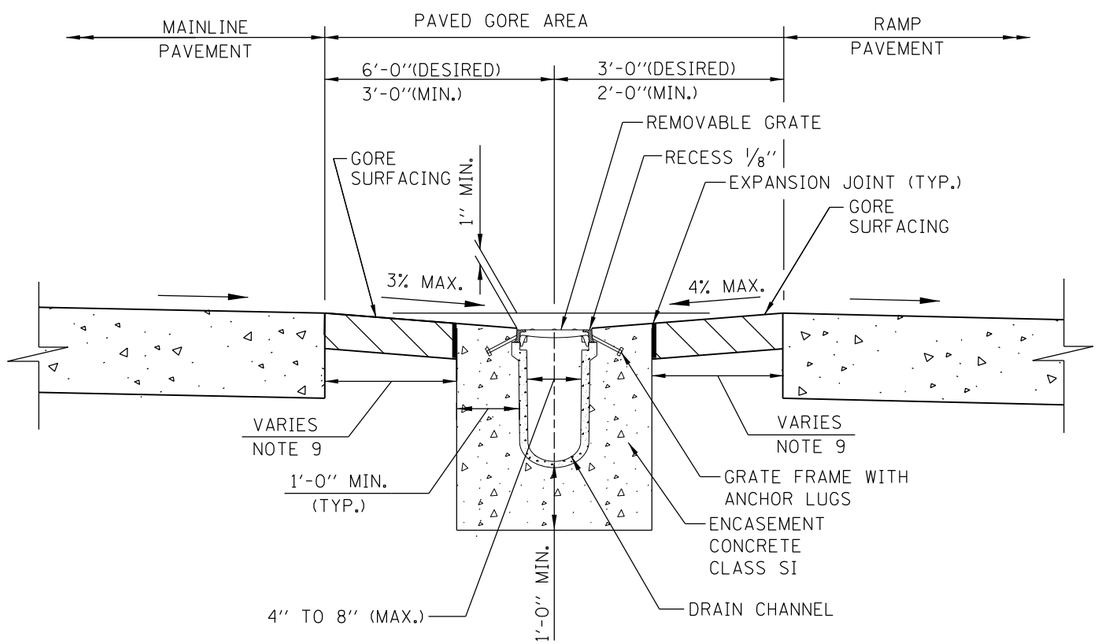
DATE	REVISIONS
5/10/07	CHANGES TO NOTES 5 AND 6
1-1-2011	REVISED NOTES
2-7-2012	REVISED NOTES

SLOPED HEADWALLS TYPE IV DETAILS

STANDARD B11-03



PLAN



SECTION A-A
DRAIN CHANNEL INSTALLATION

NOTES:

1. OUTLET PIPES AND PREFORMED CHANNEL INVERTS SHALL BE SLOPED AT 0.6% OR STEEPER TOWARD OUTLET REGARDLESS OF THE SURFACE SLOPE.
2. TRENCH DRAIN MAY BE STUBBED DIRECTLY INTO DRAINAGE STRUCTURES OR OUTLET PIPES MAY BE USED TO CONNECT TRENCH DRAIN TO DRAINAGE STRUCTURES.
3. A CLEAN-OUT PORT COMPATIBLE WITH THE MANUFACTURED SYSTEM SHALL BE PROVIDED FOR TRENCH DRAINS AT THE UPSTREAM END AND AT INTERVALS NOT TO EXCEED 100 FEET. THE CLEAN-OUT SHALL HAVE A REMOVABLE LOAD RESISTANT COVER OR GRATE.
4. TRENCH EXCAVATION MUST ALLOW FOR A MINIMUM OF 12 INCHES OF CONCRETE TO BE PLACED UNDER AND ALONGSIDE THE TRENCH DRAIN CHANNEL SYSTEM.
5. THE FINISHED LEVEL OF CONCRETE MUST BE APPROXIMATELY 1/8" ABOVE THE TOP OF THE DRAIN CHANNEL.
6. TRENCH DRAINS SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS DETAILS AND SPECIFICATIONS.
7. PROVIDE 1" EXPANSION JOINT WITH PREFORMED JOINT FILLER BETWEEN PAVED SHOULDER AND TRENCH DRAIN ENCASEMENT.
8. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL PLACEMENT (V:H).
9. WHEN THE CONCRETE ENCASEMENT FOR TRENCH DRAIN IS WITHIN 6' OF THE PAVEMENT, REPLACE THE GORE SURFACING WITH CLASS SI CONCRETE 9" DEPTH; PAY ITEM: PORTLAND CEMENT CONCRETE SHOULDER (9").

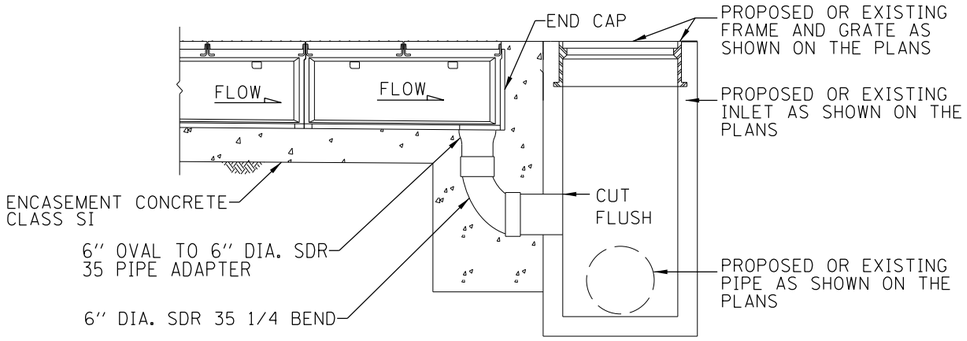
Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
2-1-2011	DELETED SLOTTED DRAIN
	ADDED TRENCH DRAIN
2-1-2013	REVISED MAINLINE SHOULDER GRADE

TRENCH DRAIN DETAIL

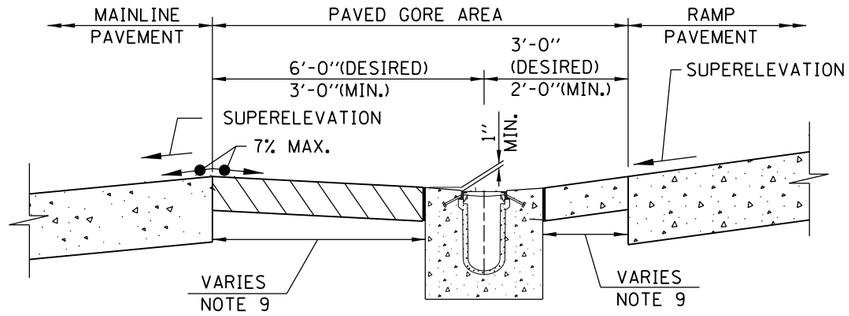
STANDARD B12-03

Paul Kovacs
APPROVED ..... CHIEF ENGINEER
DATE 1-1-2011



SECTION B-B

PIPE OUTLET TO DRAINAGE STRUCTURE



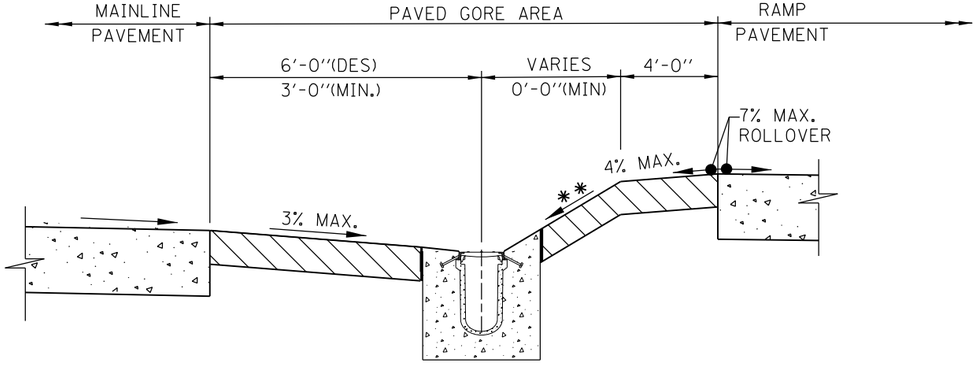
SECTION E-E

RAMP ON OUTSIDE OF

SUPERELEVATED MAINLINE SECTION

SECTION D-D

* 1:10 MAXIMUM FOR NEW CONSTRUCTION
1:4 MAXIMUM FOR REHABILITATION



SECTION C-C

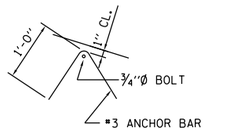
** 4% DESIRABLE FOR NEW CONSTRUCTION
1:10 MAXIMUM FOR NEW CONSTRUCTION
1:4 MAXIMUM FOR REHABILITATION

Paul Kovacs
APPROVED ..... DATE 1-1-2011
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

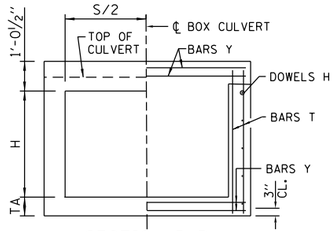
TRENCH DRAIN DETAIL

STANDARD B12-03

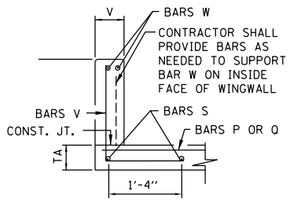


ANCHOR BARS
CONTRACTOR SHALL PROVIDE 2-#3 ANCHOR BARS PER SIDEWALL BOLT.

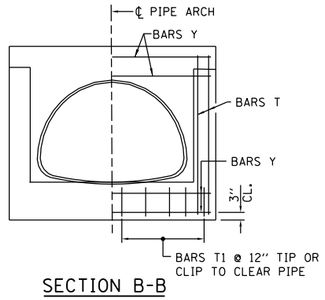
DETAIL B



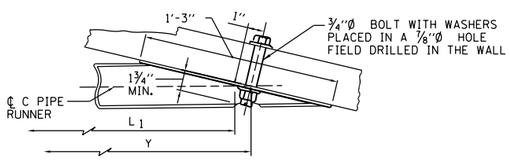
SECTION D-D



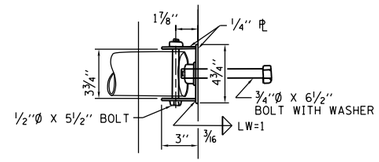
SECTION A-A



SECTION B-B



SECTION AT WING



PLAN AT HEADWALL

NOTE:

A ¾"Ø X 9½" BOLT WITH ADDITIONAL PL WASHER PLACED IN A ⅞"Ø HOLE DRILLED THROUGH THE HEADWALL OR A ¾"Ø X 8" THREADED ROD EPOXY GROUTED IN A ⅞"Ø HOLE WITH A MINIMUM EMBEDMENT OF 6⅝" MAY BE USED IN LIEU OF CAST-IN-PLACE BOLT SHOWN.

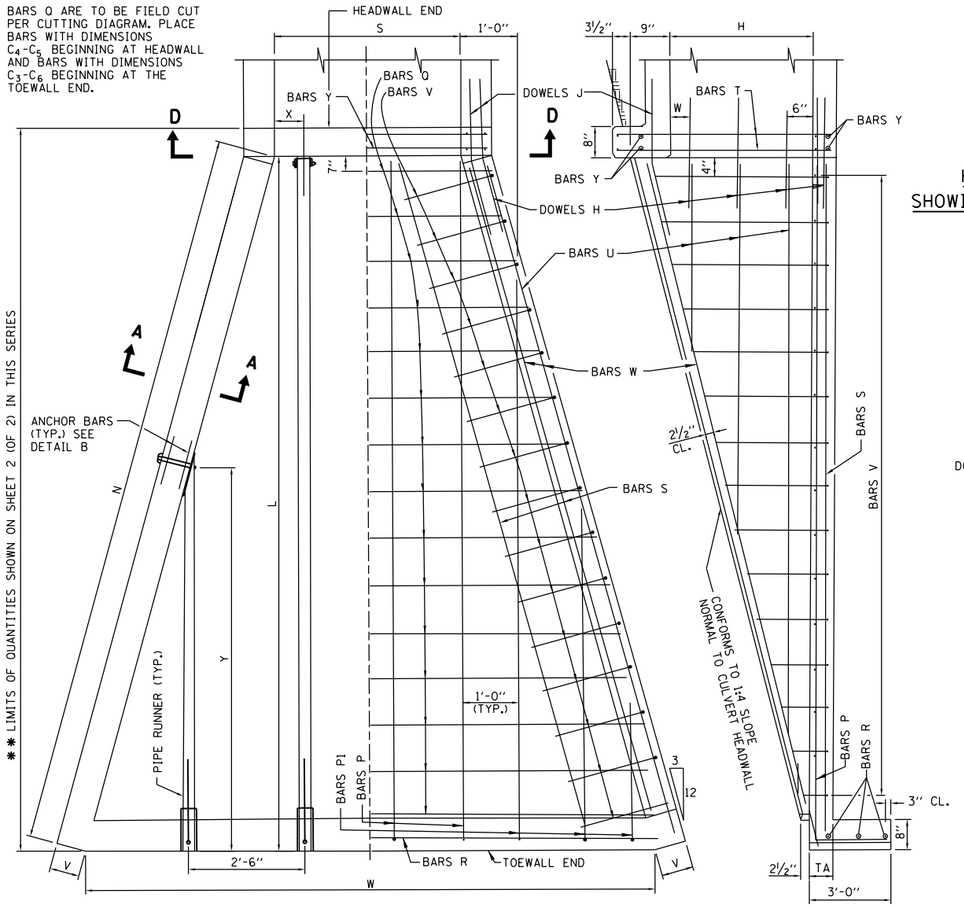
NOTE:

DOWEL BAR J & H NOT REQUIRED WITH EXISTING BOX CULVERTS PROVIDING THE REINFORCING FROM THE EXISTING BOX IS EXTENDED INTO THE NEW CONCRETE A MINIMUM OF 1'-3".

S = DESIGN SPAN
H = DESIGN HEIGHT

NOTE:

BARS O ARE TO BE FIELD CUT PER CUTTING DIAGRAM. PLACE BARS WITH DIMENSIONS C_4-C_6 BEGINNING AT HEADWALL AND BARS WITH DIMENSIONS C_3-C_6 BEGINNING AT THE TOEWALL END.



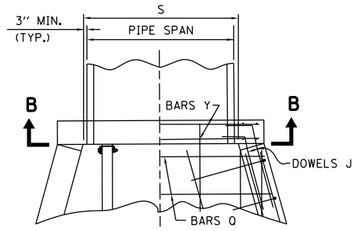
HALF PLAN
SHOWING DIMENSIONS

HALF PLAN
SHOWING REINFORCING BARS

ELEVATION
PARALLEL TO BARREL

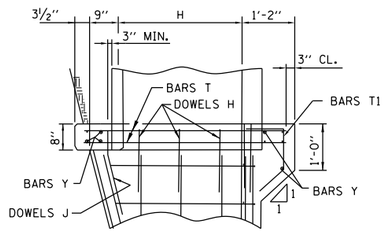
BOX CULVERT DETAILS

** DOWEL BARS EXTENDING INTO THE CONCRETE BOX CULVERT ARE INCLUDED IN THE QUANTITIES



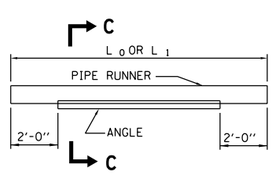
HALF PLAN
SHOWING DIMENSIONS

HALF PLAN
SHOWING REINFORCING BARS



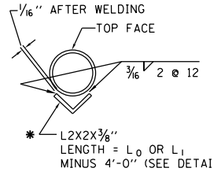
ELEVATION

PIPE ARCH DETAILS



DETAIL A

PIPE RUNNER DETAILS

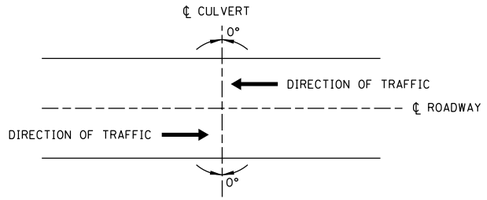


SECTION C-C

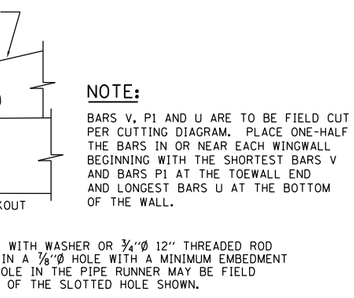
***NOTE:**

WHERE L_o OR L_1 EXCEEDS THE FOLLOWING LENGTH, THE PIPE RUNNER SHALL BE STRENGTHENED OVER THE MIDSPAN AS SHOWN.

PIPE	LENGTH
3"Ø, SCH. 40	12'-8"



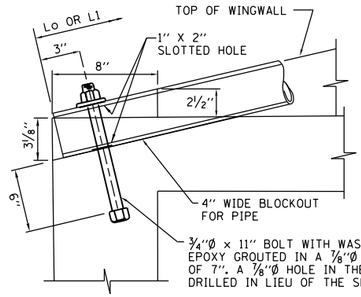
CULVERT SKEW ORIENTATION



ELEVATION AT HEADWALL

NOTE:

PIPE O.D. IS THE PIPE RUNNER OUTSIDE DIAMETER.



¾"Ø x 11" BOLT WITH WASHER OR ¾"Ø 12" THREADED ROD EPOXY GROUTED IN A ⅞"Ø HOLE WITH A MINIMUM EMBEDMENT OF 7". A ⅞"Ø HOLE IN THE PIPE RUNNER MAY BE FIELD DRILLED IN LIEU OF THE SLOTTED HOLE SHOWN.

SECTION THRU TOEWALL

NOTE:

BARS V, P1 AND U ARE TO BE FIELD CUT PER CUTTING DIAGRAM. PLACE ONE-HALF THE BARS IN OR NEAR EACH WINGWALL BEGINNING WITH THE SHORTEST BARS V AND BARS P1 AT THE TOEWALL END AND LONGEST BARS U AT THE BOTTOM OF THE WALL.

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS SI.
2. ALL EXPOSED CONCRETE EDGES SHALL HAVE A ¾" x 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW FINISHED GROUND LEVEL. COVER FROM THE FACE OF CONCRETE TO THE FACE OF REINFORCEMENT BARS SHALL BE 2", UNLESS OTHERWISE SHOWN.
3. CONCRETE QUANTITIES SHOWN ON SHEET 2 (OF 2) IN THIS SERIES ARE FOR REINFORCED CONCRETE BOX CULVERT SECTIONS AND ADDITIONAL CONCRETE REQUIRED IN HEADWALLS FOR PIPE OR ARCH CULVERT SECTIONS SHALL BE ADDED TO THESE QUANTITIES.
4. THIS STANDARD MAY BE USED FOR CULVERTS WITH SKEW OF 0° ± 7.5°. AS SHOWN PER CULVERT SKEW ORIENTATION ON THIS SHEET.
5. DESIGN: SAFETY PIPE RUNNERS ARE DESIGNED FOR A TRANSVERSING LOAD OF 1,800 POUNDS AT YIELD AS RECOMMENDED BY RESEARCH REPORT 280-1, SAFETY TREATMENT OF ROADSIDE CROSS DRAINAGE STRUCTURES, TEXAS TRANSPORTATION INSTITUTE, MARCH 1981.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
7. FOR EROSION PROTECTION SEE STANDARD B19.

Illinois Tollway
Open Roads for a Faster Future

APPROVED Paul Kovacs
CHIEF ENGINEER
DATE 6-1-2009

DATE	REVISIONS
6-1-2009	REVISED NOTES
3-1-2010	REVISED EROSION PROECTION AND NOTES
2-7-2012	TABLE QUANTITIES REVISED

SAFETY END TREATMENT FOR SINGLE CULVERTS
0° SKEW 1:4 SLOPE H ≤ 4'

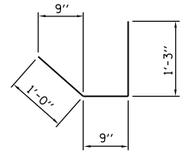
STANDARD B13-03

CULVERT SIZE	TABLE OF DIMENSIONS							TOTAL QUANTITIES ONE END			PIPE RUNNERS FOR ONE END - SIZE 3" O.D.			
								CONC.	RE-BAR	PIPE RUNNER	HEADWALL PIPE		WINGWALL PIPE	
S x H	L	N	V	W	TA	X	Y	CU. YD.	LBS.	FT.	NO.	L_0	NO.	L_1
3 x 2	10'-10"	11'-2"	7"	8'-5"	6"	0'-3"	--	3.0	346	22.16	2	11'-1"	0	--
3 x 3	14'-10"	15'-3½"	7"	10'-5"	6"	1'-6"	10'-10"	4.6	489	37.50	1	15'-2"	2	11'-2"
4 x 2	10'-10"	11'-2"	7"	9'-5"	6"	0'-9"	--	3.4	372	22.16	2	11'-1"	0	--
4 x 3	14'-10"	15'-3½"	7"	11'-5"	6"	2'-0"	12'-10"	5.0	521	41.50	1	15'-2"	2	13'-2"
4 x 4	18'-10"	19'-5"	7"	13'-5"	6"	0'-9"	11'-10"	7.0	727	63.00	2	19'-4"	2	12'-2"
5 x 2	10'-10"	11'-2"	7"	10'-5"	6"	1'-3"	5'-10"	3.7	397	34.16	2	11'-1"	2	6'-0"
5 x 3	14'-10"	15'-3½"	7"	12'-5"	6"	1'-3"	9'-10"	5.4	554	50.50	2	15'-2"	2	10'-1"
5 x 4	18'-10"	19'-5"	7"	14'-5"	6"	1'-3"	13'-10"	7.4	765	67.17	2	19'-4"	2	14'-3"
6 x 3	14'-10"	15'-3½"	7"	13'-5"	6"	1'-9"	11'-10"	5.8	583	54.67	2	15'-2"	2	12'-2"
6 x 4	18'-10"	19'-5"	7"	15'-5"	6"	0'-6"	10'-10"	8.0	800	80.33	3	19'-4"	2	11'-2"
7 x 3	14'-10"	15'-3½"	7"	14'-5"	6½"	2'-3"	13'-10"	6.5	614	58.83	2	15'-2"	2	14'-3"
7 x 4	18'-10"	19'-5"	7"	16'-5"	6½"	1'-0"	12'-10"	8.8	635	84.33	3	19'-4"	2	13'-2"
8 x 4	18'-10"	19'-5"	7"	17'-5"	7"	0'-3"	9'-10"	9.6	871	97.50	4	19'-4"	2	10'-1"

PIPE ARCH AND ELLIPTICAL PIPE CULVERTS

FOR PIPE ARCH OR ELLIPTICAL PIPE CULVERTS SELECT APPROPRIATE "S" & "H" FROM SIZES SHOWN. ADD THE FOLLOWING ADDTITIONAL BARS:

(a) 1 ADDITIONAL Y BAR
(b) #4 - T1 BARS @ APPROX. 12" CTS. (NO. = S + 2)



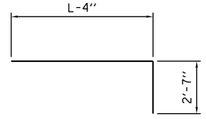
T1 BARS

THE WEIGHT OF THE ADDITIONAL BARS AND THE ADDITIONAL QUANTITY OF CONCRETE IN THE HEADWALL SHALL BE ADDED TO THE QUANTITIES SHOWN.

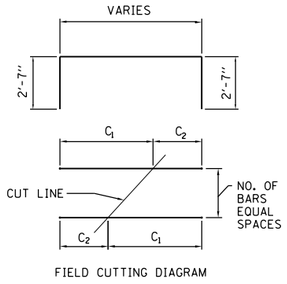
CULVERT SIZE	TABLE OF REINFORCING STEEL FOR ONE END																														
	DOWEL H #4 @ 12"		DOWEL J #6		BARS P #4 @ 12"		BARS P1 #4 @ 12"				BARS Q #4 @ 12"						BARS R 3-#4	BARS S 4-#4	BARS U #4 @ 12"				BARS V #4 @ 12"				4 BARS W		BARS Y 8-#5	BARS T 8-#5 BOX CULVERT	BARS T 8-#5 PIPE ARCH
S x H	NO.	LENGTH.	NO.	LENGTH.	NO.	LENGTH.	NO.	C_1	C_2	LENGTH.	NO.	C_3	C_4	C_5	C_6	LENGTH.	LENGTH.	LENGTH.	NO.	C_7	C_8	LENGTH.	NO.	C_9	C_{10}	LENGTH.	SIZE	LENGTH.	LENGTH.	LENGTH.	LENGTH.
3 x 2	6	2'-6"	4	4'-0"	4	13'-1"	2	8'-4"	4'-4"	17'-10"	5	8'-8"	4'-2"	6'-2"	6'-8"	12'-10"	8'-9"	10'-10"	2	8'-7"	4'-5"	13'-0"	10	2'-9"	6"	6'-3"	#5	10'-4"	3'-8"	3'-2"	3'-8"
3 x 3	8	2'-6"	4	4'-0"	4	17'-1"	3	12'-4"	4'-4"	21'-10"	7	10'-8"	4'-2"	7'-2"	7'-8"	14'-10"	10'-9"	15'-0"	3	12'-8"	4'-5"	17'-1"	14	3'-9"	6"	7'-3"	#5	14'-6"	3'-8"	4'-2"	4'-8"
4 x 2	6	2'-6"	4	4'-0"	5	13'-1"	2	8'-4"	4'-4"	17'-10"	5	9'-8"	5'-2"	7'-2"	7'-8"	14'-10"	9'-9"	10'-10"	2	8'-7"	4'-5"	13'-0"	10	2'-9"	6"	6'-3"	#5	10'-4"	4'-8"	3'-2"	3'-8"
4 x 3	8	2'-6"	4	4'-0"	5	17'-1"	3	12'-4"	4'-4"	21'-10"	7	11'-8"	5'-2"	8'-2"	8'-8"	16'-10"	11'-9"	15'-0"	3	12'-8"	4'-5"	17'-1"	14	3'-9"	6"	7'-3"	#5	14'-6"	4'-8"	4'-2"	4'-8"
4 x 4	10	2'-6"	4	4'-0"	5	21'-1"	4	16'-4"	4'-4"	25'-10"	9	13'-8"	5'-2"	9'-2"	9'-8"	18'-10"	13'-9"	19'-1"	4	16'-9"	4'-5"	21'-2"	18	4'-9"	6"	8'-3"	#6	18'-7"	4'-8"	5'-2"	5'-8"
5 x 2	6	2'-6"	4	4'-0"	6	13'-1"	2	8'-4"	4'-4"	17'-10"	5	10'-8"	6'-2"	8'-2"	8'-8"	16'-10"	10'-9"	10'-10"	2	8'-7"	4'-5"	13'-0"	10	2'-9"	6"	6'-3"	#5	10'-4"	5'-8"	3'-2"	3'-8"
5 x 3	8	2'-6"	4	4'-0"	6	17'-1"	3	12'-4"	4'-4"	21'-10"	7	12'-8"	6'-2"	9'-2"	9'-8"	18'-10"	12'-9"	15'-0"	3	12'-8"	4'-5"	17'-1"	14	3'-9"	6"	7'-3"	#5	14'-6"	5'-8"	4'-2"	4'-8"
5 x 4	10	2'-6"	4	4'-0"	6	21'-1"	4	16'-4"	4'-4"	25'-10"	9	14'-8"	6'-2"	10'-2"	10'-8"	20'-10"	14'-9"	19'-1"	4	16'-9"	4'-5"	21'-2"	18	4'-9"	6"	8'-3"	#6	18'-7"	5'-8"	5'-2"	5'-8"
6 x 3	8	2'-6"	4	4'-0"	7	17'-1"	3	12'-4"	4'-4"	21'-10"	7	13'-8"	7'-2"	10'-2"	10'-8"	20'-10"	13'-9"	15'-0"	3	12'-8"	4'-5"	17'-1"	14	3'-9"	6"	7'-3"	#5	14'-6"	6'-8"	4'-2"	4'-8"
6 x 4	10	2'-6"	4	4'-0"	7	21'-1"	4	16'-4"	4'-4"	25'-10"	9	15'-8"	7'-2"	11'-2"	11'-8"	22'-10"	15'-9"	19'-1"	4	16'-9"	4'-5"	21'-2"	18	4'-9"	6"	8'-3"	#6	18'-7"	6'-8"	5'-2"	5'-8"
7 x 3	8	2'-6"	4	4'-0"	8	17'-1"	3	12'-4"	4'-4"	21'-10"	7	14'-8"	8'-2"	11'-2"	11'-8"	22'-10"	14'-9"	15'-0"	3	12'-8"	4'-5"	17'-1"	14	3'-9"	6"	7'-3"	#5	14'-6"	7'-8"	4'-2"	4'-8"
7 x 4	10	2'-6"	4	4'-0"	8	21'-1"	4	16'-4"	4'-4"	25'-10"	9	16'-8"	8'-2"	12'-2"	12'-8"	24'-10"	16'-9"	19'-1"	4	16'-9"	4'-5"	21'-2"	18	4'-9"	6"	8'-3"	#6	18'-7"	7'-8"	5'-2"	5'-8"
8 x 4	10	2'-6"	4	4'-0"	9	21'-1"	4	16'-4"	4'-4"	25'-10"	9	17'-8"	9'-2"	13'-2"	13'-8"	26'-10"	17'-9"	19'-1"	4	16'-9"	4'-5"	21'-2"	18	4'-9"	6"	8'-3"	#6	18'-7"	8'-8"	5'-3"	5'-8"

NOTE:

REINFORCEMENT BARS BENDING DIMENSIONS ARE OUT TO OUT.

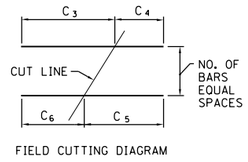


BARS P



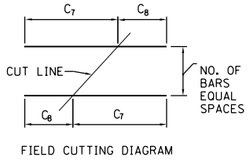
FIELD CUTTING DIAGRAM

BARS P1



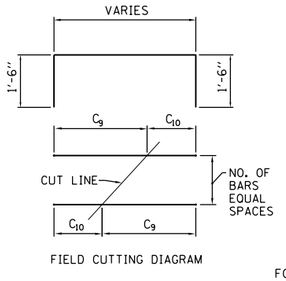
FIELD CUTTING DIAGRAM

BARS Q



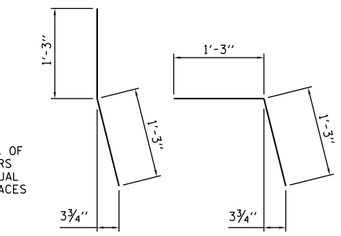
FIELD CUTTING DIAGRAM

BARS U



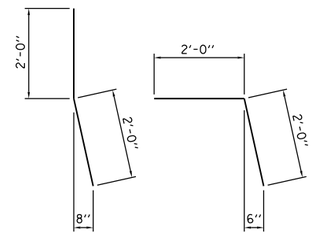
FIELD CUTTING DIAGRAM

BARS V



FOR BOX CULVERTS FOR PIPE ARCHES

DOWELS H



FOR BOX CULVERTS FOR PIPE ARCHES

DOWELS J

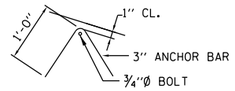
SHEET 2 OF 2

Paul Kovacs
APPROVED CHIEF ENGINEER DATE 6-1-2009

Illinois Tollway
Open Roads for a Faster Future

SAFETY END TREATMENT
FOR SINGLE CULVERTS
0° SKEW 1:4 SLOPE H ≤ 4'

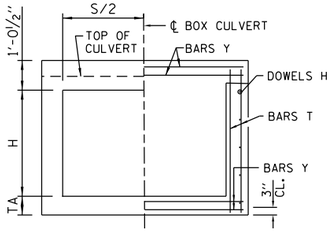
STANDARD B13-03



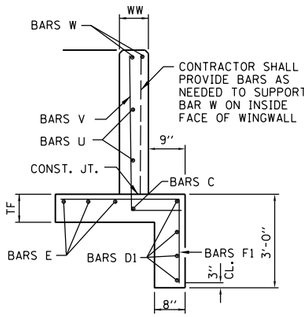
ANCHOR BARS

CONTRACTOR SHALL PROVIDE 2 #3 ANCHOR BARS PER SIDEWALL BOLT

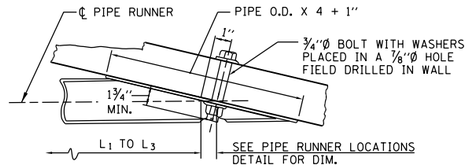
DETAIL B



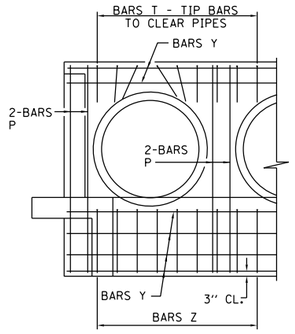
SECTION F-F



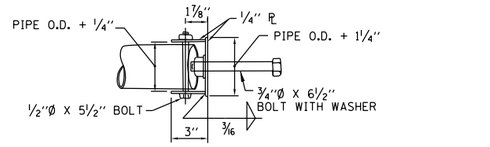
SECTION A-A



SECTION AT WING



SECTION C-C



PLAN AT HEADWALL

NOTE:

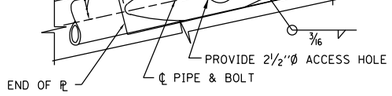
A ¾"Ø X 9½" BOLT WITH ADDITIONAL ℞ WASHER PLACED IN A ⅞"Ø HOLE DRILLED THROUGH THE HEADWALL OR A ¾"Ø X 8" THREADED ROD EPOXY GROUTED IN A ⅞"Ø HOLE WITH A MINIMUM EMBEDMENT OF 6⅝" MAY BE USED IN LIEU OF CAST-IN-PLACE BOLT SHOWN.

NOTE:

BAR F & V TO BE FIELD CUT PER CUTTING DIAGRAM. PLACE BARS WITH DIMENSIONS C_2, C_6 BEGINNING AT HEADWALL & BARS WITH DIMENSIONS C1, C5 BEGINNING AT THE TOEWALL END.

NOTE:

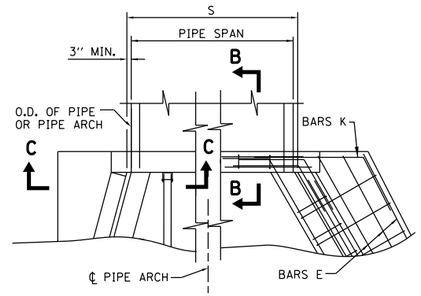
DOWEL BAR J & H NOT REQUIRED WITH EXISTING BOX CULVERTS PROVIDING THE REINFORCING FROM THE EXIST. BOX IS EXTENDED INTO THE NEW CONCRETE A MIN. OF 1'-3".



ELEVATION AT WING

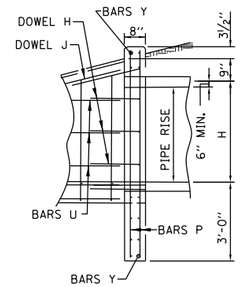
NOTE:

PIPE O.D. IS THE PIPE RUNNER OUTSIDE DIAMETER.



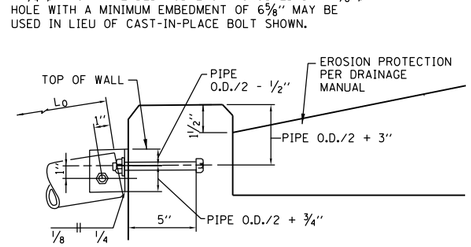
HALF PLAN SHOWING DIMENSIONS

HALF PLAN SHOWING REINFORCING BARS

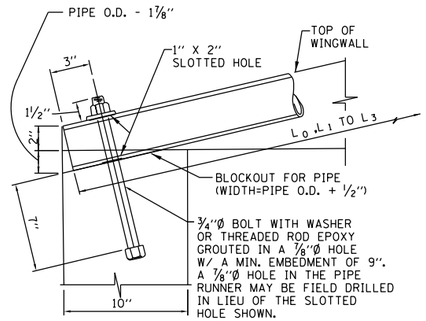


SECTION B-B

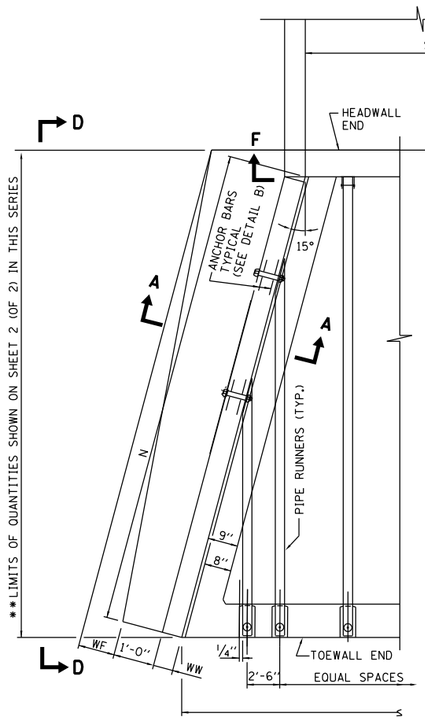
FOR PIPE AND PIPE-ARCH CULVERTS



ELEVATION AT HEADWALL

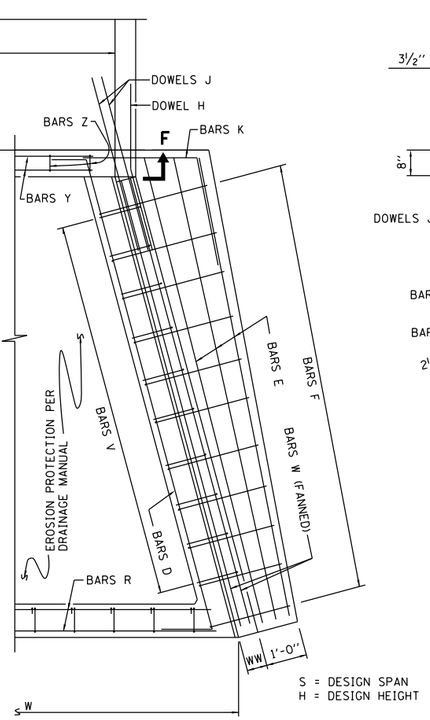


SECTION THRU TOEWALL



** DOWEL BARS EXTENDING INTO THE CONCRETE BOX CULVERT ARE INCLUDED IN THE QUANTITIES.

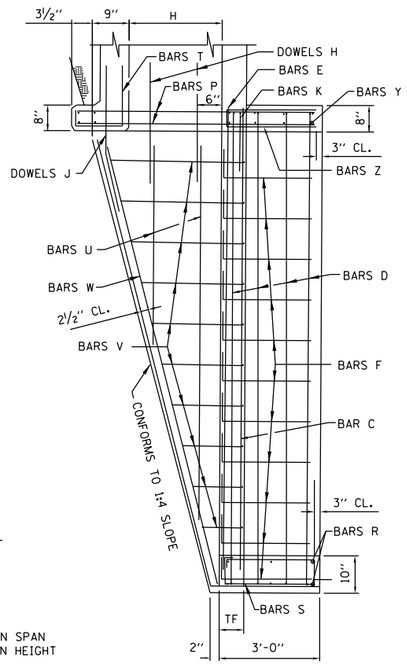
HALF PLAN SHOWING DIMENSIONS



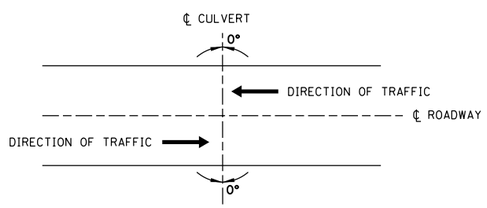
S = DESIGN SPAN
H = DESIGN HEIGHT

HALF PLAN SHOWING REINFORCING BARS

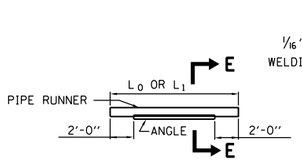
FOR BOX CULVERTS



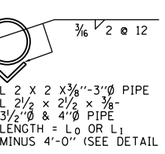
ELEVATION D-D



CULVERT SKEW ORIENTATION



DETAIL A



SECTION E-E

NOTE:

* WHERE L_0 OR L_1 EXCEEDS THE FOLLOWING LENGTH THE PIPE RUNNER SHALL BE STRENGTHENED OVER MIDSPAN AS SHOWN.

PIPE	LENGTH
3"Ø, SCH. 40	12'-8"
3½"Ø, SCH. 40	17'-3"
3½"Ø, SCH. 80	22'-1"
4"Ø, SCH. 40	22'-6"
4"Ø, SCH. 80	29'-4"

PIPE RUNNER DETAILS

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS SI.
2. ALL EXPOSED CONCRETE EDGES SHALL HAVE A ¾" x 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW FINISHED GROUND LEVEL. COVER FROM THE FACE OF CONCRETE TO THE FACE OF REINFORCEMENT BARS SHALL BE 2", UNLESS OTHERWISE SHOWN.
3. CONCRETE QUANTITIES SHOWN ON SHEET 2 (OF 2) IN THIS SERIES ARE FOR REINFORCED CONCRETE BOX CULVERT SECTIONS AND ADDITIONAL CONCRETE REQUIRED IN HEADWALLS FOR PIPE OR ARCH CULVERT SECTIONS SHALL BE ADDED TO THESE QUANTITIES.
4. THIS STANDARD MAY BE USED FOR CULVERTS WITH SKEW OF 0° ± 7.5°, AS SHOWN PER CULVERT SKEW ORIENTATION ON THIS SHEET.
5. DESIGN: SAFETY PIPE RUNNERS ARE DESIGNED FOR A TRANSVERSING LOAD OF 1,800 POUNDS AT YIELD AS RECOMMENDED BY RESEARCH REPORT 280-1, SAFETY TREATMENT OF ROADSIDE CROSS DRAINAGE STRUCTURES, TEXAS TRANSPORTATION INSTITUTE, MARCH 1981.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
7. FOR EROSION PROTECTION SEE SHEET B19.

SHEET 1 OF 2

Paul Kovacs
APPROVED ..... DATE 6-1-2009
CHIEF ENGINEER

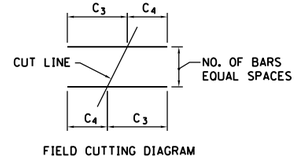
Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
6-1-2009	ADDED PIPE DIMENSION FORMULA REVISED NOTES
3-1-2010	REVISED EROSION PROTECTION AND NOTES
2-7-2012	REVISED TABLE QUANTITIES

SAFETY END TREATMENT FOR SINGLE AND MULTIPLE CULVERTS 0° SKEW 1:4 SLOPE H ≤ 8'

STANDARD B14-03

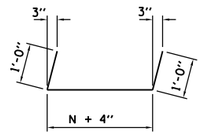
TABLE OF DIMENSIONS							TABLE OF REINFORCING STEEL FOR ONE END																									
							BARS C 2 REQD.		BARS D #8-#4	BARS E #4 (5)			BARS F					DOWEL H #5 @ 12"		DOWEL J 4-#6	BARS K 2-#5	BARS U #4 @ 12"					BARS V #4 @ 12" CTS.					BARS W 4 REQD.	
H	S	L	WF	WW	TF	N	SIZE	LENGTH	LENGTH	NO.	LENGTH	SIZE	NO.	C_1	C_2	LENGTH	NO.	LENGTH	LENGTH	LENGTH	NO.	C_3	C_4	LENGTH	NO.	C_5	C_6	C_7	LENGTH	SIZE	LENGTH
3'	9'	14'-4"	3"	7"	7"	14'-10⅛"	#4	15'-2"	17'-2"	4	16'-8"	#4	15	2'-0"	2'-2"	9'-4"	6	3'-0"	4'-6"	4'-0"	3	12'-8"	4'-5"	17'-1"	14	9"	3'-10"	1'-0"	6'-7"	#5	14'-11"
4'	9'	18'-4"	9"	7"	8"	18'-11¾"	#4	19'-4"	21'-4"	4	20'-10"	#4	19	2'-0"	2'-8"	9'-10"	8	3'-0"	4'-6"	4'-6"	4	16'-10"	4'-5"	21'-3"	18	10"	4'-11"	1'-0"	7'-9"	#6	19'-2"
5'	5'	22'-4"	1'-3"	7"	8"	23'-1½"	#4	23'-6"	25'-6"	4	25'-0"	#4	23	2'-0"	3'-2"	10'-4"	10	3'-0"	4'-6"	5'-0"	5	20'-11"	4'-5"	25'-4"	22	10"	5'-11"	1'-0"	8'-9"	#6	23'-5"
6'	6'	26'-4"	1'-9"	7"	8½"	27'-3⅛"	#4	27'-7"	29'-7"	6	29'-1"	#5	27	2'-0"	3'-8"	10'-10"	12	3'-0"	4'-6"	5'-6"	6	25'-1"	4'-5"	29'-6"	26	10"	6'-11"	1'-0"	9'-9"	#6	27'-8"
7'	7'	30'-4"	2'-3"	7"	9"	31'-4⅞"	#5	31'-9"	33'-9"	6	33'-3"	#5	31	2'-1"	4'-3"	11'-6"	14	3'-0"	4'-6"	6'-0"	7	29'-2"	4'-5"	33'-7"	30	11"	8'-0"	1'-0"	10'-11"	#6	31'-11"
8'	8'	34'-4"	2'-9"	8"	9½"	35'-6½"	#5	35'-10"	37'-10"	6	37'-4"	#6	35	2'-2"	4'-10"	12'-2"	16	3'-0"	4'-6"	6'-6"	8	33'-4"	4'-5"	37'-9"	34	11"	9'-0"	1'-1"	12'-1"	#6	36'-2"



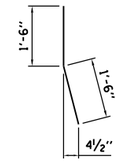
FIELD CUTTING DIAGRAM

BARS U

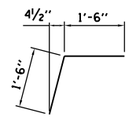
PIPE RUNNERS FOR ONE END								
H	S	SIZE (DIA)	SCHEDULE	NO WINGWALL PIPES	L_1	L_2	L_3	LENGTH (FT.)
3'	9'	3"	40	2	9'-11"	--	--	19.84
4'	9'	3"	40	2	14'-0"	--	--	28.00
5'	5'	3½"	40	4	18'-1"	8'-6"	--	53.16
6'	6'	3½"	80	4	22'-3"	12'-7"	--	69.66
7'	7'	4"	40	6	26'-4"	16'-9"	7'-2"	100.50
8'	8'	4"	80	6	30'-6"	20'-10"	11'-7"	125.83



BARS D

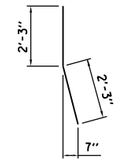


FOR BOX CULVERTS

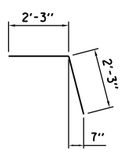


FOR PIPE CULVERTS

DOWEL H

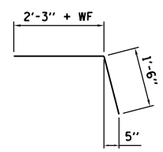


FOR BOX CULVERTS



FOR PIPE CULVERTS

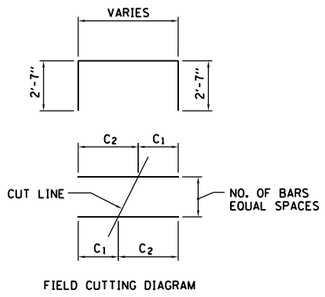
DOWEL J



DOWEL K

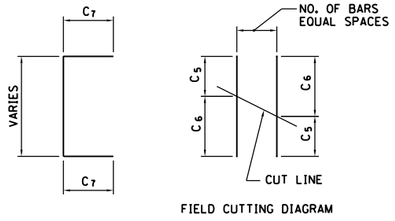
	TABLE OF DIMENSIONS		TABLE OF REINFORCING STEEL FOR MINIMUM "S"									HEADWALL PIPE RUNNERS FOR MINIMUM "S"					QUANTITIES FOR MIN. "S" (SINGLE PIPE OR CONC. BOX CULVERT)		INCREASE IN QUANTITIES FOR 1' INCREASE IN "S"	
			(2) BARS Y 12-#5	(1) BARS Z #4 @ 12"		(2) BARS R 6-#5	(1) BARS S #4 @ 12"		(1) BARS T #4 @ 12"		(3) BARS P 8-#5	SIZE (DIA.)	SCHEDULE	NO.	L_0	LENGTH (FT.)	CONCRETE CU. YD.	REIN. BARS LBS.	CONCRETE CU. YD.	REIN. BARS Lbs.
H	S	W (4)	LENGTH	NO.	LENGTH	LENGTH	NO.	LENGTH	NO.	LENGTH	LENGTH									
3'	≥ 9'	16'-8"	9'-10"	9	5'-4"	15'-10"	16	6'-10"	9	3'-0"	6'-8"	3"	40	4	14'-9"	59.00	6.9	898	0.19	29
4'	≥ 9'	18'-9"	9'-10"	9	5'-4"	17'-11"	18	6'-10"	9	3'-0"	7'-8"	3"	40	4	18'-10"	75.33	9.2	1113	0.19	29
5'	≥ 5'	16'-11"	5'-10"	5	5'-4"	16'-1"	16	6'-10"	5	3'-0"	8'-8"	3½"	40	2	23'-0"	46.00	10.9	1198	0.19	29
6'	≥ 6'	20'-1"	6'-10"	6	5'-4"	19'-3"	19	6'-10"	6	3'-0"	9'-8"	3½"	80	3	27'-2"	81.51	14.0	1589	0.19	29
7'	≥ 7'	23'-3"	7'-10"	7	5'-4"	22'-5"	22	6'-10"	7	3'-0"	10'-8"	4"	40	3	31'-3"	93.75	17.5	1905	0.19	29
8'	≥ 8'	26'-4"	9'-0"	8	5'-4"	25'-6"	25	6'-10"	8	3'-0"	11'-8"	4"	80	4	35'-4"	141.33	22.6	2416	0.19	29

NUMBER OF HDWL PIPE RUNNERS FOR ONE END			
S	No	S	No
10'	4	23'	10
11'	5	24'	10
12'	5	25'	10
13'	6	26'	11
14'	6	27'	11
15'	6	28'	12
16'	7	29'	12
17'	7	30'	12
18'	8	31'	13
19'	8	32'	13
20'	8	33'	14
21'	9	34'	14
22'	9	35'	14



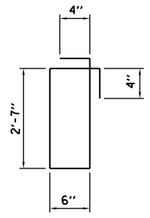
FIELD CUTTING DIAGRAM

BARS F

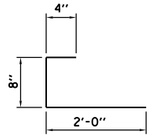


FIELD CUTTING DIAGRAM

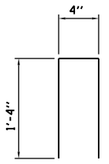
BARS V



BARS S

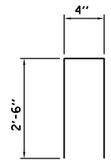


FOR BOX CULVERTS



FOR PIPE CULVERTS

BARS T



BARS Z

NOTE:

REINFORCEMENT BARS BENDING DIMENSIONS ARE OUT TO OUT.

NOTES FOR TABLE OF DIMENSIONS:

(1) THE NUMBER OF BARS S, T AND Z SHALL BE INCREASED BY 1 FOR EACH 1 FOOT OF INCREASE IN DIMENSION "S".

(2) THE LENGTH OF BARS R AND Y SHALL BE INCREASED BY 1 FOOT FOR EACH 1 FOOT OF INCREASE IN DIMENSION "S".

(3) THE NUMBER OF BARS P SHOWN ARE FOR SINGLE SPAN PIPES OR BOX CULVERTS. THIS NUMBER SHALL BE INCREASED BY 4 FOR EACH MULTIPLE OF PIPE OR BOX ADDED.

(4) THIS DIMENSION SHALL BE INCREASED BY 1 FOOT FOR EACH 1 FOOT INCREASE IN DIMENSION "S".

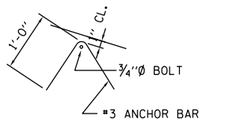
(5) THE LENGTH OF THIS BAR INCLUDES ONE 1'-6" MINIMUM LAP.

Paul Kovacs
APPROVED ..... DATE 6-1-2009
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

SAFETY END TREATMENT FOR SINGLE AND MULTIPLE CULVERTS 0° SKEW 1:4 SLOPE H ≤ 8'

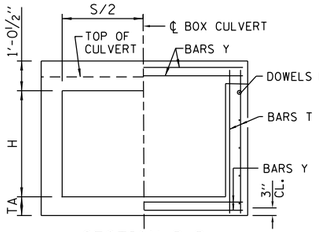
STANDARD B14-03



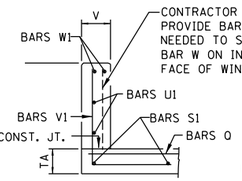
ANCHOR BARS

CONTRACTOR SHALL PROVIDE 2-#3 ANCHOR BARS PER SIDEWALL BOLT.

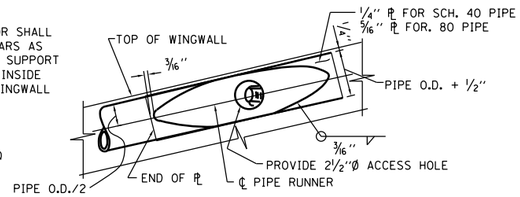
DETAIL B



SECTION D-D



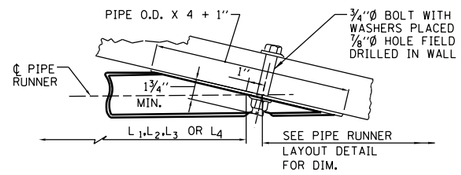
SECTION A-A



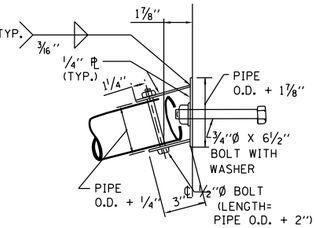
ELEVATION AT WING

NOTE:

PIPE O.D. IS THE PIPE RUNNER OUTSIDE DIAMETER



SECTION AT WING



PLAN AT HEADWALL

NOTE:

A ¾"Ø X 9½" BOLT WITH ADDITIONAL ℄ WASHER PLACED IN A ⅞"Ø HOLE DRILLED THROUGH THE HEADWALL OR A ¾"Ø X 8" THREADED ROD EPOXY GROUTED IN A ⅞"Ø HOLE WITH A MIN. EMBEDMENT OF 6⅝" MAY BE USED IN LIEU OF CAST-IN-PLACE BOLT SHOWN.

NOTES:

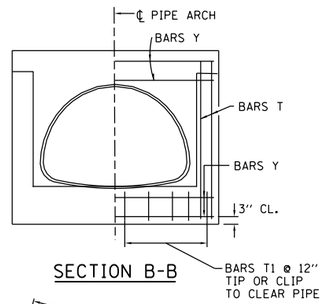
BARS O, V, AND V_1 ARE TO BE FIELD CUT PER CUTTING DIAGRAM. PLACE BARS WITH DIMENSIONS C_2 - C_3,C_9 - C_{12} BEGINNING AT HEADWALL AND BARS WITH DIMENSIONS C_1 - C_4,C_{10}, C_{11} BEGINNING AT THE TOEWALL END

NOTE:

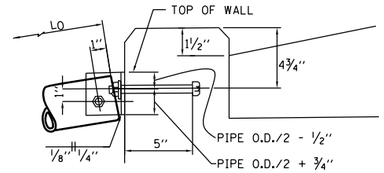
BARS P1 ARE TO BE FIELD CUT PER CUTTING DIAGRAM PLACE BARS WITH DIMENSIONS C_6-C_7 BEGINNING AT TOEWALL END OF 30° WING AND BARS WITH DIMENSIONS C_5-C_8 BEGINNING PARALLEL THE BARS P.

NOTE:

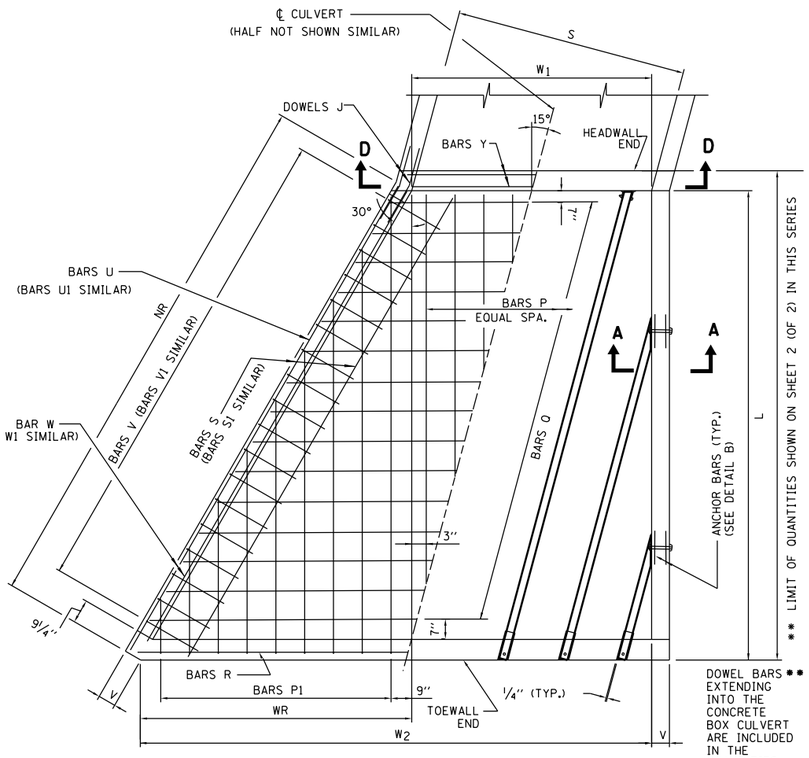
DOWEL BAR J & H NOT REQUIRED WITH EXISTING BOX CULVERTS PROVIDING THE REINFORCING FROM THE EXIST. BOX IS EXTENDED INTO THE NEW CONCRETE A MIN. OF 1'-3".



SECTION B-B

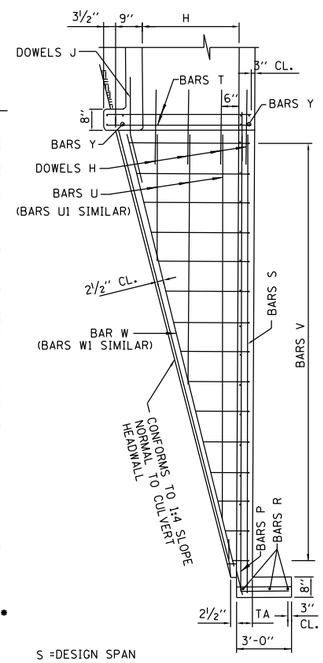


ELEVATION AT HEADWALL

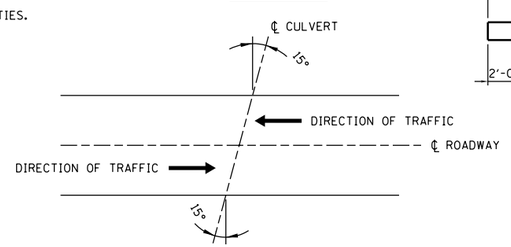


HALF PLAN SHOWING REINFORCING BARS

HALF PLAN SHOWING DIMENSIONS

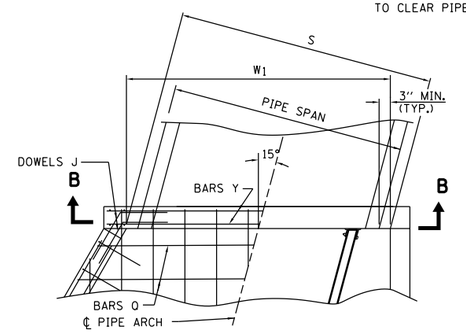


ELEVATION



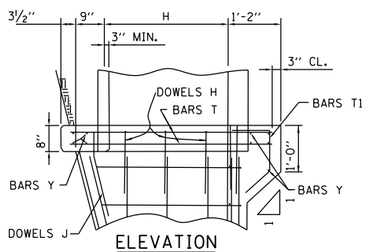
CULVERT SKEW ORIENTATION

BOX CULVERT DETAILS



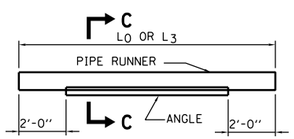
HALF PLAN SHOWING REINFORCING BARS

HALF PLAN SHOWING DIMENSIONS

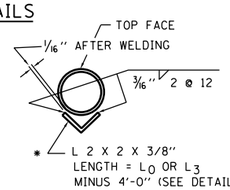


ELEVATION

PIPE ARCH DETAILS



DETAIL A

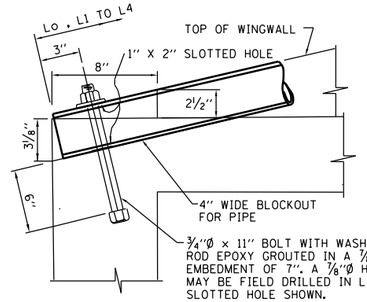


SECTION C-C

NOTE:

* WHERE L_O OR L_3 EXCEEDS THE FOLLOWING LENGTH, THE PIPE RUNNER SHALL BE STRENGTHENED OVER THE MIDSPAN AS SHOWN.

PIPE	LENGTH
3"Ø SCH 40	12'-8"
3"Ø SCH 80	15'-4"



SECTION THRU TOEWALL

PIPE RUNNER DETAILS

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS SI.
2. ALL EXPOSED CONCRETE EDGES SHALL HAVE A ¾" x 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW FINISHED GROUND LEVEL. COVER FROM THE FACE OF CONCRETE TO THE FACE OF REINFORCEMENT BARS SHALL BE 2", UNLESS OTHERWISE SHOWN.
3. CONCRETE QUANTITIES SHOWN ON SHEET 2 (OF 2) IN THIS SERIES ARE FOR REINFORCED CONCRETE BOX CULVERT SECTIONS AND ADDITIONAL CONCRETE REQUIRED IN HEADWALLS FOR PIPE OR ARCH CULVERT SECTIONS SHALL BE ADDED TO THESE QUANTITIES.
4. THIS STANDARD MAY BE USED FOR CULVERTS WITH SKEW OF 15° ± 7.5°, AS SHOWN PER CULVERT SKEW ORIENTATION ON THIS SHEET.
5. DESIGN: SAFETY PIPE RUNNERS ARE DESIGNED FOR A TRANSVERSING LOAD OF 1,800 POUNDS AT YIELD AS RECOMMENDED BY RESEARCH REPORT 280-1, SAFETY TREATMENT OF ROADSIDE CROSS DRAINAGE STRUCTURES, TEXAS TRANSPORTATION INSTITUTE, MARCH 1981.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
7. FOR EROSION PROTECTION SEE STANDARD B19.

Paul Kovacs
APPROVED ..... DATE 6-1-2009
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
6-1-2009	REVISED NOTES
3-1-2010	MODIFIED CULVERT SKEW DETAIL, REVISED EROSION PROTECTION AND NOTES
2-7-2012	REVISED TABLE QUANTITIES

SAFETY END TREATMENT FOR SINGLE CULVERTS 15° SKEW 1:4 SLOPE H ≤ 4'

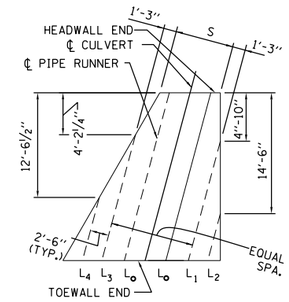
STANDARD B15-03

CULVERT SIZE (FEET)	TABLE OF DIMENSIONS							PIPE RUNNERS FOR ONE END SIZE 3" DIA.							TABLE OF REINFORCING STEEL FOR ONE END													
								HEADWALL PIPE			WINGWALL PIPE - ONE PER EACH LENGTH SHOWN				DOWELS H #4 @ 12"				DOWELS J 2-#6 EACH WALL		BARS P #4 - EQUALLY SPACED		BARS P1 #4 @ 12"					
										LENGTH	0° WALL		30° WALL		30° WALL		0° WALL		30° WALL	0° WALL								
S X H	L	NR	V	W_1	W_2	WR	TA	SCH.	NO.	L_0	L_1	L_2	L_3	L_4	NO.	LENGTH	NO.	LENGTH	LENGTH	LENGTH	NO.	LENGTH	NO.	C_5	C_6	C_7	C_8	LENGTH
3 x 2	10'-10"	12'-6 6/8"	7"	3'-1 1/4"	9'-4 1/4"	6'-3"	6"	40	2	11'-5"	6'-3"	-	7'-0"	-	3	2'-6"	3	2'-6"	4'-0"	4'-0"	4	13'-1"	3	10'-2"	1'-6"	5'-0"	6'-8"	16'-10"
3 x 3	14'-10"	17'-1 1/2"	7"	3'-1 1/4"	11'-8"	8'-6 3/4"	6"	40	2	15'-8"	10'-6"	-	11'-3"	-	4	2'-6"	4	2'-6"	4'-0"	4'-0"	4	17'-1"	4	14'-2"	2'-0"	7'-3"	8'-11"	21'-4"
4 x 2	10'-10"	12'-6 6/8"	7"	4'-1 3/4"	10'-4 3/4"	6'-3"	6"	40	2	11'-5"	6'-3"	-	7'-0"	-	3	2'-6"	3	2'-6"	4'-0"	4'-0"	5	13'-1"	3	10'-2"	1'-6"	5'-0"	6'-8"	16'-10"
4 x 3	14'-10"	17'-1 1/2"	7"	4'-1 3/4"	12'-8 1/2"	8'-6 3/4"	6"	40	2	15'-8"	10'-6"	-	11'-3"	-	4	2'-6"	4	2'-6"	4'-0"	4'-0"	5	17'-1"	4	14'-2"	2'-0"	7'-3"	8'-11"	21'-4"
4 x 4	18'-10"	21'-9"	7"	4'-1 3/4"	15'-0 1/4"	10'-10 1/2"	6"	80	2	19'-11"	14'-9"	4'-6"	15'-6"	6'-7"	5	2'-6"	5	2'-6"	4'-0"	4'-0"	5	21'-1"	5	18'-2"	2'-5"	9'-5"	11'-2"	25'-9"
5 x 2	10'-10"	12'-6 6/8"	7"	5'-2 1/8"	11'-5 1/8"	6'-3"	6"	40	2	11'-5"	6'-3"	-	7'-0"	-	3	2'-6"	3	2'-6"	4'-0"	4'-0"	6	13'-1"	3	10'-2"	1'-6"	5'-0"	6'-8"	16'-10"
5 x 3	14'-10"	17'-1 1/2"	7"	5'-2 1/8"	13'-8 7/8"	8'-6 3/4"	6"	40	2	15'-8"	10'-6"	-	11'-3"	-	4	2'-6"	4	2'-6"	4'-0"	4'-0"	6	17'-1"	4	14'-2"	2'-0"	7'-3"	8'-11"	21'-4"
5 x 4	18'-10"	21'-9"	7"	5'-2 1/8"	16'-0 5/8"	10'-10 1/2"	6"	80	2	19'-11"	14'-9"	4'-6"	15'-6"	6'-7"	5	2'-6"	5	2'-6"	4'-0"	4'-0"	6	21'-1"	5	18'-2"	2'-5"	9'-5"	11'-2"	25'-9"
6 x 3	14'-10"	17'-1 1/2"	7"	6'-2 1/2"	14'-9 1/4"	8'-6 3/4"	6"	40	3	15'-8"	10'-6"	-	11'-3"	-	4	2'-6"	4	2'-6"	4'-0"	4'-0"	7	17'-1"	4	14'-2"	2'-0"	7'-3"	8'-11"	21'-4"
6 x 4	18'-10"	21'-9"	7"	6'-2 1/2"	17'-1"	10'-10 1/2"	6"	80	3	19'-11"	14'-9"	4'-6"	15'-6"	6'-7"	5	2'-6"	5	2'-6"	4'-0"	4'-0"	7	21'-1"	5	18'-2"	2'-5"	9'-5"	11'-2"	25'-9"
7 x 3	14'-10"	17'-1 1/2"	7"	7'-3"	15'-9 3/4"	8'-6 3/4"	6 1/2"	40	3	15'-8"	10'-6"	-	11'-3"	-	4	2'-6"	4	2'-6"	4'-0"	4'-0"	8	17'-1"	4	14'-2"	2'-0"	7'-3"	8'-11"	21'-4"
7 x 4	18'-10"	21'-9"	7"	7'-3"	18'-1 1/2"	10'-10 1/2"	6 1/2"	80	3	19'-11"	14'-9"	4'-6"	15'-6"	6'-7"	5	2'-6"	5	2'-6"	4'-0"	4'-0"	8	21'-1"	5	18'-2"	2'-5"	9'-5"	11'-2"	25'-9"
8 x 4	18'-10"	21'-9"	7"	8'-3 3/8"	19'-1 7/8"	10'-10 1/2"	7"	80	4	19'-11"	14'-9"	4'-6"	15'-6"	6'-7"	5	2'-6"	5	2'-6"	4'-0"	4'-0"	9	21'-1"	5	18'-2"	2'-5"	9'-5"	11'-2"	25'-9"

CULVERT SIZE (FEET)	TABLE OF REINFORCING STEEL FOR ONE END																													
	BARS Q #4 @ 12"						BARS R 3-#4	BARS S 30° WALL 2-#4	BARS S1 0° WALL 2-#4	BARS T 8-#5 BOX CULVERT	BARS T 8-#5 PIPE ARCH	BARS U-ONE PER EACH LENGTH SHOWN #4 @ 12"				BARS U1 ONE PER EACH LENGTH SHOWN #4 @ 12"				BARS V #4 - EQUALLY SPACED						BARS V1 #4 - EQUALLY SPACED					
												30° WALL				0° WALL				30° WALL						0° WALL				
S X H	NO.	C_1	C_2	C_3	C_4	LENGTH	LENGTH	LENGTH	LENGTH	LENGTH	LENGTH	C_5	C_6	C_7	C_8	C_5	C_6	C_7	C_8	NO.	C_9	C_{10}	C_{11}	C_{12}	LENGTH	NO.	C_9	C_{10}	C_{11}	C_{12}	LENGTH
3 x 2	5	9'-7"	4'-4"	6'-8"	7'-3"	13'-11"	9'-10"	12'-2"	10'-6"	3'-2"	3'-8"	5'-0"	9'-8"	-	-	4'-4"	8'-4"	-	-	6	2'-9"	6"	1'-6"	1'-9"	6'-3"	5	2'-9"	6"	1'-6"	1'-9"	6'-3"
3 x 3	7	11'-10"	4'-4"	7'-9"	8'-5"	16'-2"	12'-2"	16'-9"	14'-6"	4'-2"	4'-8"	5'-0"	9'-8"	14'-3"	-	4'-4"	8'-4"	12'-4"	-	8	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"
4 x 2	5	10'-7"	5'-5"	7"-8"	8'-4"	16'-0"	10'-10"	12'-2"	10'-6"	3'-2"	3'-8"	5'-0"	9'-8"	14'-3"	-	4'-4"	8'-4"	-	-	6	2'-9"	6"	1'-6"	1'-9"	6'-3"	5	2'-9"	6"	1'-6"	1'-9"	6'-3"
4 x 3	7	12'-11"	5'-5"	8'-10"	9'-6"	18'-4"	13'-2"	16'-9"	14'-6"	4'-2"	4'-8"	5'-0"	9'-8"	-	-	4'-4"	8'-4"	12'-4"	-	8	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"
4 x 4	9	15'-2"	5'-5"	10'-0"	10'-7"	20'-7"	15'-6"	21'-4"	18'-6"	5'-2"	5'-8"	5'-0"	9'-8"	14'-3"	18'-10"	4'-4"	8'-4"	12'-4"	16'-4"	10	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"
5 x 2	5	11'-8"	6'-5"	8'-7"	9'-3"	18'-1"	11'-11"	12'-2"	10'-6"	3'-2"	3'-8"	5'-0"	9'-8"	-	-	4'-4"	8'-4"	-	-	6	2'-9"	6"	1'-6"	1'-9"	6'-3"	5	2'-9"	6"	1'-6"	1'-9"	6'-3"
5 x 3	7	13'-11"	6'-5"	9'-10"	10'-6"	20'-4"	14'-2"	16'-9"	14'-6"	4'-2"	4'-8"	5'-0"	9'-8"	14'-3"	-	4'-4"	8'-4"	12'-4"	-	8	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"
5 x 4	9	16'-3"	6'-5"	11'-0"	11'-8"	22'-8"	16'-6"	21'-4"	18'-6"	5'-2"	5'-8"	5'-0"	9'-8"	14'-3"	18'-10"	4'-4"	8'-4"	12'-4"	16'-4"	10	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"
6 x 3	7	14'-11"	7'-5"	10'-10"	11'-6"	22'-4"	15'-3"	16'-9"	14'-6"	4'-2"	4'-8"	5'-0"	9'-8"	14'-3"	-	4'-4"	8'-4"	12'-4"	-	8	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"
6 x 4	9	17'-3"	7'-5"	12'-0"	12'-8"	24'-8"	17'-6"	21'-4"	18'-6"	5'-2"	5'-8"	5'-0"	9'-8"	14'-3"	18'-10"	4'-4"	8'-4"	12'-4"	16'-4"	10	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"
7 x 3	7	16'-0"	8'-6"	11'-11"	12'-7"	24'-6"	16'-3"	16'-9"	14'-6"	4'-2"	4'-8"	5'-0"	9'-8"	14'-3"	-	4'-4"	8'-4"	12'-4"	-	8	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"
7 x 4	9	18'-4"	8'-6"	13'-1"	13'-9"	26'-10"	18'-7"	21'-4"	18'-6"	5'-2"	5'-8"	5'-0"	9'-8"	14'-3"	18'-10"	4'-4"	8'-4"	12'-4"	16'-4"	10	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"
8 x 4	9	19'-4"	9'-6"	14'-1"	14'-9"	28'-10"	19'-7"	21'-4"	18'-6"	5'-2"	5'-8"	5'-0"	9'-8"	14'-3"	18'-10"	4'-4"	8'-4"	12'-4"	16'-4"	10	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"

CULVERT SIZE (FEET)	TABLE OF REINFORCING STEEL FOR ONE END					
	2 BARS W		2 BARS W_1		BARS Y 8-#5	
	30° WALL		0° WALL			
S X H	SIZE	LENGTH	SIZE	LENGTH	LENGTH	
3 x 2	#5	11'-6"	#5	10'-4"	3'-11"	
3 x 3	#5	16'-2"	#5	14'-5"	3'-11"	
4 x 2	#5	11'-6"	#5	10'-4"	4'-11"	
4 x 3	#5	16'-2"	#5	14'-5"	4'-11"	
4 x 4	#6	20'-11"	#6	18'-7"	4'-11"	
5 x 2	#5	11'-6"	#5	10'-4"	6'-0"	
5 x 3	#5	16'-2"	#5	14'-5"	6'-0"	
5 x 4	#6	20'-11"	#6	18'-7"	6'-0"	
6 x 3	#5	16'-2"	#5	14'-5"	7'-0"	
6 x 4	#6	20'-11"	#6	18'-7"	7'-0"	
7 x 3	#5	16'-2"	#5	14'-5"	8'-1"	
7 x 4	#6	20'-11"	#6	18'-7"	8'-1"	
8 x 4	#6	20'-11"	#6	18'-7"	9'-1"	

TOTAL QUANTITIES ONE END		
CONC.	RE-BARS	PIPE RUNNERS
CU. YD.	LB.	FT.
3.2	395	36.09
4.9	537	53.08
3.6	426	36.09
5.3	573	53.08
7.4	781	81.17
3.9	446	36.09
5.7	610	53.08
7.9	823	81.17
6.2	635	68.75
8.4	854	101.08
6.8	676	68.75
9.3	903	101.08
10.2	950	121.00

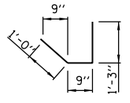


PIPE RUNNER LAYOUT

NOTE:

REINFORCEMENT BARS BENDING DIMENSIONS ARE OUT TO OUT.

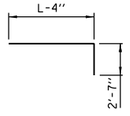
PIPE ARCH AND ELLIPTICAL PIPE CULVERTS



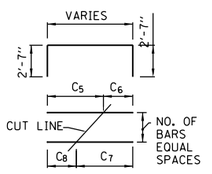
T1 BARS

FOR PIPE OR ELLIPTICAL PIPE CULVERTS SELECT APPROPRIATE "S" & "H" FROM SIZES SHOWN. ADD THE FOLLOWING ADDITIONAL BARS:
(a) 1 ADDITIONAL Y BAR
(b) #4-T1 BARS @ APPROX. 12" CTS. (NO. = S + 2)

THE WEIGHT OF THE ADDITIONAL BARS AND THE ADDITIONAL QUANTITY OF CONCRETE IN THE HEADWALL SHALL BE ADDED TO THE QUANTITIES SHOWN.

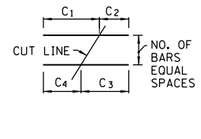


BARS P



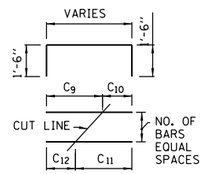
FIELD CUTTING DIAGRAM

BARS P1



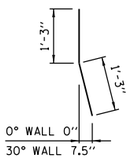
FIELD CUTTING DIAGRAM

BARS Q

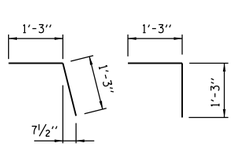


FIELD CUTTING DIAGRAM

BARS V AND V1

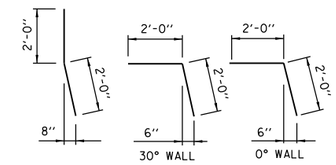


FOR BOX CULVERTS



FOR PIPE ARCHES

DOWELS H



FOR BOX CULVERTS FOR PIPE ARCHES

DOWELS J

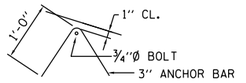
Paul Kovacs
APPROVED ..... DATE 6-1-2009
CHIEF ENGINEER

SHEET 2 OF 2

Illinois Tollway
Open Roads for a Faster Future

SAFETY END TREATMENT FOR SINGLE CULVERTS
15° SKEW 1:4 SLOPE H ≤ 4'

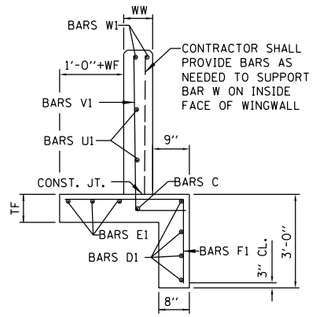
STANDARD B15-03



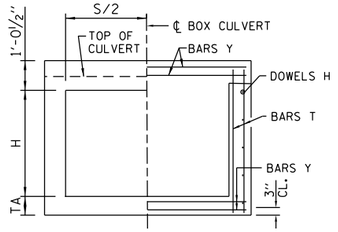
ANCHOR BARS

CONTRACTOR SHALL PROVIDE 2-#3 ANCHOR BARS PER SIDEWALL BOLT

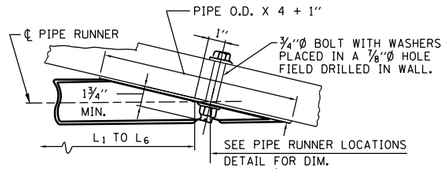
DETAIL B



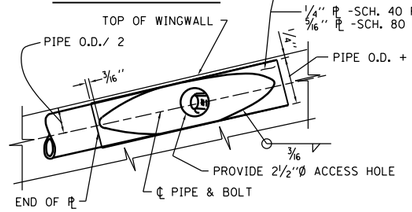
SECTION A - A



SECTION F-F



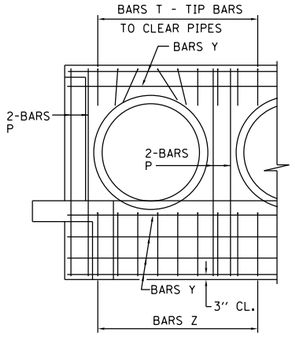
SECTION AT WING



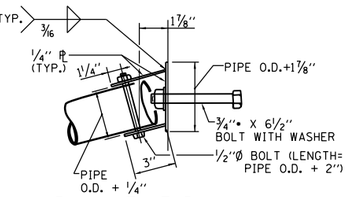
ELEVATION AT WING

NOTE:

PIPE O.D. IS THE PIPE RUNNER OUTSIDE DIAMETER.



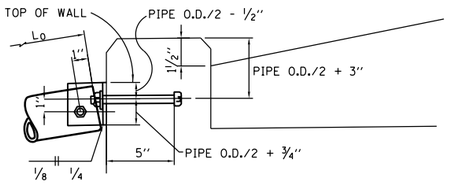
SECTION C-C



PLAN AT HEADWALL

NOTE:

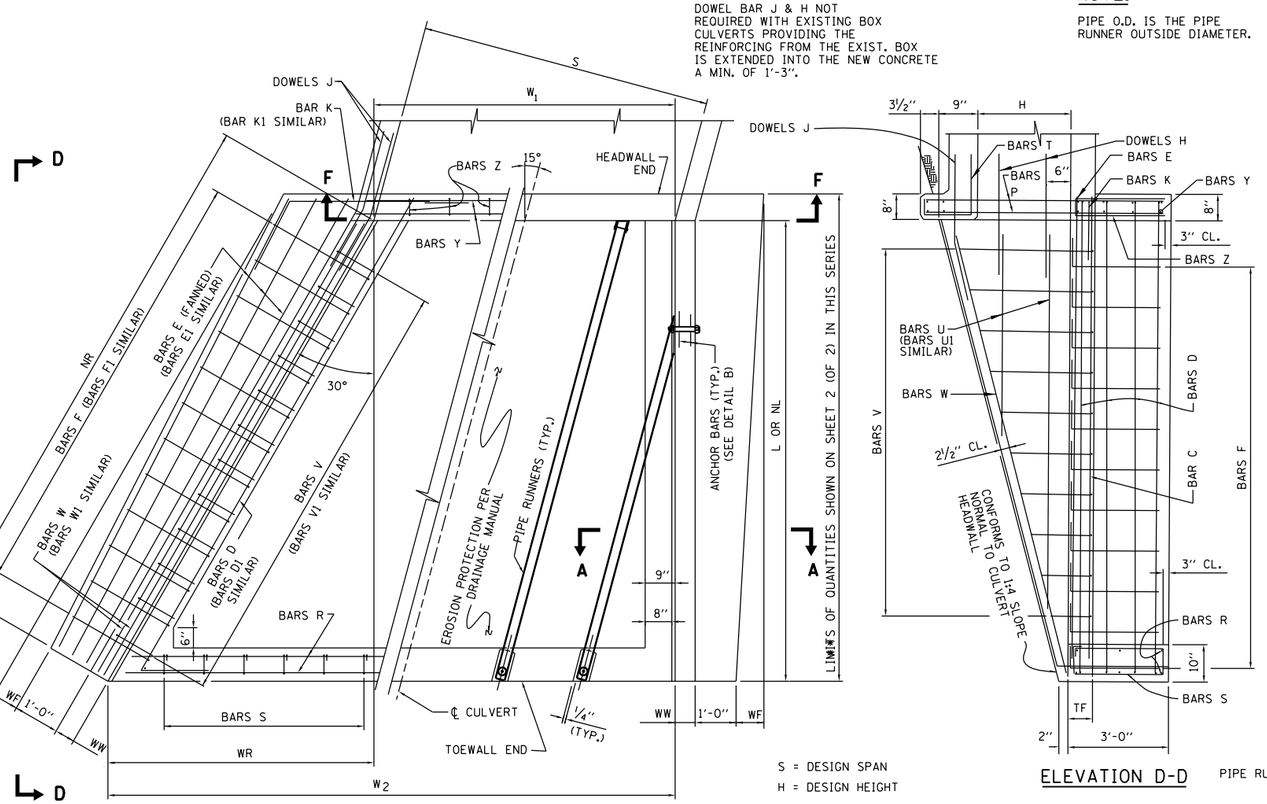
A ¾"Ø X 9½" BOLT WITH ADDITIONAL PL WASHER PLACED IN A ⅞"Ø HOLE DRILLED THROUGH THE HEADWALL OR A ¾"Ø X 8" THREADED ROD EPOXY GROUTED IN A ⅞"Ø HOLE WITH A MINIMUM EMBEDMENT OF 6⅝" MAY BE USED IN LIEU OF CAST-IN-PLACE BOLT SHOWN.



ELEVATION AT HEADWALL

NOTE:

DOWEL BAR J & H NOT REQUIRED WITH EXISTING BOX CULVERTS PROVIDING THE REINFORCING FROM THE EXIST. BOX IS EXTENDED INTO THE NEW CONCRETE A MIN. OF 1'-3".



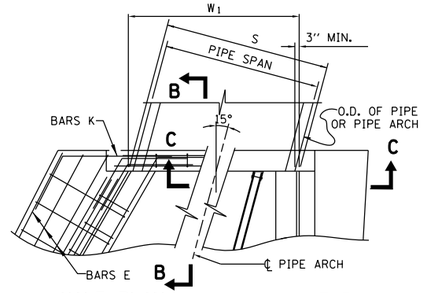
HALF PLAN
SHOWING REINFORCING BARS

HALF PLAN
SHOWING DIMENSIONS

DOWEL BARS EXTENDING ** INTO THE CONCRETE BOX CULVERT ARE INCLUDED IN THE QUANTITIES.

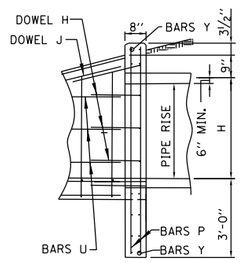
S = DESIGN SPAN
H = DESIGN HEIGHT

ELEVATION D-D



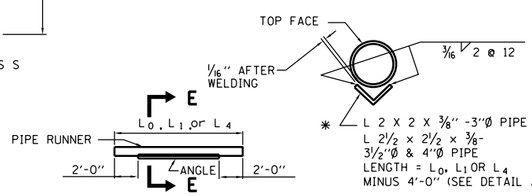
HALF PLAN
SHOWING REINFORCING BARS

HALF PLAN
SHOWING DIMENSIONS



SECTION B-B

FOR PIPE AND PIPE-ARCH CULVERTS



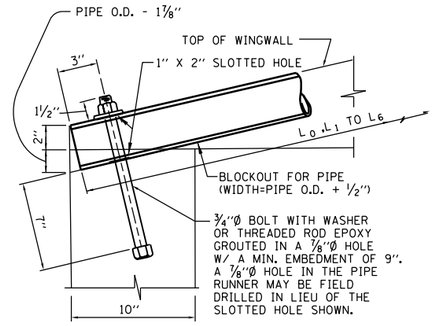
DETAIL A

SECTION E - E

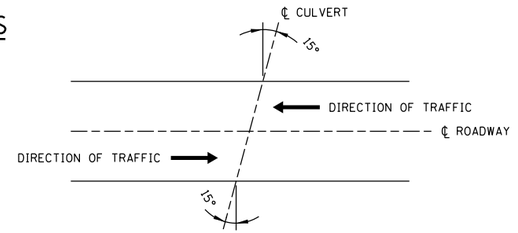
PIPE RUNNER DETAILS

*NOTE:

WHERE L_0, L_1 OR L_4 EXCEEDS THE FOLLOWING LENGTH THE PIPE RUNNER SHALL BE STRENGTHENED OVER MIDSPAN AS SHOWN.



SECTION THRU TOEWALL



CULVERT SKEW ORIENTATION

FOR BOX CULVERTS

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS SI.
2. ALL EXPOSED CONCRETE EDGES SHALL HAVE A ¾" x 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW FINISHED GROUND LEVEL. COVER FROM THE FACE OF CONCRETE TO THE FACE OF REINFORCEMENT BARS SHALL BE 2", UNLESS OTHERWISE SHOWN.
3. CONCRETE QUANTITIES SHOWN ON SHEET 2 (OF 2) IN THIS SERIES ARE FOR REINFORCED CONCRETE BOX CULVERT SECTIONS AND ADDITIONAL CONCRETE REQUIRED IN HEADWALLS FOR PIPE OR ARCH CULVERT SECTIONS SHALL BE ADDED TO THESE QUANTITIES.
4. THIS STANDARD MAY BE USED FOR CULVERTS WITH SKEW OF 15° ± 7.5°, AS SHOWN PER CULVERT SKEW ORIENTATION ON THIS SHEET.
5. DESIGN: SAFETY PIPE RUNNERS ARE DESIGNED FOR A TRANSVERSING LOAD OF 1,800 POUNDS AT YIELD AS RECOMMENDED BY RESEARCH REPORT 280-1, SAFETY TREATMENT OF ROADSIDE CROSS DRAINAGE STRUCTURES, TEXAS TRANSPORTATION INSTITUTE, MARCH 1981.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
7. FOR EROSION PROTECTION SEE STANDARD B19.

PIPE	LENGTH
3"Ø, SCH. 40	12'-8"
3½"Ø, SCH. 40	17'-3"
3½"Ø, SCH. 80	22'-1"
4"Ø, SCH. 40	22'-6"
4"Ø, SCH. 80	29'-4"

Paul Kovacs
APPROVED . . . . . DATE 6-1-2009
CHIEF ENGINEER

SHEET 1 OF 2

Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
6-1-2009	REVISED NOTES
3-1-2010	MODIFIED CULVERT SKEW DETAIL, REVISED
	EROSION PROTECTION AND NOTES
2-7-2012	REVISED TABLE QUANTITIES

SAFETY END TREATMENT FOR SINGLE AND MULTIPLE CULVERTS 15° SKEW 1:4 SLOPE H ≤ 8'

STANDARD B16-03

TABLE OF DIMENSIONS										
H	S	L	NL	NR	WW	W_1 (4)	W_2 (4)	WR	WF	TF
3′	9′	14′-4″	14′-4″	16′-6⅝″	7″	9′-3¾″	17′-7″	8′-3¼″	3″	7″
4′	9′	18′-4″	18′-4″	21′-2″	7″	9′-3¾″	19′-10¾″	10′-7″	9″	8″
5′	5′	22′-4″	22′-4″	25′-9½″	7″	5′-2″	18′-0¾″	12′-10¾″	1′-3″	8″
6′	6′	26′-4″	26′-4″	30′-4⅞″	7″	6′-2½″	21′-5″	15′-2½″	1′-9″	8½″
7′	7′	30′-4″	30′-4″	35′-0¼″	7″	7′-3″	24′-9″	17′-6″	2′-3″	9″
8′	8′	34′-4″	34′-4″	39′-7¾″	8″	8′-3½″	28′-1¼″	19′-9¾″	2′-9″	9½″

PIPE RUNNERS FOR ONE END													
			WINGWALL PIPES - ONE PER EACH LENGTH SHOWN						HEADWALL PIPE			
			0° WALL			30° WALL						
H	SIZE (DIA.)	SCHEDULE	L_1	L_2	L_3	L_4	L_5	L_6	S	NO.	Lo	TOTAL LENGTH
3′	3″	40	10′-0″	-	-	10′-8″	-	-	9′	4	15′-1″	81.00
4′	3″	40	14′-3″	-	-	14′-11″	6′-2″	-	9′	4	19′-4″	112.67
5′	3½″	40	18′-6″	8′-3″	-	19′-2″	10′-5″	-	5′	2	23′-7″	103.50
6′	3½″	80	22′-9″	12′-6″	-	23′-5″	14′-8″	5′-9″	6′	3	28′-0″	162.08
7′	4″	40	27′-0″	16′-9″	6′-7″	27′-8″	18′-11″	10′-0″	7′	3	32′-3″	203.67
8′	4″	80	31′-3″	21′-0″	10′-10″	31′-11″	23′-2″	14′-3″	8′	4	36′-6″	277.42

TABLE OF REINFORCING STEEL FOR ONE END										
	1-BAR C 30° WALL		1-BAR C1 0° WALL		BAR D 4-#4 30° WALL	BAR D1 4-#4 0° WALL	#4-BARS E 30° WALL (6)		#4-BARS E1 0° WALL (6)	
H	SIZE	LENGTH	SIZE	LENGTH	LENGTH	LENGTH	NO.	LENGTH	NO.	LENGTH
3′	#4	16′-11″	#4	14′-8″	18′-10″	16′-7″	2	18′-4″	2	16′-2″
4′	#4	21′-7″	#4	18′-8″	23′-6″	20′-7″	2	23′-0″	2	20′-2″
5′	#4	22′-2″	#4	22′-8″	24′-1″	24′-7″	2	27′-7″	2	24′-2″
6′	#4	30′-9″	#4	26′-8″	32′-8″	28′-7″	3	32′-3″	3	28′-2″
7′	#5	35′-5″	#5	30′-8″	37′-4″	32′-7″	3	36′-10″	3	32′-2″
8′	#5	40′-0″	#5	34′-8″	41′-11″	36′-7″	3	41′-6″	3	36′-2″

	TOTAL QUANTITIES ONE END MINIMUM "S"			INCREASE IN QUANTITIES FOR 1′ INCREASE IN "S"	
H	S	CONC. CU. YD.	RE-BARS LBS.	CONC. CU. YD.	RE-BARS LBS.
3′	9′	7.1	926	0.20	30
4′	9′	9.8	1153	0.20	30
5′	5′	12.0	1140	0.20	30
6′	6′	15.7	1639	0.20	30
7′	7′	20.1	1962	0.20	30
8′	8′	26.3	2482	0.20	30

TABLE OF REINFORCING STEEL FOR ONE END																													
	BARS F EQUALLY SPACED 30° WALL							BARS F1 EQUALLY SPACED 0° WALL							DOWELS H #5 @ 12″ 30° WALL		DOWELS H1 #5 @ 12″ 0° WALL		DOWELS J 4-#6 (5)	1-BAR K 30° WALL			1-BAR K1 0° WALL			2-BARS W 30° WALL		2-BARS W1 0° WALL	
H	SIZE	NO.	C_1	C_2	C_3	C_4	LENGTH	SIZE	NO.	C_1	C_2	C_3	C_4	LENGTH	NO.	LENGTH	NO.	LENGTH	LENGTH	SIZE	C_5	LENGTH	SIZE	C_6	LENGTH	SIZE	LENGTH	SIZE	LENGTH
3′	#4	7	1′-11″	2′-1″	2′-0″	2′-0″	9′-2″	#4	7	1′-11″	2′-1″	2′-0″	2′-0″	9′-2″	3	3′-0″	3	3′-0″	4′-6″	#5	3′-11″	5′-5″	#5	3′-9″	5′-3″	#5	16′-9″	#5	14′-6″
4′	#4	9	1′-11″	2′-7″	2′-3″	2′-3″	9′-8″	#4	9	1′-11″	2′-7″	2′-3″	2′-3″	9′-8″	4	3′-0″	4	3′-0″	4′-6″	#5	4′-6″	6′-0″	#5	4′-3″	5′-9″	#6	21′-6″	#6	18′-7″
5′	#4	11	1′-11″	3′-1″	2′-6″	2′-6″	10′-2″	#4	11	1′-11″	3′-1″	2′-6″	2′-6″	10′-2″	5	3′-0″	5	3′-0″	4′-6″	#5	5′-1″	6′-7″	#5	4′-9″	6′-3″	#6	26′-3″	#6	22′-9″
6′	#5	13	1′-11″	3′-8″	2′-9″	2′-10″	10′-9″	#5	13	1′-11″	3′-6″	2′-8″	2′-9″	10′-7″	6	3′-0″	6	3′-0″	4′-6″	#5	5′-8″	7′-2″	#5	5′-3″	6′-9″	#6	31′-10″	#6	26′-11″
7′	#5	15	2′-0″	4′-3″	3′-1″	3′-2″	11′-5″	#5	15	2′-0″	4′-1″	3′-0″	3′-1″	11′-3″	7	3′-0″	7	3′-0″	4′-6″	#5	6′-3″	7′-9″	#5	5′-9″	7′-3″	#6	35′-9″	#6	31′-0″
8′	#6	18	2′-1″	4′-10″	3′-5″	3′-6″	12′-1″	#6	17	2′-1″	4′-8″	3′-4″	3′-5″	11′-11″	8	3′-0″	8	3′-0″	4′-6″	#5	6′-10″	8′-4″	#5	6′-3″	7′-9″	#6	40′-6″	#6	35′-2″

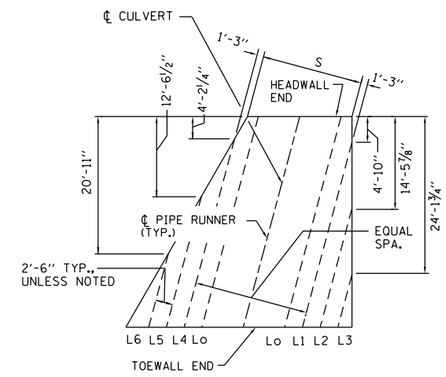
TABLE OF REINFORCING STEEL FOR ONE END																															
	BARS U- ONE PER EACH LENGTH SHOWN #4 @ 12″ 30° WALL								BARS U1 - ONE PER EACH LENGTH SHOWN #4 @ 12″ 0° WALL								BARS V #4-EQUALLY SPACED 30° WALL							BARS V1 #4-EQUALLY SPACED 0° WALL						
H	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}	C_{14}	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}	C_{14}	NO.	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	LENGTH	NO.	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	LENGTH
3′	5′-1″	9′-8″	14′-3″	-	-	-	-	-	4′-4″	8′-4″	12′-4″	-	-	-	-	-	8	3′-10″	9″	2′-2″	2′-5″	1′-0″	6′-7″	7	3′-10″	9″	2′-2″	2′-5″	1′-0″	6′-7″
4′	5′-1″	9′-8″	14′-3″	18′-11″	-	-	-	-	4′-4″	8′-4″	12′-4″	16′-4″	-	-	-	-	11	4′-11″	10″	2′-9″	3′-0″	1′-0″	7′-9″	9	4′-11″	10″	2′-9″	3′-0″	1′-0″	7′-9″
5′	5′-1″	9′-8″	14′-3″	18′-11″	23′-6″	-	-	-	4′-4″	8′-4″	12′-4″	16′-4″	20′-4″	-	-	-	13	5′-11″	10″	3′-3″	3′-6″	1′-0″	8′-9″	11	5′-11″	10″	3′-3″	3′-6″	1′-0″	8′-9″
6′	5′-1″	9′-8″	14′-3″	18′-11″	23′-6″	28′-1″	-	-	4′-4″	8′-4″	12′-4″	16′-4″	20′-4″	24′-4″	-	-	15	6′-11″	10″	3′-9″	4′-0″	1′-0″	9′-9″	13	6′-11″	10″	3′-9″	4′-0″	1′-0″	9′-9″
7′	5′-1″	9′-8″	14′-3″	18′-11″	23′-6″	28′-1″	32′-9″	-	4′-4″	8′-4″	12′-4″	16′-4″	20′-4″	24′-4″	28′-4″	-	17	8′-0″	11″	4′-4″	4′-7″	1′-0″	10′-11″	15	8′-0″	11″	4′-4″	4′-7″	1′-0″	10′-11″
8′	5′-1″	9′-8″	14′-3″	18′-11″	23′-6″	28′-1″	32′-9″	37′-4″	4′-4″	8′-4″	12′-4″	16′-4″	20′-4″	24′-4″	28′-4″	32′-4″	20	9′-0″	11″	4′-10″	5′-1″	1′-1″	12′-1″	17	9′-0″	11″	4′-10″	5′-1″	1′-1″	12′-1″

TABLE OF REINFORCING STEEL FOR MINIMUM "S" - ONE END										
		BARS Y 12-#5 (2)	BARS R 6-#5 (2)	BARS Z #4 @ 12″ (1)		BARS S #4 @ 12″ (1)		BARS T #4 @ 12″ (1)		BARS P 8-#5 (3)
H	S	LENGTH	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	LENGTH
3′	≧9′	10′-3″	17′-1″	10	5′-4″	16	6′-10″	10	3′-0″	6′-8″
4′	≧9′	10′-3″	19′-5″	10	5′-4″	18	6′-10″	10	3′-0″	7′-8″
5′	≧5′	6′-1″	17′-7″	6	5′-4″	16	6′-10″	6	3′-0″	8′-8″
6′	≧6′	7′-2″	20′-11″	7	5′-4″	20	6′-10″	7	3′-0″	9′-8″
7′	≧7′	8′-2″	24′-3″	8	5′-4″	23	6′-10″	8	3′-0″	10′-8″
8′	≧8′	9′-4″	27′-8″	9	5′-4″	26	6′-10″	9	3′-0″	11′-8″

NUMBER OF HEADWALL PIPE RUNNERS FOR 1 END			
S	NO.	S	NO.
10′	4	23′	10
11′	5	24′	10
12′	5	25′	10
13′	6	26′	11
14′	6	27′	11
15′	6	28′	12
16′	7	29′	12
17′	7	30′	12
18′	8	31′	13
19′	8	32′	13
20′	8	33′	14
21′	9	34′	14
22′	9	35′	14

NOTE:

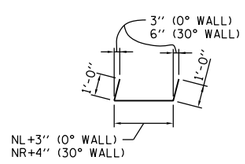
REINFORCEMENT BAR BENDING DIMENSIONS ARE OUT TO OUT.



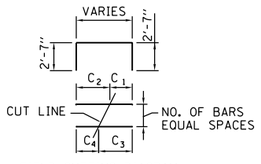
PIPE RUNNER LAYOUT

NOTES FOR TABLES:

1. THE NUMBER OF BARS S, T AND Z SHALL BE INCREASED BY 1 FOR EACH 1 FOOT OF INCREASE IN DIMENSION "W_1"
2. THE LENGTH OF BARS R AND Y SHALL BE INCREASED BY 1′-½″ FOR EACH 1 FOOT OF INCREASE IN DIMENSION "S"
3. THE NUMBER OF BARS P SHOWN ARE FOR SINGLE SPAN PIPES OR BOX CULVERTS. THIS NUMBER SHALL BE INCREASED BY 4 FOR EACH MULTIPLE OF PIPE OR BOX ADDED.
4. THIS DIMENSION SHALL BE INCREASED BY 1′-½″ INCHES FOR EACH 1 FOOT INCREASE IN DIMENSION "S".
5. 2 BARS FOR 30° WALL, 2 BARS FOR 0° WALL
6. THE LENGTH OF THIS BAR INCLUDES ONE 1′-6″ MINIMUM LAP.

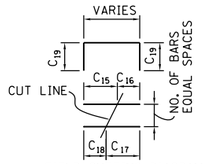


BARS D



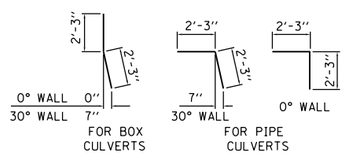
FIELD CUTTING DIAGRAM

BARS F AND F1

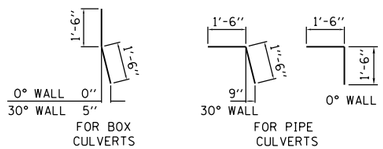


FIELD CUTTING DIAGRAM

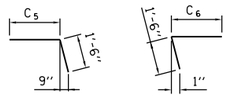
BARS V AND V1



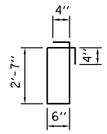
DOWELS J



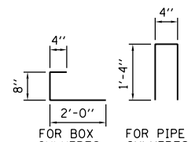
DOWELS H AND H1



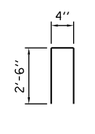
BARS K BARS K1



BARS S



BARS T



BARS Z

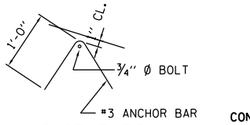
SHEET 2 OF 2

Illinois Tollway
Open Roads for a Faster Future

SAFETY END TREATMENT FOR SINGLE AND MULTIPLE CULVERTS 15° SKEW 1:4 SLOPE H ≤ 8′

STANDARD B16-03

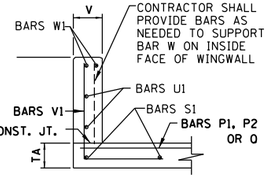
Paul Kovacs
APPROVED . . . . . DATE 6-1-2009
CHIEF ENGINEER



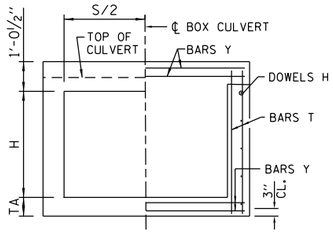
ANCHOR BARS

CONTRACTOR SHALL PROVIDE 2-#3 ANCHOR BARS PER SIDEWALL BOLT.

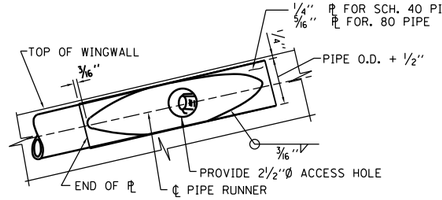
DETAIL B



SECTION A - A



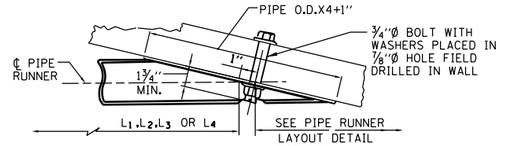
SECTION D-D



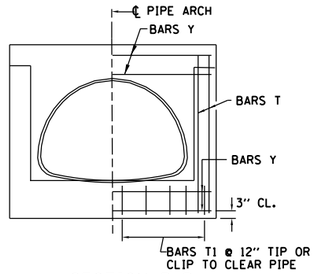
ELEVATION AT WING

NOTE:

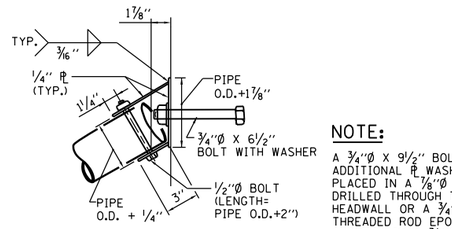
PIPE O.D. IS THE PIPE RUNNER OUTSIDE DIAMETER



SECTION AT WING



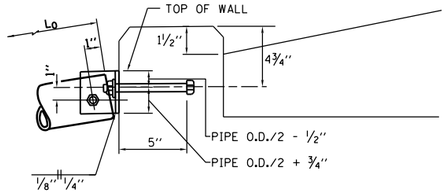
SECTION B-B



PLAN AT HEADWALL

NOTE:

A ¾"Ø X 9½" BOLT WITH ADDITIONAL ℙ WASHER PLACED IN A ⅞"Ø HOLE DRILLED THROUGH THE HEADWALL OR A ¾"Ø × 8" THREADED ROD EPOXY GROUTED IN A ⅞"Ø HOLE WITH A MIN. EMBEDMENT OF 6⅝" MAY BE USED IN LIEU OF CAST-IN-PLACE BOLT SHOWN.



ELEVATION AT HEADWALL

NOTE:

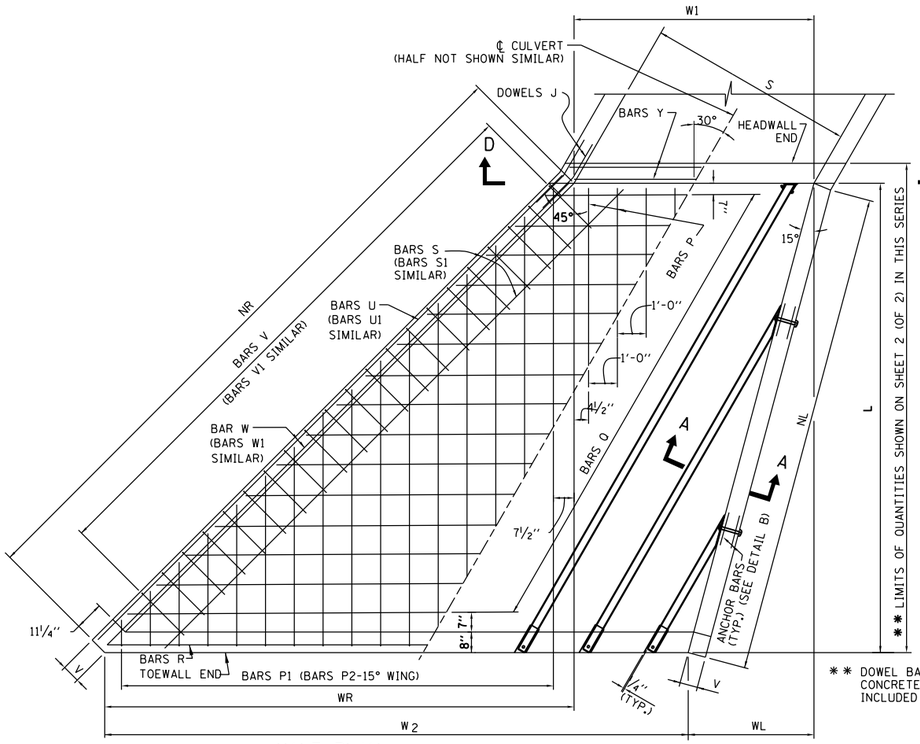
BARS O, V AND V_1 ARE TO BE FIELD CUT PER CUTTING DIAGRAM. PLACE BARS WITH DIMENSIONS C_2-C_3 AND C_9-C_{12} BEGINNING AT HEADWALL AND BARS WITH DIMENSIONS C_1-C_4 AND C_{10}-C_{11} BEGINNING AT THE TOEWALL END.

NOTE:

BARS P1 ARE TO BE FIELD CUT PER CUTTING DIAGRAM. PLACE BARS WITH DIMENSIONS C_6-C_7 BEGINNING AT THE TOEWALL END OF 45° WINGWALL AND BARS WITH DIMENSIONS C_5 -C_8 BEGINNING PARALLEL TO THE P BARS. PLACE BARS P2 PARALLEL TO THE P BARS BEGINNING WITH THE SHORTEST BARS AT THE HEADWALL END OF THE 15° WINGWALL.

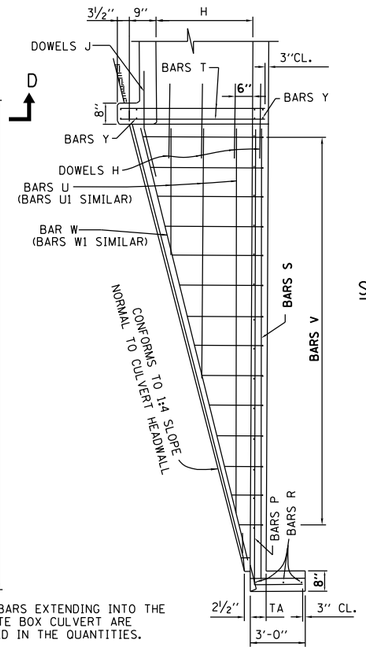
NOTE:

DOWEL BAR J & H NOT REQUIRED WITH EXISTING BOX CULVERTS PROVIDING THE REINFORCING FROM THE EXIST. BOX IS EXTENDED INTO THE NEW CONCRETE A MIN. OF 1'-3".



HALF PLAN SHOWING REINFORCING BARS

HALF PLAN SHOWING DIMENSIONS



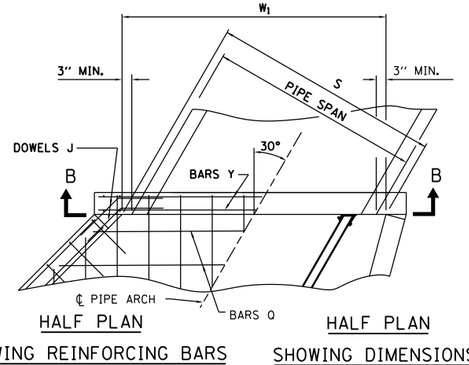
ELEVATION

** DOWEL BARS EXTENDING INTO THE CONCRETE BOX CULVERT ARE INCLUDED IN THE QUANTITIES.

S = DESIGN SPAN

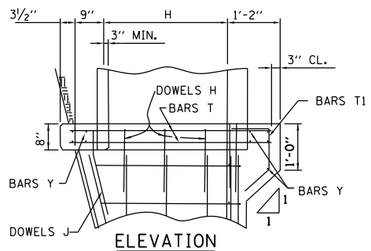
H = DESIGN HEIGHT

BOX CULVERT DETAILS



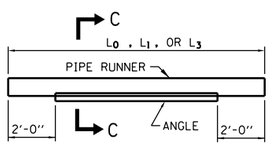
HALF PLAN SHOWING REINFORCING BARS

HALF PLAN SHOWING DIMENSIONS

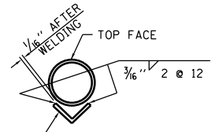


ELEVATION

PIPE ARCH DETAILS



DETAIL A



* L 2 X 2 X ⅜" - 3"Ø PIPE LENGTH = L_0, L_1 OR L_3 MINUS 4'-0" (SEE DETAIL A)

SECTION C-C

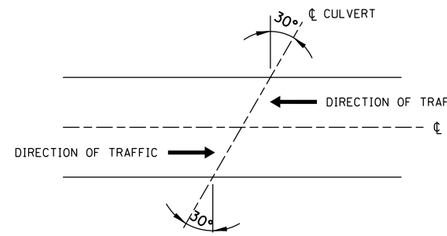
PIPE RUNNER DETAILS

*** NOTE:**

WHERE L_0 , L_1 , OR L_3 EXCEEDS THE FOLLOWING LENGTH, THE PIPE RUNNER SHALL BE STRENGTHENED OVER THE MIDSPAN AS SHOWN.

PIPE	LENGTH
3" Ø SCH 40	12'-8"
3" Ø SCH 80	15'-4"

SECTION THRU TOEWALL



CULVERT SKEW ORIENTATION

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS SI.
2. ALL EXPOSED CONCRETE EDGES SHALL HAVE A ¾" x 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW FINISHED GROUND LEVEL. COVER FROM THE FACE OF CONCRETE TO THE FACE OF REINFORCEMENT BARS SHALL BE 2", UNLESS OTHERWISE SHOWN.
3. CONCRETE QUANTITIES SHOWN ON SHEET 2 (OF 2) IN THIS SERIES ARE FOR REINFORCED CONCRETE BOX CULVERT SECTIONS AND ADDITIONAL CONCRETE REQUIRED IN HEADWALLS FOR PIPE OR ARCH CULVERT SECTIONS SHALL BE ADDED TO THESE QUANTITIES.
4. THIS STANDARD MAY BE USED FOR CULVERTS WITH SKEW OF 30° ± 7.5°, AS SHOWN PER CULVERT SKEW ORIENTATION ON THIS SHEET.
5. DESIGN: SAFETY PIPE RUNNERS ARE DESIGNED FOR A TRANSVERSING LOAD OF 1,800 POUNDS AT YIELD AS RECOMMENDED BY RESEARCH REPORT 280-1, SAFETY TREATMENT OF ROADSIDE CROSS DRAINAGE STRUCTURES, TEXAS TRANSPORTATION INSTITUTE, MARCH 1981.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
7. FOR EROSION PROTECTION SEE STANDARD B19.

Paul Kovacs
APPROVED . . . . . DATE 6-1-2009
CHIEF ENGINEER

DATE	REVISIONS
6-1-2009	REVISED NOTES
3-1-2010	MODIFIED CULVERT SKEW DETAIL, REVISED EROSION PROTECTION AND NOTES
2-7-2012	REVISED TABLE QUANTITIES

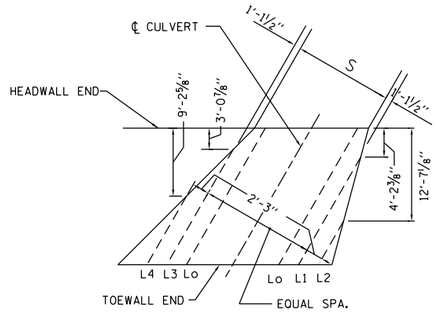
Illinois Tollway
Open Roads for a Faster Future

SAFETY END TREATMENT FOR SINGLE CULVERTS 30° SKEW 1:4 SLOPE H ≤ 4'

STANDARD B17-03

CULVERT SIZE (FEET)	TABLE OF DIMENSIONS								
S X H	L	NL	NR	V	W 1	W 2	WL	WR	TA
3 x 2	10'-10"	11'-2⅝"	15'-3⅞"	7"	3'-5⅝"	11'-4¾"	2'-10⅞"	10'-10"	6"
3 x 3	14'-10"	15'-4¼"	20'-11¾"	7"	3'-5⅝"	14'-3⅞"	3'-11¾"	14'-10"	6"
4 x 2	10'-10"	11'-2⅝"	15'-3⅞"	7"	4'-7⅜"	12'-6½"	2'-10⅞"	10'-10"	6"
4 x 3	14'-10"	15'-4¼"	20'-11¾"	7"	4'-7⅜"	15'-5⅝"	3'-11¾"	14'-10"	6"
4 x 4	18'-10"	19'-6"	26'-7⅝"	7"	4'-7⅜"	18'-4⅞"	5'-0½"	18'-10"	6"
5 x 2	10'-10"	11'-2⅝"	15'-3⅞"	7"	5'-9¼"	13'-8⅜"	2'-10⅞"	10'-10"	6"
5 x 3	14'-10"	15'-4¼"	20'-11¾"	7"	5'-9¼"	16'-7½"	3'-11¾"	14'-10"	6"
5 x 4	18'-10"	19'-6"	26'-7⅝"	7"	5'-9¼"	19'-6¾"	5'-0½"	18'-10"	6"
6 x 3	14'-10"	15'-4¼"	20'-11¾"	7"	6'-11⅛"	17'-9⅜"	3'-11¾"	14'-10"	6"
6 x 4	18'-10"	19'-6"	26'-7⅝"	7"	6'-11⅛"	20'-8⅝"	5'-0½"	18'-10"	6"
7 x 3	14'-10"	15'-4¼"	20'-11¾"	7"	8'-1"	18'-11¼"	3'-11¾"	14'-10"	6½"
7 x 4	18'-10"	19'-6"	26'-7⅝"	7"	8'-1"	21'-10½"	5'-0½"	18'-10"	6½"
8 x 4	18'-10"	19'-6"	26'-7⅝"	7"	9'-2⅞"	23'-0⅜"	5'-0½"	18'-10"	7"

PIPE RUNNERS FOR ONE END SIZE 3" DIA.						
SCHEDULE	HEADWALL PIPE		WINGWALL PIPE -ONE PER EACH LENGTH SHOWN			
			15° WALL		45° WALL	
	NO.	L_0	L_1	L_2	L_3	L_4
40	2	12'-10"	7'-10"	-	9'-2"	-
40	2	17'-8"	12'-6"	-	13'-11"	6'-7"
40	2	12'-10"	7'-10"	-	9'-2"	-
40	2	17'-8"	12'-6"	-	13'-11"	6'-7"
80	2	22'-4"	17'-3"	7'-4"	18'-7"	11'-4"
40	3	12'-10"	7'-10"	-	9'-2"	-
40	3	17'-8"	12'-6"	-	13'-11"	6'-7"
80	3	22'-4"	17'-3"	7'-4"	18'-7"	11'-4"
40	3	17'-8"	12'-6"	-	13'-11"	6'-7"
80	3	22'-4"	17'-3"	7'-4"	18'-7"	11'-4"
40	4	17'-8"	12'-6"	-	13'-11"	6'-7"
80	4	22'-4"	17'-3"	7'-4"	18'-7"	11'-4"
80	4	22'-4"	17'-3"	7'-4"	18'-7"	11'-4"



PIPE RUNNER LAYOUT

CULVERT SIZE (FEET)	TABLE OF REINFORCING STEEL FOR ONE END																										
	DOWELS H #4 @ 12" 2'-6" LG.		DOWELS J #4 @ 12" 4'-0" LG.		BARS P #4 @ 12"		BARS P1 #4 @ 12"					BARS P2 - ONE PER EACH LENGTH SHOWN #4 @ 12"					BARS Q #4 @ 12"						BARS R 3-#4	BARS S 45° WALL 2-#4	Bars S1 15° WALL 2-#4	BARS U - ONE PER EACH LENGTH SHOWN #4 @ 12"			
												LENGTH														45° WALL			
S X H	NO. *	NO. **	NO. *	NO.**	NO.	LENGTH	NO.	C_5	C_6	C_7	C_8	LENGTH	a_1	a_2	a_3	a_4	a_5	NO.	C_1	C_2	C_3	C_4	LENGTH	LENGTH	LENGTH	LENGTH	a_6	a_7	a_8	a_9
3 x 2	3	3	2	2	1	13'-1"	5	10'-6"	1'-6"	5'-6"	6'-6"	17'-2"	5'-4"	9'-1"	-	-	-	5	11'-6"	4'-11"	7'-10"	8'-7"	16'-5"	11'-10"	14'-10"	11'-0"	6'-2"	11'-10"	-	-
3 x 3	4	4	2	2	0	-	7	14'-6"	1'-6"	7'-6"	8'-6"	21'-2"	5'-4"	9'-1"	12'-10"	-	-	7	14'-5"	4'-11"	9'-4"	10'-0"	19'-4"	14'-9"	20'-6"	15'-2"	6'-2"	11'-10"	17'-6"	-
4 x 2	3	3	2	2	2	13'-1"	5	10'-6"	1'-6"	5'-6"	6'-6"	17'-2"	2'-3"	6'-0"	9'-9"	-	-	5	12'-8"	6'-1"	9'-0"	9'-9"	18'-9"	13'-0"	14'-10"	11'-0"	6'-2"	11'-10"	-	-
4 x 3	4	4	2	2	1	17'-1"	7	14'-6"	1'-6"	7'-6"	8'-6"	21'-2"	2'-3"	6'-0"	9'-9"	13'-6"	-	7	15'-7"	6'-1"	10'-6"	11'-2"	21'-8"	15'-11"	20'-6"	15'-2"	6'-2"	11'-10"	17'-6"	-
4 x 4	5	5	2	2	0	-	9	18'-6"	1'-6"	9'-6"	10'-6"	25'-2"	2'-3"	6'-0"	9'-9"	13'-6"	17'-3"	9	18'-6"	6'-1"	11'-11"	12'-8"	24'-7"	18'-10"	26'-2"	19'-4"	6'-2"	11'-10"	17'-6"	23'-1"
5 x 2	3	3	2	2	3	13'-1"	5	10'-6"	1'-6"	5'-6"	6'-6"	17'-2"	2'-10"	6'-7"	10'-4"	-	-	5	13'-10"	7'-3"	10'-2"	10'-11"	21'-1"	14'-2"	14'-10"	11'-0"	6'-2"	11'-10"	-	-
5 x 3	4	4	2	2	2	17'-1"	7	14'-6"	1'-6"	7'-6"	8'-6"	21'-2"	2'-10"	6'-7"	10'-4"	14'-0"	-	7	16'-9"	7'-3"	11'-8"	12'-4"	24'-0"	17'-1"	20'-6"	15'-2"	6'-2"	11'-10"	17'-6"	-
5 x 4	5	5	2	2	1	21'-1"	9	18'-6"	1'-6"	9'-6"	10'-6"	25'-2"	2'-10"	6'-7"	10'-4"	14'-0"	17'-9"	9	19'-8"	7'-3"	13'-1"	13'-10"	26'-11"	20'-0"	26'-2"	19'-4"	6'-2"	11'-10"	17'-6"	23'-1"
6 x 3	4	4	2	2	3	17'-1"	7	14'-6"	1'-6"	7'-6"	8'-6"	21'-2"	3'-4"	7'-1"	10'-10"	14'-7"	-	7	17'-11"	8'-4"	12'-9"	13'-6"	26'-3"	18'-3"	20'-6"	15'-2"	6'-2"	11'-10"	17'-6"	-
6 x 4	5	5	2	2	2	21'-1"	9	18'-6"	1'-6"	9'-6"	10'-6"	25'-2"	3'-4"	7'-1"	10'-10"	14'-7"	18'-3"	9	20'-10"	8'-4"	14'-3"	14'-11"	29'-2"	21'-2"	26'-2"	19'-4"	6'-2"	11'-10"	17'-6"	23'-1"
7 x 3	4	4	2	2	4	17'-1"	7	14'-6"	1'-6"	7'-6"	8'-6"	21'-2"	4'-0"	7'-9"	11'-5"	15'-2"	-	7	19'-1"	9'-6"	13'-11"	14'-8"	28'-7"	19'-5"	20'-6"	15'-2"	6'-2"	11'-10"	17'-6"	-
7 x 4	5	5	2	2	3	21'-1"	9	18'-6"	1'-6"	9'-6"	10'-6"	25'-2"	4'-0"	7'-9"	11'-5"	15'-2"	18'-6"	9	22'-0"	9'-6"	15'-5"	16'-1"	31'-6"	22'-4"	26'-2"	19'-4"	6'-2"	11'-10"	17'-6"	23'-1"
8 x 4	5	5	2	2	5	21'-1"	9	18'-6"	1'-6"	9'-6"	10'-6"	25'-2"	4'-6"	8'-3"	12'-0"	15'-9"	-	9	23'-1"	10'-8"	16'-6"	17'-3"	33'-9"	23'-6"	26'-2"	19'-4"	6'-2"	11'-10"	17'-6"	23'-1"

CULVERT SIZE (FEET)	TABLE OF REINFORCING STEEL FOR ONE END																										
	BARS U1 - ONE PER EACH LENGTH SHOWN #4 @ 12"				BARS V #4 @ 12"						BARS V1 #4 @ 12"						2 BARS W 45° WALL		2 BARS W1 15° WALL		BARS Y 8-#5	BARS T 8-#5 BOX CULVERT	BARS T 8-#5 PIPE ARCH
	15° WALL				45° WALL						15° WALL														
S X H	a_{10}	a_{11}	a_{12}	a_{13}	No.	C_9	C_{10}	C_{11}	C_{12}	LENGTH	No.	C_9	C_{10}	C_{11}	C_{12}	LENGTH	SIZE	LENGTH	SIZE	LENGTH	LENGTH	LENGTH	LENGTH
3 x 2	4'-6"	8'-7"	-	-	7	2'-9"	6"	1'-6"	1'-9"	6'-3"	5	2'-9"	6"	1'-6"	1'-9"	6'-3"	#5	14'-5"	#5	10'-8"	4'-4"	3'-2"	3'-8"
3 x 3	4'-6"	8'-7"	12'-9"	-	10	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"	#5	20'-2"	#5	14'-11"	4'-4"	4'-2"	4'-8"
4 x 2	4'-6"	8'-7"	-	-	7	2'-9"	6"	1'-6"	1'-9"	6'-3"	5	2'-9"	6"	1'-6"	1'-9"	6'-3"	#5	14'-5"	#5	10'-8"	5'-6"	3'-2"	3'-8"
4 x 3	4'-6"	8'-7"	12'-9"	-	10	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"	#5	20'-2"	#5	14'-11"	5'-6"	4'-2"	4'-8"
4 x 4	4'-6"	8'-7"	12'-9"	16'-11"	13	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"	#6	25'-11"	#6	19'-1"	5'-6"	5'-2"	5'-8"
5 x 2	4'-6"	8'-7"	-	-	7	2'-9"	6"	1'-6"	1'-9"	6'-3"	5	2'-9"	6"	1'-6"	1'-9"	6'-3"	#5	14'-5"	#5	10'-8"	6'-8"	3'-2"	3'-8"
5 x 3	4'-6"	8'-7"	12'-9"	-	10	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"	#5	20'-2"	#5	14'-11"	6'-8"	4'-2"	4'-8"
5 x 4	4'-6"	8'-7"	12'-9"	16'-11"	13	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"	#6	25'-11"	#6	19'-1"	6'-8"	5'-2"	5'-8"
6 x 3	4'-6"	8'-7"	12'-9"	-	10	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"	#5	20'-2"	#5	14'-11"	7'-10"	4'-2"	4'-8"
6 x 4	4'-6"	8'-7"	12'-9"	16'-11"	13	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"	#6	25'-11"	#6	19'-1"	7'-10"	5'-2"	5'-8"
7 x 3	4'-6"	8'-7"	12'-9"	-	10	3'-9"	6"	2'-0"	2'-3"	7'-3"	7	3'-9"	6"	2'-0"	2'-3"	7'-3"	#5	20'-2"	#5	14'-11"	9'-0"	4'-2"	4'-8"
7 x 4	4'-6"	8'-7"	12'-9"	16'-11"	13	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"	#6	25'-11"	#6	19'-1"	9'-0"	5'-2"	5'-8"
8 x 4	4'-6"	8'-7"	12'-9"	16'-11"	13	4'-9"	6"	2'-6"	2'-9"	8'-3"	9	4'-9"	6"	2'-6"	2'-9"	8'-3"	#6	25'-11"	#6	19'-1"	10'-2"	5'-2"	5'-8"

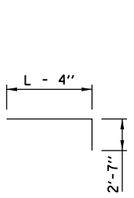
TOTAL QUANTITIES ONE END		
CONC.	RE-BARS	PIPE RUNNERS
CU. YD.	LB.	FT.
3.8	396	41.67
5.8	580	67.17
4.2	430	41.67
6.3	617	67.17
8.8	874	97.83
4.6	460	54.17
6.8	653	84.42
9.4	915	119.83
7.3	688	84.42
9.9	957	119.83
8.0	724	101.67
10.9	999	141.84
12.0	1042	141.84

NOTE:

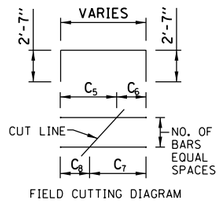
REINFORCEMENT BAR BENDING DIMENSIONS ARE OUT TO OUT.

* 45° WALL

** 15° WALL

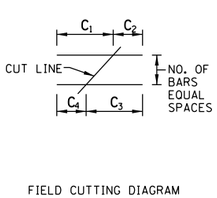


BARS P



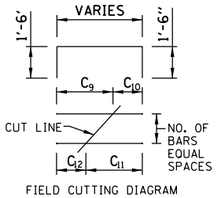
FIELD CUTTING DIAGRAM

BARS P1



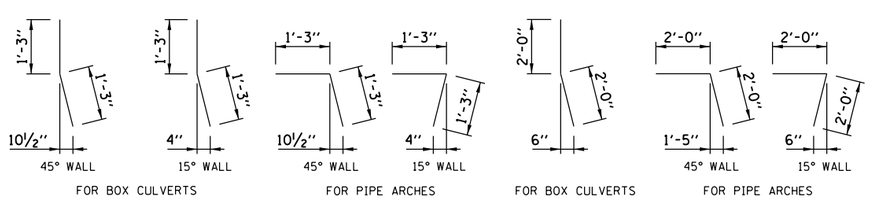
FIELD CUTTING DIAGRAM

BARS Q



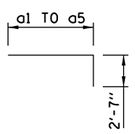
FIELD CUTTING DIAGRAM

BARS V AND V1



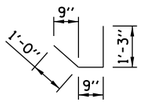
DOWELS H

DOWELS J



BAR P2

PIPE ARCH AND ELLIPTICAL PIPE CULVERTS



FOR PIPE OR ELLIPTICAL PIPE CULVERTS SELECT APPROPRIATE " S " & " H " FROM SIZES SHOWN. ADD THE FOLLOWING ADDITIONAL BARS:

(a) 1 ADDITIONAL Y BAR
(b) #4 - T1 BARS @ APPROX. 12" CTS. (NO. = S+2)

T1 BARS

THE WEIGHT OF THE ADDITIONAL BARS AND THE ADDITIONAL QUANTITY OF CONCRETE IN THE HEADWALL SHALL BE ADDED TO THE QUANTITIES SHOWN.

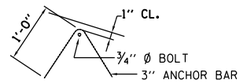
Paul Kovacs
APPROVED..... DATE 6-1-2009
CHIEF ENGINEER

SHEET 2 OF 2

Illinois Tollway
Open Roads for a Faster Future

SAFETY END TREATMENT FOR SINGLE CULVERTS 30° SKEW 1:4 SLOPE H ≤ 4'

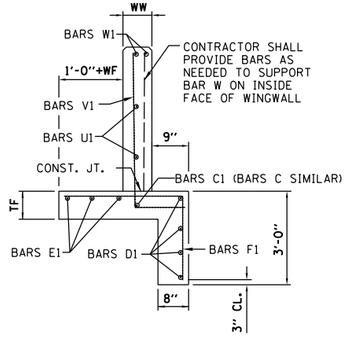
STANDARD B17-03



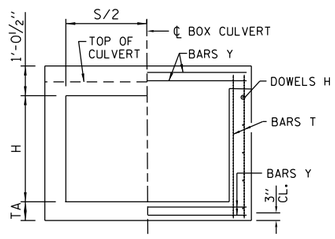
ANCHOR BARS

CONTRACTOR SHALL PROVIDE 2 #3 ANCHOR BARS PER SIDEWALL BOLT

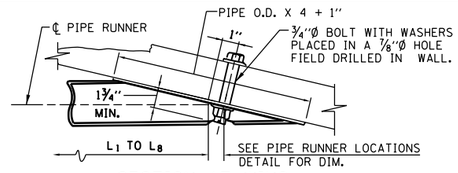
DETAIL B



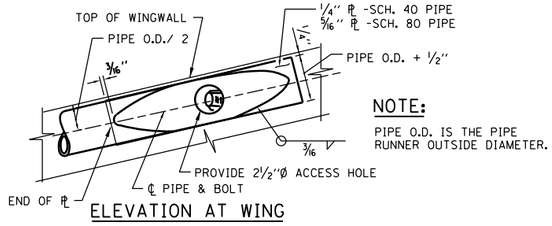
SECTION A-A



SECTION F-F



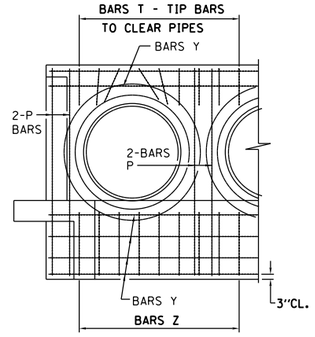
SECTION AT WING



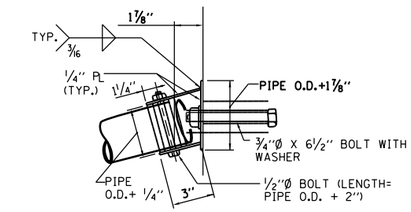
ELEVATION AT WING

NOTE:

PIPE O.D. IS THE PIPE RUNNER OUTSIDE DIAMETER.



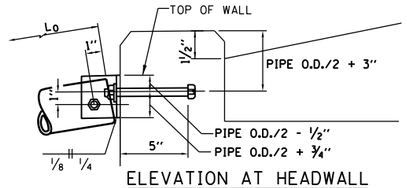
SECTION C-C



PLAN AT HEADWALL

NOTE:

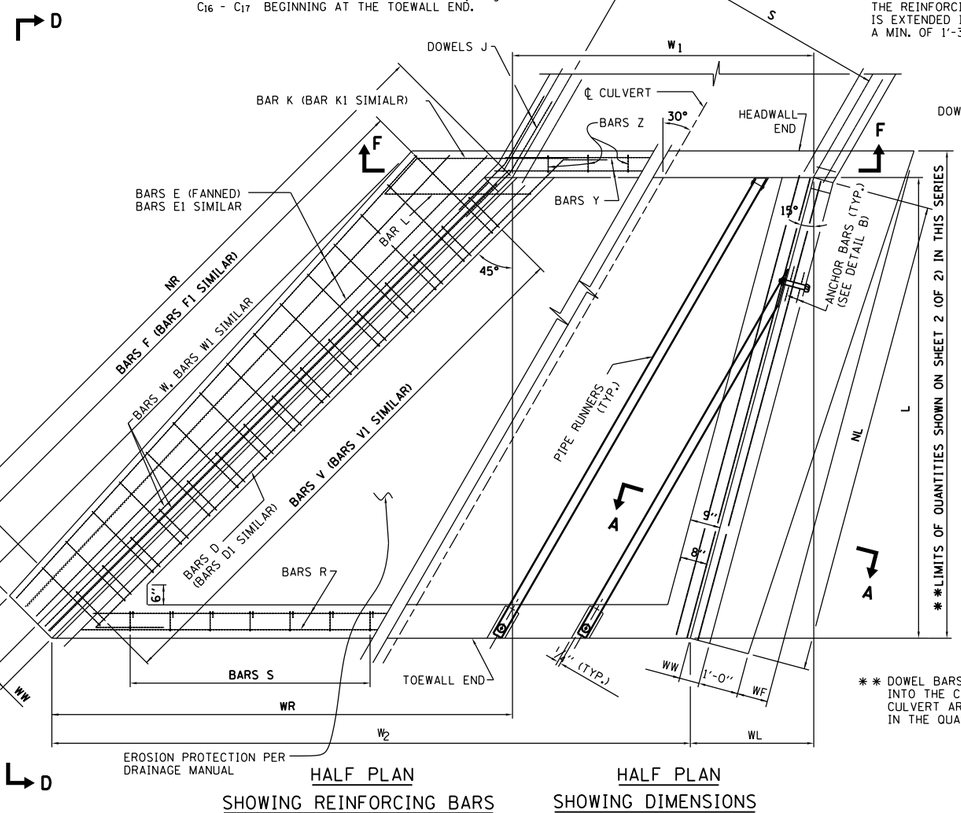
A ¾"Ø x 9½ BOLT WITH ADDITIONAL P WASHER PLACED IN A ⅞"Ø HOLE DRILLED THROUGH THE HEADWALL OR A ¾"Ø x 8" THREADED ROD EPOXY GROUTED IN A ⅞"Ø HOLE WITH A MINIMUM EMBEDMENT OF 6⅜" MAY BE USED IN LIEU OF CAST-IN-PLACE BOLT SHOWN.



ELEVATION AT HEADWALL

NOTE:

BARS F, F1, V & V1 ARE TO BE FIELD CUT PER CUTTING DIAGRAM. PLACE BARS WITH DIMENSIONS C_2 - C_4 ,C_{15} - C_{18} BEGINNING AT HEADWALL & BARS WITH DIMENSIONS C_1 - C_3, C_{16} - C_{17} BEGINNING AT THE TOEWALL END.

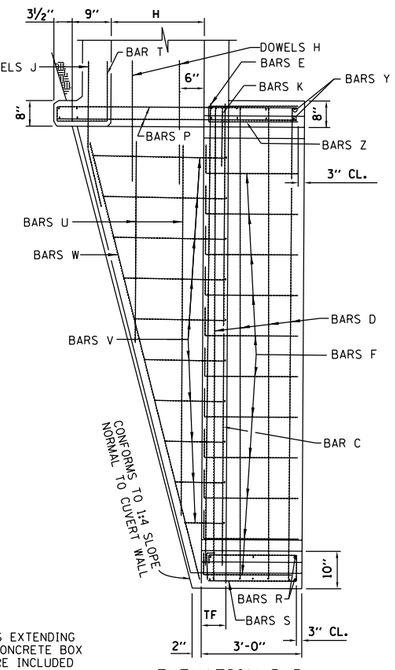


HALF PLAN SHOWING REINFORCING BARS

HALF PLAN SHOWING DIMENSIONS

NOTE:

DOWEL BAR J & H NOT REQUIRED WITH EXISTING BOX CULVERTS PROVIDING THE REINFORCING FROM THE EXIST. BOX IS EXTENDED INTO THE NEW CONCRETE A MIN. OF 1'-3".

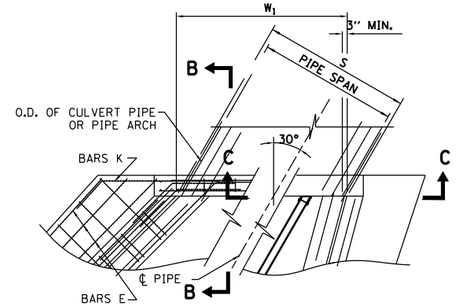


ELEVATION D-D

** DOWEL BARS EXTENDING INTO THE CONCRETE BOX CULVERT ARE INCLUDED IN THE QUANTITIES.

** LIMITS OF QUANTITIES SHOWN ON SHEET 2 (OF 2) IN THIS SERIES

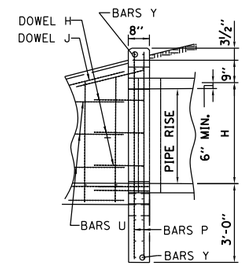
S = DESIGN SPAN
H = DESIGN HEIGHT



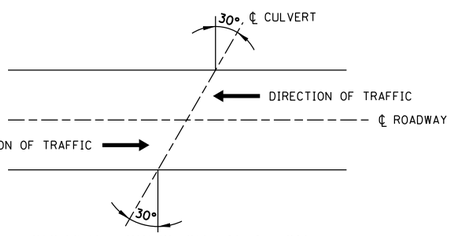
HALF PLAN SHOWING REINFORCING BARS

HALF PLAN SHOWING DIMENSIONS

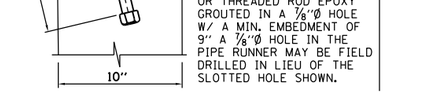
FOR PIPE AND PIPE-ARCH CULVERTS



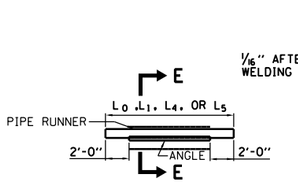
SECTION B-B



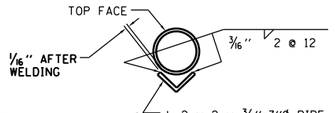
CULVERT SKEW ORIENTATION



SECTION THRU TOEWALL



DETAIL A



SECTION E-E

* NOTE:

WHERE L_0, L_1, L_4 OR L_5 EXCEEDS THE FOLLOWING LENGTH THE PIPE RUNNER SHALL BE STRENGTHENED OVER MIDSPAN AS SHOWN.

PIPE	LENGTH
3"Ø, SCH. 40	12'-8"
3"Ø, SCH. 80	15'-4"
3½"Ø, SCH. 80	22'-1"
4"Ø, SCH. 80	29'-4"

PIPE RUNNER DETAILS

FOR BOX CULVERTS

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS SI.
2. ALL EXPOSED CONCRETE EDGES SHALL HAVE A ¾" x 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW FINISHED GROUND LEVEL. COVER FROM THE FACE OF CONCRETE TO THE FACE OF REINFORCEMENT BARS SHALL BE 2", UNLESS OTHERWISE SHOWN.
3. CONCRETE QUANTITIES SHOWN ON SHEET 2 (OF 2) IN THIS SERIES ARE FOR REINFORCED CONCRETE BOX CULVERT SECTIONS AND ADDITIONAL CONCRETE REQUIRED IN HEADWALLS FOR PIPE OR ARCH CULVERT SECTIONS SHALL BE ADDED TO THESE QUANTITIES.
4. THIS STANDARD MAY BE USED FOR CULVERTS WITH SKEW OF 30° ± 7.5°, AS SHOWN PER CULVERT SKEW ORIENTATION ON THIS SHEET.
5. DESIGN: SAFETY PIPE RUNNERS ARE DESIGNED FOR A TRANSVERSING LOAD OF 1,800 POUNDS AT YIELD AS RECOMMENDED BY RESEARCH REPORT 280-1, SAFETY TREATMENT OF ROADSIDE CROSS DRAINAGE STRUCTURES, TEXAS TRANSPORTATION INSTITUTE, MARCH 1981.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).
7. FOR EROSION PROTECTION SEE STANDARD B19.

Paul Kovacs
APPROVED ..... DATE 6-1-2009
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
6-1-2009	REVISED NOTES
3-1-2010	MODIFIED CULVERT SKEW DETAIL, REVISED EROSION PROTECTION AND NOTES
2-7-2012	REVISED TABLE QUANTITIES

SAFETY END TREATMENT FOR SINGLE AND MULTIPLE CULVERTS 30° SKEW, 1:4 H≤8' & S=VARIES

STANDARD B18-03

TABLE OF DIMENSIONS

H	S	L	NL	NR	WW	W_1 (4)	W_2 (4)	WL	WR	WF	TF
3′	9′	14′-4″	14′-10 1/8″	20′-3 1/4″	7″	10′-4 3/4″	20′-10 5/8″	3′-10 1/8″	14′-4″	3″	7″
4′	9′	18′-4″	18′-11 3/4″	25′-11 1/8″	7″	10′-4 3/4″	23′-9 3/4″	4′-11″	18′-4″	9″	8″
5′	5′	22′-4″	23′-1 1/2″	31′-7″	7″	5′-9 1/4″	22′-1 1/2″	5′-11 3/4″	22′-4″	1′-3″	8″
6′	6′	26′-4″	27′-3 1/8″	37′-2 7/8″	7″	6′-11 1/8″	26′-2 1/2″	7′-5/8″	26′-4″	1′-9″	8 1/2″
7′	7′	30′-4″	31′-4 7/8″	42′-10 3/4″	7″	8′-1″	30′-3 1/2″	8′-1 1/2″	30′-4″	2′-3″	9″
8′	8′	34′-4″	35′-6 1/2″	48′-6 5/8″	8″	9′-2 7/8″	34′-4 1/2″	9′-2 3/8″	34′-4″	2′-9″	9 1/2″

TOTAL QUANTITIES ONE END MINIMUM "S"		INCREASE IN QUANTITIES FOR 1′ INCREASE IN "S"	
CONC. CU. YD.	RE-BARS LBS.	CONC. CU. YD.	RE-BARS LBS.
8.4	1050	0.22	33
11.5	1301	0.22	33
14.0	1406	0.22	33
18.4	1878	0.22	33
23.4	2343	0.22	33
30.6	2959	0.22	33

NOTE:

REINFORCEMENT BARS BENDING DIMENSIONS ARE OUT TO OUT.

PIPE RUNNERS FOR ONE END

H	SIZE (DIA.)	SCHEDULE	WINGWALL PIPES - ONE PER EACH LENGTH SHOWN 15° WALL L_1	L_2	L_3	45° WALL L_4	L_5	L_6	L_7	L_8	HEADWALL PIPES S	No.	L_0	TOTAL LENGTH
3′	3″	40	11′-11″	-	-	13′-3″	6′-0″	-	-	-	9′	4	16′-10″	98.50
4′	3″	80	16′-8″	-	-	18′-0″	10′-9″	-	-	-	9′	4	21′-7″	131.75
5′	3 1/2″	80	21′-4″	11′-6″	-	22′-8″	15′-5″	8′-2″	-	-	5′	3	26′-4″	158.08
6′	3 1/2″	80	26′-1″	16′-2″	-	27′-9″	20′-2″	12′-11″	5′-8″	-	6′	3	31′-0″	201.75
7′	4″	80	30′-10″	20′-11″	11′-0″	32′-2″	24′-9″	17′-8″	10′-9″	-	7′	4	35′-9″	291.08
8′	4″	80	35′-9″	25′-8″	15′-9″	36′-10″	29′-7″	22′-4″	15′-1″	7′-10″	8′	4	40′-6″	350.83

TABLE OF REINFORCING STEEL FOR ONE END

H	1-BAR C 45° WALL SIZE	1-BAR C 45° WALL LENGTH	1-BAR C1 15° WALL SIZE	1-BAR C1 15° WALL LENGTH	BAR D 4-#4 45° WALL LENGTH	BAR D1 4-#4 15° WALL LENGTH	#4-BARS E 45° WALL (6) NO.	#4-BARS E 45° WALL (6) LENGTH	#4-BARS E1 15° WALL (5) NO.	#4-BARS E1 15° WALL (5) LENGTH
3′	#4	20′-8″	#4	15′-3″	22′-9″	17′-2″	2	21′-4″	2	17′-0″
4′	#4	26′-4″	#4	19′-5″	28′-5″	21′-4″	2	27′-0″	2	21′-1″
5′	#4	32′-0″	#4	23′-7″	34′-1″	25′-6″	2	32′-8″	2	25′-3″
6′	#4	37′-8″	#4	27′-8″	39′-9″	29′-7″	3	38′-4″	3	29′-4″
7′	#5	44′-10″ (6)	#5	31′-10″	46′-11″ (6)	33′-9″	3	44′-0″	3	33′-6″
8′	#5	50′-6″ (6)	#5	36′-0″	52′-6″ (6)	37′-10″	3	49′-8″	3	37′-7″

TABLE OF REINFORCING STEEL FOR ONE END

H	BARS F EQUALLY SPACED 45° WALL SIZE	NO.	C_1	C_2	C_3	C_4	LENGTH	BARS L 45° WALL SIZE	NO.	C_0	LENGTH	BARS F1 EQUALLY SPACED 15° WALL SIZE	NO.	C_1	C_2	C_3	C_4	LENGTH	DOWELS H #5 @ 12″ 45° WALL NO.	LENGTH	DOWELS H #5 @ 12″ 15° WALL NO.	LENGTH	DOWELS J 4 - #6 (5) LENGTH	1-BAR K 45° WALL SIZE	C_5	LENGTH	1-BAR K1 15° WALL SIZE	C_6	LENGTH	2-BARS W 45° WALL SIZE	LENGTH	2-BARS W1 15° WALL SIZE	LENGTH
3′	#4	10	1′-11″	2′-2″	2′-0″	2′-1″	9′-3″	#4	-	--	--	#4	8	1′-11″	2′-2″	2′-0″	2′-1″	9′-3″	3	3′-0″	3	3′-0″	4′-6″	#5	4′-3″	5′-9″	#5	3′-10″	5′-4″	#5	20′-6″	#5	14′-11″
4′	#4	12	1′-11″	2′-8″	2′-3″	2′-4″	9′-9″	#4	1	3′-10″	6′-5″	#4	10	1′-11″	2′-8″	2′-3″	2′-4″	9′-9″	4	3′-0″	4	3′-0″	4′-6″	#5	5′-0″	6′-6″	#5	4′-4″	5′-10″	#6	26′-4″	#6	19′-2″
5′	#4	15	1′-11″	3′-2″	2′-6″	2′-7″	10′-3″	#4	2	4′-6″	7′-1″	#4	12	1′-11″	3′-2″	2′-6″	2′-7″	10′-3″	5	3′-0″	5	3′-0″	4′-6″	#5	5′-8″	7′-2″	#5	4′-10″	6′-4″	#6	32′-2″	#6	23′-5″
6′	#5	18	1′-11″	3′-8″	2′-9″	2′-10″	10′-9″	#5	2	5′-3″	7′-10″	#5	14	1′-11″	3′-8″	2′-9″	2′-10″	10′-9″	6	3′-0″	6	3′-0″	4′-6″	#5	6′-5″	7′-11″	#5	5′-4″	6′-10″	#6	38′-0″	#6	27′-8″
7′	#5	20	2′-0″	4′-3″	3′-1″	3′-2″	11′-5″	#5	3	6′-0″	8′-7″	#5	16	2′-0″	4′-2″	3′-1″	3′-1″	11′-4″	7	3′-0″	7	3′-0″	4′-6″	#5	7′-1″	8′-7″	#5	5′-10″	7′-4″	#7	45′-4″ (6)	#7	31′-11″
8′	#6	23	2′-1″	4′-10″	3′-5″	3′-6″	12′-1″	#6	3	6′-9″	9′-4″	#6	18	2′-1″	4′-8″	3′-4″	3′-5″	11′-11″	8	3′-0″	8	3′-0″	4′-6″	#5	7′-10″	9′-4″	#5	6′-5″	7′-11″	#7	51′-2″ (6)	#7	36′-2″

TABLE OF REINFORCING STEEL FOR ONE END

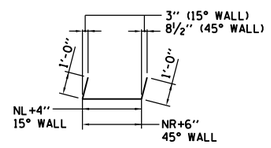
H	BARS U- ONE PER EACH LENGTH SHOWN #4 @ 12″ 45° WALL C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}	C_{14} (6)	BARS U1 - ONE PER EACH LENGTH SHOWN #4 @ 12″ 15° WALL C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}	C_{14}	BARS V #4-EQUALLY SPACED 45° WALL NO.	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	LENGTH	BARS V1 #4-EQUALLY SPACED 15° WALL NO.	C_{15}	C_{16}	C_{17}	C_{18}	C_{19}	LENGTH
3′	6′-2″	11′-9″	17′-5″	--	--	--	--	--	4′-6″	8′-7″	12′-9″	--	--	--	--	--	10	3′-10″	9″	2′-2″	2′-5″	1′-0″	6′-7″	7	3′-10″	9″	2′-2″	2′-5″	1′-0″	6′-7″
4′	6′-2″	11′-9″	17′-5″	23′-1″	--	--	--	--	4′-6″	8′-7″	12′-9″	16′-11″	--	--	--	--	13	4′-11″	10″	2′-9″	3′-0″	1′-0″	7′-9″	9	4′-11″	10″	2′-9″	3′-0″	1′-0″	7′-9″
5′	6′-2″	11′-9″	17′-5″	23′-1″	28′-9″	--	--	--	4′-6″	8′-7″	12′-9″	16′-11″	21′-0″	--	--	--	15	5′-11″	10″	3′-3″	3′-6″	1′-0″	8′-9″	11	5′-11″	10″	3′-3″	3′-6″	1′-0″	8′-9″
6′	6′-2″	11′-9″	17′-5″	23′-1″	28′-9″	34′-5″	--	--	4′-6″	8′-7″	12′-9″	16′-11″	21′-0″	25′-2″	--	--	18	6′-11″	10″	3′-9″	4′-0″	1′-0″	9′-9″	14	6′-11″	10″	3′-9″	4′-0″	1′-0″	9′-9″
7′	6′-2″	11′-9″	17′-5″	23′-1″	28′-9″	34′-5″	40′-0″	--	4′-6″	8′-7″	12′-9″	16′-11″	21′-0″	25′-2″	29′-4″	--	21	8′-0″	11″	4′-4″	4′-7″	1′-0″	10′-11″	16	8′-0″	11″	4′-4″	4′-7″	1′-0″	10′-11″
8′	6′-2″	11′-9″	17′-5″	23′-1″	28′-9″	34′-5″	40′-0″	47′-3″	4′-6″	8′-7″	12′-9″	16′-11″	21′-0″	25′-2″	29′-4″	33′-5″	24	9′-0″	11″	4′-10″	5′-1″	1′-1″	12′-1″	18	9′-0″	11″	4′-10″	5′-1″	1′-1″	12′-1″

NUMBER OF HEADWALL PIPE RUNNERS FOR 1 END

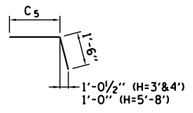
S	NO.	S	NO.
10′	5	23′	11
11′	5	24′	11
12′	6	25′	12
13′	6	26′	12
14′	7	27′	12
15′	7	28′	13
16′	8	29′	13
17′	8	30′	14
18′	8	31′	14
19′	9	32′	15
20′	9	33′	15
21′	10	34′	16
22′	10	35′	16

TABLE OF REINFORCING STEEL FOR MINIMUM "S" - ONE END

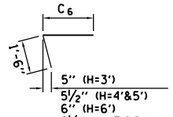
H	S	BARS Y 12-#5 (2) LENGTH	BARS R 6-#5 (2) LENGTH	BARS Z #4@12″ (1) No.	BARS Z #4@12″ (1) LENGTH	BARS S #4@12″ (1) No.	BARS S #4@12″ (1) LENGTH	BARS T #4@12″ (1) No.	BARS T #4@12″ (1) LENGTH	BARS P 8-#5 (3) LENGTH
3′	≧9′	11′-4″	19′-10″	10	5′-4″	20	6′-10″	10	3′-0″	6′-8″
4′	≧9′	11′-4″	22′-10″	10	5′-4″	23	6′-10″	10	3′-0″	7′-8″
5′	≧5′	6′-9″	21′-1″	6	5′-4″	21	6′-10″	6	3′-0″	8′-8″
6′	≧6′	7′-10″	25′-2″	7	5′-4″	25	6′-10″	7	3′-0″	9′-8″
7′	≧7′	9′-1″	29′-3″	8	5′-4″	30	6′-10″	8	3′-0″	10′-8″
8′	≧8′	10′-4″	33′-4″	9	5′-4″	34	6′-10″	9	3′-0″	11′-8″



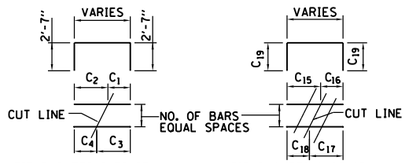
BARS D AND D1



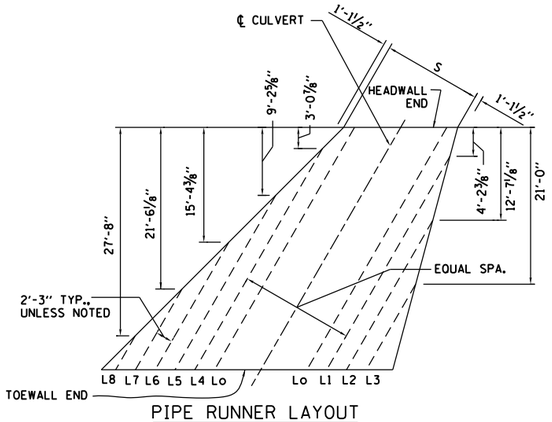
BARS K



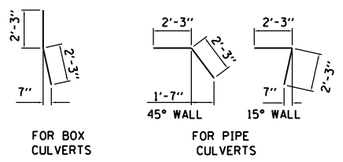
BARS K1



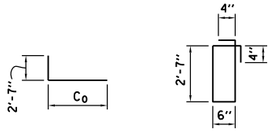
BARS F AND F1 — BARS V AND V1



PIPE RUNNER LAYOUT

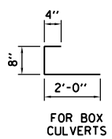


DOWELS J

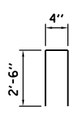


BARS L

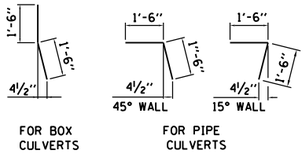
BARS S



BARS T



BARS Z



DOWELS H

NOTES FOR TABLES:

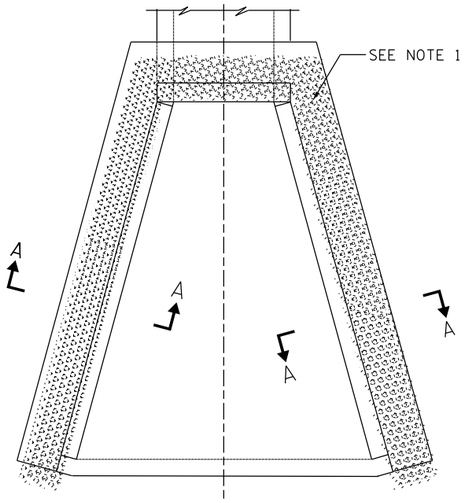
1. THE NUMBER OF BARS S, T AND Z SHALL BE INCREASED BY 1 FOR EACH 1 FOOT OF INCREASE IN DIMENSION "W1".
2. THE LENGTH OF BARS R AND Y SHALL BE INCREASED BY 1′-1 7/8″ FOR EACH 1 IF INCREASE IN DIMENSION "S".
3. THE NUMBER OF BARS P SHOWN ARE FOR SINGLE SPAN PIPES OR BOX CULVERTS. THIS NUMBER SHALL BE INCREASED BY 4 FOR EACH MULTIPLE OF PIPE OR BOX ADDED.
4. THIS DIMENSION SHALL BE INCREASED BY 1′-1 7/8″ INCHES FOR EACH 1 FOOT INCREASE IN DIMENSION "S".
5. 2 BARS FOR 15° WALL, 2 BARS FOR 45° WALL.
6. THE LENGTH OF THIS BAR INCLUDES ONE 1′-6″ MINIMUM LAP.

Paul Kovacs
APPROVED . . . . . DATE 6-1-2009
CHIEF ENGINEER

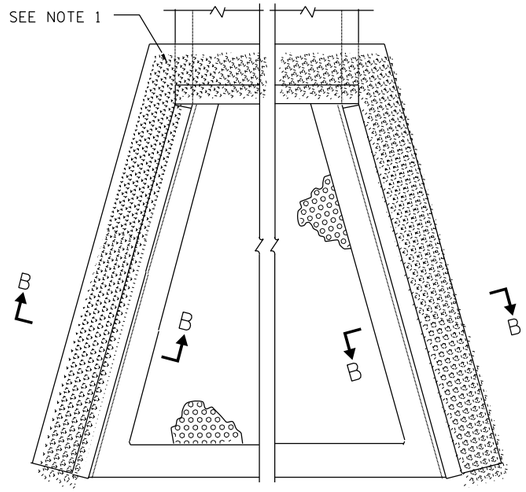
Illinois Tollway
Open Roads for a Faster Future

SAFETY END TREATMENT FOR SINGLE AND MULTIPLE CULVERTS 30° SKEW 1:4 H≤ 8′ & S=VARIES

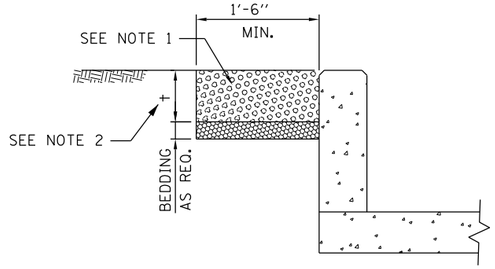
STANDARD B18-03



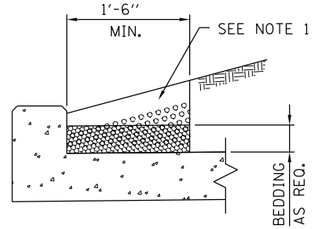
PLAN-0° SKEW, H ≤ 4'



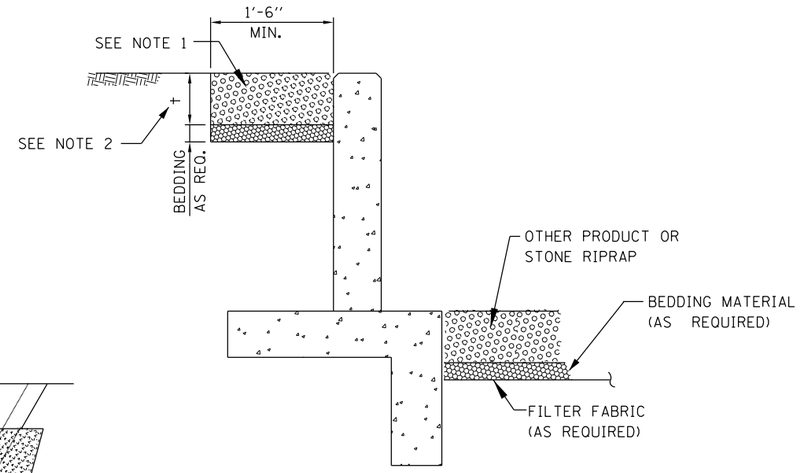
PLAN-0° SKEW, H ≤ 8'



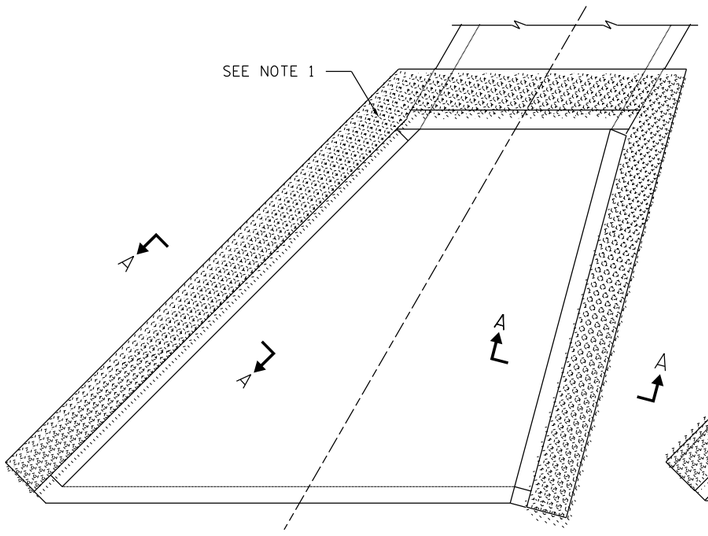
SECTION A-A



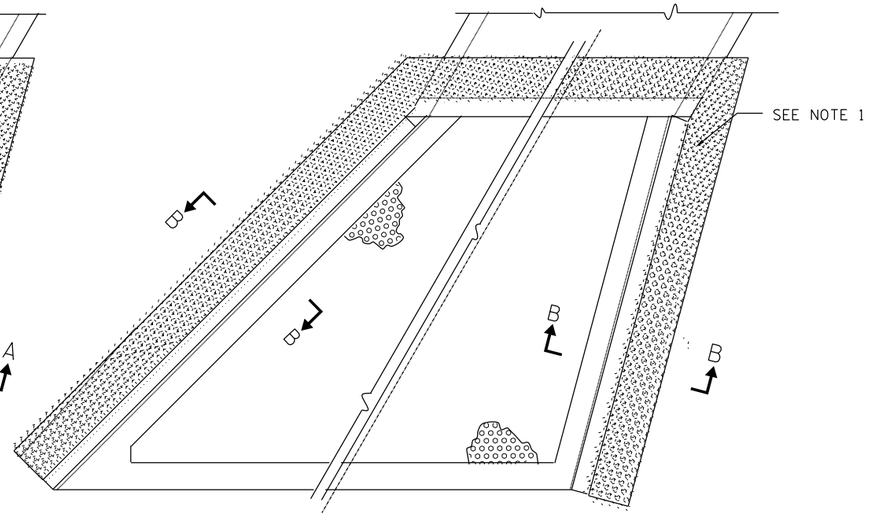
SECTION AT HEADWALL



SECTION B-B



PLAN-SKEW, H ≤ 4'



PLAN-SKEW, H ≤ 8'

NOTES:

1. THE PREFERRED METHOD FOR ACHIEVING EROSION PROTECTION AT END SECTIONS SHOULD BE THROUGH THE USE OF PRODUCTS THAT PROMOTE REVEGETATION WITHIN THE AREA OF CONCERN.
2. THICKNESS "t" WILL BE DETERMINED BY THE MANUFACTURE'S RECOMMENDATION FOR THE PRODUCT USED. STONE RIPRAP SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.
3. EROSION PROTECTION PLACEMENT SHALL BE INSTALLED FLUSH WITH ADJACENT GRADE.
4. FOR USE WITH STANDARDS B10 TO B18.

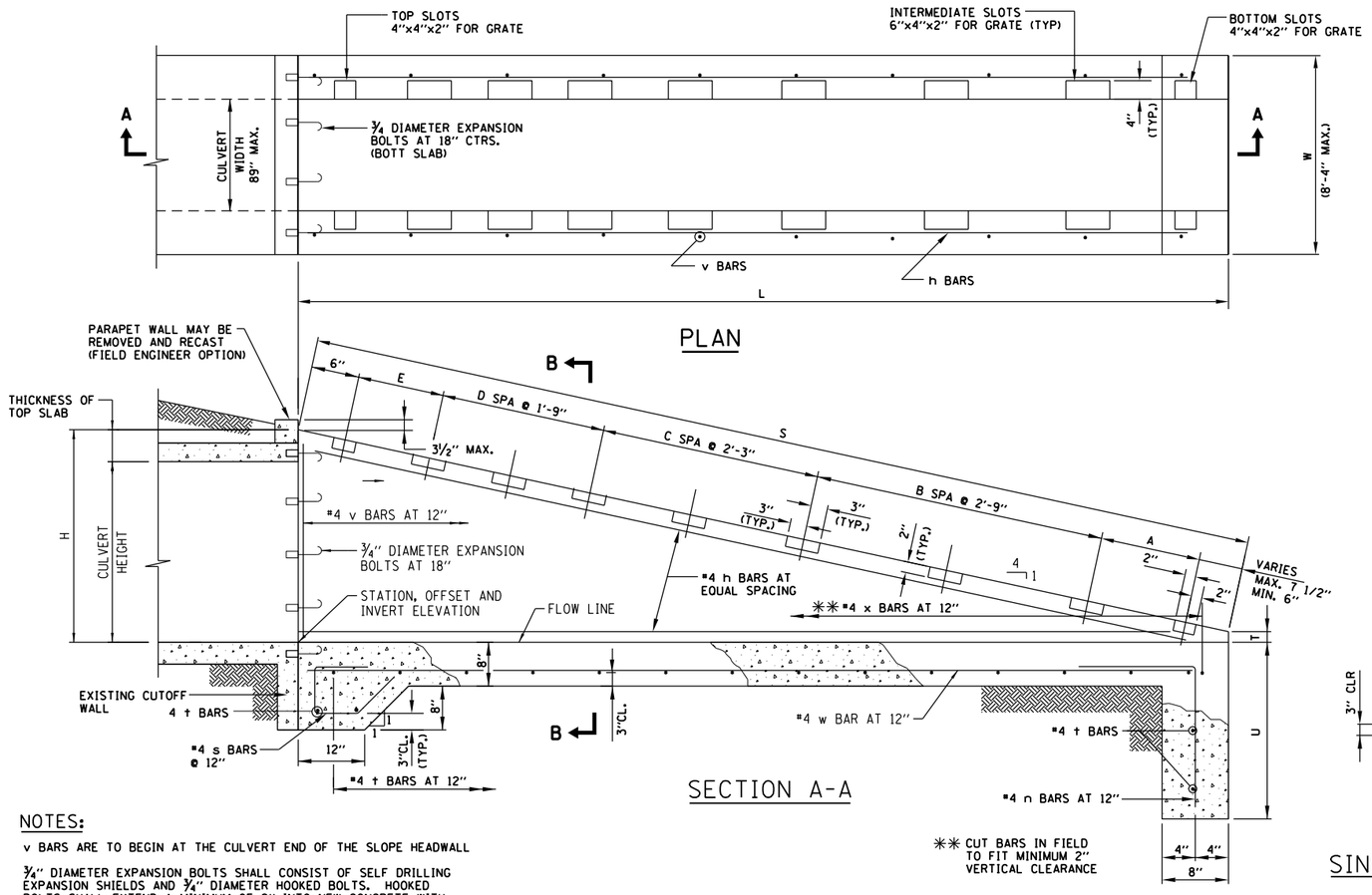
Paul Kovacs
APPROVED ..... DATE 3-1-2010
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
3-1-2010	REVISED EROSION PROTECTION AND NOTES

EROSION PROTECTION

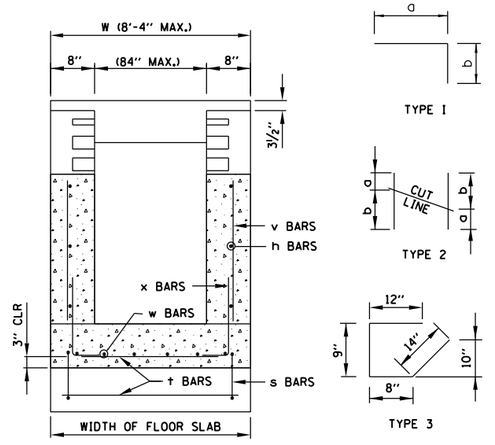
STANDARD B19-01



PLAN

SECTION A-A

** CUT BARS IN FIELD
TO FIT MINIMUM 2"
VERTICAL CLEARANCE



SECTION B-B
SINGLE BOX ≤ 84" WIDTH

DIMENSIONS AND QUANTITIES IN TWO WINGWALLS 1:4 SLOPE

CULVERT HEIGHT	DIMENSIONS							NO. OF SPACES			CONC. HDWLS CLASS SI CY *	REINF. STEEL LBS.*
	H	L	S	T	U	A	E	B	C	D		
36"	3'-8"	14'-0"	14'-5⅛"	2"	2'-8"	2'-2"	2'-2"	-	4	-	1.33	188
42"	4'-3"	16'-4"	16'-10"	2"	3'-2"	2'-8"	2'-2"	4	-	-	1.78	259
48"	4'-9"	18'-4"	18'-10¾"	2"	3'-2"	2'-2"	2'-2"	-	6	-	2.23	304
54"	5'-3"	20'-4"	20'-11½"	2"	3'-6"	2'-2"	2'-2"	4	2	-	2.72	379
60"	5'-10"	22'-8"	23'-4⅜"	2"	3'-6"	2'-2"	2'-2"	-	8	-	3.36	468

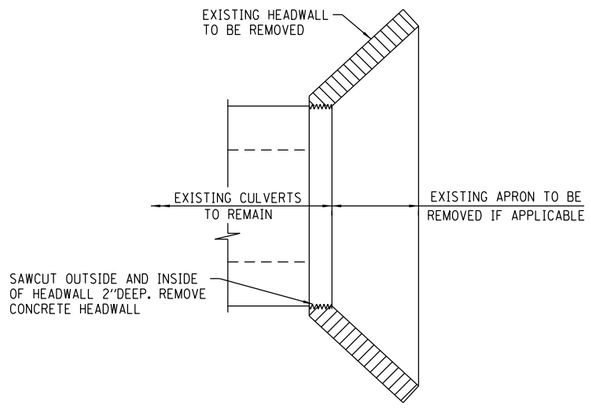
TABLE OF BARS IN ONE WINGWALL 1:4 SLOPE

NO. 4 REINFORCING BARS						
CULVERT HEIGHT	MARK	TYPE	NO. REQ'D	LENGTH	a	b
36"	h 36	STR.	4	13'-8"		
	3/4" EXP BLT	---	3	---		
	v 36	2	7	5'-6"	2'-0"	3'-6"
	x 36	1	15	3'-2"	2'-2"	1'-0"
42"	h 42	STR.	5	16'-0"		
	3/4" EXP BLT	---	4	---		
	v 42	2	10	6'-0"	1'-11"	4'-1"
	x 42	1	17	3'-2"	2'-2"	1'-0"
48"	h 48	STR.	5	18'-0"		
	3/4" EXP BLT	---	4	---		
	v 48	2	12	6'-5"	1'-10"	4'-7"
	x 48	1	19	3'-2"	2'-2"	1'-0"
54"	h 54	STR.	6	20'-0"		
	3/4" EXP BLT	---	4	---		
	v 54	2	14	6'-11"	1'-10"	5'-1"
	x 54	1	21	3'-2"	2'-2"	1'-0"
60"	h 60	STR.	7	22'-4"		
	3/4" EXP BLT	---	5	---		
	v 60	2	16	7'-7"	1'-11"	5'-8"
	x 60	1	23	3'-2"	2'-2"	1'-0"

NOTES:

v BARS ARE TO BEGIN AT THE CULVERT END OF THE SLOPE HEADWALL

¾" DIAMETER EXPANSION BOLTS SHALL CONSIST OF SELF DRILLING EXPANSION SHIELDS AND ¾" DIAMETER HOOKED BOLTS. HOOKED BOLTS SHALL EXTEND A MINIMUM OF 9" INTO NEW CONCRETE WITH ANCHORAGE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS. MINIMUM CERTIFIED PROOF LOAD = 4,080 LBS.



REMOVAL DETAIL

TABLE OF BARS IN SLAB 1:4 SLOPE
(PER FT. OF FLOOR SLAB WIDTH)

NO. 4 REINFORCING BARS								
CULVERT HEIGHT	MARK	TYPE	NO. REQ'D	LENGTH	a	b	REINF. LBS. *	CY. CONC.*
36"	n 36	1	1	4'-1"	2'-1"	2'-0"	27	.45
	w 36	STR.	1	13'-5"				
	t 36	STR	18	W-(0'-4")				
	¾" EXP BLT	---	0.67	---				
	s 36	3	1	3'-7"				
42"	n 42	1	1	4'-7"	2'-7"	2'-0"	32	.53
	w 42	STR.	1	15'-9"				
	t 42	STR	20	W-(0'-4")				
	¾" EXP BLT	---	0.67	---				
	s 42	3	1	3'-7"				
48"	n 48	1	1	4'-7"	2'-7"	2'-0"	33	.58
	w 48	STR.	1	17'-9"				
	t 48	STR	22	W-(0'-4")				
	¾" EXP BLT	---	0.67	---				
	s 48	3	1	3'-7"				
54"	n 54	1	1	4'-11"	2'-11"	2'-0"	37	.64
	w 54	STR.	1	19'-9"				
	t 54	STR	24	W-(0'-4")				
	¾" EXP BLT	---	0.67	---				
	s 54	3	1	3'-7"				
60"	n 60	1	1	4'-11"	2'-11"	2'-0"	39	.70
	w 60	STR.	1	22'-1"				
	t 60	STR	26	W-(0'-4")				
	¾" EXP BLT	---	0.67	---				
	s 60	3	1	3'-7"				

NOTES:

1. TYPE 2 "v" BARS SHALL BE ORDERED FULL LENGTH AND CUT IN THE FIELD. THE REMAINING PORTION OF THE "v" BARS SHALL BE USED IN THE OTHER WALL.
2. THE LONG LEG OF THE "n" BAR SHALL BE VERTICAL.
3. SEE STANDARD B23 FOR GRATING DETAILS.

GENERAL NOTES:

1. ALL EXPOSED CONCRETE EDGES SHALL HAVE A ¾" X 45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW FINISHED GROUND LEVEL.
2. COVER FROM THE FACE OF CONCRETE TO FACE OF REINFORCEMENT BARS SHALL BE 2" UNLESS OTHERWISE SHOWN.
3. CONCRETE QUANTITIES SHOWN ARE FOR REINFORCED CONCRETE BOX CULVERT HEADWALLS.
4. PAY ITEMS ARE IDENTIFIED BY AN ASTERISK (*).
5. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).

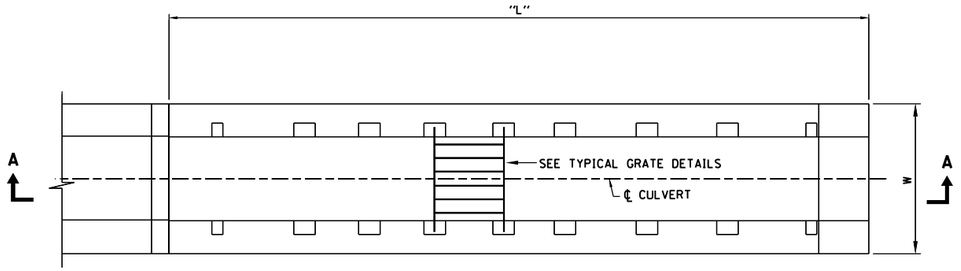
Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

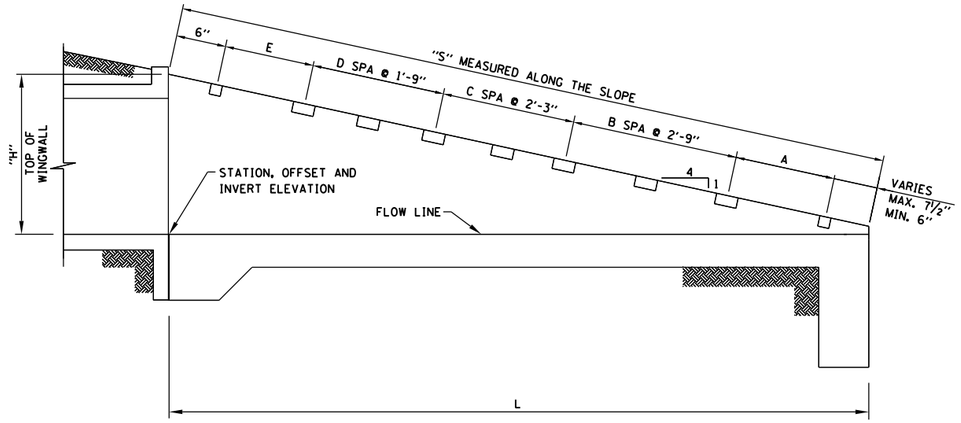
DATE	REVISIONS
6-1-2009	REVISED NOTES
1-1-2011	REVISED NOTES
2-7-2012	REVISED TABLE QUANTITIES AND NOTES

HEADWALL TYPE IV
CONCRETE BOX CULVERT
≤ 84" WIDTH

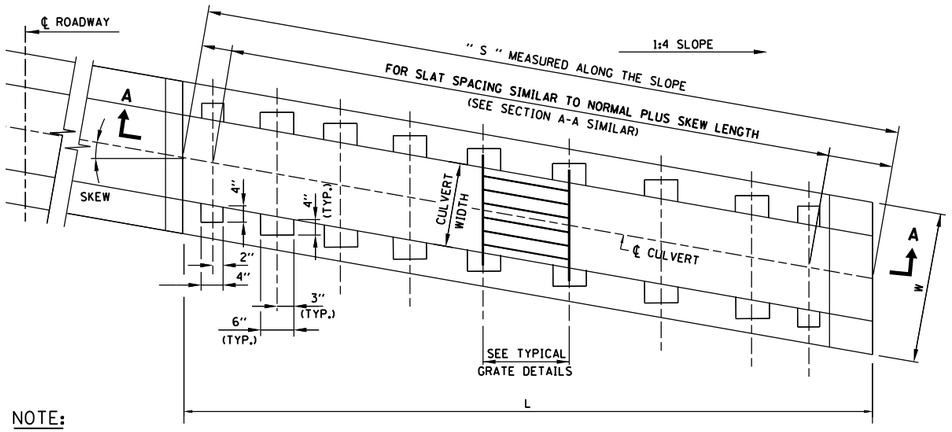
STANDARD B20-03



PLAN VIEW (NO SKEW)
SINGLE BOX CULVERT ≤ 84'' WIDE



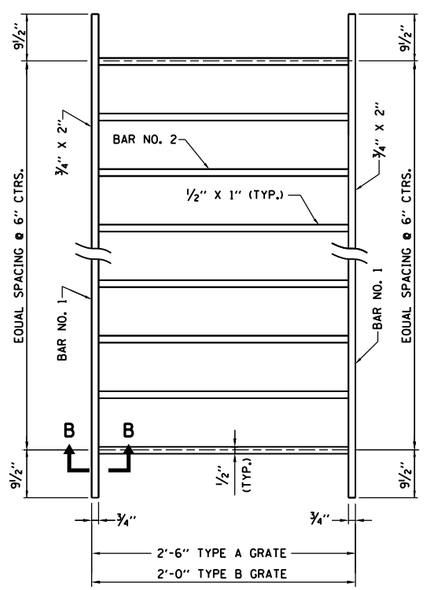
SECTION A-A
END TREATMENT - MULTIPLE OR SINGLE CELL BOX CULVERT



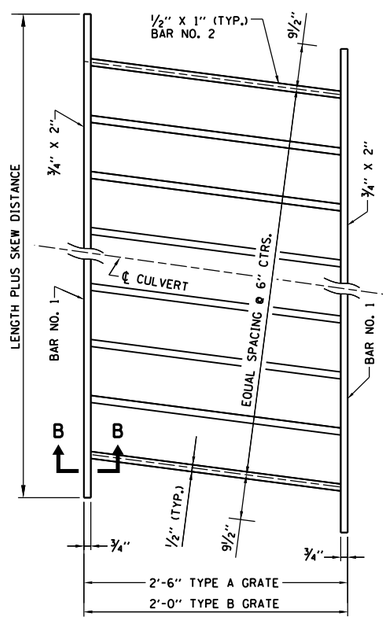
NOTE:

REINFORCEMENT BARS AND GRATE SPACING ARE SIMILAR TO BOX CULVERT AT NORMAL (NO SKEW).

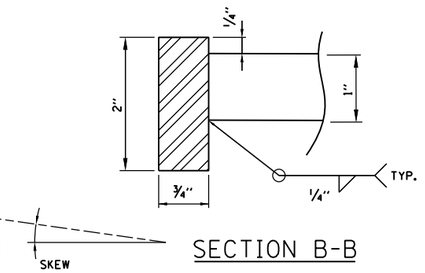
PLAN VIEW (WITH SKEW)
SINGLE BOX CULVERT ≤ 84'' WIDE



TYPICAL GRATE
(NO SKEW)



GRATE
(WITH SKEW)



SECTION B-B

GRATE DIMENSIONS AND QUANTITIES
IN ONE HEADWALL TYPE IV
BASED ON A 1 FOOT WIDTH, 1:4 SLOPE, AND NO SKEW

CULVERT HEIGHT	GRATES		BARS FOR ONE GRATE				HEADWALL GRATES (LBS.) ✳
			BAR NO. 1		BAR NO. 2		
	NUMBER REQUIRED	TYPE REQ'D.	BARS REQ'D.	LENGTH	BARS REQ'D.	LENGTH	EACH GRATE
36''	6	B	2	W-0.75	$\frac{W-1.33}{0.5}$ -1	1'-10½''	16.6W - 19.3
42''	5	A	2	W-0.75	$\frac{W-1.33}{0.5}$ -1	2'-4½''	18.3W - 22.4
	1	B	2			1'-10½''	16.6W - 19.3
48''	8	B	2	W-0.75	$\frac{W-1.33}{0.5}$ -1	1'-10½''	16.6W - 19.3
54''	4	A	2	W-0.75	$\frac{W-1.33}{0.5}$ -1	2'-4½''	18.3W - 22.4
	4	B	2			1'-10½''	16.6W - 19.3
60''	10	B	2	W-0.75	$\frac{W-1.33}{0.5}$ -1	1'-10½''	16.6W - 19.3

DIMENSIONS ''S'' FOR SLOPE 1:4
FOR VARIOUS CULVERT SIZES AND SKEWS

CULVERT HEIGHT	NO SKEW	≤ 10°	10° ≤ 20°	20° ≤ 30°
36''	14'-5⅛''	14'- 7¾''	15'- 4¼''	16'-8''
42''	16'- 10''	17'- 1''	17'- 11''	19'-5¼''
48''	18'- 10¾''	19'- 2¼''	20'-1¼''	21'-10''
54''	20'- 11½''	21'- 3⅜''	22'-3⅝''	24'-2⅜''
60''	23'- 4⅛''	23'- 8¾''	24'-10⅜''	26'-11¾''

GENERAL NOTES:

1. ALL TABLE DIMENSIONS AND QUANTITIES ARE FOR SINGLE BOX CULVERT HEADWALLS. TO ADAPT ANY OF THESE TABLES FOR DOUBLE BOX CULVERTS, DOUBLE THE NUMBER OF GRATES REQUIRED AND ADD AN ADDITIONAL WALL. (WALL THICKNESS SHALL BE SAME AS THE CENTER WALL THICKNESS OF THE BOX CULVERT)
2. FOR QUANTITY CALCULATIONS DIMENSION "W" SHALL BE MEASURED IN FEET.
3. QUANTITIES FOR SKEWED HEADWALLS NOT SHOWN.
4. PAY ITEMS ARE IDENTIFIED BY AN ASTERISK (✳).
5. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).

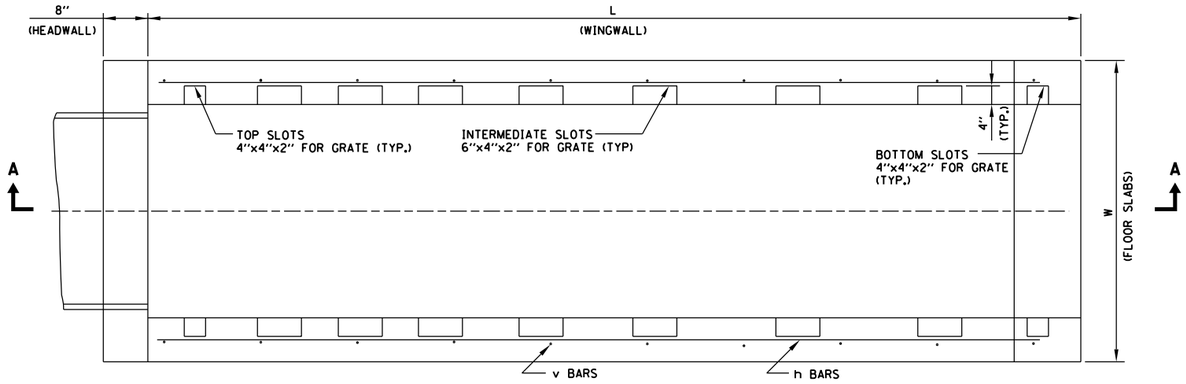
Paul Kovacs
APPROVED ..... CHIEF ENGINEER
DATE 2-7-2012

Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
6-1-2009	CHANGED SECTION B-B DIMENSION
	REVISED NOTES
2-7-2012	DELETED SECTION FROM PLAN VIEW

STEEL GRATE FOR
HEADWALL TYPE IV
BOX CULVERT ≤ 84'' WIDTH

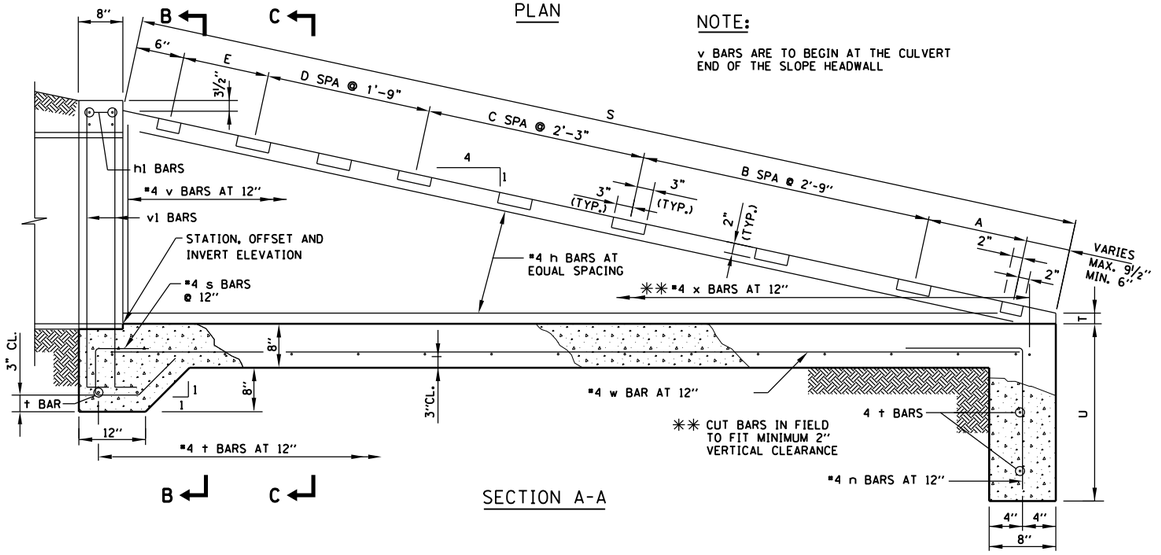
STANDARD B21-02



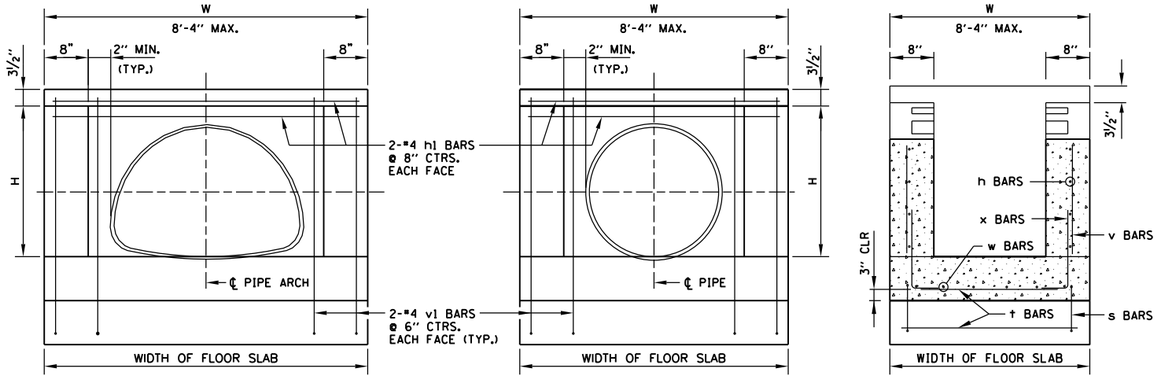
PLAN

NOTE:

v BARS ARE TO BEGIN AT THE CULVERT END OF THE SLOPE HEADWALL



SECTION A-A



SECTION B-B

ELLIPTICAL PIPE OR PIPE-ARCH

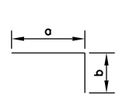
SECTION B-B

CIRCULAR PIPE

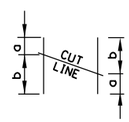
SECTION C-C

DIMENSIONS AND QUANTITIES IN TWO WINGWALLS 1:4 SLOPE

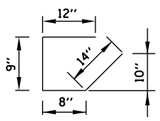
PIPE-ARCH ELLIPTICAL PIPE (SPAN ≤ 77")	CIRCULAR PIPE (DIAMETER)	DIMENSIONS							NO. OF SPACES			CONC. HDWLS. CLASS SI CY. ✳	REINF. STEEL LBS. ✳
		H	L	S	T	U	A	E	B	C	D		
RISE ≤ 30"		3'-2"	12'-0"	12'-4½"	2"	2'-8"	2'-2"	2'-2"	-	3	-	.98	151
RISE ≤ 36"		3'-8"	14'-0"	14'-5⅛"	2"	2'-8"	2'-2"	2'-2"	-	4	-	1.33	188
RISE ≤ 42"		4'-3"	16'-4"	16'-10"	2"	3'-2"	2'-8"	2'-2"	4	-	-	1.78	251
RISE ≤ 48"		4'-9"	18'-4"	18'-10¾"	2"	3'-2"	2'-2"	2'-2"	-	6	-	2.23	295
RISE ≤ 54"	54"	5'-3"	20'-4"	20'-11½"	2"	3'-6"	2'-2"	2'-2"	4	2	-	2.72	370
RISE ≤ 60"	60"	5'-10"	22'-8"	23'-4¾"	2"	3'-6"	2'-2"	2'-2"	-	8	-	3.36	428
	66"	6'-4"	24'-8"	25'-5⅛"	2"	3'-6"	2'-2"	2'-2"	4	4	-	3.96	517



TYPE 1



TYPE 2



TYPE 3

TABLE OF BARS IN ONE WINGWALL 1:4 SLOPE

NO. 4 REINFORCING BARS						
H	MARK	TYPE	NO. REQ'D	LENGTH	a	b
3'-2"	H 30	STR.	4	11"-8"		
	V 30	2	5	5'-0"	2'-0"	3'-0"
	X 30	1	13	3'-2"	2'-2"	1'-0"
3'-8"	H 36	STR.	4	13"-8"		
	V 36	2	7	5'-6"	2'-0"	3'-6"
	X 36	1	15	3'-2"	2'-2"	1'-0"
4'-3"	H 42	STR.	5	16'-0"		
	V 42	2	9	6'-0"	1'-11"	4'-1"
	X 42	1	17	3'-2"	2'-2"	1'-0"
4'-9"	H 48	STR.	5	18'-0"		
	V 48	2	11	6'-5"	1'-10"	4'-7"
	X 48	1	19	3'-2"	2'-2"	1'-0"
5'-3"	H 54	STR.	6	20'-0"		
	V 54	2	13	6'-11"	1'-10"	5'-1"
	X 54	1	21	3'-2"	2'-2"	1'-0"
5'-10"	H 60	STR.	6	22'-4"		
	V 60	2	15	7'-7"	1'-11"	5'-8"
	X 60	1	23	3'-2"	2'-2"	1'-0"
6'-4"	H 66	STR.	7	24'-4"		
	V 66	2	17	8'-1"	1'-11"	6'-2"
	X 66	1	25	3'-2"	2'-2"	1'-0"

TABLE OF BARS IN SLAB 1:4 SLOPE (PER FT. OF FLOOR SLAB WIDTH)

NO. 4 REINFORCING BARS								
H	MARK	TYPE	NO. REQ'D	LENGTH	a	b	REINF. LBS. ✳	CY. CONC. ✳
3'-2"	h 131	STR.	4	W-(0'-4")				
	v 131	1	8	5'-0"	4'-4"	8"		
	n 30	1	1	4'-1"	2'-1"	2'-0"	52	.38
	w 30	STR.	1	12'-1"				
	t 30	STR	15	W-(0'-4")				
	s 30	3	1	3'-7"				
3'-8"	h 136	STR.	4	W-(0'-4")				
	v 136	1	8	5'-6"	4'-10"	8"		
	n 36	1	1	4'-1"	2'-1"	2'-0"	58	.43
	w 36	STR.	1	14'-1"				
	t 36	STR	19	W-(0'-4")				
	s 36	3	1	3'-7"				
4'-3"	h 142	STR.	4	W-(0'-4")				
	v 142	1	8	6'-1"	5'-5"	8"		
	n 42	1	1	4'-7"	2'-7"	2'-0"	65	.50
	w 42	STR.	1	16'-5"				
	t 42	STR	21	W-(0'-4")				
	s 42	3	1	3'-7"				
4'-9"	h 148	STR.	4	W-(0'-4")				
	v 148	1	8	6'-7"	5'-11"	8"		
	n 48	1	1	4'-7"	2'-7"	2'-0"	70	.55
	w 48	STR.	1	18'-5"				
	t 48	STR	23	W-(0'-4")				
	s 48	3	1	3'-7"				
5'-3"	h 154	STR.	4	W-(0'-4")				
	v 154	1	8	7'-1"	6'-5"	8"		
	n 54	1	1	4'-11"	2'-11"	2'-0"	76	.60
	w 54	STR.	1	20'-5"				
	t 54	STR	25	W-(0'-4")				
	s 54	3	1	3'-7"				
5'-10"	h 160	STR.	4	W-(0'-4")				
	v 160	1	8	7'-8"	7'-0"	8"		
	n 60	1	1	4'-11"	2'-11"	2'-0"	82	.66
	w 60	STR.	1	22'-9"				
	t 60	STR	27	W-(0'-4")				
	s 60	3	1	3'-7"				
6'-4"	h 166	STR.	4	W-(0'-4")				
	v 166	1	8	8'-2"	7'-6"	8"		
	n 66	1	1	4'-11"	2'-11"	2'-0"	87	.71
	w 66	STR.	1	24'-9"				
	t 66	STR	29	W-(0'-4")				
	4 s	3	1	3'-7"				

GENERAL NOTES:

1. TYPE 2 "v" BARS SHALL BE ORDERED FULL LENGTH. AND CUT IN THE FIELD. THE REMAINING PORTION OF THE "v" BARS SHALL BE USED IN THE OTHER WALL.
2. THE LONG LEG OF THE "n" BARS SHALL BE VERTICAL.
3. PAY ITEMS ARE IDENTIFIED BY AN ASTERISK (✳).
4. SEE STANDARD B23 FOR GRATING DETAILS.
5. ALL CONCRETE SHALL BE CLASS SI.
6. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).

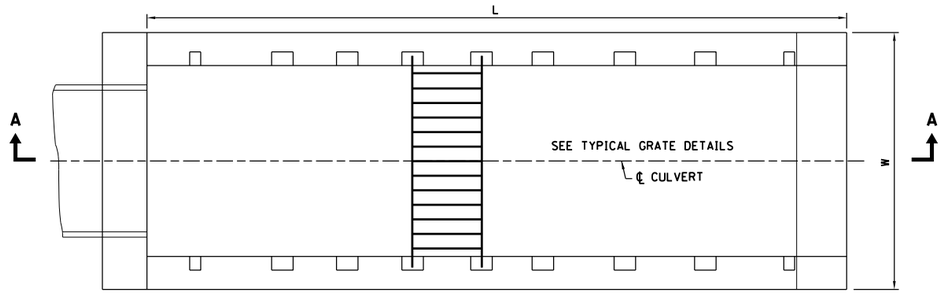
Paul Kovacs
APPROVED ..... CHIEF ENGINEER
DATE 2-7-2012

Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS
6-1-2009	CHANGED SECTION B-B DIMENSION
	REVISED NOTES
2-7-2012	REVISED TABLE QUANTITIES

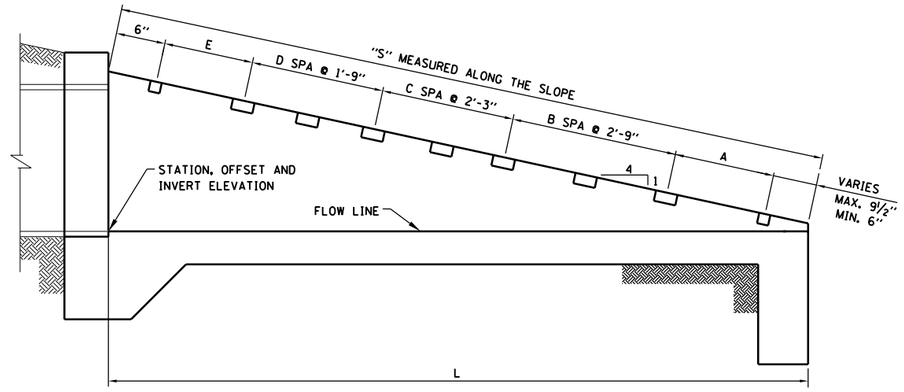
HEADWALL TYPE IV
METAL PIPE & PIPE-ARCH
CULVERTS

STANDARD B22-02



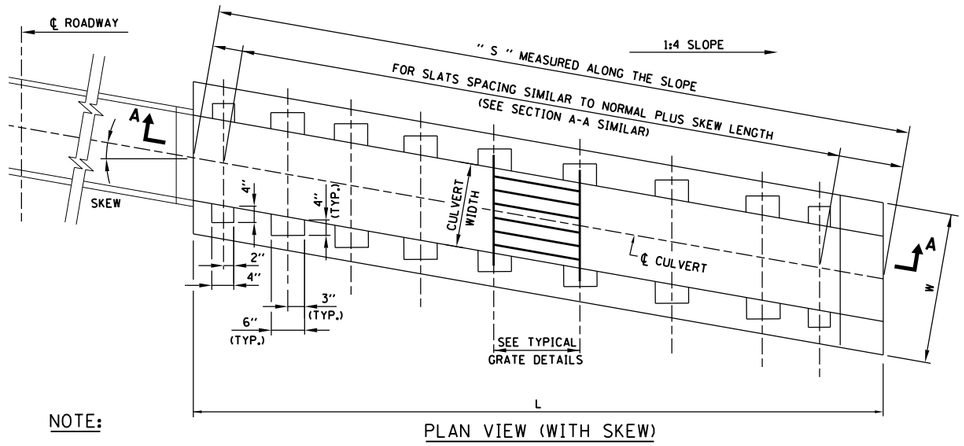
PLAN VIEW (NO SKEW)

SINGLE BOX CULVERT ≤ 84'' WIDE



SECTION A-A

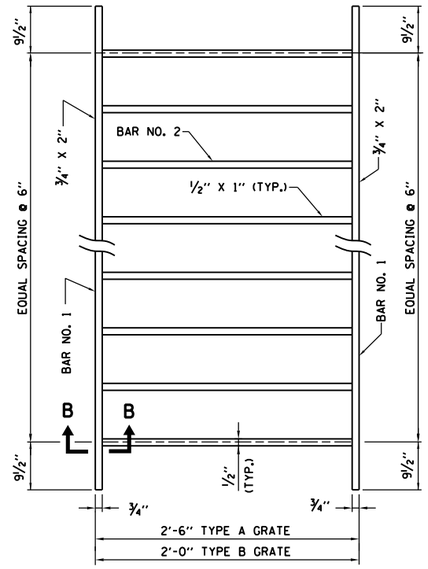
END TREATMENT - MULTIPLE OR SINGLE CELL BOX CULVERT



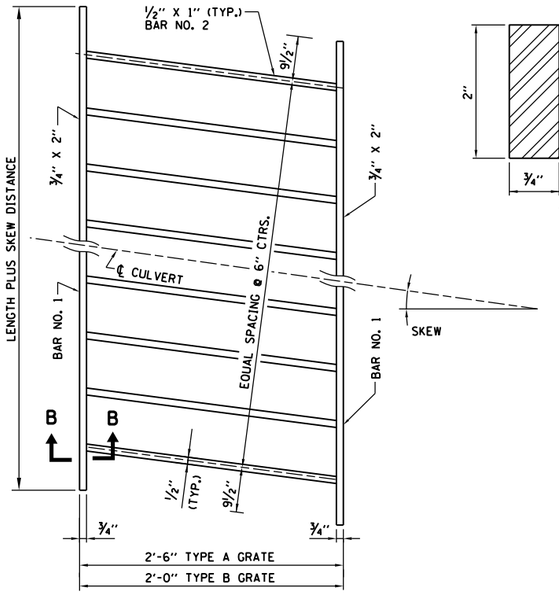
PLAN VIEW (WITH SKEW)

NOTE:

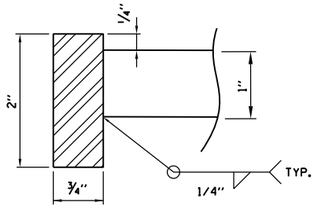
REINFORCEMENT BARS AND GRATE SPACING ARE SIMILAR TO BOX CULVERT AT NORMAL (NO SKEW).



GRATE DETAILS (WITH SKEW)



GRATE DETAILS (WITH SKEW)



SECTION B-B

GRATE DIMENSIONS AND QUANTITIES IN ONE HEADWALL TYPE IV BASED ON A 1 FOOT WIDTH, 1:4 SLOPE AND SKEW

H	GRATES		BARS FOR ONE GRATE				HEADWALL GRATES (LBS.) ✳
			BAR NO. 1		BAR NO. 2		
	NUMBER REQUIRED	TYPE REQ'D.	BARS REQ'D.	LENGTH	BARS REQ'D.	LENGTH	EACH GRATE
3'-2''	5	B	2	W-.75	$\frac{W-1.33}{0.5}$ -1	1'-10½''	16.6W - 19.3
3'-8''	6	B	2	W-.75	$\frac{W-1.33}{0.5}$ -1	1'-10½''	16.6W - 19.3
4'-3''	5	A	2	W-.75	$\frac{W-1.33}{0.5}$ -1	2'-4½''	18.3W - 22.4
	1	B	2			1'-10½''	16.6W - 19.3
4'-9''	8	B	2	W-.75	$\frac{W-1.33}{0.5}$ -1	1'-10½''	16.6W - 19.3
5'-3''	4	A	2	W-.75	$\frac{W-1.33}{0.5}$ -1	2'-4½''	18.3W - 22.4
	4	B	2			1'-10½''	16.6W - 19.3
5'-10''	10	B	2	W-.75	$\frac{W-1.33}{0.5}$ -1	1'-10½''	16.6W - 19.3
6'-4''	4	A	2	W-.75	$\frac{W-1.33}{0.5}$ -1	2'-4½''	18.3W - 22.4
	6	B	2			1'-10½''	16.6W - 19.3

DIMENSIONS "S" FOR SLOPE 1:4 FOR VARIOUS CULVERT SIZES AND SKEWS

H	NO SKEW	≤ 10°	10° ≤ 20°	20° ≤ 30°
3'-2''	12'-4½''	12'-6¾''	13'-2''	14'-3⅜''
3'-8''	14'-5¼''	14'-7¾''	15'-4¼''	16'-8''
4'-3''	16'-10''	17'-1''	17'-11''	19'-5¼''
4'-9''	18'-10¾''	19'-2¼''	20'-1¼''	21'-10''
5'-3''	20'-11½''	21'-3⅜''	22'-3⅝''	24'-2¾''
5'-10''	23'-4⅜''	23'-8¾''	24'-10⅜''	26'-11¾''
6'-4''	25'-5⅛''	25'-9¾''	27'-0⅝''	29'-4¼''

GENERAL NOTES:

1. ALL TABLE DIMENSIONS AND QUANTITIES ARE FOR SINGLE CULVERT HEADWALLS. TO ADAPT ANY OF THESE TABLES FOR DOUBLE CULVERTS, DOUBLE THE NUMBER OF GRATES REQUIRED AND ADD AN ADDITIONAL WALL. (WALL THICKNESS SHALL BE SAME AS THE CENTER WALL THICKNESS OF THE CULVERT.)
2. FOR QUANTITY CALCULATIONS DIMENSION "W" SHALL BE MEASURED IN FEET.
3. QUANTITIES FOR SKEWED HEADWALLS NOT SHOWN.
4. PAY ITEMS ARE IDENTIFIED BY AN ASTERISK (✳).
5. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT (V:H).

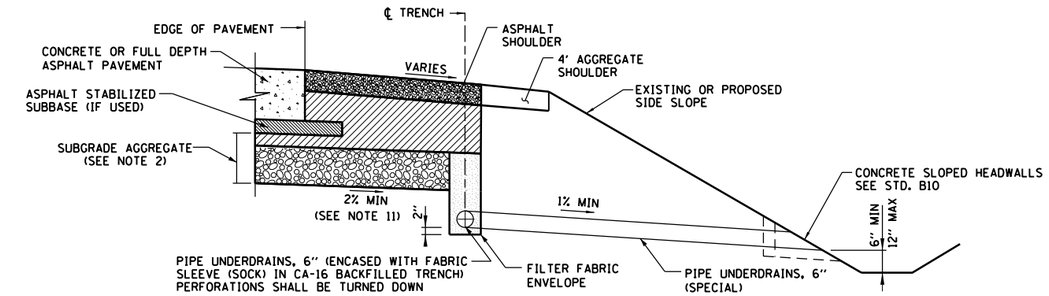
Paul Kovacs
APPROVED ..... DATE 2-7-2012
CHIEF ENGINEER

Illinois Tollway
Open Roads for a Faster Future

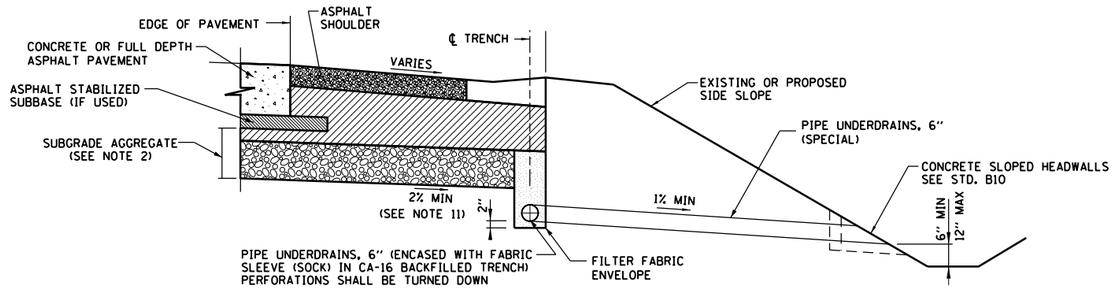
DATE	REVISIONS
6-1-2009	CHANGED SECTION B-B DIMENSION
	REVISED NOTES
2-7-2012	DELETED SECTION VIEW FROM SKEW PLAN

STEEL GRATE FOR HEADWALL TYPE IV PIPE & PIPE-ARCH CULVERTS

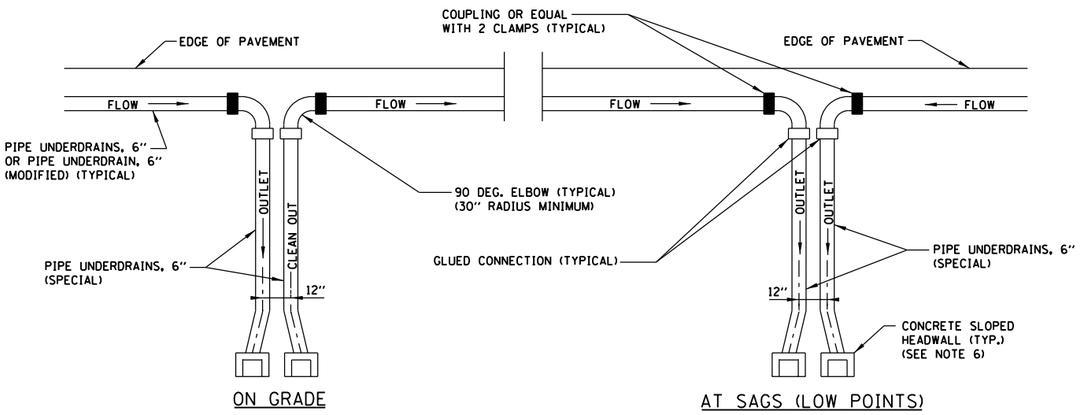
STANDARD B23-02



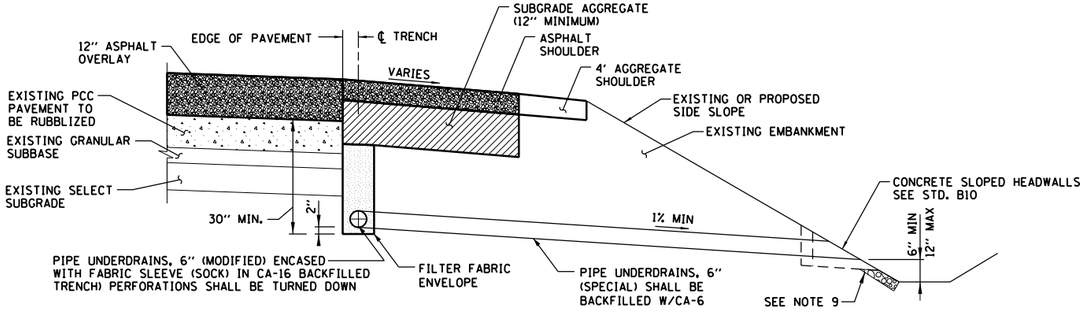
DETAIL OF PIPE UNDERDRAIN, 6"
(NEW CONSTRUCTION OR WIDENING WITHOUT GUTTER)



DETAIL OF PIPE UNDERDRAIN, 6"
(NEW CONSTRUCTION OR WIDENING WITH GUTTER)



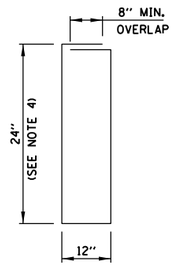
DETAIL OF PIPE UNDERDRAIN OUTLETS
(SEE NOTE 7)



DETAIL OF PIPE UNDERDRAIN, 6" (MODIFIED)
(RUBBLIZED CONCRETE PAVEMENT)

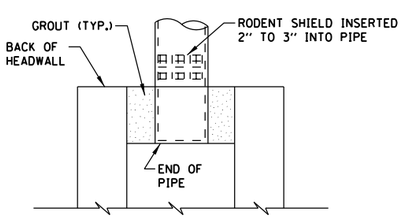
NOTES FOR PIPE UNDERDRAIN

1. FOR NEW CONSTRUCTION OR WIDENING PROJECTS, THE PIPE UNDERDRAIN INSTALLATION SHALL OCCUR AFTER SUBGRADE HAS BEEN PREPARED AND AFTER LIFT OF PCE BASE IS PLACED AND BEFORE 3" AND VARIES CA-6 CAPPING STONE IS PLACED. FOR PAVEMENT RUBBLIZATION PROJECTS, THE PIPE UNDERDRAIN SHALL BE INSTALLED PRIOR TO RUBBLIZATION.
2. SUBGRADE AGGREGATE SHALL CONSIST OF A 3" AND VARIES CA-6 CAP ABOVE A PCE BASE, THICKNESS AS NOTED IN THE PLANS.
3. ON SUPERELEVATED CURVES PLACE LONGITUDINAL UNDERDRAIN ON LOW SIDE ONLY.
4. IN AREAS WHERE ROADWAY LONGITUDINAL GRADE IS LESS THAN 0.5%, DIMENSION WILL INCREASE AS NECESSARY TO MAINTAIN MINIMUM 0.5% SLOPE IN PIPE UNDERDRAIN.
5. IF 500' MAXIMUM DISTANCE IS EXCEEDED, PIPE UNDERDRAIN SHALL BE INCREASED TO 8" DIAMETER AND TRENCH WIDTH INCREASED TO 16".
6. AT OUTLET LOCATIONS, PIPE UNDERDRAINS SHALL SEPARATE SUFFICIENTLY TO PROVIDE SPACE FOR TWO CONCRETE SLOPED HEADWALLS, OR TWO PIPES CAN RUN PARALLEL INTO A LARGER HEADWALL.
7. IN AREAS WHERE A CLOSED DRAINAGE SYSTEM EXISTS, THE PIPE UNDERDRAIN, 6" (SPECIAL) SHALL DRAIN TO THE NEAREST CATCH BASIN. THE UPPER END OF A RUN ON GRADE SHALL ALSO BE CONNECTED TO A CATCH BASIN TO BE USED AS A CLEANOUT.
8. THE OUTLET END OF THE SUBDRAIN SHALL BE PROTECTED BY A PERMANENT RODENT SHIELD. THE RODENT SHIELD SHALL HAVE THE CONFIGURATION SHOWN AND BE CONSTRUCTED FROM HOT DIP GALVANIZED STEEL INDUSTRIAL WIRE CLOTH 3x3 MESH, 0.063"x0.063" WIRE SIZE IN ACCORDANCE WITH AASHTO M232 (ASTM A153). THE COST OF THE RODENT SHIELD IS INCLUDED IN CONCRETE SLOPED HEADWALL.
9. FOR RUBBLIZATION PROJECTS, ADDITIONAL EROSION CONTROL MEASURES MAY BE NECESSARY AT THE BASE OF THE HEADWALL.
10. FOR RUBBLIZATION PROJECTS, MAXIMUM DISTANCE SHALL BE 250 FT. REGARDLESS OF ROADWAY PROFILE.
11. BOTTOM OF SUBGRADE SLOPE SHALL MATCH PAVEMENT SLOPE OF OUTSIDE LANE, BUT SHALL NOT BE LESS THAN 2%.

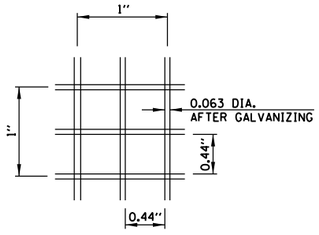


FILTER FABRIC ENVELOPE

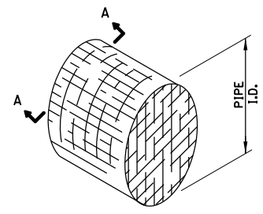
MAXIMUM ALLOWABLE DRAINAGE DISTANCE TO OUTLET OR SEPARATION DISTANCE BETWEEN OUTLETS (SEE NOTE 10)	
ROADWAY PROFILE GRADE (%)	DISTANCE
≤ 1	250 FT.
BETWEEN 1 AND 2	375 FT.
≥ 2	500 FT. (NOTE 5)



RODENT SHIELD PLACEMENT



SECTION A-A



DETAIL OF RODENT SHIELD

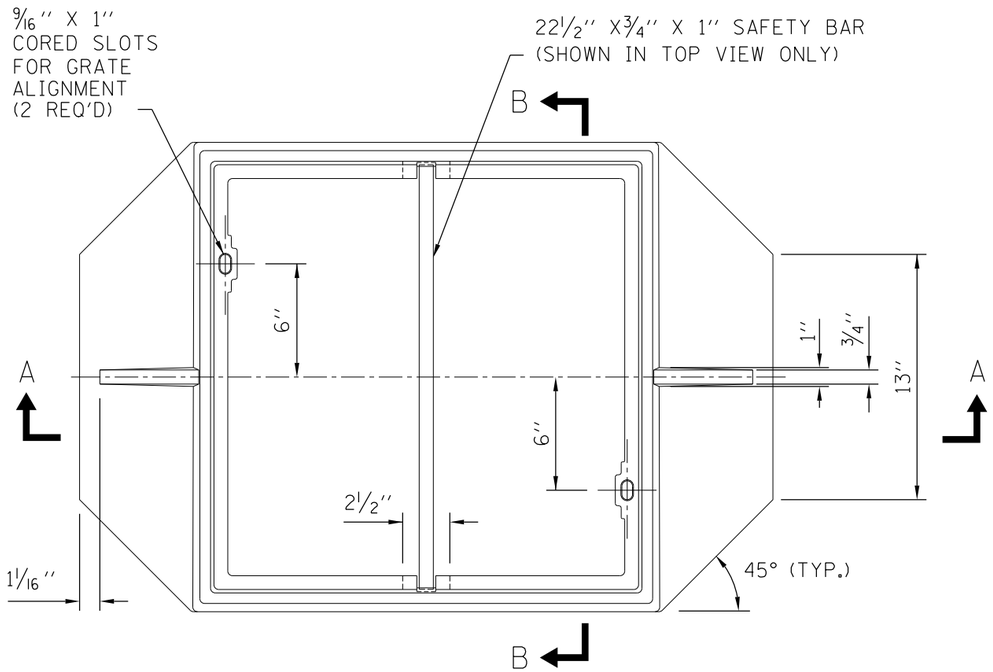
Paul Kovacs
APPROVED ..... CHIEF ENGINEER
DATE 6-1-2009

Illinois Tollway
Open Roads for a Faster Future

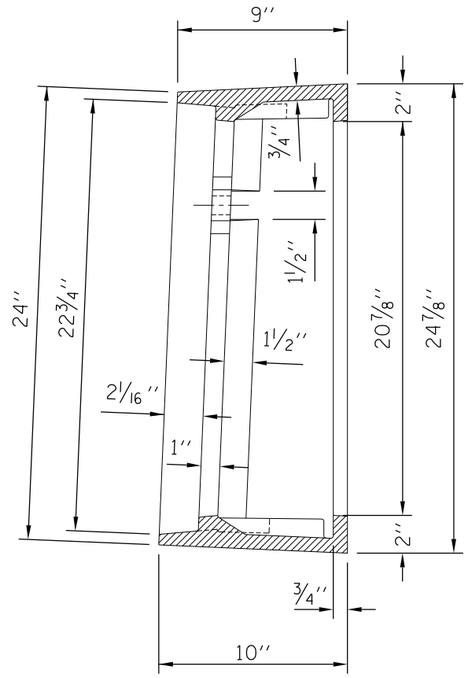
DATE	REVISIONS
6-1-09	CHANGES TO PIPE UNDERDRAIN, 6" (MODIFIED) DETAIL
11-1-12	REVISED NOTES, MODIFIED PIPE UNDERDRAIN WITHOUT GUTTER

PIPE UNDERDRAINS

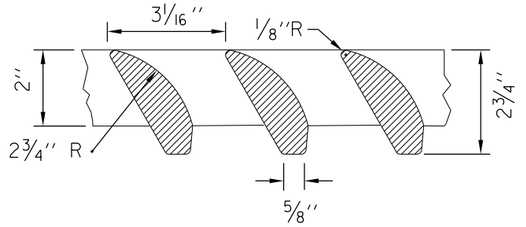
STANDARD B24-02



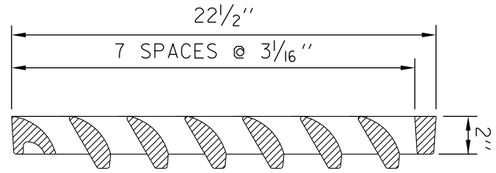
TOP VIEW



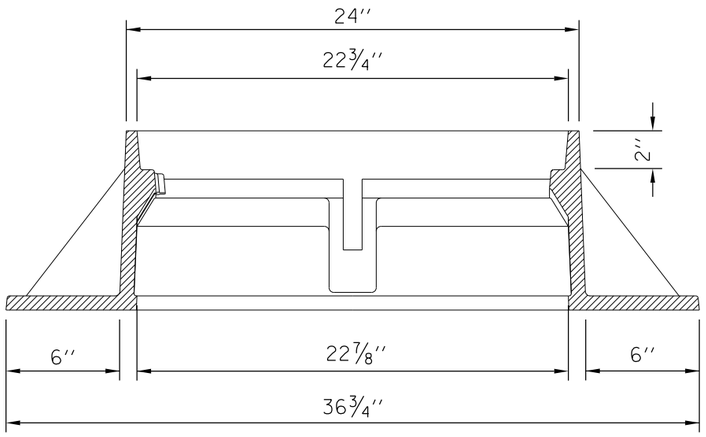
SECTION B-B



DETAIL OF VANES

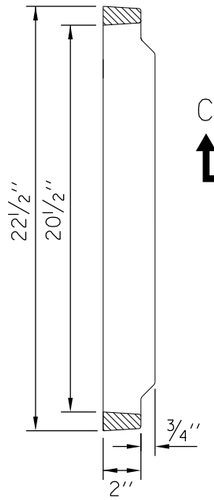


SECTION C-C

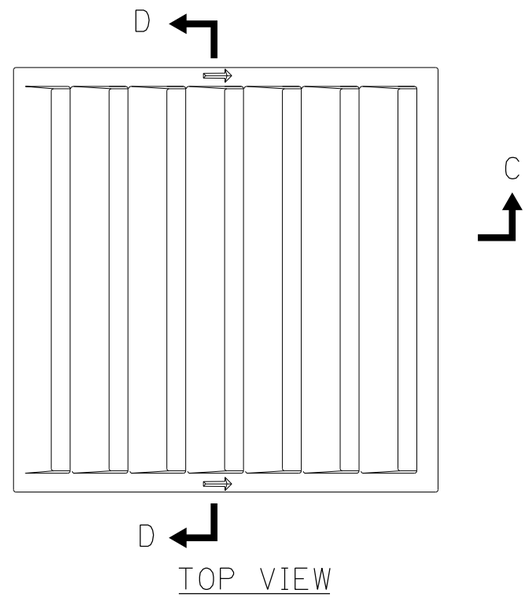


SECTION A-A

CAST FRAME



SECTION D-D



TOP VIEW

CAST GRATE

NOTES:

1. ALL FRAMES AND GRATES SHALL CONFORM TO THE REQUIREMENTS OF ART. 1006.14 FOR GRAY IRON CASTINGS AND TO ART. 1006.15 FOR DUCTILE IRON CASTINGS.

2. FRAME AND GRATE TO BE NEENAH FOUNDRY COMPANY, NEENAH NO. R-3528-V OR APPROVED EQUAL.

3. GRATE SHALL NOT BE BOLTED TO FRAME.

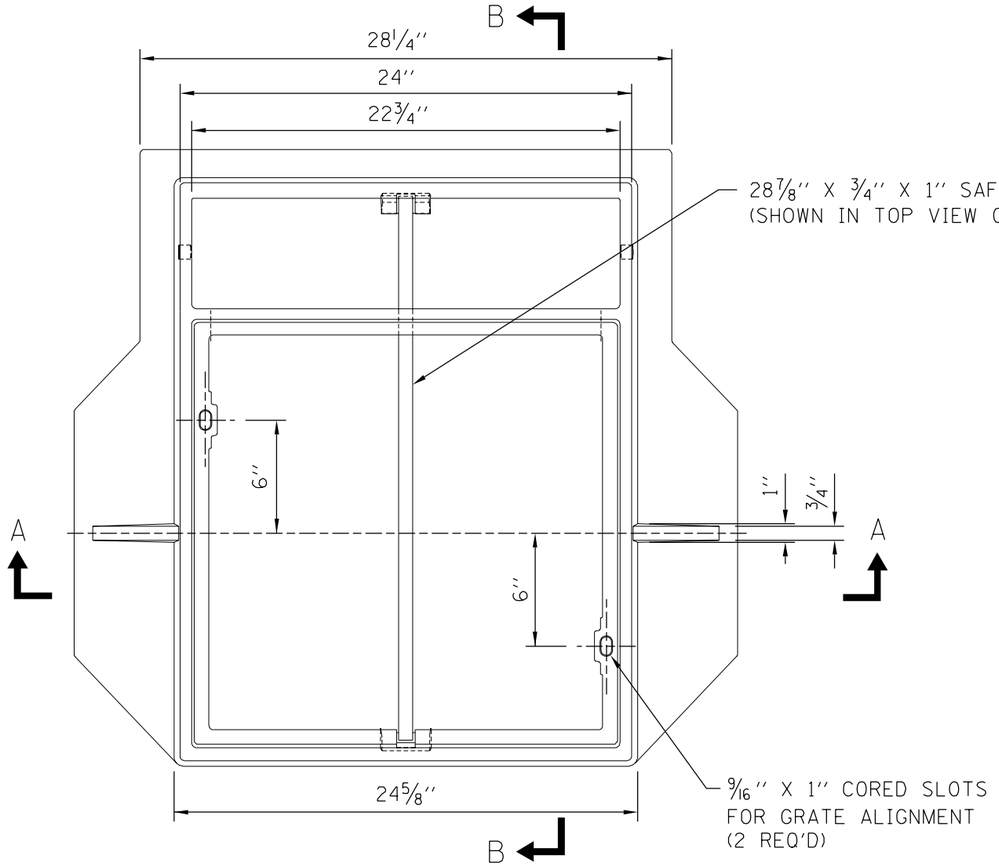
APPROVED Paul Kovacs CHIEF ENGINEER DATE 6-30-2008

Illinois Tollway
Open Roads for a Faster Future

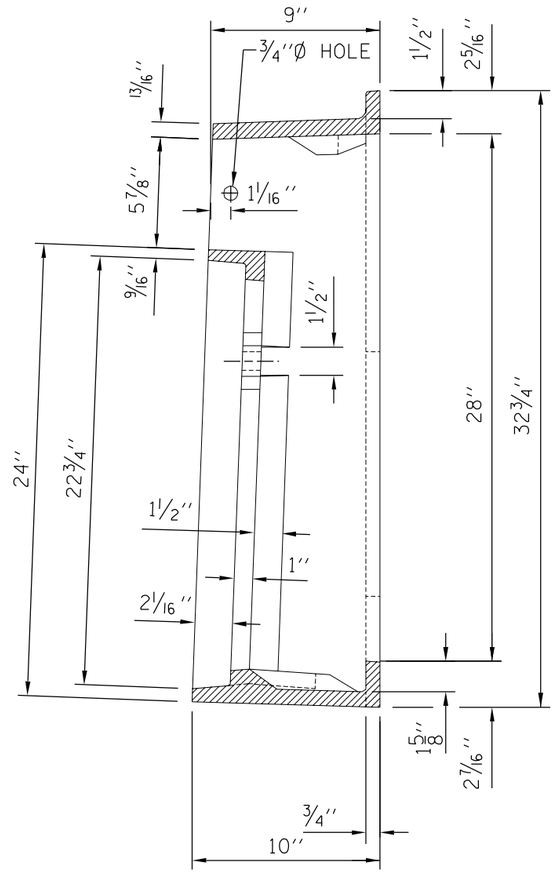
DATE	REVISIONS

FRAME AND GRATE
TYPE 20A

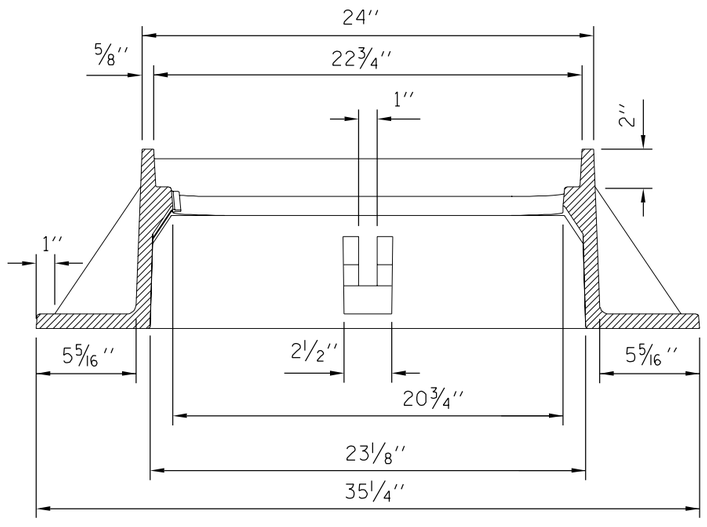
STANDARD B25-00



TOP VIEW



SECTION B-B



SECTION A-A

SHEET 1 OF 2

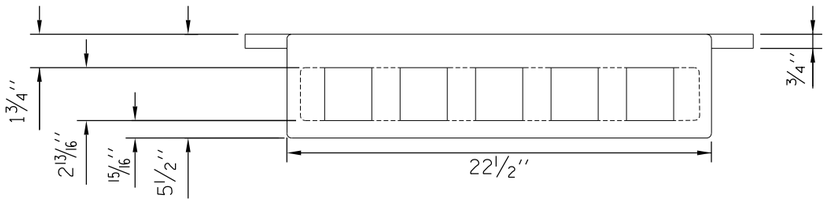
Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS

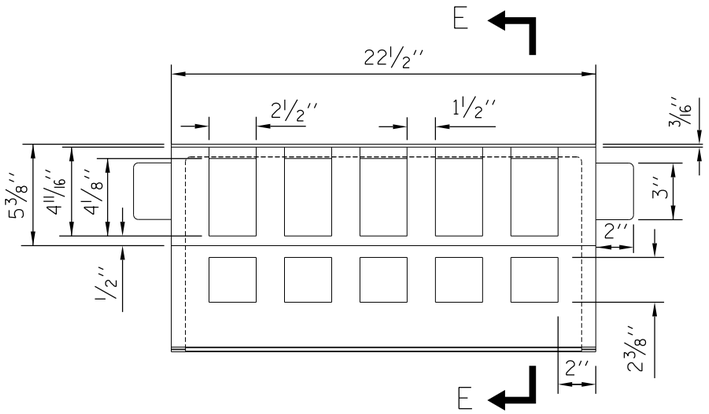
FRAME AND GRATE
TYPE 21A

STANDARD B26-00

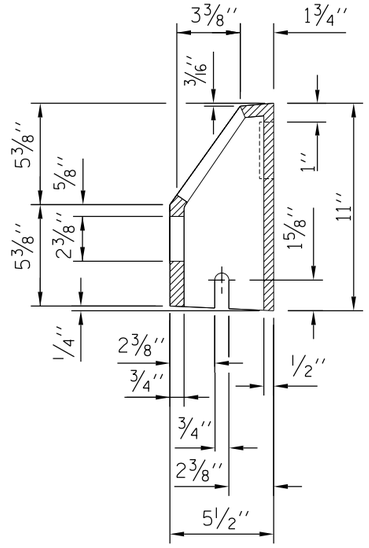
APPROVED Paul Kovacs
CHIEF ENGINEER
DATE 6-30-2008



TOP VIEW

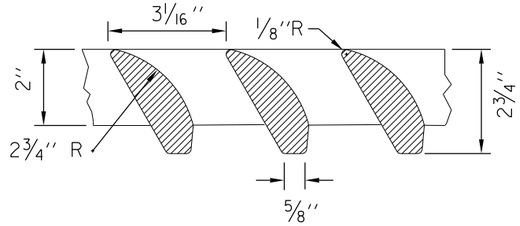


FRONT VIEW

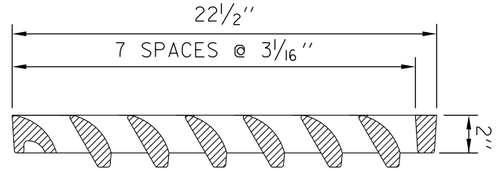


SECTION E-E

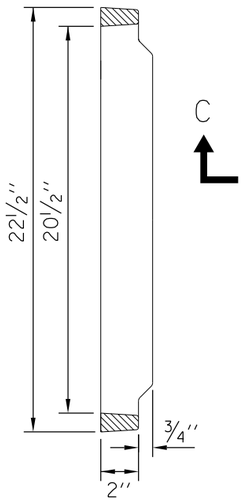
CURB BOX



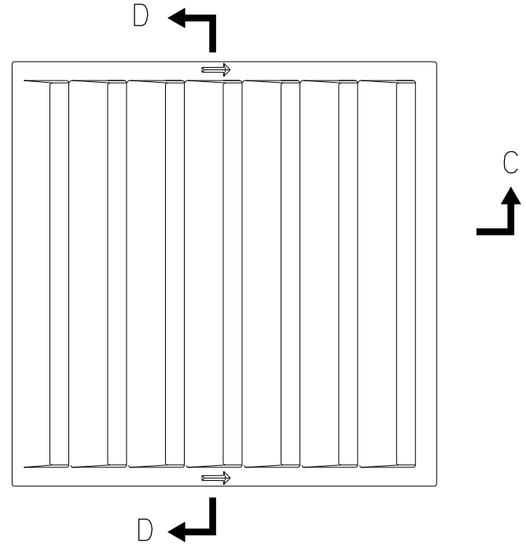
DETAIL OF VANES



SECTION C-C



SECTION D-D



TOP VIEW

CAST GRATE

NOTES:

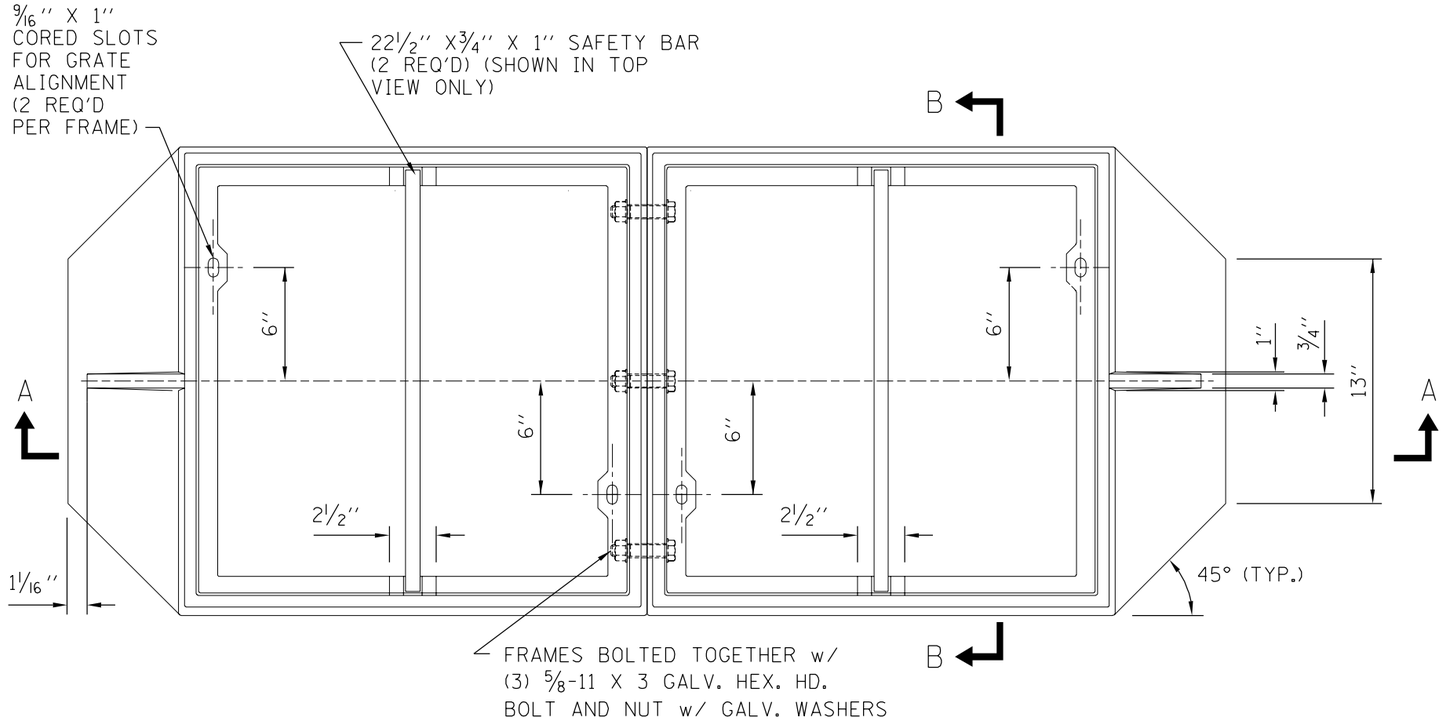
1. ALL FRAMES AND GRATES SHALL CONFORM TO THE REQUIREMENTS OF ART. 1006.14 FOR GRAY IRON CASTINGS AND TO ART. 1006.15 FOR DUCTILE IRON CASTINGS.
2. FRAME AND GRATE TO BE NEENAH FOUNDRY COMPANY, NEENAH NO. R-3527-VF OR APPROVED EQUAL.
3. GRATE SHALL NOT BE BOLTED TO FRAME.
4. CURB BOX SHALL BE BOLTED TO FRAME WITH ⅝'' GALVANIZED HEX. HD. BOLT AND NUT WITH GALV. WASHERS.
5. CURB BOXES SHALL ONLY BE USED AT SAG LOCATIONS.

APPROVED Paul Kovacs CHIEF ENGINEER DATE 6-30-2008

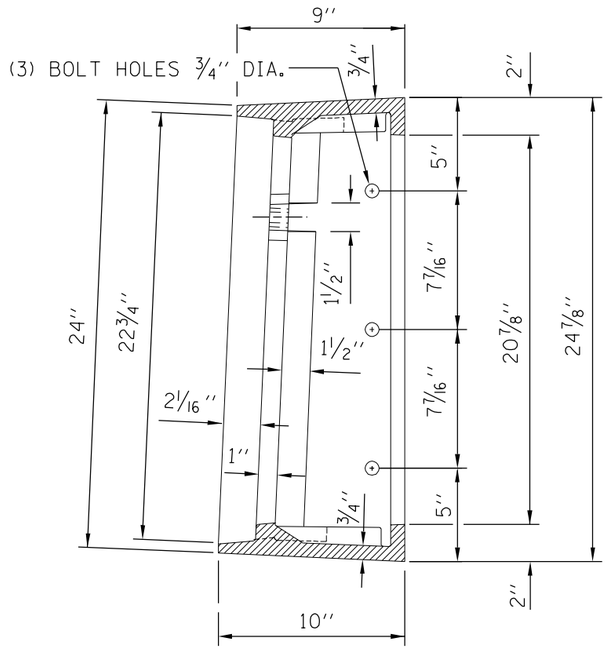
Illinois Tollway
Open Roads for a Faster Future

FRAME AND GRATE
TYPE 21A

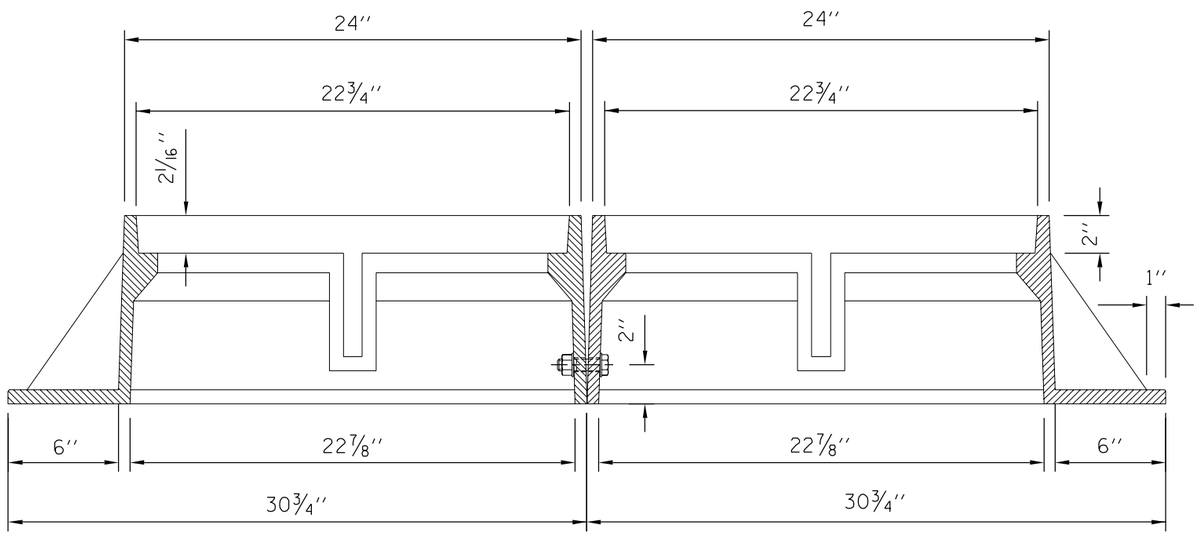
STANDARD B26-00



TOP VIEW



SECTION B-B



SECTION A-A

SHEET 1 OF 2

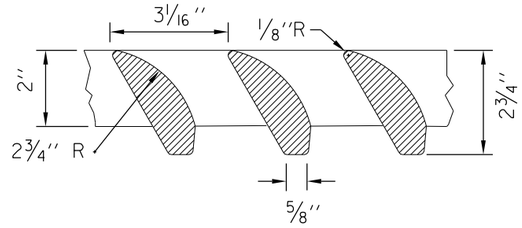
Illinois Tollway
Open Roads for a Faster Future

DATE	REVISIONS

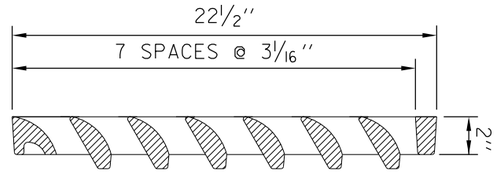
FRAME AND GRATE
TYPE 22A

STANDARD B27-00

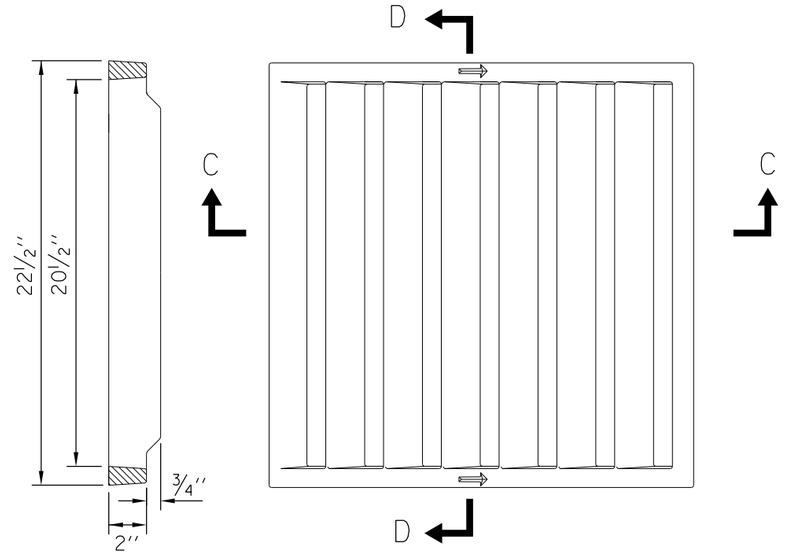
APPROVED Paul Kovacs
CHIEF ENGINEER
DATE 6-30-2008



DETAIL OF VANES



SECTION C-C



SECTION D-D TOP VIEW

NOTES:

1. ALL FRAMES AND GRATES SHALL CONFORM TO THE REQUIREMENTS OF ART. 1006.14 FOR GRAY IRON CASTINGS AND TO ART. 1006.15 FOR DUCTILE IRON CASTINGS.
2. FRAME AND GRATE TO BE NEENAH FOUNDRY COMPANY, NEENAH NO. R-3529-V OR APPROVED EQUAL.
3. GRATE SHALL NOT BE BOLTED TO FRAME.

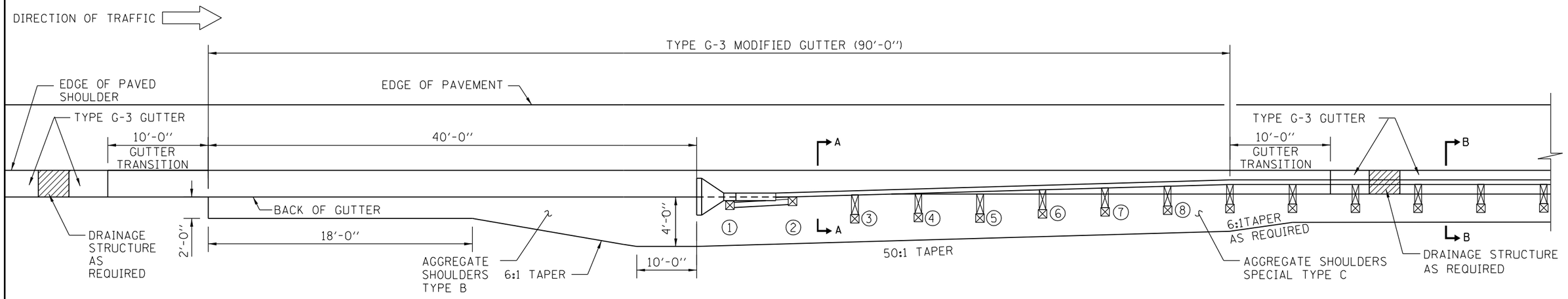
CAST GRATE
(2 REQ'D)

APPROVED Paul Kovacs CHIEF ENGINEER DATE 6-30-2008

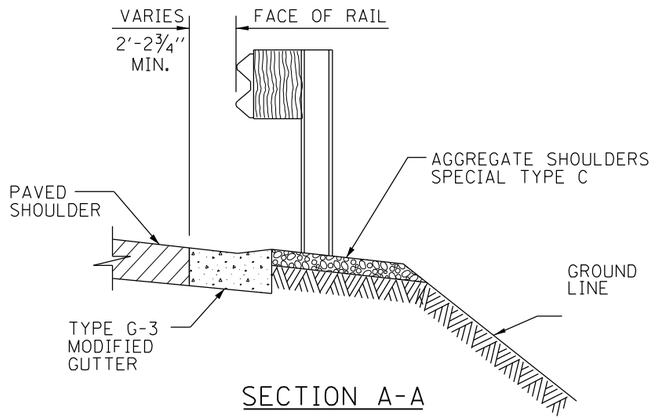
Illinois Tollway
Open Roads for a Faster Future

FRAME AND GRATE
TYPE 22A

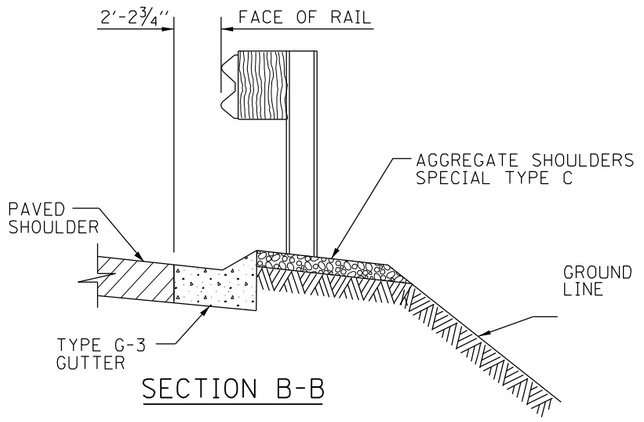
STANDARD B27-00



PLAN



SECTION A-A



SECTION B-B

TYPE G-3 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL)

NOTE:

GUTTER TRANSITIONS WILL BE PAID FOR PER FOOT AS TYPE G-3 GUTTER.

SHEET 1 OF 3

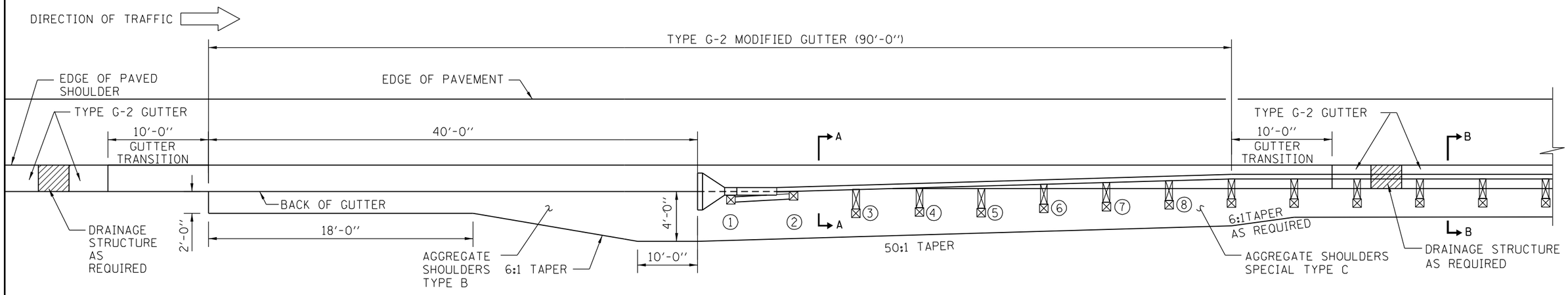
Illinois Tollway
Open Roads for a Faster Future

	REVISIONS
1-1-2011	REVISED GUTTER TRANSITION TERMINATION

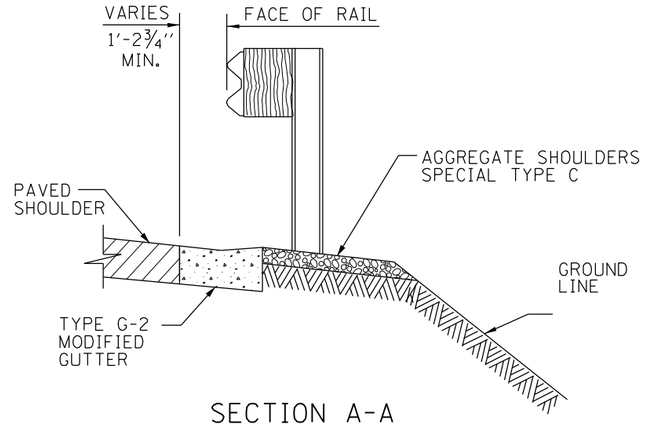
GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL)

STANDARD B28-01

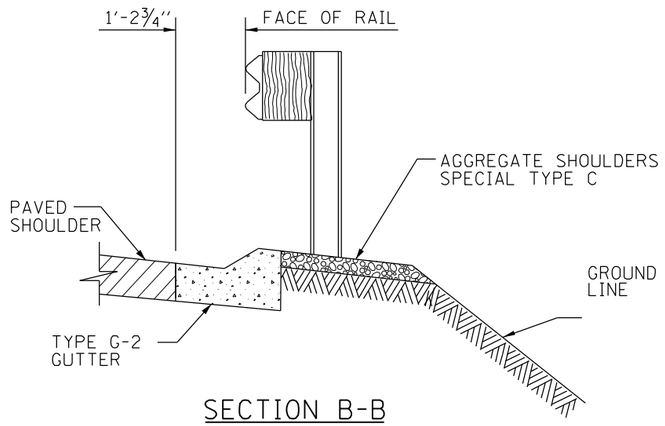
Paul Kovacs
APPROVED . . . . . DATE 3-1-2010
CHIEF ENGINEER



PLAN



SECTION A-A



SECTION B-B

NOTE:

GUTTER TRANSITIONS WILL BE PAID FOR PER FOOT AS TYPE G-2 GUTTER.

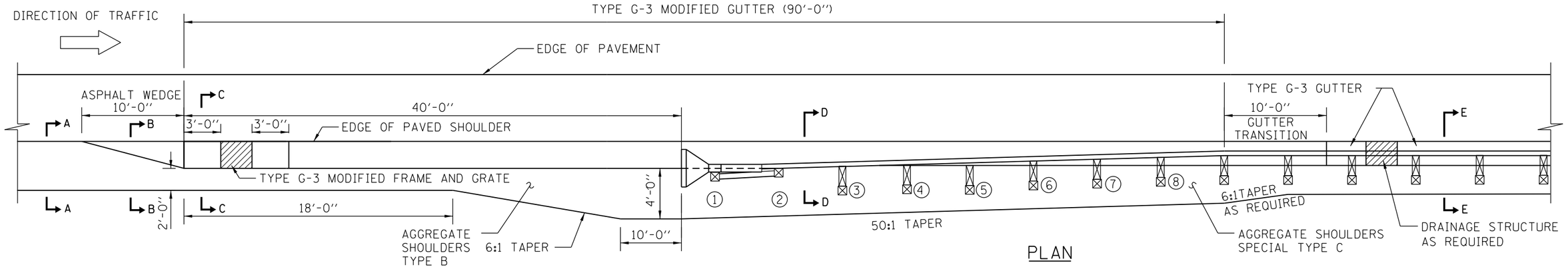
TYPE G-2 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL)

Paul Kovacs
APPROVED . . . . . CHIEF ENGINEER
DATE 3-1-2010

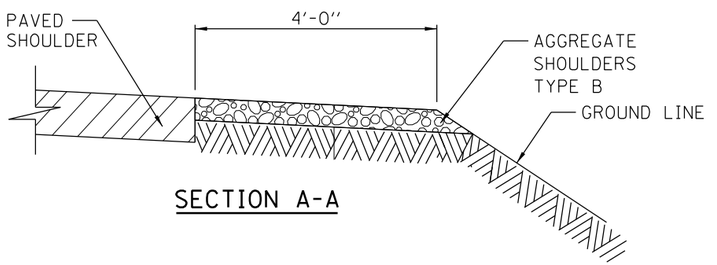
Illinois Tollway
Open Roads for a Faster Future

GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL)

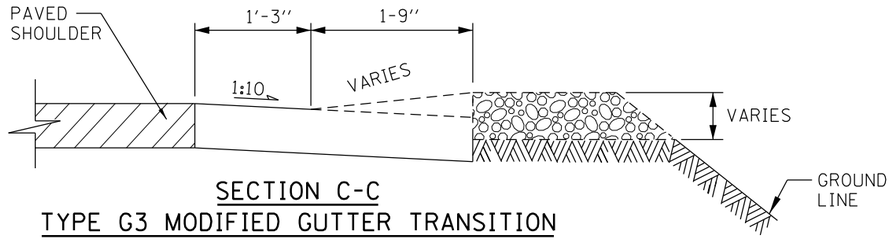
STANDARD B28-01



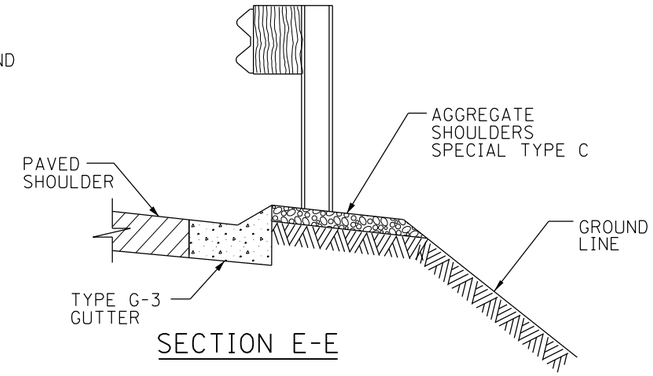
PLAN



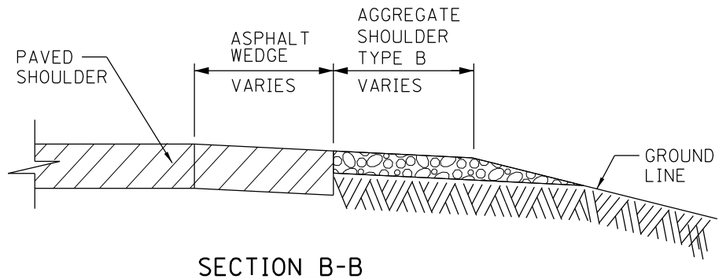
SECTION A-A



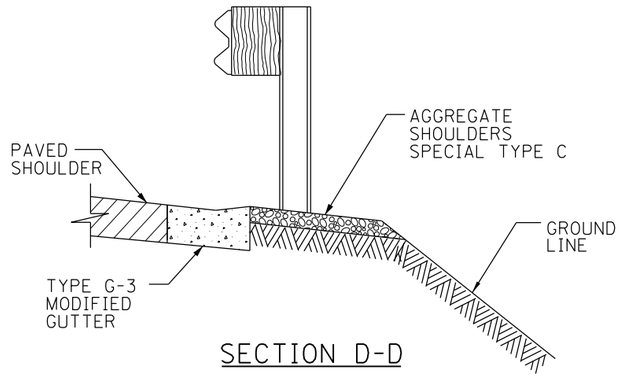
SECTION C-C
TYPE G3 MODIFIED GUTTER TRANSITION



SECTION E-E



SECTION B-B
ASPHALT SHOULDER TRANSITION



SECTION D-D

NOTE:

GUTTER TRANSITIONS WILL BE PAID FOR PER FOOT AS TYPE G-3 GUTTER.

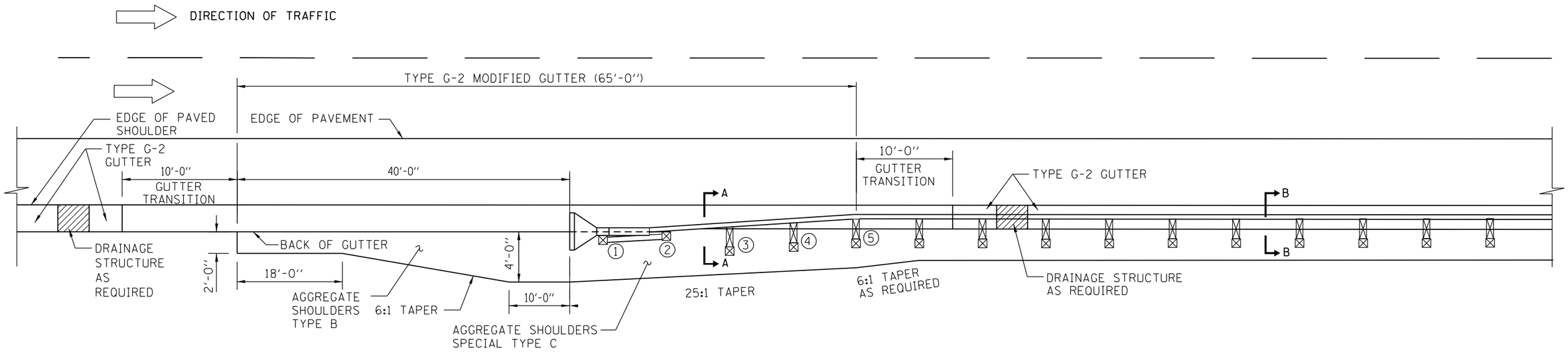
TYPE G-3 GUTTER TRANSITION TERMINATION AT TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL)

Paul Kovacs
APPROVED . . . . . DATE 3-1-2010
CHIEF ENGINEER

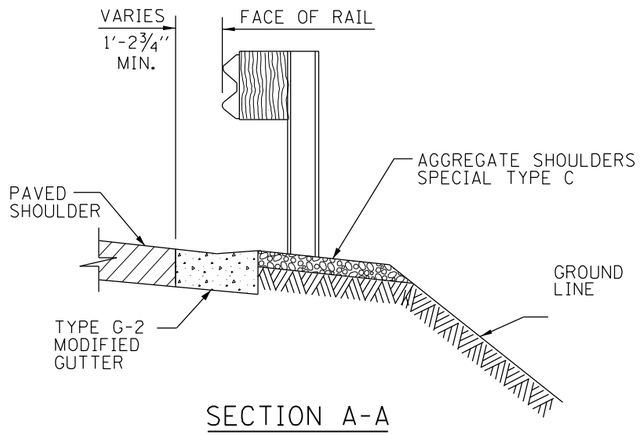
Illinois Tollway
Open Roads for a Faster Future

GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL)

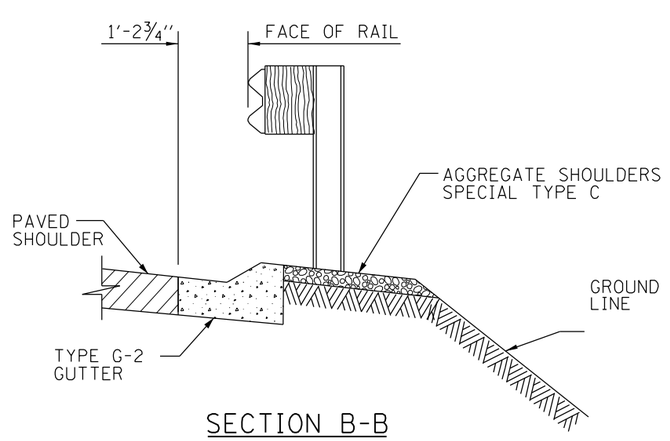
STANDARD B28-01



PLAN



SECTION A-A



SECTION B-B

NOTE:

GUTTER TRANSITIONS WILL BE PAID FOR PER FOOT AS TYPE G-2 GUTTER.

TYPE G-2 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1-A (SPECIAL)

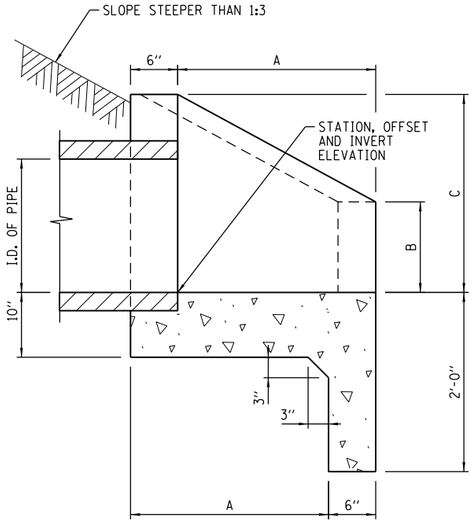
Paul Kovacs
APPROVED ..... CHIEF ENGINEER
DATE 1-1-2011

Illinois Tollway
Open Roads for a Faster Future

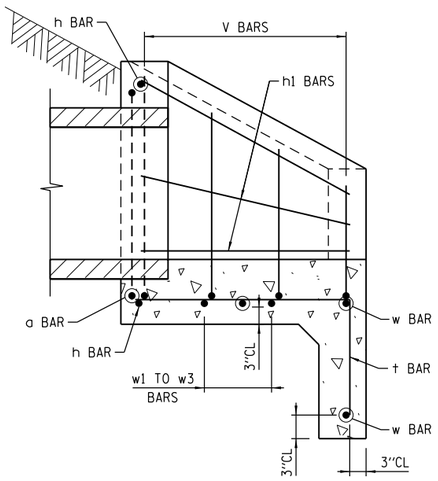
	REVISIONS

GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1-A (SPECIAL)

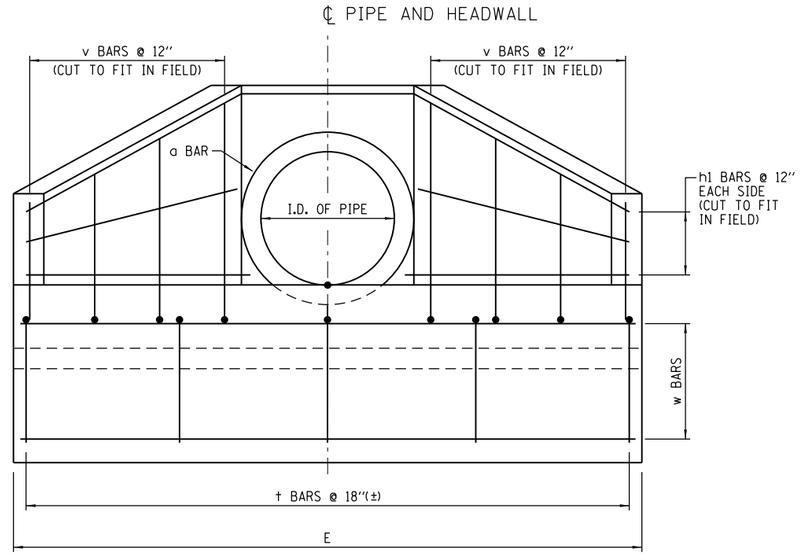
STANDARD B29-00



SECTION A-A
(DIMENSIONS)



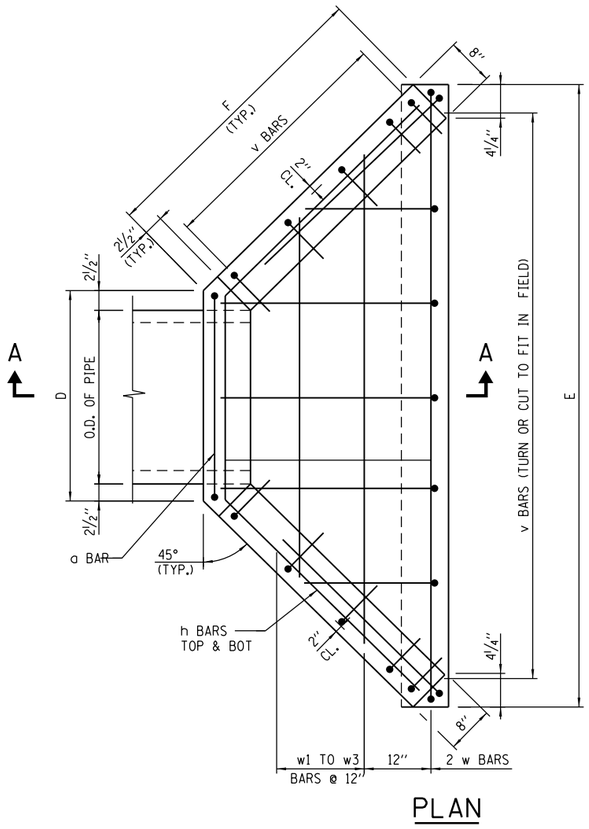
SECTION A-A
(REINFORCEMENT)



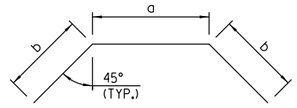
FRONT ELEVATION

NOTES:

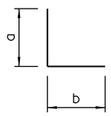
1. SLOPED HEADWALL TYPES I AND II SHALL BE CONSTRUCTED FLUSH WITH EXISTING OR PROPOSED SLOPE.
2. CLASS SI CONCRETE SHALL BE USED THROUGHOUT.
3. ALL REINFORCEMENT BARS SHOWN SHALL BE EPOXY COATED.
4. BAR BENDING DETAILS ARE DIMENSIONED OUT TO OUT OF BARS.
5. ALL EXPOSED EDGES SHALL HAVE A ¾"-45° CHAMFER. CHAMFER ON VERTICAL EDGES SHALL BE CONTINUED A MINIMUM OF ONE FOOT BELOW THE FINISHED GROUND LINE.
6. COVER FROM THE FACE OF CONCRETE TO FACE OF REINFORCEMENT BAR SHALL BE 3" FOR SURFACES FORMED AGAINST EARTH AND 2" FOR ALL OTHER SURFACES UNLESS OTHERWISE SHOWN.
7. CARE SHALL BE EXERCISED IN REMOVING ANY LENGTH OF EXISTING PIPE SO THE REMAINING PIPE IS UNDAMAGED AND FULLY FUNCTIONING.
8. ALL SLOPES ARE EXPRESSED AS UNITS OF VERTICAL DISPLACEMENT TO UNITS OF HORIZONTAL DISPLACEMENT.
9. TYPES I AND II HEADWALLS TO BE USED ONLY FOR SLOPES STEEPER THAN 1:3. DIMENSIONS AND QUANTITIES ARE BASES ON A SLOPE 1:2.
10. I.D. DENOTES INSIDE DIAMETER OF PIPE. O.D. DENOTES OUTSIDE DIAMETER OF PIPE.



PLAN

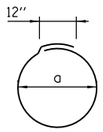


h BARS



v - BARS

† - BARS



a BARS

TABLE OF DIMENSIONS AND QUANTITIES FOR ONE HEADWALL

INSIDE DIA.OF PIPE	SLOPE OF FILL	DIMENSIONS						CL. SI CONC.	REINF. BARS.
		A	B	C	D	E	F		
21"	1:3	2'-6"	1'-2"	2'-6"	2'-8"	7'-11½"	3'-6½"	1.6 C.Y.	75 #
24"	1:3	2'-10"	1'-4"	2'-9"	2'-11"	8'-10½"	4'-2½"	2.1 C.Y.	80 #
27"	1:3	3'-2"	1'-8"	3'-0"	3'-3"	9'-7"	4'-5¾"	2.0 C.Y.	100 #
30"	1:3	3'-4"	1'-7"	3'-3"	3'-6"	10'-5½"	4'-11 "	2.7 C.Y.	120 #
36"	1:3	4'-0"	1'-10"	3'-10"	4'-1"	12'-4½"	5'-10½"	3.6 C.Y.	145 #

TABLE OF REINFORCING STEEL FOR ONE HEADWALL

BAR		21" I.D. PIPE				24" I.D. PIPE				27" I.D. PIPE				30" I.D. PIPE				36" I.D. PIPE			
MARK	SIZE	NO.	LENGTH	a	b	NO.	LENGTH	a	b	NO.	LENGTH	a	b	NO.	LENGTH	a	b	NO.	LENGTH	a	b
a	#4	1	9'-3"	31½"	-	1	10'-2"	35"	-	1	11'-1"	38½"	-	1	12'-0"	42"	-	1	13'-10"	49"	-
h	#4	2	8'-7"	2'-3"	3'-2"	2	10'-2"	2'-6"	3'-10"	2	11'-0"	2'-10"	4'-1"	2	9'-5"	3'-1"	3'-2"	2	11'-0"	3'-8"	4'-1"
h1	#4	4	3'-2"	-	-	4	3'-10"	-	-	4	4'-2"	-	-	5	4'-7"	-	-	6	5'-6"	-	-
v	#4	6	4'-0"	1'-0"	3'-0"	8	4'-3"	1'-0"	3'-3"	8	4'-6"	1'-0"	3'-6"	10	4'-9"	1'-0"	3'-9"	10	5'-4"	1'-0"	4'-4"
†	#4	6	4'-0"	1'-6"	2'-6"	6	4'-3"	1'-6"	2'-9"	6	4'-8"	1'-6"	3'-1"	7	4'-10"	1'-6"	3'-4"	8	5'-4"	1'-6"	3'-10"
w	#4	2	7'-7"	-	-	2	8'-6"	-	-	2	10'-1"	-	-	2	10'-0"	-	-	2	12'-0"	-	-
w1	#4	1	6'-0"	-	-	1	6'-11"	-	-	1	7'-11"	-	-	1	8'-7"	-	-	1	10'-6"	-	-
w2	#4	1	4'-0"	-	-	1	4'-11"	-	-	1	5'-11"	-	-	1	6'-7"	-	-	1	8'-6"	-	-
w3	#4	-	-	-	-	-	-	-	-	-	-	-	-	1	4'-7"	-	-	1	7'-6"	-	-

Paul Kovacs
APPROVED..... DATE 2-7-2012..
CHIEF ENGINEER

HEADWALL - TYPE I
(PIPE DIAMETER ≤ 36")

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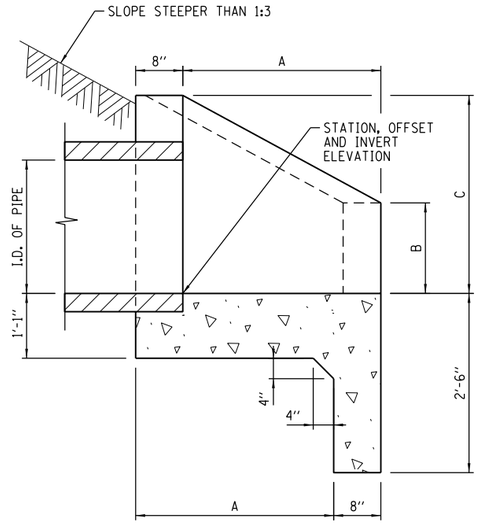
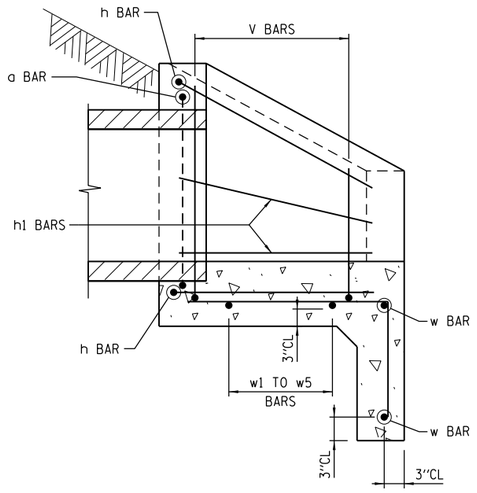
DATE	REVISIONS
2-7-2012	ADDED 21" AND 27" DIA. PIPE AND REVISED TABLE QUANTITIES

HEADWALLS
TYPE I AND II

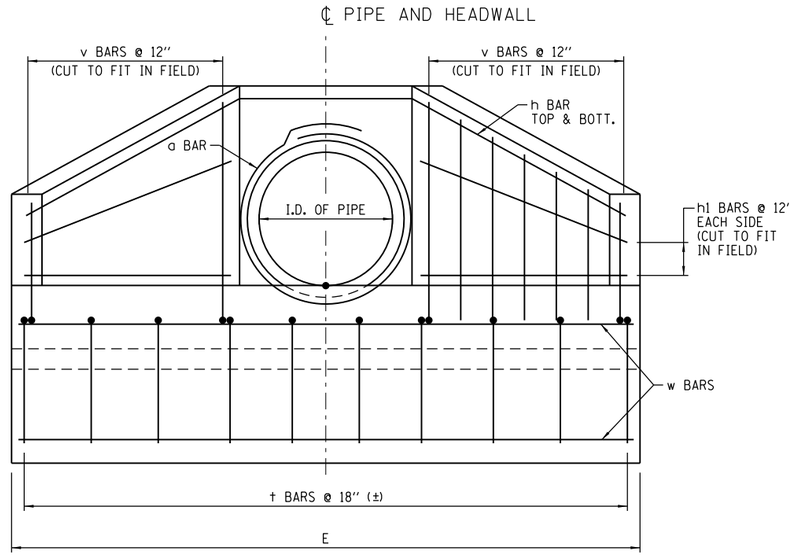
STANDARD B30-01



SECTION A-A
(DIMENSIONS)



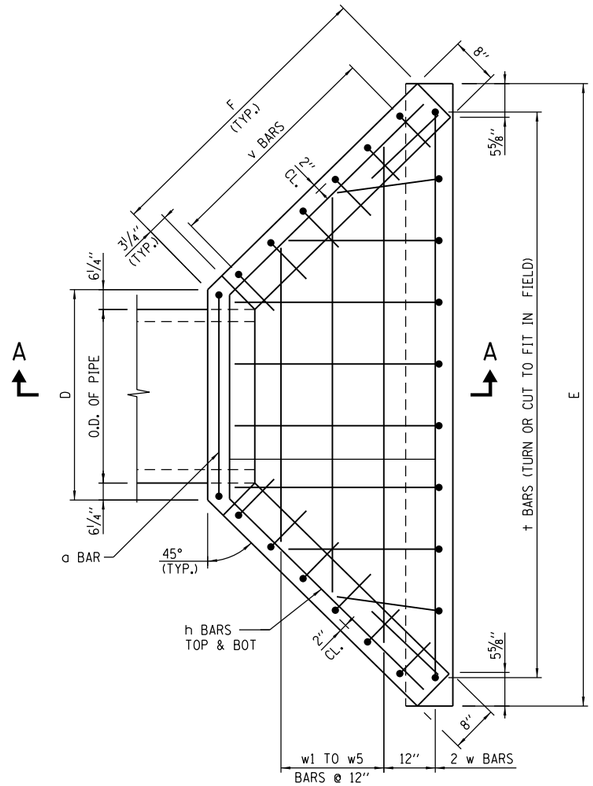
SECTION A-A
(REINFORCEMENT)



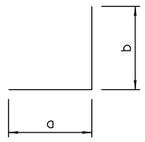
FRONT ELEVATION

NOTE:

1. FOR ADDITIONAL NOTES SEE SHEET 1 OF 2 IN THIS SERIES.

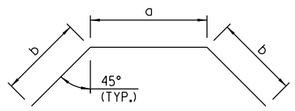


PLAN

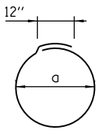


v BARS

† BARS



h BARS



a BARS

HEADWALL - TYPE II
(PIPE DIAMETER ≥ 36")

TABLE OF BARS FOR ONE HEADWALL

BAR		42" PIPE				48" PIPE				54" I.D. PIPE				60" I.D. PIPE			
MARK	SIZE	NO.	LENGTH	a	b	NO.	LENGTH	a	b	NO.	LENGTH	a	b	NO.	LENGTH	a	b
a	#5	2	15'-11"	4'-9"	-	2	17'-9"	5'-4"	-	2	19'-7"	5'-11"	-	2	21'-5"	6'-6"	-
h	#5	2	17'-7"	5'-3"	6'-2"	2	19'-9"	5'-9"	7'-0"	2	22'-0"	6'-4"	7'-10"	2	24'-1"	6'-9"	8'-8"
h1	#5	8	6'-6"	-	-	10	7'-4"	-	-	10	8'-2"	-	-	12	9'-0"	-	-
†	#5	10	6'-1"	1'-6"	4'-7"	11	6'-8"	1'-6"	5'-2"	13	7'-3"	1'-6"	5'-9"	15	7'-10"	1'-6"	6'-4"
v	#5	14	5'-10"	1'-0"	4'-10"	16	6'-6"	1'-0"	5'-6"	16	7'-1"	1'-0"	6'-1"	18	7'-8"	1'-0"	6'-8"
w	#5	2	14'-3"	-	-	2	15'-10"	-	-	2	17'-8"	-	-	2	18'-10"	-	-
w1	#5	1	12'-0"	-	-	1	13'-8"	-	-	1	15'-2"	-	-	1	16'-10"	-	-
w2	#5	1	10'-0"	-	-	1	11'-8"	-	-	1	13'-4"	-	-	1	15'-0"	-	-
w3	#5	1	8'-0"	-	-	1	9'-8"	-	-	1	11'-6"	-	-	1	13'-2"	-	-
w4	#5	-	-	-	-	1	8'-0"	-	-	1	9'-8"	-	-	1	11'-4"	-	-
w5	#5	-	-	-	-	-	-	-	-	-	7'-8"	-	-	1	9'-6"	-	-

TABLE OF DIMENSIONS AND QUANTITIES FOR ONE HEADWALL

INSIDE DIA.OF PIPE	SLOPE OF FILL	DIMENSIONS						CL. SP CONC.	REINF. BARS.
		A	B	C	D	E	F		
42"	1:3	4'-5"	2'-2"	4'-4½"	5'-6"	14'-9"	6'-6¼"	3.8 C.Y.	400 #
48"	1:3	5'-0"	2'-5"	4'-11 "	6'-0"	16'-4¾"	7'-4¼"	4.1 C.Y.	450 #
54"	1:3	5'-7"	2'-8"	5'-5½"	6'-7"	18'-1¾"	8'-2"	5.6 C.Y.	500 #
60"	1:3	6'-2"	2'-11"	6'-0 "	7'-0"	19'-2¾"	9'-0"	6.5 C.Y.	600 #

Paul Kovacs
APPROVED..... CHIEF ENGINEER
DATE 2-7-2012

SHEET 2 OF 2

Illinois Tollway
Open Roads for a Faster Future

HEADWALLS
TYPE I AND II

STANDARD B30-01