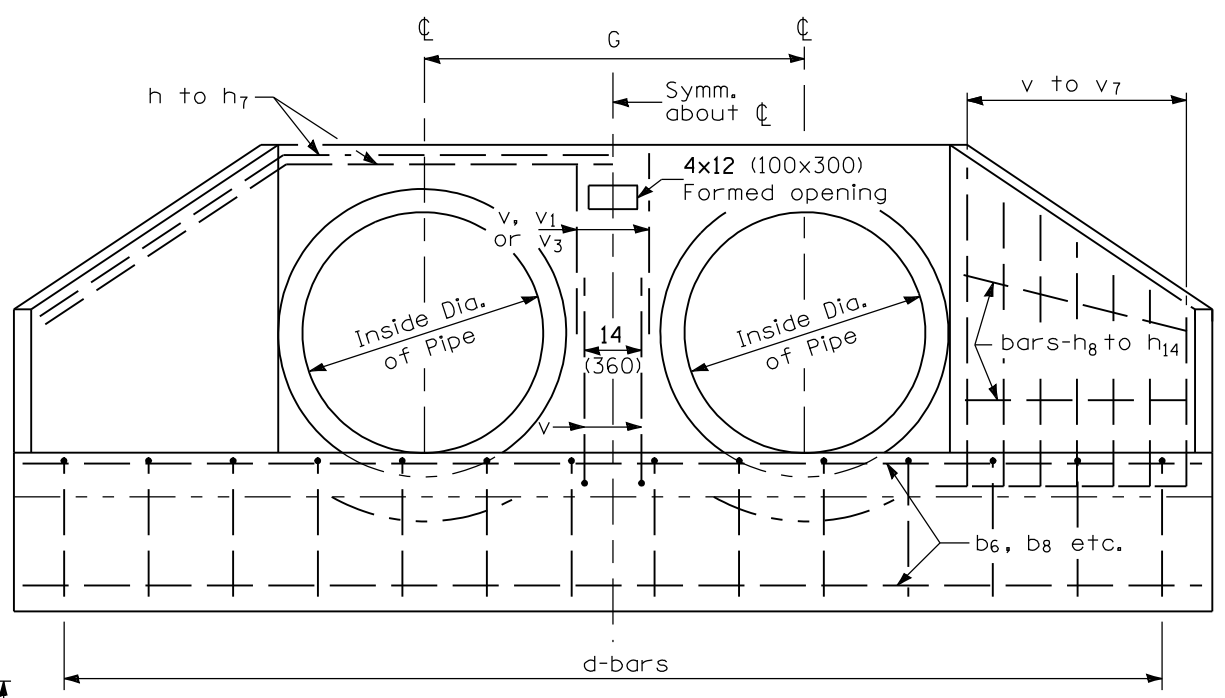
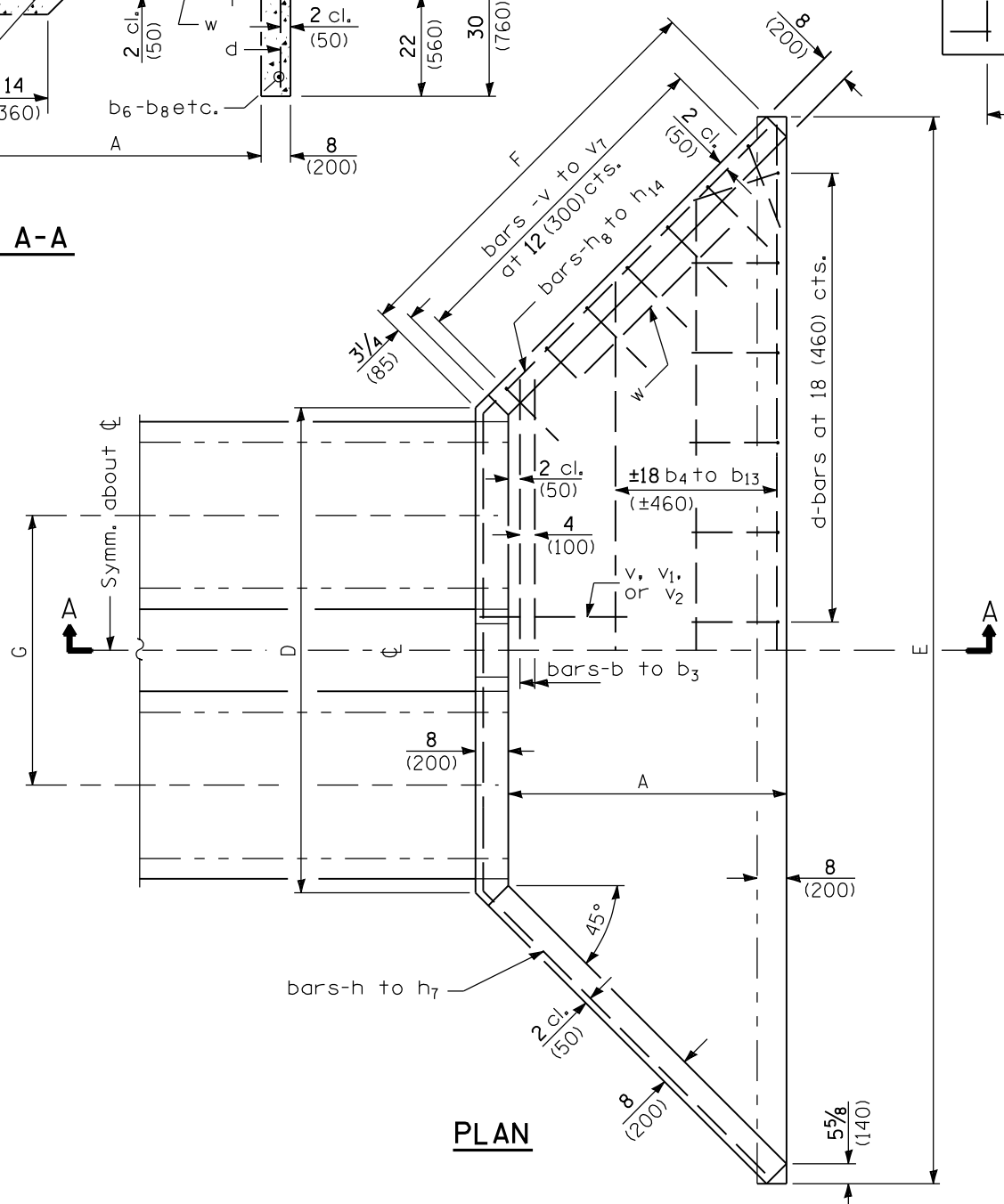


SECTION A-A



END ELEVATION



PLAN

GENERAL NOTES

All slope ratios are expressed as units of vertical displacement to units of horizontal displacement (V:H).
 All dimensions are in inches (millimeters) unless otherwise shown.

DATE	REVISIONS
1-1-09	Switched units to English (metric).
1-1-07	Soft converted metric reinforcement bars.

REINFORCED CONCRETE END SECTIONS FOR MULTIPLE (2 & 3) PIPE CULVERTS 42" (1050 mm) THRU 60" (1500 mm) DIA. AT RIGHT ANGLES WITH ROADWAY
 (Sheet 1 of 3)
STANDARD 542121-02

Illinois Department of Transportation

APPROVED January 1, 2009
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APPROVED January 1, 2009
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ISSUED 1-1-07

DIMENSIONS OF STRAIGHT BARS

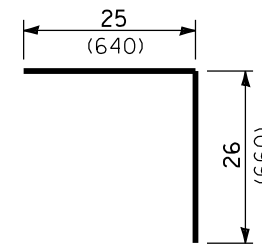
Bar	Size	Length		Bar	Size	Length	
		2-Pipes	3-Pipes			2-Pipes	3-Pipes
b	No. 5 (No. 16)	11'-9" (3.58 m)	17'-6" (5.33 m)	h ₈	No. 4 (No. 13)	4'-9" (1.45 m)	4'-9" (1.45 m)
b ₁	No. 5 (No. 16)	13'-0" (3.96 m)	19'-3" (5.87 m)	h ₉	No. 4 (No. 13)	5'-3" (1.6 m)	5'-3" (1.6 m)
b ₂	No. 5 (No. 16)	14'-0" (4.27 m)	20'-9" (6.32 m)	h ₁₀	No. 4 (No. 13)	6'-0" (1.83 m)	6'-0" (1.83 m)
b ₃	No. 5 (No. 16)	15'-3" (4.65 m)	22'-9" (6.94 m)	h ₁₁	No. 4 (No. 13)	6'-6" (1.98 m)	6'-6" (1.98 m)
b ₄	No. 4 (No. 13)	14'-6" (4.42 m)	20'-6" (6.25 m)	h ₁₂	No. 4 (No. 13)	7'-3" (2.21 m)	7'-3" (2.21 m)
b ₅	No. 4 (No. 13)	16'-3" (4.95 m)	23'-0" (7.01 m)	h ₁₃	No. 4 (No. 13)	8'-0" (2.44 m)	8'-0" (2.44 m)
b ₆	No. 4 (No. 13)	17'-3" (5.26 m)	24'-0" (7.32 m)	h ₁₄	No. 4 (No. 13)	8'-9" (2.67 m)	8'-9" (2.67 m)
b ₇	No. 4 (No. 13)	18'-0" (5.49 m)	24'-6" (7.47 m)	w	No. 4 (No. 13)	4'-0" (1.22 m)	4'-0" (1.22 m)
b ₈	No. 4 (No. 13)	19'-0" (5.79 m)	25'-3" (7.7 m)				
b ₉	No. 4 (No. 13)	20'-6" (6.25 m)	26'-0" (7.92 m)				
b ₁₀	No. 4 (No. 13)	21'-3" (6.48 m)	27'-0" (8.23 m)				
b ₁₁	No. 4 (No. 13)	23'-0" (7.01 m)	27'-9" (8.46 m)				
b ₁₂	No. 4 (No. 13)	24'-0" (7.32 m)	30'-6" (9.3 m)				
b ₁₃	No. 4 (No. 13)	26'-0" (7.92 m)	34'-0" (10.36 m)				

DIMENSIONS AND QUANTITIES

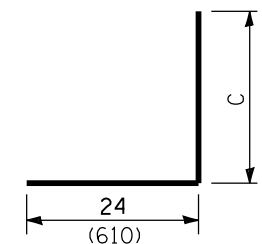
Design No.	Nominal Inside Dia. of Pipe	Slope of Wing Walls	Dimensions										Quantities			
			For all Multiples of Pipes										2 Pipes		3 Pipes	
			A	B	C	F	G	D	E	D	E	Concrete 2 End Secs. cu. yds. (m ³)	Reinf. Bars 2 End Secs. lbs. (kgs)	Concrete 2 End Secs. cu. yds. (m ³)	Reinf. Bars 2 End Secs. lbs. (kgs)	
D42-1 1/2 (D1.05-1 1/2)	42 (1050)	1:1 1/2	3'-4" (1.01 m)	26 (660)	4'-4 1/2" (1.33 m)	5'-0" (1.52 m)	5'-9" (1.75 m)	10'-7" (3.23 m)	17'-8" (5.38 m)	16'-4" (4.98 m)	23'-5" (7.13 m)	7.1 (5.4)	440 (200)	9.3 (7.1)	540 (245)	
D42-2 (D1.05-2)	42 (1050)	1:2	4'-5" (1.35 m)	26 (660)	4'-4 1/2" (1.33 m)	6'-6 1/4" (1.99 m)	5'-9" (1.75 m)	10'-7" (3.23 m)	19'-10" (6.04 m)	16'-4" (4.98 m)	25'-7" (7.8 m)	8.8 (6.7)	540 (245)	11.4 (8.7)	640 (290)	
D48-1 1/2 (D1.2-1 1/2)	48 (1200)	1:1 1/2	3'-9" (1.12 m)	29 (740)	4'-11" (1.5 m)	5'-7" (1.7 m)	6'-4" (1.93 m)	11'-9" (3.58 m)	19'-8" (5.98 m)	18'-1" (5.51 m)	26'-0" (7.91 m)	8.4 (6.4)	510 (231)	11.1 (8.5)	610 (277)	
D48-2 (D1.2-2)	48 (1200)	1:2	5'-0" (1.52 m)	29 (740)	4'-11" (1.5 m)	7'-4 1/4" (2.24 m)	6'-4" (1.93 m)	11'-9" (3.58 m)	22'-2" (6.75 m)	18'-1" (5.51 m)	28'-6" (8.68 m)	10.7 (8.2)	630 (286)	13.7 (10.5)	740 (336)	
D54-1 1/2 (D1.35-1 1/2)	54 (1350)	1:1 1/2	4'-2" (1.27 m)	32 (810)	5'-5 1/2" (1.66 m)	6'-2" (1.88 m)	6'-11" (2.11 m)	12'-11" (3.94 m)	21'-8" (6.6 m)	19'-10" (6.05 m)	28'-7" (8.71 m)	10.0 (7.6)	580 (263)	13.1 (10.0)	700 (318)	
D54-2 (D1.35-2)	54 (1350)	1:2	5'-7" (1.7 m)	32 (810)	5'-5 1/2" (1.66 m)	8'-2" (2.49 m)	6'-11" (2.11 m)	12'-11" (3.94 m)	24'-6" (7.46 m)	19'-10" (6.05 m)	31'-5" (9.57 m)	12.8 (9.8)	670 (304)	16.3 (12.5)	800 (363)	
D60-1 1/2 (D1.5-1 1/2)	60 (1500)	1:1 1/2	4'-7" (1.4 m)	35 (890)	6'-0" (1.83 m)	6'-9" (2.06 m)	7'-6" (2.29 m)	14'-11" (4.29 m)	23'-8" (7.2 m)	21'-7" (6.58 m)	31'-2" (9.49 m)	11.7 (8.9)	650 (295)	15.3 (11.7)	790 (358)	
D60-2 (D1.5-2)	60 (1500)	1:2	6'-2" (1.88 m)	35 (890)	6'-0" (1.83 m)	9'-0" (2.74 m)	7'-6" (2.29 m)	14'-11" (4.29 m)	26'-10" (8.16 m)	21'-7" (6.58 m)	34'-4" (10.45 m)	15.0 (11.5)	780 (354)	19.2 (14.7)	930 (422)	

DIMENSIONS OF BENT BARS

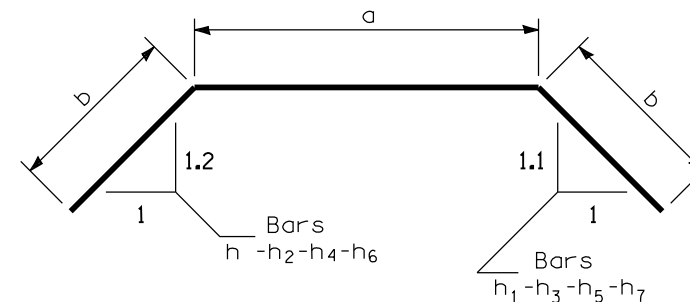
No. 5 -bars v to v ₇ (No. 16)			No. 5 -bars h to h ₇ (No. 16)						
Bars	c	Total Length	Bars	2-Pipes			3-Pipes		
				a	b	Total Length	a	b	Total Length
v	6'-0" (1.83 m)	8'-0" (2.44 m)	h	10'-5" (3.18 m)	5'-2" (1.57 m)	20'-9" (6.32 m)	16'-2" (4.93 m)	5'-2" (1.57 m)	26'-6" (8.07 m)
v ₁	5'-6" (1.68 m)	7'-6" (2.29 m)	h ₁	10'-5" (3.18 m)	6'-8" (2.03 m)	23'-9" (7.24 m)	16'-2" (4.93 m)	6'-8" (2.03 m)	29'-6" (8.99 m)
v ₂	5'-0" (1.52 m)	7'-0" (2.13 m)	h ₂	11'-7" (3.53 m)	5'-10" (1.78 m)	23'-3" (7.09 m)	17'-11" (5.46 m)	5'-11" (1.80 m)	29'-9" (9.06 m)
v ₃	4'-6" (1.37 m)	6'-6" (1.98 m)	h ₃	11'-7" (3.53 m)	7'-7" (2.31 m)	26'-9" (8.15 m)	17'-11" (5.46 m)	7'-6 1/2" (2.3 m)	33'-0" (10.06 m)
v ₄	4'-0" (1.22 m)	6'-0" (1.83 m)	h ₄	12'-9" (3.87 m)	6'-6" (1.98 m)	25'-9" (7.83 m)	19'-8" (6.0 m)	6'-6 1/2" (2.0 m)	32'-9" (10.0 m)
v ₅	3'-6" (1.07 m)	5'-6" (1.68 m)	h ₅	12'-9" (3.87 m)	8'-3" (2.51 m)	29'-0" (8.89 m)	19'-8" (6.0 m)	8'-3 1/2" (2.53 m)	36'-3" (11.06 m)
v ₆	36 (910)	5'-0" (1.52 m)	h ₆	12'-11" (4.24 m)	7'-2" (2.18 m)	28'-3" (8.60 m)	21'-5" (6.53 m)	7'-2" (2.18 m)	35'-9" (10.89 m)
v ₇	30 (760)	4'-6" (1.37 m)	h ₇	13'-11" (4.24 m)	9'-2" (2.79 m)	32'-3" (9.82 m)	21'-5" (6.53 m)	9'-3 1/2" (2.83 m)	40'-0" (12.19 m)



No. 4 (No. 13) BAR-d



BARS - v to v₇



BARS - h to h₇

Bend in field
One Required in each headwall

REINFORCED CONCRETE END SECTIONS FOR MULTIPLE (2 & 3) PIPE CULVERTS 42" (1050 mm) THRU 60" (1500 mm) DIA. AT RIGHT ANGLES WITH ROADWAY
(Sheet 2 of 3)

STANDARD 542121-02

Illinois Department of Transportation

APPROVED January 1, 2009
Ralph E. Anderson
ENGINEER OF BRIDGES AND STRUCTURES

APPROVED January 1, 2009
Ken E. Han
ENGINEER OF DESIGN AND ENVIRONMENT

ISSUED 1-1-97

BARS IN ONE END SECTION - 2 PIPES

42 Pipe (1050)				48 Pipe (1200)				54 Pipe (1350)				60 Pipe (1500)			
D42-1/2 (D1.05-1/2)		D42-2 (D1.05-2)		D48-1/2 (D1.2-1/2)		D48-2 (D1.2-2)		D54-1/2 (D1.35-1/2)		D54-2 (D1.35-2)		D60-1/2 (D1.5-1/2)		D60-2 (D1.5-2)	
BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.
d	12	d	13	d	13	d	15	d	14	d	16	d	16	d	18
b	2	b	2	b ₁	2	b ₁	2	b ₂	2	b ₂	2	b ₃	2	b ₃	2
b ₄	1	b ₄	1	b ₅	1	b ₅	1	b ₆	1	b ₆	1	b ₇	1	b ₇	1
b ₆	2	b ₆	1	b ₈	2	b ₈	1	b ₈	1	b ₉	1	b ₉	1	b ₉	1
		b ₈	2			b ₁₀	2	b ₁₀	2	b ₁₂	2	b ₁₁	2	b ₁₂	1
												b ₁₃	2		
h	2	h ₁	2	h ₂	2	h ₃	2	h ₄	2	h ₅	2	h ₆	2	h ₇	2
h ₈	4	h ₁₀	4	h ₉	4	h ₁₂	4	h ₁₀	4	h ₁₃	4	h ₁₁	4	h ₁₄	4
v ₇	6	v ₇	8	v ₇	4	v ₇	4	v ₆	4	v ₆	6	v ₅	6	v ₅	8
v ₄	4	v ₄	6	v ₅	4	v ₅	8	v ₄	4	v ₄	6	v ₃	4	v ₃	6
v ₃	2	v ₃	2	v ₃	4	v ₂	4	v ₁	4	v ₁	4	v	6	v	6
				v ₁	2	v ₁	2	v	2	v	2				
w	2	w	2	w	2	w	2	w	2	w	2	w	2	w	2

BARS IN ONE END SECTION - 3 PIPES

42 Pipe (1050)				48 Pipe (1200)				54 Pipe (1350)				60 Pipe (1500)			
D42-1/2 (D1.05-1/2)		D42-2 (D1.05-2)		D48-1/2 (D1.2-1/2)		D48-2 (D1.2-2)		D54-1/2 (D1.35-1/2)		D54-2 (D1.35-2)		D60-1/2 (D1.5-1/2)		D60-2 (D1.5-2)	
BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.	BARS	No.
d	15	d	17	d	17	d	19	d	19	d	21	d	21	d	23
b	2	b	2	b ₁	2	b ₁	2	b ₂	2	b ₂	2	b ₃	2	b ₃	2
b ₄	1	b ₄	1	b ₅	1	b ₅	1	b ₆	1	b ₇	1	b ₈	1	b ₈	1
b ₅	2	b ₅	1	b ₈	2	b ₈	1	b ₉	1	b ₁₁	1	b ₁₁	1	b ₁₀	1
		b ₈	2			b ₁₁	2	b ₁₁	2	b ₁₂	2	b ₁₂	2	b ₁₂	1
												b ₁₃	2		
h	2	h ₁	2	h ₂	2	h ₃	2	h ₄	2	h ₅	2	h ₆	2	h ₇	2
h ₈	4	h ₁₀	4	h ₉	4	h ₁₂	4	h ₁₀	4	h ₁₃	4	h ₁₁	4	h ₁₄	4
v ₇	6	v ₇	8	v ₇	4	v ₇	4	v ₆	4	v ₆	6	v ₅	6	v ₅	8
v ₄	4	v ₄	6	v ₅	4	v ₅	8	v ₄	4	v ₄	6	v ₃	4	v ₃	6
v ₃	2	v ₃	2	v ₃	4	v ₂	4	v ₁	4	v ₁	4	v	6	v	6
				v ₁	2	v ₁	2	v	2	v	2				
w	2	w	2	w	2	w	2	w	2	w	2	w	2	w	2

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 42" (1050 mm) THRU 60" (1500 mm) DIA.
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(Sheet 3 of 3)

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