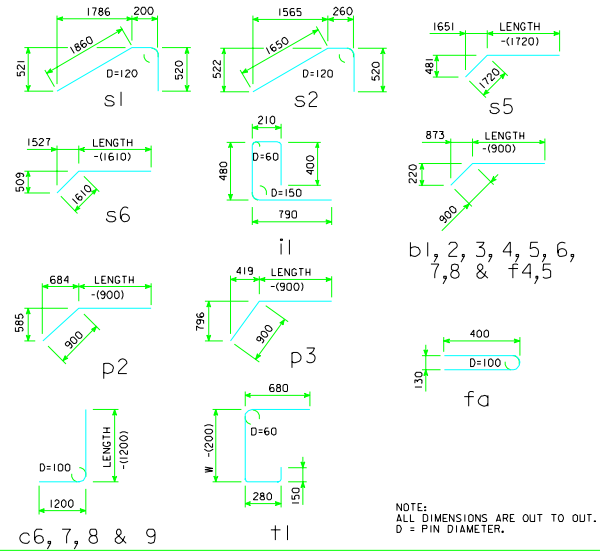
BILL OF REINFORCING FOR ONE HEADWALL
15° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION ΔΔ	SHAPE	SIZE	MARK	3600x3600 NO.	LENGTH	MASS	3600x3000 NO.	LENGTH	MASS	3600x2400 NO.	LENGTH	MASS	3600x1800 NO.	LENGTH	MASS	MARK
FENCE ANCHOR		15	fa	2	930	3	2	930	3	2	930	3	2	930	3	fa
WINGWALL, BFH L		15	b1	1	13 550	21	1	11 490	18	1	9430	15	1	7370	12	b1
WINGWALL, BFH S		15	b2	1	11 950	19	1	10 150	16	1	8350	13	1	6550	10	b2
WINGWALL BFH L		15	b3	10 (LENGTH VARIES)	3720 TO 12 990	132	8 (LENGTH VARIES)	3720 TO 10 930	92	6 (LENGTH VARIES)	3720 TO 8870	59	4 (LENGTH VARIES)	3720 TO 6810	33	b3
WINGWALL BFH S		15	b4	10 (LENGTH VARIES)	3360 TO 11 470	116	8 (LENGTH VARIES)	3360 TO 9670	82	6 (LENGTH VARIES)	3360 TO 7870	53	4 (LENGTH VARIES)	3360 TO 6070	30	b4
WINGWALL FFH L		15	b5	1	13 550	21	1	11 490	18	1	9430	15	1	7370	12	b5
WINGWALL FFH S		15	b6	1	11 950	19	1	10 150	16	1	8350	13	1	6550	10	b6
WINGWALL FFH L		15	b7	11 (LENGTH VARIES)	2690 TO 12 990	136	9 (LENGTH VARIES)	2690 TO 10 930	96	7 (LENGTH VARIES)	2690 TO 8870	64	5 (LENGTH VARIES)	2690 TO 6810	37	b7
WINGWALL FFH S		15	b8	11 (LENGTH VARIES)	2460 TO 11 470	120	9 (LENGTH VARIES)	2460 TO 9670	86	7 (LENGTH VARIES)	2460 TO 7870	57	5 (LENGTH VARIES)	2460 TO 6070	33	b8
WINGWALL FFV L		15	c1	42 (LENGTH VARIES)	840 TO 4430	174	35 (LENGTH VARIES)	840 TO 3810	128	29 (LENGTH VARIES)	840 TO 3290	94	22 (LENGTH VARIES)	840 TO 2680	61	c1
WINGWALL FFV S		15	c2	37 (LENGTH VARIES)	850 TO 4450	154	31 (LENGTH VARIES)	850 TO 3850	114	25 (LENGTH VARIES)	850 TO 3250	80	19 (LENGTH VARIES)	850 TO 2650	52	c2
WINGWALL FFV L		15	c3	2	4370	14	2	3770	12	2	3170	10	2	2570	8	c3
WINGWALL FFV S		15	c3	1	4370	7	1	3770	6	1	3170	5	1	2570	4	c3
WINGWALL BFV L		15	c4	9 (LENGTH VARIES)	840 TO 1540	17	9 (LENGTH VARIES)	840 TO 1540	17	9 (LENGTH VARIES)	840 TO 1540	17	9 (LENGTH VARIES)	840 TO 1540	17	c4
WINGWALL BFV S		15	c5	6 (LENGTH VARIES)	850 TO 1350	10	6 (LENGTH VARIES)	850 TO 1350	10	6 (LENGTH VARIES)	850 TO 1350	10	6 (LENGTH VARIES)	850 TO 1350	10	c5
WINGWALL BFV L		15	c6	33 (LENGTH VARIES)	2830 TO 5630	219	26 (LENGTH VARIES)	2830 TO 5010	160	20 (LENGTH VARIES)	2830 TO 4490	115	13 (LENGTH VARIES)	2830 TO 3880	68	c6
WINGWALL BFV S		15	c7	31 (LENGTH VARIES)	2650 TO 5650	202	25 (LENGTH VARIES)	2650 TO 5050	151	19 (LENGTH VARIES)	2650 TO 4450	106	13 (LENGTH VARIES)	2650 TO 3850	66	c7
WINGWALL BFV L		15	c8	24	3220	119	17	3220	84	10	3220	49	-----	-----	0	c8
WINGWALL BFV S		15	c8	19	3220	94	13	3220	64	7	3220	35	-----	-----	0	c8
WINGWALL BFV L		15	c9	2	5570	17	2	4970	16	2	4370	14	2	3770	12	c9
WINGWALL BFV S		15	c9	1	5570	9	1	4970	8	1	4370	7	1	3770	6	c9
APRON, LONG BOT		15	d1	9	8540	121	9	7300	103	9	6060	86	9	4810	68	d1
APRON, LONG BOT L		15	d2	3	12 060	57	3	10 020	47	3	7980	38	3	5950	28	d2
APRON, LONG BOT S		15	d3	3	10 580	50	3	8790	41	3	7010	33	3	5240	25	d3
APRON, LONG TOP		20	f1	12	8540	241	12	7300	206	12	6060	171	12	4810	136	f1
APRON, LONG TOP L		20	f2	10 (LENGTH VARIES)	490 TO 7310	92	8 (LENGTH VARIES)	750 TO 6070	64	7 (LENGTH VARIES)	240 TO 4830	42	5 (LENGTH VARIES)	510 TO 3580	24	f2
APRON, LONG TOP S		20	f3	9 (LENGTH VARIES)	340 TO 7290	81	7 (LENGTH VARIES)	820 TO 6050	57	6 (LENGTH VARIES)	420 TO 4800	37	4 (LENGTH VARIES)	910 TO 3550	21	f3
APRON, LONG TOP L		20	f4	1	13 550	32	1	11 490	27	1	9430	22	1	7370	17	f4
APRON, LONG TOP S		20	f5	1	11 950	28	1	10 150	24	1	8350	20	1	6550	15	f5
PARAPET, VERT		15	j1	25	1880	74	25	1880	74	25	1880	74	25	1880	74	j1
PARAPET, HORIZ		25	j1	4	4260	67	4	4150	65	4	4150	65	4	4100	64	j1
APRON, TRANS TOP		20	m1	3 (LENGTH VARIES)	4190 TO 4300	30	3 (LENGTH VARIES)	4080 TO 4190	29	3 (LENGTH VARIES)	4080 TO 4190	29	3 (LENGTH VARIES)	4030 TO 4140	29	m1
APRON, TRANS TOP		20	m2	30 (LENGTH VARIES)	4350 TO 7540	420	24 (LENGTH VARIES)	4250 TO 6780	312	19 (LENGTH VARIES)	4250 TO 6230	234	13 (LENGTH VARIES)	4200 TO 5520	149	m2
APRON, TRANS TOP		20	m3	3	5540	39	3	5230	37	3	4880	34	3	4550	32	m3
APRON, TRANS BOT		20	m4	25 (LENGTH VARIES)	2250 TO 6130	247	21 (LENGTH VARIES)	2250 TO 5480	191	17 (LENGTH VARIES)	2250 TO 4840	142	13 (LENGTH VARIES)	2250 TO 4190	99	m4
CURTAIN, HORIZ		20	p1	4	3700	35	4	3700	35	4	3700	35	4	3700	35	p1
CURTAIN, HORIZ L		20	p2	4	5560	62	4	5550	53	4	4750	45	4	3840	36	p2
CURTAIN, HORIZ S		20	p3	4	5060	48	4	4390	41	4	3730	35	4	3060	29	p3
WING SLOPE EF L		20	s1	2	2580	12	2	2580	12	2	2580	12	2	2580	12	s1
WING SLOPE EF S		20	s2	2	2430	11	2	2430	11	2	2430	11	2	2430	11	s2
WING SLOPE EF L		20	s3	2	12 240	58	2	10 090	48	2	7950	37	2	5800	27	s3
WING SLOPE EF S		20	s4	2	10 930	51	2	9030	43	2	7130	34	2	5210	25	s4
WING SLOPE FF L		20	s5	1	14 050	33	1	11 930	28	1	9780	23	1	7640	18	s5
WING SLOPE FF S		20	s6	1	12 540	30	1	10 640	25	1	8750	21	1	6850	16	s6
CURTAIN, VERT		15	t1	33	2410	125	28	2260	99	24	2110	80	20	1960	62	t1
ESTIMATED QUANTITIES ONE HEADWALL	REINF STEEL			3667 kg			2869 kg			2194 kg			1536 kg			
	CONC	PARAPETΔ		1.3	49.4 m³		1.2	35.4 m³		1.2	26.1 m³		1.2	17.6 m³		
		WINGS		17.1			10.4			7.1			3.9			
		FOOTING		31.0			23.8			17.8			12.5			

BENT BAR DETAILS



NOTE:
ALL DIMENSIONS ARE OUT TO OUT.
D = PIN DIAMETER.

HEADWALL NOTES:

THIS HEADWALL IS BASED ON A 3:1 SLOPE NORMAL TO CENTERLINE OF ROADWAY.

THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.

ALL EXPOSED CORNERS OF 90° OR SHARPER ARE TO BE FILLETED WITH A 20 mm DRESSED AND BEVELED STRIP.

ALL REINFORCING IS TO BE SECURELY WIRED IN PLACE BEFORE THE CONCRETE IS POURED. ALL SLAB AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAIRS AT INTERVALS OF NOT MORE THAN 900 mm IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.

CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 50 mm UNLESS OTHERWISE NOTED OR SHOWN. CLEARANCE TO THE BOTTOM ENDS OF VERTICAL BARS SHALL BE 75 mm.

CONCRETE QUANTITIES ARE ESTIMATED FROM BACK OF PARAPET.

HORIZONTAL TAILS OF BARS "b" & "s" ESTIMATED TO EXTEND 600 mm BEYOND BACK OF PARAPET (INTO END OF BARREL). LONGITUDINAL BARS "d", "f1", "f4" AND "f5" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 600 mm BEYOND BACK OF PARAPET.

THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF MILLIMETERS NECESSARY TO MEET CLEARANCE REQUIREMENTS. "MASS" COLUMN INCLUDES AN ALLOWANCE OF 650 mm FOR LAP ON BARS THAT ARE OVER 12 000 mm LONG.

ALL DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS OTHERWISE NOTED OR SHOWN.

NOTES:

1. SEE SHEET MRCB-G1-95 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

Δ NOTE: INCLUDES TOP OF WINGWALL QUANTITIES.

ΔΔ SUBSCRIPT L DENOTES LONG WING.
SUBSCRIPT S DENOTES SHORT WING.

LATEST REVISION DATE : 04-02

APPROVED BY : William A. Kruckenberg

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MFWH 15-1-95

REVISED 1/98; BEND DIMENSIONS OF i1 BAR CHANGED.

REVISED 04-02 - CHANGED THE NUMBER OF d1 BARS FOR 3600 SPANS. CONCRETE QUANTITIES ADJUSTED.
FWH15IM.SOI

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