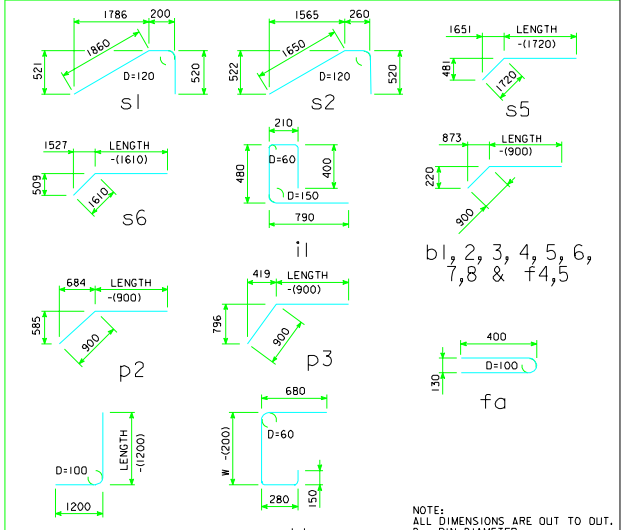
BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION ΔΔ	SHAPE	SIZE	MARK	2400x3000 NO.	2400x3000 LENGTH	2400x3000 MASS	2400x2400 NO.	2400x2400 LENGTH	2400x2400 MASS	2400x1800 NO.	2400x1800 LENGTH	2400x1800 MASS	2400x1500 NO.	2400x1500 LENGTH	2400x1500 MASS	2400x1200 NO.	2400x1200 LENGTH	2400x1200 MASS	MARK
FENCE ANCHOR		15	fa	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	fa
WINGWALL, BFH L		15	b1	1	11 490	18	1	9430	15	1	7370	12	1	6340	10	1	5310	8	b1
WINGWALL, BFH S		15	b2	1	10 150	16	1	8350	13	1	6550	10	1	5650	9	1	4750	7	b2
WINGWALL BFH L		15	b3	8 (LENGTH VARIES)	9720 TO 10 930	92	6 (LENGTH VARIES)	3720 TO 8870	59	4 (LENGTH VARIES)	3720 TO 6810	33	3 (LENGTH VARIES)	3720 TO 5780	22	2 (LENGTH VARIES)	3720 TO 4750	13	b3
WINGWALL BFH S		15	b4	8 (LENGTH VARIES)	3360 TO 9670	82	6 (LENGTH VARIES)	3360 TO 7870	53	4 (LENGTH VARIES)	3360 TO 6070	30	3 (LENGTH VARIES)	3360 TO 5170	20	2 (LENGTH VARIES)	3360 TO 4270	12	b4
WINGWALL FFH L		15	b5	1	11 490	18	1	9430	15	1	7370	12	1	6340	10	1	5310	8	b5
WINGWALL FFH S		15	b6	1	10 150	16	1	8350	13	1	6550	10	1	5650	9	1	4750	7	b6
WINGWALL FFH L		15	b7	9 (LENGTH VARIES)	2690 TO 10 930	96	7 (LENGTH VARIES)	2690 TO 8870	64	5 (LENGTH VARIES)	2690 TO 6810	37	4 (LENGTH VARIES)	2690 TO 5780	27	3 (LENGTH VARIES)	2690 TO 4750	18	b7
WINGWALL FFH S		15	b8	9 (LENGTH VARIES)	2460 TO 9670	86	7 (LENGTH VARIES)	2460 TO 7870	57	5 (LENGTH VARIES)	2460 TO 6070	33	4 (LENGTH VARIES)	2460 TO 5170	24	3 (LENGTH VARIES)	2460 TO 4270	16	b8
WINGWALL FFV L		15	c1	35 (LENGTH VARIES)	770 TO 9740	124	29 (LENGTH VARIES)	770 TO 8220	91	22 (LENGTH VARIES)	770 TO 2610	58	18 (LENGTH VARIES)	770 TO 2260	43	15 (LENGTH VARIES)	770 TO 2000	33	c1
WINGWALL FFV S		15	c2	31 (LENGTH VARIES)	780 TO 9780	111	25 (LENGTH VARIES)	780 TO 8180	78	19 (LENGTH VARIES)	780 TO 2580	50	16 (LENGTH VARIES)	780 TO 2280	38	13 (LENGTH VARIES)	780 TO 1980	28	c2
WINGWALL FFV L		15	c3	2	3700	12	2	3100	10	2	2500	8	2	2200	7	2	1900	6	c3
WINGWALL FFV S		15	c3	1	3700	6	1	3100	5	1	2500	4	1	2200	3	1	1900	3	c3
WINGWALL BFV L		15	c4	9 (LENGTH VARIES)	770 TO 1470	16	9 (LENGTH VARIES)	770 TO 1470	16	9 (LENGTH VARIES)	770 TO 1470	16	9 (LENGTH VARIES)	770 TO 1470	16	9 (LENGTH VARIES)	770 TO 1470	16	c4
WINGWALL BFV S		15	c5	6 (LENGTH VARIES)	780 TO 1280	10	6 (LENGTH VARIES)	780 TO 1280	10	6 (LENGTH VARIES)	780 TO 1280	10	6 (LENGTH VARIES)	780 TO 1280	10	6 (LENGTH VARIES)	780 TO 1280	10	c5
WINGWALL BFV L		15	c6	26 (LENGTH VARIES)	2760 TO 4940	157	20 (LENGTH VARIES)	2760 TO 4420	113	13 (LENGTH VARIES)	2760 TO 3810	67	9 (LENGTH VARIES)	2760 TO 3460	44	6 (LENGTH VARIES)	2760 TO 3200	28	c6
WINGWALL BFV S		15	c7	25 (LENGTH VARIES)	2580 TO 4980	148	19 (LENGTH VARIES)	2580 TO 4380	104	13 (LENGTH VARIES)	2580 TO 3780	65	10 (LENGTH VARIES)	2580 TO 3480	48	7 (LENGTH VARIES)	2580 TO 3180	32	c7
WINGWALL BFV L		15	c8	17	3150	84	10	3150	49	-----	-----	0	-----	-----	0	-----	-----	0	c8
WINGWALL BFV S		15	c8	13	3150	64	7	3150	35	-----	-----	0	-----	-----	0	-----	-----	0	c8
WINGWALL BFV L		15	c9	2	4900	15	2	4300	14	2	3700	12	2	3400	11	2	3100	10	c9
WINGWALL BFV S		15	c9	1	4900	8	1	4300	7	1	3700	6	1	3400	5	1	3100	5	c9
APRON, LONG BOT		15	d1	5	7300	57	5	6060	48	5	4810	38	5	4190	33	5	3570	28	d1
APRON, LONG BOT L		15	d2	3	10 020	47	3	7980	38	3	5950	28	3	4950	23	3	3950	19	d2
APRON, LONG BOT S		15	d3	3	8790	41	3	7010	33	3	5240	25	3	4370	21	3	3500	16	d3
APRON, LONG TOP		20	f1	8	7300	138	8	6060	114	8	4810	91	8	4190	79	8	3570	67	f1
APRON, LONG TOP L		20	f2	8 (LENGTH VARIES)	750 TO 6070	64	7 (LENGTH VARIES)	240 TO 4830	42	5 (LENGTH VARIES)	510 TO 3580	24	4 (LENGTH VARIES)	640 TO 2960	17	3 (LENGTH VARIES)	770 TO 2330	11	f2
APRON, LONG TOP S		20	f3	7 (LENGTH VARIES)	820 TO 6050	57	6 (LENGTH VARIES)	420 TO 4800	37	4 (LENGTH VARIES)	910 TO 3550	21	4 (LENGTH VARIES)	270 TO 2930	15	3 (LENGTH VARIES)	510 TO 2300	10	f3
APRON, LONG TOP L		20	f4	1	11 490	27	1	9430	22	1	7370	17	1	6340	15	1	5310	13	f4
APRON, LONG TOP S		20	f5	1	10 150	24	1	8350	20	1	6550	15	1	5650	13	1	4750	11	f5
PARAPET, VERT		15	j1	17	1880	50	17	1880	50	17	1880	50	17	1880	50	17	1880	50	j1
PARAPET, HORIZ		25	j1	4	2910	46	4	2910	46	4	2860	45	4	2860	45	4	2860	45	j1
APRON, TRANS TOP		20	m1	3 (LENGTH VARIES)	2840 TO 2950	20	3 (LENGTH VARIES)	2840 TO 2950	20	3 (LENGTH VARIES)	2790 TO 2900	20	3 (LENGTH VARIES)	2790 TO 2900	20	3 (LENGTH VARIES)	2790 TO 2900	20	m1
APRON, TRANS TOP		20	m2	24 (LENGTH VARIES)	3050 TO 5580	244	19 (LENGTH VARIES)	3050 TO 5030	181	13 (LENGTH VARIES)	3000 TO 4320	112	11 (LENGTH VARIES)	3000 TO 4100	92	8 (LENGTH VARIES)	3000 TO 3770	64	m2
APRON, TRANS TOP		20	m3	3	4040	29	3	3480	25	3	3380	24	3	3280	23	3	3120	22	m3
APRON, TRANS BOT		20	m4	21 (LENGTH VARIES)	1010 TO 4240	130	17 (LENGTH VARIES)	1010 TO 3590	92	13 (LENGTH VARIES)	1010 TO 2950	61	11 (LENGTH VARIES)	1010 TO 2630	47	9 (LENGTH VARIES)	1010 TO 2300	35	m4
CURTAIN, HORIZ		20	p1	4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	p1
CURTAIN, HORIZ L		20	p2	4	5650	53	4	4750	45	4	3840	36	4	3390	32	4	2940	28	p2
CURTAIN, HORIZ S		20	p3	4	4390	41	4	3730	35	4	3060	29	4	2730	26	4	2390	23	p3
WING SLOPE EF L		20	s1	2	2580	12	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	2	2430	11	s2
WING SLOPE EF L		20	s3	2	10 090	48	2	7950	37	2	5800	27	2	4730	22	2	3660	17	s3
WING SLOPE EF S		20	s4	2	9030	43	2	7130	34	2	5210	25	2	4290	20	2	3340	16	s4
WING SLOPE FF L		20	s5	1	11 930	28	1	9780	23	1	7640	18	1	6540	15	1	5490	13	s5
WING SLOPE FF S		20	s6	1	10 640	25	1	8750	21	1	6850	16	1	5900	14	1	4950	12	s6
CURTAIN, VERT		15	t1	25	2260	89	21	2110	70	17	1960	52	14	1960	43	13	1960	40	t1
ESTIMATED QUANTITIES ONE HEADWALL	REINF STEEL	PARAPET Δ	1.0	2529 kg			1.0	1903 kg		0.9	1296 kg		0.9	1070 kg		0.9	869 kg		
	CONC	WINGS	10.4	29.2 m³			7.1	21.3 m³		3.9	13.9 m³		2.9	11.3 m³		2.0	9.0 m³		
		FOOTING	17.8				13.2			9.1			7.5			6.1			

NOTES: Δ INCLUDES TOP OF WINGWALL QUANTITIES. ΔΔ SUBSCRIPT L DENOTES LONG WING. SUBSCRIPT S DENOTES SHORT WING.

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.

LATEST REVISION DATE : 04-02

APPROVED BY : William M. Sandquist

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MFWH 15-3-95

REVISED 04-02 - CHANGED THE NUMBER OF d1 BARS FOR 2400 SPANS. CONCRETE QUANTITIES ADJUSTED.

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

FWH15M.S01

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