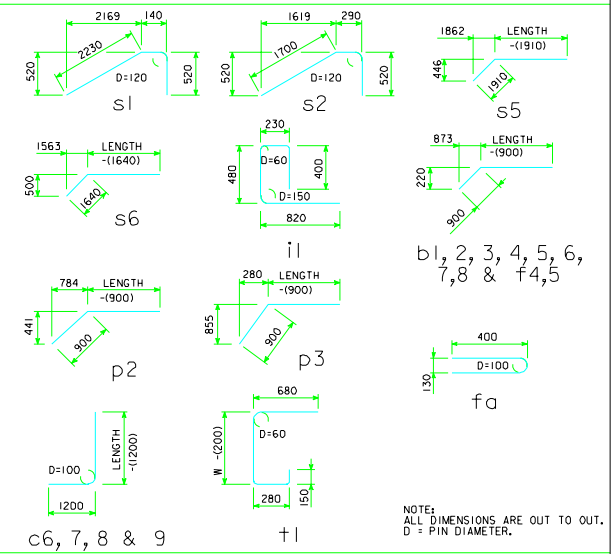
BILL OF REINF. FOR ONE HEADWALL 30° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION ΔΔ	SHAPE	SIZE	MARK	1500x1800 NO.	1500x1800 LENGTH	1500x1800 MASS	1500x1500 NO.	1500x1500 LENGTH	1500x1500 MASS	1500x1200 NO.	1500x1200 LENGTH	1500x1200 MASS	1500x900 NO.	1500x900 LENGTH	1500x900 MASS	1200x1200 NO.	1200x1200 LENGTH	1200x1200 MASS	900x900 No.	900x900 LENGTH	900x900 MASS	MARK
FENCE ANCHOR		15	fa	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	fa
WINGWALL, BFH L		15	b1	1	8780	14	1	7530	12	1	6280	10	1	5020	8	1	6280	10	1	5020	8	b1
WINGWALL, BFH S		15	b2	1	6780	11	1	5840	9	1	4910	8	1	3970	6	1	4910	8	1	3970	6	b2
WINGWALL BFH L		15	b3	4 (LENGTH VARIES)	4330 TO 8090	39	3 (LENGTH VARIES)	4330 TO 6840	26	2 (LENGTH VARIES)	4330 TO 5590	16	1	4330	7	2 (LENGTH VARIES)	4330 TO 5590	16	1	4380	7	b3
WINGWALL BFH S		15	b4	4 (LENGTH VARIES)	3460 TO 6270	31	3 (LENGTH VARIES)	3460 TO 5340	21	2 (LENGTH VARIES)	3460 TO 4400	12	1	3460	5	2 (LENGTH VARIES)	3460 TO 4400	12	1	3460	5	b4
WINGWALL FFH L		15	b5	1	8780	14	1	7530	12	1	6280	10	1	5020	8	1	6280	10	1	5020	8	b5
WINGWALL FFH S		15	b6	1	6780	11	1	5840	9	1	4910	8	1	3970	6	1	4910	8	1	3970	6	b6
WINGWALL FFH L		15	b7	5 (LENGTH VARIES)	3080 TO 8090	44	4 (LENGTH VARIES)	3080 TO 6840	31	3 (LENGTH VARIES)	3080 TO 5590	20	2 (LENGTH VARIES)	3080 TO 4330	12	3 (LENGTH VARIES)	3080 TO 5590	20	2 (LENGTH VARIES)	3080 TO 4380	12	b7
WINGWALL FFH S		15	b8	5 (LENGTH VARIES)	2530 TO 6270	35	4 (LENGTH VARIES)	2530 TO 5340	25	3 (LENGTH VARIES)	2530 TO 4400	16	2 (LENGTH VARIES)	2530 TO 3460	9	3 (LENGTH VARIES)	2530 TO 4400	16	2 (LENGTH VARIES)	2530 TO 3460	9	b8
WINGWALL FFV L		15	c1	26 (LENGTH VARIES)	760 TO 2560	68	22 (LENGTH VARIES)	760 TO 2270	52	18 (LENGTH VARIES)	760 TO 1990	39	14 (LENGTH VARIES)	760 TO 1700	27	18 (LENGTH VARIES)	760 TO 1990	39	14 (LENGTH VARIES)	760 TO 1700	27	c1
WINGWALL FFV S		15	c2	20 (LENGTH VARIES)	770 TO 2600	58	17 (LENGTH VARIES)	770 TO 2310	41	14 (LENGTH VARIES)	770 TO 2020	31	10 (LENGTH VARIES)	770 TO 1640	19	14 (LENGTH VARIES)	770 TO 2020	31	10 (LENGTH VARIES)	770 TO 1640	19	c2
WINGWALL FFV L		15	c3	1	2500	4	2	2200	7	1	1900	3	1	1600	3	1	1900	3	1	1600	3	c3
WINGWALL FFV S		15	c3	2	2500	8	1	2200	3	1	1900	3	2	1600	5	1	1900	3	2	1600	5	c3
WINGWALL BFV L		15	c4	11 (LENGTH VARIES)	760 TO 1480	19	11 (LENGTH VARIES)	760 TO 1480	19	11 (LENGTH VARIES)	760 TO 1480	19	11 (LENGTH VARIES)	760 TO 1480	19	11 (LENGTH VARIES)	760 TO 1480	19	11 (LENGTH VARIES)	760 TO 1480	19	c4
WINGWALL BFV S		15	c5	6 (LENGTH VARIES)	770 TO 1260	10	6 (LENGTH VARIES)	770 TO 1260	10	6 (LENGTH VARIES)	770 TO 1260	10	6 (LENGTH VARIES)	770 TO 1260	10	6 (LENGTH VARIES)	770 TO 1260	10	6 (LENGTH VARIES)	770 TO 1260	10	c5
WINGWALL BFV L		15	c6	15 (LENGTH VARIES)	2760 TO 3760	77	11 (LENGTH VARIES)	2760 TO 3470	54	7 (LENGTH VARIES)	2760 TO 3190	33	3 (LENGTH VARIES)	2760 TO 2900	13	7 (LENGTH VARIES)	2760 TO 3190	33	3 (LENGTH VARIES)	2760 TO 2900	13	c6
WINGWALL BFV S		15	c7	14 (LENGTH VARIES)	2550 TO 3800	70	11 (LENGTH VARIES)	2550 TO 3510	52	8 (LENGTH VARIES)	2550 TO 3220	36	4 (LENGTH VARIES)	2550 TO 2840	17	8 (LENGTH VARIES)	2550 TO 3220	36	4 (LENGTH VARIES)	2550 TO 2840	17	c7
WINGWALL BFV L		15	c8	---	---	0	---	---	0	---	---	0	---	---	0	---	---	0	---	---	0	c8
WINGWALL BFV S		15	c8	---	---	0	---	---	0	---	---	0	---	---	0	---	---	0	---	---	0	c8
WINGWALL BFV L		15	c9	1	3700	6	2	3400	11	1	3100	5	1	2800	4	1	3100	5	1	2800	4	c9
WINGWALL BFV S		15	c9	2	3700	12	1	3400	5	1	3100	5	2	2800	9	1	3100	5	2	2800	9	c9
APRON, LONG BOT		15	d1	3	5370	25	3	4680	22	3	3980	19	3	3290	15	3	3980	19	3	3290	15	d1
APRON, LONG BOT L		15	d2	3	7400	35	3	6170	29	3	4950	23	2	4720	15	3	4950	23	2	4720	15	d2
APRON, LONG BOT S		15	d3	3	5600	26	3	4690	22	3	3780	18	2	3590	11	3	3780	18	2	3590	11	d3
APRON, LONG TOP		20	f1	5	5370	63	5	4680	55	5	3980	47	5	3290	39	4	3980	37	3	3290	23	f1
APRON, LONG TOP L		20	f2	6 (LENGTH VARIES)	540 TO 4050	32	5 (LENGTH VARIES)	540 TO 3350	23	4 (LENGTH VARIES)	530 TO 2660	15	3 (LENGTH VARIES)	530 TO 1960	9	4 (LENGTH VARIES)	530 TO 2660	15	3 (LENGTH VARIES)	530 TO 1960	9	f2
APRON, LONG TOP S		20	f3	4 (LENGTH VARIES)	1160 TO 3990	24	4 (LENGTH VARIES)	450 TO 3300	18	3 (LENGTH VARIES)	680 TO 2600	12	2 (LENGTH VARIES)	930 TO 1900	7	3 (LENGTH VARIES)	680 TO 2600	12	2 (LENGTH VARIES)	930 TO 1900	7	f3
APRON, LONG TOP L		20	f4	1	8780	21	1	7530	18	1	6280	15	1	5020	12	1	6280	15	1	5020	12	f4
APRON, LONG TOP S		20	f5	1	6780	16	1	5840	14	1	4910	12	1	3970	9	1	4910	12	1	3970	9	f5
PARAPET, VERT		15	j1	11	1930	38	11	1930	33	11	1930	33	11	1930	33	9	1930	27	7	1980	21	j1
PARAPET, HORIZ		25	j1	4	2150	34	4	2150	34	4	2150	34	4	2150	34	4	1800	28	4	1450	23	j1
APRON, TRANS TOP		20	m1	3 (LENGTH VARIES)	1910 TO 2020	14	3 (LENGTH VARIES)	1910 TO 2020	14	3 (LENGTH VARIES)	1910 TO 2020	14	3 (LENGTH VARIES)	1910 TO 2020	14	3 (LENGTH VARIES)	1590 TO 1700	12	3 (LENGTH VARIES)	1270 TO 1380	9	m1
APRON, TRANS TOP		20	m2	15 (LENGTH VARIES)	2080 TO 3620	101	12 (LENGTH VARIES)	2080 TO 3290	76	9 (LENGTH VARIES)	2080 TO 2960	53	6 (LENGTH VARIES)	2080 TO 2630	33	6 (LENGTH VARIES)	1780 TO 2660	47	6 (LENGTH VARIES)	1480 TO 2080	25	m2
APRON, TRANS TOP		20	m3	2	2570	12	2	2390	11	2	2210	10	2	2030	10	3	2030	14	2	1600	8	m3
APRON, TRANS BOT		20	m4	11 (LENGTH VARIES)	440 TO 2490	38	9 (LENGTH VARIES)	440 TO 2080	27	7 (LENGTH VARIES)	440 TO 1670	17	5 (LENGTH VARIES)	440 TO 1260	10	5 (LENGTH VARIES)	510 TO 1320	11	3 (LENGTH VARIES)	1620 TO 2080	13	m4
CURTAIN, HORIZ		20	p1	4	1680	16	4	1680	16	4	1680	16	4	1680	16	4	1330	13	---	---	0	p1
CURTAIN, HORIZ L		20	p2	4	4820	45	4	4220	40	4	3620	34	4	3010	28	4	3620	34	4	3010	28	p2
CURTAIN, HORIZ S		20	p3	4	2920	28	4	2610	25	4	2290	22	4	1980	19	4	2290	22	4	1980	19	p3
WING SLOPE EF L		20	s1	2	2890	14	2	2890	14	2	2890	14	2	2890	14	2	2890	14	2	2890	14	s1
WING SLOPE EF S		20	s2	2	2510	12	2	2510	12	2	2510	12	2	2510	12	2	2510	12	2	2510	12	s2
WING SLOPE EF L		20	s3	2	6840	32	2	5550	26	2	4260	20	2	2970	14	2	4260	20	2	2970	14	s3
WING SLOPE EF S		20	s4	2	5410	25	2	4430	21	2	3450	16	2	2460	12	2	3450	16	2	2460	12	s4
WING SLOPE FF L		20	s5	1	8970	21	1	7690	18	1	6400	15	1	5110	12	1	6400	15	1	5110	12	s5
WING SLOPE FF S		20	s6	1	7010	17	1	6030	14	1	5040	12	1	4060	10	1	5040	12	1	4060	10	s6
CURTAIN, VERT		15	t1	16	1960	49	14	1960	43	11	1960	34	8	1960	25	10	1960	31	6	1960	18	t1
	REINF STEEL			1262 kg			1027 kg			804 kg			603 kg			766 kg			529 kg			
ESTIMATED QUANTITIES ONE HEADWALL	CONC	PARAPET Δ		0.9			0.9			0.9			0.9			0.8			0.8			
		WINGS		4.4	14.3 m³		3.3	11.6 m³		2.2	8.9 m³		1.3	6.7 m³		2.2	8.5 m³		1.3	5.9 m³		
		FOOTING		9.0			7.4			5.8			4.5			5.5			3.8			

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 A. Kneppmann

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MFWH 30-5-95

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

REVISED 04-02 - CHANGED THE NUMBER OF d1 BARS FOR 1500 SPANS. CONCRETE QUANTITIES ADJUSTED.

XXXXXXXXXXSYSTEMTIME XXXXXXXUSERNAME XXXXXXXXXX