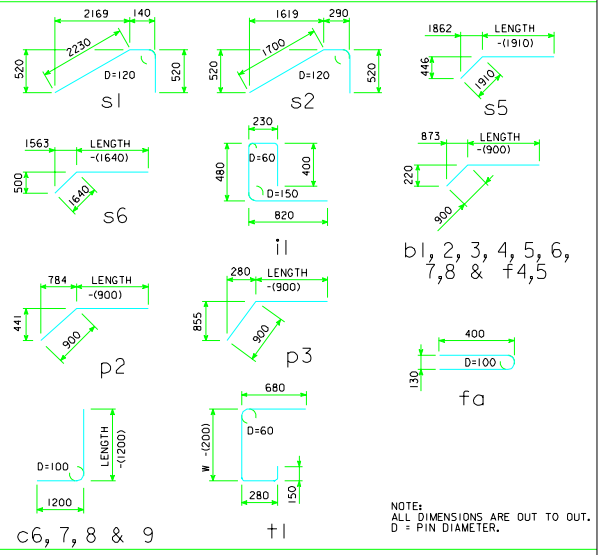
BILL OF REINF. FOR ONE HEADWALL 30° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION ΔΔ	SHAPE	SIZE	MARK	3000×3600 NO.	3000×3600 LENGTH	3000×3600 MASS	3000×3000 NO.	3000×3000 LENGTH	3000×3000 MASS	3000×2400 NO.	3000×2400 LENGTH	3000×2400 MASS	3000×1800 NO.	3000×1800 LENGTH	3000×1800 MASS	3000×1500 NO.	3000×1500 LENGTH	3000×1500 MASS	3000×1200 NO.	3000×1200 LENGTH	3000×1200 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	16 290	26	1	13 790	22	1	11 280	18	1	8780	14	1	7530	12	1	6280	10	b1
WINGWALL, BFH S		15	b2	1	12 400	19	1	10 520	17	1	8650	14	1	6780	11	1	5840	9	1	4910	8	b2
WINGWALL BFH L		15	b3	10 (LENGTH VARIES)	4330 TO 15 600	160	8 (LENGTH VARIES)	4330 TO 13 100	110	6 (LENGTH VARIES)	4330 TO 10 590	70	4 (LENGTH VARIES)	4330 TO 8090	39	3 (LENGTH VARIES)	4330 TO 6840	26	2 (LENGTH VARIES)	4330 TO 5590	16	b3
WINGWALL BFH S		15	b4	10 (LENGTH VARIES)	3460 TO 11 890	120	8 (LENGTH VARIES)	3460 TO 10 020	85	6 (LENGTH VARIES)	3460 TO 8140	55	4 (LENGTH VARIES)	3460 TO 6270	31	3 (LENGTH VARIES)	3460 TO 5340	21	2 (LENGTH VARIES)	3460 TO 4400	12	b4
WINGWALL FFH L		15	b5	1	16 290	26	1	13 790	22	1	11 280	18	1	8780	14	1	7530	12	1	6280	10	b5
WINGWALL FFH S		15	b6	1	12 400	19	1	10 520	17	1	8650	14	1	6780	11	1	5840	9	1	4910	8	b6
WINGWALL FFH L		15	b7	11 (LENGTH VARIES)	3080 TO 15 600	164	9 (LENGTH VARIES)	3080 TO 13 100	115	7 (LENGTH VARIES)	3080 TO 10 590	75	5 (LENGTH VARIES)	3080 TO 8090	44	4 (LENGTH VARIES)	3080 TO 6840	31	3 (LENGTH VARIES)	3080 TO 5590	20	b7
WINGWALL FFH S		15	b8	11 (LENGTH VARIES)	2530 TO 11 890	125	9 (LENGTH VARIES)	2530 TO 10 020	89	7 (LENGTH VARIES)	2530 TO 8140	59	5 (LENGTH VARIES)	2530 TO 6270	35	4 (LENGTH VARIES)	2530 TO 5340	25	3 (LENGTH VARIES)	2530 TO 4400	16	b8
WINGWALL FFV L		15	c1	51 (LENGTH VARIES)	810 TO 4410	209	43 (LENGTH VARIES)	810 TO 3830	157	35 (LENGTH VARIES)	810 TO 3260	112	26 (LENGTH VARIES)	810 TO 2610	70	22 (LENGTH VARIES)	810 TO 2320	54	18 (LENGTH VARIES)	810 TO 2040	40	c1
WINGWALL FFV S		15	c2	38 (LENGTH VARIES)	820 TO 4380	155	32 (LENGTH VARIES)	820 TO 3810	116	26 (LENGTH VARIES)	820 TO 3230	83	20 (LENGTH VARIES)	820 TO 2650	54	17 (LENGTH VARIES)	820 TO 2360	42	14 (LENGTH VARIES)	820 TO 2070	32	c2
WINGWALL FFV L		15	c3	2	4350	14	2	3750	12	1	3150	5	1	2550	4	2	2250	7	1	1950	3	c3
WINGWALL FFV S		15	c3	2	4350	14	2	3750	12	1	3150	5	2	2550	8	1	2250	4	1	1950	3	c3
WINGWALL BFV L		15	c4	11 (LENGTH VARIES)	810 TO 1530	20	11 (LENGTH VARIES)	810 TO 1530	20	11 (LENGTH VARIES)	810 TO 1530	20	11 (LENGTH VARIES)	810 TO 1530	20	11 (LENGTH VARIES)	810 TO 1530	20	11 (LENGTH VARIES)	810 TO 1530	20	c4
WINGWALL BFV S		15	c5	6 (LENGTH VARIES)	820 TO 1310	10	6 (LENGTH VARIES)	820 TO 1310	10	6 (LENGTH VARIES)	820 TO 1310	10	6 (LENGTH VARIES)	820 TO 1310	10	6 (LENGTH VARIES)	820 TO 1310	10	6 (LENGTH VARIES)	820 TO 1310	10	c5
WINGWALL BFV L		15	c6	40 (LENGTH VARIES)	2810 TO 5610	264	32 (LENGTH VARIES)	2810 TO 5030	197	24 (LENGTH VARIES)	2810 TO 4460	137	15 (LENGTH VARIES)	2810 TO 3810	78	11 (LENGTH VARIES)	2810 TO 3520	55	7 (LENGTH VARIES)	2810 TO 3240	33	c6
WINGWALL BFV S		15	c7	32 (LENGTH VARIES)	2600 TO 5580	205	26 (LENGTH VARIES)	2600 TO 5010	155	20 (LENGTH VARIES)	2600 TO 4430	110	14 (LENGTH VARIES)	2600 TO 3850	71	11 (LENGTH VARIES)	2600 TO 3560	53	8 (LENGTH VARIES)	2600 TO 3270	37	c7
WINGWALL BFV L		15	c8	29	3150	143	21	3150	104	13	3150	64	---	---	0	---	---	0	---	---	0	c8
WINGWALL BFV S		15	c8	21	3150	104	14	3150	69	8	3150	40	---	---	0	---	---	0	---	---	0	c8
WINGWALL BFV L		15	c9	2	5550	17	2	4950	16	1	4350	7	1	3750	6	2	3450	11	1	3150	5	c9
WINGWALL BFV S		15	c9	2	5550	17	2	4950	16	1	4350	7	2	3750	12	1	3450	5	1	3150	5	c9
APRON, LONG BOT		15	d1	7	9530	105	7	8140	89	7	6760	74	7	5370	59	7	4680	51	7	3980	44	d1
APRON, LONG BOT L		15	d2	3	14 850	70	3	12 360	58	3	9870	46	3	7400	35	3	6170	29	3	4950	23	d2
APRON, LONG BOT S		15	d3	3	11 160	53	3	9300	44	3	7450	35	3	5600	26	3	4690	22	3	3780	18	d3
APRON, LONG TOP		20	f1	10	9530	224	10	8140	192	10	6760	159	10	5370	126	10	4680	110	10	3980	94	f1
APRON, LONG TOP L		20	f2	12 (LENGTH VARIES)	580 TO 8210	124	10 (LENGTH VARIES)	570 TO 6820	87	8 (LENGTH VARIES)	550 TO 5440	56	6 (LENGTH VARIES)	540 TO 4050	32	5 (LENGTH VARIES)	540 TO 3350	23	4 (LENGTH VARIES)	530 TO 2660	15	f2
APRON, LONG TOP S		20	f3	9 (LENGTH VARIES)	710 TO 8160	94	7 (LENGTH VARIES)	1170 TO 6770	65	6 (LENGTH VARIES)	690 TO 5380	43	4 (LENGTH VARIES)	1160 TO 3990	24	4 (LENGTH VARIES)	450 TO 3300	18	3 (LENGTH VARIES)	680 TO 2600	12	f3
APRON, LONG TOP L		20	f4	1	16 290	38	1	13 790	32	1	11 280	27	1	8780	21	1	7530	18	1	6280	15	f4
APRON, LONG TOP S		20	f5	1	12 400	31	1	10 520	25	1	8650	20	1	6780	16	1	5840	14	1	4910	12	f5
PARAPET, VERT		15	j1	21	1930	63	21	1930	63	21	1930	63	21	1930	63	21	1930	63	21	1930	63	j1
PARAPET, HORIZ		25	j1	4	4050	64	4	3940	62	4	3940	62	4	3880	61	4	3880	61	4	3880	61	j1
APRON, TRANS TOP		20	m1	6 (LENGTH VARIES)	3670 TO 3950	54	6 (LENGTH VARIES)	3570 TO 3850	52	6 (LENGTH VARIES)	3570 TO 3850	52	6 (LENGTH VARIES)	3520 TO 3800	52	6 (LENGTH VARIES)	3520 TO 3800	52	6 (LENGTH VARIES)	3520 TO 3800	52	m1
APRON, TRANS TOP		20	m2	29 (LENGTH VARIES)	4060 TO 7140	382	23 (LENGTH VARIES)	3960 TO 6380	280	17 (LENGTH VARIES)	3960 TO 5720	194	10 (LENGTH VARIES)	3910 TO 4900	104	7 (LENGTH VARIES)	3910 TO 4570	70	4 (LENGTH VARIES)	3910 TO 4240	38	m2
APRON, TRANS TOP		20	m3	5	5030	59	5	4620	54	5	4240	50	5	3840	45	5	3660	43	5	3480	41	m3
APRON, TRANS BOT		20	m4	25 (LENGTH VARIES)	1770 TO 6670	248	21 (LENGTH VARIES)	1770 TO 5850	188	17 (LENGTH VARIES)	1770 TO 5040	136	13 (LENGTH VARIES)	1770 TO 4220	92	11 (LENGTH VARIES)	1770 TO 3810	72	9 (LENGTH VARIES)	1770 TO 3400	55	m4
CURTAIN, HORIZ		20	p1	4	3420	32	4	3420	32	4	3420	32	4	3420	32	4	3420	32	4	3420	32	p1
CURTAIN, HORIZ L		20	p2	4	8450	80	4	7240	68	4	6030	57	4	4820	45	4	4220	40	4	3620	34	p2
CURTAIN, HORIZ S		20	p3	4	4790	45	4	4170	39	4	3540	33	4	2920	28	4	2610	25	4	2290	22	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	14 560	69	2	11 980	56	2	9410	44	2	6840	32	2	5550	26	2	4260	20	s3
WING SLOPE EF S		20	s4	2	11 300	53	2	9350	44	2	7380	35	2	5410	25	2	4430	21	2	3450	16	s4
WING SLOPE FF L		20	s5	1	16 700	39	1	14 120	33	1	11 550	27	1	8970	21	1	7690	18	1	6400	15	s5
WING SLOPE FF S		20	s6	1	12 910	32	1	10 940	26	1	8980	21	1	7010	17	1	6030	14	1	5040	12	s6
CURTAIN, VERT		15	t1	35	2410	132	30	2260	106	25	2110	83	20	1960	62	18	1960	55	15	1960	46	t1
	REINF STEEL			951 kg			3085 kg			2801 kg			1579 kg			1312 kg			1057 kg		
ESTIMATED QUANTITIES ONE HEADWALL	CONC	PARAPET Δ		1.4	53.3 m³		1.2	37.7 m³		1.2	27.6 m³		1.2	18.2 m³		1.2	14.9 m³		1.2	11.8 m³		
		WINGS		19.3			11.7			8.0			4.4			3.2			2.2			
		FOOTING		32.6			24.8			18.4			12.6			10.5			8.4			

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 : Timothy A. Kraupenbroit

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MFWH 30-2-95

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

REVISED 04-02 - CONCRETE QUANTITIES ADJUSTED.
MFWH30M.SDT

XXXXXXXXXXSYSTEMTIME XXXXXXXXUSERNAME XXXXXXXXXX