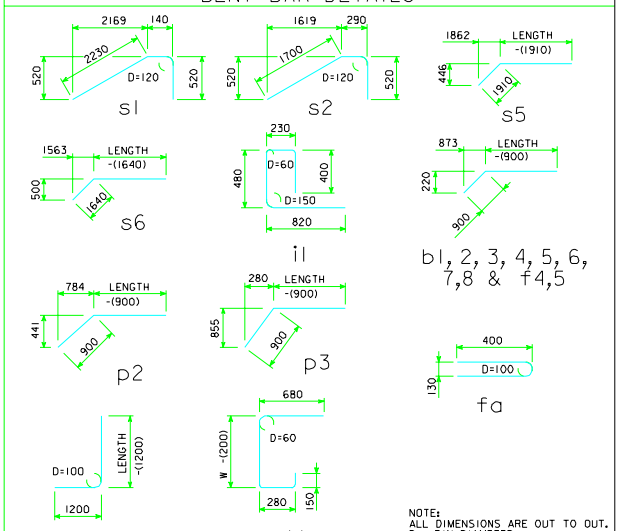
BILL OF REINF. FOR ONE HEADWALL 30° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION ΔΔ	SHAPE	SIZE	MARK	3600x3600 NO.	3600x3600 LENGTH	3600x3600 MASS	3600x3000 NO.	3600x3000 LENGTH	3600x3000 MASS	3600x2400 NO.	3600x2400 LENGTH	3600x2400 MASS	3600x1800 NO.	3600x1800 LENGTH	3600x1800 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	16 290	26	1	13 790	22	1	11 280	18	1	8780	14	b1
WINGWALL, BFH S		15	b2	1	12 400	19	1	10 520	17	1	8650	14	1	6780	11	b2
WINGWALL BFH L		15	b3	10 (LENGTH VARIES)	4330 TO 15 600	160	8 (LENGTH VARIES)	4380 TO 13 100	110	6 (LENGTH VARIES)	4330 TO 10 590	70	4 (LENGTH VARIES)	4380 TO 8090	39	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	b4
WINGWALL FFH L		15	b5	1	16 290	26	1	13 790	22	1	11 280	18	1	8780	14	b5
WINGWALL FFH S		15	b6	1	12 400	19	1	10 520	17	1	8650	14	1	6780	11	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	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	b8
WINGWALL FFV L		15	c1	51 (LENGTH VARIES)	830 TO 4430	211	43 (LENGTH VARIES)	830 TO 3850	158	35 (LENGTH VARIES)	830 TO 3280	113	26 (LENGTH VARIES)	830 TO 2680	71	c1
WINGWALL FFV S		15	c2	38 (LENGTH VARIES)	840 TO 4400	156	32 (LENGTH VARIES)	840 TO 3830	117	26 (LENGTH VARIES)	840 TO 3250	83	20 (LENGTH VARIES)	840 TO 2670	55	c2
WINGWALL FFV L		15	c3	2	4370	14	2	3770	12	1	3170	5	1	2570	4	c3
WINGWALL FFV S		15	c3	2	4370	14	2	3770	12	1	3170	5	2	2570	8	c3
WINGWALL BFV L		15	c4	11 (LENGTH VARIES)	830 TO 1550	21	11 (LENGTH VARIES)	830 TO 1550	21	11 (LENGTH VARIES)	830 TO 1550	21	11 (LENGTH VARIES)	830 TO 1550	21	c4
WINGWALL BFV S		15	c5	6 (LENGTH VARIES)	840 TO 1330	10	6 (LENGTH VARIES)	840 TO 1330	10	6 (LENGTH VARIES)	840 TO 1330	10	6 (LENGTH VARIES)	840 TO 1330	10	c5
WINGWALL BFV L		15	c6	40 (LENGTH VARIES)	2830 TO 5630	266	32 (LENGTH VARIES)	2830 TO 5050	198	24 (LENGTH VARIES)	2830 TO 4480	138	15 (LENGTH VARIES)	2830 TO 3880	78	c6
WINGWALL BFV S		15	c7	32 (LENGTH VARIES)	2620 TO 5600	206	26 (LENGTH VARIES)	2620 TO 5030	156	20 (LENGTH VARIES)	2620 TO 4450	111	14 (LENGTH VARIES)	2620 TO 3870	71	c7
WINGWALL BFV L		15	c8	29	3150	148	21	3150	104	13	3150	64	---	---	0	c8
WINGWALL BFV S		15	c8	21	3150	104	14	3150	69	8	3150	40	---	---	0	c8
WINGWALL BFV L		15	c9	2	5570	17	2	4970	16	1	4370	7	1	3770	6	c9
WINGWALL BFV S		15	c9	2	5570	17	2	4970	16	1	4370	7	2	3770	12	c9
APRON, LONG BOT		15	d1	9	9530	135	9	8140	115	9	6760	96	9	5370	76	d1
APRON, LONG BOT L		15	d2	3	14 850	70	3	12 360	58	3	9870	46	3	7400	35	d2
APRON, LONG BOT S		15	d3	3	11 160	53	3	9800	44	3	7450	35	3	5600	26	d3
APRON, LONG TOP		20	f1	12	9530	269	12	8140	230	12	6760	191	12	5370	152	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	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	f3
APRON, LONG TOP L		20	f4	1	16 290	38	1	13 790	32	1	11 280	27	1	8780	21	f4
APRON, LONG TOP S		20	f5	1	12 400	31	1	10 520	25	1	8650	20	1	6780	16	f5
PARAPET, VERT		15	j1	25	1930	76	25	1930	76	25	1930	76	25	1930	76	j1
PARAPET, HORIZ		25	j1	4	4690	74	4	4630	73	4	4630	73	4	4570	72	j1
APRON, TRANS TOP		20	m1	6 (LENGTH VARIES)	4320 TO 4590	68	6 (LENGTH VARIES)	4220 TO 4490	62	6 (LENGTH VARIES)	4220 TO 4490	62	6 (LENGTH VARIES)	4160 TO 4440	61	m1
APRON, TRANS TOP		20	m2	28 (LENGTH VARIES)	4660 TO 7630	405	22 (LENGTH VARIES)	4560 TO 6870	296	16 (LENGTH VARIES)	4560 TO 6210	203	10 (LENGTH VARIES)	4510 TO 5500	118	m2
APRON, TRANS TOP		20	m3	6	5540	78	6	5130	72	6	4800	68	6	4400	62	m3
APRON, TRANS BOT		20	m4	25 (LENGTH VARIES)	2460 TO 7360	289	21 (LENGTH VARIES)	2460 TO 6550	223	17 (LENGTH VARIES)	2460 TO 5730	164	13 (LENGTH VARIES)	2460 TO 4910	118	m4
CURTAIN, HORIZ		20	p1	4	4110	39	4	4110	39	4	4110	39	4	4110	39	p1
CURTAIN, HORIZ L		20	p2	4	8450	80	4	7240	68	4	6030	57	4	4820	45	p2
CURTAIN, HORIZ S		20	p3	4	4790	45	4	4170	39	4	3540	33	4	2920	28	p3
WING SLOPE EF L		20	s1	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	s2
WING SLOPE EF L		20	s3	2	14 560	69	2	11 980	56	2	9410	44	2	6840	32	s3
WING SLOPE EF S		20	s4	2	11 300	53	2	9350	44	2	7380	35	2	5410	25	s4
WING SLOPE FF L		20	s5	1	16 700	39	1	14 120	33	1	11 550	27	1	8970	21	s5
WING SLOPE FF S		20	s6	1	12 910	32	1	10 940	26	1	8980	21	1	7010	17	s6
CURTAIN, VERT		15	t1	37	2410	140	32	2260	114	27	2110	89	22	1960	68	t1
	REINF STEEL			4163 kg			3272 kg			2561 kg			1728 kg			
ESTIMATED QUANTITIES ONE HEADWALL	CONC	PARAPET Δ		1.5	57.1 m³		1.4	40.8 m³		1.4	30.1 m³		1.3	20.1 m³		
		WINGS		19.8			11.7			8.0			4.4			
		FOOTING		36.3			27.7			20.7			14.4			

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 : William A. Kneuppel

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MFWH 30-1-95

REVISED 04-02 - CHANGED THE NUMBER OF d1 BARS FOR 3600 SPANS. CONCRETE QUANTITIES ADJUSTED.
FWH30DM.SOI

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

XXXXXXXXXXSYSTEMTIME XXXXXXXUSERNAME XXXXXXXXXX