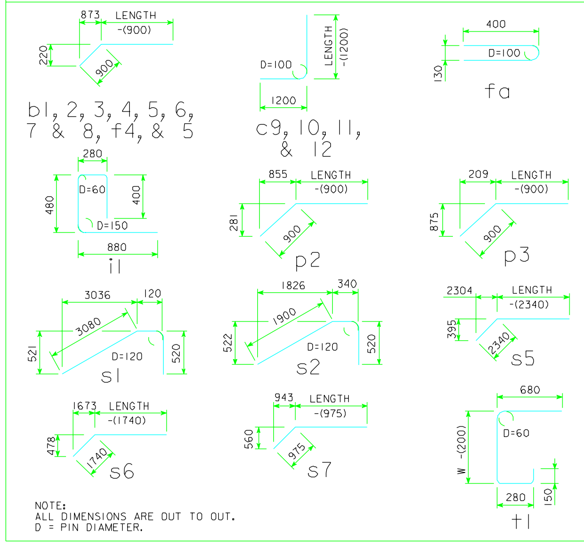
BILL OF REINFORCING FOR ONE HEADWALL
45° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION	SHAPE	SIZE	MARK	2400x3000 NO.	2400x3000 LENGTH	2400x3000 MASS	2400x2400 NO.	2400x2400 LENGTH	2400x2400 MASS	2400x1800 NO.	2400x1800 LENGTH	2400x1800 MASS	MARK
FENCE ANCHOR		15	fa	2	930	3	2	930	3	2	930	3	fa
WINGWALL BFH L		15	b1	1	18 930	30	1	15 430	24	1	11 930	19	b1
WINGWALL BFH S		15	b2	1	11 700	18	1	9600	15	1	7500	12	b2
WINGWALL BFH L		15	b3	8 (LENGTH VARIES)	5700 TO 17 950	149	6 (LENGTH VARIES)	5700 TO 14 450	95	4 (LENGTH VARIES)	5700 TO 10 950	52	b3
WINGWALL BFH S		15	b4	8 (LENGTH VARIES)	3780 TO 11 120	94	6 (LENGTH VARIES)	3780 TO 9020	60	4 (LENGTH VARIES)	3780 TO 6920	34	b4
WINGWALL FFH L		15	b5	1	18 930	30	1	15 430	24	1	11 930	19	b5
WINGWALL FFH S		15	b6	1	11 700	18	1	9600	15	1	7500	12	b6
WINGWALL FFH L		15	b7	9 (LENGTH VARIES)	3960 TO 17 950	155	7 (LENGTH VARIES)	3960 TO 14 450	101	5 (LENGTH VARIES)	3960 TO 10 950	59	b7
WINGWALL FFH S		15	b8	9 (LENGTH VARIES)	2730 TO 11 120	98	7 (LENGTH VARIES)	2730 TO 9020	65	5 (LENGTH VARIES)	2730 TO 6920	38	b8
CENTER WALL EFH		15	b9	17 (LENGTH VARIES)	1730 TO 9290	147	13 (LENGTH VARIES)	1750 TO 7590	95	9 (LENGTH VARIES)	1780 TO 5890	54	b9
WINGWALL FFV L		15	c1	60 (LENGTH VARIES)	760 TO 3790	214	49 (LENGTH VARIES)	760 TO 3220	153	37 (LENGTH VARIES)	760 TO 2610	98	c1
WINGWALL FFV S		15	c2	36 (LENGTH VARIES)	770 TO 3770	128	29 (LENGTH VARIES)	770 TO 3170	90	22 (LENGTH VARIES)	770 TO 2570	58	c2
WINGWALL FFV L		15	c3	2	3700	12	2	3100	10	2	2500	8	c3
WINGWALL FFV S		15	c3	2	3700	12	2	3100	10	2	2500	8	c3
CENTER WALL EFV		15	c4	2	420	1	2	420	1	2	420	1	c4
CENTER WALL EFV		15	c5	56 (LENGTH VARIES)	470 TO 3090	156	45 (LENGTH VARIES)	470 TO 2500	105	34 (LENGTH VARIES)	460 TO 1910	63	c5
CENTER WALL EFV		15	c6	3	3160	15	3	2560	12	3	1960	9	c6
WINGWALL BFV L		15	c7	15 (LENGTH VARIES)	760 TO 1480	26	15 (LENGTH VARIES)	760 TO 1480	26	15 (LENGTH VARIES)	760 TO 1480	26	c7
WINGWALL BFV S		15	c8	4 (LENGTH VARIES)	770 TO 1030	6	4 (LENGTH VARIES)	770 TO 1030	6	4 (LENGTH VARIES)	770 TO 1030	6	c8
WINGWALL BFV L		15	c9	45 (LENGTH VARIES)	2730 TO 4990	273	34 (LENGTH VARIES)	2730 TO 4420	191	22 (LENGTH VARIES)	2730 TO 3810	113	c9
WINGWALL BFV S		15	c10	32 (LENGTH VARIES)	2310 TO 4970	183	25 (LENGTH VARIES)	2310 TO 4370	131	18 (LENGTH VARIES)	2310 TO 3770	86	c10
WINGWALL BFV L		15	c11	30	3150	148	18	3150	89	---	---	0	c11
WINGWALL BFV S		15	c11	19	3150	94	12	3150	59	---	---	0	c11
WINGWALL BFV L		15	c12	1	4900	8	1	4300	7	1	3700	6	c12
WINGWALL BFV S		15	c12	2	4900	15	2	4300	14	2	3700	12	c12
APRON LONG BOT		15	d1	11	9970	172	11	8270	143	11	6580	114	d1
APRON LONG BOT L		15	d2	3	17 680	83	3	14 200	67	3	10 730	51	d2
APRON LONG BOT S		15	d3	3	10 700	50	3	8610	41	3	6540	31	d3
APRON LONG TOP		20	f1	16	9970	376	16	8270	312	16	6580	248	f1
APRON LONG TOP L		20	f2	14 (LENGTH VARIES)	870 TO 8760	159	11 (LENGTH VARIES)	980 TO 7060	104	8 (LENGTH VARIES)	1090 TO 5360	61	f2
APRON LONG TOP S		20	f3	9 (LENGTH VARIES)	720 TO 8870	102	7 (LENGTH VARIES)	1040 TO 7170	68	5 (LENGTH VARIES)	1360 TO 5470	40	f3
APRON LONG TOP L		20	f4	1	18 930	45	1	15 430	36	1	11 930	28	f4
APRON LONG TOP S		20	f5	1	11 700	28	1	9600	23	1	7500	18	f5
PARAPET VERT		15	i1	37	2040	119	37	2040	119	36	2040	115	i1
PARAPET HORIZ		25	j1	4	7730	121	4	7730	121	4	7620	120	j1
APRON TRANS TOP		20	m1	14 (LENGTH VARIES)	6020 TO 6710	210	14 (LENGTH VARIES)	6020 TO 6710	210	14 (LENGTH VARIES)	5940 TO 6630	207	m1
APRON TRANS TOP		20	m2	16 (LENGTH VARIES)	6790 TO 8360	285	8 (LENGTH VARIES)	6790 TO 7520	135	---	---	0	m2
APRON TRANS TOP		20	m3	11 (LENGTH VARIES)	4280 TO 5860	131	11 (LENGTH VARIES)	3840 TO 5420	120	11 (LENGTH VARIES)	3370 TO 4950	108	m3
APRON TRANS TOP		20	m4	7	4270	70	7	3780	62	7	3380	56	m4
APRON TRANS BOT		20	m5	20 (LENGTH VARIES)	5230 TO 11 310	390	16 (LENGTH VARIES)	5230 TO 10 030	287	12 (LENGTH VARIES)	5190 TO 8710	196	m5
CURTAIN HORIZ		20	p1	4	7050	66	4	7040	66	4	7010	66	p1
CURTAIN HORIZ L		20	p2	4	10 840	102	4	8940	84	4	7040	66	p2
CURTAIN HORIZ S		20	p3	4	4090	39	4	3480	33	4	2870	27	p3
WING SLOPE EF L		20	s1	2	3720	18	2	3720	18	2	3720	18	s1
WING SLOPE EF S		20	s2	2	2760	13	2	2760	13	2	2760	13	s2
WING SLOPE EF L		20	s3	2	16 120	76	2	12 570	59	2	9020	42	s3
WING SLOPE EF S		20	s4	2	10 270	48	2	8080	38	2	5900	28	s4
WING SLOPE FF L		20	s5	1	19 180	45	1	15 620	37	1	12 070	28	s5
WING SLOPE FF S		20	s6	1	12 080	28	1	9910	23	1	7710	18	s6
CENTER WALL EFH		20	s7	2	9910	47	2	8110	38	2	6320	30	s7
CURTAIN VERT		15	t1	48	2260	170	41	2110	136	34	1960	105	t1
ESTIMATED QUANTITIES ONE HEADWALL	REINF STEEL			5026 kg			3794 kg			2630 kg			
	CONC	PARAPET∆		2.1	58.5 m³		2.1	43.0 m³		2.0	28.7 m³		
		WINGS		18.6			12.5			6.9			
		FOOTING		37.8			28.4			19.8			

∆ NOTE:

INCLUDES TOP OF WINGWALL QUANTITIES
L DENOTES LONG WING
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 900mm 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", AND "f3" 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.

NOTES:

1. SEE SHEET MTWRCB-GI-95 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

LATEST REVISION DATE: 04-02

APPROVED BY: William A. Lundquist

STANDARD DESIGN

FLARED WING HEADWALLS

FOR

TWIN REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MTWH 45-7-95

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

REVISED 04-02 - CONCRETE QUANTITIES ADJUSTED.

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