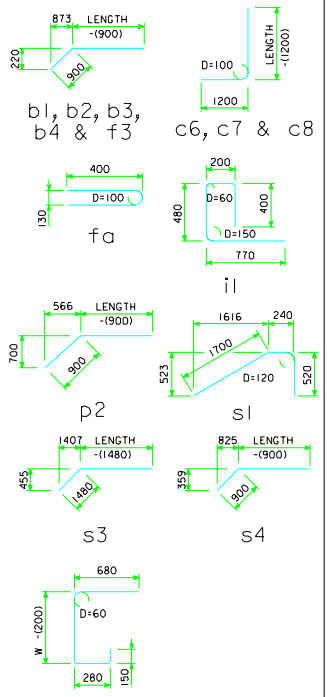
BILL OF REINFORCING FOR ONE HEADWALL 0° SKEW CULVERT SPAN X CULVERT HEIGHT

LOCATION	SHAPE	SIZE	MARK	3600×3600 NO.	3600×3600 LENGTH	3600×3600 MASS	3600×3000 NO.	3600×3000 LENGTH	3600×3000 MASS	3600×2400 NO.	3600×2400 LENGTH	3600×2400 MASS	3600×1800 NO.	3600×1800 LENGTH	3600×1800 MASS	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	MARK
FENCE ANCHOR		15	fa	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	fa
WINGWALL BFH		15	b1	2	12 290	39	2	10 440	33	2	8580	27	2	6730	21	2	12 290	39	2	10 440	33	2	8580	27	2	6730	21	b1
WINGWALL BFH		15	b2	20 (LENGTH VARIES)	2 EA 3440 TO 11 790	239	16 (LENGTH VARIES)	2 EA 3440 TO 9930	168	12 (LENGTH VARIES)	2 EA 3440 TO 8080	109	8 (LENGTH VARIES)	2 EA 3440 TO 6220	61	20 (LENGTH VARIES)	2 EA 3440 TO 11 790	239	16 (LENGTH VARIES)	2 EA 3440 TO 9930	168	12 (LENGTH VARIES)	2 EA 3440 TO 8080	109	8 (LENGTH VARIES)	2 EA 3440 TO 6220	61	b2
WINGWALL FFH		15	b3	2	12 290	39	2	10 440	33	2	8580	27	2	6730	21	2	12 290	39	2	10 440	33	2	8580	27	2	6730	21	b3
WINGWALL FFH		15	b4	22 (LENGTH VARIES)	2 EA 2510 TO 11 790	247	18 (LENGTH VARIES)	2 EA 2510 TO 9930	176	14 (LENGTH VARIES)	2 EA 2510 TO 8080	116	10 (LENGTH VARIES)	2 EA 2510 TO 6220	69	22 (LENGTH VARIES)	2 EA 2510 TO 11 790	247	18 (LENGTH VARIES)	2 EA 2510 TO 9930	176	14 (LENGTH VARIES)	2 EA 2510 TO 8080	116	10 (LENGTH VARIES)	2 EA 2510 TO 6220	69	b4
CENTER WALL EFH		15	b5	21 (LENGTH VARIES)	1390 TO 8120	157	17 (LENGTH VARIES)	1400 TO 6910	111	13 (LENGTH VARIES)	1420 TO 5710	73	9 (LENGTH VARIES)	1460 TO 4500	42	21 (LENGTH VARIES)	1390 TO 8120	157	17 (LENGTH VARIES)	1400 TO 6910	111	13 (LENGTH VARIES)	1420 TO 5710	73	9 (LENGTH VARIES)	1460 TO 4500	42	b5
WINGWALL FFV		15	c1	76 (LENGTH VARIES)	2 EA 850 TO 4440	315	64 (LENGTH VARIES)	2 EA 850 TO 3850	236	52 (LENGTH VARIES)	2 EA 850 TO 3270	168	40 (LENGTH VARIES)	2 EA 850 TO 2690	111	76 (LENGTH VARIES)	2 EA 820 TO 4410	313	64 (LENGTH VARIES)	2 EA 830 TO 3830	284	52 (LENGTH VARIES)	2 EA 830 TO 3250	167	40 (LENGTH VARIES)	2 EA 830 TO 2670	110	c1
WINGWALL FFV		15	c2	4	4380	27	2	3780	12	2	3180	10	2	2580	8	4	4350	27	2	3750	12	2	3150	10	2	2550	8	c2
CENTER WALL EFV		15	c3	2	510	2	2	510	2	2	510	2	2	500	2	2	490	2	2	490	2	2	490	2	2	480	2	c3
CENTER WALL EFV		15	c4	50 (LENGTH VARIES)	580 TO 3850	174	42 (LENGTH VARIES)	570 TO 3250	126	34 (LENGTH VARIES)	570 TO 2650	86	26 (LENGTH VARIES)	560 TO 2040	53	50 (LENGTH VARIES)	560 TO 3830	172	42 (LENGTH VARIES)	550 TO 3280	125	34 (LENGTH VARIES)	550 TO 2630	85	26 (LENGTH VARIES)	540 TO 2020	52	c4
WINGWALL BFV		15	c5	12 (LENGTH VARIES)	2 EA 850 TO 1330	21	12 (LENGTH VARIES)	2 EA 850 TO 1330	21	12 (LENGTH VARIES)	2 EA 850 TO 1330	21	12 (LENGTH VARIES)	2 EA 850 TO 1330	21	12 (LENGTH VARIES)	2 EA 820 TO 1310	20	12 (LENGTH VARIES)	2 EA 830 TO 1310	20	12 (LENGTH VARIES)	2 EA 830 TO 1310	20	12 (LENGTH VARIES)	2 EA 830 TO 1310	20	c5
WINGWALL BFV		15	c6	64 (LENGTH VARIES)	2 EA 2630 TO 5640	415	52 (LENGTH VARIES)	2 EA 2630 TO 5060	318	40 (LENGTH VARIES)	2 EA 2630 TO 4470	223	28 (LENGTH VARIES)	2 EA 2630 TO 3890	143	64 (LENGTH VARIES)	2 EA 2610 TO 5610	413	52 (LENGTH VARIES)	2 EA 2610 TO 5030	312	40 (LENGTH VARIES)	2 EA 2610 TO 4450	222	28 (LENGTH VARIES)	2 EA 2610 TO 3870	142	c6
WINGWALL BFV		15	c7	50	3150	247	38	3150	188	26	3150	129	---	---	0	50	3150	247	38	3150	188	26	3150	129	---	---	0	c7
WINGWALL BFV		15	c8	4	5580	35	2	4980	16	2	4380	14	2	3780	12	4	5550	35	2	4950	16	2	4350	14	2	3750	12	c8
APRON LONG BOT		15	d1	17	8250	220	17	7050	188	17	5850	156	17	4650	124	13	8250	168	13	7050	144	13	5850	119	13	4650	95	d1
APRON LONG BOT		15	d2	6	10 830	102	6	8950	84	6	7100	67	6	5340	50	6	10 830	102	6	8950	84	6	7100	67	6	5340	50	d2
APRON LONG TOP		20	f1	24	8250	466	24	7050	398	24	5850	331	24	4650	263	20	8250	389	20	7050	332	20	5850	276	20	4650	219	f1
APRON LONG TOP		20	f2	18 (LENGTH VARIES)	2 EA 940 TO 7450	178	15 (LENGTH VARIES)	2 EA 530 TO 6250	128	12 (LENGTH VARIES)	2 EA 950 TO 5050	85	10 (LENGTH VARIES)	2 EA 540 TO 3840	52	18 (LENGTH VARIES)	2 EA 940 TO 7450	178	15 (LENGTH VARIES)	2 EA 530 TO 6250	128	12 (LENGTH VARIES)	2 EA 950 TO 5050	85	10 (LENGTH VARIES)	2 EA 540 TO 3840	52	f2
APRON LONG TOP		20	f3	2	12 290	58	2	10 440	49	2	8580	40	2	6730	32	2	12 290	58	2	10 440	49	2	8580	40	2	6730	32	f3
PARAPET VERT		15	j1	54	1850	157	53	1850	154	53	1850	154	52	1850	151	46	1850	134	45	1850	131	45	1850	131	44	1850	128	j1
PARAPET HORIZ		25	j1	4	8010	126	4	7860	123	4	7860	123	4	7790	122	4	6810	107	4	6660	105	4	6660	105	4	6590	103	j1
APRON TRANS TOP		20	m1	35 (LENGTH VARIES)	7930 TO 11 500	801	29 (LENGTH VARIES)	7780 TO 10 720	632	24 (LENGTH VARIES)	7780 TO 10 190	508	18 (LENGTH VARIES)	7700 TO 9490	364	35 (LENGTH VARIES)	6730 TO 10 300	702	29 (LENGTH VARIES)	6580 TO 9520	550	24 (LENGTH VARIES)	6580 TO 8990	440	18 (LENGTH VARIES)	6500 TO 8290	313	m1
APRON TRANS BOT		20	m2	24 (LENGTH VARIES)	6240 TO 9690	450	20 (LENGTH VARIES)	6190 TO 9040	359	16 (LENGTH VARIES)	6190 TO 8440	276	12 (LENGTH VARIES)	6170 TO 7820	198	24 (LENGTH VARIES)	5040 TO 8490	382	20 (LENGTH VARIES)	4990 TO 7840	302	16 (LENGTH VARIES)	4990 TO 7240	230	12 (LENGTH VARIES)	4970 TO 6620	164	m2
CURTAIN HORIZ		20	p1	4	7490	71	4	7440	70	4	7440	70	4	7410	70	4	6290	59	4	6240	59	4	6240	59	4	6210	58	p1
CURTAIN HORIZ		20	p2	8	5600	106	8	4850	91	8	4100	77	8	3330	63	8	5600	106	8	4850	91	8	4100	77	8	3330	63	p2
WING SLOPE EF		20	s1	4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	s1
WING SLOPE EF		20	s2	4	11 200	106	4	9250	87	4	7300	69	4	5350	50	4	11 200	106	4	9250	87	4	7300	69	4	5350	50	s2
WING SLOPE EF		20	s3	2	12 840	60	2	10 890	51	2	8940	42	2	6990	33	2	12 840	60	2	10 890	51	2	8940	42	2	6990	33	s3
CENTER WALL EF		20	s4	2	8950	42	2	7610	36	2	6270	30	2	4930	23	2	8950	42	2	7610	36	2	6270	30	2	4930	23	s4
CURTAIN VERT		15	t1	42	2410	159	38	2260	135	34	2110	113	30	1960	92	39	2410	148	35	2260	124	31	2110	103	27	1960	83	t1
	REINF STEEL			5085 kg			4046 kg			3172 kg			2277 kg			4717 kg		3729 kg			2900 kg			2052 kg			
ESTIMATED		PARAPET△		2.0			1.9			1.9			1.8			1.8			1.7			1.7			1.6		
QUANTITIES	CONC	WINGS		20.9	65.2 m³		12.6	47.9 m³		8.5	36.2 m³		4.7	25.3 m³		20.8	59.8 m³		12.6	48.0 m³		8.5	32.3 m³		4.7	22.2 m³		
ONE HEADWALL		FOOTING		42.3			33.4			25.8			18.8			36.7			28.7			22.1			15.9			

NOTE:

△ INCLUDES TOP OF WINGWALL QUANTITIES.

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", 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. Kindsvater

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
TWIN REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MTWH 0-4-95

REVISED 04-02 - VARIOUS LENGTHS ADJUSTED FOR CONSISTENCY. CONCRETE QUANTITIES ADJUSTED.
REVISED 1/98: BEND DIMENSIONS OF i1 BAR CHANGED.
TWH04M.S01

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