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

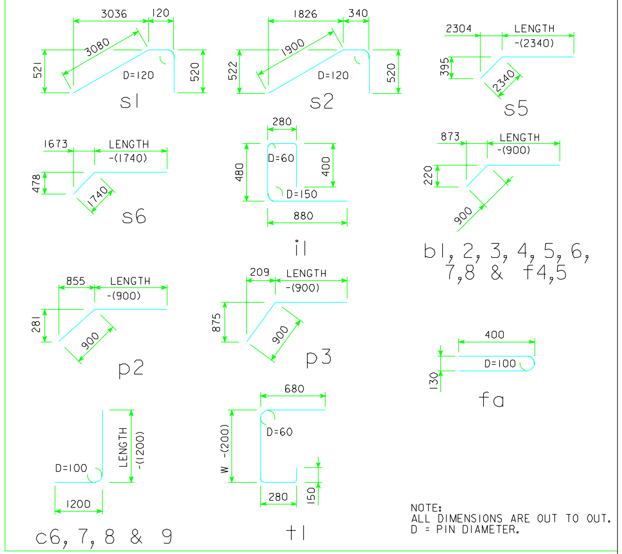
LOCATION ΔΔ	SHAPE	SIZE	MARK	3600×3600 NO.	3600×3600 LENGTH	3600×3600 MASS	3600×3000 NO.	3600×3000 LENGTH	3600×3000 MASS	3600×2400 NO.	3600×2400 LENGTH	3600×2400 MASS	3600×1800 NO.	3600×1800 LENGTH	3600×1800 MASS	MARK
FENCE ANCHOR		15	fa	2	930	3	2	930	3	2	930	3	2	930	3	fa
WINGWALL, BFH L		15	b1	1	22 430	35	1	18 930	30	1	15 430	24	1	11 930	19	b1
WINGWALL, BFH S		15	b2	1	13 800	22	1	11 700	18	1	9600	15	1	7500	12	b2
WINGWALL BFH L		15	b3	10 (LENGTH VARIES)	5700 TO 21 450	219	8 (LENGTH VARIES)	5700 TO 17 950	153	6 (LENGTH VARIES)	5700 TO 14 450	97	4 (LENGTH VARIES)	5700 TO 10 950	52	b3
WINGWALL BFH S		15	b4	10 (LENGTH VARIES)	3780 TO 13 220	134	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	22 430	35	1	18 930	30	1	15 430	24	1	11 930	19	b5
WINGWALL FFH S		15	b6	1	13 800	23	1	11 700	18	1	9600	15	1	7500	12	b6
WINGWALL FFH L		15	b7	11 (LENGTH VARIES)	3960 TO 21 450	226	9 (LENGTH VARIES)	3960 TO 17 950	159	7 (LENGTH VARIES)	3960 TO 14 450	103	5 (LENGTH VARIES)	3960 TO 10 950	59	b7
WINGWALL FFH S		15	b8	11 (LENGTH VARIES)	2730 TO 13 220	139	9 (LENGTH VARIES)	2730 TO 11 120	98	7 (LENGTH VARIES)	2730 TO 9020	65	5 (LENGTH VARIES)	2730 TO 6920	38	b8
WINGWALL FFV L		15	c1	72 (LENGTH VARIES)	830 TO 4480	300	60 (LENGTH VARIES)	830 TO 3860	221	49 (LENGTH VARIES)	830 TO 3290	158	37 (LENGTH VARIES)	830 TO 2680	102	c1
WINGWALL FFV S		15	c2	43 (LENGTH VARIES)	840 TO 4440	178	36 (LENGTH VARIES)	840 TO 3840	132	29 (LENGTH VARIES)	840 TO 3240	93	22 (LENGTH VARIES)	840 TO 2640	60	c2
WINGWALL FFV L		15	c3	2	4370	14	2	3770	12	2	3170	10	2	2570	8	c3
WINGWALL FFV S		15	c3	2	4370	14	2	3770	12	2	3170	10	2	2570	8	c3
WINGWALL BFV L		15	c4	15 (LENGTH VARIES)	830 TO 1550	28	15 (LENGTH VARIES)	830 TO 1550	28	15 (LENGTH VARIES)	830 TO 1550	28	15 (LENGTH VARIES)	830 TO 1550	28	c4
WINGWALL BFV S		15	c5	4 (LENGTH VARIES)	840 TO 1100	6	4 (LENGTH VARIES)	840 TO 1100	6	4 (LENGTH VARIES)	840 TO 1100	6	4 (LENGTH VARIES)	840 TO 1100	6	c5
WINGWALL BFV L		15	c6	57 (LENGTH VARIES)	2800 TO 5680	379	45 (LENGTH VARIES)	2800 TO 5060	278	34 (LENGTH VARIES)	2800 TO 4490	195	22 (LENGTH VARIES)	2800 TO 3880	115	c6
WINGWALL BFV S		15	c7	39 (LENGTH VARIES)	2380 TO 5640	246	32 (LENGTH VARIES)	2380 TO 5040	186	25 (LENGTH VARIES)	2380 TO 4440	134	18 (LENGTH VARIES)	2380 TO 3840	88	c7
WINGWALL BFV L		15	c8	41	3150	203	30	3150	148	18	3150	89	---	---	0	c8
WINGWALL BFV S		15	c8	26	3150	129	19	3150	94	12	3150	59	---	---	0	c8
WINGWALL BFV L		15	c9	1	5570	9	1	4970	8	1	4370	7	1	3770	6	c9
WINGWALL BFV S		15	c9	2	5570	17	2	4970	16	2	4370	14	2	3770	12	c9
APRON, LONG BOT		15	d1	9	11 670	165	9	9970	141	9	8270	117	9	6580	93	d1
APRON, LONG BOT L		15	d2	3	21 170	100	3	17 680	83	3	14 200	67	3	10 730	51	d2
APRON, LONG BOT S		15	d3	3	12 790	60	3	10 700	50	3	8610	41	3	6540	31	d3
APRON, LONG TOP		20	f1	12	11 670	330	12	9970	282	12	8270	234	12	6580	186	f1
APRON, LONG TOP L		20	f2	17 (LENGTH VARIES)	460 TO 10 150	212	14 (LENGTH VARIES)	570 TO 8450	149	11 (LENGTH VARIES)	670 TO 6750	96	8 (LENGTH VARIES)	780 TO 5060	55	f2
APRON, LONG TOP S		20	f3	10 (LENGTH VARIES)	920 TO 10 060	129	9 (LENGTH VARIES)	220 TO 8360	91	7 (LENGTH VARIES)	530 TO 6660	59	5 (LENGTH VARIES)	840 TO 4960	34	f3
APRON, LONG TOP L		20	f4	1	22 430	53	1	18 930	45	1	15 430	36	1	11 930	28	f4
APRON, LONG TOP S		20	f5	1	13 800	32	1	11 700	28	1	9600	23	1	7500	18	f5
PARAPET, VERT		15	i1	25	2040	80	25	2040	80	25	2040	80	25	2040	80	i1
PARAPET, HORIZ		25	j1	4	5810	91	4	5670	89	4	5670	89	4	5600	88	j1
APRON, TRANS TOP		20	m1	9 (LENGTH VARIES)	4490 TO 4930	100	9 (LENGTH VARIES)	4390 TO 4830	98	9 (LENGTH VARIES)	4390 TO 4830	98	9 (LENGTH VARIES)	4330 TO 4770	96	m1
APRON, TRANS TOP		20	m2	31 (LENGTH VARIES)	4950 TO 8250	482	23 (LENGTH VARIES)	4850 TO 7270	328	16 (LENGTH VARIES)	4850 TO 6500	214	8 (LENGTH VARIES)	4800 TO 5570	98	m2
APRON, TRANS TOP		20	m3	11	5660	147	11	5130	133	11	4720	122	11	4240	110	m3
APRON, TRANS BOT		20	m4	25 (LENGTH VARIES)	2850 TO 10 530	394	21 (LENGTH VARIES)	2850 TO 9250	299	17 (LENGTH VARIES)	2850 TO 7970	217	13 (LENGTH VARIES)	2850 TO 6690	146	m4
CURTAIN, HORIZ		20	p1	4	4980	47	4	4980	47	4	4980	47	4	4980	47	p1
CURTAIN, HORIZ L		20	p2	4	12 740	126	4	10 840	102	4	8940	84	4	7040	66	P2
CURTAIN, HORIZ S		20	p3	4	4700	44	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	2	3720	18	s1
WING SLOPE EF S		20	s2	2	2760	13	2	2760	13	2	2760	13	2	2760	13	s2
WING SLOPE EF L		20	s3	2	19 670	93	2	16 120	76	2	12 570	59	2	9020	42	s3
WING SLOPE EF S		20	s4	2	12 450	62	2	10 270	48	2	8080	38	2	5900	28	s4
WING SLOPE FF L		20	s5	1	22 720	54	1	19 180	45	1	15 620	37	1	12 070	30	s5
WING SLOPE FF S		20	s6	1	14 260	35	1	12 080	30	1	9910	23	1	7710	18	s6
CURTAIN, VERT		15	t1	49	2410	185	42	2260	149	36	2110	119	29	1960	89	t1

ESTIMATED QUANTITIES ONE HEADWALL			3600×3600		3600×3000		3600×2400		3600×1800	
	REINF STEEL		5410 kg		4207 kg		3173 kg		2173 kg	
	CONC	PARAPETΔ	1.8	76.1 m^3	1.7	54.3 m^3	1.7	39.7 m^3	1.6	26.3 m^3
	CONC	WINGS	24.6		14.9		10.2		5.6	
	CONC	FOOTING	49.7		37.7		27.8		19.1	

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-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
REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

JULY, 1995

MFWH 45-1-95

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

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

FWH45IM.SOI

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