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

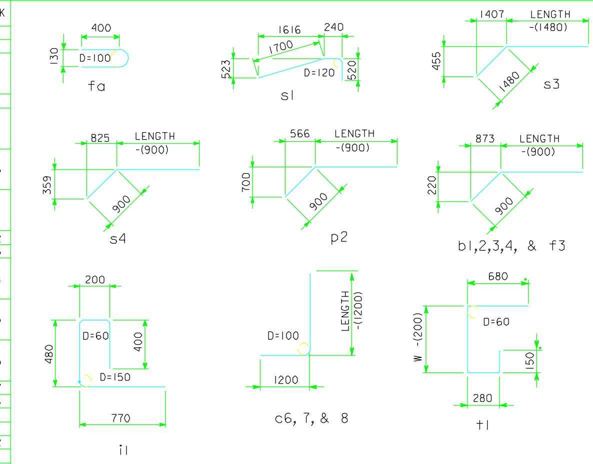
MARK	SIZE	LOCATION	SHAPE	3600 x 3600 NO.	LENGTH	MASS	3600 x 3000 NO.	LENGTH	MASS	3600 x 2400 NO.	LENGTH	MASS	3600 x 1800 NO.	LENGTH	MASS	3000 x 3600 NO.	LENGTH	MASS	3000 x 3000 NO.	LENGTH	MASS	3000 x 2400 NO.	LENGTH	MASS	MARK
fa	15	FENCE ANCHOR (GALV.)		2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	2	930	3	fa
b1	15	WINGWALL, B.F.H.		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	b1
b2	15	WINGWALL, B.F.H.		20 VAR	2 EACH 3440 / 11 790	239	16 VAR	2 EACH 3440 / 9930	168	12 VAR	2 EACH 3440 / 8080	109	8 VAR	2 EACH 3440 / 6220	61	20 VAR	2 EACH 3440 / 11 790	239	16 VAR	2 EACH 3440 / 9930	168	12 VAR	2 EACH 3440 / 8080	109	b2
b3	15	WINGWALL, F.F.H.		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	b3
b4	15	WINGWALL, F.F.H. LONG		22 VAR	2 EACH 2510 / 11 790	247	18 VAR	2 EACH 2510 / 9930	176	14 VAR	2 EACH 2510 / 8080	116	10 VAR	2 EACH 2510 / 6220	69	22 VAR	2 EACH 2510 / 11 790	247	18 VAR	2 EACH 2510 / 9930	176	14 VAR	2 EACH 2510 / 8080	116	b4
b5	15	INTERIOR WALLS, BOTH F. H.		42 VAR	2 EACH 1390 / 8120	314	34 VAR	2 EACH 1400 / 6910	222	26 VAR	2 EACH 1420 / 5710	146	18 VAR	2 EACH 1460 / 4500	84	42 VAR	2 EACH 1390 / 8120	314	34 VAR	2 EACH 1400 / 6910	222	26 VAR	2 EACH 1420 / 5710	146	b5
c1	15	WINGWALL, F.F.V.		76 VAR	2 EACH 850 / 4440	315	64 VAR	2 EACH 850 / 3860	236	52 VAR	2 EACH 850 / 3270	168	40 VAR	2 EACH 850 / 2690	111	76 VAR	2 EACH 820 / 4410	313	64 VAR	2 EACH 830 / 3830	234	52 VAR	2 EACH 830 / 3250	167	c1
c2	15	WINGWALL, F.F.V.		4	4380	27	2	3780	12	2	3180	10	2	2580	8	4	4350	27	2	3750	12	2	3050	10	c2
c3	15	INTERIOR WALLS, BOTH F. V.		4	510	2	4	510	2	4	510	2	4	500	2	4	490	4	4	490	4	4	490	4	c3
c4	15	INTERIOR WALLS, BOTH F. V.		100 VAR	2 EACH 580 / 3850	348	84 VAR	2 EACH 570 / 3250	252	68 VAR	2 EACH 570 / 2650	172	52 VAR	2 EACH 560 / 2040	106	100 VAR	2 EACH 560 / 3830	344	84 VAR	2 EACH 550 / 3230	250	72 VAR	2 EACH 550 / 2630	180	c4
c5	15	WINGWALL, B.F.V.		12 VAR	2 EACH 850 / 1330	21	14 VAR	2 EACH 850 / 1330	21	12 VAR	2 EACH 850 / 1330	21	12 VAR	2 EACH 850 / 1330	21	12 VAR	2 EACH 820 / 1310	20	12 VAR	2 EACH 830 / 1310	20	12 VAR	2 EACH 830 / 1310	20	c5
c6	15	WINGWALL, B.F.V.		64 VAR	2 EACH 2630 / 5640	415	52 VAR	2 EACH 2630 / 5060	313	40 VAR	2 EACH 2630 / 4470	223	28 VAR	2 EACH 2630 / 3890	143	64 VAR	2 EACH 2610 / 5610	413	52 VAR	2 EACH 2610 / 5030	312	40 VAR	2 EACH 2610 / 4450	222	c6
c7	15	WINGWALL, B.F.V.		50	3150	247	38	3150	188	26	3150	129	—	—	—	50	3150	247	38	3150	188	26	3150	129	c7
c8	15	WINGWALL, B.F.V.		4	5580	35	2	4980	16	2	4380	14	2	3780	12	4	5550	35	2	4950	16	2	4350	14	c8
d1	15	APRON, LONGITUDINAL, BOTTOM		25	8250	325	25	7050	278	25	5850	230	25	4650	183	21	8250	273	21	7050	233	21	5850	194	d1
d2	15	APRON, LONGITUDINAL, BOTTOM		6	10 830	102	6	8950	84	6	7100	67	6	5340	50	6	10 830	102	6	8950	84	6	7100	67	d2
f1	20	APRON, LONGITUDINAL, TOP		37	8250	721	37	7050	616	37	5850	511	37	4650	407	31	8250	721	31	7050	616	31	5850	511	f1
f2	20	APRON, LONGITUDINAL, TOP		18 VAR	2 EACH 940 / 7450	178	16 VAR	2 EACH 530 / 6250	128	12 VAR	2 EACH 950 / 5050	85	10 VAR	2 EACH 540 / 3840	52	18 VAR	2 EACH 940 / 7450	178	16 VAR	2 EACH 530 / 6250	128	12 VAR	2 EACH 950 / 5050	85	f2
f3	20	APRON, LONGITUDINAL, TOP		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	f3
i1	15	PARAPET, VERTICAL		79	1850	229	77	1850	224	77	1850	224	77	1850	224	67	1850	195	65	1850	189	65	1850	189	i1
j1	25	PARAPET, HORIZONTAL		4	11 920	187	4	11 720	184	4	11 620	182	4	11 620	182	4	10 120	159	4	9920	156	4	9820	154	j1
m1	20	APRON, TRANS., TOP		34 VAR	11 970 / 15 670	1107	29 VAR	11 770 / 14 910	911	23 VAR	11 670 / 14 130	699	18 VAR	11 670 / 13 570	535	34 VAR	10 170 / 13 860	962	29 VAR	9970 / 13 110	788	23 VAR	9870 / 12 330	601	m1
m2	20	APRON, TRANS., BOTTOM		24 VAR	10 120 / 13 570	669	20 VAR	10 020 / 12 870	539	16 VAR	9970 / 12 220	418	12 VAR	9970 / 11 620	305	24 VAR	8320 / 11 770	568	20 VAR	8220 / 11 070	454	16 VAR	8170 / 10 420	350	m2
p1	20	CURTAIN, HORIZONTAL		4	11 570	109	4	11 470	108	4	11 420	108	4	11 420	108	4	9770	92	4	9670	91	4	9620	91	p1
p2	20	CURTAIN, HORIZONTAL		8	5600	106	8	4850	91	8	4100	77	8	3330	63	8	5600	106	8	4850	91	8	4100	77	p2
s1	20	WING SLOPE, BOTH F.		4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	4	2460	23	s1
s2	20	WING SLOPE, BOTH F.		4	11 200	106	4	9250	87	4	7300	69	4	5390	50	4	11 200	106	4	9250	87	4	7300	69	s2
s3	20	WING SLOPE, F.F.		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	s3
s4	20	INTERIOR WALLS, BOTH F.		4	8950	84	4	7610	72	4	6270	60	4	4930	46	4	8950	84	4	7610	72	4	6270	60	s4
t1	15	CURTAIN, VERTICAL		49	2410	186	45	2260	160	41	2110	136	39	1960	120	45	2410	171	41	2260	146	37	2110	123	t1

ESTIMATED QUANTITIES ONE HEADWALL			3600 x 3600		3600 x 3000		3600 x 2400		3600 x 1800		3000 x 3600		3000 x 3000		3000 x 2400	
REINFORCING STEEL			6541 kg		5280 kg		4138 kg		3075 kg		6144 kg		4929 kg		3850 kg	
CONCRETE	PARAPET Δ		2.7	83.2 m^3	2.6	61.9 m^3	2.6	47.5 m^3	2.5	33.7 m^3	2.4	74.7 m^3	2.3	54.9 m^3	2.3	41.7 m^3
	WINGWALLS		25.3		15.2		10.2		5.6		25.2		15.2		10.2	
	FOOTING ΔΔ		55.2		44.1		34.7		25.6		47.1		37.4		29.2	

MASS OF BARS OVER 12 000 mm LONG INCLUDES AN ALLOWANCE FOR LAP (800 mm FOR TOP APRON "m" BARS AND 650 mm ALL OTHER BARS).
LENGTHS SHOWN FOR BARS OVER 12 000 mm LONG DO NOT INCLUDE LAP (800 mm FOR TOP APRON "m" BARS AND 650 mm ALL OTHER).

Δ NOTE: INCLUDES TOP OF WINGWALL QUANTITIES.
ΔΔ ASSUMES APRON AND FLOOR ARE EQUAL THICKNESS, ADJUST CONCRETE QUANTITIES FOR TRANSITION WHERE APRON AND FLOOR THICKNESS ARE NOT EQUAL.

BENT BAR DETAILS



NOTE: ALL DIMENSIONS ARE OUT TO OUT D = PIN DIAMETER

VARIABLE LENGTH REBAR DENOTED BY X/Y

HEADWALL NOTES:

ALL DIMENSIONS ARE IN MILLIMETERS (mm) UNLESS OTHERWISE NOTED OR SHOWN.

SEE SHEET MTRRCB-GI-94 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

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.

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 (mm) NECESSARY TO MEET THESE REQUIREMENTS.

LATEST REVISION DATE : 04-02

APPROVED BY :

STANDARD DESIGN

FLARED WING HEADWALLS

FOR

TRIPLE REINFORCED CONCRETE BOX CULVERTS

PROJECT DEVELOPMENT DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

DECEMBER, 1994

MTRH 0-5-94

REVISED 1-98 - BEND DIMENSIONS OF i1 BAR CHANGED.
REVISED 04-02 - CHANGED BAR LENGTHS AND WEIGHT TOTALS. CONCRETE QUANTITIES ADJUSTED.
TRHO5M.SOI : THIS SHEET ISSUED 03/95

XXXXXXXXXXSYSTEMTIME XXXXXXXUSERNAME XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXDGNSPEC