BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN X CULVERT HEIGHT

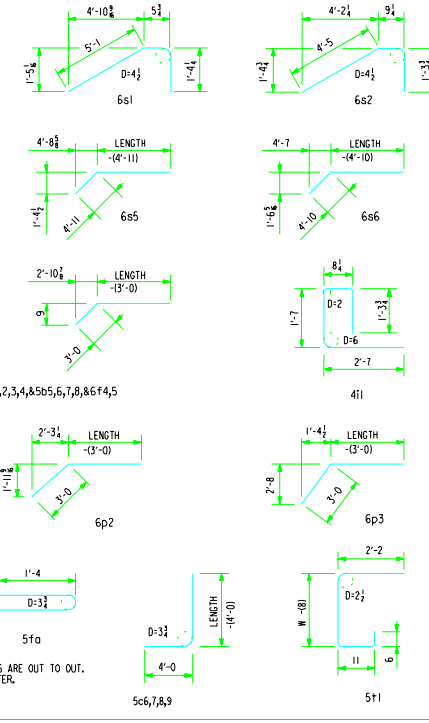
LOCATION	SHAPE	BAR	12' X 12' NO.	12' X 12' LENGTH	12' X 12' WT.	12' X 10' NO.	12' X 10' LENGTH	12' X 10' WT.	12' X 8' NO.	12' X 8' LENGTH	12' X 8' WT.	12' X 6' NO.	12' X 6' LENGTH	12' X 6' WT.	10' X 12' NO.	10' X 12' LENGTH	10' X 12' WT.	10' X 10' NO.	10' X 10' LENGTH	10' X 10' WT.	10' X 8' NO.	10' X 8' LENGTH	10' X 8' WT.	10' X 6' NO.	10' X 6' LENGTH	10' X 6' WT.	10' X 5' NO.	10' X 5' LENGTH	10' X 5' WT.	10' X 4' NO.	10' X 4' LENGTH	10' X 4' WT.	BAR
FENCE ANCHOR		5fa	2	3'-1	7	2	3'-1	7	2	3'-1	7	2	3'-1	7	2	3'-1	7	2	3'-1	7	2	3'-1	7	2	3'-1	7	2	3'-1	7	2	3'-1	7	5fa
WINGWALL, B.F.H. L		4b1	1	45'-1	31	1	38'-3	26	1	31'-5	21	1	24'-6	16	1	45'-1	31	1	38'-3	26	1	31'-5	21	1	24'-6	16	1	21'-1	14	1	17'-8	12	4b1
WINGWALL, B.F.H. S		4b2	1	39'-10	27	1	33'-10	23	1	27'-10	19	1	21'-10	15	1	39'-10	27	1	33'-10	23	1	27'-10	19	1	21'-10	15	1	18'-10	13	1	15'-10	11	4b2
WINGWALL, B.F.H. L		4b3	10 VAR	12'-7 TO 43'-6	189	8 VAR	12'-8 TO 36'-8	132	6 VAR	12'-8 TO 29'-10	85	4 VAR	12'-7 TO 22'-11	47	10 VAR	12'-7 TO 43'-6	189	8 VAR	12'-8 TO 36'-8	132	6 VAR	12'-8 TO 29'-10	85	4 VAR	12'-7 TO 22'-11	47	3 VAR	12'-8 TO 19'-6	32	2 VAR	12'-8 TO 16'-1	19	4b3
WINGWALL, B.F.H. S		4b4	10 VAR	11'-3 TO 38'-3	165	8 VAR	11'-3 TO 32'-3	116	6 VAR	11'-3 TO 26'-3	75	4 VAR	11'-3 TO 20'-3	42	10 VAR	11'-3 TO 38'-3	165	8 VAR	11'-3 TO 32'-3	116	6 VAR	11'-3 TO 26'-3	75	4 VAR	11'-3 TO 20'-3	42	3 VAR	11'-3 TO 17'-3	29	2 VAR	11'-3 TO 14'-3	17	4b4
WINGWALL, F.F.H. L		5b5	1	45'-1	49	1	38'-3	40	1	31'-5	33	1	24'-6	26	1	45'-1	49	1	38'-3	40	1	31'-5	33	1	24'-6	26	1	21'-1	22	1	17'-8	18	5b5
WINGWALL, F.F.H. S		5b6	1	39'-10	42	1	33'-10	35	1	27'-10	29	1	21'-10	23	1	39'-10	42	1	33'-10	35	1	27'-10	29	1	21'-10	23	1	18'-10	20	1	15'-10	17	5b6
WINGWALL, F.F.H. L		5b7	11 VAR	9'-2 TO 43'-6	304	9 VAR	9'-2 TO 36'-8	215	7 VAR	9'-2 TO 29'-10	142	5 VAR	9'-2 TO 22'-11	84	11 VAR	9'-2 TO 43'-6	304	9 VAR	9'-2 TO 36'-7	215	7 VAR	9'-2 TO 29'-10	142	5 VAR	9'-2 TO 22'-11	84	4 VAR	9'-2 TO 19'-6	60	3 VAR	9'-2 TO 16'-1	40	5b7
WINGWALL, F.F.H. S		5b8	11 VAR	8'-3 TO 38'-3	267	9 VAR	8'-3 TO 32'-3	190	7 VAR	8'-3 TO 26'-3	126	5 VAR	8'-3 TO 20'-3	74	11 VAR	8'-3 TO 38'-3	267	9 VAR	8'-3 TO 32'-3	190	7 VAR	8'-3 TO 26'-3	126	5 VAR	8'-3 TO 20'-3	74	4 VAR	8'-3 TO 17'-3	53	3 VAR	8'-3 TO 14'-3	35	5b8
WINGWALL, F.F.V. L		4c1	42 VAR	2'-10 TO 14'-9	247	35 VAR	2'-10 TO 12'-9	182	28 VAR	2'-10 TO 10'-8	126	21 VAR	2'-10 TO 8'-8	81	42 VAR	2'-9 TO 14'-8	244	35 VAR	2'-9 TO 12'-8	180	28 VAR	2'-9 TO 10'-7	125	21 VAR	2'-9 TO 8'-7	79	18 VAR	2'-9 TO 7'-9	63	14 VAR	2'-9 TO 6'-6	43	4c1
WINGWALL, F.F.V. S		4c2	37 VAR	2'-11 TO 14'-11	220	31 VAR	2'-11 TO 12'-11	164	25 VAR	2'-11 TO 10'-11	116	19 VAR	2'-11 TO 8'-11	75	37 VAR	2'-10 TO 14'-10	218	31 VAR	2'-10 TO 12'-10	162	25 VAR	2'-10 TO 10'-10	114	19 VAR	2'-10 TO 8'-10	74	16 VAR	2'-10 TO 7'-10	57	13 VAR	2'-10 TO 6'-10	42	4c2
WINGWALL, F.F.V. L		4c3	2	13'-9	18	2	11'-9	16	2	9'-9	13	2	7'-9	10	2	13'-8	18	2	11'-8	16	2	9'-8	13	2	7'-8	10	2	6'-8	9	2	5'-8	8	4c3
WINGWALL, F.F.V. S		4c3	1	13'-9	9	1	11'-9	8	1	9'-9	7	1	7'-9	5	1	13'-8	9	1	11'-8	8	1	9'-8	6	1	7'-8	5	1	6'-8	4	1	5'-8	4	4c3
WINGWALL, B.F.V. L		5c4	9 VAR	2'-10 TO 5'-2	38	9 VAR	2'-10 TO 5'-2	38	9 VAR	2'-10 TO 5'-2	38	9 VAR	2'-10 TO 5'-2	38	9 VAR	2'-9 TO 5'-1	37	9 VAR	2'-9 TO 5'-1	37	9 VAR	2'-9 TO 5'-1	37	9 VAR	2'-9 TO 5'-1	37	9 VAR	2'-9 TO 5'-1	37	9 VAR	2'-9 TO 5'-1	37	5c4
WINGWALL, B.F.V. S		5c5	6 VAR	2'-11 TO 4'-7	23	6 VAR	2'-11 TO 4'-7	23	6 VAR	2'-11 TO 4'-7	23	6 VAR	2'-11 TO 4'-7	23	6 VAR	2'-10 TO 4'-6	23	6 VAR	2'-10 TO 4'-6	23	6 VAR	2'-10 TO 4'-6	23	6 VAR	2'-10 TO 4'-6	23	6 VAR	2'-10 TO 4'-6	23	6 VAR	2'-10 TO 4'-6	23	5c5
WINGWALL, B.F.V. L		5c6	33 VAR	9'-5 TO 18'-9	485	26 VAR	9'-5 TO 16'-8	364	19 VAR	9'-5 TO 14'-8	239	12 VAR	9'-5 TO 12'-7	138	33 VAR	9'-4 TO 18'-8	482	26 VAR	9'-4 TO 16'-7	351	19 VAR	9'-4 TO 14'-7	237	12 VAR	9'-4 TO 12'-6	137	9 VAR	9'-4 TO 11'-8	99	5 VAR	9'-4 TO 10'-6	52	5c6
WINGWALL, B.F.V. S		5c7	31 VAR	8'-11 TO 18'-11	450	25 VAR	8'-11 TO 16'-11	337	19 VAR	8'-11 TO 14'-11	236	13 VAR	8'-11 TO 12'-11	148	31 VAR	8'-10 TO 18'-10	447	25 VAR	8'-10 TO 16'-10	335	19 VAR	8'-10 TO 14'-10	234	13 VAR	8'-10 TO 12'-10	147	10 VAR	8'-10 TO 11'-10	108	7 VAR	8'-10 TO 10'-10	72	5c7
WINGWALL, B.F.V. L		5c8	25	10'-6	274	17	10'-6	186	10	10'-6	110	-	-	-	25	10'-6	274	17	10'-6	186	10	10'-6	110	-	-	-	-	-	-	-	-	-	5c8
WINGWALL, B.F.V. S		5c8	20	10'-6	219	13	10'-6	142	7	10'-6	77	-	-	-	20	10'-6	219	13	10'-6	142	7	10'-6	77	-	-	-	-	-	-	-	-	-	5c8
WINGWALL, B.F.V. L		5c9	2	17'-8	37	2	15'-8	33	2	13'-8	29	2	11'-8	24	2	17'-7	37	2	15'-7	33	2	13'-7	28	2	11'-7	24	2	10'-7	22	2	9'-7	20	5c9
WINGWALL, B.F.V. S		5c9	1	17'-8	18	1	15'-8	16	1	13'-8	14	1	11'-8	12	1	17'-7	18	1	15'-7	16	1	13'-7	14	1	11'-7	12	1	10'-7	11	1	9'-7	10	5c9
APRON, LONGIT.,BOTT.		4d1	9	28'-4	170	9	24'-2	145	9	20'-0	120	9	15'-11	96	7	28'-4	132	7	24'-2	113	7	20'-0	94	7	15'-11	74	7	13'-10	65	7	11'-9	55	4d1
APRON, LONGIT.,BOTT. L		4d2	3	39'-4	79	3	32'-8	65	3	25'-11	52	3	19'-1	38	3	39'-4	79	3	32'-8	65	3	25'-11	52	3	19'-1	38	3	15'-10	32	3	12'-5	25	4d2
APRON, LONGIT.,BOTT. S		4d3	3	34'-11	70	3	29'-0	58	3	23'-1	47	3	17'-2	35	3	34'-11	70	3	29'-0	58	3	23'-1	47	3	17'-2	35	3	14'-3	29	3	11'-4	23	4d3
APRON, LONGIT.,TOP		6f1	12	28'-4	511	12	24'-2	435	12	20'-0	360	12	15'-11	287	10	28'-4	426	10	24'-2	363	10	20'-0	300	10	15'-11	239	10	13'-10	208	10	11'-9	176	6f1
APRON, LONGIT.,TOP L		6f2	8 VAR	6'-10 TO 24'-7	189	6 VAR	7'-9 TO 20'-5	127	5 VAR	6'-0 TO 16'-3	84	3 VAR	6'-11 TO 12'-1	43	8 VAR	6'-10 TO 24'-7	189	6 VAR	7'-9 TO 20'-5	127	5 VAR	6'-7 TO 16'-3	84	3 VAR	6'-11 TO 12'-1	43	2 VAR	7'-1 TO 9'-8	25	1	7'-7	11	6f2
APRON, LONGIT.,TOP S		6f3	7 VAR	7'-1 TO 24'-6	166	5 VAR	8'-8 TO 20'-4	109	4 VAR	7'-5 TO 16'-2	71	3 VAR	6'-1 TO 12'-0	41	7 VAR	7'-1 TO 24'-6	166	5 VAR	8'-8 TO 20'-4	109	4 VAR	7'-5 TO 16'-2	71	3 VAR	6'-1 TO 12'-0	41	2 VAR	6'-7 TO 9'-7	24	1	7'-6	11	6f3
APRON, LONGIT.,TOP L		6f4	1	45'-1	71	1	38'-3	57	1	31'-5	47	1	24'-6	37	1	45'-1	71	1	38'-3	57	1	31'-5	47	1	24'-6	37	1	21'-1	32	1	17'-8	27	6f4
APRON, LONGIT.,TOP S		6f5	1	39'-10	60	1	33'-10	51	1	27'-10	42	1	21'-10	33	1	39'-10	60	1	33'-10	51	1	27'-10	42	1	21'-10	33	1	18'-10	28	1	15'-10	24	6f5
PARAPET, VERTICAL		4f1	25	6'-2	103	25	6'-2	103	25	6'-2	103	25	6'-2	103	21	6'-2	87	21	6'-2	87	21	6'-2	87	21	6'-2	87	21	6'-2	87	21	6'-2	87	4f1
PARAPET, HORIZONTAL		7j1	4	12'-9	104	4	12'-9	104	4	12'-9	104	4	12'-9	104	4	10'-8	87	4	10'-8	87	4	10'-8	87	4	10'-8	87	4	10'-8	87	4	10'-8	87	7j1
APRON,TRANS.,TOP		6m1	3 VAR	14'-6 TO 14'-11	66	3 VAR	14'-2 TO 14'-7	65	3 VAR	14'-2 TO 14'-7	64	3 VAR	14'-0 TO 14'-5	64	3 VAR	12'-5 TO 12'-10	56	3 VAR	12'-1 TO 12'-6	55	3 VAR	12'-1 TO 12'-6	55	3 VAR	11'-11 TO 12'-4	55	3 VAR	11'-11 TO 12'-4	55	3 VAR	11'-11 TO 12'-4	55	6m1
APRON,TRANS.,TOP		6m2	30 VAR	15'-0 TO 25'-10	920	25 VAR	14'-7 TO 23'-7	716	19 VAR	14'-7 TO 21'-4	512	14 VAR	14'-5 TO 19'-4	355	31 VAR	13'-0 TO 24'-3	867	25 VAR	12'-7 TO 21'-7	641	20 VAR	12'-7 TO 19'-9	486	14 VAR	12'-5 TO 17'-4	313	11 VAR	12'-5 TO 16'-2	236	9 VAR	12'-5 TO 15'-5	188	6m2
APRON,TRANS.,TOP		6m3	3	18'-2	82	3	17'-2	77	3	16'-0	72	3	14'-11	67	3	16'-4	74	3	15'-3	69	3	14'-1	63	3	13'-1	59	3	12'-6	56	3	11'-11	54	6m3
APRON,TRANS.,BOTT.		6m4	24 VAR	8'-0 TO 20'-5	512	20 VAR	8'-0 TO 18'-3	394	16 VAR	8'-0 TO 16'-1	289	12 VAR	7'-10 TO 13'-11	196	24 VAR	5'-11 TO 18'-4	437	20 VAR	6'-0 TO 16'-2	333	16 VAR	5'-11 TO 14'-0	239	12 VAR	5'-9 TO 11'-10	158	10 VAR	5'-11 TO 10'-9	125	8 VAR	5'-11 TO 9'-8	94	6m4
CURTAIN, HORIZONTAL		6p1	4	12'-11	78	4	12'-11	78	4	12'-11	78	4	12'-11	78	4	10'-10	65	4	10'-10	65	4	10'-10	65	4	10'-10	65	4	10'-10	65	4	10'-10	65	6p1
CURTAIN, HORIZONTAL L		6p2	4	21'-9	131	4	18'-9	113	4	15'-9	95	4	12'-9	77	4	21'-9	131	4	18'-9	113	4	15'-9	95	4	12'-9	77	4	11'-3	68	4	9'-8	58	6p2
CURTAIN, HORIZONTAL S		6p3	4	16'-10	101	4	14'-7	88	4	12'-5	75	4	10'-2	61	4	16'-10	101	4	14'-7	88	4	12'-5	75	4	10'-2	61	4	9'-1	55	4	8'-0	48	6p3
WING SLOPE, BOTH F. L		6s1	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s1
WING SLOPE, BOTH F. S		6s2	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	2	6'-6	20	6s2
WING SLOPE, BOTH F. L		6s3	2	41'-9	131	2	34'-7	104	2	27'-6	83	2	20'-4	61	2	41'-9	131	2	34'-7	104	2	27'-6	83	2	20'-4	61	2	16'-9	50	2	13'-2	40	6s3
WING SLOPE, BOTH F. S		6s4	2	37'-4	112	2	31'-0	93	2	24'-8	74	2	18'-4	55	2	37'-4	112	2	31'-0'	93	2	24'-8	74	2	18'-4	55	2	15'-3	46	2	12'-0	36	6s4
WING SLOPE, F.F L		6s5	1	46'-1	72	1	38'-11	58	1	31'-9	48	1	24'-7	37	1	46'-1	72	1	38'-11	58	1	31'-9	48	1	24'-7	37	1	21'-1	32	1	17'-6	26	6s5
WING SLOPE, F.F S		6s6	1	41'-3	65	1	34'-11	52	1	28'-8	43	1	22'-4	34	1	41'-3	65	1	34'-11	52	1	28'-8	43	1	22'-4	34	1	19'-2	29	1	15'-11	24	6s6
CURTAIN, VERT.		5t1	30	7'-11	248	26	7'-5	201	23	6'-11	166	18	6'-5	120	28	7'-11	231	24	7'-5	186	21	6'-11	152	16	6'-5	107	14	6'-5	94	11	6'-5	74	5t1
ESTIMATED QUANTITIES ONE HEADWALL — REINF. STEEL				7201 lbs.			5617 lbs.			4235 lbs.			2951 lbs.			6857 lbs.			5288 lbs.			3985 lbs.			2719 lbs.			2252 lbs.			1816 lbs.		
CONCRETE — PARAPET △			1.8	67.0 cu. yd.		1.7	48.0 cu. yd.		1.7	35.5 cu. yd.		1.6	23.9 cu. yd.		1.7	62.5 cu. yd.		1.6	44.3 cu. yd.		1.6	32.5 cu. yd.		1.5	21.7 cu. yd.		1.5	17.7 cu. yd.		1.5	14.2 cu. yd.		
CONCRETE — WINGWALLS			23.3			14.1			9.6			5.3			23.3			14.1			9.6			5.3			3.9			2.7			
CONCRETE — FOOTINGS			41.9			32.2			24.2			17.0			37.5			28.6			21.3			14.9			12.3			10.0			

△ NOTE: INCLUDES TOP OF WINGWALL QUANTITIES.
WEIGHT OF BARS OVER 40'-0 LONG INCLUDE
AN ALLOWANCE OF 2'-0 FOR LAP.

SUBSCRIPT L DENOTES LONG WING.
SUBSCRIPT S DENOTES SHORT WING.

NOTES:
1. SEE DRAWING RCB-G1-87 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

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 3/4" 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 3'-0 IN EITHER DIRECTION AS OUTLINED IN THE STANDARD SPECIFICATIONS.

CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 2" UNLESS OTHERWISE NOTED OR SHOWN. CLEARANCE TO THE BOTTOM ENDS OF VERTICAL BARS SHALL BE 3 INCHES.

CONCRETE QUANTITIES ARE ESTIMATED FROM BACK OF PARAPET.

HORIZONTAL TAILS OF BARS "b" & "s" ESTIMATED TO EXTEND 2'-0 BEYOND BACK OF PARAPET (ONTO END OF BARREL). LONGITUDINAL BARS "d", "6f1", "6f4" AND "6f5" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 2'-0 BEYOND BACK OF PARAPET.

THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF FEET NECESSARY TO MEET THESE REQUIREMENTS.

LATEST REVISION DATE : 1-1-98

APPROVED BY : William A. Rawlinson

STANDARD DESIGN

FLARED WING HEADWALLS

FOR
REINFORCED CONCRETE BOX CULVERTS

HIGHWAY DIVISION
IOWA DEPARTMENT OF TRANSPORTATION

MAY , 1987

FWH 15-1-87

REVISED 1/98; BEND DIMENSIONS OF 4f1 BAR CHANGED.
FWH15G0 -REVISED : 8/89 ; 6m2 LENGTH CHANGED ON 10'x10'. CONCRETE QUANTITY CORRECTED ON 10'x8'.

XXXXXXXXXXSYSTEMTIME XXXXXXXUSERNAME XXXXXXXXXX