

BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT																	
BAR	LOCATION	SHAPE	10' x 7'			10' x 6'			10' x 5'			10' x 4'			BAR		
			NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.			
5fa	FENCE ANCHOR (GALV.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa		
4b1	WINGWALL, B.F.H. LONG		1	33'-4	22	1	29'-2	19	1	25'-0	17	1	20'-10	14	4b1		
4b2	WINGWALL, B.F.H. SHORT		1	25'-7	17	1	22'-6	15	1	19'-5	13	1	16'-3	11	4b2		
4b3	WINGWALL, B.F.H. LONG		5	14'-8 TO 31'-5	77	4	14'-8 TO 27'-3	56	3	14'-8 TO 23'-1	38	2	14'-8 TO 18'-10	22	4b3		
4b4	WINGWALL, B.F.H. SHORT		5	11'-10 TO 24'-3	60	4	11'-10 TO 21'-1	44	3	11'-9 TO 18'-0	30	2	11'-9 TO 14'-10	18	4b4		
5b5	WINGWALL, F.F.H. LONG		1	33'-5	35	1	29'-2	30	1	25'-0	26	1	20'-10	22	5b5		
5b6	WINGWALL, F.F.H. SHORT		1	25'-8	27	1	22'-6	23	1	19'-5	20	1	16'-4	17	5b6		
5b7	WINGWALL, F.F.H. LONG		6	10'-7 TO 31'-5	131	5	10'-7 TO 27'-3	99	4	10'-7 TO 23'-1	70	3	10'-7 TO 18'-10	46	5b7		
5b8	WINGWALL, F.F.H. SHORT		6	8'-9 TO 24'-3	103	5	8'-9 TO 21'-1	78	4	8'-9 TO 18'-0	56	3	8'-8 TO 14'-11	37	5b8		
5b9	INTERIOR WALLS, BOTH F.H.		22	2 EA. 5'-8 TO 19'-5	288	18	2 EA. 5'-9 TO 17'-1	214	14	2 EA. 5'-10 TO 14'-9	150	10	2 EA. 6'-1 TO 12'-5	96	5b9		
4c1	WINGWALL, F.F.V. LONG		31	2'-9 TO 9'-11	131	26	2'-9 TO 8'-9	100	22	2'-9 TO 7'-9	77	18	2'-9 TO 6'-10	58	4c1		
4c2	WINGWALL, F.F.V. SHORT		23	2'-9 TO 9'-10	97	20	2'-9 TO 8'-10	77	17	2'-9 TO 7'-11	61	14	2'-9 TO 6'-11	45	4c2		
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	---	---	---	4c3		
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	---	---	---	4c4		
4c5	WINGWALL, F.F.V. LONG		1	8'-8	6	1	7'-8	5	1	6'-8	4	2	5'-8	8	4c5		
4c5	WINGWALL, F.F.V. SHORT		1	8'-8	6	1	7'-8	5	1	6'-8	4	2	5'-8	8	4c5		
4c6	INTERIOR WALLS, BOTH F.V.		4	11'-8	4	4	11'-7	4	4	11'-7	4	4	11'-7	4	4c6		
4c7	INTERIOR WALLS, BOTH F.V.		64	2 EA. 1'-10 TO 7'-5	198	54	2 EA. 1'-10 TO 6'-5	149	44	2 EA. 1'-9 TO 5'-4	104	36	2 EA. 1'-9 TO 4'-5	74	4c7		
4c8	INTERIOR WALLS, BOTH F.V.		4	7'-6	20	4	6'-6	17	4	5'-6	15	4	4'-6	12	4c8		
5c9	WINGWALL, B.F.V. LONG		11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	11	2'-9 TO 5'-2	45	5c9		
5c10	WINGWALL, B.F.V. SHORT		5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5	2'-9 TO 4'-1	18	5c10		
5c11	WINGWALL, B.F.V. LONG		20	9'-5 TO 13'-11	243	15	9'-5 TO 12'-9	173	11	9'-5 TO 11'-11	121	7	9'-5 TO 10'-10	74	5c11		
5c12	WINGWALL, B.F.V. SHORT		18	8'-5 TO 13'-10	209	15	8'-5 TO 12'-10	166	12	8'-5 TO 11'-11	127	9	8'-5 TO 10'-11	91	5c12		
6c13	WINGWALL, B.F.V. LONG		13	10'-6	205	8	10'-6	126	---	---	---	---	---	---	6c13		
6c13	WINGWALL, B.F.V. SHORT		10	10'-6	158	7	10'-6	110	---	---	---	---	---	---	6c13		
5c14	WINGWALL, B.F.V. LONG		1	12'-8	13	2	11'-8	24	2	10'-8	22	2	9'-8	20	5c14		
5c14	WINGWALL, B.F.V. SHORT		1	12'-8	13	1	11'-8	12	1	10'-8	11	2	9'-8	20	5c14		
4d1	APRON, LONGIT., BOT.		21	19'-11	279	21	17'-8	248	21	15'-4	215	21	13'-0	182	4d1		
4d2	APRON, LONGIT., BOT. LONG		3	27'-8	55	3	23'-7	47	3	19'-6	39	3	15'-5	31	4d2		
4d3	APRON, LONGIT., BOT. SHORT		3	21'-5	43	3	18'-4	37	3	15'-3	31	3	12'-3	25	4d3		
6f1	APRON, LONGIT., TOP		31	19'-11	927	31	17'-8	823	31	15'-4	714	31	13'-0	605	6f1		
6f2	APRON, LONGIT., TOP LONG		6	5'-3 TO 16'-11	100	5	5'-3 TO 14'-7	74	4	5'-3 TO 12'-4	53	3	5'-3 TO 10'-0	34	6f2		
6f3	APRON, LONGIT., TOP SHORT		4	7'-9 TO 17'-2	75	4	5'-5 TO 14'-10	61	3	6'-2 TO 12'-6	42	2	7'-0 TO 10'-3	26	6f3		
6f4	APRON, LONGIT., TOP LONG		1	33'-5	50	1	29'-2	44	1	25'-0	38	1	20'-10	31	6f4		
6f5	APRON, LONGIT., TOP SHORT		1	25'-8	39	1	22'-6	34	1	19'-5	29	1	16'-4	25	6f5		
411	PARAPET, VERTICAL		63	6'-4	267	63	6'-4	267	63	6'-4	267	63	6'-4	267	411		
7J1	PARAPET, HORIZONTAL		4	37'-8	308	4	37'-8	308	4	37'-8	308	4	37'-8	308	7J1		
6m1	APRON, TRANS., TOP		12	35'-3 TO 37'-3	653	9	35'-3 TO 36'-9	487	6	35'-3 TO 36'-2	322	3	35'-3 TO 35'-7	160	6m1		
6m2	APRON, TRANS., TOP		2	30'-1 TO 31'-5	92	5	26'-1 TO 31'-3	215	8	22'-1 TO 31'-2	320	11	18'-1 TO 31'-1	406	6m2		
6m3	APRON, TRANS., TOP		22	5'-7 TO 28'-11	570	19	4'-11 TO 24'-11	426	16	4'-3 TO 20'-11	302	13	3'-7 TO 16'-11	200	6m3		
6m4	APRON, TRANS., BOT.		14	31'-4 TO 40'-3	756	12	31'-4 TO 38'-10	632	10	31'-4 TO 37'-6	517	8	31'-4 TO 36'-2	406	6m4		
6p1	CURTAIN, HORIZONTAL		4	36'-6	219	4	36'-6	219	4	36'-6	219	4	36'-6	219	6p1		
6p2	CURTAIN, HORIZONTAL LONG		4	18'-0	108	4	16'-0	96	4	13'-11	84	4	11'-11	72	6p1		
6p3	CURTAIN, HORIZONTAL SHORT		4	10'-9	65	4	9'-8	58	4	8'-8	52	4	7'-7	46	6p2		
6s1	WING SLOPE, BOTH F. LONG		2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	6s1		
6s2	WING SLOPE, BOTH F. SHORT		2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s2		
6s3	WING SLOPE, BOTH F. LONG		2	27'-10	84	2	23'-7	71	2	19'-3	58	2	15'-0	45	6s3		
6s4	WING SLOPE, BOTH F. SHORT		2	22'-1	66	2	18'-10	57	2	15'-7	47	2	12'-3	37	6s4		
6s5	WING SLOPE, F.F. LONG		1	33'-1	50	1	28'-10	43	1	24'-6	37	1	20'-3	30	6s5		
6s6	WING SLOPE, F.F. SHORT		1	26'-3	39	1	22'-11	34	1	19'-8	30	1	16'-5	25	6s6		
6s7	INTERIOR WALLS, BOTH F.H.		4	20'-5	123	4	17'-11	108	4	15'-5	93	4	12'-11	78	6s7		
5+1	CURTAIN, VERTICAL		42	6'-8	292	39	6'-5	261	37	6'-5	248	35	6'-5	234	5+1		
ESTIMATED QUANTITIES ONE HEADWALL			REINF. STEEL			7437 LB			6315 LB			5154 LB			4303 LB		
			CONCRETE			PARAPET Δ 3.6			55.5 CY			3.6			32.4 CY		
						WINGWALLS 11.6			46.8 CY			3.6					
						FOOTING * 40.3			29.2			24.4					

BENT BAR DETAILS

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

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

NOTE:
 WEIGHT OF BARS OVER 40'-0 LONG INCLUDES AN ALLOWANCE OF 2'-3 FOR LAP. LENGTHS SHOWN FOR BARS OVER 40'-0 LONG DO NOT INCLUDE LAP.

SHORT DENOTES SHORT WINGWALL
 LONG DENOTES LONG WINGWALL

HEADWALL NOTES:

- SEE DRAWING TRRCB G1-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
- THIS HEADWALL IS BASED ON A 31° SLOPE NORMAL TO CENTERLINE OF ROADWAY.
- THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.
- 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 (INTO END OF BARREL). LONGITUDINAL BARS "d", "6f1", AND "6f3" 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

APPROVED BY BRIDGE ENGINEER

Iowa Department of Transportation
Highway Division

STANDARD DESIGN

TRIPLE REINFORCED CONCRETE BOX CULVERTS

APRIL, 2012

FLARED WING HEADWALLS

30° SKEW

TRH 30-9-12