

BILL OF REINFORCING FOR ONE HEADWALL 0° SKEW CULVERT SPAN x CULVERT HEIGHT																																					
LOCATION	SHAPE	BAR	12' X 12'		12' X 10'		12' X 8'		12' X 6'		10' X 12'		10' X 10'		10' X 8'		10' X 6'		8' X 10'		8' X 8'		8' X 6'		BAR												
NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.	NO.	LENGTH	WT.											
FENCE ANCHOR (GALV.)	5f0	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	2	3'-1	6	5f0								
WINGWALL, B.F.H.	4b1	2	40'-11	57	2	34'-9	46	2	28'-7	38	2	22'-5	30	2	40'-11	57	2	34'-9	46	2	28'-7	38	2	22'-5	30	2	40'-11	57	4b1								
WINGWALL, B.F.H.	4b2	20	2 EACH 11'-8 TO 39'-6	342	16	2 EACH 11'-8 TO 33'-4	240	12	2 EACH 11'-8 TO 27'-2	156	8	2 EACH 11'-8 TO 21'-0	87	20	2 EACH 11'-8 TO 39'-6	342	16	2 EACH 11'-8 TO 33'-4	240	12	2 EACH 11'-8 TO 27'-2	156	8	2 EACH 11'-8 TO 21'-0	87	16	2 EACH 11'-8 TO 39'-6	342	4b2								
WINGWALL, F.F.H.	5b3	2	40'-11	90	2	34'-9	72	2	28'-7	60	2	22'-5	47	2	40'-11	90	2	34'-9	72	2	28'-7	60	2	22'-5	47	2	40'-11	90	5b3								
WINGWALL, F.F.H.	5b4	22	2 EACH 8'-7 TO 39'-6	552	18	2 EACH 8'-7 TO 33'-4	393	14	2 EACH 8'-7 TO 27'-2	261	10	2 EACH 8'-7 TO 21'-0	154	22	2 EACH 8'-7 TO 39'-6	552	18	2 EACH 8'-7 TO 33'-4	393	14	2 EACH 8'-7 TO 27'-2	261	10	2 EACH 8'-7 TO 21'-0	154	22	2 EACH 8'-7 TO 39'-6	552	5b4								
CENTER WALL, BOTH F.H.	5b5	21	2 EACH 4'-10 TO 12'-10	351	17	2 EACH 4'-10 TO 12'-10	249	13	2 EACH 4'-10 TO 12'-10	164	9	2 EACH 4'-10 TO 12'-10	95	21	2 EACH 4'-10 TO 12'-10	351	17	2 EACH 4'-10 TO 12'-10	249	13	2 EACH 4'-10 TO 12'-10	164	9	2 EACH 4'-10 TO 12'-10	95	21	2 EACH 4'-10 TO 12'-10	351	5b5								
WINGWALL, F.F.V.	4c1	76	2 EACH 2'-10 TO 14'-10	448	64	2 EACH 2'-10 TO 12'-11	337	52	2 EACH 2'-10 TO 11'-0	240	40	2 EACH 2'-10 TO 9'-0	158	76	2 EACH 2'-10 TO 14'-10	448	64	2 EACH 2'-10 TO 12'-11	337	52	2 EACH 2'-10 TO 11'-0	240	40	2 EACH 2'-10 TO 9'-0	158	76	2 EACH 2'-10 TO 14'-10	448	4c1								
WINGWALL, F.F.V.	4c2	4	13'-7	36	2	10'-0	16	2	10'-0	13	2	8'-0	11	4	13'-7	36	2	10'-0	16	2	10'-0	13	2	8'-0	11	2	10'-0	16	4	13'-7	36	4c2					
CENTER WALL, BOTH F.V.	4c3	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	2	1'-9	2	4c3					
CENTER WALL, BOTH F.V.	4c4	50	2 EACH 2'-0 TO 12'-11	249	42	2 EACH 2'-0 TO 10'-11	181	34	2 EACH 2'-0 TO 8'-10	122	26	2 EACH 2'-0 TO 6'-10	76	50	2 EACH 2'-0 TO 12'-11	249	42	2 EACH 2'-0 TO 10'-11	181	34	2 EACH 2'-0 TO 8'-10	122	26	2 EACH 2'-0 TO 6'-10	76	50	2 EACH 2'-0 TO 12'-11	249	4c4								
WINGWALL, B.F.V.	5c5	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	12	2 EACH 2'-10 TO 4'-6	46	5c5					
WINGWALL, B.F.V.	5c6	64	2 EACH 8'-10 TO 18'-10	923	52	2 EACH 8'-10 TO 16'-11	698	40	2 EACH 8'-10 TO 15'-0	497	28	2 EACH 8'-10 TO 13'-0	319	64	2 EACH 8'-10 TO 18'-10	923	52	2 EACH 8'-10 TO 16'-11	698	40	2 EACH 8'-10 TO 15'-0	497	28	2 EACH 8'-10 TO 13'-0	319	64	2 EACH 8'-10 TO 18'-10	923	5c6								
WINGWALL, B.F.V.	5c7	50	10'-6	548	38	10'-6	416	26	10'-6	285	16	10'-6	205	50	10'-6	548	38	10'-6	416	26	10'-6	285	16	10'-6	205	50	10'-6	548	5c7								
WINGWALL, B.F.V.	5c8	4	17'-7	73	2	16'-11	35	2	15'-0	31	2	13'-0	27	4	17'-7	73	2	16'-11	35	2	15'-0	31	2	13'-0	27	2	12'-11	27	4	17'-7	73	5c8					
APRON, LONGIT, BOTT.	4d1	17	27'-6	312	17	23'-6	267	17	19'-6	221	15	17'-6	176	17	27'-6	312	17	23'-6	267	15	15'-6	155	11	13'-6	143	11	15'-6	114	17	27'-6	312	4d1					
APRON, LONGIT, BOTT.	4d2	6	35'-8	143	6	29'-6	118	6	23'-5	94	6	17'-4	69	6	35'-8	143	6	29'-6	118	6	23'-5	94	6	17'-4	69	6	29'-6	118	6	17'-4	69	4d2					
APRON, LONGIT, TOP	6f1	24	27'-6	991	24	23'-6	847	24	19'-6	703	24	15'-6	559	24	27'-6	991	24	23'-6	847	24	19'-6	703	24	15'-6	559	24	27'-6	991	24	27'-6	991	6f1					
APRON, LONGIT, TOP	6f2	16	2 EACH 5'-10 TO 24'-10	368	14	2 EACH 4'-6 TO 20'-10	266	10	2 EACH 5'-10 TO 16'-10	170	8	2 EACH 4'-6 TO 12'-10	104	16	2 EACH 5'-10 TO 24'-10	368	14	2 EACH 4'-6 TO 20'-10	266	10	2 EACH 5'-10 TO 16'-10	170	8	2 EACH 4'-6 TO 12'-10	104	16	2 EACH 5'-10 TO 24'-10	368	16	2 EACH 5'-10 TO 24'-10	368	6f2					
APRON, LONGIT, TOP	6f3	2	40'-11	129	2	34'-9	104	2	28'-7	86	2	22'-5	67	2	40'-11	129	2	34'-9	104	2	28'-7	86	2	22'-5	67	2	40'-11	129	2	40'-11	129	6f3					
PARAPET, VERTICAL	4i1	51	6'-1	207	49	6'-1	199	49	6'-1	199	49	6'-1	199	49	51	6'-1	207	49	6'-1	199	49	6'-1	199	49	6'-1	199	49	6'-1	207	49	4i1						
PARAPET, HORIZONTAL	7j1	4	26'-8	218	4	26'-2	214	4	26'-2	214	4	25'-11	212	4	26'-8	218	4	26'-2	214	4	26'-2	214	4	25'-11	212	4	26'-8	218	4	26'-8	218	7j1					
APRON, TRANS, TOP	6m1	34	26'-10 TO 39'-3	1687	29	26'-4 TO 36'-10	1376	23	26'-4 TO 34'-7	1052	18	26'-4 TO 32'-6	792	34	26'-10 TO 39'-3	1687	29	26'-4 TO 36'-10	1376	23	26'-4 TO 34'-7	1052	18	26'-4 TO 32'-6	792	34	26'-10 TO 39'-3	1687	34	26'-10 TO 39'-3	1687	6m1					
APRON, TRANS, BOTT.	6m2	24	20'-9 TO 32'-3	955	20	20'-7 TO 30'-1	761	16	20'-7 TO 28'-1	585	12	20'-6 TO 26'-0	419	24	20'-9 TO 32'-3	955	20	20'-7 TO 30'-1	761	16	20'-7 TO 28'-1	585	12	20'-6 TO 26'-0	419	24	20'-9 TO 32'-3	955	24	20'-9 TO 32'-3	955	6m2					
CURTAIN, HORIZONTAL	6p1	4	25'-6	154	4	25'-4	152	4	25'-4	152	4	25'-3	152	4	25'-6	154	4	25'-4	152	4	25'-4	152	4	25'-3	152	4	25'-6	154	4	25'-6	154	6p1					
CURTAIN, HORIZONTAL	6p2	8	18'-7	223	8	16'-11	193	8	13'-7	163	8	11'-10	142	8	18'-7	223	8	16'-11	193	8	13'-7	163	8	11'-10	142	8	18'-7	223	8	18'-7	223	6p2					
WING SLOPE, BOTH F.	6s1	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	6s1					
WING SLOPE, BOTH F.	6s2	4	37'-6	225	4	31'-0	186	4	24'-6	147	4	18'-0	108	4	37'-6	225	4	31'-0	186	4	24'-6	147	4	18'-0	108	4	37'-6	225	4	37'-6	225	6s2					
WING SLOPE, F.F.	6s3	2	42'-9	134	2	36'-3	109	2	29'-9	89	2	23'-3	70	2	42'-9	134	2	36'-3	109	2	29'-9	89	2	23'-3	70	2	42'-9	134	2	42'-9	134	6s3					
CENTER WALL, BOTH F.	6s4	2	29'-10	90	2	25'-4	76	2	20'-10	63	2	16'-5	49	2	29'-10	90	2	25'-4	76	2	20'-10	63	2	16'-5	49	2	29'-10	90	2	29'-10	90	6s4					
CURTAIN, VERT.	511	41	8'-0	342	37	7'-6	289	33	7'-0	241	29	6'-5	197	39	8'-0	342	37	7'-6	289	33	7'-0	241	29	6'-5	197	39	8'-0	342	41	8'-0	342	511					
ESTIMATED QUANTITIES ONE HEADWALL	REIN. STEEL		9947 lbs.		7940 lbs.		6146 lbs.		4419 lbs.		3757 lbs.		3575 lbs.		9947 lbs.		7940 lbs.		6146 lbs.		4419 lbs.		3757 lbs.		3575 lbs.		9947 lbs.		7940 lbs.		6146 lbs.		4419 lbs.		3757 lbs.		3575 lbs.
	CONCRETE		281		216.9		169.9		124.4		94.2		70.2		281		216.9		169.9		124.4		94.2		70.2		281		216.9		169.9		124.4		94.2		70.2
	FOOTINGS		57.3		45.2		35.0		25.4		20.6		15.9		57.3		45.2		35.0		25.4		20.6		15.9		57.3		45.2		35.0		25.4		20.6		15.9

### BENT BAR DETAILS

**NOTE:** ALL DIMENSIONS ARE OUT TO OUT. Ø = PIN DIAMETER.

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

**NOTES:**

- SEE DRAWING TWRCB-G1-87 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.

### 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 1/2" 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 (UNTO 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.

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STANDARD DESIGN  
**FLARED WING HEADWALLS**  
FOR  
TWIN REINFORCED CONCRETE BOX CULVERTS

IOWA DEPARTMENT OF TRANSPORTATION - HIGHWAY DIVISION  
JULY, 1987  
TWH 0-4-87

LATEST REVISION DATE: 02-10  
APPROVED BY: *Norman E. H. ...*