

BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT

LOCATION	SHAPE	12' x 12'				12' x 11'				12' x 10'				12' x 9'				12' x 8'				12' x 7'				12' x 6'				12' x 5'				12' x 4'			
		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.	
FENCE ANCHOR (GALV.)	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	
WINGWALL, F.F.H.	5b1	2	55'-10	121	5b1	2	51'-7	112	5b1	2	47'-4	103	5b1	2	43'-1	94	5b1	2	38'-10	81	5b1	2	34'-7	72	5b1	2	30'-4	63	5b1	2	26'-1	54	5b1	2	21'-10	46	
WINGWALL, F.F.H.	5b2	22 VAR	2 EACH 12'-0 5/4'-5	779	5b2	20 VAR	2 EACH 11'-11 1/2'-2	660	5b2	18 VAR	2 EACH 11'-11 1/4'-11	551	5b2	16 VAR	2 EACH 11'-11 1/3'-5	451	5b2	14 VAR	2 EACH 11'-11 1/3'-2	360	5b2	12 VAR	2 EACH 11'-11 1/3'-2	282	5b2	10 VAR	2 EACH 11'-11 1/2'-11	213	5b2	8 VAR	2 EACH 11'-11 1/2'-8	153	5b2	6 VAR	2 EACH 11'-11 1/2'-5	101	
WINGWALL, B.F.H.	4b3	2	56'-4	78	4b3	2	52'-1	72	4b3	2	47'-8	66	4b3	2	43'-5	61	4b3	2	39'-2	52	4b3	2	34'-11	47	4b3	2	30'-8	41	4b3	2	26'-5	35	4b3	2	22'-2	30	
WINGWALL, B.F.H.	4b4	20 VAR	2 EACH 16'-9 5/4'-11	489	4b4	18 VAR	2 EACH 16'-9 5/8'-8	413	4b4	16 VAR	2 EACH 16'-7 1/4'-3	341	4b4	14 VAR	2 EACH 16'-7 1/4'-0	277	4b4	12 VAR	2 EACH 16'-7 1/4'-10	218	4b4	10 VAR	2 EACH 16'-6 1/2'-3	167	4b4	8 VAR	2 EACH 16'-6 1/2'-9	122	4b4	6 VAR	2 EACH 16'-6 1/2'-5	83	4b4	4 VAR	2 EACH 16'-6 1/2'-0	50	
WINGWALL, F.F.V.	6c1	140 VAR	2 EACH 2'-9 1/5'-0	1866	6c1	128 VAR	2 EACH 2'-9 1/3'-11	1113	6c1	116 VAR	2 EACH 2'-8 1/2'-9	933	6c1	106 VAR	2 EACH 2'-8 1/11'-11	806	6c1	70 VAR	2 EACH 2'-8 1/10'-9	490	6c1	62 VAR	2 EACH 2'-8 9/9'-9	257	6c1	54 VAR	2 EACH 2'-8 8/8'-10	207	6c1	46 VAR	2 EACH 2'-8 7/7'-11	163	6c1	36 VAR	2 EACH 2'-8 6/6'-8	112	
WINGWALL, F.F.V. (O)	6c2	2	15'-0	45	6c2	2	14'-0	29	6c2	2	13'-0	27	6c2	2	12'-0	25	6c2	2	11'-0	23	6c2	2	10'-0	20	6c2	2	9'-0	12	6c2	2	8'-0	11	6c2	2	7'-0	9	
WINGWALL, F.F.V. (A)	6c2	3	15'-0	68	6c2	3	14'-0	44	6c2	3	13'-0	41	6c2	3	12'-0	38	6c2	3	11'-0	34	6c2	3	10'-0	23	6c2	3	9'-0	18	6c2	3	8'-0	16	6c2	3	7'-0	14	
WINGWALL, B.F.V.	6c3	104 VAR	2 EACH 6'-9 1/8'-10	1998	6c3	96 VAR	2 EACH 6'-9 1/7'-10	1772	6c3	88 VAR	2 EACH 6'-9 1/6'-11	1564	6c3	80 VAR	2 EACH 6'-9 1/6'-0	1367	6c3	70 VAR	2 EACH 6'-9 1/4'-10	1135	6c3	62 VAR	2 EACH 6'-9 1/3'-10	958	6c3	54 VAR	2 EACH 6'-9 1/2'-11	554	6c3	46 VAR	2 EACH 6'-9 1/2'-0	450	6c3	36 VAR	2 EACH 6'-9 1/0'-9	329	
WINGWALL, B.F.V. (O)	6c4	1	19'-0	29	6c4	1	18'-0	27	6c4	1	17'-0	26	6c4	1	16'-0	24	6c4	1	15'-0	23	6c4	1	14'-0	21	6c4	1	13'-0	14	6c4	1	12'-0	13	6c4	1	11'-0	11	
WINGWALL, B.F.V. (A)	6c4	4	19'-0	114	6c4	4	18'-0	108	6c4	4	17'-0	102	6c4	4	16'-0	96	6c4	4	15'-0	90	6c4	4	14'-0	84	6c4	4	13'-0	54	6c4	4	12'-0	50	6c4	4	11'-0	46	
WINGWALL, B.F.V.	6c5	66	9'-0	892	6c5	62	9'-0	838	6c5	54	9'-0	730	6c5	50	9'-0	676	6c5	46	9'-0	622	6c5	42	9'-0	568	6c5	34	9'-0	319	6c5	30	8'-7	269	6c5	26	8'-1	219	
APRON, LONGIT., BOT.	4d1	11	55'-7	423	4d1	11	51'-4	392	4d1	11	47'-1	361	4d1	11	42'-10	329	4d1	11	38'-7	284	4d1	11	34'-4	252	4d1	11	30'-1	221	4d1	11	25'-10	190	4d1	11	21'-8	159	
APRON, LONGIT., TOP	6f1	13	55'-7	1124	6f1	13	51'-4	1041	6f1	13	47'-1	958	6f1	13	42'-10	875	6f1	13	38'-7	753	6f1	13	34'-4	670	6f1	13	30'-1	587	6f1	13	25'-10	504	6f1	13	21'-8	423	
PARAPET, VERTICAL	4l1	34	7'-10	178	4l1	34	7'-10	178	4l1	34	7'-10	178	4l1	34	7'-10	178	4l1	34	7'-10	178	4l1	34	7'-10	178	4l1	34	7'-10	178	4l1	34	7'-10	178	4l1	34	7'-10	178	
PARAPET, HORIZ.	8j1	4	19'-4	206	8j1	4	19'-4	206	8j1	4	18'-10	201	8j1	4	18'-10	201	8j1	4	18'-10	201	8j1	4	18'-7	198	8j1	4	18'-7	198	8j1	4	18'-7	198	8j1	4	18'-7	198	
APRON, TRANS., TOP	6m1	95	14'-2	2021	6m1	87	14'-2	1851	6m1	78	13'-10	1621	6m1	70	13'-10	1454	6m1	61	13'-10	1267	6m1	53	13'-8	1088	6m1	44	13'-8	903	6m1	36	13'-8	739	6m1	27	13'-8	554	
APRON, TRANS., TOP	6m2	22 VAR	2'-4 1/2'-10	251	6m2	22 VAR	2'-4 1/2'-7	242	6m2	22 VAR	2'-2 1/2'-8	245	6m2	21 VAR	2'-5 1/2'-5	234	6m2	22 VAR	2'-2 1/2'-8	245	6m2	21 VAR	2'-4 1/2'-4	231	6m2	22 VAR	2'-4 1/2'-7	242	6m2	21 VAR	2'-4 1/2'-4	231	6m2	22 VAR	2'-2 1/2'-8	245	
APRON, TRANS., BOT.	5m3	73	15'-7	1186	5m3	34	16'-5	838	5m3	31	15'-11	741	5m3	28	15'-1	440	5m3	25	15'-1	393	4m3	22	14'-0	206	4m3	19	14'-0	178	4m3	16	14'-0	150	4m3	13	14'-0	122	
CURTAIN, HORIZ.	6p1	6	19'-2	173	6p1	6	19'-2	173	6p1	6	18'-10	170	6p1	6	18'-10	170	6p1	6	18'-10	170	6p1	5	18'-8	140	6p1	5	18'-8	140	6p1	5	18'-8	140	6p1	5	18'-8	140	
WING SLOPE, BOTH F.	6s1	4	48'-1	301	6s1	4	43'-8	274	6s1	4	39'-4	236	6s1	4	35'-0	210	6s1	4	30'-8	184	6s1	4	26'-3	158	6s1	4	21'-11	132	6s1	4	17'-7	106	6s1	4	13'-2	79	
WING SLOPE, BOTH F. (O)	6s2	2	9'-8	29	6s2	2	9'-7	29	6s2	2	9'-9	29	6s2	2	9'-9	29	6s2	2	9'-9	29	6s2	2	9'-9	29	6s2	2	9'-9	29	6s2	2	9'-9	29	6s2	2	9'-9	29	
WING SLOPE, BOTH F. (A)	6s3	2	10'-7	32	6s3	2	10'-6	32	6s3	2	10'-6	32	6s3	2	10'-6	32	6s3	2	10'-6	32	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	6s3	2	10'-5	31	
WING SLOPE, F. F.	6s4	2	13'-8	41	6s4	2	13'-8	41	6s4	2	13'-8	41	6s4	2	13'-8	41	6s4	2	13'-8	41	6s4	2	13'-8	41	6s4	2	13'-8	41	6s4	2	13'-8	41	6s4	2	13'-8	41	
WING SLOPE, F. F. (O)	6s5	2	46'-1	144	6s5	2	41'-9	131	6s5	2	37'-4	112	6s5	2	33'-0	99	6s5	2	28'-8	86	6s5	2	24'-4	73	6s5	2	19'-11	60	6s5	2	15'-7	47	6s5	2	11'-3	34	
CURTAIN, VERT.	5t1	17	7'-11	140	5t1	17	7'-8	136	5t1	17	7'-5	132	5t1	17	7'-2	127	5t1	17	6'-11	123	5t1	17	6'-8	118	5t1	17	6'-5	114	5t1	17	6'-5	114	5t1	17	6'-5	114	
CURTAIN, VERT., ENDS	5t2	4	8'-4	35	5t2	4	8'-1	34	5t2	4	7'-10	33	5t2	4	7'-7	32	5t2	4	7'-4	31	5t2	4	7'-1	30	5t2	4	6'-10	29	5t2	4	6'-10	29	5t2	4	6'-10	29	
BRACKET, VERT.	5u1	4	6'-8	28	5u1	4	6'-5	27	5u1	4	6'-2	26	5u1	4	6'-0	25	5u1	4	5'-9	24	5u1	4	5'-7	23	5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22	

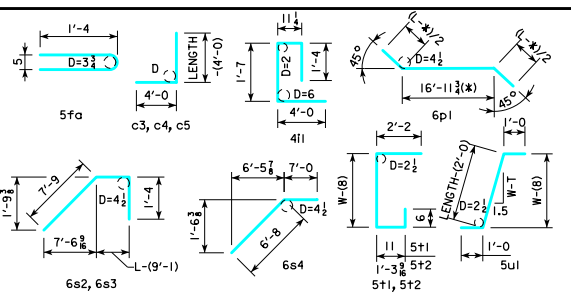
ESTIMATED QUANTITIES ONE HEADWALL	REINF. STEEL	12,797 LBS.	CONCRETE	72.9 CU.YD.	10,819 LBS.	65.4 CU.YD.	9606 LBS.	53.5 CU.YD.	8397 LBS.	47.4 CU.YD.	7175 LBS.	41.6 CU.YD.	5961 LBS.	34.6 CU.YD.	4728 LBS.	29.5 CU.YD.	4052 LBS.	25.0 CU.YD.	3371 LBS.	20.7 CU.YD.																						
	PARAPET Δ	2.3	WINGWALLS	30.8	APRON	39.8	PARAPET Δ	2.2	WINGWALLS	18.6	APRON	32.7	PARAPET Δ	2.2	WINGWALLS	15.5	APRON	29.7	PARAPET Δ	2.1	WINGWALLS	9.1	APRON	23.4	PARAPET Δ	2.0	WINGWALLS	7.0	APRON	20.4	PARAPET Δ	2.1	WINGWALLS	5.2	APRON	17.7	PARAPET Δ	2.1	WINGWALLS	3.6	APRON	15.0

Δ INCLUDES TOP OF WINGWALL QUANTITIES. (A) - INDICATES BAR LOCATED AT ACUTE CORNER. (O) - INDICATES BAR LOCATED AT OBTUSE CORNER. NOTE: WEIGHT OF BARS OVER 40'-0 LONG INCLUDE AN ALLOWANCE OF 2'-0 FOR LAP. REFER TO SHEET PWH 45-1-12 FOR ACUTE AND OBTUSE CORNER LOCATIONS.

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 3/8" 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 (INTO END OF BARREL). LONGITUDINAL BARS "4d1" AND "6f1" 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.

BENT BAR DETAILS



c BAR PIN DIAMETER	
BAR SIZE	D
4	3
5	3 1/2
6	4 1/2

NOTE: ALL DIMENSIONS ARE OUT TO CUT
D = PIN DIAMETER
SEE TABLE AT RIGHT FOR PIN DIAMETER "D" OF c BARS

Iowa Department of Transportation
Highway Division

STANDARD DESIGN - SINGLE REINFORCED CONCRETE BOX CULVERTS
PARALLEL WING HEADWALLS

APRIL, 2012

QUANTITY TABULATION

12'-0 SPAN
45° SKEW

PWH 45-5-12