

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

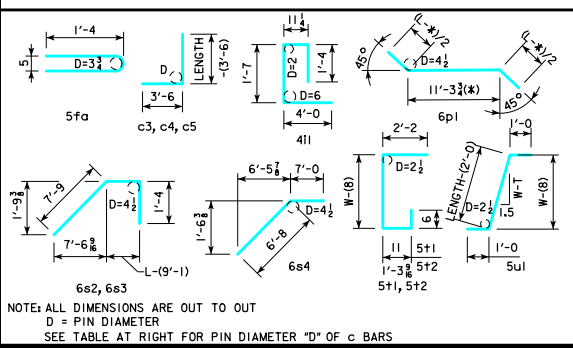
LOCATION	SHAPE	8' x 10'				8' x 9'				8' x 8'				8' x 7'				8' x 6'				8' x 5'				8' x 4'						
		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.		BAR NO.	LENGTH	WT.				
FENCE ANCHOR (GALV.)	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	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
WINGWALL, F.F.H.	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	5b1	2	17'-7	37
WINGWALL, F.F.H.	5b2	18 VAR	2 EACH 12'-0x45'-11	552	5b2	16 VAR	2 EACH 11'-11x41'-8	451	5b2	14 VAR	2 EACH 11'-11x37'-5	360	5b2	12 VAR	2 EACH 11'-11x33'-2	282	5b2	10 VAR	2 EACH 11'-11x28'-11	213	5b2	8 VAR	2 EACH 11'-11x24'-8	153	5b2	6 VAR	2 EACH 11'-11x20'-5	101	5b2	4 VAR	2 EACH 11'-11x16'-2	54
WINGWALL, B.F.H.	4b3	2	47'-8	66	4b3	2	43'-6	61	4b3	2	39'-3	52	4b3	2	34'-11	47	4b3	2	30'-8	41	4b3	2	26'-5	35	4b3	2	22'-2	30	4b3	2	17'-10	30
WINGWALL, B.F.H.	4b4	16 VAR	2 EACH 16'-7x46'-3	341	4b4	14 VAR	2 EACH 16'-7x42'-1	277	4b4	12 VAR	2 EACH 16'-7x37'-10	218	4b4	10 VAR	2 EACH 16'-6x33'-6	167	4b4	8 VAR	2 EACH 16'-6x29'-3	122	4b4	6 VAR	2 EACH 16'-6x25'-0	83	4b4	4 VAR	2 EACH 16'-6x20'-9	50	4b4	2 VAR	2 EACH 16'-6x16'-6	27
WINGWALL, F.F.V.	6c1	116 VAR	2 EACH 2'-6x12'-6	1307	6c1	106 VAR	2 EACH 2'-5x11'-8	779	6c1	70 VAR	2 EACH 2'-5x10'-6	472	6c1	62 VAR	2 EACH 2'-5x9'-6	385	6c1	54 VAR	2 EACH 2'-5x8'-7	198	6c1	46 VAR	2 EACH 2'-5x7'-8	155	6c1	36 VAR	2 EACH 2'-5x6'-5	106	6c1	26 VAR	2 EACH 2'-5x5'-2	57
WINGWALL, F.F.V. (O)	6c2	2	12'-9	38	6c2	2	11'-9	25	6c2	2	10'-9	22	6c2	2	9'-9	20	6c2	2	8'-9	12	6c2	2	7'-9	10	6c2	2	6'-9	9	6c2	2	5'-9	7
WINGWALL, F.F.V. (A)	6c2	3	12'-9	57	6c2	3	11'-9	37	6c2	3	10'-9	34	6c2	3	9'-9	31	6c2	3	8'-9	18	6c2	3	7'-9	16	6c2	3	6'-9	14	6c2	3	5'-9	11
WINGWALL, B.F.V.	6c3	88 VAR	2 EACH 6'-0x16'-2	1465	6c3	80 VAR	2 EACH 6'-0x15'-3	887	6c3	70 VAR	2 EACH 6'-0x14'-1	733	6c3	62 VAR	2 EACH 6'-0x13'-1	617	6c3	54 VAR	2 EACH 6'-0x12'-2	512	6c3	46 VAR	2 EACH 6'-0x11'-3	414	6c3	36 VAR	2 EACH 6'-0x10'-0	333	6c3	26 VAR	2 EACH 6'-0x9'-0	257
WINGWALL, B.F.V. (O)	6c4	1	16'-3	24	6c4	1	15'-3	16	6c4	1	14'-3	15	6c4	1	13'-3	14	6c4	1	12'-3	13	6c4	1	11'-3	12	6c4	1	10'-3	11	6c4	1	9'-3	10
WINGWALL, B.F.V. (A)	6c4	4	16'-3	98	6c4	4	15'-3	64	6c4	4	14'-3	59	6c4	4	13'-3	55	6c4	4	12'-3	51	6c4	4	11'-3	47	6c4	4	10'-3	42	6c4	4	9'-3	37
WINGWALL, B.F.V.	6c5	54	8'-6	689	6c5	50	8'-6	643	6c5	46	8'-6	408	6c5	42	8'-6	372	6c5	34	8'-6	296	6c5	30	7'-10	245	6c5	26	7'-10	194	6c5	22	7'-10	143
APRON, LONGIT., BOT.	4d1	7	47'-1	230	4d1	7	42'-10	210	4d1	7	38'-7	180	4d1	7	34'-4	161	4d1	7	30'-1	141	4d1	7	25'-10	121	4d1	7	21'-8	101	4d1	7	17'-5	81
APRON, LONGIT., TOP	6f1	9	47'-1	664	6f1	9	42'-10	606	6f1	9	38'-7	522	6f1	9	34'-4	464	6f1	9	30'-1	407	6f1	9	25'-10	349	6f1	9	21'-8	293	6f1	9	17'-5	237
PARAPET, VERTICAL	4i1	23	7'-10	120	4i1	23	7'-10	120	4i1	23	7'-10	120	4i1	23	7'-10	120	4i1	23	7'-10	120	4i1	23	7'-10	120	4i1	23	7'-10	120	4i1	23	7'-10	120
PARAPET, HORIZ.	7j1	4	13'-2	108	7j1	4	13'-2	108	7j1	4	13'-2	108	7j1	4	13'-2	106	7j1	4	13'-0	106	7j1	4	13'-0	106	7j1	4	13'-0	106	7j1	4	13'-0	106
APRON, TRANS., TOP	5m1	82	9'-10	841	5m1	74	9'-10	759	5m1	65	9'-10	667	5m1	57	9'-10	575	5m1	48	9'-8	484	5m1	40	9'-8	403	5m1	32	9'-8	322	5m1	24	9'-8	241
APRON, TRANS., BOT.	5m2	14 VAR	2'-2x8'-8	79	5m2	13 VAR	2'-2x8'-5	73	5m2	14 VAR	2'-2x8'-8	79	5m2	9 VAR	2'-4x8'-4	72	5m2	14 VAR	2'-1x8'-7	78	5m2	13 VAR	2'-4x8'-4	72	5m2	9 VAR	2'-5x8'-5	73	5m2	14 VAR	2'-2x8'-8	79
CURTAIN, HORIZ.	6p1	6	13'-2	119	6p1	6	13'-2	119	6p1	6	13'-2	119	6p1	5	13'-0	98	6p1	5	13'-0	98	6p1	5	13'-0	98	6p1	5	13'-0	98	6p1	5	13'-0	98
WING SLOPE, BOTH F.	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	6s1	4	9'-8	52
WING SLOPE, BOTH F. (O)	6s2	2	9'-10	30	6s2	2	9'-9	29	6s2	2	9'-9	29	6s2	2	9'-10	30	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'-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
WING SLOPE, F. F. (O)	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	6s5	2	7'-10	21
WING SLOPE, F. F. (A)	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	6s5	2	7'-10	21
CURTAIN, VERT.	5t1	12	7'-5	93	5t1	12	7'-2	90	5t1	12	6'-11	87	5t1	12	6'-8	83	5t1	12	6'-5	80	5t1	12	6'-5	80	5t1	12	6'-5	80	5t1	12	6'-5	80
CURTAIN, VERT., ENDS	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	5t2	4	6'-10	29
BRACKET, VERT.	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-8	24	5u1	4	5'-6	23	5u1	4	5'-3	22	5u1	4	5'-3	22	5u1	4	5'-3	22	5u1	4	5'-3	22
ESTIMATED QUANTITIES ONE HEADWALL	REIN. STEEL	8173 LBS.				6170 LBS.				5195 LBS.				4346 LBS.				3521 LBS.				2984 LBS.				2394 LBS.						
	CONCRETE	PARAPET Δ	1.7	40.3	PARAPET Δ	1.7	35.4	PARAPET Δ	1.7	30.7	PARAPET Δ	1.6	24.9	PARAPET Δ	1.6	21.1	PARAPET Δ	1.6	17.7	PARAPET Δ	1.6	14.5	PARAPET Δ	1.6	11.3	PARAPET Δ	1.6	8.1	PARAPET Δ	1.6	4.9	
		WINGWALLS	18.6		WINGWALLS	15.5		WINGWALLS	12.7		WINGWALLS	9.1		WINGWALLS	7.0		WINGWALLS	5.2		WINGWALLS	3.6		WINGWALLS	2.0		WINGWALLS	1.4		WINGWALLS	0.8		
		APRON	20.0		APRON	18.2		APRON	16.3		APRON	14.2		APRON	12.5		APRON	10.9		APRON	9.3		APRON	7.7		APRON	6.1		APRON	4.5		

Δ INCLUDES TOP OF WINGWALL QUANTITIES.

(A) - INDICATES BAR LOCATED AT ACUTE CORNER.
(O) - INDICATES BAR LOCATED AT OBTUSE CORNER.
REFER TO SHEET PWH 45-1-12 FOR ACUTE AND OBTUSE CORNER LOCATIONS.

NOTE: WEIGHT OF BARS OVER 40'-0 LONG INCLUDE AN ALLOWANCE OF 2'-0 FOR LAP.

BENT BAR DETAILS



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 (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.

LATEST REVISION DATE
07-2016
APPROVED BY BRIDGE ENGINEER
Nancy E. McQuinn

Iowa Department of Transportation
Highway Division

STANDARD DESIGN - SINGLE REINFORCED CONCRETE BOX CULVERTS

PARALLEL WING HEADWALLS

APRIL, 2012

QUANTITY TABULATION

8'-0 SPAN	PWH 45-7-12
45° SKEW	