

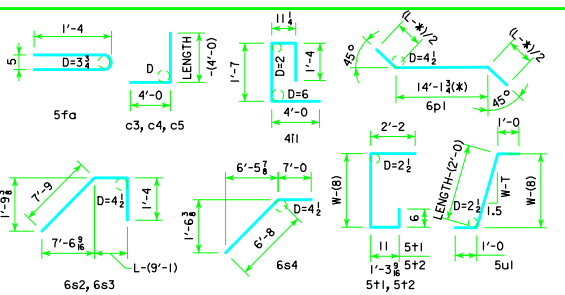
BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT

LOCATION	SHAPE	10' x 12'				10' x 11'				10' x 10'				10' x 9'				10' x 8'				10' x 7'				10' x 6'				10' x 5'				10' 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.					
FENCE ANCHOR (GALV.)	5fa	2	3'-1	6	5fa	2	3'-1	6	5fa	2	3'-1	6	5fa	2	3'-1	6	5fa	2	3'-1	6	5fa	2	3'-1	6	5fa	2	3'-1	6	5fa	2	3'-1	6	5fa	2	3'-1	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'-0x54'-5	779	5b2	20 VAR	2 EACH 11'-11x50'-2	660	5b2	18 VAR	2 EACH 11'-11x45'-11	551	5b2	16 VAR	2 EACH 12'-0x41'-8	452	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	
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'-3	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'-9x54'-11	489	4b4	18 VAR	2 EACH 16'-9x50'-8	413	4b4	16 VAR	2 EACH 16'-7x46'-3	341	4b4	14 VAR	2 EACH 16'-7x42'-0	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	
WINGWALL, F.F.V.	6c1	140 VAR	2 EACH 2'-8x14'-10	1840	5c1	192 VAR	2 EACH 2'-7x13'-10	1644	5c1	174 VAR	2 EACH 2'-7x12'-9	1391	6c1	80 VAR	2 EACH 2'-8x11'-10	871	5c1	70 VAR	2 EACH 2'-7x10'-8	484	5c1	62 VAR	2 EACH 2'-7x9'-8	396	5c1	54 VAR	2 EACH 2'-7x8'-9	319	4c1	46 VAR	2 EACH 2'-7x7'-10	160	4c1	36 VAR	2 EACH 2'-7x6'-7	110	
WINGWALL, F.F.V. (O)	6c2	2	14'-11	45	5c2	2	13'-11	29	5c2	2	12'-11	27	6c2	2	11'-11	36	5c2	2	10'-11	23	5c2	2	9'-11	21	5c2	2	8'-11	19	4c2	2	7'-11	11	4c2	2	6'-11	9	
WINGWALL, F.F.V. (A)	6c2	3	14'-11	67	5c2	3	13'-11	44	5c2	3	12'-11	40	6c2	3	11'-11	54	5c2	3	10'-11	34	5c2	3	9'-11	31	5c2	3	8'-11	28	4c2	3	7'-11	16	4c2	3	6'-11	14	
WINGWALL, B.F.V.	6c3	104 VAR	2 EACH 6'-8x18'-9	1985	6c3	96 VAR	2 EACH 6'-8x17'-9	1760	6c3	88 VAR	2 EACH 6'-8x16'-10	1533	6c3	80 VAR	2 EACH 6'-8x15'-11	1357	5c3	70 VAR	2 EACH 6'-8x14'-9	782	5c3	62 VAR	2 EACH 6'-8x13'-9	660	5c3	54 VAR	2 EACH 6'-8x12'-10	549	5c3	46 VAR	2 EACH 6'-8x11'-11	446	5c3	36 VAR	2 EACH 6'-8x10'-8	325	
WINGWALL, B.F.V. (O)	6c4	1	18'-11	28	6c4	1	17'-11	27	6c4	1	16'-11	25	6c4	1	15'-11	24	5c4	1	14'-11	16	5c4	1	13'-11	15	5c4	1	12'-11	13	5c4	1	11'-11	12	5c4	1	10'-11	11	
WINGWALL, B.F.V. (A)	6c4	4	18'-11	114	6c4	4	17'-11	108	6c4	4	16'-11	102	6c4	4	15'-11	96	5c4	4	14'-11	62	5c4	4	13'-11	58	5c4	4	12'-11	54	5c4	4	11'-11	50	5c4	4	10'-11	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	5c5	46	9'-0	432	5c5	42	9'-0	394	5c5	34	9'-0	319	5c5	30	8'-6	266	5c5	26	8'-0	217	
APRON, LONGIT., BOTT.	4d1	9	55'-7	346	4d1	9	51'-4	321	4d1	9	47'-1	295	4d1	9	42'-10	270	4d1	9	38'-7	232	4d1	9	34'-4	206	4d1	9	30'-1	181	4d1	9	25'-10	155	4d1	9	21'-8	130	
APRON, LONGIT., TOP	6f1	11	55'-7	951	6f1	11	51'-4	881	6f1	11	47'-1	811	6f1	11	42'-10	741	6f1	11	38'-7	637	6f1	11	34'-4	567	6f1	11	30'-1	497	6f1	11	25'-10	427	6f1	11	21'-8	358	
PARAPET, VERTICAL	4l1	29	7'-10	152	4l1	29	7'-10	152	4l1	29	7'-10	152	4l1	29	7'-10	152	4l1	29	7'-10	152	4l1	29	7'-10	152	4l1	29	7'-10	152	4l1	29	7'-10	152	4l1	29	7'-10	152	
PARAPET, HORIZ.	8j1	4	16'-6	176	8j1	4	16'-6	176	8j1	4	16'-0	171	8j1	4	16'-0	171	8j1	4	16'-0	171	8j1	4	15'-10	169	8j1	4	15'-10	169	8j1	4	15'-10	169	8j1	4	15'-10	169	
APRON, TRANS., TOP	5m1	97	12'-2	1231	5m1	89	12'-2	1129	5m1	80	11'-10	987	5m1	72	11'-10	889	5m1	63	11'-10	778	5m1	55	11'-8	669	5m1	46	11'-8	560	5m1	38	11'-8	462	5m1	29	11'-8	353	
APRON, TRANS., BOTT.	5m2	18 VAR	2'-4x10'-10	124	5m2	18 VAR	2'-2x10'-7	119	5m2	18 VAR	2'-2x10'-8	120	5m2	17 VAR	2'-2x10'-5	114	5m2	18 VAR	2'-2x10'-8	120	5m2	17 VAR	2'-4x10'-4	112	5m2	18 VAR	2'-2x10'-7	119	5m2	17 VAR	2'-4x10'-4	112	5m2	18 VAR	2'-2x10'-8	120	
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'-10	30	6s2	2	9'-9	29	6s2	2	9'-10	30	6s2	2	9'-10	30	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'-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	
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.	5f1	15	7'-11	124	5f1	15	7'-8	120	5f1	15	7'-5	116	5f1	15	7'-2	112	5f1	15	6'-11	108	5f1	15	6'-8	104	5f1	15	6'-5	100	5f1	15	6'-5	100	5f1	15	6'-5	100	
CURTAIN, VERT., ENDS	5f2	4	8'-4	35	5f2	4	8'-1	34	5f2	4	7'-10	33	5f2	4	7'-7	32	5f2	4	7'-4	31	5f2	4	7'-1	30	5f2	4	6'-10	29	5f2	4	6'-10	29	5f2	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'-6	23	5u1	4	5'-4	22	5u1	4	5'-4	22	5u1	4	5'-4	22	

ESTIMATED QUANTITIES ONE HEADWALL	REINF. STEEL	11,276 LBS.		10,217 LBS.		9019 LBS.		7620 LBS.		5638 LBS.		4798 LBS.		4131 LBS.		3412 LBS.		2828 LBS.	
		CONCRETE	CU.YD.	CONCRETE	CU.YD.	CONCRETE	CU.YD.	CONCRETE	CU.YD.	CONCRETE	CU.YD.	CONCRETE	CU.YD.	CONCRETE	CU.YD.	CONCRETE	CU.YD.	CONCRETE	CU.YD.
	PARAPET Δ	2.1	65.5	2.1	58.6	1.9	47.3	1.9	41.7	1.9	36.5	1.9	30.1	1.9	25.6	1.9	21.6	1.9	17.8
	WINGWALLS	30.8		26.4		18.6		15.5		12.7		9.1		7.0		5.2		3.6	
	APRON	32.6		30.1		26.8		24.3		21.9		19.1		16.7		14.5		12.3	

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.

BENT BAR DETAILS



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

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	 IOWA Department of Transportation Highway Division	STANDARD DESIGN - SINGLE REINFORCED CONCRETE BOX CULVERTS PARALLEL WING HEADWALLS APRIL, 2012 QUANTITY TABULATION 10'-0 SPAN 45° SKEW
APPROVED BY BRIDGE ENGINEER	APPROVED BY BRIDGE ENGINEER M. J. ...	PWH 45-6-12