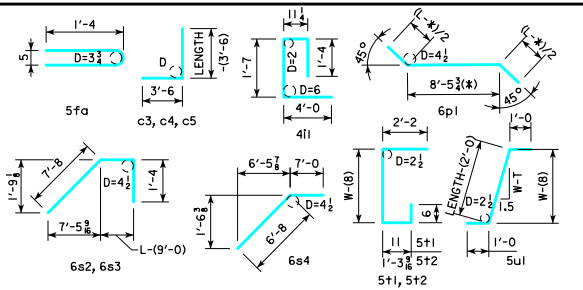


BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT

LOCATION	SHAPE	6' x 8'				6' x 7'				6' x 6'				6' x 5'				6' x 4'				6' x 3'			
		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	
WINGWALL, F.F.H.	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	14 VAR	2 EACH 11'-11:37'-5	360	5b2	12 VAR	2 EACH 11'-11:33'-2	282	5b2	10 VAR	2 EACH 11'-11:28'-11	213	5b2	8 VAR	2 EACH 11'-11:24'-8	153	5b2	6 VAR	2 EACH 11'-11:20'-5	101	5b2	4 VAR	2 EACH 11'-11:16'-2	59	
WINGWALL, B.F.H.	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'-11	24	
WINGWALL, B.F.H.	4b4	12 VAR	2 EACH 16'-7:37'-10	218	4b4	10 VAR	2 EACH 16'-6:33'-6	167	4b4	8 VAR	2 EACH 16'-6:29'-3	122	4b4	6 VAR	2 EACH 16'-6:25'-0	83	4b4	4 VAR	2 EACH 16'-6:20'-9	50	4b4	2	16'-6	22	
WINGWALL, F.F.V.	5c1	70 VAR	2 EACH 2'-5:10'-6	472	5c1	62 VAR	2 EACH 2'-5:9'-6	385	4c1	54 VAR	2 EACH 2'-5:8'-7	198	4c1	46 VAR	2 EACH 2'-5:7'-8	155	4c1	36 VAR	2 EACH 2'-5:6'-5	106	4c1	28 VAR	2 EACH 2'-5:5'-6	74	
WINGWALL, F.F.V. (O)	5c2	2	10'-9	22	5c2	2	9'-9	20	4c2	2	8'-9	12	4c2	2	7'-9	10	4c2	2	6'-9	9	4c2	2	5'-9	8	
WINGWALL, F.F.V. (A)	5c2	3	10'-9	34	5c2	3	9'-9	31	4c2	3	8'-9	18	4c2	3	7'-9	16	4c2	3	6'-9	14	4c2	3	5'-9	12	
WINGWALL, B.F.V.	5c3	70 VAR	2 EACH 6'-0:14'-1	733	5c3	62 VAR	2 EACH 6'-0:13'-1	617	6c3	54 VAR	2 EACH 6'-0:12'-3	737	6c3	46 VAR	2 EACH 6'-0:11'-3	596	5c3	36 VAR	2 EACH 6'-0:10'-0	300	5c3	28 VAR	2 EACH 6'-0:9'-1	220	
WINGWALL, B.F.V. (O)	5c4	1	14'-3	15	5c4	1	13'-3	14	6c4	1	12'-3	18	6c4	1	11'-3	17	5c4	1	10'-3	11	5c4	1	9'-3	10	
WINGWALL, B.F.V. (A)	5c4	4	14'-3	59	5c4	4	13'-3	55	6c4	4	12'-3	74	6c4	4	11'-3	68	5c4	4	10'-3	43	5c4	4	9'-3	39	
WINGWALL, B.F.V.	5c5	46	8'-6	408	5c5	42	8'-6	372	c5	-	-	-	c5	-	-	-	c5	-	-	-	c5	-	-	-	
APRON, LONGIT., BOT.	4d1	6	38'-7	155	4d1	6	34'-4	138	4d1	6	30'-1	121	4d1	6	25'-10	104	4d1	6	21'-8	87	4d1	6	17'-5	70	
APRON, LONGIT., TOP	6f1	7	38'-7	406	6f1	7	34'-4	361	6f1	7	30'-1	316	6f1	7	25'-10	272	6f1	7	21'-8	228	6f1	7	17'-5	183	
PARAPET, VERTICAL	4l1	17	7'-10	89	4l1	17	7'-10	89	4l1	17	7'-10	89	4l1	17	7'-10	89	4l1	17	7'-10	89	4l1	17	7'-10	89	
PARAPET, HORIZ.	7j1	4	10'-4	84	7j1	4	10'-2	83	7j1	4	10'-2	83	7j1	4	10'-2	83	7j1	4	10'-2	83	7j1	4	10'-2	83	
APRON, TRANS., TOP	6m1	34	7'-10	400	6m1	30	7'-8	345	6m1	25	7'-8	288	6m1	21	7'-8	242	6m1	17	7'-8	196	6m1	13	7'-8	150	
APRON, TRANS., BOT.	6m2	5 VAR	2'-2:6'-2	31	6m2	4 VAR	2'-10:5'-10	26	6m2	5 VAR	2'-7:6'-7	34	6m2	5 VAR	2'-4:6'-4	33	6m2	5 VAR	2'-2:6'-2	31	6m2	4 VAR	2'-11:5'-11	27	
CURTAIN, HORIZ.	6p1	6	10'-4	93	6p1	5	10'-2	76	6p1	5	10'-2	76	6p1	5	10'-2	76	6p1	5	10'-2	76	6p1	5	10'-2	76	
WING SLOPE, BOTH F.	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	8'-10	53	
WING SLOPE, BOTH F. (O)	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'-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	
WING SLOPE, F. F. (O)	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	6'-10	21	
WING SLOPE, F. F. (A)	5t1	9	6'-11	65	5t1	9	6'-8	63	5t1	9	6'-5	60	5t1	9	6'-5	60	5t1	9	6'-5	60	5t1	9	6'-5	60	
CURTAIN, VERT., ENDS	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	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	REINF. STEEL	4529 LBS.				3806 LBS.				3060 LBS.				2526 LBS.				1887 LBS.				1518 LBS.			
	CONCRETE	PARAPET Δ	1.5	27.6	CU.YD.	PARAPET Δ	1.4	22.2	CU.YD.	PARAPET Δ	1.4	18.6	CU.YD.	PARAPET Δ	1.4	15.5	CU.YD.	PARAPET Δ	1.4	12.6	CU.YD.	PARAPET Δ	1.4	9.9	CU.YD.
		WINGWALLS	12.7		WINGWALLS	9.1	WINGWALLS		7.0	WINGWALLS	5.2		WINGWALLS	3.6	WINGWALLS		2.2								
		APRON	13.4		APRON	11.7	APRON		10.2	APRON	8.9		APRON	7.6	APRON		6.3								

Δ INCLUDES TOP OF WINGWALL QUANTITIES. (A) - INDICATES BAR LOCATED AT ACUTE 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. (O) - INDICATES BAR LOCATED AT OBTUSE CORNER.

BENT BAR DETAILS



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

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.

REVISED 07-2016 - CHANGED FENCE ANCHOR BAR (5fa) FROM 3'-1 TO 2'-10. ENGLISH UNITS DESIGN IN ALL CAPS. DGN - PWH 45-8-12 - THIS SHEET ISSUED 04-12.

Iowa Department of Transportation
Highway Division

STANDARD DESIGN - SINGLE REINFORCED CONCRETE BOX CULVERTS

PARALLEL WING HEADWALLS

APRIL, 2012

QUANTITY TABULATION	PWH 45-8-12
6'-0 SPAN	
45° SKEW	

LATEST REVISION DATE

07-2016

APPROVED BY BRIDGE ENGINEER

Thomas E. McQuinn