

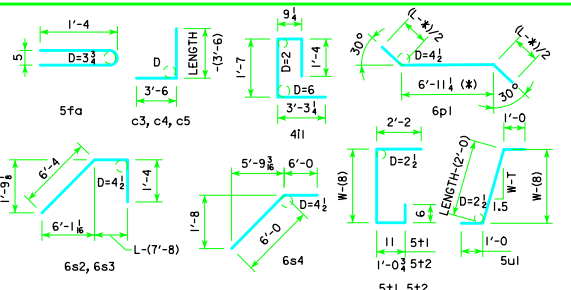
# BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT

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	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	32'-0	67	5b1	2	28'-6	59	5b1	2	25'-1	52	5b1	2	21'-7	45	5b1	2	18'-1	38	5b1	2	14'-8	31	
WINGWALL, F.F.H.	5b2	14 VAR	2 EACH 10'-1x30'-10	299	5b2	12 VAR	2 EACH 10'-1x27'-4	234	5b2	10 VAR	2 EACH 10'-0x23'-11	177	5b2	8 VAR	2 EACH 10'-0x20'-5	127	5b2	6 VAR	2 EACH 10'-0x17'-0	84	5b2	4 VAR	2 EACH 10'-0x13'-6	49	
WINGWALL, B.F.H.	4b3	2	32'-3	43	4b3	2	28'-8	38	4b3	2	25'-3	34	4b3	2	21'-9	29	4b3	2	18'-4	24	4b3	2	14'-10	20	
WINGWALL, B.F.H.	4b4	12 VAR	2 EACH 13'-9x31'-1	180	4b4	10 VAR	2 EACH 13'-8x27'-7	138	4b4	8 VAR	2 EACH 13'-8x24'-1	101	4b4	6 VAR	2 EACH 13'-8x20'-7	69	4b4	4 VAR	2 EACH 13'-8x17'-2	41	4b4	2	13'-8	18'-0	
WINGWALL, F.F.V.	5c1	58 VAR	2 EACH 2'-6x10'-7	396	5c1	50 VAR	2 EACH 2'-6x9'-5	311	4c1	44 VAR	2 EACH 2'-6x8'-6	162	4c1	36 VAR	2 EACH 2'-6x7'-5	119	4c1	30 VAR	2 EACH 2'-6x6'-6	90	4c1	24 VAR	2 EACH 2'-6x5'-8	65	
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	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, B.F.V.	5c3	58 VAR	2 EACH 6'-1x14'-2	613	5c3	50 VAR	2 EACH 6'-1x13'-0	498	6c3	44 VAR	2 EACH 6'-1x12'-1	600	5c3	36 VAR	2 EACH 6'-1x11'-0	321	4c3	30 VAR	2 EACH 6'-1x10'-1	162	4c3	24 VAR	2 EACH 6'-1x9'-3	123	
WINGWALL, B.F.V. (O)	5c4	1	14'-3	15	5c4	1	13'-3	14	6c4	1	12'-3	18	5c4	1	11'-3	12	4c4	1	10'-3	7	4c4	1	9'-3	6	
WINGWALL, B.F.V. (A)	5c4	3	14'-3	45	5c4	3	13'-3	41	6c4	3	12'-3	55	5c4	3	11'-3	35	4c4	3	10'-3	21	4c4	3	9'-3	19	
WINGWALL, B.F.V.	5c5	36	8'-6	319	5c5	34	8'-6	301	c5	—	—	—	c5	—	—	—	c5	—	—	—	c5	—	—	—	
APRON, LONGIT., BOT.	4d1	6	31'-10	128	4d1	6	28'-5	114	4d1	6	24'-11	100	4d1	6	21'-6	86	4d1	6	18'-0	72	4d1	6	14'-6	58	
APRON, LONGIT., TOP	6f1	7	31'-10	335	6f1	7	28'-5	299	6f1	7	24'-11	262	6f1	7	21'-6	226	6f1	7	18'-0	189	6f1	7	14'-6	152	
PARAPET, VERTICAL	4l1	14	7'-0	65	4l1	14	7'-0	65	4l1	14	7'-0	65	4l1	14	7'-0	65	4l1	14	7'-0	65	4l1	14	7'-0	65	
PARAPET, HORIZ.	7j1	4	8'-6	69	7j1	4	8'-3	67	7j1	4	8'-3	67	7j1	4	8'-3	67	7j1	4	8'-3	67	7j1	4	8'-3	67	
APRON, TRANS., TOP	6m1	28	7'-10	329	6m1	25	7'-8	288	6m1	22	7'-8	253	6m1	18	7'-8	207	6m1	15	7'-8	173	6m1	11	7'-8	127	
APRON, TRANS., TOP	6m2	3 VAR	3'-3x6'-8	22	6m2	3 VAR	2'-4x5'-9	18	6m2	2 VAR	3'-3x5'-0	12	6m2	3 VAR	2'-5x5'-11	19	6m2	2 VAR	3'-5x5'-1	13	6m2	3 VAR	2'-7x6'-0	19	
APRON, TRANS., BOT.	6m3	25	6'-7	247	6m3	22	5'-6	126	4m3	19	4'-8	59	4m3	16	4'-8	50	4m3	13	4'-8	41	4m3	10	4'-8	31	
CURTAIN, HORIZ.	6p1	6	8'-9	79	6p1	5	8'-7	64	6p1	5	8'-7	64	6p1	5	8'-7	64	6p1	5	8'-7	64	6p1	5	8'-7	64	
WING SLOPE, BOTH F.	6s1	4	25'-10	155	6s1	4	22'-3	134	6s1	4	18'-8	112	6s1	4	15'-0	90	6s1	4	11'-5	69	6s1	4	7'-10	47	
WING SLOPE, BOTH F. (O)	6s2	2	8'-5	25	6s2	2	8'-5	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	
WING SLOPE, BOTH F. (A)	6s3	2	8'-10	27	6s3	2	8'-10	27	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	
WING SLOPE, F. F.	6s4	2	12'-0	36	6s4	2	12'-0	36	6s4	2	12'-0	36	6s4	2	12'-0	36	6s4	2	12'-0	36	6s4	2	12'-0	36	
WING SLOPE, F. F.	6s5	2	23'-8	71	6s5	2	20'-0	60	6s5	2	16'-5	49	6s5	2	12'-10	39	6s5	2	9'-3	28	6s5	2	5'-7	17	
CURTAIN, VERT.	5t1	7	6'-11	50	5t1	7	6'-8	49	5t1	7	6'-5	47	5t1	7	6'-5	47	5t1	7	6'-5	47	5t1	7	6'-5	47	
CURTAIN, VERT., ENDS	5t2	4	7'-1	30	5t2	4	6'-10	29	5t2	4	6'-7	27	5t2	4	6'-7	27	5t2	4	6'-7	27	5t2	4	6'-7	27	
BRACKET, VERT.	5u1	4	5'-8	24	5u1	4	5'-3	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	3719 LBS.		3104 LBS.		2455 LBS.		1879 LBS.		1455 LBS.		1183 LBS.	
	CONCRETE	PARAPET Δ	1.3	PARAPET Δ	1.2	PARAPET Δ	1.2	PARAPET Δ	1.2	PARAPET Δ	1.2	PARAPET Δ	1.2
		WINGWALLS	10.4	WINGWALLS	7.4	WINGWALLS	5.7	WINGWALLS	4.2	WINGWALLS	2.9	WINGWALLS	1.8
		APRON	11.0	APRON	9.6	APRON	8.4	APRON	7.3	APRON	6.2	APRON	5.2
			22.7		18.2		15.3		12.7		10.3		8.2
			CU.YD.		CU.YD.		CU.YD.		CU.YD.		CU.YD.		CU.YD.

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 30-1-12 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

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

## 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 <b>PARALLEL WING HEADWALLS</b>
	APRIL, 2012
<b>QUANTITY TABULATION</b> 6'-0 SPAN 30° SKEW	PWH 30-8-12