

REVISED 07-2016 - CHANGED FENCE ANCHOR BAR (5fa) FROM 3'-1 TO 2'-10. ENGLISH UNITS DESIGNATED IN PWH 30-5-12 - THIS SHEET ISSUED 04-12.

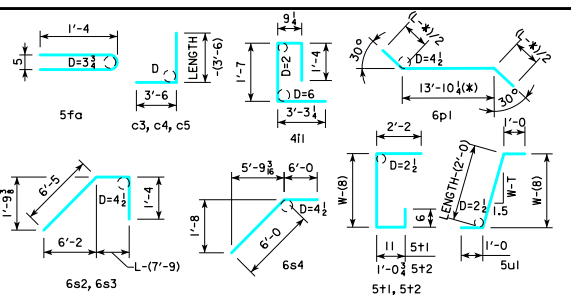
## BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN x CULVERT HEIGHT

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	45'-10	100	5b1	2	42'-4	92	5b1	2	38'-11	81	5b1	2	35'-5	74	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	
WINGWALL, F.F.H.	5b2	22	2 EACH 10'-1x44'-8	636	5b2	20	2 EACH 10'-1x41'-3	540	5b2	18	2 EACH 10'-1x37'-9	449	5b2	16	2 EACH 10'-1x34'-3	370	5b2	14	2 EACH 10'-1x30'-10	299	5b2	12	2 EACH 10'-1x27'-4	234	5b2	10	2 EACH 10'-0x23'-11	177	5b2	8	2 EACH 10'-0x20'-5	127	5b2	6	2 EACH 10'-0x17'-0	84	
WINGWALL, B.F.H.	4b3	2	46'-2	64	4b3	2	42'-8	60	4b3	2	39'-2	52	4b3	2	35'-8	48	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	
WINGWALL, B.F.H.	4b4	20	2 EACH 13'-10x45'-0	398	4b4	18	2 EACH 13'-10x41'-6	335	4b4	16	2 EACH 13'-9x38'-0	277	4b4	14	2 EACH 13'-9x34'-6	226	4b4	12	2 EACH 13'-9x31'-1	180	4b4	10	2 EACH 13'-8x27'-7	138	4b4	8	2 EACH 13'-8x24'-1	101	4b4	6	2 EACH 13'-8x20'-7	69	4b4	4	2 EACH 13'-8x17'-2	41	
WINGWALL, F.F.V.	5c1	170	2 EACH 2'-9x14'-10	1559	5c1	156	2 EACH 2'-9x13'-10	1349	5c1	96	2 EACH 2'-9x12'-11	784	5c1	86	2 EACH 2'-9x11'-10	654	5c1	58	2 EACH 2'-9x10'-10	411	5c1	50	2 EACH 2'-9x9'-8	324	4c1	44	2 EACH 2'-9x8'-9	169	4c1	36	2 EACH 2'-9x7'-8	125	4c1	30	2 EACH 2'-9x6'-9	95	
WINGWALL, F.F.V. (O)	5c2	2	15'-0	31	5c2	2	14'-0	29	5c2	2	13'-0	27	5c2	2	12'-0	25	5c2	2	11'-0	23	5c2	2	10'-0	21	4c2	2	9'-0	12	4c2	2	8'-0	11	4c2	2	7'-0	9	
WINGWALL, F.F.V. (A)	5c2	2	15'-0	31	5c2	2	14'-0	29	5c2	2	13'-0	27	5c2	2	12'-0	25	5c2	2	11'-0	23	5c2	2	10'-0	21	4c2	2	9'-0	12	4c2	2	8'-0	11	4c2	2	7'-0	9	
WINGWALL, B.F.V.	6c3	86	2 EACH 6'-4x18'-5	1599	6c3	78	2 EACH 6'-4x17'-3	1381	6c3	72	2 EACH 6'-4x16'-5	1230	6c3	64	2 EACH 6'-4x15'-3	720	6c3	58	2 EACH 6'-4x14'-5	628	6c3	50	2 EACH 6'-4x13'-3	511	6c3	44	2 EACH 6'-4x12'-4	428	6c3	36	2 EACH 6'-4x11'-3	330	6c3	30	2 EACH 6'-4x10'-4	261	
WINGWALL, B.F.V. (O)	6c4	1	18'-6	28	6c4	1	17'-6	26	6c4	1	16'-6	25	6c4	1	15'-6	16	6c4	1	14'-6	15	6c4	1	13'-6	14	6c4	1	12'-6	13	6c4	1	11'-6	12	6c4	1	10'-6	11	
WINGWALL, B.F.V. (A)	6c4	3	18'-6	83	6c4	3	17'-6	79	6c4	3	16'-6	74	6c4	3	15'-6	48	6c4	3	14'-6	45	6c4	3	13'-6	42	6c4	3	12'-6	39	6c4	3	11'-6	36	6c4	3	10'-6	33	
WINGWALL, B.F.V.	6c5	54	8'-6	689	6c5	50	8'-6	638	6c5	46	8'-6	587	6c5	42	8'-6	537	6c5	36	8'-6	319	6c5	34	8'-6	301	6c5	28	8'-6	248	6c5	26	7'-11	215	6c5	22	7'-8	176	
APRON, LONGIT., BOT.	4d1	11	45'-9	351	4d1	11	42'-3	325	4d1	11	38'-9	285	4d1	11	35'-4	260	4d1	11	31'-10	234	4d1	11	28'-5	209	4d1	11	24'-11	183	4d1	11	21'-6	158	4d1	11	18'-0	132	
APRON, LONGIT., TOP	6f1	13	45'-9	932	6f1	13	42'-3	864	6f1	13	38'-9	757	6f1	13	35'-4	690	6f1	13	31'-10	622	6f1	13	28'-5	555	6f1	13	24'-11	487	6f1	13	21'-6	420	6f1	13	18'-0	351	
PARAPET, VERTICAL	4i1	28	7'-0	131	4i1	28	7'-0	131	4i1	28	7'-0	131	4i1	28	7'-0	131	4i1	28	7'-0	131	4i1	28	7'-0	131	4i1	28	7'-0	131	4i1	28	7'-0	131	4i1	28	7'-0	131	
PARAPET, HORIZ.	8j1	4	15'-9	168	8j1	4	15'-9	168	8j1	4	15'-5	165	8j1	4	15'-5	165	8j1	4	15'-5	165	8j1	4	15'-2	162	8j1	4	15'-2	162	8j1	4	15'-2	162	8j1	4	15'-2	162	
APRON, TRANS., TOP	6m1	54	14'-2	1149	6m1	49	14'-2	1043	6m1	45	13'-10	935	6m1	40	13'-10	831	6m1	35	13'-10	727	6m1	31	13'-8	636	6m1	26	13'-8	534	6m1	22	13'-8	452	6m1	17	13'-8	349	
APRON, TRANS., BOT.	5m3	73	13'-0	990	5m3	67	13'-0	908	5m3	31	13'-6	629	5m3	28	12'-8	370	5m3	25	12'-8	330	4m3	22	11'-7	170	4m3	19	11'-7	147	4m3	16	11'-7	124	4m3	13	11'-7	101	
CURTAIN, HORIZ.	6p1	6	16'-0	144	6p1	6	16'-0	144	6p1	6	15'-8	141	6p1	6	15'-8	141	6p1	6	15'-8	141	6p1	5	15'-6	116	6p1	5	15'-6	116	6p1	5	15'-6	116	6p1	5	15'-6	116	
WING SLOPE, BOTH F.	6s1	4	40'-3	254	6s1	4	36'-8	220	6s1	4	33'-1	199	6s1	4	29'-5	177	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	
WING SLOPE, BOTH F. (O)	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-5	25	6s2	2	8'-5	25	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	
WING SLOPE, BOTH F. (A)	6s3	2	8'-10	27	6s3	2	8'-10	27	6s3	2	8'-10	27	6s3	2	8'-10	27	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	
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	6s4	2	12'-0	36	6s4	2	12'-0	36	6s4	2	12'-0	36	
WING SLOPE, F.F. (O)	6s5	2	38'-11	114	6s5	2	34'-6	104	6s5	2	30'-10	93	6s5	2	27'-3	82	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	
WING SLOPE, F.F. (A)	5t1	14	7'-8	116	5t1	14	7'-8	116	5t1	14	7'-5	108	5t1	14	7'-2	105	5t1	14	6'-11	101	5t1	14	6'-8	97	5t1	14	6'-5	94	5t1	14	6'-5	94	5t1	14	6'-5	94	
CURTAIN, VERT.	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'-7	27	5t2	4	6'-7	27	5t2	4	6'-7	27	
CURTAIN, VERT., ENDS	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'-7	27	5t2	4	6'-7	27	5t2	4	6'-7	27	
BRACKET, VERT.	5u1	4	6'-5	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	9815 LBS.	CONCRETE	59.5 CU.YD.	8832 LBS.	53.5 CU.YD.	7294 LBS.	43.8 CU.YD.	5772 LBS.	38.8 CU.YD.	4979 LBS.	34.1 CU.YD.	4207 LBS.	28.2 CU.YD.	3536 LBS.	24.1 CU.YD.	3022 LBS.	20.4 CU.YD.	2546 LBS.	16.8 CU.YD.																					
PARAPET Δ	1.9	WINGWALLS	25.1	APRON	32.5	PARAPET Δ	1.9	WINGWALLS	21.6	APRON	30.0	PARAPET Δ	1.8	WINGWALLS	15.2	APRON	26.8	PARAPET Δ	1.8	WINGWALLS	12.7	APRON	24.3	PARAPET Δ	1.8	WINGWALLS	10.4	APRON	21.9	PARAPET Δ	1.7	WINGWALLS	7.4	APRON	19.1	PARAPET Δ	1.7	WINGWALLS	5.7	APRON	16.7

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  
07-2016

**Iowa Department of Transportation**  
*Highway Division*

STANDARD DESIGN - SINGLE REINFORCED CONCRETE BOX CULVERTS

## PARALLEL WING HEADWALLS

APRIL, 2012