BILL OF REINFORCING FOR ONE HEADWALL 15° SKEW CULVERT SPAN x CULVERT HEIGHT

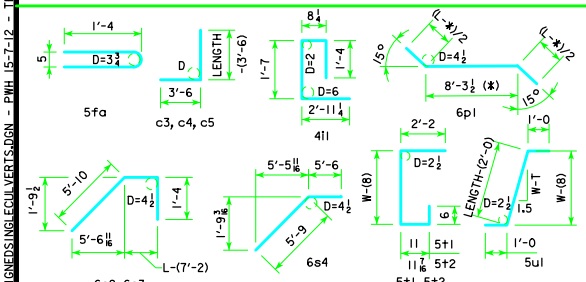
LOCATION	SHAPE	8′ x 10′				8′ x 9′				8′ x 8′				8′ x 7′				8′ x 6′				8′ x 5′				8′ x 4′			
		BAR	NO.	LENGTH	WT.	BAR	NO.	LENGTH	WT.	BAR	NO.	LENGTH	WT.	BAR	NO.	LENGTH	WT.	BAR	NO.	LENGTH	WT.	BAR	NO.	LENGTH	WT.	BAR	NO.	LENGTH	WT.
FENCE ANCHOR (GALV.)		5fa	2	3′-1	6	5fa	2	3′-1	6	5fa	2	3′-1	6	5fa	2	3′-1	6	5fa	2	3′-1	6	5fa	2	3′-1	6	5fa	2	3′-1	6
WINGWALL, F.F.H.		5b1	2	35′-0	73	5b1	2	31′-11	67	5b1	2	28′-10	60	5b1	2	25′-8	54	5b1	2	22′-7	47	5b1	2	19′-6	41	5b1	2	16′-5	34
WINGWALL, F.F.H.		5b2	18 VAR	2 EACH 9′-2;34′-0	405	5b2	16 VAR	2 EACH 9′-2;30′-11	334	5b2	14 VAR	2 EACH 9′-2;27′-9	270	5b2	12 VAR	2 EACH 9′-2;24′-8	212	5b2	10 VAR	2 EACH 9′-2;21′-7	160	5b2	8 VAR	2 EACH 9′-2;18′-5	115	5b2	6 VAR	2 EACH 9′-2;15′-4	77
WINGWALL, B.F.H.		4b3	2	35′-1	47	4b3	2	32′-0	43	4b3	2	28′-11	39	4b3	2	25′-9	34	4b3	2	22′-8	30	4b3	2	19′-7	26	4b3	2	16′-6	22
WINGWALL, B.F.H.		4b4	16 VAR	2 EACH 12′-4;34′-1	248	4b4	14 VAR	2 EACH 12′-4;31′-0	203	4b4	12 VAR	2 EACH 12′-4;27′-11	161	4b4	10 VAR	2 EACH 12′-4;24′-9	124	4b4	8 VAR	2 EACH 12′-4;21′-8	91	4b4	6 VAR	2 EACH 12′-4;18′-6	62	4b4	4 VAR	2 EACH 12′-4;15′-5	37
WINGWALL, F.F.V.		5c1	128 VAR	2 EACH 2′-6;12′-8	1012	5c1	76 VAR	2 EACH 2′-6;11′-5	552	5c1	52 VAR	2 EACH 2′-6;10′-7	355	5c1	46 VAR	2 EACH 2′-6;9′-7	290	4c1	40 VAR	2 EACH 2′-6;8′-7	148	4c1	34 VAR	2 EACH 2′-6;7′-8	115	4c1	26 VAR	2 EACH 2′-6;6′-4	77
WINGWALL, F.F.V. (O)		5c2	2	12′-9	27	5c2	2	11′-9	25	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
WINGWALL, F.F.V. (A)		5c2	2	12′-9	27	5c2	2	11′-9	25	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
WINGWALL, B.F.V.		6c3	64 VAR	2 EACH 6′-1;16′-1	1065	5c3	58 VAR	2 EACH 6′-1;15′-1	640	5c3	52 VAR	2 EACH 6′-1;14′-2	549	5c3	46 VAR	2 EACH 6′-1;13′-2	462	6c3	40 VAR	2 EACH 6′-1;12′-2	548	5c3	34 VAR	2 EACH 6′-1;11′-3	307	5c3	26 VAR	2 EACH 6′-1;9′-11	217
WINGWALL, B.F.V. (O)		6c4	2	16′-3	49	5c4	2	15′-3	32	5c4	2	14′-3	30	5c4	2	13′-3	28	6c4	2	12′-3	37	5c4	2	11′-3	23	5c4	2	10′-3	21
WINGWALL, B.F.V. (A)		6c4	2	16′-3	49	5c4	2	15′-3	32	5c4	2	14′-3	30	5c4	2	13′-3	28	6c4	2	12′-3	37	5c4	2	11′-3	23	5c4	2	10′-3	21
WINGWALL, B.F.V.		6c5	42	8′-6	536	5c5	36	8′-6	319	5c5	34	8′-6	301	5c5	30	8′-6	266	c5	—	—	—	c5	—	—	—	c5	—	—	—
APRON, LONGIT., BOTT.		4d1	7	35′-0	164	4d1	7	31′-10	149	4d1	7	28′-9	134	4d1	7	25′-8	120	4d1	7	22′-6	105	4d1	7	19′-5	91	4d1	7	16′-4	76
APRON, LONGIT., TOP		6f1	9	35′-0	473	6f1	9	31′-10	430	6f1	9	28′-9	389	6f1	9	25′-8	347	6f1	9	22′-6	304	6f1	9	19′-5	262	6f1	9	16′-4	221
PARAPET, VERTICAL		4l1	17	6′-7	75	4l1	17	6′-7	75	4l1	17	6′-7	75	4l1	17	6′-7	75	4l1	17	6′-7	75	4l1	17	6′-7	75	4l1	17	6′-7	75
PARAPET, HORIZ.		7j1	4	9′-8	79	7j1	4	9′-8	79	7j1	4	9′-8	79	7j1	4	9′-6	78	7j1	4	9′-6	78	7j1	4	9′-6	78	7j1	4	9′-6	78
APRON, TRANS., TOP		6m1	32	9′-10	473	6m1	29	9′-10	428	6m1	26	9′-10	384	6m1	23	9′-8	334	6m1	20	9′-8	290	6m1	17	9′-8	247	6m1	14	9′-8	203
APRON, TRANS., TOP		6m2	2 VAR	4′-0;7′-9	18	6m2	2 VAR	3′-7;7′-4	16	6m2	2 VAR	3′-2;6′-11	15	6m2	2 VAR	2′-9;6′-5	14	6m2	2 VAR	2′-4;6′-1	13	6m2	1	5′-8	9	6m2	1	5′-3	8
APRON, TRANS., BOTT.		5m3	61	6′-11	440	6m3	28	7′-9	326	6m3	25	7′-9	291	5m3	22	6′-9	155	4m3	19	5′-11	75	4m3	16	5′-11	63	4m3	13	5′-11	51
CURTAIN, HORIZ.		6p1	6	10′-1	91	6p1	6	10′-1	91	6p1	6	10′-1	91	6p1	5	9′-11	74	6p1	5	9′-11	74	6p1	5	9′-11	74	6p1	5	9′-11	74
WING SLOPE, BOTH F.		6s1	4	30′-2	181	6s1	4	26′-11	162	6s1	4	23′-8	142	6s1	4	20′-5	123	6s1	4	17′-2	103	6s1	4	13′-11	84	6s1	4	10′-7	64
WING SLOPE, BOTH F. (O)		6s2	2	7′-11	24	6s2	2	7′-11	24	6s2	2	7′-11	24	6s2	2	7′-11	24	6s2	2	7′-10	24	6s2	2	7′-10	24	6s2	2	7′-10	24
WING SLOPE, BOTH F. (A)		6s3	2	8′-1	24	6s3	2	8′-1	24	6s3	2	8′-1	24	6s3	2	8′-1	24	6s3	2	8′-0	24	6s3	2	8′-0	24	6s3	2	8′-0	24
WING SLOPE, F. F.		6s4	2	11′-3	34	6s4	2	11′-3	34	6s4	2	11′-3	34	6s4	2	11′-3	34	6s4	2	11′-3	34	6s4	2	11′-3	34	6s4	2	11′-3	34
WING SLOPE, F. F.		6s5	2	27′-11	84	6s5	2	24′-8	74	6s5	2	21′-5	64	6s5	2	18′-1	54	6s5	2	14′-10	45	6s5	2	11′-7	35	6s5	2	8′-4	25
CURTAIN, VERT.		5t1	9	7′-5	70	5t1	9	7′-2	67	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
CURTAIN, VERT., ENDS		5t2	4	7′-5	31	5t2	4	7′-2	30	5t2	4	6′-11	29	5t2	4	6′-8	28	5t2	4	6′-5	27	5t2	4	6′-5	27	5t2	4	6′-5	27
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
ESTIMATED QUANTITIES ONE HEADWALL	REINF. STEEL	5831 LBS.				4312 LBS.				3709 LBS.				3114 LBS.				2481 LBS.				1947 LBS.				1596 LBS.			
	CONCRETE	PARAPET Δ	1.3		29.6 CU.YD.	PARAPET Δ	1.3		26.0 CU.YD.	PARAPET Δ	1.3		22.6 CU.YD.	PARAPET Δ	1.2		18.4 CU.YD.	PARAPET Δ	1.2		15.5 CU.YD.	PARAPET Δ	1.2		13.0 CU.YD.	PARAPET Δ	1.2		10.6 CU.YD.
		WINGWALLS	13.6			WINGWALLS	11.4			WINGWALLS	9.3			WINGWALLS	6.7			WINGWALLS	5.1			WINGWALLS	3.8			WINGWALLS	2.6		
		APRON	14.7			APRON	13.3			APRON	12.0			APRON	10.5			APRON	9.2			APRON	8.0			APRON	6.8		

Δ INCLUDES TOP OF WINGWALL QUANTITIES.

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

(A) - INDICATES BAR LOCATED AT ACUTE CORNER.
(O) - INDICATES BAR LOCATED AT OBTUSE CORNER.
REFER TO SHEET PWH 15-1-12 FOR ACUTE AND OBTUSE CORNER LOCATIONS.

BENT BAR DETAILS



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

c BAR PIN DIAMETER	
BAR SIZE	D
4	3
5	3¾
6	4½

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 ¾" 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.

22-11
LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

Iowa Department of Transportation
Highway Division

STANDARD DESIGN - SINGLE REINFORCED CONCRETE BOX CULVERTS

PARALLEL WING HEADWALLS

APRIL, 2012

QUANTITY TABULATION 8′-0 SPAN 15° SKEW

PWH 15-7-12

ENGLISH,RFDSIGNFDSINGLECULVERTS.DGN - PWH 15-7-12 - THIS SHEET ISSUED 04-12.