BILL OF REINFORCING FOR ONE HEADWALL 0° 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.	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	39′-10	83	5b1	2	36′-10	77	5b1	2	33′-10	71	5b1	2	30′-10	64	5b1	2	27′-10	58	5b1	2	24′-10	52	5b1	2	21′-10	46	5b1	2	18′-10	39	5b1	2	15′-10	33
WINGWALL, F.F.H.		5b2	22 VAR	2 EACH 8′-10±38′-10	547	5b2	20 VAR	2 EACH 8′-10±35′-10	466	5b2	18 VAR	2 EACH 8′-10±32′-10	391	5b2	16 VAR	2 EACH 8′-10±29′-10	323	5b2	14 VAR	2 EACH 8′-10±26′-10	260	5b2	12 VAR	2 EACH 8′-10±23′-10	204	5b2	10 VAR	2 EACH 8′-10±20′-10	155	5b2	8 VAR	2 EACH 8′-10±17′-10	111	5b2	6 VAR	2 EACH 8′-10±14′-10	74
WINGWALL, B.F.H.		4b3	2	39′-10	53	4b3	2	36′-10	49	4b3	2	33′-10	45	4b3	2	30′-10	41	4b3	2	27′-10	37	4b3	2	24′-10	33	4b3	2	21′-10	29	4b3	2	18′-10	25	4b3	2	15′-10	21
WINGWALL, B.F.H.		4b4	20 VAR	2 EACH 11′-10±38′-10	338	4b4	18 VAR	2 EACH 11′-10±35′-10	287	4b4	16 VAR	2 EACH 11′-10±32′-10	239	4b4	14 VAR	2 EACH 11′-10±29′-10	195	4b4	12 VAR	2 EACH 11′-10±26′-10	155	4b4	10 VAR	2 EACH 11′-10±23′-10	119	4b4	8 VAR	2 EACH 11′-10±20′-10	87	4b4	6 VAR	2 EACH 11′-10±17′-10	59	4b4	4 VAR	2 EACH 11′-10±14′-10	36
WINGWALL, F.F.V.		5c1	148 VAR	2 EACH 2′-8±14′-10	1351	5c1	90 VAR	2 EACH 2′-8±13′-8	767	5c1	82 VAR	2 EACH 2′-8±12′-8	656	5c1	56 VAR	2 EACH 2′-8±11′-8	419	5c1	50 VAR	2 EACH 2′-8±10′-8	348	4c1	44 VAR	2 EACH 2′-8±9′-8	181	4c1	38 VAR	2 EACH 2′-8±8′-8	144	4c1	32 VAR	2 EACH 2′-8±7′-8	110	4c1	26 VAR	2 EACH 2′-8±6′-8	81
WINGWALL, F.F.V. (L)		5c2	2	14′-11	31	5c2	2	13′-11	29	5c2	2	12′-11	27	5c2	2	11′-11	25	5c2	2	10′-11	23	4c2	2	9′-11	13	4c2	2	8′-11	12	4c2	2	7′-11	11	4c2	2	6′-11	9
WINGWALL, F.F.V. (R)		5c2	2	14′-11	31	5c2	2	13′-11	29	5c2	2	12′-11	27	5c2	2	11′-11	25	5c2	2	10′-11	23	4c2	2	9′-11	13	4c2	2	8′-11	12	4c2	2	7′-11	11	4c2	2	6′-11	9
WINGWALL, B.F.V.		6c3	74 VAR	2 EACH 6′-3±18′-3	1362	5c3	68 VAR	2 EACH 6′-3±17′-3	833	5c3	62 VAR	2 EACH 6′-3±16′-3	727	5c3	56 VAR	2 EACH 6′-3±15′-3	628	5c3	50 VAR	2 EACH 6′-3±14′-3	535	5c3	44 VAR	2 EACH 6′-3±13′-3	447	6c3	38 VAR	2 EACH 6′-3±12′-3	528	6c3	32 VAR	2 EACH 6′-3±11′-3	421	5c3	26 VAR	2 EACH 6′-3±10′-3	224
WINGWALL, B.F.V. (L)		6c4	2	18′-5	55	5c4	2	17′-5	36	5c4	2	16′-5	34	5c4	2	15′-5	32	5c4	2	14′-5	30	5c4	2	13′-5	28	6c4	2	12′-5	37	6c4	2	11′-5	34	5c4	2	10′-5	22
WINGWALL, B.F.V. (R)		6c4	2	18′-5	55	5c4	2	17′-5	36	5c4	2	16′-5	34	5c4	2	15′-5	32	5c4	2	14′-5	30	5c4	2	13′-5	28	6c4	2	12′-5	37	6c4	2	11′-5	34	5c4	2	10′-5	22
WINGWALL, B.F.V.		6c5	48	8′-6	613	5c5	44	8′-6	390	5c5	42	8′-6	372	5c5	38	8′-6	337	5c5	34	8′-6	301	5c5	30	8′-6	266	c5	—	—	—	c5	—	—	—	c5	—	—	—
APRON, LONGIT., BOTT.		4d1	9	39′-10	239	4d1	9	36′-10	221	4d1	9	33′-10	203	4d1	9	30′-10	185	4d1	9	27′-10	167	4d1	9	24′-10	149	4d1	9	21′-10	131	4d1	9	18′-10	113	4d1	9	15′-10	95
APRON, LONGIT., TOP		6f1	11	39′-10	658	6f1	11	36′-10	609	6f1	11	33′-10	559	6f1	11	30′-10	509	6f1	11	27′-10	460	6f1	11	24′-10	410	6f1	11	21′-10	361	6f1	11	18′-10	311	6f1	11	15′-10	262
PARAPET, VERTICAL		4i1	21	6′-5	90	4i1	21	6′-5	90	4i1	21	6′-5	90	4i1	21	6′-5	90	4i1	21	6′-5	90	4i1	21	6′-5	90	4i1	21	6′-5	90	4i1	21	6′-5	90	4i1	21	6′-5	90
PARAPET, HORIZ.		7j1	4	11′-8	95	7j1	4	11′-8	95	7j1	4	11′-4	93	7j1	4	11′-4	93	7j1	4	11′-4	93	7j1	4	11′-2	91	7j1	4	11′-2	91	7j1	4	11′-2	91	7j1	4	11′-2	91
APRON, TRANS., TOP		6m1	51	12′-2	923	6m1	47	12′-2	859	6m1	43	11′-10	764	6m1	39	11′-10	693	6m1	35	11′-10	622	6m1	31	11′-8	543	6m1	27	11′-8	473	6m1	23	11′-8	403	6m1	19	11′-8	333
APRON, TRANS., TOP		m2	—	—	—	m2	—	—	—	m2	—	—	—	m2	—	—	—	m2	—	—	—	m2	—	—	—	m2	—	—	—	m2	—	—	—	m2	—	—	—
APRON, TRANS., BOTT.		5m3	73	8′-11	679	5m3	67	8′-11	623	6m3	31	9′-5	438	6m3	28	9′-5	396	5m3	25	8′-7	224	4m3	22	7′-7	111	4m3	19	7′-7	96	4m3	16	7′-7	81	4m3	13	7′-7	66
CURTAIN, HORIZ.		6p1	6	12′-2	110	6p1	6	12′-2	110	6p1	6	11′-10	107	6p1	6	11′-10	107	6p1	6	11′-10	107	6p1	5	11′-8	88	6p1	5	11′-8	88	6p1	5	11′-8	88	6p1	5	11′-8	88
WING SLOPE, BOTH F.		6s1	4	35′-8	214	6s1	4	32′-6	195	6s1	4	29′-4	176	6s1	4	26′-2	157	6s1	4	23′-0	138	6s1	4	19′-10	119	6s1	4	16′-8	100	6s1	4	13′-7	82	6s1	4	10′-5	63
WING SLOPE, BOTH F. (L)		6s2	2	7′-9	23	6s2	2	7′-9	23	6s2	2	7′-9	23	6s2	2	7′-9	23	6s2	2	7′-9	23	6s2	2	7′-9	23	6s2	2	7′-9	23	6s2	2	7′-9	23	6s2	2	7′-9	23
WING SLOPE, BOTH F. (R)		6s3	2	7′-9	23	6s3	2	7′-9	23	6s3	2	7′-9	23	6s3	2	7′-9	23	6s3	2	7′-9	23	6s3	2	7′-9	23	6s3	2	7′-9	23	6s3	2	7′-9	23	6s3	2	7′-9	23
WING SLOPE, F. F.		6s4	2	11′-0	33	6s4	2	11′-0	33	6s4	2	11′-0	33	6s4	2	11′-0	33	6s4	2	11′-0	33	6s4	2	11′-0	33	6s4	2	11′-0	33	6s4	2	11′-0	33	6s4	2	11′-0	33
WING SLOPE, F. F.		6s5	2	33′-5	100	6s5	2	30′-3	91	6s5	2	27′-1	81	6s5	2	23′-11	72	6s5	2	20′-9	62	6s5	2	17′-7	53	6s5	2	14′-5	43	6s5	2	11′-3	34	6s5	2	8′-1	24
CURTAIN, VERT.		5t1	11	7′-11	91	5t1	11	7′-8	88	5t1	11	7′-5	85	5t1	11	7′-2	82	5t1	11	6′-11	79	5t1	11	6′-8	76	5t1	11	6′-5	74	5t1	11	6′-5	74	5t1	11	6′-5	74
CURTAIN, VERT., ENDS		5t2	4	7′-11	33	5t2	4	7′-8	32	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′-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

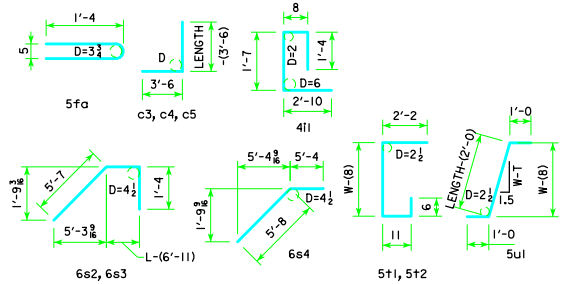
ESTIMATED QUANTITIES ONE HEADWALL	REINF. STEEL	7873 LBS.			6124 LBS.			5361 LBS.			4645 LBS.			3980 LBS.			3250 LBS.			2768 LBS.			2356 LBS.			1851 LBS.		
	CONCRETE	PARAPET Δ	1.5	46.5 CU.YD.	PARAPET Δ	1.5	41.6 CU.YD.	PARAPET Δ	1.4	33.6 CU.YD.	PARAPET Δ	1.4	29.6 CU.YD.	PARAPET Δ	1.4	25.9 CU.YD.	PARAPET Δ	1.3	21.2 CU.YD.	PARAPET Δ	1.3	18.1 CU.YD.	PARAPET Δ	1.3	15.3 CU.YD.	PARAPET Δ	1.3	12.5 CU.YD.
		WINGWALLS	21.8		WINGWALLS	18.7		WINGWALLS	13.2		WINGWALLS	11.0		WINGWALLS	9.0		WINGWALLS	6.4		WINGWALLS	5.0		WINGWALLS	3.7		WINGWALLS	2.5	
		APRON	23.2		APRON	21.4		APRON	19.0		APRON	17.2		APRON	15.5		APRON	13.5		APRON	11.8		APRON	10.3		APRON	8.7	

Δ INCLUDES TOP OF WINGWALL QUANTITIES.

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

(L) - INDICATES BAR LOCATED AT LEFT CORNER.
(R) - INDICATES BAR LOCATED AT RIGHT CORNER.
REFER TO SHEET PWH 0-1-12 FOR LEFT AND RIGHT 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.

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
10′-0 SPAN
0° SKEW

PWH 0-6-12

ENGLISHLRFDSIGNEDSINGLECULVERTS.DGN - PWH 0-6-12 - THIS SHEET ISSUED 04-12.