

ENGLISH\FDS\DESIGNED\CULVERTS.DGN - PWH 45-8-20 - THIS SHEET ISSUED 07-2020.

## Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

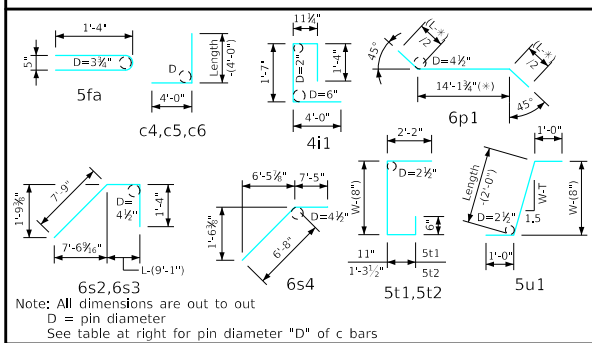
Location	Shape	10' x 12'				10' x 11'				10' x 10'				10' x 9'				10' x 8'				10' x 7'																										
		Bar No.	No.	Length	Wt.	Bar No.	No.	Length	Wt.	Bar No.	No.	Length	Wt.	Bar No.	No.	Length	Wt.	Bar No.	No.	Length	Wt.	Bar No.	No.	Length	Wt.																							
Fence Anchor (Galv.)		5fa	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	5'-2"	122	5b1	2	5'-11"	113	5b1	2	4'-8"	104	5b1	2	4'-3"	96	5b1	2	3'-9"	82	5b1	2	3'-4"	73																							
Wingwall, F.F.H.		5b2	22 Var.	2 Each 11'-9" to 5'-2"	776	5b2	20 Var.	2 Each 11'-9" to 4'-11"	658	5b2	18 Var.	2 Each 11'-9" to 4'-5"	550	5b2	16 Var.	2 Each 11'-9" to 4'-1"	449	5b2	14 Var.	2 Each 11'-9" to 3'-7"	358	5b2	12 Var.	2 Each 11'-9" to 3'-0"	280																							
Wingwall, B.F.H.		4b3	2	5'-6"	79	4b3	2	4'-8"	73	4b3	2	4'-1"	67	4b3	2	4'-3"	62	4b3	2	3'-9"	53	4b3	2	3'-5"	47																							
Wingwall, B.F.H.		4b4	20 Var.	2 Each 16'-7" to 5'-4"	489	4b4	18 Var.	2 Each 16'-7" to 5'-0"	413	4b4	16 Var.	2 Each 16'-5" to 4'-6"	340	4b4	14 Var.	2 Each 16'-5" to 4'-1"	276	4b4	12 Var.	2 Each 16'-5" to 3'-7"	216	4b4	10 Var.	2 Each 16'-4" to 3'-3"	166																							
Wingwall, F.F.V.		5c1	104 Var.	2 Each 2'-7" to 14'-7"	931	5c1	96 Var.	2 Each 2'-7" to 13'-8"	814	4c1	88 Var.	2 Each 2'-7" to 12'-8"	448	4c1	80 Var.	2 Each 2'-7" to 11'-9"	383	4c1	72 Var.	2 Each 2'-7" to 10'-8"	416	4c1	64 Var.	2 Each 2'-7" to 9'-8"	336																							
Wingwall, F.F.V.		5c2	50 Var.	2 Each 9'-0" to 14'-8"	617	5c2	42 Var.	2 Each 9'-0" to 13'-9"	498	4c2	32 Var.	2 Each 9'-0" to 12'-7"	231	4c2	24 Var.	2 Each 9'-0" to 11'-8"	166	c2	--	--	--	c2	--	--	--																							
Wingwall, F.F.V. (O)		5c3	2	15'-0"	31	5c3	2	14'-0"	29	4c3	2	13'-0"	17	4c3	2	12'-0"	16	4c3	2	11'-0"	15	4c3	2	10'-0"	13																							
Wingwall, F.F.V. (A)		5c3	3	15'-0"	47	5c3	3	14'-0"	44	4c3	3	13'-0"	26	4c3	3	12'-0"	24	4c3	3	11'-0"	22	4c3	3	10'-0"	20																							
Wingwall, B.F.V.		6c4	104 Var.	2 Each 6'-9" to 18'-9"	1992	5c4	96 Var.	2 Each 6'-9" to 17'-10"	1231	5c4	88 Var.	2 Each 6'-9" to 16'-10"	1082	5c4	80 Var.	2 Each 6'-9" to 15'-11"	946	5c4	70 Var.	2 Each 6'-9" to 14'-9"	785	5c4	62 Var.	2 Each 6'-9" to 13'-10"	666																							
Wingwall, B.F.V. (O)		6c5	1	19'-0"	29	5c5	1	18'-0"	19	5c5	1	17'-0"	17	5c5	1	16'-0"	17	5c5	1	15'-0"	16	5c5	1	14'-0"	15																							
Wingwall, B.F.V. (A)		6c5	4	19'-0"	114	5c5	4	18'-0"	75	5c5	4	17'-0"	71	5c5	4	16'-0"	67	5c5	4	15'-0"	63	5c5	4	14'-0"	58																							
Wingwall, B.F.V.		6c6	68	9'-0"	919	6c6	60	9'-0"	811	6c6	50	9'-0"	676	6c6	42	9'-0"	568	5c6	34	9'-0"	319	5c6	26	9'-0"	244																							
Apron, LongR. Bott.		4d1	11	55'-11"	429	4d1	11	51'-8"	397	4d1	11	47'-6"	367	4d1	11	43'-3"	336	4d1	11	39'-0"	287	4d1	11	34'-9"	255																							
Apron, LongR. Top		6f1	11	55'-11"	964	6f1	11	51'-8"	894	6f1	11	47'-6"	825	6f1	11	43'-3"	755	6f1	11	39'-0"	644	6f1	11	34'-9"	574																							
Parapet, Vertical		4i1	21	7'-10"	110	4i1	21	7'-10"	110	4i1	21	7'-10"	110	4i1	21	7'-10"	110	4i1	21	7'-10"	110	4i1	21	7'-10"	110																							
Parapet, Horiz.		9j1	4	16'-6"	224	9j1	4	16'-6"	224	9j1	4	16'-0"	218	9j1	4	16'-0"	218	9j1	4	16'-0"	218	9j1	4	15'-9"	214																							
Apron, Trans., Top		6m1	97	12'-2"	1773	6m1	88	12'-2"	1608	6m1	80	11'-10"	1422	5m1	71	11'-10"	876	5m1	63	11'-10"	778	5m1	54	11'-8"	657																							
Apron, Trans., Top		6m2	18 Var.	2'-3" to 10'-9"	176	6m2	18 Var.	2'-6" to 11'-0"	182	6m2	18 Var.	2'-1" to 10'-7"	171	5m2	18 Var.	2'-1" to 10'-10"	124	5m2	18 Var.	2'-1" to 10'-7"	119	5m2	18 Var.	2'-3" to 10'-9"	122																							
Apron, Trans., Bott.		6m3	73	13'-3"	1453	5m3	67	12'-5"	868	5m3	61	12'-0"	763	6m3	28	12'-9"	536	6m3	25	12'-9"	479	5m3	22	11'-9"	270																							
Curtain, Horiz.		6p1	6	16'-3"	146	6p1	6	16'-3"	146	6p1	6	15'-11"	143	6p1	6	15'-11"	143	6p1	6	15'-11"	143	6p1	5	15'-9"	118																							
Wing Slope, Both F.		6s1	4	48'-4"	305	6s1	4	43'-11"	278	6s1	4	39'-7"	238	6s1	4	35'-3"	212	6s1	4	30'-10"	185	6s1	4	26'-6"	159																							
Wing Slope, Both F. (O)		6s2	2	9'-5"	28	6s2	2	9'-5"	28	6s2	2	9'-7"	29	6s2	2	9'-7"	29	6s2	2	9'-7"	29	6s2	2	9'-8"	29																							
Wing Slope, Both F. (A)		6s3	2	10'-5"	31	6s3	2	10'-5"	31	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	14'-1"	42	6s4	2	14'-1"	42	6s4	2	14'-1"	42	6s4	2	14'-1"	42	6s4	2	14'-1"	42	6s4	2	14'-1"	42																							
Wing Slope, F.F.		6s5	2	45'-10"	145	6s5	2	41'-6"	132	6s5	2	37'-2"	112	6s5	2	32'-9"	98	6s5	2	28'-5"	85	6s5	2	24'-1"	72																							
Curtain, Vert.		5t1	15	7'-11"	124	5t1	15	7'-8"	120	5t1	15	7'-5"	116	5t1	15	7'-2"	112	5t1	15	6'-11"	108	5t1	15	6'-8"	104																							
Curtain, Vert. Ends		5t2	4	8'-4"	35	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																							
Bracket, Vert.		5u1	4	6'-7"	27	5u1	4	6'-4"	26	5u1	4	6'-2"	26	5u1	4	5'-11"	25	5u1	4	5'-8"	24	5u1	4	5'-6"	23																							
Estimated Quantities One Headwall	Reinf. Steel	12,164 LB				9904 LB				8282 LB				6755 LB				5664 LB				4734 LB																										
	Concrete	Parapet Δ 2.3		Wingwalls 30.4		Apron * 32.9		65.6 CY		2.3		26.1		30.3		58.7 CY		2.1		18.4		26.9		47.4 CY		2.1		15.3		22.0		41.8 CY		2.1		12.5		22.0		36.6 CY		2.0		8.9		19.2		30.1 CY

Δ Includes top of wingwall quantities.  
 \* Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal.

(A) - Indicates bar located at acute corner.  
 (O) - Indicates bar located at obtuse corner.  
 Refer to Sheet PWH 45-1-20 for acute and obtuse corner locations.

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

### Bent Bar Details



c Bar Pin Diameter	
Bar Size	D
5	3/8"
6	1/2"

### Headwall Notes:

- This headwall is based on a 3:1 slope normal to centerline of roadway.
- The sides of the apron are to be formed to ensure correct line and grade.
- All apron 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'-5" 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'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.
- Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

Standard Design - Single Reinforced Concrete Box Culverts

**Parallel Wing Headwalls**

July, 2020

Quantity Tabulation  
 10'-0" Span  
 45° Skew

PWH 45-8-20  
 SHEET 1 OF 2