

ENGLISH\FDS\DESIGNED\CULVERTS.DGN - PWH 45-10-20 - THIS SHEET ISSUED 07-2020.

### Bill of Reinforcing for One Headwall 45° Skew 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	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	39'-2	82	5b1	2	34'-11	73	5b1	2	30'-9	64	5b1	2	26'-6	55	5b1	2	22'-3	46	5b1	2	18'-0	38
Wingwall, F.F.H.		5b2	14 Var.	2 Each 11'-9 to 37'-3	358	5b2	12 Var.	2 Each 11'-9 to 33'-0	280	5b2	10 Var.	2 Each 11'-9 to 28'-9	211	5b2	8 Var.	2 Each 11'-9 to 24'-6	151	5b2	6 Var.	2 Each 11'-9 to 20'-3	100	5b2	4 Var.	2 Each 11'-9 to 16'-0	58
Wingwall, B.F.H.		4b3	2	39'-7	53	4b3	2	35'-3	47	4b3	2	31'-0	41	4b3	2	26'-9	36	4b3	2	22'-6	30	4b3	2	18'-3	24
Wingwall, B.F.H.		4b4	12 Var.	2 Each 16'-5 to 37'-7	216	4b4	10 Var.	2 Each 16'-4 to 33'-3	166	4b4	8 Var.	2 Each 16'-4 to 29'-1	121	4b4	6 Var.	2 Each 16'-4 to 24'-7	82	4b4	4 Var.	2 Each 16'-4 to 20'-3	49	4b4	2	16'-4	22
Wingwall, F.F.V.		4c1	94 Var.	2 Each 2'-5 to 10'-6	406	4c1	82 Var.	2 Each 2'-5 to 9'-6	326	4c1	72 Var.	2 Each 2'-5 to 8'-7	265	4c1	46 Var.	2 Each 2'-5 to 7'-7	154	4c1	36 Var.	2 Each 2'-5 to 6'-5	106	4c1	28 Var.	2 Each 2'-5 to 5'-5	73
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	--	c2	--	--	--	c2	--	--	--	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	10'-10	14	4c3	2	9'-10	13	4c3	2	8'-10	12	4c3	2	7'-10	10	4c3	2	6'-10	9	4c3	2	5'-10	8
Wingwall, F.F.V. (A)		4c3	3	10'-10	22	4c3	3	9'-10	20	4c3	3	8'-10	18	4c3	3	7'-10	16	4c3	3	6'-10	14	4c3	3	5'-10	12
Wingwall, B.F.V.		5c4	70 Var.	2 Each 6'-7 to 14'-7	773	5c4	62 Var.	2 Each 6'-7 to 13'-8	655	5c4	54 Var.	2 Each 6'-7 to 12'-8	542	5c4	46 Var.	2 Each 6'-7 to 11'-9	440	5c4	36 Var.	2 Each 6'-7 to 10'-7	322	5c4	28 Var.	2 Each 6'-7 to 9'-8	237
Wingwall, B.F.V. (O)		5c5	1	14'-10	15	5c5	1	13'-10	14	5c5	1	12'-10	13	5c5	1	11'-10	12	5c5	1	10'-10	11	5c5	1	9'-10	10
Wingwall, B.F.V. (A)		5c5	4	14'-10	62	5c5	4	13'-10	58	5c5	4	12'-10	54	5c5	4	11'-10	49	5c5	4	10'-10	45	5c5	4	9'-10	41
Wingwall, B.F.V.		5c6	34	9'-0	319	5c6	26	9'-0	244	5c6	16	9'-0	150	c6	--	--	--	c6	--	--	--	c6	--	--	--
Apron, LongR. Bott.		4d1	7	39'-0	182	4d1	7	34'-9	162	4d1	7	30'-6	143	4d1	7	26'-3	123	4d1	7	22'-0	103	4d1	7	17'-9	83
Apron, LongR. Top		6f1	7	39'-0	410	6f1	7	34'-9	365	6f1	7	30'-6	321	6f1	7	26'-3	276	6f1	7	22'-0	231	6f1	7	17'-9	187
Parapet, Vertical		4i1	13	7'-10	68	4i1	13	7'-10	68	4i1	13	7'-10	68	4i1	13	7'-10	68	4i1	13	7'-10	68	4i1	13	7'-10	68
Parapet, Horiz.		9j1	4	10'-4	141	9j1	4	10'-1	137	9j1	4	10'-1	137	9j1	4	10'-1	137	9j1	4	10'-1	137	9j1	4	10'-1	137
Apron, Trans., Top		5m1	34	7'-10	278	5m1	29	7'-8	232	5m1	25	7'-8	200	5m1	21	7'-8	168	5m1	17	7'-8	136	5m1	12	7'-8	96
Apron, Trans., Top		5m2	5 Var.	2'-1 to 6'-1	21	5m2	5 Var.	2'-9 to 6'-9	25	5m2	5 Var.	2'-6 to 6'-6	23	5m2	5 Var.	2'-3 to 6'-3	22	5m2	5 Var.	2'-0 to 6'-0	21	5m2	5 Var.	2'-9 to 6'-9	25
Apron, Trans., Bott.		5m3	49	6'-4	324	5m3	22	6'-1	140	5m3	19	6'-1	121	5m3	16	6'-1	102	5m3	13	6'-1	82	5m3	10	6'-1	63
Curtain, Horiz.		6p1	6	10'-3	92	6p1	5	10'-1	76	6p1	5	10'-1	76	6p1	5	10'-1	76	6p1	5	10'-1	76	6p1	5	10'-1	76
Wing Slope, Both F.		6s1	4	30'-10	185	6s1	4	26'-6	159	6s1	4	22'-2	133	6s1	4	17'-9	107	6s1	4	13'-5	81	6s1	4	9'-1	55
Wing Slope, Both F. (O)		6s2	2	9'-7	29	6s2	2	9'-8	29	6s2	2	9'-8	29	6s2	2	9'-8	29	6s2	2	9'-8	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	28'-5	85	6s5	2	24'-1	72	6s5	2	19'-8	59	6s5	2	15'-4	46	6s5	2	11'-0	33	6s5	2	6'-7	20
Curtain, Vert.		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	5t1	9	6'-5	60
Curtain, Vert. Ends		5t2	4	7'-4	31	5t2	4	7'-1	30	5t2	4	6'-10	29	5t2	4	6'-10	29	5t2	4	6'-10	29	5t2	4	6'-10	29
Bracket, Vert.		5u1	4	5'-8	24	5u1	4	5'-5	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	4334 LB				3556 LB				2991 LB				2349 LB				1919 LB				1552 LB			
	Concrete	27.6 CY				22.1 CY				18.6 CY				15.5 CY				12.5 CY				9.9 CY			
	Parapet Δ	1.6	Wingwalls	12.5	Apron *	13.5	1.5	8.9	11.7	1.5	6.8	10.3	1.5	5.0	9.0	1.5	3.4	7.6	1.5	2.1	6.3	1.5	2.1	6.3	

Δ Includes top of wingwall quantities.

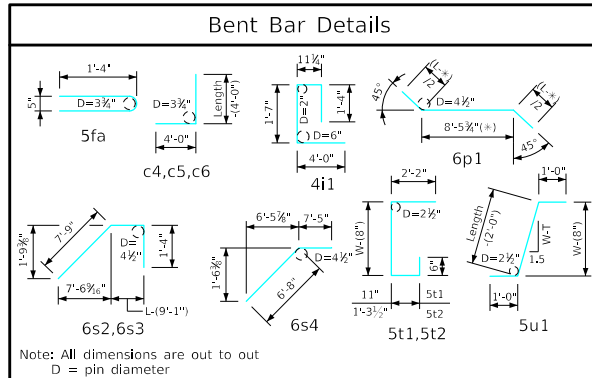
\* Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal.

(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.

#### 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		PWH	45-10-20
6'-0" Span			
45° Skew			