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

Location	Shape	12' x 12' Bar	No.	Length	Wt.	12' x 11' Bar	No.	Length	Wt.	12' x 10' Bar	No.	Length	Wt.	12' x 9' Bar	No.	Length	Wt.	12' x 8' Bar	No.	Length	Wt.	12' x 7' 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	56'-2	122	5b1	2	51'-11	113	5b1	2	47'-8	104	5b1	2	43'-5	96	5b1	2	39'-2	82	5b1	2	34'-11	73
Wingwall, F.F.H.		5b2	22 Var.	2 Each 11'-9 to 54'-2	776	5b2	20 Var.	2 Each 11'-9 to 49'-11	658	5b2	18 Var.	2 Each 11'-9 to 45'-9	550	5b2	16 Var.	2 Each 11'-9 to 41'-6	449	5b2	14 Var.	2 Each 11'-9 to 37'-3	358	5b2	12 Var.	2 Each 11'-9 to 33'-0	280
Wingwall, B.F.H.		4b3	2	56'-9	79	4b3	2	52'-6	73	4b3	2	48'-1	67	4b3	2	43'-10	62	4b3	2	39'-7	53	4b3	2	35'-3	47
Wingwall, B.F.H.		4b4	20 Var.	2 Each 16'-7 to 54'-9	489	4b4	18 Var.	2 Each 16'-7 to 50'-6	413	4b4	16 Var.	2 Each 16'-5 to 46'-1	340	4b4	14 Var.	2 Each 16'-5 to 41'-10	276	4b4	12 Var.	2 Each 16'-5 to 37'-7	216	4b4	10 Var.	2 Each 16'-4 to 33'-3	166
Wingwall, F.F.V.		5c1	104 Var.	2 Each 2'-8 to 14'-8	940	5c1	96 Var.	2 Each 2'-8 to 13'-9	822	4c1	88 Var.	2 Each 2'-8 to 12'-9	453	4c1	80 Var.	2 Each 2'-8 to 11'-10	387	4c1	94 Var.	2 Each 2'-8 to 10'-9	421	4c1	82 Var.	2 Each 2'-8 to 9'-9	340
Wingwall, F.F.V.		5c2	50 Var.	2 Each 9'-1 to 14'-9	621	5c2	42 Var.	2 Each 9'-1 to 13'-10	502	4c2	32 Var.	2 Each 9'-1 to 12'-8	232	4c2	24 Var.	2 Each 9'-1 to 11'-9	167	c2	--	--	--	c2	--	--	--
Wingwall, F.F.V. (O)		5c3	2	15'-1	31	5c3	2	14'-1	29	4c3	2	13'-1	17	4c3	2	12'-1	16	4c3	2	11'-1	15	4c3	2	10'-1	13
Wingwall, F.F.V. (A)		5c3	3	15'-1	47	5c3	3	14'-1	44	4c3	3	13'-1	26	4c3	3	12'-1	24	4c3	3	11'-1	22	4c3	3	10'-1	20
Wingwall, B.F.V.		6c4	104 Var.	2 Each 6'-10 to 18'-10	2005	5c4	96 Var.	2 Each 6'-10 to 17'-11	1239	5c4	88 Var.	2 Each 6'-10 to 16'-11	1090	5c4	80 Var.	2 Each 6'-10 to 16'-0	953	5c4	70 Var.	2 Each 6'-10 to 14'-10	791	5c4	62 Var.	2 Each 6'-10 to 13'-11	671
Wingwall, B.F.V. (O)		6c5	1	19'-1	29	5c5	1	18'-1	19	5c5	1	17'-1	18	5c5	1	16'-1	17	5c5	1	15'-1	16	5c5	1	14'-1	15
Wingwall, B.F.V. (A)		6c5	4	19'-1	115	5c5	4	18'-1	75	5c5	4	17'-1	71	5c5	4	16'-1	67	5c5	4	15'-1	63	5c5	4	14'-1	59
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, Longit., Bott.		4d1	13	55'-11	507	4d1	13	51'-8	470	4d1	13	47'-6	433	4d1	13	43'-3	397	4d1	13	39'-0	339	4d1	13	34'-9	302
Apron, Longit., Top		6f1	13	55'-11	1139	6f1	13	51'-8	1056	6f1	13	47'-6	975	6f1	13	43'-3	892	6f1	13	39'-0	762	6f1	13	34'-9	679
Parapet, Vertical		4i1	25	7'-10	131	4i1	25	7'-10	131	4i1	25	7'-10	131	4i1	25	7'-10	131	4i1	25	7'-10	131	4i1	25	7'-10	131
Parapet, Horiz.		9j1	4	19'-3	262	9j1	4	19'-3	262	9j1	4	18'-10	256	9j1	4	18'-10	256	9j1	4	18'-10	256	9j1	4	18'-7	253
Apron, Trans., Top		6m1	95	14'-2	2021	6m1	86	14'-2	1830	6m1	78	13'-10	1621	5m1	69	13'-10	996	5m1	61	13'-10	880	5m1	52	13'-8	741
Apron, Trans., Top		6m2	22 Var.	2'-3 to 12'-9	248	6m2	22 Var.	2'-6 to 13'-0	256	6m2	22 Var.	2'-1 to 12'-7	242	5m2	22 Var.	2'-4 to 12'-10	174	5m2	22 Var.	2'-1 to 12'-7	168	5m2	22 Var.	2'-3 to 12'-9	172
Apron, Trans., Bott.		6m3	73	16'-1	1763	5m3	67	15'-3	1066	6m3	31	15'-7	726	6m3	28	15'-7	655	6m3	25	15'-7	585	5m3	22	14'-7	335
Curtain, Horiz.		6p1	6	19'-1	172	6p1	6	19'-1	172	6p1	6	18'-9	169	6p1	6	18'-9	169	6p1	6	18'-9	169	6p1	5	18'-7	140
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	17	7'-11	140	5t1	17	7'-8	136	5t1	17	7'-5	132	5t1	17	7'-2	127	5t1	17	6'-11	123	5t1	17	6'-8	118
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'-5	27	5u1	4	6'-2	26	5u1	4	5'-11	25	5u1	4	5'-9	24	5u1	4	5'-6	23

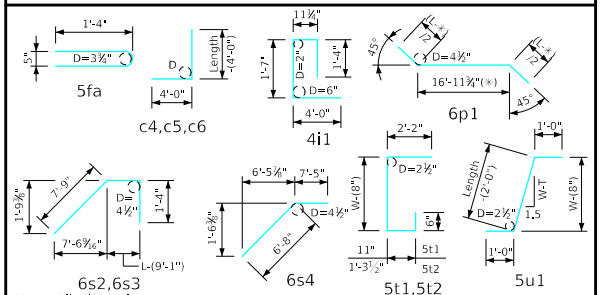
Estimated Quantities One Headwall	Reinf. Steel		13,175 LB		10,755 LB		8846 LB		7354 LB		6202 LB		5191 LB	
	Concrete	Parapet Δ	2.5	72.9 CY	2.5	65.5 CY	2.3	53.6 CY	2.3	47.4 CY	2.3	41.6 CY	2.2	34.6 CY
		Wingwalls	30.4		26.1		18.4		15.3		12.5		8.9	
		Apron ✳	40.0		36.9		32.9		29.8		26.8		23.5	

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.

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

(A) - Indicates bar located at acute corner.
(0) - Indicates bar located at obtuse corner.
Refer to Sheet PWH 45-1-20 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
5	3¾"
6	4½"

Headwall Notes:

1. This headwall is based on a 3:1 slope normal to centerline of roadway.
2. The sides of the apron are to be formed to ensure correct line and grade.
3. 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.
4. 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.
5. Concrete quantities are estimated from back of parapet.
6. 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.
7. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

Standard Design - Single Reinforced Concrete Box Culverts

Parallel Wing Headwalls

July, 2020

Quantity Tabulation
12'-0" Span
45° Skew

PWH 45-7-20
SHEET 1 OF 2

ENGLISHLRFDSIGNEDSINGLECULVERTS.DGN - PWH 45-7-20 S1 - THIS SHEET ISSUED 07-2020.