Bill of Reinforcing for One Headwall 15° Skew Span x Culvert Height

Location	Shape	10' x 12' Bar	No.	Length	Wt.	10' x 11' Bar	No.	Length	Wt.	10' x 10' Bar	No.	Length	Wt.	10' x 9' Bar	No.	Length	Wt.	10' x 8' Bar	No.	Length	Wt.	10' 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	41'-7	92	5b1	2	38'-6	80	5b1	2	35'-5	74	5b1	2	32'-4	67	5b1	2	29'-2	61	5b1	2	26'-1	54
Wingwall, F.F.H.		5b2	22 Var.	2 Each 9'-2 to 40'-2	571	5b2	20 Var.	2 Each 9'-2 to 37'-1	482	5b2	18 Var.	2 Each 9'-2 to 34'-0	405	5b2	16 Var.	2 Each 9'-2 to 30'-11	334	5b2	14 Var.	2 Each 9'-2 to 27'-9	270	5b2	12 Var.	2 Each 9'-2 to 24'-8	212
Wingwall, B.F.H.		4b3	2	41'-9	59	4b3	2	38'-8	52	4b3	2	35'-6	47	4b3	2	32'-5	43	4b3	2	29'-3	39	4b3	2	26'-2	35
Wingwall, B.F.H.		4b4	20 Var.	2 Each 12'-5 to 40'-4	356	4b4	18 Var.	2 Each 12'-5 to 37'-3	299	4b4	16 Var.	2 Each 12'-4 to 34'-1	248	4b4	14 Var.	2 Each 12'-4 to 31'-0	203	4b4	12 Var.	2 Each 12'-4 to 27'-11	161	4b4	10 Var.	2 Each 12'-4 to 24'-9	124
Wingwall, F.F.V.		5c1	76 Var.	2 Each 2'-7 to 14'-6	677	5c1	70 Var.	2 Each 2'-7 to 13'-6	587	4c1	64 Var.	2 Each 2'-7 to 12'-7	324	4c1	58 Var.	2 Each 2'-7 to 11'-7	274	4c1	68 Var.	2 Each 2'-7 to 10'-7	299	4c1	60 Var.	2 Each 2'-7 to 9'-7	244
Wingwall, F.F.V.		5c2	36 Var.	2 Each 9'-2 to 14'-8	447	5c2	30 Var.	2 Each 9'-2 to 13'-8	357	4c2	24 Var.	2 Each 9'-2 to 12'-9	176	4c2	16 Var.	2 Each 9'-2 to 11'-5	110	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	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, B.F.V.		6c4	76 Var.	2 Each 6'-3 to 18'-2	1394	5c4	70 Var.	2 Each 6'-3 to 17'-3	858	5c4	64 Var.	2 Each 6'-3 to 16'-3	751	5c4	58 Var.	2 Each 6'-3 to 15'-4	653	5c4	52 Var.	2 Each 6'-3 to 14'-4	558	5c4	46 Var.	2 Each 6'-3 to 13'-4	470
Wingwall, B.F.V. (O)		6c5	1	18'-6	28	5c5	1	17'-6	18	5c5	1	16'-6	17	5c5	1	15'-6	16	5c5	1	14'-6	15	5c5	1	13'-6	14
Wingwall, B.F.V. (A)		6c5	2	18'-6	56	5c5	2	17'-6	37	5c5	2	16'-6	34	5c5	2	15'-6	32	5c5	2	14'-6	30	5c5	2	13'-6	28
Wingwall, B.F.V.		6c6	50	8'-6	638	5c6	44	8'-6	390	5c6	38	8'-6	337	5c6	30	8'-6	266	5c6	24	8'-6	213	5c6	18	8'-6	160
Apron, Longit., Bott.		4d1	11	41'-7	323	4d1	11	38'-5	282	4d1	11	35'-4	260	4d1	11	32'-3	237	4d1	11	29'-2	214	4d1	11	26'-0	191
Apron, Longit., Top		6f1	11	41'-7	727	6f1	11	38'-5	635	6f1	11	35'-4	584	6f1	11	32'-3	533	6f1	11	29'-2	482	6f1	11	26'-0	430
Parapet, Vertical		4i1	21	6'-7	92	4i1	21	6'-7	92	4i1	21	6'-7	92	4i1	21	6'-7	92	4i1	21	6'-7	92	4i1	21	6'-7	92
Parapet, Horiz.		7j1	4	12'-0	98	7j1	4	12'-0	98	7j1	4	11'-8	95	7j1	4	11'-8	95	7j1	4	11'-8	95	7j1	4	11'-6	94
Apron, Trans., Top		5m1	50	12'-2	634	5m1	46	12'-2	584	5m1	42	11'-10	518	5m1	38	11'-10	469	5m1	34	11'-10	420	5m1	30	11'-8	365
Apron, Trans., Top		5m2	4 Var.	2'-7 to 11'-0	28	5m2	4 Var.	2'-3 to 10'-7	27	5m2	3 Var.	4'-6 to 10'-1	23	5m2	3 Var.	4'-1 to 9'-8	22	5m2	3 Var.	3'-8 to 9'-3	20	5m2	3 Var.	3'-3 to 8'-10	19
Apron, Trans., Bott.		6m3	73	9'-10	1078	5m3	67	9'-0	629	6m3	31	9'-5	438	5m3	37	8'-8	334	5m3	25	8'-8	226	5m3	22	8'-6	195
Curtain, Horiz.		6p1	6	12'-6	113	6p1	6	12'-6	113	6p1	6	12'-2	110	6p1	6	12'-2	110	6p1	6	12'-2	110	6p1	5	12'-0	90
Wing Slope, Both F.		6s1	4	36'-8	220	6s1	4	33'-5	201	6s1	4	30'-2	181	6s1	4	26'-11	162	6s1	4	23'-8	142	6s1	4	20'-5	123
Wing Slope, Both F. (O)		6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24
Wing Slope, Both F. (A)		6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24
Wing Slope, F.F.		6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35
Wing Slope, F.F.		6s5	2	34'-2	103	6s5	2	30'-11	93	6s5	2	27'-8	83	6s5	2	24'-5	73	6s5	2	21'-2	64	6s5	2	17'-11	54
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
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
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

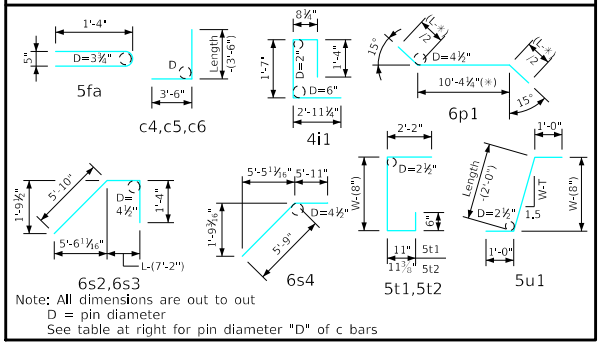
Estimated Quantities One Headwall	Reinf. Steel		10' x 12'		10' x 11'		10' x 10'		10' x 9'		10' x 8'		10' x 7'	
			8035 LB		6206 LB		5062 LB		4383 LB		3762 LB		3236 LB	
	Concrete	Parapet Δ	1.7	48.1 CY	1.7	43.1 CY	1.5	34.6 CY	1.5	30.6 CY	1.5	26.7 CY	1.4	22.0 CY
		Wingwalls	22.3		19.1		13.4		11.2		9.1		6.5	
		Apron ✳	24.1		22.3		19.7		17.9		16.1		14.1	

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 15-1-20 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
10'-0" Span
15° Skew

PWH 15-8-20
SHEET 1 OF 2

ENGLISHLRFDSIGNEDSINGLECULVERTS.DGN - PWH 15-8-20 S1 - THIS SHEET ISSUED 07-2020.