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

Location	Shape	16' x 6' Bar	No.	Length	Wt.	16' x 5' Bar	No.	Length	Wt.	16' x 4' Bar	No.	Length	Wt.
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6
Wingwall, F.F.H.		5b1	2	23'-0	48	5b1	2	19'-10	41	5b1	2	16'-9	35
Wingwall, F.F.H.		5b2	10 Var.	2 Each 9'-2 to 21'-7	160	5b2	8 Var.	2 Each 9'-2 to 18'-5	115	5b2	6 Var.	2 Each 9'-2 to 15'-4	77
Wingwall, B.F.H.		4b3	2	23'-1	31	4b3	2	19'-11	27	4b3	2	16'-10	22
Wingwall, B.F.H.		4b4	8 Var.	2 Each 12'-4 to 21'-8	91	4b4	6 Var.	2 Each 12'-4 to 18'-6	62	4b4	4 Var.	2 Each 12'-4 to 15'-5	37
Wingwall, F.F.V.		4c1	52 Var.	2 Each 2'-10 to 8'-11	204	4c1	34 Var.	2 Each 2'-10 to 8'-0	123	4c1	26 Var.	2 Each 2'-10 to 6'-8	82
Wingwall, F.F.V.		c2	--	--	--	c2	--	--	–	c2	--	--	--
Wingwall, F.F.V. (O)		4c3	2	9'-3	12	4c3	2	8'-3	11	4c3	2	7'-3	10
Wingwall, F.F.V. (A)		4c3	2	9'-3	12	4c3	2	8'-3	11	4c3	2	7'-3	10
Wingwall, B.F.V.		5c4	40 Var.	2 Each 6'-6 to 12'-8	400	6c4	44 Var.	2 Each 6'-6 to 11'-7	598	5c4	36 Var.	2 Each 6'-6 to 10'-8	322
Wingwall, B.F.V. (O)		5c5	1	12'-9	13	6c5	1	11'-9	18	5c5	1	10'-9	11
Wingwall, B.F.V. (A)		5c5	2	12'-9	27	6c5	2	11'-9	35	5c5	2	10'-9	22
Wingwall, B.F.V.		5c6	12	8'-6	106	c6	--	--	–	c6	--	--	--
Apron, Longit., Bott.		4d1	17	22'-11	260	4d1	17	19'-10	225	4d1	17	16'-8	189
Apron, Longit., Top		6f1	17	22'-11	585	6f1	17	19'-10	506	6f1	17	16'-8	426
Parapet, Vertical		4i1	33	6'-7	145	4i1	33	6'-7	145	4i1	33	6'-7	145
Parapet, Horiz.,		9j1	4	17'-9	241	9j1	4	17'-9	241	9j1	4	17'-9	241
Apron, Trans., Top		5m1	36	17'-8	663	5m1	30	17'-8	553	5m1	24	17'-8	442
Apron, Trans., Top		5m2	9 Var.	2'-1 to 17'-0	90	5m2	8 Var.	3'-6 to 16'-7	84	5m2	8 Var.	3'-2 to 16'-3	81
Apron, Trans., Bott.		4m3	19	13'-11	177	4m3	16	14'-5	154	4m3	13	13'-11	121
Curtain, Horiz.		6p1	5	18'-2	136	6p1	5	18'-2	136	6p1	5	18'-2	136
Wing Slope, Both F.		6s1	4	17'-1	103	6s1	4	13'-10	83	6s1	4	10'-7	64
Wing Slope, Both F. (O)		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
Wing Slope, F.F.		6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35
Wing Slope, F.F.		6s5	2	14'-8	44	6s5	2	11'-4	34	6s5	2	8'-1	24
Curtain, Vert.		5t1	17	6'-5	114	5t1	17	6'-5	114	5t1	17	6'-5	114
Curtain, Vert, Ends		5t2	4	6'-5	27	5t2	4	6'-5	27	5t2	4	6'-5	27
Bracket, Vert.		5u1	4	5'-5	23	5u1	4	5'-5	23	5u1	4	5'-5	23

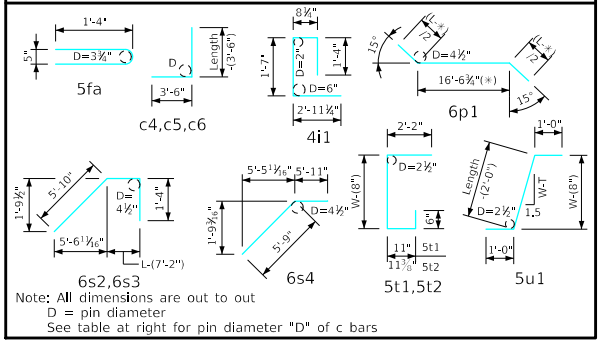
Estimated Quantities One Headwall			Reinf. Steel	3801 LB		3455 LB		2750 LB	
	Concrete	Parapet Δ	1.9	28.1 CY		1.9	23.9 CY	1.9	19.8 CY
		Wingwalls	5.0			3.7		2.5	
		Apron ✳	21.2			18.3		15.4	

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.
(0) - Indicates bar located at obtuse corner.
Refer to Sheet PWH 15-1-20 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



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"
7	5⅛"

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
16'-0" Span
15° Skew

PWH 15-5-20
SHEET 2 OF 2

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