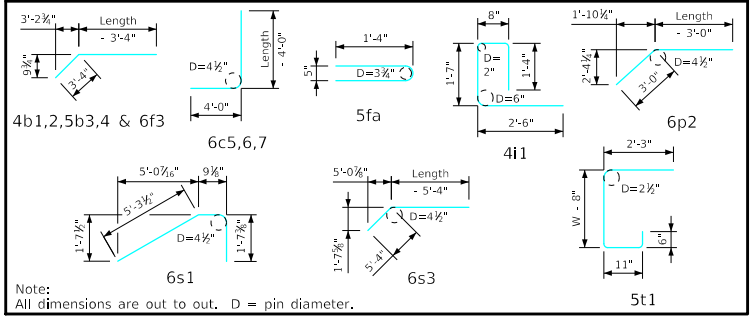
Bill of Reinforcing for One Headwall 0° Skew Span x Culvert Height

Bar	Location	Shape	5' x 6' No.	5' x 6' Length	5' x 6' Wt.	5' x 5' No.	5' x 5' Length	5' x 5' Wt.	5' x 4' No.	5' x 4' Length	5' x 4' Wt.	5' x 3' No.	5' x 3' Length	5' x 3' Wt.	4' x 4' No.	4' x 4' Length	4' x 4' Wt.	3' x 3' No.	3' x 3' Length	3' x 3' Wt.	Bar
5fa	Fence Anchor (Galv.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa
4b1	Wingwall, B.F.H.		2	22'-8	30	2	19'-7	26	2	16'-6	22	2	13'-5	18	2	16'-6	22	2	13'-5	18	4b1
4b2	Wingwall, B.F.H.		8 Var.	2 Each 11'-11 to 21'-3	89	6 Var.	2 Each 11'-11 to 18'-2	60	4 Var.	2 Each 11'-11 to 15'-1	36	2	12'-0	16	4 Var.	2 Each 11'-11 to 15'-1	36	2	12'-0	16	4b2
5b3	Wingwall, F.F.H.		2	22'-8	47	2	19'-7	41	2	16'-6	34	2	13'-5	28	2	16'-6	34	2	13'-5	28	5b3
5b4	Wingwall, F.F.H.		10 Var.	2 Each 8'-11 to 21'-3	157	8 Var.	2 Each 8'-11 to 18'-2	113	6 Var.	2 Each 8'-11 to 15'-1	75	4 Var.	2 Each 8'-11 to 12'-0	44	6 Var.	2 Each 8'-11 to 15'-1	75	4 Var.	2 Each 8'-11 to 12'-0	44	5b4
4c1	Wingwall, F.F.V.		40 Var.	2 Each 2'-8 to 8'-10	154	32 Var.	2 Each 2'-8 to 7'-7	110	26 Var.	2 Each 2'-8 to 6'-7	80	20 Var.	2 Each 2'-8 to 5'-7	55	26 Var.	2 Each 2'-8 to 6'-7	80	20 Var.	2 Each 2'-8 to 5'-7	55	4c1
4c2	Wingwall, F.F.V.		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4c2
4c3	Wingwall, F.F.V.		2	7'-7	10	4	6'-7	18	4	5'-7	15	4	4'-7	12	4	5'-7	15	4	4'-7	12	4c3
5c4	Wingwall, B.F.V.		12 Var.	2 Each 2'-8 to 4'-4	44	12 Var.	2 Each 2'-8 to 4'-4	44	12 Var.	2 Each 2'-8 to 4'-4	44	12 Var.	2 Each 2'-8 to 4'-4	44	12 Var.	2 Each 2'-8 to 4'-4	44	12 Var.	2 Each 2'-8 to 4'-4	44	5c4
6c5	Wingwall, B.F.V.		28 Var.	2 Each 8'-8 to 12'-10	452	20 Var.	2 Each 8'-8 to 11'-7	304	14 Var.	2 Each 8'-8 to 10'-7	202	8 Var.	2 Each 8'-8 to 9'-7	110	14 Var.	2 Each 8'-8 to 10'-7	202	8 Var.	2 Each 8'-8 to 9'-7	110	6c5
6c6	Wingwall, B.F.V.		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6c6
6c7	Wingwall, B.F.V.		2	11'-7	35	4	10'-7	64	4	9'-7	58	4	8'-7	52	4	9'-7	58	4	8'-7	52	6c7
4d1	Apron, Longit., Bott.		3	15'-11	32	3	13'-11	28	3	11'-11	24	3	9'-11	20	3	11'-11	24	3	9'-11	20	4d1
4d2	Apron, Longit., Bott.		6	17'-8	71	6	14'-7	58	6	11'-6	46	6	8'-5	34	6	11'-6	46	6	8'-5	34	4d2
6f1	Apron, Longit., Top		4	15'-11	96	4	13'-11	84	4	11'-11	72	4	9'-11	60	3	11'-11	54	2	9'-11	30	6f1
6f2	Apron, Longit., Top		8 Var.	2 Each 4'-7 to 12'-10	105	6 Var.	2 Each 5'-4 to 10'-10	73	4 Var.	2 Each 6'-1 to 8'-10	45	4 Var.	2 Each 4'-0 to 6'-10	33	4 Var.	2 Each 6'-1 to 8'-10	45	4 Var.	2 Each 4'-0 to 6'-10	33	6f2
6f3	Apron, Longit., Top		2	22'-8	68	2	19'-7	59	2	16'-6	50	2	13'-5	40	2	16'-6	50	2	13'-5	40	6f3
4i1	Parapet, Vertical		11	6'-1	45	11	6'-1	45	11	6'-1	45	11	6'-1	45	9	6'-1	37	7	6'-1	28	4i1
7j1	Parapet, Horizontal		4	6'-2	50	4	6'-2	50	4	6'-2	50	4	6'-2	50	4	5'-2	42	4	4'-2	34	7j1
6m1	Apron, Trans., Top		18 Var.	6'-4 to 12'-9	258	15 Var.	6'-4 to 11'-7	202	13 Var.	6'-4 to 10'-10	168	10 Var.	6'-4 to 9'-9	121	13 Var.	5'-4 to 9'-10	148	10 Var.	4'-4 to 7'-9	91	6m1
6m2	Apron, Trans., Bott.		9 Var.	2'-3 to 6'-3	57	7 Var.	2'-3 to 5'-3	39	5 Var.	2'-3 to 4'-3	24	3 Var.	2'-3 to 3'-3	12	--	--	--	--	--	--	6m2
6p1	Curtain, Horizontal		4	5'-3	32	4	5'-3	32	4	5'-3	32	4	5'-2	31	4	4'-3	26	4	3'-2	19	6p1
6p2	Curtain, Horizontal		8	11'-1	133	8	9'-10	118	8	8'-7	103	8	7'-4	88	8	8'-7	103	8	7'-4	88	6p2
6s1	Wing Slope, Both F.		4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	4	7'-8	46	6s1
6s2	Wing Slope, Both F.		4	17'-7	106	4	14'-4	86	4	11'-1	67	4	7'-10	47	4	11'-1	67	4	7'-10	47	6s2
6s3	Wing Slope, F.F.		2	23'-8	71	2	20'-5	61	2	17'-2	52	2	13'-11	42	2	17'-2	52	2	13'-11	42	6s3
5t1	Curtain, Vertical		13	6'-6	88	11	6'-6	75	9	6'-6	61	7	6'-6	47	9	6'-6	61	7	6'-6	47	5t1
	Estimated Quantities One Headwall	Reinf. Steel		2282 LB			1842 LB			1457 LB			1101 LB			1373 LB			984 LB		
		Concrete Parapet Δ	1.0			1.0			1.0			1.0			1.0			0.9			
		Concrete Wingwalls	5.0	16.4 CY		3.7	13.2 CY		2.5	10.3 CY		1.5	7.7 CY		2.5	9.8 CY		1.5	6.8 CY		
		Concrete Apron ✳	10.4			8.5			6.8			5.2			6.3			4.4			

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.

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.
Lengths shown for bars over 40'-0" long do not include lap.

Bent Bar Details



Note:
All dimensions are out to out. D = pin diameter.

Headwall Notes:

1. See Sheet FWH G2-21 for General Notes, Specifications, and Design Stresses.
2. This headwall is based on a 3:1 slope normal to centerline of roadway.
3. The sides of the apron are to be formed to ensure correct line and grade.
4. 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.
5. 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.
6. Concrete quantities are estimated from back of parapet.
7. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "d", "6f1" and "6f3" 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.
8. 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

Flared Wing Headwalls

February, 2021

Quantity Tabulation
5'-0", 4'-0" & 3'-0" Spans
0° Skew

FWH 0-11-21

ENGLISHLRFDSIGNEDSINGLECULVERTSFWH.DGN - FWH 0-11-21 - THIS SHEET ISSUED 02-2021.