

ENGLISHLRFDDESIGNEDSINGLECVLVERTSFHW.DGN - FW 15-12-21 - THIS SHEET ISSUED 02-2021.

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

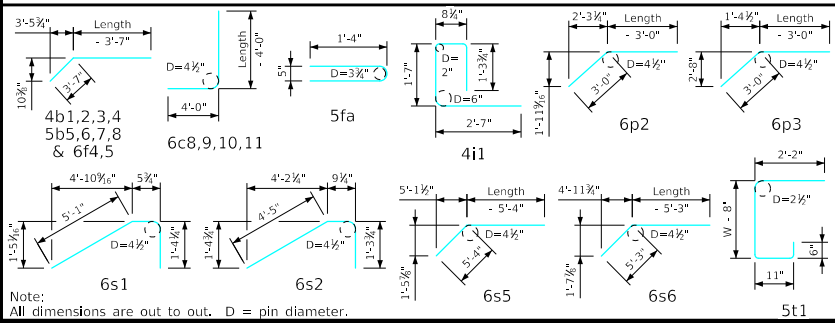
Bar	Location	Shape	5' x 6'			5' x 5'			5' x 4'			5' x 3'			Bar		
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.			
5fa	Fence Anchor (Galv.)		2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	5fa		
4b1	Wingwall, B.F.H, Long		1	25'-1	17	1	21'-7"	14	1	18'-2"	12	1	14'-9"	10	4b1		
4b2	Wingwall, B.F.H, Short		1	22'-4"	15	1	19'-4"	13	1	16'-4"	11	1	13'-4"	9	4b2		
4b3	Wingwall, B.F.H, Long		4 Var.	13'-2 to 23'-6	49	3 Var.	13'-2 to 20'-1	33	2 Var.	13'-2 to 16'-7	20	1	13'-2	9	4b3		
4b4	Wingwall, B.F.H, Short		4 Var.	11'-11 to 20'-11	44	3 Var.	11'-11 to 17'-11	30	2 Var.	11'-11 to 14'-11	18	1	11'-11	8	4b4		
5b5	Wingwall, F.F.H, Long		1	25'-1	26	1	21'-8"	23	1	18'-3"	19	1	14'-10"	15	5b5		
5b6	Wingwall, F.F.H, Short		1	22'-4"	23	1	19'-4"	20	1	16'-4"	17	1	13'-4"	14	5b6		
5b7	Wingwall, F.F.H, Long		5 Var.	9'-0 to 23'-6	87	4 Var.	9'-0 to 20'-1	62	3 Var.	9'-0 to 16'-8	41	2 Var.	9'-0 to 13'-3	24	5b7		
5b8	Wingwall, F.F.H, Short		5 Var.	9'-0 to 21'-0	78	4 Var.	9'-0 to 18'-0	56	3 Var.	9'-0 to 15'-0	38	2 Var.	9'-0 to 12'-0	22	5b8		
4c1	Wingwall, F.F.V, Long		22 Var.	2'-8 to 8'-10	85	18 Var.	2'-8 to 7'-8	62	15 Var.	2'-8 to 6'-9	47	11 Var.	2'-8 to 5'-7	30	4c1		
4c2	Wingwall, F.F.V, Short		19 Var.	2'-8 to 8'-8	72	16 Var.	2'-8 to 7'-8	55	13 Var.	2'-8 to 6'-8	41	10 Var.	2'-8 to 5'-8	28	4c2		
4c3	Wingwall, F.F.V, Long		--	--	--	--	--	--	--	--	--	--	--	--	4c3		
4c4	Wingwall, F.F.V, Short		--	--	--	--	--	--	--	--	--	--	--	--	4c4		
4c5	Wingwall, F.F.V, Long		1	7'-7"	5	2	6'-7"	9	2	5'-7"	4	2	4'-7"	6	4c5		
4c5	Wingwall, F.F.V, Short		2	7'-7"	10	2	6'-7"	9	2	5'-7"	7	2	4'-7"	6	4c5		
5c6	Wingwall, B.F.V, Long		9 Var.	2'-8 to 5'-0	36	9 Var.	2'-8 to 5'-0	36	9 Var.	2'-8 to 5'-0	36	9 Var.	2'-8 to 5'-0	36	5c6		
5c7	Wingwall, B.F.V, Short		6 Var.	2'-8 to 4'-4	22	6 Var.	2'-8 to 4'-4	22	6 Var.	2'-8 to 4'-4	22	6 Var.	2'-8 to 4'-4	22	5c7		
6c8	Wingwall, B.F.V, Long		13 Var.	9'-4 to 12'-10	216	9 Var.	9'-4 to 11'-8	142	6 Var.	9'-4 to 10'-9	90	2 Var.	9'-4 to 9'-7	28	6c8		
6c9	Wingwall, B.F.V, Short		13 Var.	8'-8 to 12'-8	208	10 Var.	8'-8 to 11'-8	153	7 Var.	8'-8 to 10'-8	102	4 Var.	8'-8 to 9'-8	55	6c9		
6c10	Wingwall, B.F.V, Long		--	--	--	--	--	--	--	--	--	--	--	--	6c10		
6c10	Wingwall, B.F.V, Short		--	--	--	--	--	--	--	--	--	--	--	--	6c10		
6c11	Wingwall, B.F.V, Long		1	11'-7"	17	2	10'-7"	32	1	9'-7"	14	2	8'-7"	26	6c11		
6c11	Wingwall, B.F.V, Short		2	11'-7"	35	2	10'-7"	32	2	9'-7"	29	2	8'-7"	26	6c11		
4d1	Apron, Longit., Bott.		3	16'-5"	33	3	14'-4"	29	3	12'-4"	25	3	10'-3"	21	4d1		
4d2	Apron, Longit., Bott, Long		3	19'-8"	39	3	16'-3"	33	3	12'-10"	26	3	9'-5"	19	4d2		
4d3	Apron, Longit., Bott, Short		3	17'-5"	35	3	14'-5"	29	3	11'-5"	23	3	8'-5"	17	4d3		
6f1	Apron, Longit., Top		4	16'-5"	99	4	14'-4"	86	4	12'-4"	74	4	10'-3"	62	6f1		
6f2	Apron, Longit., Top Long		4 Var.	5'-6 to 13'-2	56	3 Var.	5'-11 to 11'-1	38	2 Var.	6'-5 to 9'-0	23	1	6'-11	10	6f2		
6f3	Apron, Longit., Top Short		4 Var.	4'-5 to 13'-3	53	3 Var.	5'-3 to 11'-2	37	2 Var.	6'-2 to 9'-1	23	1	7'-1	11	6f3		
6f4	Apron, Longit., Top Long		1	25'-1	38	1	21'-8"	33	1	18'-3"	27	1	14'-10"	22	6f4		
6f5	Apron, Longit., Top Short		1	22'-4"	34	1	19'-4"	29	1	16'-4"	25	1	13'-4"	20	6f5		
4i1	Parapet, Vertical		11	6'-2"	45	11	6'-2"	45	11	6'-2"	45	11	6'-2"	45	4i1		
7j1	Parapet, Horizontal		4	6'-4"	52	4	6'-4"	52	4	6'-4"	52	4	6'-4"	52	7j1		
6m1	Apron, Trans., Top		2 Var.	6'-8 to 6'-10	20	2 Var.	6'-8 to 6'-10	20	2 Var.	6'-8 to 6'-10	20	2 Var.	6'-8 to 6'-10	20	6m1		
6m2	Apron, Trans., Top		16 Var.	7'-1 to 12'-8	237	13 Var.	7'-1 to 11'-7	182	10 Var.	7'-1 to 10'-5	131	8 Var.	7'-1 to 9'-8	101	6m2		
6m3	Apron, Trans., Top		2 Var.	4'-3 to 6'-11	17	2 Var.	4'-4 to 7'-0	17	2 Var.	4'-6 to 7'-1	17	1	4'-7"	7	6m3		
6m4	Apron, Trans., Bott.		10 Var.	1'-10 to 6'-8	64	8 Var.	1'-10 to 5'-7	45	6 Var.	1'-10 to 4'-6	29	4 Var.	1'-10 to 3'-5	16	6m4		
6p1	Curtain, Horizontal		4	5'-5"	33	4	5'-5"	33	4	5'-5"	33	4	5'-4"	32	6p1		
6p2	Curtain, Horizontal, Long		4	12'-8"	76	4	11'-2"	67	4	9'-8"	58	4	8'-2"	49	6p2		
6p3	Curtain, Horizontal, Short		4	10'-2"	61	4	9'-1"	55	4	7'-11"	48	4	6'-10"	41	6p3		
6s1	Wing Slope, Both F., Long		2	6'-11"	21	2	6'-11"	21	2	6'-11"	21	2	6'-11"	21	6s1		
6s2	Wing Slope, Both F., Short		2	6'-6"	20	2	6'-6"	20	2	6'-6"	20	2	6'-6"	20	6s2		
6s3	Wing Slope, Both F., Long		2	19'-10"	60	2	16'-3"	49	2	12'-8"	38	2	9'-1"	27	6s3		
6s4	Wing Slope, Both F., Short		2	17'-11"	54	2	14'-9"	44	2	11'-7"	35	2	8'-5"	25	6s4		
6s5	Wing Slope, F.F, Long		1	25'-0"	38	1	21'-5"	32	1	17'-10"	27	1	14'-3"	21	6s5		
6s6	Wing Slope, F.F, Short		1	22'-8"	34	1	19'-6"	29	1	16'-4"	25	1	13'-2"	20	6s6		
5t1	Curtain, Vertical		12	6'-5"	80	10	6'-5"	67	8	6'-5"	54	6	6'-5"	40	5t1		
Estimated Quantities One Headwall			Reinf. Steel			2350 LB			1901 LB			1473 LB			1099 LB		
			Concrete			17.2 CY			13.8 CY			10.8 CY			8.1 CY		
			Parapet Δ			1.1			1.1			1.1			1.1		
			Wingwalls			5.2			3.8			2.6			1.6		
			Apron =			10.9			8.9			7.1			5.4		

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.

"Short" Denotes Short Wingwall
 "Long" Denotes Long Wingwall

Bent Bar Details



Headwall Notes:

- See Sheet FW 21 for General Notes, Specifications, and Design Stresses.
- 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" and "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "d", "6f1", "6f4" and "6f5" 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	IOWADOT Highway Division	
		Standard Design - Single Reinforced Concrete Box Culverts	
		Flared Wing Headwalls	
		February, 2021	
Quantity Tabulation		FWH	
5'-0" Span		15-12-21	
15° Skew			