

ENGLISHLRFDDESIGNEDSINGLECVLVERTSFHW.DGN - FW 30-12-21 - THIS SHEET ISSUED 02-2021.

Bill of Reinforcing for One Headwall 30° Skew Span x Culvert Height

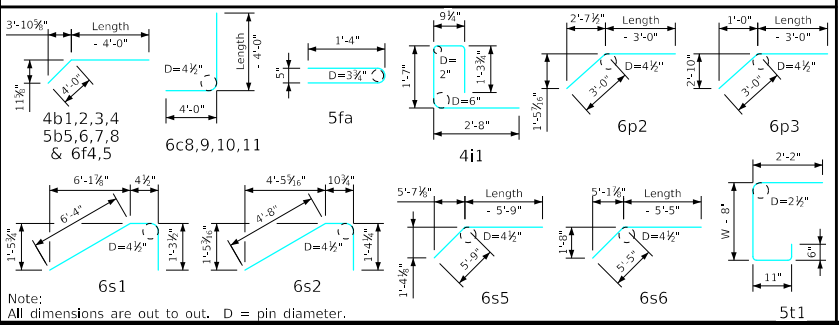
Bar	Location	Shape	5' x 6'			5' x 5'			5' x 4'			5' x 3'			Bar		
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.			
5fa	Fence Anchor (Galv.)		2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	5fa		
4b1	Wingwall, B.F.H, Long		1	30'-2"	20	1	26'-0"	17	1	21'-10"	15	1	17'-8"	12	4b1		
4b2	Wingwall, B.F.H, Short		1	23'-6"	16	1	20'-5"	14	1	17'-3"	12	1	14'-2"	9	4b2		
4b3	Wingwall, B.F.H, Long		4 Var.	15'-8" to 28'-3"	59	3 Var.	15'-8" to 24'-1"	40	2 Var.	15'-8" to 19'-10"	24	1	15'-8"	10	4b3		
4b4	Wingwall, B.F.H, Short		4 Var.	12'-10" to 22'-1"	47	3 Var.	12'-9" to 19'-0"	32	2 Var.	12'-9" to 15'-10"	19	1	12'-9"	9	4b4		
5b5	Wingwall, F.F.H, Long		1	30'-2"	31	1	26'-0"	27	1	21'-10"	23	1	17'-8"	18	5b5		
5b6	Wingwall, F.F.H, Short		1	23'-6"	25	1	20'-5"	21	1	17'-4"	18	1	14'-2"	15	5b6		
5b7	Wingwall, F.F.H, Long		5 Var.	11'-7" to 28'-3"	104	4 Var.	11'-7" to 24'-1"	74	3 Var.	11'-7" to 19'-11"	49	2 Var.	11'-7" to 15'-9"	29	5b7		
5b8	Wingwall, F.F.H, Short		5 Var.	9'-9" to 22'-1"	83	4 Var.	9'-9" to 19'-0"	60	3 Var.	9'-8" to 15'-11"	40	2 Var.	9'-8" to 12'-9"	23	5b8		
4c1	Wingwall, F.F.V, Long		26 Var.	2'-8" to 8'-8"	98	22 Var.	2'-8" to 7'-8"	76	18 Var.	2'-8" to 6'-9"	57	14 Var.	2'-8" to 5'-9"	39	4c1		
4c2	Wingwall, F.F.V, Short		20 Var.	2'-8" to 8'-9"	76	17 Var.	2'-8" to 7'-10"	60	14 Var.	2'-8" to 6'-10"	44	10 Var.	2'-8" to 5'-7"	28	4c2		
4c3	Wingwall, F.F.V, Long		--	--	--	--	--	--	--	--	--	--	--	--	4c3		
4c4	Wingwall, F.F.V, Short		--	--	--	--	--	--	--	--	--	--	--	--	4c4		
4c5	Wingwall, F.F.V, Long		2	7'-7"	10	2	6'-7"	9	2	5'-7"	7	1	4'-7"	3	4c5		
4c5	Wingwall, F.F.V, Short		1	7'-7"	5	1	6'-7"	4	1	5'-7"	4	2	4'-7"	6	4c5		
5c6	Wingwall, B.F.V, Long		11 Var.	2'-8" to 5'-1"	44	11 Var.	2'-8" to 5'-1"	44	11 Var.	2'-8" to 5'-1"	44	11 Var.	2'-8" to 5'-1"	44	5c6		
5c7	Wingwall, B.F.V, Short		5 Var.	2'-8" to 4'-0"	17	5 Var.	2'-8" to 4'-0"	17	5 Var.	2'-8" to 4'-0"	17	5 Var.	2'-8" to 4'-0"	17	5c7		
6c8	Wingwall, B.F.V, Long		15 Var.	9'-4" to 12'-8"	248	11 Var.	9'-4" to 11'-8"	173	7 Var.	9'-4" to 10'-9"	106	3 Var.	9'-4" to 9'-9"	43	6c8		
6c9	Wingwall, B.F.V, Short		15 Var.	8'-4" to 12'-9"	238	12 Var.	8'-4" to 11'-10"	182	9 Var.	8'-4" to 10'-10"	130	5 Var.	8'-4" to 9'-7"	67	6c9		
6c10	Wingwall, B.F.V, Long		--	--	--	--	--	--	--	--	--	--	--	--	6c10		
6c10	Wingwall, B.F.V, Short		--	--	--	--	--	--	--	--	--	--	--	--	6c10		
6c11	Wingwall, B.F.V, Long		2	11'-7"	35	2	10'-7"	32	2	9'-7"	29	1	8'-7"	13	6c11		
6c11	Wingwall, B.F.V, Short		1	11'-7"	17	1	10'-7"	16	1	9'-7"	14	2	8'-7"	26	6c11		
4d1	Apron, Longit., Bott.		3	18'-1"	36	3	15'-9"	32	3	13'-5"	27	3	11'-1"	22	4d1		
4d2	Apron, Longit., Bott, Long		3	23'-9"	48	3	19'-7"	39	3	15'-4"	31	3	11'-2"	22	4d2		
4d3	Apron, Longit., Bott, Short		3	18'-7"	37	3	15'-5"	31	3	12'-4"	25	3	9'-2"	18	4d3		
6f1	Apron, Longit., Top		4	18'-1"	109	4	15'-9"	95	4	13'-5"	81	4	11'-1"	67	6f1		
6f2	Apron, Longit., Top Long		5 Var.	5'-3" to 14'-7"	74	4 Var.	5'-3" to 12'-4"	53	3 Var.	5'-3" to 10'-0"	34	2 Var.	5'-4" to 7'-8"	20	6f2		
6f3	Apron, Longit., Top Short		4 Var.	5'-5" to 14'-10"	61	3 Var.	6'-2" to 12'-6"	42	2 Var.	7'-0" to 10'-3"	26	1	7'-11"	12	6f3		
6f4	Apron, Longit., Top Long		1	30'-2"	45	1	26'-0"	39	1	21'-10"	33	1	17'-8"	27	6f4		
6f5	Apron, Longit., Top Short		1	23'-6"	35	1	20'-5"	31	1	17'-4"	26	1	14'-2"	21	6f5		
4i1	Parapet, Vertical		11	6'-4"	47	11	6'-4"	47	11	6'-4"	47	11	6'-4"	47	4i1		
7j1	Parapet, Horizontal		4	7'-1"	58	4	7'-1"	58	4	7'-1"	58	4	7'-1"	58	7j1		
6m1	Apron, Trans., Top		3 Var.	6'-10" to 7'-2"	32	3 Var.	6'-10" to 7'-2"	32	3 Var.	6'-10" to 7'-2"	32	3 Var.	6'-10" to 7'-2"	32	6m1		
6m2	Apron, Trans., Top		16 Var.	7'-5" to 13'-0"	245	13 Var.	7'-5" to 11'-11"	189	10 Var.	7'-5" to 10'-9"	136	7 Var.	7'-5" to 9'-8"	90	6m2		
6m3	Apron, Trans., Top		4 Var.	4'-9" to 8'-1"	39	4 Var.	4'-1" to 7'-5"	35	4 Var.	3'-5" to 6'-9"	31	4 Var.	2'-9" to 6'-1"	27	6m3		
6m4	Apron, Trans., Bott.		10 Var.	2'-1" to 8'-3"	78	8 Var.	2'-1" to 6'-11"	54	6 Var.	2'-1" to 5'-6"	34	4 Var.	2'-1" to 4'-2"	19	6m4		
6p1	Curtain, Horizontal		4	5'-11"	36	4	5'-11"	36	4	5'-11"	36	4	5'-10"	35	6p1		
6p2	Curtain, Horizontal, Long		4	16'-0"	96	4	13'-11"	84	4	11'-11"	72	4	9'-11"	60	6p2		
6p3	Curtain, Horizontal, Short		4	9'-8"	58	4	8'-8"	52	4	7'-7"	46	4	6'-7"	40	6p3		
6s1	Wing Slope, Both F., Long		2	8'-0"	24	2	8'-0"	24	2	8'-0"	24	2	8'-0"	24	6s1		
6s2	Wing Slope, Both F., Short		2	6'-11"	21	2	6'-11"	21	2	6'-11"	21	2	6'-11"	21	6s2		
6s3	Wing Slope, Both F., Long		2	23'-2"	70	2	18'-10"	57	2	14'-7"	44	2	10'-3"	31	6s3		
6s4	Wing Slope, Both F., Short		2	18'-4"	55	2	15'-1"	45	2	11'-10"	36	2	8'-7"	26	6s4		
6s5	Wing Slope, F.F, Long		1	29'-3"	44	1	25'-0"	38	1	20'-8"	31	1	16'-5"	25	6s5		
6s6	Wing Slope, F.F, Short		1	23'-7"	35	1	20'-4"	31	1	17'-0"	26	1	13'-9"	21	6s6		
5t1	Curtain, Vertical		16	6'-5"	107	14	6'-5"	94	12	6'-5"	80	9	6'-5"	60	5t1		
Estimated Quantities One Headwall			Reinf. Steel			2669 LB			2163 LB			1695 LB			1242 LB		
			Concrete			1.2			1.2			1.2			1.2		
			Parapet Δ			1.2			1.2			1.2			1.2		
			Wingwalls			5.9			4.3			2.9			1.8		
			Apron =			12.8			10.4			8.2			6.2		
			19.9 CY			15.9 CY			12.3 CY			9.2 CY					

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" & "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		30-12-21	
30° Skew			