

Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

Bar	Location	Shape	14' x 7'			14' x 6'			14' x 5'			14' x 4'			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	47'-2"	33	1	41'-4"	29	1	35'-6"	24	1	29'-8"	20	4b1		
4b2	Wingwall, B.F.H, Short		1	30'-1"	20	1	26'-7"	18	1	23'-1"	15	1	19'-7"	13	4b2		
4b3	Wingwall, B.F.H, Long		5 Var.	21'-2 to 44'-5"	111	4 Var.	21'-1 to 38'-7"	80	3 Var.	21'-1 to 32'-9"	54	2 Var.	21'-1 to 26'-11"	32	4b3		
4b4	Wingwall, B.F.H, Short		5 Var.	14'-6 to 28'-5"	72	4 Var.	14'-6 to 24'-11"	53	3 Var.	14'-6 to 21'-5"	36	2 Var.	14'-6 to 17'-11"	22	4b4		
5b5	Wingwall, F.F.H, Long		1	47'-2"	52	1	41'-4"	46	1	35'-6"	37	1	29'-9"	31	5b5		
5b6	Wingwall, F.F.H, Short		1	30'-1"	31	1	26'-7"	28	1	23'-1"	24	1	19'-7"	20	5b6		
5b7	Wingwall, F.F.H, Long		6 Var.	15'-4 to 44'-5"	189	5 Var.	15'-4 to 38'-7"	141	4 Var.	15'-4 to 32'-9"	100	3 Var.	15'-4 to 26'-11"	66	5b7		
5b8	Wingwall, F.F.H, Short		6 Var.	11'-0 to 28'-6"	124	5 Var.	11'-0 to 25'-0"	94	4 Var.	11'-0 to 21'-6"	68	3 Var.	11'-0 to 18'-0"	45	5b8		
4c1	Wingwall, F.F.V, Long		43 Var.	2'-9 to 10'-0"	183	37 Var.	2'-9 to 9'-0"	145	31 Var.	2'-9 to 7'-11"	110	25 Var.	2'-9 to 6'-11"	81	4c1		
4c2	Wingwall, F.F.V, Short		26 Var.	2'-10 to 10'-0"	111	22 Var.	2'-10 to 8'-10"	86	19 Var.	2'-10 to 8'-0"	69	15 Var.	2'-10 to 6'-10"	48	4c2		
4c3	Wingwall, F.F.V, Long		--	--	--	--	--	--	--	--	--	--	--	--	4c3		
4c4	Wingwall, F.F.V, Short		--	--	--	--	--	--	--	--	--	--	--	--	4c4		
4c5	Wingwall, F.F.V, Long		1	8'-9"	6	1	7'-9"	5	2	6'-9"	9	2	5'-9"	8	4c5		
4c5	Wingwall, F.F.V, Short		1	8'-9"	6	2	7'-9"	10	1	6'-9"	5	2	5'-9"	8	4c5		
5c6	Wingwall, B.F.V, Long		15 Var.	2'-9 to 5'-2"	62	15 Var.	2'-9 to 5'-2"	62	15 Var.	2'-9 to 5'-2"	62	15 Var.	2'-9 to 5'-2"	62	5c6		
5c7	Wingwall, B.F.V, Short		4 Var.	2'-10 to 3'-8"	14	4 Var.	2'-10 to 3'-8"	14	4 Var.	2'-10 to 3'-8"	14	4 Var.	2'-10 to 3'-8"	14	5c7		
6c8	Wingwall, B.F.V, Long		28 Var.	9'-4 to 14'-0"	491	22 Var.	9'-4 to 13'-0"	369	16 Var.	9'-4 to 11'-11"	255	10 Var.	9'-4 to 10'-11"	152	6c8		
6c9	Wingwall, B.F.V, Short		22 Var.	8'-0 to 14'-0"	363	18 Var.	8'-0 to 12'-10"	282	15 Var.	8'-0 to 12'-0"	225	11 Var.	8'-0 to 10'-10"	156	6c9		
6c10	Wingwall, B.F.V, Long		14	10'-6"	221	--	--	--	--	--	--	--	--	--	6c10		
6c10	Wingwall, B.F.V, Short		9	10'-6"	142	--	--	--	--	--	--	--	--	--	6c10		
6c11	Wingwall, B.F.V, Long		1	12'-9"	19	1	11'-9"	18	2	10'-9"	32	2	9'-9"	29	6c11		
6c11	Wingwall, B.F.V, Short		1	12'-9"	19	2	11'-9"	35	1	10'-9"	16	2	9'-9"	29	6c11		
4d1	Apron, Longit., Bott.		9	24'-5"	147	9	21'-7"	130	9	18'-9"	113	9	15'-11"	96	4d1		
4d2	Apron, Longit., Bott, Long		3	39'-9"	80	3	33'-11"	68	3	28'-1"	56	3	22'-3"	45	4d2		
4d3	Apron, Longit., Bott, Short		3	25'-1"	50	3	21'-7"	43	3	18'-1"	36	3	14'-7"	29	4d3		
6f1	Apron, Longit., Top		13	24'-5"	477	13	21'-7"	421	13	18'-9"	366	13	15'-11"	311	6f1		
6f2	Apron, Longit., Top Long		8 Var.	6'-5 to 20'-8"	163	7 Var.	5'-7 to 17'-10"	123	5 Var.	6'-10 to 15'-0"	82	4 Var.	6'-0 to 12'-2"	55	6f2		
6f3	Apron, Longit., Top Short		5 Var.	7'-4 to 21'-0"	106	4 Var.	7'-11 to 18'-2"	78	3 Var.	8'-6 to 15'-4"	54	2 Var.	9'-1 to 12'-6"	32	6f3		
6f4	Apron, Longit., Top Long		1	47'-2"	74	1	41'-4"	66	1	35'-6"	53	1	29'-9"	45	6f4		
6f5	Apron, Longit., Top Short		1	30'-1"	45	1	26'-7"	40	1	23'-1"	35	1	19'-7"	29	6f5		
4j1	Parapet, Vertical		29	6'-8"	129	29	6'-8"	129	29	6'-8"	129	29	6'-8"	129	4j1		
10j1	Parapet, Horizontal		4	21'-5"	369	4	21'-5"	369	4	21'-5"	369	4	21'-5"	369	10j1		
6m1	Apron, Trans., Top		11 Var.	17'-2 to 19'-0"	299	11 Var.	17'-2 to 19'-0"	299	11 Var.	17'-2 to 19'-0"	299	9 Var.	17'-2 to 18'-8"	242	6m1		
6m2	Apron, Trans., Top		9 Var.	19'-3 to 22'-3"	280	6 Var.	19'-3 to 21'-2"	182	2 Var.	19'-3 to 19'-8"	58	2 Var.	13'-5 to 14'-2"	41	6m2		
6m3	Apron, Trans., Top		18 Var.	6'-7 to 16'-2"	308	18 Var.	5'-5 to 15'-0"	276	18 Var.	4'-10 to 14'-5"	260	16 Var.	4'-3 to 12'-9"	204	6m3		
6m4	Apron, Trans., Bott.		14 Var.	13'-4 to 27'-3"	427	12 Var.	13'-4 to 25'-1"	346	10 Var.	13'-4 to 23'-0"	273	8 Var.	13'-4 to 20'-10"	205	6m4		
6p1	Curtain, Horizontal		4	19'-9"	119	4	19'-9"	119	4	19'-8"	118	4	19'-8"	118	6p1		
6p2	Curtain, Horizontal, Long		4	26'-6"	159	4	23'-4"	140	4	20'-2"	121	4	17'-0"	102	6p2		
6p3	Curtain, Horizontal, Short		4	10'-7"	64	4	9'-6"	57	4	8'-6"	51	4	7'-6"	45	6p3		
6s1	Wing Slope, Both F., Long		2	8'-4"	25	2	8'-4"	25	2	8'-4"	25	2	8'-4"	25	6s1		
6s2	Wing Slope, Both F., Short		2	7'-11"	24	2	7'-11"	24	2	7'-11"	24	2	7'-11"	24	6s2		
6s3	Wing Slope, Both F., Long		2	39'-0"	117	2	33'-1"	99	2	27'-2"	82	2	21'-3"	64	6s3		
6s4	Wing Slope, Both F., Short		2	23'-6"	71	2	19'-10"	60	2	16'-2"	49	2	12'-7"	38	6s4		
6s5	Wing Slope, F.F, Long		1	45'-1"	71	1	39'-2"	59	1	33'-3"	50	1	27'-5"	41	6s5		
6s6	Wing Slope, F.F, Short		1	29'-5"	44	1	25'-10"	39	1	22'-2"	33	1	18'-6"	28	6s6		
5t1	Curtain, Vertical		35	6'-8"	243	32	6'-5"	214	29	6'-5"	194	26	6'-5"	174	5t1		
Estimated Quantities One Headwall			Reinf., Steel			6166 LB			4927 LB			4091 LB			3333 LB		
			Concrete			45.9 CY			37.8 CY			31.0 CY			24.8 CY		
			Parapet Δ			2.5			2.5			2.5			2.5		
			Wingwalls			9.8			7.5			5.5			3.8		
			Apron =			33.6			27.8			23.0			18.5		

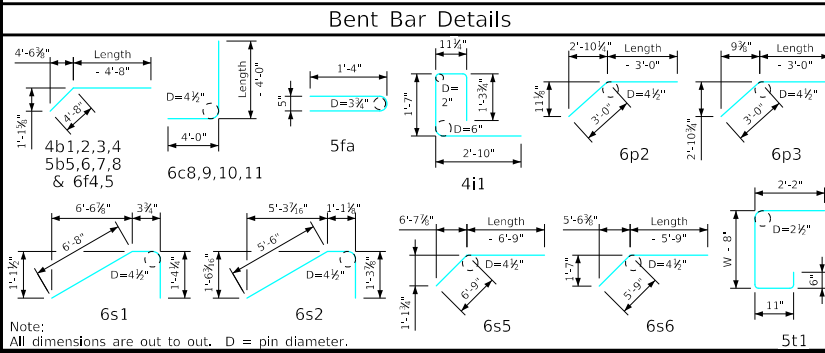
Δ Includes top of wingwall quantities.
 * Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal.

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

Headwall Notes:

- See Sheet FW45-8-21 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" requirements reflect 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 45-8-21
		14'-0" Span 45° Skew	Sheet 2 of 2