

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

Bar	Location	Shape	12' x 12'		12' x 11'		12' x 10'		12' x 9'		12' x 8'		12' x 7'		Bar			
			No.	Length	Wt.	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	2	2'-10"	6	5fa
4b1	Wingwall, B.F.H, Long		1	45'-7"	32	1	42'-2"	30	1	38'-9"	26	1	35'-4"	24	1	31'-11"	21	4b1
4b2	Wingwall, B.F.H, Short		1	40'-4"	29	1	37'-4"	25	1	34'-4"	23	1	31'-4"	21	1	28'-4"	19	4b2
4b3	Wingwall, B.F.H, Long		10 Var.	13'-2 to 44'-0	194	9 Var.	13'-2 to 40'-7	163	8 Var.	13'-2 to 37'-2	134	7 Var.	13'-2 to 33'-9	110	6 Var.	13'-2 to 30'-4	87	4b3
4b4	Wingwall, B.F.H, Short		10 Var.	11'-11 to 38'-11	170	9 Var.	11'-11 to 35'-11	144	8 Var.	11'-11 to 32'-11	120	7 Var.	11'-11 to 29'-11	98	6 Var.	11'-11 to 26'-11	73	4b4
5b5	Wingwall, F.F.H, Long		1	45'-8"	50	1	42'-3"	47	1	38'-10"	41	1	35'-5"	37	1	31'-11"	33	5b5
5b6	Wingwall, F.F.H, Short		1	40'-4"	45	1	37'-4"	39	1	34'-4"	36	1	31'-4"	33	1	28'-4"	30	5b6
5b7	Wingwall, F.F.H, Long		11 Var.	9'-0 to 44'-1	314	10 Var.	9'-0 to 40'-8	266	9 Var.	9'-0 to 37'-3	221	8 Var.	9'-0 to 33'-0	182	7 Var.	9'-0 to 30'-5	147	5b7
5b8	Wingwall, F.F.H, Short		11 Var.	9'-0 to 39'-0	275	10 Var.	9'-0 to 36'-0	235	9 Var.	9'-0 to 33'-0	197	8 Var.	9'-0 to 30'-0	163	7 Var.	9'-0 to 27'-0	131	5b8
4c1	Wingwall, F.F.W, Long		42 Var.	2'-10 to 14'-10	248	39 Var.	2'-10 to 13'-11	218	35 Var.	2'-10 to 12'-9	182	32 Var.	2'-10 to 11'-11	158	29 Var.	2'-10 to 11'-0	134	4c1
4c2	Wingwall, F.F.W, Short		37 Var.	2'-10 to 14'-10	218	34 Var.	2'-10 to 13'-10	189	31 Var.	2'-10 to 12'-10	162	28 Var.	2'-10 to 11'-10	137	25 Var.	2'-10 to 10'-10	114	4c2
4c3	Wingwall, F.F.W, Long		19 Var.	9'-8 to 14'-11	156	16 Var.	9'-8 to 14'-1	127	12 Var.	9'-8 to 12'-11	91	9 Var.	9'-8 to 12'-0	65	--	--	--	4c3
4c4	Wingwall, F.F.W, Short		17 Var.	9'-8 to 15'-0	140	14 Var.	9'-8 to 14'-0	111	11 Var.	9'-8 to 13'-0	83	8 Var.	9'-8 to 12'-0	58	--	--	--	4c4
4c5	Wingwall, F.F.W, Long		2	13'-9"	18	2	12'-9"	17	2	11'-9"	16	2	10'-9"	14	2	9'-9"	7	4c5
5c6	Wingwall, B.F.V, Long		9 Var.	2'-10 to 5'-2	38	9 Var.	2'-10 to 5'-2	38	9 Var.	2'-10 to 5'-2	38	9 Var.	2'-10 to 5'-2	38	9 Var.	2'-10 to 5'-2	38	5c6
5c7	Wingwall, B.F.V, Short		6 Var.	2'-10 to 4'-6	23	6 Var.	2'-10 to 4'-6	23	6 Var.	2'-10 to 4'-6	23	6 Var.	2'-10 to 4'-6	23	6 Var.	2'-10 to 4'-6	23	5c7
6c9	Wingwall, B.F.V, Short		31 Var.	8'-10 to 18'-10	644	28 Var.	8'-10 to 17'-10	561	25 Var.	8'-10 to 16'-10	482	22 Var.	8'-10 to 15'-10	408	19 Var.	8'-10 to 14'-10	338	6c9
6c10	Wingwall, B.F.V, Long		25	10'-6"	394	22	10'-6"	347	18	10'-6"	284	15	10'-6"	237	12	10'-6"	189	6c10
6c11	Wingwall, B.F.V, Short		22	10'-6"	347	19	10'-6"	300	16	10'-6"	252	13	10'-6"	205	10	10'-6"	158	6c11
6c12	Wingwall, B.F.V, Long		33 Var.	9'-6 to 18'-10	702	30 Var.	9'-6 to 17'-11	618	26 Var.	9'-6 to 16'-9	513	23 Var.	9'-6 to 15'-11	439	20 Var.	9'-6 to 15'-0	368	6c12
6c13	Wingwall, B.F.V, Short		2	17'-9"	53	2	16'-9"	50	2	15'-9"	47	2	14'-9"	44	2	13'-9"	41	6c13
6c14	Wingwall, B.F.V, Long		2	17'-9"	53	2	16'-9"	50	2	15'-9"	47	2	14'-9"	44	2	13'-9"	41	6c14
4d1	Apron, Longit., Bott.		9	28'-10"	173	9	26'-9"	161	9	24'-9"	149	9	22'-8"	136	9	20'-7"	124	4d1
4d2	Apron, Longit., Bott, Long		3	40'-3"	86	3	36'-10"	74	3	33'-5"	67	3	30'-0"	60	3	26'-7"	53	4d2
4d3	Apron, Longit., Bott, Short		3	35'-6"	71	3	32'-5"	65	3	29'-5"	59	3	26'-5"	53	3	23'-5"	47	4d3
6f1	Apron, Longit., Top		11	28'-10"	476	11	26'-9"	442	11	24'-9"	409	11	22'-8"	374	11	20'-7"	340	6f1
6f2	Apron, Longit., Top Long		9 Var.	5'-5 to 25'-7	210	8 Var.	5'-10 to 23'-6	176	7 Var.	6'-3 to 21'-5	145	6 Var.	6'-8 to 19'-5	118	5 Var.	7'-2 to 17'-4	92	6f2
6f3	Apron, Longit., Top Short		8 Var.	5'-5 to 25'-8	187	7 Var.	6'-3 to 23'-8	157	6 Var.	7'-0 to 21'-7	129	6 Var.	4'-11 to 19'-6	110	5 Var.	5'-9 to 17'-5	87	6f3
6f4	Apron, Longit., Top Long		1	45'-8"	72	1	42'-3"	67	1	38'-10"	58	1	35'-5"	53	1	31'-11"	48	6f4
6f5	Apron, Longit., Top Short		1	40'-4"	64	1	37'-4"	56	1	34'-4"	52	1	31'-4"	47	1	28'-4"	43	6f5
4i1	Parapet, Vertical		25	6'-2"	103	25	6'-2"	103	25	6'-2"	103	25	6'-2"	103	25	6'-2"	103	4i1
7j1	Parapet, Horizontal		4	14'-1"	115	4	13'-11"	114	4	13'-9"	112	4	13'-9"	112	4	13'-9"	112	7j1
6m1	Apron, Trans., Top		3 Var.	14'-5 to 14'-9	66	3 Var.	14'-3 to 14'-7	65	3 Var.	14'-1 to 14'-5	64	3 Var.	14'-1 to 14'-5	64	3 Var.	13'-11 to 14'-3	63	6m1
6m2	Apron, Trans., Top		30 Var.	15'-0 to 25'-10	920	27 Var.	14'-10 to 24'-7	799	25 Var.	14'-7 to 23'-7	717	22 Var.	14'-7 to 22'-6	613	19 Var.	14'-7 to 21'-4	512	6m2
6m3	Apron, Trans., Top		5 Var.	7'-2 to 17'-7	93	5 Var.	7'-2 to 17'-9	93	4 Var.	7'-2 to 15'-0	67	4 Var.	7'-4 to 15'-2	68	4 Var.	7'-5 to 15'-3	68	6m3
6m4	Apron, Trans., Bott.		24 Var.	8'-0 to 20'-5	512	22 Var.	8'-0 to 19'-4	452	20 Var.	8'-0 to 18'-3	394	18 Var.	8'-0 to 17'-2	340	16 Var.	8'-0 to 16'-1	289	6m4
6p1	Curtain, Horizontal		4	12'-8"	76	4	12'-8"	76	4	12'-8"	76	4	12'-8"	76	4	12'-8"	76	6p1
6p2	Curtain, Horizontal, Long		4	21'-9"	131	4	20'-3"	122	4	18'-9"	113	4	17'-3"	104	4	14'-2"	85	6p2
6p3	Curtain, Horizontal, Short		4	16'-10"	101	4	15'-9"	95	4	14'-7"	88	4	13'-6"	81	4	12'-5"	75	6p3
6s1	Wing Slope, Both F., Long		2	6'-11"	21	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	2	6'-6"	20	6s2
6s3	Wing Slope, Both F., Long		2	4'-1'-3"	131	2	3'-7'-9"	113	2	3'-4'-2"	103	2	3'-0'-7"	92	2	2'-7'-0"	81	6s3
6s4	Wing Slope, Both F., Short		2	3'-6'-11"	111	2	3'-3'-9"	101	2	3'-0'-7"	92	2	2'-7'-5"	82	2	2'-4'-3"	73	6s4
6s5	Wing Slope, F.F, Long		1	4'-6'-5"	73	1	4'-2'-10"	68	1	3'-9'-3"	59	1	3'-5'-8"	54	1	3'-2'-1"	48	6s5
6s6	Wing Slope, F.F, Short		1	4'-1'-8"	66	1	3'-8'-6"	58	1	3'-5'-4"	53	1	3'-2'-2"	48	1	2'-9'-0"	44	6s6
5t1	Curtain, Vertical		30	7'-11"	248	28	7'-8"	224	26	7'-5"	201	25	7'-2"	187	23	6'-11"	166	5t1
Estimated Quantities One Headwall			Reinf. Steel	8293 LB		7310 LB		6391 LB		5574 LB		4677 LB		3944 LB				
			Concrete		66.7 CY													
			Parapet Δ	1.8		1.8		1.7		1.7		1.7		1.6		1.6		
			Wingwalls	23.0		18.1		13.9		11.6		9.5		6.8		6.8		
			Apron *	41.9		36.9		32.1		28.0		24.1		20.3		20.3		28.7 CY

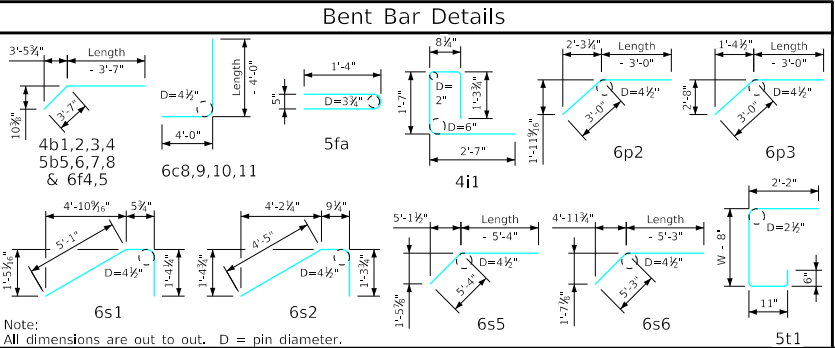
Δ Includes top of wingwall quantities.
 * Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal.

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

Headwall Notes:

- See Sheet FWH G2-21 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 AUGUST 2022 APPROVED BY BRIDGE ENGINEER	 Standard Design - Single Reinforced Concrete Box Culverts
	Flared Wing Headwalls February, 2021
	Quantity Tabulation 12'-0" Span 15° Skew
	FWH 15-8-21 Sheet 1 of 2