

ENGLISHLRFDDESIGNEDSINGLECULVERTSFHW.DGN - FWH 15-8-21 51 - THIS SHEET ISSUED 02-2021.

### 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	78	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'-10	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.V, 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.V, 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.V, 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.V, 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.V, Long		2	13'-9"	18	2	12'-9"	17	2	11'-9"	16	2	10'-9"	14	1	9'-9"	7	4c5
4c5	Wingwall, F.F.V, Short		2	13'-9"	18	2	12'-9"	17	2	11'-9"	16	2	10'-9"	14	2	9'-9"	13	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		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	6c9
6c10	Wingwall, B.F.V, Long		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	6c10
6c10	Wingwall, B.F.V, Short		25	10'-6"	394	22	10'-6"	347	18	10'-6"	284	15	10'-6"	237	12	10'-6"	189	6c10
6c10	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	6c10
6c11	Wingwall, B.F.V, Long		2	17'-9"	53	2	16'-9"	50	2	15'-9"	47	2	14'-9"	44	1	13'-9"	41	6c11
6c11	Wingwall, B.F.V, Short		2	17'-9"	53	2	16'-9"	50	2	15'-9"	47	2	14'-9"	44	2	13'-9"	42	6c11
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, Top		4	14'-1"	115	4	13'-11"	114	4	13'-9"	112	4	13'-9"	112	4	13'-9"	112	7j1
6m1	Parapet, Horizontal, Bott.		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'-8	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., Top		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	Apron, Trans., Bott.		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	15'-9"	95	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, Both 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, Both 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	Wing Slope, F.F, Short		30	7'-11"	248	28	7'-8"	224	26	7'-5"	201	25	7'-2"	187	23	6'-11"	166	5t1
Curtain, Vertical Estimated Quantities One Headwall			Reinf. Steel		8293 LB		7310 LB		6391 LB		5574 LB		4677 LB		3944 LB			
			Concrete		66.7 CY		56.8 CY		47.7 CY		41.3 CY		35.3 CY		28.7 CY			

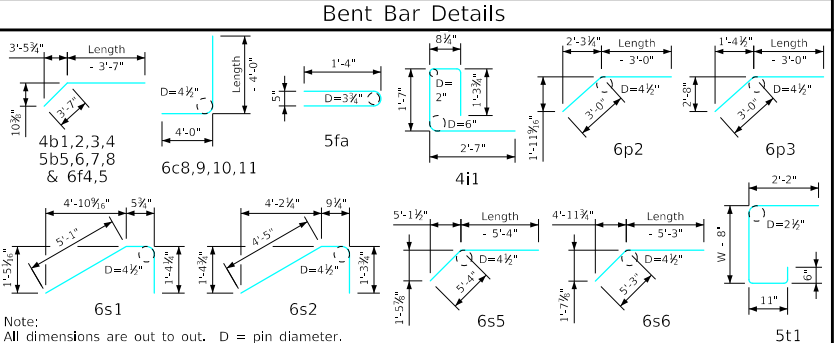
Δ Includes top of wingwall quantities.  
 \* Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal.

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