

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

Bar	Location	Shape	8' x 10'		8' x 9'		8' x 8'		8' x 7'		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	5fa			
4b1	Wingwall, B.F.H. Long		1	38'-9"	26	1	35'-4"	24	1	31'-11"	21	1	28'-6"	19	4b1
4b2	Wingwall, B.F.H. Short		1	34'-4"	23	1	31'-4"	21	1	28'-4"	19	1	25'-4"	17	4b2
4b3	Wingwall, B.F.H. Long		8 Var.	13'-2 to 37'-2	134	7 Var.	13'-2 to 33'-9	110	6 Var.	13'-2 to 30'-4	87	5 Var.	13'-2 to 26'-11	67	4b3
4b4	Wingwall, B.F.H. Short		8 Var.	11'-11 to 32'-11	120	7 Var.	11'-11 to 29'-11	98	6 Var.	11'-11 to 26'-11	78	5 Var.	11'-11 to 23'-11	60	4b4
5b5	Wingwall, F.F.H. Long		1	38'-10"	41	1	35'-5"	37	1	31'-11"	33	1	28'-6"	30	5b5
5b6	Wingwall, F.F.H. Short		1	34'-4"	36	1	31'-4"	33	1	28'-4"	30	1	25'-4"	26	5b6
5b7	Wingwall, F.F.H. Long		9 Var.	9'-10 to 37'-3	221	8 Var.	9'-10 to 33'-10	182	7 Var.	9'-10 to 30'-5	147	6 Var.	9'-10 to 26'-11	115	5b7
5b8	Wingwall, F.F.H. Short		9 Var.	9'-0 to 33'-0	197	8 Var.	9'-0 to 30'-0	163	7 Var.	9'-0 to 27'-0	131	6 Var.	9'-0 to 24'-0	103	5b8
5b9	Interior Wall, Both F.H.		17 Var.	5'-6 to 24'-4	264	15 Var.	5'-7 to 22'-3	218	13 Var.	5'-7 to 20'-2	175	11 Var.	5'-8 to 18'-2	137	5b9
4c1	Wingwall, F.F.V. Long		35 Var.	2'-8 to 12'-7	178	32 Var.	2'-8 to 11'-9	154	29 Var.	2'-8 to 10'-10	131	25 Var.	2'-8 to 9'-8	103	4c1
4c2	Wingwall, F.F.V. Short		31 Var.	2'-8 to 12'-8	159	28 Var.	2'-8 to 11'-8	134	25 Var.	2'-8 to 10'-8	111	22 Var.	2'-8 to 9'-8	91	4c2
4c3	Wingwall, F.F.V. Long		12 Var.	9'-6 to 12'-9	89	9 Var.	9'-6 to 11'-10	64	--	--	--	--	--	--	4c3
4c4	Wingwall, F.F.V. Short		11 Var.	9'-6 to 12'-10	82	8 Var.	9'-6 to 11'-10	57	--	--	--	--	--	--	4c4
4c5	Wingwall, F.F.V. Long		2	11'-7"	15	2	10'-7"	14	1	9'-7"	6	2	8'-7"	11	4c5
4c6	Wingwall, F.F.V. Short		2	11'-7"	15	2	10'-7"	14	2	9'-7"	13	2	8'-7"	11	4c6
4c7	Interior Wall, Both F.V.		2	4'-0"	5	2	4'-0"	5	2	4'-0"	5	2	4'-0"	5	4c7
4c8	Interior Wall, Both F.V.		41 Var.	1'-9 to 10'-3	164	37 Var.	1'-9 to 9'-4	137	33 Var.	1'-9 to 8'-4	111	28 Var.	1'-9 to 7'-2	83	4c8
5c9	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	5c9
5c10	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	5c10
5c11	Wingwall, B.F.V. Long		26 Var.	9'-4 to 16'-7	351	23 Var.	9'-4 to 15'-9	301	20 Var.	9'-4 to 14'-10	252	16 Var.	9'-4 to 13'-8	192	5c11
5c12	Wingwall, B.F.V. Short		25 Var.	8'-8 to 16'-8	330	22 Var.	8'-8 to 15'-8	279	19 Var.	8'-8 to 14'-8	231	16 Var.	8'-8 to 13'-8	186	5c12
6c13	Wingwall, B.F.V. Long		20	10'-6"	315	17	10'-6"	268	14	10'-6"	221	10	10'-6"	158	6c13
6c13	Wingwall, B.F.V. Short		18	10'-6"	284	15	10'-6"	237	12	10'-6"	189	9	10'-6"	142	6c13
5c14	Wingwall, B.F.V. Long		2	15'-7"	33	2	14'-7"	30	1	13'-7"	14	2	12'-7"	26	5c14
5c14	Wingwall, B.F.V. Short		2	15'-7"	33	2	14'-7"	30	2	13'-7"	28	2	12'-7"	26	5c14
4d1	Apron, Longlt., Bott.		11	24'-9"	182	11	22'-8"	167	11	20'-7"	151	11	18'-6"	136	4d1
4d2	Apron, Longlt., Bott. Long		3	33'-5"	67	3	30'-0"	60	3	26'-7"	53	3	23'-1"	46	4d2
4d3	Apron, Longlt., Bott. Short		3	29'-5"	59	3	26'-5"	53	3	23'-5"	47	3	20'-5"	41	4d3
6f1	Apron, Longlt., Top		16	24'-9"	595	16	22'-8"	545	16	20'-7"	495	16	18'-6"	445	6f1
6f2	Apron, Longlt., Top Long		7 Var.	6'-3 to 21'-5	145	6 Var.	6'-8 to 19'-5	118	5 Var.	7'-2 to 17'-4	92	4 Var.	7'-7 to 15'-3	69	6f2
6f3	Apron, Longlt., Top Short		6 Var.	7'-0 to 21'-7	129	6 Var.	4'-11 to 19'-6	110	5 Var.	5'-9 to 17'-5	87	4 Var.	6'-7 to 15'-4	66	6f3
6f4	Apron, Longlt., Top Long		1	38'-10"	58	1	35'-5"	53	1	31'-11"	48	1	28'-6"	43	6f4
6f5	Apron, Longlt., Top Short		1	34'-4"	52	1	31'-4"	47	1	28'-4"	43	1	25'-4"	38	6f5
4j1	Parapet, Vertical		33	6'-2"	136	33	6'-2"	136	33	6'-2"	136	33	6'-2"	136	4j1
7j1	Parapet, Horizontal		4	18'-9"	153	4	18'-9"	153	4	18'-9"	153	4	18'-6"	151	7j1
6m1	Apron, Trans., Top		4 Var.	19'-0 to 19'-7	116	4 Var.	19'-0 to 19'-7	116	4 Var.	19'-0 to 19'-7	116	4 Var.	18'-9 to 19'-4	114	6m1
6m2	Apron, Trans., Top		23 Var.	19'-10 to 28'-1	828	20 Var.	19'-10 to 26'-11	702	17 Var.	19'-10 to 25'-10	583	15 Var.	19'-7 to 24'-10	500	6m2
6m3	Apron, Trans., Top		6 Var.	6'-10 to 19'-11	121	6 Var.	6'-11 to 20'-0	121	6 Var.	7'-1 to 20'-1	122	6 Var.	4'-5 to 17'-6	99	6m3
6m4	Apron, Trans., Bott.		20 Var.	13'-0 to 23'-3	544	18 Var.	13'-0 to 22'-2	475	16 Var.	13'-0 to 21'-1	410	14 Var.	12'-11 to 19'-11	345	6m4
6p1	Curtain, Horizontal		4	17'-8"	106	4	17'-8"	106	4	17'-8"	106	4	17'-7"	106	6p1
6p2	Curtain, Horizontal, Long		4	18'-9"	113	4	17'-3"	104	4	15'-9"	95	4	14'-2"	85	6p2
6p3	Curtain, Horizontal, Short		4	14'-7"	88	4	13'-6"	81	4	12'-5"	75	4	11'-3"	68	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	34'-2	103	2	30'-7	92	2	27'-0	81	2	23'-5	70	6s3
6s4	Wing Slope, Both F., Short		2	30'-7	92	2	27'-5	82	2	24'-3	73	2	21'-1	63	6s4
6s5	Wing Slope, F.F. Long		1	39'-3	59	1	35'-8	54	1	32'-1	48	1	28'-6	43	6s5
6s6	Wing Slope, F.F. Short		1	35'-4	53	1	32'-2	48	1	29'-0	44	1	25'-10	39	6s6
6s7	Interior Wall, Both F.H.		2	26'-3	79	2	23'-11	72	2	21'-8	65	2	19'-4	58	6s7
5t1	Curtain, Vertical		30	7'-5"	232	29	7'-2"	217	27	6'-11"	195	24	6'-8"	167	5t1
Estimated Quantities			Reinf. Steel		6440 LB		5467 LB		4651 LB						
Concrete			7344 LB		47.3 CY		40.6 CY		33.1 CY						
Parapet Δ			2.1		14.8		12.1		8.6						
Wingwalls			17.9		30.4		26.4		22.4						
Apron *			34.7												

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.

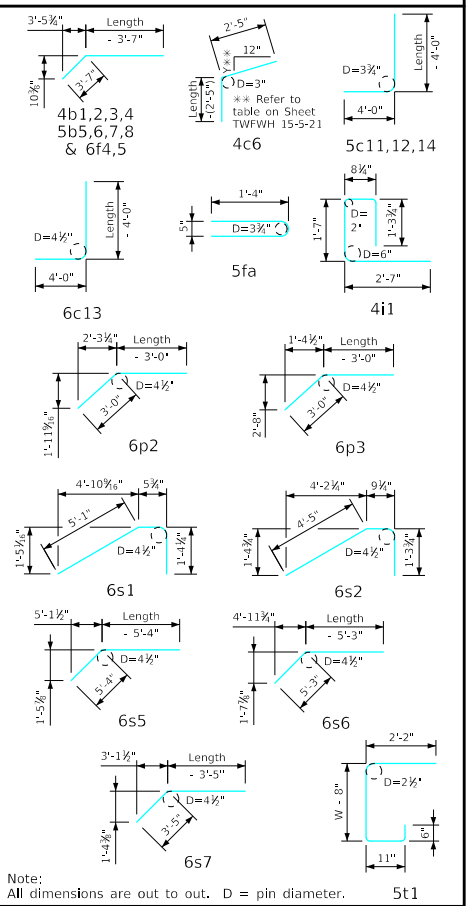
Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap. Lengths shown for bars over 40'-0" long do not include lap.

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

Headwall Notes:

- See Sheet TWFH G1-21 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.

Bent Bar Details



LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

Standard Design - Twin Reinforced Concrete Box Culverts

Flared Wing Headwalls

February, 2021

Quantity Tabulation 8'-0" Span 15° Skew	TWFH 15-8-21 Sheet 1 of 2
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