

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

Bar	Location	Shape	10' x 7'			10' x 6'			10' x 5'			10' 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	34'-4"	23	1	30'-2"	20	1	26'-0"	17	1	21'-10"	15	4b1		
4b2	Wingwall, B.F.H. Short		1	26'-7"	18	1	23'-6"	16	1	20'-5"	14	1	17'-3"	12	4b2		
4b3	Wingwall, B.F.H. Long		5 Var.	15'-8" to 32'-5"	80	4 Var.	15'-8" to 28'-3"	59	3 Var.	15'-8" to 24'-1"	40	2 Var.	15'-8" to 19'-10"	24	4b3		
4b4	Wingwall, B.F.H. Short		5 Var.	12'-10" to 25'-3"	64	4 Var.	12'-10" to 22'-1"	47	3 Var.	12'-9" to 19'-0"	32	2 Var.	12'-9" to 15'-10"	19	4b4		
5b5	Wingwall, F.F.H. Long		1	34'-5"	36	1	30'-2"	31	1	26'-0"	27	1	21'-10"	23	5b5		
5b6	Wingwall, F.F.H. Short		1	26'-8"	28	1	23'-6"	25	1	20'-5"	21	1	17'-4"	18	5b6		
5b7	Wingwall, F.F.H. Long		6 Var.	11'-7" to 32'-5"	138	5 Var.	11'-7" to 28'-3"	104	4 Var.	11'-7" to 24'-1"	74	3 Var.	11'-7" to 19'-11"	49	5b7		
5b8	Wingwall, F.F.H. Short		6 Var.	9'-9" to 25'-3"	110	5 Var.	9'-9" to 22'-1"	83	4 Var.	9'-9" to 19'-0"	60	3 Var.	9'-8" to 15'-11"	40	5b8		
5b9	Interior Wall, Both F.H.		11 Var.	6'-1" to 19'-10"	149	9 Var.	6'-2" to 17'-6"	111	7 Var.	6'-3" to 15'-2"	78	5 Var.	6'-6" to 12'-10"	50	5b9		
4c1	Wingwall, F.F.V. Long		31 Var.	2'-9" to 9'-11"	131	26 Var.	2'-9" to 8'-9"	100	22 Var.	2'-9" to 7'-9"	77	18 Var.	2'-9" to 6'-10"	58	4c1		
4c2	Wingwall, F.F.V. Short		23 Var.	2'-9" to 9'-10"	97	20 Var.	2'-9" to 8'-10"	77	17 Var.	2'-9" to 7'-11"	61	14 Var.	2'-9" to 6'-11"	45	4c2		
4c3	Wingwall, F.F.V. Long		--	--	--	--	--	--	--	--	--	--	--	--	4c3		
4c4	Wingwall, F.F.V. Short		--	--	--	--	--	--	--	--	--	--	--	--	4c4		
4c5	Wingwall, F.F.V. Long		1	8'-8"	6	2	7'-8"	10	2	6'-8"	9	2	5'-8"	8	4c5		
4c5	Wingwall, F.F.V. Short		1	8'-8"	6	1	7'-8"	5	1	6'-8"	4	1	5'-8"	4	4c5		
4c6	Interior Wall, Both F.V.		2	4'-1"	5	2	4'-0"	5	2	4'-0"	5	2	4'-0"	5	4c6		
4c7	Interior Wall, Both F.V.		32 Var.	1'-10" to 7'-5"	99	27 Var.	1'-10" to 6'-5"	74	22 Var.	1'-9" to 5'-4"	52	18 Var.	1'-9" to 4'-5"	37	4c7		
4c8	Interior Wall, Both F.V.		2	7'-6"	10	2	6'-6"	9	2	5'-6"	7	2	4'-6"	6	4c8		
5c9	Wingwall, B.F.V. Long		11 Var.	2'-9" to 5'-2"	45	11 Var.	2'-9" to 5'-2"	45	11 Var.	2'-9" to 5'-2"	45	11 Var.	2'-9" to 5'-2"	45	5c9		
5c10	Wingwall, B.F.V. Short		5 Var.	2'-9" to 4'-1"	18	5 Var.	2'-9" to 4'-1"	18	5 Var.	2'-9" to 4'-1"	18	5 Var.	2'-9" to 4'-1"	18	5c10		
5c11	Wingwall, B.F.V. Long		20 Var.	9'-5" to 13'-11"	243	15 Var.	9'-5" to 12'-9"	173	11 Var.	9'-5" to 11'-9"	121	7 Var.	9'-5" to 10'-10"	74	5c11		
5c12	Wingwall, B.F.V. Short		18 Var.	8'-5" to 13'-10"	209	15 Var.	8'-5" to 12'-10"	166	12 Var.	8'-5" to 11'-11"	127	9 Var.	8'-5" to 10'-11"	91	5c12		
6c13	Wingwall, B.F.V. Long		13	10'-6"	205	8	10'-6"	126	--	--	--	--	--	--	6c13		
6c13	Wingwall, B.F.V. Short		10	10'-6"	158	7	10'-6"	110	--	--	--	--	--	--	6c13		
5c14	Wingwall, B.F.V. Long		1	12'-8"	13	2	11'-8"	24	2	10'-8"	22	2	9'-8"	20	5c14		
5c14	Wingwall, B.F.V. Short		1	12'-8"	13	1	11'-8"	12	1	10'-8"	11	1	9'-8"	10	5c14		
4d1	Apron, Longit., Bott.		13	20'-4"	177	13	18'-1"	157	13	15'-9"	137	13	13'-5"	117	4d1		
4d2	Apron, Longit., Bott. Long		3	27'-11"	56	3	23'-9"	48	3	19'-7"	39	3	15'-4"	31	4d2		
4d3	Apron, Longit., Bott. Short		3	21'-8"	43	3	18'-7"	37	3	15'-5"	31	3	12'-4"	25	4d3		
6f1	Apron, Longit., Top		20	20'-4"	611	20	18'-1"	543	20	15'-9"	473	20	13'-5"	403	6f1		
6f2	Apron, Longit., Top Long		6 Var.	5'-3" to 16'-11"	100	5 Var.	5'-3" to 14'-7"	74	4 Var.	5'-3" to 12'-4"	53	3 Var.	5'-3" to 10'-0"	34	6f2		
6f3	Apron, Longit., Top Short		4 Var.	7'-9" to 17'-2"	75	4 Var.	5'-5" to 14'-10"	61	3 Var.	6'-2" to 12'-6"	42	2 Var.	7'-0" to 10'-3"	26	6f3		
6f4	Apron, Longit., Top Long		1	34'-5"	52	1	30'-2"	45	1	26'-0"	39	1	21'-10"	33	6f4		
6f5	Apron, Longit., Top Short		1	26'-8"	40	1	23'-6"	35	1	20'-5"	31	1	17'-4"	26	6f5		
4f1	Parapet, Vertical		41	6'-4"	173	41	6'-4"	173	41	6'-4"	173	41	6'-4"	173	4f1		
7j1	Parapet, Horizontal		4	25'-3"	206	4	25'-3"	206	4	25'-3"	206	4	25'-3"	206	7j1		
6m1	Apron, Trans., Top		10 Var.	23'-8" to 25'-5"	369	10 Var.	23'-8" to 25'-5"	369	9 Var.	23'-8" to 25'-2"	330	7 Var.	23'-8" to 24'-10"	255	6m1		
6m2	Apron, Trans., Top		6 Var.	25'-9" to 27'-8"	241	3 Var.	25'-9" to 26'-6"	118	1	25'-5"	38	3 Var.	17'-11" to 20'-6"	87	6m2		
6m3	Apron, Trans., Top		16 Var.	5'-5" to 22'-2"	331	16 Var.	4'-9" to 21'-6"	315	16 Var.	4'-1" to 20'-10"	299	13 Var.	3'-5" to 16'-10"	198	6m3		
6m4	Apron, Trans., Bott.		14 Var.	18'-11" to 27'-10"	492	12 Var.	18'-11" to 26'-5"	409	10 Var.	18'-11" to 25'-1"	330	8 Var.	18'-11" to 23'-9"	256	6m4		
6p1	Curtain, Horizontal		4	24'-1"	145	4	24'-1"	145	4	24'-1"	145	4	24'-1"	145	6p1		
6p2	Curtain, Horizontal, Long		4	18'-0"	108	4	16'-0"	96	4	13'-11"	84	4	11'-11"	72	6p2		
6p3	Curtain, Horizontal, Short		4	10'-9"	65	4	9'-8"	58	4	8'-8"	52	4	7'-7"	46	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	27'-5"	82	2	23'-2"	70	2	18'-10"	57	2	14'-7"	44	6s3		
6s4	Wing Slope, Both F., Short		2	21'-8"	65	2	18'-4"	55	2	15'-1"	45	2	11'-10"	36	6s4		
6s5	Wing Slope, F.F. Long		1	33'-7"	50	1	29'-3"	44	1	23'-0"	38	1	20'-8"	31	6s5		
6s6	Wing Slope, F.F. Short		1	26'-11"	40	1	23'-8"	36	1	20'-5"	31	1	17'-1"	26	6s6		
6s7	Interior Wall, Both F.H.		2	22'-10"	63	2	18'-4"	55	2	15'-10"	48	2	13'-4"	40	6s7		
5t1	Curtain, Vertical		32	8'-8"	223	29	8'-5"	194	27	8'-5"	181	25	8'-5"	167	5t1		
Estimated Quantities			Reinf. Steel			Reinf. Steel			Reinf. Steel			Reinf. Steel					
One Headwall			Concrete			Concrete			Concrete			Concrete					
			Parapet Δ			Parapet Δ			Parapet Δ			Parapet Δ					
			Wingwalls			Wingwalls			Wingwalls			Wingwalls					
			Apron *			Apron *			Apron *			Apron *					
			42.8 CY			4844 LB			3875 LB			3199 LB					
			2.6			2.6			2.6			2.6					
			9.7			7.5			5.5			3.7					
			30.5			25.7			21.7			17.9					
			29.8 CY			29.8 CY			29.8 CY			24.2 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.

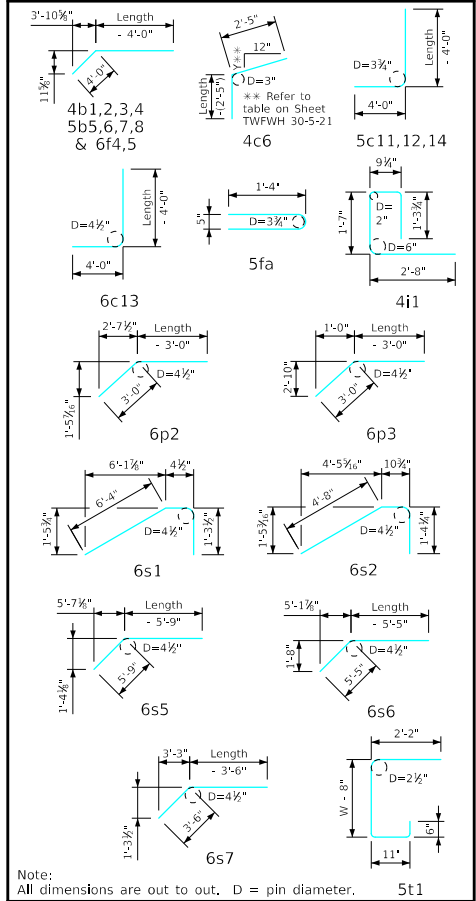
Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap. Lengths shown for bars over 40'-0" long do not include lap.

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

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 10'-0" Span 30° Skew	TWFH 30-7-21 Sheet 2 of 2
--	---------------------------------