

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

Bar	Location	Shape	12' x 7'			12' x 6'			12' x 5'			12' 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'-10" to 10'-0"	133	26 Var.	2'-10" to 8'-10"	101	22 Var.	2'-10" to 7'-10"	78	18 Var.	2'-10" to 6'-11"	59	4c1
4c2	Wingwall, F.F.V. Short		23 Var.	2'-10" to 9'-11"	98	20 Var.	2'-10" to 8'-11"	78	17 Var.	2'-10" to 8'-0"	62	14 Var.	2'-10" to 7'-0"	46	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	2	7'-9"	10	2	6'-9"	9	2	5'-9"	8	4c5
4c5	Wingwall, F.F.V. Short		1	8'-9"	6	1	7'-9"	5	1	6'-9"	5	1	5'-9"	4	4c5
4c6	Interior Wall, Both F.V.		2	4'-2"	6	2	4'-1"	5	2	4'-1"	5	2	4'-1"	5	4c6
4c7	Interior Wall, Both F.V.		32 Var.	1'-11" to 7'-6"	101	27 Var.	1'-11" to 6'-6"	76	22 Var.	1'-10" to 5'-5"	53	18 Var.	1'-10" to 4'-6"	38	4c7
4c8	Interior Wall, Both F.V.		2	7'-7"	10	2	6'-7"	9	2	5'-7"	7	2	4'-7"	6	4c8
5c9	Wingwall, B.F.V. Long		11 Var.	2'-10" to 5'-3"	46	11 Var.	2'-10" to 5'-3"	46	11 Var.	2'-10" to 5'-3"	46	11 Var.	2'-10" to 5'-3"	46	5c9
5c10	Wingwall, B.F.V. Short		5 Var.	2'-10" to 4'-2"	18	5 Var.	2'-10" to 4'-2"	18	5 Var.	2'-10" to 4'-2"	18	5 Var.	2'-10" to 4'-2"	18	5c10
5c11	Wingwall, B.F.V. Long		20 Var.	9'-6" to 14'-0"	245	15 Var.	9'-6" to 12'-10"	175	11 Var.	9'-6" to 11'-10"	122	7 Var.	9'-6" to 10'-11"	75	5c11
5c12	Wingwall, B.F.V. Short		18 Var.	8'-6" to 13'-11"	210	15 Var.	8'-6" to 12'-11"	168	12 Var.	8'-6" to 12'-0"	128	9 Var.	8'-6" to 11'-0"	92	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'-9"	13	2	11'-9"	25	2	10'-9"	22	2	9'-9"	20	5c14
5c14	Wingwall, B.F.V. Short		1	12'-9"	13	1	11'-9"	12	1	10'-9"	11	1	9'-9"	10	5c14
4d1	Apron, Longit., Bott.		17	20'-4"	231	17	18'-1"	205	17	15'-9"	179	17	13'-5"	152	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		24	20'-4"	733	24	18'-1"	652	24	15'-9"	568	24	13'-5"	484	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		49	6'-4"	207	49	6'-4"	207	49	6'-4"	207	49	6'-4"	207	4f1
7j1	Parapet, Horizontal		4	29'-11"	245	4	29'-11"	245	4	29'-11"	245	4	29'-11"	245	7j1
6m1	Apron, Trans., Top		11 Var.	28'-0" to 29'-10"	478	11 Var.	28'-0" to 29'-10"	478	9 Var.	28'-0" to 29'-6"	389	6 Var.	28'-0" to 28'-11"	256	6m1
6m2	Apron, Trans., Top		4 Var.	30'-2" to 31'-3"	184	1 Var.	30'-2" to 30'-2"	45	2 Var.	22'-7" to 23'-11"	70	5 Var.	18'-7" to 23'-10"	159	6m2
6m3	Apron, Trans., Top		18 Var.	6'-1" to 24'-11"	419	18 Var.	5'-5" to 24'-3"	401	16 Var.	4'-9" to 21'-5"	314	13 Var.	4'-1" to 17'-5"	210	6m3
6m4	Apron, Trans., Bott.		14 Var.	23'-7" to 32'-5"	589	12 Var.	23'-7" to 31'-1"	493	10 Var.	23'-7" to 29'-8"	400	8 Var.	23'-7" to 28'-4"	312	6m4
6p1	Curtain, Horizontal		4	28'-9"	173	4	28'-9"	173	4	28'-9"	173	4	28'-8"	172	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	20'-10"	63	2	18'-4"	55	2	15'-10"	48	2	13'-4"	40	6s7
5t1	Curtain, Vertical		36	8'-8"	250	33	8'-5"	221	31	8'-5"	207	29	8'-5"	194	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 *			
			6313 LB			5345 LB			4322 LB			3589 LB			
			48.4 CY			40.7 CY			34.1 CY			27.9 CY			
			3.0			3.0			3.0			3.0			
			9.7			7.5			5.5			3.7			
			35.7			30.2			25.6			21.2			

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.

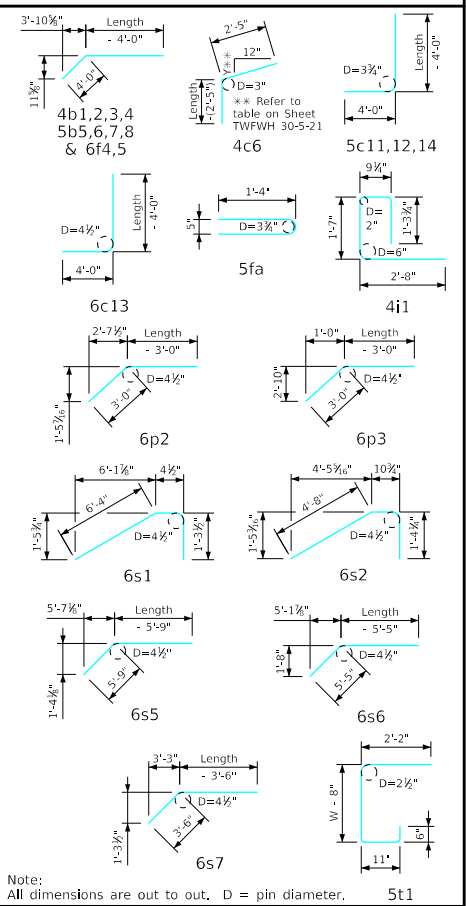
Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap. Lengths shown for bars over 40'-0" long do not include lap.

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

Headwall Notes:


- See Sheet TWFHW 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 12'-0" Span 30° Skew	TWFHW 30-6-21 Sheet 2 of 2
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