

ENGLISHLRFDDESIGNEDSINGLECULVERTSFHW.DGN - FW 30-6-21 S2 - THIS SHEET ISSUED 02-2021.

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

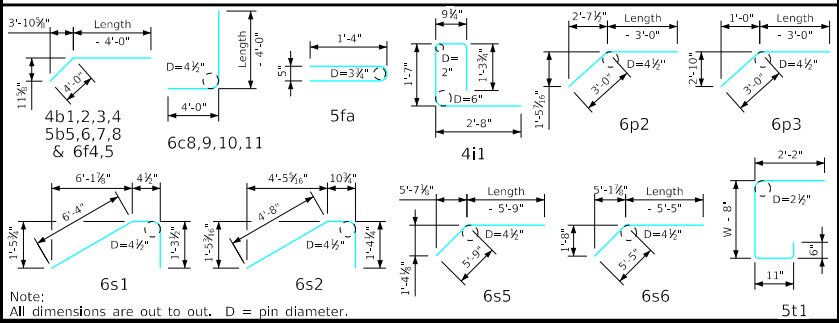
Bar	Location	Shape	16' x 7'			16' x 6'			16' x 5'			16' x 4'			Bar		
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.			
5fa	Fence Anchor (Galv.)		2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	5fa		
4b1	Wingwall, B.F.H, Long		1	34'-4"	23	1	30'-2"	20	1	26'-0"	17	1	21'-10"	15	4b1		
4b2	Wingwall, 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		
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		
5c6	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	5c6		
5c7	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	5c7		
6c8	Wingwall, B.F.V, Long		20 Var.	9'-6 to 14'-0"	353	15 Var.	9'-6 to 12'-10"	252	11 Var.	9'-6 to 11'-10"	176	7 Var.	9'-6 to 10'-11"	107	6c8		
6c9	Wingwall, B.F.V, Short		18 Var.	8'-6 to 13'-11"	303	15 Var.	8'-6 to 12'-11"	241	12 Var.	8'-6 to 12'-0"	185	9 Var.	8'-6 to 11'-0"	132	6c9		
6c10	Wingwall, B.F.V, Long		11	10'-6"	173	--	--	--	--	--	--	--	--	--	6c10		
6c10	Wingwall, B.F.V, Short		8	10'-6"	126	--	--	--	--	--	--	--	--	--	6c10		
6c11	Wingwall, B.F.V, Long		1	12'-9"	19	2	11'-9"	35	2	10'-9"	32	2	9'-9"	29	6c11		
6c11	Wingwall, B.F.V, Short		1	12'-9"	19	1	11'-9"	18	1	10'-9"	16	1	9'-9"	15	6c11		
4d1	Apron, Longit., Bott.		11	20'-4"	149	11	18'-1"	133	11	15'-9"	116	11	13'-5"	99	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		15	20'-4"	458	15	18'-1"	407	15	15'-9"	355	15	13'-5"	302	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		
4i1	Parapet, Vertical		33	6'-4"	140	33	6'-4"	140	33	6'-4"	140	33	6'-4"	140	4i1		
9j1	Parapet, Horizontal		4	19'-9"	269	4	19'-9"	269	4	19'-9"	269	4	19'-9"	269	9j1		
6m1	Apron, Trans., Top		8 Var.	18'-7 to 19'-11"	231	8 Var.	18'-7 to 19'-11"	231	8 Var.	18'-7 to 19'-11"	231	8 Var.	18'-7 to 19'-11"	231	6m1		
6m2	Apron, Trans., Top		10 Var.	20'-3 to 23'-8"	330	7 Var.	20'-3 to 22'-6"	225	4 Var.	20'-3 to 21'-5"	125	1	20'-3"	30	6m2		
6m3	Apron, Trans., Top		12 Var.	5'-8 to 17'-11"	213	12 Var.	5'-0 to 17'-2"	200	12 Var.	4'-4 to 16'-6"	188	12 Var.	3'-8 to 15'-11"	176	6m3		
6m4	Apron, Trans., Bott.		14 Var.	13'-6 to 22'-4"	377	12 Var.	13'-5 to 20'-11"	309	10 Var.	13'-5 to 19'-7"	248	8 Var.	13'-5 to 18'-3"	190	6m4		
6p1	Curtain, Horizontal		4	18'-8"	112	4	18'-7"	112	4	18'-7"	112	4	18'-7"	112	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	25'-0"	38	1	20'-8"	31	6s5		
6s6	Wing Slope, F.F, Short		1	26'-10"	40	1	23'-7"	35	1	20'-4"	31	1	17'-0"	26	6s6		
5t1	Curtain, Vertical		28	6'-8"	195	26	6'-5"	174	24	6'-5"	161	22	6'-5"	147	5t1		
Estimated Quantities One Headwall			Reinf., Steel			5098 LB			4098 LB			3450 LB			2841 LB		
			Concrete			37.1 CY			30.8 CY			25.5 CY			20.6 CY		
			Parapet Δ			2.2			2.2			2.2			2.2		
			Wingwalls			7.7			5.9			4.3			2.9		
			Apron =			27.2			22.7			19.0			15.5		

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

Bent Bar Details



Headwall Notes:

- See Sheet FW 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.

LATEST REVISION DATE	APPROVED BY BRIDGE ENGINEER	
		Standard Design - Single Reinforced Concrete Box Culverts
		Flared Wing Headwalls
		February, 2021
Quantity Tabulation		FWH 30-6-21
16'-0" Span 30° Skew		
		Sheet 2 of 2