

ENGLISHLRFDDESIGNEDSINGLECULVERTSFHW.DGN - FW 15-6-21 S2 - THIS SHEET ISSUED 02-2021.

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

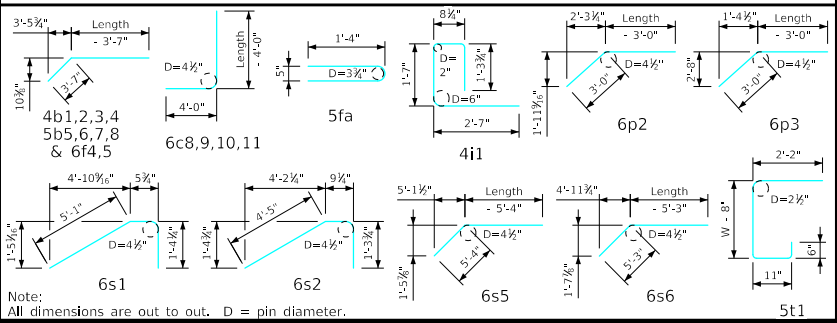
Bar	Location	Shape	16' x 7'			16' x 6'			16' x 5'			16' x 4'			Bar		
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.			
5fa	Fence Anchor (Galv.)		2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	5fa		
4b1	Wingwall, B.F.H, Long		1	28'-6"	19	1	25'-1"	17	1	21'-7"	14	1	18'-2"	12	4b1		
4b2	Wingwall, B.F.H, Short		1	25'-4"	17	1	22'-4"	15	1	19'-4"	13	1	16'-4"	11	4b2		
4b3	Wingwall, B.F.H, Long		5 Var.	13'-2" to 26'-11"	67	4 Var.	13'-2" to 23'-6"	49	3 Var.	13'-2" to 20'-1"	33	2 Var.	13'-2" to 16'-7"	20	4b3		
4b4	Wingwall, B.F.H, Short		5 Var.	11'-11" to 23'-11"	60	4 Var.	11'-11" to 20'-11"	44	3 Var.	11'-11" to 17'-11"	30	2 Var.	11'-11" to 14'-11"	18	4b4		
5b5	Wingwall, F.F.H, Long		1	28'-6"	30	1	25'-1"	26	1	21'-8"	23	1	18'-3"	19	5b5		
5b6	Wingwall, F.F.H, Short		1	25'-4"	26	1	22'-4"	23	1	19'-4"	20	1	16'-4"	17	5b6		
5b7	Wingwall, F.F.H, Long		6 Var.	9'-0" to 26'-11"	115	5 Var.	9'-0" to 23'-6"	87	4 Var.	9'-0" to 20'-1"	62	3 Var.	9'-0" to 16'-8"	41	5b7		
5b8	Wingwall, F.F.H, Short		6 Var.	9'-0" to 24'-0"	103	5 Var.	9'-0" to 21'-0"	78	4 Var.	9'-0" to 18'-0"	56	3 Var.	9'-0" to 15'-0"	38	5b8		
4c1	Wingwall, F.F.V, Long		25 Var.	2'-10" to 9'-10"	106	22 Var.	2'-10" to 9'-0"	87	18 Var.	2'-10" to 7'-10"	64	15 Var.	2'-10" to 6'-11"	49	4c1		
4c2	Wingwall, F.F.V, Short		22 Var.	2'-10" to 9'-10"	93	19 Var.	2'-10" to 8'-10"	74	16 Var.	2'-10" to 7'-10"	57	13 Var.	2'-10" to 6'-10"	42	4c2		
4c3	Wingwall, F.F.V, Long		--	--	--	--	--	--	--	--	--	--	--	--	4c3		
4c4	Wingwall, F.F.V, Short		--	--	--	--	--	--	--	--	--	--	--	--	4c4		
4c5	Wingwall, F.F.V, Long		2	8'-9"	12	1	7'-9"	5	2	6'-9"	9	1	5'-9"	4	4c5		
4c5	Wingwall, F.F.V, Short		2	8'-9"	12	2	7'-9"	10	2	6'-9"	9	2	5'-9"	8	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	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	5c7		
6e8	Wingwall, B.F.V, Long		16 Var.	9'-6" to 13'-10"	280	13 Var.	9'-6" to 13'-0"	220	9 Var.	9'-6" to 11'-10"	144	6 Var.	9'-6" to 10'-11"	92	6e8		
6e9	Wingwall, B.F.V, Short		16 Var.	8'-10" to 13'-10"	272	13 Var.	8'-10" to 12'-10"	212	10 Var.	8'-10" to 11'-10"	155	7 Var.	8'-10" to 10'-10"	103	6e9		
6c10	Wingwall, B.F.V, Long		8	10'-6"	126	--	--	--	--	--	--	--	--	--	6c10		
6c10	Wingwall, B.F.V, Short		7	10'-6"	110	--	--	--	--	--	--	--	--	--	6c10		
6c11	Wingwall, B.F.V, Long		2	12'-9"	38	1	11'-9"	18	2	10'-9"	32	1	9'-9"	15	6c11		
6c11	Wingwall, B.F.V, Short		2	12'-9"	38	2	11'-9"	35	2	10'-9"	32	2	9'-9"	29	6c11		
4d1	Apron, Longit., Bott.		11	18'-6"	136	11	16'-5"	121	11	14'-4"	105	11	12'-4"	91	4d1		
4d2	Apron, Longit., Bott, Long		3	23'-1"	46	3	19'-8"	39	3	16'-3"	33	3	12'-10"	26	4d2		
4d3	Apron, Longit., Bott, Short		3	20'-5"	41	3	17'-5"	35	3	14'-5"	29	3	11'-5"	23	4d3		
4f1	Apron, Longit., Top		15	18'-6"	417	15	16'-5"	370	15	14'-4"	323	15	12'-4"	278	6f1		
6f2	Apron, Longit., Top Long		4 Var.	7'-7" to 15'-3"	69	4 Var.	5'-6" to 13'-2"	56	3 Var.	5'-11" to 11'-1"	38	2 Var.	6'-5" to 9'-0"	23	6f2		
6f3	Apron, Longit., Top Short		4 Var.	6'-7" to 15'-4"	66	4 Var.	4'-5" to 13'-3"	53	3 Var.	5'-3" to 11'-2"	37	2 Var.	6'-2" to 9'-1"	23	6f3		
6f4	Apron, Longit., Top Long		1	28'-6"	43	1	25'-1"	38	1	21'-8"	33	1	18'-3"	27	6f4		
6f5	Apron, Longit., Top Short		1	25'-4"	38	1	22'-4"	34	1	19'-4"	29	1	16'-4"	25	6f5		
4j1	Parapet, Vertical		33	6'-2"	136	33	6'-2"	136	33	6'-2"	136	33	6'-2"	136	4j1		
9j1	Parapet, Horizontal		4	17'-9"	241	4	17'-9"	241	4	17'-9"	241	4	17'-9"	241	9j1		
6m1	Apron, Trans., Top		4 Var.	18'-0" to 18'-7"	110	4 Var.	18'-0" to 18'-7"	110	4 Var.	18'-0" to 18'-7"	110	4 Var.	18'-0" to 18'-7"	110	6m1		
6m2	Apron, Trans., Top		15 Var.	18'-10" to 24'-1"	483	12 Var.	18'-10" to 22'-11"	376	9 Var.	18'-10" to 21'-10"	275	6 Var.	18'-10" to 20'-8"	178	6m2		
6m3	Apron, Trans., Top		5 Var.	6'-8" to 17'-2"	89	6 Var.	4'-2" to 17'-3"	97	6 Var.	4'-3" to 17'-4"	97	6 Var.	4'-5" to 17'-5"	98	6m3		
6m4	Apron, Trans., Bott.		14 Var.	12'-2" to 19'-2"	329	12 Var.	12'-2" to 18'-1"	273	10 Var.	12'-2" to 17'-0"	219	8 Var.	12'-2" to 15'-11"	169	6m4		
6p1	Curtain, Horizontal		4	16'-10"	101	4	16'-9"	101	4	16'-9"	101	4	16'-9"	101	6p1		
6p2	Curtain, Horizontal, Long		4	14'-2"	85	4	12'-8"	76	4	11'-2"	67	4	9'-8"	58	6p2		
6p3	Curtain, Horizontal, Short		4	11'-3"	68	4	10'-2"	61	4	9'-1"	55	4	7'-11"	48	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	23'-5"	70	2	19'-10"	60	2	16'-3"	49	2	12'-8"	38	6s3		
6s4	Wing Slope, Both F., Short		2	21'-1"	63	2	17'-11"	54	2	14'-9"	44	2	11'-7"	35	6s4		
6s5	Wing Slope, F.F, Long		1	28'-7"	43	1	25'-0"	38	1	21'-5"	32	1	17'-10"	27	6s5		
6s6	Wing Slope, F.F, Short		1	25'-10"	39	1	22'-8"	34	1	19'-6"	29	1	16'-4"	25	6s6		
5t1	Curtain, Vertical		24	6'-8"	167	22	6'-5"	147	20	6'-5"	134	18	6'-5"	120	5t1		
Estimated Quantities One Headwall			Reinf. Steel			4512 LB			3658 LB			3077 LB			2526 LB		
			Concrete			32.3 CY			26.9 CY			22.3 CY			18.1 CY		
			Parapet Δ			1.9			1.9			1.9			1.9		
			Wingwalls			6.8			5.2			3.8			2.6		
			Apron =			23.6			19.6			16.6			13.6		

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 2-21 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" requirements reflect 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 15-6-21 Sheet 2 of 2
16'-0" Span 15° Skew		