

ENGLISHLRFDDESIGNEDSINGLECULVERTSFWH.DGN - FW 30-9-21 51 - THIS SHEET ISSUED 02-2021.

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

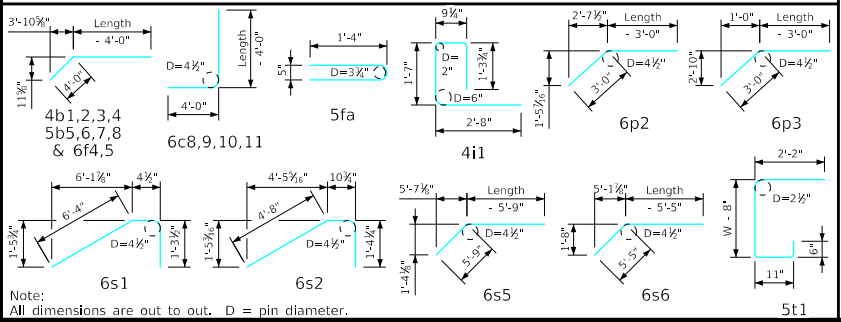
Bar	Location	Shape	10' x 12'			10' x 11'			10' x 10'			10' x 9'			10' x 8'			10' x 7'			Bar
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	
5fa	Fence Anchor (Galv.)	U	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa
4b1	Wingwall, B.F.H, Long	W	1	55'-2	38	1	51'-0	36	1	46'-10	33	1	42'-8	30	1	38'-6	26	1	34'-4	23	4b1
4b2	Wingwall, B.F.H, Short	W	1	42'-2	30	1	39'-1	26	1	36'-0	24	1	32'-10	22	1	29'-9	20	1	26'-7	18	4b2
4b3	Wingwall, B.F.H, Long	W	10 Var.	15'-8 to 53'-3	237	9 Var.	15'-8 to 49'-1	199	8 Var.	15'-8 to 44'-11	165	7 Var.	15'-8 to 40'-9	134	6 Var.	15'-8 to 36'-7	105	5 Var.	15'-8 to 32'-5	80	4b3
4b4	Wingwall, B.F.H, Short	W	10 Var.	12'-11 to 40'-9	181	9 Var.	12'-11 to 37'-8	152	8 Var.	12'-11 to 34'-7	127	7 Var.	12'-10 to 31'-5	103	6 Var.	12'-10 to 28'-4	82	5 Var.	12'-10 to 25'-3	64	4b4
5b5	Wingwall, F.F.H, Long	W	1	55'-3	60	1	51'-1	56	1	46'-11	51	1	42'-9	47	1	38'-7	40	1	34'-5	36	5b5
5b6	Wingwall, F.F.H, Short	W	1	42'-3	47	1	39'-2	41	1	36'-0	38	1	32'-11	34	1	29'-9	31	1	26'-8	28	5b6
5b7	Wingwall, F.F.H, Long	W	11 Var.	11'-7 to 53'-4	382	10 Var.	11'-7 to 49'-1	324	9 Var.	11'-7 to 44'-11	270	8 Var.	11'-7 to 40'-9	221	7 Var.	11'-7 to 36'-7	176	6 Var.	11'-7 to 32'-5	138	5b7
5b8	Wingwall, F.F.H, Short	W	11 Var.	9'-10 to 40'-10	293	10 Var.	9'-10 to 37'-9	248	9 Var.	9'-10 to 34'-7	208	8 Var.	9'-10 to 31'-6	172	7 Var.	9'-9 to 28'-4	139	6 Var.	9'-9 to 25'-3	110	5b8
4c1	Wingwall, F.F.W, Long	W	51 Var.	2'-9 to 14'-9	298	47 Var.	2'-9 to 13'-9	259	43 Var.	2'-9 to 12'-10	224	39 Var.	2'-9 to 11'-10	190	35 Var.	2'-9 to 10'-11	160	31 Var.	2'-9 to 9'-11	131	4c1
4c2	Wingwall, F.F.W, Short	W	38 Var.	2'-9 to 14'-8	221	35 Var.	2'-9 to 13'-8	192	32 Var.	2'-9 to 12'-9	166	29 Var.	2'-9 to 11'-9	140	26 Var.	2'-9 to 10'-9	117	23 Var.	2'-9 to 9'-10	97	4c2
4c3	Wingwall, F.F.W, Long	W	23 Var.	9'-7 to 14'-10	188	19 Var.	9'-7 to 13'-11	149	15 Var.	9'-7 to 12'-11	113	11 Var.	9'-7 to 12'-0	79	--	--	--	--	--	--	4c3
4c4	Wingwall, F.F.W, Short	W	18 Var.	9'-4 to 14'-10	145	15 Var.	9'-4 to 13'-10	116	12 Var.	9'-4 to 12'-10	89	9 Var.	9'-4 to 11'-11	64	--	--	--	--	--	--	4c4
4c5	Wingwall, F.F.W, Long	W	2	13'-8	18	2	12'-8	17	2	11'-8	16	1	10'-8	14	1	9'-8	6	1	8'-8	6	4c5
4c5	Wingwall, F.F.W, Short	W	2	13'-8	18	2	12'-8	17	2	11'-8	16	2	10'-8	14	2	9'-8	13	1	8'-8	6	4c5
5c6	Wingwall, B.F.V, Long	W	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	11 Var.	2'-9 to 5'-2	45	11 Var.	2'-9 to 5'-2	45	5c6
5c7	Wingwall, B.F.V, Short	W	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	5 Var.	2'-9 to 4'-1	18	5 Var.	2'-9 to 4'-1	18	5c7
6c9	Wingwall, B.F.V, Long	W	40 Var.	9'-5 to 18'-9	846	36 Var.	9'-5 to 17'-9	734	32 Var.	9'-5 to 16'-10	631	28 Var.	9'-5 to 15'-10	531	24 Var.	9'-5 to 14'-11	439	20 Var.	9'-5 to 13'-11	350	6c9
6c9	Wingwall, B.F.V, Short	W	33 Var.	8'-5 to 18'-8	671	30 Var.	8'-5 to 17'-8	588	27 Var.	8'-5 to 16'-9	510	24 Var.	8'-5 to 15'-9	436	21 Var.	8'-5 to 14'-9	365	18 Var.	8'-5 to 13'-10	301	6c9
6c10	Wingwall, B.F.V, Long	W	31	10'-6	489	27	10'-6	426	23	10'-6	363	19	10'-6	300	15	10'-6	237	11	10'-6	172	6c10
6c10	Wingwall, B.F.V, Short	W	23	10'-6	363	20	10'-6	315	17	10'-6	268	14	10'-6	221	11	10'-6	173	8	10'-6	126	6c10
6c11	Wingwall, B.F.V, Long	W	2	17'-8	53	2	16'-8	50	2	15'-8	47	1	14'-8	42	1	13'-8	37	1	12'-8	32	6c11
6c11	Wingwall, B.F.V, Short	W	2	17'-8	53	2	16'-8	50	2	15'-8	47	2	14'-8	44	2	13'-8	41	1	12'-8	36	6c11
4d1	Apron, Longit., Bott.	W	7	31'-11	149	7	29'-7	138	7	27'-3	127	7	25'-0	117	7	22'-8	106	7	20'-4	95	4d1
4d2	Apron, Longit., Bott, Long	W	3	48'-9	103	3	44'-7	94	3	40'-5	86	3	36'-3	73	3	32'-1	64	3	27'-11	56	4d2
4d3	Apron, Longit., Bott, Short	W	3	37'-3	75	3	34'-2	68	3	31'-0	62	3	27'-11	56	3	24'-9	50	3	21'-8	43	4d3
6f1	Apron, Longit., Top	W	9	31'-11	431	9	29'-7	400	9	27'-3	368	9	25'-0	338	9	22'-8	306	9	20'-4	275	6f1
6f2	Apron, Longit., Top Long	W	11 Var.	5'-4 to 28'-6	279	10 Var.	5'-4 to 26'-2	237	9 Var.	5'-4 to 23'-10	197	8 Var.	5'-4 to 21'-7	162	7 Var.	5'-3 to 19'-3	129	6 Var.	5'-3 to 16'-11	100	6f2
6f3	Apron, Longit., Top Short	W	8 Var.	7'-0 to 28'-8	214	7 Var.	7'-9 to 26'-5	180	7 Var.	8'-5 to 24'-1	155	6 Var.	6'-2 to 21'-9	126	5 Var.	6'-11 to 19'-6	99	4 Var.	7'-9 to 17'-2	75	6f3
6f4	Apron, Longit., Top Long	W	1	55'-3	87	1	51'-1	80	1	46'-11	74	1	42'-9	68	1	38'-7	58	1	34'-5	52	6f4
6f5	Apron, Longit., Top Short	W	1	42'-3	67	1	39'-2	59	1	36'-0	54	1	32'-11	49	1	29'-9	45	1	26'-8	40	6f5
4i1	Parapet, Vertical	W	21	6'-4	89	21	6'-4	89	21	6'-4	89	21	6'-4	89	21	6'-4	89	21	6'-4	89	4i1
7j1	Parapet, Horizontal	W	4	13'-5	110	4	13'-3	108	4	13'-1	107	4	13'-1	107	4	13'-1	107	4	12'-10	105	7j1
6m1	Apron, Trans., Top	W	5 Var.	12'-8 to 13'-5	98	5 Var.	12'-6 to 13'-3	97	5 Var.	12'-4 to 13'-1	95	5 Var.	12'-4 to 13'-1	95	5 Var.	12'-4 to 13'-1	95	5 Var.	12'-2 to 12'-11	94	6m1
6m2	Apron, Trans., Top	W	31 Var.	13'-8 to 24'-11	898	28 Var.	13'-6 to 23'-7	780	25 Var.	13'-4 to 22'-4	670	21 Var.	13'-4 to 20'-10	539	18 Var.	13'-4 to 19'-8	446	15 Var.	13'-2 to 18'-5	356	6m2
6m3	Apron, Trans., Top	W	7 Var.	8'-11 to 15'-7	129	7 Var.	8'-2 to 14'-10	121	7 Var.	7'-5 to 14'-1	113	8 Var.	6'-9 to 14'-6	128	8 Var.	6'-1 to 13'-10	120	8 Var.	5'-4 to 13'-1	111	6m3
6m4	Apron, Trans., Bott.	W	24 Var.	6'-6 to 22'-2	517	22 Var.	6'-6 to 20'-10	452	20 Var.	6'-6 to 19'-6	391	18 Var.	6'-6 to 18'-1	332	16 Var.	6'-6 to 16'-9	279	14 Var.	6'-6 to 15'-5	230	6m4
6p1	Curtain, Horizontal	W	4	11'-9	71	4	11'-9	71	4	11'-9	71	4	11'-9	71	4	11'-9	71	4	11'-8	70	6p1
6p2	Curtain, Horizontal, Long	W	4	28'-0	168	4	26'-0	144	4	24'-0	144	4	22'-0	132	4	20'-0	120	4	18'-0	108	6p2
6p3	Curtain, Horizontal, Short	W	4	15'-11	96	4	14'-11	90	4	13'-10	83	4	12'-10	77	4	11'-9	71	4	10'-9	65	6p3
6s1	Wing Slope, Both F., Long	W	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	2	8'-0	24	6s1
6s2	Wing Slope, Both F., Short	W	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	2	6'-11	21	6s2
6s3	Wing Slope, Both F., Long	W	2	48'-11	154	2	44'-7	141	2	40'-4	128	2	36'-0	120	2	31'-9	95	2	27'-5	82	6s3
6s4	Wing Slope, Both F., Short	W	2	38'-0	114	2	34'-9	104	2	31'-6	95	2	28'-2	85	2	24'-11	75	2	21'-8	65	6s4
6s5	Wing Slope, F.F, Long	W	1	59'-0	86	1	50'-9	80	1	46'-5	73	1	42'-2	67	1	37'-10	57	1	33'-7	50	6s5
6s6	Wing Slope, F.F, Short	W	1	43'-3	69	1	40'-0	60	1	36'-8	55	1	33'-5	50	1	30'-2	45	1	26'-10	40	6s6
5t1	Curtain, Vertical	W	34	7'-11	281	33	7'-8	264	30	7'-5	232	28	7'-2	209	25	6'-11	180	22	6'-8	153	5t1
Estimated Quantities One Headwall			Reinf. Steel	9030 LB	72.1 CY	1.8	7978 LB	60.9 CY	1.7	6989 LB	51.0 CY	1.7	6003 LB	43.9 CY	1.7	5012 LB	37.2 CY	1.7	4193 LB	30.1 CY	
			Concrete	26.1		20.5		15.8		13.2		10.7		7.7		24.8		20.7			
			Wingwalls	44.1		38.6		33.5		29.0		24.8		20.7							
			Apron *																		

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 "b1" and "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "d", "g1", "f1", "g4" and "f5" 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 30-9-21
		10'-0" Span	
		30° Skew	Sheet 1 of 2