

ENGLISHLRFDDESIGNEDSINGLECULVERTSFWH.DGN - FW 30-9-21 S2 - THIS SHEET ISSUED 02-2021.

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

Bar	Location	Shape	10' x 6'			10' x 5'			10' x 4'			Bar
			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	5fa
4b1	Wingwall, B.F.H. Long		1	30'-2"	20	1	26'-0"	17	1	21'-10"	15	4b1
4b2	Wingwall, B.F.H. Short		1	23'-6"	16	1	20'-5"	14	1	17'-3"	12	4b2
4b3	Wingwall, B.F.H. Long		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		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	30'-2"	31	1	26'-0"	27	1	21'-10"	23	5b5
5b6	Wingwall, F.F.H. Short		1	23'-6"	25	1	20'-5"	21	1	17'-4"	18	5b6
5b7	Wingwall, F.F.H. Long		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		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		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		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		2	7'-8"	10	2	6'-8"	9	2	5'-8"	8	4c5
4c5	Wingwall, F.F.V. Short		1	7'-8"	5	1	6'-8"	4	1	5'-8"	4	4c5
5c6	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	5c6
5c7	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	5c7
6c8	Wingwall, B.F.V. Long		15 Var.	9'-5" to 12'-9"	250	11 Var.	9'-5" to 11'-9"	175	7 Var.	9'-5" to 10'-10"	106	6c8
6c9	Wingwall, B.F.V. Short		15 Var.	8'-5" to 12'-10"	239	12 Var.	8'-5" to 11'-11"	183	9 Var.	8'-5" to 10'-11"	131	6c9
6c10	Wingwall, B.F.V. Long		--	--	--	--	--	--	--	--	--	6c10
6c10	Wingwall, B.F.V. Short		--	--	--	--	--	--	--	--	--	6c10
6c11	Wingwall, B.F.V. Long		2	11'-8"	35	2	10'-8"	32	2	9'-8"	29	6c11
6c11	Wingwall, B.F.V. Short		1	11'-8"	18	1	10'-8"	16	1	9'-8"	15	6c11
4d1	Apron, LongR., Bott.		7	18'-1"	85	7	15'-9"	74	7	13'-5"	63	4d1
4d2	Apron, LongR., Bott. Long		3	23'-9"	48	3	19'-7"	39	3	15'-4"	31	4d2
4d3	Apron, LongR., Bott. Short		3	18'-7"	37	3	15'-5"	31	3	12'-4"	25	4d3
6f1	Apron, LongL., Top		9	18'-1"	244	9	15'-9"	213	9	13'-5"	181	6f1
6f2	Apron, LongL., Top Long		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, LongL., Top Short		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, LongL., Top Long		1	30'-2"	45	1	26'-0"	39	1	21'-10"	33	6f4
6f5	Apron, LongL., Top Short		1	23'-6"	35	1	20'-5"	31	1	17'-4"	26	6f5
4i1	Parapet, Vertical		21	6'-4"	89	21	6'-4"	89	21	6'-4"	89	4i1
7j1	Parapet, Horizontal		4	12'-10"	105	4	12'-10"	105	4	12'-10"	105	7j1
6m1	Apron, Trans., Top		5 Var.	12'-2" to 12'-11"	94	5 Var.	12'-2" to 12'-11"	94	5 Var.	12'-2" to 12'-11"	94	6m1
6m2	Apron, Trans., Top		12 Var.	13'-2" to 17'-3"	274	9 Var.	13'-2" to 16'-2"	198	6 Var.	13'-2" to 15'-0"	127	6m2
6m3	Apron, Trans., Top		8 Var.	4'-8" to 12'-5"	103	8 Var.	4'-0" to 11'-9"	95	8 Var.	3'-4" to 11'-1"	87	6m3
6m4	Apron, Trans., Bott.		12 Var.	6'-6" to 14'-0"	185	10 Var.	6'-6" to 12'-8"	144	8 Var.	6'-6" to 11'-4"	107	6m4
6p1	Curtain, Horizontal		4	11'-8"	70	4	11'-8"	70	4	11'-8"	70	6p1
6p2	Curtain, Horizontal, Long		4	16'-0"	96	4	13'-11"	84	4	11'-11"	72	6p2
6p3	Curtain, Horizontal, Short		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	6s1
6s2	Wing Slope, Both F., Short		2	6'-11"	21	2	6'-11"	21	2	6'-11"	21	6s2
6s3	Wing Slope, Both F., Long		2	23'-2"	70	2	18'-10"	57	2	14'-7"	44	6s3
6s4	Wing Slope, Both F., Short		2	18'-4"	55	2	15'-1"	45	2	11'-10"	36	6s4
6s5	Wing Slope, F.F. Long		1	29'-3"	44	1	25'-0"	38	1	20'-8"	31	6s5
6s6	Wing Slope, F.F. Short		1	23'-7"	35	1	20'-4"	31	1	17'-0"	26	6s6
5t1	Curtain, Vertical		20	6'-5"	134	18	6'-5"	120	16	6'-5"	107	5t1
			Reinf. Steel			2700 LB			2170 LB			
Estimated Quantities One Headwall			Concrete	Parapet Δ	1.7	Concrete	Wingwalls	1.7	Concrete	Apron *	1.7	
				Apron *	5.9		Apron *	4.3		Apron *	2.9	
					17.1			14.2			11.4	
			24.7 CY			20.2 CY			16.0 CY			

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.

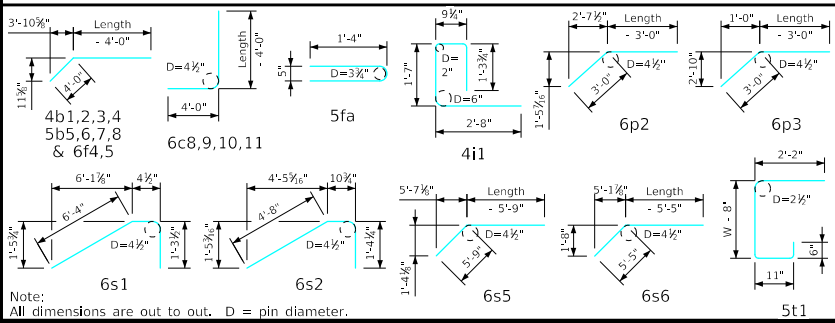
"Short" Denotes Short Wingwall
"Long" Denotes Long Wingwall

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.

Headwall Notes:

- See Sheet FW 30-9-21 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	IOWA DOT Highway Division	
		Standard Design - Single Reinforced Concrete Box Culverts	
		Flared Wing Headwalls	
		February, 2021	
Quantity Tabulation		10'-0" Span	FWH 30-9-21
30° Skew		Sheet 2 of 2	