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

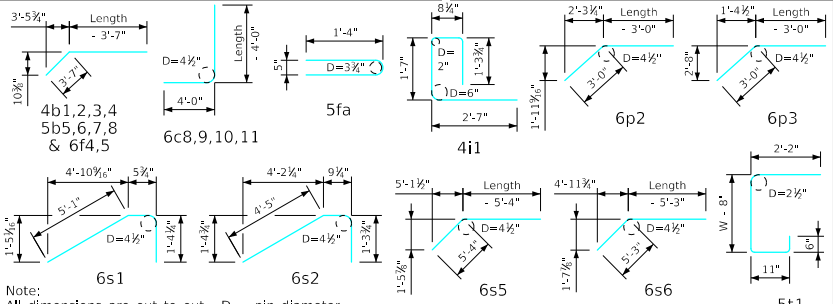
Bar	Location	Shape	12' x 6' No.	12' x 6' Length	12' x 6' Wt.	12' x 5' No.	12' x 5' Length	12' x 5' Wt.	12' x 4' No.	12' x 4' Length	12' x 4' Wt.	Bar
5fa	Fence Anchor (Galv.)		2	2'-10	6	2	2'-10	6	2	2'-10	6	5fa
4b1	Wingwall, B.F.H. Long		1	25'-1	17	1	21'-7	14	1	18'-2	12	4b1
4b2	Wingwall, B.F.H. Short		1	22'-4	15	1	19'-4	13	1	16'-4	11	4b2
4b3	WIngwall, B.F.H. Long		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		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	25'-1	26	1	21'-8	23	1	18'-3	19	5b5
5b6	Wingwall, F.F.H. Short		1	22'-4	23	1	19'-4	20	1	16'-4	17	5b6
5b7	Wingwall, F.F.H. Long		5 Var.	9'-10 to 23'-6	87	4 Var.	9'-10 to 20'-1	62	3 Var.	9'-9 to 16'-8	41	5b7
5b8	Wingwall, F.F.H. Short		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		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		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		1	7'-9	5	2	6'-9	9	1	5'-9	4	4c5
4c5	Wingwall, F.F.V. Short		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	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	5c7
6c8	Wingwall, B.F.V. Long		13 Var.	9'-6 to 13'-0	220	9 Var.	9'-6 to 11'-10	144	6 Var.	9'-6 to 10'-11	92	6c8
6c9	WIngwall, B.F.V. Short		13 Var.	8'-10 to 12'-10	212	10 Var.	8'-10 to 11'-10	155	7 Var.	8'-10 to 10'-10	103	6c9
6c10	Wingwall, B.F.V. Long		--	--	--	--	--	--	--	--	--	6c10
6c10	Wingwall, B.F.V. Short		--	--	--	--	--	--	--	--	--	6c10
6c11	Wingwall, B.F.V. Long		1	11'-9	18	2	10'-9	32	1	9'-9	15	6c11
6c11	WIngwall, B.F.V. Short		2	11'-9	35	2	10'-9	32	2	9'-9	29	6c11
4d1	Apron, Longit,, Bott.		9	16'-5	99	9	14'-4	86	9	12'-4	74	4d1
4d2	Apron, Longit,, Bott, Long		3	19'-8	39	3	16'-3	33	3	12'-10	26	4d2
4d3	Apron, Longit,, Bott, Short		3	17'-5	35	3	14'-5	29	3	11'-5	23	4d3
6f1	Apron, Longlt,, Top		11	16'-5	271	11	14'-4	237	11	12'-4	204	6f1
6f2	Apron, Longit,, Top Long		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, Longlt,, Top Short		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	25'-1	38	1	21'-8	33	1	18'-3	27	6f4
6f5	Apron, Longit,, Top Short		1	22'-4	34	1	19'-4	29	1	16'-4	25	6f5
4i1	Parapet, Vertical		25	6'-2	103	25	6'-2	103	25	6'-2	103	4i1
7j1	Parapet, Horizontal		4	13'-7	111	4	13'-7	111	4	13'-7	111	7j1
6m1	Apron, Trans,, Top		3 Var.	13'-11 to 14'-3	63	3 Var.	13'-11 to 14'-3	63	3 Var.	13'-11 to 14'-3	63	6m1
6m2	Apron, Trans,, Top		14 Var.	14'-5 to 19'-4	355	11 Var.	14'-5 to 18'-2	269	8 Var.	14'-5 to 17'-1	189	6m2
6m3	Apron, Trans,, Top		4 Var.	4'-11 to 12'-9	53	4 Var.	5'-0 to 12'-10	54	4 Var.	5'-2 to 13'-0	55	6m3
6m4	Apron, Trans,, Bott.		12 Var.	8'-0 to 13'-11	198	10 Var.	8'-0 to 12'-10	156	8 Var.	8'-0 to 11'-9	119	6m4
6p1	Curtain, Horizontal		4	12'-8	76	4	12'-8	76	4	12'-8	76	6p1
6p2	Curtain, Horizontal, Long		4	12'-8	76	4	11'-2	67	4	9'-8	58	6p2
6p3	Curtain, Horizontal, Short		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	6s1
6s2	WIng Slope, Both F., Short		2	6'-6	20	2	6'-6	20	2	6'-6	20	6s2
6s3	Wing Slope, Both F., Long		2	19'-10	60	2	16'-3	49	2	12'-8	38	6s3
6s4	Wing Slope, Both F., Short		2	17'-11	54	2	14'-9	44	2	11'-7	35	6s4
6s5	Wing Slope, F.F. Long		1	25'-0	38	1	21'-5	32	1	17'-10	27	6s5
6s6	WIng Slope, F.F. Short		1	22'-8	34	1	19'-6	29	1	16'-4	25	6s6
5t1	Curtain, Vertical		18	6'-5	120	16	6'-5	107	14	6'-5	94	5t1
	Estimated Quantities One Headwall	Reinf. Steel		3135 LB			2598 LB			2092 LB		
		Concrete Parapet Δ	1.6	23.7 CY		1.6	19.5 CY		1.6	15.7 CY		
		Concrete Wingwalls	5.2			3.8			2.6			
		Concrete Apron ✳	16.9			14.1			11.5			

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



Note:
All dimensions are out to out. D = pin diameter.

Headwall Notes:

1. See Sheet FWH G2-21 for General Notes, Specifications, and Design Stresses.
2. This headwall is based on a 3:1 slope normal to centerline of roadway.
3. The sides of the apron are to be formed to ensure correct line and grade.
4. 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.
5. 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.
6. Concrete quantities are estimated from back of parapet.
7. 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.
8. Dimensions are in feet and inches unless otherwise noted.

LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER

IOWADOT Highway Division

Standard Design - Single Reinforced Concrete Box Culverts

Flared Wing Headwalls

February, 2021

Quantity Tabulation
12'-0" Span
15° Skew

FWH 15-8-21
Sheet 2 of 2

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