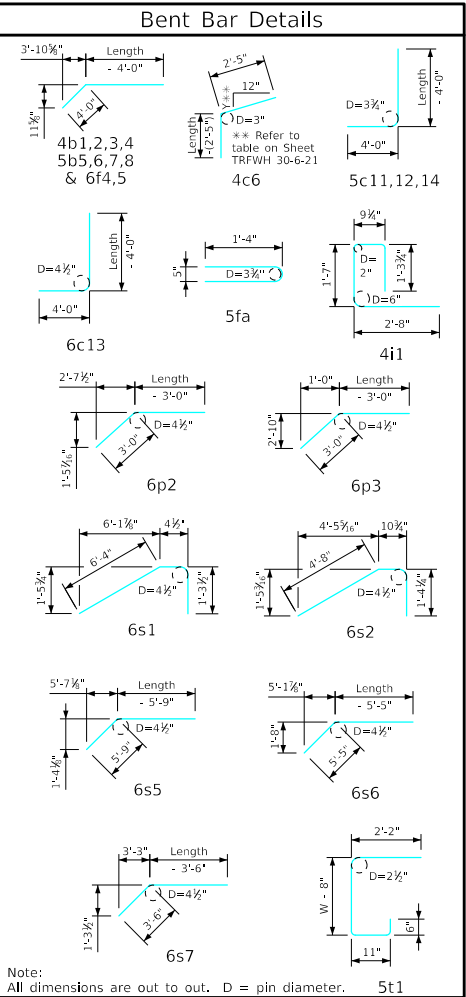


Bill of Reinforcing for One Headwall 30° Skew Span x Culvert Height

Bar	Location	Shape	12' x 12'			12' x 11'			12' x 10'			12' x 9'			12' x 8'			Bar		
			No.	Length	Wt.	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	2	2'-10"	6	5fa		
4b1	Wingwall, B.F.H. Long		1	55'-2"	38	1	51'-0"	36	1	46'-10"	33	1	42'-8"	30	1	38'-6"	26	4b1		
4b2	Wingwall, B.F.H. Short		1	42'-2"	30	1	39'-1"	26	1	36'-0"	24	1	32'-10"	22	1	29'-9"	20	4b2		
4b3	Wingwall, B.F.H. Long		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	4b3		
4b4	Wingwall, B.F.H. Short		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'-11 to 31'-5	103	6 Var.	12'-11 to 28'-4	82	4b4		
5b5	Wingwall, F.F.H. Long		1	55'-3"	60	1	51'-1"	56	1	46'-11"	51	1	42'-9"	47	1	38'-7"	40	5b5		
5b6	Wingwall, F.F.H. Short		1	42'-3"	46	1	39'-2"	41	1	36'-0"	38	1	32'-11"	34	1	29'-9"	31	5b6		
5b7	Wingwall, F.F.H. Long		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	5b7		
5b8	Wingwall, F.F.H. Short		11 Var.	9'-0 to 40'-10	293	10 Var.	9'-0 to 37'-9	248	9 Var.	9'-0 to 34'-7	208	8 Var.	9'-0 to 31'-6	172	7 Var.	9'-9 to 28'-4	139	5b8		
5b9	Interior Wall, Both F.V.		42 Var.	2 Each 6'-0 to 31'-4	818	38 Var.	2 Each 6'-0 to 29'-1	695	34 Var.	2 Each 6'-0 to 26'-9	581	30 Var.	2 Each 6'-0 to 24'-5	476	26 Var.	2 Each 6'-1 to 22'-2	383	5b9		
4c1	Wingwall, F.F.V. Long		51 Var.	2'-10 to 14'-10	301	47 Var.	2'-10 to 13'-10	262	43 Var.	2'-10 to 12'-11	226	39 Var.	2'-10 to 11'-11	192	35 Var.	2'-10 to 10'-10	162	4c1		
4c2	Wingwall, F.F.V. Short		38 Var.	2'-10 to 14'-9	223	35 Var.	2'-10 to 13'-9	194	32 Var.	2'-10 to 12'-10	167	29 Var.	2'-10 to 11'-10	142	26 Var.	2'-10 to 10'-10	119	4c2		
4c3	Wingwall, F.F.V. Long		23 Var.	9'-8 to 14'-11	189	19 Var.	9'-8 to 14'-0	150	15 Var.	9'-8 to 13'-0	114	11 Var.	9'-8 to 12'-0	80	--	--	--	4c3		
4c4	Wingwall, F.F.V. Short		18 Var.	9'-5 to 14'-11	146	15 Var.	9'-5 to 13'-11	117	12 Var.	9'-5 to 12'-11	90	9 Var.	9'-5 to 12'-1	64	--	--	--	4c4		
4c5	Wingwall, F.F.V. Long		2	13'-9	18	2	12'-9	17	2	11'-9	16	1	10'-9	7	1	9'-9	7	4c5		
4c5	Wingwall, F.F.V. Short		2	13'-9	18	2	12'-9	17	2	11'-9	16	2	10'-9	14	2	9'-9	13	4c5		
4c6	Interior Wall, Both F.V.		4	4'-2	11	4	4'-2	11	4	4'-2	11	4	4'-2	11	4	4'-2	11	4c6		
4c7	Interior Wall, Both F.V.		108 Var.	2 Each 1'-11 to 12'-4	514	100 Var.	2 Each 1'-11 to 11'-6	448	90 Var.	2 Each 1'-11 to 10'-5	371	82 Var.	2 Each 1'-11 to 9'-6	313	72 Var.	2 Each 1'-11 to 8'-5	248	4c7		
4c8	Interior Wall, Both F.V.		4	12'-7	34	4	11'-7	31	4	10'-7	28	4	9'-7	26	4	8'-7	23	4c8		
5c9	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	11 Var.	2'-10 to 5'-3	46	5c9		
5c10	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	5 Var.	2'-10 to 4'-2	18	5c10		
5c11	Wingwall, B.F.V. Long		40 Var.	9'-6 to 18'-10	591	36 Var.	9'-6 to 17'-10	513	32 Var.	9'-6 to 16'-11	441	28 Var.	9'-6 to 15'-11	371	24 Var.	9'-6 to 15'-0	307	5c11		
5c12	Wingwall, B.F.V. Short		33 Var.	8'-6 to 18'-9	469	30 Var.	8'-6 to 17'-9	411	27 Var.	8'-6 to 16'-10	357	24 Var.	8'-6 to 15'-10	305	21 Var.	8'-6 to 14'-10	256	5c12		
6c13	Wingwall, B.F.V. Long		33	10'-6	520	29	10'-6	457	25	10'-6	394	21	10'-6	331	17	10'-6	268	6c13		
6c13	Wingwall, B.F.V. Short		25	10'-6	394	22	10'-6	347	19	10'-6	300	16	10'-6	252	13	10'-6	205	6c13		
5c14	Wingwall, B.F.V. Long		2	17'-9	37	2	16'-9	35	2	15'-9	33	1	14'-9	15	1	13'-9	14	5c14		
5c14	Wingwall, B.F.V. Short		2	17'-9	37	2	16'-9	35	2	15'-9	33	2	14'-9	31	2	13'-9	29	5c14		
4d1	Apron, Longit., Bott.		25	31'-11	533	25	29'-7	494	25	27'-3	455	25	25'-0	418	25	22'-8	379	4d1		
4d2	Apron, Longit., Bott. Long		3	48'-9	102	3	44'-7	94	3	40'-5	86	3	36'-3	73	3	32'-1	64	4d2		
4d3	Apron, Longit., Bott. Short		3	37'-3	75	3	34'-2	68	3	31'-0	62	3	27'-11	56	3	24'-9	50	4d3		
6f1	Apron, Longit., Top		37	31'-11	1774	37	29'-7	1644	37	27'-3	1514	37	25'-0	1389	37	22'-8	1260	6f1		
6f2	Apron, Longit., Top Long		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	6f2		
6f3	Apron, Longit., Top Short		8 Var.	7'-0 to 28'-8	214	7 Var.	7'-9 to 26'-5	180	7 Var.	5'-5 to 24'-1	155	6 Var.	6'-2 to 21'-9	126	5 Var.	6'-11 to 19'-6	99	6f3		
6f4	Apron, Longit., Top Long		1	55'-3"	86	1	51'-1"	80	1	46'-11"	74	1	42'-9"	68	1	38'-7"	58	6f4		
6f5	Apron, Longit., Top Short		1	42'-3"	67	1	39'-2"	59	1	36'-0"	54	1	32'-11"	49	1	29'-9"	45	6f5		
4i1	Parapet, Vertical		77	6'-4	326	75	6'-4	317	75	6'-4	317	75	6'-4	317	75	6'-4	317	4i1		
7j1	Parapet, Horizontal		4	45'-9	392	4	45'-5	390	4	45'-0	386	4	45'-0	386	4	45'-0	386	7j1		
6m1	Apron, Trans., Top		16 Var.	42'-8 to 45'-6	1117	16 Var.	42'-4 to 45'-2	1109	16 Var.	42'-0 to 44'-10	1101	15 Var.	42'-0 to 44'-7	1030	13 Var.	42'-0 to 44'-3	889	6m1		
6m2	Apron, Trans., Top		9 Var.	45'-9 to 48'-9	671	6 Var.	45'-5 to 47'-4	440	3 Var.	45'-1 to 45'-10	216	1	44'-9	71	3 Var.	34'-8 to 37'-3	162	6m2		
6m3	Apron, Trans., Top		29 Var.	8'-8 to 39'-9	1054	29 Var.	7'-10 to 38'-11	1018	29 Var.	7'-0 to 38'-1	982	29 Var.	6'-4 to 37'-5	953	25 Var.	6'-9 to 33'-5	754	6m3		
6m4	Apron, Trans., Bott.		24 Var.	38'-10 to 54'-6	1762	22 Var.	38'-8 to 53'-0	1587	20 Var.	38'-6 to 51'-5	1412	18 Var.	38'-6 to 50'-1	1252	16 Var.	38'-6 to 48'-8	1094	6m4		
6p1	Curtain, Horizontal		4	44'-1	278	4	43'-10	277	4	43'-8	276	4	43'-8	276	4	43'-8	276	6p1		
6p2	Curtain, Horizontal, Long		4	28'-0	168	4	26'-0	156	4	24'-0	144	4	22'-0	132	4	20'-0	120	6p2		
6p3	Curtain, Horizontal, Short		4	15'-11	96	4	14'-11	90	4	13'-10	83	4	12'-10	77	4	11'-9	71	6p3		
6s1	Wing Slope, Both F., Long		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		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		2	48'-11	154	2	44'-7	141	2	40'-4	128	2	36'-0	108	2	31'-9	95	6s3		
6s4	Wing Slope, Both F., Short		2	38'-0	114	2	34'-9	104	2	31'-6	95	2	28'-2	85	2	24'-11	75	6s4		
6s5	Wing Slope, F.F., Long		1	55'-0	86	1	50'-9	80	1	46'-5	75	1	42'-2	67	1	37'-10	57	6s5		
6s6	Wing Slope, F.F., Short		1	43'-4	68	1	40'-1	64	1	36'-9	55	1	33'-6	50	1	30'-3	45	6s6		
6s7	Interior Wall, Both F.H.		4	33'-3	200	4	30'-10	185	4	28'-4	170	4	25'-10	155	4	23'-4	140	6s7		
5t1	Curtain, Vertical		60	7'-11	495	58	7'-8	464	55	7'-5	425	53	7'-2	396	50	6'-11	361	5t1		
			Estimated Quantities One Headwall			Reinf. Steel			15,813 LB			Parapet Δ			4.4					
			Concrete						133.9 CY			Wingwalls			40.1					
			Apron *			89.4			31.5			115.9 CY			80.1					
									4.2			12,669 LB			4.2			11,204 LB		
									24.1			99.4 CY			20.0			87.4 CY		
									71.1						63.2			55.6		
															4.2			9705 LB		
															16.3			76.1 CY		
															55.6					



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

- #### Headwall Notes:
- See Sheet TRFWH G1-21 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.

IOWADOT Highway Division

Standard Design - Triple Reinforced Concrete Box Culverts

Fledged Wing Headwalls

February, 2021

Quantity Tabulation</
