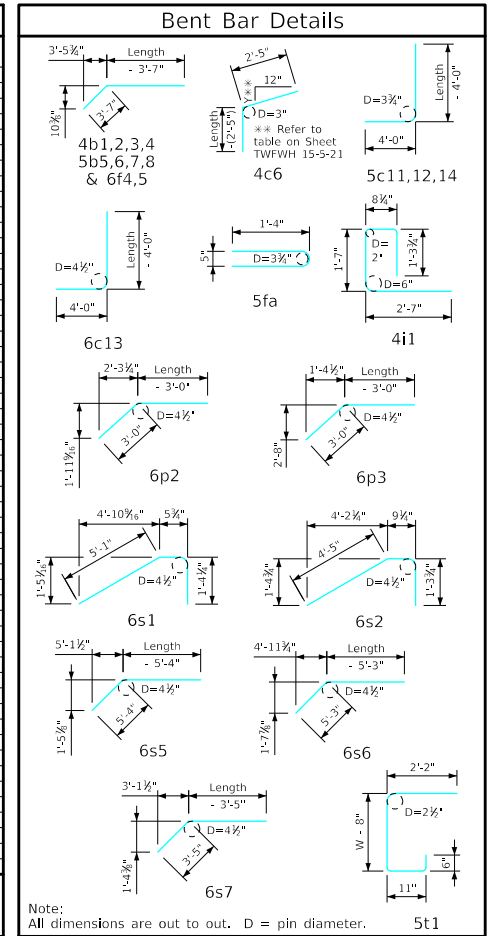


Bill of Reinforcing for One Headwall 15° Skew Span x Culvert Height															
Bar	Location	Shape	12' x 7'			12' x 6'			12' x 5'			12' x 4'			Bar
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	
5fa	Fence Anchor (Galv.)		2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	5fa
4b1	Wingwall, 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
5b9	Interior Wall, Both F.H.		11 Var.	5'-8 to 18'-2	137	9 Var.	5'-9 to 16'-1	102	7 Var.	5'-10 to 14'-0	72	5 Var.	6'-0 to 11'-10	47	5b9
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
4c6	Interior Wall, Both F.V.		2	4'-2"	6	2	4'-2"	6	2	4'-2"	6	2	4'-1"	5	4c6
4c7	Interior Wall, Both F.V.		28 Var.	1'-11 to 7'-4	87	24 Var.	1'-11 to 6'-4	66	20 Var.	1'-11 to 5'-5	49	16 Var.	1'-10 to 4'-5	33	4c7
4c8	Interior Wall, Both F.V.		2	7'-7"	10	2	6'-7"	9	2	5'-7"	7	2	4'-7"	6	4c8
5c9	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	5c9
5c10	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	5c10
5c11	Wingwall, B.F.V. Long		16 Var.	9'-6 to 13'-10	195	13 Var.	9'-6 to 13'-0	153	9 Var.	9'-6 to 11'-10	100	6 Var.	9'-6 to 10'-11	64	5c11
5c12	Wingwall, B.F.V. Short		16 Var.	8'-10 to 13'-10	189	13 Var.	8'-10 to 12'-10	147	10 Var.	8'-10 to 11'-10	108	7 Var.	8'-10 to 10'-10	72	5c12
6c13	Wingwall, B.F.V. Long		10	10'-6"	158	7	10'-6"	110	--	--	--	--	--	--	6c13
6c13	Wingwall, B.F.V. Short		9	10'-6"	142	6	10'-6"	95	--	--	--	--	--	--	6c13
5c14	Wingwall, B.F.V. Long		2	12'-9"	27	1	11'-9"	12	2	10'-9"	22	1	9'-9"	10	5c14
5c14	Wingwall, B.F.V. Short		2	12'-9"	27	2	11'-9"	25	2	10'-9"	22	2	9'-9"	20	5c14
4d1	Apron, Longlt., Bott.		17	18'-6"	210	17	16'-5"	186	17	14'-4"	163	17	12'-4"	140	4d1
4d2	Apron, Longlt., Bott. Long		3	23'-1"	46	3	19'-8"	39	3	16'-3"	33	3	12'-10"	26	4d2
4d3	Apron, Longlt., Bott. Short		3	20'-5"	41	3	17'-5"	35	3	14'-5"	29	3	11'-5"	23	4d3
6f1	Apron, Longlt., Top		24	18'-6"	667	24	16'-5"	592	24	14'-4"	517	24	12'-4"	445	6f1
6f2	Apron, Longlt., 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, Longlt., 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, Longlt., Top Long		1	28'-6"	43	1	25'-1"	38	1	21'-8"	33	1	18'-3"	27	6f4
6f5	Apron, Longlt., Top Short		1	25'-4"	38	1	22'-4"	34	1	19'-4"	29	1	16'-4"	25	6f5
4i1	Parapet, Vertical		49	6'-2"	202	49	6'-2"	202	49	6'-2"	202	49	6'-2"	202	4i1
7j1	Parapet, Horizontal		4	26'-9"	219	4	26'-9"	219	4	26'-9"	219	4	26'-9"	219	7j1
6m1	Apron, Trans., Top		6 Var.	27'-1 to 28'-0	248	6 Var.	27'-1 to 28'-0	248	6 Var.	27'-1 to 28'-0	248	6 Var.	27'-1 to 28'-0	248	6m1
6m2	Apron, Trans., Top		11 Var.	28'-4 to 32'-1	499	8 Var.	28'-4 to 30'-11	356	6 Var.	28'-4 to 30'-2	264	3 Var.	28'-4 to 29'-1	129	6m2
6m3	Apron, Trans., Top		9 Var.	5'-7 to 26'-5	216	9 Var.	5'-8 to 26'-7	218	8 Var.	5'-9 to 24'-0	179	9 Var.	3'-3 to 24'-2	185	6m3
6m4	Apron, Trans., Bott.		14 Var.	21'-2 to 28'-2	519	12 Var.	21'-2 to 27'-2	436	10 Var.	21'-2 to 26'-1	355	8 Var.	21'-2 to 25'-0	277	6m4
6p1	Curtain, Horizontal		4	25'-10"	155	4	25'-10"	155	4	25'-10"	155	4	25'-10"	155	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'-6"	43	1	25'-0"	38	1	21'-5"	32	1	17'-10"	27	6s5
6s6	Wing Slope, F.F. Short		1	23'-10"	39	1	22'-8"	34	1	19'-6"	29	1	16'-4"	25	6s6
6s7	Interior Wall, Both F.H.		2	19'-4"	58	2	17'-1"	51	2	14'-9"	44	2	12'-6"	36	6s7
5t1	Curtain, Vertical		30	6'-8"	209	28	6'-5"	187	26	6'-5"	174	24	6'-5"	161	5t1
Estimated Quantities			Reinf. Steel			Reinf. Steel			Reinf. Steel			Reinf. Steel			
One Headwall			Concrete			Parapet Δ			Wingwalls			Apron *			
			2.7			4.9			3.3			18.7			
			8.6			6.6			30.1			24.7			
			31.2			26.5			22.5			18.7			
			5619 LB			4776 LB			3879 LB			3221 LB			
			42.5 CY			35.8 CY			30.1 CY			24.7 CY			



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 TWFHW 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.

LATEST REVISION DATE	APPROVED BY BRIDGE ENGINEER	IOWADOT Highway Division	
		Standard Design - Twin Reinforced Concrete Box Culverts	
		Flared Wing Headwalls	
		February, 2021	
		Quantity Tabulation 12'-0" Span 15° Skew	TWFHW 15-6-21 Sheet 2 of 2