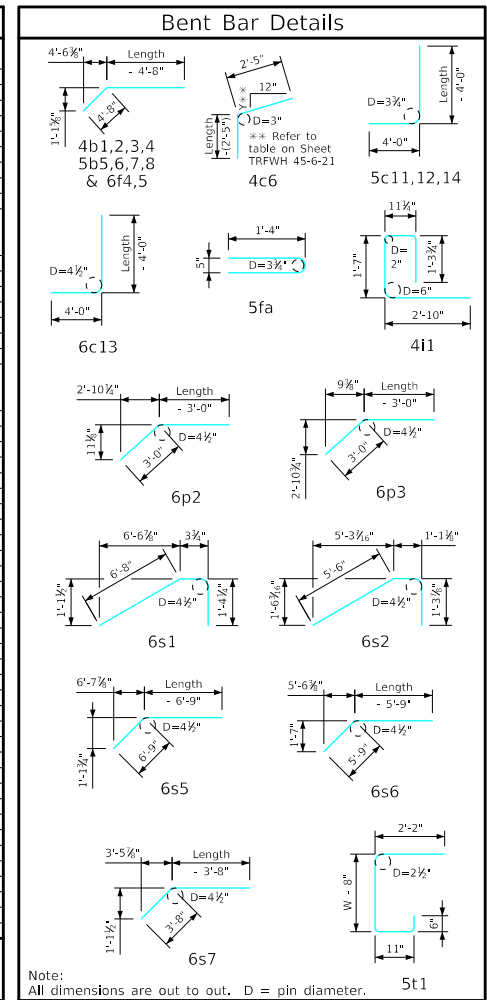


Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height																	
Bar	Location	Shape	12' x 7'			12' x 6'			12' x 5'			12' x 4'			Bar		
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.			
5fa	Fence Anchor (Galv.)		2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	5fa		
4b1	Wingwall, B.F.H. Long		1	47'-2"	33	1	41'-4"	29	1	35'-6"	24	1	29'-8"	20	4b1		
4b2	Wingwall, B.F.H. Short		1	30'-1"	20	1	26'-7"	18	1	23'-1"	15	1	19'-7"	13	4b2		
4b3	Wingwall, B.F.H. Long		5 Var.	21'-2" to 44'-5"	111	4 Var.	21'-1" to 38'-7"	80	3 Var.	21'-1" to 32'-9"	54	2 Var.	21'-1" to 26'-11"	32	4b3		
4b4	Wingwall, B.F.H. Short		5 Var.	14'-6" to 28'-5"	72	4 Var.	14'-6" to 24'-11"	53	3 Var.	14'-6" to 21'-5"	36	2 Var.	14'-6" to 17'-11"	22	4b4		
5b5	Wingwall, F.F.H. Long		1	47'-2"	52	1	41'-4"	46	1	35'-6"	37	1	29'-9"	31	5b5		
5b6	Wingwall, F.F.H. Short		1	30'-1"	31	1	26'-7"	28	1	23'-1"	24	1	19'-7"	20	5b6		
5b7	Wingwall, F.F.H. Long		6 Var.	15'-4" to 44'-5"	189	5 Var.	15'-4" to 38'-7"	141	4 Var.	15'-4" to 32'-9"	100	3 Var.	15'-4" to 26'-11"	66	5b7		
5b8	Wingwall, F.F.H. Short		6 Var.	11'-0" to 28'-6"	124	5 Var.	11'-0" to 25'-0"	94	4 Var.	11'-0" to 21'-6"	68	3 Var.	11'-0" to 18'-0"	45	5b8		
5b9	Interior Wall, Both F.V.		22 Var.	2 Each 7'-0" to 23'-8"	352	18 Var.	2 Each 7'-1" to 20'-10"	262	14 Var.	2 Each 7'-3" to 18'-0"	184	10 Var.	2 Each 7'-5" to 15'-1"	117	5b9		
4c1	Wingwall, F.F.V. Long		43 Var.	2'-9" to 10'-0"	183	37 Var.	2'-9" to 9'-0"	145	31 Var.	2'-9" to 7'-11"	110	25 Var.	2'-9" to 6'-11"	81	4c1		
4c2	Wingwall, F.F.V. Short		26 Var.	2'-10" to 10'-0"	111	22 Var.	2'-10" to 8'-10"	86	19 Var.	2'-10" to 8'-0"	69	15 Var.	2'-10" to 6'-10"	48	4c2		
4c3	Wingwall, F.F.V. Long		--	--	--	--	--	--	--	--	--	--	--	--	4c3		
4c4	Wingwall, F.F.V. Short		--	--	--	--	--	--	--	--	--	--	--	--	4c4		
4c5	Wingwall, F.F.V. Long		1	8'-9"	6	1	7'-9"	5	2	6'-9"	9	2	5'-9"	8	4c5		
4c5	Wingwall, F.F.V. Short		1	8'-9"	6	2	7'-9"	10	1	6'-9"	5	2	5'-9"	8	4c5		
4c6	Interior Wall, Both F.V.		4	4'-1"	11	4	4'-1"	11	4	4'-1"	11	4	4'-1"	11	4c6		
4c7	Interior Wall, Both F.V.		76 Var.	2 Each 1'-10" to 7'-5"	235	66 Var.	2 Each 1'-10" to 6'-6"	184	54 Var.	2 Each 1'-10" to 5'-5"	131	44 Var.	2 Each 1'-10" to 4'-6"	93	4c7		
4c8	Interior Wall, Both F.V.		6	7'-7"	30	6	6'-7"	26	6	5'-7"	22	6	4'-7"	18	4c8		
5c9	Wingwall, B.F.V. Long		15 Var.	2'-9" to 5'-2"	62	15 Var.	2'-9" to 5'-2"	62	15 Var.	2'-9" to 5'-2"	62	15 Var.	2'-9" to 5'-2"	62	5c9		
5c10	Wingwall, B.F.V. Short		4 Var.	2'-10" to 3'-8"	14	4 Var.	2'-10" to 3'-8"	14	4 Var.	2'-10" to 3'-8"	14	4 Var.	2'-10" to 3'-8"	14	5c10		
5c11	Wingwall, B.F.V. Long		28 Var.	9'-4" to 14'-0"	341	22 Var.	9'-4" to 13'-0"	256	16 Var.	9'-4" to 11'-11"	177	10 Var.	9'-4" to 10'-11"	106	5c11		
5c12	Wingwall, B.F.V. Short		22 Var.	8'-0" to 14'-0"	252	18 Var.	8'-0" to 12'-10"	196	15 Var.	8'-0" to 12'-0"	156	11 Var.	8'-0" to 10'-10"	108	5c12		
6c13	Wingwall, B.F.V. Long		18	10'-6"	284	12	10'-6"	189	--	--	--	--	--	--	6c13		
6c13	Wingwall, B.F.V. Short		11	10'-6"	173	7	10'-6"	110	--	--	--	--	--	--	6c13		
5c14	Wingwall, B.F.V. Long		1	12'-9"	13	1	11'-9"	12	2	10'-9"	22	2	9'-9"	20	5c14		
5c14	Wingwall, B.F.V. Short		1	12'-9"	13	2	11'-9"	25	1	10'-9"	11	2	9'-9"	20	5c14		
4d1	Apron, Longit., Bott.		25	24'-5"	408	25	21'-7"	360	25	18'-9"	313	25	15'-11"	266	4d1		
4d2	Apron, Longit., Bott. Long		3	39'-9"	80	3	33'-11"	68	3	28'-1"	56	3	22'-3"	45	4d2		
4d3	Apron, Longit., Bott. Short		3	25'-1"	50	3	21'-7"	43	3	18'-1"	36	3	14'-7"	29	4d3		
6f1	Apron, Longit., Top		37	24'-5"	1357	37	21'-7"	1199	37	18'-9"	1042	37	15'-11"	885	6f1		
6f2	Apron, Longit., Top Long		8 Var.	6'-5" to 20'-8"	163	7 Var.	5'-7" to 17'-10"	123	5 Var.	6'-10" to 15'-0"	82	4 Var.	6'-0" to 12'-2"	55	6f2		
6f3	Apron, Longit., Top Short		5 Var.	7'-4" to 21'-0"	106	4 Var.	7'-11" to 18'-2"	78	3 Var.	8'-6" to 15'-4"	54	2 Var.	9'-1" to 12'-6"	32	6f3		
6f4	Apron, Longit., Top Long		1	47'-2"	74	1	41'-4"	66	1	35'-6"	53	1	29'-9"	45	6f4		
6f5	Apron, Longit., Top Short		1	30'-1"	45	1	26'-7"	40	1	23'-1"	35	1	19'-7"	29	6f5		
4j1	Parapet, Vertical		75	6'-8"	334	75	6'-8"	334	75	6'-8"	334	75	6'-8"	334	4j1		
7j1	Parapet, Horizontal		4	54'-8"	467	4	54'-8"	467	4	54'-8"	467	4	54'-8"	467	7j1		
6m1	Apron, Trans., Top		5 Var.	43'-7" to 44'-4"	348	1	43'-7"	69	27 Var.	16'-0" to 35'-6"	1044	27 Var.	13'-2" to 32'-8"	929	6m1		
6m2	Apron, Trans., Top		22 Var.	21'-8" to 37'-5"	976	26 Var.	18'-10" to 37'-7"	1102	20 Var.	4'-8" to 15'-4"	300	16 Var.	4'-1" to 12'-6"	199	6m2		
6m3	Apron, Trans., Top		27 Var.	6'-5" to 21'-0"	556	23 Var.	5'-10" to 18'-2"	415	--	--	--	--	--	--	6m3		
6m4	Apron, Trans., Bott.		14 Var.	46'-7" to 60'-6"	1177	12 Var.	46'-7" to 58'-4"	989	10 Var.	46'-7" to 56'-2"	808	8 Var.	46'-7" to 54'-1"	634	6m4		
6p1	Curtain, Horizontal		4	53'-0"	333	4	52'-11"	332	4	52'-11"	332	4	52'-11"	332	6p1		
6p2	Curtain, Horizontal, Long		4	26'-6"	159	4	23'-4"	140	4	20'-2"	121	4	17'-0"	102	6p2		
6p3	Curtain, Horizontal, Short		4	10'-7"	64	4	9'-6"	57	4	8'-6"	51	4	7'-6"	45	6p3		
6s1	Wing Slope, Both F., Long		2	8'-4"	25	2	8'-4"	25	2	8'-4"	25	2	8'-4"	25	6s1		
6s2	Wing Slope, Both F., Short		2	7'-11"	24	2	7'-11"	24	2	7'-11"	24	2	7'-11"	24	6s2		
6s3	Wing Slope, Both F., Long		2	39'-0"	117	2	33'-1"	99	2	27'-2"	82	2	21'-3"	64	6s3		
6s4	Wing Slope, Both F., Short		2	23'-6"	71	2	19'-10"	60	2	16'-2"	49	2	12'-7"	38	6s4		
6s5	Wing Slope, F.F. Long		1	45'-1"	71	1	39'-2"	59	1	33'-3"	50	1	27'-5"	41	6s5		
6s6	Wing Slope, F.F. Short		1	29'-5"	44	1	25'-10"	39	1	22'-2"	32	1	18'-6"	28	6s6		
6s7	Interior Wall, Both F.H.		4	24'-4"	146	4	21'-4"	128	4	18'-4"	110	4	15'-4"	92	6s7		
5t1	Curtain, Vertical		59	6'-8"	410	55	6'-5"	368	53	6'-5"	355	49	6'-5"	328	5t1		
			Reinf. Steel			10,329 LB			8772 LB			7203 LB			6037 LB		
			Concrete			80.9 CY			68.2 CY			57.4 CY			47.3 CY		
			Parapet Δ			5.1			5.1			5.1			5.1		
			Wingwalls			14.6			11.1			8.1			5.5		
			Apron *			61.2			52.0			44.2			36.7		



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

Flared Wing Headwalls

February, 2021

Quantity Tabulation 12'-0" Span 45° Skew	TRFWH 45-7-21 Sheet 2 of 2
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LATEST REVISION DATE

APPROVED BY BRIDGE ENGINEER