

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

Location	Shape	8' x 10'				8' x 9'				8' x 8'				8' x 7'				8' x 6'				8' x 5'				8' x 4'				
		Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	Bar	No.	Length	Wt.	
Fence Anchor (Galv.)		5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	5fa	2	2'-10	6	
Wingwall, F.F.H.		5b1	2	39'-3	82	5b1	2	35'-10	75	5b1	2	32'-4	67	5b1	2	28'-11	60	5b1	2	25'-5	53	5b1	2	22'-0	46	5b1	2	18'-6	39	
Wingwall, F.F.H.		5b2	18 Var.	2 Each 10'-0 to 37'-8	447	5b2	16 Var.	2 Each 10'-0 to 34'-3	369	5b2	14 Var.	2 Each 10'-0 to 30'-9	298	5b2	12 Var.	2 Each 10'-0 to 27'-4	234	5b2	10 Var.	2 Each 10'-0 to 23'-10	176	5b2	8 Var.	2 Each 10'-0 to 20'-5	127	5b2	6 Var.	2 Each 10'-0 to 16'-11	84	
Wingwall, B.F.H.		4b3	2	39'-6	53	4b3	2	36'-1	48	4b3	2	32'-7	44	4b3	2	29'-1	39	4b3	2	25'-7	34	4b3	2	22'-2	30	4b3	2	18'-8	25	
Wingwall, B.F.H.		4b4	16 Var.	2 Each 13'-8 to 37'-11	276	4b4	14 Var.	2 Each 13'-8 to 34'-5	225	4b4	12 Var.	2 Each 13'-8 to 31'-0	179	4b4	10 Var.	2 Each 13'-7 to 27'-6	137	4b4	8 Var.	2 Each 13'-7 to 24'-0	100	4b4	6 Var.	2 Each 13'-7 to 20'-7	68	4b4	4 Var.	2 Each 13'-7 to 17'-1	41	
Interior Wall, Both F.H.		5b5	17 Var.	7'-4 to 38'-9	409	5b5	15 Var.	7'-5 to 35'-3	334	5b5	13 Var.	7'-5 to 31'-9	266	5b5	11 Var.	7'-6 to 28'-4	206	5b5	9 Var.	7'-7 to 24'-10	152	5b5	7 Var.	7'-9 to 21'-4	106	5b5	5 Var.	8'-1 to 17'-10	68	
Wingwall, F.F.V.		4c1	72 Var.	2 Each 2'-5 to 12'-6	359	4c1	64 Var.	2 Each 2'-5 to 11'-4	294	4c1	76 Var.	2 Each 2'-5 to 10'-5	326	4c1	68 Var.	2 Each 2'-5 to 9'-7	273	4c1	58 Var.	2 Each 2'-5 to 8'-6	211	4c1	36 Var.	2 Each 2'-5 to 7'-4	117	4c1	30 Var.	2 Each 2'-5 to 6'-5	89	
Wingwall, F.F.V.		4c2	26 Var.	2 Each 8'-11 to 12'-4	185	4c2	20 Var.	2 Each 8'-11 to 11'-6	136	c2	--	--	--	c2	--	--	--	c2	--	--	--	c2	--	--	--	c2	--	--	--	--
Wingwall, F.F.V. (O)		4c3	2	12'-10	17	4c3	2	11'-10	16	4c3	2	10'-10	14	4c3	2	9'-10	13	4c3	2	8'-10	12	4c3	2	7'-10	10	4c3	2	6'-10	9	
Wingwall, F.F.V. (A)		4c3	2	12'-10	17	4c3	2	11'-10	16	4c3	2	10'-10	14	4c3	2	9'-10	13	4c3	2	8'-10	12	4c3	2	7'-10	10	4c3	2	6'-10	9	
Wingwall, B.F.V.		6c4	72 Var.	6'-1 to 16'-2	1203	5c4	64 Var.	6'-1 to 15'-1	706	5c4	58 Var.	6'-1 to 14'-2	613	5c4	50 Var.	6'-1 to 13'-0	498	5c4	44 Var.	6'-1 to 12'-2	419	5c4	36 Var.	6'-1 to 11'-0	321	5c4	30 Var.	6'-1 to 10'-2	254	
Wingwall, B.F.V. (O)		6c5	1	16'-4	25	5c5	1	15'-4	16	5c5	1	14'-4	15	5c5	1	13'-4	14	5c5	1	12'-4	13	5c5	1	11'-4	12	5c5	1	10'-4	11	
Wingwall, B.F.V. (A)		6c5	3	16'-4	74	5c5	3	15'-4	48	5c5	3	14'-4	45	5c5	3	13'-4	42	5c5	3	12'-4	39	5c5	3	11'-4	35	5c5	3	10'-4	32	
Wingwall, B.F.V.		6c6	42	8'-6	536	5c6	36	8'-6	319	5c6	28	8'-6	248	5c6	22	8'-6	195	5c6	14	8'-6	124	c6	--	--	--	c6	--	--	--	
Interior Wall, Both F.V		4c7	2	3'-7	5	4c7	2	3'-7	5	4c7	2	3'-7	5	4c7	2	3'-7	5	4c7	2	3'-7	5	4c7	2	3'-7	5	4c7	2	3'-7	5	
Interior Wall, Both F.V		4c8	69 Var.	1'-4 to 10'-0	261	4c8	62 Var.	1'-4 to 9'-0	214	4c8	55 Var.	1'-4 to 7'-11	170	4c8	48 Var.	1'-3 to 6'-11	131	4c8	42 Var.	1'-3 to 6'-1	103	4c8	35 Var.	1'-3 to 5'-1	74	4c8	28 Var.	1'-3 to 4'-0	49	
Interior Wall, Both F.V		4c9	2	10'-4	14	4c9	2	9'-4	12	4c9	2	8'-4	11	4c9	2	7'-4	10	4c9	2	6'-4	8	4c9	2	5'-4	7	4c9	2	4'-4	6	
Apron, Longit., Bott.		4d1	18	39'-2	471	4d1	18	35'-8	429	4d1	18	32'-3	388	4d1	18	28'-9	346	4d1	18	25'-4	305	4d1	18	21'-10	263	4d1	18	18'-4	220	
Apron, Longit., Top		6f1	18	39'-2	1059	6f1	18	35'-8	964	6f1	18	32'-3	872	6f1	18	28'-9	777	6f1	18	25'-4	685	6f1	18	21'-10	590	6f1	18	18'-4	496	
Parapet, Vertical		4i1	33	7'-0	154	4i1	33	7'-0	154	4i1	33	7'-0	154	4i1	33	7'-0	154	4i1	33	7'-0	154	4i1	33	7'-0	154	4i1	33	7'-0	154	
Parapet, Horiz.		7j1	4	20'-11	171	7j1	4	20'-11	171	7j1	4	20'-11	171	7j1	4	20'-8	169	7j1	4	20'-8	169	7j1	4	20'-8	169	7j1	4	20'-8	169	
Apron, Trans., Top		5m1	32	18'-8	623	5m1	29	18'-8	565	5m1	33	18'-8	642	5m1	22	18'-5	423	5m1	18	18'-5	346	5m1	15	18'-5	288	5m1	11	18'-5	211	
Apron, Trans., Top		5m2	9 Var.	3'-1 to 16'-11	94	5m2	9 Var.	2'-4 to 16'-2	87	5m2	12 Var.	3'-3 to 17'-6	130	5m2	9 Var.	2'-4 to 16'-2	87	5m2	9 Var.	3'-3 to 17'-1	95	5m2	9 Var.	2'-5 to 16'-3	88	5m2	9 Var.	3'-4 to 17'-2	96	
Apron, Trans., Bott.		6m3	61	18'-9	1718	5m3	55	18'-0	1033	5m3	33	18'-0	620	5m3	22	17'-8	405	4m3	19	16'-11	215	4m3	16	16'-11	181	4m3	13	16'-11	147	
Curtain, Horiz.		6p1	6	21'-3	192	6p1	6	21'-3	192	6p1	6	21'-3	192	6p1	5	21'-0	158	6p1	5	21'-0	158	6p1	5	21'-0	158	6p1	5	21'-0	158	
Wing Slope, Both F.		6s1	4	33'-2	199	6s1	4	29'-6	177	6s1	4	25'-11	156	6s1	4	22'-4	134	6s1	4	18'-8	112	6s1	4	15'-1	91	6s1	4	11'-6	69	
Wing Slope, Both F. (O)		6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	6s2	2	8'-4	25	
Wing Slope, Both F. (A)		6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	6s3	2	8'-9	26	
Wing Slope, F.F.		6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	6s4	2	12'-5	37	
Wing Slope, F.F.		6s5	2	30'-8	92	6s5	2	27'-1	81	6s5	2	23'-5	70	6s5	2	19'-10	60	6s5	2	16'-3	49	6s5	2	12'-8	38	6s5	2	9'-0	27	
Interior Wall, Both F.		6s6	2	40'-4	128	6s6	2	36'-9	110	6s6	2	33'-1	99	6s6	2	29'-7	89	6s6	2	25'-11	78	6s6	2	22'-4	67	6s6	2	18'-9	56	
Curtain, Vert.		5t1	20	7'-5	155	5t1	20	7'-2	149	5t1	20	6'-11	144	5t1	20	6'-8	139	5t1	20	6'-5	134	5t1	20	6'-5	134	5t1	20	6'-5	134	
Curtain, Vert, Ends		5t2	4	7'-7	32	5t2	4	7'-4	31	5t2	4	7'-1	30	5t2	4	6'-10	29	5t2	4	6'-7	27	5t2	4	6'-7	27	5t2	4	6'-7	27	
Bracket, Vert.		5u1	4	6'-1	25	5u1	4	5'-11	25	5u1	4	5'-8	24	5u1	4	5'-5	23	5u1	4	5'-3	22	5u1	4	5'-3	22	5u1	4	5'-3	22	

c Bar Pin Diameter	
Bar Size	D
5	3 3/4"
6	4 1/2"

Reinf. Steel	9170 LB				7095 LB				6101 LB				4957 LB				4104 LB				3332 LB				2801 LB			
	Estimated Quantities One Headwall	Parapet Δ	Wingwalls	Apron *	2.3	17.1	27.4	2.3	13.9	24.7	2.2	9.8	21.6	2.2	7.5	18.9	2.2	5.4	16.5	2.2	4.0	14.0	2.2	3.7	14.0	2.2	3.7	14.0
Concrete	53.1 CY				46.8 CY				40.9 CY				33.6 CY				28.6 CY				24.1 CY				19.9 CY			

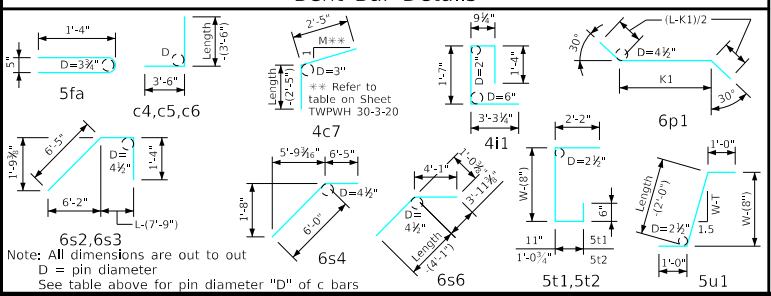
Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap. Δ Includes top of wingwall quantities. \* Assumes apron and floor are equal thickness, adjust concrete quantities for transition where apron and floor thickness are not equal. (A) - Indicates bar located at acute corner. (O) - Indicates bar located at obtuse corner. Refer to Sheet TWPWH 30-1-20 for acute and obtuse corner locations.

#### Headwall Notes:

- 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 "4d1" and "6f1" 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	<p style="margin: 0;">Standard Design - Twin Reinforced Concrete Box Culverts</p> <h3 style="margin: 0;">Parallel Wing Headwalls</h3> <p style="margin: 0;">July, 2020</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">Quantity Tabulation</td> <td style="width: 50%; border: none;">TWPWH 30-8-20</td> </tr> <tr> <td style="border: none;">8'-0" Span</td> <td style="border: none;"></td> </tr> <tr> <td style="border: none;">30° Skew</td> <td style="border: none;"></td> </tr> </table>	Quantity Tabulation	TWPWH 30-8-20	8'-0" Span		30° Skew	
Quantity Tabulation	TWPWH 30-8-20							
8'-0" Span								
30° Skew								

#### Bent Bar Details



ENGLISH REDSIGNED IN CULVERTS.DGN - TWPWH 30-8-20 - THIS SHEET ISSUED 07-2020.