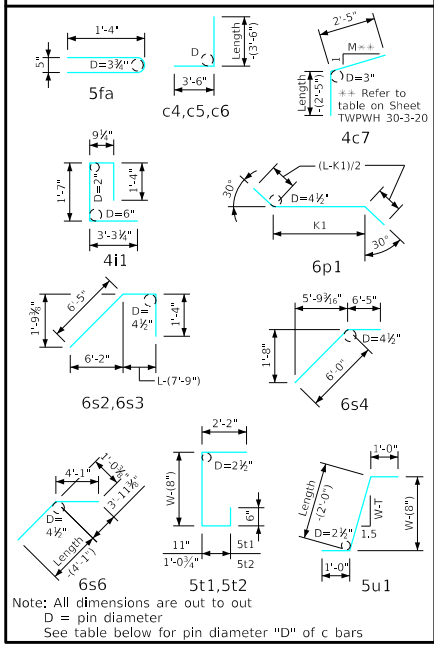


ENGLISHLRFDDESIGNEDTWINCULVERTS.DGN - TWPWH 30-7-20 51 - THIS SHEET ISSUED 07-20-2020

### Bent Bar Details



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

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

Location	Shape	10' x 12'				10' x 11'				10' x 10'				10' x 9'				10' x 8'				10' x 7'			
		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	
Wingwall, F.F.H.	5b1	2	46'-2"	101	5b1	2	42'-9"	94	5b1	2	39'-3"	82	5b1	2	35'-10"	75	5b1	2	32'-4"	67	5b1	2	28'-11"	60	
Wingwall, F.F.H.	5b2	22 Var.	2 Each 10'-0" to 44'-7"	636	5b2	20 Var.	2 Each 10'-0" to 41'-2"	539	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	
Wingwall, B.F.H.	4b3	2	46'-6"	65	4b3	2	43'-1"	61	4b3	2	39'-6"	53	4b3	2	36'-1"	48	4b3	2	32'-7"	44	4b3	2	29'-1"	39	
Wingwall, B.F.H.	4b4	20 Var.	2 Each 13'-9" to 44'-11"	398	4b4	18 Var.	2 Each 13'-9" to 41'-6"	335	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	
Interior Wall, Both F.H.	5b5	21 Var.	7'-4" to 45'-8"	588	5b5	19 Var.	7'-5" to 42'-2"	496	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	
Wingwall, F.F.V.	5c1	86 Var.	2 Each 2'-7" to 14'-8"	774	5c1	78 Var.	2 Each 2'-7" to 13'-7"	658	4c1	72 Var.	2 Each 2'-7" to 12'-8"	367	4c1	64 Var.	2 Each 2'-7" to 11'-6"	301	4c1	76 Var.	2 Each 2'-7" to 10'-7"	334	4c1	68 Var.	2 Each 2'-7" to 9'-9"	280	
Wingwall, F.F.V.	5c2	40 Var.	2 Each 9'-1" to 14'-7"	494	5c2	34 Var.	2 Each 9'-1" to 13'-8"	403	4c2	26 Var.	2 Each 9'-1" to 12'-6"	187	4c2	20 Var.	2 Each 9'-1" to 11'-8"	139	c2	--	--	--	c2	--	--	--	
Wingwall, F.F.V. (O)	5c3	2	15'-0"	31	5c3	2	14'-0"	29	4c3	2	13'-0"	17	4c3	2	12'-0"	16	4c3	2	11'-0"	15	4c3	2	10'-0"	13	
Wingwall, F.F.V. (A)	5c3	2	15'-0"	31	5c3	2	14'-0"	29	4c3	2	13'-0"	17	4c3	2	12'-0"	16	4c3	2	11'-0"	15	4c3	2	10'-0"	13	
Wingwall, B.F.V.	6c4	86 Var.	2 Each 6'-3" to 18'-5"	1593	5c4	78 Var.	2 Each 6'-3" to 17'-3"	956	5c4	72 Var.	2 Each 6'-3" to 16'-4"	848	5c4	64 Var.	2 Each 6'-3" to 15'-3"	718	5c4	58 Var.	2 Each 6'-3" to 14'-4"	623	5c4	50 Var.	2 Each 6'-3" to 13'-2"	506	
Wingwall, B.F.V. (O)	6c5	1	18'-6"	28	5c5	1	17'-6"	18	5c5	1	16'-6"	17	5c5	1	15'-6"	16	5c5	1	14'-6"	15	5c5	1	13'-6"	14	
Wingwall, B.F.V. (A)	6c5	3	18'-6"	83	5c5	3	17'-6"	55	5c5	3	16'-6"	52	5c5	3	15'-6"	48	5c5	3	14'-6"	45	5c5	3	13'-6"	42	
Wingwall, B.F.V.	6c6	56	8'-6"	715	5c6	50	8'-6"	443	5c6	42	8'-6"	372	5c6	36	8'-6"	319	5c6	28	8'-6"	248	5c6	22	8'-6"	195	
Interior Wall, Both F.V	4c7	2	3'-9"	5	4c7	2	3'-9"	5	4c7	2	3'-9"	5	4c7	2	3'-9"	5	4c7	2	3'-9"	5	4c7	2	3'-9"	5	
Interior Wall, Both F.V	4c8	83 Var.	1'-6" to 12'-2"	379	4c8	76 Var.	1'-6" to 11'-2"	322	4c8	69 Var.	1'-6" to 10'-2"	269	4c8	62 Var.	1'-6" to 9'-2"	221	4c8	55 Var.	1'-6" to 8'-1"	176	4c8	48 Var.	1'-5" to 7'-1"	136	
Interior Wall, Both F.V	4c9	2	12'-6"	17	4c9	2	11'-6"	15	4c9	2	10'-6"	14	4c9	2	9'-6"	13	4c9	2	8'-6"	11	4c9	2	7'-6"	10	
Apron, Longit., Bott.	4d1	22	46'-1"	713	4d1	22	42'-7"	661	4d1	22	39'-2"	576	4d1	22	35'-8"	524	4d1	22	32'-3"	474	4d1	22	28'-9"	423	
Apron, Longit., Top	6f1	22	46'-1"	1603	6f1	22	42'-7"	1487	6f1	22	39'-2"	1294	6f1	22	35'-8"	1179	6f1	22	32'-3"	1066	6f1	22	28'-9"	950	
Parapet, Vertical	4i1	43	7'-0"	201	4i1	43	7'-0"	201	4i1	41	7'-0"	192	4i1	41	7'-0"	192	4i1	41	7'-0"	192	4i1	41	7'-0"	192	
Parapet, Horiz.	7j1	4	26'-2"	214	7j1	4	26'-2"	214	7j1	4	25'-7"	209	7j1	4	25'-7"	209	7j1	4	25'-7"	209	7j1	4	25'-3"	206	
Apron, Trans., Top	5m1	50	23'-2"	1208	5m1	46	23'-2"	1111	5m1	41	22'-8"	969	5m1	36	22'-8"	851	5m1	32	22'-8"	757	5m1	27	22'-5"	631	
Apron, Trans., Top	5m2	16 Var.	2'-2" to 21'-8"	199	5m2	15 Var.	2'-8" to 20'-11"	184	5m2	15 Var.	2'-11" to 21'-1"	188	5m2	16 Var.	2'-2" to 21'-7"	198	5m2	15 Var.	2'-7" to 20'-10"	183	5m2	15 Var.	2'-2" to 21'-2"	189	
Apron, Trans., Bott.	6m3	73	23'-11"	2622	6m3	67	23'-11"	2407	6m3	61	23'-5"	2145	6m3	55	23'-5"	1934	5m3	25	22'-7"	589	5m3	22	22'-3"	511	
Curtain, Horiz.	6p1	6	26'-5"	238	6p1	6	26'-5"	238	6p1	6	25'-10"	233	6p1	6	25'-10"	233	6p1	6	25'-10"	233	6p1	6	25'-7"	192	
Wing Slope, Both F.	6s1	4	40'-4"	257	6s1	4	36'-9"	221	6s1	4	33'-2"	199	6s1	4	29'-6"	177	6s1	4	25'-11"	156	6s1	4	22'-4"	134	
Wing Slope, Both F. (O)	6s2	2	8'-3"	25	6s2	2	8'-3"	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	
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	
Wing Slope, F.F.	6s5	2	37'-11"	114	6s5	2	34'-3"	103	6s5	2	30'-8"	92	6s5	2	27'-1"	81	6s5	2	23'-5"	70	6s5	2	19'-10"	60	
Interior Wall, Both F.	6s6	2	47'-5"	150	6s6	2	43'-10"	139	6s6	2	40'-4"	128	6s6	2	36'-9"	110	6s6	2	33'-9"	99	6s6	2	29'-7"	89	
Curtain, Vert.	5t1	25	7'-11"	206	5t1	25	7'-8"	200	5t1	25	7'-5"	193	5t1	25	7'-2"	187	5t1	25	6'-11"	180	5t1	24	6'-8"	167	
Curtain, Vert, Ends	5t2	4	8'-1"	34	5t2	4	7'-10"	33	5t2	4	7'-7"	32	5t2	4	7'-4"	31	5t2	4	7'-1"	30	5t2	4	6'-10"	29	
Bracket, Vert.	5u1	4	6'-7"	27	5u1	4	6'-4"	26	5u1	4	6'-2"	26	5u1	4	5'-11"	25	5u1	4	5'-8"	24	5u1	4	5'-6"	23	
Estimated Quantities One Headwall	Reinf. Steel	13,818 LB				11,777 LB				10,002 LB				8888 LB				6697 LB				5780 LB			
	Concrete	Parapet Δ	2.8		2.8		2.6		2.6		2.6		2.6		2.6		2.6		2.5		2.5		2.5		
		Wingwalls	34.6	87.1 CY	29.6	78.3 CY	20.7	64.2 CY	17.1	56.9 CY	13.9	49.9 CY	9.8	41.6 CY	8.8	33.4	29.3								
		Apron *	49.7		45.9		40.9		37.2		33.2		33.4												

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

Standard Design - Twin Reinforced Concrete Box Culverts

## Parallel Wing Headwalls

July, 2020

Quantity Tabulation  
10'-0" Span  
30° Skew

TWPWH  
30-7-20  
Sheet 1 of 2

APPROVED BY BRIDGE ENGINEER