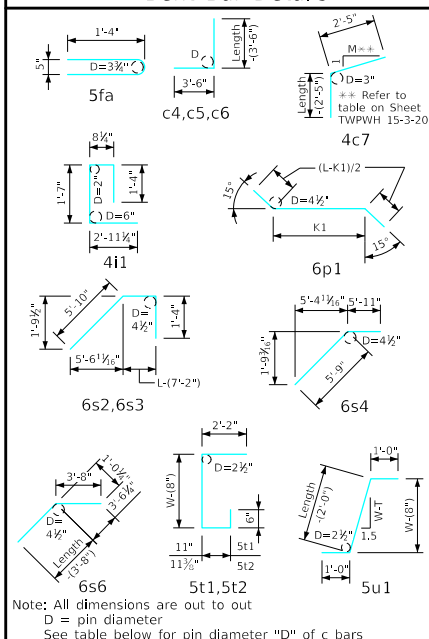


Bent Bar Details



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

Bill of Reinforcing for One Headwall 15° 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.				
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	41'-7	92	5b1	2	38'-6	80	5b1	2	35'-5	74	5b1	2	32'-4	67	5b1	2	29'-2	61	5b1	2	26'-1	54	
Wingwall, F.F.H.	5b2	22 Var.	2 Each 9'-2 to 40'-2	571	5b2	20 Var.	2 Each 9'-2 to 37'-1	482	5b2	18 Var.	2 Each 9'-2 to 34'-0	405	5b2	16 Var.	2 Each 9'-2 to 30'-11	334	5b2	14 Var.	2 Each 9'-2 to 27'-9	270	5b2	12 Var.	2 Each 9'-2 to 24'-8	212	
Wingwall, B.F.H.	4b3	2	41'-9	59	4b3	2	38'-8	52	4b3	2	35'-6	47	4b3	2	32'-5	43	4b3	2	29'-3	39	4b3	2	26'-2	35	
Wingwall, B.F.H.	4b4	20 Var.	2 Each 12'-5 to 40'-4	356	4b4	18 Var.	2 Each 12'-5 to 37'-3	299	4b4	16 Var.	2 Each 12'-4 to 34'-1	248	4b4	14 Var.	2 Each 12'-4 to 31'-0	203	4b4	12 Var.	2 Each 12'-4 to 27'-11	161	4b4	10 Var.	2 Each 12'-4 to 24'-9	124	
Interior Wall, Both F.H.	5b5	21 Var.	6'-7 to 41'-2	525	5b5	19 Var.	6'-8 to 38'-1	443	5b5	17 Var.	6'-8 to 35'-0	369	5b5	15 Var.	6'-8 to 31'-10	301	5b5	13 Var.	6'-9 to 28'-9	241	5b5	11 Var.	6'-10 to 25'-7	186	
Wingwall, F.F.V.	5c1	76 Var.	2 Each 2'-7 to 14'-6	677	5c1	70 Var.	2 Each 2'-7 to 13'-6	587	4c1	64 Var.	2 Each 2'-7 to 12'-7	324	4c1	58 Var.	2 Each 2'-7 to 11'-7	274	4c1	68 Var.	2 Each 2'-7 to 10'-7	299	4c1	60 Var.	2 Each 2'-7 to 9'-7	244	
Wingwall, F.F.V.	5c2	36 Var.	2 Each 9'-2 to 14'-8	447	5c2	30 Var.	2 Each 9'-2 to 13'-8	357	4c2	24 Var.	2 Each 9'-2 to 12'-9	176	4c2	16 Var.	2 Each 9'-2 to 11'-5	110	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	76 Var.	2 Each 6'-3 to 18'-2	1394	5c4	70 Var.	2 Each 6'-3 to 17'-3	858	5c4	64 Var.	2 Each 6'-3 to 16'-3	751	5c4	58 Var.	2 Each 6'-3 to 15'-4	653	5c4	52 Var.	2 Each 6'-3 to 14'-4	558	5c4	46 Var.	2 Each 6'-3 to 13'-4	470	
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	2	18'-6	56	5c5	2	17'-6	37	5c5	2	16'-6	34	5c5	2	15'-6	32	5c5	2	14'-6	30	5c5	2	13'-6	28	
Wingwall, B.F.V.	6c6	50	8'-6	638	5c6	44	8'-6	390	5c6	38	8'-6	337	5c6	30	8'-6	266	5c6	24	8'-6	213	5c6	18	8'-6	160	
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	75 Var.	1'-6 to 12'-2	342	4c8	68 Var.	1'-6 to 11'-1	286	4c8	62 Var.	1'-6 to 10'-1	240	4c8	56 Var.	1'-6 to 9'-2	200	4c8	50 Var.	1'-6 to 8'-2	161	4c8	44 Var.	1'-6 to 7'-2	127	
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	41'-7	647	4d1	22	38'-5	565	4d1	22	35'-4	519	4d1	22	32'-3	474	4d1	22	29'-2	429	4d1	22	26'-0	382	
Apron, Longit., Top	6f1	22	41'-7	1454	6f1	22	38'-5	1269	6f1	22	35'-4	1168	6f1	22	32'-3	1066	6f1	22	29'-2	964	6f1	22	26'-0	859	
Parapet, Vertical	4i1	43	6'-7	189	4i1	43	6'-7	189	4i1	41	6'-7	180	4i1	41	6'-7	180	4i1	41	6'-7	180	4i1	41	6'-7	180	
Parapet, Horiz.	7j1	4	23'-5	191	7j1	4	23'-5	191	7j1	4	22'-11	187	7j1	4	22'-11	187	7j1	4	22'-11	187	7j1	4	22'-8	185	
Apron, Trans., Top	5m1	48	23'-2	1160	5m1	44	23'-2	1063	5m1	40	22'-8	946	5m1	36	22'-8	851	5m1	32	22'-8	757	5m1	28	22'-5	655	
Apron, Trans., Top	5m2	8 Var.	2'-6 to 22'-1	103	5m2	8 Var.	2'-2 to 21'-9	100	5m2	7 Var.	4'-3 to 21'-1	92	5m2	7 Var.	3'-11 to 20'-8	90	5m2	7 Var.	3'-6 to 20'-4	87	5m2	7 Var.	3'-0 to 19'-9	83	
Apron, Trans., Bott.	6m3	73	21'-3	2330	5m3	67	20'-5	1427	6m3	31	20'-8	962	5m3	37	19'-11	769	5m3	25	19'-11	519	5m3	22	19'-8	451	
Curtain, Horiz.	6p1	6	23'-10	215	6p1	6	23'-10	215	6p1	6	23'-4	210	6p1	6	23'-4	210	6p1	6	23'-4	210	6p1	6	23'-1	173	
Wing Slope, Both F.	6s1	4	36'-8	220	6s1	4	33'-5	201	6s1	4	30'-2	181	6s1	4	26'-11	162	6s1	4	23'-8	142	6s1	4	20'-5	123	
Wing Slope, Both F. (O)	6s2	2	7'-9	23	6s2	2	7'-9	23	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24	6s2	2	7'-10	24	
Wing Slope, Both F. (A)	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	6s3	2	8'-0	24	
Wing Slope, F.F.	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	6s4	2	11'-8	35	
Wing Slope, F.F.	6s5	2	34'-2	103	6s5	2	30'-11	93	6s5	2	27'-8	83	6s5	2	24'-5	73	6s5	2	21'-2	64	6s5	2	17'-11	54	
Interior Wall, Both F.	6s6	2	43'-1	137	6s6	2	39'-9	119	6s6	2	36'-7	110	6s6	2	33'-4	100	6s6	2	30'-1	90	6s6	2	26'-10	81	
Curtain, Vert.	5t1	22	7'-11	182	5t1	22	7'-8	176	5t1	22	7'-5	170	5t1	22	7'-2	164	5t1	22	6'-11	159	5t1	22	6'-8	153	
Curtain, Vert, Ends	5t2	4	7'-11	33	5t2	4	7'-8	32	5t2	4	7'-5	31	5t2	4	7'-2	30	5t2	4	6'-11	29	5t2	4	6'-8	28	
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	Rein. Steel	12,348 LB				9721 LB				8029 LB				7019 LB				6024 LB				5214 LB			
	Concrete	Parapet Δ	2.5	78.1 CY	2.5	70.2 CY	2.4	57.7 CY	2.4	51.2 CY	2.4	44.8 CY	2.3	37.4 CY	2.3	33.4	2.3	30.0	2.3	26.3	2.3	23.3	2.3	20.3	

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 15-1-20 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	
		Standard Design - Twin Reinforced Concrete Box Culverts
		Parallel Wing Headwalls
		July, 2020
		Quantity Tabulation 10'-0" Span 15° Skew
		TWPWH 15-7-20 Sheet 1 of 2