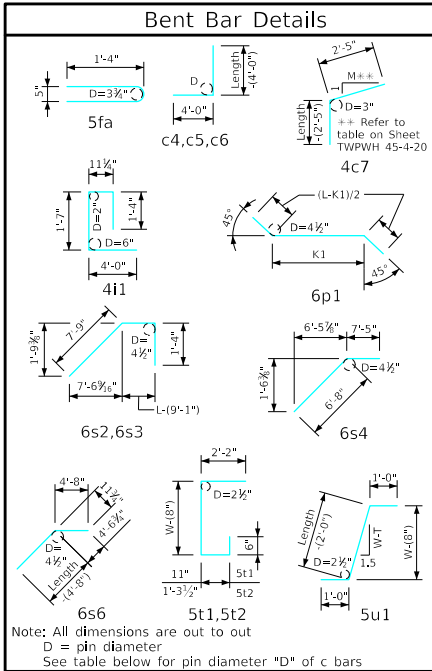


ENGLISHLRFD\DESIGNEDTWINCULVERTS.DGN - TWPWH 45-7-20 52 - THIS SHEET ISSUED 07-2020



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

Note: Weight of bars over 40'-0" long include an allowance of 2'-5" for lap.

### Bill of Reinforcing for One Headwall 45° Skew Span x Culvert Height

Location	Shape	12' x 6'				12' x 5'				12' x 4'			
		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	
Wingwall, F.F.H.	5b1	2	39'-2"	82	5b1	2	34'-11"	73	5b1	2	30'-9"	64	
Wingwall, F.F.H.	5b2	10 Var.	2 Each 11'-9" to 37'-3"	358	5b2	8 Var.	2 Each 11'-9" to 33'-3"	280	5b2	6 Var.	2 Each 11'-9" to 28'-9"	211	
Wingwall, B.F.H.	4b3	2	39'-7"	53	4b3	2	35'-3"	47	4b3	2	31'-0"	41	
Wingwall, B.F.H.	4b4	8 Var.	2 Each 16'-5" to 37'-7"	216	4b4	6 Var.	2 Each 16'-5" to 33'-3"	166	4b4	4 Var.	2 Each 16'-4" to 29'-1"	121	
Interior Wall, Both F.H.	5b5	9 Var.	8'-10" to 38'-5"	320	5b5	7 Var.	8'-10" to 34'-2"	247	5b5	5 Var.	9'-0" to 29'-10"	182	
Wingwall, F.F.V.	4c1	72 Var.	2 Each 2'-8" to 10'-9"	421	4c1	46 Var.	2 Each 2'-8" to 9'-9"	340	4c1	36 Var.	2 Each 2'-8" to 8'-10"	277	
Wingwall, F.F.V.	c2	--	--	--	c2	--	--	--	c2	--	--	--	
Wingwall, F.F.V. (O)	4c3	2	11'-1"	15	4c3	2	10'-1"	13	4c3	2	9'-1"	12	
Wingwall, F.F.V. (A)	4c3	3	11'-1"	22	4c3	3	10'-1"	20	4c3	3	9'-1"	18	
Wingwall, B.F.V.	5c4	54 Var.	2 Each 6'-10" to 14'-10"	791	6c4	60 Var.	2 Each 6'-10" to 12'-11"	671	6c4	48 Var.	2 Each 6'-10" to 12'-11"	556	
Wingwall, B.F.V. (O)	5c5	1	15'-1"	16	6c5	1	14'-1"	15	6c5	1	13'-1"	14	
Wingwall, B.F.V. (A)	5c5	4	15'-1"	63	6c5	4	14'-1"	59	6c5	4	13'-1"	55	
Wingwall, B.F.V.	5c6	16	9'-0"	319	c6	--	9'-0"	244	c6	--	9'-0"	150	
Interior Wall, Both F,V	4c7	2	3'-10"	5	4c7	2	3'-10"	5	4c7	2	3'-10"	5	
Interior Wall, Both F,V	4c8	51 Var.	1'-6" to 8'-4"	223	4c8	42 Var.	1'-6" to 7'-3"	172	4c8	34 Var.	1'-6" to 6'-3"	132	
Interior Wall, Both F,V	4c9	2	8'-7"	11	4c9	2	7'-7"	10	4c9	2	6'-7"	9	
Apron, Longit., Bott.	4d1	26	39'-0"	677	4d1	26	34'-9"	604	4d1	26	30'-6"	530	
Apron, Longit., Top	6f1	26	39'-0"	1523	6f1	26	34'-9"	1357	6f1	26	30'-6"	1191	
Parapet, Vertical	4i1	49	7'-10"	256	4i1	49	7'-10"	256	4i1	49	7'-10"	256	
Parapet, Horiz.	7j1	4	37'-0"	303	7j1	4	36'-7"	299	7j1	4	36'-7"	299	
Apron, Trans., Top	5m1	31	26'-8"	1335	5m1	23	26'-5"	1102	5m1	14	26'-5"	854	
Apron, Trans., Top	5m2	47 Var.	2'-0" to 25'-6"	688	5m2	47 Var.	2'-2" to 25'-2"	670	5m2	47 Var.	2'-5" to 25'-5"	682	
Apron, Trans., Bott.	5m3	19	33'-9"	1267	5m3	16	32'-8"	750	5m3	13	32'-8"	647	
Curtain, Horiz.	6p1	5	36'-11"	333	6p1	5	36'-8"	275	6p1	5	36'-8"	275	
Wing Slope, Both F.	6s1	4	30'-10"	185	6s1	4	26'-6"	159	6s1	4	22'-2"	133	
Wing Slope, Both F. (O)	6s2	2	9'-7"	29	6s2	2	9'-8"	29	6s2	2	9'-8"	29	
Wing Slope, Both F. (A)	6s3	2	10'-5"	31	6s3	2	10'-5"	31	6s3	2	10'-5"	31	
Wing Slope, F.F.	6s4	2	14'-1"	42	6s4	2	14'-1"	42	6s4	2	14'-1"	42	
Wing Slope, F.F.	6s5	2	28'-5"	85	6s5	2	24'-1"	72	6s5	2	19'-8"	59	
Interior Wall, Both F.	6s6	2	39'-8"	119	6s6	2	35'-5"	106	6s6	2	31'-1"	93	
Curtain, Vert.	5t1	36	6'-11"	260	5t1	36	6'-8"	250	5t1	36	6'-5"	241	
Curtain, Vert. Ends	5t2	4	7'-4"	31	5t2	4	7'-1"	30	5t2	4	6'-10"	29	
Bracket, Vert.	5u1	4	5'-9"	24	5u1	4	5'-6"	23	5u1	4	5'-4"	22	
Estimated Quantities	Reinf. Steel	7266 LB				6475 LB				5403 LB			
One Headwall	Concrete	Parapet Δ	3.5	51.4 CY	Parapet Δ	3.5	43.7 CY	Parapet Δ	3.5	36.3 CY	Parapet Δ	3.5	
		Wingwalls	9.2		Wingwalls	6.7		Wingwalls	4.5				
		Apron =	38.7		Apron =	33.5		Apron =	28.3				

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 45-1-20 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

12'-0" Span

45° Skew

TWPWH

45-7-20

Sheet 2 of 2