

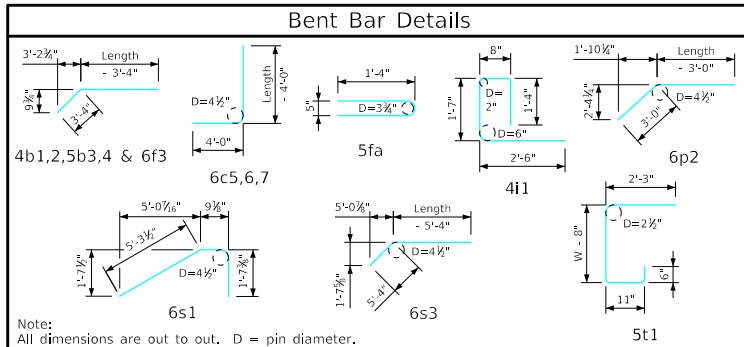
ENGLISHRFDISIGNEDSINGLECVLVERTSFWH.DGN - FW 0-5-21 51 - THIS SHEET ISSUED 02-2021.

### Bill of Reinforcing for One Headwall 0° Skew Span x Culvert Height

Bar	Location	Shape	16' x 14'			16' x 13'			16' x 12'			16' x 11'			16' x 10'			16' x 9'			16' x 8'			Bar		
			No.	Length	Wt.	No.	Length	Wt.	No.	Length	Wt.	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	2	2'-10"	6	2	2'-10"	6	2	2'-10"	6	5fa		
4b1	Wingwall, B.F.H.		2	47'-4"	66	2	44'-3"	62	2	41'-2"	58	2	38'-1"	51	2	35'-0"	47	2	31'-11"	43	2	28'-10"	39	4b1		
4b2	Wingwall, B.F.H.		24 Var.	2 Each 11'-10 to 45'-11	469	22 Var.	2 Each 11'-11 to 42'-10	406	20 Var.	2 Each 11'-11 to 39'-9	345	18 Var.	2 Each 11'-11 to 36'-8	292	16 Var.	2 Each 11'-11 to 33'-7	243	14 Var.	2 Each 11'-11 to 30'-6	198	12 Var.	2 Each 11'-11 to 27'-5	158	4b2		
5b3	Wingwall, F.F.H.		2	47'-5"	104	2	44'-4"	98	2	41'-3"	91	2	38'-2"	80	2	35'-1"	73	2	32'-0"	67	2	28'-11"	60	5b3		
5b4	Wingwall, F.F.H.		26 Var.	2 Each 8'-10 to 46'-0	754	24 Var.	2 Each 8'-10 to 42'-11	653	22 Var.	2 Each 8'-10 to 39'-10	558	20 Var.	2 Each 8'-10 to 36'-9	475	18 Var.	2 Each 8'-10 to 33'-8	400	16 Var.	2 Each 8'-10 to 30'-7	330	14 Var.	2 Each 8'-10 to 27'-6	266	5b4		
4c1	Wingwall, F.F.V.		88 Var.	2 Each 2'-10 to 16'-9	576	82 Var.	2 Each 2'-10 to 15'-10	511	76 Var.	2 Each 2'-10 to 14'-10	448	70 Var.	2 Each 2'-10 to 13'-10	390	64 Var.	2 Each 2'-10 to 12'-11	337	58 Var.	2 Each 2'-10 to 11'-11	286	52 Var.	2 Each 2'-10 to 10'-11	239	4c1		
4c2	Wingwall, F.F.V.		48 Var.	2 Each 9'-6 to 16'-11	424	42 Var.	2 Each 9'-6 to 16'-0	358	36 Var.	2 Each 9'-6 to 15'-0	295	30 Var.	2 Each 9'-6 to 14'-0	235	24 Var.	2 Each 9'-6 to 13'-1	181	18 Var.	2 Each 9'-6 to 12'-1	130	--	--	--	4c2		
4c3	Wingwall, F.F.V.		4	15'-9"	42	4	14'-9"	39	4	13'-9"	37	4	12'-9"	34	2	11'-9"	16	2	10'-9"	14	2	9'-9"	13	4c3		
5c4	Wingwall, B.F.V.		12 Var.	2 Each 2'-10 to 4'-6	46	12 Var.	2 Each 2'-10 to 4'-6	46	12 Var.	2 Each 2'-10 to 4'-6	46	12 Var.	2 Each 2'-10 to 4'-6	46	12 Var.	2 Each 2'-10 to 4'-6	46	12 Var.	2 Each 2'-10 to 4'-6	46	12 Var.	2 Each 2'-10 to 4'-6	46	5c4		
6c5	Wingwall, B.F.V.		76 Var.	2 Each 8'-10 to 20'-9	1688	70 Var.	2 Each 8'-10 to 19'-10	1507	64 Var.	2 Each 8'-10 to 18'-10	1330	58 Var.	2 Each 8'-10 to 17'-10	1162	52 Var.	2 Each 8'-10 to 16'-11	1006	46 Var.	2 Each 8'-10 to 15'-11	855	40 Var.	2 Each 8'-10 to 14'-11	713	6c5		
6c6	Wingwall, B.F.V.		58	10'-6"	915	52	10'-6"	820	46	10'-6"	725	40	10'-6"	631	34	10'-6"	536	28	10'-6"	442	22	10'-6"	347	6c6		
6c7	Wingwall, B.F.V.		4	19'-9"	119	4	18'-9"	113	4	17'-9"	107	4	16'-9"	101	2	15'-9"	47	2	14'-9"	44	2	13'-9"	41	6c7		
4d1	Apron, Longit., Bott.		11	31'-11"	235	11	29'-11"	220	11	27'-11"	205	11	25'-11"	190	11	23'-11"	176	11	21'-11"	161	11	19'-11"	146	4d1		
4d2	Apron, Longit., Bott.		6	42'-5"	180	6	39'-4"	158	6	36'-3"	145	6	33'-2"	133	6	30'-1"	121	6	27'-0"	108	6	23'-11"	96	4d2		
6f1	Apron, Longit., Top		15	31'-11"	719	15	29'-11"	674	15	27'-11"	629	15	25'-11"	584	15	23'-11"	539	15	21'-11"	494	15	19'-11"	449	6f1		
6f2	Apron, Longit., Top		20 Var.	2 Each 4'-6 to 28'-10	501	18 Var.	2 Each 5'-2 to 26'-10	433	16 Var.	2 Each 5'-10 to 24'-10	368	16 Var.	2 Each 3'-10 to 22'-10	320	14 Var.	2 Each 4'-6 to 20'-10	266	12 Var.	2 Each 5'-3 to 18'-10	217	10 Var.	2 Each 5'-11 to 16'-10	171	6f2		
6f3	Apron, Longit., Top		2	47'-5"	150	2	44'-4"	140	2	41'-3"	131	2	38'-2"	115	2	35'-1"	105	2	32'-0"	96	2	28'-11"	87	6f3		
4i1	Parapet, Vertical		33	6'-1"	134	33	6'-1"	134	33	6'-1"	134	33	6'-1"	134	33	6'-1"	134	33	6'-1"	134	33	6'-1"	134	4i1		
9j1	Parapet, Horizontal		4	18'-0"	245	4	17'-8"	240	4	17'-6"	240	4	17'-6"	238	4	17'-4"	236	4	17'-4"	236	4	17'-4"	236	9j1		
6m1	Apron, Trans., Top		39 Var.	18'-2 to 32'-5	1482	37 Var.	17'-10 to 31'-4	1366	34 Var.	17'-10 to 30'-3	1228	31 Var.	17'-8 to 28'-11	1085	29 Var.	17'-6 to 28'-0	991	26 Var.	17'-6 to 26'-11	867	23 Var.	17'-6 to 25'-9	747	6m1		
6m2	Apron, Trans., Top		28 Var.	11'-9 to 25'-3	778	26 Var.	11'-9 to 24'-3	703	24 Var.	11'-9 to 23'-3	631	22 Var.	11'-9 to 22'-3	562	20 Var.	11'-9 to 21'-3	496	18 Var.	11'-9 to 20'-3	433	16 Var.	11'-9 to 19'-3	372	6m2		
6p1	Curtain, Horizontal		4	16'-3"	98	4	16'-3"	98	4	16'-3"	98	4	16'-3"	98	4	16'-3"	98	4	16'-3"	98	4	16'-3"	98	6p1		
6p2	Curtain, Horizontal		8	21'-1"	253	8	19'-10"	238	8	18'-7"	223	8	17'-4"	208	8	16'-1"	193	8	14'-10"	178	8	13'-7"	163	6p2		
6s1	Wing Slope, Both F.		4	7'-8"	46	4	7'-8"	46	4	7'-8"	46	4	7'-8"	46	4	7'-8"	46	4	7'-8"	46	4	7'-8"	46	6s1		
6s2	Wing Slope, Both F.		4	43'-7"	276	4	40'-4"	257	4	37'-1"	223	4	33'-10"	203	4	30'-7"	184	4	27'-4"	164	4	24'-1"	145	6s2		
6s3	Wing Slope, F.F.		2	49'-8"	156	2	46'-5"	147	2	43'-2"	137	2	39'-11"	120	2	36'-8"	110	2	33'-5"	100	2	30'-2"	91	6s3		
5t1	Curtain, Vertical		39	8'-6"	346	37	8'-3"	318	35	8'-0"	292	33	7'-9"	267	31	7'-6"	242	29	7'-3"	219	27	7'-0"	197	5t1		
			Reinf. Steel			10,808 LB			9791 LB			8776 LB			7806 LB			6875 LB			6012 LB			5106 LB		
Estimated Quantities One Headwall			Parapet Δ			2.2			2.1			2.1			2.0			1.9			1.9			1.9		
			Concrete			92.3 CY			25.5			22.2			17.4			13.4			11.2			9.1		
			Wingwalls			56.1			50.0			45.0			39.9			35.0			30.7			26.6		
			Apron +			56.1			50.0			45.0			39.9			35.0			30.7			26.6		

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.



#### Headwall Notes:

- See Sheet FWH G2-21 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" and "6f3" 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 - Single Reinforced Concrete Box Culverts
		Flared Wing Headwalls
		February, 2021
Quantity Tabulation		FWH 0-5-21 Sheet 1 of 2
16'-0" Span 0° Skew		