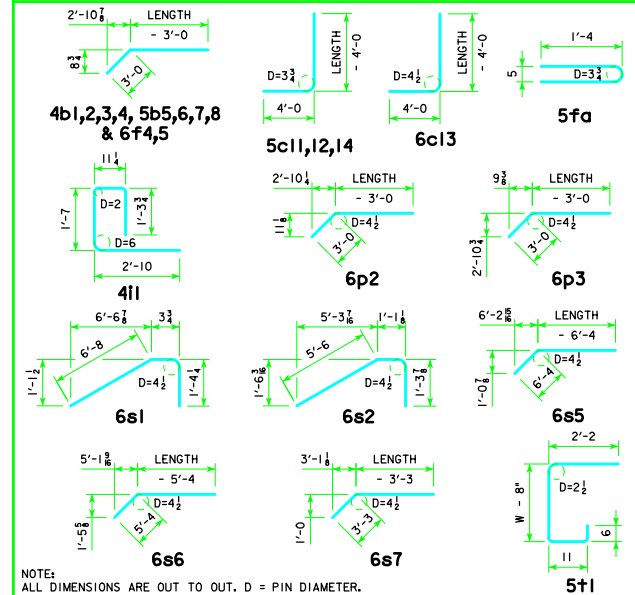


ENGLISH REDIGNS (DWN) IN CULVERTS.DGN - TWH 45-10-12 - THIS SHEET ISSUED 04-12.

BILL OF REINFORCING FOR ONE HEADWALL 45° SKEW CULVERT SPAN x CULVERT HEIGHT

BAR	LOCATION	SHAPE	8' x 7'			8' x 6'			8' x 5'			8' x 4'			BAR		
			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	5fa		
4b1	WINGWALL, B.F.H. LONG		1	45'-6	32	1	39'-8	26	1	33'-10	23	1	28'-0	19	4b1		
4b2	WINGWALL, B.F.H. SHORT		1	28'-5	19	1	24'-11	17	1	21'-5	14	1	17'-11	12	4b2		
4b3	WINGWALL, B.F.H. LONG		5	19'-6 TO VAR. 42'-9	105	4	19'-5 TO VAR. 36'-11	75	3	19'-5 TO VAR. 31'-1	51	2	19'-5 TO VAR. 25'-3	30	4b3		
4b4	WINGWALL, B.F.H. SHORT		5	12'-10 TO VAR. 26'-9	66	4	12'-10 TO VAR. 23'-3	48	3	12'-10 TO VAR. 19'-9	33	2	12'-10 TO VAR. 16'-3	19	4b4		
5b5	WINGWALL, F.F.H. LONG		1	45'-6	50	1	39'-9	41	1	33'-11	35	1	28'-1	29	5b5		
5b6	WINGWALL, F.F.H. SHORT		1	28'-5	30	1	24'-11	26	1	21'-5	22	1	17'-11	19	5b6		
5b7	WINGWALL, F.F.H. LONG		6	13'-8 TO VAR. 42'-9	179	5	13'-8 TO VAR. 36'-11	132	4	13'-8 TO VAR. 31'-1	93	3	13'-8 TO VAR. 25'-3	61	5b7		
5b8	WINGWALL, F.F.H. SHORT		6	9'-4 TO VAR. 23'-3	113	5	9'-4 TO VAR. 20'-5	85	4	9'-4 TO VAR. 16'-4	61	3	9'-4 TO VAR. 14'-8	40	5b8		
5b9	INTERIOR WALL, BOTH F.H.		11	6'-7 TO VAR. 23'-3	171	9	6'-8 TO VAR. 20'-5	127	7	6'-10 TO VAR. 17'-7	89	5	7'-0 TO VAR. 14'-8	56	5b9		
4c1	WINGWALL, F.F.V. LONG		43	2'-7 TO VAR. 9'-10	178	37	2'-7 TO VAR. 8'-10	141	31	2'-7 TO VAR. 7'-9	107	25	2'-7 TO VAR. 6'-9	78	4c1		
4c2	WINGWALL, F.F.V. SHORT		26	2'-8 TO VAR. 9'-10	109	22	2'-8 TO VAR. 8'-8	83	19	2'-8 TO VAR. 7'-10	67	15	2'-8 TO VAR. 6'-8	47	4c2		
4c3	WINGWALL, F.F.V. LONG		---	---	---	---	---	---	---	---	---	---	---	---	4c3		
4c4	WINGWALL, F.F.V. SHORT		---	---	---	---	---	---	---	---	---	---	---	---	4c4		
4c5	WINGWALL, F.F.V. LONG		1	8'-7	6	2	7'-7	5	2	6'-7	9	2	5'-7	7	4c5		
4c5	WINGWALL, F.F.V. SHORT		1	8'-7	6	2	7'-7	10	1	6'-7	4	2	5'-7	7	4c5		
4c6	INTERIOR WALL, BOTH F.V.		2	1'-6	2	2	1'-6	2	2	1'-6	2	2	1'-6	2	4c6		
4c7	INTERIOR WALL, BOTH F.V.		38	1'-8 TO VAR. 7'-3	113	33	1'-8 TO VAR. 6'-4	88	27	1'-8 TO VAR. 5'-3	62	22	1'-8 TO VAR. 4'-4	44	4c7		
4c8	INTERIOR WALL, BOTH F.V.		3	7'-5	15	3	6'-5	13	3	5'-5	11	3	4'-5	9	4c8		
5c9	WINGWALL, B.F.V. LONG		15	2'-7 TO VAR. 5'-0	59	15	2'-7 TO VAR. 5'-0	59	15	2'-7 TO VAR. 5'-0	59	15	2'-7 TO VAR. 5'-0	59	5c9		
5c10	WINGWALL, B.F.V. SHORT		4	2'-8 TO VAR. 3'-6	13	4	2'-8 TO VAR. 3'-6	13	4	2'-8 TO VAR. 3'-6	13	4	2'-8 TO VAR. 3'-6	13	5c10		
5c11	WINGWALL, B.F.V. LONG		28	9'-2 TO VAR. 13'-10	336	22	9'-2 TO VAR. 12'-10	252	16	9'-2 TO VAR. 11'-9	175	10	9'-2 TO VAR. 10'-9	104	5c11		
5c12	WINGWALL, B.F.V. SHORT		22	7'-10 TO VAR. 13'-10	249	18	7'-10 TO VAR. 12'-8	192	15	7'-10 TO VAR. 11'-10	154	11	7'-10 TO VAR. 10'-8	106	5c12		
6c13	WINGWALL, B.F.V. LONG		18	10'-6	284	12	10'-6	189	---	---	---	---	---	---	6c13		
6c13	WINGWALL, B.F.V. SHORT		11	10'-6	173	7	10'-6	110	---	---	---	---	---	---	6c13		
5c14	WINGWALL, B.F.V. LONG		1	12'-7	13	1	11'-7	12	2	10'-7	22	2	9'-7	20	5c14		
5c14	WINGWALL, B.F.V. SHORT		1	12'-7	13	2	11'-7	24	1	10'-7	11	2	9'-7	20	5c14		
4d1	APRON, LONGIT., BOT.		11	24'-0	176	11	21'-2	156	11	18'-4	135	11	15'-6	114	4d1		
4d2	APRON, LONGIT., BOT. LONG		3	39'-3	79	3	33'-6	67	3	27'-8	55	3	22'-0	44	4d2		
4d3	APRON, LONGIT., BOT. SHORT		3	24'-8	49	3	21'-3	43	3	17'-10	36	3	14'-5	29	4d3		
6f1	APRON, LONGIT., TOP		16	24'-0	577	16	21'-2	509	16	18'-4	441	16	15'-6	372	6f1		
6f2	APRON, LONGIT., TOP LONG		8	6'-5 TO VAR. 20'-8	163	7	5'-7 TO VAR. 17'-10	123	5	6'-10 TO VAR. 15'-0	82	4	6'-0 TO VAR. 12'-2	55	6f2		
6f3	APRON, LONGIT., TOP SHORT		5	7'-4 TO VAR. 21'-0	106	4	7'-11 TO VAR. 18'-2	78	3	8'-6 TO VAR. 15'-4	54	2	9'-1 TO VAR. 12'-6	32	6f3		
6f4	APRON, LONGIT., TOP LONG		1	45'-6	72	1	39'-9	60	1	33'-11	51	1	28'-1	42	6f4		
6f5	APRON, LONGIT., TOP SHORT		1	28'-5	43	1	24'-11	37	1	21'-5	32	1	17'-11	27	6f5		
4f1	PARAPET, VERTICAL		33	6'-8	147	33	6'-8	147	33	6'-8	147	33	6'-8	147	4f1		
7j1	PARAPET, HORIZONTAL		4	25'-4	207	4	25'-4	207	4	25'-4	207	4	25'-4	207	7j1		
6m1	APRON, TRANS., TOP		13	20'-3 TO VAR. 22'-6	417	13	20'-3 TO VAR. 22'-6	417	11	20'-3 TO VAR. 22'-1	350	7	20'-3 TO VAR. 21'-4	219	6m1		
6m2	APRON, TRANS., TOP		6	22'-9 TO VAR. 24'-8	214	2	22'-9 TO VAR. 23'-2	69	2	16'-1 TO VAR. 16'-10	49	6	13'-3 TO VAR. 17'-0	136	6m2		
6m3	APRON, TRANS., TOP		21	6'-6 TO VAR. 17'-9	382	22	5'-4 TO VAR. 17'-2	372	20	4'-9 TO VAR. 15'-5	303	16	4'-2 TO VAR. 12'-7	201	6m3		
6m4	APRON, TRANS., BOT.		14	17'-3 TO VAR. 31'-1	508	12	17'-3 TO VAR. 29'-0	417	10	17'-3 TO VAR. 26'-10	331	8	17'-3 TO VAR. 24'-9	252	6m4		
6p1	CURTAIN, HORIZONTAL		4	23'-7	142	4	23'-7	142	4	23'-7	142	4	23'-7	142	6p1		
6p2	CURTAIN, HORIZONTAL LONG		4	26'-6	159	4	23'-4	140	4	20'-2	121	4	17'-0	102	6p2		
6p3	CURTAIN, HORIZONTAL SHORT		4	10'-7	64	4	9'-6	57	4	8'-6	51	4	7'-6	45	6p3		
6s1	WING SLOPE, BOTH F. LONG		2	8'-4	25	2	8'-4	25	2	8'-4	25	2	8'-4	25	6s1		
6s2	WING SLOPE, BOTH F. SHORT		2	7'-11	24	2	7'-11	24	2	7'-11	24	2	7'-11	24	6s2		
6s3	WING SLOPE, BOTH F. LONG		2	39'-5	118	2	33'-6	101	2	27'-7	83	2	21'-8	65	6s3		
6s4	WING SLOPE, BOTH F. SHORT		2	23'-11	72	2	20'-3	61	2	16'-8	50	2	13'-0	39	6s4		
6s5	WING SLOPE, F.F. LONG		1	44'-8	70	1	38'-9	58	1	32'-10	49	1	26'-11	40	6s5		
6s6	WING SLOPE, F.F. SHORT		1	28'-11	43	1	25'-3	38	1	21'-7	32	1	18'-0	27	6s6		
6s7	INTERIOR WALL, BOTH F.H.		2	23'-11	72	2	20'-11	63	2	17'-11	54	2	14'-11	45	6s7		
5f1	CURTAIN, VERTICAL		37	6'-8	257	33	6'-5	221	31	6'-5	207	27	6'-5	181	5f1		
ESTIMATED QUANTITIES ONE HEADWALL			REINF. STEEL			5408 LB			4234 LB			3419 LB					
			CONCRETE			PARAPET Δ 2.8 WINGWALLS 12.3 FOOTING * 33.9			2.8 40.4 CY			2.8 33.3 CY			2.8 27.6 CY		

BENT BAR DETAILS



HEADWALL NOTES:

- SEE DRAWING TWRCB GI-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
- THIS HEADWALL IS BASED ON A 3:1 SLOPE NORMAL TO CENTERLINE OF ROADWAY.
- THE SIDES OF THE FOOTING ARE TO BE FORMED TO INSURE CORRECT LINE AND GRADE.
- ALL SLAB AND FLOOR 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'-0 BEYOND BACK OF PARAPET (INTO END OF BARREL). LONGITUDINAL BARS "d", "f", "g", AND "h" ESTIMATED TO PROJECT INTO END SECTION OF BARREL A MINIMUM OF 2'-0 BEYOND BACK OF PARAPET.
- THE "LENGTH" COLUMN REFLECTS TOTAL NUMBER OF FEET NECESSARY TO MEET THESE REQUIREMENTS.

LATEST REVISION DATE	
	STANDARD DESIGN TWIN REINFORCED CONCRETE BOX CULVERTS APRIL, 2012
	FLARED WING HEADWALLS 45° SKEW

APPROVED BY BRIDGE ENGINEER

4234 LB	3419 LB
2.8	2.8
6.9	3.3
20.1	27.6