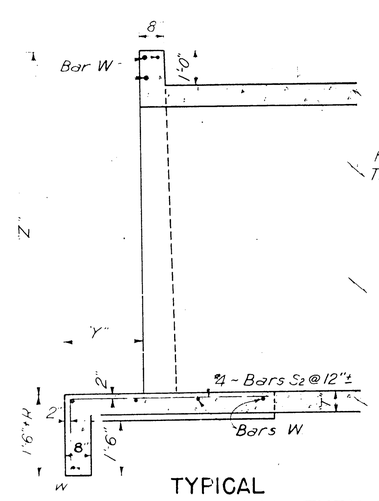
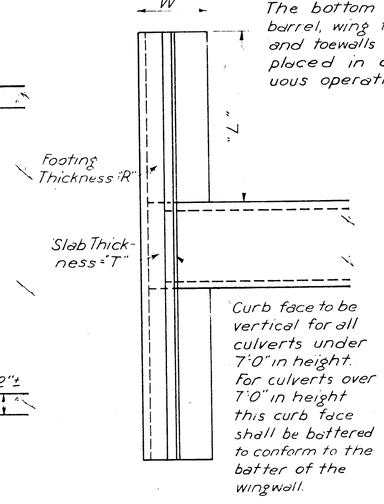
CULVERT SIZE	SLAB DEPTH	MAX FILL	WING HEIGHT	WING LENGTH	TOTAL QUANT. 4 WINGWALLS CONC	TOTAL QUANT. 4 WINGWALLS REINF	TABLE OF DIMENSIONS R	W	V	D	Y
S H	T"	FT	Z	L"	CY	LB					
3 x 2	6"	14'	3'-6"	5'-3"	4.10	558	6½"	2'-6"	8"	10"	1'-0"
3 x 3	6"	14'	4'-6"	6'-9"	6.11	818	7"	2'-10"	8"	1'-2"	1'-0"
4 x 2	6"	12'	3'-6"	5'-3"	4.21	564	6½"	2'-6"	8"	10"	1'-0"
4 x 3	6"	12'	4'-6"	6'-9"	6.23	824	7"	2'-10"	8"	1'-2"	1'-0"
4 x 4	6"	12'	5'-6"	8'-3"	8.75	1322	7"	3'-5"	8"	1'-7"	1'-2"
5 x 2	6"	8'	3'-6"	5'-3"	4.33	569	7"	2'-6"	8"	10"	1'-0"
5 x 3	6"	8'	4'-6"	6'-9"	6.34	829	7"	2'-10"	8"	1'-2"	1'-0"
5 x 4	6"	8'	5'-6"	8'-3"	8.87	1328	7"	3'-5"	8"	1'-7"	1'-2"
5 x 5	6"	8'	6'-6"	9'-9"	11.86	1876	7"	4'-0"	8"	2'-0"	1'-4"
6 x 3	6"	8'	4'-6"	6'-9"	6.46	835	7"	2'-10"	8"	1'-2"	1'-0"
6 x 4	6"	8'	5'-6"	8'-3"	8.90	1332	7"	3'-5"	8"	1'-7"	1'-2"
6 x 5	6"	8'	6'-6"	9'-9"	11.99	1883	7"	4'-0"	8"	2'-0"	1'-4"
6 x 6	6"	8'	7'-6"	11'-3"	15.56	2616	7"	4'-8"	8"	2'-3"	1'-9"
7 x 3	6½"	8'	4'-6½"	6'-10"	6.68	841	7"	2'-10"	8"	1'-2"	1'-0"
7 x 4	6½"	8'	5'-6½"	8'-4"	9.24	1341	7"	3'-5"	8"	1'-7"	1'-2"
7 x 5	6½"	8'	6'-6½"	9'-10"	12.27	1890	7"	4'-0"	8"	2'-0"	1'-4"
7 x 6	6½"	8'	7'-6½"	11'-4"	15.89	2624	7"	4'-8"	8"	2'-3"	1'-9"
7 x 7	6½"	8'	8'-6½"	12'-10"	21.55	3650	8"	5'-2"	9½"	2'-6½"	1'-10"
8 x 4	6½"	4'	5'-6½"	8'-4"	9.36	1341	7"	3'-5"	8"	1'-7"	1'-2"
8 x 5	6½"	4'	6'-6½"	9'-10"	12.40	1897	7"	4'-0"	8"	2'-0"	1'-4"
8 x 6	6½"	4'	7'-6½"	11'-4"	16.03	2632	7"	4'-8"	8"	2'-3"	1'-9"
8 x 7	6½"	4'	8'-6½"	12'-10"	21.70	3659	8"	5'-2"	9½"	2'-6½"	1'-10"
8 x 8	6½"	4'	9'-6½"	14'-4"	28.49	5222	9"	5'-9"	10½"	2'-8½"	2'-2"
8 x 4	7"	6'	5'-7"	8'-4"	9.41	1347	7"	3'-5"	8"	1'-7"	1'-2"
8 x 5	7"	6'	6'-7"	9'-10"	12.46	1897	7"	4'-0"	8"	2'-0"	1'-4"
8 x 6	7"	6'	7'-7"	11'-4"	16.11	2632	7"	4'-8"	8"	2'-3"	1'-9"
8 x 7	7"	6'	8'-7"	12'-10"	21.79	3659	8"	5'-2"	9½"	2'-6½"	1'-10"
8 x 8	7"	6'	9'-7"	14'-4"	28.60	5222	9"	5'-9"	10½"	2'-8½"	2'-2"
8 x 4	7½"	8'	5'-7½"	8'-5"	9.54	1347	7"	3'-5"	8"	1'-7"	1'-2"
8 x 5	7½"	8'	6'-7½"	9'-11"	12.61	1897	7"	4'-0"	8"	2'-0"	1'-4"
8 x 6	7½"	8'	7'-7½"	11'-5"	16.30	2632	7"	4'-8"	8"	2'-3"	1'-9"
8 x 7	7½"	8'	8'-7½"	12'-11"	22.02	3659	8"	5'-2"	9½"	2'-6½"	1'-10"
8 x 8	7½"	8'	9'-7½"	14'-5"	28.88	5222	9"	5'-9"	10½"	2'-8½"	2'-2"
9 x 5	7"	6'	6'-7"	9'-10"	12.59	1904	7"	4'-0"	8"	2'-0"	1'-4"
9 x 6	7"	6'	7'-7"	11'-4"	16.26	2640	7"	4'-8"	8"	2'-3"	1'-9"
9 x 7	7"	6'	8'-7"	12'-10"	21.95	3668	8"	5'-2"	9½"	2'-6½"	1'-10"
9 x 8	7"	6'	9'-7"	14'-4"	28.78	5232	9"	5'-9"	10½"	2'-8½"	2'-2"
9 x 9	7"	6'	10'-7"	15'-10"	37.26	G874	9½"	6'-4"	12½"	2'-10½"	2'-5"
9 x 5	8"	8'	6'-8"	10'-0"	12.90	1904	7"	4'-0"	8"	2'-0"	1'-4"
9 x 6	8"	8'	7'-8"	11'-6"	17.35	2640	7½"	4'-9"	8½"	2'-3½"	1'-9"
9 x 7	8"	8'	8'-8"	13'-0"	23.11	3668	8½"	5'-4"	9½"	2'-7½"	1'-11"
9 x 8	8"	8'	9'-8"	14'-6"	30.73	5232	9½"	6'-0"	11"	2'-11"	2'-2"
9 x 9	8"	8'	10'-8"	16'-0"	38.93	G874	10"	6'-6"	12½"	2'-11½"	2'-6"
10 x 5	7"	4'	6'-7"	9'-10"	12.72	1911	7"	4'-0"	8"	2'-0"	1'-4"
10 6	7"	4'	7'-7"	11'-4"	16.41	2648	7"	4'-8"	8	2'-3"	1'-9"
10 x 7	7"	4'	8'-7"	12'-10"	22.11	3677	8"	5'-2"	9½"	2'-6½"	1'-10"
10 x 8	7"	4'	9'-7"	14'-4"	28.96	5241	9"	5'-9"	10½"	2'-8½"	2'-2"
10 x 9	7"	4'	10'-7"	15'-10"	37.45	G885	9½"	6'-4"	12½"	2'-10½"	2'-5"
10 x 10	7"	4'	11'-7"	17'-4"	46.02	8740	11"	7'-0"	13½"	3'-2½"	2'-8"
10 x 5	8"	6'	6'-8"	10'-0"	13.04	1911	7"	4'-0"	8"	2'-0"	1'-4"
10 x 6	8"	6'	7'-8"	11'-6"	17.51	2648	7½"	4'-9"	8½"	2'-3½"	1'-9"
10 x 7	8"	6'	8'-8"	13'-0"	23.26	3677	8½"	5'-4"	9½"	2'-7½"	1'-11"
10 x 8	8"	6'	9'-8"	14'-6"	30.91	5241	9½"	6'-0"	11"	2'-11"	2'-2"
10 x 9	8"	6'	10'-8"	16'-0"	39.14	G885	10"	6'-6"	12½"	2'-11½"	2'-6"
10 x 10	8	6'	11'-8"	17'-6"	48.80	8740	11"	7'-0"	13½"	3'-2½"	2'-8"
10 x 5	8½"	8'	6'-8½"	10'-1"	13.20	1911	7"	4'-0"	8"	2'-0"	1'-4"
10 x 6	8½"	8'	7'-8½"	11'-7"	17.71	2648	7½"	4'-9"	8½"	2'-3½"	1'-9"
10 x 7	8½"	8'	8'-8½"	13'-1"	23.52	3677	8½"	5'-4"	9½"	2'-7½"	1'-11"
10 x 8	8½"	8'	9'-8½"	14'-7"	31.20	5241	9½"	6'-0"	11"	2'-11"	2'-2"
10 x 9	8½"	8'	10'-8½"	16'-1"	39.50	G885	10"	6'-6"	12½"	2'-11½"	2'-6"
10 x 10	8½"	8'	11'-8½"	17'-7"	49.18	8740	11"	7'-0"	13½"	3'-2½"	2'-8"

TABLE OF REINFORCING STEEL FOR 4 WING WALLS

WING SIZE Z	L"	BARS R NO	SIZE	SPAC	LENGTH	WEIGHT	BARS S1 NO	SIZE	SPAC	LENGTH	WEIGHT	#4 BARS T1 @18"± NO	LENGTH	WEIGHT	#4 BARS T2 @12"± NO	LENGTH	WEIGHT	BARS U NO	SIZE	SPAC	LENGTH	WEIGHT	#4 Bars P @18"c.c. SPAC	LENGTH	WEIGHT	#4 BARS W @12"± NO	LENGTH	WEIGHT	TOTAL WEIGHT
3'-6"	5'-3"	24	#4	12"	5'-1"	81	24	#4	12"	3'-11"	63	16	5'-0"	53	8	5'-0"	27	16	#5	18"	6'-0"	100	20	3'-9"	50	28	8'-9"	164	538
4'-6"	6'-9"	32	#4	11"	6'-1"	130	32	#4	11"	4'-3"	91	24	6'-6"	104	8	6'-6"	35	24	#5	18"	6'-0"	150	24	4'-9"	76	28	11'-3"	210	796
5'-6"	8'-3"	60	#4	7"	7'-3"	291	60	#4	7"	4'-10"	194	32	8'-0"	171	8	8'-0"	43	32	#5	18"	6'-0"	200	28	5'-9"	108	32	13'-3"	283	1290
6'-6"	9'-9"	56	#5	8½"	8'-5"	492	60	#5	8"	5'-5"	339	32	9'-6"	203	12	9'-6"	76	32	#5	18"	6'-0"	200	32	6'-9"	144	36	15'-9"	379	1833
7'-6"	11'-3"	80	#5	7"	9'-10"	820	80	#5	7"	6'-1"	507	40	11'-0"	294	12	11'-0"	88	40	#5	18"	6'-0"	250	36	7'-9"	186	36	17'-3"	415	2560
8'-6½"	12'-10"	112	#5	5½"	11'-4"	1324	104	#5	6"	6'-7"	714	48	12'-7"	403	12	12'-7"	101	48	#5	18"	6'-0"	300	40"	8'-9"	234	40	18'-11"	505	3581
9'-6½"	14'-4"	108	#6	6½"	12'-9"	2068	116	#6	6"	7'-4"	1277	48	14'-1"	452	16	14'-1"	150	48	#5	18"	6'-0"	300	44	9'-9"	287	44	20'-6"	603	5137
10'-7"	15'-10"	140	#6	5½"	14'-4"	3,013	140	#6	5½"	7'-11"	1665	56	15'-7"	583	16	15'-7"	167	56	#5	18"	6'-0"	350	48	10'-10"	347	44	22'-0"	647	6772
11'-7"	17'-4"	168	#6	5"	15'-9"	3974	168	#6	5"	8'-7"	2165	64	17'-1"	730	16	17'-1"	183	64	#5	18"	6'-0"	401	52	11'-10"	411	48	23'-6"	754	8618

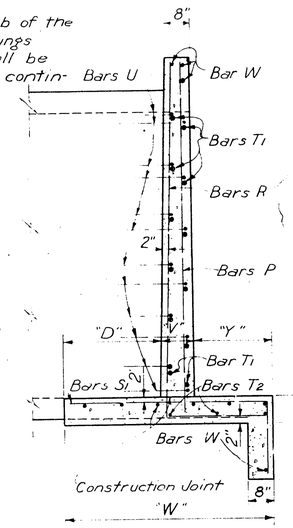


TYPICAL
LONGITUDINAL SECTION THRU BOX
SHOWING DETAIL OF APRON

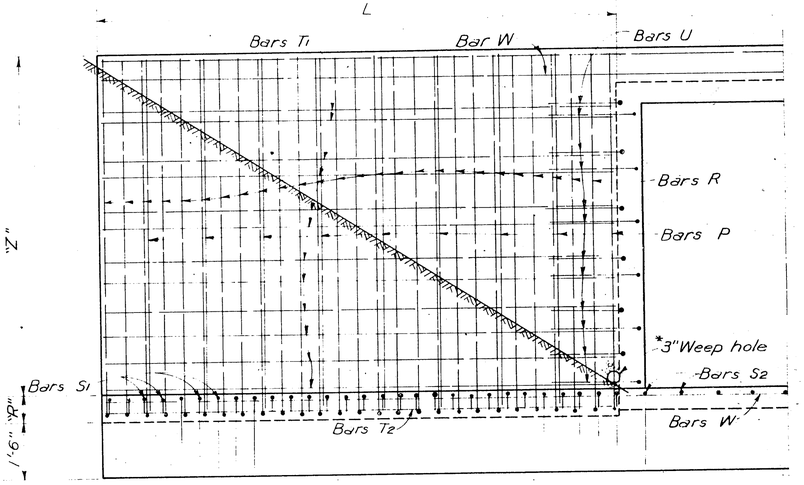


PLAN VIEW OF
WING WALL

NOTE
The bottom slab of the barrel, wing footings and toewalls shall be placed in one continuous operation.



SECTION



HALF ELEVATION

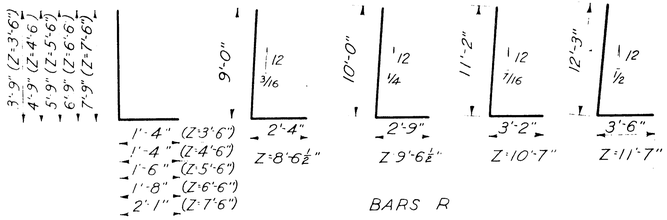
DETAIL OF WING WALL

* Place one weep hole per wing at approximate earth line as shown. Fill around inlet of drains with broken stone or coarse gravel to permit free passage of water. Weep holes required for Z = 6'-6" and greater.

GENERAL NOTES

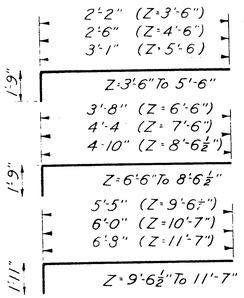
All concrete shall be Class C. Chamfer all exposed corners ¾" unless specified otherwise.

All dimensions relating to reinforcing steel are to centers of bars.

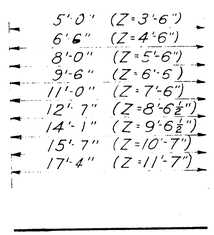


BARS R

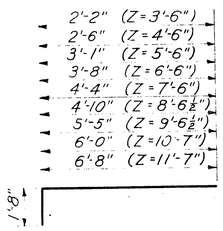
Z = 3'-6" To 7'-6"



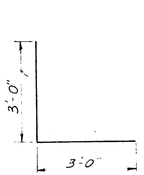
BARS S1



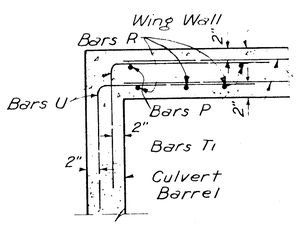
BARS T1



BARS S2
(Culvert Apron)



BARS U



ARRANGEMENT OF
WING WALL REINF.
AT CULVERT WALL

BILL OF #4 BARS S2 @ 12"± FOR 2 CULVERT APRONS

"Z"	SHAPE	NO	LGTH	WEIGHT
3'-6"	3'-0"	8	3'-10"	20
	4'-0"	10	3'-10"	26
	5'-0"	12	3'-10"	31
4'-6"	3'-0"	8	4'-2"	22
	4'-0"	10	4'-2"	28
	5'-0"	12	4'-2"	33
	6'-0"	14	4'-2"	39
	7'-0"	16	4'-2"	45
5'-6"	4'-0"	10	4'-9"	32
	5'-0"	12	4'-9"	38
	6'-0"	14	4'-9"	44
	7'-0"	16	4'-9"	51
	8'-0"	18	4'-9"	57
6'-6"	5'-0"	12	5'-4"	43
	6'-0"	14	5'-4"	50
	7'-0"	16	5'-4"	57
	8'-0"	18	5'-4"	64

"Z"	SPAN	NO	LGTH	WEIGHT
6'-6"	9'-0"	20	5'-4"	71
	10'-0"	22	5'-4"	78
7'-6"	6'-0"	14	6'-0"	56
	7'-0"	16	6'-0"	64
	8'-0"	18	6'-0"	72
	9'-0"	20	6'-0"	80
	10'-0"	22	6'-0"	88
8'-6½"	7'-0"	16	6'-6"	69
	8'-0"	18	6'-6"	78
	9'-0"	20	6'-6"	87
	10'-0"	22	6'-6"	96
9'-6½"	8'-0"	18	7'-1"	85
	9'-0"	20	7'-1"	95
	10'-0"	22	7'-1"	104
10'-7"	9'-0"	20	7'-8"	102
	10'-0"	22	7'-8"	113
11'-7"	10'-0"	22	8'-4"	122

TEXAS HIGHWAY DEPARTMENT

PARALLEL WINGS-NORMAL

FOR SINGLE BOX CULVERTS

3 x 2 TO 10 x 10

PW-N

DN. C.I.S.E.W.H.	DRAWING	DATE	FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.			SHEET NO.
CK. DR. W.H.	Original	June 1948	6	TEXAS				
DR. A.B.L.	Rev Oct 1958							
CK. DR. W.H.	Rev Jan 1959							
JR. A.L.B.	Rev Nov 1964							
CK. TH. W.H.			DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.
				DALLAS				