DOUBLE BOX CULVERTS

Span 4'

Item	2' A	2' B	2' C	3' A	3' B	3' C	3' D	4' A	4' B	4' C	4' D
Max. Fill Over Top	11	21	32	11	23	34	46	11	23	34	46
Conc. Top Slab T_1	6½	6½	7¼	6½	6½	7½	8½	6½	6½	7½	8½
Conc. Bottom Slab T_2	6	7¼	8½	6	7½	8½	9½	6	7½	8½	9½
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6
"a" Size: Bar #	5	4	4	5	4	4	4	5	4	4	4
"a" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½
"a" Length	10-3	10-2	10-2	10-3	10-2	10-2	10-2	10-3	10-2	10-2	10-2
"b" or "b1" Size: Bar #	5	5	5	5	5	5	5	5	5	5	5
"b" or "b1" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½
Length "b"	9-4	9-4	9-6	9-4	9-4	9-6	9-7	9-4	9-4	9-6	9-7
Length "b1"	9-4	9-5	9-6	9-4	9-5	9-6	9-7	9-4	9-5	9-6	9-7
"c" Size: Bar #	4	5	5	4	5	5	5	4	5	5	5
"c" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½
"c" Length	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6
"d" Dist. Bars Top Slab-Tot. No.	10	6	6	10	6	6	6	10	6	6	6
"d" Dist. Bars Bottom Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	4	4	5
"e" Bars Spacing	18	18	18	18	18	16	12	18	12	9	10
Spacers Number	23			26				29			
Quan. Concrete: C.Y. per lin. ft.	0.47	0.51	0.57	0.53	0.57	0.63	0.69	0.59	0.63	0.69	0.75
Quan. Reinf.: Lbs. per lin. ft.	81	74	84	84	79	91	101	87	85	99	111
Hydraulics Area A	16			24				32			
Hydraulic Radius R	0.67			0.86				1.00			
Neutral Slope %	0.64			0.70				0.77			
Head Factor k	0.75			0.55				0.45			
Entrance Capacity Q_{10}	70			128				198			
Design Discharge Q_{100}	116			214				326			

Span 5'

Item	2' A	2' B	2' C	3' A	3' B	3' C	4' A	4' B	4' C	4' D	5' A	5' B	5' C	5' D
Max. Fill Over Top	6	24	36	6	24	36	6	23	34	46	6	23	34	46
Conc. Top Slab T_1	6¾	7¾	9¼	6¾	7¾	9¼	6¾	7¾	9	10¼	6¾	7¾	9¼	10¼
Conc. Bottom Slab T_2	6½	8¾	10¼	6½	8¾	10¼	6½	8¾	10	11¼	6½	8¾	10	11¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"a" Size: Bar #	5	4	4	5	4	4	5	4	4	4	5	4	4	4
"a" Spacing	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
"a" Length	12-3	12-2	12-2	12-3	12-2	12-2	12-3	12-2	12-2	12-2	12-3	12-2	12-2	12-2
"b" or "b1" Size: Bar #	5	5	6	5	5	6	5	5	6	6	5	5	6	6
"b" or "b1" Spacing	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
Length "b"	11-5	11-6	11-7	11-5	11-6	11-7	11-5	11-6	11-7	11-8	11-5	11-6	11-7	11-8
Length "b1"	11-4	11-6	11-7	11-4	11-6	11-7	11-4	11-5	11-7	11-8	11-4	11-6	11-7	11-8
"c" Size: Bar #	4	5	6	4	5	6	4	5	6	6	4	5	6	6
"c" Spacing	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
"c" Length	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6
"d" Dist. Bars Top Slab-Tot. No.	12	6	6	12	6	6	12	6	6	6	12	6	6	6
"d" Dist. Bars Bottom Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	4	5	4	4	5	5
"e" Bars Spacing	18	18	18	18	18	16	18	12	10	10½	18	8½	9	9
Spacers Number	23			26			29				32			
Quan. Concrete: C.Y. per lin. ft.	0.58	0.69	0.80	0.63	0.75	0.86	0.69	0.80	0.89	0.98	0.74	0.86	0.97	1.04
Quan. Reinf.: Lbs. per lin. ft.	99	100	109	103	104	112	106	109	119	133	109	116	126	148
Hydraulics Area A	20			30			40				50			
Hydraulic Radius R	0.71			0.94			1.11				1.25			
Neutral Slope %	0.59			0.62			0.67				0.73			
Head Factor k	0.69			0.49			0.39				0.34			
Entrance Capacity Q_{10}	86			160			246				344			
Design Discharge Q_{100}	142			264			406				568			

Span 6'

Item	3' A	3' B	3' C	4' A	4' B	4' C	5' A	5' B	5' C	5' D	6' A	6' B	6' C	6' D
Max. Fill Over Top	4	20	34	4	20	34	4	19	33	43	4	19	33	43
Conc. Top Slab T_1	7¼	8¼	10½	7¼	8¼	10½	7¼	8¼	10½	12	7¼	8¼	10½	12
Conc. Bottom Slab T_2	7¼	9½	11½	7¼	9½	11½	7¼	9½	11½	12¾	7¼	9½	11½	12¾
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	7½
"a" Size: Bar #	5	4	4	5	4	4	5	4	4	4	5	4	4	4
"a" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½
"a" Length	14-3	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-2	14-3	14-2	14-2	14-8
"b" or "b1" Size: Bar #	5	6	6	5	6	6	5	6	6	7	5	6	6	7
"b" or "b1" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½
Length "b"	13-6	13-6	13-8	13-6	13-6	13-8	13-6	13-6	13-8	13-9	13-6	13-6	13-8	14-2
Length "b1"	13-5	13-7	13-8	13-5	13-7	13-8	13-5	13-6	13-8	13-9	13-5	13-6	13-8	14-2
"c" Size: Bar #	4	6	6	4	6	6	4	6	6	7	4	6	6	7
"c" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½
"c" Length	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6
"d" Dist. Bars Top Slab-Tot. No.	12	6	6	12	6	6	12	6	6	6	12	6	6	6
"d" Dist. Bars Bottom Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	5	5	4	5	6	6
"e" Bars Spacing	18	18	16	18	14	8½	18	10	9½	7	18	11	9	6
Spacers Number	30			33			36				36			
Quan. Concrete: C.Y. per lin. ft.	0.77	0.90	1.08	0.82	0.96	1.13	0.88	1.01	1.19	1.30	0.93	1.07	1.25	1.47
Quan. Reinf.: Lbs. per lin. ft.	121	119	147	125	124	155	128	131	164	175	129	137	177	201
Hydraulics Area A	36			48			60				72			
Hydraulic Radius R	1.00			1.20			1.33				1.50			
Neutral Slope %	0.56			0.59			0.62				0.66			
Head Factor k	0.450			0.358			0.305				0.271			
Entrance Capacity Q_{10}	192			296			414				544			
Design Discharge Q_{100}	318			488			682				896			

Span 8'

Item	4' A	4' B	4' C	5' A	5' B	5' C	6' A	6' B	6' C	7' A	7' B	7' C	7' D	8' A	8' B	8' C	8' D
Max. Fill Over Top	3	14	25	3	14	25	3	14	25	3	14	25	37	3	14	25	37
Conc. Top Slab T_1	8½	9½	12	8½	9½	12	8½	9½	12	8½	9½	12¼	14¼	8½	9½	12¼	14¼
Conc. Bottom Slab T_2	7½	10¾	12¾	7½	10¾	12¾	7½	10¾	12¾	7½	10¾	13	15	7½	10¾	13	15¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	7	7	7	8	7	7	8	8½
"a" Size: Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4
"a" Spacing	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
"a" Length	18-4	18-2	18-2	18-4	18-2	18-2	18-4	18-2	18-2	18-7	18-5	18-5	18-8	18-7	18-5	18-8	18-10
"b" or "b1" Size: Bar #	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7
"b" or "b1" Spacing	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
Length "b"	17-7	17-8	17-9	17-7	17-8	17-9	17-7	17-8	17-9	17-10	17-10	18-0	18-5	17-10	17-10	18-3	18-6
Length "b1"	17-5	17-8	17-9	17-5	17-8	17-9	17-5	17-8	17-9	17-8	17-11	18-0	18-5	17-8	17-11	18-0	18-7
"c" Size: Bar #	4	6	7	4	6	7	4	6	7	4	6	7	7	4	6	7	7
"c" Spacing	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
"c" Length	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-7	8-7	8-7	8-8	8-7	8-7	8-8	8-9
"d" Dist. Bars Top Slab-Tot. No.	16	8	8	16	8	8	16	8	8	16	8	8	8	16	8	8	8
"d" Dist. Bars Bottom Slab-Tot. No.	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
"e" Bars Size: Bar #	4	4	4	4	4	5	4	5	6	4	5	6	7	4	5	7	7
"e" Bars Spacing	18	18	10½	18	12	10	18	11½	10	14	9½	7½	8½	11½	8½	7½	8
Spacers Number	41			44			44			47			56	50		60	
Quan. Concrete: C.Y. per lin. ft.	1.08	1.30	1.55	1.14	1.37	1.61	1.19	1.42	1.66	1.32	1.56	1.83	2.14	1.39	1.62	1.99	2.27
Quan. Reinf.: Lbs. per lin. ft.	169	175	200	172	181	218	173	188	229	185	199	248	299	191	207	284	314
Hydraulics Area A	64			80			96			112				128			
Hydraulic Radius R	1.33			1.54			1.71			1.87				2.00			
Neutral Slope %	0.52			0.54			0.56			0.59				0.62			
Head Factor k	0.314			0.262			0.229			0.206				0.189			
Entrance Capacity Q_{10}	394			552			724			914				1116			
Design Discharge Q_{100}				910			1194			1506				1842			

APPROVAL RECOMMENDED

BRIDGE ENGINEER
REGISTERED CIVIL ENGINEER NO.5585

APPROVED SEPTEMBER 1, 1966

STATE HIGHWAY ENGINEER
REGISTERED CIVIL ENGINEER NO.5945

Note: For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities.

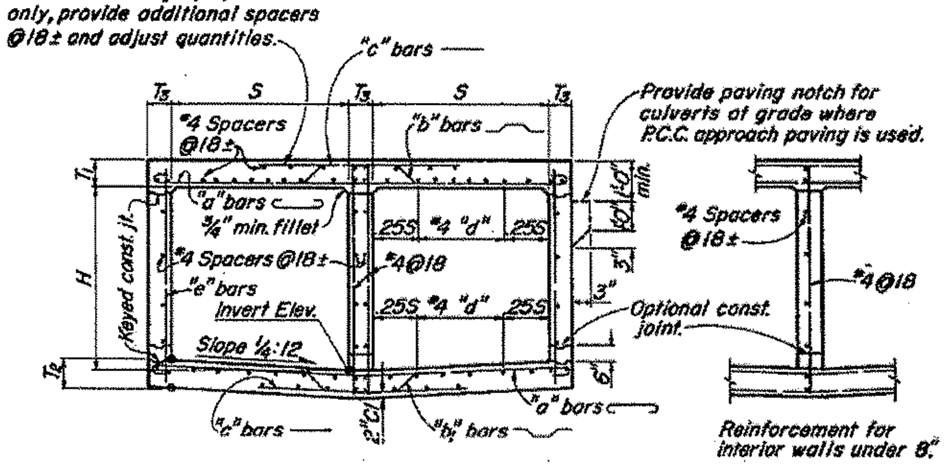
Span 10'

Item	5' A	5' B	5' C	6' A	6' B	6' C	7' A	7' B	7' C	8' A	8' B	8' C	8' D	10' A	10' B	10' C	10' D
Max. Fill Over Top	2	17	30	2	17	30	2	17	30	2	16	29	36	2	16	29	36
Conc. Top Slab T_1	8¾	12¾	16	8¾	12¾	16	8¾	12¾	16	8¾	12¾	16	17¼	8¾	12¾	16	17½
Conc. Bottom Slab T_2	8¼	13½	16½	8¼	13½	16½	8¼	13¾	16¾	8¾	13½	16½	18¼	8¾	13½	16½	18½
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6½	7	7	7	7½	8½	8	8	9	10
"a" Size: Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4
"a" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9
"a" Length	22-4	22-2	22-2	22-4	22-2	22-2	22-4	22-4	22-5	22-7	22-6	22-7	22-10	22-10	22-8	22-11	23-2
"b" or "b1" Size: Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8
"b" or "b1" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9
Length "b"	21-7	21-10	22-0	21-7	21-10	22-0	21-7	21-11	22-3	21-10	21-1	22-4	22-9	22-1	22-4	22-9	23-1
Length "b1"	21-5	21-10	22-0	21-5	21-10	22-0	21-5	21-11	22-3	21-9	22-0	22-4	22-9	22-0	22-3	22-8	23-2
"c" Size: Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8
"c" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9
"c" Length	10-6	10-6	10-6	10-6	10-6	10-6	10-6	10-7	10-7	10-7	10-7	10-8	10-9	10-8	10-8	10-9	10-10
"d" Dist. Bars Top Slab-Tot. No.	18	10	10	18	10	10	18	10	10	18	10	10	10	18	10	10	10
"d" Dist. Bars Bottom Slab-Tot. No.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" Bars Size: Bar #	4	4	5	4	4	5	4	4	6	4	5	6	7	4	6	6	7
"e" Bars Spacing	18	10	10	18	6	6½	14	6	8	11	8½	6	6	7½	7	5½	5
Spacers Number	48			48			51			54			64	68			
Quan. Concrete: C.Y. per lin. ft.	1.40	2.05	2.46	1.45	2.07	2.48	1.51	2.18	2.64	1.66	2.27	2.74	3.04	1.92	2.51	3.05	3.41
Quan. Reinf.: Lbs. per lin. ft.	236	254	310	238	274	324	243	280	339	252	278	355	430	279	327	400	476
Hydraulics Area A	100			120			140			160				200			
Hydraulic Radius R	1.67			1.88			2.06			2.22				2.50			
Neutral Slope %	0.49			0.51			0.52			0.54				0.58			
Head Factor k	0.238			0.205			0.183			0.165				0.143			
Entrance Capacity Q_{10}	690			906			1142			1396				1952			
Design Discharge Q_{100}	1136			1494			1882			2300				3220			

Span 12'

Item	6' A	6' B	6' C	7' A	7' B	7' C	8' A	8' B	8' C	9' A	9' B	9' C	9' D	10' A	10' B	10' C	10' D	12' A	12' B	12' C	12' D
Max. Fill Over Top	2	14	26	2	14	26	2	14	26	2	14	26	36	2	14	26	36	2	14	26	36
Conc. Top Slab T_1	10	14	17½	10	14¼	17½	10¼	14¼	17¾	10¼	14½	17¾	20¾	10¼	14½	17¾	20¾	10¼	14½	18¼	21¼
Conc. Bottom Slab T_2	9¼	14¾	18	9¼	15	18¼	9¾	15	18½	10	15¼	18¾	21¼	10¼	15¼	18¾	21½	10½	15¼	19¼	22
Conc. Sidewalls T_3	6	6	6½	7	7	7	8	8	8½	9	9	9	10	9	9	9½	11	9	10	11	12
"a" Size: Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	4
"a" Spacing	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
"a" Length	26-4	26-2	26-4	26-7	26-5	26-5	26-10	26-8	26-10	27-1	26-11	26-11	27-1	27-1	26-11	27-3	27-5	27-1	27-2	27-5	27-8
"b" or "b1" Size: Bar #	6	8	8	6	8	8	6	8	8	6	8	8	9	6	8	8	9	6	8	8	9
"b" or "b1" Spacing	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
Length "b"	25-8	25-10	26-3	25-11	26-1	26-4	26-2	26-4	26-9	26-5	26-8	26-10	27-4	26-5	26-8	27-2	27-6	26-5	26-11	27-5	27-10
Length "b1"	25-6	25-10	26-3	25-9	26-2	26-4	26-1	26-5	26-9	26-4	26-8	26-11	27-4	26-4	26-8	27-2	27-7	26-4	26-11	27-5	27-11
"c" Size: Bar #	5	8	8	5	8	8	5	8	8	5	8	8	9	5	8	8	9	5	8	8	9
"c" Spacing	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
"c" Length	12-6	12-6	12-7	12-7	12-7	12-7	12-8	12-8	12-9	12-9	12-9	12-9	12-10	12-9	12-9	12-10	12-11	12-9	12-10	12-11	13-0
"d" Dist. Bars Top Slab-Tot. No.	24	10	10	24	10	10	24	10	10	24	10	10	10	24	10	10	10	24	10	10	10
"d" Dist. Bars Bottom Slab-Tot. No.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" Bars Size: Bar #	4	4	5	4	4	5	4	4	5	4	5	7	8	4	7	8	8	6	7	8	9
"e" Bars Spacing	18	8	8	15	6	6½	12	5½	6	9	7½	8½	8	8½	11	8½	9	12	8	7	7
Spacers Number	52			55			68			68				72				76			
Quan. Concrete: C.Y. per lin. ft.	1.64	2.59	3.16	1.97	2.77	3.28	2.19	2.93	3.59	2.38	3.15	3.69	4.25	2.48	3.23	3.86	4.49	2.67	3.53	4.30	4.92
Quan. Reinf.: Lbs. per lin. ft.	309	317	401	316	330	415	336	363	460	345	374	485	578	351	394	519	592	371	427	567	673
Hydraulics Area A	144			168			192			216				240				288			
Hydraulic Radius R	2.00			2.21			2.40			2.57				2.73				3.00			
Neutral Slope %	0.46			0.48			0.49			0.51				0.52				0.56			
Head Factor k	0.189			0.167			0.151			0.138				0.128				0.114			
Entrance Capacity Q_{10}	1086			1372			1676			2000				2340				3080			
Design Discharge Q_{100}	1792			2260			2760			3300				3860				5080			

For culverts at grade, extend "c" bars full length, top slab only, provide additional spacers @18± and adjust quantities.



TYPICAL SECTION
(Showing reinforcement for interior walls 8" and over.)

STATE OF CALIFORNIA
TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

DOUBLE BOX CULVERTS | D 81

Return to Table of Contents