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## INTERCOLONIAL RAILWAY.

## TABLE OF QUANTITIES

IN

## CULVERTS AND OTHER STRUCTURES.

Ottawa: PRINTED BY HUNTER, ROSE & COMPANY. 1871.



## INTERCOLONIAL RAILWAY.

#### TABLES OF QUANTITIES IN STRUCTURES.

These Tables were prepared for the purpose of facilitating the calculations of quantities in the different sections of the line, preliminary to asking for Tenders. It is believed they will prove useful in many ways to members of the staff, and they are published for that purpose.

Tables D, E and F, give quantities in the various kinds of Box Culverts under all Embankments up to 80 feet in height.

Table G gives the leading dimensions of all Arch Culverts between 4 feet and 20 feet span, according to the accompanying standard diagram.

Table H gives the half lengths of level arch culverts from 4 feet to 20 feet span for all heights of embankment under 80 feet (this table is supplementary to and to be used instead of Table A in General Intructions No. 4 for Arch Culverts. For Box Culverts, Table A should be used).

Table I gives quantities in 4 feet Arch Culverts.

Table	K	do	5	feet Arch	6
Table	L	do	6	feet Arch	6
Table	M	do	8	feet Arch	: 6
Table	N	do , ·	10	feet Arch	"
Table	0	do	12	feet Arch	
Table	Р	do	14	feet Arch	6
Table	Q	do	16	feet Arch	"
Table	R	do	18	feet Arch	4
Table	S	do	20	feet Arch	"

Table T gives quantities in Beam Culverts and Bridges, according to the accompanying standard diagram and sheet No. 11 in Lithographed General Plans.

It was intended to add to these Tables some data by which the quantities in inclined culverts might be approximately estimated, but it has been found that no reliable rule can be laid down. Various attempts were made to establish a formulæ which would give an approximation for average ground; a per centage varying from three to twenty-five per cent. was added to the quantities in the within Tables, in preparing some of the schedules for intending Contractors, but experience has shown that the actual increase is so very variable owing to the changeable character of the foundation strata, that no formulæ can be depended on even for rough estimates.

The General Plans referred to in these Tables are those lithographed and published, and the General Instructions, together with Tables A, B and C, are those previously printed in connexion with this line of Railway.

#### SANDFORD FLEMING.

Chief Engineer.

OTTAWA, Dec. 31st, 1870.

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## INTERCOLONIAL RAILWAY.

TABLES OF QUANTITIES IN CULVERTS, &c.

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#### TABLE D. (Level)-Box Culverts, 2ft. 6in. × 2ft. 6in.

This is a Table of Quantities in Box Culverts 2ft. 6in.  $\bowtie 2ft.$  6in. according to LITHOGRAPHED GENERAL PLANS, SHEET No. 3, adopted for the construction of the Intercolonial Railway. The heights of Formation above surface of Paving on centre line of Railway being known, the lengths correspond with those found in TABLE A, GENERAL INSTRUCTIONS No. 4, and the quantities are as herein given.

#### The Table is calculated on the following data :

Per foot rnn of Culvert	fasonry,	1.093	cub. yds.	Paving,	0.0926	cub. yds.
Additional for Upper end of Culvert	Do	2.900	"	Do	2.5000	46
Additional for Lower end of Culvert	Do	3.900	"	Do	2.5000	"

Height of For- mation Level above Surface of Paving.	Length of Box. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Box. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.
5 feet.	22.0	30.6	7.0	25 feet.	86.0	100.8	13.0
6	25.0	34.1	7.3	26	89.0	104.1	13.2
7	28.0	37.4	7.6	27	92.0	107.4	13.5
8	31.0	40.7	7.9	28	95.0	110.7	13.8
9	34.0	44.0	8.2	29	98.0	113.9	14.1
10 .	38.0	48.4	8.6	30	102.0	118.3	14.4
11	41.0	51.7	8.9	31	105.0	121.6	14.7
12	44.0	55.0	9.2	32	108.0	124.9	15.0
13	47.0	58.3	9.5	33	111.0	128.2	15.3
14	50.0	61.6	9.8	34	114.0	131.5	15.6
15	54.0	66.0	10.2	35	118.0 ·	135.7	16.0
16	57.0	69.3	10.5	36	121.0	139.0	16.3
17	60.0	72.6	10.8	37	124.0	142.3	16.5
18	63.0	75.9	11.1	38	127.0	145.6	16.8
19	66.0	79.2	11.3	39	130.0	148.8	17.0
20	<b>7</b> 0. <b>0</b>	83.1	11.5	40	134.0	153.2	17.4
21	73.0	86.5	11.8	41	137.0	156.5	17.7
22	76.0	89.8	12.0	42	140.0	159.8	18.0
23	79.0	93.1	12.3	43	143.0	163.1	18.3
24	82.0	96.4	12.6	44	146.0	166.4	18.6

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#### TABLE D. - Continued.

This is a Table of Quantities in Box Culverts 2ft. 6in.  $\bowtie 2ft.$  6in. according to LITHOGRAPHED GENERAL PLANS, SHEET NO. 3, adopted for the construction of the Intercolonial Railway. The height of Formation above surface of Paving on centro line of Railway being known, the lengths correspond with those found in TABLE A, GENERAL INSTRUCTIONS No. 4, and the quantities are as herein given.

The Table is calculated on the following data :

Height of For- mation Level above Surface of Paving.	Length of Box. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of Fur- mution Level above Surface of Paving.	Length of Box. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.
45 feet.	150.0	170.8	19.0	63 feet.	207.0	233.1	24.1
46	153.0	174.0	19.2	64	210.0	236.4	24.4
47	156.0	177.2	19.5	65	214 0	240.7	24.8
48	159.0	180.5	19.8	66	217.0	244.0	25.2
49	162.0	183.8	20.1	67	220.0	247.3	25.5
50	166.0	188.2	20.5	68	223.0	250.6	25.8
51	169.0	191 5	20.8	69	226.0	253.9	26.1
52	172.0	194.8	21.1	70	230.0	258.3	26.5
53	175.0	198.1	21 4	71	233.0	261.6	26.8
54	178.0	201.4	21.7	72	236.0	264.7	27.1
55	182.0	205.8	22.1	73	239.0	267.9	27.4
56	185.0	209.0	22.3	74	242.0	271.1	27.7
57	188.0	212.2	22.5	75	246.0	275.5	28.1
58	191.0	215.5	22.7	76	249.0	278.8	28.4
59	194.0	218.8	23.0	77	252.0	282.1	28.7
60	198.0	223.2	23.3	78	255.0	285.4	29.0
61	201.0	226.5	23.6	79	258.0	288.7	29.3
62	204.0	229.8	23.9	80.	262.0	293.1	29.7

For approximate quantities in inclined Culverts, see Table Q.

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## TABLE E. (Level)-Box Culverts, 2ft. 6in. × 4ft. 0.

This is a Table of Quantities in Box Culverts, 2/t. 6in. × 4ft. 0., according to LATHOGRAPHED GENERAL PLANS, SHEET NO. 3, adopted for the construction of the Intercolonial Railway. The heights of Formation above surface of Paving on centre line of Railway being known, the lengths correspond with those found in TABLE A, GENERAL INSTRUCTIONS NO. 4, and the quantities are as herein given.

#### The Table is calculated on the following data:

Amount per foot run of Culvert......Masonry, 1 37 cub. yds. Paving, 0.0926 cub. yds. Additional for Upper end of Culvert.. Do 3.19 " Do 3.33 " Additional for Lower end of Culvert.. Do 4.1 " Do 3.33 "

of For- Level Surface Dg.	of Box.	rRY. yards.	G. yards.	of For- Level Surface ring.	of Box.	NRY. yards.	NG.
Height mation above of Pavi	Length Feet.	MASON Cubie	PAVIN Cubic	Height mation above of Par	Length Feet.	MAS0 Cubic	PAVI Cubic
6feet.	21	36.1	8.6	26 feet.	85	123.7	14.5
7	24	40.2	8.9	27	88	127.8	14.8
8	27	44.3	9.2	28	91	131.9	15.1
9	30	48.4	9.4	29	94	136.0	15.4
10	34	53.8	9.8	30	98	141 6	15.8
11	37	58.0	10.0	31	101	145.7	16.1
12	40	62.1	10.3	32	104	149.8	16.4
13 -	43	66.2	10.6	33	107	153.9	16.6
14	46	70.3	10.9	34	110	158.0	16.9
15	50	75.7	11.3	35	114	163.5	17.3
16	53	79.8	11.6	36	117	167.6	17.6
17	56	83.9	11.9	37	120	171.7	17.9
18	59	88.0	12.2	38	123	175.8	181
19	62	92.1	12.4	39	126	179.9	18.4
20	66	97.8	3 12.8	40	130	185.4	18.8
21	69	101.9	9 13.1	41	133	189.5	19.1
22	72	106.	0 13.4	42	136	193.6	<b>19.4</b>
23	75	110.	1 13.7	43	139	197.7	7   19.7
24	78	114.	2 13.9	44	142	201.8	3 19.9
25	82	119.	6 14.3	3 45	146	207.	3 20.3

#### TABLE E.-Continued.

This is a Table of Quantities in Box Culverts 2ft.  $6in \bowtie 4ft. 0in.$ , according to LITHOGRAPHED GENERAL PLANS, SHEET No. 3, adopted for the construction of the Intercolonial Railway. The heights of Formation above surface of Paving on centre line of Railway being known, the lengths correspond with those found in TABLE A, GENERAL INSTRUCTIONS No. 4, and the quantities are as herein given.

The Table is calculated on the following data :

Amount per foot run of Culvert...... Masonry, 1.37 cub. yds. Paving, 0.0926 cub. yds. Additional for Upper end of Culvert.. Do 3.19 " Do 3.33 " Additional for Lower end of Culvert.. Do 4.16 " Do 3.33 "

Height of For- mation Level above Surface of Paving.	Length of Box. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Box. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.
46 feet.	149	211.4	20.5	64 feet.	206	289.5	25.9
47	152	215.5	20.8	65	210	295.0	26.2
48	155	219.6	21.1	66	213	299.2	26.5
49	158	223.7	21.4	67	216	303.3	26.7
50	162	229.3	21.8	68	219	307.4	27.0
51	165	233.4	22.1	69	222	311.5	27.3
52	168	237.5	22.4	70	226	317.0	27.7
53	171	241.6	22.6	71	229	321 1	27.9
54	174	245.7	22.9	72	232	325.2	28.2
55	178	251.2	23.3	73	235	329.3	28.5
56	181	255.3	23.6	74	238	333.4	28.8
57	184	259.4	23.9	75	242	338.9	29.2
58	-187	263.5	24.1	76	245	343.0	29.5
59	190	267.6	24.4	77	248	347.1	29.8
60	194	273.1	24.8	78	251	351.2	30.1
61	197	277.2	25.1	79	254	355.3	<b>30.4</b>
62	200	281.3	25.4	80	258	360.8	30.7
63	203	285.4	25.7				

For approximate quantities in inclined Culverts, see special memoranda.

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## TABLE F. (Level)-Double Box Culverts, 2ft. 6in. × 4ft. 0.

This is a Table of Quantities in Double Box Culverts, 2/t. 6in.  $\times$  4ft. 0., according to LATHOGRAPHED GENERAL PLANS. SHEET NO. 4, adopted for the construction of the Intercolonial Railway. The heights of Formation above surface of Paving on centre line of Railway being known, the lengths correspond with those found in TABLE A, GENERAL INSTRUCTIONS NO. 4, and the quantities are as herein given.

#### The Table is calculated on the following data :

Amount per foot run of Culvert	Masonry	, 2 20	cub. yds.	Paving,	0.185	cub. yds.
Additional for Upper End	Do	3.66	46	Do	5.16	"
Additional for Lower End	Do	6.00	66	Do	5.16	"
Additional for Hower Hadding						

Height of For- mation Level above Surface of Paving.	Length of Arch. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch. Feet.	MASONRY. Cubic yards.	PAVING.  Cubic yards.
6 feet.	21	55.9	14.2	26 feet.	85	196.6	26.0
7	<b>24</b>	62.5	14.7	27	88	203.2	26.5
8	27	69.1	15.3	28	91	209.8	27.1
9	30	75.7	15.9	29	94	216.5	27.6
10	34	84.5	16.6	30	98	225.4	28.4
11	37	91.1	17.2	31	101	232.0	29.0
12	40	97.7	17.7	32	104	238.6	29.5
13	43	104.3	18.2	33	107	245.2	30.1
14	46	110.9	18.8	34	110	251.8	30.6
15	50	119.7	19.5	35	114	260.6	31.4
16	53	126.3	20.1	36	117	267.2	31.9
17	56	132.9	20.6	37	120	273.8	32.5
18	59	139.5	21.1	38	123	280.4	33.0
19	62	146.1	21.7	39	126	286 8	33.6
20	66	154.9	22.5	40	130	295.6	34.4
21	69	161.5	23.0	41	133	302.2	34.9
22	72	168.1	23.6	42.	136	308.8	35.5
23	75	174.7	24.1	43	139	315.4	36.0
24	78	181.3	24.7	44	142	322.0	36.5
25	82	190.1	25.4	45	146	330.8	37.3

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#### TABLE F.- Continued.

This is a Table of Quantities in Double Box Culverts 2ft. 6in.  $\times$  4ft. 0in., according to LITHOGRAPHED GENERAL PLANS, SHEET NO. 4, adopted for the construction of the Intercolonial Railway. The heights of Formation above surface of Paving on centre line of Railway being known, the lengths correspond with those found in TABLE A, GENERAL INSTRUCTIONS NO. 4, and the quantities are as herein given.

#### The Table is calculated on the following data :

Height of For- mation Level above Surface of Paving.	Length of Arch. Feet.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch. Feet.	MASONRY. Cubic yards.	PAVING. Cabic yards.
46 feet.	149	337.4	37.8	64 feet.	206	462.8	48.4
47	152	344.0	38.4	65	210	471.6	49.2
48	155	350.6	38.9	66	213	478.2	49.7
49	158	357.2	39.4	67	216	484.8	50.3
50	162	366.0	40.2	68	219	491.4	50.8
51	165	372.6	40.7	69	222	498.0	51.4
52	168	379.2	41.3	70	226	506.8	52.2
53	171	385.8	41.8	71	229	513.4	52.7
54	174	392.4	42.4	72 ·	232	520.0	53.3
55	178	401.2	432	73	235	526.6	53.8
56	181	407.8	43.8	74	238	533.2	54.4
57	184	414.4	44.3	75	242	542.0	55.2
58	187	421.0	44.9	76	245	548.6	55.7
59	190	427.6	45.4	77	248	555.2	56.3
60	194	436.4	46.2	78	251	561.8	56.8
61	197	443.0	46.7	79	254	568.4	57.3
62	200	449.6	47.3	80	258	577.2	58.1
63	203	456.2	478				

For approximate quantities in inclined Culverts, see special memoranda.

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#### TABLE

Dimensions of Arch Culverts from

SPAN OF CULVERT.	Thickness of Walls at Springing.	Half Width over upper Wings.	Width of Pilaster.	Projection of Pilaster at top.	Thickness of Wings at Upper End, and of Parapet over Arch at Lower End.	Inside Length of Springing course.	Length of Wings, Lower End.	Thickness of wings under steps.	Thickness of Wings below Springing at Ends.	Half width over Arch Lower End.
*e. d.	e. f.	i. l.	m. n.	o. p.	p. r.	s. t.	s. v.	<b>x.</b> w.	d. w.	i. w.
ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in,	ft. in.	ft. in.	ft. in.	ft. in.	ft. in,
40	26	110	23	10	40	30	96	23	26	46
50	29	$127\frac{1}{2}$	$24\frac{1}{2}$	$10\frac{1}{2}$	$41\frac{1}{2}$	$31\frac{1}{2}$	106	26	29	53
60	33	143	26	11	43	33	116	29	30	63
80	40	$174\frac{1}{2}$	29	12	46	3.6	140	33	36	76
100	48	206	30	1.3	49	39	166	89	4.0	90
120	54	239	33	14	50	4.0	190	43	46	106
140	510	270	39	15	53	43	216	43	46	116
160	64	303	46	16	56	46	240	43	46	126
180	69	336	53	17	59	49	260	43	46	136
20.,0	72	369	60	18	60	50	280	4.,3	46	146

HORIZONTAL DIMENSIONS.

• These letters have reference to corresponding letters in the Diagram.

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Half width over Arch Lower End.

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ft. in, 4..6 5..3 6..3 7..6 9..0 10..6 11..6 12..6 13..6 14..6

## Four to Twenty Feet Span.

6 ...

			VERTICAL DIMENSIONS.									
Thickness of Apron, Lower End.	Side of Triangle at rear of Upper Wings.	Thickness of Arch.	Height of Arch.	Height of Bench Walls above Paving.	Thickness of Coping.	Thickness of Course over Arch.	Height of Upper Wings above Paving.	Thickness of Spring- ing Course.	Thickness of Paving.			
v. y.	f. f.	a.b.	b. c.	g. h.	i. k.	k. a.	l. m.	d. s.	e. z.			
ft. in,	ft. iv.	ft. in.	ft. iv.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.			
30	00	14	60	60	13	10	97	10	10			
$31\frac{1}{2}$	00	15	70	70	$13\frac{1}{2}$	$10\frac{1}{2}$	1010	10	11			
33	00	16	80	80	14	11	1111	10	12			
36	2.9	17	100	100	15	12	142	10	13			
39	30	18	120	120	15	12	163	10	14			
40	3.3.	110	140	140	16	13	187	10	15			
43	3. 9	20	160	160	16	13	209	11	16			
46	4.6	22	18.0	180	17	13	230	1.,2	17			
49	53	2.4	200	200	18	13	253	13	18			
50	60	26	220	220	19	13	276	14	19			

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## INTERCOLONIAL RAILWAY

DIAGRAM

to accompany Tables of Arch Culverts from 4 to 20 Feet Span.

The letters correspond with these in the accompanying Juble of Dimensions.

Sundford Fleming, Chief Engineer.

W.J. Forrest del.







#### TABLE H.

Shewing the half lengths of Arch Culverts (from Centre Line to the end of arch) for every height of Embankment (above paving) up to 80 feet, assuming the Culverts to be on a level—that is to say—without any inclination between the Upper and Lower ends, and also at right angles to the Centre Line of Railway.

\* (This Table is supplementary to, and to be used instead of Table A, General Instructions No. 4, for Arch Culverts.—For Box Culverts, see Table A.)

Height of formation level above			НА	LF LE	NGTH;	SOFC	ULVE	RTS.		
paving in centre of Culverts.	4 feot.	5 foet.	6 feet.	8 feet.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.
10 feet.	13.0									
11	14.5									
12	16.0									
13	17.5	16.0								
1.1	19.0	17.5								
15	210	19.0	17.5							
16	22.5	20.5	19.0					1		
17	24.0	22.0	20.5	16.0						
18	25.5	23.5	22.0	17.5			<u></u>			
19	27.0	25.0	23.5	19.0	16.0					
20	29.0	26.5	25.0	20.5	17.5	15.5				
21	30.5	28.0	26.5	22.0	19.0	17.0	,13.5			
22	32.0	29.5	28.0	23.5	20.5	18.5	15.0	12.0		
23	33.5	31.0	29.5	25.0	22.0	20.0	16.5	13.5	10.0	
24	35.0	32.5	31.0	26.5	23.5	21.5	18.0	15.0	11,5	
25	37.0	34.5	33.0	28.0	25.0	23.0	19.5	16.5	13.0	10.0
26	38.5	36.0	34.5	29.5	26.5	24.5	21.0	18.0	14.5	11.5
27	40.0	37.5	36.0	31.0	28.0	26.0	22.5	19.5	16.0	13.0
28	41.5	39.0	37.5	33.0	29.5	27.5	24.0	21.0	17.5	14.5
29	<b>43</b> .0	40.5	39.0	34.5	31.0	29.0	25.5	22.5	19.0	16.0
30	45.0	42.5	41.0	36.0	33.0	30.5	27.0	24.0	20.5	17.5

the end of to 80 feet, without any ight angles

A, General

20 ft.

8 ft.

10.0 11,5

 13.0
 10.0

 14.5
 11.5

 16.0
 13.0

 17.5
 14.5

 19.0
 16.0

 20.5
 17.5

TABLE H.-Continued.

Shewing the half lengths of Arch Culverts (from Centre Line to the end of arch) for every height of Embankment (above paving) up to 80 feet, assuming the Culverts to be on a level—that is to say—without any inclination between the Upper and Lower ends, and also at right angles to the Centre Line.

\* (This Table is supplementary to, and to be used instead of Table A, General Instructions No. 4, for Arch Culverts. For Box Culverts, see Table A.)

Height of Formation			ПА	LF LE	NGTH	SOFC	OF CULVERTS.					
above paving.	4 feet.	5 feet.	6 fuet.	8 feet.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.		
31	46.5	44.0	42.5	37.5	34.5	32.5	28.5	25.5	22.0	19.0		
32	48.0	45.5	44.0	39.0	36.0	34.0	30.5	27.0	23.5	20.5		
33	49.5	47.0	45.5	<b>41</b> .0	37.5	35.5	32.0	29.0	25.0	22.0		
34	51.0	48.5	47.0	42.5	39.0	37.0	33.5	30.5	27.0	23.5		
35	53,0	50.5	49.0	44.0	41.0	38.5	35.0	32,0	28.5	25.5		
36	54.5	<b>5</b> 2.0	505	45.5	42.5	40.5	36.5	33.5	30.0	27.0		
37	56.0	53.5	52.0	47.0	44.0	42.0	38.5	35.0	31.5	28.5		
38	57.5	55.0	53 5	49.0	45.5	43.5	40.0	37.0	33.0	30. <b>0</b>		
39	59.0	56.5	55.0	50.5	47.0	45.0	41.5	38.5	35.0	31. <b>5</b>		
40	61.0	58.5	57.0	52.0	49.0	46.5	43.0	40.0	36.5	33.5		
41	62.5	60.0	58.5	53.5	50.5	48.5	44.5	41.5	38.0	35.0		
42	64.0	61.5	60.0	55.0	52.0	50.0	46.5	43.0	39.5	36.5		
43	65.5	63.0	61.5	57.0	53.5	51.5	48.0	<b>45.0</b>	41.0	38.0		
44	67.0	64.5	63.0	58.5	55.0	53.0	49.5	<b>46.5</b>	43.0	39.5		
45	69.0	66.5	65.0	60.0	57.0	54.5	51.0	48.0	44.5	41.5		
46	70.5	68.0	66.5	61.5	58.5	56.5	52.5	49.5	46.0	43.0		
47	72.0	69.5	68.0	63.0	60.0	58.0	54.5	51.0	47.5	44.5		
48	73.5	71.0	69.5	65.0	61.5	59.5	56.0	53.0	49.0	46.0		
49	75.0	72.5	71.0	66.5	63,0	61.0	57.5	54.5	51.0	47.5		
50	77.0	745	73.0	68.0	65.0	62.5	59.0	56.0	52.5	49.5		
51	78.5	76.0	74.5	69.5	66.5	64.5	60.5	57.5	54.0	51.0		
	1	1										

#### TABLE H.-Continued.

Shewing the half lengths of Arch Culverts (from Centre Line to the end of arch) for every height af Embankment (above paving) up to 80 feet, assuming the Culverts to be on a level—that is to say—without any inclination between the Upper and Lower ends, and also at right angles to the Centre Line of Railway.

\* (This Table is supplementary to, and to be used instead of Table A, General Instructions No. 4, for Arch Culverts.—For Box Culverts, see Table A.)

Height of Formation	HALF LENGTHS OF CULVERTS.												
above paving.	4 feet.	5 feet.	6 foot.	8 feet.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.			
52 feet.	80.0	77.5	76.0	71.0	68.0	66.0	62.5	59.0	55.5	52.5			
53	81.5	79.0	77.5	73.0	69.5	67.5	64 0	61.0	57.0	54.0			
54	83.0	80.5	79.0	74 5	71.0	69.0	65.5	62.5	59.0	55.5			
55	85.0	82 5	81.0	76.0	73.0	70.5	67.0	64.0	60.5	57.5			
56	86.5	84.0	82.5	77.5	74 5	72.5	68.5	65.5	62.0	59.0			
57	88.0	85.5	84.0	79.0	76.0	74.0	70.5	67.0	63.5	60.5			
58	89.5	87.0	85.5	81.0	77.5	75.5	72.0	69.0	65.0	62.0			
59	91.0	88.5	87.0	82.5	79.0	77.0	73.5	70,5	67.0	63.5			
60	93.0	90.5	89.0	84.0	81.0	78.5	75.0	72.0	63.5	65.5			
61	94.5	92 0	90.5	85.5	82.5	80.5	76.5	73.5	70.0	67.0			
62	96.0	93.5	92.0	87.0	84.0	82.0	78.5	75.0	71.5	68.5			
63	97.5	95.0	93.5	89.0	85.5	83.5	80.0	77.0	73.0	70-0			
64	99.0	96.5	95.0	90.5	87.0	85.0	81.5	78.5	75.0	71.5			
65	101.0	98.5	97.0	92.0	89.0	86.5	83.0	80.0	76.5	73.5			
66	102.5	100.0	98.5	93 5	90.5	88.5	84.5	81.5	78.0	75.0			
67	104.0	101.5	100.0	95 0	92.0	90.0	86.5	83.0	79.5	76.5			
68	105.5	103.0	101.5	97.0	93.5	91.5	88.0	85.0	81.0	78.0			
69	107.0	104.5	103.0	98.5	95.0	93.0	89.5	86.5	83.0	79.5			
70	109.0	106.5	105.0	100.0	97.0	94.5	91.0	88.0	84.5	81.5			
71	110.5	108.0	106.5	101.5	98.5	96.5	92.5	89.5	86.0	83.0			
72	ا 112.0	109.5	108.0	103.0	100.0	98.0	94 5	91.0	87.5	84.5			
	1	1			1	1		1					

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#### TABLE H.-Continued.

Shewing the half lengths of Arch Culverts (from Centre Line to the end of arch) for every height of Embankment (above paving) up to 80 feet, assuming the Culverts to be on a level-that is to say-without any inclination between the Upper and Lower ends, and also at right angles to the Centre Line of Railway.

\* (This Table is supplementary to, and to be used instead of Table A, General Instructions No. 4, for Arch Culverts.—For Box Culverts, see Table A.)

.,	General	

1

	20 ft.	
5	52,5	
)	54.0	
	55.5	
5	57.5	
)	59.0	
5	60.5	
)	62,0	
	63.5	
þ	65.5	
	67.0	
ľ	68.5	
ļ	70-0	
ļ	71.5	
	73.5	
i	75.0	
	76.5	
	78.0	
	79.5	
	81.5	
	83.0	

84.5

Height of Formation		HALF LENGTHS OF CULVERTS.												
Level above paving.	4 foet.	5 feet,	6 feet.	8 feet.	10 ft.	12 ft.	14 ft.	16 ft.	18 ft.	20 ft.				
73 feet.	113.5	111.0	109.5	105.0	101.5	99.5	96.0	93.0	89.0	86.0				
74	115.0	112.5	111.0	106.5	103.0	101.0	97.5	94.5	91.0	87.5				
75	117.0	114.5	113.0	108.0	105.0	102.5	99.0	96.0	92.5	89.5				
76	118.5	116.0	114.5	109.5	106.5	104.5	100.5	97.5	94.0	91.0				
77	120.0	117.5	116.0	111.0	108.0	106.0	102.5	99.0	95.5	92.5				
78	121.5	119.0	117.5	113.0	109.5	107.5	104.0	101.0	97.0	94.0				
79	123.0	120.5	119.0	114.5	111.0	109.0	105.5	102.5	99.0	95.5				
80	125.0	122.5	121.0	116.0	113.0	110.5	107.0	104.0	100.5	97.5				

Note.—The line of paving must always be a few inches at least under the lowest point in the natural bed of streams. See General Instructions (No. 3) in reference to this. The height of formation level above line of paving at the intersection of centre line being found in the first column, the half length of Arch of each kind will be seen in the respective columns opposite. The Wings, at least so much as extend beyond the ends of the Arch, are not included in the above half lengths.

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#### TABLE I.

#### (Level)-4 Feet Arch Culverts.

This is a Table of quantities in Four Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Tuble G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 4 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of	f Culve	rt	fasonry,	2.44 c	ub. yds.	Paving,	0.0926	cub.	yds
Additional for	Lower	End	Do	25.56	"	Do	0.8800	"	
Additional for	Upper	End	Do	29.82	"	Do	0.6000	"	
Do	do	]	Retaining	g wall .		Do	1.5000	"	

Height of For- mation Level above Surface of Paving.	Lengin of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubio yards.
10 feet.	26	118.8	5.4	30 feet.	90	275.0	11.3
11	29	126.1	5.7	31	93	282.3	11.6
12	<b>32</b>	133.5	5.9	32	96	289.6	11.9
13	35	140.8	6.2	33	99	296.9	12.2
14	38	148.1	6.5	34	102	304.2	12.5
15	42	157.9	6.8	35	106	314.0	12.8
16	45	165.2	7.1	36	109	321.3	13.1
17	43	172.5	7.5	37	112	328.6	13.4
18	51	179.8	7.7	38	115	335.9	136
19	54	187.1	8.0	39	118	343.2	13.9
20	58	196.9	8.3	40	122	353.0	14.3
21	61	204.2	8.6	41	125	360.4	14.5
22	64	211.5	8.9	42	128	367.7	14.8
23	67	218.8	9.2	43	131	375.0	15.1
24	70	226.2	9.5	44	134	382.3	15.4
25	74	236.0	9.8	45	138	392.1	15.8
26	77	243.3	10.1	46	141	399.4	16.0
27	80	250.6	10.4	47	144	406.7	16.3
28	83	257.9	10.7	48	147	414.0	16.6
29	86	265.2	10.9	49	150	421.3	16.9

#### TABLE I.- Continued.

This is a Tuble of quantities in Four Feel Arch Culverts, according to the accompanying Diagram and Dimensions given in Tuble G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 4 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of Culver	·tM	asonry,	2.44	cub. yds.	Paving,	0.0926	cub. yds.
Additional for Lower I	End bul	Do	25.56	"	Do	0.8800	1Ĩ
Additional for Upper 1	and	Do	29.82	se .	Do	0.6000	"
Do do	Re	taining	wall		Do	1.5000	"

testing and the second s							
Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
50 feet.	154	431.1	17.3	66	<b>205</b>	555.6	22.0
51	157	438.4	17.6	67	208	<b>5</b> 62. <b>9</b>	22.2
52	160	445.7	17.9	68	211	570.2	22.5
53	163	453.1	18.1	69	214	577.5	22.8
54	166	460.4	18.4	70	218	587.3	23.2
55	170	470.2	18.8	71	221	<b>594.6</b>	23.5
56	173	477.5	19.0	72	<b>2</b> 24	601.9	23.7
57	176	484.8	19.3	73	227	609.2	24.0
58	179	492.1	19.6	74	230	616.5	24.3
59	182	499.4	19.9	75	234	626.3	24.7
60	186	509.2	20.3	76	237	633.6	24.9
61	189	516.5	20.5	77	240	641.0	25.2
62	192	523.8	20.8	78	243	648.3	25.5
63	195	531.2	21 0	79	246	655.6	25.8
64	198	538.5	21.3	80	250	665.4	26.1
65	202	548.3	21.7				

For approximate quantities in inclined Culverts, see special memoranda.

#### lverts.

rding to  $\vec{r}$ . The  $\vec{r}$ . The own, the be found wings at walls at

cub. yds.

PAVING. Cubic yards. 11.3 ) 11.6 3 11.9 6 12.29 12.5  $\mathbf{2}$ 0 12.8 13.13 13.4 6 9 136 13.9  $\mathbf{2}$ 0 14.3 1 14.5ī 14.8 15.1b 15.4B 15.8 16.0 16.3 16.6

16.9

#### TABLE K.

#### (Level)-5 Feet Arch Culverts-

This is a Table of quantities in Five Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremi!ies of wings at lower end, to 5 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot ru	n of Culve	rt	lasonry,	292 (	eub. yds.	Paving,	0.135	cub. yds.
Additional	for Lower	End	Do	35.02	"	Do	1.420	"
Additional	for Upper	End	Do	37.35	44	Po	.966	"
Do	do		Retainin	g wall		Do	1.800	"

138			1	1 2 3 8 1			
Ful Lev	Arel	Y.	rds.	Lev Lev g.	Arcl	.Y.	rds.
t of on e Su trin	h of	ONR c ya	NG.	e Sun	h of	ONB C ya	NG
eigh nati nbov of Pa	engt	(AS( Cubi	AVI Cubi	eigh abov of Pa	engt	LAS( Cubi	AVI
H	<u>й</u>	<u></u>	A	# - 4 0			A.
13 feet.	32	165.8	8.5	32 feet.	91	338.1	16.5
14	35	174.6	8.9	33	94	346.8	16.8
15	38	183.3	9.3	34	97	355.6	17.3
16	41	192.1	9.7	35	101	367.3	17.8
17	44	200.9	10.1	36	104	376.0	18.2
18	47	209.6	10.5	37	107	384.8	18.6
19	50	218.4	10.9	38	110	393.6	19.0
20	53	227.1	11.3	39	113	402.3	19.4
21	56	235.9	11.7	40	117	414.0	20.0
22	59	244.6	12.1	41	120	122 8	20.4
23	62	253.4	12.5	42	123	431.5	20.8
24	65	262.2	13.0	43	126	410.3	21.2
25	69	273.9	13.5	44	129	449.0	21.6
26	72	282.6	13.9	45	133	460.7	22.1
27	75	291.4	14.3	46	136	469.5	22.5
28	78	300.1	14.7	47	139	478.2	22.9
29	81	308.9	15.1	43	142	487.0	23.3
30	85	320.6	15.6	49	145	495.8	23.8
31	88	329.3	16.0	50	149	507.5	24.3

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#### lverts.

rding to G. The g. The own, the oe found wings at walls at

ub. yds.

Cubic yards. PAVING. 16.5 16.8 3 17.3 3 17.83 0 18.2β 18.6 6 19.0 B 19.420.0D B 20.4Б 20.8 B 21.2 21.6 b

> 22.1 22.5

#### 22.9 23.3

23.8

24.3

#### TABLE K.-Continued.

Thic is a Table of quantities in Five Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masenry is calculated to a depth of 3 fest under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings ai lower end, to 5 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of Culvert	Masonry,	2.92	cub. yds.	Paving,	0.135	cub. yds.
Additional for Lower I	End Do	35.02	"	Do	1.420	4
Additional for Upper E	Ind Do	37.35	"	Do	.966	46
Do du	Rotaining	Wall	1	Do	1.800	"

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Ileight of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
51feet.	152	516.2	24.7	66feet.	200	656.4	31.1
52	155	524.9	25.1	67	203	665.1	31.6
53	158	533.7	25.5	68	206	673.9	32.0
54	161	542.5	25.9	69	209	682.6	32.4
55	165	554.2	26.4	70	213	694.3	32.9
56	168	562.9	26.8	71	216	703.1	33.3
57	171	571.7	27.3	72	219	711.8	33.7
58	174	580.4	27.7	73	222	720.6	34.1
59	177	589.2	28.1	74	225	729.4	34.6
60	181	600.9	28.6	75	229	741.1	35.1
61	184	609.6	29.0	76	232	749.8	35.5
62	187	618.4	29.4	77	235	758.6	35.9
63	190	627.2	29.8	78	238	767.3	36.3
64	193	635.9	30.2	79	241	776.1	36.7
65	197	647.6	30.7	80	245	787.8	37.2

For approximate quantities in inclined Culverts, see special memoranda.

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#### TABLE L.

#### (Level)-6 Feet Arch Culverts.

This is a Table of quantities in six Feet Arch, Culverts, according to the accompanying Diagram and Dimensions given in Tuble G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 6 feet beyond the upper end, and includes retaining walls at foot of stopes.

Per foot run of Co	ulvert	Masonry,	3.68	cub. yds.	Paving,	0.194	cub. yds.
Additional for Lov	ver End	Do	44.57	<b>6</b> 6	Do	2.236	**
Additional for Upp	per End	Do	47.00	**	Do	1.555	44
Do	do 1	Retaining	wall .		Do	2.600	44

-							
Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mution Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
15 feet.	35	220.3	13.2	34 feet.	94	437.5	24.6
16	38	231.4	13.7	35	98	452.2	25.4
17	· 41	242.4	14.3	36	101	463.2	26.0
18	44	253.5	14.9	37	104	474.3	26.5
19	47	264.5	15.5	38	107	485.3	27.1
20	50	275.6	16.1	39	110	496.4	27.7
21	<b>5</b> 3	286.6	16.7	40	114	511.1	28.5
22	56	297.6	17.2	41	117	522.1	29.1
23	59	308.7	17.8	42	120	533.2	29.7
24	62	319.7	18.4	43	123	544.2	30.3
25	66	334.4	19.2	44	126 <sup>′</sup>	555.3	30.8
26	69	345.5	19.8	45	130	570.0	31.6
27	72	356.5	20.4	46	135	581.0	32.2
28	75	367.6	20.9	47	136	<b>592.0</b>	32.7
29	78	378.6	21.5	48	139	603.1	33.3
30	82	393.3	22.3	49	142	614.1	33.9
31	85	404.4	22.9	50	146	628.8	34.7
32	<b>8</b> 8	415.4	23.5	51	149	639.9	35.3
33	91	426.4	24.0	52	152	650.9	35.9

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Cubic yards. PAVING. 24.625.426.026.527.127.7

> 28.5 29.1 29.7 30.3 30.8 31.6 32.232.7

> > 33.3 33.**9** 34.7

35.3

35.9

#### TABLE L.-Continued.

This is a Table of quantities in Six Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 6 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of C	ulvert	Mas	onry,	3.68	eub. yds.	Paving,	0.194 ci	ab. yds.
Additional for Lov	ver End	1	Do 4	4.57	"	Do	2.236	"
Additional for Up	per End		Do 4	17.00	"	Do	1.555	66
Do	do	Reta	ining	wall .		Do	2.600	"

			_				
Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	If eight of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING.
53 feet.	155	662.0	36.5	67 feet	200	827.6	45.2
54	158	673.0	37.0	68	· 203	838.6	45.8
55	162	687.7	37.8	69	206	849.6	46.4
56	165	698.7	38.4	70	210	864.4	47.2
57	168	709.8	38.9	71	213	875.4	47.7
58	171	720.8	39.5	72	216	886.4	48.3
59	174	731.9	40.1	73	219	897.5	48.9
60	178	746 6	40.9	74	222	908.5	49.4
61	181	757.6	41.5	75	226	923.2	50.2
62	184	768.7	42.1	76	229	934.3	50,8
63	187	779.7	42.7	77	232	945.3	51.4
64	190	790.7	43.2	78	235	956.4	52.0
65	194	805.5	44.0	79	238	967.4	52,6
66	197	816.5	44.6	80	242	982.1	53.4

For approximate quantities in inclined Culverts, see special memoranda.

#### TABLE M.

#### (Level)-8 Feet Arch Culverts.

This is a Table of quantities in Eight Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremilies of wings at lower end, to 8 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot ru	n of	Culve	rt	Masonry,	5.18	cub. yds.	Paving,	0.301	cub. yds.
Additional	for	Lower	End	Do	67.95	"	Do	4.213	"
Additional	for	Upper	End	Do	75.00	**	Do	3.000	"
Do		do	••••••	Retaining	g wall.		Do	4.000	"

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
17 feet.	32	308.7	20.8	36 feet.	91	614.3	38.6
18	35	324.2	21.7	37	94	629.8	39.5
19	38	339,8	22.6	38	98	650.6	40.7
20	41	355.3	23.5	39	101	666.1	41.6
21	44	370.8	24.4	40	104	681.7	42.5
22	47	386.4	25.3	41	107	697.2	43.4
23	50	401.9	26.2	42	110	712.7	44.3
<b>24</b>	53	417.5	27.1	43	114	733.5	45.5
25	56	433.0	28.0	44	117	749.0	<b>46.4</b>
26	59	448.5	28.9	45	120	764.5	47.3
27	62	464.0	29.8	46	123	780.1	<b>48.2</b>
28	66	484.8	31.0	47	126	795.6	49.1
29	69	500.4	31.9	48	130	816.3	50.3
30	72	515.9	32.8	49	133	821.9	51.2
31	75	531.4	33.7	50	136	847.4	52.1
32	78	547.0	34.7	51	139	863.0	53.0
33	82	567.7	35.9	52	142	878.5	54.0
34	85	583.2	36.8	53	146	899.2	55.2
35	88	598.8	37.7	54	149	914.7	56.1

#### TABLE M.-Continued.

This is a Table of quantities in Eight Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Mosonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 8 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of	Culve	rt	lasonry,	5.18	cub. yds.	Paving,	0.301	cub. yds.
Additional for	Lower	End	Do	67,95	46	Do	4.213	44
Ad litional for	Upper	End	Do	75.09	"	Do	3.000	"
Do	do	l	Retainin	g Wal	1	Do	4.000	46

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
<b>55</b> feet.	152	930.3	57.0	68 feet.	194	1147.8	69.6
56	155	945.8	57.9	69	197	1163.4	70.5
57	158	961.4	58.8	70	200	1179.0	71.4
58	162	982.1	60.0	71	203	1194.5	72.3
59	165	997.6	60.9	72	206	1210.0	73.2
60	168	1013.2	61.8	73	210	1230.7	74.4
61	171	1028.7	62.7	74	213	1246.3	75.3
62	174	1044.2	63,6	75	216	1261.8	76.2
63	178	1065.0	64.8	76	219	1277.4	77.1
64	181	1080.5	65.7	77	222	1292.9	78.0
65	184	1096.1	66.6	78	226	1313.6	79.2
66	187	1111.6	67.5	79	229	1329.1	80.1
67	190	1127.1	68.4	80	232	1344.7	81.0

For approximate quantities in inclined Culverts, see special memoranda.

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cording ī. The The g. non, the e found vings at walls at

ub. yds. " "

Cubic yards. PAVING. 38.6 39.5 40.741.6 42.543.4 44.345.546.4 47.348.249.1 50.3 51.2

> 52.153.0 54.0 55.256.1

#### TABLE N.

#### (Level)-10 Feet Arch Culverts.

This is a Table of quantities in Ten Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Musonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 10 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per fost run o	f Culve	rt	lasonry,	6 82 c	ub. yds.	Paving,	0.120	cub. yds.
Additional for	Lower	· End	Du	96.31	+6	Do	7.000	••
Additional for	Upper	End	Do	102.60	46	Do	4.940	61
Do	do		letaining	g wall		Do	6.800	"

Height of For- ration Level abore Surface of Paving.	Length of Arch.	MASONKY. Cubic yards.	PAVING. Cubis yards.	Height of For- mution Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
19 feet.	32	417.1	32.2	38 feet.	91	819.5	57.0
20	35	437.6	33.4	39	94	840.0	58.2
21	38	458.1	34.7	40	98	867.3	59.9
22	41	478.5	36.0	41	101	887.7	61.2
23	44	499.0	37.2	42	104	908.2	62.4
24	47	519.4	38.5	43	107	928.6	63.7
25	50	539.9	39.7	44	110	949.1	64.9
26	53	560.4	41.0	45	114	976.4	66.6
27	56	580.8	42.2	46	117	996.8	67.9
28.	59	601.3	43.5	47	120	1017.3	69.1
29	62	621.7	44.8	48	123	1037.8	70.4
30	66	649.0	46.4	49	126	1058.2	71.7
31	69	669.5	47.7	50	130	1085.5	73.4
32	72	690.0	49.0	51	133	1106.0	74.6
33	· 75	710.4	50.2	52	136	1126.4	75.9
34	78	730.9	51.5	53	. 139	1146.9	77.1
35	82	758.1	53.2	54	142	1167.3	78.4
36	85	778.6	54.4	55	146	1194.6	80.0
37	88	799.1	55.7	56	149	1215.1	81.3

#### lverts.

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cub. yds. 66 44 66

PAVING. Cubic yards. 57.0

> 59.9 61.2 62.4 63.7 64.9

58.2

66.6 67.9 69.1 70.4 71.7 73.4 74.6

> 75.9 77.1 78.4 80.0 81.3

#### TABLE N. - Continued.

This is a Table of quantities in Ten Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 10 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run o.	f Culve	rt	asonry,	6.82 c	ub. yds.	Paving,	0.420	cub. yds.
Additional for	Lower	End	Do	96.31	++	Do	7.000	66
Additional for	Upper	End	Do	102.60	16	Do	4.940	**
Do	do	R	etaining	g wall		Do	6.800	66

Height of For- nation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	lleight of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
57 feet.	152	<b>1</b> 235.5	82.6	69	190	1494.7	98.5
58	155	1256.0	83.9	70	194	1522 0	100.2
59	158	1276.4	85.1	71	197	1542.4	101.5
60	162	1303.7	86.8	72	200	1562.9	102.7
61	165	1324.2	88.0	73	203	1583.4	104.0
62	168	1344.7	89.3	74	206	1603.8	105.3
63	171	1365.1	90.5	75	210	1631.1	106.9
64	174	1385.6	91.8	76	213	1651.6	108.2
65	178	1412.9	93.5	77	216	1672.0	109.5
66	181	1433.3	94.8	78	219	1692.5	1107
67	184	1453.8	96.0	79	222	1713.0	112.0
68	187	1474.2	97.3	80	226	1740.3	113.7

For approximate quantities in inclined Culverts, see special memoranda.

#### TABLE 0.

#### (Level)-12 Feet Arch Culverts.

This is a Table of quantities in Twelve Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found apposite. Paving is supposed to extend from the extremities of wings at lower end, to 12 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of	f Culve	rt	Masonry,	8.50	cub. yds.	Paving,	0.551	cub. yds
Additional for	Lower	End	Do	136 70	<b>66</b>	Do	10.470	66
Additional for	Upper	End	Do	147.18	64	Do	7.555	66
Do	do		Retaining	wall		Do	9,800	44

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards	Ileight of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
20 feet.	31	547.4	44.9	39 feet.	90	1048.9	77.4
21	34	572.9	46.5	40	93	1074.4	79.0
22	37	598.4	48.2	41	97	1108.4	81.3
23	40	623.9	49.8	42	100	1133.9	82.9
24	43	649.4	51.5	43	103	1159.4	84.5
25	46	674.9	52.2	44	106	1184.9	86.2
26	49	700.4	54.8	45	109	1210.4	88.9
27	52	725.9	56.5	46	113	1244.4	90.1
28	55	751.4	58.1	47	116	1269.9	91.7
29	58	776.9	59.8	48	, 119	1295.4	93.8
. 30	61	802.4	66.4	49	122	1320.9	95.0
31	65	836.4	63.6	50	125	1346.4	96.6
32	68	861.9	65.3	51	129	1380.4	88.9
33	71	887.4	66.9	52	132	1405.9	100.5
34	74	912.9	68.6	53	135	1431.4	101.2
35	77	938.4	70.2	54	138	1456.9	103.8
36	81	972.4	72.4	55	141	1482.4	105.5
37	84	997.9	74.1	56	145	1516.4	107.7
38	87	1023.4	75.9	57	148	1541.9	109.3

#### ch Culverts.

erts, according Puble G. The Paving. The Ing known, the will be found es of wings at ining walls at

0.551	cub. yds.
10.470	44
7.555	66

PAVING.

77.4 79.0

81.3 82.9

84.5

86.2

88.9

90.1 91.7

93.8

95.0

96.6

88.9

100.5 101.2

103.8 105.5

107.7

109.3

9,800

Cubie yards.

048.9

074.4108.4

133.9

159.4

184.9210.4

244.4

269.9

295.4320.9

346.4

380.4

405.9

431.4 456.9

482.4

516.4 541.9

#### TABLE O.-Continued.

This is a Table of quantities in Fwelve Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Tuble G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 12 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of	Culve	rt	Masonry,	8.50	cub. yds.	Paving,	0.551	cub. vds.
Additional for	Lower	End	Do	136.70		Do	10,470	
Ad litional for	Upper	End	Do	147.18	"	Do	7.555	66
Do	do		Retainin	g Wall.		Do 1	0.800	66

-							
Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Ileight of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
58 feet.	151	1567.4	111.0	70	189	1890.4	132.0
59	154	1592.9	112.7	71	193	1924.4	134.2
60	157	1618.4	114.3	72	196	1949.9	135.8
61	161	1652.4	116.5	73	199	1975.4	137.5
62	164	1677.9	118.2	74	202	2000.9	138.2
63	167	1703.4	119.8	. 75	205	2026.4	140.8
64	170	1728.9	121.5	76	209	2060.4	143.0
65	173	1754.4	123.1	77	212	2085.9	144.6
66	177	1788.4	125.3	78	215	2111.4	146.3
67	180	1813.9	127.0	79	218	2136.9	147.9
68	183	1839.4	128.6	80	221	2162.4	149.6
69	186	1864.9	130.3			-	

For approximate quantities in inclined Culverts, see special memoranda.

#### TABLE P.

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#### (Level)-14 Feet Arch Culverts.

This is a Table of quantities in Fourteen Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 14 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run o	f Culver	rt	M	asonry,	9.74	enb. yds.	Paving,	0.70	cub. yds.
Additional for	Lower J	Ind		Do	168.41	44	Do	14.93	61
Additional for	Upper 1	and		Do	188.46	64	Do	10.88	66
Do	do		R	etaining	wall		Do	13.40	"

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
21 feet.	27	619.8	58.1	40 feet.	86	1194.5	99.4
22	30	649.1	60.2	41	89	1223.7	101.5
23	33	678.3	62.3	42	93	1262.7	104.3
24	36	707.5	64.4	43	96	1291.9	106.4
25	39	736.7	66.5	44	99	1321.1	108.5
26	<b>4</b> 2	765.9	68.6	45	102	1350.3	110.6
27	45	795.2	70.7	46	105	1379.6	112.7
28	48	824.4	72.8	47	109	1418.5	115.5
29	51	853.6	74.9	48	112	1447.7	117.6
30	54	882.8	77.0	49	115	1477.0	119.7
31	57	912.0	79.1	50	118	1506.2	121.8
32	61	951.0	81.9	51	121	1535.5	123.9
33	64	980.2	84.0	52	125	1574.4	126.7
34	67	1009.4	86.1	53	128	1603.6	128.8
35	70	1038.6	88.2	54	131	1632.8	130.9
36	73	1067.9	90.3	55	. 134	1662.0	133.0
37	77	1106.8	93.1	56	137	1691.2	135.1
38	80	1136.1	95.2	57	141	1730.2	137.9
39	83	1165.3	97.3	58	144	1759.4	140.0

#### lverts.

cording 7. The wn, the e found ings at walls at

ub. yds.

PAVING. Cubic yards.

99.4
101.5
104.3
106.4
108.5
110.6
112.7
115.5
117.6
119.7
121.8

#### TABLE P.-Continued.

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This is a Table of quantities in Fourteen Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the w' le structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 14 feet beyond the upper end, and includes retaining walls at foot of stopes.

Per foot run o:	f Culvert	 fasonry,	9.74	cub. yds.	Paving,	0.70 c	ub. yds.
Additional for	Lower End	 Do	168.41	66	Do	14.93	66
Additional for	Upper Ead	 Do	188,46	66	Do	10.88	66
Do	do	 letaining	wall		Do	13.40	66

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	lleight of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
59 feet.	147	1788.6	142.1	70 feet.	182	2129.5	166.6
60	150	1817.8	144.2	71	185	2158.8	168.7
61	153	1847.1	146.3	72	189	-197.7	171.5
62	157	1886.1	149.1	73	192	26.9	173.6
63	160	1915.3	151.2	74	195	$2256\ 2$	175.7
64	163	1944.5	153.3	75	198	2285,4	177.8
65	166	1973.7	155.4	76	201	2314.6	179.9
66	169	2002.9	157-5	77	205	2353.6	182.7
67	173	2041.9	160.3	78	208	2382.8	184.8
68	176	2071.1	162.4	79	211	2412.0	186.9
69	179	2100.3	164.5	80	214	2441.2	189.0

For approximate quantities in inclined Culverts, see special memoranda.

123.9 126.7 128.8 130.9 133.0 135.1 137.9

#### TABLE Q.

#### (Level)-16 Feet Arch Culverts.

This is a Table of quantities in Sixteen Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Musonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Musonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 16 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of	f Culve	rt	Masonry,	11.63	cub. yds.	Paving,	0.850	cub. yds.
Additional for	Lower	End	Do	204.00	66	Do	20.400	"
Ad litional for	Upper	End	Do	249.50	"	Do	15.000	"
Do	do		Retainin	g wall		Do	18.760	"

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
22 feet.	24	732.6	74.5	41 feet.	83	1418.8	124.6
23	27	767.5	77.0	42	86	1453.7	127.2
<b>24</b>	30	802.4	79.6	43	90	1500.2	130.6
25	33	837.3	82.1	44	93	1535.1	133.1
26	36	872.2	84.7	45	96	1570.0	135.7
27	39	907.1	87.3	46	99	1604.9	138.3
<b>2</b> 8	42	942.0	89.8	47	102	1639.8	140.8
29	45	976.9	92.4	48	106	1686.3	]44.2
30	48	1011.8	94.9	49	109	1721.2	146.7
31	51	1046.7	97.4	50	112	1756.1	149.3
32	54	1081.5	100.0	51	<u>15</u>	1791.0	151.8
33	58	1128.0	103.4	52	118	1825.9	154.4
34	61	1162.9	106.9	53	122	1872.4	157.8
35	64	1197.8	108.5	54	125	1907.3	100.4
36	67	1232.7	111.0	55	128	1942.2	162.9
37	70	1267.6	113.6	56	131	1977.1	165.5
38	74	1214.1	117.0	57	134	2012.0	168.0
39	77	1349.0	119.6	58	138	2058.5	171.4
40	80	1383.9	122.1	59	141	2093.4	174.0

#### verts.

ording The The vn, the found ngs at valls at

ub. yds. "

PAVING. Cubic yards.

<u>م</u> 124.6

127.2

. . .

130.6

133.1135.7

138.3140.8

144.2

146.7

149.3151.8

154.4

157.8

100.4

162.9

165.5

168.0

171.4

174.0

#### TABLE Q.-Continued.

This is a Table of quantities in Sixteen Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 16 feet beyond the upper end, and inclusive retaining walls at foot of slopes.

Per foot run of Culvert Masonry Additional for Lower End Do Additional for Upper End Do Do do	, 11.63 cub. yds. 204 00 " 249.50 " g wall	Paving, 0.83 Do 20.40 Do 15.00	60 cub. yds. 0 ''
--	---	--------------------------------------	----------------------

- e e	I d	1		1			
Height of Fo mation Lev above Surfa of Paving.	Length of Arc	MASONRY. Cubic yards.	PAVING. Cubiz yards.	Height of For mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
60	144	2128.3	176.5	71	179	2535.3	206.3
61	147	2163.2	179.1	72	182	2570.2	208.8
62	150	2198.1	181.6	73	186	2616.7	212 2
63	154	2244.6	185.0	74	189	2651.6	214.8
64	157	2279.5	187.6	75	192	2686.5	217.3
65	160	2314.4	190.1	76	195	2721.4	219.9
66	163	2349.3	192.6	77	198	2756.3	222.4
67	166	2384.2	195.2	78	202	2802.8	225.8
68	170	2430.7	198.6	79	205	2837.7	228.4
69	173	2465.5	201.2	80	208	2872.6	230.9
70	176	2500.4	203.7			1	-00.0

For approximate quantities in inclined Culverts, see special memoran la.

#### TABLE R.

#### (Level)-18 Feet Arch Culverts.

This is a Table of quantities in Eighteen Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremilies of wings at lower end, to 18 feet beyond the upper ent, and includes retaining walls at foot of slopes.

Per foot run o	f Culve	rt	Masonry,	14.18	cub. yds.	Paving	, 1.00	cub. yds.
Additional for	Lower	End	Do	251.13	"	Do	26.50	"
Additional for	Upper	End	Do	312.84	"	Do	20.00	"
Do	do		Retaining	g wall		Do	23 30	"

Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
23 feet.	20	847.6	90.3	42 feet.	79	1684.2	149.3
24	23	890.1	93.3	43	82	1726.7	152.3
25	26	932.6	96.3	44	86	1783.4	156.3
26	29	975.2	99.3	45	89	1826.0	159.3
27	32	1017.7	102.3	46	92	1868.5	162.3
28	35	1060.3	105.3	47	95	1911. <b>1</b>	165.3
29	38	1102.8	108.3	48	98	1953.6	168.3
30	41	1145.3	111.3	49	102	2010.3	172.3
31	-44	1187.9	114.3	50	105	2052.9	175.3
32	47	1230.4	117.3	51	108	2095.4	178.3
33	50	1272.9	120.3	52	111	2137.9	181.3
34	54	1329.7	124.3	53	114	2180.5	184.3
35	57	1372.2	127.3	54	118	2237.2	188.3
36	60	1414.7	130.3	55	121	2279.7	191.3
37	63	1457.3	133.3	56	124	2322.3	194.3
38	66	1499.8	136.3	57	127	2364.8	197.3
39	70	1556.6	140.3	58	130	2407.4	200.3
40	73	1599.1	143.3	59	134	2464.1	204.3
41	76	1641.6	146.3	60	137	2506.6	207.3

#### lverts.

ccording G. The g. The own, the be found vings at walls at

ub. yds.

PAVING. \_\_\_\_\_\_Cubic yards. 149.3 152.3156.3 159.3162.3165.3168.3172.3175.3178.3181.3 184.3188.3191.3 194.3 197.3 200.3 204.3

207.3

#### TABLE R.-Continued.

This is a Table of quantities in Eighteen Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Massnry is calculated to a depth of 3 feet under surface of Paving The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Paving is supposed to extend from the extremities of wings at lower end, to 18 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run c Additional for Additional for Do	of Culve Lower Upper do	ertN End EndF	lasonry Do Do Retainin	, 14.18 251,13 312.84 g wall	eub. yds. "	Paving Do Do Do	, 1.00 26.50 20.00 23.80	cub. yds	

1 9 9	1 4	1	1	11 1 - 0			
Height of Fo mation Lev above Surfa of Paving.	Length of Arc	MASONRY. Cubic yards.	PAVING. - Cubie 3 ards.	Height of For mation Leve above Surface of Paving.	Length of Arch	MASONRY. Cubie yards.	PAVING. Cubic yards.
61 feet.	140	2549.1	210.3	71	172	3002.9	242.3
62	143	2591.7	213.3	72	175	3045.5	245.3
63	146	2634.2	216.3	73	178	3088.0	248.3
64	150	2691.0	220.3	. 74	182	3144.7	252.3
65	153	2733.5	223.3	75	185	3187.3	255.3
66	156	2776.0	226.3	76	188	3229.8	258.3
67	159	2818.6	229.3	77	190	3272.3	261.3
68	162	2861.1	232.3	78	194	3314.9	264.3
69	166	2917.8	236.3	79	198	3371.6	268.3
70	169	2960.4	239.3	80	201	3414.1	271.3

For approximate quantities in inclined Culverts, see special memoranda.

#### TABLE S.

#### (Level)--20 Feet Arch Culverts.

- This is a Table of quantities in Twenty Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found apposite. Paving is supposed to extend from the extremities of wings at lower end, to 20 feet beyond the upper end, and includes retaining walls at foot of slopes.

Per foot run of	f Culve	rt	Masonry,	17.48	cub. yds.	Paving,	1.200	cub. yds.
Additional for	Lower	End	Do	292.50	*4	Do	33.570	
Ad fitional for	Upper	End	Do	397.81	66	Do	26.000	66
Do	do		Retainin	g wall .		Do	29.600	"

Height of For- mation Level above Surfact of Paving-	Length of Arch	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.
$25{ m feet}.$	20	1039 9	113.2	-1-1 feet.	79	2071.2	184.0
26	23	1092.3	116.8	45	83	2141.1	188.8
27	26	1144.8	120.4	-46	86	2193.6	192.4
28	29	1197.2	124.0	47	89	2246.0	196.0
29	32	1249.7	127.6	48	92	2298.4	199.6
30	35	1302.1	131.2	49	95	2350.9	203.2
31	38	1354.5	134.8	50	99	2420.8	208.0
32	41	1407.0	138.4	51	102	2473.3	211.6
33	-1-1	1459.4	142.0	52	105	2525.7	215.2
34	-47	1511.9	145.6	53	108	2578.1	218.8
35	51	1581.8	150.4	54	111	2630.6	222.4
36	54	1634.2	154.0	55	115	2700.5	227.2
37	57	1686.6	157.6	56	118	2753.0	230.8
38	60	1739.1	161.2	57	121	2805.4	234.4
39	63	1791.5	164.8	58	124	2857.8	238.0
40	67	1861.4	1696	59	127	2910.2	241.6
41	70	1913.9	173.2	60	131	2980.2	246.4
42	73	1966.3	176.8	61	134	8032.6	250.0
43	76	2018.8	180.4	62	137	3085,1	25?.6

#### alverts.

ccording G. The ag. The own, the be found wings at walls at

) cub. yds. ) " 0 "

Cubic yards. PAVING. 184.0188.8192.4196.0 199.6203.2208.0 211.6 215.2218.8222.4227.2230.8 ) 234.4

3

2

2

6

1

238.0

241.6

246.4

250.0

25?.6

#### TABLE S.-Continued.

This is a Table of quantities in Twenty Feet Arch Culverts, according to the accompanying Diagram and Dimensions given in Table G. The Masonry is calculated to a depth of 3 feet under surface of Paving. The height of formation level above surface on centre line being known, the quantities of Masonry and Paving in the whole structure will be found opposite. Faving is supposed to extend from the extremities of wings at lower end, to 20 feet beyond the upper end, and includes relaining walls at foot of slopes.

Per fost run of Culvert											
Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.	Height of For- mation Level above Surface of Paving.	Length of Arch.	MASONRY. Cubic yards.	PAVING. Cubic yards.				
63 feet	. 140	3137.5	257.2	72 feet.	169	3644.4	292.0				
64	143	3189.9	260.8	73	172	3696.9	295.6				
65	1.47	3259.9	265.6	7.1	175	3749.3	299.2				
66	150	3312.3	269.2	75	179	3819.2	301.0				
67	153	3364.7	272.8	76	182	3871 7	207 G				
68	156	3417.2	276.4	77	185	3994 1	211.0				
69	159	3469.6	280.0	78	188	3076 5	214.0				
70	163	3539.5	284.8	79	191	1020 0	014.8				
71	166	3592.0	288.4	80	195	1098.0	318.4 909 0				
**			and the second se			1000.0	0				

For approximate quantities in inclined Culverts, see special memoranda.





#### TABLE T.

#### EXPLANATIONS AND REFERENCES.

This is a Table of Quantities in the several kinds of open structures which will require to be employed when the embankments are not sufficiently high to admit Arch Culverts. The first column at the left hand is for the height of formation level above the surface of paving in the middle of the stream.

COLUMNS No. 1, give the quantities in small Beam Culverts according to SHEET No. 4, GENERAL LITHOGRAPHED DRAWINGS.

COLUMNS NO. 2 give the quantities in large Beam Culverts according to SHEET NO. 11, GENERAL LITHOGRAPHED DRAWINGS, from 5 to 14 feet high, above which height this design will not be employed.

COLUMNS NO. 3 give the quantities in Beam Bridges of 20 feet clear span according to SHEET NO. 11, GENERAL LITHOGRAPHED DRAWINGS, in which this structure is designated "24 feet Beam Bridge." The quantities of Paving are calculated to a span of 20 feet. In calculating the quantities of Masonry for these Bridges, the walls are increased in thickness according to the height, as shown in the accompanying diagram. The quantities in this structure are given up to a height of 21 feet; but the structure next described becomes more economical, as will be seen, at a lower elevation, and is preferred.

COLUMNS No. 4 give the quantities in Bridges of 20 feet span according to the special drawing accompanying this Table, and for heights of from 16 to 25 feet. Retaining walls extending from each angle of the abutments, as shewn in the diagram, are included in the quantities of paving.

\*a. In small Beam Culverts the Paving is assumed to extend 5 feet beyond the end of the abutments, and the Pitching of the bottoms of the slopes is taken to extend as follows, for each height of Bank, viz :—for 2 feet Bank, 3 feet,—for 3 feet Bank, 4.5 feet,—for 4 feet Bank, 6 feet,—and for 5 feet Bank, 7.5 feet.

\*b. In large Beam Culverts the Paving is assumed to extend 5 feet beyond the ends of the wing walls, and the retaining walls 9 feet beyond the same points. The quantities given in the Table are calculated according to the Drawing, (Sheet No. 11), and should any variation in the span be made, allowance must be made therefor in the amount of paving at the following rates :—for Culverts in 5 feet Bank, 0.94 c. yds. per foot of span,—in 6 feet Bank, 1.05 per foot of span,—in 7 feet Bank, 1.20 per foot,—in 8 feet Bank, 1.36 per foot,—in 9 feet Bank, 1.52 per foot,—in 10 feet Bank, 1,68 per foot,—in 11 feet Bank, 1.83 per foot,—in 12 feet Bank, 2.00 per foot,—in 13 feet Bank, 2.19 per foot,—and in 14 feet Bank, 3.42 per foot,

\*c. In Beam Bridges the Paving is calculated as extending 10 feet outside of the opening, and the Pitching is assumed to be of the following lengths, according to the heights of the embankments, viz :—for 5 feet. 11 feet,—for 6 feet, 13 feet, for 7 feet, 15 feet,—for 8 feet, 17 feet,—for 9 feet, 19 feet,—10 feet, 21 feet,—for 11 feet 23 feet,—for 12 feet, 25 feet,—for 13 feet 26 feet,—for 14 feet, 28 ieet,—for 15 feet, 30 feet,—for 16 feet, 32 feet,—for 17 feet, 34 feet,—for 18 feet, 35 feet,—for 19 feet, 36 feet, for 20 feet, 38 feet,—and 21 feet, 40 feet. Allowance must be made in the quantities of paving, in the event of any variation in the span at the rate of 2.46 cubie yards per foot of span.

\*d. In Beam Bridges, according to the Diagram attached to this Table, the paving is assumed to extend 10 feet outside the opening and retaining walls were calculated as extending from 25 feet for the 16 feet Bank to 31 feet 9 inches for the 25 feet Bank, increasing uniformly in length by 9 inches for each foot in height of Bank. Allowance must be made in the quantities of paving at the rate of 2.46 "ubic yards for each foot of span, in the event of larger or smaller openings being deemed advisable. n structures e not suffie left hand ving in the

erts accords.

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of 20 feet tographed m Bridge." et. In calwalls are the accomen up to a nore econoed.

0 feet span le, and for from each uded in the

feet beyond es is taken to et,—for 3 feet

eet outside of ths, according eet, 13 feet, feet,—for 11 8 feet,—for 15 35 feet,—for ance must be te span at the

his Table, the ng walls were t 9 inches for foot in height he rate of 2.46 penings being

17 90 1 190 1

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tion	SHEET	No. 4.	SHEET	' No. 11,	(General	Plans.	DIA	RAM
Forma	(General Small Be ver	Plans.) eam Cul- ts.	Large Be ver	am Cul- ts.	Beam	Bridge.	Beam Bridge	
t of abc		1 # 1		1 #1	1 str.,		1 41 1	
Heigh Level o	Masonry.	Paving.	Masonry.	Paving and Re-	Masonry	Paving and Re-	Masonry	Paving and Re-
Feet.	Cub. yds.	Cu. yds.	Cub. yds.	Walls.	Cu. yds.	Walls.	Cu. yds.	Walls.
		1	\$	8		3		1 £
2	27.4	6.5	lass .		lass y.			
3	33.1	7.0	nd C		ad C			
4	39.0	7.5	Secor		Secor			
5	44.9	8.1	57.2	21.9	59.5	57.8		
6			72.0	22.7	68.2	60.9		
7	lass y.		87.8	24.1	79.3	64.0	bury.	
8	nd C		104.6	25.3	92.8	67.1	Masc	
9	Seco		122.4	26.5	108.8	70.2	lass	
10			141.2	27.7	127.4	73.3	cond C	
11			161.1	28.8	148.7	76.4	Se.	
12			182.1	30.0	173.6	79.5		
13			204.2	30.8	200.7	81.1		
14	••••		227.4	31.8	230.9	84.2		
15	•••••				264.4	87.3		
16	Overtities	of Maga		···;···	301.4	90.4	319.6	102.5
17	ond to the	or maso	nry given	under	342.1	93.5	354.6	103.8
18	this Table		the dark	lines in	386.6	95.1	391.4	105.1
19			st Class M	asonry.	435.4	96.6	429.9	106.4
20					488.2	99.7	470.3	107.8
21			••••		545.4	102.8	512.4	109.1
22							556.4	110.5
23			•••••		•••••		602.0	111.8
24							649.5	113.2
25				•••••			698.9	114.5

TABLE T.







in hilles

ELEVATION.

## **INTERCOLONIAL RAILWAY**

#### DIAGRAM

of Abutment for Beam Bridges referred to in Table T Column Nº 4.

The length of Abutment AB is in all cases equal to the height of formation above During at C.D.

W.I. Forrest del.



#### DIAGRAM

Being Details of Beam Bridges of gree General Plan Sheet Nº11 The correspond in Columns Nº3 of the accompanying tab





#### DIAGRAM

Beam Bridges of greater height than shown on wt Nº11 The corresponding quantities will be found of the accompanying table (T)



HALF PLAN OF ABUTMENT.

PLAN OF ABOTMEN

