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TABLES AND DIAGRAMS

FOR FACILITATING THE MAKING OF

ESTIMATES FOR SEWERAGE WORK

By S. M. SWAAB, C.E.

NEW YORK: THE ENGINEERING NEWS PUBLISHING COMPANY. 1902.



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GENERAL

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TABLES AND DIAGRAMS FOR FACILITATING THE COMPUTATION OF ESTIMATES FOR SEWERAGE WORK.

By S. M. SWAAB, Civil Engineer, Philadelphia, Pa.

The object of the accompanying tables and diagrams, as the title suggests, is to facilitate the computation of estimates for sewerage work. The figures represent in the case of masonry the gross amount of brick and mortar and stone and mortar which comprise the brick masonry and stone masonry indicated by the tables.

The quantity of mortar in brick masonry amounts to about 25 to 30% of the total bulk, and the quantity of mortar in stone masonry amounts to about 32 to 35%. Five hundred bricks, more or less, of standard size are required to lay a cubic yard of brick masonry where the joints are from $\frac{1}{4}$ to $\frac{3}{5}$ -in. thick. About 2% should be allowed for breakage and cutting. The quantities of excavation indicated by the diagrams are the minimum quantities which will allow the trench to be as wide from top to bottom as the greatest external width of the "cradle." The quantities of excavation for sewers not in "masonry cradle" refer to a trench equal in width at the top to the greatest external width of the sewer, and at the bottom to conform to the shape of the section.

Allowance has been made in all the diagrams so that the quantities indicated thereon represent the total amount of excavation to the "outside bottom" of the sewer; but as the figures representing the depth of the sewer below grade are invariably given on the "inside bottom" of the



sewer, the depth, in these diagrams, for convenience, is also given to the "inside bottom."

Method of Using the Diagrams.

The internal dimensions in feet and inches of the egg shape and circular sewers will be found on the left of the diagrams in every case. Run over this line toward the right until the curve is found representing the depth to the inside bottom of the sewer below the surface; then follow down the vertical line which intersects the curve at this point to the bottom of the diagram, on which may be read off at once the quantity of excavation.

All the quantities given in the tables and diagrams are in cubic yards and decimais of a cubic yard per linear foot of sewer. The quantities given in the tables have merely to be multiplied by the length of the sewer to find the total amount of brick or stone masonry, excavation, etc., in any given piece of work.

The following examples will illustrate the method of using the tables and diagrams:

Example 1.—Given a 3-ft. diameter circular sewer in "fuli cradle," 1,000 ft. long, 12 ft. deep to inside bottom: From Plate I.:

Quantity of brickwork $= -0.292$ cu.yds. per lin.ft. 1,000
Total " " 292 cu. yds. per 1,000 ft.
From Piate I.: Quantity of masonry $= -0.48$ cu.yds. per lin.ft. $1,000$
Total " " 480 cu. yds. per 1,000 ft.
From Plate VII.: Quantity of excavation = -3.54 cu.yds. per lin.ft. 1,000
Total " " 3,540 cu. yds. per 1,000 ft.
Example 2Given an 8-ft. diameter circular sewer in "partial cradie" 1,000 ft. long, 18 ft. deep to inside bot- tom:



From Plate II.:	From Plate IV.:
Quantity of brickwork = -1.14 cu.yds. per lin.ft.	Quantity of masonry $= -0.50$ cu.yds. per lin.ft.
1,000	1,000
Total " " 1,140 cu. yds. per 1,000 ft.	Total " 500 cu. yds. per 1,000 ft.
From Plate II.:	From Plate XVI.:
Quantity of masonry $= -1.414$ cu.yds. per lin.ft.	Quantity of excavation = -2.58 cu.yds. per lin.ft.
1,000	1,000
Total " " 1,414 cu. yds. per 1,000 ft.	Total " 2,580 cu. yds. per 1,000 ft.
From Plate XII.:	Example 4.—Given a 4-ft. 6-in. diameter circular sewer,
Quantity of excavation $= -9.4$ cu.yds. per lin.ft.	9-in. brickwork (double ring of brick all around), 1,000
1,000	ft. long, 9 ft. 6 ins. deep to inside bottom.
Total " 9,400 cu. yds. per 1,000 ft.	From Plate I.:
Example 3.—Given a 2-ft. 2-in. × 3-ft. 3-in. egg-shape	Quantity of brickwork = -0.458 cu.yds. per lin.ft.
sewer in "full cradle," 1,000 ft. long, 10 ft. deep to in-	1,000
side bottom:	Total " " 458 cu. yds. per 1,000 ft.
From Plate IV.: Quantity of brickwork = -0.25 cu.yds. per lin.ft. 1,000	From Plate VI.: Quantity of excavation $= -2.15$ cu.yds. per lin.ft. 1,000
Total " " 250 cu. yds. per 1,000 ft.	Total " 2,150 cu. yds. per 1,000 ft.

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For quantity of excavation in rock, where the arch, haunch and counterarch are used without masonry cradle, read the quantity of excavation for the given size and depth from the diagram showing the quantity of excavation for circular sewer in partial cradle in cubic yards; next find the quantity of masonry required for the sewer in partial cradle in cubic yards; subtract the latter from the former, and the result is the total amount of rock excavation.

Example 5.-Given a 10-ft. diameter sewer in "rock excavation" 17 ft. to inside bottom.

An infinite number of combinations of the various tables and diagrams will suggest themselves as occasion demands. The tables and diagrams are applicable to all combinations where the general "dimensions and design" of the sewer sections compare favorably with the dimensions of the sections on which these tables were based, as shown by the headings of the different tables.





Plate I.

	Circular Sewers								
Si	Ar Masonry Arch, Haune and Frounderech		the Masoury (Credie Ass thick counterate counterate by Masoury (al Credie has thick has thick treate		Brich Masonry				
Brich		Bria Pinchu Africh	Full Full 9min	Pari Pari	Asinch Brick 9 inch Brich ring all around around				
Ft.	11.	Quan	tity in cubi	c yards p	or. linear	foot			
2	0	0. 227	0.3		0.103	0.24			
	3	. 235	.33		.114	. 261			
	6	. 244	. 35		.125	. 284			
1	9	. 270	. 43		.136	. 3			
3.	0	. 292	. 48		.147	. 327			
	3	.320	. 54	12.915 (1933)	./58	. 35			
	6	. 348	.59		.169	· 37			
	9	.360	. 65		.18	. 39			
4	0	.38	.7		./9	.41			
	3	.40	. 74		.20	.436			
103	6	.42	. 78		.21	.458			
	9	.45	. 85		. 223	.48			
. 5.	0	.49	. 90	0.74	0.234	0.50			
-	3	.54	0.96	0.80					
	6	.57	1.03	0.87					
	9	0.60	1.07	0.93					

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1 2.5

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	Circular	Sewers	
Size	Brick Masonry 13 in Arch, Hound and 9 inch counterarch	RubbeMosong In Full Crock I Linches thick under counteract of centre	Rubble Mosomy In Portigl Crade 12 inches thick under counterverth of centre
Ft. 1n.	Quantityincu	ibic yords pr	linear foot.
6_0	0.885	1.33	1.0
3	0.9	1.40	1.06
9	0.927	1.48	1.1
6	0.975	1.53	1.16
7 0	1:0	1.57	1.2
3	1.04	1.60	1.29
9	1.06	1.68	1.33
6	11	1.78	1:375
8 0	1.14	1.84	1.4/4
3	1175	1.93	1.47
9	121	2.0	1.52
6	1.25	2.1	1.58
0 6	1.28	2.2	1.63
3	1:32	2.27	17
9	1.35	2:35	1.77
6	1.39	243	1.84
10.01	1.43	2.51	1.90
3	1.46	2.63	2.0
9	1.50	2.72	210
6	1.53	2:86	2.20
0 11	1.57	3.0.	2:33
8	1.60	3.1	2.40
9	1.63	3.2	2.50
6	1.675	3.35	2.60
12.0	1.70	· 3.45	2.66

Plate II.



Circular Sewers							
Size	9	Brick Masonry 18 in Arch, Haunch and 9 inch counterarch	Rubble Masonry 12 inchesthick under counterarch at centre InFullCradle In Partial Cradle				
Ft.	In.	Quantity in Co	ubic yards pr.	linear foot.			
12	.0	1.75	3.45	2.66			
	3	1.82	3.50	2.72			
	6	1.9	3.58	2.76			
	9	2.0	3.70	2.84			
13		2.1	3.75	2.91			
Carlos and	3	2.12	3.85	2.97			
	6	2.25	3.90	3.06			
	9	2,31	3.95	3.14			
14	0	2.40	4.22	3.23			
1.280.00	3	2.50	4.4	3.36			
12 Cartan	6	2.60	4.6	3.5			
	9	2.65	4.75	3.70			
15	0	2.75	503	3.90			



Egg Shape Sewers (SECTION)							
Size	BrickMosony 9in Arch,Hound 8 4 1/2 in- countergrah	Rubble Fur Masonry 9in. thick under counterarch at centre.	Brich Masonry single ring of Deuble ning 4/2 in thick 9 in thic				
and a set	Quantity	in cubic yo	ords pr. lii	near foot.			
1'6" x 2'3"	0.Z	0.35	0.099	0.231			
1'8' 2'6"	0. Z/4	0.37	0.108	0.249			
110" 2'9"	0.225	0.42	0.117	0.267			
2'0' 3'0'	0.237	0.44	0:126	0.286			
2'2" 3'3"	0.25	0.30	0.136	0.304			
2'4" 3'6"	0.266	0.56	0.144	0.321			
2'6' 3'9'	0.28	0.59	0.155	0.34			
2'8" 4'0"	0.288	0.63	0./63	0.359			
210 43	0.31	0.7/	0.172	0.376			
3'0' 4'6'	0.32	0.81	0./8/	0.39			
3'2" 4'9"	0.335	0.875	0.190	0.41			
3'4" x 5'0"	0.352	0.981	0.20	0.432			





Plate V.



Plate VI.





Plate VII.

Table showing Quantity of Excavation in cubi	cyds.
pr.linear foot of Circular Sewer In Full Cradle.	

	0	4			- 6	man in	Geet	
Etin.	10'	11'	12	13	14	15	16	
20	2.3	2.53	2.7/	2.92	3.13	3.34	3.54	
2	2.43	2.65	2.76	3,13	3.27	3.5	3.72	
26	2.56	2.78	3.0/	3.35	3.5	3.71	3.94	5
29	2.8	3.06	13:25.	3.5	375	4'0	4.28	210
30	3.0	3.28	3.54	3.8	4.07	4.36	462	12
3	3.17	13.5	375	4.12	14.38	4.62	49	1610
36	3.42	3.73	40-	-4.37	4.9	4.97	5.3	0
39	3.6		-4.23			5.2	5.52	1.5
40	3.78	4.12	4.46	4.8	5.13	547	5.82	tit
4	3:85	4.18	4.50	4.85	5.2	5.53	5.9	un
46	3.89	4.24	4.59	4.9	5.3	5.67	6.0	0
49	3.96	4.32	4.68	5.0	5.4	5.76	6.11	



Plate VIII.












Plate XI.





Plate XII.





Plate XIII.





Plate XIV.





Plate XV.







Plate XVI.

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