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By F. R. Chailquist

In 1921 the Minnesota legislature, under the provisions of chapter 274, provided that when any municipality or political subdivision "shall determine that any public work or construction is necessary to be done either by contract or by day labor, or otherwise, an estimate of cost thereof shall be made." This law also provides that accurate accounts shall be kept for each project and "that such account shall show in accurate tabulated form under appropriate headings the total of all classes, kinds and descriptions of work performed and of all material entering into such public work or construction . . . including the cost of all materials, supplies and services furnished or paid for by said municipality and the cost of all labor when said work or construction is done by day labor; and when said work or construction is done by contract, the price paid to the contractor for each class, kind or description of work performed and materials furnished; and in all cases the cost of all overhead, the cost of engineering, and of all other expense involved in the total cost of such public work or construction, which total shall be tabulated and distinctly shown."

It is apparent from the foregoing excerpts from the law that its requirements can be met only by the establishment of a rather detailed cost-accounting system. The law, however, failed to provide any penalty for non-compliance with its provisions; consequently it was not surprising to find the various municipalities slow or altogether neglectful in taking steps toward adoption of an adequate accounting scheme.

Beginning with the year 1925, the board of county commissioners of Hennepin County by resolution committed themselves to the adoption of a cost-accounting procedure for work on roads and bridges which would meet the legal provisions. The system installed at that time has been in continuous operation since, and is believed to be one of the first cost-accounting systems in the United States for work on county roads and bridges, if not the first. Cost accounting for municipal work at that time was something unheard of and so radical a change from the customary procedure that it was only natural it should meet with a certain amount of opposition, or at least passive resistance to its require-

ments. The necessity of reporting, accounting and being held responsible for materials, equipment and time, and of having these items, together with overhead, segregated and compiled into unit costs which reflected the efficiency or inefficiency of the individual and the organization as a whole represented a procedure heretofore never dreamed of and not to be countenanced in municipal affairs. This opposition has now to a great extent disappeared, and it is possible to get the information which must be forthcoming in all cost work.

The advocates and supporters of the plan realize that they have not traveled far in cost work when the yardstick of the better managed private enterprise is applied to their efforts, but it is believed that the past four years' experience has proved without a shadow of doubt that cost accounting, properly applied, can be and is one of the best means of reducing the tax burden, stimulating municipal management and promoting to a considerable degree the same efficiency, economy and foresight existing in and so essential to private industry with its ever narrowing profit margin. Cost accounting can be the most effective tool in the executive's kit, if it serves management facts hot as news—not cold as history. It must prophesy—not merely record past performance. Unfortunately municipal accounting in the past has invited indifference rather than attention on the part of those who most need the benefit of a properly conceived and operated fact-finding organization.

In presenting this outline of a part of the procedure, it is frankly admitted that the motives are selfish. The writer and his associates are looking for suggestions, comments and constructive criticism from any source whatsoever, and from those who have had experience in like work an exchange of ideas. If, in addition, this article may perchance be of some assistance to someone now wrestling with the same problems that confronted Hennepin County in 1925, it will be a double reward for any effort put forth in telling this story.

For the purpose of illustration, a graveling job has been selected. The law, as noted, provides that before any job is started an estimate shall be made. Estimates are prepared in duplicate by the highway-engineering department and submitted to the county board. The board either approves or rejects such estimate. When an estimate is favorably acted upon, a copy of the approved estimate is forwarded to the accounting department.

As the essential facts of the estimate are shown in the cost report on the following pages, it is not necessary to submit a copy of such estimate for the purpose of this discussion. It may be of interest, however, to mention at this point that as soon as the work was approved the foreman was supplied with a copy of the estimate and mimeographed time cards bearing the same operation classifications as those shown in the engineer's estimate of cost. It is apparent, therefore, that the engineer establishes the necessary operation classification at the inception of the job. This classification is rigidly adhered to except in so far as it is necessary to make changes upon authorized approval. To have the story of the job comparable from its beginning to its end, it has been found very essential to insist upon a detailed operation estimate and strict compliance with such operation classification in reporting both labor and material. As the cost work is all done on Hollerith tabulating machines, the Hollerith tabulating card is used as a time card, payrolls being compiled mechanically from the time card made out by the employee.

After completion, the cost report on pages 357 and 358 was compiled for the job under consideration.

The detailed cost sheet covers every commodity or ingredient entering into the production, while the summary of cost, in addition to giving an abbreviated history of the job, analyzes and compares quantities, total costs and unit costs.

The engineering department's estimate of cost when made was set up as an encumbrance against the annual budget and was also used as a measuring stick of the progress of the work during the time it was being done.

The engineering department's final report was made after the job was completed and is the same as the estimate except only for the fact that actual instead of estimated quantities are used.

The cost based on the previous year's averages, together with the engineering department's estimate and final report, is a comparative measuring medium used to determine whether or not actual costs are just and warranted. To some extent, where it has been possible, unit costs of like jobs performed by units other than in the immediately surrounding territory have been compiled and averaged. This composite figure has then been used as an additional yardstick for measuring and justifying actual costs. This is the closest approach to the use of standard costs that has yet been made.

SUMMARY OF COST OF PROJECT 813—CONSTRUCTION

Gravel road 10 from road 100 to road 13, a distance of 6.9 miles

Engineering dept. estimates of cost June 16 and Aug. 1, 1928. Engineering dept. final report Nov. 16, 1928

	Engr. dept. estimated cost	Engr. dept. final report	Cost based on 1927 averages	Actual cost	Details of actual cost: Equipment	Labor	Hired trucks	Loading	Gravel	Other costs
220 Strip pit—										
Cubic yards	300.	188.6	188.6	188.6						
Cost per yard	.30	.30	.52	.393		.34				.053
Total	$ 90.00	$ 56.58	$ 98.07	$ 74.14		$ 64.08				$ 10.06
231 Screening—										
Cubic yards	9,192.	11,223.6	11,223.6	11,223.6						
Cost per yard	.05	.05	.15	.137	.053	.068				.016
Total	$ 459.60	$ 561.18	$ 1,683.54	$ 1,533.24	$ 597.57	$ 768.46				$ 167.21
240 Loading—										
Cubic yards	9,192.	11,223.6	11,223.6	11,223.6						
Cost per yard	.20	.20	.214	.202	.001	.001		.20		
Total	$ 1,838.40	$ 2,244.72	$ 2,401.85	$ 2,263.02	$ 8.10	$ 8.45		$2,244.72		$ 1.75
250 Hauling—county trucks—										
Cubic yards		3,219.4	3,219.4	3,219.4						
Yard miles		18,304.94	18,304.94	18,304.94						
Cost per yard mile		.16	.164	.143	.062	.066				.015
Total		$ 2,928.79	$ 3,002.01	$ 2,624.44	$1,132.11	$1,207.59				$ 284.74
250 Hauling—hired trucks—										
Cubic yards		6,872.7	6,872.7	6,872.7						
Yard miles		42,732.66	42,732.66	42,732.66						
Cost per yard mile		.16	.177	.172			.16			.012
Total		$ 6,837.23	$ 7,563.68	$7,352.90			$6,837.24			$ 515.66
250 Hauling—total—										
Cubic yards	9,192.	10,092.1	10,092.1	10,092.1						
Yard miles	51,490.	61,307.6	61,307.6	61,307.6						
Cost per yard mile	.16	.16	.173	.163						
Total	$ 8,238.40	$ 9,766.02	$10,559.50	$ 9,977.34						
260 Shape and compact—										
Cubic yards	9,192.	10,092.1	10,092.1	10,092.1						
Cost per yard	.05	.05	.049	.04	.004	.031				.005
Total	$ 459.60	$ 504.61	$ 494.51	$ 404.34	$ 38.43	$ 316.61				$ 49.40
201 Gravel—										
Cubic yards	9,192.	10,092.1	6,640.40	6,640.40						
Cost per yard	.17	.17	.17	.17					.17	
Total	$ 1,562.64	$ 1,715.66	$ 1,128.85	$ 1,128.85*					$1,128.85	
Pit road cost			$ 80.39	$ 80.39	$ 4.70	$ 41.84		$ 8.08	$ 9.58	$ 16.19
Engineering expense	$ 432.22	$ 445.46	$ 1,377.10	$ 574.79						$ 574.79
Engineering % of cost	3.42%	3. %	8.12%	3.71%						
Cost of project	$13,080.86	$15,294.23	$17,823.81	$16,036.11	$1,780.91	$2,406.93	$6,837.24	$2,252.80	$1,138.43	$1,619.80
Average haul—county trucks		5.68 mi.		5.68 mi.						
" " hired trucks		6.22 "		6.22 "						
" " total	5.60 mi.	6.05 "	4.11 mi.	6.05 "						

* Part payment; balance paid in 1929.

DETAILED COST OF PROJECT No. 813

			220 Strip pit	231 Screen	240 Load	250 Hauling	260 Shape and compact	201 Gravel cost	Pit road	Eng'ring	Total
Equipment cost—											
Gravel loader 1402	41.72	hrs.		$ 29.50							$ 29.50
Gravel bin 1404	196.51	"		30.96							30.96
Gravel conveyor 1406	202.47	"		82.12							82.12
Gravel screen 1407	196.51	"		61.18							61.18
Gas and water tank 1609	228.9	"				$14.08					14.08
Gas and water tank 1611	228.9	"				14.08					14.08
Bunk house 1905	463.87	"				14.73					14.73
Bunk house 1906	367.8	"				9.07					9.07
Truck 3101	8.94	"		4.47							4.47
Truck 3104	157.34	"		3.22		72.94			$ 1.48		77.64
Truck 3108	16.09	"		7.92							7.92
Truck 3109	179.06	"		6.62	$8.10	254.85					269.57
Truck 3110	215.76	"		6.71		184.32					191.03
Truck 3111	191.29	"		60.54		108.64					169.18
Truck 3112	112.88	"		21.38		149.06					170.44
Truck 3113	250.42	"		90.80		130.62					221.42
Truck 3114	224.62	"		21.90		177.04					198.94
Automobile 3519	3.58	"		2.68		2.68					5.36
Tractor 3606	198.30	"		167.57							167.57
Grader 3747	10.	"							2.27		2.27
Grader 3766	266.36	"					$ 38.43		.95		39.38
Total equipment cost	3,761.32	"		$597.57	$8.10	$1,132.11	$ 38.43		$ 4.70		$1,780.91
Labor cost—											
4013 Foreman	309.44	hrs. at .90	$ 5.86	93.92	.98	144.59	28.88		4.27		278.50
4021 Laborers	367.59	" " .62½	7.26	167.77						$ 54.94	229.97
4034 Tractor op.	224.22	" " .75		168.16							168.16
4035 Truck driver	1,510.09	" " .75		250.48	6.75	873.13			2.24		1,132.60
4036 Man and team	329.26	" " 1.00	50.96				266.98		11.32		329.26
4038 Man and team	27.89	" " .80							22.30		22.30
4047 Watchman	602.16	" " .50		88.13	.72	189.87	20.65		1.71		301.08
Total labor cost			$64.08	$768.46	$8.45	$1,207.59	$316.51		$41.84	$ 54.94	$2,461.87
Hauling gravel—hired trucks						$6,837.24					$6,837.24
Gravel cost								$1,128.25	$ 9.58		1,138.43
Loading rock, 1,131.5 yds					$ 226.30						226.30
Loading gravel, 10,092.1 yds					2,018.42				8.08		2,026.50
Other costs—											
Telephone				$ 1.00		1.00					2.00
Transportation			$ .56	9.09	.09	25.00	$ 2.79		.42		37.95
Lumber									8.94		8.94
Workmen's comp. insurance			1.22	24.32	.28	92.32	5.79		.79		124.72
General overhead			8.28	132.80	1.38	682.08	40.82		6.04	$ 10.54	881.94
Engineering										509.31	509.31
Total other costs			$10.06	$ 167.21	$ 1.75	$ 800.40	$49.40		$16.19	$519.85	$1,564.86
Total cost of project			74.14	1,533.24	2,263.02	9,977.34	404.34	$1,128.85	80.39	574.79	16,036.11

Generally speaking, the length of haul will have a definite influence on hauling costs. For this reason, the length of haul is set forth on all gravel-job cost sheets.

After the cost reports are made, the individual operations are recapped and averaged, so that by the end of the season a comparative report of unit or operation costs is available. The summary of such average unit costs, as incorporated in the annual report, is illustrated by the summary of gravel-hauling costs for the year 1928 on page 360. This summary gives a three-year comparison for each of the three media used for performance of the gravel-hauling operation; namely, by county trucks, by hired trucks, or under contract. As will be noted, this gives a rather clear-cut picture of the relative merits of the three methods in use.

The benefits derived from the installation of a cost-accounting scheme have been to a great extent the same as those derived by private enterprise. Establishment of proper cost-accounting procedure, whether it be municipal or private, means first of all better control over labor, material, equipment and overhead items. When the sins of omission and commission are recorded, brought to light and charged against someone, it is only natural that the improvement should be rather pronounced. To illustrate this point and the general saving that cost accounting can effect in municipal affairs, two examples may be cited. In 1928, with more and older equipment, the cost of repairs and maintenance amounted to $60,381, as against $93,037 in 1925, the year in which cost accounting was installed. The unit cost for hauling gravel with county trucks in 1925 was 23.57 cents. In 1928 with practically the same personnel and exactly the same wage scale in effect it was 16.3 cents, which means that the 1928 programme for this particular operation would have cost $5,940 more in 1925. These are only two of many savings that could be mentioned. Many of the benefits can not be measured in dollars and cents, as, for instance, the increased sense of responsibility starting with the executives and reaching to the laborer in the field; the possibility of planning future work more intelligently and effectively; the revelation of faulty and wasteful methods, past and present, etc., etc. Against these savings must be set the expense of accounting, amounting in 1928 to $10,587. Of this amount not to exceed $8,000 is chargeable to cost accounting, as at least $2,500 to $3,000 would be required whether any cost accounting was done or not.

SUMMARY OF OPERATION COSTS—HAULING GRAVEL 250

		Cu. yds.	Yard miles	Average haul-miles	Labor	Equipment	Misc.	Total cost	Cost per yard mile
Hauling gravel—county trucks		19,762.96	81,711.29	4.13	$6,219.17	$5,820.45	$1,333.17	$13,372.79	16.3¢
" " hired trucks		22,786.24	115,147.45	5.05				20,087.16	17.4¢
" " under contract		7,716.40	25,275.50	3.28				3,538.57	14.0¢
Totals for 1928		50,265.60	222,134.24	4.42	$6,219.17	$5,820.45	$1,333.17	$36,998.52	16.7¢
Cost per yard mile—									
Hauling gravel—county trucks	1928	19,762.96	81,711.29	4.13	7.6¢	7.1¢	1.6¢		16.3¢
	1927		94,374.85	4.19	6.8¢	8.5¢	1.1¢		16.4¢
	1926		124,888.64	3.77	6.3¢	9.7¢	1.6¢		17.6¢
Hauling gravel—hired trucks	1928	22,786.24	115,147.45	5.05					17.4¢
	1927		140,936.95	4.19					17.7¢
	1926		32,866.00	5.76					15.6¢
Hauling gravel—under contract	1928	7,716.4	25,275.50	3.28					14.0¢
	1927		41,662.30	4.09					16.5¢
	1926		116,631.40	3.68					16.9¢
Hauling gravel—total	1928	50,265.60	222,134.24	4.42					16.7¢
	1927		278,738.48	4.11					17.3¢
	1926		318,313.03	4.07					16.8¢

Several years' experience with municipal affairs leads to the opinion that, excepting only the possibility of devising some scheme which would always insure the selection of the most capable man for every public office, good accounting can do more toward stimulating and maintaining economy and efficiency in public affairs than any other one thing. Municipal budgeting has been acclaimed as the most important advance in municipal government. There is no question that proper budget procedure does insure proper planning and consideration of expenditures, but it falls down in that it does not provide an effective follow-up capable of measuring and appraising in a manner understandable both by officers and citizens the quantity, quality and unit cost of the services and production received for the outlays provided in the budget. In other words, no effective yardstick is provided for assuring the public that their servants have been efficient as well as honest—and administration can be effective only when it is both efficient and honest.

Studying and providing the accounting procedure necessary to produce this highly desirable information seems to be of sufficient importance, both from a civic and selfish viewpoint, to warrant the consideration of the best accounting minds in the country.