averages less than the actual quantities placed. These ratios are shown to be about as follows:

Total cu. yds. of aggregate billed.	= 3,633.2	
Total cu. yds. of concrete laid ...	= 3,422.7	
Excess of aggregate over total concrete	210.5 =	6%
Total cu. yds. of aggregate billed.	= 3,633.2	
Total cu. yds. of payment concrete	= 3,310.7	
Excess of aggregate over payment concrete	322.5 =	10%
Yardage of total concrete	= 3,422.7	
Yardage of payment concrete	= 3,310.7	
Yardage of excess concrete	= 112.0 —	3.4%

Costs of Preparing Aggregate.—The average cost per cubic yard of the aggregate, for preparation exclusive of overhead charges, and transportation to the contractor's platforms has been as follows:

Excavation	$0.118
Hauling to plant	.031
Screening and crushing	.139
Loading	.061
Repairs to plant	.019
Repairs to cars, crane and dinkey	.011
Office	.005
Fuel	.123
Total	$0.507

It is expected that this cost will be materially reduced in the coming season.

ANNUAL REPORT ON HIGHWAY IMPROVEMENT IN ONTARIO.

ACCORDING to the annual report of the Department of Public Highways of Ontario, which has just been received, investigation shows that there are in the province approximately 55,000 miles of roads. About 20,000 miles are well graded earth roads; about 3,000 miles are surfaced with broken stone; and about 19,000 miles are surfaced with gravel. Many of the gravel roads are of inferior construction; nevertheless, the proportion of surfaced roads is very creditable to the municipal organization of the province. Unfortunately, the improvement is not uniform, and the gravelled roads are largely confined to those areas in which gravel has been plentiful; while other districts are devoid of surface improvement other than grading and drainage.

The mileage of surfaced roads is encouraging, however, in that while many may be in a neglected state, or of inferior construction, they would more readily and cheaply respond to the systematic attention which it is the desire of Mr. McLean to encourage. The building of important market roads under county systems will be of more extended benefit by reason of even moderate improvement of the local feeders; while the development of a few roads of greater commercial importance between cities can be made to join up the entire system of roads throughout the province in a most favorable manner.

The report, which contains 226 pages, is filled with data of real value to all highway engineers and contractors. Under the heading "General Features of County Road Systems," it gives briefly the features of the system as organized under the Highway Improvement Act. We reprint herewith extracts from this section of the report:

One of the first duties of a county council, when a county road system has been established under the Highway Improvement Act, is to select a road superintendent. The work is carried on by the road superintendent, under the direction of the council and the road committee of the council. Too much care cannot be taken by the council in the selection of the superintendent. His qualification for the work, and close application to its management, more than any other factor, will determine the degree of success attained. Good business management, with thoroughly practical ideas and methods, are essential. The superintendent is not required by the Act to be an engineer; but, if he is not such, occasional engineering services will be required, especially in bridge construction and details of grading. The cost of management is not great, and, compared with ordinary township methods, is one of the most profitable items of expenditure. Experienced supervision and skilled workmen are gradually trained—largely the secret of good roads wherever they are found.

Cost of County Roads.—The roads commonly built under county road systems are not necessarily expensive. They are usually gravel roads, or broken-stone roads, well graded and drained—such as serve the needs of farm traffic. Preferably material of the locality, gravel or broken stone, is used. If there is no local material, and it has to be brought in by rail, the cost is greater—but is shared by the province.

A number of districts in Ontario, such as portions of York, Peel, Halton, Welland, Essex and Kent, have no local material for road-making. In such cases an entirely new road must be built, often on a clay subsoil, and freight rates on stone must be added—all tending to higher cost, and amounting to from $4,000 to $8,000 per mile.

In other districts, however, such as Frontenac, Lanark or Hastings, there is an abundant supply of stone on or close to the road, and frequently the task is one of regarding and putting a surface over an old stone or macadam road. In such cases, a cost of $2,500 or $3,500 per mile is an ordinary expenditure.

Certain districts, on the other hand, have an abundant supply of gravel. Many of the roads have been gravelled from time to time and a good foundation has been made. In such cases, the work usually consists of removing sod shoulders, improving the drainage, and adding a new surface of gravel—costing from $1,000 to $2,000 per mile for substantial work suited to local traffic.

A standard form of construction consists of an earth grade, twenty-four feet between shoulders, outside of which are the open drains. In the centre of the grade is placed, for a "single track" road, gravel or stone to a width of ten feet, and a depth varying from six to twelve inches, according to the traffic, subsoil and existing foundation. Good grading and drainage are of first importance. The road should be rolled with a ten-ton steam roller to complete for traffic. If the road is on an important line of through traffic, or adjacent to a city, the earth grade should be twenty-seven feet wide instead of twenty-four, and provision made for a "double-track" of gravel or stone, eighteen feet wide. This, however, is rarely necessary. A single track of metal nine or ten feet wide may first be laid, and later widened to eighteen feet as traffic increases.

Duties of Patrolman.—The patrolman's primary duty is to keep the travelled surface in good condition, but there are other duties for which he should be responsible. His chief duties should be: (1) To repair the road surface; (2) to rake off loose stones and gravel; (3) to clean out ditches and their outlets; (4) to keep culverts free from obstruction; (5) to cut and burn weeds; (6) to repair guard rails; (7) to periodically inspect bridges and cul-