

We have a daily yard report which shows materials received, gasoline and oil used by each piece of equipment, and a time report showing the man's name, what he did, and the number of hours he worked. From this sheet, the yard payroll is made. In addition, a tractor report is turned in by district men showing number of miles traveled in maintaining roads, and the gasoline and oil consumed by them for the month. From these reports one can determine what any one person did any day during the month.

When claims or invoices for material furnished are filed by firms, they all come to us to be O.K'd before they are allowed by the county commissioners. These claims are all checked with the delivery tickets and, if found to be correct, are O.K.'d by the supervisor. Then, opposite the entry of the requisition in the ledger, the date is stamped showing the date the claim was filed for approval of the county commissioners.

Often one wants to know how much gravel or cement he has purchased from a certain person, and in his ledger he has this at his fingertips. If he depends upon the county auditor for this, he will probably be disappointed, as his county auditor posts his books only by voucher number and amount, so that one will have to look up several claims before he gets the information he is seeking.

Above all, let me impress upon your minds that to keep these records that are so necessary, it is very essential that you have adequate, competent clerical help.

OIL MATS

Ivan Craggs,
Johnson County Road Supervisor,
Franklin

In our county no attempt was made in the past to provide plans and specifications for construction of bituminous-surfaced roads. Each road superintendent carried out his own ideas, and the contractor did the best he could with whatever kind of material was furnished.

We have in Johnson County approximately 60 miles of oil mat, 50 miles of which were constructed by scarifying the old gravel road to a depth of 2 inches, and putting this loose material into a windrow on either side of the road. Approximately 0.3 gallons per square yard of A-50 or A-60 road oil was applied to the roadbed as a primer. The loose material was again placed over the road, and to this was added approximately 0.7 gallons per square yard of A-70 oil. It was mixed and graded, spread evenly, and rolled to produce a mat 1½ inches thick.

On account of the many kinds of material used in the old road, hardly any two sections were the same. The cost of

this type of road was around \$1,100 per mile. Bituminous material costs seven to eight cents per gallon applied.

At the time of construction little or no consideration was given to drainage, and no consideration to shoulder material on either side of the road to support and protect the edges of the mat. As a result, traffic has caused the mat to spread, and the edges are broken.

During the past few years approximately 20 miles of road were surfaced with road oil or S.C. 2 and S.C. 3. These roads were first brought to the required grade and cross-section, and proper drainage was established. To the old roadbed, approximately 0.2 gallon per square yard of S.C. 3 was applied as a primer. Then approximately 100 pounds per square yard of clean pit-run gravel were placed on the road, and approximately 0.7 gallon per square yard of S.C. 3 was applied, graded, mixed, and spread evenly over the road, then rolled, producing a mat $1\frac{1}{2}$ inches thick. The cost was approximately \$1,200 per mile.

We have a 3-mile section of road where an oil mat was constructed on the old road by first bringing the road to proper grade and cross-section and adding approximately 125 pounds per square yard of clean dipped gravel and adding sufficient S.C. 3 to this material to produce a mat approximately 2 inches thick without priming the old road. After three years we notice very little difference in these two types of road, except that where the prime coat was used, the old roadbed became soft in places and the surface was likewise affected.

We have a $2\frac{1}{2}$ -mile section of road, surfaced to a depth of 2 inches, using washed gravel varying in size from $\frac{1}{8}$ to $\frac{3}{4}$ inch and not using a primer on the old surface. We believe this road type to be the best. It can be constructed 18 feet wide for approximately \$1,200 per mile.

Experience has taught us that in order to obtain good results, the contractor must be honest and competent, and must purchase his materials from reliable producers.

I mention this because so many times here in Indiana we have paid dearly for work done by some "would-be" contractor who took advantage of the unskilled road superintendent and commissioners. Some of these contractors are trying to do business today.

I have knowledge of a 7-mile section of road that during the past two years has had applications of four different kinds of materials. Calcium chloride was first applied. It did not prove satisfactory, and road oil was applied to eliminate the dust; then cutback asphalt was applied, and at present the road is resurfaced with tar. No one has made an attempt to figure the cost.

I believe that in each case the material met the required specifications, and no doubt would have produced good results,

but I've never seen a worse case of workmanship. The work did not have the proper supervision, and the contractor would not carry the responsibility.

Until road supervisors have a knowledge of the properties of road materials, and a lot of experience, they will have to depend upon those men who have knowledge of materials and are making this Road School possible.

ROAD OIL AND POWDERED ASPHALT

George H. Morrow,
Howard County Surveyor and City Engineer,
Kokomo

Powdered asphalt and road oil were first used in Howard County on what is known as the Touby Pike. The road was originally constructed of gravel and crushed stone and compacted by traffic. At subsequent intervals additional material, usually crushed stone, was added as maintenance required. About four years ago traffic had increased to the point that it was deemed advisable to do something more than add stone, in order to prevent expensive upkeep and to eliminate dust. It was therefore decided to surface-treat the road, using road oil mulch, cutback asphalt, and tar surface treatments on different sections. The different applications relieved the situation for a time, but it was soon apparent that something more substantial would have to be undertaken. It was then decided to improve the road by increasing its thickness and at the same time building a smooth, firm, and durable wearing-surface.

In order to conserve the available funds as much as possible, local gravel in close proximity to the road was selected. The sieve analysis of the gravel showed that there was an insufficient amount of coarse material to insure proper stability; so a certain percentage of crushed stone (size No. 8) was obtained from the local stone quarry at Kokomo and added to the gravel.

The bituminous material selected to cement and hold the aggregate together was composed of two kinds of asphalt, which, when combined together in the mixing process, produced an asphaltic cement of 250+ penetration. The decision to use that type of cement was made in order to compare its use with other kinds, namely, cutback asphalt, emulsified asphalt, road oil, and tars of different characteristics. It was thought that it might be possible to coat each piece of aggregate more thoroughly and uniformly with a film of asphaltic cement, and with less labor and construction cost, by using powder and flux oil than by using one of the above-mentioned cements.