Sewers (Labor)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catch basins</td>
<td>$138.59</td>
</tr>
<tr>
<td>Sewers</td>
<td>2,079.95</td>
</tr>
<tr>
<td>Ditches</td>
<td>222.97</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2,441.51</strong></td>
</tr>
<tr>
<td><strong>Average per mile</strong></td>
<td><strong>$34.10</strong></td>
</tr>
</tbody>
</table>

Maintenance of Streets

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repairing and rebuilding</td>
<td>$10,074.48</td>
</tr>
<tr>
<td>Patching</td>
<td>588.20</td>
</tr>
<tr>
<td>Repairing and building equipment</td>
<td>1,745.63</td>
</tr>
<tr>
<td>Marking (Zoning)</td>
<td>929.63</td>
</tr>
<tr>
<td>Materials</td>
<td>16,000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$29,337.94</strong></td>
</tr>
<tr>
<td><strong>Average per mile</strong></td>
<td><strong>$333.39</strong></td>
</tr>
</tbody>
</table>

Grand Total ........................................................... $64,630.11

TREATMENT OF GRAVEL STREETS WITH BITUMINOUS MATERIALS

By H. A. Blunk,
City Engineer, Martinsville, Indiana.

In the city of Martinsville, our experience in treating gravel streets has been almost exclusively with the so-called road oils. It is the preparation, treating and maintaining of this particular kind of street that I shall attempt to discuss in this brief paper.

We will assume that the street has been properly constructed as to drainage, width, crown, materials, etc., for no amount of surface treating and maintenance can completely compensate for poor construction.

Streets that are worn to the extent of requiring additional materials, should be reshaped and given a thin coat, or coats, of gravel during the winter or early spring preceding the oiling. The size of gravel for this surface coat should range uniformly from 3/4 to 1/4 inch. It should be hard, durable and reasonably free from dirt and other soft materials.

If gravel is applied prior to the alternate freezing and thawing of the spring months and subjected to reasonable traffic, little difficulty is experienced in securing a satisfactory bond with the old materials before the time for oiling arrives. However, where oiling has been regularly practiced, many of our streets have gone for three or four years without the necessity of adding new materials.
Purpose of Oiling

Viewed from the standpoint of the good housewife, the primary purpose of oiling streets is to alleviate the dust evil. Actuated almost solely by the desire to get rid of dust, the first oil was placed upon our streets, just in patches, here and there, where the property owner was willing to pay the expense.

When viewed from the standpoint of the tax-payer's pocket book and the convenience of the traveling public, there are other benefits to be derived from the use of the proper kind of road oil quite as important as that of controlling the dust. Judging from the wear on many of our unoiled streets and roads, the saving in new surfacing materials justifies the expenditure for the oil.

Final Preparation Before Applying the Oil

Streets that have never been oiled should be kept in proper cross section, by use of the grader or drag, from the time the frost leaves the ground until the oil is applied.

When the street has been previously oiled and the surface is hard and contains broken places or potholes, we use a grader with scarifying attachment to break up the surface. We scarify just deep enough to get below the bottom of the potholes. If the surface breaks up in large pieces, a farm harrow is run over the street until the surface is thoroughly pulverized.

We then lift the scarifying attachment and set the grader blade so as to plane the surface of the street from the center to the gutter line. This is done to make sure that the potholes have all been removed. The operation is then reversed and the fine materials brought in toward the center until an even blanket of such materials is spread over the entire surface. This blanket, under the action of traffic and a little attention with a light drag, will soon be thoroughly compacted and ready for the application of the oil.

Applying the Oil

We have been using oil of from 50 to 65 per cent asphaltum content, shipped to us in tank cars supplied with steam coils. The cars are set on the siding by the municipal water and light plant, where steam is applied to the coils from 6 to 12 hours before the oil is pumped into the distributor.

We have a horse drawn distributor, of 600 gallons capacity, with a gasoline heating device, so that it is possible to hold the temperature of the oil at the desired point, usually from 130 to 180 degrees F. while driving to any street in the city.

The weather condition is a very important factor in the efficient application of road oil. The ground should be warm
and dry, but not dusty. An ideal time is just sufficient time
after a shower so that there will be no dust and yet the
surface will be dry.

Where there is a covering of dust, it should be sprinkled
down a sufficient length of time ahead of the oiler, or re­
moved to the side of the street by means of a grader. In
this latter method the dust may be either thrown back upon
the oil surface for a covering or hauled away.

Where streets have been previously oiled, we usually apply
at the rate of about $\frac{1}{4}$ gallon per square yard. On the
more heavily traveled streets, sometimes a second, though
lighter application is made.

Protection of Fresh Oil

Last spring we tried three different methods as follows:

First. The old method of attempting to keep the traffic
off the street until it had time to dry and for the oil to
penetrate, so that it would not pick up.

Second. We ran the grader over the street in front of the
oiler removing the loose surface materials to the sides; then,
after the oil was put on, this loose material was thrown over
the surface for a covering. The traffic was then permitted to
use the street at once, thus working the covering into the
oil.

Third. We used a covering of clean, hard, screened gravel,
ranging in size from about $\frac{3}{4}$" down to $\frac{1}{4}$". The amount
would have to be determined by the condition of each in­
dividual street. Just enough was used to keep the oil from
running to the gutters and from picking up under traffic.

The latter method was by far the most economical and
satisfactory. Some sections, so treated last May, have thus
far not required scarifying and grading. A part of South
Main Street, which is very heavily traveled, being a part of
State Highway No. 37, running from Indianapolis through
Martinsville to Bloomington is an example. The very few
potholes which have formed in these sections have been
successfully handled by filling with a seasoned mixture of
Tarvia K. P. and small limestone chips.

Maintenance of Oiled Streets

The sections that were simply oiled and turned over to
traffic, without the screened gravel covering, presented the
biggest problem in the way of summer maintenance.

You may relieve the dust situation and thereby satisfy the
good housewife by oiling a street and forgetting about it
until the next spring. But when an oiled street begins to
break and holes begin to form, immediate attention must be
given or it is soon in worse condition for traffic than the
unoiled street.
Our method of getting rid of potholes after oiling is much the same as that used in preparing the street for the oil in the first instance. We scarify just deep enough to go below the bottom of the holes, then pulverize the surface with a light farm harrow. Next we plane off the surface from the center to the sides, to make a smooth, even bed. The black, pulverized material is then pulled in and spread evenly over the entire street. We follow this with a light drag. The action of traffic will completely compact this blanket in a very short time. The hot rays of the sun, and action of capillary attraction, will almost always bring plenty of oil to the surface to keep down the dust.

After this re-working, with the oil slowly coming back to the surface and bonding with the surface materials, the tendency to form breaks and holes is much less than when first applied. Sometimes, however, it is necessary to repeat this maintenance process later in the season. But usually two such operations will carry any of our streets through the summer and fall months.

We generally meet with some objections, when scarifying and planing off the surface, from those who are primarily interested in the dust laying merits of the oil. However, when the process is completed and the street, in addition to being dustless, presents a smooth, easy surface for traffic, these objections are forgotten.

SURFACE TREATED GRAVEL ROADS

By W. O. Jones,
Wayne County Highway Superintendent.

Before embarking on our program in Wayne County, we studied the surface treated gravel problem very thoroughly. We visited the State of Wisconsin and spent considerable time going over the surface treated roads in the county in which the state capital is located. We read up on everything which we could find of recent publication on this subject and then basing our judgment on what we had seen and read, coupled with the knowledge gleaned from our previous experience, we launched our program.

Don’ts

Later on in this paper we are going to discuss what we considered the best practice when we applied our last bituminous material last fall but before we pass on to that, we will mention some don’ts which may serve as conclusions.