

gest two applications. This should be maintained with a planer-type machine from 1 to 3 times a week, depending on the amount of traffic, for a period of six months to a year. I am of the opinion that, by doing this, we will have less trouble with our bituminous surfaces. We have had very good success with our mats following this type of preparation, using the exact equipment and practically the same process as described in our resurface work. Where you have thus prepared a road and have provided ample base and have good drainage, I have very little fear of the mat failing, even though it be a thin mat. At least a thin mat will have more chances under these conditions than on a road having little or no base and poor drainage.

On a road thus put in shape, and maintained until the base is well set and all culvert fills are settled, we put the surface in shape by using a motor grader and Gledhill shaper, cutting the surface to the desired crown. We then prime by using at least .25 gallon of bituminous material per square yard, and close the road from 2 to 4 days. On a road thus primed, we would put a new mat exactly the same as the resurface described, using stone or washed gravel up to three-quarter-inch to the desired thickness wanted. In every case, we finish the surface with a finer aggregate, making it as near waterproof as possible.

Your location geographically might justify a different plan. These conditions differ, even on roads within the same county, but the basic principles will always be the same. They are:

1. You must have adequate drainage.
2. You must have enough base material, well compacted, to support your road.

I think most of us have made mistakes in attempting to build a black-top surface where we knew the conditions were unfavorable. This is caused frequently by influences beyond our control as road supervisors.

## USE OF POWDERED ASPHALT IN LOW-COST ROAD WORK

Peter Draper, Madison County Road Supervisor,  
Anderson, Indiana

We first used powdered asphalt in 1937. Therefore, I am not wholly prepared to give final conclusions. Naturally, we were favorably impressed by the many claimed advantages of this product, and the scientific facts demonstrating economy, greater durability, adaptability to varying road conditions, and so forth.

The staff of the contractor was augmented by field engineers of the company, who surveyed the work to be done

sometime before it was started. The aggregate was inspected both on the road and in the pits. Samples were taken and analyzed at the refinery laboratory at Robinson, Illinois, and definite formulas determined to make a first-class bituminous mix.

The correct amount of aggregate was placed on the road and the work was done with modern equipment and experienced men, under the direction of the refinery field engineer. I believe this thoroughness of preparation insures the character and quality of the work done.

With the powdered asphalt, we used our own native gravel, of which we have several deposits in our county. This gravel carries a considerable amount of sand, which gives us a very dense waterproof top.

We first coat the aggregate with the liquid asphalt, which easily mixes with this finer-graded native aggregate; then the asphalt in powder form is applied in the proper proportions through an ordinary lime spreader or calcium drill. Then the windrow is bladed until the two asphalts are thoroughly combined. After laying out the road mix, we do not wait a day or two for it to set up. The reason for this is that there are no dissolving liquids to evaporate in order for the asphalt to become hard. This being the case, we have an asphalt cement, together with finely graded aggregate, which seems to be a perfect combination.

In portland cement concrete, we require a very densely graded aggregate, in order to make the cement do its best work. The same thing is true of black top. The open spaces between the pieces of aggregate must be filled with something, either asphalt or sand particles. Having these voids filled with the sand portion of the aggregate makes the mat waterproof throughout the entire thickness. This eliminates the requirement of sealing the top after the traffic has set the original mat. Of course, when figuring black top, any sealing, whether done the first or second year, should be considered as part of the original cost.

The use of powder has several advantages, and among the most important is the predetermining of the asphalt cementing quality. That is, by the use of more powder, or less powder, you can predetermine just the consistency required for the type of job or the type of aggregate involved. This is a very important feature.

This material also has advantages in making patching mixture. By using a small concrete mixer, we pre-mix our patching material, using the two asphalts, first putting the liquid asphalt and aggregate into the mixer, allowing it to turn a few times until the aggregate becomes coated, then adding the powder, using a bucket marked so that we use the same amount each time without having to weigh each batch. We also measure our aggregate and oil by a marked container.

A few more turns of the mixing drum and the material is dumped out on a sheet-iron floor under the mixer, in order to make shoveling easier. We either haul it out and use it immediately or put it in stock-piles for future use.

The mixture does not seem to set up or become hard until it has been compacted by either rolling or traffic, because it contains no volatile material. Being able to predetermine the asphaltic content, thereby making the patching mixture either a soft pliable mass or a harder material, we have found that we can patch any of our roads with the same materials, either our concrete roads with the harder mixture, or other types of surfacing with the softer, more pliable mixture.

When making large patches, we use our roller in order to make this repaired area as smooth as the existing surface, but where we are filling small holes, we use a tamp or let traffic iron out the patches. We are of the opinion that we get about as good results whether they are pre-compacted or compacted under traffic. By using the finer aggregate, we are able to feather the edges of the patch, or to make a thin skin patch, sealing the "alligator" cracks that sometimes occur where the base is weak.

## ENGINEERING SERVICES TO TOWNS, CITIES, AND INDIVIDUALS

J. C. Eckert, Ripley County Surveyor and Road Supervisor,  
Versailles, Indiana

I am assuming that this subject applies to the work which we do that is not in the line of our official duties as county surveyors or engineers. Chapter 148, Section 1, of the Acts of the General Assembly of 1935, states:

That for the purpose of safeguarding life, health and property, no person shall practice or offer to practice the profession of engineering or of land surveying in this state, unless and until such person shall submit evidence that he is qualified so to practice and shall have been registered, as hereinafter provided. It shall be unlawful for any person to practice or offer to practice the profession of engineering or of land surveying in this state, or to use, in connection with his name, or otherwise assume, or advertise, any title or description tending to convey the impression that he is a professional engineer or a land surveyor, unless such person shall have been duly registered or is exempted under the provisions of this act.

Of course, as the duly elected county surveyors, we are exempt from this act in performing the official duties of county surveyor, but that does not give us the authority to do other work unless we are registered. As I interpret the law, we, as county surveyors or engineers, are required only to