

STAGE CONSTRUCTION

By Clifford Siniff, Highway Superintendent, Allen County

The subject of stage construction is something in which we are all interested. It applies to all kinds of roads whether they are in the course of construction or maintenance. We superintendents are using stage construction in our work when a township road is turned over to the county. In most cases, we have to start at once applying material or doing grade work to get this road in shape for the general public to use. We are applying stage construction to this particular type of road as soon as it becomes a part of our system.

A road that has just been turned into the county system may be of no particular importance at the time, but in a few years it may be carrying a considerable amount of traffic. In all probability it will be carried through various phases of stage construction until it has received some type of hard surface.

I started working in the Maintenance Division of the State Highway Department when the state took over in its system what were at that time called county roads. These have now developed into state and federal aid roads. Ten years ago these roads were the most important ones in the county. A great change has occurred in our road system in this period of time the effects of which are felt by the state, county, and township as well.

For example, ten years ago we had in Indiana 277,255 passenger cars and at present we have 754,487—an increase of 200%. Of motor trucks and busses ten years ago we had 31,654 and at present we have 128,488, or an increase of approximately 300%. From this, you see how the traffic on our roads has increased in the past ten years. This traffic increase that we have experienced means that we have roads in our counties at present that are just as important to the local community as the state roads were ten years ago.

Now what did the state highway officials do when they took the roads into their system? They started to maintain them on a more up-to-date scale by the motor patrol method. On some of the more heavily traveled roads they found that in applying stone or gravel and dragging they were not meeting with public approval. This was due to the fact that beyond

a certain traffic density it is impossible to maintain a road with a decent cross-section and smooth riding surface. So the state started to apply stage construction by securing additional right of way, rebuilding grades, putting in proper drainage, and strengthening the subbase.

The request for better roads of a surface other than stone or gravel became so great that it was impossible for the construction department to meet the demand through pavements. In order to provide the traveling public with a year-round road with a smooth riding surface, they found it necessary to start utilizing their old stone and gravel roads having an adequate subbase. They strengthened this subbase by building up with water-bound patches to a true cross-section in order to apply black-top surfacing materials. The above statements apply to the counties now just as they did to the state then.

I wish to take my own county as an illustration, for I am sure that our problems in Allen County will correspond in general to the problems in your own counties. We have a great many roads that are of practically no importance to the general public. These roads serve only the few people that live on them, the mail man and school bus driver, but to these particular people they are very important roads and have to be maintained. We can, however, take care of this type of road at a very nominal cost if we use proper maintenance methods.

Then we have another type of road that we might term our primary road that serves the public in general. This type costs a great deal more to maintain, because of its heavier traffic. There is only one thing that makes a road costly to maintain and that is traffic. I am sure you will all agree with me on that statement.

In Allen County we have certain sections where the roads carry a lot of traffic and we find it very difficult and expensive to maintain a good cross-section and smooth riding surface throughout the year.

Allen County Methods

Last year we started to do something with these roads having a considerable amount of traffic. We took one in particular, called the Hoagland Road, which connects a small village of about 350 inhabitants with Federal Road No. 27, the dis-

tance being about four miles. This road had proved very expensive to maintain and the people in that vicinity commenced demanding a better type of surface.

By previous maintenance this surface had been widened to about 18' but we found by making tests that we did not have sufficient subbase outside of the original 12 feet. We found it necessary to excavate a trench 3½ feet wide and 8 inches deep on each side of the old water-bound macadam. We then built an 8-inch water-bound base, in two courses of 4 inches each, to tie up with the old water-bound base. By making proper tests, we learned that the old base contained from 7 inches to 9 inches of good material so that by building the two 3½-foot trenches we then had 19 feet of base. We also added water-bound patches to build up low places and reduce humps at road intersections.

All the care possible should be taken in building up the base to a true cross-section. If this is not done, it will be difficult to construct a smooth riding surface.

We used a No. 1 stone (2½ inches-4 inches) in widening the base. For truing up the base to cross-section, we used various sizes that we found necessary in eliminating low spots. An 18' straight edge was used continually.

Side forms were spiked into position on the subgrade. These we backed up with earth which subsequently formed the road shoulders. The side forms are often omitted but they are of very great assistance in obtaining the proper cross-section.

On this base we built a bituminous macadam surface course. Berm boards were set carefully to proper height and alignment and backed up with earth. We next applied our top stone, using No. 2 (1½ inches-2½ inches). This stone was dumped on the base from trucks, and stone hooks and rakes were used in pulling the stone along the berm boards.

For levelling, we used a 2½-ton caterpillar tractor and a small Adams 7-foot grader, which we found very effective. We followed up this operation with an 18' straight edge, hand picking the stone. Much care must be taken in levelling the surface.

We next used a ten-ton roller, which helped in finding weak or low spots. We would then go back with straight edge and hand pick the stone, thus eliminating any irregularities that had developed from the rolling.

Surface Course

We applied bitumen with a pressure distributor at the rate of $1\frac{1}{2}$ gallons per square yard. We spread just enough key-stone so that the roller would not pick up any of the large stone. The roller had a tendency to pick up the stone in hot weather much more than in cool weather. We equipped the roller with a sprinkling system to wet the rollers to prevent picking up stone. This key-stone was used at the rate of one ton per 40 square yards of surface. The surface was rolled thoroughly in order to force the key-stone into the voids and produce a tightly compacted surface.

The second application of bituminous material was applied at the rate of $\frac{3}{4}$ gallon per square yard and covered with just enough fine stone to keep the roller from sticking. The surface was rolled thoroughly to compact it. The roller should be used for at least five days while the bitumen is soft.

Additional fine cover should be used sparingly as required during rolling and the total should not exceed one cubic yard to 240 square yards of surface. All voids left in the top should be filled by brooming a fine covering material over the surface, the surplus being finally swept off.

The road was opened to traffic for about two weeks prior to the third application of bituminous material. There is nothing quite so good for closing up surface voids as traffic. The third treatment consisted of $\frac{1}{3}$ gallon per square yard and a fine covering stone ($\frac{1}{4}$ inch to $\frac{5}{8}$ inch). Next we dragged the surface with a long base drag to eliminate any irregularities that still remained.

This work was done by the county highway department, using our own personnel and equipment, with the exception of the application of bitumen, which operation we let out to a contractor. We also rented a ten-ton tandem roller for use on the top course.

Equipment used:

- Six 2-ton trucks
- One stone unloader
- Two 10-ton rollers
- One 7-foot grader
- One 10-foot grader
- One 10-ton tractor
- One $2\frac{1}{2}$ -ton tractor

We were able to purchase equipment and build the road by

changing over to the patrol system on January 1, 1929. We found this system a great saving over the old assistant superintendent method.

The increasing use of motor vehicles in agricultural districts and smaller communities of this state is being reflected in the tremendous increase in the building of higher types of local and county roads, which are necessary as feeders to heavily traveled highways. With each succeeding year, the percentage of graded and drained earth roads decreases and the percentage of surfaced roads increases.

WHAT CONSTITUTES A COUNTY HIGHWAY PROGRAM?

By E. L. Gates, Superintendent of Highways, DuPage County, Illinois

I presume that this question might be answered in a great many different ways and that all of them might be correct. I can only give some suggestions that have grown out of my experience as superintendent of highways of DuPage County, Illinois. This immediately answers one phase of the subject, for the location of a county has a great deal to do with its program.

A county may be next to a large city or a large city may be situated in a county. The traffic in this kind of county would be a great deal different and would call for a different program from that in a county situated some distance from a large center.

The physical condition would also have a great influence on the highway program of the county.

I would say that the ability to raise funds for roads would be next in importance, for it takes money to carry out a program; although a well defined plan can still be made up and an ideal established, even before enough money is available to accomplish the program.

However, in our planning, we have to watch the financial side of the question just as we would in any other business.

Probably a definite idea of the needs of a locality and the funds available are all we need to start a program.

I presume all will admit that wherever we are situated or how much money we may have, there should be a well defined road program if we ever expect to have good roads.