

CRUSHING AND SCREENING GRAVEL

By William Barnes, Howard County Road Supervisor

The use of gravel as a road metal is a well established practice in Indiana, as in many other sections of the United States, wherever it is available without too much expense. Crushed rock, slag, shells, and many other materials are used where gravel is hard to get or too expensive.

Indiana is fortunate in having a great number of gravel pits or banks. In the old days, pit-run gravel was spread on the roads. This practice left many large-sized stones in the traveling surface. During the reign of the horse-drawn traffic, these large stones did not interfere very much. But, with the coming of the high-speed automobile, those large rocks had to be picked out of the roadbed. This was an expensive process, still being carried on in some counties where the road surfaces are being worked into real highways.

Good practice today demands that no large "niggerheads," stones, boulders, or whatever you choose to call them, be placed in the road. The method of accomplishing this is quite debatable. Two methods are advocated—crushing and screening. Each has its advantages and disadvantages. Both methods are used in Indiana.

Before we enter a discussion of the merits of either method, let us look at the requirements for road metal. First, the material must be self-draining. In other words, it should not retain water enough to form a paste, such as clay. Second, the material should be of such quality that it will pack fairly well under traffic so as to form a traveling surface that is quite firm. Third, it should be of such a nature that it will stay on the road under traffic and not rapidly disintegrate into dust and fly away, nor readily push out of the confines of the traveling surface. The frequency of maintenance depends on how well the material stays in place. Fourth, the material should be economical, but not necessarily cheap, as often the cheapest is the most expensive in the long run.

Those are the main requirements for a good metal. Let us now scrutinize these requirements and see how each can be accomplished. The first one needs no explanation, as it is agreed that gravel and the above-mentioned materials are more or less waterproof. The second requirement, the packing quality, is accomplished by proper grading from small to large sizes so that each particle can settle under traffic to fill the voids, leaving a firm surface. If the particles are angular, it will help considerably in packing. So far, nothing has been said about the maximum size of material. It does not come

under the heading of this paper, but we can say that the metal should all pass the 1-inch screen. Howard County uses $\frac{3}{4}$ -inch maximum with very satisfactory results. The third requirement, stability, is obtained in two ways—first, weight, and second, shape. Fine material, in dry weather, blows away; smooth material, even in the larger sizes, pushes out under the wheels of traffic. The fourth requirement, that of cost, is altogether too controversial to be dealt with in this paper. However, it will be mentioned again in a little different light than would be required if it were discussed here.

Now that we have the requirements and means of accomplishment, let us look at the materials themselves. A pile of crushed limestone looks as if it should fill the bill completely. It is heavy, hard, angular-shaped, and seems well graded. But the cost in most localities demands something different. Right here in our own county we have lots of gravel available. We look at a pile and see that it has too much material in it over one inch in size to make it suitable for our roads. The price in the pit or bank gives us a little leeway to treat this material. So the question arises, Shall we screen or shall we crush?

CRUSHING VS. SCREENING

The argument is on. The advocate of crushing outlines his reasons as follows:

1. Crushing gives more uniform-sized material throughout regardless of which bank or pit it comes from. After crushing, all the material will look nearly alike.
2. As it is crushed, angular material results, which is desirable for packing and staying on the road.
3. The larger material is put on the road after crushing and not wasted.
4. Crushing allows more of the material bought and paid for to go onto the roads. And, in turn, it keeps the pit or bank cleaned up at all times—that is to say, when a pit has been crushed out, there are no large rocks to be hauled away and wasted.

Crushing can be done for about 7 cents per cubic yard, loaded onto trucks. So the cost is not very much out of line.

The advocate of screening will perhaps start off by saying that his pits do not contain much oversized material and that crushing would not be justified. Therefore, the argument ends. However, he cannot say that most of his aggregate is angular-shaped. He must admit that whatever large material is screened out is lost from the road surface. He may say that there is not enough lost to make any material difference, that his oversized material comes in handy for filling washouts. His cost may be a little lower than crushing.

You can see that Howard County is an advocate of crushing the gravel. I have not tried to give the impression of being an authority, because that would be out of reason. Conditions govern everything. The highway extension here at Purdue is trying to gather facts and figures about all phases of road work so that we can all have a better understanding of the one common problem, that of maintaining roads.

WORK DONE ON DUBOIS COUNTY ROADS DURING 1933

By Carl Heim, Dubois County Surveyor and Road Supervisor

Twenty-five miles of road were graded by the landowners under the Gap Road Law and 14.2 miles of these newly constructed grades were surfaced with stone or gravel in 1933. *The grades on these roads were constructed by the landowners without cost to the county, except for finishing the grade with the county tractor and grader. The county furnished the culverts and bridges.* This method of road construction has been practiced in the adjoining counties for the past ten or twelve years and provides a low-cost road to the county. A comparison of the roads built in previous years by contract is shown in Table II.

Table I lists roads worked on in 1933 and shows the mileage surveyed, the mileage on which the grade is practically completed, the mileage of grade surfaced, and the approximate cost to the county to date.