

Panel Discussion of Questions on County and City Road and Street Problems*

QUESTION: Is a county-owned dragline advisable?

ERNEST H. COFFIN: In qualifying myself to answer this question, I asked one of the three smallest counties in the State, which has owned a dragline for some three or four years. They are well pleased with the results and feel that it is a good investment.

I also asked one of the three largest counties in the State, which has owned a dragline for four or five years. They also are enthusiastic about the results and feel that it is an indispensable piece of equipment in their county highway department.

From an average-sized county, receiving an average amount of gasoline tax money, I received the following report:

For five years preceding 1940 this county had paid out a total of approximately \$30,000.00 in equipment rental for a dragline, paying \$6.00 an hour to have creek channels straightened, dirt loaded, and other ditching work done. They paid 25 cents per cubic yard for gravel dipped in the pile and 35 cents per cubic yard for gravel dipped, screened, and loaded into county trucks, this being a fair and reasonable price. This does not include the cost of the gravel in the ground.

On the showing of this figure of \$30,000.00 the County Council of this county very graciously appropriated \$10,000.00 for the purchase of a dragline.

* EDITOR'S NOTE: This discussion represents a successful attempt to develop a new type of program in which various county and state officials were asked to submit questions that they would like to have answered on this program. More questions were received than could be answered in one session. A few of the more practical and interesting questions are included in the Proceedings. The panel included the following: Ernest H. Coffin, Road Supervisor, Wayne County; Clyde R. Black, Senator, Cass and Fulton Counties; Don Gilbert, Surveyor, Steuben County; Otto K. Jensen, State Examiner, State Board of Accounts; P. D. Miesenhelder, Consulting Engineer, Indianapolis; Raymond L. Pike, Director, Indiana Economic Council; T. E. Shelburne, Research Engineer, Joint Highway Research Project, Purdue University; and C. E. Williams, City Civil Engineer, South Bend. The presiding officer was Albert J. Wedeking, Member, State Highway Commission of Indiana.

This county purchased a ¾-yard dragline in June of 1940. Accurate daily reports were made and data compiled on this piece of equipment, and the following figures are a summary of this report:

The capital investment of the dragline, trailer, gravel bin, screens, stone bins, etc., was \$10,640.58.

In this report I will summarize for the 27-month period following the purchase of this machine.

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| The labor cost of an operator and helpers who were charged to the machine for this period amounted to.... | \$ 3,794.38 |
| The cost of gas, oil, and grease..... | 754.74 |
| The cost of the repairs..... | 807.55 |
| Making a total operating cost of..... | 5,356.67 |
| Or a total of capital and operating cost for the 27-month period of | 15,997.25 |

During this same 27-month period a total of 1,134½ hours were devoted to loading dirt, ditching, and straightening creek channels. The machine was credited for this work at the rate of \$5.00 and \$6.00 per hour according to the amount of extra help required besides the operator.

Crediting the machine for this work.....\$ 5,776.50

Also during this same period 28,776 cubic yards of gravel were dipped, screened, and loaded into the county trucks. Crediting the machine with 35 cents for this kind of work, the same price as had been previously paid, makes a credit of..... 10,336.28

This makes a total credit to the machine for this period.... 16,112.78

As against the capital and operating cost of..... 15,997.25

Thus, the machine showed a credit at the end of the 27 months of 115.53

The same daily reports were continued until the end of 1943. At that date the machine showed a credit of.... 6,671.31

Today the machine is in excellent condition.

To those counties who own their own equipment, have earth to move, and channels to straighten, on the basis of the above reports I would answer the question, "Is a county-owned dragline advisable?"
Yes.

QUESTION: Why are not county ditches maintained at public expense?

DON GILBERT: Funds for emergency repair of tile drains up to \$50.00 and for open drains to a specified amount have been paid from

a general tax levy for many years. However, the justification for taxing any property for a specific purpose is based on benefits to be received by the property taxed.

A general levy in Tippecanoe County would assess many farms and much city property that receive no direct benefit from artificial drainage. Therefore, such a tax would be unequitable.

QUESTION: What are the legal and engineering aspects of septic tanks draining into ditches?

P. D. MIESENHELDER: This is a double-barreled question. Let us first consider the engineering aspects. I assume that "into ditches" means roadside ditches. The flow from a septic tank is not constant but intermittent. This most likely will result in a continuously wet spot in the side ditch. Such a wet spot may cause trash to collect, obstructing storm flow, and certainly will make more difficult the cleaning and maintenance of the ditch. Depending upon soil characteristics and relative elevations, the wet spot in the ditch may cause a softening of the subgrade of the road, making it difficult to maintain the surface, or in extreme cases possibly causing a failure of the surfacing.

It appears to me that a more important engineering aspect is from a health standpoint. It seems that the public, in general, believes that sewage which has passed through a septic tank is made safe. This is not true. Septic tanks are extensively used because of the low cost and the small amount of attention required, and because they remove a large percentage of the organic solids in the sewage. But the effluent from a septic tank is high in bacteria content and, though this may not be the same bacteria contained in the sewage entering the tank, still it cannot be considered safe. The effluent also contains in suspension small particles of organic solids. If there is a continuous flow in the ditch these particles will be deposited along the banks at the water line. If there is intermittent or no flow in the ditch, they will be deposited on the ground surface where the discharge occurs. This organic matter accumulates and will, after only a short time, become putrid and very obnoxious. It is my opinion that much good would be accomplished if the public could be enlightened concerning the merits of a septic tank.

The legal aspect of a septic tank's draining into ditches is in the province of an attorney. Probably an engineer would do well not to invite trouble by attempting an opinion. However, I believe it is safe to say that, at least in some instances, the drainage of septic tanks into ditches would be covered by the Stream Pollution Control Law enacted

by the State legislature in 1943. Also, there is a statute enacted several years earlier defining a public nuisance. Certainly the effluent from a septic tank discharged into a roadside ditch is a public nuisance as defined.

QUESTION: How can a county finance a post-war program without resort to Federal or State aid?

RAYMOND L. PIKE: Frankly, I do not know the answer to this question. If it becomes necessary for any county to plan a well-balanced program to assist in times of unemployment, one of the principal items should be highway construction. Since there is now, and has been for some time, a moratorium on what is known as the "three-mile road law," formerly used by both townships and counties, and since the only funds available for highway construction to my knowledge are the county's portion of the gasoline tax, I fail to see just how a program of any magnitude could be financed without Federal or State aid. It is for this reason that we are recommending to all governmental units that they bring to the blueprint stage their plans for *needed* projects, in order that they may be prepared, if it becomes necessary for the State or Federal government to assist in a time of crisis.

QUESTION: What facilities should cities provide for expanding air transportation (freight and passenger)?

CLDYE E. WILLIAMS: It is my opinion that the city should provide all the facilities needed for expanding air transportation. This statement is impossible to substantiate now because past experience has not justified it. In the past, the maximum return that could be expected from airport expenditures has been the maintenance. The initial cost must be written off.

With the future possibilities of freight transportation in mind, industry will be looking for locations that provide ample facilities for their shipping, and every city is looking for new industries. In our own city, with Bendix laying down freight in India forty-eight hours after it is loaded at the airport, we can't afford to be without adequate shipping facilities.

In the future, airport expense will yield a profitable return from freight shipping alone. Also, it is not unreasonable to expect as many plane owners as car owners now. Should we force our citizens to move to another community because they cannot park their planes near our city?

QUESTION: What are the best methods and materials for patching bituminous roads and surfaces? What special precautions should be taken for patching bituminous surfaces during winter months?

TILTON E. SHELBURNE: Patching is a very important item in the maintenance of bituminous surfaces. The thoroughness and care exercised in patching will determine, to a great extent, the riding qualities of the finished surface. Too much emphasis cannot be placed upon the importance of adequate patching. Several items are of particular significance, including shape of patch, size of aggregate, and the proportioning of the aggregate and bituminous material.

The shape of a bituminous patch has a pronounced effect upon its performance under traffic. From our investigations it was found that when a hole is shaped so that traffic enters on a feather edge and leaves on a vertical edge, very little rutting or shoving results.

Patches may be classed into two types: namely, skin patches and pre-mixed patches. The former type is generally used for small depressions less than $\frac{3}{4}$ of an inch in depth, while the latter is used for holes of greater depth. The first step is to outline or mark the depression. After marking, the surface is cleaned and painted with bituminous material. Dry aggregate screenings are then spread to absorb the excess bituminous material. The finished surface of the patch should be smooth and level with the surrounding road or street surface.

If too much bituminous material is used, the patch may become unstable during warm weather and shove, rut, or bleed. If too small an amount of bituminous material is used, the patch may ravel under traffic. To eliminate the possibilities of these occurrences, the materials used for patching should be pre-mixed. Much more uniform results can be secured in this manner.

In the deeper holes, larger aggregates should be used; when deeper than four inches, it is common practice to place large aggregate in the bottom and cover with fine aggregate. Successful patching is also dependent upon proper compaction. For good appearance, the same materials as were used in the original surface should be used for patching. All three of the bituminous materials commonly used, namely, cutback asphalts, emulsified asphalts, and tars, can be employed for patching. It is generally recognized that tars have better adhesive properties than asphalts, but that asphalts have more cohesive strength and are less susceptible to temperature changes and weathering.

Since the major portion of the patching material is aggregate, consideration should be given to the properties of the aggregate that make them suitable or unsuitable for this type of work. It is of primary im-

portance that the aggregate be hard and tough so that it can resist the abrasive action of traffic. These characteristics can be determined by standard tests. For patching materials, it is important that the aggregate be reasonably clean, to obtain good adherence of the bituminous material to the particles. Fine particles of dust, when present in the mixture, tend to change the consistency of the bituminous material. In the case of emulsified asphalt, excessive dust may cause it to break faster.

It has been recognized for some time that aggregates vary in their ability to resist stripping of the bituminous materials. The adhesion of the bituminous material to aggregate, in the presence of water, has received considerable attention in recent years. Investigations have been conducted to devise ways and means of improving the coating properties of various aggregates. Likewise, the grading of the aggregate used for patching is important, as it governs to a great extent the quantity of bituminous material required and also affects the stability of the finished patch.

Finally, weather conditions are important as they affect not only the prosecution of the work but also the performance of the patching materials. For example, in summer a coarse-textured patch may compact in place under traffic in warm weather, whereas in winter it would be whipped out by traffic in a day or two. In cold weather, particular care must be taken to insure a bond between the old pavement and the patched material. The finished surface must also be well sealed to prevent the entrance of surface moisture. In addition to the hindrance during construction mentioned above, adverse weather conditions affect the curing of the bituminous materials. Extensive tests were conducted by the Project a few years ago upon the effect of curing conditions upon the strength of aggregate-bituminous mixtures. These studies emphasized the importance of proper curing and indicated the cause of some failures which had been observed in the field. They confirmed field observations that best results with aggregate-bituminous mixtures were secured during the summer, when at least a month of hot weather remains for curing the bituminous material so that it may obtain higher strength.

CLYDE E. WILLIAMS: Our experience has not been very complimentary. We try to avoid patching as much as possible. Cuts are filled with bank-run gravel or cinders and left until weather permits patching with bituminous-coated aggregate. This works fine as long as the ground is frozen. When it rains, the cinders wash out.

This fall we used a patented admixture applied to our bituminous-coated aggregate material with slacked lime in a pugmill mixer that

seems to be working very well. If it proves satisfactory, we will stock-pile a quantity of the material for next winter.

QUESTION: Why can't the counties number the county highways?

ERNEST H. COFFIN: In answering this question, as many of the others, one can only give his personal opinion, and the answer given must be thus taken.

In 1939 this question was a subject for discussion at the Purdue Road School, and a very excellent paper was prepared by one of the road supervisors of our northern counties who had installed this system. Unfortunately, this paper failed to get into the Proceedings of that meeting, and I am able to give the figures only by memory. As I recall it, the cost of installation was approximately \$15,000.00, and he carried a maintenance crew at that time of four men and two trucks devoting all of their time to the sign department.

A few other counties have likewise installed the numbering system, but I have been unable to learn the original cost or the maintenance cost.

The numbering of roads in the main would benefit only strangers to a given community. Very few of you pay any attention to State Highway numbering within a radius of 100 miles, and the same would be true of the county roads in your vicinity. Hence, unless a uniform system could be adopted for all counties, a stranger coming into a county would first have to learn the key before the numbering system would be of any assistance.

It is my personal opinion that under present county highway financing, and until such time as the average county can have better solved their weed, brush, and hazardous bridge problems, it cannot economically afford to install this extensive sign department.

I can easily see that the need of a numbering system would be very much more advantageous in counties like Marion, and many other counties where the housing conditions are congested and the county roads are virtually city streets, but for the average county I would answer this question, "Why can't the counties number the county highways?" by saying, "With present finances they cannot afford it."

QUESTION: Through what sources can county surveyors and other public officials obtain reliable personnel? •

DON GILBERT: At present, help is where you can find it. We are all competing for help. I think a county official should look for and appeal to persons who will be more attracted by the kind of work.

the compensation, and the surroundings being offered, than by other offices or by defense jobs. The source is very much local.

QUESTION: In case of existing combined sewer system looking forward to an early installation of a sewage disposal plant, should a city adhere to future separate sewer system expansion? Trend of a new addition is to build houses, and first demand pavement and sidewalk; then later it becomes necessary to drain the storm-water, even before a sanitary sewer is demanded on account of previously installed septic tanks. Common practice is opposite to the textbook theory.

P. D. MEISENHELDER: The "trend" is quite prevalent. A man buys an acre of ground or a lot in an outlying section. He builds a house, drills a well, puts in a septic tank, and discharges the overflow into the roadside ditch. Others do likewise, and soon a new neighborhood has been created. With the prestige of their number, a pavement may be obtained for the road. After this improvement, the need of storm drainage becomes evident and is added. Then an effort is made to have the new section included in the corporation limits, or it may already have been. The last thing thought of or considered is sanitary sewers and sewage disposal. This sequence happens probably because of the builder's effort to "get by" with the least possible initial expenditure. But that it is sometimes easier to do a thing wrong does not make it right, and the total cost of the improvements would generally be less, and better results obtained if such a procedure were not followed.

To answer the question, I would definitely say "Yes". The size of the treatment plant to be built, and therefore its cost, will be established by the volume of sewage to be passed through it. Also, after the plant is completed, the operating cost would be increased by the larger volume of sewage. To be sure, it may be arranged, in the case of combined sewers, so that the peak or storm flow may partly by-pass the plant. This results in raw, untreated sewage being discharged into a stream, which is undesirable even though it is diluted. Even with such an arrangement it is not likely to make possible a reduction of the size of the plant to that which could be used with separate systems, not to mention difficulties from an operation standpoint. It may not be feasible to change over completely a combined system to a separate system, but certainly there is an opportunity for a step in the right direction when extensions are to be made.

The city of Indianapolis furnishes an example. The first portion of the present treating plant was placed in operation about 1925 or

1926; but the policy was adopted, I believe, about 1920, that any expansion of the sewer system should be separate sewers. For other cities confronted with this problem it is recommended that they adopt separate systems for any future expansion unless there should be some exceptional circumstances.

I would like to add that any city intending to build a sewage treatment plant as a post-war project would do well to complete the plans and specifications now. The great amount of detail work necessary requires time for careful preparation, and well-prepared plans and specifications will save money and result in a better job.

CLYDE E. WILLIAMS: The first consideration should be that of economics. There might be cases adaptable to the combined system and also cases where separate sewers would be more economical.

Nothing would be gained by constructing local sewers in a district that has some combined sewers. Control chambers would have to be built anyway, and part of the total flow diverted during rainy seasons.

I can think of at least one instance where separate sewers would be desirable. An outlying district might connect its sanitary sewers to an adjacent district without greatly overloading the combined sewers of that district. That would be desirable if it eliminated a lengthy trunk sewer. This can only be done when the natural run-off facilities are ample and the storm sewers can be constructed without too much expense. This arrangement would not change the treatment plant design, however.

QUESTION: What is the controlling factor in the amount of post-war work that should be planned?

RAYMOND L. PIKE: It is my opinion that *need* is the one factor that should control all our planning for the future. I realize that unless we should experience mass unemployment during the conversion period, we may be preparing plans for needed projects that may not all be constructed for some years. I feel, however, that in the past most of us have been too slow in preparing our plans for improvements. We usually wait until the last minute and then rush the planning work at such speed that all phases do not receive proper study and consideration. Under ordinary circumstances it is a decided advantage to have plans for worthwhile projects prepared well in advance, so that everyone concerned can have sufficient time to review and perfect any plans made.

As I said in my talk Monday, I would recommend that *first of all* we should plan those projects for which funds are or can be made avail-

able for both the planning and the construction. We should *next* plan those projects for which funds are available for the planning and for which a portion of the cost of construction can be secured. *Finally*, we should do everything possible towards perfecting plans for those projects which are needed and for which funds are not now available.

QUESTION: What is the best method of laying a new surface on old asphalt pavements on residential streets with light traffic?

CLYDE E. WILLIAMS: I suppose every engineer and every street commissioner in the State has an answer all his own for this question except me, and everyone thinks his answer is the best. I don't know because we haven't done any actual resurfacing. I'd like to mention one thing we did do that I think is worthy.

We had some downtown asphalt streets come through the last winter in a terrible condition. They were cracked so badly that there wasn't anything solid enough to patch to and expect it to hold; and there was plenty of patching to be done.

We planned to resurface these with 1½ inches to 2 inches of hot (AH) top. Upon investigation we found that cutback could not be obtained for that purpose; only .3 gallon would be allowed for maintenance. We decided to try to salvage what was left of the pavement by patching, and to put on a seal coat that would last until asphalt was again available.

Three-tenths gallon per square yard of cutback was applied after holes ¾-inch and greater in depth were patched, and from 30 to 40 pounds of No. 12 stone was applied uniformly to the surface. This was followed by a road maintainer equipped with steel wire brushes, which tended to smooth out the surface. We followed this with a light roller that also tended to level the surface and embed the stone. Traffic followed, and the surplus stone was taken up later. Thus far there hasn't a crack developed in the surface of these pavements. Unless I am badly mistaken, and the following freezing and thawing will be the final test, we saved many square yards of pavement by this process.

QUESTION: What part should a county surveyor play in planning for the post-war period?

DON GILBERT: The county surveyor should give, or offer, his professional advice to any post-war planning agency that may exist in his county. He could plan a program of county drain repair—an act by the Legislature enabling the counties to own and operate equipment

would help—so that, when and if the time of unemployment comes, he could use more labor.

The development of county recreational areas and county reforestation are other possibilities that could come under the jurisdiction of the county surveyor to use labor for a useful purpose.

The Acts of 1935 enable a county to acquire lands and plant and maintain forests owned by the county.

QUESTION: Should not engineers and public officials work more closely with industries, labor, school-recreation, and park directors?

CLYDE E. WILLIAMS: The degree of co-operation of engineers with industry, labor, and recreational and park directors is something that cannot be measured. Some officials may co-operate less than others and still feel that they are co-operating to the fullest extent.

In matters of traffic, it is essential that the engineer, industry, and labor sit down together and study the problem. In addition to these, it is essential that the transportation utility be represented. Recent co-operation of the school and city officials, the park director, and the engineer has resulted in a uniform system of winter-playground facilities on the streets and proper protective devices.