THE SECONDARY-ROAD PROBLEM

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The secondary-road problem is one which has increased in importance year by year until it is now one of the foremost topics of discussion in highway circles. People living on the back roads have watched the progress of improvements on the main trunk lines over a long period of time. They have seen them paved, repaved, widened, and resurfaced to meet ever-changing traffic conditions, and they have wondered why the unimproved trails leading past their own homes have been all but forgotten.

Fast transportation on the main roads has led to the adoption of consolidated schools with their thousands of miles of school bus routes. The rural mail carriers travel nearly two million miles every week day to deliver the mail; hundreds of thousands of miles are traveled every day by trucks hauling farm produce to market; but those back roads, otherwise known as secondary roads, are in pretty much the same condition now that they were twenty years ago, except for a rather insignificant mileage as compared with the total. Rural mail carriers' associations, school boards, farm organizations, and many others are now beginning to demand better service on the so-called farm-to-market roads. These demands are now being heard by Congress, and by the various state legislatures, with the result that during the past few years many laws have been passed and much money has been appropriated for the benefit of the secondary roads.

All of these efforts seem rather puny, however, when compared with the colossal size of the job before us. Sixty per cent of the 30,000,000 farm people in this country are living today on roads which are impassable during certain portions of the year. What is the answer? What methods and general plans may be employed to improve this enormous mileage of rural roads in the shortest length of time? This accomplishment will not be brought about by the activity of any one group or of any one administrative body. The job will not be done in a reasonable length of time by the U. S. Bureau of Public Roads or by the various state highway departments or by our present hit-and-miss methods of county and township administrations. If we attain any reasonable success with the development of this vast system of roads within a reasonable time, it will only be brought about by the maximum coordination of effort of federal, state, and county highway bodies. In other words, we must try to develop the maximum efficiency of existing highway organizations by seeking out and correcting the weak spots.
You may well ask, "How can this best be accomplished?" Well, there are three rules which must be observed, and they may be listed as follows:

1. We must have the best possible political and administrative set-up from top to bottom.
2. We must have adequate finances.
3. We must have competent technical administration of the work and the most efficient use of local materials.

Let us analyze each one of these major requirements and see what may be done with our present set-up to make it function according to these ideals.

**POLITICAL AND ADMINISTRATIVE SET-UP**

No doubt everyone will agree that the present political and administrative set-ups for the U. S. Bureau of Public Roads and for the various state highway departments are satisfactory. There may be some individual exceptions, but generally speaking, the coordinated effort of the Bureau and of the state highway departments is accomplishing excellent results. On the other end of the scale, we can probably all agree that the township unit is obviously too small for efficient administration of highway work, except in a few scattered instances. It is not being suggested that the township unit be eliminated as a unit of government, but that the administration of highway affairs calls for a type of personnel, equipment, and organization which is impossible in a unit as small as a township.

Let us assume then that the smallest highway unit shall be the county. Does the county unit measure up with the Bureau of Public Roads and the state highway departments? We all know that it does not, except in certain instances which are all too few. Failure on the part of the counties to meet the increasing demand for rural road development has in some states led to the elimination of county units and has turned the administration of highway work over to the states. This is a rather natural public reaction; if the county is not accomplishing results, why not try the state? North Carolina and Pennsylvania are outstanding examples, but even this drastic change has not accomplished what the people sought. It seems to be impossible to obtain enough money at the top to finance such a program. In a conversation a short time ago Mr. MacDonald, Chief of the U. S. Bureau of Public Roads, stated, "It looks as though we have about reached the limit on the question of obtaining finances at the top. Our future development must depend more and more on the interest and development of the local units and of their willingness to assist in financing the job." It is now quite clear that the maximum development of secondary roads cannot be obtained without the political influence and financial assistance of the county.
units. The solution does not lie in the elimination of county units in favor of state units, but rather in the proper development of those same county units. While it may be granted that a state unit in certain cases can efficiently carry out the improvement and maintenance of the secondary-road system, it does not at all follow that the state unit may be able to obtain the necessary finances to carry on a sufficient program. In fact, present information points to the contrary. Let us then proceed to the business of developing the best possible county unit for handling this job.

The county set-ups are different in almost all states, and it is easy to find faults in most of them. The wrong kind of political or administrative structure is at the bottom of most of the faults. Where we have county highway officials elected by the people, we find inherent in the system many of the faults which have made the townships inefficient. On the other hand, where the county highway authority is too far removed from the people, the highway organization is not sufficiently responsive to the wishes of the public. The ideal set-up is one which will be reasonably responsive to public will, but at the same time be sufficiently independent to carry out long-range policies and programs.

In 1930, it was my good fortune to assist in carrying out a study of county organizations for the American Road Builders’ Association. This involved extended trips where types of organization and the results obtained from them might be studied right on the ground. In this manner, and with the help of the information previously gathered, I obtained a rather complete picture of the entire country as regards county organization and administration. I am sorry to say that much was extremely disappointing; but there were also a great many examples of efficiently operated counties. In those cases, the reasons for good results were usually apparent and were, as a rule, inherent in the general set-up and not alone the work of certain outstanding individuals, but rather a combination of a good political set-up with the proper personnel. The more I learned about the nationwide situation, the more I acquired respect for the county set-up in my own state of Michigan. I say, without any spirit of boastfulness whatever, that the Michigan county set-up meets the ideal requirements previously outlined more nearly than that in any other state which was investigated. The Michigan county set-up still has many weak spots to be improved, but the proper basic principles are there, and perhaps a brief explanation of the system may be in order at this time.

The governing body of the county is the board of supervisors. County highway work is under the jurisdiction of a three-man county road commission, which is appointed by the board of supervisors. The three commissioners are appointed for six-year staggered terms. This is an important factor,
as it makes for continuity in the planning and execution of a program. The county road law of Michigan requires that the commissioners act as an administrative body only, and that they employ a competent engineer or superintendent to handle the actual administration of the work. This usually leads to the building of efficient organizations which are not torn down or interrupted through changes in the personnel of the three-man commission. One of the weak spots in the system is the provision that under certain conditions the commissioners may be elected by the people. This is done in some counties, and experience over a long period of years has plainly shown that the appointive plan is superior. In fact, there is now appearing considerable sentiment in favor of amending the county road law to provide for the appointment of road commissioners in all counties in the state. In my county of Kent, the chairman of the commission has been a member of the board for more than seventeen years, and the other two members have been on the board nearly as long. I have been employed as engineer-manager for the board for a little over seventeen years. I have never had a contract with the board, but have simply served in this capacity without any particular term of office, the only requirement being that my results must be satisfactory to the board. Kent county is no exception to the rule in this respect. A great many counties in Michigan have about this same kind of record with respect to the service of their personnel. It is worthy of note that the road commissioners are appointed by a bi-partisan board of supervisors, which makes it imperative that the road commissioners stay out of party politics. It then logically follows that the road commission's organization will do likewise.

In certain instances in Michigan the road commissioners have violated the law by failing to operate as an administrative body only. This is particularly true in some of the poorer counties where the road commissioners have taken it upon themselves to handle much of the work directly. This plan of operation has led to many difficulties and is one of our weak spots which must be corrected. It should not be inferred that the Michigan plan is the only satisfactory solution; this is one way of doing it and is something to aim at. At least the results obtained over a long time have shown the value of certain outstanding points in the set-up so that they may be recommended for use in places where changes are contemplated. The township highway unit in Michigan has been eliminated, and all of the former township roads are now under the jurisdiction of the counties. While this has apparently been a step forward, the counties have already experienced difficulty in obtaining the money to do the job which was formerly paid for by the townships. In this respect, it is a direct parallel with the situation where states have taken over county units.
ADEQUATE FINANCING

After we have a satisfactory political and administrative structure, we still can accomplish very little without adequate finances to do the job. Again we find it necessary to coordinate the efforts of federal, state, and county agencies; this can also well include townships in states where they exist. Most of us can remember when federal aid was first extended to the states. At that time, many of the state highway departments were woefully lacking in proper organizations to carry out a logical highway program, particularly as to the engineering qualifications of its organization. The Bureau of Public Roads laid down certain requirements which the states would have to meet in order to obtain the federal aid. In the space of a few years, all of the states had found ways and means of complying with the Bureau's requirements. The influence of the Bureau has done a great deal to develop the state highway organizations to the high standards of today. It is felt by many that some plan which will extend this same idea from the states to the counties might accomplish similar results. Advocates of this plan, together with organizations boosting for rural road improvements, have succeeded in obtaining limited federal funds for use on secondary roads. It is difficult to justify federal aid for these secondary roads unless it results in the improvement of the county organizations. With this thought in mind, the counties of Michigan, in cooperation with the state highway department, have worked out a plan which is more or less a duplication of the original federal aid plan to states. In this case, the federal aid money is being allotted to counties on the same plan by which federal money is being allotted to states. The state highway department will exercise about the same degree of control over the county work that the Bureau of Public Roads now exercises over the state highway departments. In order to obtain the federal aid, each county must match its allotment 50-50, and must furnish engineering services of a quality satisfactory to the state highway department. The county engineer will make the surveys, plans, and estimates and furnish the necessary engineering supervision and inspection during construction. It is felt that this plan will undoubtedly lead to a general improvement of the county engineering organizations. There are eighty-three counties in the state, and all but sixteen of them have submitted projects for approval and will carry out the program as planned.

If federal aid for secondary roads is to be continued, some such plan as this should be carried out in every state. Otherwise, the federal aid money will become a deterrent to proper development of the county units. It is obvious that we cannot hope to improve any large mileage of our county roads with federal aid, but it can be used to set up the proper organization
and plan for handling the balance of the county work which may be financed otherwise. The most prevalent plan for financing county work at present is through the collection of gas and weight tax or license moneys. In every state, there should be a fair division of these funds between the state highway department and the counties. It is regrettable, however, that there is so great a tendency nowadays to eliminate all other forms of revenue for highway construction and maintenance. If we are to improve the millions of miles of unimproved farm-to-market roads within a reasonable length of time, the local units must stay in the picture. Where township units exist, they should be asked to contribute through the township-at-large taxes, and their interest should be encouraged by giving them something to say as to what their tax money should be expended for; in fact, their degree of control in this respect should be about in proportion to the amounts of money furnished by such units. This type of participation may be stimulated by working out county-wide programs which are to be financed 50% by the county and 50% by the township.

In 1937, we carried out such a 50-50 program in Kent County with splendid success. A similar program has already been laid out and approved for 1938. All appropriations by the townships are voted on by the people at their annual township meetings in the spring. It is quite evident that the people are much more willing to vote tax money if they are closely associated with the program and have something to say about it. While the appropriation in each township is small, it should be remembered that in the aggregate, the total of such appropriations can very easily become larger than we could ever hope to obtain through federal aid or possibly through state aid. All three sources of revenue should be linked together so that there is a proper distribution of the funds and in such a way that the interest of all highway organizations from top to bottom is kept alive and active. Whenever control of the work is taken away from one of the units, such as the county, the initiative and the will of that unit to raise funds is almost immediately eliminated. This is the only way that adequate finances may be obtained.

COMPETENT TECHNICAL ADMINISTRATION AND EFFICIENT USE OF LOCAL MATERIALS

After we have an appropriate political and administrative set-up, and adequate finances to handle the work, we still have the job to do. The people expect maximum returns on their investment; therefore, the funds available must be made to produce the maximum mileage of good roads. Just how can this be done and what are the things which must be considered of first importance? In the writer's opinion,
all of the roads on the secondary system should be reasonably well maintained before using the finances for other purposes. Even the most optimistic can hardly see far enough into the future to estimate a time when we can say that all of our secondary roads have been improved. This being the case, it is unfair to ask all of the people to assist in furnishing highway funds and then furnish service to only a few where funds may be available for new improvements. All of the roads should be maintained in reasonable condition for rural mail service, school bus routes, and other delivery services which have become such an important part of the rural residents' daily existence. There are times when it is next to impossible to keep many of the roads passable because of certain seasonal weather conditions (Figs. 1 and 2). How well we can do the job at these times depends, of course, on many factors and must be left to the judgment of the local highway authorities. It should be remembered, however, that the rural residents will be much more willing to contribute tax money for improvements to roads on which they do not live if they are being furnished with reasonable maintenance service at the same time. With the large mileage of roads in every county, it goes without saying that an efficient maintenance force must be well organized and must be furnished with proper equipment, materials, and personnel to do the work.

Any funds remaining after provisions for reasonable maintenance should be used to improve as much mileage as possible. The number of miles which can be improved with a given amount of money depends to a great extent upon the ideas of
the individual who has charge of carrying out the program. It is therefore highly important that each county, or, in some cases, groups of counties, employ the services of trained and experienced engineers. Those engineers who have had considerable experience in both county and state work are especially valuable. Men trained only in state highway work usually have a tendency to carry out design standards which are too high to be practical on the majority of our county roads, with the result that the mileage improved is too small either to satisfy public opinion or to make satisfactory progress on a long-time construction program. Engineers trained only on county work have a tendency to hold their standards so low that so-called stage construction becomes impossible; in other words, further developments on their roads call for complete reconstruction rather than stage construction, which simply adds something to what was previously built. This plan of handling the work is of course wasteful in the long run, but it has the immediate advantage of satisfying more people. The best type of engineer is the one who can strike a happy medium between these two extremes, who will keep the clamor for mileage fairly well in hand, without at the same time sacrificing so much on design standards that the original investment is lost when the future developments come about. This situation is one which can hardly be put down in black on white for a young engineer to follow. Years of experience alone can give a man the judgment necessary to arrive at the proper balance.

It is of course obvious that the county engineer must know the technic of road building; but there is another angle to the situation which calls for a combination of engineering skill,
a knowledge of local materials available, and a great deal of original thinking. Any competent engineer can build one of our standard-type roads by shipping in the necessary materials, but when a man builds highly satisfactory roads out of cheap materials found close at hand which perhaps are not ordinarily used in road building, that is real engineering. Engineers should not become prejudiced as to types, but should keep ever before them the idea of getting the most good roads for the least money, and they should learn to use the types which will accomplish that result.

In general, it is safe to say that most improvements should be constructed of such materials and in such manner that

Fig. 3. Rebuilding and widening a section of road that broke up badly each spring. Shoulders built up ready for gravel surface—6" to 10" thick, and 21' wide.

Fig. 4. Gravel being added and compacted with tamper roller—21' wide, 10" thick at shoulder, 6" thick at center.
the road may be further developed by stage construction methods (Figs. 3, 4, 5, and 6). There are many instances, however, when even this rule must be sacrificed in favor of greater mileage. Public demand and high-speed automobiles operating on low-pressure balloon tires today call for smooth, dustless surfaces, and no matter what type of road we construct we should plan for an eventual surface which meets these requirements.

The question of bridges on secondary roads is another where there is plenty of room left for ingenuity and original

Fig. 5. The gravel base completed and ready to receive bituminous surface.

Fig. 6. A 1 1/2" mixed-in-place bituminous retread surface, 20' wide, placed on the re-constructed gravel base.
thinking (Figs. 7, 8, and 9). We have not by any means exhausted the field of design, particularly with reference to small bridges. Nearly every county has literally hundreds of small bridges which are weak and out of date (Fig. 10) and must be replaced or rebuilt as time goes on. The combined cost of all of these bridges runs into large figures, and there is still plenty of opportunity to work out designs for permanent structures for less money than they have been costing us in the past.

In conclusion, let me repeat that the secondary-road problem is not to be solved by a single idea but rather by a combination of a proper administrative organization operating with sufficient finances to construct our secondary roads at a reasonable rate, by the employment of skilled engineering serv-

Fig. 7. A two-span structure over Rogue River—total length, 45 feet. Stringers continuous over center pier. Reinforced concrete floor and railings. Center pier and abutments constructed of H-piles backed up by heavy corrugated metal sheets. All cross framing, plates, and stringers welded solidly together. Total cost $5,522.00, including approaches, channel change, and engineering costs.

Fig. 8. Same bridge as Fig. 7. Roadway still unimproved.
Fig. 9. Showing how H-piles are protected at water line. A length of sewer pipe is stripped down over the pile and filled with concrete.

Fig. 10. Strengthening and repairing old steel truss bridge. Welder at work on floor beam. Steel members are added by welding wherever necessary to furnish additional strength. Practically all old steel bridges may be brought up to legal loading capacity in this manner.

ices combined with the most efficient use of available materials. When this plan of county operation is combined in the general picture with the federal and state highway activities, the maximum results consistent with reasonable taxation will be obtained.