

# A Program for Development and Research in Local Rural Highway Administration

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Improvement of local rural highway administration would be greatly facilitated by the solution of four basic problems. They are:

1. A general understanding of the professional character of the qualifications required of the executive of the local rural highway department. These qualifications include (a) specialized knowledge of highway engineering and (b) a capacity for management.
2. Development of usable uniform cost accounting procedures.
3. Development of criteria for measuring the performance of road equipment.
4. Development of standards for local road maintenance.

Although the first problem is more fundamental than the others, its solution will likely emerge as a by-product of the attack on the others. And the solutions of the others are most likely to be adaptations to highway matters of knowledge and procedures already known and used in other areas. It is suggested, therefore, that applied rather than pure research is indicated.

A secondary problem is composed of two parts: (a) how may local rural highway management be aroused to seek assistance, and (b) how may those with knowledge which can be adapted to the needs be brought into effective contact with the needs.

It is suggested that imaginative leadership may accomplish this contact and that ways of financing the procedure can be found.

● **THE PRIMARY** and perhaps the basic current problem of local rural highway administration is to secure an understanding and general acceptance of the nature of the professional qualifications required of the executive of the county highway department. This problem exists because of the specific way in which the organization for the supply of local road services developed.

Roads have been constructed and maintained from the beginning of American history by the people who use them, and from the beginning of our history the predominate use of roads has been by the people who live in the immediate neighborhood. Also the main services to the people were performed by local governments of one kind or another. Hence, these local governments were assigned the task of supplying road facilities.

This they could do. The materials to build the roads were ready at hand along the way where they were to be used. The finances to purchase them were contributed by the people who owned the land served by the roads. The labor to work the roads was to be found in the homes on the adjoining land. Further, the know-how to build and maintain the roads was essentially the same as that required to wrest a living from the land. So when a man was selected by his neighbors to be their political officer, he had the qualifications to manage their roads. If he got elected, he would know how to manage the one or two or three men who might have worked for him on his farm.

Had the society been static there would be no serious road problems; but two revolutions took place. The first was specialization, or the division of labor. As a result of it, men working on the roads spent their whole time at it. These men no longer built roads in order to go and come to their own homes, and a new motivation had to be supplied to them. Providing this motivation became the task of management, of the new

full-time executive of the road department. It was necessary that he acquire the knowledge and skills of leadership of how to organize workers into an efficient unit. In short the official was required to have managerial know-how. This was the first revolution.

The second was the development of a body of specialized knowledge. It had equally far reaching implications. This body of knowledge, already great, is being added to constantly. Now a man has to have special training in order to be able to use it and to keep up with the accretion of new knowledge.

Legislatures have recognized these developments by providing highway-department structure which takes them into account. The usual pattern is an elected board with an appointed executive official who is supposed to have the technical and managerial know-how. Legislative awareness in a number of states of the need for technical know-how is shown by the requirement that the executive be a registered professional engineer. This is a handy standard. Training and experience in highway work also may be used to test engineering competence. On the other hand neither county boards or public opinion have shown as much awareness of the need for technical know-how as have the legislatures. Where this is true the problem is one of securing a comprehension of their importance. This is primarily an educational process, but in some instances education may be buttressed by legislation.

On the other hand the standards for managerial know-how are subjective, hard to set down in writing. It is generally supposed that the kind of knowledge which a man must have to get himself elected is the kind which fits him to judge the capacity of another man to manage. While this is true, it seems likely that research might develop standards which would be as useful as are those now used for measuring engineering know-how.

However, the immediate problem is not so much the development of standards for judging the managerial know-how of candidates for positions as county highway executives, but the recognition by the public and policy boards of the necessity that their executive employees have such qualifications.

The lack of a general understanding of the professional qualifications of the executive employee of the board is reflected in the functioning of many county highway departments. For example, in practice there is no distinction between the formulation of policy and its execution. Boards do not understand how they are charged with responsibility for reviewing the work of the road department to see whether it was done as planned and what can be learned from the experience of the past year to improve the policy for the next. Often the executive employee of the board fails to understand fully what his function is, how he should collect information, and shape it into recommendations to the board, how he can use his professional association to help keep up-to-date with the professional knowledge, and how his professional stature can be strengthened through his own affiliation with other members of the association. Frequently he does not have a proper appreciation of his role as manager.

The second problem is: How can usable uniform cost accounting procedures to provide comparative standards of performance be devised and installed in the counties?

The county highway department, like any other agency supported by public funds, needs special attention given to means whereby it can judge its own performance. Private agencies have automatic built-in standards to measure their success or failure. Since they sell what they produce, be it goods or services, they must be able to produce for less than they can sell for. They must make a profit or they go out of business. A county highway department has no such standard; and further, the forces of inertia and the fear of offending public opinion by innovation are so strong that responsible officials are unlikely to be concerned over how well each unit of work is being done.

It is the purpose of cost accounting procedures to provide standards of judgment for counties. These standards are of two kinds. In the first place, each operation carried on in the county can be evaluated in terms of its absolute cost and in terms of cost in relation to the cost of other activities. For example, is it preferable to use crushed limestone or gravel on a given road? In the second place, both individual operations and the work of the county as a whole can be judged in terms of what other counties are doing.

In order for a cost accounting system to be used by counties to evaluate their own operations, the system must have the following characteristics, and be used under the following conditions: (a) It must be accurate. (b) It must be simple; that is it must be sufficiently simple that workmen or their foremen can fill out daily reports on how much, where, and by whom work is done, what supplies, materials, and equipment are used, etc. (c) The work must be classified into categories and the distinctions so clearly understood that it is always reported in the same category. (d) Constant, central supervision must be carried on to secure uniformity. This necessitates regular consultation among county highway executives, schooling of the bookkeepers either by bringing them together at least annually or by providing someone to visit with them and supervise their practices to keep them uniform. (e) The data collected in each county should be subjected to central analysis. (f) Information developed by the central analysis should be distributed regularly to all interested counties. (g) Each county should be privileged to ask for a special analysis of comparative data to help it with its own special problems.

When a county highway executive has the benefit of accurate data in the formulation of his recommendations to his board, the advantages for public relations, employee morale, road construction, and maintenance are too obvious to require further comment.

The third problem is the development of criteria for measuring the performance of equipment. The only presently available criteria are provided by common sense observation—how much work should be expected of a truck, a motor patrol. Should the performance of a given piece of equipment be measured in the number of hours worked, amount of work done, or by some other standards? How does one know whether he has a balanced equipment fleet? When is a fleet of trucks so large as to require another leader? Does one need a motor grader for each 50, 75, 100, 150, or 200 miles of gravel road? What sizes of motor graders are most efficient for different jobs? What size of trucks is required for most efficient operation? When should equipment be rented rather than owned? Indeed, what proportion of the total amount of the road budget should be spent on equipment?

The fourth problem is the development of standards for road maintenance. When is maintenance no longer economical and new construction to be advised? What is the relation between the volume of traffic and the need for blading a gravel road; between the quality of gravel used to surface the road, and the need for blading; between soil conditions and surface treatment? How much float should a motor grader carry across the surface of a road? Should a windrow be left along the edge during dry weather? Should dry maintenance be used or should water be applied as is done in some places? This list of questions could be extended indefinitely.

This list of problems—the recognition of the professional character of county highway management; uniform cost accounting, standards for evaluating equipment and its operation, maintenance standards—are the central problems. Deal with them and they reduce the complexity of other problems and open the way to their solution. It is suggested therefore that attack on these problems holds promise of yielding results of considerable magnitude.

How can each of the problems be got at? Consider each in the order listed.

First: How to secure a general understanding and recognition of the professional character of the qualified county road executive. The characteristics of a profession are the possession of specialized knowledge which can be secured only by prolonged training and which can be applied to some practical every day problem. Obviously nothing can be done to confer these characteristics on a group of men. It is a growing process which must go on in each man. He, himself, must earn his own way into the possession of knowledge and acquire the skills to apply it. Membership in a profession is in a sense the by-product of long training and practice.

What can the members of the profession do to bring about such a development?

First: Such a group of men should associate themselves together; first, because they can and do learn from each other; and second, because by association they are able to secure public recognition. A logical first unit for association is the state. County highway executives have demonstrated the usefulness of state association; for

example, in Illinois, Iowa, Kansas, and Minnesota County Highway Engineers have performed a signal service to the whole profession by demonstrating how status can be achieved through a vigorous state association. The local Division of the American Road Builders Association has long served as a clearing house for information for roadmen, though it serves a wider purpose than the professional needs of the county highway executive. The need for a national association whose membership is limited to professional men only was recognized by the formation of the National Association of County Engineers in 1956. Whether the profession of county highway executive is viable on a national scale is to be determined by how such an association as the National Association of County Engineers fares. If it succeeds, then we have a nation-wide profession. If it fails, then at most we can have a profession only in geographic pockets. This is a matter for the county highway executives themselves to decide. If they join the associations, taking an active part in their activities, and make them go, the profession will develop and the public interest will be better served. If not, the public interest will suffer, but no one but the county executives themselves can give the answer to this.

The Minnesota County Highway Engineers Association has demonstrated the technique of how to develop an understanding and recognition of the professional character of the highway executive. Its policy from the early days of the association was to disregard the individual personal advantage of the members of the association and to seek only the advancement of highway service to the people. The county highway executives in Minnesota have worked together, pooled their knowledge, supplied information to the highway department and the legislature, supported the case for better highways and streets, held high class institutes concerned with technical and managerial aspects of county highway departments, and by this they have won a high professional place for themselves. This has been a frontier venture which has pointed the direction and pioneered the way for every county highway executive in every state of the union.

The National Association of County Engineers has adopted a program which will permit a comparable development on a national scale. It has classified the functions of county road departments into nine main categories and set up committees to study these functions. Some of these committees have already begun to function in a way which shows there is solid basis for a developing consciousness of a nation wide profession.

It may be suggested that the profession of county highway executives should assume the initiative in the whole area of local road development. It should devise projects; it should assign these to committees of its own membership; it may have the work done by its own members or it may employ staff from the outside. It may ask assistance from outside specialists, but because of its familiarity with the problems it should be able to discover most of the needs earlier than outsiders. It should be ever alert to developments where ever they might occur which might throw light on road problems or which can be appropriated to the benefit of rural road building and maintenance.

The primary solution to the problem of securing an understanding and general recognition of the profession of the county highway executive is for the profession itself to seize the initiative in the attack on the problems of county highway management. There are a number of problems in the management field which should be attacked. It was pointed out above that standards are needed for judging managerial know-how. The practices of private and other public and private agencies should be examined to see if they have standards which are adaptable to counties. Second, inquiry should be undertaken to see if standards can be developed from county highway experience. Other inquiry could include, among other things; organizational arrangements; incentives; recruitment; promotions within departments, from county to county, and from positions in one state to positions in other states. But these problems are secondary to the recognition of highway executives themselves that they must themselves through their associations assume the initiative in dealing with these and other matters. And as they dedicate themselves through their associations to these or other problems, they will create a most favorable atmosphere for the growth of their profession and its subsequent general acceptance.

While the primary burden for earning a professional status rests with county highway executives themselves, they may receive assistance from other sources and co-operate to this purpose with other persons and groups. For example, the Washington State

Association of County Commissioners arranged for a joint committee of commissioners and county road engineers to study the functions of the board and of the engineer and the relations between the board and the engineer. The study resulted in the preparation of a manual setting forth these relations and functions. It is difficult to conceive of a project which would contribute more to the improvement of county highway administration than for the officials themselves to engage in such an undertaking as did Washington county officials. This project could be undertaken with great profit in each of the states. The National Association of County Engineers has such a project in the planning stage.

We may now turn to the second of the major problems—the development of uniform accounting procedures.

The problem here is primarily one of adaptation rather than of discovering new procedures. The profession of accountants has devised ways of keeping track of the amounts of materials, labor, and all other elements of cost in the productive process. They know how to analyze the records and to understand their meaning and how they may be used to guide future actions. Four aspects of adapting accounting to county highways need specific inquiry: (a) The provision of forms to report daily work which are simple enough that crew men or foremen will fill them out accurately. (b) How best to educate these persons to fill out the necessary forms. (c) How to secure uniformity in keeping records throughout each state and between states. (d) How the records of each county can be analyzed for the benefit of all other counties.

Minnesota experience since 1945 has shown that these four problems are the chief ones in a cost accounting system. Plans in Minnesota to deal with these seem to point the way to a solution of them. Agreement was first reached on a classification of activities so that each county would record the same activity in the same category as did every other county. This has been approached through a stream of directives and the production of a manual. It is understood that arrangements have been made for traveling auditors to work with the county bookkeepers to insure uniformity. It is also understood that some kind of a central analysis is to be attempted. Washington county men have also devised and installed an accounting system.

Perhaps a description of a project which is underway in Indiana will illustrate the kind of thing which could be attempted in other states. Prior to the present, only sporadic efforts have been made in Indiana counties to keep records for management purposes. However, a number of counties have from time to time expressed an interest in the problem and a few have been working on it by themselves. Plans for setting up a system were made known to the counties. Those which had expressed an interest in the project were invited to attend a planning conference. As a result of all counties being notified of what was under way, a number of others also came so that about one-fifth of all the counties attended the preliminary conference. A certified public accountant, a graduate student in the Business School of Indiana University, has been employed to do the staff work. He is charged with: (a) preparing forms; (b) holding training sessions with the participant county bookkeepers; (c) installing the system in those counties and visiting them to see that the records are being kept uniformly; (d) devising a means of analyzing records and distributing information as to trends, and comparative results of different operations for the information of all participants.

It is planned for this man to work at this project until June 1, 1959. By that time, it is anticipated that the project will be developed to the point that it can be turned over to some official agency which can extend the system to the counties which have not yet adopted it. Also by that time it is anticipated that a system for central analysis and the distribution of information will have been developed so that participating counties will be eager for it. The means of financing the project will be discussed at a later point.

If a number of states could undertake such a project, then some type of national coordinating body should be developed. It would seem the National Association of County Engineers would have a direct interest in this and it would seem that contact with committees of AASHO would be useful. Improving the degree of uniformity and the development of central analysis are the points of growth in the states having usable cost records. The states not having such records should consider the adoption of a management-records system.

Criteria for measuring road equipment productivity are as yet practically nonexistent.

It would seem that one promising approach to the problem would be to examine existing county equipment records. There are a number of counties which do keep records. For example, it is believed that individual counties in such states as Illinois, Iowa, Kansas, Michigan, Minnesota, Wisconsin, and Washington have records which would show the number of hours each piece of equipment has worked during its entire life in the county, the costs of repairs, grease, tires, fuel, oil, and amount of work done. If records in the county highway offices in these or other states were analyzed, significant information might be revealed. In the course of time, such information as this may become available from the cost records referred to above. But, the value of such information is such that it should be sought out from every source available at the earliest opportunity.

Another project should be seriously considered, namely, a controlled experiment with equipment. Once, sufficient, reliable data have been collected, then it should be possible to devise experiments to determine whether more or less units of a given piece of equipment would provide better results and whether different combinations would be more efficient.

Projects for the development of maintenance standards should be designed, first, to find out what is now done; and, second, to find the effects of varying amounts of maintenance; and, third, to establish relations between soils, kinds of road surfaces, weather conditions, and volume and weight of traffic.

The maintenance project as conceived by Howard Bussard of the Automotive Safety Foundation was developed and adopted by the Minnesota County Highway Engineers Association in 1955 pointed the way. Unfortunately, the prosecution of this project had to be postponed because of the press of other matters.

This was a most ambitious project. It was anticipated that as many as from 50 to 60 counties would each select for study sections of both bituminous and gravel surfaced roads. The plan called for accurate records of work done, for varying the amounts done and for a comparison of results. The engineers themselves through committees of their own members appointed by the officials of the state association were to assume the burden not only of formulating the plans for the project but for actually carrying it out. A manual of operations was in process of being completed to secure uniformity in procedure. While the volume of work in developing and executing the plans for this project would be many times greater than anything attempted before, it is of the same character of other projects completed by the Minnesota County Engineers. For example, with their own initiative they did plan, develop, and install and operate a system of cost records. The esprit de corps and the momentum generated through 15 years of successful association together may be such that they could carry this project to a successful conclusion. But it may be suggested that the task would be easier if ways could be found whereby they could supply themselves with a staff to do the leg work in such a time consuming and extensive undertaking as their maintenance project.

Similar projects should be undertaken in several other states, but it would seem to be almost unreasonable to expect county highway executives, generally isolated as they are in many states, to assume the initiative, plan projects, and to undertake the time-consuming task of the added maintenance work with the meticulous accuracy necessary to a successful conclusion of the project.

This brings us to a consideration of a means of financing and supplying staff for projects such as this.

In a number of states ear-marked funds special agencies, etc., are available for financing and prosecuting research. Among these states are Alabama, Indiana, Iowa, Washington. In 1935 Congress adopted the policy of providing that up to one-and-one-half percent of all highway construction funds appropriated for distribution to the states might be used for highway planning surveys, research, testing, etc. This policy, inaugurated when all federal funds were to be matched in equal amounts by the states, has been continued with those funds which permit decreased matching requirements for the states. For reasons of convenience the Bureau of Public Roads has lumped all one-and-one-half percent funds together—those which must be met equally by the state and those which require the state to put up 10 cents to match 90 cents contributed by the national government. When the fifty-fifty and ninety-ten one-and-one-half percent funds are thus mingled, the state contribution to any given research project usually amounts to

something in the neighborhood of 30 cents to 70 cents contributed by the national government. Consequently, there is an abundance of money available for the national contributions to research projects.

Counties have ordinarily benefited indirectly from the expenditures of one-and-one-half percent funds, as for example, the information developed in the Highway Planning Surveys. However, there are precedents for projects being undertaken expressly for the benefit of counties and paid for out of the one-and-one-half percent funds. For example, during the summer of 1957, an Indiana county project was paid for from these funds. Among other things, a manual for county use of Federal Aid on secondary roads was prepared. And the Indiana state associations of County Commissioners and County Road Supervisors are applying to the Indiana State Highway Department for one-and-one-half percent funds to finance the project described above to establish a system of cost records for managerial purposes in Indiana counties.

There could be more than one source of funds to match the Federal contribution. In Indiana the State Highway Department contributes matching money from its own funds. This is certainly a proper recognition of the responsibility of any state highway department for the welfare and improvement of the system of highways in the state regardless of the particular jurisdiction under which the legislature of that state has chosen to put a segment of the system. A second source of matching would be to take them from the counties' share of the undivided funds before distribution. This would probably require a legislative authorization in some of the states. This would appear to be a desirable procedure since it would bring the projects under the control of the counties through their associations of county highway officials. It would also permit the counties to select and finance projects without fear of being too generous with state funds. A third means of providing matching money would be for the counties to appropriate funds from their own highway resources as they do now to match federal aid for the construction of their roads, however, this means would not seem to be wholly satisfactory. The kind of projects suggested should yield data beneficial to many counties. Direct county contribution to the costs would entail problems of securing full co-operation of all counties, finding an equitable formula for prorating costs etc. The appropriation by individual counties might be useful as a makeshift arrangement for those states where the state highway department was unable or unwilling to carry the burden and where it would not be possible to use undistributed county funds until after a legislative authorization could be secured.

Should the managers of such undertakings as the Minnesota-maintenance-study of the Indiana-cost-records project desire the assistance of a national committee to assist with formulating the proposal, or with supervising operations or with evaluating results, certainly no difficulty of paying for the travel and per diem expenses of committee members should be anticipated. The national contribution is so disproportionately large to that of the state that it would be proper to have the national interest represented. Such consultation and assistance could take the following form:

First, the state association would set up a joint committee. It would work out a plan. It would probably want to appoint a director of the project. The director might be a county highway executive who was released part time from his own duties to manage the project or he might be a full time appointee of the committee. It would supply him with what ever technical or other assistance needed. It might want to assemble a team of consultants composed of some or all of the following: and engineer, an accountant, a sociologist, and economist, a lawyer, a psychologist, and a political scientist. The plan could take any number of forms. For example, if a maintenance standard project were to be undertaken, five-mile stretches of typical roads in each of the participating states could be selected as experimental units. This would be done with the consent of the board in each of the counties selected. It would be agreed that the practice prescribed by the research committee would be carried on quickly and precisely and that costs in excess of those normally incurred were to be borne by the research committee. Experimentation with different kinds of maintenance would then be carried on for whatever time required to secure the information sought. The body of information growing out of the experiment would then be accumulated, digested, and distributed.

Or suppose it was decided to experiment with organization and administrative practices

and it was decided to use a single county or a small number of counties for comparative purposes. The type, structure, and the proposed practices would be drawn up as clearly as could be before installation in the county or counties. Full consultation would be held with the boards and with the public in those counties. Should the experiment envisage structural forms or administrative procedures not currently permitted by law, then the plan would also have to be presented to the legislature of the state involved. It is my considered opinion that such proposals if carefully developed and thoughtfully presented would be gladly accepted in a sufficient number of counties for successful experiment and that legislatures would be equally happy to provide the legal authority. About the only limit on legal authority would be constitutional. It would seem to be asking too much of a state to suggest legal changes which could be accomplished only after constitutional amendment.

It may be concluded that the resources are available to carry on research. County highway departments and their leaders have demonstrated an interest in it. There are a number of key problems which are basic. Much knowledge has been accumulated in other areas which would be applicable to highway administration. Much other knowledge needs to be sought out. Leadership in research could effect the combination.

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