

Improvement Priority Ratings for Local Rural Roads in Indiana

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RURAL HIGHWAY CLASSIFICATION AND EVALUATION PROCEDURES FOR INDIANA COUNTIES

The 92 county highway departments of Indiana which are responsible for over 76 thousand miles of road, may well be described as "big business" enterprises as evidenced by the fact that as a group they received more than \$26 million from the Motor Vehicle Highway Account in the calendar year 1954. The allocations received by the individual counties in that year ranged from a low value of \$62,043.23 (Ohio County) to a high value of \$1,402,906.76 (Marion County). If the available funds per county in 1954 are divided by their respective county road mileages for the same period, the available funds per mile of county road varies from approximately \$232 to \$994 per mile, representing 64 cents (Spencer County) and \$2.72 (Marion County) per mile per day respectively. Ohio County, with the least mileage (180 miles) received about \$345 per mile, while Allen County, with the greatest county road mileage in the state (1,512.20 miles), received approximately \$480 per mile. The statewide average was \$341.82 per mile or 94 cents a mile per day.

A brief glance at the above data quickly reveals that the available funds appear to be inadequate if each mile of county highway is to be developed and maintained in such a manner as to satisfy the desires of each taxpayer and motor vehicle operator. In fact, if each mile of county highway had more than a gravel or stone surface, road funds presently

available to the counties probably would not be sufficient to properly maintain these surfaces. Thus it is imperative, as in any successful business operation, that the available funds be spent by competent administrators where the greatest benefit will result.

This paper describes the development of rational procedures for the classification and improvement priority evaluation of those rural roads in Indiana which are under county administration. Many of the procedures were developed and field-tested in a pilot study conducted at the request of the Board of Commissioners of Allen County, Indiana. In addition to their use in the pilot study, the completed procedures were evaluated by several national authorities. Certain procedures were also used in the Indiana State Highway Needs Study.

Need for Factual Data

It has often been said that the most important roads in the world to an individual are those roads that are used by that individual. However true this may be, one of the keystones of democratic government is that government funds must be expended in the best public interest. An adequate and unbiased evaluation of what constitutes the public interest has been of great concern to county road officials who must establish a proper balance between rapidly increasing traffic volumes and service requirements on certain highways and the increasing general demand for more and better expenditures on all roads.

The public interest is best served if county highway funds are expended under the direction of competent management. This is rather difficult to achieve in Indiana because there are no professional qualifications for highway supervisors and employment of personnel is often made solely on a political patronage basis. Haphazard budgeting and record keeping procedures and frequent administration and personnel changes are common. In the 15 year period from 1939 through 1953 there were over 400 county highway supervisors employed by the 92 counties ranging from one in Morgan, Newton, Union, and Wayne Counties to eleven in Martin County. These practices have resulted in a lack of interest on the part of competent engineers and a shortage of an adequately trained work force.

Furthermore, frequent changes and poorly qualified county highway administrators have often contributed to the absence of programming and long-range planning which are basic elements essential to the development of an efficient county highway system. While certain roads may be developed during one year, entirely unrelated projects are often initiated in the next year with little or no concern for the completion of projects initiated in the previous year. After several years of such

chaotic programming, a county may find itself with a non-integrated system of several pavement types in various stages of construction and repair, ranging from sections of narrow, thinly-surfaced gravel roads used by several hundred vehicles a day, to a wide, high-type pavement nearby serving less than fifty vehicles a day.

Benefits Derived from Rational Procedures

Rational procedures for classifying and evaluating the current and potential use and the present physical condition of county highways should provide county officials with an administrative tool which serves the following purposes:

1. Relevant facts are assembled in an orderly manner to aid in the establishment of priorities for the construction and reconstruction of highway sections which are unable, according to certain prescribed standards, to safely and economically serve the demands of traffic, abutting property, and the public interest.
2. Personal judgment is minimized or eliminated in the assignment of priorities.
3. An objective basis is provided for meeting community and political pressures in highway planning and construction.
4. Administrators, councilmen, and legislators are provided with an average measure of the adequacy of the existing county highway system and an evaluation of the progress made in the overall highway program. This progress, indicated by increased or decreased highway adequacy through periodic evaluations, provides a means of measuring the adequacy of road funds.
5. The public's investment in the highway system is protected because funds are budgeted according to the relative order of need.

COUNTY HIGHWAY CLASSIFICATION

Most highway engineers and administrators will agree that it would not only be unnecessary but also be completely undesirable to build and maintain all county highways as high-type pavements. Indiana counties have not nor could they expect to possess sufficient funds, equipment, materials, and manpower to undertake a highway program of such a magnitude. Consequently, it is necessary that the various highways be designated according to their respective importance. The importance of a given highway will vary among different individuals as their dependence on that highway varies, so it is essential that any designation or classification of county highways be made in the public interest.

Before county highways can be classified into various systems it is necessary to determine how many different systems are practical and necessary. A careful consideration of Indiana governmental, financial, and physical conditions has led to the conclusion that three systems of county highways would be most desirable. The degree to which a highway fulfilled the primary purpose of county highways—which is to serve local traffic, abutting property, and the community—is used for classifying the rural road as a County Primary Highway, a County Secondary Highway, or as a Local Service Highway. The ultimate objective of any classification system is to provide a coordinate arrangement of state, County Primary, County Secondary, and Local Service Highways which will adequately provide for the present and foreseeable future needs of the county.

Traffic volume and character of use should play a major part in the classification of county highways because nearly all Indiana county highway revenues are derived from highway user imposts. On the other hand, the effect of abutting property cannot be completely ignored because of the direct relationship between land use and traffic generation. Community interest is indicated by the service provided by the highway. This service may be measured by a study of the areas of locations which are linked together by the road. Service routes or special use made of the highway may also warrant consideration.

Only a minimum number of miles of county highways should be placed in the County Primary and County Secondary systems. This is essential because with limited funds, the mileage of routes requiring higher design standards must also be limited.

Future growth and development must also be evaluated in order to provide a coordinated highway plant which will provide for future as well as current requirements.

Basic Traffic Information Is Essential

Before a county highway can be classified or evaluated, it is essential that information is available concerning the volume and character of traffic using the road. In 1937, the Indiana State Highway Planning Survey published traffic volume maps showing the daily volume for all county roads in each county. Current maps may be developed by collecting appropriate data from properly selected field stations (manned for at least eight hours except for a few control stations which should be utilized for 24 hours or more) and applying proper expansion factors to provide pertinent information for all rural roads. The selection of these stations may be influenced by the county road mileage and the number of persons available to do the field counting. In the Allen

County Study, for example, 125 eight-hour stations (9 a.m.—1 p.m. and 2 p.m.—6 p.m.) and five 24-hour stations were used.

Traffic Count Personnel

The manual count of eight hours or for some other selected period may be made by volunteers from local organizations such as the Farm Bureau, civic groups, high schools, etc. A responsible person, called the Township Captain, is placed in charge of each township. This person aids in the instruction of those who are to serve as manual counters and supervises them during the count period. Transportation is provided to permit him to visit each counter several times during the count period. All completed count forms are collected by the township captain who in turn transmits them to the survey headquarters.

The volunteer counters are assigned to townships other than the one in which they reside. Some persons may object because they will construe this as a questioning of their honesty. Therefore it must be emphasized that the assignments to other townships are being made so that they may become familiar with the other fellow's problems.

County officials will find that a volunteer traffic count program can serve as an excellent public relations approach to promote better understanding of local highway problems. Much of this information may be presented during the instruction period for the township captains and in later instruction periods for the manual counters. The completed traffic map is based on the data collected during the count period, and should provide an excellent source of public information.

Average daily traffic volumes are generally used to provide limits for design standards. One common practice for local roads is to provide reasonably high standards for average volumes in excess of 400 vehicles per day, intermediate standards for average volumes between 100 and 400 vehicles per day, and lower standards for average volumes less than 100 vehicles per day. These limits have been used in the Illinois, Mississippi and Ohio highway needs studies and were recommended for use by Indiana counties.

Determination of Abutting Land Use

The necessity for any county highway is directly related to the manner in which the land adjacent to the highway is used. Thus, roads passing through highly productive farmland may have high seasonal, but low annual traffic volumes, while roads through relatively poor farmland, which has been subject to suburban residential development, may serve high daily volumes of traffic. Cultural institutions such as schools are handicapped if the highways serving them are impassable

much of the time. Roadside parks and other recreational facilities may be used by highly concentrated traffic volumes only during favorable weather conditions, thereby causing greatly fluctuating traffic volumes on their access roads.

Information concerning the frequency and type of roadside development is obtained in the field and compared with existing records. The field study usually may be made concurrent with the road inventory.

Determination of Community Interest

Community interest may be indicated by the area or communities connected by the highway. A road may serve as a vital connecting link between a small community and a large city or a major traffic artery. Another road may carry high volumes of traffic between two state routes or connect an important or productive area with a distribution center or access highway. This information may be obtained from a study of local land use maps, population maps, and a knowledge of local conditions.

The importance of the various types of service routes such as school or commercial bus, rural mail, milk collection, or heavy trucking routes using the highway varies in each county. In Allen County, for example, so much of the rural mileage carried school bus, milk, and rural mail routes that these service routes were of little value in differentiating between highways for classification purposes. Local school, commercial bus, mail, trucking, and other officials should be consulted for service route information.

The County Primary System

Certain highways, because of their location in the county and method of construction, may have average daily traffic volumes ranging from about 400 vehicles a day to several thousand vehicles a day. These roads may serve to connect a large city with a smaller rural community, or they may serve as a vital connecting link between two state highways or to connect highly productive areas with the highway. Such highways are the type to be considered for inclusion in the County Primary System.

The County Secondary System

Roads which carry traffic volumes ranging from 100 to 400 vehicles a day generally belong in the County Secondary System. The service provided by the roads, such as connecting less important communities with each other and/or with higher classification roads or highways, should also be considered.

The Local Service System

All remaining low traffic volume rural roads, which, as the designation implies, carry low daily volumes of less than 100 vehicles per day and which primarily serve only the local area, are classed as Local Service Roads. These roads, in general, do not serve as many people nor as much of the county and consequently may have a lower design standard.

THE HIGHWAY INVENTORY

An accepted and valuable business practice is that of conducting periodic inventories in order to determine the current status of the business. The county highway administrator, like his commercial counterpart, should have a vital interest in knowing the present status of his business—the county road system. Most citizens have definite opinions concerning what is wrong with the county roads and how these faults are to be corrected. Consequently, when county road administrators are forced to allocate funds on the basis of opinions rather than facts, they can usually expect varied amounts of criticism from disappointed petitioners.

Generally, records describing the existing physical conditions of the county road system are inadequate and often inaccurate. It is therefore essential that the initial inventory be as complete and precise as possible. All pertinent information—such as highway number or name; right-of-way, shoulder, and roadway widths; roadside culture; type and condition of the pavement and surface; topography; horizontal alignment; passing sight distance; stopping sight distance; safe driving speed; and gradient—should be recorded for each tenth of a mile. This record will not only provide county road administrators with a factual record of essential road information, but the location and extent of critical conditions are readily evident. It is imperative, therefore, that the county highways be properly identified through an accepted rural road identification system.

Inventory Procedures

One or more three man “logging” crews are used to obtain the factual data such as width, types, etc. One “rating” party may then complete the information, such as condition and adequacy comments, for all the highways. The number of logging parties depends on the available manpower and time, but should be kept to a minimum in order that comparable information may be obtained. Only one rating party should be used to insure the relative evaluation of all highways.

After completion of the inventory, this information is used to establish priority ratings for each of the various road systems. It appears that the most representative, realistic, and desirable approach to the procedures for rural county highway evaluation should include a measure of the use or service provided by the highway section under question and a measure of the physical condition of that section.

Service Ratings

As state previously, the primary purpose of county highways is to serve local traffic, abutting property, and the community. Information concerning the volume and character of traffic is made available through the traffic count, and knowledge of the land use of abutting property can be obtained during the road inventory. Community service is indicated by the use of certain roads for rural mail routes, school or other scheduled bus routes and other public services. With the daily traffic volume carrying the most weight, it seems obvious that the more of these three elements (volume and character of traffic, abutting land use, and community service) existing along a given section of highway, the more critical is the urgency for providing a satisfactory highway to serve this demand. The combination of the traffic, roadside culture, and service factors is called the Service Rating and can range from zero, which indicates no need, to 50. If two road sections have identical unsatisfactory design features, but one road carries a high daily traffic volume through a region of concentrated roadside development, while the other carries a relatively low traffic volume through undeveloped lands, there seems to be no doubt that the former should have priority. The relative weights allocated to the various elements should be based on judgment which may have to be rather arbitrary because of the lack of reliable information and study in this area.

Road Ratings

The ability of a highway section to satisfy service demands can be measured when the various elements of the three main factors of structural adequacy, geometric design, and safety are compared with design standards. The most important of these factors is structural adequacy. It includes such elements as pavement type, pavement condition, roadside drainage, structures, and railroad grade crossings. If these elements of structural adequacy are in critical condition, especially pavement condition and structures, the ability of that section of road to provide satisfactory service is definitely limited.

Geometric design elements include right-of-way, pavement and shoulder widths; gradient; and alignment. The most important of these

elements is pavement width, and consequently, it receives a higher value in the rating process.

The safety factor includes such elements as surface riding condition, shoulder condition, safe driving speed, stopping sight distance, and passing sight distance.

The sum of the respective structural adequacy, geometric design, and safety factors is called the Road Rating and the weights assigned to the various factors are generally consistent with comparable practice in similar studies. The Road Rating may range from one, which would indicate a complete lack of desirable conditions, to 100, which would indicate a "perfect" highway.

PRIORITY ESTABLISHMENT FOR HIGHWAY IMPROVEMENT

The Service Rating factor is a relative measure of the service furnished by a given section of highway while the Road Rating factor is a relative measure of the physical condition of that highway section. The relating of these two factors to each other to establish a numerical priority for improvement is called the Priority Rating.

Comments on the Use of the Priority Rating

The Priority Rating has been developed to rank highway sections within a given highway classification. In other words, county primary highways are not to be compared with county secondary or local service highways, or vice versa, because the Road Ratings are based on different design standards. County administrators should decide how funds are to be allocated between the various classification systems and then the Priority Rating should be used to establish the urgency of various highway sections within the classification system.

The ranking of the different highway sections should be considered as the important purpose of the Priority Rating function. Because all rankings of highway sections are relative, it does not matter if the various field evaluations are consistently high or low so long as they are consistent.

THE ALLEN COUNTY STUDY

A study of the type just described was performed by the Traffic Engineering Services Unit of the Joint Highway Research Project at Purdue University for Allen County, Indiana. All of the county roads of that county were classified into County Primary, County Secondary,

or Local Service roads. Then an inventory of the mileage on the County Primary (149.7 miles) and that on the County Secondary System (137.8 miles) was made and a Priority Rating determined for each road section in each system. A report which included a traffic volume map, road classification map, and the priority ranking of each road in the County Primary and Secondary systems was prepared. Inventory data, design standards and a great amount of other material were also included.

Such a study as described should be performed by each county in Indiana. It is not necessary that Purdue perform the survey, for it can be performed by any competent engineering organization or engineer. In fact, the most dividends from such a study would be obtained if it were planned, conducted, and placed into operation by a county engineer. Such an individual would assure that the results would be re-evaluated periodically and provide a continuing supervision over use of the results.

To relate what Allen County thinks of this study, a portion of an article by Mr. P. E. Henebry, Commissioner of Allen County will be quoted. Mr. Henebry writes:

"For the first time in its history Allen County, Indiana has achieved a realistic approach to its county road problems.

"Ever since the horse and buggy days, when road improvement became a vital part of community progress, road work was done on a by guess and by chance basis. Today we have a scientific engineering survey of our highway needs and can develop an orderly and progressive improvement program. To make the survey we needed cooperative help of our citizenry. Inasmuch as this was a pioneer movement, never before undertaken in Indiana, we had to feel our way cautiously. We developed a 'sales' approach to reach those in the rural areas.

"First, we told them that a realistic appraisal of the County road needs was imperative. We also explained that the observations of the experts were not binding on the county but merely a suggested course of procedure.

"Then, too, we kept emphasizing the inadequacy of funds available for road improvements and that we believed that first things should come first as far as roads are concerned—traffic wise speaking.

"We ourselves knew that this highway engineering survey, if successful, would provide us with ample ammunition to resist the pressure groups, to resist those seeking personal favors, or even political considerations.

"We who are responsible for road improvement know that it is only natural that the road which provides an individual egress and

ingress to a community is to him the most important of all roads. That particular road, he contends, should be first on the priority list.

"As a result of this survey we as commissioners now are able to sit down with this individual or group of citizens and present a true picture of what is being done in the highway improvement program and how the particular road he or they seek to have improved compares to other road projects in the county.

"We have had remarkable success in being able to reason with our people. We also have succeeded in convincing them that we have made a sincere effort to use our limited road funds to the best interest of the entire community.

"As a result of study we have adopted minimum standards for road improvements and have proceeded with a program of hard surfacing that calls for approximately twenty additional miles of road per year. This has convinced our rural dwellers that they are being given the utmost consideration in the over-all development of our county road program. Moreover, the progress we have made has brought the realization that the conveniences sought are obtainable only on a 'must' basis.

"For instance, we learned that more than 60 percent of our county road system had an extremely low traffic count. We found that 12.8 percent of the roads had a traffic count of 25 vehicles or less. Then, too, we found that in the next bracket came a traffic count of 26 to 99 cars a day, which summed up percentage wise totalled 48.7 percent. Adding these two together we learned that over one half of our roads were not subjected to heavy traffic and that these highways could wait their turn for hard surface improvement.

"What else did the traffic count disclose?

"We found that 26.3 percent of our roads were used by not less than 100 nor more than 399 cars daily, while in the next to the top bracket the roads which had a traffic count of 400 to 999 cars daily constituted only 9.2 percent.

"More revealing was that this study proved that the roads which bore the greatest amount of traffic—anywhere from 1,000 vehicles to 2,500 or more daily—represented only three percent of the road system.

"Armed with these statistics the road locations and other information, we soon were able to determine which roads should receive preferential treatment.

"The study, begun in 1954 and concluded last year, needs to be constantly revised to keep abreast with changing conditions and population shifts. Every three or four years the information should be brought to date.

"It cost our county only \$1,406.25 to obtain this information from Purdue. That expense represented solely the processing of its findings and the compilation.

"We, in Allen County consider this expense one of the best investments in road work ever made.

"We now know more than ever before how we can use our funds to provide the greatest service to the greatest number of people.

"We know also that since road revenue is produced by road use, the improvements should be made where the funds are earned.

"We only wish that this survey had been undertaken some years ago when our traffic problems first began to mount. Certainly we feel that we have taken a forward step in highway improvement based on actual knowledge of what, when, where and how to better our county road program."

Any county can do the same. Will your county be next?