

Road Surface Management - Local Road Applications

by

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A: INTRODUCTION

The Wisconsin Transportation Technology Transfer Center (Transportation Information Center) has developed a roadway management program for Wisconsin local agencies. This system has been developed in cooperation with local road agency associations and the Wisconsin Department of Transportation. Wisconsin's pavement management system has evolved from a basically paper system developed in 1987 to a computerized pavement management system coordinated with Wisconsin DOT data base.

While many sophisticated pavement management systems have been developed in the past, Wisconsin local governments have been slow to adopt these systems. The sophisticated nature of these programs along with the relatively high implementation costs have been a barrier to their use. The objective of the TIC in developing a new system specifically for local road agencies was to overcome these barriers and encourage local agencies to benefit from information provided by a basic roadway management system.

Wisconsin has over 1,950 local government agencies with highway responsibilities (cities, villages, towns, and counties). It was recognized that even a basic pavement management system requires some technical assistance if a local agency is to use this system. Due to the large number of agencies and limited technical staff available to the TIC, a "train the trainer" program has been used from the beginning. The concept is to train people located throughout the state. These resource people would then be able to help their own local agencies implement a pavement management system. These resource people included technical staff with county highway departments, regional planning commissions, University of Wisconsin-Extension staff, Wisconsin DOT staff, and consultants.

A major upgrading of the capability of the pavement management system is underway during 1993-94. The computer program is being expanded to provide additional capacity to make future pavement needs projections and provide more comprehensive reports. This work is done in anticipation of the ISTEA requirements for pavement management systems at the local level.

B: BENEFITS

An effective pavement management system assists local government officials in making better decisions for their use of their limited resources. It is also of assistance to local governmental officials when responding to their constituents about what and when road improvements will be made. Local officials are constantly under pressure to provide higher level service with limited resources. A well documented pavement management system provides a sound basis for making decisions and communicating those decisions to the public and elected officials.

An effective pavement management system will improve the quality of the decisions made by local governmental officials. Selecting the correct maintenance or rehabilitation technique requires knowledge of roadway conditions. A pavement management system will provide the information that will improve the decisions and help assure all improvements are cost effective. This should be the principle benefit of a roadway management system to the local agency.

On-going evaluation of roadway conditions will allow road managers to track the effects of their decisions. One can learn which rehabilitation techniques last the longest under various conditions. Today, we have many alternative ways to repair and rehabilitate pavements. It is essential that roadway managers evaluate these techniques in their own environment. Performance under local traffic, soil, and environmental conditions is

necessary information to improve local decision making. By implementing even a basic roadway management program, it is possible to evaluate the performance of these techniques and improve our selection and budgeting procedures.

What size budget is needed for your local road agency? This question is impossible to answer without an accurate inventory of existing conditions and a projection of improvement needs for several years. A basic pavement management system will give you this information in an objective manner that is understandable for local officials and the public. A pavement management system will allow a roadway manager to effectively communicate the real needs for your road system. Communicating these needs in convincing terms is the first step in building public support for an adequate roadway improvement budget. It is not likely we will receive the funding we need until we can convince the public there is a legitimate need and until they are convinced we know how to use these funds in a cost effective manner. A pavement management system is an effective tool to communicate with our public.

Some experience in Wisconsin with implementing a basic pavement management system shows there are significant benefits. Agencies with limited resources have found it possible to develop and implement their own pavement management system with very little outside help. The system is helpful in developing annual budgets and answering citizen's questions on future roadway improvement needs. More importantly local road agencies have found that when they effectively communicate the need for larger roadway improvement budgets the public has responded. It has also been reported that a roadway management system can take some of the politics out of roadway improvement decisions. It provides an atmosphere where objective decision making can select projects on their merit. And finally, a pavement management system can allow an agency to do preventive maintenance. This allows an investment in pavements that are still in good condition at a nominal cost. This prevents complete deterioration and the need to reconstruct roadways where modest investments in preventative maintenance can preserve roads for less cost.

C: OBJECTIVES FOR PMS

1: BASIC SYSTEM

It is very important to determine who will use the roadway management system. The system must be designed to meet users needs. It is very tempting to build a comprehensive system that includes a large data bank and sophisticated computer analysis. The problem with this technique is that it usually requires large data collection efforts which can be costly for local road agencies. In addition we often lack the technical knowledge necessary to accurately predict future performance of low volume roads. Therefore, many of the analysis prediction techniques have very limited practical applications. It is considered more advantageous to have wide acceptance and use of a basic pavement management system than very limited use of a more sophisticated system.

2: ROADWAY SYSTEM SELECTION

It is very desirable to develop a pavement management system that serves all of the mileage of an individual local road agency. A comprehensive look at the total system will provide better decision making than one system that only includes high volume roads or roads on the federal aid system. Since the (ISTEA) pavement management system may only be required on a limited number of miles, there may be a temptation to serve only these needs and neglect entire roadway systems. This decision is very important and it determines the type of pavement management system that will eventually be developed.

3. LOCAL USERS

One of the primary benefits of a pavement management system is improved decision making by the personnel and elected officials at the local level. A management

system should be designed with these users in mind. Local officials are more likely to use this information if they are involved in the collection and analysis. In other words, it should be their system, not a system designed for someone else's use.

"Buy in" by local officials can best be achieved if they are involved in developing the initial system. It is also necessary for the pavement management system to have the flexibility to adjust cost, priority ranking criteria, etc. to fit local needs. Finally, it is helpful if all data can be collected by local officials. While there may be some sacrifice of uniformity on a state-wide or county-wide basis, the involvement and commitment of local officials with the data collection and analysis is considered more important.

4. FLEXIBILITY

A "one size fits all" pavement management system on a state-wide basis may not be realistic. If we are going to include small local agencies, it means the system will have some limitations. These should not preclude larger agencies from implementing a more comprehensive or sophisticated pavement management system. The benefits of all agencies, large and small, making use of pavement management tools is more desirable than consistency. If some state-wide data collection needs exist then it may be necessary to require that the pavement management systems used have the ability to relate to a common base of pavement conditions. That is, provide a way to translate between the different pavement evaluation systems so that some common analysis of data would be possible.

D: PAVEMENT MANAGEMENT SYSTEM ELEMENTS

1: INVENTORY

Basic to a pavement management system is the development of a roadway system inventory. Data should be limited to those items that will be used in the analysis. Flexibility for additional inventory items may be desirable.

The inventory must be coordinated with a local or state-wide reference system. Consideration of a reference system should include likelihood of future development of a GIS and coordination with traffic safety data, etc.

It is likely that urban governments will have additional inventory needs beyond those in a normal rural roadway agency. Urban communities in Wisconsin have found it very useful to inventory sidewalks, curb and gutter, storm sewer, parking conditions, etc. These items are not of interest to most rural agencies. This flexibility to meet inventory needs is essential.

2: ROAD SURFACE CONDITION EVALUATION

The most essential item of the pavement evaluation system is the selection and use of the tool that will evaluate the condition of the pavement. This vital data will determine the usefulness and accuracy of all future analysis. Selecting a practical yet effective evaluation procedure should be given top priority in the development of any pavement evaluation system. You will want an evaluation tool that is accurate and reliable to use in making maintenance and rehabilitation decisions. On the other hand, you must be able to collect this data with local agency personnel if you are going to avoid high implementation costs. Therefore, this selection requires a compromise that should not be taken lightly.

The Wisconsin local pavement management system uses the PASER evaluation system. This has proven highly acceptable by local road agencies and has sufficient substance to allow accurate decisions about maintenance and rehabilitation. This is a significantly different system than one adopted by Wisconsin DOT. The Wisconsin DOT system includes a Distress Index that requires extensive data collection by trained personnel. The principle advantage of their Distress Index approach is that it provides more consistency in data collection on a state-wide system. This was a prime consideration in developing an evaluation tool for use by the Wisconsin DOT.

3: PRIORITY RANKING/PROJECT SELECTION

A principle product of a pavement management system is a priority listing of projects. There are several important considerations in developing your priority ranking system. You may choose to have a comprehensive system that includes not only pavement condition but drainage, geometrics, functional classification, ride, safety, etc. In making a decision on what to include in this criteria, it is most important to determine how the pavement management system is to be used. If it is principally a pavement maintenance management system many of the factors above should not be included. When one combines geometrics, safety, and pavement conditions the relative project rankings become very arbitrary. Priority rankings should also reflect the values of the local road agency. Include what is important in their decision and budgeting process.

Experience in using the Wisconsin pavement management system indicates most local road agencies are primarily concerned with their pavement maintenance and rehabilitation budget. Therefore, pavement condition is the priority factor. The current system uses a priority ranking scheme that considers only the functional classification and pavement condition rating. This tends to emphasize pavements that have higher traffic and/or are in greater need of repair. This common sense approach is consistent with most local road managers and public officials inherent judgment. Local road agencies are able to independently consider improvements required by safety, roadway capacity, etc.

One major deficiency in considering only functional classification and pavement condition rating is that it may not give sufficient priority to preventative maintenance type projects. This deficiency is currently being addressed in the upgrading of the pavement management system being developed in Wisconsin.

4. MANAGEMENT REPORTS

A pavement management system should provide a series of reports of use to local road managers. One of the most useful outputs can be a simplified (bar graph) report that portrays the condition of the local road system. That is, what percent of mileage is in various stages of repair. How much is in good condition, fair condition, poor condition, etc. A visual picture of this status can convey more information to decision makers than many pages of written reports.

Budget estimates can also be provided. Given the condition of the local roadway system one can estimate the costs to provide the most reasonable maintenance or rehabilitation technique for each roadway element. While the sum total for all of this work will be overwhelming, it is an interesting piece of information. Of more use, however, is the development of annual budgets based on the priority scheme and budget capability. Normally, annual budget recommendations for three to five years would be most useful. This information is for general planning only and specific annual budgets must consider other projects and budget limitations.

It is also extremely helpful to have an estimation of the average annual budget required for roadway maintenance and improvement. While many assumptions have to be made in order to reach this conclusion, it is only necessary to estimate the approximate size of this budget. Most agencies have no real objective idea of what their annual pavement improvement budget should be. Annual budgets are typically developed to reflect past budgets rather than actual need.

5. IMPLEMENTATION

Encouraging the use of a pavement management system by local officials requires a significant effort. Training materials must be developed and a system of technical support is required on an on-going basis. It is also important that one agency or organization be designated responsible for upgrading and maintaining the pavement management system.

One should not underestimate the cost and commitment required to develop and

provide technical support for a pavement management system on a state-wide or regional basis. Most local road agencies will have on-going questions and suggestions for upgrading the local road management system. Many improvements to the pavement management system can develop after the system has been used for several years.

E: CONCLUSION

The TIC and Wisconsin DOT believe the benefits of a pavement management system are worth the effort. A system for local governments require careful consideration of their needs and capabilities. Wisconsin DOT and TIC plan to continue their support and development of a pavement management system that addresses the ISTEA requirements as well as local user needs and benefits.