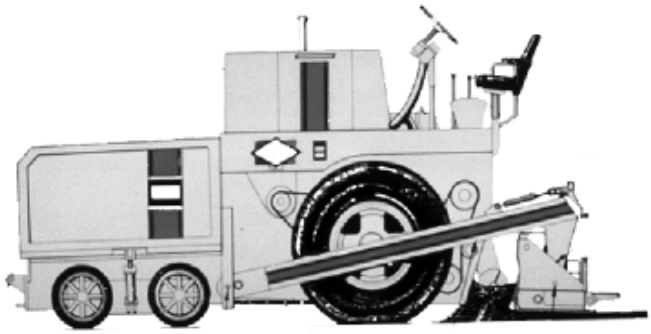
Baystate Roads Program
Local Technical Assistance Program (LTAP)
Tech Notes

Tech Note #38

Pavement Management Systems: An Overview

For most municipalities, the roadway network (all non-state roads within local jurisdiction) potentially represents one of its largest funding liabilities. In some towns, the street system has already deteriorated to the point where the funds necessary for needed repairs far exceed available funds. And for other towns, if something does not change soon, they will also find themselves in a similar situation. To better understand the solution to this problem, it is important to understand how we got to this point.



Common Practices

Although we have reached the twenty-first century and the age of ultra-high technology, many municipalities continue to develop maintenance, rehabilitation and reconstruction (MR&R) budgets using old-school technology. Typically, local agencies will develop the MR&R budget using one or more of the following techniques:

➢**Last Year's Budget -** The budget is based on last year's funding, possibly with an arbitrary increase or decrease (usually to fix the worst streets).

➢**Standard Program -** A program based on a periodic maintenance schedule, such as micro-surfacing every five years and an overlay every fifteen years, whether or not the street really needs it.

➢**"Fighting Fires" Approach -** Fix the ones citizens constantly complain about.

➢**Worst-First -** The streets in the worst shape are fixed first. This approach has a certain logical (although incorrect) appeal that satisfies the public and some council members.

➢**Political Pressure -** Use political considerations to establish priorities and budgets.

➢**Gut Feel -** Rely on the experience, knowledge and "gut feel" of managers and experienced employees.

For many local agencies, these techniques worked when things were much simpler. There were fewer streets, lighter traffic, streets were new and taxes seemed to stretch a little farther. Since the system worked, it became entrenched as the standard operating procedure for many agencies. However, today it is much more difficult to make these techniques work. Two of the main reasons for this difficulty are:

1. They typically focus primarily on streets in bad shape. Far too often, the maintenance program consists only of rehabilitating and/or reconstructing roads in poor condition. Since these repairs are very expensive, this type of approach will quickly deplete a maintenance budget,

leaving little or no money for preventive maintenance. As such, only a few streets are restored while many streets in good shape are allowed to deteriorate. This practice of delaying maintenance will prove costly in the long run.

2. The selection process is subjective. In many cases, the process to decide on which streets should be fixed is not based on hard facts such as, what is the shape of the overall roadway network or which repair is the most cost-effective for each street. In other words, the current method of developing the town's annual MR&R plan is probably lacking a financial strategy that strives to ensure that the taxpayers' hard earned money is properly spent.

Although these practices may have proved to be satisfactory in the past, they will work in the future only if a municipality is lucky enough to have roads in good shape and a vast supply of money.

Unfortunately, the reality for most municipalities is that they are closer to the opposite end of the spectrum. Money is tight and the existing street system, as well as other associated infrastructure, continues to age. Things will only get worse in the future. The aging of the infrastructure combined with other factors such as future growth, political pressure to reduce taxes and constantly rising construction costs will severely strain public works budgets. Therefore, local agencies cannot continue to utilize outdated methods of managing streets and be able to survive financially. It is obvious that a more cost-effective method of managing the resources is necessary.

A Solution:

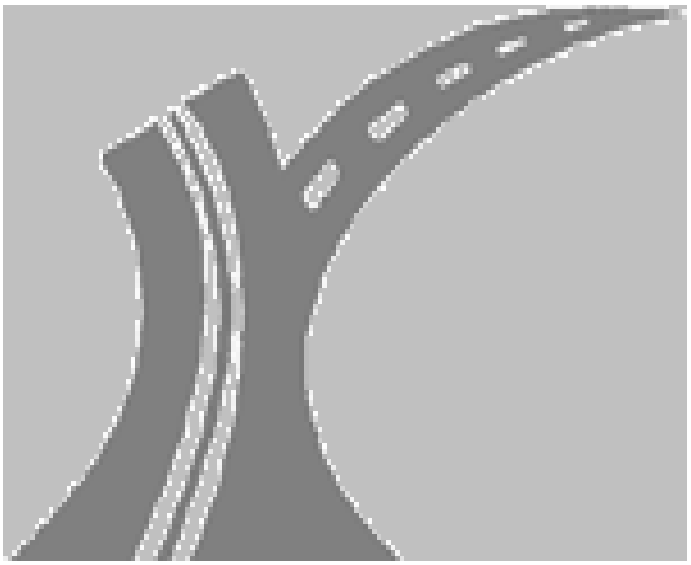
So how do we cost-effectively manage the maintenance of municipal streets? Unfortunately, there are no magic black boxes or crystal balls to provide the answer to this difficult question. However, a system must be developed where decisions are based on a rational, systematic method of analyzing good information which produces consistent results. This can only be accomplished using a formalized decision making process such as a pavement management system. That is why the Baystate Roads Program strongly suggests the use of a pavement management system (PMS) to assist in developing cost-effective budgets. A PMS, if properly implemented, will allow a community to maintain its street system as efficiently as possible by providing a national, systematic approach to road surface maintenance.

What is a PMS?

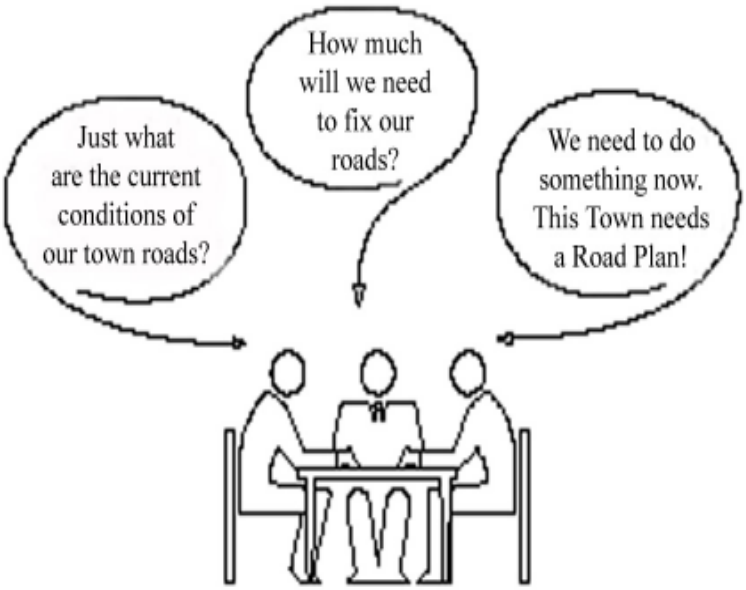
Although many people think of a PMS as simply a computer program, it is much more than that. A PMS is a formalized process that provides decision makers with the information necessary to make good investments with the taxpayers' money. This program should include a systematic, consistent approach to evaluate the present condition of each pavement surface, determine the proper type of maintenance to return the pavement to an acceptable level of service, prioritize necessary repairs, and generate useful reports.

The complexity of a PMS can vary greatly. At the ultra, high-tech end of the spectrum, an optimization-type PMS will be able to determine the best investment strategy (as defined by the agency) every year for an extended number of years. This type of system will be able to analyze many different "what-if" scenarios to determine what will happen to the overall condition of the network due to such things as a change in the level of funding or the type of MR&R strategies used. Such a high-tech system requires tremendous amounts of data which are very expensive and time consuming to collect. This can only be justified by a large agency such as a state DOT.

At the other end of the spectrum, is the simple manual method using a pencil and paper. The only significant cost is manpower required to gather some basic data. This type of system is better than nothing, since it does record



the condition of each road segment. However, most municipalities need additional information such as the associated costs of all repairs, etc. Since this type of information can be easily generated using a simplified PMS which utilizes an inexpensive, easy-to-use "low-tech" computer program to store and analyze data, a manual method should be considered only as a **last resort**.



It would be beneficial if all municipalities could have a state-of-the-art PMS, but for most local agencies, it is not practical. Luckily, a simplified PMS using a "low-tech" computer program will do just fine for the majority of local agencies. Obviously, a simplified PMS will not optimize investment over a five or ten year period. However, it will be based on the basic principle of selecting the proper MR&R technique and applying it at the correct time. Therefore, a basic PMS will provide the basic information necessary to assist local agency personnel to make intelligent, informed decisions.

The Basic Process:

The process can vary greatly depending upon the needs and wishes of the individual agency. At least in the beginning, it is probably better to keep it relatively simple. Any PMS should include the following six basic steps:

1. Form a PMS steering committee to oversee the implementation of a PMS. This is crucial to ensuring that a PMS will be successfully implemented. If everyone does not work toward the common goal of trying to develop a system that will produce a cost-effective MR&R plan, the chances of success will decrease proportionally to the amount of resistance.

2. Gather all pertinent information about each segment in the road network such as the length, width, surface type, etc. (referred to as the road inventory survey).

3. Design a systematic method of gathering all relevant information pertaining to the condition of all road surfaces in the network (referred to as a distress survey).

4. Develop repair strategies - using the cost and expected life of the various MR&R techniques, determine the most efficient repair based on the needs of the community.

5. Determine when to do the maintenance.

6. Budget funds that focus on preventive maintenance so as to prevent major deterioration from occurring.

Since there is usually an organizational resistance to change, it is imperative that the initial implementation of a PMS be as successful as possible. Therefore, the initial system should be fairly simple to ensure this goal. As an agency becomes more comfortable with the process and moves up the learning curve, the process can become more complex as needed.

What Type of Information is Generated?

The main goal of a PMS is to provide the information required by the decision makers to determine how to cost-effectively maintain the road network. With this goal in mind, a basic PMS should be able to generate a series of reports that include the following:

1. Road Inventory - contains a list of each road segment in the network along with the physical characteristics of each segment. It would include information such as the length, width, type of road surface, traffic volume, etc. for each road segment.

2. Condition Summary - A summary of the condition of each pavement surface (results from the distress survey).

3. Repair Strategies - A summary of all appropriate MR&R techniques required to improve each road segment in the network, listed in alphabetical order. The selection of the appropriate MR&R for each road segment is based on the particular type or types of surface distress that are present.

4. Prioritized Repair Strategies - A summary similar to the Repair Strategies Report, except that the order in which road segments are listed is based upon a prioritization scheme. In other words, the road segment which should be repaired first is listed first and the road which should be fixed last is listed last. Prioritization is based on certain weighted factors such traffic, roughness and surface distresses. Selection of the weighting factors should be based upon the specific needs of the municipality.

5. Budget Reports - Typical reports could include: how many streets can be repaired based upon a specified budget, and how much it would cost to upgrade all streets, etc.

What PMS Should We Use?

When starting out, it is best to implement a system that is basic in nature, easy-to-use, but still provides the necessary information to make prudent investment decisions. What local agencies need is a method that meets the following criteria:

1. It is easy to learn and apply because most decision makers have little or no formal technical training.

2. It must be systematic and provide an organized approach to assure that all essential factors are taken into account.

3. It must be practical. Taking care of roads and streets is an ongoing real life activity. Therefore, the process must be both workable and realistic.

4. It must be understood and accepted by the local board. A total commitment to the program is vital to make it work.

The Baystate Roads Program recommends that municipalities strongly consider using the Road Surface Management System (RSMS) developed by the New Hampshire T^2 Center because it was developed to meet the four requirements stated above. It is a time-tested system that has been used successfully by many municipalities throughout the United States. The Road Surface Management System and the Sign Inventory Management System (SIMS) are distributed together in a CD called PWMS Distribution. The CD contains the latest RSMS software, the manual, a sign handbook, and other information for a small fee. Please visit the New Hampshire website for complete details: www.t2.unh.edu.

Quality Control

All required MR&R and other activities such as utility work in the roadway must be properly constructed to ensure that they last as long as possible. In addition, new roads must be required to meet reasonably high quality standards. A poorly built road can deteriorate quickly and, thereby, become a money pit that will drain the municipality of precious funds for many years to come. Since the costs of these additional maintenance problems due to poor quality work must be added to the already strained maintenance budget, the results could be devastating. Therefore, any successful PMS must include a quality control program to ensure that all road surfaces stay in good shape for as long as is cost-effectively possible.

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