



## Standard Guide for Pavement Management Implementation<sup>1</sup>

This standard is issued under the fixed designation E 1889; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This guide covers basic procedures to follow in implementing an effective pavement management process. Pavement management includes activities and decisions related to providing and maintaining pavements, many of which must be made with supporting information that should be generated from a pavement management system (PMS). Implementation is considered complete when pavement management is a routine part of the management process, and the agency utilizes the pavement management process to make relevant decisions, including funding decisions.

1.2 The guide is intended for use by agencies that manage pavements including those on airfields, highways, parking lots, roads and streets.

1.3 Pavement management, as discussed in this guide, is exercised at network and project-level as described in Guide E 1166, and the AASHTO Guidelines for Pavement Management Systems.

1.4 No reference is made to the time needed to complete the implementation. The amount of time will depend on the size of the pavement network and the resources available to support implementation.

1.5 This guide is not a standard method or practice, that is, it is not intended to provide exact steps that must be followed by every agency implementing a pavement management process. It is expected that each agency will use the material in this guide to develop an implementation plan to meet the needs and constraints unique to the agency.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

E 867 Terminology Relating to Traveled Surface Characteristics<sup>2</sup>

E 1166 Guide for Network-Level Pavement Management<sup>2</sup>

#### 2.2 AASHTO Standard:

### Guidelines for Pavement Management Systems<sup>3</sup>

### 3. Terminology

3.1 *Definitions*—Terminology used in this guide conforms to the terminology included in Terminology E 867.

#### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *champion*—an advocate, or small group of advocates, in an agency that recognizes the need for a pavement management system and works to get it adopted and implemented.

### 4. Significance and Use

4.1 This guide provides potential and current pavement management users with an outline of the process and steps to follow when implementing and operating pavement management systems.

4.2 This guide may be used by the following:

4.2.1 Individuals within agencies interested in finding information about pavement management to determine if they want to pursue implementation;

4.2.2 Pavement engineers, maintenance supervisors or other persons trying to get agency management personnel to commit to implementing a pavement management system within their agency;

4.2.3 Personnel in an agency in which the decision to implement a pavement management system has been made but where the pavement management processes, pavement management decision support software or data collection procedures, or both, have not been selected;

4.2.4 Personnel in an agency that is developing a database and beginning use of a newly adopted pavement management system; and

4.2.5 Personnel in an agency that have a pavement management system in place and are trying to make the pavement management process a routine part of the agency decision making.

### 5. Procedure

5.1 *Pavement Management Implementation*—Although this section appears sequentially, an agency may start at any point based on the status of pavement management implementation in that agency. Some of the steps may be completed concurrently and other steps may or may not be needed by individual

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.03.

<sup>3</sup> Available from American Association of State Highway and Transportation Officials, Washington, DC, 20001.

agencies. It may be necessary at times to backup and repeat previously completed steps.

*5.2 Deciding that Pavement Management is Needed in the Agency*—Sections 5.2-5.2.5 provide information to guide the champion through a process of deciding to pursue implementation of a pavement management system in the agency.

*5.2.1 First Knowledge*—The champion recognizes a need to change or enhance the manner in which decisions are made about pavements in the agency.

*5.2.2 Information Gathering*—The champion develops the knowledge necessary to envision how pavement management would benefit the agency and the forms of pavement management that would be appropriate for the agency. The champion should gather information about pavement management that will help in formulating the agency's objectives and purposes. The information would include items such as the determination of what information is desired, how the process would be used, what answers it could provide, how much it would cost to implement, the benefits it would provide, and what changes would be required in the existing agency. This includes the development of a set of well defined preliminary goals.

*5.2.3 Decision to Pursue*—The champion decides to actively pursue adoption of pavement management in the organization based on the benefits and costs associated with pavement management implementation. The champion must be able to compare advantages and disadvantages of potential pavement management processes with current procedures based on information developed in 5.2.2. The preliminary goals of the pavement management system should be clearly outlined at this time.

*5.2.4 Develop Alliances*—Pavement management usually crosses several traditional divisions of authority within an agency. Members of each agency division that must interact with the pavement management process may be able to prevent, or retard, adoption. An alliance of key individuals in each affected division should be developed, and they should formulate an initial set of goals.

*5.2.5 Getting Pavement Management on the Agenda*—In most agencies, innovations which affect the management efforts of several divisions, such as pavement management, must be approved by at least the agency director and often by elected officials. Pavement management must become a part of the agenda, formal or informal, from which the decision makers work.

*5.3 Obtaining an Agency Decision*—Sections 5.3-5.3.5 provide information to guide the champion through a process to lead the agency to a decision to adopt a pavement management system. The pavement management champion must convince the agency management that formalized pavement management is appropriate for the agency. The method of decision making within the agency will have an impact on how the pavement management champion organizes the information, gets the topic on the agenda (formal or informal) and develops support for the pavement management decision, but it has little impact on the information needed. The champion must guide the agency through the same general steps that the champion went through in deciding to pursue adopting pavement management.

*5.3.1 Agency Persuasion*—The champion must convince agency management that adopting a pavement management system is to their advantage. Knowledge of the principles of pavement management, problems with the current process, and advantages of pavement management systems are needed to complete this.

*5.3.2 Agency Decision*—The agency decision makers decide they want to adopt pavement management. Documented information on the benefits and costs associated with pavement management are needed at this time. Results from other agencies can be used to demonstrate the results of adopting pavement management. The decision to adopt can be conditional based on using a trial implementation, and the final implementation decision can be made when satisfactory results have been obtained from the trial implementation.

*5.3.3 Form a Steering Committee*—A steering committee should be formed of upper level management personnel and possibly include elected or appointed commission officials. All divisions affected by or involved in the implementation of a pavement management system should be represented on this committee. This committee should provide the support needed to facilitate the changes created by the pavement management system crossing traditional lines of authority. They should prepare goals for the implementation group. These goals should be based on the purpose of the proposed system as previously outlined in 5.2.1-5.2.5.

*5.3.4 Gain Commitment for Resources*—Real commitment has been achieved in most agencies when resources have been committed. The steering committee should ensure that adequate resources to support pavement management implementation, including funding, have been allocated.

*5.3.5 Form an Implementation Group*—The implementation group will convert the goals prepared by the steering committee into a work plan which details the tasks and resources required to implement the pavement management system. This group will be responsible for the day-to-day implementation efforts. In small agencies the implementation group may be a single person, hopefully the pavement management champion. In larger agencies, a separate pavement management work group may be formed.

*5.4 Selecting and Testing Pavement Management Processes*—Sections 5.4-5.4.6 provide information to guide the agency through the process to select appropriate procedures for the pavement management systems. At this point, the decision to adopt, or at least complete a trial implementation of, pavement management has been reached by the agency. The pavement management system components, including software and data collection processes, have not as yet been fixed. This phase normally includes matching and restructuring processes as the agency identifies the pavement management system components, data collection methods and management procedures that meet the needs and constraints of the agency.

*5.4.1 Organizational Analysis*—The implementation group must understand how the agency operates to determine how a pavement management systems can be used to support or improve the decision making process. They must compare decision making with the support of a pavement management system to the existing process to determine how it can be used

to facilitate the existing decision making or alleviate existing problems.

5.4.1.1 This should include a review of the agency structure, the communication flow, data collection processes, existing data bases, data flows, decision making processes, and other affected infrastructure management systems. The implementation group must have this information to demonstrate the problem and show how available pavement management decision support software and processes provide the needed solutions. They must demonstrate the relative advantage provided by the pavement management processes and their compatibility with existing procedures or how they will address deficiencies of the existing procedures.

5.4.2 *Select and Design System*—Pavement management processes, decision support software, and hardware requirements must be selected or developed to provide the support needed by the agency while fitting the constraints imposed by the resources available. The data to be collected, the cycle of data collection, and requirements to update the database must be designated based on the data standards and definitions. Basic decisions about division of effort between network-level and project-level pavement management processes as well as the interface between network and project-level management must be made. Requirements for training resources and software support should be defined. All of this must be based on the support needed as determined in the organizational analysis described in 5.4.1 to ensure that the adopted procedures meet the needs of the agency and can be implemented within the resources available to the agency.

5.4.3 *Modify Selected Pavement Management Process*—Data collection procedures, management processes, and decision support software selected in 5.4.2 are modified to fit the needs and constraints of the specific agency. This may be extensive, or it may entail only small changes such as restructuring a report.

5.4.4 *Prepare Staged Implementation Plan*—The implementation group uses the goals established by the steering committee and information collected in 5.4.1 to develop an implementation plan in as much detail as possible. It may not be possible to implement pavement management for a large network in a short time. Each data collection process, decision support procedure, report, and data storage method must be tried to determine if it matches the needs and constraints of the agency. Changes need to be planned and identified early to avoid costly revisions. The use of a trial implementation in a staged or phased implementation facilitates these adjustments.

5.4.5 *Implement Through Trial Operation*—A small percentage of the network is used to test the pavement management procedures, decision support processes and data collection procedures. The trial implementation should go through every management step in the pavement management process. This allows the agency to try the system, and it serves as an aid in training the various users of pavement management who should be involved in the implementation efforts.

5.4.6 *Document Results*—The results and costs of the trial operation should be thoroughly documented. Recommendations for modifications to the adopted pavement management system and implementation plan should be developed.

5.5 *Final Agency Decision*—Sections 5.5-5.5.3 provide the information to guide the agency to a final decision about pavement management and making revisions to the implementation plan. The implementation group and steering committee presents the results of the trial implementation to the agency management. The agency may decide to repeat a few previous steps because of problems encountered during the trial implementation prior to continuing into full implementation.

5.5.1 *Final Decision*—The agency decision makers commit to continue with full implementation and allocate adequate resources to support the implementation. In some cases, this may follow repeating some previous steps in the trial implementation and a re-evaluation of the results of the trial implementation.

5.5.2 *Revise the Goals*—After the trial implementation, the original goals developed by the steering committee should be thoroughly reviewed. Based on the organizational analysis and the information gained from the trial implementation, goals should be revised to match the needs to the constraints, especially the available resources needed for full implementation and use. It is particularly important to consider training and support plans in the goals as well as in the funding needs at this point.

5.5.3 *Revise the Implementation Plan*—The pavement management implementation group should review the work plans, resource requirements, and time requirements. The implementation group should work from the revised goals using the information learned during the trial implementation to revise the implementation plan. The pavement management procedures, the decision support software, and the data collection methods used in the trial implementation should be thoroughly reviewed. At this point it is possible to make major changes relatively easily; after all data is collected and entered into the data storage software, it is almost impossible to make major changes for a number of years. Any changes to pavement management procedures, decision support software, data collection methods, and data storage procedures identified as needed during the review must be included in the plan; however, they should be planned to allow the implementation to continue while permitting required improvements. The plan can call for the data collection be staged to match available resources to the work required to complete this effort.

5.6 *Implementation for Entire Network*—Sections 5.6-5.6.5 provide information to guide the agency through a process to complete the data collection and prepare the agency to fully utilize a pavement management program. After the trial implementation, the pavement management process must be implemented for the remainder of the network including required modifications. This may require that the agency go back and collect new data, or the same data in a different way, for the trial network. This will entail the most intensive data collection and training activities. Several tasks may run concurrently.

5.6.1 *Complete Required Revisions*—This will include the required revisions to the decision support software, data collection procedures, and data storage. This can be completed concurrently with 5.6.2.

5.6.2 *Complete Data Collection*—The data collection and inclusion of various elements of the network will often be

staged even after trial implementation. The most important pavements might be included in the first stage. The next most important group may be included in the next stage. This would continue until data is collected for the entire network. A method to ensure the quality of data must be established and in place at this time.

**5.6.3 Enter Data**—The collected data is entered into the database and checked for accuracy and completeness. All relevant reports are generated and reviewed.

**5.6.4 Develop Agency Specific Models**—The data collected is used to calibrate prediction models to the performance of the pavements that the agency manages.

**5.6.5 Train Staff**—Training should be included as an essential element of each activity. As the scope of pavement management increases and the implementation steps are completed, all of the users and operators involved in pavement management must be trained on pavement management concepts and system usage.

**5.7 Effective Pavement Management Operations**—Sections 5.7-5.7.5 provide information to guide the agency to the point where the pavement management system is used as a routine part of the pavement decisions making process, including funding decisions.

**5.7.1 Matching Output to Management Styles and Needs**—As new management personnel use the pavement management system, additional pavement management system requirements will be identified. It is essential that these requirements be met to maintain the credibility of the pavement management system.

**5.7.2 Placement in the Organization**—To ensure continuity of pavement management utilization, provisions must be made to formalize pavement management in the organizational structure. Although a single champion may have led the development and implementation of pavement management in the organization, pavement management responsibilities must

be formally designated to survive inevitable management and personnel changes.

**5.7.2.1** The responsibility for data collection, data entry, and maintaining integrity of the data base must be assigned. Specific persons should be assigned the responsibility for keeping their portion of the data current and maintaining its validity.

**5.7.3 Training on a Continuing Basis**—Changes and improvements, especially in the reporting system, the data collection processes, and the analysis techniques will need to continue indefinitely, although at a much reduced rate. Training is needed when changes are made to the systems; however, cyclic training is needed even when changes do not occur, especially for those processes that are completed intermittently and for staff who only spend a few weeks each year in pavement management activities.

**5.7.4 Establish a Feedback Loop**—After pavement management has been implemented, current information should be used. A feedback loop should be established so that condition information, cost data, and performance projections are kept current by periodically reviewing and adjusting them.

**5.7.5 Adjust and Improve to Keep Up with Changing Capabilities and Needs**—Pavement management processes continue to evolve as technologies advance. Data collection techniques are changing each year. Computer capabilities continue to increase, allowing more complex analysis and storage of larger data sets. More easily understandable decision support processes are being developed which can replace complex, difficult to understand procedures. A successful pavement management system will require continuing support and modifications.

## **6. Keywords**

6.1 implementation; pavement management; pavement management systems; PMS; systems implementation

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