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Standard Guide for Prioritization of Data Needs for Pavement Management¹

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1. Scope

1.1 This guide identifies data needs for pavement management systems. It also addresses the relative importance of various types of pavement data.

1.2 This guide was developed for use by federal, state, and local agencies, as well as consultants who provide services to those agencies.

1.3 This guide describes a process and provides a set of recommendations that any agency may use to develop a plan for acquiring pavement management data. Any individual agency may justifiably assign higher or lower priority to specified data items depending on their needs and policy.

1.4 *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:

- D 3319 Test Method for Accelerated Polishing of Aggregates Using the British Wheel²
- D 4123 Test Method for Indirect Tension Test for Resilient Modulus of Bituminous Mixtures²
- D 4602 Guide for Nondestructive Testing of Pavements Using Cyclic Loading Dynamic Deflection Equipment³
- D 4694 Test Method for Deflection With a Falling-Weight-Type Impulse Load Device²
- D 4695 Guide for General Pavement Deflection Measurements²
- D 4748 Test Method for Determining the Thickness of Bound Layers Using Short-Pulse Radar²
- D 5340 Test Method for Airport Pavement Condition Index Surveys²
- E 274 Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire²
- E 303 Method of Measuring Surface Frictional Properties Using the British Pendulum Tester²
- E 445 Test Method for Stopping Distance on Paved Sur-

faces Using a Passenger Automobile Equipped With Full-Scale Tires²

E 501 Specification for Standard Tire for Pavement Skid-Resistance Tests²

E 503 Test Methods for Measurement of Skid Resistance on Paved Surfaces Using a Passenger Vehicle Diagonal Braking Technique²

E 524 Specification for Standard Smooth Tire for Pavement Skid-Resistance Tests²

E 556 Test Method for Calibrating a Wheel Force or Torque Transducer Using a Calibration Platform (User Level)²

E 660 Practice for Accelerated Polishing of Aggregates or Pavement Surfaces Using a Small-Wheel, Circular Track Polishing Machine²

E 670 Test Method for Side Force Friction on Paved Surfaces Using the Mu-Meter²

E 770 Test Method for Classifying Pavement Surface Textures²

E 867 Terminology Relating to Travelled Surface Characteristics²

E 950 Test Method for Measuring the Longitudinal Profile of Traveled Surfaces With an Accelerometer Established Inertial Profiling Reference²

E 965 Test Method for Measuring Surface Macrotexture Depth Using a Sand Volumetric Technique²

E 1082 Test Method for Measurement of Vehicular Response to Traveled Surface Roughness²

E 1166 Guide for Network-Level Pavement Management²

E 1170 Practice for Simulating Vehicular Response to Longitudinal Profiles of a Vehicular Traveled Surface²

E 1215 Specification for Trailer Used for Measuring Vehicle Response to Road Roughness²

E 1274 Test Method for Measuring Pavement Roughness Using a Profilograph²

2.2 Other Publications:

Guidelines on Pavement Management, AASHTO (1990)⁴

AASHTO Guide for Design of Pavement Structures, AASHTO (1986)⁴

FHWA Pavement Policy for Highways, Federal Register, Vol 54, No. 8 pp. 1353–58 (Jan. 13, 1989)⁵

¹ This guide is under the jurisdiction of ASTM Committee E-17 on Vehicle-Pavement Systems and is the direct responsibility of Subcommittee E17.41 on Pavement Management.

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² Annual Book of ASTM Standards, Vol 04.03.

³ Annual Book of ASTM Standards, Vol 04.08.

⁴ Available from the American Association of State Highway and Transportation Officials, 444 N. Capitol St. NW, Washington, DC 20001.

⁵ Available from the U.S. Department of Transportation, Federal Highway Administration, Washington, DC 20590.

Pavement Management Practices, NCHRP Synthesis 135 (1987)⁶
Guidelines and Procedures for Maintenance of Airport Pavements, FAA Circular 150-5320-6⁷

3. Significance and Use

3.1 A key objective of all pavement-management systems (PMS) is to provide a factual basis for improving the quality of decision making regarding the budgeting, design, programming, construction, maintenance and operation of a pavement network. Quality decision making requires a current inventory of the pavement system, evaluation of the present condition and use of the pavement system, estimation of future condition, and the implications of any changes in condition.

3.2 This guide may be used to identify data needs for pavement management by considering the use, generic type, and relative importance of the pavement. It can also assist in identifying methods for obtaining the data.

3.3 Any data element selected for collection should have a specific use and be of value in providing information from the PMS for the decision making process.

3.4 The specific type of data needed to make informed pavement management decisions will vary with such factors as the size, complexity and condition of the pavement network, the levels of service to be provided, the agency budget and budgeting process. Further, since pavement management is a dynamic process, responsive to changes in technology, the data needs for a particular agency may be expected to change over time. Accordingly, judgment invariably will be required in applying this guide to develop a hierarchy of data needs.

4. Data Types and Acquisition Methods

4.1 General types of pavement management data include the actual physical measurement of the pavement, information about usage, (that is, traffic and accident data) and administrative information. Both the types and acquisition methods of pavement management data can be generally classified.

4.2 The most appropriate classifications for the various

types of pavement data are those related to the following groups.

4.2.1 *Performance*, the ability of a pavement to fulfill its purpose over time as reflected in the measurable change in condition over time,

4.2.2 *History*, past occurrences that influence pavement performance,

4.2.3 *Costs*, investment necessary for performance improvement or the liability as a result of declining performance,

4.2.4 *Policies and Regulations*, decisions that are made as constraints to pavement systems,

4.2.5 *Geometry*, alignment, dimensions and shape of the pavement and its appurtenances, and

4.2.6 *Environment*, external factors affecting pavement performance.

4.3 This classification scheme has been used to incorporate all the component generic data items in Table 1. Table 1 also presents the corresponding methods to acquire those data items, again on a generic basis.

5. Sample Size and Frequency

5.1 The collection of pavement management data may be continuous or may involve a sampling process based on time, location, or other suitable parameters. The general type of sample (stratified or continuous), its size, and the time interval between repeat sampling, may vary considerably from agency to agency and from one type of analysis to another. The appropriate type and rate of sampling is dictated primarily by the nature of the analysis to be performed (that is, network versus project, trend analysis versus project design), the relative importance of the end use (that is, policy setting versus routine analysis), the budget of the managing agency, as well as conventional statistical considerations required to ensure that the data will be sufficiently accurate and precise to permit valid inferences to be drawn.

6. Uses of Data

6.1 Pavement management data is used for network and project level purposes. Network level management requires information for planning, budgeting, and forecasting trends. Project level management requires information for design and engineering of specific pavement sections or projects. The various data are used in network and project level analysis as shown in Table 2.

⁶ Available from the Transportation Research Board, Box 289, Washington, DC 20055.

⁷ Available from the Federal Aviation Administration, 800 Independence Ave., S.W., Washington, DC 20591.

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TABLE 1 Pavement Management Data Items and Acquisition Methods

Performance-Related		
Data Category	Typical Acquisition Method(s)	Available Related ASTM Standards
Roughness	subjective rating response type equipment profile measurement and response simulation profilograph measurements	E 1082, E1215 E 950, E1170 E 1274
Surface distress	pavement distress surveys (manual or automated)	D 5340
Friction	side force equipment locked wheel equipment slip friction (incipient) equipment pendulum equipment	E 670 E 274, E445, E501, E503, E524, E556 E 303
Deflection	texture measurement methods impulse equipment static equipment cyclic force equipment	D 3319, E660, E770, E965 D 4694, D4695 D 4695 D 4602, D4695
Layer material properties	in-situ and laboratory material testing back-calculation of material properties from field tests nondestructive pavement tests layer thickness	Many ASTM standards (Vol 04.03) None exist. Several useful methods available D 4694, D4695 D 4748
History-Related		
Maintenance history	records, estimates, surveys, in-situ testing	
Construction history (includes new construction, reconstruction, rehabilitation and repair)	as-built records, estimates, surveys, in-situ testing	
Traffic	records, estimates and surveys	
Accidents	records, estimates and surveys	
Cost-Related		
Construction costs (includes new construction, reconstruction, rehabilitation and repair)	records, estimates and surveys	
Maintenance costs	records, estimates and surveys	
User costs	records, estimates and surveys	
Policy-Related		
Budget	records, public officials and other agencies	
Available alternatives	records, organizations, suppliers and other agencies	
Levels of service	public officials and policy statements	
Geometry-Related		
Section dimensions	records, estimates, direct measure and in-situ testing	
Curvature	records, estimates and direct measure	
Cross slope	records, estimates and direct measure	
Vertical curvature	records, estimates and direct measure	
Shoulder/curbs	records, estimates and direct measure	
Environment-Related		
Drainage	analysis from records or field observation/measurement	
Climate	analysis from records or field observation/measurement	

TABLE 2 Typical Uses of Pavement Management Data

Data Category		Network Level	Project Level
Performance-Related			
Roughness	a) Describe present status and estimate impacts on users b) Predict future status (deterioration curves) and impact on condition and users c) Identify current and future needs d) Basics for priority analysis and programming	a) Quality assurance (as-built quality of new surface) b) Create deterioration curves	
Surface distress	a) Describe present status and estimate impacts on users b) Predict future status (deterioration curves) and impact on condition and users c) Identify current and future needs d) Maintenance priority programming e) Determine effectiveness and benefits of alternative treatments	a) Selection of maintenance treatment b) Predict future status	c) Estimate milling/leveling/overlay quantities d) Determine effectiveness and benefit of alternative treatments
Surface friction	a) Describe present status and estimate impacts on users b) Predict future status and impact on condition and users c) Priority programming d) Determine effectiveness and benefit of alternative treatments	a) Identify spot or section rehabilitation requirements b) Determine effectiveness and benefit of alternative treatments	
Deflection	a) Describe present status b) Predict future status and impact on condition c) Identify structural inadequacies d) Determine seasonal load restrictions e) Priority programming of rehabilitation	a) Input rehabilitation design b) Determine as-built structural adequacy c) Estimate remaining service life d) Determine seasonal load restrictions e) Determine effectiveness and benefit of alternative treatments	