*A2B06: Committee on Pavement Monitoring, Evaluation, and Data Storage*
*Chairman: Jerome F. Daleiden*

# Pavement Monitoring, Evaluation, and Data Storage

**JEROME F. DALEIDEN**, *Fugro-BRE*

The Committee on Pavement Monitoring, Evaluation, and Data Storage is concerned with data-gathering and processing issues in support of the other committees in the Section on Pavement Management. In this capacity, the committee focuses on means for documenting pavement responses to both traffic and the environment. Evaluation of such data, for the purposes of this committee, is limited to interpretation for enhancing design and management decisions. Finally, data storage issues are addressed as they relate to facilitating the use of such data in responding to inquiries on pavement issues.

## STATE OF THE ART

Automation technology continues to advance at what seems to be an exponential growth rate. Although files of any significant size (greater than a few megabytes of memory) used to require storage on tape, 10-gigabyte hard drives are now commonplace for desktop computers. Similarly, processor speeds have advanced at a comparable pace. By comparison, technology for the monitoring of pavement condition does not appear to have kept pace with other technological improvements over the past 10 years. This is particularly mystifying when one considers the advancements that have been made in the general field of data acquisition and processing. The need to collect pavement data more expeditiously and reliably remains. Only pavement ride quality and rut depth data can be collected with acceptable levels of accuracy, resolution, and precision in real time (at normal highway speeds). Research and development are under way to advance the state of the art in the collection of structural capacity data, but the collection of pavement surface condition data remains at an unacceptable level similar to what it was a decade ago.

Although agency needs for such data continue to expand, resources for their collection seemingly dwindle. In reality, the technology simply has not kept pace with the expectations of the industry, and this has created a gap that remains to be addressed. The Subcommittee on Automated Technology for Pavement Evaluation has been focusing primarily on the implementation of automated technology for pavement surface condition evaluation. Specifically, the subcommittee has been serving as a forum for discussions between industry and state highway agency personnel on

- Evaluation of procedures used to perform automated condition surveys,
- The need for specifications for data collection procedures and quality control, and
- Experiences in the analysis of results obtained by automated technology.

Despite the attention being paid to this subject, many agencies still collect pavement surface distress data manually, for a variety of reasons, not the least of which are lack of confidence in the capabilities of automated data collection technology in this area and the high cost of collection using the automated technology.

Advances in computer technology have definitely facilitated the volumes of data that can be collected and stored. Similarly, greater access to positioning satellites has made the location of data in the field more accurate, which has assisted in making the storage, retrieval, or both, of the increasing volumes of data much more manageable and user friendly.

## INFORMATION GAPS

Issues associated with the cost or benefit of pavement management data remain. It is still not entirely clear how much data is enough to adequately address the needs of an agency at the appropriate management level (network and project). Questions such as those in the following sections are not easily addressed. The responses rely heavily on the intended uses for the data. There does not appear to be any clear-cut strategy, however, for resolving such issues. The committee will continue to have a strong interest in fostering the exchange of ideas to aid in addressing these pavement data collection issues.

### Structural Capacity Needs

Many agencies are still trying to establish when structural capacity data are truly needed. Should structural capacity data be obtained only for project designs, or can such data be used to supplement management decisions? Can we justify the cost of collecting such data at a network level? How should the data be summarized and represented in such a network-level application?

### Surface Condition Needs

Along these same lines, needs for surface condition assessment continue to be a source of uncertainty. How detailed should we be in establishing our network-level surface condition assessment? Do we need severity levels? How many different distresses are truly required for a decision about which projects to work on? Do we need to know details regarding locations of the distresses observed or just average quantities? What kinds of decisions require severity levels and additional distress types?

### Application of Surface Condition Data

Similarly, analysis of visual distress data collection for pavement management remains a significant abstraction to many agencies. Should we act on a threshold value? Should we plan for rehabilitation when the rate of deterioration increases? How detailed should the data collection be to ensure that the analysis would be meaningful? If we just develop composite scores, are we getting the most out of our data collection? Will programs such as pavement preservation require additional data? The ability to store and process large volumes of data has advanced considerably, but this may simply be fostering significant inefficiencies.

### Data Consistency

Consistency of data across transportation agencies remains one of the significant distractions to this industry. Although research is being conducted on the optimum strategies for collection of pavement data, agencies are being pushed to do something in the meantime. As they address their current needs, trends are established that cannot easily be redirected. The challenge of persuading agencies to convert to new or universal systems grows larger with each passing year.

### Contracting Data Collection

As the trend toward privatization continues, issues associated with the quality management of contract pavement data collection grow. Although variability in such data is considered commonplace, defining an acceptable level of variability remains daunting, partly because the amount of variability experienced is seldom well documented and partly as a result of the lack of standardization. Agencies need guidance on how to determine the quality of the data collected both by their own forces and by contract data collectors, whether the data are collected manually or by using automated equipment.

## LOOKING AHEAD

The desire to have an all-in-one pavement-monitoring vehicle remains. With resource limitations, safety concerns, and the need for quicker answers, agencies continue to seek out the most efficient means for documenting the condition of their pavement facilities. Profile data already can be collected in real time. Structural capacity data will likely be obtainable in a similar fashion within the next decade. Steps must be taken, however, to produce a clearer set of objectives for collection of surface condition data to allow for its automation.

If extremely detailed pavement surface distress data are truly needed, advances in image resolution will be required. If a standard set of critical distresses can be agreed upon (with a specified tolerance for accuracy), industry should be able to focus on those distresses and develop some consistency in their collection. The quality and accuracy of the data appear to be of far greater concern than the ability to collect these data rapidly. Advances in automation technology, as previously discussed, show little signs of slowing down, and we can already collect more than we can use. However, the industry as a whole continues to struggle with a definitive statement of what good quality is and how accurately it must (or can) be obtained. Until these issues are adequately addressed, pavement monitoring will not be able to capitalize on the advancements of the automation boom.

This committee has not seen much activity in the collection of data for mechanistic analysis, but as design procedures move in this direction, it is anticipated that more attention will be focused on the monitoring of pavements for validating such design procedures. Although several studies are being carried out in this field, current motivating factors (like resource limitations, safety issues, and environmental concerns) have not highlighted the importance of these studies. If mechanistic design procedures become commonplace, as predicted by others, a change in the emphasis of this committee may be forthcoming.