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**Alternates**

- **Automated Pavement Condition Data Collection Quality Control, Quality Assurance and Reliability**  
  Samy Noureldin  
  Indiana DOT, West Lafayette, Indiana, USA

- **Automated Comprehensive Survey of Pavement and Roadway Assets**  
  Kelvin Wang  
  University of Arkansas, Fayetteville, Arkansas, USA

- **Factors Affecting Initial Pavement Roughness of Concrete Pavement**  
  Haifang Wen  
  Bloom Consultants LLC, New Berlin, Wisconsin, USA
A NOTE ABOUT THE DAWG

The DAWG is an international forum for the discussion of methods of analysis of pavement performance data. Presentations at DAWG-sponsored forums address the technical interests of professionals engaged in highway research and engineering design, maintenance, and rehabilitation who are engaged in collecting, processing, and analyzing such data and developing insights into the behavior of pavements. Presentations offered by forum attendees (by prior arrangement) focus on work-in-progress concerning the development of techniques for extracting and analyzing data, and early results of recent applications of these techniques. Topics such as model building, sensitivity analysis, and development of transfer functions linking structural response to distress are especially popular and welcome.

A DAWG-sponsored forum has a minimum of formality to encourage open discussion among attendees and minimize the time between the presenters' preparation and dissemination of analytical results. The agenda is prepared in advance, based on responses to a call for abstracts. Abstracts are reviewed solely for conformity with DAWG guidelines, and as many as time permits are placed on the agenda. Presentations are not subjected to prior technical review. Copies of presentation materials are not distributed. Presentations are not published. Comments by forum attendees are not recorded.

DAWG-sponsored forums are held twice each year: immediately preceding the TRB Annual Meeting in Washington DC in January, and approximately at the midyear at another location. The midyear meeting is usually held in conjunction with a major highway pavement conference where it is expected that many attendees will also be interested in participating in a DAWG forum. If requested by the organizers, the DAWG will arrange and conduct a formal paper session conforming to all the policies and procedures of the conference.

As a TRB committee, the DAWG has appointed members who serve as a steering committee to guide the planning of future meetings. However, DAWG forums are open to everyone interested in the subjects to be discussed, and all attendees enjoy equal status. There is no registration requirement or fee required to attend meetings, but advance notice of the intent to attend a particular forum is recommended and appreciated.

Inquiries are welcome from those interested in adding their names to the DAWG's mailing list, and those wishing to submit abstracts of presentations for consideration for presentation at a particular forum. Inquiries and abstracts should be directed to:

Dr. A. Robert Raab
Transportation Research Board
500 Fifth Street NW
Washington, DC 20001
Telephone: 202-334-2569
Fax: 202-334-3471
Email: rraab@nas.edu
TRB’s DATA ANALYSIS WORKING GROUP (“the DAWG”)
PRESENTATION ABSTRACT FORM

TITLE OF PRESENTATION:

ABSTRACT:

(Guidelines:

• Any person who wishes to brief the DAWG on the status of his/her unfinished and unpublished work is invited to submit an abstract.

• Each abstract must contain a small set of questions on issues being considered by the submitter in the further development of his/her project.

• Each briefing will be followed by a period devoted to consideration of the presenter’s questions and requests for advice.

• Briefings should focus on techniques for extracting, processing, and analyzing pavement performance data, as well as preliminary results of applications of these techniques.

Note: Please delete the guidelines and use this space for your abstract.)

PRESENTER’S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

1-

2-

3-

PRESENTER’S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

NAME: ______________________________________________________________________________

MAILING ADDRESS: ________________________________________________________________

_________________________________________________________

_________________________________________________________

TELEPHONE/FAX/EMAIL: ________________________________________________

Completed forms should be sent to:
A. Robert Raab, PhD, PE, FASCE
Senior Program Officer, TRB
Email: rraab@nas.edu
DEVELOPMENT OF MIX DESIGN AND TESTING PROCEDURES FOR COLD PATCHING MIXTURES

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ABSTRACT:

This study aims at developing a design method and performance-related testing recommendations for homemade and containerized cold patching mixtures. Increasing costs and problems with the stability, durability, workability, and stockpile life of homemade patching mixtures led the Texas Department of Transportation (TxDOT) to investigate improvements to their cold mix design procedures.

Cold mix failure mechanisms were identified and addressed during the first year of the study. The influence of material characteristics such as gradation, aggregate type, binder viscosity and type (MC or RC), binder content, compaction, temperature, curing time, and the use of admixtures were quantified through a series of laboratory tests. In the laboratory, mixes were prepared using the Marshall hammer, the Texas and the Superpave Gyratory Compactors and tested for stability using the Hamburg Wheel Tracking Device (HWTD) and the Marshall press, and tested for workability with the Cold Patch Slump Test (CPST). Those mixtures with promising laboratory test results are undergoing accelerated pavement testing (APT) with the Model Mobile Load Simulator (MMLS3). The use of MMLS3 testing overcomes some of the limitation with specimen preparation encountered when preparing specimens and reproduced more realistic testing conditions.

Some of the promising mixtures were also tested in the field late last winter in the TxDOT Lubbock district under unusually warm winter conditions. An evaluation protocol was developed to evaluate the performance of the various patches in the field. Those mixes placed in Lubbock showed very good workability but relatively poor stability. Therefore, improved mixes will be laid down and monitored this winter for determining field performance.

The challenge ahead lies in correlating the results from the laboratory and MMLS3 testing to the performance of these mixtures in the field. Ultimately, a meaningful correlation will determine how current mixture design practice should be modified to attain optimal performance.

PRESENTER’S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

1. Is there any study available that compares the workability and field performance of containerized versus homemade mixtures? What about comparison among containerized mixes?
2. Is the evaluation protocol for rating the patching mixtures in the field adequate? Do you know of any similar protocol available? Do you believe the distress weightings are adequate?
3. Any suggestions on correlating laboratory testing results with results from testing in the field to determine expected performance? Accurate expected field performance is very important for the economic analysis that will follow.

PRESENTER’S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
FWD DATA PROCESSING FOR ACCURATE DYNAMIC BACKCALCULATION OF PAVEMENT LAYER PARAMETERS

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ABSTRACT:

This presentation discusses the results from backcalculation of flexible pavement layer parameters based on dynamic interpretation of FWD test using frequency and time-domain solutions. The frequency-domain solution uses complex deflection functions (compliance) at single or multiple frequencies as the predicted quantities, while the time-domain solution uses either the peak deflections, the deflections near the peaks or the overall deflection time histories as the predicted quantities. An iterative process is used to match the predicted quantities to the corresponding measured quantities or observations. Moreover, different objective functions in the inversion procedure have been studied, for instance the sum of relative squared error and the sum of absolute error between predictions and observations. Results with field FWD data show that the solution, the type of observations and the objective function have a significant influence on the backcalculated moduli and the number of iterations required for convergence. In fact, the frequency-domain method can lead to large errors if the measured FWD deflection time histories are truncated and not corrected. Furthermore, possible discrepancies between in-situ and theoretical pavement behavior could render this method unsuitable. However, the time-domain method seems to be more robust. Clearly, there is a need to find the right way of processing FWD data for its accurate interpretation with dynamic methods.

PRESENTER’S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

1. Which observations from FWD data result in the most accurate backcalculated parameters? Are we omitting pertinent information when using only the peak deflections?
2. Is the sum of relative squared error the most appropriate form for the objective function to ensure accurate backcalculated layer parameter values when dealing with deflection time histories or compliance functions?
3. Can consistent results be obtained when analyzing the same FWD data set with different forward dynamic models and backcalculation algorithms?

PRESENTER’S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
NETWORK ANALYSIS ON FLOODING DAMAGE OF PAVEMENT STRUCTURES CAUSED BY HURRICANE KATRINA

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ABSTRACT:

Hurricane Katrina devastated New Orleans and caused the sustained flooding in the area. Limited pre- and post-flooding tests indicated that the pavement structures tested had been adversely impacted by the flood water and that it would take approximately 2.5 inches of asphalt to mitigate the damages. Consequently, LADOTD hired an independent contractor to structurally test approximate 235 miles of the Federal aided urban highway within and outside of the flooding area. FWD test was performed every one-tenth of mile over each of the selected roadways, accompanied with other field tests. The FWD data was imported into a GIS system with a USGS geo-referenced map and compared with the extensive flood maps available through NOAA and FEMA. So it was possible to spatially and graphically classify all test points according to criteria of flooding versus non-flooding, short flooding duration versus longer flooding duration, shallow flooding versus deep flooding, and thin pavement versus thick pavement. Three pavement types were considered in this analysis. They are AC, PCC, and composite pavements. The statistical inference about the difference in the means of compared data groups was conducted with 95% confidence. These differences in a network level were then converted into dollars and cents with the current market cost of asphalt pavement construction.

PRESENTER’S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

1. Do we have a better approach to estimate the flooding damage of pavement structure?
2. Do we have a better way to interpret the final results?

PRESENTER’S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
CHARACTERIZING AND UNDERSTANDING FROST HEAVE AT THE MN/ROAD PROJECT

R. Barnes, L. Khazanovich, and A. Shamim
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ABSTRACT:

From 1993 through 2001 more than 34,500 accurate, pavement elevation measurements were systematically
taken to better understand frost heave, and the interaction between frost heave and engineered parameters of
pavement design at the Minnesota Road Research Project site.

The measurement campaign involved 20 test sections from both the high-volume mainline portion of the site
(3.5 miles of Interstate 94 near Otsego, Minnesota) and the adjacent low-volume loop (a 2.5 mile closed loop).
A suite of portland cement concrete and hot mix bituminous asphalt sections, on various engineered pavement
base designs, were include in the data.

Each test section had up to 29 frost pins embedded, but exposed, in the upper pavement layer. The frost pins
were placed along the centerline of the traveled lanes and uniformly spaced at 40 or 50 feet. The elevations of
the frost pin heads were accurate measured periodically over five years. Measurements were taken twice a
month during the late fall, winter, and early spring, and once every other month the rest of the year; there were
84 measurement days over the five years.  The elevation measurements were taken relative to bench marks
placed on deep, frost-free, footings.

Variations of the frost pin elevations coincided with the presence and absence of frost for the Minnesota
seasons:  e.g. a hard, persistent, frost starting in late November and continuing through later March, with a
possible mid-winter thaw.  Elevations of the frost pins increased by 0.06-0.10 feet (1.8-3.0 cm) through the
winter, decreased by a comparable amount in the late spring, and held steady during the summer and early
fall.

Exploration of this data set has identified a number of notable patterns.  (1) The subgrade composition and
designed base impact the magnitude of frost heave.  (2) The spatial variability of frost heave within each test
section, at fixed times, increased in a consistent fashion through the life of the project.  (3) The magnitude of
frost heave was spatially correlated, with correlation lengths in excess of 100-200 feet.

PRESENTERS’ QUESTIONS: We would like to receive comments, suggestions, and feedback from the
meeting's attendees on the following matters:

1. Can the seasonal variation of the frost pin elevations be attributed to frost heave, or are there other
   mechanisms that must be considered and accounted for?  What additional information is necessary to
distinguish between the candidate mechanisms?
2. Given our current understanding for the mechanisms of frost heave (both micro and meso-scale
   processes) how can the increase in spatial variability over time be explained?  Is this a hysteresis-type
   phenomenon?
3. The mechanism of frost heave described in the technical literature suggests a process length scale on the
   order of one a few inches, or less (e.g. millimeter-scale ice crystals).  How then can we explain the
   identified frost heave correlation lengths of more than 100-200 feet?
4. A continuation of this experiment is being considered for the new test sections, which are currently under
design.  Is this a worthwhile endeavor?  If so, how should the new data collection campaign be designed?
   What additional information should be collected?

PRESENTERS’ STATEMENT: This work is still in progress, and has not been submitted for presentation or
publication at another meeting.
ROAD CONDITION VARIABLES AND MEASURES OF EFFECTIVENESS

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ABSTRACT:

This is the next step of the development presented at the DAWG Forum that was held in Trondheim, Norway, in 2005.

In the Swedish Road Administration (SRA), the road condition is described using a number of condition variables collected by laser measurements or visual inspections.

The condition variables are used to
- describe maintenance standard specifying trigger values for the variables
- assess backlog according to the maintenance standard
- assess condition-based road capital value
- specify maintenance strategy for the road network
- set up goals for the annual plan
- monitor achievement of the goals.

Maintenance standard is defined by using trigger values for condition variables. The trigger values are selected with regards to both road preservation and with regards to road user effects. The combination of the trigger values represents SRA's idea of proper balance between different goals, the external effectiveness. There is a maintenance standard and a special standard for winter operations.

Compliance to maintenance standard is monitored using the term “backlog”. It is defined as cost of optimal road works to be performed on road components that have some condition variable value under trigger values of the maintenance standard. Its value for the 80,000 km of paved roads is about 2,000 million euro.

The internal effectiveness of maintenance in the SRA is defined by following formula:

\[ \text{IE/Maintenance} = \frac{\text{Condition Improvement due to maintenance}}{\text{Maintenance Costs}} \]

The internal effectiveness of winter operations in the SRA is defined by following formula:

\[ \text{IE/Winter} = \frac{\text{(Expected Condition due to Operations – Shortage Costs)}}{\text{Operations Costs}} \]

Both the maintenance costs and winter operations costs are adjusted for so-called cost-influencing factors like inflation, weather, new roads, traffic growth, change in environmental demands, etc.

The internal effectiveness measures are supposed to become the main aggregated performance indicators of the organization.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1. What condition variables for paved roads are missing?
2. What alternative methods for specification of maintenance standard are used?
3. What methods for assessment of overall road condition are used (alternatives to backlog)?
4. What alternatives methods for assessment of maintenance effectiveness are used?

PRESENTER’S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
ABSTRACT:

The present study describes the results of a survey on the performance of asphalt overlays built through milling and filling old asphalt surfaces of heavy loaded urban roads in São Paulo City (Brazil). Pavement sections were monitored since the last restoration accomplishment by measurement of roughness and cracking progression. Based on measurements of structural and functional patterns, empirical models were developed to predict the performance of roughness and cracking of asphalt overlays by using generalized linear models. The proposed cracking models have shown to be less optimistic than the HDM-4 performance models. On the other hand, the roughness models developed resulted quite similar to the HDM-4’s. Prediction models are based on ESAL’s, overlay thickness, deflection after overlay, age and Structural Number (SN).

Roughness surveys were carried out using both the Bump Integrator as well as through inertial profilometer. Crack development and progression was monitored by means of condition surveys. Surveys were carried out every four months and monitoring endured up to 8 x 10^7 ESAL’s between 2002 and 2005. The structural strength of asphalt overlaid pavements was evaluated by means of FWD measurements. The full experimental design consisted of a set of 19 pavement sections.

By comparing obtained results to HDM-4 predictions by its simulation taking into account traffic and pavement parameters, it was found that the general model was able to predict quite well IRI evolution; on the other hand, crack development observed in field was much faster and critical than anticipated by HDM-4 model. Such difference could be explained by the presence of reflective cracking in the experiment.

PRESENTER’S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

1. Are there recent studies trying to improve HDM 4 prediction models for urban pavements?
2. Is there recent international experiences concerning differences and accuracy for inertial profilometers measurements and bump integrator systems? How do these differences affect reliability of performance models for IRI?
3. Structural number (SN) seems to be a good parameter for physical description of pavement stiffness. How do researches in developed countries, such as LTPP studies, consider SN calculations for use in statistical performance modeling: through field thicknesses and actual material behavior or simply by FWD measurements?

PRESENTER’S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
ABSTRACT:

The Gauteng Department of Public Transport, Roads and Works (GDPRW) have initiated a large-scale test programme together with other sponsors to improve the methods for evaluating hot-mix asphalt (HMA) in South Africa. The first phase of the testing programme focuses on the evaluation of the resistance to permanent deformation of a standard HMA, using both Accelerated Pavement Testing (APT) and laboratory testing methods.

In the presentation, selected initial results from the first APT tests (field) are compared with the data from the first laboratory tests (including wheel-tracking type tests). Further, preliminary evaluation of the effect of different compaction methods on the laboratory sample densities is evaluated.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1. Experiences with wheel tracking type tests on HMA, specifically regarding temperature regimes.
2. Experiences with comparisons between scaled and full-scale loading devices on HMA performance.

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
CHARACTERIZATION OF THE STRESS INFLUENCE CONE UNDER FALLING WEIGHT DEFLECTOMETER TESTING

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ABSTRACT:

This research focuses on the quantification of the stress zone under the Falling Weight Deflectometer (FWD). Through the investigation of time history deflection influence lines captured by the various FWD sensors and the measurement of true in-depth deflections measured with Multi-Depth Deflectometers (MDDs), it is possible to determine the exact influence zone of the dropping weight of the FWD.

It is realized that the elastic surface deflections measured by the FWD are influenced by, among other factors, the strength, thickness and density of the various layers of which the pavement is made up and that the stress cone for any type of pavement structure will differ. It is believed that through studying the stress zones of various pavement structures it will be possible to refine back-calculation modeling of pavement layers through FWD testing.

The investigation of time-history response of both the FWD and MDD will also assist in the calibration of dynamic finite element modeling in attempts to improve on existing layer stiffness characterization.

This study is in its inception phase and preliminary data of only one type of pavement structure are presented.

PRESENTER’S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

1. Have anybody done such a study and is the date available?
2. What about the relative position of the FWD base plate with respect to the MDD sensor?
3. Can this analysis be used in dynamic FEM?
4. How do you handle strong interlayers (i.e.: a cemented layer placed between two granular layers?)

PRESENTER’S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
State Highway Agencies have recognized the need for high quality data in their pavement management systems. Until now however, it has been difficult to arrive at the value of good data. Pavement condition data collection at network level plays the most important role in pavement preservation and management programs. Pavement condition assessment significantly impacts pavement performance analyses and modeling that is essential for setting preservation and rehabilitation priorities and hence allocating appropriate funding. Therefore, it is imperative to collect and process high quality pavement condition data from either contract or in-house. In the past two decades major components of pavement condition data collection became almost fully automated.

Applying statistical concepts to quality management is not unique for highway agencies although these concepts were historically focused on highway construction materials and processes. Three well known definitions are typically used and may also be tailored for appropriate application in pavement condition data collection and processing; Quality management (QM), Quality control (QC) and Quality assurance (QA). If there is high variability in the data (as a result of equipment, process or human involvement), it is possible that there will be too much “noise” to permit meaningful year-to-year comparisons and the data collected itself may be of limited value.

QM of pavement data collection and processing has reached a point similar to that experienced in the past by those working with the QM of highway materials and construction processes. There is no clear delineation between what is the responsibility of the data collector (vendor or highway agency) and what is the responsibility of the user of the data collected (highway agency). The control of data quality can be viewed as the responsibility of the collector, because that entity produces the data and has the tools and resources to influence the quality of those data. On the other hand, the user is in the best position to assess acceptability of the data provided, because that entity is the ultimate owner of the data. The different responsibilities typically would be reflected in two very different elements of the overall QC plan, the QA plan or the QM Plan.

Long Term Pavement Performance, LTPP, studies showed that the overall reliability of manual distress data interpretations is higher than video logs interpretations. Manual survey interpretation provided higher distress level than video logs interpretations on the same sections, possibly reflecting the relative difficulty in discerning low severity distress from video logs as compared with field observations. However, there was a reasonable correlation between manual and video log interpretation values for most pavement distresses. This finding suggests that generally it is more difficult to discern surface distresses from images than from field observations. It may also follow that surface distress variability needs additional research and quantification before realistic QA provisions can be incorporated in distress data collection contracts. The LTPP work, however, is of a research nature such that the findings might not be directly applicable to network-level pavement management work.

The Indiana Department of Transportation (INDOT) manages approximately 11,000 miles highway system of Interstates, U.S. Roads, and State Routes. This system utilizes automated collected pavement surface condition data which includes pavement distress index, international roughness index and rut depth. A pavement quality index is calculated employing this data. Interstates are surveyed annually and the rest of the network is surveyed biannually by a consultant. Video tapes of the pavement are used by the consultant to measure the severity and extent of surface distresses as described by an INDOT manual supplied to the consultant. The first 500 ft of each mile is rated from the video by the consultant. One lane is surveyed for multilane segments. Texture, and skid resistance data is separately collected and interpreted in-house.

INDOT as well as many State Highway agencies depend totally on the vendor to provide the quality of data needed. That level of quality itself is not well defined except in very general terms, such as requiring that the data to be of sufficient quality to feed pavement management program algorithms. Current QC/QA on automated data of pavement condition elements collected for INDOT by the contractor is very limited. Discrepancies have been reported between pavement conditions collected via video logs by the contractor versus those collected manually by experienced INDOT personnel. It is essential that a set of QA (including
Repeatability and reproducibility) acceptance criteria for pavement condition parameters is developed that is accepted and agreed upon by all units within INDOT using the information.

Research is needed for INDOT to develop a detailed statistical quality management programs for automated pavement data collection and processing to achieve the desired high quality data for pavement condition elements. Relevant technologies, other States experiences and features needing standardization need to be investigated. Recommendations for establishing guidelines that INDOT can use to develop its quality management practices for contracting pavement condition data collection need to be provided.

The main objectives of this research study are:
- To assess current automated data collection practices being conducted by INDOT and evaluate its accuracy.
- To establish typical variability values for surface distresses and other pavement condition elements.
- To develop data on typical year-to-year changes in pavement distress indices as well as typical precision and bias statements.
- To establish pavement condition QA guidelines, requirements, procedures or practices that could be used by INDOT to develop or improve quality management practices for contract pavement condition data collection.

PRESENTER’S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

1. Existing experiences on QM plans for automated pavement condition data.
2. Possible limitations to a comprehensive QM plan.
3. Experiences on possible benefits of a QM plan; cost savings, better allocation of funds etc

PRESENTER’S STATEMENT: This work will be starting and has not been submitted for presentation or publication at another meeting.
ABSTRACT:

This presentation discusses results from the most recent research conducted by the team at the University of Arkansas in two areas: automated distress survey and automated sign survey. In 2005, the application of laser based imaging for pavement image acquisition opened the door to low-power, sun-light friendly, and high-resolution acquisition of pavement images. The presentation will discuss the implementation of the laser based imaging system. In addition, the Automated Distress Analyzer (ADA) developed in Arkansas has also been refined and integrated into the laser based imaging system to form a real-time system for both acquisition and processing for cracks. Based on imaging experience gained in developing ADA, the researchers also embarked on the difficult task of developing sign detection system for recognition and classification. This presentation will discuss the development progress and applicability of the sign detection technology and future directions.

The ultimate goal of the research team is to develop a highly integrated, multi-function, and fully automated data vehicle for real-time data acquisition of pavement and roadside structures and real-time processing for distresses and various condition surveys.

PRESENTER’S QUESTIONS:  I would like to receive comments, suggestions, and feedback from the meeting’s attendees on the following matters:

3. What is the minimum resolution in terms of millimeter for cracking, rutting, faulting and other surface defects in your agency?
4. In rutting survey, what is user preference between a line-laser system with hundreds of points and point-laser with several points, despite the fact the line-laser system may provide some lesser accuracy?
5. Is one-pass for all multifunction vehicle important for users?

PRESENTER’S STATEMENT:  This work is still in progress, and has not been submitted for presentation or publication at another meeting.
FACTORS AFFECTING INITIAL PAVEMENT ROUGHNESS OF CONCRETE PAVEMENT

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ABSTRACT:

Past studies have shown that the initial pavement roughness greatly affects the future pavement roughness and roughness progression rate. Initial pavement roughness is also an important input to the roughness prediction model in mechanistic-empirical (M-E) design guide. This study analyzed the design and construction factors affecting initial pavement roughness. Initial International Roughness Index (IRI) data of 90 concrete pavements constructed from 2000 to 2004 were analyzed using multiple regression method. The factors considered in this study included concrete pavement slab thickness, project location, dowel bar placement, joint spacing, base type, and pavement length. The factors affecting initial pavement roughness were identified.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1. The factors included herein only include a portion of factors that may affect the initial roughness. Any other factors, such as curling and warping?
2. This is an observational study, instead of experimental study. Multiple regression method was used to statistically analyze the data. Is there better analysis method for these unbalanced, observational data?

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.
Pavement Performance Data Analysis Forum

Conducted by TRB’s Data Analysis Working Group (“The DAWG”)

January 20, 2007

DAWG Steering Committee

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Alex T. Vieser, South Africa

Appointed Members
- Guy Dalé, SHARE Goodman, Canada
- Jia Yu, China
- Hans Jørgen Eitman Larsen, Denmark
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- Brian Fermie, United Kingdom
- Karim Chatti, NHI
- Albediah Mansor, Malaysia
- Sanny Robinsrud, A. P. Beataas, Jørgen Præst, Olga Serezhkina, Amy Simpson, Wim leed Uddin
- Kevin C. Wang, Larry Wiser, USA

TRB Data Analysis Working Group

- **Provenance:** Standing Committee E1003
- **Charter:** To provide an international forum for exchange of methods of analysis of pavement performance data
- **Funding:** By FHWA under contract with TRB
- ** Oversight:** By the DAWG Steering Committee

Nature of DAWG Forum

- **Schedule:**
  - Every January in Washington, DC
  - Every mid-year at an international conference
- **Technical Content:**
  - Unpublished work still in development
- **Emphasis:**
  - Techniques and preliminary results
- **Atmosphere:**
  - Informal and unscripted
- **Product:**
  - Dialog between presenters and attendees

Today’s Topics

- Mix design and testing procedures
- a.m. break
- Accurate dynamic back-calculation
- Network analysis of flooding damage
- lunch break & informal mini-briefings
- Characterization of frost heave
- Road condition variables
- Linear performance prediction model
- p.m. break
- Evaluation of permanent deformation potential
- Characterization of FWD stress influence cone
- Steering Committee meeting

Presentation Format

- 30 minutes for presentation and clarifying questions
- 15 minutes for presenter’s questions and general discussion
- Time monitored closely
- Post-forum discussions encouraged
Mid-Year Meetings

▲ Recent
- 8/2002  9th ICAP, Copenhagen, Denmark
- 7/2003  Mairepav’03, Guimarães, Portugal
- 8/2005  BCRA’05, Trondheim, Norway
- 6/2006  GeoShanghai’06, Shanghai, China

▲ Future
- 6/2007  ACPSEM, Athens, Greece
- 2008 ???