



TECHSUMMARY *February 2016*

SIO No. 30000221 / LTRC Project No. 10-4B

Development of Performance-based Specifications for Louisiana Asphalt Mixtures

INTRODUCTION

In recent years, asphalt pavements built with acceptable levels of quality required in the Louisiana Standard Specifications for Roads and Bridges have started to experience premature failures more frequently than before. Primary causes of the frequent premature failures can be attributed to the increased traffic volume on highways. Adaptation of unconventional asphalt paving technologies, such as the use of high percentage recycling materials, polymer modified asphalt cements, warm-mix asphalt technologies, etc., can also make it challenging to adequately guarantee the long-term performance of pavements with conventional quality requirements such as voids filled with asphalt (VFA), air voids (AV), roadway density, international roughness index (IRI), etc. Coupled with the rapid decline of experienced QC/QA personnel, this lack of effective QC/QA methodologies pose a tremendous challenge to ensure long-term performance of asphalt pavement in Louisiana.

The performance-based specification (PBS) concept has emerged as an effective approach to overcome the shortcomings of the current QC/QA specification by taking the predictable performance of pavements directly as the quality goals of the construction. Clear understanding on the features and requirements of the PBS was needed to prepare a tailored approach for the Louisiana Department of Transportation and Development (DOTD) to improve the effectiveness of current asphalt pavement specifications. This research, therefore, was conducted to investigate the applicability of key PBS principles and to develop a framework for the implementation of the tailored PBS for Louisiana asphalt pavement mixtures.

OBJECTIVE

The primary objective of this research was to develop a framework for the implementation of a PBS for new and rehabilitated asphalt pavements. Specific objectives of the study included:

- Identifying state-of-the-practice of PBS employed in highway agencies,
- Evaluating the applicability of key PBS principles to LA pavements,
- Developing a tailored PBS for DOTD, and
- Developing a framework of the PBS implementation in Louisiana.

METHODOLOGY

Based upon the findings from the existing literatures, a comprehensive experimental matrix was designed to provide both field and laboratory performance data of asphalt pavements and mixtures. Nine field projects across Louisiana were selected (Figure 1). Field samples from these nine projects were obtained and brought into the lab for laboratory rutting and cracking performance evaluations using the loaded wheel tracking (LWT) device and semi-circular bending (SCB) test, respectively. Field rutting and cracking performance data were obtained from the Louisiana

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PRINCIPAL INVESTIGATOR:

Louay N. Mohammad, Ph.D.

LTRC CONTACT:

Samuel B. Cooper, III, Ph.D., P.E.
225-767-9164

FUNDING:

SPR: TT-Fed/TT-Reg

Louisiana Transportation Research Center

4101 Gourrier Ave
Baton Rouge, LA 70808-4443

www.ltrc.lsu.edu

pavement management system (PMS) and compared to the laboratory performance data to evaluate the correlations between the field and lab performances.

CONCLUSIONS

Through the laboratory and field investigations on the rutting and cracking performance of asphalt pavements and mixtures, the following observations were made:

- The concept of performance-based specification is promising, since it takes more direct performance measure as the quality goal of the pavement construction. However, applications of the concept to actual projects require the use of complicated prediction models for material properties and pavement performance.
- A simplified approach to the standard performance-related or performance-based specification procedure can be attempted to improve the reliability of current QC/QA specifications, while avoiding the use of complicated prediction models.
- The LWT device can be a practical tool for evaluating rutting performance of asphalt mixtures and pavements. The LWT measured rut depths of 6 mm or less and 10 mm or less can be the tentative target quality limits for the Level 2 and Level 1 Louisiana asphalt pavements, respectively.
- SCB Jc was found to be a promising cracking performance indicator of asphalt mixtures. The minimum SCB Jc values of 0.6 and 0.5 kJ/m² are proposed as the cracking performance criteria in order to ensure acceptable cracking performance of Level 2 and Level 1 asphalt mixtures, respectively.
- According to the qualitative comparison between standard and simplified PBS approaches, the simplified procedure seemed to discriminate different performing asphalt pavements as effectively as the more complicated standard PBS. With the absence of locally calibrated cracking prediction models at the present time, the simplified PBS would be more effective in ensuring acceptable cracking resistance of asphalt pavements.
- A sampling and testing plan was prepared and recommended for a continued data collection effort to further validate the performance criteria and to help address unknown challenges for implementing the PBS in practice.

From the observations listed above, it can be concluded that a simplified performance based specification procedure, which include LWT and SCB tests, can be added to the current QC/QA specification to better guarantee the long-term performance of Louisiana asphalt pavements. A continued research effort to collect further field and laboratory performance data is desired to validate the proposed performance criteria and to address unknown challenges in implementing the recommended PBS approach.

RECOMMENDATIONS

This research study concluded that LWT and SCB tests can be adopted as potential laboratory test methods to better evaluate the long term pavement performance. Since this study includes a limited number of projects, it is recommended to conduct an extended monitoring of this proposed methodology. This data collection effort can identify difficulties in implementing the proposed PBS and help to make necessary modifications.

The SCB test was conducted on partially field-aged specimens in this study. It is necessary to investigate the long-term performance of these pavement sections to better evaluate the aging influence on the SCB testing.

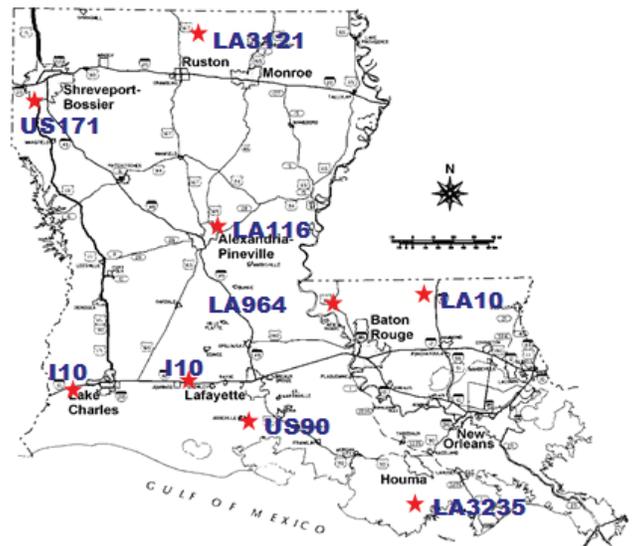


Figure 1
Field project locations