

SELECTION OF LONG LASTING REHABILITATION TREATMENT USING LIFE CYCLE COST ANALYSIS AND PRESENT SERVICEABILITY RATING

April 2017

PROJECT TITLE
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FINAL REPORT ~
[FHWA-OK-15-06](#)
ODOT SP&R 2261

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OVERVIEW Preserving the current pavement network has become one of the top priorities for highway agencies. There are many pavements on important routes that have exceeded their design lives and are in need of cost effective and sustainable rehabilitation that restores distressed pavements and improves performance. A well-planned rehabilitation strategy helps agencies determine the needs for enhancement of the system's functional ability with multi-year maintenance and rehabilitation (M&R) treatment programs. It also helps the agency optimize the allocations of annual investment in pavement rehabilitation programs at network and project levels. Results of this study can help Oklahoma Department of Transportation (ODOT) engineers determine interstate pavement network needs and make rehabilitation decisions for the next 35 years.

RESULTS This study developed a performance based guideline reinforced by the emphasis on cost for pavement rehabilitation strategies to be adopted for high-traffic volume roadways in the state of Oklahoma. Flexible and composite (asphalt surface over concrete pavements) roads from eight field divisions were evaluated for their rehabilitation needs. The condition of 14 interstate pavement sections representing 14 pavement family groups in the state has been investigated using historical data (i.e. performance measurements, traffic, climate and structural integrity of existing pavements obtained by falling weight deflectometer (FWD) analysis) provided by ODOT. Figure 1 shows the representative pavement family groups.

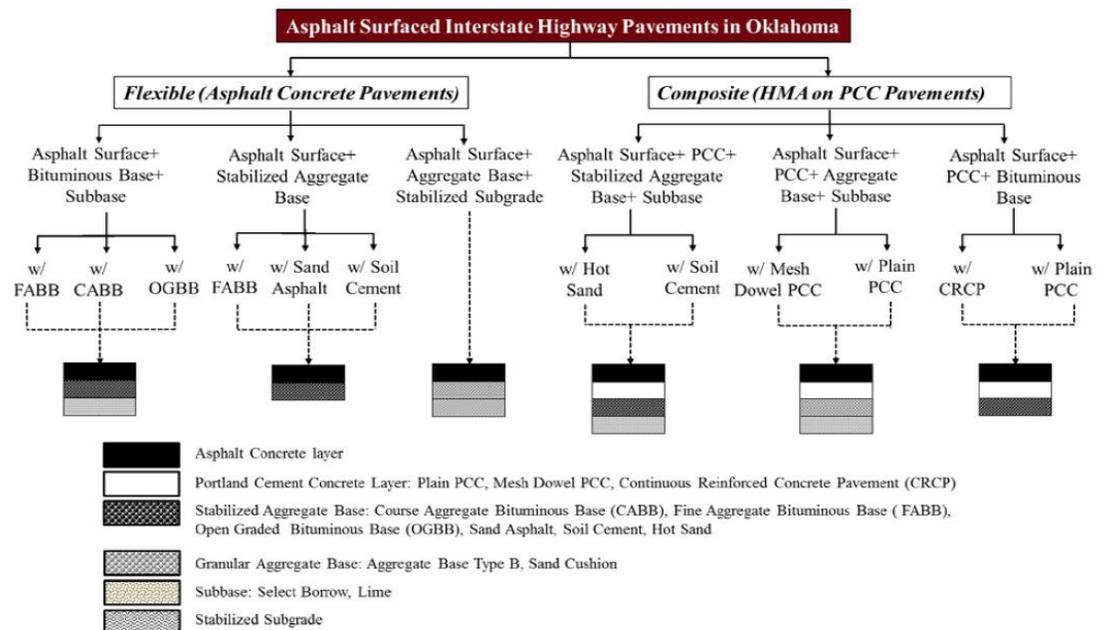


Figure 1 Representative Pavement Family Groups Investigated in This Study

The Mechanistic-Empirical Pavement Design Guide (MEPDG) analysis tool was used for the structural design and performance prediction. The results of MEPDG analysis were then modified based on the field observations to properly account for local conditions in Oklahoma. Results were used to develop an evaluation output matrix and series of time-based rehabilitation strategies that address pavement needs for the next 35 years. The life cycle cost analysis was also conducted to quantify the benefits of selecting each renewal solution.

The service life of rehabilitation obtained from MEPDG analysis served as a guide in the development of time-based rehabilitation strategies. The slight modification is applied on extended service lives based on expert opinions to account for field consideration and inaccuracy of some of performance prediction equations in MEPDG. Three typical flexible and two typical composite pavement groups with specified thickness of layers are defined to cover major Oklahoma interstate highways. A series of time-based rehabilitation solutions are suggested for these typical sections and structural index is used as trigger value for categorizing rehabilitation strategies. Two alternatives are considered for pavements with different levels of structural index, as illustrated in Figure 2. These simplified solutions are believed to provide a viable decision making tool for the agency's decision makers for the purpose of cost-effectiveness analysis of investigated renewal solutions in this study.

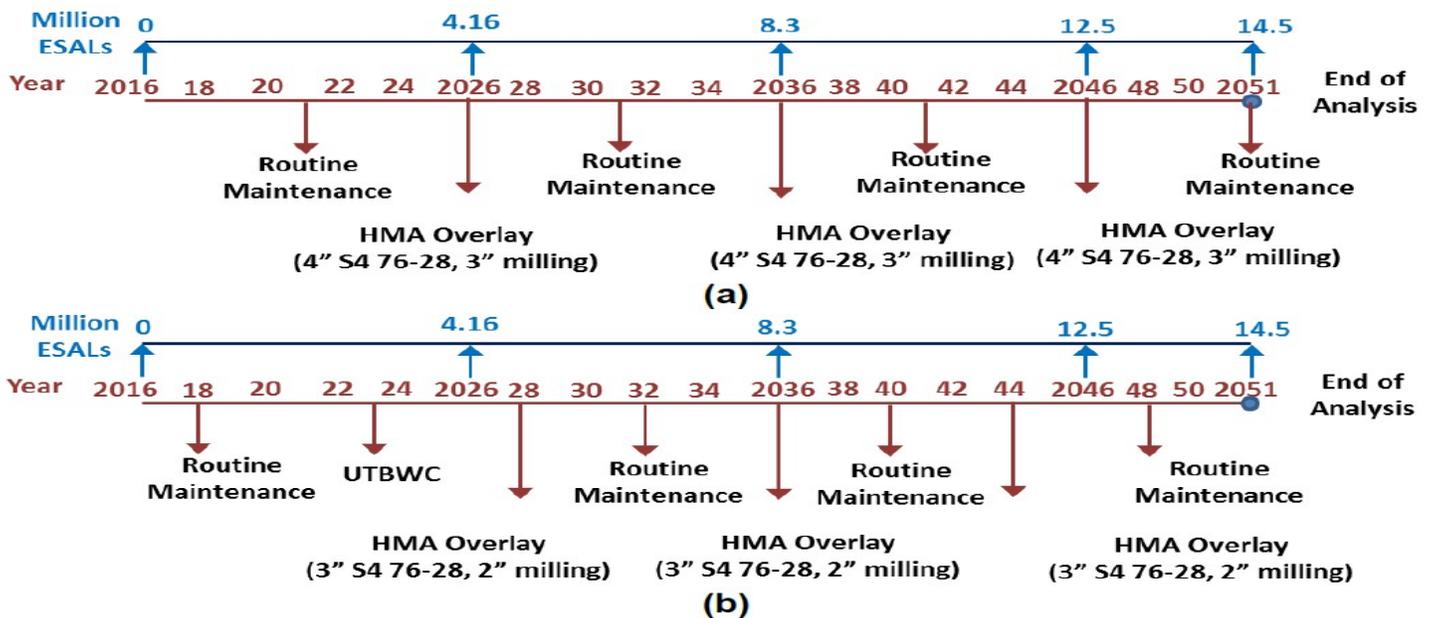


Figure 2 Two Suggested Rehabilitation Strategies, Alternatives (a) and (b), for Flexible Pavements with Structural Index > 80

Three levels of rehabilitation activities were considered, including light, medium and heavy rehabilitation for each pavement family group and a combination of local material properties, structural integrity and environmental condition were used for structural analysis and the development of the evaluation output matrix. The matrix can be used as a supplemental tool to help ODOT engineers with the rehabilitation related decision making process. A series of time-based renewal solutions are recommended for pavement family groups with similar existing condition and the most cost effective methodology is determined by performing the life cycle cost analysis using RealCost software.

POTENTIAL BENEFITS A well-planned rehabilitation approach helps agencies to optimize the allocation of annual investments in pavement rehabilitation programs. A wide range of variables influence the selection strategy for rehabilitation and maintenance of each pavement. Currently, many agencies are struggling with the selection of an optimal time-based and cost-effective rehabilitation strategy to address the long-term needs of pavements. This study provided a methodology for project-level evaluation of high traffic volume asphalt-surfaced pavements located in the state of Oklahoma and developed a performance based rehabilitation strategy for selecting a long lasting and cost-effective solution.