ABSTRACT

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Pavement begins to deteriorate as soon as it is constructed and opened to traffic. Understanding current pavement behavior and estimating its future performance are extremely important for investment decisions, pavement maintenance strategies and improving the quality of infrastructure over time. In an attempt to better understand the relationship of current pavement behavior and future pavement performance, this study evaluated investigated warranted asphalt pavement performance, quantified their effectiveness and determined if warranty specifications should be recommended for better pavement performance. Additionally, the study used national pavement data to develop pavement performance predictive models to determine the viability of predicting pothole formation.

Since 1996, warranted asphalt pavements have been placed on a trial basis in Indiana in an attempt to improve pavement performance and prevent premature failures. This study examined the performance of asphalt pavement warranties by comparing international roughness index, rutting and friction number data for both warranted and non-warranted asphalt pavements. The results indicated that, overall, the warranted asphalt pavements performed more effectively than similar non-warranted asphalt pavements. An initial cost comparison indicates that, in general, the warranted pavements were more expensive, although the differences in initial costs seems to have decreased as more warranted pavement projects were built. Additionally, the findings show that warranted pavements lasted one to seven years longer than comparable non-warranted pavements, generally providing lower IRI values and minimal rutting. When initial asphalt pavement costs

were amortized over the pavement service lives, the warranted pavements were at least 12 to 30% more cost effective than comparable non-warranted pavements.

Additionally, models to predict pothole formation were developed. In a part of this section, four years of data from various pavements were collected and statistically analyzed. A model was developed to estimate the average number of potholes per lane mile due to traffic loads and weather conditions depending on the route type. The models show a good match between the estimated values and the actual corresponding records of patch material per lane mile.

The second model was developed to include the effect of pavement surface condition in addition to geographical location. Two years of data for interstate highways in Indiana were examined. The results showed that high and medium severity alligator and high severity longitudinal cracking were the pavement distresses that were found to be statistically significant among all the pavement distress types. Also, the model revealed that the effect of pavement distress significantly varied across pavement segments.

Finally, a comprehensive range of variables in modeling such as factors related to pavement structure and design were used to model the probability of occurrence of pothole. A sample of 25 pavement segments located in four Midwestern states in the United States was examined. Data for existing potholes, frequency of maintenance activities, age, traffic loads, weather records and pavement structure were collected for these segments for the years 1996 through 2012. Estimation results indicate a combination of factors that are most likely to result in pothole formation. User agencies can use this information to select the best pavement structural design under specific anticipated traffic loads and weather conditions in order to minimize the probability of pothole formation.