

COST-EFFECTIVENESS OF CRACK SEALING MATERIALS AND TECHNIQUES FOR ASPHALT PAVEMENTS

Final Report

By

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ABSTRACT

Sealing or filling cracked asphalt pavements to prevent the intrusion of water into the pavement structure has long been an accepted practice of the Montana Department of Transportation (MDT). The goals of this research are to establish the most economical and effective method of sealing pavement cracks for Montana; and to better determine the role of crack sealing within Montana's pavement management system (PvMS). This study has involved the construction of four experimental test sites within larger crack sealing projects. These test sites have included combinations of eleven sealant materials and six sealing techniques. Monitoring of the test sites includes visual inspections (for all of the sites) and nondestructive structural readings and surface distress identification under Montana's PvMS (for one test location). An estimate of the useful life of each crack sealing method has been determined from these investigations.

This report presents information on project history, the project methodology used for evaluating and analyzing the performance of sealed cracks, and the results of the cost-effectiveness analysis. Final results are presented for the four test sites: Conrad, Dutton, Tarkio, and Helena (Seiben). Results show that similar performance has been observed for all materials with ASTM D 5329 cone penetrations in excess of 90. In general, routing of transverse cracks improved the performance of the sealants. Routing does not appear necessary for centerline longitudinal cracks. Notably, router operators seem to prefer the shallow reservoir configuration as compared to square reservoirs.

The test site established near Helena provided the most reliable and useful data. As such, a detailed review of the final performance from four and a half years of service is summarized. In general, the highest failure rates occur during the coldest period of the year, and much of this distress exhibits a tendency to "heal" after exposure to the summer heat and traffic. An eclectic forecasting model has proven useful in predicting the life of crack sealing operations for those methods that did not show complete failure during the evaluation period. Structural evaluations using a Falling Weight Deflectometer did not prove an advantage for any particular sealing technique or sealing material nor did they prove the benefit of sealing cracks in asphalt pavements. Therefore, conducting a life-cycle cost analysis was impractical because no structural or ride benefit was proven at this site, however, a cost-effectiveness analysis was performed and the averaged results showed that, overall, Crafc0 522 was the most cost-effective material and the Shallow and Flush was the most cost-effective fill technique. However, the crack sealing approach that has the highest cost-effectiveness as calculated herein (defined as the ratio of effectiveness to cost) may not offer the best value, if this effectiveness is in excess of that required to protect the pavement from premature damage. Therefore, even though the most cost-effective material and techniques have been determined, more research is necessary to substantiate the need for higher performance materials and techniques.