

Gravel Road Paving Guidelines

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Introduction

The percentage of gravel roads in rural areas in Kansas is higher than most states. A wide variation of traffic volumes across different regions and variations of local conditions and scenarios present a great challenge for local agencies to determine the suitable roadway surface type for local rural roads, especially considering constraints on transportation budgets. The primary objective of this research was developing specific guidelines to identify the most suitable roadway surface (gravel vs. paved) for a particular roadway section with given conditions. Surveys were carried out to determine the importance of factors affecting the selection of a roadway surface type, which were later used for guideline development.

Project Description

General guidelines were developed using the multi-criteria assessment method in order to fulfill the objectives in this study. The key factors in decision-making in regards to paving were identified as agency cost, safety, vehicle operating cost (VOC), traffic volume, purpose of road usage, and public preference. Multi-criteria assessment method involves calculating the weights for the factors important in decision-making, obtaining respective scaled values for each factor for paved and gravel surfaces, and eventually calculating the final score for paved and gravel surface type. Equations were formulated to carry out life-cycle cost (LCC) analysis along with the present worth evaluation, which provided flexibility to calculate agency cost by considering local conditions. VOC could be calculated for paved and gravel roads considering variations in the speeds of different classes of vehicles, gradient and horizontal curvature of the road, and the conversion factor for cost on paved surface versus gravel surface. Safety analysis was carried out for local rural roads in Kansas for 5 years, from 2010 to 2014, using the Kansas Department of Transportation's Kansas Crash Analysis and Reporting System (KCARS) database.

Project Description (Continued)

After calculating the equivalent property damage only (EPDO) crash rates on paved and gravel roads in Kansas, results showed that paved surfaces were in general safer than gravel surfaces, which was taken into consideration while calculating the scaled values for safety. The final score is calculated by multiplying the weights of each factor and their respective scaled values. The roadway surface type with a higher score is the preferred alternative for a road section under consideration.

Project Results

A computer-based Gravel Road Paving Guidelines Program was created as a user interface, using Visual Studio to carry out all complex calculations for determining LCC and VOC considering local variations. The program also helped determine final total scores for paved and gravel roads by considering scaled values of all important factors considered for conversion. Another approach using cost versus traffic volume showed that the break-even point for traffic volume decreased with an increased percentage of trucks and increased vehicle speeds. Developed guidelines help determine the best roadway surface type for any set of local conditions. The Gravel Road Paving Guidelines Program is available upon request to KDOT#Research.Library@ks.gov.

Project Information

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