

Glen Furtado

Thesis

Vehicle Stability on Combined Horizontal and Vertical Alignments

Abstract

This study examines vehicle stability through lateral acceleration levels using computer simulation. The objective was to compare the minimum flat horizontal curve radius used in traditional geometric design guides with the minimum radius based on vehicle dynamics on three-dimensional (3D) alignments. A vehicle dynamics simulation computer program was used to examine vehicle dynamics and stability on 3D alignments. The program uses a sophisticated two-axle dynamics model that traditionally has only been used by mechanical engineers in experimenting with vehicle characteristics.

It was found that vehicle stability is not compromised on 3D alignments compared to 2D alignments for the test cases examined. Differences in the required minimum horizontal radii were obtained due to the transient effects of a vehicle traveling along a horizontal curve. These transient effects due to changes in road geometry include driver steering, vehicle off tracking, and vehicle roll. In order to maintain the currently acceptable comfort thresholds, increases up to 16.6% of the minimum horizontal radii suggested by the current North American geometric design guides are required.

Degree

M.A.Sc.

Completion

2002

Supervisors

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