



Effect of Adverse Weather Conditions on Vehicle Braking Distance of Highways

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Abstract

The effect of adverse weather conditions on the safety of vehicles moving on different types of roads and measuring its margin of safety have always been a major research issue of highways. Determining the exact value of friction coefficient between the wheels of the vehicle and the surface of the pavement (usually Asphalt Concrete) in different weather conditions is assumed as a major factor in design process. An appropriate method is analyzing the dynamic motion of the vehicle and its interactions with geometrical elements of road using dynamic simulation of vehicles. In this paper the effect of changes of friction coefficient caused by the weather conditions on the dynamic responses of three types of vehicles: including Sedan, Bus, and Truck based on the results of Adams/car Simulator are investigated. The studies conducted on this issue for different weather conditions suggest values ranging from 0.04 to 1.25. The results obtained from simulation based on Adams/car represent that the friction coefficient in values of 0.9, 0.8, 0.7, 0.6 do not effect on braking distance significantly and it is possible to attribute them all to dry weather condition. However, as it was anticipated the values of 0.5, 0.4, 0.28 and 0.18 have significant differences in braking distance. Hence, the values of 0.5, 0.4, 0.28 and 0.18 can be attributed to wet, rainy, snowy and icy conditions respectively.

Keywords: Road Conditions; Friction Coefficient; Dynamic Responses of the Vehicle; Braking Distance; Simulation.

1. Introduction

The effect of undesirable road conditions on the safety of current vehicles on different types of roads is constantly considered as a major subject in Transportation engineering in all over the world. The statistics of fatality represent that winter, as the most adverse weather condition, not only can it have significant effect on road surface, but also is considered as a major factor particularly where transportation and weather condition are interconnected, this means, Geometric Design and Road Safety, Figures 1 and 2 show the number of fatality of accidents in the US between 2009 and 2010 clearly [1].

The role of Geometric Design, by defining the exact value of the friction coefficient between the surface of the road (usually Asphalt Concrete) and the tire of vehicle which occurs in different weather conditions as major factor, on the other hand the dynamic response of the vehicle as a second factor, have to be investigated. When the parameters of Geometric design and vehicles are investigated interactively, it could be said that designing is close to reality.

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