

Powered Two-Wheeler Rider's Comfort over Road Sections with Skew Superelevation

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Abstract : The proper surface water drainage not only affects vehicle movement dynamics but also increases the likelihood of an accident due to the fact that inadequate drainage is associated with potential hydroplaning and splash and spray driving conditions. Nine solutions have been proposed to address hydroplaning in sections with inadequate drainage, e.g., augmented superelevation and longitudinal rates, reduction of runoff length, and skew superelevation. The latter has been extensively implemented in highways recently, enhancing the safety level in the applied road segments in regards to the effective drainage of the rainwater. However, the concept of the skew superelevation has raised concerns regarding the driver's comfort when traveling over skew superelevation sections, particularly at high speeds. These concerns alleviated through the concept of the round-up skew superelevation, which reduces both the lateral and the vertical acceleration imposed to the drivers and hence, improves comfort and traffic safety. Various research studies aimed at investigating driving comfort by evaluating the lateral and vertical accelerations sustained by the road users and vehicles. These studies focused on the influence of the skew superelevation to passenger cars, buses and trucks, and the drivers themselves, traveling at a certain range of speeds either below or above the design speed. The outcome of these investigations which based on the use of simulations, revealed that the imposed accelerations did not exceed the statutory thresholds even when the travelling speed was significantly greater than the design speed. Nevertheless, the effect of the skew superelevation to other vehicle types for instance, motorcycles, has not been investigated so far. The present research study aims to bridge this gap by investigating the impact of skew superelevation on the motorcycle rider's comfort. Power two-wheeler riders are susceptible to any changes on the pavement surface and therefore a comparison between the traditional superelevation practice and the skew superelevation concept is of paramount importance. The methodology based on the utilization of sophisticated software in order to design the model of the road for several values of the longitudinal slope. Based on the values of the slopes and the use of a mathematical equation, the accelerations imposed on the wheel of the motorcycle were calculated. Due to the fact that the final aim of the study is the influence of the skew superelevation to the rider, it was deemed necessary to convey the calculated accelerations from the wheel to the rider. That was accomplished by implementing the quarter car suspension model adjusted to the features of two-wheeler vehicles. Finally, the accelerations derived from this process evaluated according to specific thresholds originated from the International Organization for Standardization, which correspond to certain levels of comfort. The most important conclusion drawn is that the comfort of the riders is not dependent on the form of road gradient to a great extent due to the fact that the vertical acceleration imposed to the riders took similar values regardless of the value of the longitudinal slope.

Keywords : acceleration, comfort, motorcycle, safety, skew superelevation

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