

Modeling the Road Pavement Dynamic Response Due to Heavy Vehicles Loadings and Kinematic Excitations General Asymmetries

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Abstract : The deterioration of pavement can lead to the formation of potholes, which cause the wheels of a vehicle to experience unusual and uneven movement. In addition, improper loading practices of heavy vehicles can result in dynamic loading of the pavement due to the vehicle's response to the irregular movement caused by the potholes. Previous studies have only focused on the effects of either the road's uneven surface or the asymmetrical loading of the vehicle, but not both. This study aimed to model the pavement's dynamic response to heavy vehicles under different loading configurations and wheel movements. A sample of 225 cases with symmetrical and asymmetrical loading and kinematic movements was used, and 27 validated 3D pavement-vehicle interactive models were developed using SIMWISE 4D. The study found that the type of kinematic movement experienced by the heavy vehicle affects the pavement's dynamic loading, with eccentrically loaded, asymmetrically kinematic heavy vehicles having a statistically significant impact. The study also suggests that the mass of the vehicle's suspension system plays a role in the pavement's dynamic loading.

Keywords : eccentricities, pavement dynamic loading, vertical displacement dynamic response, heavy vehicles

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