

Identification of hydroplaning risk areas in Expressways: Case study on Southern Expressway, Sri Lanka

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Abstract

Safety is one of the main functional requirements of expressways which are designed to operate at 100km/h. One of the key considerations in providing safety is ensuring adequate frictional performance especially during wet weather. Hydroplaning is a phenomenon that occurs on wet pavements which poses a serious safety risk to vehicles especially on high speed roadways. Vehicles subjected to hydroplaning are likely to be involved in fatal or grievous accidents. There are several roadway, vehicular and environmental causal factors that contribute to the hydroplaning. A speed at which a vehicle hydroplaning is dependent on its tire pressure, wheel load, tire thread pattern, pavement micro texture and the water film depth generated during the rainfall among several other parameters. For expressways where vehicles generally travel at high speeds controlling development of Water Film Thickness is particularly important. The road alignment and longitudinal cross-sectional profile play an important role in affecting water film thickness generated during the rainfall event. Depending on the water film thickness generated on road segment, the hydroplaning risk for a given operational speed, vehicle characteristic will vary. This methodology is applied on the Southern Expressway-Sri Lanka to identify road segments that have higher hydroplaning risk.

Several locations were observed as water stagnating areas and one of them was used in the study. Gallaway formula and Road Research laboratory (RRL) method were used to find the estimated water film thickness and the contour maps of flow depths for different rainfall intensities were developed for the road segment. Based on the water film thickness, contour maps and the hydroplaning speed derived for the water film thickness and hydroplaning risk prone areas were identified. This will be useful for further study of these areas and to propose possible design or repair mechanisms. Further such a study will be helpful for the design of new expressways covering the whole island in the future.

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