The Influence of Roughness, Rutting and Changes in Crossfall on Crash Risk

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The safe system approach to road safety works on the principle that it is not acceptable for a road user to be killed or seriously injured if they are involved in a crash. The safe system approach also acknowledges that road users are fallible and will continue to make mistakes. Integral to the safe system approach are safer roads and roadsides and understanding crashes and risks. This paper examines the contribution of three key pavement surface characteristics to crash risk, these being wheelpath roughness, rutting and change in crossfall (i.e. rate-of-rotation).

Statistical modelling was performed on injury crashes that occurred on the New Zealand state highway network. Where possible, the statistical modelling was complemented by limited on-road testing using instrumented vehicles to validate key relationships.

The main results were:

- The effect of roughness depends on curvature, the effect being strongest on curves with radius of curvature in the range 500 to 2000 metres.
- Considering the International Roughness Index (IRI) and profile variance measures of roughness, 10 metre wavelength profile variance is a better predictor of crash risk than either 3 metre or 30 metre wavelength profile variance but is only slightly better, if at all, than IRI.
- Crash rates decrease slightly as rut depth increases over the normal range of rut depths - particularly for dry crashes.
- There appears to be an increase in crash rates when water accumulates on the road surface because of poor run-off due to low crossfall compared with gradient
- Change in crossfall was shown to have a statistically significant effect on crash risk even when the analysis was restricted to straight rural roads (horizontal curvature > 2000 m).