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Probabilistic Analysis and Design of Freeway Deceleration Speed Change Lanes

In highway design, knowledge about the design parameters and inputs is imperfect. Current geometric design guides provide deterministic methods for the design requirements by using conservative values to consider uncertainty. The design of freeway deceleration speed change lanes (SCLs) depends on the manner of deceleration, initial speed, and final speed at the SCL. SCL length should provide drivers with enough distance to diverge at a reasonable speed and decelerate comfortably. The purpose of this research is to develop probabilistic methodology for evaluating and designing freeway deceleration SCLs using reliability analysis. Models were developed to evaluate the operational performance of SCLs using field data. Three different methodologies were used for evaluating SCL length. PNC, which corresponds to the probability that drivers require a deceleration length longer than what is provided at the SCL, was calculated for each study site. Design graphs were developed to design based on PNC for lengths below 300 m.

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