

EVALUATION OF SINGLE LANE PARALLEL-TYPE ENTRANCE RAMP TERMINAL USING VEHICLE DYNAMICS MODEL FOR FREEWAYS

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Abstract

Providing an appropriate length of highway entrance ramps is an important feature that should be considered in freeway design. The recommended minimum acceleration lane length in the Green Book of the American Association of State Highway and Transportation Officials (AASHTO) is currently used for designing entrance ramp terminals. However, in some cases, traffic congestion and crashes are observed when heavy trucks enter freeways, which indicates they could not accelerate enough and did not reach the merge speed at the end of the acceleration lane. Therefore, several scenarios were simulated using a dynamic simulation model (TruckSim) for heavy vehicles with weight to power ratios of 61, 67, 86, and 108 (kg/kW) and grades of zero, ± 3 , and $\pm 5\%$. Subsequently, a linear regression model was presented to calculate acceleration lane lengths. The results showed that the acceleration rate of heavy vehicles is not adequate, especially in upgrades. For example, at $+5\%$ upgrades, heavy trucks cannot accelerate to the merge speed mentioned in the AASHTO. Conversely, the acceleration rate of heavy vehicles increased in downgrades; therefore, some heavy vehicles were able to achieve merge speed along the proposed length of AASHTO.

Keywords: Acceleration Lane Length; Dynamic Simulation; Heavy Vehicles; Merge Speed.