

Investigation of Over-Height Truck Collision to Bridge Girders

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Over-height tractor-semitrailer collisions with highway bridges occur frequently in the United States. Among consequences, the bridge superstructure is structurally damaged and the motorists both on and under the bridge are exposed to safety hazards. In addition, a severe damage to the bridge superstructure requires extensive retrofit, which demands a significant time and budget. While the impact force from a vehicle collision to a bridge component determines the extent of damage to the bridge superstructure, design for over-height tractor-semitrailer collision has not been explored in the current design guides and specifications. To address this gap, the main objective of this study is to estimate impact forces generated from over-height tractor-semitrailer collisions through detailed numerical simulations. In this study, an over-height tractor-semitrailer crashes into an AASHTO Type I prestressed concrete I-beam while attempting to pass under a bridge. The impact scenarios considered include nine impact velocities, ranging from 10 to 90 mph (16 to 145 km/h), two vehicle weights consisting of an empty vehicle and a vehicle with the maximum gross weight allowed on interstate highways, and a bridge with and without diaphragms. The outcome of this study provides a reliable estimate of impact force which can be employed to design bridge superstructures against impact from over-height tractor-semitrailers.

Keywords: Over-height truck; bridge collision; tractor-semitrailer; superstructure impact; finite element model