

Using Finite Element to Predict Failure of Light Weight Bridges Due to Vehicles Impact: Case Study

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Abstract : The collapse of a light weight pedestrian bridges due to vehicle collision is investigated and studied in detail using a dynamic nonlinear finite element analysis. Typical bridge widely used in Jordan is studied and modeled under truck collision using one dimensional beam finite element in order to minimize analysis time due to the dynamic nature of the problem. Truck collision with the bridge is simulated at different speeds and locations of collisions using dynamic explicit finite element scheme with material nonlinearity taken into account. Energy absorption of bridge is investigated through principle of energy conservation, where truck kinetic energy is assumed to be stored in the bridge as strain energy. Weak failure points in the bridges were identified, and modifications are proposed in order to strengthen the bridge structure and prevent total collapse. The proposed design modifications on bridge structure were successful in allowing the bridge to fail locally rather than globally and expected to help in saving lives.

Keywords : finite element method, dynamic impact, pedestrian bridges, strain energy, collapse failure

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