

Influence of deformation due to collision on mechanical behavior of steel bridge

E. Yamaguchi, T. Amamoto & D. Nakashima

Kyushu Institute of Technology, Kitakyushu 804-8550, Japan

ABSTRACT: A truck on a highway occasionally collides with the main girder of a bridge over the highway. The influence of the damage due to collision on the mechanical behavior of the bridge has to be evaluated for the safety of traffic on the bridge. Yet it is not always an easy task, since not much is known about the mechanical behavior of a deformed girder. One of the authors has been involved in the safety evaluation of a few steel girder bridges damaged by collision. One of those bridges consisted of two steel main-girders and one main-girder looked badly damaged: the web was deformed outwardly; some transverse stiffeners were buckled; some other stiffeners were separated from the web; and bolted connections between some lateral struts and the web were broken. Making use of the information on the actual damage, the collision load is estimated by the finite element analysis and the deformation of the main girder is reproduced. The load-carrying capacities of the main girder without damage, the main girder damaged by collision, the main girder with larger damage are then studied numerically. The results indicate that the damage influences the load-carrying capacity, but the influence is limited even though the deformation is much larger than the fabrication error allowed in the bridge design codes.