# Development and Assessment of Simplified Models for Dynamic Analyses of Bridge Piers Subjected to Barge Impact

This dissertation developed a complex finite element barge impact model to investigate the dynamic phenomena involved in real barge impact event, and proposed an efficient simplified impact model which can replicate the complex finite element barge impact model with sufficient prediction accuracy for a wide range of impact scenarios. This verified simplified impact model, which requires very low computational cost, is then applied to evaluate the energy-dissipation capacity of pile-supported independent protective structures which are widely used in bridge designs against barge impact. In addition, a novel crashworthy device made of steel beams arranged in a framed manner is devised and investigated using the simplified impact model. Finally, the simplified impact model is used for reliability analyses of RC bridge pier column subjected to barge impact considering the randomness of different design parameters.