

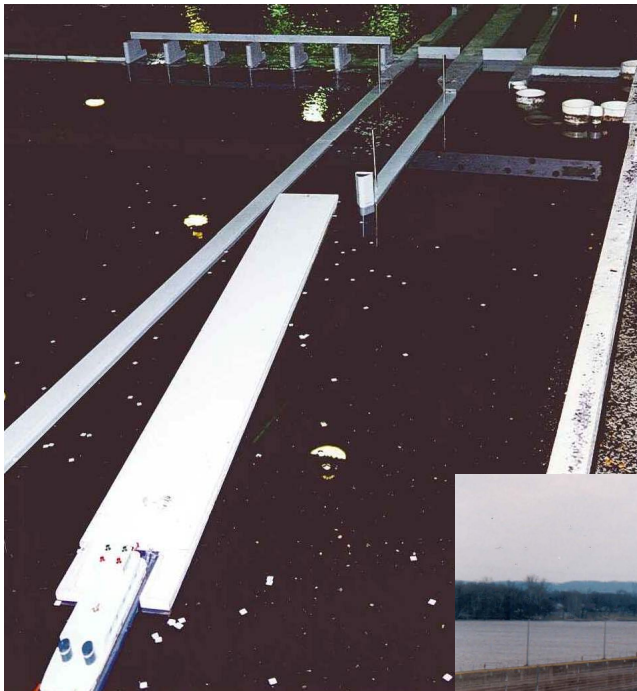
Prediction of Loads due to Ship Impact

Glosthen has developed analytical techniques to predict forces and deformations in vessel-to-vessel collisions, as well as impact loads on structures such as lock walls or bridge piers.

In a large series of vessel collision studies, we developed guidelines for barge stowage of radioactive material that were eventually incorporated into an ANSI Standard 14.24 the *American National Standard for highway route controlled quantities of radioactive materials - domestic barge transport* (ANSI, 1995).

Another large study of river barge impacts on lock walls and guidewalls was undertaken for the Civil Engineering Research Foundation. This work was incorporated into a U.S. Army Corps of Engineers guide, *Engineering and Design – Barge Impact Analysis* (USACE, 1993).

We have also developed methods for implementing the ASHTO Specification for vessel collisions with highway bridges, which can be found in their *Guide Specification and Commentary for Vessel Collision Design of Highway Bridges* (ASHTO, 2009).



As part of its support for the construction of the Olmsted Dam on the Ohio River, Glosthen undertook model scale testing to verify input parameters for analytical guidewall impact calculations. This testing, pictured left, was conducted at the U.S. Corps of Engineers Waterways Experiment Station in Vicksburg, Mississippi. Overall, approximately 500 model tests were conducted to obtain distributions of impact speed, both longitudinal and lateral, and collision angle. The impact forces and force impulses were computed, as well as each event's associated probability.



In addition to model scale testing, limited full scale testing was conducted on the Ohio River as pictured above.