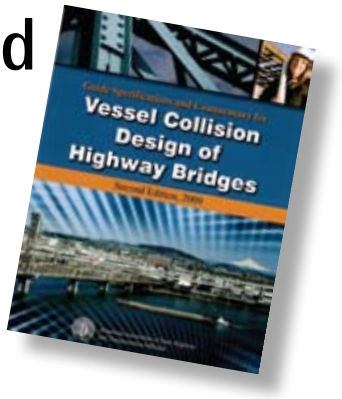
The AASHTO Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges

by Michael A. Knott, Moffatt & Nichol



This 2nd Edition (2009) of the *Guide Specifications* incorporates the following enhancements:

- Lessons learned from the use of the original 1991 Guide Specifications
- Current LRFD Bridge Design methodology
- Clarification of some of the risk procedure elements
- Minor modifications and corrections
- Discussion of results from barge and ship collision research conducted since the original edition

The *Guide Specifications* now highlights procedures to evaluate existing bridges. A new example illustrates the procedure for vessel collision risk assessment.

The many subject areas covered by the 2nd Edition include deep draft and shallow draft waterways; ship and barge characteristics; vessel impact analysis methods; location of impact forces; minimum impact loads; impact load combination; design impact speed, energy, and forces; deterministic method and probabilistic method of selecting the design vessel; probability of vessel aberrancy; geometric probability of collision; probability of collapse; annual frequency of collapse; risk acceptance criteria; cost of collision; pier protection requirements; fenders, pile structures, dolphin, and island protection systems; moveable bridge protection; motorist warning systems; and navigation alternatives for bridge protection.

The manual was developed by Moffatt & Nichol (M&N) under contract to the Federal Highway Administration (FHWA). A 2-day short course to train engineers on the use of the new manual has also been developed by M&N for FHWA, state DOTs, and bridge designers.

Michael A. Knott is vice president of Moffatt & Nichol in Richmond, Va.

The AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms

by John M. Kulicki, Modjeski and Masters Inc.

In 2004 and 2005, hurricanes caused significant damage to numerous structures in Florida, Mississippi, and Louisiana. The bridges were similar to many low-lying coastal bridges composed of numerous relatively short spans located close to the mean high water level. These types of structures are susceptible to extreme horizontal and vertical forces and moments exerted by waves brought within reach of the superstructure by storm surge. The estimated replacement and/or repair cost for four of the longer bridges (I-10 Twin Spans over Lake Pontchartrain, I-10 over Escambia Bay, U.S. 90 over Bay St. Louis, and U.S. 90 over Biloxi Bay) is $1.6 billion.

In response to the need to learn more about how to design and retrofit coastal bridges, a pooled fund study was developed by some 10 concerned states and the Federal Highway Administration (FHWA). A team led by Modjeski and Masters Inc. and including coastal engineers Moffatt & Nichol, and Ocean Engineering Associates Inc. (OEA); geotechnical experts from D'Appolonia Inc.; and assistance from Dennis R. Mertz, was selected for the project. The work was guided by the Bridge Wave Task Force chaired initially by William Nickas then of the Florida DOT and later by Gregory Perfetti of the North Carolina DOT.

Capitalizing on work previously started by OEA and the University of Florida (UF), a numerical simulation of wave action on bridge cross sections called the Physics Based Method (PBM) was developed. Results were confirmed by comparison to model test measurements in the UF wave tank and the pattern of failure and survival of the spans of the I-10 bridge over Escambia Bay. Numerous simulations with the PBM were used to develop empirical equations for vertical and horizontal forces and overturning moments acting on a cross section. These are then extended to a full-bridge span. A three-level approach based on increasingly more rigorous meteorological and oceanographic input was developed to estimate wave height. All of this was codified in the AASHTO Guide Specification, which was adopted in 2008.

John M. Kulicki is chairman/CEO of Modjeski and Masters Inc., Consulting Engineers in Harrisburg, Pa.

Both publications are available from the AASHTO online bookstore at https://bookstore.transportation.org/. The item code for the 2nd Edition of the Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges *is GVCB-2 and for the* Guide Specifications for Bridges Vulnerable to Coastal Storms *is BVCS-1.*