

Kentucky Lock Addition Floating Caisson

Kentucky Lock, Kentucky

Owner: USACE, Nashville District

Description: In 1969, the US Army Corps of Engineers designed and fabricated a floating caisson for use as a dewatering structure at various locks on the Tennessee and Cumberland Rivers. The floating caisson is used for dewatering locks in order to perform maintenance, inspection, and repairs. Using one caisson and existing lock miter gates, either end of the lock can be dewatered. In order to inspect both miter gates at one time, a second closure structure is required at the other end.

INCA Engineers, Inc., A Tetra Tech Company (INCA) provided final plans and specifications for the fabrication and construction of a second floating caisson at Kentucky Lock. The design included an increase of an additional 18-inch extension in height in the vertical position, provisions for lock dewatering pipes on the caisson, provisions for caisson installation at any Tennessee or Cumberland River lock without modification to the lock structures, and analyses for flotation and rotation.

INCA created a model of the existing structure based on drawings provided, in order to review its structural efficiency. A preliminary design of the new structure was created based on first principals and buckling criteria from the American Bureau of Shipping. This preliminary design was used to create the finite element model of the new caisson. Final results were documented in the Design Report.

INCA developed the concept design for the floating caisson based on the Corps' design requirements and the plans of the existing caisson. This structure, when installed in the bulkhead position, is a hydraulic steel structure whose failure would have life-safety consequences. Elements developed in the design included reduced draft in the horizontal position, reduced initial draft in the vertical position, refined structural design, improved towing capability, and added lock dewatering capability.

The new caisson was designed so it can be installed at any Tennessee or Cumberland River Lock, where the existing caisson is used, without any modifications to the lock structures.

Special Features:

- ▶ Development of structures to facilitate maintenance of submerged elements in-the-dry
- ▶ Finite element analysis of steel structures
- ▶ Cathodic protection
- ▶ Painting systems
- ▶ Improvements of an existing system for better operation and maintenance
- ▶ Buoyancy analysis of floating elements

