

# Tokai Power Plant, Japan Open Caisson Feasibility Study

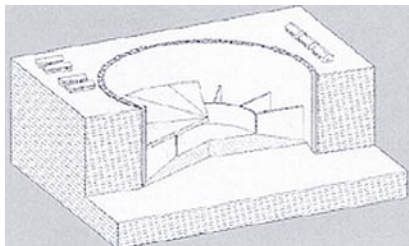
Ben C. Gerwick, Inc. investigated the feasibility of open caisson construction for General Electric's Nuclear Energy Division who had been assigned to investigate possible alternative construction techniques and case histories to help confirm that construction of a two-unit nuclear power plant could be accomplished at a site known to have a challenging geology.

The site is a reclaimed shoreline area of approximately 1,000,000 square meters. The subsurface conditions consist of 18 to 20 meters sandy fill and alluvium upon 28 to 35 meters soft to medium stiff marine silty clays over 11 to 18 meters dense sands and gravels, with bedrock claystone at 68 meters depth. This shoreline location is seismically active.

Each unit will include both a reactor, and turbine plant, as well as associated heat exchanger, waste and control room facilities. Local Licensing regulations require these structures to be founded on bedrock.

#### Services Performed:

- Feasibility Study
- Constructibility
- Tremie Concrete
- Slurry Walls
- Seismic Analyses



Reactor foundation.



Aerial view of Tokai Nuclear Power Plant.

Critical to the open caisson method was devising methods to control sinking, prevent tipping, optimize excavation and concrete placement production, allow for thorough visual inspection of bedrock and permitting reliable determination of schedule and cost. The proposed solutions involved improving the upper very soft marine clays with wick drains and deep soil mixing to prevent multi-layer failure effects. Special cutting edge details with air and water jet systems to aid caisson penetration were incorporated.

A unique system of support piles, jacking frames, and heavy-lift linear jacks was developed to control the lowering rate and prevent tipping of the large diameter caisson, as it sunk down through the soft strata.

Year of Completion: 1993

Client: General Electric,  
Nuclear Energy Division

The construction process included offshore slip-forming technology of the caisson walls, luffing tower and crawler cranes for initial excavation by clamshell bucket. A pontoon mounted cutterhead suction dredge would then be floated within the caisson. This would be fitted with a very steep ladder, enabling excavation to bedrock at 60 meters depth and final cleaning and seating of the caisson on the bedrock claystone. Then a thick tremie seal would be placed at the bottom, allowing dewatering and subsequent construction of the power plant to complete the construction process.