

PROJECT PROFILE

SITING AND GEOTECHNICAL STUDIES FOR ANGRA NUCLEAR POWER PLANT

D'Appolonia has performed siting studies, development of seismic design bases, design of building and component foundations and civil works, and construction monitoring for more than 40 nuclear power plants world wide. A project of particular interest with respect to problem soil and foundation conditions was the Angra Nuclear Power Plant in Brazil.

Our responsibilities for the Angra project included analysis of a slope failure that occurred during construction and preparation of remedial designs. The partial excavation for a cooling water discharge canal at the base of a residual soil slope combined with heavy rainfall led to horizontal soil displacements in excess of 25 inches along a 1,300-foot section of the cooling water canal.

D'Appolonia conducted a comprehensive study encompassing both static and dynamic analyses to evaluate the stability of the failed slope resulting from implementation of various remediation design alternatives. The recommended repair measures comprised a toe berm buttress enclosing a box culvert section to carry the canal flow and a drainage gallery in the uppermost portion of the slope to lower the ground water level.



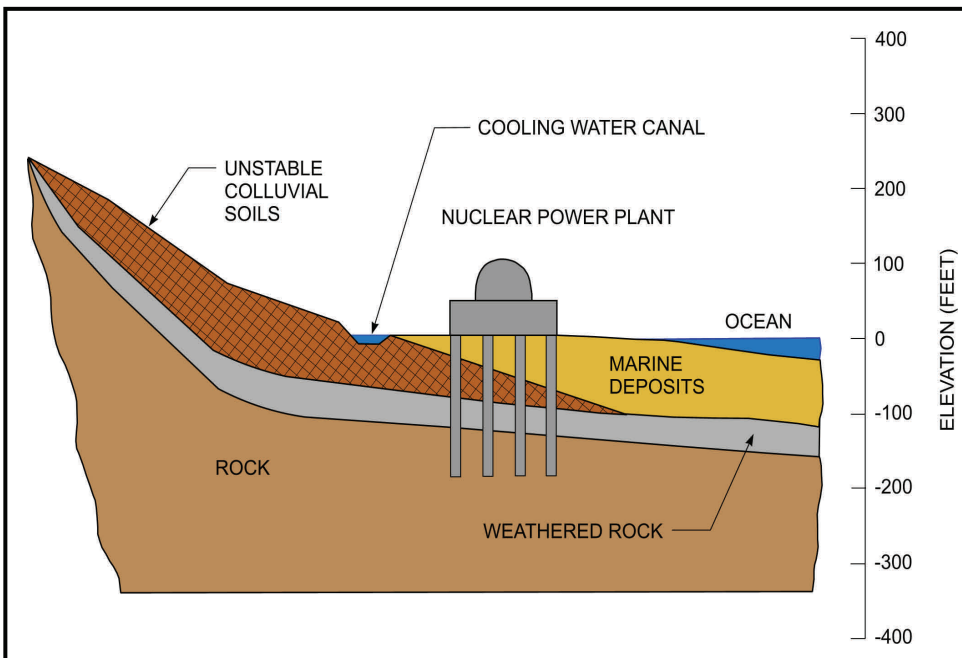
The Angra Nuclear Power Plant during construction.

Another area of D'Appolonia involvement at the Angra plant site related to foundation design. Difficulties encountered during the construction of drilled shaft foundations led to concerns regarding their integrity and capacity. We planned and directed a 1,200-ton load test and acoustic surveys of constructed shafts to determine the shaft capacity and to characterize construction defects. We also performed engineering analyses to determine individual shaft capac-

ity and developed recommendations for substandard shafts.

D'Appolonia's services to the nuclear industry have included sites in Iran, Italy, Korea, Pakistan, Puerto Rico, Spain, and 12 U.S. states. Our work for these projects included:

- Monitoring of micro-earthquake detection systems to obtain data for establishing seismic design criteria,
- Design of impoundments to provide emergency cooling water storage,
- Design and construction monitoring for excavation dewatering systems in highly pervious coastal sand and limestone deposits,
- Designs, construction management and development of operations manuals for well fields in coastal aquifers to provide emergency water supply replenishment, and
- Development of designs and procedures for decommissioning various aspects of nuclear facilities including well fields, containments, and foundation components.



Cross section of Angra site showing area of slope instability.