

## **ENGINEERING GEOLOGY IN LARGE SCALE PROJECTS**

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### **ABSTRACT**

The safety of Large Scale Projects is a major requirement for their implementation.

That safety depends on the structural behavior of the projects which is a function of the geological and geotechnical conditions of the related ground serving as foundations of the project (case for example of Dams and Bridges) or as a terrain to be excavated (case for example of Tunnels and High Slopes).

This implies, during the design stage; the assessment of the geological conditions and geotechnical behavior of the ground (rock mass or soil) in order to design these large projects properly, avoiding collapses and damages.

During the second half of the 20th century, large structures expanded all over the world because of the economic development experienced by many countries. In most cases, those structures had a significant interference with the ground and large collapses resulted from a lack of information concerning the geological, hydrogeological and geotechnical properties of the terrain.

That situation contributed to the establishment of two new sciences, Engineering Geology and Rock Mechanics, responsible for the geological modelling of the ground and for the assessment of its relevant geotechnical properties.

In general, that is only possible, after a comprehensive geological reconnaissance, through the establishment of a site investigations program, using techniques adapted to the nature of the ground and to the associated engineering problems. With that information, it will be possible to prepare the engineering geological model of the ground and, based on the respective characteristics, to have a proper and safe design of the respective foundations.

The presentation illustrates the principles referred above applied to the design of the foundations of Ribeiradio Dam, 76 m high concrete gravity, in a very difficult rock mass, and of Vasco da Gama Bridge, 13 Km long, crossing the Tagus River in Lisbon, through piles 75 m deep and up to 2,2 m in diameter. If time permits, the presentation will still include the interesting case of a very shallow double tunnel in a motorway, second ring road around Lisbon, which had to replace an open excavation section of the motorway, because Dinosaurs footprints were found during construction.