ABSTRACT

The recent falling of a minipile wall, which was executed during the renovation works of the old Hotel Florida (close to the top of the Tibidabo mountain in the Barcelona area), produced important damages in the property and the adjacent zones, which obligated to undertake its reconstruction.

The retaining wall was executed within the construction works to build in front of the hotel a new building in the subsoil. This new building included a new access and a parking area under the actual ground level, with a total depth of excavation between 15 m and 17m from the original esplanade. The building was going to be placed at a topographic level of 492.5 m and it was going to have an area in plain of about 1,400 m². The project included various sections of diaphragm walls executed in the perimeters SW and NE. Due to construction determinants it was decided to modify the initial project of pile walls by the minipiles ones. In March 2001 the justification of the project was presented and the projected started to be executed. On the afternoon of the 7th of March of 2001 the minipiles wall collapsed in the SW limit of the excavation, affecting an important stretch of itself. The subsequent debris removal modified the collapsed state in which the wall had remained, so no information is available about the previous state since the area was inspected after these modifications. Because of that, the subsequent visual inspections were not representatives of the state of the wall following its collapse.

This Master Thesis aims to analyse retrospectively the causes that lead to the falling of the wall. This analyse will be done by using both the classic techniques and the Finite-Element Method. After analysing the possible factors that provoked the falling of the wall, different design alternatives to reconstruct the wall will be proposed.

Firstly, the available documentation have been analysed to characterize the involved conditioners. This analyse includes a detailed study of the documents that directly affected the wall project, i.e. the topographic measurements, the geotechnical study and the initial memorandum of the project. After this analyse, the massif has been characterized from a geotechnical point of view.

After some familiarization with the study case, some analysing methods, like software to calculate retaining structures or Finite Elements programs for the analysis of rocks and soils, have been explored. These programs, by establishing the possible collapse scenarios, have been used to determine the factors that provoked the collapse.

A range of possible values of the soil strength parameters have been established from this analyse. From all this data and all the considerations formulated in this work, a proposal for the wall reconstruction and its cost estimation, have been proposed.

The Master Thesis is structured in 7 chapters, including an initial chapter of introduction, objectives and scope and a final chapter of conclusions. It also includes bibliographic references, annexes and complementary documentation.

This work strictly deals with the collapsed wall and do not enter into considerations about other retaining structures of the work area.

The proposed reconstruction solution does not represent a final solution for the retaining structure from an engineering point of view, since this kind of solution should correspond to a complete engineering project.