Pisa, Basilica's Square

Engineering geological conditions and problems:

The problem of the inclination of the Pisa's Tower (Toscana region) is the aspect which, over the centuries, has most fascinated and aroused the curiosity of visitors. Experts have debated at length, in particular in the XIX century, over whether or not the inclination came about as a result of problems of static which emerged during the construction of the Tower: in other words, whether the inclination was the result of an unforeseen and inevitable progressive subsidence of the ground, or whether it constituted an effect consciously desired by the architect. In the Pisa plain a naturally occurring subsidence rate of 0,5 – 4 mm per year has been inferred from historical and geological data for the last 7000 years.

The floods coming from the Arno River represent another geological hazard, but there's a long distance between the square and the river. During the last important flood, in the 1966, historical monuments in Pisa were not affected.

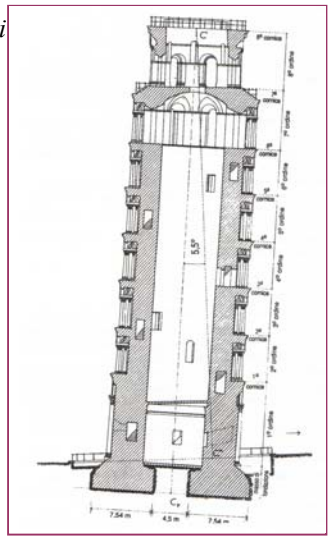
The Square
(www.guide.storiadellarte.com)

The Tower
(www.guide.storiadellarte.com)

Investigations and protection measures already realized:

The last restoration of the tower has occurred during the last ten years. The works consisted first in geotechnical work as excavation, with a controlled removal of certain amounts of soil. Several small pipes were thrust slantwise into the soil until they reached the foundation bottom. In 1997, the Bell Tower was anchored to the ground by means of two large steel cables placed around the third order and fastened to two anchorages. Other works are structural.

The monitoring includes both static and dynamic systems.



Tower cross-section
(Burland et al, 2000)

Supplementary information:

The square is known in all the world as *Campo dei Miracoli*. It represents one of the example of the Romanic style, with a fusion of Classic, Early Christian, Lombard and Oriental style. In any case, the buildings, erected in different times, have a stylistic unitariness.

References on studies already done:

BURLAND J.B., JAMIOLKOWSKI M. e VIGGIANI C. (2000) "La salvaguardia della Torre di Pisa: aspetti di geotecnica". Convegno GEOBEN Torino 7-9 giugno 2000, pag. 263-294

ROSSI A., CALORE C. e PIZZI U. (2000) "Land subsidence of Pisa plain, Italy: experimental results and preliminary modelling study". Proceedings of the Sixth International Symposium and Land Subsidence, 24-29 September 2000, Ravenna, Italy, pag. 91-103