



## Evaluating the Geotechnical and Geophysical Characteristics of Expanding Districts in Tehran Using Field Experiments

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### Abstract

Considering the increasing population growth and the rapid growth of urbanization and pollution in the environment, providing zoning maps and urban engineering geology seem to be important. The rapid construction growth of cities, as well as the confrontation with events such as earthquakes and failure to observe the geological and geotechnical issues, has caused many engineering problems. The use of geophysical methods not only cannot provide us a complete and comprehensive information on the geotechnical conditions of the earth but also has many disturbances in urban areas, and its use in urban centers is almost impractical. Therefore, it seems that the best way of examining and interpreting the geotechnical characteristics of a site, especially in urban areas, is the use of suspicious data. Therefore, performing geotechnical studies and geotechnical zoning can be useful for retrofitting buildings and engineering structures and reducing their risks. Hence, zoning studies are conducted in this research in order to better recognize the technical soil status for safe construction due to rising the population of Tehran in recent decades and the concentration of population in certain areas of Tehran, especially in the eastern and western regions (districts 4 and 22). In this study, different geotechnical field tests such as standard penetration test (SPT), cone penetration test (CPT) were used to estimate parameters such as adhesion coefficient (C), internal friction angle ( $\varphi$ ), Young modulus (E). Other common experiments with conventional geophysical experiments, such as in good experiments, refractive and CSSW were applied to estimate geophysical parameters of bedrock depth and shear wave velocity for zoning these areas.

*Keywords:* Cone Penetration Test; Standard Penetration Test; In-Well Test; Soil Adhesion Coefficient; Internal Friction Angle; Young Modulus.

### 1. Introduction

Given the high seismic location of Tehran and the presence of natural hazards in the city and the limited resources and facilities for effective coping in dealing with possible crises, it is necessary to reduce the risks by applying the measures. On the other hand, the new constructions unlike the past need for parking and other interconnections and thus an increase in the number of underground floors with the rise of land value in Tehran and increasing the number of floors. Therefore, identifying the geotechnical features of the construction site and the design of buildings based on local and environmental conditions plays an essential role in improving the quality of construction. Hence, zoning studies are conducted in this research in order to recognize the technical soil status better for safe construction due to rising the population of Tehran in recent decades and the concentration of population in certain areas of Tehran, especially in the eastern and western regions (districts 4 and 22). The purpose of this research is to investigate the geotechnical data related to the drilled boreholes in districts 4 and 22 of Tehran using statistical software. Accordingly, an estimation of the parameters is presented with the desired level of confidence. Finally, an appropriate method was detected using the inverse distance fourth-order interpolation statistical method according to the data type and scattering. Then, different maps of geotechnical micro-zonation of quaternary deposits of Tehran's 4th and 22nd districts were prepared using various GIS software. In this study, different geotechnical field tests such as standard penetration test (SPT), cone

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