

# Geotechnical and Geological Information on the City of Sanandaj

Behrooz Samadian<sup>1</sup>, Ali Fakher<sup>2\*</sup>

1. Department of Civil Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran
2. Department of Civil Engineering, University of Tehran, Tehran, Iran

Received: 6 Nov 2016 Accepted: 17 July 2017

## Extended Abstract

Paper pages (95-122)

### Introduction

Geotechnical investigations merely through boring and engineering experiments are considered a difficult task as they are highly costly and time-consuming. The identification of large areas initially requires geological studies followed by the inclusion of geotechnical information. Finally, a geological and geotechnical classification is prepared for the entire area. This type of classifications is employed in strategic urban planning and quick selection of geotechnical variables in small-scale projects. The present research performed the steps involved in these investigations and classifications for the city of Sanandaj, Iran. Hence, the geological-geotechnical classification of the city of Sanandaj was presented by integrating the geological information of this city with the geotechnical data obtained from drilled boreholes as well as multiple wells at different locations in this city.

### Materials and Methods

This study was conducted on the city of Sanandaj in six steps. The steps involved and their respective objectives are given in summary in Table 1.

### Discussion

This study is applicable to those regions with insufficient information on their boreholes. The present study used only 211 boreholes, the distance

**Table1. Steps involved in this study**

Step	Title	Objective or result
1	General geological investigation of the considered region	Identifying the general geological characteristics
2	Determining the appearance of the layers through field investigations	Determining the rock units and soil layers as well as their outcrops and investigating their appearance
3	Identifying subsurface layers	Determining the layer types and drawing the longitudinal and lateral profiles
4	Geological classification based on the steps involved in formation of units	Determining the characteristics of geological units and their origin of emergence
5	Determining the geotechnical attributes of geological units	a)Collecting the available information, b) controlling the available information, c) completing the information
6	Presenting a geological-geotechnical classification for the considered region	a) Presenting geological-geotechnical classification, b) presenting geological identification criteria to determine the type of a given unit at the site of the project

between which was greater than 5 km in some areas of the Sanandaj city. Hence, although no sufficient information was available on many areas of Sanandaj, the proposed method in this study was able to identify the geotechnical attributes of all soil layers and rock units. This study emphasizes on geological and geotechnical classification and presents a step-by-step method to systematically relate geological and geotechnical studies. By integrating these classifications, geotechnical identification of extensive regions such as urban areas can be facilitated even if the number of boreholes is insufficient. Moreover, simple identification criteria can be extracted from this method, through which the engineering attributes of the layers at each point can be determined. This method can be used as an optimal and economical method for geotechnical identification of extensive areas.

### **Conclusion**

The following summaries can be concluded from this study:

- The step-by-step procedure of integrating geological and geotechnical information was described, through which the geological-geotechnical classification for this city was obtained.

- The geological units identified for Sanandaj were shale, limestone, andesite, and Quaternary, which includes layers of alluvial clay, residual clay, and sand and gravel. The extent and distribution of each of the aforementioned units in Sanandaj were identified and plotted. Moreover, the physical and mechanical characteristics of each of the units as well as their geotechnical hazards were determined and presented.
- In this study, simple geotechnical criteria such as faults, altitude level, and distance from river were identified. These parameters were effective in identification of geological units in Sanandaj.

**Keywords:** Sanandaj Site, Urban Geology, Geotechnical Tests, Classification

---

\*Corresponding Author: [afakher@ut.ac.ir](mailto:afakher@ut.ac.ir)