Opinion Article

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Engineering Behavior of Earth Materials

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Geotechnical engineering, also referred to as geotechnics, is that the branch of engineering concerned with the engineering behavior of earth materials. It uses the principles of soil mechanics and rock mechanics for the answer of its respective engineering problems. It also relies on knowledge of geology, hydrology, geophysics, and other related sciences.

The science of geotechnical engineering was primarily developed by the Austrian Karl Terzaghi within the early 20th century. He was a professor at the Vienna University of Technology and later at Harvard University. Before his death in 1963 he bequeathed all his technical and scientific material to NGI. His works are held by the Terzaghi Library at NGI, which opened in 1967.

In addition to engineering, geotechnical engineering also has applications in military, mining, petroleum, coastal engineering, and offshore construction. The fields of geotechnical engineering and engineering geology have knowledge areas that overlap, however, while geotechnical engineering may be a specialty of engineering, engineering geology may be a specialty of geology: They share an equivalent principle of soil mechanics and rock mechanics, but differ within the application.

Geotechnical engineering is that the systematic application of techniques which allows construction on, in, or with geomaterials, i.e., soil and rock. Every engineering structure and construction is said to soil in how, and subsequently, its design will depend upon properties of the soil or rock. Geotechnical operations are of importance with reference to soil sampling, investigating geomaterials properties, controlling water table and flow also as environmental and hydrological interactions. Foundation engineering, excavations and supporting ground structures, underground structures, dams, natural or artificial fills, roads and airports, subgrades and ground structures, and slope stability assessments are samples of geotechnical engineering applications in practice.

Despite notable progress in geotechnical engineering, many solutions are still approximate, which is especially thanks to the natural inherent inhomogeneity of soils and dominant environmental conditions. Additionally, soils are more sensitive to local environmental conditions compared to other prefabricated building materials like steel or concrete. Consequently, it might be necessary to possess comprehensive understanding of natural soil deposits, environment interactions, and response to local conditions to permit more accurate prediction of geomaterials engineering performance and behavior in projects.

Geo-technics is applied when planning infrastructure like roads and tunnels also as buildings and other constructions onshore and offshore. The discipline also involves performing numerical calculations, analyzing the steadiness of slopes and cliffs, and assessing load-bearing capacity, settlement and deformation in man-made structures.

Research and development in geotechnical engineering is administered to enhance and further refine equipment and methods for completing ground surveys.