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Editorial

Engineering Geology: History, Practice, Modern Tasks

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Engineering geology (Ukrainian: Engineering Geology; German: Ingenieurgeologie; French: Geologie technique, geotechnique; Italian: Geotecnica) is included in the complex of geological sciences. According to the "Mountain Encyclopedia", this is a science about the structure, properties and dynamics of the geological environment, its rational use and protection during engineering and economic activities. The main tasks of engineering geology: study of the current state and patterns of formation of engineering and geological conditions, predicting their changes in the process of construction and economic activity; engineering and geological substantiation of protective measures ensuring the rational development of the territory, mineral resources and environmental protection.

Engineering geology is characterized by the application of geological methods to engineering research (surveys) in order to identify and take into account geological factors related to the location, design, construction, operation and maintenance of construction sites. To solve the problems of engineering geology, field observations, field and laboratory experimental work, modeling, analytical calculations, stationary observations and other general geological and special geotechnical methods are used.

As a result of the analysis of the performed surveys, geological engineers provide geological and geotechnical recommendations for design. The goal of a geological engineer is mainly to evaluate the interaction of building objects with soils and to study how engineering-geological processes affect human-made structures and human activities.

Brief History of Engineering Geology

Geology is one of the oldest areas of human activity and one of the first sciences. The study of rocks, minerals, ores of various metals has been conducted for many centuries. At the same time, the science and practice of engineering geology began to emerge as a separate discipline only in the late XIX and early XX centuries. The first book, Engineering Geology, was published by William Penning in 1880. The first textbook on engineering geology in the United States was written in 1914 by Rhys and Watson.

At the beginning of the twentieth century, geologist Charles Burke became the first American engineer - a geologist. He worked on several New York City water supply projects, then worked on the design and construction of the Hoover Dam and many other construction projects.

The largest studies of the first half of the twentieth century in engineering geology were carried out in the USA - K. Terzagi, R. Peck, J. Taylor, T. Lamb; in the UK - A. Skempton; in France - J. Talobre; in Austria - L. Muller. A particularly significant role in the formation of engineering geology as science was played by the Soviet scientist F.P. Savarensky.

With the intensive development of production and economic activity, including construction, man has become the largest geological force, and this, according to the definition of V. I. Vernadsky, has formed a new global geological phenomenon - the "noosphere". On this scientific basis, engineering geology has been developing for many decades.

In 1979, Academician E. M. Sergeev defined engineering geology "as a science of the geological environment, its rational use and protection in connection with the possibility of occurrence of geological processes harmful to humans". The three main sections of engineering geology that have developed are characterized as follows:

Engineering geodynamics is the science of modern geological processes of importance in the national economic and construction activities.

Soil science is a science that studies any rocks and soils, as multicomponent dynamic systems that change in connection with human engineering activities.

Regional engineering geology is a scientific direction for understanding the laws governing the formation of engineering-geological conditions of large geological regions and the forecast of their change under the influence of human engineering activities.

At the same stage of development, such directions as engineering geology of cities, marine engineering geology, engineering geology of mineral deposits were formed.

Among the famous modern Ukrainian scientists, are M. G. Demchishin (regional engineering geology), G. I. Rudko (engineering geodynamics, monitoring of the geological environment, geoecology), E. A. Yakovlev (ecology), V. M. Shestopalov (hydrogeology and ecogeology), G. G. Strizhelchik (engineering surveys).

At present, the main task of engineering geology as a science can be considered the creation of prerequisites for participation in the management of the development of the geological environment and harmonization of the "man - geological environment" system.

Research practice

Engineering-geological surveys and studies can be performed:

- For residential, commercial and industrial buildings and structures;
- For state and military facilities;
- For public developments, such as power plants, wind turbines, power lines;
- For storm sewers, wastewater treatment plants, water treatment plants, pipelines (aqueducts, water pipes), tunnels;
- For hydraulic structures: canals, dams, reservoirs;
- For railways and roads, bridges, airports;
- For the development of a mine and quarry, reclamation of territories of worked mines;
- For wetland recovery programs;
- For government, commercial or industrial waste disposal sites;
- For coastal works: protection of sandy beaches, the stability of cliffs or sea cliffs, the construction of a harbor, pier and promenade;
- For offshore operations: drilling platforms and underwater pipelines, underwater cable;
- As well as for other types of objects.

Engineering-geological studies can be carried out at the stages of long-term planning, analysis of environmental impact, general structural design, at the stages of detailed design and construction of public and private buildings and structures, as well as at the stages of reconstruction.

Works performed by geological engineers include: assessment of all types of geological hazards; determination of geotechnical properties of soils, including the possibility of their use as building materials; resistance of lands to landslides and other slope processes; to erosion of all kinds, floods, dehydration; seismic surveys.

Engineering and geological studies are carried out by a geological engineer who is trained, has the qualifications and experience associated with the recognition and interpretation of natural processes, understanding how these processes affect human-made structures (and vice versa), as well as knowledge of the methods by which you can to prevent risks or mitigate the consequences arising from adverse natural or man-made incidents. The main task of a geological engineer is to protect life and property from damage that can be caused by various geological processes and phenomena.

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