

## Soil specificity and its impact on investments.



Interview with **Radosław Michalski**, a geotechnical engineer, co-owner of the **Fort Polska** design office. He has several years of practice and experience in preparation and management of geotechnical, structural and construction projects. Specializes in **the issues of foundation and design of underground structures.**

### **Why is geotechnics important for the realized investments?**

Geotechnics is a combination of engineering and geology. Requires knowledge of both soil behavior and structural work. It deals with the interaction between the structure and the subsoil, which has its own memory and history. Sometimes the same soil, but coming from other geographical regions, has different properties. Actually - modeling of the soil, similar to reality, has a very large impact on

the adopted economy of solutions and the level of safety of the designed structural elements.

### **How have the soil study documentation and geotechnical designs changed over the years? How does it look like in practice now?**

Unfortunately, until recently, Poland was very different from the rest of the European Union countries when it comes to the level of geotechnical knowledge, and more precisely, it was difficult to obtain proper laboratory

tests depending on what was the subject of the project. The standard was to determine soil characteristics based on leading parameters - compaction index for sands and plasticity for cohesive soils according to the standard - Direct Foundation of Buildings. The value of these determined parameters was only suitable for calculating shallow foundations. The easiest way to show this is based on the soil deformation modulus defining its deformability, which affects foundation settlements and deformation of excavation shielding. They should be determined completely differently for shallow foundations, differently for tunnels and excavation shielding. In 2013, a Regulation came into force, regarding requirements that should be met for soil testing depending on the complexity of the structure, complexity of soil conditions and the need to develop geotechnical projects - i.e. a study that should give the designer of the structure necessary information on how to model the soil and determine possible adverse processes occurring in the soil, threats, hydrogeological conditions. Unfortunately, some geotechnical projects are still being developed by Geologists - which is also a mistake due to the applicable law, or by constructor engineers, who do not have the necessary knowledge and competence to prepare them - they are simply made as "art" for the Office because such are the requirements...

Fortunately, awareness among investors and designers is increasing and both the scope, type of research and the quality of Geotechnical Projects is getting better.

### **What errors in the construction phase can eliminate geotechnics?**

First of all, making a good reconnaissance of the ground, appropriate to the planned investment project, allows you to design an optimal structure and minimize the risk associated with unforeseen situations - e.g. displacement of the bottom of the excavation or the occurrence of locally weak layers.

### **Geotechnics in Poland and in the world.**

Poland is very diverse in terms of geological structure. In Warsaw alone, we have places where clays are very shallow - on the surface, or lie less than 50 m from ground level. In the south of Poland, we have loess, in the mountainous regions rocks, in the central and northern parts loams associated with lake sediments. Soils around the world are equally diverse, and in addition there are aspects such as seismic impacts that also affect the behavior of land and their impact on the building. As far as the level of knowledge and geotechnical research is concerned, in the world Geotechnics is much more developed, more advanced soil research is being done, new constitutive models are being developed, adapted to a given type of soil. Poland is trying to chase but we still have a lot to catch up on.

### **Land specificity and its impact on investments.**

In my opinion, the type of soil and water conditions has a key impact on the investment. I am talking mainly about the economic aspect, because current knowledge allows to practically make a foundation on any

type of soil - the only issue is the budget. It often happens that due to the soil and water conditions of a given type of building / investment, it is not profitable to do so because the costs associated with foundation are deadly. Our highways are a good example - where it is said that 1km of their construction is the most expensive in Europe. It is related to, among others, with soil conditions and the need to reinforce the ground for most of their sections. I always encourage investors to do geological research and geotechnical analysis before buying a construction plot to assess whether a given investment intent in certain soil and water conditions will make economic sense.

#### **Geotechnics in urban areas.**

Urban areas have a very large impact on the development of Geotechnics, because they put more and more difficult tasks for

designers and contractors. Tight buildings - not enough space, the need to provide parking spaces - the need to perform deep excavations while minimizing the impact on buildings located in the impact zone or even in an acute border with deep excavations. In addition, existing utilities, the need to ensure continuity of communication, transfer of very heavy loads to the ground - high-rise buildings, drainage of excavations.

Each project is different and requires an individual approach. It is impossible to apply universal geotechnical solutions for a given type of object, because they depend on the conditions of the plot, the contractor's possibilities and the details of the functional solutions of the object. That is why Geotechnics is an extremely important component of the construction process.