Methodology of Engineering Geological Investigation for Family Houses and with Applications in Construction and Geotourism

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https://doi.org/10.29227/IM-2025-02-02-129

Submission date: *2025-08-05* | Review date: *2025-08-25*

Abstract

An engineering geological survey is a key tool for safe and efficient foundation engineering, including small-scale constructions such as family houses. Its purpose is to comprehensively assess the geological, geotechnical, and hydrogeological conditions of the site, verify the suitability of the area for construction, and propose an optimal foundation solution with respect to the bearing capacity, settlement, and infiltration of stormwater into the foundation ground. This article systematically describes the successive phases of an engineering geological survey for small buildings — from desk study and field reconnaissance through field investigations, sampling, and documentation, to the interpretation of results and preparation of the final report. Attention is paid both to normative and legislative requirements and to the methodological approach to assessing ground conditions and designing suitable foundation solutions. A well-executed survey minimizes construction risks, optimizes foundation design, and prevents costly remedial measures. The outcome is a clear and practically applicable model procedure that can serve as methodological guidance for designers, geotechnical engineers, and builders, even in typical family house projects.

Keywords: *engineering geological survey, ground conditions, foundation engineering, foundation ground, geological conditions, desk study, penetration test, laboratory analyses*

1. Introduction

In the design preparation of family houses, emphasis is often placed primarily on architectural solutions, energy efficiency, or budget optimization. However, the geological and geotechnical conditions of the construction site are frequently overlooked or underestimated, despite their crucial impact on the stability, safety, durability, and overall economy of the building process.

An engineering geological survey is a fundamental tool for obtaining relevant information about the composition and properties of the foundation ground, the presence of groundwater, and potential geological risks — such as unstable layers, anthropogenic fills, landslide-prone areas, expansive clays, or increased concentrations of natural radioactive gas (radon). The survey results represent an essential basis for selecting a suitable foundation method and help to prevent technical complications, damage to foundation structures, and unnecessary additional costs.

For small-scale buildings, particularly individual residential houses, the engineering geological survey is often carried out only to a limited extent, or it is even replaced by an informal "expert estimate." Such an approach carries a significant risk of insufficient understanding of the ground conditions, which may lead to serious issues during construction or later use of the structure. Although the regulatory requirements for the scope of investigation for family houses are less stringent than for large engineering structures, the survey should still meet the basic legislative and technical standards and be adapted to the local geological conditions.

The aim of this article is to present a recommended structure, scope, and procedure for conducting an engineering geological survey for family house construction. The text covers all stages of the survey — from desk study and field reconnaissance to field and laboratory investigations, evaluation of results, and preparation of the final report. The methodology is based on the currently valid legislation, technical standards, and professional practice of engineering geology in the Czech Republic. The scientific study builds on previous research [15-19].

2. Legislative Framework

An engineering geological survey represents a professional activity aimed at acquiring, evaluating, and interpreting information about the composition, structure, and properties of the geological environment in a given area. The results of the survey are used not only to assess the suitability of the site for the intended construction project and to design an optimal foundation method, but also to identify potential geotechnical and environmental risks that could threaten the construction process or the long-term use of the structure.

The scope, methodology, and timeline of the survey are determined by the project documentation, which must take into account the current level of geological knowledge of the area, the purpose and type of construction, the technical requirements of the client, available financial and time resources, and above all the valid legislation and technical standards.

Geological works in the Czech Republic are governed by **Act No. 62/1988 Coll., on Geological Works**, as amended. This law defines the requirements for the qualified performance of geological activities, establishes the rights and obligations of both contractors and clients, and regulates the exercise of state administration in the field of geology. Geological works may be carried out only by persons holding a certificate of professional competence issued by the Ministry of the Environment (MoE) [10].

The Act is supplemented by implementing decrees, in particular **Decree No. 206/2001 Coll**., on certificates of professional competence, and **Decree No. 282/2001 Coll**., on the registration of geological works and the submission of results to the Czech Geological Survey (Geofond) [13, 14].

From the perspective of building permitting, the key regulation is **Act No. 183/2006 Coll., the Building Act**, which defines the requirement for an engineering geological survey as part of the documentation for zoning or building proceedings [12]. For projects with a potential environmental impact, it is also necessary to follow **Act No. 100/2001 Coll.**, on Environmental Impact Assessment (EIA), which may include geological and hydrogeological aspects [11].

In terms of technical standards, the engineering geological survey is designed and carried out mainly in accordance with **CSN EN 1997-1 Eurocode 7: Geotechnical Design – Part 1: General Rules [4]**, and **CSN EN 1997-2 Eurocode 7: Geotechnical Design – Part 2: Ground Investigation and Testing [5]**. Sampling and groundwater measurement follow **CSN EN ISO 22475-1: Geotechnical Investigation and Testing – Sampling Methods and Groundwater Measurements – Part 1: Technical Principles**.

For small-scale buildings, it is recommended to follow also **CSN P 73 1005: Engineering Geological Survey** [3]. Other relevant standards include those for soil classification (**CSN EN ISO 14688-1, -2**) and laboratory testing (series **CSN EN ISO 17892**).

In addition to legal and normative documents, methodological guidelines issued by the **Ministry of the Environment**, the **Czech Geological Survey [1]**, and the **Czech Association of Engineering Geologists** can also be used to unify the approach to investigation activities.

The legislative and normative framework ensures the professional quality and comparability of engineering geological surveys and provides the basis for safe, economical, and environmentally sound design of building foundations in accordance with the geological conditions of the specific site.

3. Preparation of the Survey

The preparatory phase of an engineering geological survey represents a crucial step to ensure its quality, efficiency, and technical focus. Its primary purpose is to collect sufficient background information to design the investigation so that it meets the requirements of the designer, the nature of the planned structure, and the geological specifics of the site.

This phase primarily includes a **desk study**, which aims to evaluate the existing geological, hydrogeological, and geotechnical documentation for the investigated area — including archival boreholes, maps, professional studies, or data from previous surveys. The desk study helps to preliminarily assess the geological conditions and identify potential risks such as anthropogenic fills, slope instabilities, groundwater occurrence, or aggressive soil components.

The desk study is followed by **field reconnaissance**, during which the site is physically inspected by a qualified specialist. The goal is to verify the current terrain situation, morphology, drainage, accessibility, and possible anthropogenic alterations. Field reconnaissance can reveal factors that are not apparent from maps or archival sources — such as local fills, remnants of old structures, or evidence of land reclamation.

The preparation also includes the elaboration of **project documentation for the survey**, which defines the objectives, scope, methods, expected schedule, location of boreholes, their depths, and expected outputs. The survey design must be prepared by a qualified professional and comply with the current legislation, particularly **Act No. 62/1988 Coll.** [10], and the relevant Czech and European technical standards (**CSN, EN, ISO,** and **Eurocode 7**) [2-5].

A well-prepared investigation minimizes the risk of incomplete or irrelevant data on the ground conditions, reduces the need for additional supplementary works, and ensures that the results will be practically applicable in foundation design. Although this phase is often simplified for small-scale buildings such as family houses, its omission can lead to major errors in the project documentation.

3.1 Desk Study

The first step of any engineering geological survey is a detailed desk study, the purpose of which is to gather and evaluate all available information about the geological, hydrogeological, geomorphological, and geotechnical characteristics of the area. This stage has a significant influence on the choice of investigation methods and the scope of fieldwork and therefore represents an essential prerequisite for an effective and targeted survey.

The main information sources include geological, hydrogeological, and engineering geological maps; archival reports from previous surveys conducted in the area or its surroundings; results of old boreholes and laboratory analyses; and records of slope deformations, landslides, radon risk, or historical mining activities. An invaluable source of information is the **Geofond database** of the **Czech Geological Survey**, which contains borehole logs, archived reports, and data on groundwater levels, slope failures, and other natural anomalies such as radioactivity or contamination [1].

In addition to specialized geological data, publicly available tools are used during the desk study — such as cadastral maps, orthophotos, historical aerial images, and GIS applications operated by state and municipal authorities. These data can reveal anthropogenic modifications of the landscape, the existence of older constructions, drainage systems, or changes in land use.

The outcome of the desk study is a preliminary formulation of the **basic geological profile** of the locality, identification of potential risks (e.g., fills, fault zones, aggressive waters), and proposal of an adequate investigation scope. Based on the collected data, the number and depth of boreholes are determined, and suitable methods for sampling and laboratory testing are selected. A thoroughly executed desk study minimizes costs, increases efficiency, and contributes to the reliability of the final site assessment.

3.2 Field Reconnaissance

After the desk study, a **field reconnaissance** follows, during which the assumptions derived from archival materials are verified directly on site. The main objective of this stage is to identify terrain morphology, natural and anthropogenic landforms, surface features, potential signs of slope instability, rock outcrops, groundwater seepage, or the presence of fills and construction debris. At the same time, accessibility for drilling equipment, the occurrence of underground utilities, and the possibilities for infiltration or drainage of stormwater are assessed.

Field reconnaissance helps to optimize the positioning of geological boreholes, trial pits, or penetration tests in relation to the geometry of the proposed structure and the expected ground conditions. This phase usually includes preliminary geological

mapping, collection of surface samples, and initial geotechnical observations (e.g., soil consistency, bearing capacity of the surface layer, or current soil moisture).

Based on the geological character of the area, a **preliminary radon risk estimate** may also be made. However, in cases required by law, direct in situ measurements of radon concentration in soil gas must be performed in accordance with **Act No. 263/2016 Coll., the Atomic Act**, and related regulations [8].

The significance of field reconnaissance lies in the possibility of adjusting the survey scope and methods to the actual terrain conditions, identifying potentially problematic areas, and preparing the groundwork for the detailed project documentation of geological works. It is a key step in ensuring the efficiency and reliability of the subsequent field and laboratory investigations while minimizing the need for additional works.

4. Field and Laboratory Investigations

Field and laboratory investigations represent the core stage of an engineering geological survey. Their main objective is to obtain direct information on the composition, structure, and physico-mechanical properties of soils and rocks at the planned construction site. The results form the basis for the design of the foundation method, determination of the bearing capacity of the foundation ground, identification of groundwater levels, and assessment of other geofactors that may affect the construction process or the long-term stability of the building.

Field investigations are carried out in accordance with the approved project documentation and adapted to the character of the site and the type of structure. For small-scale buildings, such as single-family houses, the most commonly used techniques include shallow trial pits, core or auger drilling, dynamic or static penetration tests, and sampling for laboratory analyses. Particular attention must be paid to the correct spatial distribution and depth of the exploratory points – the base of each borehole or pit should extend at least 1.0–1.5 m below the planned foundation level, or down to a sufficiently competent and undisturbed layer of foundation ground.

Laboratory testing provides a detailed quantitative description of the material properties of soils and rocks (grain size, plasticity, consistency, permeability, bulk density, natural moisture, etc.), which are essential for the calculation of settlements, stability of foundations, and the design of adequate engineering solutions.

4.1 Exploratory Boreholes

Exploratory boreholes are the fundamental means of obtaining direct information about the geological profile within the investigated area. They may be conducted as manually excavated pits (usually of square cross-section up to about 2 m in depth) or by means of light drilling equipment such as auger or rotary coring rigs. The selection of the method depends on the required investigation depth, accessibility, and soil type, as well as on the need to obtain either disturbed or undisturbed samples.

Each borehole or pit allows direct documentation of the soil profile — recording and describing the sequence and thickness of the encountered layers, their color, consistency, moisture, grain composition, admixtures (gravel, coal fragments, organic matter), and the presence of groundwater. When groundwater is encountered, its depth, type (free or confined), and response behavior are recorded.

Soils are classified according to **CSN EN ISO 14688** (Geotechnical investigation and testing – Identification and classification of soils) and **CSN P 73 1005** (Engineering Geological Survey). The classification is primarily based on grain-size distribution, plasticity, and organic content. The main soil groups are coarse-grained soils (gravels and sands), fine-grained soils (silts and clays), and organic soils (humic or peat-rich). Additional properties such as cohesion, consistency, plasticity, permeability, and swelling potential are also assessed, as they are crucial for determining bearing capacity and compressibility of the foundation ground.

For bedrock layers, the assessment focuses on the degree of weathering, integrity, structure, and tectonic disturbance. Discontinuities such as fractures, joints, and separations are described in terms of frequency, orientation, openness, and infilling. These characteristics are key for evaluating the mechanical behavior and stability of the rock mass with respect to foundation engineering.

The goal of the borehole investigation is to construct a realistic geological cross-section of the site, which will serve as the basis for determining the foundation level, the design of the foundation structure, or the need for potential ground improvement measures. Properly executed boreholes are a decisive factor for the quality and reliability of the entire engineering geological survey [6, 7, 9].

4.2 Penetration Tests

Penetration tests are an integral part of field investigations and serve to determine in situ the bearing capacity, compaction, and homogeneity of the foundation ground. For small-scale construction projects, **light (DPH)** or **medium (DPM) dynamic penetration tests** are most frequently used. These consist of repeatedly driving a conical steel tip into the ground by a standardized hammer while recording the number of blows required to penetrate a given depth (typically 10 or 20 cm).

The results are expressed as a penetration resistance curve, which reflects variations in soil resistance with depth. This enables the identification of stronger and weaker layers and the evaluation of relative bearing capacity and soil compaction. Compared to boreholes, penetration tests provide a more detailed vertical resolution of geotechnical variability and are particularly useful in heterogeneous ground conditions.

They are also valuable for verifying the compaction of fills or sub-bases and for orientational assessment of soil properties in areas with limited accessibility. The obtained data can be correlated empirically with key geotechnical parameters — such as the angle of internal friction, cohesion, or deformation modulus — either through standard correlations or in combination with laboratory results.

Although penetration testing is an indirect method, correctly interpreted results significantly enhance the reliability of foundation design, especially in cases where the laboratory test dataset is limited. [6, 7, 9]

4.3 Sampling and Laboratory Analyses

Laboratory analyses form an indispensable part of the engineering geological survey, enabling the quantitative determination of physical and mechanical parameters of soils and rocks essential for the design of safe and economical foundations.

Samples are collected during fieldwork. **Disturbed samples** (e.g., from fills or loose materials) are mainly used for grain-size analysis and index properties, while **undisturbed samples** are obtained using thin-walled tube samplers or similar devices that preserve the natural structure and water content of the soil. These samples are necessary for determining mechanical parameters such as unconfined compressive strength, deformation modulus, consolidation characteristics, or swelling potential.

The most common laboratory tests include:

- **Grain-size analysis** (sieving and sedimentation),

- **Atterberg limits** (liquid and plastic limits),
- **Natural water content**, **bulk density**, and **porosity**,
- **Consistency classification** (e.g., using a penetrometer),
- **Plasticity index**, **compressibility**, and **swelling index**.

If environmental or chemical risks are suspected, additional analyses are performed, such as chemical aggressiveness of groundwater toward concrete structures (sulfate, chloride, nitrate, and ammonium content), pH, electrical conductivity, and organic contamination.

The laboratory results are subsequently used to calculate the bearing capacity of the foundation ground, estimate settlement magnitude and uniformity, determine the appropriate foundation type and dimensions, and assess the need for soil improvement or replacement.

Proper interpretation of these data within the broader geological and geotechnical context is essential. The designer must consider not only the absolute values of parameters but also their spatial variability, past loading history, anthropogenic influences, and possible seasonal groundwater fluctuations, all of which can significantly affect foundation performance over time. [6, 7, 9]

5. Evaluation of Results and Preparation of the Final Report

After the completion of field and laboratory investigations, the next crucial stage of the engineering geological survey is the comprehensive evaluation and synthesis of all collected data into a final report. This report represents a key document in the design and planning process, serving as a professional and technical basis for designers, structural engineers, investors, and building authorities. Its structure and level of detail must comply not only with applicable technical standards but also with the specific requirements of the project and the characteristics of the investigated site.

The report typically begins with **identification details** — the name of the client and contractor, the site location, the purpose of the investigation, and the dates of fieldwork. This is followed by a **summary of the methods and scope of work**, including the number and type of boreholes, depths reached, testing methods, instruments used, and laboratory analyses performed.

A separate section describes the **geological, hydrogeological, and engineering-geological conditions** of the site based on the actual field and laboratory findings. The composition, thickness, and classification of the soils and rocks are documented together with their consistency, relative bearing capacity, permeability, and the relationship to the groundwater table. If technically significant geofactors were encountered (e.g., anthropogenic fills, rock outcrops, radon occurrence, or aggressive groundwater), they are described in detail and evaluated with respect to their influence on the proposed construction.

A major part of the report focuses on the **analysis of geotechnical properties of the foundation ground**, including their spatial variability. Results of laboratory tests and penetration tests (DPH/DPM) are presented, along with any radon index measurements or chemical analyses when required. Based on the synthesis of all information, the **foundation layer** — i.e., the geological stratum that is sufficiently strong, compressively favorable, and capable of transferring structural loads — is identified.

The report also includes a **recommendation for the suitable foundation system**. For typical single-family houses, shallow foundations on continuous footings or foundation slabs are usually proposed. In more complex conditions, deep foundations, partial soil replacement, or other ground-improvement measures may be suggested. The recommendation specifies the foundation depth, foundation type, width of the foundation base, drainage requirements (where groundwater was detected), and additional measures for stability and uniform settlement control.

Design values of key soil parameters are presented, such as:

- **Deformation modulus (E^d)**,
- **Angle of internal friction (φ)**,
- **Cohesion (c)**,
- **Unit weight (γ)**, and
- **Coefficient of permeability (k)**.

These parameters constitute the input data for structural and geotechnical design calculations according to Eurocode 7 and related national standards.

The report also commonly contains **recommendations for storm-water management**, including possibilities of infiltration on site, requirements for drainage systems, or limitations due to hydrogeological conditions. When significant geohazards are identified — such as slope instability, tectonic discontinuities, aggressive groundwater, or high radon potential — clear warnings and site-specific recommendations are provided for the designer.

The **drawing appendix** typically includes:

- A site plan showing the positions of boreholes and test pits,
- Geological and engineering-geological cross-sections,
- Tables of laboratory and penetration test results,
- Maps of hydrogeological or radon conditions (if applicable).

When properly executed, the final report becomes one of the most important technical documents in the entire design process. It provides the factual foundation for safe, reliable, and economical structural design, ensures compliance with geotechnical standards, and supports informed decision-making during the planning and construction phases. [6, 7, 9]

6. Model Example of an Engineering-Geological Survey for a Single-Family House

This chapter presents a model case study of an engineering-geological and hydrogeological survey (hereinafter referred to as **EGS** and **HGS**), conducted in **April 2025** in the municipality of **Rajhradice** (Brno-venkov District, Czech Republic). The investigation formed part of the project documentation for a planned single-family house. The main objectives were to assess the foundation ground conditions, hydrogeological regime, and the feasibility of **storm-water infiltration** in accordance with Czech legislation and Eurocode 7 requirements.

6.1 Scope and Methodology of the Survey

From the engineering-geological perspective, the survey corresponded to a **detailed site investigation** under Decree No. 369/2004 Coll., focusing on the identification of foundation ground conditions and potential geotechnical hazards.

At the same time, an **indicative hydrogeological investigation** was carried out according to **ČSN 75 9010**, verifying the potential for infiltration of precipitation water into the subsoil.

The scope of work was defined by a qualified geotechnical contractor and approved by the client, considering the building type, available data, and project requirements.

The survey included:

- Archival research of existing geological and hydrogeological data,
- **Field reconnaissance**,
- Two **core-drilled exploratory boreholes** to a depth of approx. 3 m,
- Sampling and documentation of soils,
- Geotechnical evaluation including the determination of the **design bearing capacity of the foundation ground**.

6.2 Archival Research and Field Reconnaissance

No archival boreholes or previous geological works were recorded near the site. Therefore, publicly available data from the **Czech Geological Survey (CGS)** were used — including geological, hydrogeological, and engineering-geological maps at a scale of 1 : 50 000, as well as maps of geohazards and undermined areas. These provided a basic overview of the regional geological setting and potential risks such as slope instability, flood zones, or subsidence.

Prior to fieldwork, a **terrain reconnaissance** confirmed the flat topography of the site, the absence of visible deformations, fills, or rock outcrops. The surface was covered by grassland with historical agricultural use. A functional drainage ditch was identified nearby. The terrain was fully accessible for borehole drilling and infiltration testing.

6.3 Field Work and Geological Cross Section

Two **core-drilled boreholes** were performed using a lightweight **vibratory coring rig**. Samples were collected using **Eijkelkamp core samplers** (Ø 60–100 mm). The borehole depths were designed with respect to the planned foundation depth and the need to verify infiltration capacity. Laboratory tests were not required, as the encountered soils were geologically common and well classifiable in the field.

Encountered layers:

- 0.0–1.2 m: floodplain clay (sandy clay, class F4 CS – stiff to firm),
- 1.2–1.9 m: fluvial silty sand (S4 SM – medium dense),
- below 1.9 m: fluvial sand layers (S3 S-F and S2 SP) with lenses of clay of medium plasticity (F6 CI).

The geological setting corresponds to **Quaternary fluvial sediments** of Pleistocene age (Riss stage). Below approximately 6 m depth, **Neogene calcareous clays** of Badenian age occur.

6.4 Groundwater Conditions

A **free (unconfined) groundwater table** was encountered in both boreholes at depths of **2.8–2.9 m b.g.l.**, associated with permeable fluvial sand horizons.

The aquifer is bounded above by low-permeability clays and below by impermeable Neogene formations. Since the planned shallow foundation level lies well above the groundwater table, groundwater occurrence is **not limiting** for the proposed development.

6.5 Assessment of Foundation Ground Conditions

Based on the findings, the site can be classified as belonging to **Geotechnical Category 1** according to **CSN P 73 1005**.

The foundation ground — sandy clay (F4 CS) and silty sand (S4 SM) — exhibits adequate bearing capacity and stability. The **design bearing capacity** was determined **as q_{dt}= 150 kPa**, which is sufficient for typical one- to two-storey residential buildings (typical load range 20–75 kPa).

6.6 Foundation Recommendations

The most suitable and economical foundation method is **shallow strip foundations** (*continuous footings*). Alternatively, a **raft (slab) foundation** may be used — for example, for low-energy or passive houses where structural rigidity and uniform settlement are required.

In such cases, a structural design considering the type of concrete, reinforcement layout, and slab thickness is necessary. The **foundation depth** must be placed below the local frost line — at least **0.8 m (preferably 1.0 m)** below finished ground level, particularly for light structures and clayey frost-susceptible subsoil.

6.7 Workability and Earthwork

The soils are **easily excavatable** with conventional construction equipment or manually. According to **CSN 73 6133**, they correspond to **Workability Class I**; under the older **CSN 73 3050**, mostly **Class 2**, locally **Class 3** (for stiff clays).

Unsupported excavations are recommended up to **1.5 m** deep; for deeper trenches, shoring or slope profiling is required. Recommended **slope inclinations** for stable excavation walls:

- up to 1.5 m: 1 : 0.75 (≈ 53°),
- in deeper sandy layers: 1 : 1.25 to 1 : 1.75 (≈ 39°–30°),
  valid under dry conditions and without heavy machinery near the edge.

6.8 Summary and Conclusions

The foundation ground conditions of the investigated site are suitable for shallow foundations of standard single-family houses in terms of bearing capacity, uniformity, and geotechnical behavior.

From both a normative and practical engineering standpoint, the plot can be considered fully buildable.

The presence of groundwater at greater depth, the homogeneous subsoil composition, and the absence of geotechnical hazards represent favorable conditions for construction without the need for ground-improvement measures.

The final selection of the foundation type and depth must be determined by the responsible structural designer or geotechnical engineer, based on detailed static calculations and the specific structural layout, while taking into account the conclusions of this survey.

7. Conclusion

An **engineering-geological survey** forms an essential and indispensable part of the preparation process for any construction project — including small-scale developments such as single-family houses. Although these structures are relatively modest in size, the influence of the **geological environment** on their safety, functionality, and service life is fundamental. Insufficient understanding of the **foundation ground conditions** may lead to serious structural defects, including **differential settlements, wall dampness, cracking,** or even **local stability failures**.

This article has provided a detailed overview of the individual stages of an engineering-geological survey — from **archival research** and **field reconnaissance**, through **field and laboratory investigations**, to **data interpretation and the preparation of the final report**. It has been demonstrated that even for projects classified under **Geotechnical Category 1**, it is essential to follow the **basic methodological and legislative framework**, which ensures technical reliability and practical applicability of the survey results in design and construction.

Although the extent of investigation for single-family houses is generally less demanding than for large-scale engineering structures, this stage of the building process must not be underestimated. A **properly executed survey** offers significant advantages:

- it enables optimization of the **foundation design**,
- minimizes the need for **additional ground improvement or remedial measures**,
- identifies **hidden geological or environmental risks** (such as fills, aggressive groundwater, or high radon potential), and
- contributes to a **reduction of overall construction costs**.

Early identification of **unfavorable subsurface conditions** can prevent technical failures that would otherwise be costly and difficult to remedy at later stages of construction. Therefore, the engineering-geological survey should not be viewed as a mere **formal requirement**, but rather as a **key investment** in the safety, durability, and long-term functionality of the structure.

Given the pronounced **geological variability** of the Czech Republic — often observable even within a single building plot — the inclusion of a geotechnical investigation in project preparation is not only recommended but in practical terms **absolutely essential**.

Acknowledgements

The authors also thank the VŠB-Technical University of Ostrava, Faculty of Mining and Geology, for supporting the SGS project (SP2025/077 and SP2024/096), within which this article was prepared.

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