

Annual Review 2010

Professional and creative approach is typical of us.
We emphasize the complex character of the services we provide.

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Introduction



Dear Shareholders, Dear Business Partners, Dear Employees,

I am delighted to be provided with the opportunity to address you through the Annual Review on our activities in 2010. As has become the tradition, I am able to state that we have succeeded in meeting the objectives we have stipulated for the year 2010.

During the entire year we have worked to satisfy the expectations related with the renaming of our company in 2009. Now, the worldwide expertise and experience collected by the globally operating engineering group ARCADIS are available to all our clients and employees. In a number of cases these opportunities have proved to be not only perceived, but also successfully used by our clients.

The company's basic strategic plans that are in compliance with the policy of the ARCADIS Group have been continuously met. The company continues to maintain its leading position in the market of geotechnical services. It also expands its current services into regions, seeks and introduces new types of services, and expands its client portfolio, especially with clients from the private sector. Simultaneously, it is establishing itself in foreign markets, namely in Slovakia through its Structural Unit and through its cooperation with its subsidiary, GEOFOS.

The success expressed by economic indicators has exceeded our plans and expectations. Emphasis was put primarily on reaching higher than the planned level of our own achievements. We succeeded in this, because the company's revenues increased to almost EUR 11.6 million compared to EUR 10.8 million in 2009. The profits generated amounted to nearly EUR 1.6 million before taxes. The company's equity capital increased from EUR 9.4 million to EUR 10.6 million. All this happened in the times when civil engineering is going through a period of substantial drop in activities. As in the foregoing years, these results could be achieved thanks to two basic reasons. Even in spite of the tough conditions in the market, we continued to continuously work on the development of our employees. At the same time, we involved a large group of our employees in the preparation of the company's policy for the years 2011 through 2013. The mutual interconnection between the company's contribution aimed at continuous professional growth of employees and development of their managerial and language skills on one hand and between the employees' engagement in their work and their concern about the company's successful future on the other hand has again proved to bear fruit.

Last year, in this very place, I stated: "I must mention our client focus. We are fully aware that the best advertisement is doing high-quality work. We are also aware that we constantly have to improve our ability to recognize and understand our clients' needs. Only then can we continue to be our business partners' first choice if they want a job done or a problem solved in our area of business. The long-term nature of business relationships with many of our clients is proof that we are on the right path." Another year has passed and I still deeply believe that our client focus is the correct way; our experience has unambiguously proved that these words are absolutely true. Our place is anywhere that we are in the position of a recognized business partner beneficial for its client through a unique solution, as opposed to anywhere we would be in a no-name-subcontractor position.

The structure of our most important clients has not changed significantly for several years. In 2010, our activities were still focused first and foremost on the field of transport infrastructure. Given the possibility for a comprehensive approach to solving an issue and given the possibility to optimize the planned solution, it is logical. The ability to resolve unexpected situations and thus reduce costs which would usually increase significantly in these instances is important.

Thanks to this approach our major clients include, directly or indirectly, investors in the field of transport infrastructure, such as Railway Infrastructure Administration, Road and Motorway Directorate, Waterways Directorate or the individual regions of the Czech Republic. Similarly, our leading clients include in fact all the biggest and most significant construction companies.

Last year was a difficult one for civil engineering in the Czech Republic. A clear example is the governmental program promoting maintenance of investments in transport infrastructure on one hand, as opposed to the radical reductions in the 2011 budget in combination with the vague policy of the ministry of transport on the other hand. We expect the announced trend of seeking more cost-effective solutions to be pursued. This approach is in harmony with our long-term policy, which we have been able to apply when working with private clients and construction contractors. Our focus on such services that give our clients the required added value has again proved to be very prudent.

I also believe it is important to mention our activities in the ARCADIS CZ holding. Our joint business with our colleagues from the design company ARCADIS Bohemiaplan s.r.o., with ARCADIS Project management s.r.o. and with GEOFOS, s.r.o., has enabled us to offer "turn-key" solutions, starting with cooperation with the client from the beginning of its investment plan through to delivery of the completed work.

Of course, in 2010 our company again contributed to the development of the field. Educational and publishing activities consisted of more than forty speeches given by our specialists in conferences and seminars. Over 60 written works were published. We became involved in standard creation and resolved a number of tasks in applied research.

We are fully aware that both looking back and looking to the future are important for ARCADIS Geotechnika a.s. It remains true that implementation of the company's strategy and that of our parent company, as expressed in the fulfillment of targeted economic goals, continuing with engaging the younger generation of employees in company management, primarily with the systematic development of key employees and, last but not least, establishing long-term relationships with our clients are our standard objectives for 2011. However, 2011 is going to be the year of significant changes. In 2011, we will have to cope with our new material tasks: implementing the planned changes in the company's internal management and handling the changes in the construction market.

Compared to last year, we expect 2011 to be more complicated for our company in different aspects. However, even in this situation we consider ensuring high level of specialization and high quality of our work to be our priorities. The same way we were able to meet our plans for 2010, I believe we are able to fulfill our plans for 2011.

Let us enjoy good health and enough strength to achieve them.

Prague, March 28, 2011



Ing. Václav Hořejší, MBA
Chairman of the Board of Directors



Basic Information about the Company

ARCADIS Geotechnika a.s. is the largest and oldest geotechnical consulting company in the Czech Republic, with 85 years of history. The uniqueness, success and strength of ARCADIS Geotechnika a.s. lies with the combination of knowledge and experience obtained from many years on the Czech market and knowledge of modern European approaches to preparing and managing large engineering projects.

The company focuses on consulting, supervision, surveying and testing for engineering structures, particularly in geotechnical engineering, foundation engineering, underground structures as well as the environment.

| | |
|---------------------------------|---|
| Business Name: | ARCADIS Geotechnika a.s. |
| Identification Number: | 411 92 168 |
| VAT Registration Number: | CZ 411 92 168 |
| Company Seat: | Geologická 988/4, Prague 5, 152 00, Czech Republic |
| Legal form: | share corporation |
| Incorporation Date: | October 24, 1991 The company was recorded in the Commercial Register administered by the Municipal Court in Prague, under Section B, Entry No. 992 |
| Bank Details: | Komerční banka a.s., Prague 1, Spálená 108/51 |
| Account Number: | 7006931/0100 |
| Registered Capital: | EUR 1,920.000 |
| Equity: | EUR 10,612.000 (as of December 31, 2010) |
| Capital Structure: | ARCADIS as the majority shareholder has owned 100 % of the company shares since May, 2008 |



Company Statutory Bodies

Company Board of Directors:

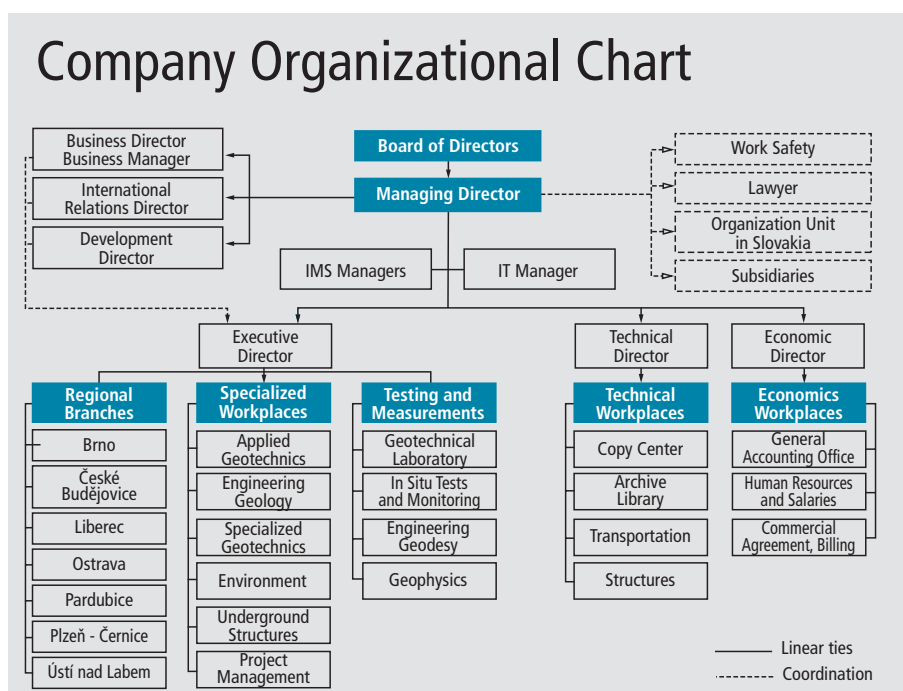
- Ing. Václav Hořejší, MBA**
Chairman of the Board of Directors
- Ing. Vítězslav Herle**
Member of the Board of Directors
- Mgr. Jan Kárník**
Member of the Board of Directors

Supervisory Board:

- Ing. Zdeněk Sekyra**
Chairman of the Supervisory Board
- Ing. Jaroslav Hejl**
Member of the Supervisory Board
- Ing. Petr Kučera**
Member of the Supervisory Board

Company Management:

- Ing. Václav Hořejší, MBA, Managing Director**
- Mgr. Jan Kárník, Executive Director**
- Doc. Ing. Alexandr Rozsypal, CSc., Development Director**
- Ing. Vítězslav Herle, International Relations Director**
- Ing. Jiří Růžička, CSc., Business Director**
- Ing. Vladimír Pachta, Technical Director**
- Ing. Petr Rezek, Economic Director**



Subsidiaries of ARCADIS Geotechnika a.s.

SG - Geoprojekt, spol. s r.o.

ID No.: 262 37 636, TAX ID No.: CZ 262 37 636
Šumavská 525/33, 602 00 Brno, Czech Republic
Tel.: +420 549 133 343, Fax: +420 549 133 284
E-mail: geoprojekt@geoprojekt.cz
www.geoprojekt.cz



Design studio based in Brno, specializing in comprehensive design work, especially for foundation engineering, geotechnical construction, landslide reconstruction, transport and underground construction.

SG - Geoinženýring s.r.o.

ID No.: 258 23 884, TAX ID No.: CZ 258 23 884
28. října 2663/150, 702 00 Ostrava, Czech Republic
Tel.: +420 597 577 377, Fax: +420 597 577 677
E-mail: geoinzenyring@geoinzenyring.cz
www.geoinzenyring.cz



Specialist geotechnics company based in Ostrava, which deals with engineering and project management, especially underground, engineering and ecological construction and mining engineering.

Organizational Unit, Slovakia

ARCADIS Geotechnika a.s.

Organizational Unit, Slovakia

ID No.: 359 07 371, TAX ID No.: SK 202 1902 355
Miletičova 23, 821 09 Bratislava
Slovak Republic
Tel./Fax: +421 2 502 44 475
E-mail: michalica@arcadisgt.sk
www.arcadisgt.sk

Since 2005 has offered the Slovak market the complete assortment available from the parent company ARCADIS Geotechnika a.s. It uses the knowledge and experience gained 85 years and the superior know-how of the multinational ARCADIS group.



Introducing ARCADIS CZ

ARCADIS CZ a.s. is a new, dynamic, multiprofessional company, which was established in 2007. It is part of the ARCADIS group, one of the leading globally operating engineering companies, which is its majority owner.

ARCADIS CZ provides consulting, supervising and engineering work, and the design and management of construction projects for engineering, industrial and civil constructions, environment, energy, mining, and water and waste management.

ARCADIS CZ has a holding structure – all work and business activities are diversified into subsidiaries. The key companies of the ARCADIS CZ group in the Czech Republic are:

[ARCADIS Geotechnika a.s.](#)

[ARCADIS Project Management s.r.o.](#)

[ARCADIS Bohemiaplan s.r.o.](#)

In Slovakia, the ARCADIS CZ group does business through its subsidiary company, [GEOFOS, s.r.o.](#) and also with the Organizational Unit Slovakia, which was founded there in 2005 by ARCADIS Geotechnika.



Organizational Structure of ARCADIS CZ

| Czech Republic | Slovak Republic |
|--|--|
| ARCADIS Bohemiaplan | GEOFOS |
| ARCADIS Geotechnika SG-Geoprojekt SG-Geoinženýring | ARCADIS Geotechnika Organizational Unit, Slovakia |
| ARCADIS Project management | |

The group's business strategy is based on using synergistic effects arising from the holding structure. The subsidiaries complement each other and ARCADIS CZ can therefore offer its clients a wide range of fully comprehensive services. The company provides all the services on ethical principles contained within the guidelines of the International Federation of Consulting Engineers, FIDIC.

The ARCADIS CZ group companies are equipped with modern technologies and quality apparatus, along with highly qualified staff. In 2010, there were 73 authorized engineers and technicians active in construction working for ARCADIS CZ. The total average number of employees reached 335 in this year.

A major asset of the ARCADIS CZ group, as a universal consulting company, is its independence, meaning that it is not linked through capital or otherwise to investors or large construction companies involved in the construction or environmental markets.

Company Headquarters

[ARCADIS CZ a.s.](#)

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Subsidiaries of ARCADIS CZ



ARCADIS Project Management

ARCADIS Project Management s.r.o. (formerly HOMOLA Projektmanagement s.r.o.) is one of the leading consultancy companies in the Czech Republic, operating since 1995. It became a member of the international ARCADIS group in 2005. The company focuses on comprehensive project management activities, cost and quality management for all stages of the construction process for investment projects, as well as environmental protection in the construction field, related advisory services for investors and hydro-engineering and infrastructure structures. As an independent consultant, ARCADIS Project Management offers high quality services corresponding to international standards and gives impartial supervision for the maximum efficiency of its clients' investments.

With a team of highly qualified engineers and top staff from many fields, ARCADIS Project Management is able to cover not only all the stages of the project, but to help their clients with fit out by management, tenant coordination, optimizing energy demands, LEED and BREEAM certification and other activities.

ARCADIS Project Management often participate in construction which then receives awards in Czech and internationally competitions:

Reconstruction of Malostranská Beseda in Prague

- Title of Construction of the Year 2010
- Award of the President of the Senate of the Czech Parliament in the competition Construction of the Year 2010

Amazon Court, administrative building at the River City Prague Complex

- MIPIM Architectural Review Future Project Award 2008 – international competition winner
- Nomination for the Development News Awards in the Construction of the Year 2009 competition

Multifunctional football stadium for SK Slavia Prague

- Nomination for the title Construction of the Year 2008

Nile House, office building in the River City Prague Complex

- Best of Realty – 1st prize in the category New Office Buildings, 2005
- Best Office Building – award from Construction & Investment Journal, 2005
- CEE Construction Design of the Year, 2005 – award for quality at a realty competition on the CEE territory



ARCADIS Project Management s.r.o.
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www.arcadispm.cz

 **ARCADIS**
ARCADIS Project Management s.r.o.

ARCADIS Bohemiaplan

The design and engineering company BOHEMIAPLAN, s.r.o. was founded in June 1991 with the privatization of the branch design division of Báňské Projekty Teplice, active in Plzeň since 1952. The change in name to ARCADIS Bohemiaplan s.r.o. confirmed the company's affiliation to the ARCADIS CZ group, of which it has been a part since 2009.

Currently, the company has 65 qualified professionals and since 1991 has successfully implemented over 2400 orders of various kinds. The company provides comprehensive design and engineering services including planning, investment activities and performance of construction and technical supervision. For selected structures, the company provides its own construction including the supply of technology, installation and commissioning. The company offers a wide range of activities, primarily in the energy, industrial, engineering, water and ecological structure and surface construction fields

ARCADIS Bohemiaplan s.r.o.
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326 00 Plzeň, Czech Republic
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www.arcadisbp.cz



GEOFOS

GEOFOS, s.r.o. is the leading Slovak geotechnics company with years of history and professional experience in engineering geology, geotechnics, field measurements, ecology and geodesy. It provides comprehensive services to its clients in the fields of surveying, monitoring, supervision and consultancy at various stages of planning and construction of roads and motorways, hydro-engineering structures, tunnels and bridges, railways and the environment. The company was founded in 1991 by splitting from the well-known enterprise, IGHP Žilina. In 2005, Stavební geologie – Geotechnika, a.s., from 2002 part of the international ARCADIS group, acquired a majority share in GEOFOS. Since 2007 GEOFOS has been a subsidiary of ARCADIS CZ.

GEOFOS is made up of a professional team of almost 40 professionals and top specialists with extensive experience obtained in Slovakia and on international projects. Currently, the company is expanding dynamically and is one of the leaders in Slovakia in the field of engineering geology and geotechnics, primarily in the application of geotechnics for underground structures.

GEOFOS, s.r.o.
Veľký Diel 3323
010 08 Žilina
Slovak Republic
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www.geofos.sk



ARCADIS Group



ARCADIS is a leading international globally-operating group, which provides consultancy, engineering, project solutions and architectural services, project and facility management in the fields of infrastructure, water, environment and buildings. In this business segment, the ARCADIS group is one of the five biggest companies in Europe, while globally it is among the ten largest companies with a similar focus. In the global environmental market, ARCADIS is one of the three largest companies. Its experts specialize in improving mobility, sustainable development and improving the quality of life worldwide.

The ARCADIS group operates in Europe, Asia, North and South America and in 200 branches in a hundred countries around the world, and employs almost 16,000 employees. The total sales volume for the group exceeded EUR 2 billion in 2010.

ARCADIS is unique for its extensive international network, with strong positions on local markets, allowing them to apply their expertise on a global scale, and to provide services to customers of different nationalities looking for service providers who can help them globally.

Organizational Structure of ARCADIS NV

| The Netherlands | Europe except the Netherlands | United States of America | Rest of World |
|-------------------|---|--------------------------|-------------------------|
| ARCADIS Nederland | Belgium ARCADIS Belgium | ARCADIS US | Brazil ARCADIS Logos |
| PRC | Czech and Slovak Republic ARCADIS CZ | RTKL | Chile ARCADIS Chile |
| | France ARCADIS FCI | Malcolm Pirnie | China ARCADIS Asia |
| | Italy ARCADIS SET | | RTKL |
| | Germany ARCADIS Deutschland | | |
| | Poland ARCADIS Polska | | |
| | Romania ARCADIS Eurométudes | | |
| | United Kingdom ARCADIS UK | | |
| | RTKL | | |

Company Headquarters ARCADIS NV

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E-mail: info@arcadis.com
www.arcadis.com

UN-HABITAT – United Nations Agency for Human Settlements

On March 24, 2010, the international ARCADIS Group and UN-HABITAT, the United Nations agency for human settlements, commenced their cooperation. The common goal of their cooperation is to improve the quality of life in rapidly growing cities around the world, currently the living place of more than 50% of the world's population. More than one billion of these 50% live in slums or substandard housing. If nothing is done, this number will double in the next thirty years. ARCADIS and UN-HABITAT are a good fit: both organizations focus on the improvement of the urban environment and operate globally.

The common efforts of UN-HABITAT and ARCADIS, the main partner of the program, supported by ARCADIS' expertise in the field of civil engineering, urban planning, water management, infrastructure and environment, will focus on two activities. The first activity is the participation of ARCADIS' employees in UN-HABITAT's projects, such as the recovery program for Haiti. The second one will be transferring know-how and expertise in urban planning and development by organizing seminars for city officials from around the world, for example in the field of climate change adaptation.

Anna Tibaijuka, Executive Director of UN-HABITAT, explains the importance of the partnership with ARCADIS: "UN-HABITAT operates all over the world and there is an increasing demand for our services. The more we can share innovation and expertise, the more effective we can be. ARCADIS is our key partner and is open to sharing its knowledge and spirit of innovation with the rest of the world, and we would like to facilitate this sharing process."



Transport
Infrastructure
- Roads
- Motorways



Key Project in the Czech Republic 2010



Road R35 – Hradec Králové (Sedlice) – Opatovice – Technical Supervision of the Investor (2007–2010)

Road and Motorway Directorate of the Czech Republic, Pardubice Administration
The construction forms the groundwork of the northern connection of the Czech Republic, i.e., the R35 expressway from Hradec Králové to Mohelnice. Moreover, this construction project is characterized by a special design of intersection of R35 expressway with class I road I/37 and regional roads near Opatovice. The construction has been awarded with 2010 Construction Award of the State Fund for Transport Infrastructure.

Company Activity:

- technical supervision of the investor for road structures, bridges, drainage facilities, construction of noise barriers, etc.
- geotechnical supervision of the investor



R6 Road Sokolov – Tisová (2008–2011)

Road and Motorway Directorate of the Czech Republic, Prague
Extension of the R6 Sokolov – Tisová expressway between Karlovy Vary and Cheb from two lanes to four. The length of the section is 5.5 km and includes 6 bridges.

Company Activity:

- geotechnical supervision of the construction contractor including assessment of rock workability and suitability of soil for embankments
- monitoring settlement of embankments
- recalculating stability of slopes for cuts
- geotechnical consultation

D1 Motorway – Mořice – Kroměříž – Supervision (2007–2010)

Road and Motorway Directorate of the Czech Republic, Prague
Supervision of two D1 motorway extensions, Mořice – Kojetín, 1.5 km long at km 54.625-57.000 and Kojetín – Kroměříž-west, 4 km long at 55.000-61.000 km. Construction also includes 6 bridges and 2 class III road reroutings.

Company Activity:

- construction supervision (design and cost management, QA/QC)
- monitoring of construction (project documentation, work progress, control tests, work quality)



R 55 Expressway Skalka – Hulín – Technical Supervision (2008–2010)

Road and Motorway Directorate of the Czech Republic, Brno Administration
The construction is part of a set of constructions for the R55 expressway Olomouc – Břeclav. Completion of R 5503, length: 10.800 m, category R 24.5/120, will enable connection with D1 motorway and therefore also with R 35. The construction comprised 123 construction objects: and 16 road relocations.

Company Activity:

- technical supervision of the investor – liability for the main route and relocation of roads
- geotechnical consultation



I/58 Road Příbor – By-Pass (2009–2010)

Road and Motorway Directorate of the Czech Republic, Ostrava Administration
Construction of the Příbor city by-pass – intersection with I/48 road and by-pass in direction of Kopřivnice. Length is 5.328 km, the construction includes 11 bridges and flyover interchange Příbor.

Company Activity:

- geotechnical supervision during foundation of bridges (piles) and implementing embankment bodies
- geotechnical monitoring of settlement
- mathematical modeling of settlement and its temporal progress
- geotechnical consultation work





Road I/11 – Mokré Lazce (2009–2011)

Road and Motorway Directorate of the Czech Republic, Ostrava Administration
Construction of a new road of category S 22.5/80 in the length of 9.750 km, which includes 14 bridges, 1 pedestrian subway and 2 collectors.

Company Activity:

- additional geotechnical surveys
- mathematic modeling of embankment slopes stability on inclined subgrade including reinforcement proposal
- geotechnical monitoring of embankments settlement in two sections
- optimization of materials selection for the embankments and adaptation of subgrade before embankments construction
- geotechnical supervision, consulting services



Road I/56 – Ostrava – Místecká Street Extension (2008–2010)

Road and Motorway Directorate of the Czech Republic, Ostrava Administration
Construction of a motorway access road I/56 – Místecká Street extension, construction I and II from the centre of Ostrava towards D47 motorway through the area of OSTRAMO Vlček company. Basic characteristics of the project: section length: 3.056 km, 6 bridges (of that 1 elevated highway), 3 retaining walls, Mariánskohorská intersection.

Company Activity:

- geotechnical supervision during foundation of bridges (piles) and implementing embankment bodies
- geotechnical monitoring and mathematic modeling of embankments settlement
- optimization of embankments reinforcement and assessment of the embankment's influence on the existing main sewer underneath
- consultation work



Road I/48 – Rychaltice – Frýdek-Místek Section (2010–2012)

Road and Motorway Directorate of the Czech Republic, Ostrava Administration
Construction of expressway between Rychaltice and Frýdek-Místek. Section length is 7.043 km (SO 101 – main route), 3.050 km (SO 160 – auxiliary road). The construction comprised 17 bridges, 1 cut-and-cover tunnel Lysůvky (length 160 m), retaining walls in front of and behind the tunnel with the length of 205 and 720 m.

Company Activity:

- geotechnical supervision during foundation of bridges, retaining walls, cut-and-cover tunnel, and during embankments construction
- mathematic modeling of embankments settlement, stability of cuts and embankments, including reinforcement design
- geotechnical monitoring of embankments settlement and stability of cuts (12 profiles), geotechnical monitoring of retaining walls and tunnel
- additional geotechnical surveying of bridges and tunnel
- consulting services



Transport
Infrastructure
- Railways

Key Project in the Czech Republic 2010

Modernization of the 3rd Transit Railway Corridor (2002–2016)

Railway Infrastructure Administration of the Czech Republic, Prague

Modernization of the 3rd transit railway corridor 1st branch: the borders of Germany – Cheb – Plzeň – Prague, 2nd branch: Dětmárovice – Český Těšín – Mosty u Jablunkova – border of Slovak Republic. Reconstruction of existing and construction of a new substructure and superstructure, bridges, culverts, tunnels and walls.

Company Activity:

Providing geotechnical activities as required by the customer for design documentation processing and during implementation of constructions:

- consultation during processing preparatory documentation and constructions projects and assessment of their geotechnical parts
- geotechnical supervision during the reconstruction of substructure and superstructure
- implementation of field and laboratory verification tests



Přerov Railway Station Reconstruction – Geotechnical Supervision (2009–2013)

Railway Infrastructure Administration of the Czech Republic,
Olomouc Administration

Přerov railway station reconstruction between km 179.880 and 184.100, including exits towards Olomouc (up to km 184.611) and Ostrava (up to km 185.615). This was the first phase of reconstruction of one of the largest railway nodes in the Czech Republic. The construction comprised substructure remediation under all running tracks in Přerov station, including entrance sections of the railway station, reconstruction of 7 structures including the bridge over Bečva.

Company Activity:

- geotechnical supervision during implementation of substructure, drainage and structural layers of the sleeper base
- geotechnical supervision during foundation of bridges and culverts and Central Dispatching building foundation
- control tests for gravels, aggregate ballast, geosynthetics
- consultancy services for the investor





Modernization of the 4th Transit Railway Corridor (2004–2010)

Railway Infrastructure Administration of the Czech Republic, Prague
Modernization of the 4th transit railway corridor (German border – Děčín)
– Prague – Tábor – České Budějovice – Horní Dvořiště – Austrian border.
Reconstruction of existing and construction of a new substructure and superstructure, bridges, culverts, tunnels and walls.

Company Activity:

Providing geotechnical activities as required by the customer for design documentation processing and during implementation of constructions:

- consultation during design of individual constructions and assessment of their geotechnical parts
- geotechnical supervision during the reconstruction of substructure and superstructure
- field and laboratory verification tests



Brno – Storage Sidings – Geotechnical Survey and Supervision (2006–2010)

Railway Infrastructure Administration of the Czech Republic,
Olomouc Administration

Execution of the 1st phase of the complex reconstruction of Brno railway junction comprising extension and adaptation of the existing storage sidings in Brno – Heršpice, including relocation of railway in the length of 2.0 km. The construction was preceded by detailed geotechnical survey for design of the 1st phase, which was carried out in 2006.

Company Activity:

- detailed geotechnical survey
- design of sleeper bed structure, earthworks, and reinforcement
- geotechnical supervision during execution of substructure, drainage, and structural layers of the sleeper bed, as well as during foundation of bridges and culverts
- verification tests and consulting for the investor



Bystřice n. Olší – Český Těšín – Railway Optimization – GT Supervision (2009–2012)

Railway Infrastructure Administration of the Czech Republic,
Olomouc Administration

Optimization of the railway section between Bystřice nad Olší and Český Těšín in the length of 11.489 km. This railway forms part of the transit railway corridor No. III. The construction comprised substructure remediation under, reconstruction of 34 structures.

Company Activity:

- geotechnical supervision during implementation of substructure, foundation of bridges and culverts, drainage and structural layers of the sleeper base
- geotechnical supervision over railway relocations in the flood-plain of Olše river
- control tests for gravels, aggregate ballast, geosynthetics
- consultancy services for the investor



Underground Structures

Key Project in the Czech Republic 2010

Prague – Lochkov Tunnels – Supervisory Geotechnical Monitoring (2006–2010)

Road and Motorway Directorate of the Czech Republic, Prague

The Lochkov tunnels are part of the construction of the ring road around Prague. The driven two-lane tunnel has a length of 1.252 m, the driven three-lane has a length of 1.302 m. The profile of the stope of the two-lane tunnel is about 103 m², and 137 m² approx. for the three-lane one. Both driven tunnels are connected to adjacent cut-and-cover tunnels. The cut-and-cover section at Radotín portal is 20 m long and at Lochkov portal up to 347 m long.

Company Activity:

- monitoring office and geotechnical monitoring of driving
- convergence, inclinometric and extensometric measurements
- trigonometric measurements of excavated pits, portals and cut-and-cover tunnels
- levelling measurements and dynamometric measurements of anchors



Prague – Blanka Tunnels – Surveying and Monitoring (2007–2012)

Prague Municipal Authority, Department of the Municipal Investor

Construction of the northwestern part of the inner ring road in the section Myslbečova – Pelc Tyrolka (Blanka tunnels). Tunnel transport connection (total length of tunnels is 12.140 m) between Troja and Malovanka with links to the D8 motorway and the existing Strahovský tunnel. Part of the set of constructions, in addition to the tunnels, are 4 fly-over junctions, a new bridge over the Vltava River and flood protection measures in Troja.

Company Activity:

- geological documentation of driving of tunnels and excavation of construction pits
- comprehensive geotechnical monitoring (tunnels, construction pits, surface objects)
- measurement of seismic and acoustic effects of blasting
- management and evaluation of geotechnical monitoring (BARAB® system)
- additional geological surveying





Prague – Exit from “Národní třída” Underground Station – Complex GT Monitoring (2009–2010)

Prague Public Transport Company

In order to make the “Národní třída” underground station accessible for immobile persons and to create an emergency exit from this station, a barrier-free access to this station has been constructed using a combination of two elevator shafts with an intermediate underground transfer corridor. The excavated shaft of oval shape is terminated in a transfer corridor consisting of two mutually perpendicular short galleries.

Company Activity:

- complex geotechnical supervision over the construction (GTM Office)
- geotechnical monitoring
- convergence measurements of the primary lining of driven structures and trigonometric surveying of existing underground tunnels
- monitoring of the effects of underground construction on the surface development



D8 – Prackovice and Radejčín Tunnels – Geotechnical Monitoring (2008–2010)

Road and Motorway Directorate of the Czech Republic, Prague

The Prackovice and Radejčín are part of the construction of the D8 motorway through the České Středohoří mountain range in the direction of Ústí n. Labem. The Prackovice tunnel is made up of two motorway tunnels 270 m (LTT) and 260 m (RTT) long respectively. The Radejčín tunnel tubes have a total length of 600 m (LTT) and 620 m (RTT). The axial distance between the tunnels is 27.5 m.

Company Activity:

- geological documentation of faces
- measuring the shape of excavations and stress on contact of the rock
 - primary lining
- laboratory tests of rocks
- monitoring work for lead participant in geotechnical monitoring



Mosty u Jablunkova – Tunnel Reconstruction (2007–2011)

Railway Infrastructure Administration of the Czech Republic,
Olomouc Administration

Jablunkov tunnel is being reconstructed within the framework of optimization of the railway section between the Czech-Slovak state border and Bystřice nad Olší. The reconstruction comprises construction of a new underground structure while only a part of the right stone bench of the original tunnel is preserved. The new tunnel is constructed using the NATM method. Its total length will be 612 m, of which 564 m will be driven. An emergency situation occurred in the tunnel in November 2009, which resulted in tunnel collapse, the consequences of the collapse were eliminated in 2010 and the most appropriate method of tunnel completion is currently being selected.

Company Activity:

- geotechnical monitoring and survey
- laboratory tests of soils and grounds
- subsurface drainage concept design
- consultancy services as required by the investor



Water Management Structures

Key Project in the Czech Republic 2010

Vltava Waterway Hluboká n/V. – Hněvkovice Dam – Týn n/V. (2008–2010)

Directorate of Waterways of the Czech Republic, Prague

Engineering-geological survey for partial construction jobs forming part of the project “Vltava Waterway Completion” between Hluboká nad Vltavou – Hněvkovice Dam and Hněvkovice – Týn nad Vltavou. The survey was carried out for relocation of a water mains and for identification of navigation depths in Hněvkovice dam.

Company Activity:

- core drilling
- machine excavated pits in the river bed using Komatsu underwater dozer
- borehole logging performed from a floating bay
- laboratory tests of rocks and soils
- initial survey of soils contamination



Labe – WW “Děčín Weir” – Hydrogeological and GT Monitoring (2000–2010)

Directorate of Waterways of the Czech Republic, Prague

Monitoring levels and quality of water, detection of subsurface ground movements in the bank section of the Elbe River in Střekov – border with Germany for the documentation of hydrogeological and geotechnical conditions before the planned construction.

Company Activity:

- hydrogeological monitoring and documentation of works
- geotechnical monitoring and engineering geological survey
- sampling of water and soil and their laboratory analysis
- total hydrogeological assessment and processing of EIA documentation
- geotechnical stability calculations





Želivka – Feeder Gallery – Monitoring (1995–2010)

Vodní díla TBC, a.s., Prague

Drinking water feeder gallery Želivka – Prague is a unique in water management that transports drinking water long-range in pressure mode; the length of the feeder gallery is 51.3 km.

Company Activity:

- long-term regular monitoring of hydrological conditions
- monitoring the quality of groundwater and surface water
- updating of information from environmental zoning
- cooperation with the technical and safety supervision of the gallery
- consulting



Revitalization of Olše River Basin in the Czech Republic – GT Survey and Supervision (2010)

Silesian Water Management Alliance, Ostrava–Zábřeh

Global aim of the project is to improve the cleanness of water in Olše river. The objective of the project is to fulfill the requirements of directive 91/271/ECC on municipal waste-water cleaning. The area of focus spreads over 24.221 ha and the project is co-financed by the European Union and by the State Environmental Fund of the Czech Republic. The project comprises construction of sewer system in the rural agglomeration of Jablunkov, Návsí, and Mosty u Jablunkova.

Company Activity:

- additional geotechnical surveying for objects of pumping stations and sewage treatment plant
- additional geotechnical surveying in the areas of trenchless technology application
- geotechnical supervision during earthworks execution
- consultation work



R52 Expressway – Hydrogeological survey (2009–2010)

Road and Motorway Directorate of the Czech Republic, Brno

Advance hydrogeological (HG) survey of R52 expressway, construction 5206 Perná – state border Czech Republic/Austria. Detailed HG survey and obtaining information about qualitative and quantitative conditions in the area before commencement with the construction. Both surface and underground waters were monitored.

Company Activity:

- installation of automatic registration equipment on boreholes and in wetlands
- underground water level and humidity data readings
- surface and underground water sampling for laboratory analyses
- literature search on climatic conditions



Environmental Projects

Key Project in the Czech Republic 2010

Chabařovice – Waste Deposit (2002–2011)

SCES Group spol. s r.o., Ústí nad Labem, Czech Republic

The chemical waste landfill by Chabařovice is one of the most dangerous toxic and industrial waste landfills in the Czech Republic. The landfill was first used in 1908 and was used until 1993, when decision about its complete, technically highly demanding remediation was made. ARCADIS Geotechnika's specialists have participated in the remediation works since the extensive landslide on the northern slopes of the landfill in 2002.

Company Activity:

- additional engineering-geological survey
- landslide monitoring
- numeric modeling, analysis of geotechnical risks
- design of remediation measures and cooperation in design preparation
- geotechnical supervision



Chvaletice Power Plant – 4th Construction – Reclamation (2002–2010)

ČEZ a.s., Prague

Survey and monitoring for unloading yard for ashes from the Chvaletice Power Plant. Monitoring the water level and chemical status of groundwater in the area of the south-west foreground of the unloading yard for ashes in advance of starting to store products of desulphurization in new cartridges in the south-west and western parts of the unloading yard.

Company Activity:

- long-term hydrogeological monitoring
- hydrogeological survey
- stability calculations and consultations





Božkov – Sludge Pit Reclamation (2002–2010)

REKKA s.r.o., České Budějovice

Geotechnical work during reclamation of the sludge pit for ashes in the area of Plzeň-Božkov. Hydrogeological assessments of the impact of ground-water with the influence of reclamation. Long-term hydrogeological monitoring.

Company Activity:

- geotechnical work and stability calculations
- laboratory work
- hydrogeological assessment
- compaction checks



Ema Overburden Dump – Survey and Monitoring of Thermal Processes (2007–2011)

DIAMO, s.p., ODRA Branch, Ostrava-Vítkovice

Survey and monitoring of thermal processes at the Ema overburden dump, which is the highest point of the city of Ostrava. The works consisted in long-term monitoring. Their objective was to determine temporal changes in the body of the overburden dump.

Company Activity:

- survey of the extent of thermal processes and determining their intensity
- regular thermal monitoring at the surface and in probes inside the body of the overburden dump
- aerial photography in the infrared spectrum
- monitoring of gases (CO₂, CO, CH₄)



Hodějovice – Sludge Pit – Remediation and Reclamation (2001–2009)

REKKA, s.r.o., České Budějovice

Reclamation of the Hodějovice sludge pit with an area of approx. 50 ha, which lies in the gradual drainage of the sludge pit and the following suspension and coverage of the total amount of about 3 million m³ of hydraulically stowed material with remediation soils. The sludge pit is bordered for 1/3 of the perimeter with a five-stage dam, approx. 15 m high.

Company Activity:

- hydrogeological survey
- numeric stress-strain and stability analysis of the dam system and hydraulically stowed ashes
- long-term monitoring of shear displacements (inclinometry) and groundwater levels
- technical supervision



Remediation of Rock Faces and Slopes

Key Project in the Czech Republic 2010

Bohumilice v Čechách – Rock Face Remediation (2010)

EDIKT a.s., České Budějovice

Remediation of an emergency condition of the rock face above Bohumilice v Čechách – Vimperk railway between km 27.400 and 27.700. The remediated area of the rock face was 1,000 m². Remediation works consisted in cleaning the rock exposure and protective double-twist steel nets were installed on such prepared rock exposure. The completed remediation measures enable safe movement of persons and trains below the rock face.

Company Activity:

- emergency condition assessment and technical design regarding its elimination
- geotechnical assessment with works proposal
- execution of remedial and related earthworks



Road II/147 near Sušice – Retaining Wall Remediation (2010)

Road Administration and Maintenance, Klatovy

Remediation works consisted in complete repair of 42 meter section of the road and damaged retaining wall, which cracked towards the river valley. The earth plain was compacted according to the design of ARCADIS Geotechnika and a new retaining wall was constructed. The retaining wall has been constructed from reinforced soil using the TensarTech Green Slope system with inclination of 2.75:1. The remediated area was 150 m².

Company Activity:

- remediation design
- removal of the existing structure including milling works
- construction of the reinforced structure including the earth formation
- loading and verification tests execution
- road structure execution and crash barrier installation





Srní – Bicycle Path – Reinforced Soil Retaining Wall (2010)

Administration of the National Park and Protected Natural Area Šumava, Vimperk

ARCADIS Geotechnika was requested to construct a retaining wall near Srní on newly constructed bicycle path Gerlova Huť – Nová Hůrka – Prášily – Srní. The wall has been constructed from reinforced soil using the Tensar Green Slope system with inclination of 2.75:1. The system consists of three components – steel meshes, geogrids Tensar RE, and backfill soil. Retaining wall length is 400 m, average height is 2.8 m, overall volume of the reinforced slope was 3,000 m³.

Company Activity:

- assessment of slope stability and suitability of used soil
- installation of reinforcing elements and assurance of their functionality by compaction
- compaction checks
- remediation works
- permanent geotechnical supervision



Hluboká n. Vlt. – Damaged Retaining Wall Remediation (2010)

National Institute for Preservation of Historical Monuments, České Budějovice Administration

Remediation works on damaged retaining wall behind building at Náměstí ČSLA square No. 25 consisted in cleaning the rock exposure according to the requirements of the investor and designer – removal of vegetation, loose stones, potentially unstable rock blocks, and weathered mass. Protective double-twist steel nets and protective nets with anti-erosion geosynthetic material were installed on such prepared rock exposure. Crown of the existing retaining wall was raised and drainage boreholes were executed in the wall.

Company Activity:

- assessment of the emergency condition and technical solution design
- emergency condition elimination
- cooperation with designer during retaining wall remediation design
- remediation works



Jeseník District – Landslides Caused by Floods (2010)

Žulová Municipality, Česká Ves Municipality

Landslides near Česká Ves, Tomkovice, and Žulová in Jeseník region activated after sudden floods at the end of June 2009. Some of them even endangered public roads or family houses. In 2010, the Ministry of Environment of the Czech Republic provided funding for design documentation preparation for selected landslides.

Company Activity:

- stability analyses of selected landslides (assessment of the condition before and after the landslide) with regard to precipitation
- stability analyses of proposed stabilization measures
- preparation of design documentation for Žulová landslide above family houses No. 211, 219, 220, 221



Other Projects

Key Project in the Czech Republic 2010

Loukov – Fuel Storage Tanks (2007–2011)

ČEPRO, a.s., Prague

Construction of four reinforced concrete fuel tanks with a total volume of $4 \times 35,000 \text{ m}^3$; the diameter of one tank is 48 m and the height is 24 m. Construction will take place in a sloped construction pit, which is secured on the south side with a pair of pile walls. Upon completion of the construction works and installation of technology, the tanks will be covered with backfill and the surface landscaped.

Company Activity:

- engineering geology survey for construction
- numeric modeling
- cooperation on the project for ground construction of fill for the tanks
- geotechnical supervision during construction and consultation work
- geotechnical monitoring of construction



NPP Temelín – Geophysical Measurements (2010)

ENERGOPRŮZKUM Praha, spol. s r.o.

Surface geophysical measurements within the framework of the New Nuclear Facility project in Temelín NPP (areas S1 and S2). The purpose of the measurements within area S1 (inside the power plant area) was to determine the locations of backfilled construction pits and determination of backfill character. Measurements performed within area S2 outside the NPP area focused on identifying the thickness of overlying formations and depth and degree of rock bed weathering.

Company Activity:

- Shallow Refraction Seismics (SRS)
- Electric Resistance Tomography (ERT)
- magnetometric survey





Prague – Charles Bridge – “As-Is” Surveying of Statues and Sculptures (2009–2010)

GKI - Ing. L. Poláček, Prague

“As-is” surveying of thirty statues and sculptures with the aim of obtaining their 3D documentation. Scanning with Leica HDS 3000 laser scanner was combined with digital photogrammetry technology. Using digital photography, the back (water side) parts of the statues were generated, which were not accessible using the laser scanner.

Company Activity:

- “As-is” surveying of 30 statues and sculptures
- 3D digital model in form of point cloud covered with realistic texture for each statue or sculpture



Prague – Troja Bridge – Piles Integrity Verification (2010)

Metrostav a.s., Division 5, Prague

Construction of a new Troja Bridge in Prague between Holešovice and Troja city districts forms an integral part of the City Ring Road between Myslbekova and Pelc-Tyrolka. This is an arch bridge with the roadway below. Total bridge length is 250 m, total height of the structure is 34 m above the maximum navigation water level of the river, and the arc span of the bridge is 204 m. The most is deep-founded, both abutments and pillars are founded on drilled piles protruding into the parent rock.

Company Activity:

Integrity check of drilled piles under the pillar and abutment foundations. PIT (Pile Integrity Test) and CHA (Cross Hole Analysis) methods were used. In total, 115 piles were tested using the PIT method and 8 piles were tested using the CHA ultrasonic method. All piles had the diameter of 1.5 m and length between 14.5 and 15.5 m.



Prague 1 – Department Store – Engineering-Geological Survey (2010)

NP Investments a.s., Prague

Reconstruction of ČSOB bank palace in Prague 1, Na Příkopě 14, to a poly-functional department store – northern part of the object will be preserved, a new building with five underground and eight overground floors will be constructed in the southern part. Complexity of the project situated in urban area is further increased due to presence of underground objects – underground tunnels and collector pass under or along the palace.

Company Activity:

Engineering-geological survey for design of new building foundations, construction pit securing, and assessment of the existing foundations.



Key Foreign Projects 2010

Slovakia D1 Motorway, Sverepec – Vrtižer – Construction Supervision (2008–2010)

Národná diaľničná spoločnosť, a.s. Bratislava, Slovak Republic

Newly constructed 1st and 2nd section of D1 motorway between Sverepec and Vrtižer belonging into D 26.5/100 category between chainages 0.000 – 9.595 km is situated outside the built-up areas between old Váh river bet and Hričovský canal. The motorway passes mostly over bridges in given section. At the end – behind the bridge across Váh river – it connects to the adjacent structure D1 Vrtižer – Hričovské Podhradie. Hričovský canal bridge dominates mainly due to its length of 1,786 m which makes it one of the longest bridges in Slovakia. The construction has been awarded the main prize in the Construction of the Year 2010 competition.

Company Activity:

Construction-technical supervision pursuant to the provisions of FIDIC for the 2nd section of the D1 motorway



Poland – A1 Motorway – Geotechnical Survey (2008–2010)

Consortium consisting of Alpine Bau GmbH / Alpine Bau Deutschland AG / Alpine stavební společnost CZ s.r.o. / spółka cywilna, Warsaw, Poland

The new stretch of motorway in Poland in the section Swierklany – Gorzyczky with the length of 18.33 kilometres includes 29 bridges, of which 3 were elevated, 2 fly-over junctions – Mszana and Gorzyce. The construction is taking place at 4.8 kilometres in length on undermined ground.

Company Activity:

- execution of an additional geotechnical survey (2,689 m of boreholes)
- proposed modifications of the embankment subsoil, including settlement calculations and timing of settlement of embankments in 9 profiles (procedures according to EN 1997-1 and Polish standards)
- optimizing the selection of materials for embankments, using loose waste material





Slovakia – Žilina – Krásno nad Kysucou Railway Modernization (2008–2011)

Slovak Railway, Bratislava, Slovak Republic

Section between Žilina and Krásno nad Kysucou with the length of 19 km forms part of Žilina – Čadca – Poland/Czech Republic. This is a highly important railway line which is used mainly for cargo transport – the railway connects Slovak Republic with the industrial area around Ostrava. 85 % of the costs relating to modernization of this railway is paid by EU's Cohesion Fund.

Company Activity:

Construction supervision pursuant to the provisions of FIDIC for the modernized railway section with relevant technological equipment.



Macedonia – Instability of Hydraulic Power Plant Feed Pipeline (2010–2011)

HYDROPOL Project & Management, a.s., Prague

Feed pipeline of the hydraulic power plant near Pesocani municipality in Macedonia was constructed between 1951 and 1952. The feed pipeline leads over the terrain surface and its individual sections are stabilized by anchoring blocks founded in the slope. Continuously developing deformations of the feed pipeline resulted in massive water leakage in 2010. A new erosion gully was formed, which further endangers the feed pipe stability.

Company Activity:

- field engineering-geological reconnaissance
- surveying works design
- geological and geotechnical consultation work



Slovakia – Modernization of Trnava – Nové Mesto n. Váhom Railway (2006–2010)

Slovak Railway, Bratislava, Slovak Republic

Modernization of railway from Trnava to Nové Mesto nad Váhom within 47.550 – 100.500 railway kilometers for ground speed up to 160 km/h, the second stage from Piešťany to Nové Mesto nad Váhom.

Company Activity:

- investor's technical supervision
- technical and geotechnical supervision during renovation of subbase and superstructure, during remediation of present bridges and construction of new bridge structures and during execution of filling structures
- engineering services
- consultation services for the client

Poland – Laliki Tunnel – Geotechnical Monitoring (2008–2010)

Dopravstav a.s. Bielsko-Biala, Poland

The Construction of a new motorway tunnel and escape galleries on the S69 route – Bielsko-Biala – to the PL/SK border, connected with the D3 motorway – border of PL/SK – Čadca – Žilina. Main technical data: length of the tunnel 900 m, cross-section of 120 m², escape gallery with a cross-section of 42 m².

Company Activity:

ARCADIS Geotechnika carries out comprehensive monitoring during the construction of the tunnel. The works include engineering geological documentation, comprehensive measuring in the tunnel, on the surface and portals, including the adjacent buildings effected by the construction.



Slovakia – R1 Expressway – Independent Supervision (2009–2013)

Vinci Concessions (represented by GRANVIA, a.s.), Bratislava, Slovak Republic
Construction of a new multilane road R1 between Nitra, West – Tekovské Nemce and Banská Bystrica – Northern By-Pass. Design, construction, operation, and maintenance of the road are based on a PPP (Public Private Partnership) scheme, i.e., financed from both public and private sources. This is the first PPP project in the history of the Slovak Republic.

Company Activity:

Independent Engineer

(design inspection, certification of the construction works, monitoring of compliance with OHS and environmental protection principles, works quality inspection)



Slovakia – Turecký vrch Tunnel – Geotechnical Monitoring (2009–2010)

Consortium Dopravní stavby OHL ŽS, a.s. Brno / SKANSKA BS a.s., Prievidza
A double-track railway tunnel and an escape gallery have been driven using NATM technology under Turecký vrch hill within the framework of Nové Mesto nad Váhom – Púchov double-track railway modernization. Tunnel length: is 1.775 m, escape gallery length is 245 m, excavation cross-section of the tunnel was 106–130 m².

Company Activity:

Complex geotechnical monitoring at the tunnel construction site performed for the contractor (in cooperation with GEOFOS, s.r.o.) within the following extent:

- engineering-geological documentation including in-situ tests
- position of the chief geologist and geotechnical engineer of the contractor
- convergence, inclinometric, and extensometric measurements
- monitoring office management, including data sharing through BARAB® on-line database



Our Success in Contest Czech Transport Construction



This year was ARCADIS Geotechnika a.s.'s second time in its history that it participated in the national contest Czech Transport Construction and Technology 2010, organized by the Ministry of Transport of the Czech Republic. At the time of its first participation in this prestigious contest in 2007, our company received the jury's honorable award for the construction **"Road I/35 – Reconstruction of Landslide at Hřebeč Tunnel"**.

In 2011 ARCADIS Geotechnika a.s. entered the 8th year of the competition with its project **"Lightweight Earth Structure on Expressway R6 between Jenišov and Nové Sedlo"**, which it successfully carried out in 2010 in cooperation with EUROVIA CS, a.s. (contractor) and PRAGOPROJEKT, a.s. (designer).

Construction of R6 expressway between Nové Sedlo and Jenišov is exceptional mainly by its non-traditional passage over section with low load bearing capacity designed by ARCADIS Geotechnika a.s. According to available information, it is the largest lightweight embankment constructed not only in the Czech Republic but also in Europe. This modern design based on lightweight ceramic aggregate Liapor resulted not only in significant reduction of general settlement of the embankment, but also reduction of the construction time. Last but not least, the total cost of the construction was reduced. This project is a great example of the successful combination of technical and utility value of a construction work and of favorable financial aspects.

In total 33 projects, technologies, and innovations entered the competition; they were assessed by a professional jury predominantly from the project effectiveness point of view (financial cost related to technical difficulty and time of implementation), incorporation of structure into landscape, the extent of their environmental-friendly-character, and significance of each project for safety in transport. Our successful project made a good impression on the jury and in the tough competition, it was awarded, together with 18 other projects, technologies, and innovations, **the nomination for Czech Transport Construction, Project, and Innovation for 2010**. Such nomination award is not only a significant acknowledgement of the good work of the big implementation team, but it also increases the prestige of the entire geotechnics industry.



Cooperation on Award-Winning Structures

In addition to its important success in the competition that resulted in its nomination for the Czech Transport Construction, Project, and Innovation for 2010 award, ARCADIS Geotechnika a.s. can also be reasonably proud of the fact that its employees have participated in a number of other award-winning projects:

Optimization of the Railway between Planá u Mariánských Lázní and Cheb

- Awarded the title of Czech Transport Construction of the Year 2010

Lann's Dockyard Project

- Title of Czech Transport Construction of the Year 2010

Road I/34 at Česká Bělá – By-Pass Road

- Award from the Minister of Transport in the Czech Transport Construction of the Year 2010 competition

Prague Ring Road – Structure 514

- Award of Chairman of the Czech Chamber of Certified Engineers and Technicians (CKAIT) and Award of Mayor of Capital City of Prague in the 2010 Czech Transport Construction competition

Road I/56 Ostrava, Místecká Street Extension, 1st Construction

- Award of President of SPS CR and Award of Association of Regions of the Czech Republic in the Czech Transport Construction 2010 competition

I/34 Interconnection of Transport Rings of České Budějovice

- Nomination for the title Czech Transport Construction of the Year 2010

Lightweight Earth Structure on Expressway R6 between Jenišov and Nové Sedlo

- Nomination for the title Czech Transport Construction of the Year 2010

D1 Motorway – Svěrepec to Vrtižer Section

- The main prize in the Construction of the Year 2010 competition
- Award from the School of Civil Engineering of the Slovak University of Technology in Bratislava in the Construction of the Year 2010 competition
- Award from the Slovak Minister of Economy and Construction in the Construction of the Year 2010 competition

R35 Expressway, Hradec Králové (Sedlice) to Opatovice

- Nomination for the title Construction of the Year 2010
- Award from the State Fund for Transport Infrastructure for Construction of the Year 2010

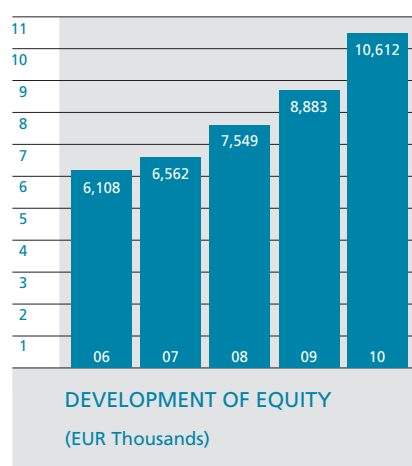
D1 Motorway, Construction 0134.1, Phase II, Mořice to Kroměříž Section

- Nomination for the title Construction of the Year 2010
- Nomination for the Czech Transport Construction of the Year 2009 award

In the above-listed projects, employees of ARCADIS Geotechnika primarily carried out geotechnical surveys, technical supervision for the investor, geotechnical and construction supervision, comprehensive geotechnical monitoring, consultancy and assessments for investors, and geological documentation of tunnel faces for these structures.



Balance Sheet

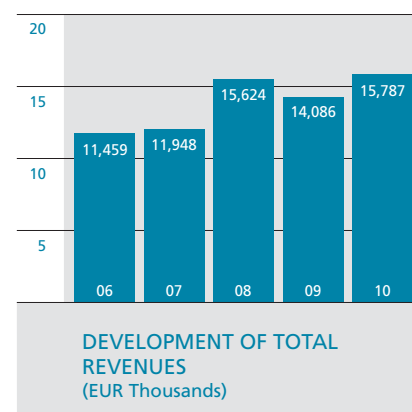


| | <i>EUR Thousands</i> | |
|-------------------------------------|----------------------|---------------|
| | 2010 | 2009 |
| ASSETS | | |
| Fixed Assets | 2,340 | 2,023 |
| Intangible fixed assets | 91 | 50 |
| Tangible fixed assets | 1,658 | 1,677 |
| Long-term investments | 591 | 295 |
| Current assets | 12,400 | 9,640 |
| Investories | 255 | 181 |
| Long-term receivables | 384 | 387 |
| Short-term receivables | 7,973 | 6,149 |
| Financial assets | 3,788 | 2,923 |
| Deferrals | 81 | 82 |
| TOTAL ASSETS | 14,821 | 11,744 |
| LIABILITIES | | |
| Equity | 10,612 | 8,883 |
| Registered capital | 1,920 | 1,818 |
| Statutory reserve fund | 453 | 429 |
| Other funds | 87 | 62 |
| Retained earnings | 6,907 | 5,356 |
| Profit for the current period | 1,245 | 1,217 |
| Liabilities | 4,163 | 2,840 |
| Provisions | 242 | 147 |
| Long-term liabilities | 11 | 21 |
| Short-term liabilities | 3,910 | 2,672 |
| Accruals | 47 | 20 |
| TOTAL LIABILITIES AND EQUITY | 14,821 | 11,744 |

Official exchange rate of December 31, 2010
was 1 EUR = CZK 25,060

Profit and Loss Account

| | <i>EUR Thousands</i> | |
|--|----------------------|---------------|
| | 2010 | 2009 |
| REVENUES | | |
| Revenues from production | 14,656 | 12,933 |
| Proceeds from disposals of fixed assets and raw material | 35 | 9 |
| Other operating revenues | 984 | 798 |
| Interest revenues | 48 | 25 |
| Other financial revenues | 64 | 181 |
| Revenue from long-term financial assets | 0 | 140 |
| TOTAL REVENUES | 15,787 | 14,086 |
| COSTS | | |
| Costs of sales | 7,386 | 6,846 |
| Personnel expenses | 6,087 | 4,992 |
| Taxes and charges | 30 | 27 |
| Depreciations of intangible and tangible fixed assets | 333 | 307 |
| Net book value of fixed assets and raw material sold. | 2 | 0 |
| Change in provisions and adjust. relating to open activity | 88 | 50 |
| Other operating expenses | 149 | 122 |
| Other financial expenses | 144 | 234 |
| Income tax on ordinary profit | 324 | 289 |
| TOTAL COSTS | 14,542 | 12,869 |
| Profit for the Accounting Period *) | 1,245 | 1,217 |



*) Profit after tax

Integrated Management System

ARCADIS Geotechnika has implemented an integrated management system that merges the system of safety management and of occupational health and safety protection system with an environmental management system and a quality management system. All our systems have of course been certified.

The integrated system of ARCADIS Geotechnika focuses on our customers, business partners, and employees. It is the main instrument used to manage the risks related to our company's business.

The published **"Company Management Policy"** declares our focus on client satisfaction, development of partnership and universal development of company's employees, high quality of services, reduction of risks related to the company's business, and emphasis on environmental protection as well as sustainable development.

Between January 31, and February 2, 2011, the regular supervision audit of the occupational health and safety protection system and the quality system as well as a re-certification audit of the EMS system took place. Our company succeeded, with no weaknesses, let alone discrepancies identified in our integrated system. The company's certification for all three systems was further expanded in 2010 to include certification for construction of roads and motorways.



Human Resources

The total average number of employees reached 194 in 2010. During the course of the year we hired 20 new employees.

The company had always taken great care to educate and develop its employees, and 2010 was not different. Costs for educational activities in that year amounted to almost EUR 120 thousand. Employees participated in a whole range of conferences, seminars and courses in the Czech Republic and abroad, such as: The ITA/AITES WTC World Tunnel Congress in Vancouver, Canada, the 11th IAEG World Congress in Auckland, New Zealand, the conference Tunnels and Underground Construction Turkey in Istanbul, the 11th International Conference Underground Structures Prague 2010, Danube European Conference DECGE 2010 in Bratislava, seminar Earthworks in London, Field Geotechnical Methods in Ústí n/L, Railway Bridges and Tunnels 2010 in Prague, Road Conference 2010 in Hradec Králové, Foundation Engineering 2010 in Brno, and others.

The company organized several internal seminars focused on improvement of professional knowledge and managerial skills; some were lectured by our key experts, for example our regular seminars in engineering and geology.

In 2010, the intensive system of language training continued for employees. Over 50% of employees participate in the language programs, in which they improve their knowledge of English, German, French, Russian and Spanish.

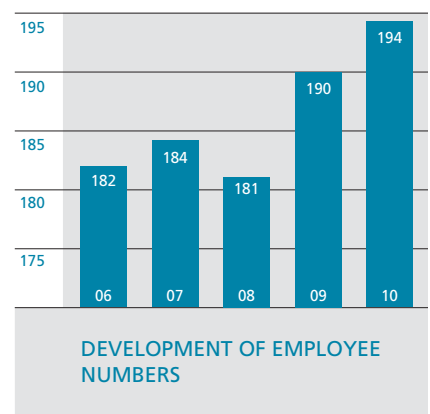
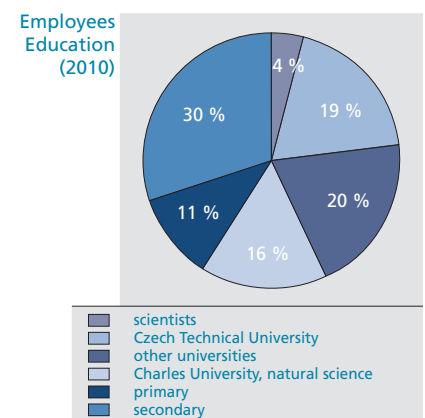


Authorization and Licences

At the end of 2010, 38 authorized engineers or technicians active in construction worked for the company. The most authorizations (24) were in the field of geotechnical engineering. Other fields are represented to a lesser extent, in particular statics and dynamics of constructions, transport construction and ground construction. Some authorized individuals have authorization in several fields.

Company employees are also holders of other certifications, licences and certificates, for example certification of professional competence in design, implementation and evaluation of geological works (23 people hold a total of 36 certifications for professional competence in the fields of engineering geology, hydrogeology, environmental and remediation geology, geophysics, deposit geology and testing of geological construction), official licences for verification of results for surveying activities, licences from the Mining Authority (total of 77 certifications for professional competence to perform a function during mining or an activity carried out using mining methods).

Four employees work as expert witnesses.





Participation in Educational Programs of ARCADIS Group

The QUEST educational program (Knowledge Transfer Program) was set up by the ARCADIS group for employees of companies in the ARCADIS group to exchange knowledge and transfer personal experience. The program supports the synergistic strategy of the group's companies and is aimed primarily at employees who have not yet had much international experience. It allows exchange study trips in other branches within the group. ARCADIS Geotechnika has been active in this program since 2008.

In 2010, we hosted a colleague from the branch of ARCADIS in Poland at our Czech and Slovak workplaces specializing in underground construction, and within the framework of the QUEST program, Ing. O. Kostohryz went for a study visit to ARCADIS in Chile, department of tunnels and underground construction, in January 2011.

ARCADIS GKN – Global Knowledge Network

The exchange of knowledge, skills and development are at ARCADIS group level coordinated via Global Knowledge Networks, which bring their clients global evaluations of experience from professionals in the whole of the group.

The following leading specialists from ARCADIS Geotechnika a.s. worked in international multi-company GKN work groups in 2010:

Ing. Václav Hořejší, MBA – GKN Large Projects

Mgr. Jan Kárník – GKN Water Management

RNDr. František Kresta, Ph.D. – GKN Rail

Ing. Václav Veselý – GKN Tunnels



Technical Development

Technical development financed from the company's own resources is a permanent constant of the business policy of ARCADIS Geotechnika a.s. Continuous investment in new up-to-date equipment and technology, together with development of methodology introducing such equipment in common working activities constitute a prerequisite for our maintaining the leading position of ARCADIS Geotechnika a.s. in the geotechnics market.

ARCADIS Geotechnika a.s. also invested financial, human and material resources into its own technical development in 2010. The following projects and tasks were solved:

Field Testing

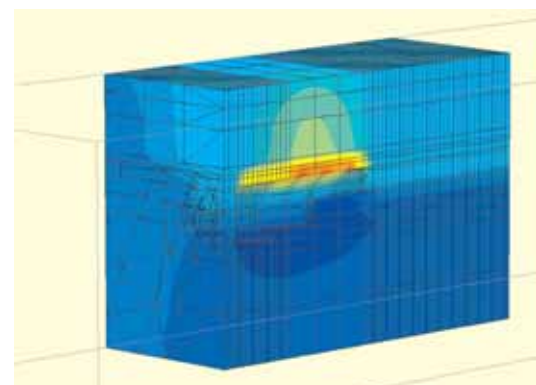
- Introduction of remote reading from horizontal and vertical inclinometers using the Bluetooth system.
- Introduction of continuous reading of data with remote transmission while monitoring engineering structures.

Geomechanics Laboratory

Introduction of laboratory testing of intergranular water permeability of rock materials with very low permeability coefficient. These works were carried out within the framework of the research project organized by the Ministry of Industry and Trade.

Mathematical Modeling of Geotechnical Problems

- Completing, reviewing of outputs, and final report from research project of internal technical development "Stress-strain response of solid rock mass in dependence on distance of weak zone from tunnel face". Conceptual 3D model, created with the PLAXIS Tunnel 3D software, for various distances of the weak zone from the face of the driven tunnel. Results will be used for further related complex analyses and will also be taken into consideration in interpreting of measured convergences.
- Creation of table templates for quick evaluation of pile foundation according to the first limit strata. Templates created using EXCEL are designed for the special geotechnics team and for other employees for internal or job-related assessment of piles. The main advantage is the promptness that compensates for the simplification and inaccuracies given by the aspects of the very ground and geology in which it is placed.
- Written summary of aspects required to assess lateral earth pressures affecting the supporting structures. Concept that may be used in future as the basis for internal software (created for example using the VISUAL BASIC programming language).





Geophysics Department

Electric Resistance Tomography (ERT)

In 2010 the existing equipment was expanded to consist of 14 sections of a multi-conductor cable, each section consisting of 8 electrodes, with electrodes placed in intervals of 5 m (with the maximum length of profile without rolling being 555 m), which enables increase in the depth reach of the method up to 85 m and use of 3D surveying (area metering).

Introduction of New Method CMD-Explorer (Electromagnetic Conductivity Meter)

This is a new contactless method for direct measuring of specific conductivity of soils and rocks that is used for quick exploration of areas of interest, conversion of results to specific resistance, and calculations in Res2Dinv software. This method also enables supplementing of results of the ERT method in the near-surface layer where ERT itself provides no data, the result being the overall resistance image of the profile measured from the surface and area metering using the GPS system.

Innovation of Geo-radar Equipment SIR-20

A new control notebook was purchased as well as the most recent version of RADAN software, which enables more efficient collecting of data and expanding of options for data processing.

Underground Structures Department

In 2010 we completed the works on the in-house standard "Geotechnical Tunnel Monitoring". This internal standard is the basic document used when preparing monitoring projects, including geotechnical supervision during driving works. The standard also specifies methods of evaluation and presenting of geo-monitoring results as well as forms of related decision-making processes.

BARAB® Database System

BARAB® is a modern database system developed by ARCADIS Geotechnika a.s. to collect, archive, analyse, interpret, and present data collected during geotechnical monitoring, especially in tunnel constructions. The system is continuously innovated and expanded. The last significant expanding was when the GIS platform was added, which enables visualisation of data and graphic presentation of data from the BARAB® database, together with the project supporting documentation, and also extends the number of options in search for required information in the database using a graphic interface.

Within the framework of innovations of the BARAB® database system, in 2010 we also verified the system of continuous deformation metering using optical total stations with remote data transmission.

Patents, Inventions, and Utility Designs

On January 20, 2011, the Industrial Property Authority granted to ARCADIS Geotechnika a.s. the following:

CZ Patent No. 302 315 for invention "Method and Equipment for Protection of Railway Bed while Working on Parallel Line".

The authors of this invention are our employees, Ing. Jiří Růžička, CSc., and Václav Malý, who devised it and implemented it in cooperation with Ing. Miroslav Rykl.

This invention is designed for railway engineering, including, without limitation, reconstructions and repairs on track superstructures the railway beds of which are filled with gravel.

Use of this equipment and method to protect the railway bed while working on the parallel line according to this invention enables fast, simple, and easy vacating of space for works required for an unlimited period of time as well as simple installation of railway bed protection equipment.

This method of railway bed protection while working on a parallel line can be successfully used while working on the track superstructures covered with gravel as well as in adjusting, cleaning, and insulating of the same, etc. It can also be used in road constructions and wherever it is required to build holding elements preventing fallout of non-cohesive materials during reconstructions and create space for future connection of the structures.

In 2010 the Industrial Property Authority granted to the employees of our subsidiary SG - Geoinženýring s.r.o. in Ostrava the following four Certificates of Registration of Utility Design:

UV 20 751 Equipment for Two-Level Temperature Sensing

Authors of utility design: Ing. J. Hájovský, CSc., L. Keclík

Thermometer sensing values at two depth levels. It is used in thermal monitoring of mine dumps and can also be used in all measuring probes with diameter 20 mm.

UV 20 895 Pre-Stressed Compensation Anchor Pin

Authors of utility design: Ing. J. Hájovský, CSc., L. Keclík

A special anchor pin enabling controlled pre-stressing or regulated resistance in the event of mass rock deformation. Convenient for use predominantly in environments with expected convergence of ceilings and sides of mine excavations.

UV 20 896 Synthetic Tension Anchor

Author of utility design: Ing. J. Hájovský, CSc.

A fastener made of synthetic material suitable for aggressive environment or spaces in which driving is to take place, or, as the case may be, underground structures are to be constructed in the future.

UV 21 267 Portable Safety Mat

Authors of utility design: Ing. J. Hájovský, CSc., L. Keclík

Protective grid securing the working space from falling loosened pieces of rock. Enables safe advance at the face of driven mine works.



Standardization



Employees of ARCADIS Geotechnika a.s. have been in the long term actively involved in increasing the professional level of the engineering geology and geotechnics fields in the Czech Republic. In this context their participation in standardization and methodology unification for these fields is of major significance.

ARCADIS Geotechnika a.s. represented by Ing. Vítězslav Herle, chief geotechnical engineer of the company, has been the long-term chair of the Technical Standardization Committee TNK 41 "Geotechnical Engineering" at the Office for Standardization, Measurement and State Testing (ÚNMZ), formerly the Czech Standardization Institute (ČNI). Since 2008, ARCADIS Geotechnika a.s. has had an agreement concluded with ÚNMZ on performing functions of the Centre for Technical Standardizations (CTN) and in 2009 the company was granted an official license to use the CTN and Centre for Technical Standardizations trademark. CTN cooperates with European technical committees CEN TC 250 Eurocodes (working group SC 7 Designing Geotechnical Structures), TC 288 Performance of Special Geotechnical Works, TC 341 Geotechnical Research and Testing, and TC 396 Earth Works.

Through these activities it significantly influences the professional level of geotechnical standardization in the Czech Republic and harmonization of such standards with the relevant European standards.

Within the framework of the activities of committee TNK 41 Geotechnics, the tasks on which employees of ARCADIS Geotechnika a.s. worked in 2010 included, without limitation, the following:

CEN/TC 250/SC 7 Eurocodes. Eurocode 7 Designing Geotechnical Structures

- CSN EN 1997 – 2 (Eurocode 7–2), Amendment 1. Designing Geotechnical Structures – Part 2: Research and Testing of Foundation Soil

Within the framework of the activities of CTN, ARCADIS Geotechnika arranged for the translation of Amendment 1 to CSN EN 1997-2 into the Czech language. The standard was translated by Ing. V. Herle. Amendment 1 to the standard was published in October 2010.

CEN/TC 288 Execution of Special Geotechnical Works

- CSN EN 14490 Earth Nailing

The standard was translated into the Czech language by Ing. V. Herle in cooperation with Ing. I. Novotná. The standard was published in October 2010.

- CSN EN 1536 Execution of Special Geotechnical Works – Drilled piles (review)

The reviewed standard was translated by doc. J. Masopust in cooperation with Ing. V. Herle.

- CSN EN 1538 Execution of Special Geotechnical Works – Underground Walls (review)

The reviewed standard was translated by Ing. J. Řičica in cooperation with Ing. V. Herle.

CEN/TC 396 Earthworks

The earth works technical committee commenced its activities in 2009. The work of all five working committees is coordinated by the working committee WG1, of which Ing. V. Herle is a member. Another Czech representative in TC 396 is RNDr. F. Kresta, Ph.D., who was also nominated for the working group WG 4 Control Testing and Monitoring.

After the first session of WG 1 in Paris in January 2010, the second session convened in Prague in June 2010. ARCADIS Geotechnika a.s. was in charge of the organization of the session, and the session was highly rated by all members of the working group WG 1.

The first general session of TC 396 took place in Brussels in September 2010. In this session, the job descriptions of individual working groups were specified in greater detail and an invitation was issued to experts from individual states to register for these working groups. Ing. V. Herle attended two sessions of WG 1 (January 2010 – Paris, June 2010 – Prague) and the general session TC 396 in Brussels.

In 2010, Ing. V. Herle participated in drawing up the following Czech standards related to geotechnics:

- [CSN 73 6133 Design and Execution of Earth Formation for Roads](#)

An extensive standard into which classification was incorporated from the cancelled CSN 73 1001; this standard includes also a new classification of soils and rocks by workability (replacement for the cancelled standard CSN 73 3050). Drawn up by Ing. V. Kuchta, in cooperation with Ing. J. Zajíček and Ing. V. Herle. The standard was published in February 2010 after two years' work on its compilation.

- [CSN 73 0037 Ground Pressure on Engineering Structures, Amendment Z1](#)

The ground pressure standard was amended in order to remedy its conflict with the provisions of CSN EN 1997-1. Amended by Ing. V. Herle. The amendment was published in May 2010.

- [CSN 73 6244 Transition zone of bridges on highways](#)

In Schedule D procedure is stipulated for settlement of embankment, including coefficients of structural firmness (according to the cancelled CSN 73 1001). The standard was drawn up by Ing. V. Herle. The standard was published in October 2010.

- [CSN 75 2410 Small Water Reservoirs](#)

The reviewed standard (originally from 1997) was drawn up by Hydroprojekt Praha. Ing. V. Herle was one of the members of the committee.





Technical Conditions of Ministry of Transport of the Czech Republic

Based on the requirement of the Ministry of Transport of the Czech Republic, employees of ARCADIS Geotechnika in 2010 drew up the following Technical Conditions (TP):

- **TP 93 Fly Ashes and Ashes in Earth Formations of Roads**
This is the second amendment to the standard since its publishing in 1997 that our company was in charge of drawing up. Ing. V. Herle is the author of the amendment.
- **TP 138 Use of Cinder Aggregate for Roads**
RNDr. F. Kresta, Ph.D. is the author of this standard.
- **TP 176 Spoil Backfill in Road Formations**
RNDr. F. Kresta, Ph.D. is the author of this standard.
- **TP 233 Geo-Radar Method of Road Construction**
RNDr. J. Nedvěd is the author.
- **TP 237 Geotechnical Monitoring of Road Tunnels**
Doc. Ing. A. Rozsypal, CSc. is the author of the amendment.

Technical Conditions of Ministry of Transport of the Slovak Republic

In 2010 the Ministry of Transport of the Slovak Republic approved the following standards:

- **Technical and Quality Conditions TKP, Part 28, Geotechnical Monitoring for Tunnels and Exploratory Galleries**

These Technical Conditions were also drawn up by the specialists of ARCADIS Geotechnika a.s.



International Committee IAEG C25

Ing. Jan Novotný, CSc., worked in the scientific committee IAEG C25 – Use of Engineering Geological Models, in 2010. This committee IAEG (International Association of Engineering Geology) deals with creation of a guide for preparation and use of engineering and geological models. The current task of the committee is to produce a well-illustrated manual of “Conceptual Models”.

J. Novotný attended the 11th World Congress IAEG, taking place from September 5 through 10, 2010, in New Zealand, where he attended the session of committee C25 and represented the Czech Republic at the Council Meeting of IAEG.

Applied Research

Applied research works are the permanent center of attention of the company's management and constitute one of the basic piers of the company's long-term policy. Again, in 2010, employees of ARCADIS Geotechnika a.s. solved within the framework of the company development program a number of research projects and development projects financed from public funds, mostly from ministry of industry and trade's programs, as well as many projects fully financed by the company itself.

These included namely the following:

Tasks Assigned by Ministry of Industry and Trade

- **Project VaV MPO – No. 1H-PK/31**

Assessment methods and tools to evaluate impact of engineering barriers on remote interactions in deep repository (2005–2010)

Research was completed in 2009. In 2010 the final opposition proceedings took place. The aim was to draw up a methodology determining efficiency of grouting mixtures used in fissure system of granitoid rocks. The solution was based on laboratory and field-based testing and measurements focused mainly on hydrodynamic and migration parameters of fissures. Subsequently, mathematical models of the experiments were produced. Results of the research will be used to determine spreading of contaminants in the zone of remote interactions in deep radioactive waste repository. Research works were conducted in cooperation with other companies.

The main task output is to produce methodology for efficiency of grouting mixtures used in the fissure system of granitoid rocks. A patent was also registered during the task, including a special television camera which allows the concentration of the tracer material, uraninite, to be set in the flow field of groundwater.

- **Project VaV MPO – No. 2A-2TP1/055**

Research of use of energetic potential of quarry water (2007–2010)

Solution of this extensive task created the requisites for common routine use of quarry water for thermal pumps with focus on quarry water from ore, coal, and uranium repositories. The research focused on special technological problems consisting of high mineralization of such water. A successful pilot experiment was a part of the research.





- **Project VaV MPO – No. FR-TI1/367**

Research into the impact of inter-grain permeability of granites for the safety of deep depositing in geological formations and development of a methodology and measuring apparatus (2009–2013)

This project has the character of basic research bringing new knowledge of regularity of slow water flow in granites of simple dislocations in relation to the primary porosity of the rocks. The research includes development of apparatus and methods for both in situ and laboratory measurements.

Research works focus on the issue of permeable zones in apparently compact and non-fissured mass of granitic rocks, especially researches options for migration of tracer material along crystal grains in fresh and altered granites in laboratory conditions and in situ at the testing location.

The fundamental objective of the task solution is to identify inter-grain permeability in granite rocks and its qualities and the ways it is influenced by geochemical or hydrodynamic processes. Included in the research into conditions for existence of inter-grain permeability is theoretical and experimental research of geotechnical and physical changes related to time.

- **Project VaV MPO – No. FT-TA5/128**

Complex solution of stabilization of earth or rock environments for construction of underground structures (2008–2010)

The subject of this research project was the development of new progressive technologies for stabilization of rock environment, improvement of physical and mechanical qualities of rock materials, and development of type-related procedures for stabilization of rock environment with regard to main types of the rock environment. The research task was concluded upon the successful completion of opposition proceedings in 2010.

Task of the Czech Mining Office

- **Project ČBÚ–61–08**

Monitoring underground objects in the usage stage (2008–2010)

This project was solved in cooperation with Energie Kladno a.s. and Metroprojekt a.s., and was successfully defended in 2010. It provided data for restoration and supplementation of regulations governing monitoring of underground structures during operation. Energie Kladno a.s. was the lead member of this project.

In its work, ARCADIS Geotechnika focused on preparing the principles for permanent monitoring of a load-bearing structure of underground construction to prevent accidents with major material damage or a decrease in functionality of underground work. Outputs of the project also included proposed wording of certain sections of Regulation No. 55 of the Czech Mining Office.



Grant Agency Czech Republic Project

- Grant Project No. 103/09/2016

Building structures influenced by underground activities – prediction of development of stress, deformation, and damage (2009–2011)

Proposal for this project was submitted in 2008. The Grant Agency accepted it and its resolution commenced in January 2009. The grant recipient and project leader was the Professional Society for Science and Research. ARCADIS Geotechnika is a co-recipient of the financing from the Grant Agency of the Czech Republic.

The subject of this project solution is to develop a theory for prediction of development of the deformation field in relation to changes in the stress field around the excavation and tunnel face while taking into consideration time in various types of rock grounds and improvement of methodology for measuring results processing. Inter alia the project deals with theoretical assumptions for introduction of engineering risks analysis with the perspective of its application in engineering risk management during construction of engineering structures.

The objectives of the project are as follows:

- a) to obtain new information through basic research on types and distribution of uncertainties in rock mass and regularities in probability behavior of rocks usable for methodology of geotechnical risk management in civil engineering
- b) to draw up suitable methods based on probability approach in order to stipulate probability of occurrence of undesirable phenomena or probability of obtaining certain values of geotechnical parameters for quantitative determination of geotechnical risk gravity
- c) to draw up a theoretical basis for application of observation methods and monitoring for their more efficient use during shallow tunnels construction. These objectives include drawing up methods for selecting the option of warning conditions and their criteria and procedures aimed at evaluation of satisfaction of the given criteria of warning conditions
- d) to draw up theoretical solution and calculation procedures for methodology of static analysis the output of which will be deformation criteria for non-disturbance of static function of main types of building structures located in overburden of shallow city tunnels.



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Published by:

ARCADIS Geotechnika a.s.
Prague 07/2011

Author:

ARCADIS Geotechnika a.s.

Editing:

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Photographs:

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Layout:

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Graphic design, printing:

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