



DOPAS



# DOPAS Training Workshop 2015

Introduction to the course and CTU

Radek Vašíček

Centre of Experimental Geotechnics,  
Faculty of Civil Engineering, CTU in Prague

14 September 2015

D1 5.1

*The research leading to these results has received funding from the European Union's European Atomic Energy Community's (Euratom) Seventh Framework Programme FP7/2007-2013, under Grant Agreement No. 323273 for the DOPAS project.*



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Správa úložišť radioaktivních odpadů  
Radioactive Waste Repository Authority

B+TECH



Svensk Kärnbränslehantering AB

Radioactive Waste  
Management



Galson Sciences Ltd

DBE-TEC  
DBE TECHNOLOGY GmbH



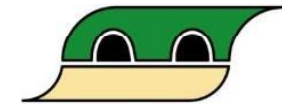
*DOPAS Training Workshop 2015, 14 – 18 September 2015*  
*The Josef Underground Research Centre*  
*Faculty of Civil Engineering, Czech Technical University in Prague*

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# Introduction to the Training Workshop



Radek Vašíček  
Centre of Experimental Geotechnics,  
Faculty of Civil Engineering, CTU in Prague



14 September 2015, D1 5.1.1

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# Content

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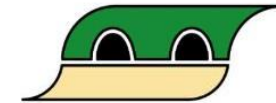
- CTU team
- Activities
- Programme
- Transport
- Wifi & data
- Tutors



# CTU team & contacts

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- Radek Vašíček (coord. at CTU...)
- [radek.vasicek@fsv.cvut.cz](mailto:radek.vasicek@fsv.cvut.cz)
- +420605141405
  
- Jiří Svoboda (EPSP, monitoring...)
- [jiri.svoboda@seznam.cz](mailto:jiri.svoboda@seznam.cz)
  
- Lucie Hausmannová (Wed)
- [lucie.hausmannova@fsv.cvut.cz](mailto:lucie.hausmannova@fsv.cvut.cz)
  
- Michal Roll (The Josef geology...)
- [trilobitm@seznam.cz](mailto:trilobitm@seznam.cz)



Centre of Experimental Geotechnics,  
Faculty of Civil Engineering,  
Czech Technical University in Prague



# Learning tools & activities

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- Lectures
- Practical exercises
- Discussion
- Listening and understanding
- Working in pairs or groups
- Reporting to others
- Feedback... (form)



# Learning tools & activities

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- *Icebreaker*
- *Picnic*
- *Movie night*
- *Culture in underground...*



<http://www.afterimagegallery.com/kanzlericebreaker.htm>



# Programme structure

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## Four Learning Units

- 1: From requirements to design basis of plugs and seals
- 2: Preparation of an in-situ or full-scale plug or sealing experiment
- 3: Design of a seal for an experiment/ demonstrator within the broader context of RD&D programmes; Safety assessment and Performance assessment of closure as design input
- 4: Construction feasibility of a plugging experiment

## Two "Technical & introductory" units

- 5: Workshop info (now...)
- 6: The Josef info (Tue morning)



# Schedule

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## Three days outside Prague

- Mon – CTU
- Tue – The Josef underground facility (cars)
- Wed – ÚJV Řež, a.s. (train)
- Thu – The Josef underground facility (cars)
- Fri – CTU (same room)





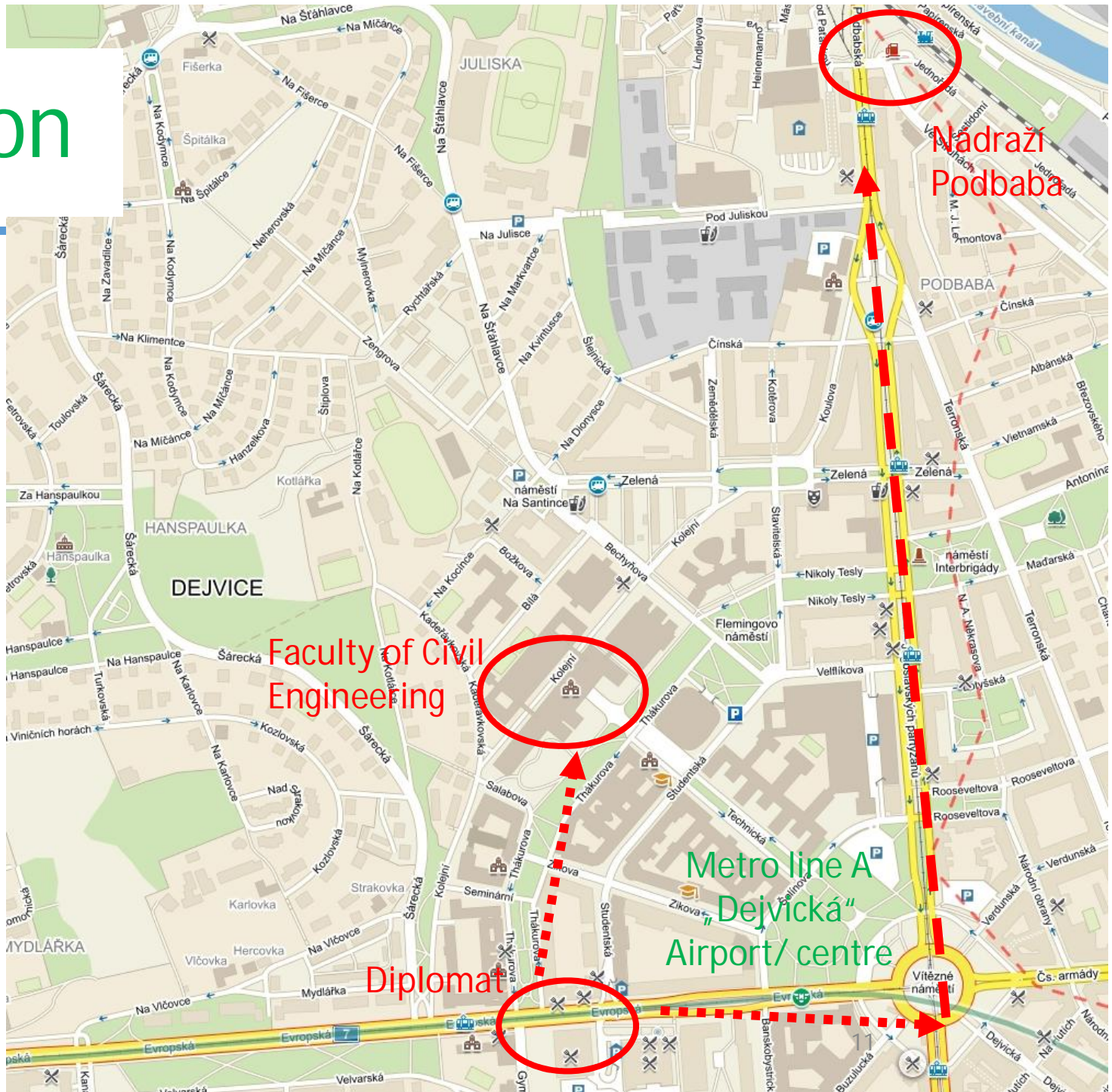
# Transport

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- Mon, Fri (CTU) – walk J
- Tue, Thu (Josef facility)
  - VW transporters (white & red & blue on Thu)
  - 7.45 pick-up in front of Diplomat (red car, meeting with Jana)
  - 7.45 Krystal (white car and Radek)
- Wed (UJV Řež, SÚRAO)
  - 7.15 group meeting in front of Diplomat (with Lucie)
  - public transport (3 tram stops to Nádraží Podbaba)
  - 7.48 train to Řež u Prahy
  - 16.22 Train back to Prague and SÚRAO by train...



# Location



# Data

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## Wifi

- CTU (Mon, Fri)
  - EDUROAM
  - wififce (dopas2015)
- Josef (Tue, Thu)
  - EDURAOM
  - CVUT-HOST (dopas2015)
  - By Jiri Svoboda

## Course materials

- <http://ceg.fsv.cvut.cz/misc/DOPAS/>
- the area is password protected. User: dopas Password: training



# Programme

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- Follows...



DOPAS Training workshop 14-18 September 2015 in Czech Republic			Final 8 September 2015	Version 2	
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DAY 1	Location: Prague CTU	Chair of the day: Jacques Wendling		Organisation and Tutor names	Activity type
14.9.2015	Time	Duration (min)			
<b>Material no</b>		<b>Orientation to the Training Workshop (5.)</b>			
DAY 1: 5.1.1; 5.1.2	09:00-09:30	30	Welcome; Introduction to the training workshop programme and CTU - CEG	CTU/Radek Vasicek	presentation
DAY 1: 5.2.1; 5.2.2	09:30-10:00	30	Introduction to DOPAS project and to Posiva	Posiva/Marjatta Palmu	presentation
DAY 1: 5.3	10:00-10:45	45	Icebreaker, course objectives and concept of time	Posiva/Marjatta Palmu and all	participant's objective setting and activity
10:45-11:00		15 <i>Coffee break</i>			
<b>Learning Unit 1: From Requirements to design basis of plugs and seals</b>					
<b>Material no</b>		<b>1.1 Understanding requirements management and their application for plugs and seals design basis</b>			
DAY 1: 1.1.1a-b; 1.1.2	11:00-11:40	20+20	The role of plugs and seals. Different timelines, different host rocks (case of clay and crystalline repository concepts). Introduction to Andra and SKB.	Andra/Jacques Wendling incl. Nagra content, SKB/Pär Grahm	lecture/s
<b>Material no</b>		<b>1.2 Requirements - understanding and applying them</b>			
DAY 1: 1.2.1	11:40-12:00	20	Sources of requirements. Participants' reflection activity	Andra/Posiva/SKB	participant's reflection activity
12:00-13:00		60 <i>Lunch break</i>			
DAY 1: 1.2.2	13:05-13:25	20	Generic introduction to requirements management (hierarchy in engineering, V-model)	Posiva/Marjatta Palmu	lecture
DAY 1: 1.2.3; 1.2.4	13:25-14:00	30	The Design Basis development work flow for Plugs and Seals	SKB/Pär Grahm	lecture
14:00-14:20		20 <i>Coffee break</i>			
<b>Material no</b>		<b>1.3 Developing a design basis for an experiment</b>			
DAY 1: 1.3.1	14:20-14:50	30	Case example of EPSP experiment	SURAO/Marketa Dvorakova	presentation
DAY 1: 1.3.2	14:50-15:20	30	Scoping the DOMPLU experiment (case DOMPLU) to meet the requirements and challenges - a project management perspective. Moving from the initial design to an experiment in place.	SKB/Pär Grahm	Brief intro to DOMPLU and lecture
DAY 1: 1.3.3	15:20-16:25	15 + 50 incl. break	<u>Exercise 1</u> : Group work on WBS method in scoping an experiment or a technical development project	Students & Pär Grahm	Intro to exercise and participants' work
16:25-16:30		5 <i>Short break for presentation setup</i>			
DAY 1: 1.3.4	16:30-17:00	15+10	Presentation of Exercise 1 results on structuring a technical development project and summary by tutor	Student groups and SKB/Pär Grahm	exercise report and feedback to exercises
17:00		<i>End of Day 1</i>			

# Programme

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DAY 2	Location: Josef	Duration	Chair of the day: Jiri Svoboda , afternoon: Dean Gentles	Organisation and Tutor name (n = 4+1)	Activity type
15.9.2015	Time	min			
	<b>7:45-9:00</b>	<b>75</b>	<b>Transfer from Prague to Josef</b>	<b>Cars leaving from hotels Krystal and Diplomat</b>	
Material no		Orientation to Josef (6.)			
DAY 2: 6.1			Practicalities and advice to studying and acting in Josef - Safety instructions	CTU/Radek Vasicek	instruction
DAY 2: 6.2a; 6.2b	09:00-10:50	110	Presentation of Josef and the EPSP experiment in Josef	CTU/Radek Vasicek or Jiri Svoboda	presentation and videos
DAY 2: 6.3			Visit to the EPSP experiment in Josef (60 min)	CTU/Radek Vasicek & Jiri Svoboda	site visit, participants' notes
			<b>Coffee break</b> (included in the above)		
DAY 2: 6.4	10:50-11:05	15	Introduction/division to groups for the week's student exercises and related reporting (2-5)	Posiva/Marjatta Palmu, CTU/Radek Vasicek	instruction
Learning Unit 2: Preparation of an in-situ or full-scale plug or sealing experiment					
Material no		2.1 How to come up with a coherent demonstrator program for plugs and seals?			
DAY 2: 2.1	11:05-12:00	45	Theoretical basis to Andra's interative safety assessment process and the last iteration cycle	Andra/Jacques Wendling	Lecture and interaction with participants
	<b>12:00-13:00</b>	<b>60</b>	<b>Lunch break (time fixed due to Josef)</b>		
DAY 2: 2.1	13:00-13:35	35	Cases from the safety assessment iteration cycle in Andra's demonstrator programme in clay. The role and implementation of FSS experiment in DOPAS project	Andra/Jacques Wendling	Comprehensive review of outcome and interaction with participants to find out Andra's approach during the last round of iteration of the S.A.
Material no		2.2 The role of instrumentation and monitoring in an experiment			
DAY 2: 2.2	13:40-14:40	60	The role of instrumentation and monitoring in an experiment	CTU/Svoboda	lecture, examples of sensors
	<b>14:40-15:00</b>	<b>15</b>	<b>Coffee break</b>		
DAY 2: 2.2.1	15:00-19:00	240	One (or two) groups 1+2 : <b>Exercise 2</b> Thermometers in Josef	CTU/Svoboda	Guided participant activities in Josef; reporting in two groups
DAY 2: 6.5	19:00-21:15	135	<b>Picnic at Josef</b>	CTU	
	<b>21:15-22:15</b>	<b>60</b>	<b>Return to Prague</b> <b>End of Day 2</b>		

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DAY 3	Location: REZ	Duration	Chair of the day: Morning: Marjatta Palmu, Afternoon: Andre Rübel	Organisation and Tutor name (n = 10+1)	Activity type	
16.9.2015	Time Leave DIPLOMAT 7:15 and take train 7.48 Praha-Podbaba railway station	20	<b>7:48 Train from Prague to Rez</b>	400m walk from Diplomat hotel to Dejvicka bus terminal, take 3 bus stops, duration 4min, every 5min	<b>Need your ID with you (preregistrations done by 1.9.2015)</b>	
<b>Learning Unit 3: Design of a seal for an experiment/demonstrator within the broader context of RD&amp;D programmes; Safety assessment and Performance assessment of closure as design input</b>						
<b>3.1 How to move from initial design in an iterative manner to the final experiment design and construction (to as built) and assess the outcome. What is the state of the art in the demonstrator programs today? What questions still need to be addressed?</b>						
<b>Material no</b>						
DAY 3: 3.1.1	08:30-9:15	45	Andra's scientific programme and the main questions to be replied for the next report (DAC) and after submission of DAC	Andra/Jacques Wendling	lecture	
<b>9:15-9:35</b>		20	<b>Coffee break</b>			
DAY 3: 3.1.2	9:35-10:25	50	Plugs as a part of the demonstration programmes in Nordic countries (YJH and FUD and stages in licencing ) incl. alternative plugs	Posiva/Petri Koho (incl. SKB program points)	perspective lecture (crystalline rock environment, different management process)	
<b>3.2 Behavior of plug components and materials</b>						
<b>Material no</b>						
DAY 3: 3.2.1	10:30-10:50	20	The use of individual tests to complement existing material and process knowledge (case of REM metric experiment)	Case by Andra/Jacques Wendling	lecture on a case example	
DAY 3: 3.2.2	10:50-11:10	20	Group division and instructions for <u>Exercises 3-4</u>	UJV/Petr Vecernik, Katerina Videnska, Dagmar Trpkosova	instruction	
DAY 3: 3.2.3	11:10-12:00	50	<b>Exercise 3:</b> Stress test of concrete	UJV team	guided exercise	
<b>12:00-13:00</b>		60	<b>Lunch break</b>			
DAY 3: 3.2.4	13:00-13:40	40	The role of pH in the Czech plug system and a summary on the use of the work in the Czech safety assessment/case - influence of pH	UJV team	lecture and demonstration	
<b>13:40-14:10</b>		30	<b>Coffee break</b>			
DAY 3: 3.2.5	14:10-15:10	60	<b>Exercise 4:</b> Interaction of concrete with bentonite	UJV team	guided exercise	
	15:10-15:40	30	Group discussion on the <u>exercise 3-4 results</u>	Participants and SURAO/UJV	participants' activity	
<b>16.22-16:50</b>		20	<b>16:22 Train to Prague to SURAO info centre (Dlazdena 6, 110 00 Prague)</b>			
DAY 3: 7.1			Presentation of the Czech siting programme	SURAO/Lukas Vondrovic	presentation	
DAY 3: 7.2	17:00-18:00	60	Presentation of SURAO public involvement and information activities	SURAO/Lucie Steinerova	presentation	
DAY 3: 8	18:00 - until 21:00		<i>Movie night in Prague at SURAO with related discussions</i>	Movie - into eternity 76 min OK (Marjatta organises)	SURAO info center	
<b>End of Day 3</b>						

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DAY 4	Location: Josef	Duration	Chair of the day: Pär Grahm and Petri Koho	Organisation and Tutor name (n=6+1)	Activity type
17.9.2015	Time 7:45-8:50	60	<b>Transfer from Prague to Josef</b>	Cars leaving from hotels Diplomat & Krystal	3 cars reserved
<b>Material no 3. 3 Introduction to Safety Assessment and the role of Safety case (Learning Unit 3)</b>					
DAY 4: 3.3	8:50-10:40	90+20 coffee	Integration of experimental work and process modelling in safety assessment and safety case; Time perspective considerations; summarising the current theoretical and iterative approach. Modelling vs. technical testing and demonstrating.	GRS/Andre Rübel	lecture providing SA basis, repeating and reflecting on the previous day: tests and cases, time visualisation
<b>4. Learning Unit 4: Construction feasibility of a plugging experiment</b>					
<b>Material no 4.1 Practical underground work concerns in setting up an in-situ or full-scale experiment</b>					
DAY 4: 4.1.1	10:50-11:10	20	Risk management for large-scale experiments and work underground	SKB/Pär Grahm	lecture
DAY 4: 4.1.2	11:10-11:55	40	Case example of POPLU experiment ( start slot location + RSC and design; moving into real repository construction, as built vs. design)	Posiva/Petri Koho	lecture/presentation
<b>12:00-13:00 60 Lunch break</b>					
DAY 4: 4.1.3	13:10-14:00	40+10	<b>Exercise 5</b> Two groups: Identifying and prioritizing risks for full-scale experiments G1: DOMPLU and G2: POPLU	Participants and tutors Pelle and Petri	group exercise, 5 min each for quick group summary, final presentation last day
DAY 4: 4.1.4	14:00-14:40	40	Feasibility of a seal in a clay rich host environment. How to adapt the technological process including alternative concept/s (Risk identification and management perspective incl.)	Andra/ Regis Foin	lecture
<b>14:40-15:00 20 Coffee break</b>					
<b>Material no 3.4 Monitoring for performance assessment of experiment components (Thermal processes) - Learning Unit 3</b>					
DAY 4: 2.2.1/3.4	15:00-16:45	105	<b>Exercise 2 continues:</b> EPSP data and its handling from the underground thermal sensor monitoring	CTU/Svoboda	guided exercise, potential time for reports
DAY 4: 9	<b>17:00-18:00</b>	60	<i>Culture at the Cathedral</i>	CTU/Svoboda	
	<b>18:20-19:20</b>	60	<b>Return to Prague</b> <i>End of Day 4</i>	CTU	to hotels with minibuses



# Programme

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DAY 5	Location: Prague CTU	Duration	Chair of the day: Radek Vasicek	Organisation and Tutor name (n =10+1)	Activity type
18.9.2015	Time				
<b>Material no</b>	<b>4.3 How to further apply the lessons learned for the future (Learning Unit 4)</b>				
DAY 5: 4.3.1	8:30-9:45	75	How the lessons learned can be applied to programmes not yet in demonstration stage - Case of RWM	RWM/Dean Gentles	lecture with summary view, too
9:45-10:00		15	<i>Coffee break</i>		
DAY 5: 4.3.2	10:00-10:45	45	Preparing for ELSA experiment (not yet an in-situ experiment)	GRS/Andre Rübel	lecture/ presentation with link and summary view
<b>4.2 Working methods underground and for experiments (Learning Unit 4)</b>					
DAY 5: 4.2.1	10:45-11:55	30-40 min + 30 min	Panel on experiences, constraints and lessons learned (5 -10 min intro by each, Q&A, discussions)	SKB/Pär Graham + Posiva/Petri Koho; CTU/J.S. SURAO/Marketa D.; GRS/Andre, RWM/Dean; Andra/ Regis Foin, + moderators Marjatta/Radek	interactive panel
12:00-13:00		<i>Lunch break</i>			
DAY 5: 10.1	13:00-14:15	75	<u>Reporting of exercises 2-5 by participants</u>	6 group presentation of participants. Exercise 2, both groups each 15 min with commenting; for Exercise 3 only one and Exercise 4 only one, each 10 min including commenting, Exercise 5 both groups 10 min each (Tutors: UJV, CTU, Posiva including commenting)	participants' activity, interactive feedback
14:15-14:30		<i>Coffee break</i>			
DAY 5: 10.2	14:30-14:45	15	Instructions for returning exercise reports	CTU/Radek Vasicek & Posiva/Marjatta Palmu	instruction
DAY 5: 11	14:45-15:45	60	Summary, assessment and feedback discussion	Posiva/Marjatta Palmu, CTU/Radek Vasicek	teaching and assessment discussion
<b>Closing of Training Workshop</b>					

# Tutors

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Bělíčková, Lucie

Dvořáková, Markéta

Foin, Régis

Gentles, Dean

Grahm, Pär

Koho, Petri

Palmu, Marjatta

Roll, Michal

Rübel, Andre

Steinerová, Lucie

Svoboda, Jiří

Trpkošová, Dagmar

Vašíček, Radek

Večerník, Petr

Wendling, Jacques

Videnská, Kateřina

Vondrovic, Lukáš

SURAO, Czech Republic

SURAO, Czech Republic

ANDRA, France

RWM Ltd (Radioactive Waste Management), GB

SKB AB, Sweden

Posiva Oy, Finland

Posiva Oy, Finland

CTU, Czech Republic

GRS, Germany

SURAO, Czech Republic

CTU, Czech Republic

ÚJV Řež, Czech Republic

CTU, Czech Republic

ÚJV Řež, Czech Republic

ANDRA, France

ÚJV Řež, Czech Republic

SURAO, Czech Republic

# Any questions?

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Programme, timeschedule, food, weather...

Do you know „father of soil mechanics“ Karl von Terzaghi?  
And do you know where he born?



Thunovska street, below Prague castle, 2km from here

20



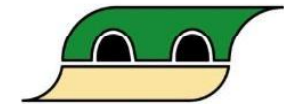
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# Introduction to the CTU



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Centre of Experimental Geotechnics,  
Faculty of Civil Engineering, CTU in Prague



14 September 2015, D1 5.1.2

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Správa úložišť radioaktivních odpadů  
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# Czech Technical University in Prague

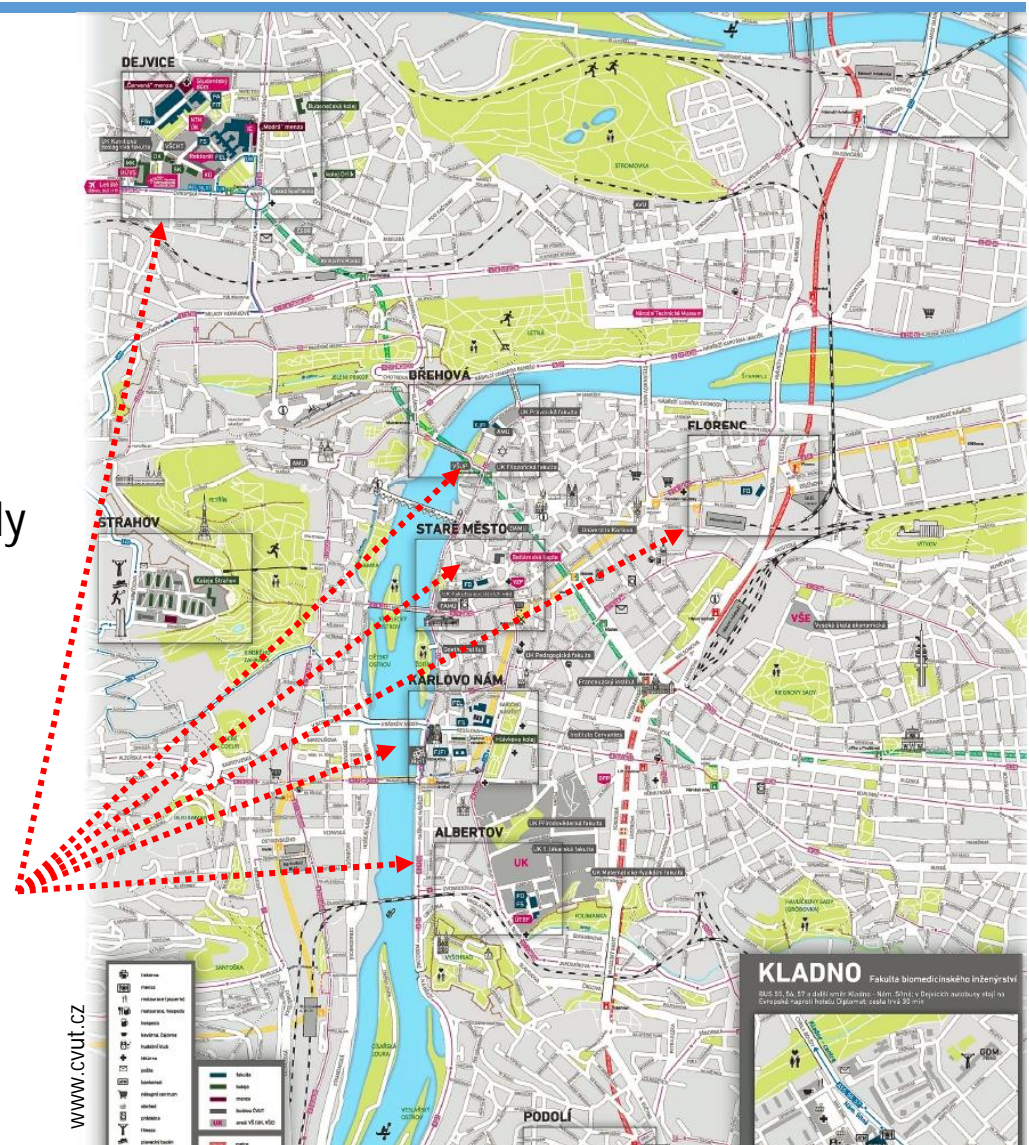
- The oldest technical university in Central Europe

*The Czech Technical University in Prague was established on the initiative of Josef Christian Willenberg, on the basis of a foundation deed signed by Emperor Joseph I and dated 18 January, 1707.*



# Czech Technical University in Prague

- Approx. 23,000 students
- 2,966 international students (13%)
- 1,500 teaching and research staff
- 8 faculties - whole of the technical sciences spectrum
- 176 (in Czech) + 70 (other lang.) study programmes
- The CTU credit system is compatible with the ECTS (European Credit Transfer System)
- Faculties located in Dejvice, Prague centre and also outside city



# Czech Technical University in Prague

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## Faculties of:

- **Civil Engineering**, fsv.cvut.cz
- Mechanical Engineering, fs.cvut.cz
- Electrical Engineering, fel.cvut.cz
- **Nuclear Science and Physical Engineering**, fjfi.cvut.cz
- Architecture, fa.cvut.cz
- Transportation Sciences, fd.cvut.cz
- Biomedical Engineering, fbmi.cvut.cz
- Information Technology, fit.cvut.cz

## Institutes

- Klokner Institute
- Masaryk Institute of Advanced Studies
- Institute of Experimental and Applied Physics
- Research Centre for Industrial Heritage
- Centre for Radiochemistry and Radiation Chemistry



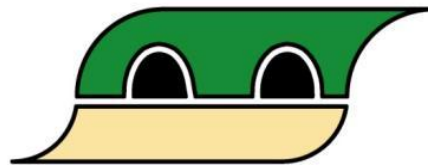
# Faculty of Civil Engineering

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- 5,430 students and 450 teaching and research staff
- 37 departments and research centres

←  
**Centre of Experimental Geotechnics (CEG)**

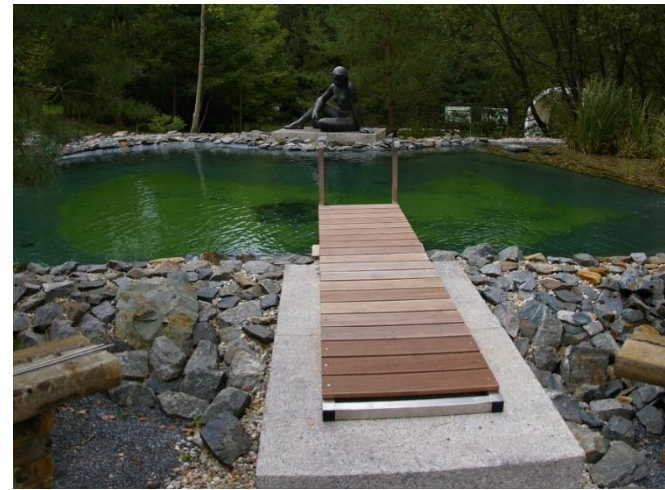
- Operates geotechnical laboratory and **the Josef facility**





# The Josef facility – tomorrow - D2 6.2a

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# Faculty of Civil Engineering

- Studies of Civil Engineering at CTU in Prague currently consist of **bachelor** (4y), **master** (1,5y) and **doctoral** (3y) degrees in study programmes with several branches.

## Bachelor Degree Study Programmes

- Civil Engineering
- Building Engineering
- Geodesy and Cartography
- Architecture and Building Engineering
- Civil Engineering (in English)
- 3,420 students

## Master Degree Study Programmes

- Civil Engineering
- Geodesy and Cartography
- Architecture and Building Engineering
- Buildings and Environment
- Intelligent Buildings
- Civil Engineering (in English)
- Buildings and Environment (in English)
- Nuclear Engineering Constructions
- 1,480 students

## Doctoral Degree Study Programmes

- Civil Engineering
- Geodesy and Cartography
- Architecture and Building Engineering
- 530 students



# Faculty of Civil Engineering

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CTU - QS World University Ranking 2014/15 (5,000 univ.)

- Overall rank 411-420
- 51 – 100 in Civil & Structural Engineering
- 101 – 150 in Physics & Astronomy
- 151 – 200 in Computer Science & Information Systems, Electrical & Electronic Engineering, Mechanical, Aeronautical & Manufacturing Engineering



# CTU other activities

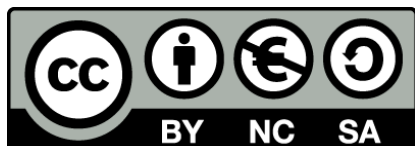
- CTU kindergarden
- CTU primary school
- Student AIR House project – Solar decathlon 2013 competition
- Concerts in Betlem chapel
- Student activity „Sun school“ in Kargyak, India <http://www.suryaschool.org/>
- ...



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Thank you...