

Workshop Programme

ISSMGE
TC-101

Advances in **Multiphysical Testing** of Soils and Shales

3 - 5 September 2012

EPFL, Lausanne, Switzerland

amtss.epfl.ch

SIMSG ISSMGE



Organized by
Lyesse Laloui & Alessio Ferrari

Welcome !



The Swiss Federal Institute of Technology in Lausanne, the Technical Committee 101 of the International Society for Soil Mechanics and Geotechnical Engineering, and the city of Lausanne welcome you to the International Workshop “Advances in Multiphysical Testing of Soils and Shales” (AMTSS-2012).

We are delighted to announce that more than 90 participants from 22 countries will attend the event. We believe that the AMTSS Workshop will provide a forum for debate, learning and innovation on the challenging topic of multiphysical testing of soils and shales. We look forward to the excellent presentations, the fruitful discussions and the wonderful opportunities to meet socially.

Switzerland's fourth city, Lausanne has the distinction of being the headquarter of the International Olympic Committee with a history of tradition and strong training and cultural assets. We believe the city is an ideal place for this event. Welcome to Lausanne!

Thank you very much for coming.

Lyesse Laloui, Alessio Ferrari
September, 2012

Organising committee:

Ali Seiphoori
Alice Di Donna
Barbara Tinguely
Chao Li
Donatella Manca
Valentina Favero

Acknowledgement

The Organizing Committee would like to extend its great gratitude to the following sponsors and organizations who generously contribute and support to the success of AMTSS 2012

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About the Workshop

The workshop will focus on the significant advances of knowledge regarding the experimental analysis of soils and shales that have been achieved during the last decade. Some fundamental issues have been solved, and important achievements have been made in certain areas, including the development of multiphase testing facilities for non-isothermal conditions and the characterization of the microstructural arrangement for complex geomaterials.

This outstanding progress in the field has had relevant consequences in the theoretical developments of geomechanical theories, such as the constitutive modelling of multiphysical and multiscale processes, as well as important engineering applications. The workshop is aimed at stimulating the debate on the advances in experimental geomechanics; contributions on unsaturated soil testing, non-isothermal experiments and chemo-osmotic experimental evidences are welcomed. The workshop proceedings will be published in the Springer Series in Geomechanics and Geoengineering.

The workshop will be held between 3 and 5 September 2012 at the conference facilities of the EPFL in Lausanne (Switzerland). The workshop is organized by the Laboratory for Soil Mechanics (LMS) at the EPFL.



Contact

Laboratory for Soil Mechanics
EPFL-ENAC-LMS
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Workshop secretary:
Barbara Tinguely
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Assistance:

If you have any problems within or out of EPFL during the workshop, please feel free to contact Mr. Chao Li for help.

Mobile phone number: +41 78 728 2105. Language support: English, French and Chinese.

About the Venue

The inspiring and dynamic learning EPFL
ambiance comes fully to its right at the campuses of both the Swiss Federal Institute of Technology of Lausanne (EPFL) and the University of Lausanne (located just east of EPFL). With green all around - except for the southern side, which looks out over the lake - and all necessary academic and personal facilities within hand reach, the campus of EPFL offers a perfect environment. It is not without reason that more than ten thousand students and academics find their ways here.



Accommodation:

Special hotel prices have been negotiated with some hotels. If you wish to book your stay in one of those hotels, please announce yourself as a participant to the "AMTSS Workshop at EPFL" in order to profit of the special prices. Some of the hotels have limited availability: please take care to make your reservation as soon as possible. Most of the hotels in the Lausanne's area offer a free travel card for public transport during your stay. The list of hotels can be found on the workshop website: <http://amtss.epfl.ch/venue.html>.

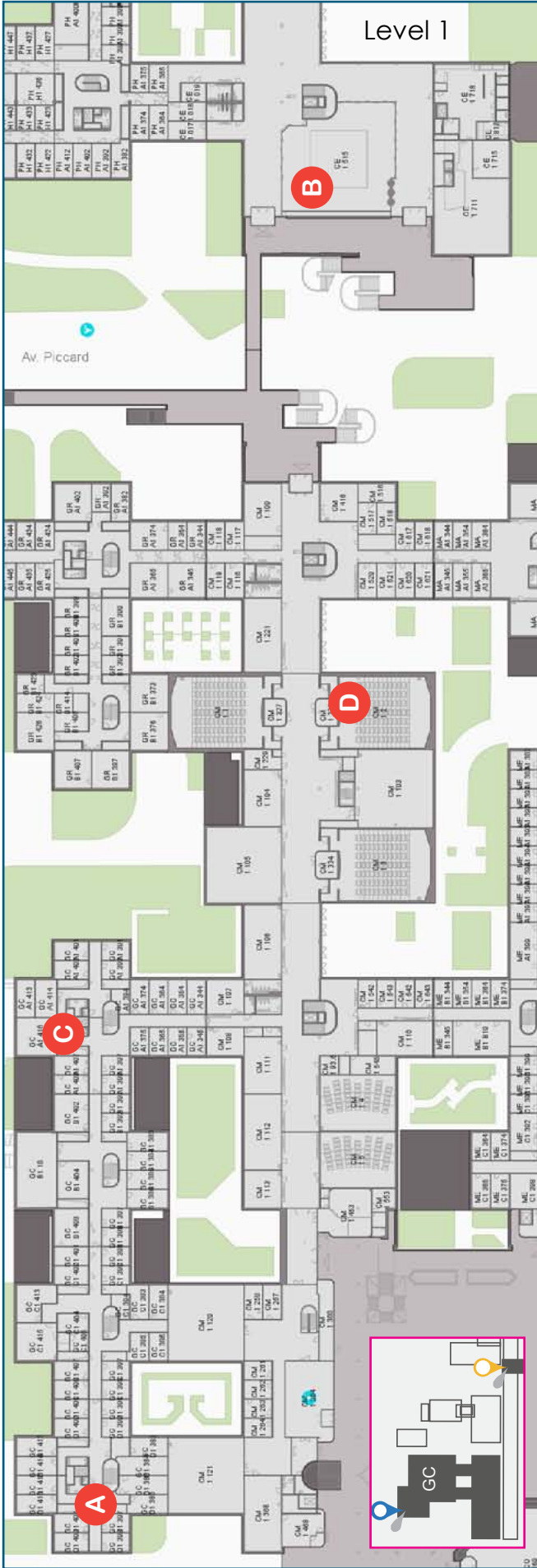
Transport:






Coming by plane and by train

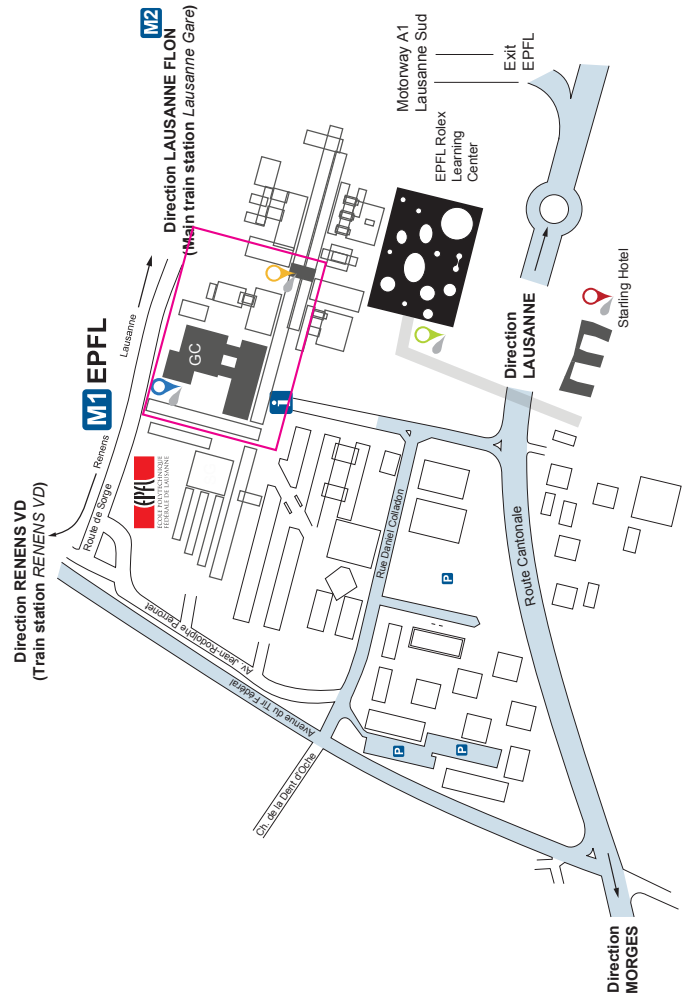
Genève-Cointrin is the nearest airport (40-60 minutes). The train from Zürich Airport takes approximately 2h 30 to go to Lausanne. From these airports, you can take a train to *Lausanne Gare*, then the metro (*Lausanne Gare* - Metro M2> *Lausanne Flon* > Metro M1 - EPFL). Or you can take a train to *Renens VD*, then the metro (*Renens VD* - Metro M1> EPFL). Please see the map on page 6.

Coming by car

The coordinates N46.52184, E6.56488 will take you directly to a parking lot at the campus.



- A** Level 0: GC D0 386 - Short course room
- B** Level 1: CE 1 515 Salle Polyvalente - Workshop room
- C** Level 1: GC A1 416 - TC 101 Meeting room
- D** Level 2: Restaurant Le Vinci
-  Laboratory of Soil Mechanics
-  Rolex Learning Center - Welcome cocktail
-  Salle Polyvalente - Workshop room
-  Starting Hotel
-  Zoom area



Programme at a Glance

Sunday, Sep.2

18:30 - 20:00

Registration - Rolex Learning Center
Welcome cocktail - Rolex Learning Center

Monday, Sep.3

08:00 - 08:45

Registration - Salle Polyvalente

08:45 - 09:00

Welcome opening - Salle Polyvalente

09:00 - 12:30
Chairman:
A. Tarantino

Theme lecture - Salle Polyvalente
L. R. Hoyos: Advances in experimental modelling of unsaturated soil behaviour over a whole range of paths and modes of deformation
Thematic session - Salle Polyvalente
Testing in variably saturated conditions

12:30 - 13:30

Lunch - Le Vinci

13:30 - 16:00
Chairman: T. Schanz

Theme lecture - Salle Polyvalente
F. Marinho: Undrained shear of plastic soils under suction
Thematic session - Salle Polyvalente
Testing in non-isothermal conditions

16:00 - 18:00
Chairman: X. Cheng

Theme lecture - Salle Polyvalente
E.C. Leong: Triaxial testing of unsaturated soils
Thematic session - Salle Polyvalente
Testing in non-isothermal conditions

19:00 - 22:00

Workshop dinner at at L'Epicurios

Tuesday, Sep.4

08:30 - 12:30
Chairman:
R. Ewy

Theme lecture - Salle Polyvalente
A. Ferrari: Thermo-hydro-mechanical testing of shales
Thematic session - Salle Polyvalente
Experimental analyses of shales behaviour
Thematic session - Salle Polyvalente
Compressibility, strength and time dependent investigations

12:30 - 13:30

Lunch - Le Vinci

13:30 - 16:00
Chairman: P. Marschall

Theme lecture - Salle Polyvalente
E. Romero: Air tests on low-permeability claystone formations. Experimental results and simulations
Thematic session - Salle Polyvalente
Micro-scale investigations and image-analysis techniques

16:00 - 18:15
Chairman: F. Masroui

Theme lecture - Salle Polyvalente
J. Kodikara: Desiccation cracking in clayey soils: mechanisms and modelling
Thematic session - Salle Polyvalente
Micro-scale investigations and image-analysis techniques

18:15 - 18:45

Workshop closure

Wednesday, Sep.5

09:00 - 12:15

Short Course - GC D0 386
Advanced Experimental Geomechanics

09:30 - 11:30

TC 101 Meeting - GC A1 416

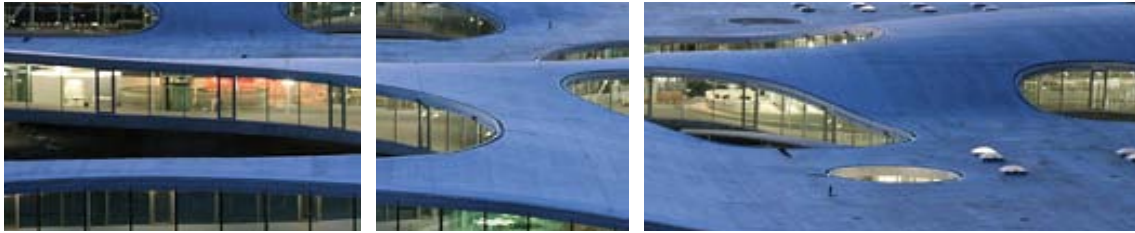
11:45 - 12:30

Visit of the EPFL Soil Mechanics Laboratory

Social Programme

Welcome Cocktail - Sunday, Sep. 2 - 18:30-20:00

Participants will be welcomed in the remarkable Rolex Learning Center. The single-room space, covering 20'000 m², incorporates an inspiring learning environment, as well as a well-filled library with volumes on all sciences taught at EPFL. On top of that, the "Wave" functions as a meeting point for regional, national and international parties of the most diverse backgrounds.



Workshop Dinner - Monday, Sep. 3 - 19:00-22:00

The workshop dinner will be held at 'L'Epicurios' during the evening of Monday. On the top floor of la Miroiterie of the district Flon, in the heart of Lausanne, participants will love this restaurant, with its traditional cuisine and magnificent, panoramic roof terrace with the view of the whole city.



Workshop Lunch - Sep. 2-3 - 12:30-13:30

Workshop lunch for attendees will take place in the restaurant 'Le Vinci' in the campus of EPFL.

Daily Programme

Monday, Sep 3

08:00 - 08:45	Registration
08:45 - 09:00	Opening Ceremony

Welcome Remarks

Prof. Lyesse Laloui, Dr. Alessio Ferrari, Workshop Organizers
Prof. Hervé Di Benedetto, ISSMGE TC101 Chair

Theme Lecture

- 09:00 Advances in experimental modelling of unsaturated soil behaviour over a whole range of paths and modes of deformation**
Laureano R. Hoyos

Chair: A. Tarantino

Thematic Session: Testing in variably saturated conditions

- 09:30 Influence of hydraulic hysteresis on the resilient behavior of a natural compacted sand**
Xuan Nam Ho, Hossein Nowamooz, Cyrille Chazallon, Bernard Migault
- 09:45 Monotonic simple shear response of fine grained silts under different saturation condition**
F. Daliri, D. H. Basu
- 10:00 Effect of loading and suction history on time dependent deformation of crushed granular aggregates**
Enrique Romero, Clara Alvarado, Eduardo E. Alonso
- 10:15 Ultrasonic testing of unsaturated soils**
Z.Y. Cheng, E.C. Leong
- 10:30 Coffee Break**
- 11:00 Factors influencing water retention characteristics of granular materials**
Gilbert J. Kasangaki, Gabriela M. Medero, Jin Y. Ooi
- 11:15 Evaluation of collapse potential investigated from different collapsible soils**
Qasim A.J. Al-Obaidi, Saad F. Ibrahim, Tom Schanz
- 11:30 Experimental methodology for chemo-mechanical weathering of calcarenites**
M. O. Ciantia, R. Castellanza, C. di Prisco, T. Hueckel
- 11:45 Thematic session discussion**
- 12:15 Lunch**

Daily Programme

Monday, Sep 3

Theme Lecture

13:30 Undrained shear of plastic soils under suction
Fernando A. M. Marinho

Chair: T. Schanz

Thematic Session: Testing in non-isothermal conditions

14:00 Development and calibration of a direct shear device for concrete-soil interface tests at high temperature
Alice Di Donna, Lyesse Laloui

14:15 Shear strength of clay during thaw
Anders Beijer Lundberg

14:30 Tests in thermo-hydraulic cells to simulate the behaviour of engineered barriers
M.V. Villar, R. Gómez-Espina, P.L. Martín, J.M. Barcala

14:45 Influence of freeze-thaw action on hydro-mechanical behavior of unsaturated crushable volcanic soils
Tatsuya Ishikawa, Tetsuya Tokoro

15:00 Plane-symmetrical simulation of flow and heat transport in fractured geological media: a discrete fracture model with Comsol
Biguang Chen, Erxiang Song, Xiaohui Cheng

15:15 Formulation of Tsinghua-Thermosoil Model: a fully coupled THM model based on non-equilibrium thermodynamic approach
Zhichao Zhang, Xiaohui Cheng

15:30 Coffee Break

Theme Lecture

16:00 Triaxial testing of unsaturated soils
Eng Choon Leong

Chair: X. Cheng

Thematic Session(Cont.): Testing in non-isothermal conditions

16:30 An innovative triaxial cell for thermo-hydro-mechanical investigation in unsaturated geomechanics
Ali Seiphoori, Alessio Ferrari, Lyesse Laloui

16:45 Thermo-hydraulic behaviour of Boom clay using a heating cell: an experimental study
Lima A., Romero E., Gens A., Li X.L, J. Vaunat

17:00 Thermo-hydro mechanical column experiment to study expansive soil behaviour
Tom Schanz, Long Nguyen-Tuan, Maria Datcheva

17:15 Effect of elevated temperatures on a pond lining system for brines from coal seam gas extraction sites
Abdelmalek Bouazza

17:30 Thematic session discussion

19:00 - 22:00

Workshop Dinner

Daily Programme

Tuesday, Sep 4

Theme Lecture

08:30 Advances in the testing of the hydro-mechanical behaviour of shales
Alessio Ferrari, Lyesse Laloui

Chair: R. Ewy

Thematic Session: Experimental analyses of shale behaviour

09:00 Nanochemomechanics of shale: coupled WDS-indentation analysis
Amer Deirieh, J. Alberto Ortega, and Franz-Josef Ulm

09:15 Shale swelling/shrinkage, suction and osmosis
Russell T. Ewy

09:30 Polish experience with testing of selected shales as material for road base courses
Leszek Rafalski, Jadwiga Wilczek

09:45 Experimental methods for characterization of cap rock properties for CO₂ storage
E. Aker, E. Skurtveit, L. Grande, F. Cuisiat, Ø. Johnsen, M. Soldal, B. Bohloli

10:00 Thematic session discussion

10:15 Coffee Break

Chair: A. Bouazza

Compressibility, strength and time-dependent investigations

10:45 Long term compression behaviour of soft organic sediments
Marta Boso, Jürgen Grabe

11:00 On creep laboratory tests in soil mechanics
Arman Khoshghalb

11:15 One dimensional consolidation under high pressure oedometric condition considering time dependent loading
Donatella Manca, A. Ferrari, Lyesse Laloui

11:30 Variation of cohesive sediment strength with stress level
Brendan Casey, John T. Germaine

11:45 Meso-scale oedometer test system for volume change determination in problematic soils
Shahid Azam, Peter Gutiw, Mavinakere E. Raghunandan

12:00 Evaluation of geotechnical properties and liquefaction behavior of cohesive subgrade soil stabilized with fly ash, gypsum and lime
Saad F. Ibrahim Al. Abdullah

12:15 Thematic session discussion

12:30 Lunch

Daily Programme

Tuesday, Sep 4

Theme Lecture

- 13:30 Air tests on low-permeability claystone formations. Experimental results and simulations**
Enrique Romero, Rainer Senger, Paul Marschall, Rodrigo Gómez

Chair: P. Marschall

Thematic Session: Micro-scale investigations
and image analysis techniques

- 14:00 Pore size distribution and soil water suction curve from micro-tomography measurements and real 3-D digital microstructure of a compacted granular media by using direct numerical simulation technique**
Felix H. Kim, Dayakar Penumadu, Volker P. Schulz and Andreas Wiegmann
- 14:15 Porosity and pore-size distribution of geomaterials from X-ray CT scans**
H.S. Shin, K.Y. Kim & G.N. Pande
- 14:30 Volumetric strain mechanisms and induced anisotropy analyses in clayey materials**
Mahdia Hattab, Jean-Marie Fleureau
- 14:45 Application of x-ray tomography to the characterisation of grain-scale mechanisms in sand**
G. Kaddhour, E. Ando, S. Salager, P. Bésuelle, C. Viggiani, S. Hall, J. Desrues
- 15:00 Observation of shear banding characteristics on sand in torsional shear test using image analysis technique**
Seto Wahyudi, Yukika Miyashita, Junichi Koseki
- 15:15 Experimental and quantitative study on micro-structure of soft soil in Suzhou**
Xiaozhao Li, Liang Cao, Zhiyong Xiong, Rong Yang, Juan Ma

15:30 Coffee Break

Theme Lecture

- 16:00 Desiccation cracking in clayey soils: mechanisms and modelling**
Jayantha Kodikara, Susanga Costa

Chair: F. Masroui

Thematic Session(Cont.): Micro-scale investigations
and image analysis techniques

- 16:30 Development of a new experimental device in order to improve swelling-shrinkage analysis of clayey soils**
Tatiana Maison, Jean-Bernard Kazmierczak, Farid Laouafa, Patrice Delalain
- 16:45 Localisation processes and size effects for fissured clay specimens**
Claudia Vitone, Federica Cotecchia, Cino Viggiani
- 17:00 Experimental study of the deformation pattern around a penetrating coned tip**
P. Paniagua, A.S. Gylland, S. Nordal
- 17:15 Micro-scale testing of capillary bridge evolution due to evaporation**
Boleslaw Mielniczuk, Tomasz Hueckel, Moulay Said El Youssou
- 17:30 Anisotropy of mica probed by nanoindentation**
Rohit Pant, Liming Hu, Guoping Zhang
- 17:45 Thematic session discussion**

18:15 - 18:45

Workshop Closure

Daily Programme

Wednesday, Sep 5

Short Course - Advanced Experimental Geomechanics - GC D0 386

09:00 **Multiphase and non-isothermal testing of geomaterials**
Alessio Ferrari

09:45 **Constitutive modelling calibration from advanced multiphysical testing**
Laureano R. Hoyos

10:30 **Coffee break**

11:00 **Microstructural investigations of geomaterials**
Enrique Romero

09:30 - 11:30

TC 101 Meeting - GC A1 416

11:45 - 12:30

Visit of the EPFL Soil Mechanics Laboratory

Theme Lecturers

Theme Lecture (09:00 - 09:30, Sep. 3)



Prof. Laureano Hoyos
Department of Civil Engineering
University of Texas Arlington, USA

Recent advances in experimental modelling of unsaturated soil behaviour over a whole range of paths and modes of deformation

Theme Lecture (13:30 - 14:00, Sep. 3)



Prof. Fernando A. M. Marinho
Departamento de Engenharia de Estruturas e Geotécnica
Universidade de Sao Paulo, Brazil

Undrained shear of plastic soils under suction

Theme Lecture (16:00 - 16:30, Sep.3)



Prof. Eng Choon Leong
School of Civil and Environmental Engineering
Nanyang Technological University, Singapore

Triaxial testing of unsaturated soils

Theme Lecture (08:30 - 09:00, Sep.4)



Dr. Alessio Ferrari
Laboratory of Soil Mechanics
Ecole Polytechnique Fédérale de Lausanne, Switzerland

Advances in the testing of the hydro-mechanical behaviour of shales

Theme Lecture (13:30 - 14:00, Sep.4)



Prof. Enrique Romero
Department of Geotechnical Engineering and Geo-Sciences
Universitat Politècnica de Catalunya, Spain

Air tests on low-permeability claystone formations. Experimental results and simulations

Theme Lecture (16:00 - 16:30, Sep.4)



Prof. Jayantha Kodikara
Department of Civil Engineering
Monash University, Australia

Desiccation cracking in clayey soils: mechanisms and modelling

Information on Lausanne

Lausanne is built on three hills, surrounded by vineyard-covered slopes, with Lake Geneva at its feet. Rising impressively from the opposing French lakeshore are the Savoy Alps. The attractive old town is largely car-free. Small alleyways with cafes and boutiques shape the streetscape in the medieval city centre.

The old town is dominated by the cathedral, which is regarded as Switzerland's most impressive piece of early Gothic architecture. Lausanne was a diocesan town for over a thousand years. Shopping streets can be found surrounding the cathedral as well as in the pretty waterfront area of Ouchy. Switzerland's only metro connects the various parts of the town and eases travel in this incline-based town.

Climate

Lausanne enjoys an especially mild climate, with much of its weather being directly influenced by its proximity to nearby Lake Geneva. Warm and somewhat humid winds often arrive from the Atlantic, along with breezes from Lake Geneva, freshening the air in Lausanne and cooling down temperatures during the hot summer months. The climate in Lausanne is at its hottest between July and August, when temperatures average 25°C / 77°F by day and drop to around 14°C / 57°F at night. The average temperature in November is 9°C / 48°F.

Communication

The international dialing code for Switzerland is: +41

Area code for Lausanne: 21

The outgoing code is 00 followed by the relevant country code.

Important phone numbers in Switzerland:

Fire brigade: 118

Police: 117

Ambulance: 144

Electricity

Switzerland has its own standard plug (3 pin). Voltage 230V/50Hz. An international plug adapter is recommended.



Health

There are no vaccinations required to enter Switzerland.

Language

The four official languages in Switzerland are German, French, Italian and Romansh. Lausanne is located in the French-speaking part of Switzerland.

Currency

The official currency is the Swiss Franc (CHF). Check the currency websites for the current exchange rate.

Time difference

Time zone: UTC +1

Tipping

There is no obligation to tip in Switzerland as service is included in the price in restaurants, bars and hotels. Rounding to the next Swiss franc for small amounts or giving a couple of Swiss francs when spending larger amounts in expensive restaurants is usual.



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Field of application:

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- Geosynthetic test equipment
- Frozen soil and geothermal testing equipment
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