First Circular
International Short Course on
Permafrost Engineering

Effective Design and Construction in Permafrost Regions

April 28 – May 3, 2016
Edmonton, Alberta

Department of Civil and Environmental Engineering
University of Alberta
and
Cold Regions Geotechnology Division
Canadian Geotechnical Society
Permafrost Engineering

April 28 – May 3, 2016 in Edmonton, Alberta

Why should you attend this Course

Upon completion of the course you will:

• Have a working knowledge of logistic challenges of building in Northern Regions.
• Understand the origin and different types of ground ice.
• Know how to determine the existing thermal regime and impact of changing environmental conditions on this regime.
• Understand the unique behavior of freezing, frozen and thawing soils and understand how to design for these conditions.
• Know how to evaluate and design foundations and slopes in permafrost.
• Be exposed to case histories related to hydrocarbon pipelines in permafrost, mine design, tailings impoundments under Arctic conditions and pile foundation support systems in regions of saline permafrost.

Who should attend this Course?

If you are an engineer who has never attended a permafrost engineering course or want to learn about the latest information in permafrost engineering.

• Public works engineer
• Environmental engineer
• Geotechnical engineer
• Mining engineer
• Construction engineer
• Pipeline engineer
• Regulatory engineer
• Engineers-in-training
COURSE CONTENT

Introduction
Definition of the North
Environmental considerations
Geology and physiography of northern regions
Definition of permafrost and its distribution
Engineering challenges working in permafrost

Surface Features (Landforms) in Permafrost Areas
Features associated with freezing, thawing or cyclic freezing and thaw

Ground Ice and Ground Ice Landforms
Surface and atmospheric water
Subsurface water
Ground ice and geology
Engineering classification of permafrost soils

Ground Thermal Regime in Permafrost Areas
Earth’s energy balance

Thermal Properties of Frozen and Unfrozen Soils
Thermal conductivity, specific heat, latent heat and apparent specific heat

Heat Flow Equations
No phase change, phase change and heat flow around pipes

Site Investigation in Permafrost Areas
General considerations
Logistics
Drilling and sampling
Geophysical techniques
Temperature measuring systems

Frozen Soils Mechanical Properties
Elastic Parameters
Strength properties
Effect of temperature, ice content, confining pressure and time
Special aspects of failure of frozen ground
Creep behavior

Mechanics of Thawing Ground
Amount of thaw settlement and time rates of settlement
Linear theory of thaw consolidation

Freezing of Soils and Frost Heave Theory
Frost heave mechanics

Foundations in Permafrost
Geothermal aspects
Shallow foundations
Piles

Slope Stability in Permafrost
Falls, flows and slides
Creep
Cuts in permafrost

Case Histories
Course Conduct and Instructors

You will have numerous opportunities during the course to interact with and learn from the exceptional experienced instructors. Each is a professional engineer with extensive permafrost engineering experience in leading edge research and consulting, and is dedicated to your learning.

**Kevin Biggar, P.Eng., Ph.D.**

Dr. Biggar has worked in Arctic and cold temperature environments since 1981. He has considerable experience in foundations, frost heave, and fate and transport of contaminants in these conditions. He currently co-teaches the permafrost engineering graduate course at the University of Alberta. He has done research in the following areas related to cold regions engineering: assessment of the fate of petroleum spills in permafrost, remediation of petroleum contaminated sites in Canadian climates, improvement of foundations in permafrost, improvement of electrical grounding in permafrost, ground freezing for soil stabilization and sampling of loose cohesion less sediments, and use of freeze-separation to clean up contaminated waters. He also chairs a biennial workshop on assessment and remediation of contaminated sites in Arctic and cold climates.

**David C. Sego, Ph.D., P.Eng.**

Dr. Sego is a Professor Emeritus in the Department of Civil and Environmental Engineering at the University of Alberta, Edmonton, Alberta. He currently co-teaches a course on permafrost engineering. His industrial experience and research interest focus on the behavior of saline and non-saline permafrost, and special problems with foundations in saline permafrost. He has directed extensive research studying the interaction of offshore Arctic structures and sea ice. Recently he has undertaken research into dewatering of mine wastes using freeze-thaw and separating contaminants from industrial wastewater using spray-freezing technology. He also has directed industrial projects and research directed at using artificial ground freezing.

**Lukas Arenson, Dr.Sc.Techn.ETH, Dipl.Ing.ETH**

Dr. Arenson’s main area of expertise is geotechnical, mountain permafrost engineering with specialization on frozen soil mechanics. He studied the dynamics of ice-rich frozen slopes, in particular rock glaciers, from a geotechnical viewpoint and has expert knowledge in in-situ testing and monitoring of mountain permafrost. In addition, he developed analytical solutions to analyze rock glacier stability. Later, Dr. Arenson concentrated on the thermo-mechanical processes of frozen and freezing soils on a microstructural level to better understand the strength and deformation properties of frozen soils with changing stress, temperature and salinity. Dr. Arenson has further been studying the effects of natural air convection in cold climates to prevent permafrost degradation, to re-establish pre-construction thermal regimes after pipeline or road constructions and to accelerate the consolidation of mine waste tailings.
General Information

**Fees** Cover five full days of instruction, course notes, textbook, list of references for further study, break refreshments and lunches. Fee does not include lodging or other meals. We do not publish proceedings, and due to copyright laws, course materials are not available for resale after the course.

**Cancellation** We strongly encourage enrollment in advance as enrollment will be limited and course conduct is also predicted on adequate enrollment. If you cannot attend once enrolled, please notify us immediately. Cancellations will be accepted up to March 31, 2016. After that date you may substitute another person to take your place at the course. This is a limited enrollment course, and “no-shows” will be billed the full amount if they have not cancelled prior to March 31, 2016.

**Payment** Please forward your cheque made payable to The University of Alberta with your registration form. MasterCard, American Express and Visa are also accepted for the payment of fees. Upon receipt of payment your registration will be confirmed by e-mail.

**Enrollment Options** Enrollment in advance by e-mail, phone or mail is recommended before March 31, 2016 (Fee: $2,300). After that date, enrollment is available with an additional fee of $400. If inadequate enrollment is not received by March 31, 2016, the course will be cancelled and payments refunded. Be sure you receive our confirmation before the course or call 780-492-2176. Course participants will receive a copy of O.B. Andersland and B. Ladanyi's book published in 2003. Students will also receive a two-CD set of presentations made at the *Permafrost and Arctic Geotechnology Symposium – Our Canadian Legacy* held November 15 and 16, 2004, in Calgary, Alberta.

**Course Location and Accommodation** This course will be held at the University of Alberta.

**Campus Tower Suite Hotel:** Reservations call 1-800-709-1824 or (780) 439-6060. Inform the reservation specialist that you will be attending the University of Alberta Permafrost Engineering Short Course. 1 Bedroom Superior: $179.00 + tax. Parking available at $16.00 + tax per day.

**Lister Hall Conference Centre:** Reservations call: (780) 492-6056. Inform the reservation specialist that you will be attending the University of Alberta Permafrost Engineering Short Course. New hotel style room: $109 + tax. Parking available at $7.00 per day.

**Varscona:** Reservations call: (780) 434-6111. Inform the reservation specialist that you will be attending the University of Alberta Permafrost Engineering Short Course. The standard rooms are available at $140 per night. Complimentary parking, deluxe breakfast buffet, evening wine & cheese tasting (except Sunday), Wi-Fi and 24-hour access to Fitness Centre & Business Centre.
Four Easy Ways to Enroll

**Enrollment Form**

**Course Information**

Please enroll me in **Permafrost Engineering**
April 28-May 3, 2016, in Edmonton, Alberta

**Fee:** (before March 31, 2016): $2,300.00
(after March 31, 2016): $2,700.00

**Registration Information:**

Name: ________________________________
Title/Company: ________________________
Address: ______________________________
City/Prov./Postal Code: ________________
Telephone: ________________________ Fax: ________________________
E-Mail: ______________________________
Credit Card Number ____________________
Name of Cardholder ____________________
Expiry Date __________ CSV Code: __________
VISA ______ AMEX ________ MASTERCARD _______

* Further communication with participants will be via email.