



Vancouver Geotechnical Society

A Local Section of the Canadian Geotechnical Society

www.v-g-s.ca

2014-2015 Executive Committee:

Chair	-(Kumar) S. Sriskandakumar, BGC	604-684-5900
Past-Chair	-Ryan Mills, Tetra Tech EBA	604-685-0275
Program Director	-Ali Amini, NAGL	604-984-0759
Treasurer	-Chris Longley, Stantec	604-436-3014
Secretary	-Yoshi Tanaka, Levelton	604-278-1411
Registrar	-Robyn Barnett, Tetra Tech EBA	604-685-0275
Web Manager	-Marc Bossé, Thurber	604-684-4384
CGS Director	-Jason Pellett, Tetra Tech EBA	604-685-0275
Member-at-Large	-Mike Hopson, Nilex	604-420-6433

A TWO-DAY WORKSHOP BY MR. MIKE JEFFERIES AND DR. DAWN SHUTTLE

DEVELOPING CONFIDENCE IN CRITICAL STATE SOIL MECHANICS

Friday & Saturday, January 16 & 17, 2015

INSTRUCTORS:

Mr. Mike Jefferies & Dr. Dawn Shuttle

The workshop will be taught by Mr. Mike Jefferies and Dr. Dawn Shuttle. Mike is the originator of NorSand, and the author of a widely-cited text on critical state soil mechanics. Dawn has implemented the NorSand in various finite element applications, as well as developed the methodology for recovering state parameter from CPT data.

COURSE OUTLINE:

Participants will develop models in the standard Microsoft Excel environment and use the Excel charting function to graph their results and the comparisons with test data.

The workshop will proceed in steps with ideas/equations being introduced with participants then coding these steps into their worksheet. Examples will be shown at each step to keep all participants on track.

The workshop will be limited to thirty (30) participants to allow the workshop leaders adequate time to interact with all in the workshop.

The timing of the workshop will depend on the group's progress, but is estimated to follow the following schedule:

Time	Topic	Format
Day 1		
08:00 – 08:30	Registration	Coffee & doughnuts
08:30 – 09:00	Euler Integration	Lecture
09:00 – 09:30	Set up spreadsheets	Tutorial; Participants create outline xls
09:30 – 10:15	Original Cam Clay (OCC)	Lecture; hand-out with OCC equations
10:15 – 11:45	Implement Undrained OCC	Tutorial; coffee as needed
11:45 - 12:00	Verification-1	Lecture; hand out with Wroth solution
12:00 - 12:45	Lunch	Provided
12:45 - 13:15	Verification-2	Tutorial; Participants verify their xls
13:15 – 13:45	Mod Cam Clay (MCC)	Lecture; hand-out with MCC equations
13:45 - 14:15	Change OCC to MCC	Tutorial; Participants create 2 nd version of their xls to implement MCC
14:15 – 14:45	Why OCC/MCC don't match real soils	Lecture; Participants follow along using their OCC xls.
14:45 – 15:00	Tea Break	Coffee, Tea & doughnuts
15:00 – 16:00	Fixing OCC for real soils => NorSand (NS)	Lecture; hand-out with NS equations; definition of soil properties
16:00 – 16:30	Extend OCC to Undrained NS	Tutorial; Participants modify their xls to create NS
16:30 - 17:00	Effect of soil properties	Tutorial; Participants use their xls to explore effect of soil properties and state on undrained static liquefaction



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Time	Topic	Format
Day 2		
08:00 – 8:30	Breakfast	Coffee & doughnuts
08:30 – 09:00	From undrained to drained: The <i>consistency condition</i>	Lecture; hand out with equations
09:00 – 09:45	Drained NS	Tutorial; Participants modify their xls to do both drained and undrained loadings
09:45 – 10:15	Fraser River sand data	Lecture; Introducing data hand-out
10:15 – 11:45	Modelling drained triaxial tests	Tutorial; Participants add data to their xls and simulate drained tests to validate their xls against data; coffee as needed
11:45 - 12:15	From triaxial to plane strain	Lecture; hand-out with equations
12:15 - 13:00	Lunch	Provided
13:00 - 13:15	Intro to VBA	Lecture; participants follow with xls
13:15 - 13:45	Intro to Cyclic Simple Shear with NorSand	Lecture; participants provided with open-code <i>NorSandCSS.xls</i> for their use
13:45 - 14:45	Modelling cyclic liquefaction	Tutorial; participants use <i>NorSandCSS.xls</i> to validate against 'liquefaction initiative' CSS data on FRS (data provided)
14:45 - 15:30	Getting state parameter from CPT	Lecture
15:30 - 15:45	Tea Break	
15:45 - 16:45	Site-specific calibration of CPT	Tutorial; 'widget' for CPT as hand-out
16:45 - 17:15	Silts: dealing with sample disturbance in CSS tests	Lecture; participants follow using their xls

REQUIREMENTS

- 1) Workshop participants will need to bring a laptop computer with Excel installed to participate in the exercises.
- 2) Participants will need to be familiar with using Excel for engineering calculations (i.e. for implementing simple equations), and with graphing (charting) in Excel. Other advanced aspects of Excel will be taught as part of the course.
- 3) The workshop will be ideal for those who attended the May 2014 VGS short course by Professor Malcolm Bolton, but sufficient background will be provided for those who did not.

BACKGROUND

Critical state soil mechanics (CSSM) is the only framework that predicts/quantifies the effect of void ratio on the mechanical behaviour of soil. CSSM is built on a century of developments in theoretical soil mechanics, but has not transitioned to wide use in engineering practice. There appears to be three reasons for this situation: i) CSSM does not provide a simple equation relating stress and strain; ii) the ideas are expressed in hard to comprehend jargon; and, iii) the limitations of Cam Clay are still perceived to exist in more modern developments.

The aim of this workshop is for all attendees to become confident in using CSSM across a spectrum of applications from assessing laboratory data through to developing design parameters. Confidence will be achieved by minimizing presentations in favour of participants being guided through developing their own spreadsheets to model soil behaviour – an approach insisted on three decades ago by Peter Wroth as the only way to grasp CSSM and still valid today. Once working spreadsheets have been created, participants will be guided through calibration of soil properties and onto modelling sample disturbance.

Laboratory data will be provided on Fraser River sand for use by workshop participants, but participants are encouraged to bring their own triaxial data (test requirements will be circulated to registered participants before the



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workshop).

This workshop can be viewed as a further step from the May 2014 VGS short course by Professor Malcolm Bolton, and will focus on “how” rather than extended lectures about “what”. The models developed in the course will start with Original Cam Clay (the initial theoretical model) discussed by Professor Bolton, and then move on to NorSand (which works with real soils).



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REGISTRATION FORM

Date: Friday & Saturday, January 16 & 17, 2015
Time: 8:00 am to 5:30 pm
Location: Executive Inn, 4201 Lougheed Highway, Burnaby, BC V5C 3Y6 (Phone: 604-298-2010)

Breakfast & Lunch will be provided as well as beverages during morning and afternoon breaks.

Space is limited to **30** participants on a first come, first serve basis. The deadline for acceptance of mailed registrations is **January 10th, 2015**.

Please **MAIL** your completed registration form before the above deadline to The Vancouver Geotechnical Society:

Contact: Robyn Barnett, Tetra Tech EBA
 Email: Robyn.Barnett@tetrattech.com, Tel: 604-685-0275
 Address: Oceanic Plaza, 9th Floor, 1066 West Hastings Street, Vancouver, BC, V6E 3X2

Please enclose with your registration form a cheque with the appropriate registration sum payable to "The Vancouver Geotechnical Society".

No other forms of registration or payment method will be accepted. Registration will be considered valid only when this form and the cheque for the appropriate registration sum has been received and cleared.

Name: _____ Affiliation: _____

Daytime phone: _____ Email: _____

Cheque enclosed (all in Canadian Dollar):

VGS/CGS Members

Early Bird (before Dec 20th, 2014) \$375 Regular \$425

Non-Members

Early Bird (before Dec 20th, 2014) \$425 Regular \$475

Full-Time Students

Early Bird (before Dec 20th, 2014) \$175 Regular \$225

Cancellation of registration will not be accepted after **January 10, 2015**.

Registration fee includes breakfast, lunch and beverages during breaks. Course notes will be provided electronically. The course is credited with 15 hours of professional development.

For out of town registrants, rooms are available from \$120 (Deluxe Suites, QS/HCS/DDS/DD including wifi and parking) per night. If calling the hotel directly (604-298-2010) mention the VGS workshop.