



The Finnish Society for Rock Mechanics

presents

Short Course on

THE Q-SYSTEM IN ROCK ENGINEERING

**TWO DAY COURSE FOR GEOLOGISTS
AND ROCK ENGINEERS**



March 26-28, 2019

Espoo, Finland

General Info

The course focusses on the Q-system of rock mass characterization, the link between the Q-system and various design parameters, and support for underground constructions. The practical applications of the Q-system and some case studies will be presented. The course includes a tunnel mapping exercise.

The course will be given by **Dr. Nick Barton**, who is an internationally known and respected rock engineer, with 45 years of experience from hundreds of projects in 38 countries. These have mostly concerned rail and metro projects, also tunnels and caverns for hydropower, rock slope stability, major dam abutment and foundation stability, and nuclear waste disposal rock characterization studies in various countries.



He obtained a Ph.D. on rock slope stability from Imperial College, London in 1971. He worked for 25 years in the Norwegian Geotechnical Institute. He is author/co-author of more than 320 papers in technical journals and conference proceedings and has written two books.

He is the principal developer of the Q-system of rock mass characterization, and of a shear strength criterion for rock joints based on JRC and JCS, each widely used internationally. Since 2000 he has had his own international rock engineering consultancy, registered as Nick Barton & Associates in Oslo, and also has an office in São Paulo. In 2011 he gave the 6th Mueller Award Lecture of ISRM, in the Beijing ISRM congress.

Course content

This two day short course will cover the key elements of the lecturer's internationally applied developments in rock mechanics and rock engineering. The course will start with a thorough treatment of the Q-system of rock mass classification and its many site-interpretation and tunnel-design aspects. This system was developed mostly from hydropower-related tunnels and caverns, but was updated by Grimstad, with a lot of road tunnel cases in 1993.

International experiences will be reflected in numerous case record examples, often from hydropower projects, using rock joint characterization techniques and rock mass Q-system application, in its many possible forms.

The links between Q and seismic velocity will be explained. Mapping techniques, core logging interpretation, and so-called 'histogram-logging' will be emphasized as the most efficient way to collect site data, since variability can be treated realistically. Rock mass improvement techniques using pre-injection will be also be quantified, and effects on Q demonstrated.



Fundamentals of rock joint characterization, and coupled behaviour involving permeability, shear strength, and stiffness, will also be covered. Links to the strength of rock fill will also be indicated.

The *Q-slope* method will also be introduced, for estimating safe unsupported slope angles in jointed rock masses. The application of *Q* in the field of TBM prognosis, termed Q_{TBM} will also be described. The shear strength of rock masses has been linked to *Q*, and modelling using ‘ c then $\tan \phi$ ’ (degradation of ‘ c ’, then mobilization of $\tan \phi$) principles are suggested as a more realistic method when there is progressive failure. A method for estimating rock mass permeability termed Q_{H_2O} will also be described. This has links to pre-injection needs and its design for water-proofing tunnels.

On the third day, the attendees will have a chance to take part in a hands-on tunnel mapping exercise (1.5 h) with the assistance of Dr. Nick Barton and university staff. This exercise will be organized in the Test Tunnel at the campus of Aalto University in Espoo.

Who should attend the course?

The course is aimed at those working with geoenvironmental projects: rock engineers, geologists and students who wish to have a better knowledge of the *Q*-system and its use for different applications in rock construction. There is no requirement to be a specialist in the subjects to follow the well-illustrated lectures, but this is a higher-level course and background knowledge will be helpful.

Academic Credit

Course certificate will be issued containing a description of the program. Check with your supervising professor if academic credit is granted.

Course Materials

Electronic download link will be provided to download the course notes prior to the course.



Price

The price to attend is

- Participant 330 € (300€ ISRM/EAGE¹)
 - University students 110 € (100€ ISRM/EAGE¹)
- ¹) Discounted price to members of ISRM or EAGE.

Paying participants will receive tea and lunch vouchers for the cafeteria/restaurant in the same building (2 days).

Note! Only IBAN bank transfers are accepted. Receipts will be provided. Invoices will not be sent.

Registration

Register to the course latest March 22th using the link:

[>> REGISTRATION FORM <<](#)

Program

See the detailed program: [here](#).

Accommodation Info

Participants in the course arrange their own accommodation. Recommended options:

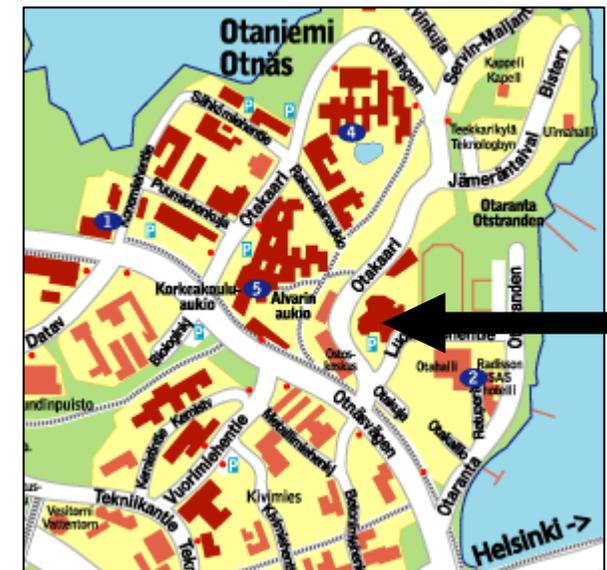
Radisson Blu Hotel Espoo is located 0.5 km from the Aalto campus. www.radissonblu.fi

Sokos Hotel Tapiola Garden is located 2.0 km from the Aalto campus, www.sokoshotels.fi

Eurohostel is located centrally in Helsinki, 11 km from the Aalto campus. www.eurohostel.eu

Course Venue

Lumituuli auditorium, Dipoli, Espoo, Finland
Otakaari 24, 02150 Espoo



Welcome to the course!

Questions regarding registration, payment and organizing matters can be directed to:

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