

# ITACET training course at the World Tunnel Congress

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9-10<sup>th</sup> June 2017, Bergen



Photo: Gunnar Kopperud



The easy tunnels are already built – leaving  
the challenging and interesting ones to you!

# WELCOME

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**The WTC 2017, the ITA-CET Committee and the ITA-CET Foundation have the pleasure of inviting you to the ITACET Training Course that has become a traditional part of the annual World Tunnel Congress. The 2017 WTC training course will focus on "Excavation and Support in Soft Ground Conditions" and will take place on the Friday and Saturday before the WTC, on the 9th-10th June at the University of Bergen.**

**The prime goal is to attract young professionals and students, with an interesting and useful program and world class speakers. The issues discussed will be of interest to professionals internationally.**

## **A worldwide development in soft ground tunnelling**

Tunnelling in Norway is dominated by typical hard rock conditions and unlined tunnels supported with sprayed concrete and rock bolts as the prime rock support methods. Despite this, hard rock tunneling has experienced soft ground in weak zones in between the surrounding hard rock. Sometimes these sections of soft or adverse ground can be tens of meters wide, requiring support and contingencies as if the tunnel were fully excavated in soft ground.

There has been an incredible worldwide development in soft ground tunneling and it is not a bold claim that the majority of ongoing tunnels worldwide is excavated in such circumstances.

## **The easy tunnels are already built – leaving the challenging and interesting ones to you!**

There is a global trend towards increasingly longer tunnels and underground projects are becoming more complex, often with a combination of hard rock and softer ground. This is both due to the higher requirements and expectations from society, the removal of technology limits and the fact that the geology is what it is when the tunnel alignment or cavern location has been decided. This is also seen in the Scandinavian tunneling industry, with some projects with extremely challenging geology coming up in the next years, including the world's deepest subsea tunnel and new urban infrastructure projects in mixed ground conditions.

Traditionally, there are two schools of tunneling, where one is associated with hard rock tunneling and the other with tunneling in soft rock/soil conditions. However, hard rock tunneling does not always involve hard rock and good rock conditions. Certain sections can be disrupted

by much softer ground conditions which are the extreme opposite to that of rock. Such varying conditions and extreme situations could benefit from experience gained from the school of soft ground tunneling. Consequently, tunnel engineers require knowledge of a variety of ground conditions that could occur during tunneling works, including excavation and support in soft ground conditions.

## **Top International Speakers!**

This course will bridge the gap between the schools of hard rock tunneling (which prevails in Norway and Scandinavia and many places around the world) and soft ground tunneling, by taking experience from soft ground conditions and applying it to the extreme needs that appear in hard rock tunneling from time to time.

To keep the lectures on a top international level, ITACET has invited speakers from major internationally recognized universities within the tunneling industry.

These international speakers have been invited to share their experience with you. Together with some of the most respected experts within their field, representing owners, suppliers and contractors, they will all be at your disposal for questions and discussions, an opportunity not to be missed!

The training course is also an ideal chance to network and meet other young tunnelers in a friendly, professional and collegial setting.

The price of this two-day course is 4500 NOK and you can register at [www.WTC2017.com](http://www.WTC2017.com)

# TENTATIVE PROGRAM

## Friday 9<sup>th</sup> June 2017

<b>08.30-09.00</b>	<b>Registration and morning Coffee</b>
<b>09.00-09.15</b>	Welcome, <i>T. Celestino/E. Grov</i>
<b>09.15-09.30</b>	Introduction to the course, and ITA initiative for training, <i>S. Log/R. Galler</i>
<b>09.30-10.00</b>	Defining soft/challenging ground – Geological aspects, <i>B. Nilsen</i>
<b>10.00-10.30</b>	History of soft ground tunneling, <i>M. Knights</i>
<b>10.30-11.15</b>	Principles of conventional tunnelling in soft ground, <i>N. Munfah</i>
<b>11.15-12.00</b>	Principles of mechanized tunnelling in soft ground, <i>T. Babendererde</i>
<b>12.00-13.00</b>	<b>Conventional excavation: auxiliary methods</b> <b>12.00:</b> High pressure grouting, pipe umbrella, jet grouting... <i>E. Grov</i> <b>12.40:</b> Freezing <i>A. Berggren</i>
<b>13.00-14.00</b>	<b>Lunch</b>
<b>14.00-15.00</b>	<b>Mechanized excavation: specific aspects</b> <b>14.00:</b> EPB vs Slurry TBM, <i>T. Babendererde</i> <b>14.30:</b> Hard rock TBMs in soft ground and dual mode, <i>B. Grothen</i>
<b>15.00-15.45</b>	Choice of the excavation method: mechanized or conventional? <i>R. Galler</i>
<b>15.45-17.30</b>	<b>Selected case studies on the presented topics: (20 mins each)</b> - Sao Paolo challenges, <i>P. Grasso</i> - Hallandsas, <i>F. Renault from Vinci</i> - Seattle Alaskan Way Tunnel, <i>N. Munfah</i> - The twin two-lane highway Tunnel Žilina in Slovakia, <i>R. Karel (M. Hrdina)</i>

## Saturday 10<sup>th</sup> June 2017

<b>08.30-09.00</b>	<b>Morning Coffee</b>
<b>09.00-09.15</b>	Welcome - recap from yesterday, <i>S. Log</i>
<b>09.15-10.00</b>	Future relevant projects in Soft/challenging Tunneling in Norway, <i>Amund Bruland NTNU</i>
<b>10.00-10.45</b>	Urban Soft Ground Tunnelling – Challenges and lessons learned, <i>E. Chiriotti (WG2 leader)</i>
<b>10.45-11.30</b>	Geotechnical investigations in soft ground - New developments, <i>P. Grasso</i>
<b>11.30-12.15</b>	Main parameters for design in conventional tunnelling, <i>F. Amberg</i>
<b>12.15-13.00</b>	Settlement control using soil conditioning in EPB tunnelling, <i>D. Peila</i>
<b>13.00-14.00</b>	<b>Lunch</b>
<b>14.00-15.30</b>	<b>Recent technological developments (18 min each max)</b> - bolting and support installation, <i>Normet - R. Dimmock</i> - grouting and soil reinforcement, <i>Mapei - E. D. Negro</i> - shotcrete and immediate support, <i>Sika - E. Schumperli</i> - waterproofing, <i>ASF - K.G. Holter</i> - contribution of fibers for efficient lining, <i>Bekaert</i>
<b>15.30-17.00</b>	<b>Exchanges - Panel discussion with experts</b> - The technological limits in the current methods? Lengths, pressures etc., <i>P. Grasso</i> - How to make the tunnel construction more eco-friendly? <i>R. Galler</i> - Can we manage all kind of risks? The limits of the design and calculation methods, <i>D. Peila</i>
<b>17.00-17.30</b>	Recap of the two days, conclusions and Farewell, <i>Log / Grov</i>

WE LOOK  
FORWARD TO  
SEEING YOU IN  
**BERGEN!**



Register at [www.WTC2017.com](http://www.WTC2017.com)