ITA – AITES General Assembly and World Tunnel Congress

BERGEN
Norway 9 – 15 June 2017

PROGRAM
SURFACE CHALLENGES
UNDERGROUND SOLUTIONS
Worldwide there is a quest for urban space driven by the increasing urbanization. According to the ITACUS white paper (2010) more than half of the world’s population lives in urban areas.

The challenges are numerous and availability of space for necessary infrastructure is crucial. The underground is at present only marginally utilized. The potential for extended and improved utilization is enormous.

“Surface challenges – Underground solutions” is more than a slogan; for ITA-AITES and its members it is a challenge and commitment to contribute to sustainable development.
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WELCOME TO WTC 2017
Dear Colleagues, Dear Friends

The World Tunnel Congress 2017 and ITA 43rd General Assembly will be held in Bergen, Norway, from June 9 to 15. Norway is the country with the highest ratio in the world of tunnel length per inhabitant for civil engineering purposes. The presence of the Crown Prince in the event is a clear indication of the importance of the underground construction industry in Norway. The intense use of the underground space will certainly be a message to be taken home by many attendees in addition to the new information which will be made available during the congress, Working Group and Committee meetings. Fifteen well selected topics cover a wide range of potential interests, ranging from local flavour – like underwater tunnels and utilization of underground for energy – to seismic design of underground excavations.

The numbers available so far point towards a remarkable success. About 340 full papers were accepted after careful selection from several hundred abstracts submitted. All the exhibitor’s booths have been sold, which also indicates the real possibility of first-hand information about new products and networking.

The topic of the Open Session will be “Rethinking major infrastructures: a new look at underground solutions and public acceptance”. It is at the intersection of two major concerns of ITA: the need for underground works for the infrastructure and the reaction by the public, not always favourable at the beginning. It is our role not only to propose, design and construct underground facilities, but also to come up with how to approach the affected population. The lessons from some recent successful case histories in very sensitive areas must be learned.

The WTC is also the occasion for all the Working Groups and Committees to hold face-to-face meetings and consolidate a solid step of the progress of their work along the past year. The event is, for many reasons, the appropriate forum for establishing solid bases for the actions which have lead the global underground construction industry to a steady and solid increase in the past years. It is our role to consolidate this trend. For that purpose, I wish all the attendees a very successful congress.

I welcome you all to Bergen!

Sao Paulo, May 11, 2017

Tarcisio B. Celestino
ITA President
The Norwegian Tunnelling Society (NFF) is honoured to welcome you to the ITA-AITES World Tunnel Congress here in Bergen. Bergen is the capital of the West Coast of Norway, situated between «The 7 mountains». The city is well known for trading fish to Europe for almost a 1000 years.

Norway, and especially the West Coast, is known for high mountains, deep valleys and long fjords. Norway is also enriched with a lot of rain. This gives the opportunity for hydropower and Norway is self-sufficient with 100 % renewable energy. The production of hydropower in Norway is challenging and excavation of tunnels has been necessary. Together with the demand for good infrastructure, a lot of road- and railroad tunnels have been built. Almost 7000 km tunnels have been excavated in Norway and that means that every inhabitant is the «owner» of almost 1,3 meter tunnel!

Innovation has always been an important part of our culture. A lot of the technology for the tunnelling industry has been developed in our country. The Norwegian Tunnelling Society has chosen to use «Surface Challenges - Underground Solutions» as a slogan for the World Tunnel Congress this year. In urban areas the use of surface will have an increasing value. The lack of new urban space will demand a more efficient use of the underground. The tunnel industry has many of the answers for solving these challenges. And our industry is very important for the Green shift.

At ITA-AITES World Tunnel Congress in Bergen you will meet many of the leading tunnel experts of the world. This is a unique possibility for sharing knowledge and experience.

The Norwegian Tunnelling Society wishes you warmly welcome to WTC 2017.

Frode Nilsen
President
Norwegian Tunnelling Society
Dear WTC attendees,

On behalf of the city of Bergen I wish to thank the member nations of the International Tunneling and Underground Space Association for choosing Bergen as host to the joint World Tunneling Congress this year.

It is a pleasure to give you all a warm welcome to Bergen! A city surrounded with seven mountains and a city known to be “the gateway to the magnificent fjords of Norway”. Norway is known for our rich nature, deep fjords, high mountains and midnight sun. However, this demography is also the exact reason for why communication and infrastructure has been, and still can be somewhat challenging.

The same landscape that has attracted millions of tourists has also produced a tunneling community of global standing. Underground construction in Norway is a creative, flexible and solution-oriented industry with advanced technological competence, and years of valuable experience.

Bergen is an international city, packed with history and culture. In the mid-13th century, Bergen became an important European city of trade, as the Hanseatic League opened one of their offices on the wharf – which we call “Bryggen”. This made Bergen into a European hub of commerce, seafaring and craftsmanship. Back then, the ocean and the infrastructure on the sea made it possible to communicate with Europe and the rest of the world. Today, our region has several world leading tunnels that connect our businesses’, products, and people not only with the rest of our country but also the rest of the international community.

I wish you all the best and good luck with the WTC congress of 2017 “Surface challenges – underground solutions”!

Marte Mjøs Persen
Mayor of Bergen
Download the WTC 2017 app to stay informed during the congress!

HOW TO DOWNLOAD:
Simply scan this QR-code or search for WTC 2017 in Google Play or App Store
We proudly presents our sponsors for this years WTC!

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![utt](image2)

![MAPEI](image3)

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![HERRENKNECHT](image4)

![Marti AS](image5)

![ORICA](image6)

![PRETEC](image7)

![SANDVIK](image8)
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SWS Innovation in underground infrastructure

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STETEBAG

WEBAC
GENERAL INFORMATION

LOCATION INFORMATION

All technical sessions and exhibition will be conducted at:
Venue: Grieghallen.
Address: Edvard Griegs Plass 1, Bergen, Norway.
www.grieghallen.no

ITACET Training Course will be conducted at:
Venue: The Natural Science Building (Norwegian: Realfagbygget). The building is a part of the Faculty of Mathematics and Natural Sciences at the University of Bergen.
Address: Allégaten 41, Bergen, Norway.
www.uib.no/eia/77784/realfagbygget

REGISTRATION HOURS

Attendee & Exhibitor Registration & Secretariat Hours
Location: Grieghallen, Main entrance – Secretariat Area
Saturday 10 June: 13:00-18:00
Sunday 11 June: 07:30-18:00
Monday 12 June: 07:30-18:00
Tuesday 13 June: 07:30-19:00
Wednesday 14 June: 07:30-18:00

The Registration desk will be staffed by the PCO First United AS. Tel: + 47 55 23 00 70

ITACET TRAINING COURSE REGISTRATION

Location: The Natural Science Building, University of Bergen
Friday 09 June: 08:30-09:00
Saturday 10 June: 08:30-09:00

The Training course registration will be staffed by Program Committee representatives. Contact: +47 48 29 87 92 Sindre Log or +47 95 14 41 04 Eivind Grøv

EXHIBITION HOURS

Exhibition Halls Opening Hours:
Monday 12 June: 10:15-17:00
Tuesday 13 June: 09:00-19:00
Wednesday 14 June: 09:00-15:30
INTERNET

A complimentary Wifi network is set up throughout the Grieghallen venue, including the Exhibition Halls.

Name of network: Master Builders Solutions
Password: BASFwtc2017

PRESS ROOM & INTERVIEW ROOM

Location: Grieghallen, Main Entrance / Secretariat Area

The Press Room and the Interview Room will be available to all accredited media journalists. The press room will be furnished with works space and printers. The Interview room is reserved for interviews and will have a Media vanity wall.

Opening Hours:
Monday 12 June: 07:30-18:00
Tuesday 13 June: 07:30-18:00
Wednesday 14 June: 07:30-18:00

ORAL PRESENTERS COFFEE & SPEAKER-READY ROOM

Oral presenters’ Morning Coffee brief:
All orally presenting authors and session chairs should attend the coffee in the morning on the day of their presentation. An important speaker’s briefs will be given by the Program Committee representatives.

Location: Grieghallen, Main Entrance / Secretariat Area
Room signed: Speaker’s Lounge

Briefing times:
Monday 12 June: 07:30-08:30
Tuesday 13 June: 07:30-08:30
Wednesday 14 June: 07:30-08:30

Speaker-Ready Room:
Speakers can check or submit their presentation in advance in this room. It will be staffed by technicians. Oral presenters are asked to bring it to the Speaker Ready room to ensure the quality of their presentation(s) including fonts,
bullets, outlines, animations, etc. The Speaker Ready Room computers are configured with the same hardware and software as those in the presentation rooms. All presenters are asked to submit their final presentation revisions no later than 4 hours prior to their presentation time.

Location: Grieghallen, Main Entrance / Secretariat Area
Room signed: Speaker’s Lounge

Opening Hours:
Monday 12 June: 07:30-18:00
Tuesday 13 June: 07:30-19:00
Wednesday 14 June: 07:30-18:00

REGISTRATION INFORMATION
After 1 April 2017 on-site registration fees apply. Full payment MUST accompany the completed Onsite Registration Form. Payment is to be made in NOK currency.

REGISTRATION POLICY
All attendees, authors, and exhibitors of the WTC 2017 World Tunnel Congress are required to register. Badges are required for admittance to all technical sessions, exhibits, and social functions. Those who have not brought the pre-arrival badge pdf can have it printed at the WTC 2017 Registration Desks in Grieghallen.

CANCELLATIONS/SUBSTITUTION POLICY
If circumstances require you to cancel your World Tunnel Congress registration, you must do so in writing. Written notice must be sent to the PCO First United at pco@firstunited.no

Congress Fee cancellation terms:
Cancellations received before 1 May 2017 will be honored with a full refund. Cancellations after 1 May 2017 or for non-attendance will not be subject to refund consideration. In case of questions – please contact the PCO First United AS on pco@firstunited.no or call: +47 55 23 00 70
Hotel Reservations:
Registrants are responsible for cancellation of their hotel accommodations. If hotels reservations have been made through the PCO First United, please contact the PCO First United AS on pco@firstunited.no or call: +47 55 23 00 70

Hotel reservations cancellation terms:
Due to the special conditions of the event, the first deposit is non-refundable. You may change the number of nights online until 31 May 2017. The full hotel reservation value is non-refundable after 1 June 2017. All cancellations must be made in writing to the PCO on pco@firstunited.no

AUDIO/VIDEOTAPING, DIGITAL RECORDING, AND PHOTOGRAPHY

Because all presentations and associated materials are the speakers’ intellectual property, please obtain the speakers’ permission to record their session or activity in any medium. The WTC 2017 hosts and Organizers and their representatives reserves the right to ask any attendee to move within or to leave a session venue if their use of technology is disruptive to speakers or other attendees.

WTC MORNING RUN

ITA Young Members invite you all to the morning run:
Starts at Grieghallen
Monday 12 June at 6.30AM
Wednesday 14 June at 7.00AM
Moderate speed, manageable length

WTC CONGRESS PUB

Zachariasbryggen – Address: Torget 2

WTC APP

To download, search for WTC 2017 in your Google Play or Apple App store or simply scan this QR code.
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PROGRAM

WTC 2017
Podium and Poster Presentations
The 2017 WTC Technical Program includes more than 300 podium and poster presentations from more than 40 countries.

The full-length manuscripts for all presentations are contained on a USB in your backpack. You may order a hard copy of the proceedings, as a print-on-demand for an additional charge.

Abstracts of all manuscripts are printed in full in The Book of Abstracts, also found in your backpack. The congress backpack is a quality gift to you from NFF, made possible by NFF and sponsors; Normet, Mapei and Forcit. Backpacks are common in Norway for use in school, at work, for hiking and travel. Bring it home as a souvenir.

Please refer to Technical Sessions At-a-Glance for a quick review of the technical sessions for each day. The schedule for the Poster sessions is listed in the program for each day. Posters will be displayed in the hall outside the main Concert Hall at the hours given in this program or app.

Poster authors will be present from 15:00–16:00 in the afternoon sessions every day to answer questions and discuss their paper/poster. On the poster sessions Wednesday morning the authors will be present from 10.30-11.30.

We hope you will enjoy many interesting presentations during these days in Bergen.
WTC 2017 Registration starting 07:30am

**Monday, 12th**
- **09:00** to **09:30**: Technical Session (hosted by ITA-AITES)
- **10:00** to **10:30**: Technical Session (hosted by ITA-
  TESF)
- **11:00** to **11:30**: Technical Session (hosted by ITA-
  EU)
- **12:00** to **12:30**: Technical Session (hosted by ITA-
  TECH)
- **13:00** to **13:30**: Technical Session (1 parallel)

**Tuesday, 13th**
- **09:00** to **09:30**: Technical Session (hosted by ITA-
  COE)
- **10:00** to **10:30**: Technical Session (hosted by ITA-
  US)
- **11:00** to **11:30**: Technical Session (hosted by ITA-
  TECH)
- **12:00** to **12:30**: Technical Session (3 parallels)

**Wednesday, 14th**
- **09:00** to **09:30**: Technical Session (hosted by ITA-
  TECH)
- **10:00** to **10:30**: Technical Session (hosted by ITA-
  TECH)
- **11:00** to **11:30**: Technical Session (hosted by ITA-
  TECH)
- **12:00** to **12:30**: Technical Session (hosted by ITA-
  TECH)

**Thursday, 15th**
- **09:00** to **09:30**: Technical Session (hosted by ITA-
  TECH)
- **10:00** to **10:30**: Technical Session (hosted by ITA-
  TECH)
- **11:00** to **11:30**: Technical Session (hosted by ITA-
  TECH)
- **12:00** to **12:30**: Technical Session (hosted by ITA-
  TECH)

**Friday, 16th**
- **09:00** to **09:30**: Technical Session (hosted by ITA-
  TECH)
- **10:00** to **10:30**: Technical Session (hosted by ITA-
  TECH)
- **11:00** to **11:30**: Technical Session (hosted by ITA-
  TECH)
- **12:00** to **12:30**: Technical Session (hosted by ITA-
  TECH)

**Saturday, 17th**
- **09:00** to **09:30**: Technical Session (hosted by ITA-
  TECH)
- **10:00** to **10:30**: Technical Session (hosted by ITA-
  TECH)
- **11:00** to **11:30**: Technical Session (hosted by ITA-
  TECH)
- **12:00** to **12:30**: Technical Session (hosted by ITA-
  TECH)
CONFERENCE MAP

- **Poster Wall Area**
- **Per Gynt Sal** (Lecture hall)
- **Concert Hall** (Lecture hall)
- **Stage** (Lecture hall)
- **Outside Main Entrance**
- **Troldtog** (Lecture hall)
- **Level 3**
- **Level 2**
- **Level 1**
- **Level 0**

- **Svane**
- **Øvingsrom 305**
- **Bekken**
- **Hallen**
- **Nina**
- **Peer Gynt Foyer 1**
- **Foyer 2 GH**
- **Peer Gynt Foyer 2**
- **Bøygen**
- **Hobergsuiten**
- **Sulamitten**
- **Glassrommet**
- **Klokkeklang**
- **Småtroll**
- **Gjendine**

- **Klokkeklang Troldtog Per Gynt HallConcert Hall Stage**
- **Outside Main Entrance**

- **Level 0**
- **Level 1**
- **Level 2**
- **Level 3**

- **Concert Hall**
- **Stage**
- **Per Gynt Hall**
- **Klokkeklang**
- **Troldtog**
- **Poster Wall Area**
- **Outside Main Entrance**

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We invite all WTC participants and their accompanying persons to join us at the Welcome Reception in the Foyer 2 Spissen in Grieghallen. There you may network with colleagues and friends while appetizers and cocktails are served.

Attire: smart casual.

This reception is included in the registration fee.
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>07:30</td>
<td>WTC 2017 Registration (07:30-08:30)</td>
</tr>
</tbody>
</table>
| 08:55-13:00 | Opening ceremony  
Moderator: Arne Hjeltnes |
| 08:55  | All to be seated, door closed                                          |
| 08:58  | H.K.H Crown Prince Haakon Magnus arrives  
Arne Hjeltnes            |
| 09:00  | Cultural performance - Holbergssuiten Grieg  
Musicians from Bergen Philharmonic Orchestra |
| 09:05  | Opening speech by H.K.H Crown Prince Haakon Magnus                   |
| 09:10  | Introduction by the Conferencier  
Arne Hjeltnes              |
| 09:15  | Welcome to Norway by NFF  
Frode Nilsen                   |
| 09:22  | Welcome to WTC2017 and ITA General Assembly  
Tarcisio Celestino          |
| 09:30  | Welcome to WTC2017 by Political Norway  
Tom Christer Nilsen          |
| 09:40  | “View on tunneling in Norway”  
Arne Hjeltnes                |
| 10:00  | Cultural performance - Slideshow followed by Holbersuite by Grieg  
Musicians from Bergen Philharmonic Orchestra  
Photo by Audun Rikardsen  
Production by Dag Vidar Hopey  
(Parkas Production AS) |
| 10:15  | Coffee break and opening of exhibition                                |
| 10:45  | WTC Platinum sponsors introduction                                  |
| 10:50  | Sir Muir Wood lecture: Geological uncertainties in tunnelling - Risk Assessment and Quality Assurance  
Håkan Stille, Introduced by the ITA-president |

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:35</td>
<td><strong>Selected paper: “The factors affecting the performance of three different TBMs in a complex geology in Istanbul”</strong></td>
<td>Nuh Bilgin</td>
</tr>
<tr>
<td>11:50</td>
<td><strong>Coffee break</strong></td>
<td></td>
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MONDAY 12 JUNE

PROGRAM

14:00-17:00  **Technical Session 3: Innovations in drill & blast tunnelling**
This session covers a range of recent developments within different technologies for drill-and-blast excavation of tunnels, such as scanning and 3D image technology for geometrical control and geological mapping, drilling patterns and detonator initiation technology, blast vibration control, conveyor belt muck transportation, as well as utilization of measurements while drilling (MWD) parameters.

14:00-17:00  **Technical Session 4: Tunnelling for energy and environmental purposes**
This session has main focus on contributions related to underground hydropower projects and repositories for nuclear waste. Important aspects of hydropower tunnelling are covered, such as containment of unlined pressure tunnels, issues related to first filling of unlined waterways and head loss due to tunnel roughness. The presentations on nuclear waste have main focus on risk issues and on research being conducted at underground laboratories in different countries.

14:00-17:00  **Posters on Technical Session 1, 2 and 3**

14:00-16:00  **Technical Site Visit - Group 1**

15:00-18:00  **Press trip to Ulriken TBM**

16:00-18:00  **Technical Site Visit - Group 2**

19:00-22:00  **ITA-AITES Young Members Reception**  
(For all participants under 35)  
Ole Bull Huset  
Address: Øvre Ole Bullsplass 3

Concert Hall  Per Gynt Hall  Poster Wall Area  Klokkeklang  Stage  Outside Main Entrance
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00-14:20</td>
<td>Technical Session 1: Urban Tunnelling</td>
<td>Chair: Eli Morgan, Vice Chair: Martin Knights, Damian Mc Garr</td>
</tr>
<tr>
<td></td>
<td>Surface challenges and underground solutions – The Follo Line project</td>
<td>Fernando Vara</td>
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<td>Applicability of Rock Mass Classifications for TBM Performance Prediction</td>
<td>Alireza Salimi</td>
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<td>with Focus on RMR</td>
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<td>The Follo Line project – The use of a new excavation system for TBM</td>
<td>Oliver Schneider</td>
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<td>in a drill &amp; blast excavation</td>
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<td>14:20-14:40</td>
<td>Technical Session 2: Mechanized Tunnelling in Hard Rock Conditions</td>
<td>Chair: Amund Bruland, Vice Chair: Lars Vedel/TPA</td>
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<td></td>
<td>Redesign of the rock support in the bus ramps</td>
<td>Beatrice Lindstrom</td>
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<td>Due to changing geology</td>
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<td>Applicability of the new rock abrasivity test method for cutter life</td>
<td>Francisco Javier Macias</td>
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<td>assessments in hard rock conditions</td>
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<td>Recent advances in geologic mapping in drill &amp; blast</td>
<td>Markus Pötsch</td>
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<td>Tunnelling through recently unconsolidated material in the SWFLO Hydro</td>
<td>Nichole Boullbee</td>
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<td>Planning, design and construction of the WestConnex underground motorway</td>
<td>Charles MacDonald</td>
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<td>project, Sydney, Australia</td>
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<td>TBM performance prediction using PLCM and comparison with TBM field</td>
<td>Cemal Balci</td>
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<td>14:40-15:00</td>
<td>Technical Session 3: Innovations in Drill &amp; Blast Tunnelling</td>
<td>Chair: Pär Lidholm, Vice Chair: Janne Myhr/Constanza</td>
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<td>First filling of hydraulic tunnels of the Venda Nova III hydropower</td>
<td>Carlos Esteves</td>
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<td>Drill plan handling for increasing the quality of the excavated tunnel</td>
<td>Nichole Boullbee</td>
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<td>15:00-15:20</td>
<td>Technical Session 4: Tunnelling for Energy and Environmental Purposes</td>
<td>Chair: Øyvind Engeset, Vice Chair: Harvey Parker/Jørn Tonnon</td>
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<td>Optimized Design and Construction of Nor-</td>
<td>Ola Woldmo</td>
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<td>Monday 12 June 12:00-12:20</td>
<td>Katrine Falbe-Hansen</td>
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3D FEM analysis on the measured earth pressure on lining considering initial ground displacement
Salisa Chaiyaput

A new software for the design of presupports in conventional tunneling with risk analysis method.
Nicolas Gilleron

A novel construction plan of Beijing subway construction
Xinggao Li

Analysis of Safety Issues and Installation Time of Innovative Pipe Umbrella Installation Methods
Guenther Volkmann

Back Analysis Of Brusnice Tunnel Based On Neural Networks
Jan Pruska

Back Analysis of Monitoring Data for Underground Stations of Jakarta MRT Project
Narentorn Yingyongrattanakul

BIM-to-FEM: Incorporating Numerical Simulations into BIM Concepts with Application to the Wehrhahn-Line Metro in Dusseldorf
Markus Scheffer

Bottom-up excavation near existing roads Case study of M4 Metro Line Extension
Catalin Boroianu

Box Tunnel under XVII-th century arch Trujillo bridge at Lima (Peru)
Xavier Gost Mayans

Challenges regarding ventilation, aerodynamics and climate of Stuttgart 21
Peter Reike

Collapse Mechanism of Tunnel below Underground Structure
Ho-Jong Kim

Composite tunnel linings, allowing a more cost effective and sustainable tunnel design
Hyuk-il Jung

Computer Aided Steel-Fiber Reinforced Segment Design Using a Multi-Scale Modeling Framework
Vojtech Gall

Construction of highway tunnel with the renovation of the railroad viaduct
Keigo Gunji

Copenhagen Cityringen Project: Passage with minimum cover under historical building - compensation and jet grouting as mitigation measures and TBM operation
Antonio Raschilla

Cross Passages construction in soft soil by RCC Box Pushing in MRTS
Alvaro Casasus

Cross-passage opening in TBM tunnels concepts, load-bearing behaviour and experimental investigations
Oliver Fischer
POSTERS
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Delhi Underground Metro Phase3. Planning and Construction in an urban environment
Pramod Ahuja

Design and Construction Challenges of a Major CSO Tunnel and Pump Station System in Indianapolis
Verya Nasri

Design and Optimization of the 8,800 long Bossler Tunnel for the Highspeed Railway Line Stuttgart 21
Conrad Prof. Dr.-Ing. Boley

Experiment Study on Ground Suitability for EPB Shield Tunneling in Silty Sand Stratum
Chi-Hao Cheng

Helsinki City Rail Loop: Urban Shallow Tunnel Railway Design in Hard Rock
Arto Wegelius

Implementation of 3D-models as construction document for the building contracts.
Bo Larsson Gruber

Influence of creep on bursting resistance of plain and fibre reinforced concrete
Erik Bernard

Influence of Structural Openings on the Behavior of Existing Structures
Hiroyuki Minakami

Interceptor along the Emscher Successful implementation of a major project for the structural transformation in the Ruhr area using the smallest EBP TBM in the world
Norbert Stratemeier

Isolation structure in Ring Rail Line
Klaus Einsalo

Load-Bearing and Bonding Behaviour of Hybrid Concrete Tunnel Lining Segments
M.Sc. Sven Plückelmann

Mechanical behaviour of quasi-rectangular segmental tunnel lining: further insights from full-scale ring tests
Xian Liu

New RBS Railway Station: The excavation of two large shallow caverns below the Railway Main Station of Bern (Switzerland)
Marco Ramoni

Numerical back-analysis in mixed face condition: the Lyon Metro B extension project
Gabriele Giordano

Performance Analysis of Different Radial Joint Shapes in Segmental Tunnel Lining
Reza R. Osgouei

Precast tunnel segment: experimental tests of longitudinal joints
Gerald Schmidt-Thró

Predicting the range of volume loss in shallow tunnelling
Minh Ngan VU

Prediction of volume settlement trough due to tunneling in sands
Eshagh Namazi
Protection of Adjacent Buildings Due to Mixshield Tunnelling in Mixed Ground with Round Gravel and Mudstone
Qiang Wang

Qatar Rail, Doha Metro Gold Line Project / Assessment of TBM breaking-in activity to Souq Waqif station under adverse conditions
Spiros Massinas

Realization Of The Nordfjordur Tunnel, Iceland
Aleš Gothard

Rock Engineering Challenges in Finnoo Metro Station area, Espoo, Finland
Ulla Sipola

SCL Design Optimisation at Bank - A combined lining approach
Ali Nasekhian

Shotcrete Excavations in Cohesionless Soils Comparison of Different Methods for the Reduction of Settlements
Jochen Fillibeck

Subway Tunnel Construction In Karstic Geology: The Application of the Roadheader Method
Xuehui Zhang

Super-large Diameter Slurry Shield Tunneling in Rock-Soil Mixed Ground under 0.72MPa Pressure: A Case Study of Nanjing Yangtze River (Weisan Road) Tunnel
Qing Yang

Surface challenges and underground solutions for the project “Ringenksbanen - E16”
Morten Klokkersveen

Surface challenges resulting in underground solutions at various locations along the route of the UK’s new High Speed Railway (HS2) for 21st Century
Colin Rawlings

The complex design of two tunnels under archeological remnants in urban area: planning and measurements of a particular case
Gianpiero Russo

The Impact of Evolving Requirements for Fire Safety and Emergency Planning on the Configuration of Underground Metro Systems
Mike Deevy

The influence of constitutive models on the mechanical behavior of conventional shallow overburden tunnel
Muhammad Shehzad Khalid

The new tunnel construction method applying both cast-in-place concrete linings and segment linings by a single TBM
Tsunaki Ueda

The underpass of MS subway at the intersection with the underground Domodossola Railway Station in Milan
Elena Rovetto

Tunneling Alternatives below Syracuse, New York
Alireza Ayoubian
POSTERS
(on Technical Session 1, 2 and 3)

Tunneling induced settlements in saturated soils under transient condition
Paolo Perazzelli

Tunneling through an underground maze in the Ekeberg hill
Hanne Wiig Sagen

Tunnelling of highly gradients tunnels near critical infrastructures
Rita Sanfilippo

Urban Challenges of the Downtown Los Angeles Regional Connector Tunnel Project
Willikam Hansmire

Warsaw metro Line 2 - TBM Excavation in difficult condition: The underpass of Vistola river
Andrea Canzoneri

Water Infiltration and Crack Control for Tunnel Concrete Lining
Mehdi Bakhshi

Waterjet rock cutting performance for rock excavation in urban area
Tae-Min Oh

A Design Framework for TBM Face Equilibrium in Permeable Ground
Tiago Dias

A new approach for the prediction of TBM penetration rate based on Particle Swarm Optimization (PSO)
Seyedamirasad Fatemi

Brief Introduction Of The First Quasi Rectangular Shield Tunnel In China
Chen Jixiang

Case study of cutterhead selection and cutting tools configuration of shield machines in sandy cobble stratum
Dajun Yuan

Copenhagen Cityringen Project - Shield blockage events: causes, management and solutions
Valerio Violo

Drill and split, a feasible option to careful blasting
Hanne Wiig Sagen

Effect of Conditioning on Soil Workability determined by Mini-Slump and Flow Table Tests
Hanifi Copur

Effect of the face support pressure on tunnelling-induced ground movements
Dimitrios Litsas

Effects of the ground water pressure in the surrounding of cross passage openings with segmental concrete lining
Isabel Reig

Evaluation of settlement behaviour during EPB shield TBM tunneling in soft ground
Sang-Hwan Kim

Evaluation of the effect of muck Shape and Size on performance of TBM - A Case Study of Golab II Water Transfer Tunnel
Jafar Khademi Hamidi
POSTERS
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Feasibility analysis for the use of fiber reinforced concrete precast segment in nonskra hydraulic tunnels
Benoit De Rivaz

From tail void grouting to real time steering of TBMs: Selected results from the Collaborative Research Project Interaction Modeling in Mechanized Tunneling
Günther Meschke

Importance of face pressure and tail void grouting on numerical modeling of shield TBM tunneling through soft ground formation
Kiseok Kim

Launching Structures For Tbm Tunnelling. Design And Purpose.
Luis Pinillos Lorenzana

New abrasion test (NAT) for the evaluation of hard-rock TBM cutter life
Ebrahim Farrokh

Practical Considerations for Designing Rock Support for Tunnel Linings in Open Gripper TBMs
Bruce Ashcroft

Practical Relevance of Rheology of Foam-conditioned Sands in EPB Tunneling
Mario Galli

Predicting Roadheader Performance by using Portable Linear Cutting Machine
Can Polat

Project control by using the NTNU model methodology: The new Ulriken Tunnel
Francisco Javier Macias

Raise Boring Machine performance in the Yusufeli Dam and HEPP Project
Aydin Shaterpour Mamaghani

Replacement of PFA in bi-component annulus grouting applications
Ryan Griffith

Rock breaking under the disc cutters of a TBM - A part of the reasearch project FAST-Tunn
Solveig Vassenden

Rondout West Branch Bypass Tunnel Advancements in Mechanized Excavation A TBM Boring in hard rock against high water pressure and high water inflows beneath the Hudson River in New York
Tyler Sandell

Separation of used bentonite suspensions in slurry shield tunneling: improvement of depositing costs by introduction of a new method
Ivan Popovic

Singapore’s Slurry TBMs The Slurry
Enrico dal negro

Solutions for minimization the soil settlement using EPBM innovations
Sergey Mazein

Study on short and long term effects of chemicals on fine-grained soils for mecha-nized tunneling
Diego Sebastiani
POSTERS
(on Technical Session 1, 2 and 3)

Successful EPB-Tunnel Drives with Conditioning Agents based on Laboratory Research
Dipl.-Mineraloge Eugen Kleen

The application of ductile yielding elements for precast lining segments
Michael Henzinger

The Brenner Base Tunnel, Overview and TBM Specifications at the Austrian Side
Michael Rehbock-Sander

The Largest Tunnel In Freshly Consolidated Soft Soil: Tuen Mun Chek Lap Kok Project
Thibaut Lockhart

The surge shafts of Venda Nova III hydropower surge tank – geological conditions and constructive solutions
Tiago Marques

The TBM return to Norway at Røssåga HEPP – TBM operation through extremely hard rock, karstic features and other challenges
Sindre Log

Gian Luca Menchini

Wear prediction and maintenance frequencies of slurry pipes for TBM tunneling
Tae Young Ko

Application of an Electric Rock Breaking method to mitigate vibration during tunnel blasting
Jun Lee
TUESDAY 13 JUNE

PROGRAM

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<tr>
<td>07:30</td>
<td>WTC 2017 Registration (07:30-08:30)</td>
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<tr>
<td>09:30-09:40</td>
<td>ITACET Foundation awards presented to Nepal Tunnelling Association and to Dr Martin Herrenknecht</td>
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It is often said; the easiest infrastructure projects have already been built. Nevertheless; undertaking a major project tends to be increasingly challenging, both because of technical and financial considerations, but also because public acceptance tends to be more at stake in modern infrastructure development. From this perspective, tunneling and underground technologies may contribute to provide solutions to meet these challenges and facilitate the implementation process. Communication, understanding and respect might also become important elements in addition to technical understanding and knowledge to undertake a major underground infrastructure project.

During this Open session, owners, contractors, and experts involved in major projects over the world will share their experience and comment on the issues faced when implementing new infrastructure and lessons learned from these experiences.

Jean-Christophe Giesbert will be the moderator of this Open Session.

- The public acceptance issue for the new European railway connection between Italy and France, Lyon-Turin
  Mr Mario Virano General, CEO of TELT (Tunnel EuroAlpin Lyon Turin)
- Biggest investment in infrastructure in the Faroe Island ever, Subsea tunneling in the Faroe Island, Mr Teitur Samuelsen: CEO of the infrastructure company P/F Eytur og Sandoyartunlar
- Experience from the Deutche Bahn
  Mr Heinz Ehrbar, Deutche Bahn
- Debate – How to get acceptance for important major projects
• Relocation of Shatin Sewage Treatment Works to Caverns
  
  Project manager Robert Chan

• Environmental planning, tailor-made mitigations and communication as important project tools for public understanding. Major rail projects in Norway.
  
  Project Manager Mrs Anne Kathrine Kalager, Bane Nor

• Experience of the radioactive waste disposal facility construction in Korea
  
  Mr Lee, Seung-Hyun, manager, KORAD

• New York City’s Second Avenue Subway, the social, technical, political and commercial benefits and decisions made
  
  Mr Brian Fulcher

• Debate - How tunneling technology may improve acceptance in the public during planning and execution

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09:30 Exhibitions open

13:00 Lunch (13:00-14:00)

14:00-17:00 Technical session 5: ITATECH – Innovations in drill, blast and rock support

In the ITA-TECH session you will gain insights from six key innovations within D&B, and Rock Support. In the rock support half we will share test results from load sharing between primary and secondary linings and discuss the benefits in terms of structural lining thickness. Additionally we will give some key insights on in-situ pressure measurements during pre-excavation grouting in rock tunnels, and discuss the design philosophy of and for permanent sprayed concrete linings. The D&B half will deal with - How to investigate blasting damage, and experiences from using conveyer belts for mucking in tunnelling. Finally - D&B vibration monitoring and prediction, at the Borzoli Erzelli Tunnel will be presented. The session will include interaction with the audience and be moderated by two of our prime sponsors from Robbins Company and BASF.
The ITACUS session during WTC 2017 focuses on underground space and how we together can work towards an urban underground future. We will hear from experts on new concepts involving underground space planning, design and policy. We will discuss what actions are required to ensure that underground space becomes part of urban planning and engineering. This is the core value at the heart of ITA-CUS activities. During the session, we will look at how you can get involved with these activities and use them to stimulate awareness on underground space in your own working environment.

Technical session 7: ITACOSUF – New security challenges for design and operation
The presentations in ITA-COSUF will be given by internationally leading experts and the workshop will be divided in two parts, Case studies and Hazard identifications. The case studies will include presentations about how different threats can be identified and what is the impact of human factors in case of disaster and terror. The hazard identification part will tackle topics like assessing the impact of hazardous goods in tunnels and what is the impact of explosions to the underground structure.

Technical session 8: Tunnelling in adverse ground conditions
Main focus of this session will be difficult ground conditions including poor ground and adverse water ingress conditions in a hard rock case. Recent examples from the alpine base tunnel projects Gotthard and Brenner as well as interesting experiences from the past in the Apennines will be presented.

Posters on Technical Session 4, 8 and 9

Technical Site Visit - Group 1

Technical Site Visit - Group 2

Concert Hall   Per Gynt Hall   Poster Wall Area
Klokkeklang   Stage   Outside Main Entrance
RAPID ADVANCE & VIBRATION MANAGEMENT

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## TECHNICAL SESSIONS AT-A-GlANCE

### TUESDAY 13 JUNE

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<td>Technical Session 6: ITACUS – Use of underground drill blast and rock support</td>
<td>Jeroen van Eldert</td>
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<tr>
<td>14:00-14:20</td>
<td>Technical Session 7: ITACOSUF – New security challenges for design and operation</td>
<td>Hans Admiraal (Co-chair), Antonia Cornaro (Vice-chair)</td>
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<td>Technical Session 8: Tunnelling in adverse ground conditions</td>
<td>Massimo Coli</td>
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<td>14:30-14:50</td>
<td>Technical Session 9: Innovative solutions in drill blast and rock support</td>
<td>Giovan Cassani</td>
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### PER GYNT HALL

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<tr>
<td>14:50-15:10</td>
<td>ITACUS II: The EU COST SubUrban Toolkit has been developed to help planners, geologists and engineers.</td>
<td>Ignace van Campenhout</td>
</tr>
<tr>
<td>14:55-15:15</td>
<td>Stad Ship Tunnel - Security issues of a submarine tunnel</td>
<td>Terje Andreassen, Norwegian Coastal Administration</td>
</tr>
<tr>
<td>15:00-15:20</td>
<td>Grouting in Malefjell road tunnel - High groundwater pressure and challenging geological conditions</td>
<td>Kristin Hilde Holmøy</td>
</tr>
<tr>
<td>15:20-15:40</td>
<td>Break</td>
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<tr>
<td>15:45-16:05</td>
<td>Discussion</td>
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<tr>
<td>15:45-16:05</td>
<td>Results of in situ pressure measurement during pre-excavation grouting in rock tunnels</td>
<td>Lloyd T Юрbidge</td>
</tr>
<tr>
<td>15:50-16:10</td>
<td>ITACUS III: Collaboration is required to advance applied research that will support the further development of underground space. Felix Amberg will explain a new Swiss initiative open for international collaboration: the Swiss Centre for Applied Underground Technology.</td>
<td>Felix Amberg</td>
</tr>
<tr>
<td>16:00-16:20</td>
<td>Tunnel face deformation limits and interaction with cavity support: The experience inside the exploratory tunnel of the Brenner Base Tunnel Project</td>
<td>Thomas Keisel</td>
</tr>
<tr>
<td>16:00-16:20</td>
<td>How cities can utilize underground space for sustainable development</td>
<td>Per Tengborg</td>
</tr>
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<td>16:20-16:40</td>
<td>Assessing the passage of hazardous goods through road tunnel to improve security management planning</td>
<td>Benjamin Truchot</td>
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<td>16:10-16:30</td>
<td>Technical Session 5: ITACOSF – Use of underground anchors</td>
<td>Alun Thomas</td>
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<tr>
<td>16:30-16:40</td>
<td>Technical Session 6: ITACTECH – Innovations in Drill and Blasting</td>
<td>Per Rindorf, Benoît Bleville, Levent Demirel, and栎安韧</td>
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<tr>
<td>16:40-16:55</td>
<td>Technical Session 7: KLOKKENLANGE – New security challenges for design</td>
<td>Engelhard Stephan</td>
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<td>16:55-17:00</td>
<td>Technical Session 8: Tunnelling in adverse ground conditions</td>
<td>Bent Aagaard</td>
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<tr>
<td>16:50-17:00</td>
<td>Discussion and concluding remarks</td>
<td>Christian Thienert, STUVA</td>
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<tr>
<td>16:55-17:00</td>
<td>Closing the ITACOSF workshop</td>
<td>Roland Leucker</td>
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### TECHNICAL SESSION 5: ITACOSF – Use of underground anchors
- Alun Thomas

### TECHNICAL SESSION 6: ITACTECH – Innovations in Drill and Blasting
- Per Rindorf
- Benoît Bleville
- Levent Demirel
-栎安韧

### TECHNICAL SESSION 7: KLOKKENLANGE – New security challenges for design
- Engelhard Stephan

### TECHNICAL SESSION 8: Tunnelling in adverse ground conditions
- Bent Aagaard
Conquering
Connecting Norway by rail: 5 Herrenknecht Hard Rock TBM s are on the move for 45 km of new first-class rail tubes at the New Ulrikentunnel and Follo Line projects.

Hardest Rock
Massive geologies call for experienced partners. Herrenknecht is making headway through hard rock – for over 822 km.

Contractors:
› Follo Line: Acciona Infraestructuras and Ghella ANS
› Ulrikentunnel: Skanska Strabag Ulriken ANS

Pioneering Underground Technologies
› www.herrenknecht.com

GOLD SPONSOR
## TUESDAY 13 JUNE

### POSTERS
(on Technical Session 4, 8 and 9)

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<tr>
<td>Tunnel Challenges - Datwyler Sealing Solutions</td>
<td>Anette Dr. Wiesmath</td>
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<tr>
<td>Surface challenges and underground solutions - The Follo Line Project</td>
<td>Fernando Vara</td>
</tr>
<tr>
<td>Study on the environmental impact of chemicals used in mechanized tunneling techniques</td>
<td>Giorgio Vilardi</td>
</tr>
<tr>
<td>Structure-borne sound from tunnelling works – measurements and predictions</td>
<td>Clas Ola Høsøien</td>
</tr>
<tr>
<td>Structural Design Calculation Tool of Steel Fiber Reinforced Concrete(SFRC) Segmental Lining</td>
<td>Kwang Soo Kim</td>
</tr>
<tr>
<td>State of the art design, construction and documentation methods in infrastructure projects</td>
<td>Johannes Gollegger</td>
</tr>
<tr>
<td>Local splitting and crushing behavior under TBM hydraulic jacks</td>
<td>Giuseppe Tiberti</td>
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<tr>
<td>Innovative Traffic Barrier For Road And City Tunnels</td>
<td>Ondřej Nývlt</td>
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<td>Implementing contractors know-how in early construction project phases finding a way for the Austrian tunnel construction industry</td>
<td>Lena Paar</td>
</tr>
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<td>How time-dependency influences the Longitudinal Displacement Profile during the construction of deep tunnels</td>
<td>Chrysothemis Paraskevopoulou</td>
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<td>Ground Freezing Pressures on Excavation Support System</td>
<td>Joseph Sopko</td>
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<td>Geopolymer Binders for Tunnel Applications</td>
<td>Roar Myrdal</td>
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<td>Full scale testing of SFRC segmental lining using independent and wireless instrumentation systems</td>
<td>Xavier Monin</td>
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<td>Effect of sample preparation and freezing temperature on mechanical properties of frozen soil in subsea tunnel construction</td>
<td>Dongseop Lee</td>
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<td>Documentation, control and quality assurance of operational and technical aspects of grouting works in tunnelling</td>
<td>Dr. Harald Krenn</td>
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<td>Cut And Cover Tunnel In Swelling Soil</td>
<td>Flaviu Ioan Nică</td>
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<td>Crack development and effect of ageing on performance of composite shell sprayed concrete tunnel linings</td>
<td>Jiang Su</td>
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<td>Correlation of the results of standard beam and panel tests</td>
<td>Karoly Peter Juhasz</td>
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<td>Thomas Pabst</td>
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<td>Bologna- High Speed Railway Station: Geostuctural Monitoring Project</td>
<td>Alberto Balestrieri</td>
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<td>Best Practices and Perspectives for Cross Connections in Twin-Tube Rail Tunnels</td>
<td>Marco Bettelini</td>
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<td>Use Of Innovative Underground Solutions To Increasing The Resiliency Of Istanbul: The Case Of New Metro Lines</td>
<td>Giuseppe Astore</td>
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<td>Under-passing of Karoon River by EPB-TBM in Urban Environment Ahwaz Metro Case Study from Iran</td>
<td>Dieter Wenner</td>
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<td>Short-term rockburst prediction in TBM Tunnels</td>
<td>Jack Mierzejewski</td>
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<td>Safety precautions against fuel leakage into NATM tunnels of Uskudar Umranlye - Cekmekoy Metro Project</td>
<td>Ismail Gündoğdu</td>
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<td>M6 Metro Line in Bucharest, Romania</td>
<td>Catalin Boroianu</td>
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<td>Blominmaki a large scale underground waste water treatment plant</td>
<td>Jari Haapala</td>
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<td>Cover grouting through unconsolidated deposits at the Upper Lillooet Hydro Electric Project, Pemberton, BC, Canada.</td>
<td>Benno Ring</td>
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<td>Engineering Design and Construction of Underground Power House Caverns of Mangdechhu Hydro-Electric Project (720 MW), Bhutan</td>
<td>A.K. Mishra</td>
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<td>Sediment-sluicing tunnel constructed neighboring to an existing earth dam with innovative design, construction and monitoring technology</td>
<td>Chia-Han Lee</td>
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<td>Stability Assessment Of The Underground Powerhouse Cavern For The Sach Khas Hydroelectric Project In Himachal, India</td>
<td>Ajender Rathore</td>
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<td>Study of Large Underground Cavern of Hydropower Project in Western China</td>
<td>Feng Shurong</td>
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<td>Topographic effect in the selection of unlined pressure tunnels/shafts - A review of a case from Nepal Himalaya</td>
<td>Chhatra Bahadur Basnet</td>
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<td>A new concept for seismic mitigation method for immersion joint</td>
<td>Wenhao Xiao</td>
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<td>Application of Liquid Air Refrigerant to Artificial Ground Freezing in Enclosed Subsea Tunnels</td>
<td>Youngjin Son</td>
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<td>A conceptual study on the development of an underground metro rail system in the Kathmandu Valley, Nepal</td>
<td>Binod Amatya</td>
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Aerodynamic Sizing Of High Speed Train Tunnels - The Saverne Tunnel Case
Xavier Guiga

Assessment Of Tunnel Construction Possibilities In Deep High Squeezing Permo Carboniferous Ground
Jakob Likar

Construction of Portals in Poor Conditions
Sergio Sánchez

Construction of Tehri Pump Storage Project (2x250MW) in highly adverse geological conditions - A case study
Rakesh Kumar Khali

Demolition and reconstruction of a railway tunnel without interruption of traffic
Antonio Malaguti

Design and Construction of Various Underground Components of CSO Systems
Verya Nasri

Design of a large metro station cavern in weak rocks
Martino Semeraro

Design of Mined Cross Passages for Waterview Project Auckland (NZ): Comparison between Predicted vs Actual Performance
Wataru Okada

Experience from The Ulriken tunnel, the first large TBM on railroad tunnels in Norway
Thorbjorn Bakketun
Complete supplier of products for rock support.

EXHIBITION STAND GOLD 3

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PRETEC CHINA
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## PROGRAM (Before lunch)

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<tr>
<td>07:30-08:30</td>
<td>WTC 2017 Registration</td>
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<td>08:30-11:00</td>
<td>ITA Young members General meeting</td>
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<tr>
<td>08:30-13:00</td>
<td><strong>Technical session 9: Case histories, lessons learned</strong>&lt;br&gt;This session covers selected cases of particular significance related to tunnel excavation in rock and soil based on conventional drill and blast tunnelling, NATM and mechanical excavation. The selected cases cover experience and lessons learned from road, railway, metro as well as hydropower tunnels. New technology for planning, including Building Information Models (BIM), is presented and challenges related to tunnelling in difficult ground and cases of damage to support systems are discussed.</td>
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<td>08:30-13:00</td>
<td><strong>Technical session 10: Mechanized tunneling in soft and mixed ground conditions</strong>&lt;br&gt;This session presents new experiences and technologies related to mechanized soft ground tunnelling, as well as mixed face tunnelling. The presentations will include soft ground conditioning, mechanized tunnelling in mixed ground conditions, settlement analyses and prediction of tunnelling performance.</td>
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<td>08:30-13:00</td>
<td><strong>Technical session 11: Rock support and water proofing technology</strong>&lt;br&gt;This session includes recent developments and experiences in three main topics: cementitious pre-grouting technology for water control, permanent waterproof tunnel linings based on sprayed concrete and sprayed membranes, as well as innovations in sprayed concrete tunnel support and segmental lining fibre reinforcement.</td>
</tr>
<tr>
<td>08:30-13:00</td>
<td><strong>Technical session 12: Site investigation, ground characterization</strong>&lt;br&gt;This session includes contributions describing investigation prior to as well as during tunnelling/excavation. Issues related to ground classification and characterization are covered, including swelling ground. New investigation methods are</td>
</tr>
</tbody>
</table>
discussed, as well as challenging aspects of traditional methods. Key issues for TBM tunnelling as well as conventional tunnelling are covered.

09:00 Exhibition Hall opens

09:00-13:00 Posters on Technical Session 10, 11 and 12

09:00-11:00 Technical Site Visit - Group 1

13:00-14:00 Lunch

PROGRAM (After lunch)

14:00-17:00 Technical session 13: Underwater tunnels
This session will discuss experience from planning, design and construction of deep underwater tunnels, including the world’s longest and deepest subsea road tunnel, presently under construction in Norway. Special techniques for crossing severe faults and weakness zones will be discussed, including ground freezing. Emphasis will also be on durability of rock support and lining in the particularly harsh conditions of the subsea tunnels.

14:00-17:00 Technical session 14: Stability assessment and risk mitigation
This session covers several aspects of risk analyses including tools for this purpose as well as specific examples of risk management under challenging conditions from several projects.
PROGRAM (After lunch)

14:00-17:00 Technical session 15: Seismic design of underground structures
Main focus of this session is on potential effects of seismicity on underground structures and design methodology for minimizing the effects of seismicity. Many of the contributions are discussing design of earthquake resistant joints and gaskets, and design of segment linings for tunnelling through active faults. Survey systems for tunnels in earthquake regions are also covered.

14:00-17:00 Posters on Technical Session 13, 14 and 15

16:00-18:00 Technical Site Visit - Group 2

17:30-18:00 Closing ceremony.

19:30-23:00 Gala Dinner
After several days with trips, tours, joint sessions, exhibitions and technical sessions it is time to close the main part of WTC 2017. A surprise from Bergen city will help you to find your way to the Closing Ceremony in the main Concert Hall. There the relay baton will be given to Dubai WTC 2018 with the best of luck from NFF and Norway.

Wednesday night it is time for the Gala dinner. Again we will meet in the Foajé 2 Spissen in Grieghallen. A perfect location for a dinner with colleagues, old friends and new friends. A three course dinner will be served with selected wines. And who knows? There might be dancing after a tasty meal. Tickets for this event may be purchased while registering for WTC 2017. Attire: Business formal.
<table>
<thead>
<tr>
<th>Time</th>
<th>Technical Session 9: Case histories, lessons learned</th>
<th>Technical Session 10: Mechanized tunneling in soft and mixed ground conditions</th>
<th>Technical Session 11: Rock support and water proofing technology</th>
<th>Technical Session 12: Site investigation, ground characterization</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30-08:50</td>
<td>Øyvind Englestad</td>
<td>Markus Thewes</td>
<td>Wulf Schubert</td>
<td>Eivind Grøv</td>
</tr>
<tr>
<td>08:50-09:00</td>
<td>Utilization of Building Information Modelling (BIM) for tunneling and infrastructure development</td>
<td>Soil Conditioning with Artificial Soil and Foam in EPB tunneling</td>
<td>New ductile tunnel lining system</td>
<td>Chair: Eivind Grøv, Vice chair: Robert Sturk/TBA</td>
</tr>
<tr>
<td>09:00-09:10</td>
<td>The development of underground works at Metro de Santiago: half a century of history</td>
<td>Study of the impacts of various factors on shield jamming at the TBM tunneling through squeezing ground</td>
<td>Innovation of FRC design for underground application</td>
<td>Chair: Per Drevland Jakobsen, Vice chair: Lars Babendererde/TBA</td>
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<tr>
<td>09:10-09:30</td>
<td>Jobergtunnelen - the first use of NATM in Norway</td>
<td>Development of a soil abrasion test and analysis of impact of soil conditioning on tool wear for soft ground mechanized tunneling</td>
<td>Development of a sub-slab restraint net and frictional restraint net for sprayed shotcrete</td>
<td>Chair: Karl Gunnar Holter, Vice chair: TBA/TBA</td>
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**Technical Sessions at a Glance (Before lunch)**
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<tr>
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<th>Session</th>
<th>Speaker(s)</th>
<th>Title</th>
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<tbody>
<tr>
<td>09:30-09:50</td>
<td>In-situ fire tests to assess tunnel lining fire resistance</td>
<td>Konstantinos Miltiadis Sakkas</td>
<td>Design of segmental linings with macro synthetic fibre reinforcement</td>
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<td>Ralf Winterberg</td>
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<tr>
<td>09:50-10:10</td>
<td>Effect of Clogging on EPB TBM Performance in Al Safat Waste Water Tunnel</td>
<td>Emre Avunduk</td>
<td>Hyperspectral imaging: a novel geological mapping technique for subsurface construction sites</td>
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<td>Tobias Kurz</td>
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<td></td>
<td>Lessons learned from design and construction of Nant-de-Drance Powerhouse</td>
<td>Etienne Garin</td>
<td>Consideration of Design/Policy on the Early Ring Closure Method using 24 Tunnel Construction Data in Japan</td>
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<td>Masahiro Nakata</td>
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<td>Feng Lu</td>
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<td>Detailed TBM boring cycle estimation using Rock Mass Rating system</td>
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<td>Nicola Della Valle</td>
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<tr>
<td>10:30</td>
<td>Break (10:30-11:00)</td>
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<tr>
<td>11:00-11:20</td>
<td>Semmering Base Tunnel - Large Caverns In Challenging Conditions</td>
<td>Michael Proprenter</td>
<td>Difficult Ground Solutions (DGS): New TBM Solutions. Carves a Path to Success</td>
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<td>Doug Harding</td>
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<tr>
<td>11:20-11:40</td>
<td>High Speed Railway Milan Genoa, implementation of coupled analysis to estimate thermo-mechanical effects produced by the fire on the TBM segmental lining</td>
<td>Lapo Baccolini</td>
<td>Providing the right geotechnical exploration and testing data for closed-face soil tunneling</td>
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<td>Harvey Parker</td>
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<td>Lessons learned from open pit blast fences causing near-fatal accident in a close underground drift</td>
<td>Vegard Olsen</td>
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<td>The application of Semi-Automatic Tubular Arch inside Boscaccio Tunnel: a new concept of primary lining</td>
<td>Carla Luigina Zenti</td>
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<td></td>
<td>Cutting tool wear evaluation for soft ground TBM</td>
<td>Ebrahim Farrokh</td>
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<td>Jon Hurt</td>
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<td>Compressible Grout and Integrated Protective Linings on the West Trunk Sewer Contract 2</td>
<td>Jon Hurt</td>
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<tr>
<td>11:40-12:00</td>
<td>Technical Session 10: Mechanized tunneling in soft and mixed ground conditions</td>
<td>Ilhun Chang</td>
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<tr>
<td>12:00-12:20</td>
<td>Technical Session 11: Rock support and water proofing technology</td>
<td>Natalie Blacklock</td>
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<tr>
<td>12:20-12:40</td>
<td>Technical Session 12: Site investigation, ground characterization</td>
<td>Jennifer J. Day</td>
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</table>

**Technical Session 9:** Case histories, lessons learned

- 11:40-12:00: Design and Construction of the Headrace Tunnel Grouting against Water Ingress in the Uma Oya Project, Sri Lanka (Ataollah Rahbar Farshbar)
- 12:40-13:00: Metro Doha Green Line Challenges delivering a world class urban tunneling project (Rainer Rengshausen)

**Technical Session 10:** Wear prediction for soft ground tunneling tools – a new approach regarding the dominant influencing factors in the tribological system of tunneling tools (Jakob Kuepferle)

**Technical Session 11:** Detailed engineering geological investigations and numerical modeling for a planned road tunnel in the Bhutan Himalaya (Rajinder Bhasin)

**Technical Session 12:** Mechanized tunneling in soft and mixed ground conditions (Ilhun Chang)

**Technical Session 13:** Ground support design, instrumentation and observational approach (Roger Story)

**Technical Session 14:** Mechanized solutions for cross passage construction (Peter Schmaeda)

**Technical Session 15:** Mechanized tunneling in soft ground: support design, instrumentation and observational approach (Roger Story)

**Technical Session 16:** How to protect our Nature – Chemistry in TBM tunneling. From the laboratory to On-Site use and muck disposal (Lars Langmaack)

**Technical Session 17:** Repair of the Rive-de-Gier Tunnel (Catherine Larive)

**Technical Session 18:** Application of Composite Geological Strength Index for healed rockmass structure to deep mine tunneling (Satoshi Ito)

**Technical Session 19:** Application of Scout Hole Programs in Deep Tunneling Operations Under High Stress Conditions (Natalie Blacklock)

**Technical Session 20:** Innovative One-pass Lining Solution For Doha’s Deep Tunnel Sewer System (Anna Olliver)

**Technical Session 21:** Sprayed Waterproofing Membranes on recent SCL Tunneling Projects in London (Anita Wu)

**Technical Session 22:** From hard into soft ground: safe & efficient handling of transition zones (Tim Babendererde)
# TECHNICAL SESSIONS AT-A-GLANCE (After lunch)

<table>
<thead>
<tr>
<th>TECHNICAL SESSION 13: Underwater tunnels</th>
<th>TECHNICAL SESSION 14: Stability assessment and risk mitigation</th>
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<td>Chair: Bjørn Nilsen</td>
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<tr>
<td>Vice chair: TBA/TBA</td>
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<td>Vice chair: Qiu Wenge/Daniele Peila</td>
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</tbody>
</table>

**14:00-14:20**

- **Technical Session 13:**
  - Construction of Central Wan Chai bypass tunnel in Hong Kong Harbour: Surface challenges and underground solutions
  - Tim Leung
  - On the role of the Engineering Geologist in the Construction Phase of Challenging Tunnel Projects
  - Dr. Ralf J. Plinninger

- **Technical Session 14:**
  - Non-linear deformation analysis of seismic joints for subway structures during earthquakes
  - Hisham Nofal

**14:20-14:40**

- **Technical Session 13:**
  - Effectiveness of advance drainage with respect to face stability of subaqueous tunnels crossing high-permeability ground
  - Sara Zingg
  - Tunnel projects: Risk exposure, risk management and insurance coverage: A realistic roadmap
  - Thomas Kontsists

- **Technical Session 14:**
  - Earthquake resistant joint for underground structure against longitudinal seismic displacement
  - Naotoshi Yasuda

**14:40-15:00**

- **Technical Session 13:**
  - Tunnel seismic investigations at low overburden in subsea tunnels
  - Jozef Jach Mietko
  - Passage of a precast segments lining tunnel through an active fault: Thessaloniki Metro experience
  - Neda Doduchaddah

- **Technical Session 14:**
  - Risk management: Tunneling through major active fault zone
  - Aziz Alami
  - Investigation of factor of safety in squeezing ground conditions and technical contractual mitigation measures
  - Øyvind Dammy

**15:00-15:20**

- **Technical Session 13:**
  - The Håtug subsea road project: Engineering geological challenges and technical contractual mitigation measures
  - Taher Elsamni

- **Technical Session 14:**
  - Implementation of seismic joints in Istanbul Strait Road Tube Crossing Project
  - Fabrizio Carriero

**15:20-15:40**

- **Technical Session 15:**
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  - Neda Doduchaddah

- **Technical Session 13:**
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**15:40-16:00**

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### TECHNICAL SESSIONS AT-A-GLANCE (After lunch)

**STAGE**

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<td>15:40-16:00</td>
<td>Anne-Merete Gilje</td>
<td>Victor Hugo Franco</td>
<td>Arjan Luttikholt</td>
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<td>16:00-16:20</td>
<td>Solving the challenges of the Santoña Laredo General Interceptor tunnel for Collector</td>
<td>Key elements for keeping the costs of tunneling projects under control</td>
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<tr>
<td>16:20-16:40</td>
<td>Toméu Orfila Farràs</td>
<td>Emmanuel Humbert</td>
<td>Masashi Nakaya</td>
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<tr>
<td>16:40-17:00</td>
<td>Global Analysis of Submerged Floating Tube Bridge: A Case Study for the Crossing of Bjørnefjorden in Norway</td>
<td>Shear strength monitoring using thermal imaging at Bond Street Station Upgrade</td>
<td>Development and application of cable-less seismic survey system in mountain tunnel</td>
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<td></td>
<td>Xu Xiang</td>
<td>Benoit Jones</td>
<td>Alejandro Domínguez</td>
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<td>Changwon Kwak</td>
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<td>Yuqi Tan</td>
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<td>Masashi Nakaya</td>
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**CONCERT HALL**

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<tr>
<th>Time</th>
<th>Technical Session 15: Seismic design of underground structures</th>
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<td>Yuqi Tan</td>
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</table>
RV. 13 RYFAST – SOLBAKK TUNNELEN

The project is part of the public initiative with the goal of a ferry-free road link between Ryfylke and Jæren. Two parallel tunnels, each 14 km in length are expected to be completed in mid 2018.

Come and visit us at our booth at the World Tunnel Congress in Bergen.

→ Marti after hour on Tuesday, 13th June 2017 / 4.30pm ←
A DFN-LiDAR method for the estimation of rockmass conditions in underground projects
Ioannis Vazaios

Development of a back analysis method for the estimation of in situ stress based on the measured convergence in the Horonobe Underground Research Laboratory
Kazuhei Aoyagi

Influence of loading rate and saturation on the crack damage thresholds of Cobourg limestone with respect to Deep Geological Repository (DGR) tunnel design
Eric Jaczkowski

Influence of stiffness of back-fill grouting material for void above tunnel lining upon load-bearing capacity of tunnel structure
Atsushi Kusaka

Mass transfer modeling of hydrogen sulphide (H2S) generated in London Tideway Tunnels (LTT): A new methodology for odour and ventilation system design
Sofia Georgaki

"Old Kaiser Wilhelm Tunnel" - Rehabilitation of a 130 yrs old Railway tunnel
Gernot Jedlitschka

Addressing Uncertainties in upgrade of victorian tunnels as part of the Edinburgh to Glasgow Improvement Programme
Manuel Neves

Countermeasure for deformed road tunnel by precast concrete members with partial thin thickness
Toshiaki Ishimura

Deep Urban Excavations With Flexible Support At Riyadh Metro Line 5
Eduardo Salvador

Long-term durability of permanent lining concrete in mountain tunnel
Nobuharu Isago

Long-Term Experimental Assessment of Water-Tightness of Gasket with Hydrophilic Sealant under High Water Pressure
Joungho Kim

MiniBars - A non-corroding fiber for rock support
Sindre Sandbakk

Rapid tunneling
Kåre Johan Eikrem

The design and excavation of the Tunnels along the Road 6 in the North of Israel
Andrea Oss

A method to investigate the causes of deformation in existing tunnels using measurement vehicle system technology
Yoshiyuki Shigeta

A Virtual Reality Monitoring System for Tunnel Boring Machines
Christoph Traxler

Deformation and Cracks Sensing Method And Application of Intelligent Electric Duct Bank Structure
Genji Tang

Deformation Monitoring of Tunnel Segments by 3D Laserscanning
Klaus Chmelina

Development of System for Detecting Spalling and Peeling in Subway Tunnel Lining
Aya Otsuki

POSTERS
(Before lunch on Technical Session 10, 11 and 12)
POSTERS
(Before lunch on Technical Session 10, 11 and 12)

Geological Follow-Up Of Follo Line Double Shield Tbm Tunnels
Elisabeth Grasbakken

Health monitoring and maintenance priority assessment for tunnel lining by using Tunnel lining Crack Index(TCI)
Ayaka Kitamura

High Speed Train Milan Genoa, Parametric Analysis Of Rock Stress-Strain Control During Tunnel Excavation In The Argille A Palombini Formation
Mauro Frandino

Innovation on Site Investigation for A High Potential Gas Inflow Tunnel in Taiwan
Fuyuan Hsiao

Interactive geotechnical characterization with GIS and 3D geo-model applied to Lyons metro project.
Romain Prost

Methodology and analysis for the automatic tunnel deformation detection based on 3D LiDAR point cloud
Mingrui Zhao

Model test and trial construction of polyurea spray as the spalling prevention method of tunnel lining concrete
Keisuke Shimamoto

Monitoring of immersed tunnels in use fact or fiction?
Bart Hendrix

Select an appropriate approach in geotechnical studies contributing factor to accurately predict the ground settlement due to tunneling
Mohamad Reza Baghban Golpasand

Site Specific Seismic Study For Tunnel No. 12 Of Tupul-Imphal Railway Line In Manipur, India.
Manichandra Sanoujam

The importance of prospection beyond the tunnel face: impacts on excavation production and benefits
Stefan Skuk

Tunnelling muck classification: definition and application
Claudio Oggeri

Pre-investigations for TBM tunnelling
Pål Drevland Jakobsen

POSTERS
(After lunch on Technical Session 13, 14 and 15)

Stability Analysis Of Blocks Formed With Determined Joint Network And In-Situ Stress Level. A Case Study Of Assembly Chambers With Numerical Code 3Dec - The Follobanen Project
Isabel Reig

A risk evaluation of shield TBM tunnelling in soft marine sedimentary soils
Kwang Ho You
<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
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<tbody>
<tr>
<td>Analysis of the long-term behaviour of tunnel entrances with</td>
<td>Max Barbosa</td>
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<td>numerical three-dimensional simulations</td>
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<tr>
<td>Benefits of Detailed Incident Recordkeeping</td>
<td>Christina Lindstrom</td>
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<tr>
<td>Design strategy of tunnel-12 passing through a regional Churachandpur-Mao-Fault in the Tupul Imphal B.G, line section in India</td>
<td>Tauhidur Rahman</td>
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<tr>
<td>Estimation of in situ stress from borehole breakout in brittle rock for the prediction of shaft overbreak</td>
<td>Andrew LeRiche</td>
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<tr>
<td>Evaluation and analysis of laboratory tests of bolt-anchored, steel-fiber-reinforced shotcrete linings</td>
<td>Lamis Ahmed</td>
</tr>
<tr>
<td>Naturally occurring asbestos in the Rocks belonging to Sestri Voltaggio Zone (Liguria, Northern Italy). Excavation Railway tunnels management Terzo Valico dei Giovi</td>
<td>Fiorenza Pennino</td>
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<tr>
<td>New three-dimensional deformation measuring system by laser scanning integrated with image processing technology</td>
<td>Koji Murakami</td>
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<tr>
<td>On Failure Probability in Thin Irregular Shotcrete Shells</td>
<td>Andreas Sjölander</td>
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<tr>
<td>Predicting stand-up time of the tunnel face using 3D numerical simulations</td>
<td>Abdullah Alsahly</td>
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<td>Real-time prediction during TBM advance</td>
<td>Fabrizio Bove</td>
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<td>Risks in Tunnelling Analysis: Procedures and lessons learned relating to the Zurich Cross Rail</td>
<td>Martin Bosshard</td>
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<td>Safety Management Of Epbm Technology In Urban Environment</td>
<td>Harald Wagner</td>
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<tr>
<td>SSS-Infra approach to assess and mitigate the risks related to an extreme weather condition</td>
<td>Paolo Fantini</td>
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<td>The effects of the Mechanical and Thermal Properties Uncertainties on the Fire Safety of Concrete Tunnel Lining</td>
<td>Francesco Rosignuolo</td>
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<td>The stability analysis about front slopes at the tunnel entrance based on principle of minimum potential energy</td>
<td>Xiangcan Wang</td>
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<td>Theoretical Study Of Three Dimensional Face Failure Mechanism Of Shallow Tunnels In Soil</td>
<td>Andres Melo</td>
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<td>Three-dimensional visualisation of methane concentration distribution in tunnels to increase underground safety</td>
<td>Makito Nago</td>
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<td>Dynamic characterization of structures surrounding an underground construction under ambient mechanical noise</td>
<td>Antoine Rallu</td>
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CT-Bolt® - The optimal solution for rock support

Rock Support
www.ct-bolt.com

We have extensive tunneling experience. Long or short, wide or narrow.
PROGRAM
ITA-AITES
ANNUAL MEETING
IT-AITES
PROGRAM OVERVIEW

Saturday
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Working Group Meetings
ITA Reception (by invitation only)
Haakonshallen

Sunday
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Monday
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Tuesday
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Wednesday
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Executive Council
General Assembly, Meetings in WG and Committees
Sessions open for everybody

ITA Reception (by invitation only)
Haakonshallen

ITA Reception (by invitation only)
Panorama

ITA-CET Steering Board Meeting

Prime Sponsor Meeting

ITA-AITES Young Members Reception (For all participants under 35)

WTC 2020 Candidate dinner (by invitation only)
Restaurant Fløyen

ITAtech Industry Reception (by invitation only)

Registration

71
You will find the ITA Secretariat at Halling during the whole period.

**SATURDAY 10 JUNE**

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<tr>
<td>07:30</td>
<td>WTC 2017 Registration (07:30-08:30)</td>
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<tr>
<td>08:30-12:30</td>
<td>ITA-AITES Executive Council Meeting</td>
<td>Bukken</td>
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<tr>
<td>14:00-17:00</td>
<td>Working groups / committees / ExCo meeting</td>
<td>Salong Nina</td>
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<tr>
<td>18:30-20:30</td>
<td>ITA Reception (By invitation only)</td>
<td>Haakonhallen, address: Edvard Griegs plass 1</td>
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**SUNDAY 11 JUNE**

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<tr>
<td>07:30</td>
<td>WTC 2017 Registration (07:30-08:30)</td>
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<td>08:30-13:00</td>
<td>General assembly I</td>
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<td>Lunch for ITA Member Nations delegates</td>
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<td>WG 22: Meeting room Bukken</td>
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<td>17:00-18:30</td>
<td>ITA-TECH Steering Board</td>
<td>Salong Nina</td>
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MONDAY 12 JUNE

07:30  WTC 2017 Registration (07:30-08:30)

14:00-17:00  Working groups and committee meetings
- ITA-TECH Sprayed Concrete: Meeting room Harpen
- ITA-TECH PFRCs: Meeting room Øvingsrom 305
- ITA-TECH D&B: Meeting room Holbergsuiten
- ITA-TECH L&W: Meeting room Svane
- ITA-TECH Investigation: Meeting room Per Gynt Foyer 1
- ITACET Steering board: Meeting room Sulamitten
- WG 2: Meeting room Trolldog
- WG 3: Meeting room Gjendine
- WG 11: Meeting room Bekken
- WG 14: Meeting room Småtroll
- WG 17: Meeting room Per Gynt Foyer 2
- WG 19: Meeting room Bøygen
- WG 21: Meeting room Bekkelokket
- WG 22: Meeting room Bukken

19:00-23:00  ITA-TECH Industry Reception (By invitation only)
Panorama, access by boat from Bergen Harbour
Individual walk from multiple hotels to the meeting point at the Strandkai Pier, next to the Fish market, city centre of Bergen (approx. 15 min walk from HQ Scandic Ørnen Hotel)

19:00-22:00  ITACET Young Members Reception
(For all participants under 35)
Ole Bull Huset
Address: Øvre Ole Bullsplass 3

TUESDAY 13 JUNE

07:30  WTC 2017 Registration (07:30-08:30)

08:30-09:30  Presentation of results from WG and Committees
Meeting room Concert Hall

14:00-16:00  Nordic Forum
Meeting room Bøygen

16:00-17:00  WTC 2019 Advisory Board
Meeting room Bekken

17:00-18:30  PS Meeting
Meeting room Salong Nina
**19:00-22:00 WTC2020 Candidates dinner**
(by invitation only)
Restaurant Fløyen, on top of Fløybanen
Individual walk from multiple hotels to the Fløyen Funicular Station, in the city centre of Bergen (approx. 15min walk from HQ Scandic Ørnen Hotel) where you will be given funicular tickets for the journey to Mt Fløyen from 18:30. The Candidate dinner starts at 19:00 at the Mt Fløyen Restaurant.

**WEDNESDAY 14 JUNE**

08:30- Young Members General meeting
13:00 Meeting room Salong Nina

09:30- ITA-CUS Steering board
12:00 Meetingroom Harpen and Bøygen

13:30- ITA-AITES General assembly II
17:00 Meeting room Peer Gynt
All you need for precise tunneling!

No matter what your challenge is: A small tunnel or a large tunnel, a hydroelectric plant or a subway line, or a utility tunnel for any purpose. We are specialists in underground tunnels!

Come to booth no 50 and talk to us about tunneling precision.

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Bane NOR is a state-owned company responsible for the national railway infrastructure of Norway.

Bane NOR's mission is to ensure accessible railway infrastructure and efficient and user-friendly services, including the development of hubs and goods terminals.

The company is responsible for the planning, development, administration, operation and maintenance of the national railway network, traffic management and administration and development of railway property.

WELCOME TO OUR STAND AT THE EXIBITION AREA
Presentation of current and up-coming tunneling projects.

banenor.no
EXHIBITION
EXHIBITION HOURS

Exhibition Halls Opening Hours:

Monday 12 June: 10:15-17:00
Tuesday 13 June: 09:00-19:00
Wednesday 14 June: 09:00-17:00

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Steel Fibres for Segmental Lining Reinforcement

Visit our stand n° 51 and find out more about our reference project on segment production with steel fibres in Norway, Follo Line.

contact@bm-underground.com

Bekaert - Advertentie WTC 2017.indd   1 24/05/2017   12:07

SILVER SPONSORS
DSI Supplies Safety

You can count on our System Solutions
Customized for your challenging tunneling projects!

FOCUSED
FORWARD

STAYING AHEAD OF YOUR NEXT CHALLENGE

Every project has its own unique challenges, which is why every Robbins TBM is built with your specific needs in mind. From machine design to tunnel completion, we are by your side working together to create new methods, and set new records in underground excavation.

We invite you to learn more about our latest products and projects in our 2017 presentation series at WTC.
TRIPS AND TOURS
 Ulriken Water Treatment Plant

**Group 1:**
Departure from Grieghallen to Ulriken Water Treatment Plant: 14:00. Back to Grieghallen at 16:00

**Group 2:**
Departure from Grieghallen to Ulriken Water Treatment Plant: 16:00 Back to Grieghallen at 18:00.

**Total capacity:**
90 people (45 people / 1 bus per group)

**The work:**
- Access tunnels and caverns to the processing plant, intake pipe, clean water reservoir.
- New sub surface processing plant with full purification of drinking water.
- New water intake in the reservoir Svartediket.
- New water pool in rock, 70 m above sea level.
- Modification of existing pithead installations for access.
- Tunnel (about 2 km).

**Contact:** Nils Borge Romslo, +47 918 52 917
The E39 from Rådal to Os – Tunnel and road construction

Group 1:
Departure from Grieghallen to "The New Road Project of E39 – Council – Os": 14:00. Back to Grieghallen at 16:00.

Group 2:
Departure from Grieghallen to "The New Road Project of E39 – Council – Os": 16:00 Back to Grieghallen at 18:00.

Total capacity:
90 people (45 people / 1 bus per group)

- Purpose: The aim is to establish an efficient system for the transport of goods and passengers. Our society expects efficient traffic flow and regional accessibility, as well as road safety in the network of main roads.
- Extent: In total, 18,000 m of main road and 1300 m of new county road with pedestrian and cycle lane.
- Financing: Road toll and national government.
- Total cost: NOK 6.2 billion.
- Start: 2015
- Estimated opening: 2020

Contact: Nils Borge Romslo, +47 918 52 917
Ulriken railway project with tunnel boring machine (TBM) for the new Bergen railway line between Arna and Bergen City

Group 1:
A departure from Grieghallen 10:00, in Arna approx. 10:30, maximum number of 45 people. Back to Grieghallen 13:00.

Group 2:
A departure from Grieghallen 14:00, in Arna approx. 14:30, a maximum of 45 people. Back to the Grieghallen 17:00.

Total capacity:
90 people (45 people / 1 bus per group)

The New Ulriken tunnel from Arna to Bergen, 7.8 km long will be the first railway tunnel in Norway constructed with Tunnel Boring Machine (TBM). The TBM has a diameter of 9.3 m. The contract has a value of 1.3 billion NOK.

Contact: Nils Borge Romslo, +47 918 52 917
LNS is represented in the form of 13 companies all over the planet. More than 850 employees in many countries are now linked to the LNS family, and we are steadily pushing back the boundaries of what is possible. Enormous knowledge of our trade, innovation, courage and a strong will to succeed have made us into specialists in demanding projects where our competitors would see only impossible logistics. We have been involved in projects in the Arctic and Antarctic, in Hong Kong, in Chile, in the Faroe Islands, in Iceland and Greenland.

The LNS group provides the following products and services:

- Tunnels and rock chambers
- Road building
- Mining contracts
- Rubin mining
- Rock support and injection
- Earthworks
- Concrete production
- Production of modules and wood elements

Tel: +47 76 11 57 00 / www.lns.no
Kollsnes Gas Terminal
Kollsnes Gas Process Plant in Øygarden Municipality north-east of Bergen, was set in operation in 1996 as a part of the Troll Project. At the plant, gas from the Troll, Kvitbjørn og Visund fields in the North Sea are processed, with a capacity of 145 Sm3 NGL – natural gas liquids and 69 000 Sm3 condensate per day.

Shore approach of the Troll gas pipelines
An important civil work at Kollsnes was the Shore Approach of the Troll Gas pipeline as shown on the figure below. The work was executed from January 1991 to December 1995, and comprised 7500m tunnels to a connection point for the Troll pipelines 3600 m from landside and 200 m under sea level.

The Sture Oil Terminal
At the Sture Terminal in Øygarden municipality, approximately 60 km north-east of Bergen, the construction work started in 1984 with Norsk Hydro as operator.

Contact: Arild Neby, +47 458 05 826

Tour to Kollsnes Gas Terminal / Sture Oil Terminal in Øygarden municipality
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Oslo never fails to deliver unique experiences and tastes. With its old history yet modern feel, the city gives the visitor a wonderful mixture of both old and new. And in the core of the city ends The Follo Line. The country’s largest infrastructure project with the so far longest railroad tunnel in Norway. Despite low population numbers, the nightlife is really pulsating, with numerous bars, clubs, cinemas, theatres and musical scenes. Oslo has a considerable geographic size, but there are only some 600,000 people living there. The city hence offers unique nature interactions that are difficult to match anywhere else in Europe. Hills and forests on one side, and the magnificent Oslo fjord on the other, surround the city.

The Follo Line Project: Urban project constructing the longest railway tunnel in the Nordic countries
The 20 km long tunnel at Follo Line is the longest railway tunnel to date in the Nordic countries. This is Norway’s first long twin tube railway tunnel constructed with tunnel boring machines.

The new, in total 22 km long double track railway line between Oslo and the small town of Ski, will provide a significantly improved railway capacity for the region south of Oslo towards the border of Sweden. The line will be completed in December 2021.

Contact: Anne Kathrine Kalager, +47 911 01 321
POST CONGRESS TOUR

15-17 JUNE - 2 NIGHTS

“NORWAY IN A NUTSHELL”

Bergen-Balestrand-Laerdal-Aurland-Flåm-Oslo or return to Bergen. This tour includes a visit to the world’s longest fjord and the world’s longest road tunnel. A private orientation is given by the Norwegian Public Road Administration. The group will also be given the opportunity to join a private visit to the White Caves in Gudvangen. An optional trip to the Hydro Power Plant in Aurland is also included.

Contact: Nils Borge Romslo, + 47 918 52 917

15-17 JUNE - 2 NIGHTS

"THE TRIP TO NEW RECORDS"

Going east and then south from Bergen you will go through the beautiful landscape of Hardanger. On the way you will be given private tour to power plants, pass the new Hardanger bridge and end up in Stavanger. On the way you will visit the ongoing Ryfast project with three tunnels. You will also get information about the Rogfast Project. The Rogfast will include a tunnel that will be the world’s longest sub-sea road-tunnel, with its length at 26.7 km. It will also be the deepest sub-sea road-tunnel in the world, the deepest point is appx 390 m beneath the sea level.

Contact: Gunnar Gjæringen, +47 950 88 783
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ACCOMPANYING PERSONS PROGRAM

MONDAY 12 JUNE

Historic walking tour of the Hansa area of Bergen

Bryggen in Bergen
Start from the Grieg hall Congress Centre at 10:00.

See the magnificent and unique architecture of the City. The tour will include a «back stage» stroll through the old buildings at Bryggen – the wharf area, which is on the official UNESCO’s World Heritage List.

The tour includes entrance to the Hanseatic Museum, which will introduce the visitor to an interesting insight into the lives and work of the German Hansa fish traders during the middle ages. The second inside visit will be made to ‘Schøtstuene’ the Hanseatic assembly rooms. These are old assembly rooms where the Hanseatic merchants gathered for warm meals, held court meetings and taught the apprentices. End at the Hanseatic ‘Bryggen Tracteursted’ restaurant for two-course lunch. Lunch include coffee and iced water. Other beverages payable at the restaurant.

After lunch – optional visit to the KODE Art museums of Bergen, situated next to the Grieg hall.

KODE offer temporary exhibitions of art and design as well as extensive presentations of works by Edvard Munch, J.C. Dahl and Nikolai Astrup. The Rasmus Meyer Collection and the Silver Treasure are two of the most important collections KODE administers. (Entrance fee to KODE is not included in the excursion price, admission NOK 100 per person, payable at entrance)

Duration: 3 hours.
Operation subject to max. 15 bookings.
Cost per person NOK 650.-

Contact: Arnulf Hansen, +47 901 69 726
ACCOMPANYING PERSONS PROGRAM

TUESDAY 13 JUNE

Troldhaugen – The home of Edvard Grieg

Private concert at the home of Edvard Grieg
Start from the Grieg hall Congress Centre at 10:00.

A coach will depart from the Grieg hall with a local English speaking guide. The trip will start with a short orientation tour of Bergen before continuing to the outskirts of the city, to Troldhaugen. Troldhaugen (the hill of the Trolls) was built in 1885, and was the home of Norway’s most famous composer, Edvard Grieg. He lived there for 22 years, and composed many of his best-known works in the little garden hut by the shore of Lake Nordås.

There will be a short guided tour of the home before you will be enjoying a private, exclusive Grieg concert in “Troldsalen”, a separate chamber music hall built in 1985.

After the visit, a two-course lunch will be served at the mountainside Bellevue Restaurant, offering bird’s eye view of Bergen. Lunch include coffee and iced water. Other beverages payable at the restaurant

Duration: 4 hours
Operation subject to max. 40 bookings.
Cost per person NOK 900.-

Contact: Arnulf Hansen, +47 901 69 726
Start from the Grieg hall Congress Centre at 10:00.

This tour will take the visitors by private coach and local guide for a 3 hours sightseeing of Bergen. The tour will include all main sights in the city centre. The tour will then proceed to the open-air museum of ‘Gamle Bergen’.

The city of Bergen is known for its old wooden houses and at the Old Bergen museum (open-air museum) consists of a whole cluster of them. Some of them are on their original sites, but the majority has been collected from other parts of Bergen. Here they have been rebuilt along streets, alleys, and on squares, just as they would have been 100-200 years ago. The houses are carefully restored to its original beauty and show the original Bergen architecture traditions. The interiors are from our forefather’s times, several generations past. They give visitors of today a picture of life in those days at work and time of leisure, in sorrow and happiness in old Bergen. Enjoy a two-course lunch at the ‘Old Bergen Tracteursted’ restaurant before return transfer to the Grieg hall.

Duration 3 Hours.
Operation subject to max. 30 bookings.
Cost per person NOK 750.-

Contact: Arnulf Hansen, +47 901 69 726
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PROFESSIONAL CONGRESS ORGANIZER
AIM Group International - Milan Office
Via R. Ripamonti, 129
20161 MILANO
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