



## Auxiliary measures: ground improvement for tunnelling

### Day 1:

#### **Session 1: General overview**

08:30 – 09:30: Basic considerations of auxiliary measures

#### **Session 2: Injections**

09:30 – 10:30: Design of injection works in rock

10:30 – 11:00: *Coffee Break*

11:00 – 12:00: Design of injection work in soil

12:00 – 13:00: Ground improvement for tunnelling projects

13:00 – 14:00: *Lunch*

14:00 – 15:00: Injection materials

15:00 – 16:00: Compensation grouting – fundamentals & case history

16:00 – 16:30: *Coffee Break*

16:30 – 17:30: Grouting in fault zones – lessons learnt from the Gotthard Base tunnel

#### **Session 2: Drainage**

17:30 – 18:30: Design of drainage works

### Day 2:

#### **Session 3: Forepoling and face reinforcement**

08:00 – 09:00: Forepoling design

09:00 – 10:00: Face reinforcement design

10:00 – 10:30: *Coffee break*

10:30 – 11:30: Execution and technology

11:30 – 12:30: Case histories

12:30 – 13:30: *Lunch*

#### **Session 4: Jet Grouting**

13:30 – 14:30: Design and application in tunnelling including case histories

14:30 – 15:30: Execution aspects including case histories

15:30 – 16:00: *Coffee break*

#### **Session 5: Ground Freezing application**

16:00 – 17:00: Ground Freezing design and application in tunnelling including case histories

17:00 – 18:00: Execution aspects including case histories

18:00 – 18:30: Discussion and closing remarks