

Control and Monitoring of Tunnels and Underground Space

27-29 November 2017

Bhutan

Objective: To provide information, methods, and examples of “monitoring” the effects of tunnelling, including the monitoring of tunnel machine performance, to control tunnelling to achieve acceptable excavation performance with stable underground structures, and prevent damage to existing structures and utilities. Monitoring allows the tunnel design and construction procedures to be adjusted and validated as tunnelling takes place.

Topics include instrumentation (equipment and typical applications), interpretation of monitoring data, role of monitoring in risk management, contractual aspects, and case histories. The course is of interest for owners, designers and construction engineers, supervisors, and managers.

Monday, 27th November

Session 1: Introduction and Overview

09.00-09.15: Welcome and opening : ITA and local representatives

09.15-09.45: General presentation on tunnel monitoring (objectives, why, what and who)

09.45-10.30: Types of instruments, data collection, information management

10.30-11.00: Coffee Break

11.00-11.45: Monitoring during investigation and study process

11.45-12.30: Role of monitoring in a risk management approach

12.30- 13.00: Questions and Answerse

13.00-14.00: Lunch

Session 2: Monitoring during construction

14.00-14.45: Monitoring methods in conventional tunnelling

14.45-15.30: Case study 1 : Conventional project

15.30-16.00: Coffee Break

16.00-16.45: Monitoring methods in mechanized tunnelling

16.45-17.30: Case study 2 : Mechanized project

17.30-18.00: Questions and answers

Tuesday, 28th November

Session 3: Tools and organisation

09.00-09.45: Topographical methods to monitor deformations

09.45-10.30: Instrumentation installation

10.30-11.00: Coffee Break

11.00-11.45: Monitoring Interpretation – Case Studies

11.45-12.30: Contractual roles and responsibilities: what entity has responsibility?

12.30- 13.00: Questions and Answers

13.00-14.00: Lunch

Session 4: Case studies – Learnings from various projects

14.00-14.45: Case study : Monitoring on Hard Rock TBMs

14.45-15.15: Coffee break

15.15-16.00: Case study : Monitoring a tunnel in a landslide area

16.00-16.45: Round table : Future developments in monitoring

16.45-17.15: Closing Remarks

Wednesday, 29th November

Technical site visit - Punatshangchhu Hydroelectric Project