

## Seminar on Underground Space Use

Singapore – November 2012

*Tentative program – February 2012*

**Seminar Objective:** Introduction for engineers, architects, planners and public administrators to the use of underground space to increase liveability and sustainability in urban areas and in other key public resource regions. The seminar will identify key issues that need to be considered when using underground space and will show how these key issues are dealt with on a worldwide basis.

**Background:** This course outline has been developed by the ITA Committee on Underground Space (ITACUS) in conjunction with the ITA Committee on Education and Training (ITA-CET).

### Day 1 - Introduction and Overview

09.00-09.45: Welcome and Opening: ITA and concerned country representatives (Han Admiraal)

- Registration
- Opening
- Information on ITA, ITACUS and ITA-CET activities
- Information on projects in the host country

09.45-10.30: Solutions and missed opportunities (Han Admiraal)

- Presentation of 2-3 international projects that highlight how underground space can address infrastructure and new facility needs while maintaining or improving liveability
- Presentation of 2-3 international projects where a lack of prior appreciation for underground space use either precluded or greatly increased costs for underground projects

10.30-11.00: Coffee Break

11.00-11.45: A history of underground space use (Ray Sterling)

- Transportation
- Other infrastructure uses
- Building uses
- Rock cavern uses
- Classification of underground space uses by geometry and type of use

11.45-12.30: Brief overview of construction methods (Wout Broere)

- Cut-and-cover structures
- Tunnelled and mined structures

12.30-14.00: Lunch

## **Advantages and Disadvantages / Sustainability and Need for Planning**

14.00-14.45: Detailed exploration of potential advantages and disadvantages (Jean Paul Godard)

- Location
- Isolation
- Topography
- Human factors
- Safety
- Life-cycle cost

14.45-15.30: Sustainability issues (Han Admiraal)

- Preserve opportunities for future generations
- Environmental impact
- Reusability
- Maintenance and replacement

15.30-16.00: Coffee Break

16.00-16.45: Key planning and design issues for individual underground facilities (Monique Labbé and Ray Sterling)

- Tunnels
- Buildings
- Mined space
- Utilities and common utility tunnels
- Pedestrian networks

16.45-17.30: Example (s) on assessing key issues for underground facilities

17.30-18.00: Questions and Answers

## **Day 2 Planning and cost-benefit issues for broad-scale underground space use**

09.00-09.45: Focus on initial and life cycle cost examples (Jean Paul Godard and Ray Sterling)

- Infrastructure projects
- Building projects
- Pedestrian networks
- Importance of land value

09.45-10.30: Legal and compensation issues for underground space (international examples and methodology) (Ray Sterling)

- Depth of ownership / easement practices and costs
- Mineral rights
- Liability issues
- Special situations (e.g. reuse of space after mineral extraction)

10.30-11.00: Coffee break



11.00-11.45: Human factors and risk (Han Admiraal)

- Psychological issues
- Physiological issues
- Fire and life safety
- Disaster protection

11.45-12.30: International examples and case studies of master planning for underground space use (Ilkka Vahaaho and other presenters)

- Finland
- Norway
- Sweden
- Netherlands
- USA

12.30-14.00: Lunch

## **Guidance for planning and design of underground spaces**

14.00-14.45: International examples/case studies of master planning (continued) (Ilkka Vahaaho and other presenters)

- France
- Japan
- China
- Singapore

14.45-15.30: A practical approach for underground space use planning (Ilkka Vahaaho)

- Stage of urban development
- Key geographical, topographical and geological features
- Matching planning effort to urban conditions
- Public input

15.30-16.00: Coffee Break

16.00-16.45: Practical approach to planning (continued) (Ilkka Vahaaho)

- Master planning components
- Utilities and common utility tunnels
- Tunnelling for transportation and other infrastructure
- Pedestrian networks
- Open-cut developments
- Mined space developments
- Multi-functional opportunities

16.45-17.30: Assessment of examples and opportunities (Work session with several presenters)

- Attendees assess good and bad examples
- Attendees identify opportunities in real and/or hypothetical case studies

17.30-18.00: Closing Remarks