

Strategic Theme 4: Resilient Infrastructure

Goal

The goal of Strategic Theme 4 is to improve the quality and efficiency of road infrastructure through the effective management of assets in accordance with user expectations and government requirements. TC 4.4 has been formed to focus on road tunnels within Theme 4.

Overview

This was the seventh meeting of the full Technical Committee and was held in-person in Dehradun, India. The purpose of this TC 4.4 meeting was to present and discuss the main activities and products of the TC 4.4 Work Groups and discuss preparations for the final meeting for the cycle which will be held during the 2023 World Road Congress in October.

The Committee also organised and participated in the International Seminar on “Advances in Design, Construction and Operation of Tunnels”, held in Dehradun on 19-21 April.

17 April 2023

Mr Ingo Kaundinya (Chair of TC 4.4) opened the meeting and 20 members participated along with several observers.

TC 4.4 has 73 full members, including corresponding members, 17 Associate members and 82 associates in Working Groups.

Work Groups

Work Group 1 – Best Practices in Urban and Heavily Trafficked Tunnels

This Group is working on best practices in management (maintenance and traffic operations) in urban and heavily trafficked tunnels. It has prepared and published a Case Study Report in April 2022.

The full technical report on best practices in management (maintenance and traffic operations), particularly for heavily trafficked tunnels has been published in English. It includes an update of the PIARC report from 2008, titled “Urban tunnels – recommendations to managers and operating bodies for design, management, operation and maintenance”. The Group is arranging translation of the full report in French and Spanish.

Work Group 2 – Tunnel Resilience

The Work Group is developing a report on increasing tunnel resilience with the aim of increasing the availability of tunnels, safely. The Group’s literature review has been completed and a report published by the WRA in March 2021. The Group has prepared 18 case studies on tunnel resilience from 13 countries (including one case study from Australia). The case studies together with the literature review, form a briefing note report, which was published in March 2022.

The Group is working on the preparation of measure sheets for each measure that improves resilience. These sheets will provide a brief overview of each measure with an indication of the ease of implementation and the expected effectiveness of each measure. The measure sheets will be included in the full report and there will also be a road map to manage and improve resilience. The final version of the full report will be available for the World Road Congress in 2023. Approval of the report by PIARC and its publication are anticipated in late 2023 or early 2024.

I am a member of this Work Group.

Work Group 3 – Intelligent Transport Systems in Tunnels

This Work Group is examining ITS developments for road network management and what could be applied in tunnels to improve safety and traffic flow efficiency. This Group is using surveys to obtain some of the information for its report.

The structure of the technical report has been developed, but data collection is on-going, and preparation of the full report is delayed.

Work Group 4 – Impact of New Propulsion Technologies

This Group is studying the impact of new propulsion technologies on road tunnel operations and safety and how to prevent and mitigate the potential consequences of incidents involving alternative fuel vehicles. A collection of case studies has been completed and presented in a report which was published in 2022.

A draft full technical report has been prepared and is being reviewed by the Technical Committee members. The final report is expected to be submitted to PIARC General Secretariat for approval in June 2023 and be ready for presentation at the World Road Congress in October.

The Work Group is finding that there is much new development and research on this topic. Hence, this topic may continue into the next PIARC cycle.

Task Force- DGQRAM

DG-QRAM is software that is used to classify tunnels for use by dangerous goods vehicles. In the current cycle, the software has been further upgraded to better meet user's needs. The upgraded tool (Version 4.10) is available on the PIARC website. Training sessions for the new DG-QRAM software are planned to be held in October 2023 in Paris. Further modules could be developed for DGQRAM, but further funding is required.

I enquired as to whether training could be done remotely as it would be cost prohibitive for many potential users to travel long distances (such as from Australia) to attend the training. I was informed that it would be difficult for beginners to be trained remotely. If there is sufficient interest from Australia, consideration would be given to sending trainers to Australia (for a fee).

Task Force – Knowledge Management

This Task Force continues to progressively update the manual with new content from the last cycle and the current cycle. Case study reports prepared by the Work Groups will be included in the appropriate sections of the manual.

News from General Secretariat

Over 50 publications released by PIARC in the current cycle.

Expect to approve the Strategic Themes, Technical Committees and Task Forces in April 2023 (not the members).

First Delegates will soon be asked to nominate Chairs and Work Group Leaders.

At the World Road Congress, there will be a session for each Technical Committee and Task Force to present the results of their work.

18 April 2023

Liaison with other organisations

ITA and ITA – Cosuf

ITA – Cosuf aims at being the center of excellence for world-wide exchange of information and know-how regarding safety and security of underground facilities.

ITA and ITA-Cosuf have been working closely with PIARC at work group level on key road tunnel issues. A road tunnels congress will be held in Athens in May 2023 and will cover operational safety issues.

CIE-International Commission on Illumination

This organisation's key aim is to prepare guides for the design of exterior and internal lighting. Only one committee of this organisation is currently active. This is the committee dealing with tunnel lighting evolution. It is revising the methodology for lighting short tunnels (for energy saving and use of dynamic control of LED lighting systems).

Potential Topics for the Next Cycle

Possible topics for the next cycle of the Road Tunnels Committee have been discussed at the last few meetings of our committee. We have settled on the following topics and tasks to recommend to PIARC General Secretariat for consideration.

- Road tunnel operations and safety issues related to the usage of new energy carriers in road vehicles. Continue the work undertaken by Work Group 4.
- Collect more data relating to incidents.
- Digitilisation of tunnel operations; new approaches.
- Sustainability of tunnel operations; new approaches.
- Impact of the development of walking and cycling facilities in urban road tunnels.
- Further development of DG-QRAM.
- Continuous update of the Road Tunnels Manual.
- Conduct 3rd international conference on road tunnel operations and safety.
- Conduct two international seminars in Low and Middle Income Countries.

World Road Congress 2023 – Prague

Our Technical Committee is invited to make presentations at the World Road Congress on the following topics.

Topic 47 – Digitalisation of road tunnel design and management.

Topic 48 – Road tunnel operation and safety issues related to the usage of new energy carriers in road vehicles.

Technical Presentations

NEXCO – Japanese tunnel company

NEXCO is a government owned company that designs, constructs and operates tunnels.

It engages in PPP procurement opportunities across the globe.

NEXCO has a research institute and manages 565 km of tunnels.

It provides engineering services to developing countries and is currently providing significant support to India's tunnel development, including the provision of training and SMEs.

Tunnel Renovation Benchmarks (Austria)

We received a short presentation on the costs to refurbish road tunnel systems in Austria.

Based on experience in 67 tunnels in Austria in recent years, the average cost to refurbish road tunnels systems has been in the order of 3,700 Euros per metre to 4,700 Euros per metre.

Currently, the costs are approximately 7,000 Euros per metre. The significant cost increase is attributed to Covid-19 and the war in Ukraine.

Developments in Brussels

We were informed that robots are being used to conduct underground inspections in Brussels. This approach was developed to improve safety and efficiency of underground inspections. Anticipate the application of robots for underground work, including for construction of tunnels.

Next Meetings

2 – 6 October 2023: World Road Congress in Prague, Czech Republic and a TC meeting.

19 – 21 April 2023 International Seminar on Advances in design, Construction and Operation of Tunnels.

This seminar was held in Dehradun with presenters from TC 4.4, representatives of the Ministry of Road Transport and Highways, Government of India and others from Thailand and ITA-Cosuf. There were 12 sessions .

Session 1: Conceptual Planning & Design for Road Tunnels.

Sessions 2: Ventilation and Fire Protection.

Session 3: Latest Developments in Tunnel Construction.

Session 4: Sustainable Road Tunnel Operation.

Session 5: Geotechnical and Geophysical Investigations.

Session 6: Safety Issues.

Session 7: Contractual Issues/Risk Management.

Session 8: Risk Management.

Session 9-12: Case Studies on Road/Rail Tunnel Project Projects.

There was also a Technical Visit to Rishikesh-Karnaprayag rail line tunnel project.

I made a presentation on Sustainable Road Tunnels and was Co-Chair for one of the sessions.

Some interesting points noted from the various presentations:

In France, to assist with self-evacuation in tunnels, they have developed an arrangement which includes dynamic chevrons to assist users to find the escape route and refuge area, flashing lights alongside the door of the refuge area, the use of a siren and audio messages.

Information campaigns are also used to explain what to do in case of a fire or a vehicle breakdown in a tunnel.

In Austria, they have learnt that the simpler the ventilation system the less prone it is to malfunction. Full transverse systems are proving to be difficult to maintain. Semi-transverse systems are the most beneficial for smoke extraction and fire control.

In Norway they have an average of two large fire incidents a month in tunnels. No significant damage in 80% of the incidents. The longitudinal grades in tunnels can be up to 10%. Steep grades is considered to be a key factor in the cause of fires as steep grades tend to stress heavy vehicles.

George Mavroyeni
Technical Director, Independent Reviewer
AECOM Australia Pty Ltd
April 2023