

# INDIA



**Name of Association:** Tunnelling Association of India  
**Type of Structure:** Non-profit, open association  
**Number of Members:** 600

## ASSOCIATION ACTIVITIES DURING 2023 AND TO DATE

- TAI organized the biennial event in Mumbai which was attended by the ITA President online. The event was well attended by the about 300 tunnel and underground professionals from Clients, consultants, academia, contractors, manufacturers and suppliers
- Tunnelling Asia Conference – Underground The Need of the Day, 27th - 28th June 2022, Mumbai
- 3rd Edition of TAI-Tunnelling and Underground Space Awards 2022
- Workshop on Observational Approach in Tunnelling: Evolvement, Issues and Challenges, 24th – 25th June, 2022, Mumbai
- TAIYM Annual Conference - Underground Space: Challenges & Opportunities, 28th June, 2022, Mumbai

## Workshops and International conferences

- Workshop on Best Practices for Safe Cross Passage - Investigation, Design and Construction, 27th – 28th April 2023, New Delhi
- International Conference on EPC Contract Management – Challenges and Issues, December/January 2024
- International Conference on Tunnelling for Infrastructure Projects – Challenges and Issues, February 2024, Rishikesh/Guwahati
- Tunnelling Asia 2023 Biennial Conference - Theme: Climate Change Resilience and Sustainability in Tunnelling and Underground Space, November 2023, Goa
- TAI Awards – Distribution in Tunnelling Asia conference
- Hosting of ITA Award Function

## Publications

### TAI Young Member Group

Publications:

- Preparation of Manual and Guidelines
- TAI journal – 2 Nos. (Half yearly)

TAI Publications:

- Guidelines for Precast Fibre Reinforced Shotcrete Segment
- Guidelines for Geo-physical Investigations for Tunnels
- Manual on Underground Works Proceedings of the Workshops
- Observational approach in tunnelling: evolvement, Issues and Challenges
- Tunnel Design and Construction: Issues & Challenges
- Innovation in Tunnelling Technologies
- Risk management in Tunnelling Proceedings of Tunnelling Asia' 2022 Conference

## CURRENT TUNNELLING ACTIVITIES

Large-scale infrastructure projects in India have created significant opportunities in the tunnelling segment. India will invest Rs. 700bn on infrastructure development, which will provide a boost to the country's tunnelling industry as well. There has been a sharp increase in the budgetary outlay for the road (by Rs. 140bn) and railway (by Rs. 100.5bn) sectors. Over Rs. 82bn has been allocated for metro rail projects in the country. There is also a focus on infrastructure development in the north-eastern region, a prime market for the tunnelling industry.

In the past few years, the Indian industry has developed several landmark and strategic tunnel projects. The country's longest rail tunnel, the 11km Pir Panjal Tunnel, and longest road tunnel, the 9.8km Chenani-Nashri Tunnel were put into operation in Jammu & Kashmir. The 8.8km Rohtang Tunnel is the world's longest road tunnel being built at an altitude of 10,000 feet.

The world's longest TBM-driven tunnel without intermediate access – the 43.5km AMR Water Tunnel – is being built in Andhra Pradesh. India's first underwater metro rail tunnel is also being constructed as part of the Kolkata Metro project. Mumbai is building India's biggest urban water tunnel.

Tunnelling methods have also evolved in recent times. TBMs were successfully used for the Hydropower Projects in Jammu & Kashmir for the construction of a 14.6km long tunnel with an impressive monthly tunnelling progress of 816m. DMRC is using the NATM technology for the first time to construct a metro tunnel under the on-going Phase III of the Delhi metro project.

A few projects have faced delays due to long-standing issues. These pertain to geological surprises, weak risk identification and assessment, contractual disputes, old contracting practices, out dated tunnel design practices and construction methods, and inadequate safety mechanisms.

Contractors have started using advanced technologies and methodologies to enhance productivity and ensure timely delivery of projects. In addition, deployment of modern systems for monitoring, lighting, ventilation, safety and security are also being explored.

## North East Frontier Railway

(Construction) is executing a number of new projects to connect the capitals of the North Eastern states. Apart from these, several projects such as gauge conversion and doubling have been undertaken to improve the connectivity and mobility in this area. Since the alignment of these connectivity projects mostly pass through difficult terrain with deep gorges and high hills, construction involves a large number of tunnels. North-east region is geologically one of the most complex formations. The major rock formation consists of sand; silty clay and shale with limestone. The formation in this part is mostly immature and there are several thrust and faults.

Out of 188.6km of tunnelling identified in various sanctioned projects, 12.60km have been commissioned for train operation and another 42km of tunnelling has been completed with track linking shortly.

## Jiribam-Tupul – Imphal New Line

**Project (110.62km):** Out of total 59.5km of tunnelling involved, 42km has been completed. Construction is in full swing to complete the balance of 17.05km. The longest tunnel is between Tupul - Imphal, and is 11.55km.

## Bhairabi - Sairang New Line Project

**(52.35km) in Mizoram:** There are 23

tunnels with total length of 9.26km, the longest being 1.76km. Of the above, underground excavation and primary support in 5.2km has been completed and the final lining is in progress.

**Dimapur - Kohima New Line Project (88km):** About 30km of tunnelling is involved in this project.

**Barnihat- Shillong New Line Project (108km):** There are 31 tunnels with a total length of 39.06km. The longest tunnel is 4.11km.

#### **Sevok-Rangpo New Line Project:**

About 38.55km of tunnelling is involved in this project.

With a view to provide an alternative and a reliable transportation system to Jammu & Kashmir, the Gov. of India planned a 326km long railway line joining the Kashmir valley with the Indian Railways network. Jammu-Udhampur-Srinagar- Baramulla Railway line is the toughest project being constructed in mountainous terrain. It passes through the young Himalayas, tectonics thrust and faults. Jammu- Udhampur section (54km) was completed in April 05. Udhampur-Baramulla section i.e USBRL Project (272km) is being executed as a National project.

#### **Udhampur – Srinagar – Baramulla Rail Link:**

The 326km long USBRL Project involves 38 tunnels (with a combined length of 119km) with the longest being 11.2015km. There are also 927 Bridges ( combined length of 13km).

Out of 326km length from Jammu to Baramulla , 215km have been completed and commissioned (66%) as detailed below:

- Jammu-Udhampur section (54km) commissioned in Apr'05
- Quazigund - Baramulla section (118km) commissioned in phases from 2008 to 2009
- Quazigund – Banihal section (18km) commissioned in June 2013
- Udhampur – Katra section ( 25km) commissioned in July 2014

The balance length of 111km from Katra to Banihal is in progress. This section predominantly involves tunnelling (97km). At present 51km out of 97km of tunnelling and 12 bridges out of 37 have been completed.

#### **Delhi Metro Phase-IV Project**

The Delhi Metro Rail Corporation (DMRC), is undertaking the mega-expansion of the Delhi Metro Phase-IV to add over 100km of six new metro lines to the existing network, which will connect various parts of Delhi and the surrounding National Capital Region (NCR). The new lines will have a total length of 103.94km, with the addition of 28 new stations to the DMRC network. The Delhi Metro Rail Corporation (DMRC) is making significant progress on Phase-IV of the metro network. This phase comprises a total of 65km, of which 28km will be underground.

The DMRC has already constructed a 10km tunnel while work is ongoing on a 4km tunnel on the Aerocity-Tughlakabad corridor. In the coming months, tunnelling will commence on several other stretches. The underground stations are being constructed using traditional 'cut and cover', whilst TBMs are being employed for the tunnels.

Due to the route's passage through heavily populated areas, the DMRC faces a substantial hurdle in completing the 18 stations it plans to construct on the underground portion of Phase-IV. Throughout the underground work, the structures above the work zones will be continuously observed. A total of 19km of the line's total length will be buried under the Aerocity–Tughlakabad corridor, while 9km will be under the Janakpuri West–RK Ashram Marg sector. By the end of 2025, the DMRC hopes to have finished the Phase-IV project.

#### **Chennai Metro Rail Project Phase I**

The Metro consist of two corridors approximately 45km in length, with 32 stations of which 19 are underground and 13 elevated. The route within the main city is proposed to be underground with twin tunnels connecting the underground stations whilst the southern section will be constructed on viaducts between the elevated stations. Generally the underground stations have two levels with a concourse above platform level and the tunnels about 12m to 16m below ground level. There will be a total of 37km of tunnels, of which 36km (single tunnel length) will be bored using EPBMs and 1km will be constructed by cut and cover. As part of Phase II, CMRL will be developing an underground network of 80.5km as part of Corridor 3, 4 and 5.

#### **Mumbai Metro Network**

Plans for the metro network in Mumbai are dynamic and will have the following corridors:

1. Versova-Andheri-Ghatkopar (11km)
  2. Charkop-Bandra-Mankhurd (33km)
  3. Colaba-Bandra-SEEPZ (33.5km) under construction
  4. Charkop - Dahisar (8km)
  5. Wadala-Ghatkopar-Teenhat naka (21km)
  6. SEEPZ-Kanjur Marg (7km)
  7. Andheri(E) - Dahisar(E) (18km)
  8. Andheri - Ghatkopar –Mankhurd (16.5km)
  9. Sewri – Prabhadevi (5km)
- Total: 153km

#### **Highway Tunnels**

*Zojila Road Tunnel in J&K to Leh:* A 14.1km long single tube road tunnel with two traffic lanes and a parallel egress tunnel (14.2km). The maximum overburden is approx. 660m. The civil construction cost is some Rs 5486 Crore without approaches and the construction period is 7 years.

*Pir-Ki-Gali Tunnel in J&K, NH-244:* The main tunnel length is approx. 8.508km with an egress tunnel length of approx. 8.508 km and a maximum overburden of approx. 660m. The civil construction cost is Rs 4185 Crore and the construction period is 79 months.

*Vailoo Tunnel in J&K:* The length is 8.5km with an approximate cost of 3500 Crore.

*Daranga Tunnel in J&K on NH 244:* 4.5km long.

*Kiratpur-Neharchowk:* 5km

*Pandoh:* 10km

*Shimla By-Pass:* 6km

#### **FUTURE ACTIVITIES**

##### **Conferences:**

- Tunnelling in Infrastructure development: Issues and Challenges at Guwahati

##### **Workshop:**

- NATM & TBM Tunnelling including Risk Management
- Health and Safety in Tunnel and Underground Construction

##### **Software application in Tunnelling Training Programme for Young engineers:**

- Tunnel Design and Construction
- Conventional Tunnelling
- Mechanized Tunnelling
- Sprayed Concrete
- Innovation in Tunnelling Technologies