

India



Name: Tunnelling Association of India

Number of Members: 300 members

ASSOCIATION ACTIVITIES DURING 2018 AND TO DATE

Main activities:

- Organization of Conference
- Seminar
- Workshop
- Training Programmes

TAI Awards

TAI Young Member Group Launched

Publications:

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

TAI Publications:

- Guidelines for Precast Fibre Reinforced Shotcrete Segment;
- Guidelines for Geophysical Investigations for Tunnels

Proceedings of the Workshops

- NATM & TBM Tunnelling including Risk Management
- Tunnelling in Himalayan Geology
- Tunnel Design and Construction: Issues & Challenges
- Innovation in Tunnelling Technologies
- Ventilation in Long Tunnels and Fire Safety
- Risk management in Tunnelling
- Observational approach in tunnelling : evolution, Issues and Challenges
- Drilling and blasting in tunnelling operations

Proceedings of Tunnelling Asia'2019 Conference

CURRENT TUNNELLING ACTIVITIES

The tunneling industry comprises around 1500 tunnels spanning over 3,000km. Of these, 900 spanning 1500km are operational and over 600 covering 1500km are under implementation. Hydropower tunnels account for the biggest share (around 60% in terms of no. of tunnels and 72% in terms of length). By 2030, the number of tunnel projects planned in different States in India will require an investment of US\$58bn.

Hydropower Tunnels:

Considerable tunneling activity is involved in the hydropower projects and it is bound to accelerate since major thrust has been laid by the Govt. of India for harnessing available hydropower potential of 2,44,000MW including Pumped Storage development out of which so far about 40,000MW has been developed. Construction of these hydropower projects will involve extensive tunnelling, underground caverns and other connected infrastructure on a much larger scale of more than 1000km practically in every type of strata. Hydro power dominates the tunnelling industry both in number and length of tunnels as 980 major hydropower tunnel works covering over 2,165km. A typical hydropower tunnel project is an expensive venture, with an average cost of US\$10M/km. In terms of investment, the hydro tunnel market in India is estimated at US\$22bn.

Metro Rail Tunnels

The Government of India has decided that cities with a population of more than 2 million will have metro rail such as Delhi & NCR extensions, Chennai, Bangalore, Mumbai, Kolkata, Hyderabad, Ahmadabad, Pune, Surat, Kanpur,

Lucknow, Nagpur, Indore, Coimbatore, Patna, Kozhikode, Raipur, Bhopal Trivandrum, Chandigarh, Navi Mumbai, Ludhiana, Jaipur, Kochi etc. There are more than 21 cities which fall under this category where metro rail work is being executed/planned involving a total route length of 1391km, out of which 400km has been planned in tunnels involving an investment of about US\$25bn.

Railway Tunnels

Railway tunnels account for a 29% share in overall tunnel length i.e. 453 railway tunnels is covering 332km. About 316 tunnels covering 138km length have been completed. About 137 tunnel works covering 194km are underway on various rail line projects. Important national projects already planned involve the construction of several tunnels of about 420km length and an investment of US\$6.3bn. On an average, a typical railway tunnel costs US\$15M/km.

Irrigation, Urban Water and Sewerage Tunnels

Irrigation has the biggest market for tunnelling in the water and sewerage segment. Over 72 irrigation, urban water and sewerage tunnels spanning over 350km and water and sewerage tunnels spanning over 42km are planned to in Maharashtra and Tamil Nadu. The Ministry of Water Resources is planning tunnel projects of about 200km as part of river linking projects. There will be an investment of US\$0.6bn.

Road and highway tunnels

Road and highway tunnels are more useful in the Himalayan region and Western Ghats. About 30 roads and



highway tunnels covering over 120km are planned to be awarded and implemented at an investment of about US\$2.5bn.

Underground caverns development:

Phase-I of the Indian strategic crude oil reserve programme involves construction of storage units of 5.33 million metric tonnes (MMT) at an expenditure of US\$0.6bn. Phase-II involves stocking of strategic reserves by Govt. of India involve storage units of 12.5 MMT at an expenditure of US\$2bn.

North East Frontier Railway

- As per 'Vision 2020' of Indian Railways, North East Frontier Railway (Construction) is executing a number of new projects to connect the capitals of the North Eastern states. Since the projects mostly pass through difficult terrain with deep gorges and high hills, construction involves a large number of tunnels..
- 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, which is 11.55km.
- Bhairabi - Sairang New Line Project (52.35km) in Mizoram: There are 23 tunnels with a total length of 9.26km. The longest tunnel is 1.76km. Underground excavation and primary support in 5.2km has been completed and 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 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.
- Salonia - Khumtai New Line Project: (99km): About 17.65km of tunnelling is involved in this project.

Delhi Metro Phase- III project

- For the first time on the Delhi Metro, two of the tunnel drives have been completed by dragging the TBMs through a station. Naraina station box was completed with a temporary base slab on which both the TBMs were dragged through for completion of a small length of tunnel on the other side of the station.
- 45 EPBMs have been deployed by the



- contractors. 26 worked simultaneously at the peak period, 20 are still working.
- There are total 74 tunnel drives out of which 57 drives have been completed and remaining 17 are in progress. Overall, present progress of tunnelling is 91%. The internal finished dia. of all the tunnels is 5.7 to 5.8m.
 - Precast segmental lining has been used, with each ring comprising 6 segments including one key segment. Length of ring varies from 1200mm to 1500mm. The precast tunnel lining segments are with M-50 concrete with use of mero silica. These have been cast in 13 state of the art segment casting yards developed by different contractors with steam curing facilities to reduce the de-molding time and increase the production capacity.
 - Total 53725 no. of lining rings have been used in Phase-III.
 - Tunnel drives below old buildings have been completed with minimum effect on a structures.
 - Tunneling in line No. 6 has been successfully completed through an area having many heritage buildings.

Chennai Metro Rail Project

Phase I of the Metro consist of two corridors approximately 45km in length, with 32 stations of which 19 are underground and 13 are elevated. The route within the main city area is proposed as 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 are at about 12m to 16m below ground level. Twin tunnels are bored using state of the art TBMs. 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.

Plans for the Mumbai Metro are ongoing 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

The Zojila Road Tunnel in J&K to Leh: Length of tunnel is 14.1km, in a 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: 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 egress tunnel length of approx 8.508km. The maximum overburden is approx 660m. The civil construction cost is Rs 4185 Crore and the construction period is 79 months.

FUTURE TUNNELLING 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

Publication:

TAI Journal: Half Yearly