

## MD Speaks

Ms. Ashwini Bhide, IAS

With monsoon round the corner, all contractors and engineers have started working dedicatedly to ensure that ongoing works don't disrupt the city traffic. Towards this necessary planning and deployment of special and specific works has been ensured confirming to MCGM and State Government Disaster Management directives/guidelines for every monsoon. The objective was to ensure that the ongoing works of Metro-3 continue without interruptions while ensuring traffic movement around the work zones. All pre-monsoon activities are nearly completed and as precautionary measures the Disaster Management teams will be ready for citizen's safety by 1<sup>st</sup> June, 2018.

Notwithstanding the citizens' complaints and Hon High Court directives, MMRC has decided to deploy additional measures to curb noise pollution due to construction activities. These include deployment of de-mucking handle (mechanical) to the piling rigs/auger blade, installation of noise barriers at various construction sites, training of contractors' workforce to be noise sensitive etc.

Tunneling activity is progressing at a steady pace at the 4 TBM sites that have been activated. TBM lowering at remaining sites is likely to be completed by July, after which, desired progress rate can be achieved. So far, more than 3000 m tunneling has been completed hitherto by 8 TBMs. Wainganga-1 & 3 TBMs, of Pkg 07 (Pali Ground-SEEPZ) completed 405 m & 33 m of tunneling respectively. These TBMs would build 2 tunnels of 1300 m each between Pali Ground and CSIA-T2. Krishna-1 TBM of Pkg 04 has completed 852 m journey from Naya Nagar to Shitaladevi Station. This TBM will complete its remaining journey of 1642 m towards Dadar station.

This month, TBM Tapi 1 of Pkg 06 has arrived from China. This is the 13<sup>th</sup> TBM out of total 17, and will be used for construction of 1427 m of twin tunnels from CSIA T2 to Sahar Road Station.

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MD, MMRC Ms. Ashwini Bhide and ED, MMRC Mr. R. Ramana interacted with children who attended the exhibition

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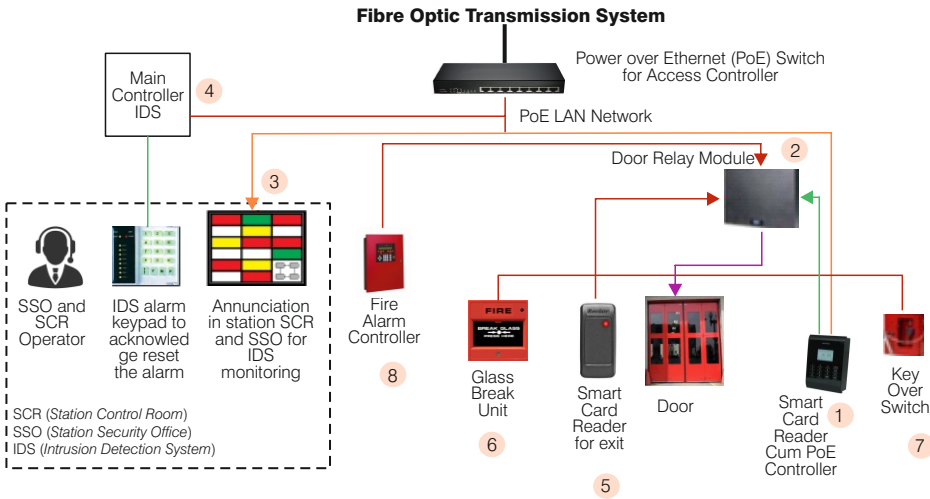
# ACIDS

## Access Control & Intrusion Detection System

Access Control and Intrusion Detection System is covered as a part of Telecom System which provides efficient solutions for access control and intrusion detection. It ensures restricted access to secured areas and detection of unauthorized persons at Metro-3 installations.

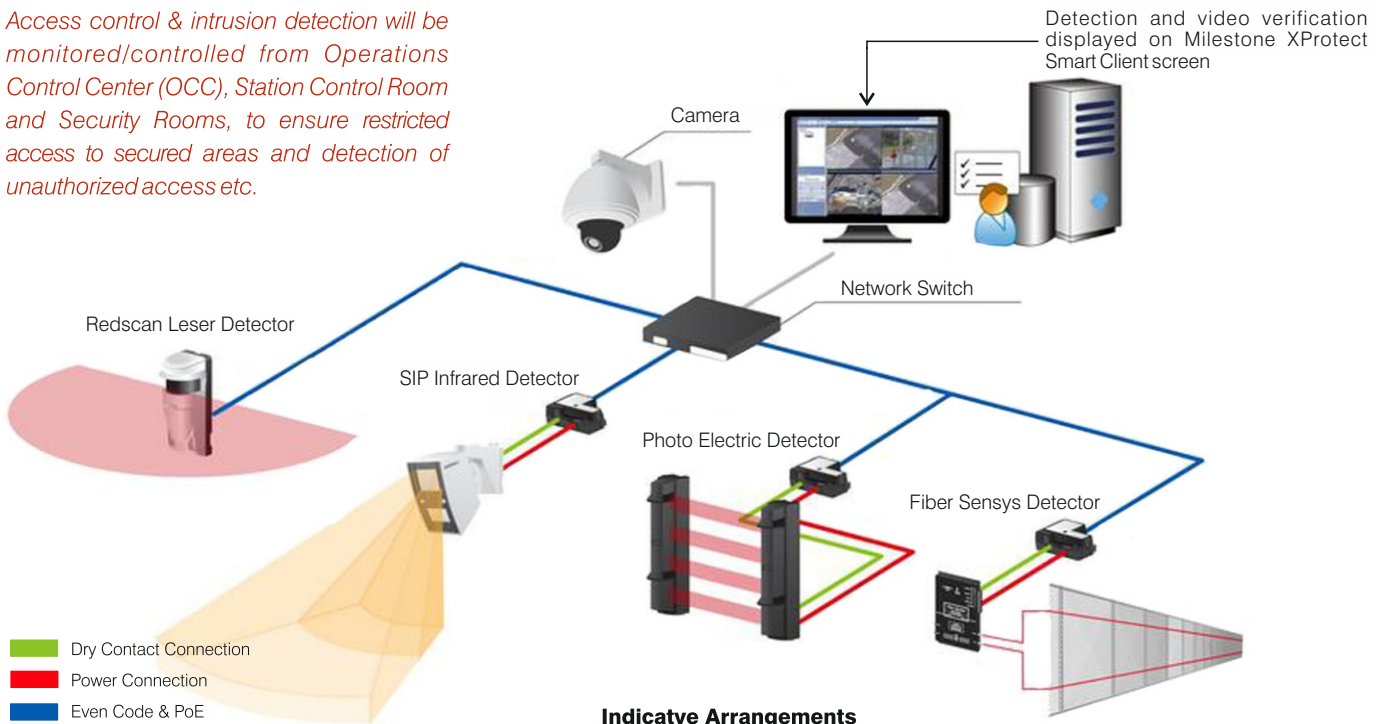
### Access Control

**Station Door ACS Architecture for Stations**



The main purpose of Access Control System (ACS) is to regulate the movement of unauthorized personnel to restricted areas, such as operations and maintenance rooms, service buildings, depot, tracks and tunnels. It allows authorized staff to use access cards to gain access to different levels of security areas within the transit system thus preventing unauthorized access. Common smart card for authorizing access to restricted areas as well as to paid areas (controlled through AFC gates) will be provided to Metro-3 employees. There will be level based identity cards for different types of employees like Metro-3 employees, contractors and visitors in station, tunnel and depot areas.

*Access control & intrusion detection will be monitored/controlled from Operations Control Center (OCC), Station Control Room and Security Rooms, to ensure restricted access to secured areas and detection of unauthorized access etc.*



### Intrusion Detection

Metro-3 has planned Intrusion Detection System to be installed at the various station areas, track areas, tunnel passages, workshop & storage areas of depot and perimeter fencing of depot wall to detect unauthorized entries in these areas. It is used to detect open doors of equipment rooms, tunnel cross passages, shafts, emergency exit shafts, platform ends, depot workshops and storerooms. It also detects intrusion from gates of Metro-3 property, perimeter fences of depot and ramp area approaching depot.

This system makes use of intrusion detection technologies like motion, infrared detectors, sensing cables etc. CCTV monitoring of restricted areas has also been planned to be integrated with access control and intrusion detection facility to take snapshots for events or alarms.

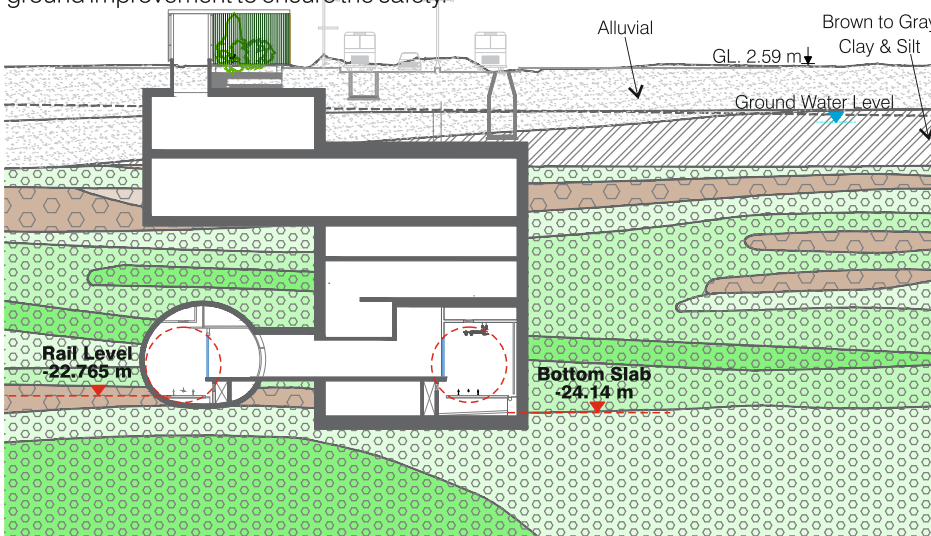
# What Lies Beneath The Earth

In last month, we have seen the geological profile of Construction Package 1. In this issue, we will look through the profile of Construction Package 2. It starts with CST Metro station and ends at the beginning of Mumbai Central Station. This package includes four Stations (CST Metro, Kalbadevi, Girgaon and Grant Road Metro).

The predominant rock type found in this stretch is Basalt for length up to Girgaon, further Breccia is found until end of the construction package. Basalt is harder and stronger variety of rock and the Breccia is weaker than Basalt. The CST Metro Station is being constructed by Cut and Cover method whereas Kalbadevi, Girgaon and Grant Road stations are planned to be constructed by New Austrian Tunneling Method (NATM).

## The challenges while working in this area are:-

- 1. Rocky Strata:** It is variable and different type of rocks like Basalt and Breccia are encountered. Any weak rock layer shall be identified during construction and necessary precautionary measures will be taken as necessary.
- 2. Strength of Rock:** It varies in similar grade of rock at different locations. For example, at different locations the strength of fresh Basalt varies from about 29000 kPa to 78000 kPa and that of fresh Breccia varies from about 6000 kPa to 11000 kPa.
- 3. Ground Water:** Existing ground water in this area is about 2.5 below ground level. Therefore, earth-retaining system should be water tight in upper soil and highly fractured rock mass layers.
- 4. Upper Soil and Completely Weathered Rock Mass:** During the station construction, the top soil and weathered rock will be supported by secant piles (earth retaining system), which will be constructed before start of the excavation.
- 5. Heritage Structures:** The presence of heritage structures in this stretch is a challenge while working underground. The stretch has a high-density population and old buildings with height between 5 to 10 floors along with newly constructed High-rise buildings.
- 6. NATM Construction:** It would need some heavy support and even some kind of ground improvement to ensure the safety.



Grant Road Station Cross Section

### Weathering and Grade Legend:

Fresh Rock	Moderately Weathered	Completely Weathered
Slightly Weathered	Highly Weathered	

# MD Speaks

*Continued from page 1*

On the R&R front, allotment of tenements for 379 PAP structures required for tunnel ramp at Sariput Nagar JVLR has been concluded in the 2<sup>nd</sup> phase. 232 PAPs were earlier shifted to Chakala in the 1<sup>st</sup> Phase, remaining 83 were allotted in computerized lottery at Karve Nagar, Kanjurmarg.

21 private buildings required for Girgaon & Kalbadevi Metro stations are being acquired by negotiations by MMRC. 778 tenants will be rehabilitated in the same area after completion of project/station works. Though they will shift to redeveloped buildings with larger size houses and shops, they are at present required to arrange for alternate accommodation for which rent is being paid by MMRC. So far 3 properties were acquired and 290 tenants signed rent agreements for alternative accommodation. Constant public consultation and mutually agreed steps are being taken with utmost transparency to ensure the rehabilitation process shall benefit the PAPs.

On the Systems front, bid for Automatic Fare Collection system was opened recently. Five bidders viz M/s. RCS France SAS, Consortium of M/s. L&T and MSI Global, JV of M/s. Kalindee and ASIS, M/s Indra Sistemas S.A., Consortium of M/s Datamatics Global services Ltd. and AEP will compete to win the job.

A lot is being achieved and we are slowly surpassing the learning curve on challenging tasks, building confidence within the citizens, our supporters and project team. Our journey although full of challenges, is also a journey of fulfillment of a Vision!



# Know Your Station - BKC Metro Station



Income Tax Office



Guru Nanak Hospital & Research Centre



Asian Heart Institute



ICICI Bank



Maharashtra Housing and Area Development Authority



Map source : <http://www.loginmumbai.org/map.html>

The Metro-3 will connect the area directly by proposed underground station. BKC is also identified for Mumbai-Ahmedabad Bullet Train Terminus with International Finance and Services Centre (IFSC). Metro-3, Metro-2 and Bullet Train Terminus all together will boost the influx of development around the area, enhance the connectivity and ease the movement. BKC is designed as a mid-terminal station as the first phase of Metro-3 (BKC to SEEPZ) will terminate at BKC Station. As mentioned previously, the station has longest length among Metro-3 stations (473 m while length of other stations is about 250 m), as this station includes a stabling line and two switches at both ends of the station for the train to shift from stabling to main line track. This leads to increase in the overall length of the station, which also provides more area at concourse level which is utilised for additional retail and commercial facilities as ridership at BKC is also high as compared to other stations due to interchange with Metro Line 2.

The proposed BKC Metro Station would be the longest station of Metro-3 having its interchange with proposed Mumbai Metro Line 2. Station location beneath the Sant Dnyaneshwar Marg is strategic with major business destinations around, abutted by mangroves in the Mahim Creek on its eastern side. Currently BKC is accessed by Kurla Station on Central Railway and Bandra Station on Western Railway, which are 2 to 4 km away from BKC. Hence so far, area has been depending on the BEST bus service, autorickshaw and taxi service for connectivity from the nearby Kurla and Bandra Stations. Some companies also run private shuttle bus services from offices to the stations to facilitate their employees to commute everyday.

BKC was built on marshy land having 370 ha area on either side of the Mithi River, Vakola Nalla and Mahim Creek. It is abutting Kurla at east and Bandra at west side. MMRDA was the Special Planning Authority for Planning and development of this complex. The commercial development in BKC includes private and government offices (state and central government) and is home to many headquarter offices of companies, 5-star hotels, institutions, clubs, banks, staff quarters, convention centers, Diamond Bourse and speciality hospitals. There is constant daily influx of working people at BKC. Approximately four lakh people working in various offices throughout the BKC.

The proposed station will serve important landmarks like, Income Tax Office, Reserve Bank of India, National Stock Exchange, Family Court, MMRDA office, City Park, Government Colony, Reliance Jio Infocomm Limited etc.

Although BKC has concentrated office spaces, due to lack of social spaces, the area becomes practically deserted in the evenings and weekends while the offices are closed. Many planned CBDs in India and overseas face this issue as the desertedness also leads to other mishaps and social concerns. MMRDA is now introducing other amenities and facilities like restaurants, shopping malls, recreational areas etc which has generated life after work hours at BKC. The transit hub in future will undoubtedly enrich the quality of spaces in the business district especially in non-working hours creating it as a new recreational destination for the city.

# Controlled Blasting

*This is in continuance with the previous volume's article, written by Dr. More Ramulu. Dr. Ramulu is a principal scientist at Central Institute of Mining & Fuel Research, Nagpur.*

Controlled Blasting techniques adopted for rock excavation at Pali Ground launching shaft package 7 are 'bottom hole decking', 'effective delay scattering' and 'bottom hole shock relief'. These are more safe, productive and innovative blasting techniques than Line drilling, Bottom hole initiation, Pre-splitting and Smooth blasting.

### 1. Bottom hole decking technique

It consists of air decking at the bottom of the hole in dry holes by means of a wooden spacer or a PVC pipe for improving fragmentation, reducing specific charge, ground vibrations and over break/damage in open cut blasting. This reduces peak particle velocity by 40% and over break/damage by 35%. It has been proved that the bottom-hole air decking is an effective technique for improving blasting productivity as well as safety.

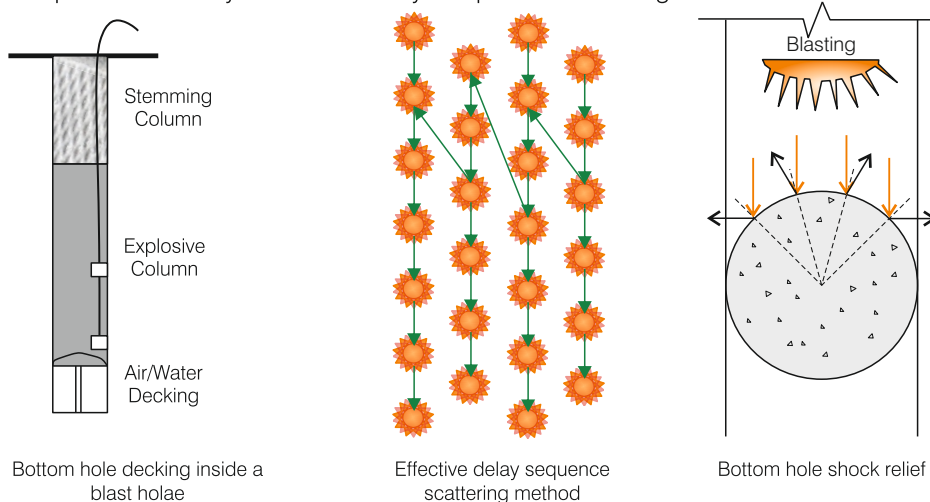
### 2. Effective scattering delay sequence technique

Involving the delay firing of blast holes in such a way that the destructive interference of vibrations take place and results in reducing the vibration intensity i.e. peak particle velocity, which is essential in urban blasting near sensitive structures. This method resulted in further reduction of 20-25% of peak particle velocity.

### 3. Bottom hole shock relief technique

It consists of inserting reinforced concrete balls at the bottom of blast holes for re-orienting the shock energy to the desired directions. This shock energy relief blasting technique greatly reduces the blast vibration intensity by 50% and overbreak/damage by 40%.

All the above three new controlled blasting techniques are very simple, easy to practice and proved to be very effective in safety compliance of blasting.

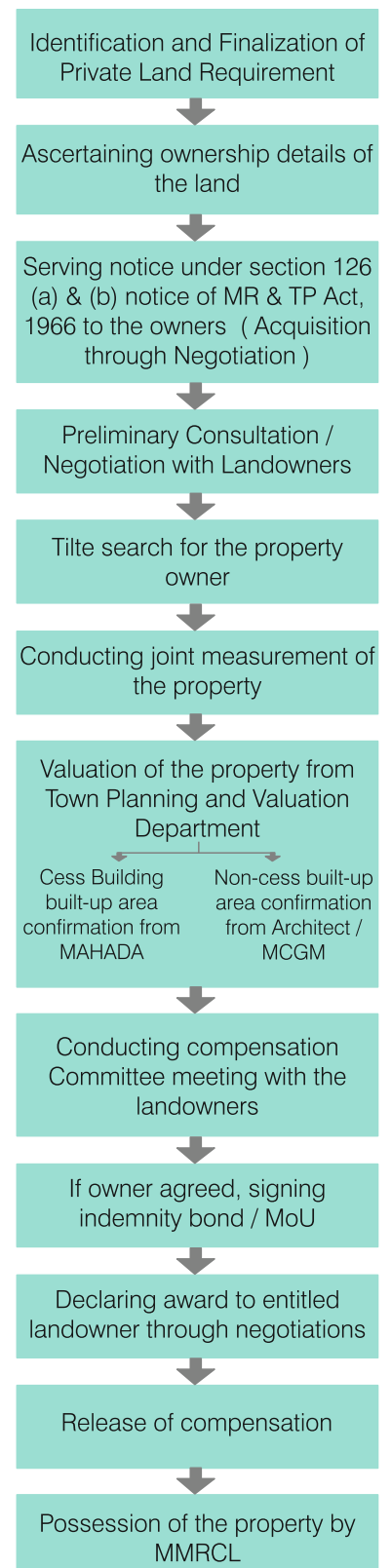


*The ultra-controlled blast designs and methodology provided by CIMFR helped us in conducting blasting at Municipal Pali ground shaft location, which is surrounded by very sensitive and critical structures and habitats. The CIMFR blasting methodology was not only safer but also productive, with a maximum yield of 500 cu.m. in a day, which helped us in completion of the challenging task in record 60 days' time.*



# Acquisition of Private Lands

Process followed for Acquisition of Private Lands in Kalbadevi and Girgaon for Metro-3.



## Expert Speaks

*Our expert author for Expert Speaks section is Mr. Shivaprasad Khened, Director at Nehru Science Centre and National Gallery of Modern Art, Mumbai. Mr. Khened has been associated with the science museums/centres (National Council of Science Museums) in India for more than 31 years. Mr. Khened has served as the Director and head of three National level science centres/museums namely; National Science Centre, New Delhi, Nehru Science Centre, Mumbai and Visvesvaraya Industrial & Technological Museum, Bangalore. He also has the distinction of heading (as the Director) two internationally acclaimed National Galleries of Modern Art, in Bangalore and Mumbai for 5 years.*



Mumbai suburban Rail transport (central, western and harbour line) is inextricably linked to the life of most Mumbaikars. Every single day millions of people use suburban rail transport to commute in Mumbai. Daily, more than 2000 plus train services in Mumbai are commissioned to hurtle through the city, carrying millions of Mumbaikars to their destinations. Yet the ever increasing population and unending migration of people to Mumbai metropolis is making it extremely difficult and often dangerous for people to commute by suburban rail. Most rail commuters in Mumbai, especially during the peak hours, are confronted with every day challenge of searching for foot-space in a train that does not even have an additional square inch of space left. Realising this hard fact, the civic infrastructure planners have long been struggling with solutions and have firmly believed that the time has truly come for 'the lifeline' of Mumbai to now change to Metro (rail based Mass Rapid Transit System).

Accordingly, the Government of Maharashtra taking all stakeholders on board, has committed to implementing the 'Metro Rail Projects' to improve traffic & transportation scenario in Mumbai Metropolitan Region(MMR) and has entrusted this task to the Mumbai Metropolitan Regional Development Authority (MMRDA), with the Chief Minister as its Chairman, to implement its vision. The ambitious Metro Rail Master Plan includes 9 corridors covering a length of 146.5 k.m., out of which 32.5 k.m was proposed underground and rest elevated. One of the most challenging corridors in this master plan that employs the best of technology, is the Metro-3 project.

On occasion of the National Technology Day 11<sup>th</sup> May 2018, we at Nehru Science Centre had opportunity to host the exhibition on 'Making of Metro-3' and 'Scientific Antiquities' inaugurated by Mrs. Ashwini Bhide, MD MMRC. The exhibition provided a glimpse into the technological marvels that are used in the making of Metro-3 corridor. Mrs. Bhide spoke on the technological challenges involved in the project while honestly touching upon some issues including displacement of people, uprooting of several trees, sound pollution and such other medium-term problems and adopted mitigations.

Upon completion, Metro-3 with 27 stations would connect six business districts, 30 educational institutes, 30 recreational facilities and domestic as well as international airport terminals. Metro transport has revolutionised public transport in most parts of the world including the city of Delhi, which now boasts of an advanced metro rail system. As per UITP site, as of April 2014, there were 168 metro system in 55 countries. The site further states that last 15 years have seen a considerable expansion in terms of metro systems and infrastructure globally. It adds that a total of 194 metro lines (both existing and new networks) accounting for approximately 40% of the length of metro infrastructure worldwide, have been opened during this period. It goes on to add that in 2014 alone, 513 km of new metro infrastructure and 355 new metro stations were put into service. Among the new metro systems that were inaugurated in this period, Mumbai is one of them. The Mumbai Metro 1 (Versova-Andheri-Ghatkopar) corridor was opened to commuter traffic in June 2014.

It has now emerged as the most hassle-free transportation mode and its ridership per weekday jumped to 3.55 lakh commuters in 2017, up from 2.96 lakh in February 2016.

The Metro Transport is one of the most preferred transport in the world with several densely populated cities adopting this means of transport. The busiest metro network in the world is Tokyo, which boasts close to 3.6 billion passenger journeys per year. Chinese metro systems have experienced even more significant passenger growth, with Beijing (+39%) and Shanghai (+25%) rising to 2nd and 3rd busiest networks. Taken together, metro systems in Asia carry over 80 million passengers per day, nearly half the world total passengers and with most Indian cities preferring this mode of transport this number is only heading north words.

This year's National Technology Day was truly memorable for us. We opened the 'Machined to Think Gallery' (opened by Dr Anil Kakodkar), organised the OCSC valedictory event of the International Astronomy Olympiad, opened the Making of Metro Line 3 and the scientific antiquities exhibition to commemorate this important day. Technology continues to be one of the key drivers for empowering individuals, societies and countries. Therefore, we must owe our debt to Atal ji who recognised the importance of technology, in the growth of our nation, and declared 11<sup>th</sup> of May, back in 1998, to be celebrated as the National Technology Day.



## News @ MMRC



Ms. Jhanja Tripathy, Jt. Secretary & Financial Advisor at MoHUA, India and Director MMRC visited the tunnel site at Pali Ground, Marol Andheri East, Pkg-7 tunnel site.

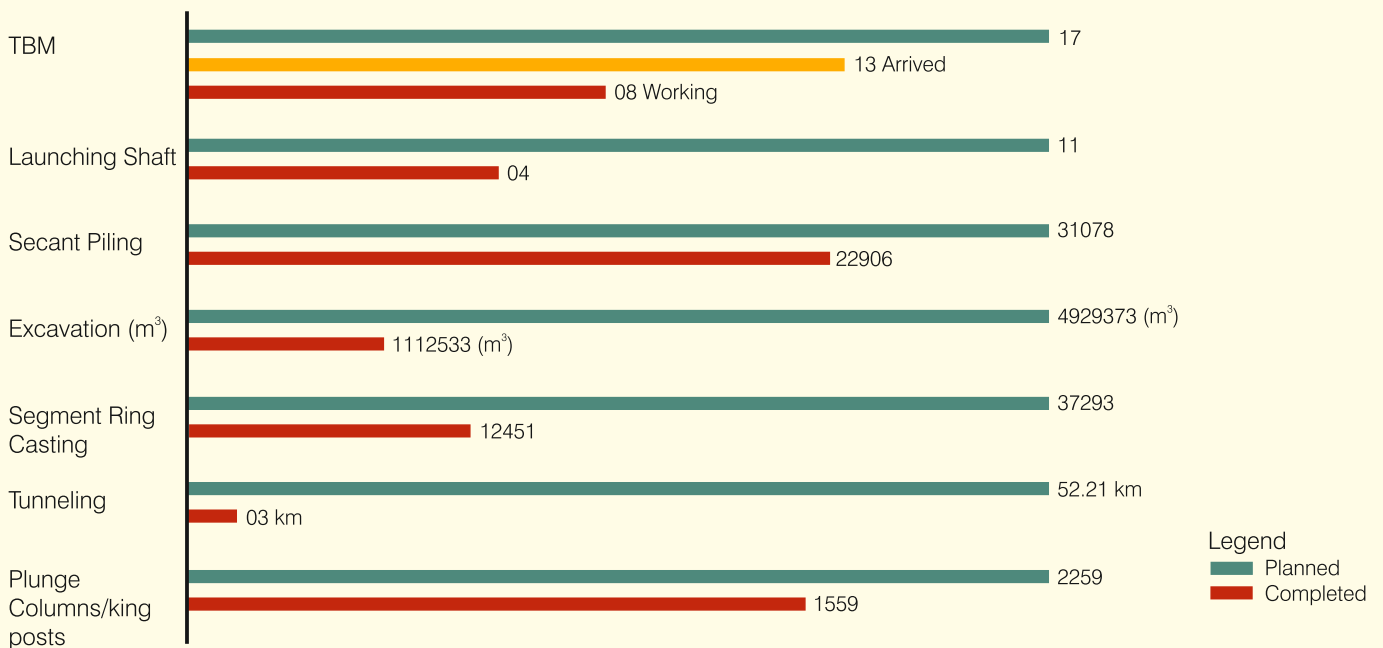
Architects from Practicing Engineers, Architects, & Town Planners Association (P.E.A.T.A) visited Metro-3 site, pkg-2 at CST Metro Station launching shaft & tunnel at Azad Maidan and appreciated the quality and safety procedures being followed.

Specially Designed Mechanical Device attached to the Piling Rig for removing muck from the auger blade to control sound caused by banging which is otherwise practised. This is Metro-3's additional measure to curb noise pollution.



## Project Progress Update

As on 26<sup>th</sup> May, 2018



Website Link

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### CONTRIBUTIONS

**ARTICLES**  
 Sudhir Sahare  
 D. M. Godbole  
 Rishi Kumar  
 Dikshant Meshram  
 Vaidehi More

**EDITING AND GRAPHICS**  
 Pallavi Kulkarni  
 Zarqa Khan

### Connect With Us

@MumbaiMetro3  
 Mumbai Metro Rail Corporation, MMRC

[www.mmrc.com](http://www.mmrc.com)

**Mumbai Metro Rail Corporation**

NaMTTRI Building, Plot No. R-13  
 'E'- Block, Bandra Kurla Complex  
 Bandra (E), Mumbai 400051.