METRO CUBE

VOLUME 12
SEPTEMBER 2017

MMRC
ADDING NEW DIMENSIONS

Content

MD SPEAKS

Ms.Ashwini Bhide

It was indeed a proud moment for Metro team that the first TBM lowering started and Cutter head was lowered in the presence of Hon. Chief Minister of Maharashtra Shri Devendra Fadnavis on 21st of September at Naya Nagar launching shaft (Pkg.4). Addressing the media and press representatives on this occasion, Hon. CM assured that the project has all the necessary permissions and Court clearances and is progressing satisfactorily.

The TBM for Pkg. 2 has also arrived in Mumbai and delivery process of remaining 15 TBMs and construction of their launching shafts are in advanced stages.

Allotment of residential & commercial tenements to 232 PAFs from MIDC and Marol stations has been completed. This would clear the remaining encumbrances for the two stations. Declaration of award has started for private lands being acquired. With this more sites and work fronts will be available to contractors.

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PRECAST SEGMENTAL LINING

Segment lining is a pre cast concrete member used as a support system in tunnels excavated using TBMs. Universally, segmental linings are used in tunnel and shaft construction (segment lining for shafts is later removed after completion of tunneling activity, however for Metro-3, segment lining is not used for shaft construction) and can be designed to suit a specific tunnel geometry with a variety of fixings details, segment thickness and tunnel diameter. The segments are joined together to form the tunnel ring which serves the following purposes:

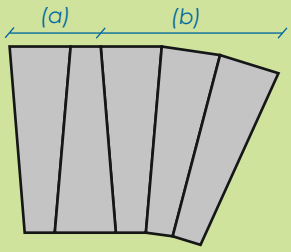
- Allows the TBM hydraulic jacks to thrust against the ring to move the TBM forward
- Finishing up the internal wall of the tunnel
- Ensuring that the tunnel will be resilient enough to withstand external pressure

The tunnel ring is usually composed of a variable number of segments. The number of segments varies from 4 to 10, depending on the tunnel geometry and constraints. In Metro-3 project, 6 segments will be used to form the ring, 5 standard rings and 1 tapered ring, known as the key segment is used to close and hold the ring together. Several moulds are required to cast segments inorder to form a complete ring.

As per general outlined design specifications adopted for Metro-3, the minimum thickness of lining is 275 mm and minimum grade of concrete is M45.

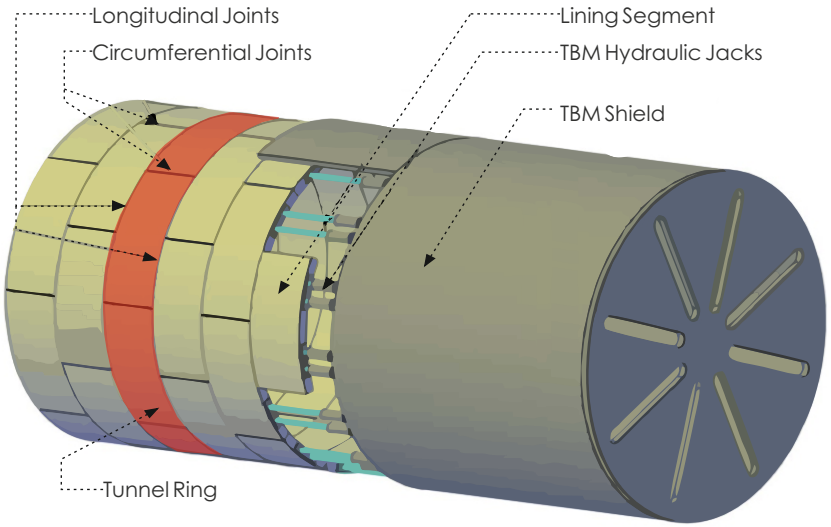
The tunnel lining has to withstand following factors:

- Ground pressures of all kinds (dead load, swelling and reduction pressures), water pressure, chemical wear
- Annular ring grouting, transportation conditions of finished segment, thrust forces, backup loads
- Temperature influences from air or waste water, exposure to chemical/salt and fire, climatic effects like de-icing etc.
- The thrust force to propel the TBM forward during tunnel excavation through hard rock.



Straight (a) and curved (b)tunnel segment alignment

The universal rings with both side tapering was adopted in the design because they are well suited for straight and curved alignment.



Assembly of tunnel segments to form tunnel lining

MD SPEAKS

Continued from page 1

The apprehensions of individuals and organised groups in South Mumbai more specifically, the matters of J N Petit Trust and that of noise regulations raised in court are being addressed suitably.

Though these matters have partially affected pace of construction, we expect necessary relief will be granted by the Hon. High Court following the assessment by expert structural engineers.

The initiatives to address the concerns of construction work during night and the limitations of performing certain activities during day time will be presented to the Court while seeking eviction of stay.

Final notification of change of land use for metro car depot at Aarey has cleared the way for the depot works.

Procurement of Systems Components is also progressing satisfactorily to meet the planned award dates.

JICA Fact Finding mission is scheduled to visit in the 2nd week of October as part of 2nd tranche loan processing. Accordingly, the team is also getting ready for this.

As monsoon is closing, the metro team and the contractors are looking forward for 200 day working season full of action and accomplishments.

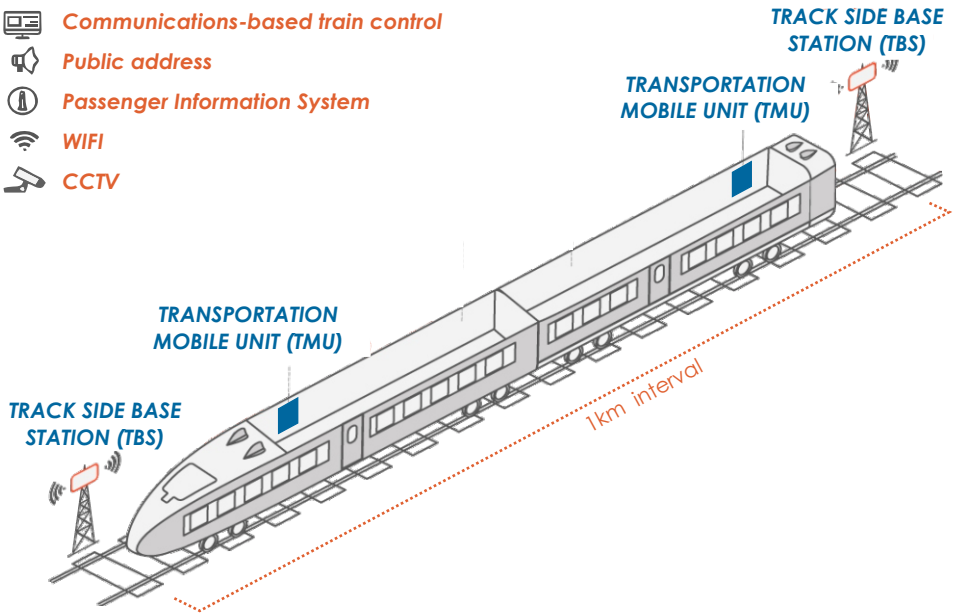
At the same time we expect full cooperation from citizens and the opinion makers.

VIDEO TRANSMISSION SYSTEM

Video Transmission System (VTS) is a CCTV system similar to a web camera which is an absolute requirement for surveillance of metro operations especially in Unattended Train Operation (UTO) or fully automated metro system environment. Video surveillance ensures passenger safety and makes automated metro operations more efficient.

Elements of VTS

- *Communications-based train control*
- *Public address*
- *Passenger Information System*
- *WIFI*
- *CCTV*



How does this work ?

The video transmission from the CCTV system at various crucial locations is monitored constantly at the Operation and Control Center located in the metro car depot.

VTS incorporates three primary elements :

Track-Side Base Stations (BS)

Deployed along the train route to provide continuous coverage and connectivity to rolling stock. Each BS is deployed with multiple antennas and operates in auto diversity/MIMO (multiple input and multiple output) modes. Base stations are typically deployed at intervals of up to 1km (0.6 miles) underground or up to 5km (3 miles) above ground (based on topology and country regulations).

Mobile Units (MU)

Installed on-board and connected to designated train antennas to assure continuous communication with the nearest BS. Two mobile radio units can be installed on-board to enhance resiliency and coverage.

Management & Monitoring tools

It will be in OCC with central network management system, real-time performance monitoring and fine performance analysis applications.

Metro station premises and train interiors will be remotely monitored by officials in OCC with the use of CCTV installed at various locations. Any unusual activity will be notified to the officers through radio transmission and necessary action can be taken promptly. This will not only help an action against damage, but also create an awareness and behavioural culture within the metro users.

Benefits of VTS in Metro-3

- Noticing criminal activities such as illegal trading, terrorism, harassments, theft and havoc.
- Controlling activities destructive to metro property like spitting, littering etc.
- Ensures safety and security of kids, women commuters, senior citizens and differently abled people.
- The VTS system would enable quickest actions during exigencies

Efficiency of VTS is determined by:

- Vibration, humidity and dust resistance
- Clear image quality in a range of dark and light environments
- Easy installation for different locations on the trains

KNOW YOUR STATION - SCIENCE MUSEUM

Nehru Centre & Art Gallery

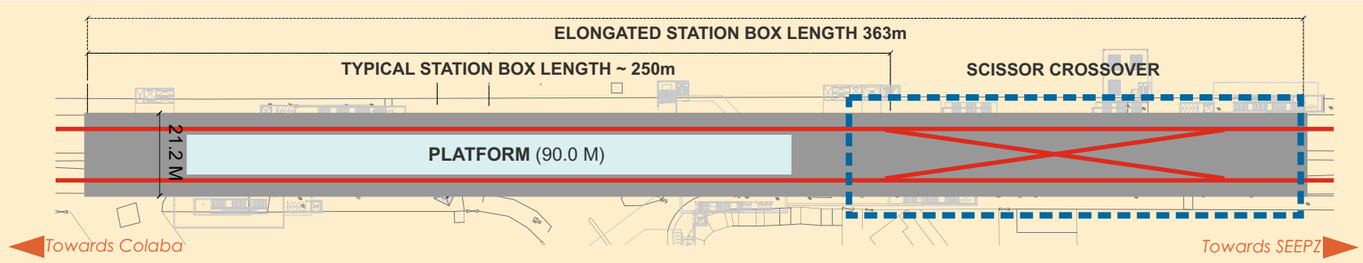
High Street Phoenix Mall

Remnants of Century Mills embedded within the redevelopment

National Sports Club Of India

Station Work in Progress

Source: www.loginmumbai.org



Scissor crossover in Science Museum Station showing the elongated cut & cover station box (plan at platform level)

Worli was one among islands that once constituted the archipelago (a group of islands) of Mumbai. After reclamation of seven islands to form the island city of Mumbai in the 19th century and once Mumbai became a host for textile mills, Worli got established as an integral hub of industry and residence for mill workers.

Soon after the decline of mill industry in 20th century, redevelopment projects across the mill lands changed the face of Worli precinct. With the changed development policies and building bylaws for redevelopment, high rise residential, commercial and office buildings started mushrooming within Worli that created a different skyline which is visible when one drives along Haji Ali. A few remnants which remind people of the glory of mills can still be seen include Shakti Mills, Apollo Mills etc. Science Museum Metro Station is planned at the junction of Dr. E Moses Marg and Senapati Bapat Marg. The nearest suburban railway stations are Lower Parel in the north and Mahalaxmi in the south and there is a need of integrating the suburban stations to the metro station for better commute.

The station is located very close to important recreational and institutional destinations like High Street Phoenix Mall, Nehru Science Centre, Nehru Centre Art Gallery etc.

Elongated Cut & Cover Station

The station is designed with elongated cut an cover typology as it has a scissor cross over proposed at SEEPZ end which adds to the station length. A cross over switch is a mechanism used in railway engineering which helps the train to change between parallel tracks. A scissor crossover is an X shaped crossover switch.

METRO MAINTANANCE DEPOT

In mass rapid transit systems like Metro-3, to ensure all day long running of trains without any disruptions requires highly efficient control, signaling and telecommunication systems. Along with this, constant maintenance of trains and tracks is a necessity. To ensure planned run of ample trains that can cater to the growing demand with strict time schedule, Metro-3 has an operations control and maintenance depot designated at its north terminal at Aarey.

Operations Control Centre and Maintenance Shed at Aarey

On August 22, 2014, the State Government handed over 30 ha of land out of the total area of 1,287 ha land in Aarey colony for Metro-3 Car Depot. Only 25 ha is being used for the Car Depot which constitutes less than 2% of the total area of Aarey Colony.

A conscious attempt has been made to retain the green cover in 5 Ha area within the car depot. The land is surrounded by Jogeshwari-Vikhroli Link Road (JVLR), Goregoan-Powai Link Road (GPLR), and Marol-Maroshi road. Metro-3 system will be remotely monitored for time schedule, speed, safety and security, electric(traction) supply, track status, train position, signaling, ventilation and air conditioning in tunnel and stations etc.

Apart from remote monitoring, rolling stock(trains) are required to undergo regular physical checks, maintenance and cleaning. These operations will be carried out in the Aarey depot along with provision of space for stabling yard where the locomotive is parked outside the scheduled running time.

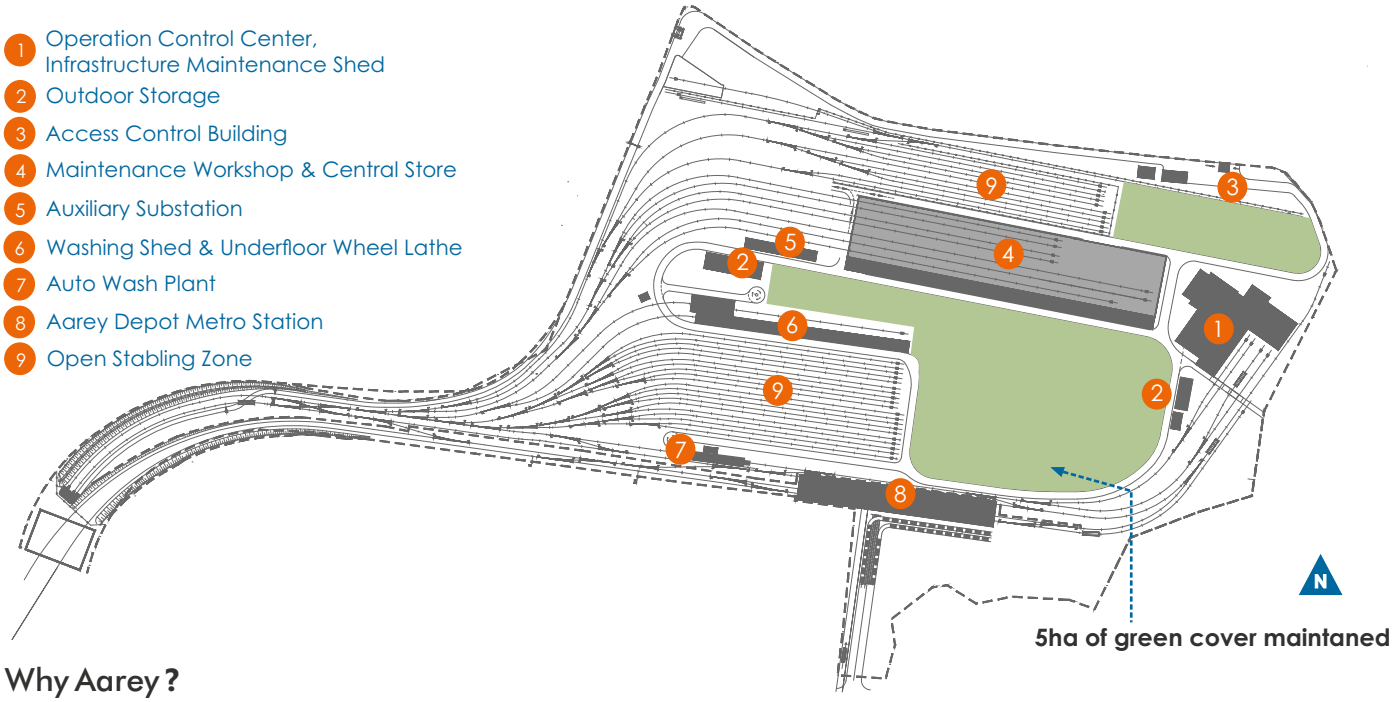
Facilities at Aarey Depot :

- 35 stabling lines (place where locomotives are parked while awaiting their next turn of duty) for parking of trains during non-working hours
- Operation Control Centre (OCC)
- Administrative Building
- Inspection and maintenance workshops

Did you know ?

Metro Depot has been exempted from requirement of environmental clearances and doesn't fall under the Eco-sensitive Zone.

Four (04) EHV pylons of incoming two 220kV transmission lines which are infringing with the proposed depot are being removed and the lines will be subsequently laid underground.



Why Aarey ?

After ascertaining the pros and cons of various options for car depot the site at Aarey colony was finalized by MMRC. However, taking note of the objection raised by NGOs and Citizens, the State Government in 2015, constituted a committee of six experts to revisit the alternatives for Car Depot and if a suitable alternative is not found, to suggest mitigating measures to minimize environmental damages to the Aarey Colony. The first option of Kanjurmarg, Eastern Expressway, suggested by the committee could not be adopted due to non availability of land, court stay, technical, operational and financial implications. Therefore, an option of modified car depot at Aarey was adopted and almost 5 Ha. of dense tree cover was thus saved.

R&R UPDATES

25th underground station of Metro-3 is planned at MIDC and for construction of this station MMRC was required to relocate some commercial establishments and project affected families. The entire process of allocation of tenements is executed in a transparent manner through a lottery system. Recently a lottery for 232 PAPs of MIDC was conducted in MMRDA. Out of 232 PAPs, 228 are residential, three are commercial and one is residential cum commercial. This helped in allotment of the properties in an unbiassed manner.

Around 2807 people will be impacted due to the project out of which 1574 were already rehabilitated by MMRC in residential buildings located at Chakala, Kurla and Kanjurmarg whereas, commercial PAPs were shifted at Govandi and Jogeshwari.

Lottery for PAFs at MIDC conducted in MMRDA Auditorium

Chairman of MMRC Board of Directors Mr.Durga Shanker Mishra, IAS, along with other members of BoD, visited construction sites of Metro -3

Ms. Ashwini Bhide, MD, MMRC interacted with newly inducted IAS Officers during their visit to MMRC

TBM UPDATE

The first of two Slurry TBMs, a rebuilt 6.65 m diameter machine, passed its Factory Acceptance Test on September 4, 2017 in Singapore. The machine, fitted with a Robbins cutterhead and outer shields, is destined for the Metro-3 under UGC03 for the Dogus-Soma JV, and will begin excavation in late 2017. The FAT for a second 6.65 m (21.8 ft) diameter Slurry TBM will be conducted by the end of 2017.

Features of Slurry TBMs

- The cutterheads of the machines are fitted with wear protection, wear detection bits, and Robbins 17-inch disc cutters for the conditions
- Grizzly bars will limit the size of boulders that can enter the cutterhead to 250 mm
- The slurry systems includes rock crushers as well as abrasion-resistant plating in high-wear areas

Why do Mumbai need Slurry TBM?

Slurry machines were selected due to the challenging ground conditions of Mumbai. They possess the adequate amount of power to suit the hard rock geology of Mumbai and to tackle water table and variable geology, especially basalt of higher hardness.

The two TBMs are the first of the four machines being provided by Robbins for Metro-3. Another two 6.65 m (21.8 ft) diameter Crossover XRE machines will bore parallel 2.8 km (1.7 mi) tunnels on a separate contract in 2018.

The two machines will excavate parallel 3.5 km long tunnels between Mumbai Central and Worli station sites, passing through three intermediate cut and cover stations (Mahalaxmi Metro, Science Museum, Acharya Atre Chowk) on the way.

Ground conditions consist of fresh to weathered basalt and breccia rock up to 100 MPa* UCS(Uniaxial Compressive Strength) with water pressures up to 3 bar*.

** MPa (Mega Pascal)*

SI unit of compressive strength

PACKAGE UPDATES

Dr. Ranjit Patil, Minister of State Home, Urban Development, General Administration, Law & Judiciary, Parliamentary Affairs, Government of Maharashtra visited Azad Maidan TBM shaft of Package 2 to review the status of ongoing work.

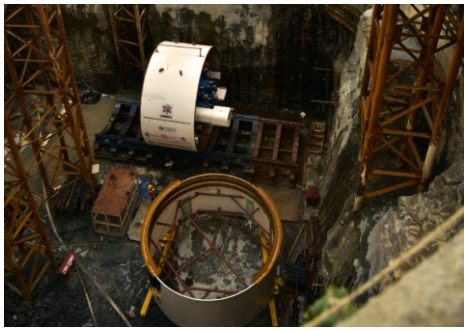
Hon. Minister with senior MMRC officials and contractors of the Package 2 reviewed the civil work undertaken at Azad Maidan and was briefed on overall progress of the project including the status of the secant piles, arrival of the TBM, manpower and safety measures adopted on site.

MD, MMRC apprised him about various critical aspects o f the project like the arrival of second TBM at Azad Maidan, important safety features such as Platform Screen Door Technology and other resource related updates. On this occassion, MD, MMRC said, "The positive feedback from the Hon. Minister has motivated us for a smooth and swift execution of Metro-3."

While expressing his satisfaction on the overall project progress, Mr. Patil specifically appreciated MMRC's approach and management of traffic diversion which is implemented by various contractors to minimize the adverse impact due to the construction activity partly or fully on the road.

Hon. Minister of State, Urban Development visits Package 2 site to review work progress

LOWERING OF FIRST TBM



Glimpses of the TBM lowering at Naya Nagar

The Honourable Chief Minister of Maharashtra, Shri Devendra Fadnavis, witnessed lowering of the first TBM for Metro-3 corridor at the launching shaft in Naya Nagar, Mahim. "It was very exciting to witness the lowering of the first TBM for Mumbai's first underground Metro corridor. This showcases the speed with which the work on this corridor is progressing. This green mass rapid transit system will not only help improve environment but also go a long way in reducing traffic on roads and congestion in suburban rails", said Shri Fadnavis.

The front shield, middle shield, cutter head, erector, screw conveyor and tail-skin shield and other parts of the machine will be assembled to form a 110m long TBM.

MMRC Control Room

Contact us @ 8291751545 to report monsoon related grievances pertaining to Metro-3 construction work.

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