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MMRC
ADDING NEW DIMENSIONS

METRO CUBE

A MUMBAI METRO RAIL CORPORATION NEWSLETTER

Content

MD Speaks

Ms. Ashwini Bhide, IAS

I wish all Metro CUBE readers a very happy, prosperous New Year 2019. While stepping in to the new year 2019, it's obvious to look back to 2018 and review our performance towards our targets. The year 2018 was significant in shaping the Metro-3 project implementation to be more affirmative and has taken our engagement with all stakeholders to conclusive stages. The initiatives include land acquisition, rehabilitation & resettlement, redevelopment of Kalabadevi-Girgaon affected plots, utility shifting, etc. Majority procurement of key system contracts were either concluded or are in final stages. All the TBMs have been delivered and deployed on site with almost 16.0 km (i.e. 30%) tunneling completed including two breakthroughs and work at all underground stations started. In 2019 we expect to complete substantial portion of tunneling and significant part of underground station works along with start implementation of system works.

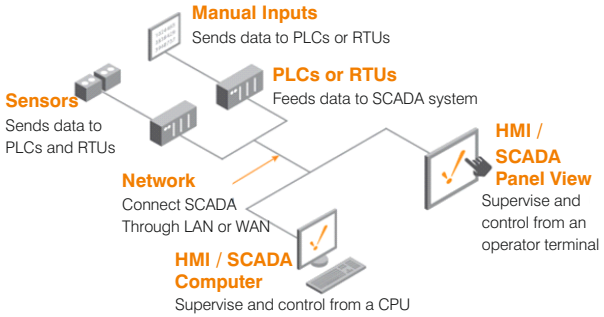
Continued on Page 2

Supervisory Control and Data Acquisition

In the early 1950s, computers were first developed and used for industrial control purposes. Supervisory control began to become popular among the major utilities, oil and gas pipelines, and other industrial markets at that time. In 1960s, telemetry was established for monitoring, which allowed for automated communications to transmit measurements and other data from remote sites to monitoring equipment. The term "SCADA" (Supervisory Control and Data Acquisition) was coined in the early 1970s, and the rise of microprocessors and PLCs during that decade increased enterprises' ability to monitor and control automated processes more than ever before. SCADA started off with a mainframe computer having limited functions with proprietary communication protocols called as monolithic SCADA. Modern SCADA is much more advanced than the monolithic SCADA. It allows real-time data, monitoring and integration.

The Basic SCADA Architecture

1. **PLC/RTU:** PLC is a high-speed microprocessor based digital controller which continuously monitors status of the field devices through sensors
2. **HMI:** HMI is the interface between the process being monitored or controlled and operators. In short, HMI is operator's dashboard.
3. **Communication Protocol:** When Intelligent Devices communicate with each other, there needs to be a common set of rules and instructions that each device follows. A specific set of Communication Rules is called a Protocol.
4. **Sensor:** Sensor is a device Which converts real time physical variations, such as pressure, temperature, velocity, etc., into electronic signals or vice-versa.



SCADA is a software which automates the complex network elements of mechanical and electrical system, which is impossible for humans to monitor and control.

Primary objectives of SCADA

- Real time remote monitoring and operation
- Dynamic display with data, alarm and events (alarm annunciation/ acknowledgement)
- Data presentation (trending, charting)
- Data logging/ acquisition

Important components of SCADA

- Programmable logic controller (PLC)/ Remote terminal unit (RTU)
- Human Machine Interface (HMI)
- Workstations
- Communication network (LAN/WAN)
- Sensors or field devices/ Intelligent Electronic Devices (IED)

Features of SCADA in Metro-3 project will be discussed in next issue.

MD Speaks

Hon. Supreme court of India, Bombay High Court and National Green Tribunal gave favorable verdicts after verification of facts and submissions by MMRC; that has given fillip to the project implementation.

The month of December has seen the second tunnel breakthrough at SEEPZ by Wainganga-3 from Pkg 7 after 125 days of tunneling (568 m). Clearing of 150 yrs old fish market at Chira Bazar, Girgaon is a major milestone in ensuring Kalabadevi and Girgaon stations. This cooperation of fisherwomen who conducted business from there for generations is an excellent demonstration of citizens cooperation to Metro-3 implementation. This has enabled the Pkg 2 contractor to commence station work at Kalbadevi; the last remaining station. JICA Fact Finding Mission for 3rd Tranche of Loan took overall review of the project with a special emphasis to environmental aspects including site visits.

In order to take the project to citizens, MMRC engaged with students of Sir JJ School of Arts who painted 18 canvases showcasing glimpses of Metro-3 construction sites. The artist students blended their art and imagination to create unique expressions of otherwise harsh landscape of construction sites. Selected paintings were used in 2019 calendar.

Continued from Page 1

I interacted with citizens from Thane and surrounding region, through lecture in *Narendra Ballal Smruti Vyakhyanmala* organized by Arth Foundation and *Thane Vaibhav* focusing on importance of citizen participation in public infrastructure projects and also prepare minds of *Thanekars* to support forthcoming metros in the MMR region. Public interaction organized by the Directorate of Information & Public Relations, GoM through *Doordarshan Sahyadri* channel helped us reaching out to the entire state of Maharashtra. Such dialogues have contributed immensely in generating support from people. We wish to continue our engagement with the society in various ways during the rest of the project period.

What Lies Beneath The Earth

In previous article, we had seen the alignment of Construction Package 7. This month we will see Construction Package of Depot. The Depot of Metro-3 is located in Aarey Colony Area. The alignment comes out of tunnel after the Jogeshwari Vikroli Link Road and enters in Depot area. This package includes one station (Aarey Depot Station – At grade station).

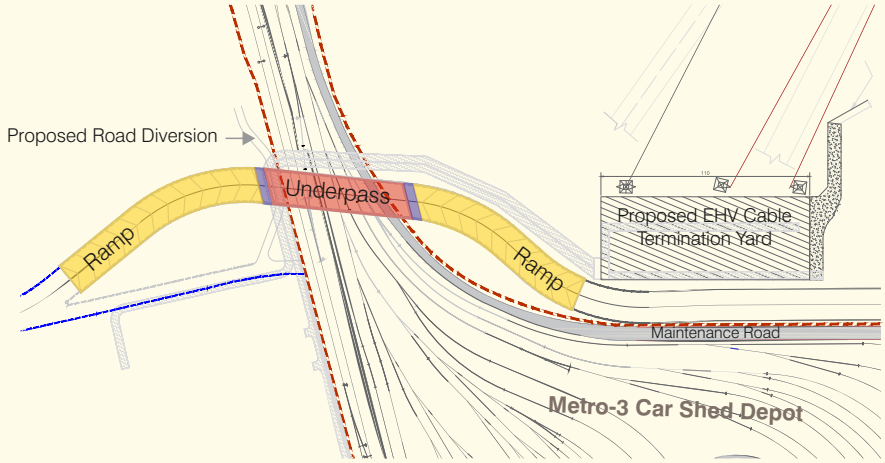
The challenges while working in this area:

1. **Rocky Strata:** It is variable and different type of rock, e.g., Basalt and Breccia encountered. Any weak rock layer shall be identified during construction and necessary precautionary measures to be taken as necessary.
2. **Strength of Rock:** Strength of rock varies in similar grade of rock at different locations.
3. **Ground Water:** Shallow Ground water will pose difficulties during construction of Open foundations and the dewatering will be required to be done.
4. **The underpass structure:** It is one of the deepest structures in the depot area. The excavation needs to be completed in stages and then construction of the structure.

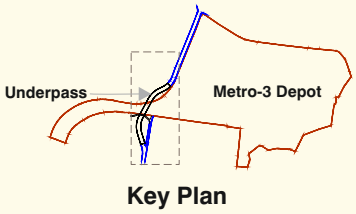
The geology is residual soil underlain by completely weathered rock and then hard rock. The predominant rock type found in this stretch is Basalt and Breccia of grade of weathering III or higher.

Basalt is harder and stronger variety of rock and the Breccia is weaker than Basalt. The Depot buildings will be founded on the strong rock with open foundation. The existing surface is undulating and needs to be flattened for the construction. This needs earth filling in the area for raising the levels.

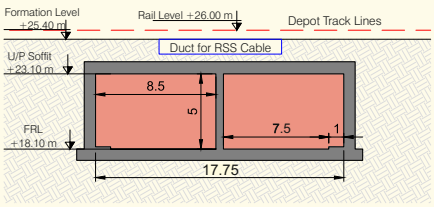
This is the last article in the series of Geotechnical Profile of the Metro-3 project alignment started in February 2018.



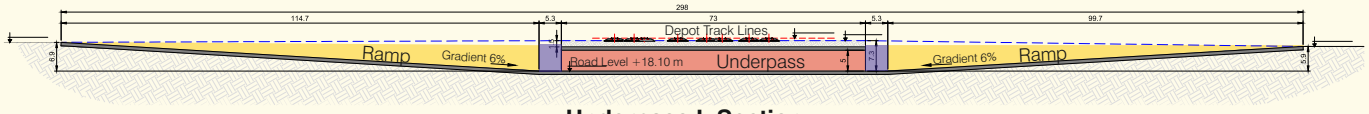
Underpass Plan



Key Plan



Underpass Cross Section



Underpass L-Section

JICA Update

MMRC is implementing Metro-3 with the financial assistance of 57.2% of the total project cost from Japan International Corporation Agency (JICA). Till date two loan agreements have been signed with JICA. 1st Tranche of loan amounting to ¥71 billion and 2nd Tranche amounting to ¥100 billion.

JICA Fact Finding Mission visited MMRC from 3-12 December 2018 wherein Metro-3 project status was reviewed and the fund requirement for the project was assessed including environmental and social aspects.

The Fact Finding Mission confirmed that the 3rd Tranche of JICA loan amount shall be ¥400 million and the balance amount shall be part of next tranche. JICA Fact Finding Mission further conducted site visits wherein MMRC's efforts towards cleanliness and safety at each location was appreciated.

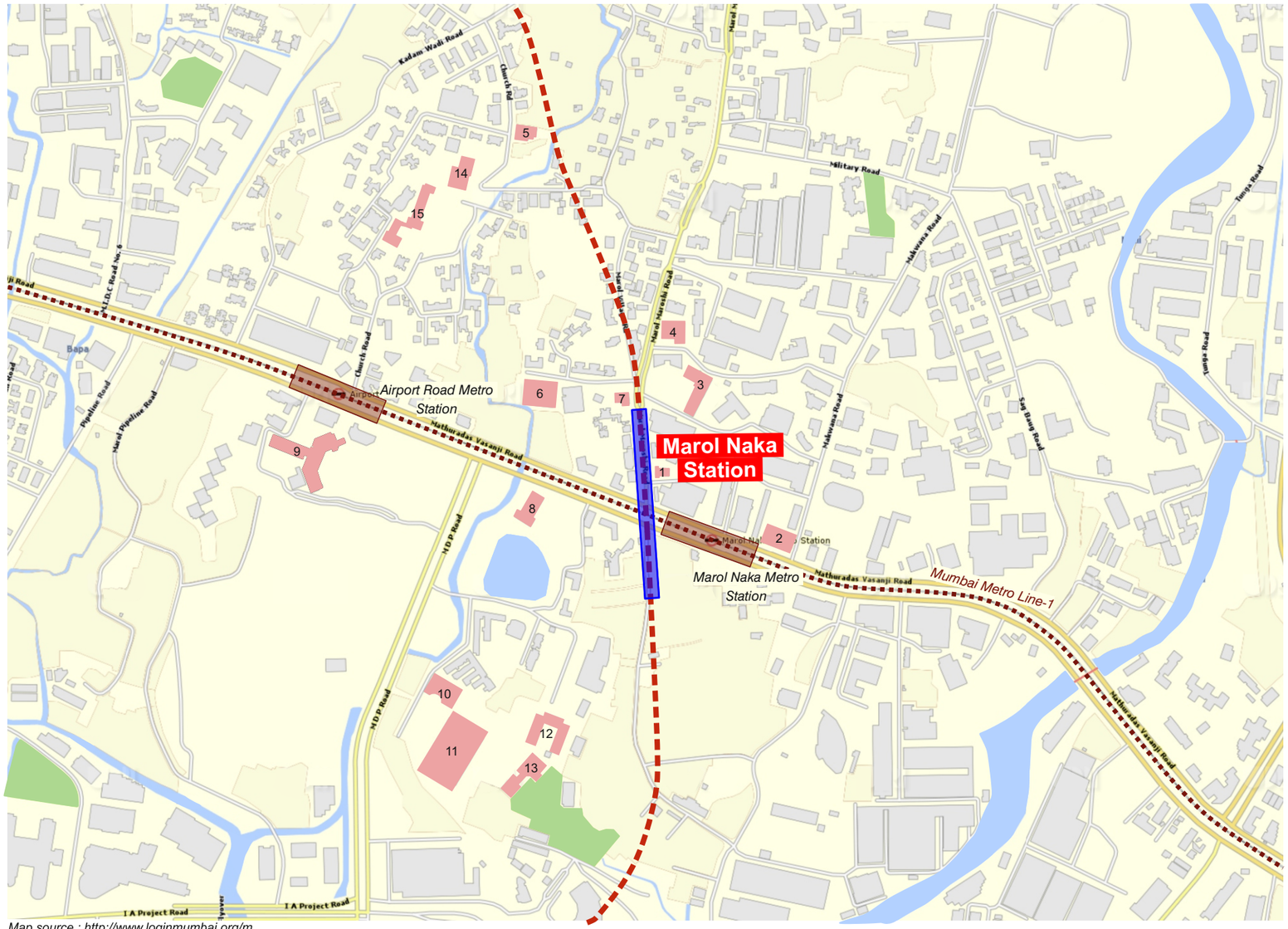
Know Your Station - Marol Naka Station

Hotel Sahar Garden

Marol Municipal High School

Pearl Academy

Marol Fire Station



Map source : http://www.loginmumbai.org/m

1. Hotel Sahar Garden
2. Pearl Academy
3. Hotel Marigold
4. Hotel Silver Inn
5. MCGM Market
6. Marol Municipal High School
7. Hotel Ashwin
8. Mirage Hotel
9. The Leela
10. The Lalit Residency
11. The Lalit Mumbai Hotel
12. Waterstones Hotels
13. Waterstones Club
14. St. John the Evangelist Church
15. St. John The Evangelist High School

Mirage Hotel

Marol Naka Station (Mumbai Metro Line1)

Hotel Ashwin

Marol Village has been inhabited for centuries under the influence of Portuguese and British rule. This influence can be prominently witnessed even today as the Portuguese architecture seamlessly infuses with Marathi culture. The Marol village (Gaothan) gets its recognition from the establishment of St. John Evangelist Church since 1840. Traditional life of East Indians who live in Marol along with Hindus and Muslims has changed in recent decades, especially with the accelerated pace of redevelopment. Marol locality has now been upgraded as far as real estate is considered due to the Marol Naka Metro Station of Mumbai Metro Line-1.

Marol consists of the areas Marol village, Marol Naka, Marol Depot, Marol Maroshi Bus Station, Military Road, Marol Pipeline, Vijay Nagar, Bhavani Nagar, parts of JB Nagar, and parts of Marol MIDC. It is near to the International Airport. Marol Naka Station lies beneath the Marol Maroshi Road and crosses the Mumbai Metro line-1 with Marol Naka Metro Station. The Marol-Maroshi Road stretches from Marol Naka up to Maroshi Naka (in Aarey colony), beyond which is the Picnic Spot.

Marol has a good east-west connectivity by Mumbai Metro Line-1. Marol Naka Metro Station of Line-1 serves the Marol neighbourhood of Andheri. BEST launched a special bus service Metro Pheri 1 which brings commuters from a distance to the closest of the 3 metro stations it serves (Chakala (J.B.Nagar), Airport Road, Marol Naka). This area is still far off from direct reach of Central Railway. Now with introduction of underground Marol Naka Station of Metro-3, the area will be directly connected to the South Mumabi. The nearest station on Western Railway is Andheri, which is at a distance of about 4.2 km.

Marol Bus Depot is around at 2.2 km form proposed underground station. Marol Police Camp is home to the families of people working for the Maharashtra Police is located at about 2.3 km from station. It is mainly the base camp for the State Armed Constabulary.

The proposed Station will serve the important landmarks, such as Pearl Academy, Mirage Hotel, The Leela, Marol Municipal High School, St. John Evangelist Church, St. John Evangelist High School, Hotel Marigold, Hotel Silver Inn, etc.

TRANSED 2018 - Mobility for All

This article is in continuation with the previous article, in November 2018, Volume 26.

A Master Plan for Mumbai Metro was prepared in 2004 which proposes implementation of metro corridors in three phases, i.e., Phase I: 2005-2011, Phase II: 2011-2016 and Phase III: 2016-2021. MMRDA has carried out studies for all the three Phases. Metro corridors during the period 2005-2009 are Line1, Line 2 and Line 3 (Line 1: Versova-Andheri-Ghatkopar, Line 2: Mankhurd-Bandra-Charkop and Line 3: Colaba-Bandra-SEEPZ).

Interventions in Safe Mobility for the Elderly and PwDs Proposed by Metro-3

The proposed Metro-3 station designs are in compliance with the 'Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons' published by the Ministry of Urban Affairs and Employment, India in 1998. The total alignment length is 33.508 km. A total of 27 (26 underground + 1 at-grade) stations have been proposed along the entire length of the alignment. The proposed Metro-3 Corridor is expected to have a daily ridership of 1.70 million and maximum Peak Hour Peak Direction Traffic (PHPDT) of 42,000 by 2031.

Metro-3 Interventions: At Street Level

- Ramps are proposed from the road/drop off areas to the walkway to aid people using wheelchairs to access the walkways, and aslo will be provided to access elevators.
- Elevators are to be provided at two ends of the stations, and on either side of the road which will eliminate road crossing for elderly & physically challenged passengers.

Metro-3 Interventions: Elevators

- Elevators have been sized so that wheelchair can be easily maneuvered. It will have hand rail inside for the aid of PwDs and elderly. Elevator walls are proposed to be mirrored so that visibility is maintained for a wheelchair using passenger.
- Announcements would declare the level that the elevator is about to reach, and other safety guidelines.
- For passengers with visual impairments, the elevator operating buttons to have information in Braille on all levels.

Metro-3 Interventions: At Concourse Level

- Tactile strips connect the staircases and elevators from street level to the concourse & platform levels.
- Ticket vending machines are proposed to aid the passengers with speech impairments.
- Wide automatic fare gates are proposed for the wheelchair bound passengers.
- Toilet for PwDs is accessed through a ramp provided with wheelchair access at each station concourse.

Metro-3 Interventions: At Platform Level

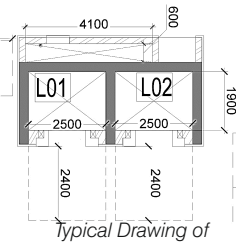
- Tactile strips to guide visually impaired, connecting staircases and elevators from concourse level to railcar door.
- Gap between the platform and railcar floor is minimized. Hence, Wheelchairs can easily roll over, and visually impaired can easily walk without accidentally trapping their feet in the gap.
- Pictograms along with signages in 3 languages - Marathi, Hindi and English; to denote facilities and statutory signs.
- Public information display will help to know which train is arriving & related information.

PHPDT and Daily Ridership for Metro-3

Year	Max. PHPDT	Daily Ridership (in millions)
2016	25700	1.006
2025	39000	1.387
2031	42000	1.699

Ramp up to Walkways

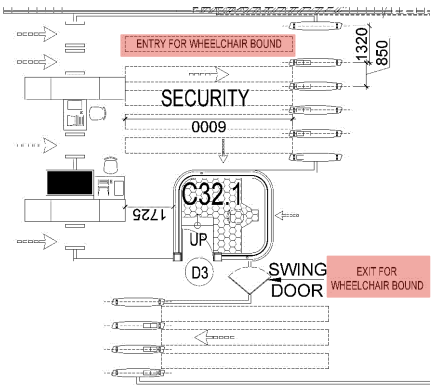
Elevator operating buttons in Braille



Typical Drawing of Elevator

Metro-3 Interventions: Rolling Stock

- Designated space to be reserved for the elderly & PwDs in railcar.
- Stainless steel grab poles and rails to be provided in the standing areas of the railcar for the comfort and safety of passengers.
- Grab handles to be of bright colours to help passengers with cognitive and visual impairments.
- Station staff to monitor passenger movement and provide personal help to any elderly or PwDs who needs assistance. Staff to receive training to get sensitized for assisting the elderly & PwDs.



Plan - Wide Fare Gates

Expert Speaks

Our author for 'Expert Speaks' section for this month is Dr. Noorjahan Aibani, recently achieved her PhD in Life and Health Sciences from Ulster University, Northern Ireland, UK. She completed her Masters of Pharmacy from SNDT Women's University, Juhu Santacruz, has worked as Junior Research Fellow at the Department of Biomedical Sciences, IIT Bombay, Powai in the past and is a holder of three international publications. She loves to travel and has been to London, Edinburgh, Glasgow in the UK and San Francisco, New York and Washington D.C in USA having first hand observed the workings of London Underground and New York subway.

Technological advancements have massively upgraded our way of living in recent years. There have been rapid breakthroughs in various areas such as engineering and healthcare in recent times. It is high time that Mumbai creates a mark for itself in world class travel and adds its name on the map along with large metro cities, such as London, Paris and New York. Since the first Mumbai suburban railway route started in the British era almost 160 years ago in 1853, there have been quite a few advancements in technology from the traditional steam engine to the conversion to electric engines in 1925 and introduction of Western Line in 1867 and Harbour Line in 1910. However, the increasing number of commuters has put a tremendous pressure one these existing railway lines and there is an urgent need to explore other ways of transportation. More than 3000 people died while travelling in local trains in the year 2017 alone either by suicide, illegally crossing the tracks or by falling from the trains and the numbers are ever increasing.

The introduction of additional and advanced railway systems to local trains will provide a means to relieve this pressure to some extent while improving the commuter experience. The collective initiative of building metro rail systems by the Central and State Governments is certainly a step forward to rising with the challenges posed by the setbacks of our current mass transit systems. At the time of their commencement, local trains were designed to run from north to south, the idea of connecting to eastern and western parts of the city is brilliant. The success of Metro line-1 indicates the need of more number of such systems which will not only provide a respite from the congested local trains but also give connectivity for hard to reach areas while reducing the travel time.

There have been some notable concerns about the construction of metro rail systems in Mumbai such as accumulation of ground water during monsoon especially for underground rail lines, cutting of trees, displacement of slum dwellers and their rehabilitation, space for car sheds and maintenance, and connectivity between different lines. The transparency of the government agencies towards these issues has been of utmost importance towards the successful completion of these projects. It has been eye opening to learn about the endeavours of the MMRCL to overcome these problems. The regular updates on the MMRCL website provide detailed description of all the activities carried out along with the estimated timelines for the completion of various projects.

Metro-3 prides in the use of advanced tunnelling and construction technologies with investments from international agencies ensuring good quality of the facilities to be provided. The superior engineering methods will ensure that the metro is not affected by water logging during monsoon. The efforts taken by the MMRCL to not only maintain the quality of such a large-scale infrastructure undertaking but also to find ways to reduce the environmental impact have been commendable.

The recent plantation of 17000 trees and further plans to plant 20900 more trees proves the efforts taken by MMRC to undo any damage to trees caused by the constructions. Moreover, there have been efforts to minimise the impact of these metros on the lives of slum dwellers as evident by their rehabilitation schemes.

Generally, in cities such as London and New York, the bus and tube stations are connected to airports which enhances the efficiency and allows easy connectivity to commuters. The connection of Metro-3 with the International and Domestic Airports will be a boon to international and domestic air travellers and will also provide a boost to the tourism sector. The threat to the environment in the construction of this metro system far outweighs its long-term impact on air pollution and fuel consumption. The estimated future reduction in the carbon dioxide emission and the electricity generation capacity of these trains further points towards a more sustainable future.

The introduction of state of art of transport facilities in Mumbai paves the way for more technological progressions in future. Being a Mumbaikar, I have witnessed first-hand the woes of commuting to work every day. With higher working hours and increasing work pressures, the metro lines will not only help with the professional well-being of the common man but will also improve their personal lives. Nevertheless, such transport systems are imperative for the smooth functioning and betterment of a major metro city like Mumbai.

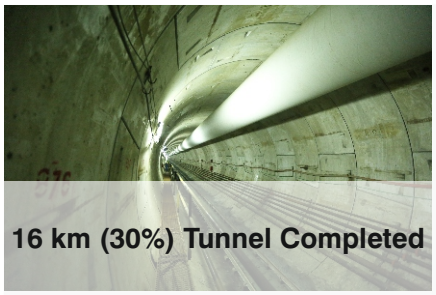
News @ MMRC

MMRC Calendar-2019

MMRC art initiative involved 10 students of Sir. JJ School of Arts and resulted in 18 paintings related to Metro-3 construction sites. 6 paintings have been selected to be featured in the 2019 calendar. A panel of judges led by Mr. Prabhakar Kolte, celebrated artist, Mr. Abhay Sardesai and Ms. Anjali Gupte, art critics were involved in selection of paintings for calendar and the best art work. The Digital copy of calendar has been uploaded on MMRCL website at *www.mmrcl.com/en/media-centre/gallery/photo-gallery.*

The calendar for 2019 is the result of an art initiative undertaken by MMRC jointly with the JJ School of Art. The Students visited various work sites along the alignment of Metro-3. Their young mind received certain insights of this unique construction activity and the art works are a reflection of their experiance.

Year 2018 progress



16 km (30%) Tunnel Completed

2439001 m^3 (49%) Excavation Completed

All 17 TBMs are working and 2 breakthroughs have been achieved

All 27 stations' work has started

MMRC has awarded 7 contracts in year 2018

75.75 ha land has been acquired out of 76 ha required land

MMRC Control Room

Contact us @ +91 9136805065 to report monsoon related grievances pertaining to Metro-3 construction work

Website Link

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