



MMRC

ADDING NEW DIMENSIONS

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METRO CUBE

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Content

- 1 MD Speaks
- 2 Supervisory Control and Data Acquisition
- 3 Quality In Totality
- 4-5 Know Your Station
- 6 Project Progress Update
Twin Tunnel Breakthrough
- 7 Multimodal Integration
- 8 Media Glimpses

MD Speaks

Ms. Ashwini Bhide, IAS

The new year 2019 started with a big bang for Team Metro-3. This was demonstrated by twin tunnel breakthrough in Package 4 on 31st January 2019 in less than 30 min interval. Krishna 1, the first TBM that was lowered on 21st September 2017 by package 4 contractor from Nayanagar launching shaft and completed its drive of 2490 m. TBM Krishna 2, lowered on 18th October 2017 from same launching shaft completed its tunnel drive of 2472 m. Krishna 1 & 2 are Earth Pressure Balancing TBMs; made by Herrenknecht, made their way through the rocky strata made of Basalt, Breccia & tuff to see the light at Dadar metro station. It is the result of consistent and continuous effort by a team of 15 engineers, 85 technicians and workers over 16 months period. The 1779 & 1766 RCC rings were used to build the twin tunnels @ 10-12m/day. All 17 TBMs started working from November 2018, have together completed 18.65 km of tunnelling till date. TBM Vaitarna 1 & 2 of package 2 successfully completed a cumulative tunnelling of 3 km.

Continued on Page 2

SCADA

Supervisory Control and Data Acquisition

This article is in continuation with the previous article, in December 2018, Volume 27.

Features of SCADA in Metro-3: All SCADA would be IP (Internet Protocol) enabled & controlled through OCC (Operations Control Centre).

Power SCADA (33 kV Auxiliary and 25 kV Traction SCADA): Power SCADA system has been used for control and monitoring of 25 kV traction as well as 33 kV auxiliary network. If power supply failure occurs due to any problem in grid supply, power supply, is promptly switched over to alternate source to maintain punctuality of trains. Remote control of electric traction and auxiliary power supply is supervised and controlled by Traction Power Controller (TPC) sitting in OCC. Main functions, such as remote opening and closing of circuit breaker, fault detection, fault isolation and monitoring of feeder.

Building Management Solution (BMS)/M&E SCADA:

- Monitoring and control of lift and escalators. Functions, such as remote start-stop, reversal, speed change (escalators).
- Fire detection and control - Zone wise status, alarms and control, Fire alarm control panel (FACP) mains on/off status, FACP battery voltage status and alarm, gas flooding actuation and panel flooding status/alarm/control.
- Monitoring and control of normal and emergency lighting in station (25%, 50%, 75%, 100%) depending upon the occupancies in station.
- Monitoring, control of incoming and outgoing circuit breakers of all Main Distribution Boards (MDB), pumps, motor control centres parameters, such as alarms, open/close status, voltage, current, frequency, power factor, etc.
- BMS is capable to monitor and control equipment in depot area, at grade Aarey Station and administration building. Functions, such as remote opening-closing of circuit breaker, fault detection, fault isolation and measurement of electrical parameters (power factor, frequency, voltage, current, etc.) for depot ASS. Monitoring and controlling of AHU, chillers, cooling towers, pump operations (sump pump, cooling tower pumps, chiller pumps, fire pumps).

Tunnel Ventilation System (TVS) & Environmental Control System (ECS) SCADA:

- TVS & ECS SCADA are mission-critical life safety systems that will protect the passengers during fire and smoke emergencies in the stations/tunnels.
- TVS & ECS equipment distributed throughout the Metro-3 is to be monitored and controlled during the normal as well as emergency operating conditions. The TVS & ECS SCADA shall provide relevant data/information, which would enable maintenance staff to assess the need for unscheduled preventive maintenance based on degradation of normal operating parameters.
- TVS & ECS SCADA system shall incorporate the following primary functions;
 - ⇒ Monitor and control the ECS air conditioning, ventilation, smoke control, etc.
 - ⇒ Monitor and control the TVS including mode setting for fans & dampers.
 - ⇒ Provide continuous effective monitoring at OCC/BCC of all TVS/ECS equipment distributed throughout the system.
 - ⇒ Alert operation and maintenance staff rapidly to equipment malfunctions, especially those likely to cause disruption to operation of the Metro Rail and provide a facility for acknowledging the alarm.
 - ⇒ Provide control of TVS mode for individual and group of stations.

MD Speaks

Continued from Page 1

Similarly TBM Godavari 1, 2 & 3 in package 5 also completed a cumulative tunnelling of 3 km. Station construction is in full swing at Azad Maidan, Siddhi Vinayak, Vidya Nagari, BKC, CSIA T2 and Marol Naka.

Contract for Automatic Fare Collection (AFC) system was awarded to Consortium of M/s ASIS Elektronik be Billisim Sistemleri A.S., Turkey & Kalindee Rail Nirman a Div of Texmaco Rail & Engineering Ltd. India (Kalindi-ASIS JV). AFC plays a critical role in metro with high ridership. AFC will also accept "Common Mobility Card" being deployed for all other public transport operators and provide seamless travel of commuters throughout Mumbai Metropolitan Region (MMR).

In continuation of our public outreach program; interaction with local citizen was arranged by *Marathi Vyavasaik Vyapari Mitramandal* at Dadar. MMRC made their strong presence in the Mumbai Marathon Dream Run for the third successive year. MMRC team filled with enthusiasm and energy stands for Fitter India and continues to encourage staff to be part of this initiative.

Team MMRC and GC jointly celebrated sports event "Udaan – Athletics Meet 2018-19" followed by annual Get together; a cultural evening. The hardworking technocrats and professionals enjoyed some light and fun filled moments together that also gave opportunity to young talent who gave performances in music, dance and games. This gave the required fillip to the team to enthusiastically take the year ahead.

I am reminded of the thunderous applause by those witnessed the twin tunnel break through at Dadar that would continue to encourage Team Metro-3 in their effort to bring this world class infrastructure early to Mumbai. The credit of this ongoing accomplishment goes to the team of engineers, stake holders and especially citizens of Mumbai for their support and patience.



Quality In Totality

MMRC piloted the practices of quality management, gave the initial thrust to the model of its implementation in the construction of this mega underground metro line in the context of Indian construction practices and its run through. This led to creation of a formidable quality team from the very start of the project, exclusively to assure stakeholders and most of all the general public - *delivery of a fine product within a reasonable time.*

The basic shape of the prevailing quality management actions of Metro-3 is as in figure 1, which is perennial in observation, thoroughly checked, studied, implemented and acted upon, and in continuous improvement to achieve a near-perfect quality level, in the Green-zone. For this, in the spirit of ISO and under austere quality standards for the fulfilment of contractual requirements, Metro-3 practices stringent Quality Management System (QMS) at 3-levels that covers the responsibilities of the Authorities (Governments of India and Maharashtra), Procuring Entity/ Supervising Unit (MMRC/ General Consultant, GC) and Construction Agency, the Contractors' Joint Ventures (CJV). CJVs are responsible for Quality Control Management System, while the Procuring Entity and Supervising Unit are responsible for Quality Assurance Management System. The QMS for this Project is based on elementary Deming's Cycle PDCA (plan-do-check-act), as depicted in the schematic diagram, figure 2.

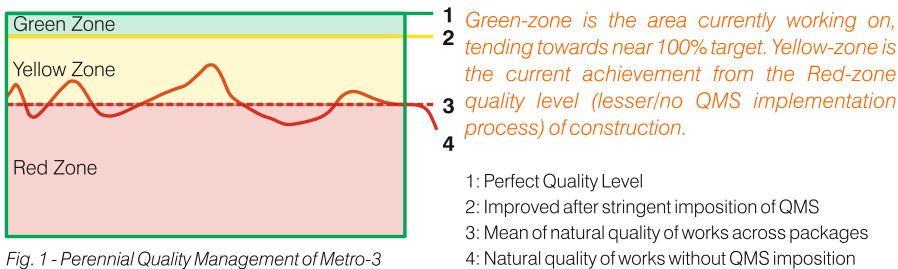


Fig. 1 - Perennial Quality Management of Metro-3

To achieve maximum quality compliance (which lies in the region of Green-zone, figure 1), the project QMS has imposed various tools like audits, inspections, unique valuation of tunnel rings/special structures, stringent approval process, network of monitors, Non-Conformation Report (NCR), Contractor's Surveillance Report (CSR), Request For Inspection (RFI), training/ workshops, meetings, joint inspections, quality-walks, etc.

One the other hand, every CJV exclusively certified themselves ISO for their management of execution. Integrated Management System (IMS - QMS, EMS, OHSAS, etc.) certification is also in their possession and practice, which includes even Risk Management coverage. Two major contrivance that makes our quality lie in Green-zone is our 24X7 monitored large Central Site Laboratories (8 in numbers that meets requirements of the *National Accreditation Board for Testing and Calibration Laboratories*, NABL) and a tamperproof Documentation System (through a contemporary software "*Project Management Information System*", PMIS).



Quality Team Training for good workmanship at Metro-3 Site



World Quality Day Celebration at Metro-3 Site

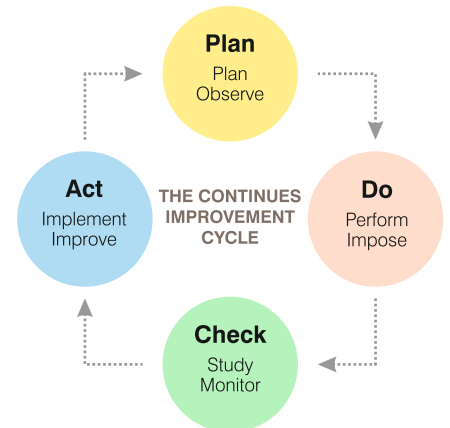


Fig. 2 Process of Deming's Cycle PDCA

MMRC and the GC are confident of contractor's QMS which has a focused strategy to achieve a successful delivery of "Quality Product". Their quality procedures, inspection & testing plans, documentation process, audits, trainings, quality awareness plans and various manuals structure the guidelines for implementing such system. Being a *Design and Build* contract, CJVs various plans, policies and procedures, which are approved by the GC in concurrence with MMRC, like Project Quality Plan (PQP), Manufacture Quality Plan (MQP), Design Quality Plan (DQP), etc., forms the foundation of their quality process or system. Compliances with these are checked by the MMRC and GC from time to time by way of surveillance audits and inspections.

MMRC's overall quality management effort is designed in such a way that it becomes pressing on contractors not to deviate from the project requirements, so much so that contractors at times conducted as much as 16 audits per day covering various scopes to ensure compliances. This is just an example of how our established procedures reaped dynamic results of implementation. This iconic project has a robust quality team to ensure that QMS is in place and in totality. Quality comes by choice, and at Metro-3, we are a team of technically-intolerant quality watchmen, highly qualified and big in numbers, which will leave fossils of such impressions even beyond 120 years of corridor's design service life, dedicated to the people of Mumbai!

Know Your Station - MIDC Station



Ackruti Trade Centre



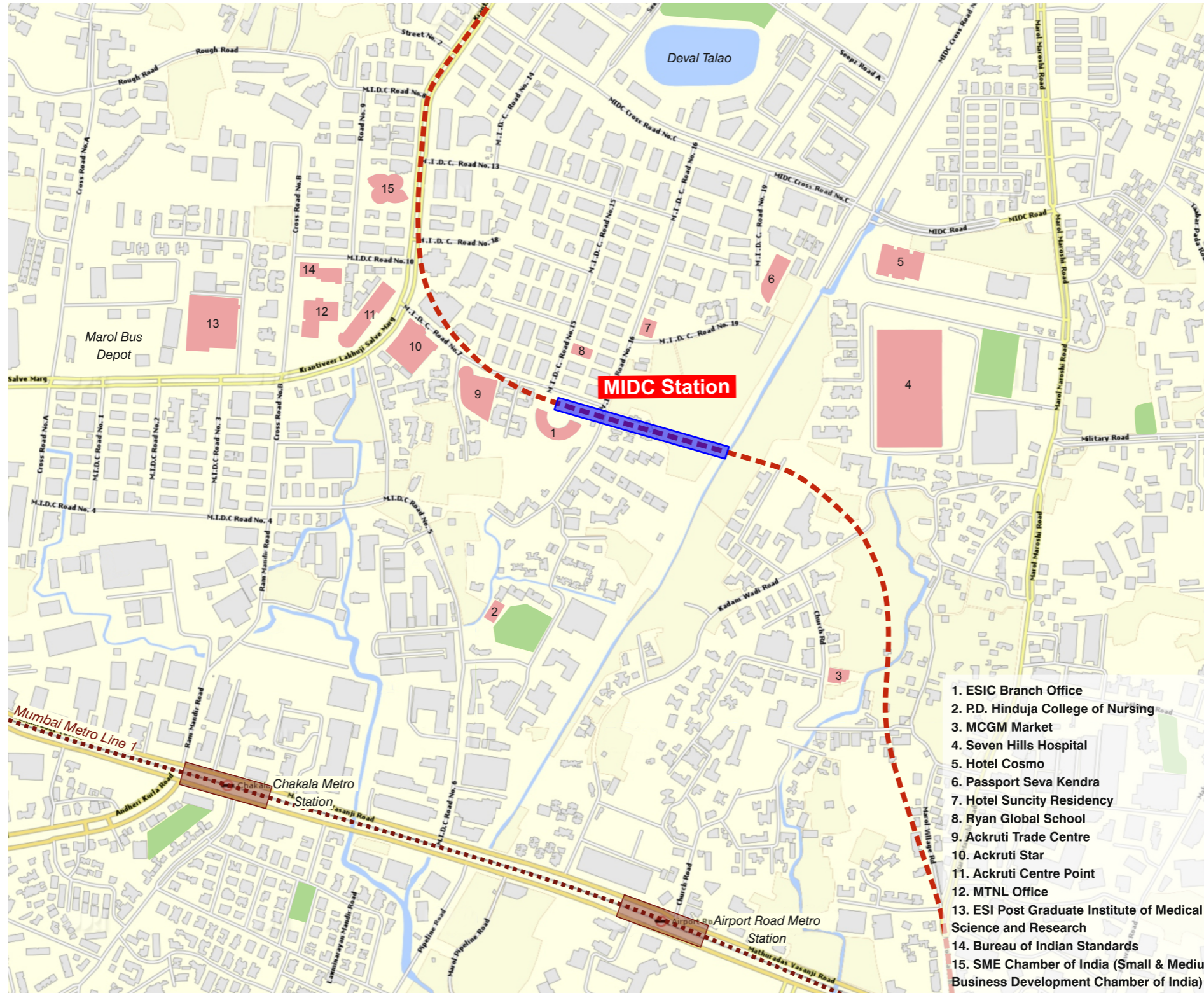
Ackruti Centre Point



Hotel Suncity Residency



The Regale



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

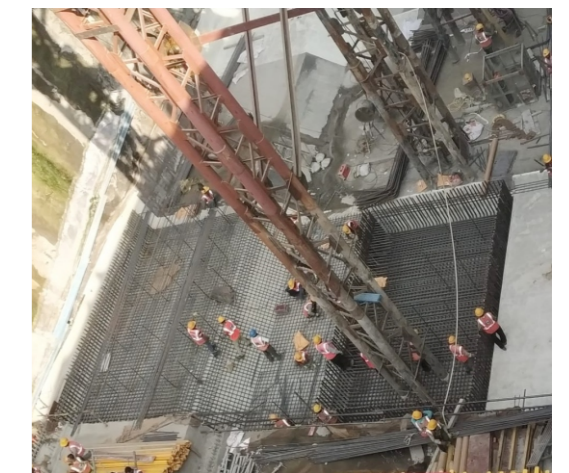
Station will mainly serve the important institutions like Brihanmumbai Municipal Corporation, MCGM market, ESIC Sub-Regional office, Passport Seva Kendra Andheri, Seven Hills Hospital, Bureau of Indian Standards, Ackruti Trade Centre, etc. Some of the educational institutions served by the station are ESI Post Graduate Institute of Medical Science and Research Andheri, Hasanat High School, Ryan Global School, Natvar Nagar Mumbai Public School and P. D. Hinduja College of Nursing. Metro-3 will boost the area as presently there is no direct connectivity by suburban railway. Metro-3 will become a catalyst for high intensity commercial development within MIDC and surrounding areas as these will be connected with the rest of the city through transit. Its proximity to the domestic and international airports and CBDs of Andheri, BKC make it a potential destination for industry based activities like convention centers, corporate gatherings, hosting multilateral interactions, etc. which can thrive further after coming of Metro-3.

This month, we cover the 25th underground metro station northwards from Colaba, MIDC Station on Metro-3, located beneath the Road Number 16, Shree Krishna Nagar at Andheri East. MIDC stands for Maharashtra Industrial Development Corporation. The station is named so because it is surrounded by the MIDC Industrial Estate. The station serves the neighbouring areas of Kondivita, Marol Industrial Estate, Chakala Industrial Estate, Pandit Dindayal Upadhyaya Nagar and Shri Krishna Nagar.

The nearest stations on the Metro Line-1 are Chakala (J.B. Nagar), Airport Road and Marol Naka at 1.5 to 2 km distances from proposed MIDC Station. The nearest suburban railway station is Andheri which is 4 km away and to the west of the WEH. So far, this area has been depending on the BEST bus, taxi, auto rickshaw services for connectivity from nearby stations.



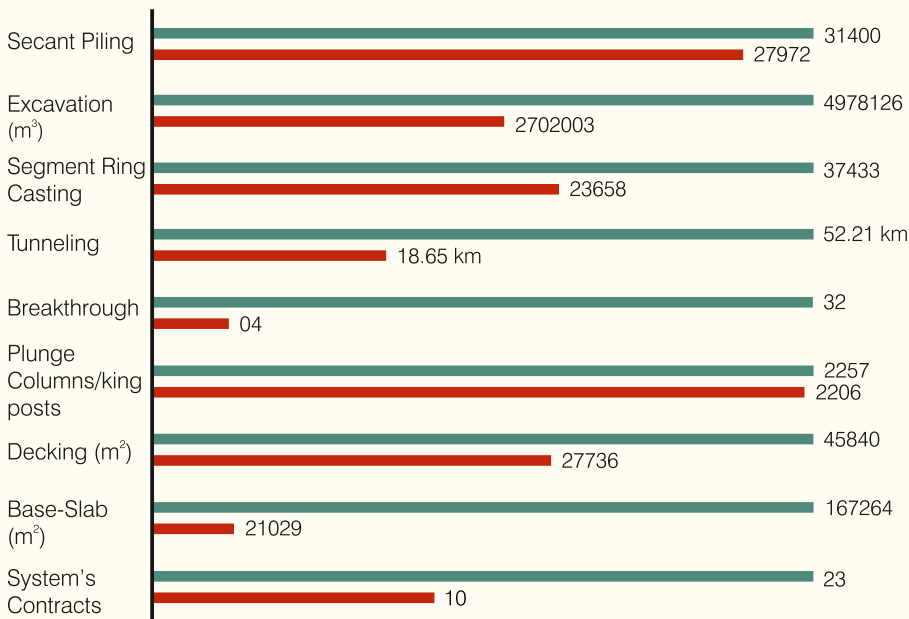
MIDC station work is in progress



Base Slab Work at MIDC station

Project Progress Update

As on 31st January, 2019



MMRC awarded two contracts, Automatic Fare Collection System on 15th January 2019 and Escalators (Lot-E1, Aarey to Dadar, 13 Stations) on 31st January 2019.

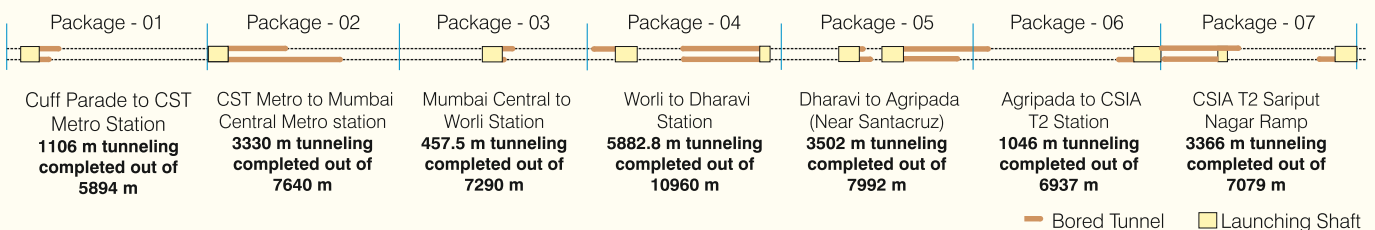
Legend
█ Planned
█ Completed

Twin Tunnel Breakthrough



MMRC witnessed a twin tunnel breakthrough of the third and fourth TBM of Metro-3 corridor at Dadar Metro Station. TBM Krishna 1 was lowered on 21st September 2017 from Nayanagar launching shaft, completed its tunnel drive of 2490 m in pkg-4 to see the light at its end at Dadar metro station. TBM Krishna 2 was lowered on 18th October 2017 from Nayanagar launching shaft completed its tunnel drive of 2472 m in pkg-4 at Dadar metro station. Once more it marks the achievement of an important milestone towards the steady completion of the 33.5 km long Metro-3 corridor. It is the result of consistent and continuous effort by a team of nearly 15 engineers, 85 technicians and workers together in each TBM to make this reach of tunneling successful. Krishna1 & 2 made their way through the rocky strata made of Basalt grade 3 & 2, Breccia grade 4, 3 & 2 and Tuff grade 4 & 3, drilling relentlessly for exactly 506 and 479 days respectively. These TBM's were equipped with Earth Pressure Balance Technology. For the purpose, 17 Tunnel Boring Machines have been commissioned at ten TBM shafts. Overall 35% work has been completed till now.

Tunnel Progress Update As on 30th January 2019





Multimodal Integration

Mumbai is one of the most highly populated cities and is the capital city of Maharashtra, also called the financial capital of India. With a population of 12.44 million and a high population density of nearly 21,000 persons/square km, the demand of proper transportation system and the role of the transportation system in the lives of the average earning population are crucial.

Majority of Mumbai's population relies on the bus and suburban railway services. Mumbai suburban railway is the lifeline of the city. More than 80% of all the motorized trips are undertaken on public bus and rail services and more than half of the trips of public transport are taken on the rail services. Approximately 8 million commuters use the 2900 trains of the suburban rail system. During peak hours these trains are overcrowded to nearly four times the network's capacity.

Being the commercial capital of India, Mumbai's public transportation systems are very good yet have not been able to keep pace with the city's immense growth. The infrastructure gap is evident from the chronic congestion on roads and suburban railway lines, resulting in the reduction of valuable pedestrian space, pedestrian-vehicle conflicts, overloading, traffic blocks, safety issues, environmental pollution and operational inefficiency. Mumbai Metro is another was introduced with the objective to supplement the overcrowded Mumbai Suburban Railway network, and for providing connectivity between central Mumbai and the northern suburbs.

Mumbai will soon have a new 276 km Metro infrastructure as per Mumbai Metropolitan Region Development Authority (MMRDA)'s Metro Master Plan. Each station will have a concentration of intensified development around itself. Mumbai already has a cultural acceptance of high density mixed-use development. This would add to the infrastructural load as there are going to be about 200 new Metro stations coming up in Mumbai.

To ensure balance between the intensified development around station areas and mobility infrastructure available to cater to the increasing intensity of development, it is important to relook at the way the infrastructure is planned. A single mode of transport cannot cater to the ever-growing transport needs of the city. For an efficient and sustainable transportation system, various modes need to be introduced and gradually developed in an integrated manner. These modes need to be further integrated to enable easy transfer of passengers from one mode to another with minimum time loss.

Integration of various transit facilities is a must for the success of public transport systems in the city. In order to ensure safe and efficient accessibility to all the stations by using all modes of transport, Multimodal Integration Planning for all the metro station areas plays critical role. These measures include aspects, such as improvement of roadway designs, traffic calming measures, pedestrian and bicycle infrastructure, landscaping, way-finding signages and parking management.

Multimodal Integration would facilitate smooth and efficient interchange with the suburban rail system and MRT system. It is expected to reduce the current travel time by anything between 50% and 75% depending on road conditions. Most importantly, it is expected to induce a modal shift from private to public modes of transport, hence reducing traffic congestion on other transit modes. Last but not the least, multimodal integration and transit-oriented development move hand in hand, one complements and facilitates the other.

In the forthcoming issues, we plan to include a series of articles which cover different aspects of transit oriented development and multimodal integration opportunities around metro plans in Mumbai and specifically with Metro 3.

Team MMRC and GC jointly celebrated sports followed by cultural evening. All enjoyed some light and fun filled moments together that also gave opportunity to young talent who gave performances in music, dance and games. This gave the required fillip to the team to enthusiastically take the year ahead.

Udaan – Athletics Meet 2018-19 & Annual Get Together



Media Glimpses

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