



METRO CUBE

A MUMBAI METRO RAIL CORPORATION NEWSLETTER

MD SPEAKS

Ms. Ashwini Bhide, IAS

The 2019 year-end issue of METRO CUBE marking the end of 2nd decade of 21st century, is also a combined issue for November-December months. At MMRC, we would like to remember the year that has gone as an year of many milestones; the procurement process for almost all the Civil and System components essential for the project were concluded, civil works especially the tunneling has made biggest leap as well as the station construction. Land acquisition for project works completed 99.8%, Rehabilitation & Resettlement of slum dwellers completed 100%, in-situ rehabilitation of Kalbadevi - Girgaon residents made significant progress, Rolling Stock manufacturing started and many more. A brief account of milestones of 2019 and project progress has been captured in an article in this issue.

By early December, Package 7 has completed 100% tunneling scope of the project with the 24th breakthrough; cumulative length of 7.08 km. and have started demobilizing the TBMs deployed. Together, the 7 packages have completed 40 km of tunneling which is 74% of tunneling scope. Station construction works at all 26 u/g stations are in full swing. As regards the Depot works, the same has been on hold since the date of stay declared by State Govt. The track work; the last of civil tenders was awarded keeping in line with the scheduled Revenue Operation Date (ROD).

Continued on Page 3

Content

MD Speaks	1
Lifts/Elevators	2
MD Speaks	3
Metro-3 Station Area Planning/Management Student Competition	4-5
Metro-3 Station Area Planning/Management Special Recognition Award for Transformative Ideas	6-7
All About Construction Package - UGC02	8-9
Station Works - Concrete Decking for Road Traffic	10
Supporting Underground Utilities	11
Environmental Management Plan Waste Water Recycling at UGC02	12
Lifts/Elevators	13
Year 2019 Highlights	14
Expert Speaks Goals For 2020	15
News @ MMRC	16



Lifts/Elevators

Details of Lift/Elevators used for Metro-3 & Emergency Operation of Elevators in power failure & fire

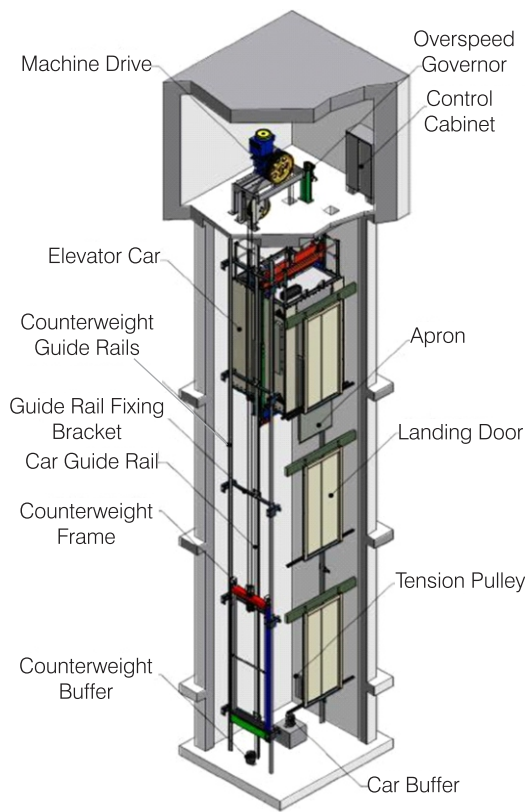
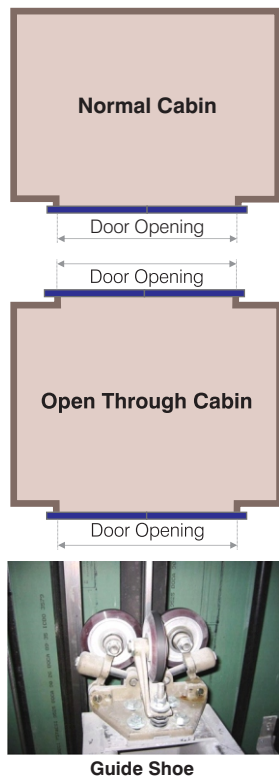
Two different types of Lift/Elevator are proposed for Metro-3. First is 1000 kg/13 passengers elevator which involves primarily for the movement of passengers including disabled & elderly persons and staff of MMRC. And second is 2000 kg freight elevator which involves primarily for the movement of materials including maintenance staff. The nominal speed for the elevators will be 1m/s in either direction.

Automatic Rescue Device (ARD) to be provided which will be able to move the elevators with any load from no load to full load at reduced speed to the nearest landing and open the doors upon reaching the landing.

Uninterruptible Power Source (UPS) to be provided for alarm system, intercom system, emergency car lighting, and the ventilation fan in case of power failure. The battery backup for UPS will be of 120 minutes. RMS (Remote Monitoring System) is provided in SCR (Station Control Room) with which monitoring function can be carried out.

Elevator Car Type

- 1) Normal Cabin
- 2) Open Through Cabin



Basic Lift Components

Safety Features

Speed governors will be provided which will stop the lift in case speed exceed 20% above the rated speed. 3D infrared curtain and photocells to be provided that will detect the movement of passenger during entry/exit and activate the detector to stop the closing movement of the doors and re-open them before hitting the person.

Emergency alarm button will be provided in the car that once pressed will send a signal in the SCR regarding which further can be communicated through intercom system provided in the car. Overload, seismic sensors to be provided.

The water sensors in the elevator pits will be provided. Each elevator car will be provided with progressive type safety gear mounted on the lower member of the car frame structure.

Lift/Elevator Fault Diagnostic System

Comprehensive elevator monitoring and fault diagnostic system will be provided for each elevator. Maintenance Management Information System will be provided which will provide maintenance schedules, status report, summaries of maintenance activities, replacement of any spares details, inventory control for spares & consumables, etc. Web based real time predictive maintenance solution will be provided by the Contractor which will predict maintenance issues before they occur along with facility to transfer fault data/log/detailed reports, etc. Trapping of passengers in elevators through Short Message Service (SMS) to designated contact numbers will also be provided.

Emergency Operation of Lift/Elevators in the Event of Power Failure

All the elevators will be backed up by DG (Diesel Generator) set in case of power failure. In the event of power failure and fire, the operation of elevators will be in accordance with the "Emergency Operation of Elevators in the Event of Fire" and the power supply will be from the emergency supply panel at the stations.

Elevator emergency Automatic Rescue Device (ARD) is a special device with battery back-up to home the elevators to the nearest landing in the event of power failure will be provided in an elevator which is only used during an event of a power failure or blackout in a building. An elevator emergency landing device is useful for preventing passengers from being trapped inside the elevator during power failure.

Continued on Page 13

MD Speaks

Continued from Page 1

After finalization of Rolling Stock mockup of Metro-3 - AQUA Line in early November, M/s. Alstom has commenced the manufacturing of train coaches at Sri City in Andhra Pradesh. The first train set is expected to be delivered by November 2020. Rest of the 31 trains will be delivered in 24 months thereafter. Remaining system works; Traction & Power supply, Tunnel Ventilation & Environment Control System, Lifts & Escalators, Automatic Fare Collection System and other Depot contracts awarded in 2019 are finalizing the designs, vendors and actual productions at respective sources/factories. Two more systems contracts for supply, installation, testing & commissioning of tracks and supply of rails for track work were awarded in December 2019. This will kick off track works after completion of tunneling.

During the year 2019, acquisition of private lands required for project works has been completed including declaration of awards, payment of compensation and transfer of ownership in the name of MMRC except a few pockets. Rehabilitation & Resettlement of slum dwellers has been completed 100%. Further, the R&R team has also completed shifting of Kalbadevi-Girgoan PAPs by granting rent for transit period including temporary housing for limited number of PAPs. As part of In-situ re-development, tender process for final rehabilitation building has also been initiated.

Following a presentation to Hon. Chief Minister Shri. Udhavji Thakre, on 3rd December 2019, Hon. Minister of Urban Development Department, GoM, Shri. Eknathji Shinde visited the construction works at CST Metro Station on 14th December 2019 and took first-hand update about the ongoing work. He appreciated the way MMRC has handled challenges of Metro-3 so far and expressed that State Govt. is committed to complete the project on time. The State Government appointed Committee has started working on the issue of Metro Car Depot at Aarey Milk Colony and MMRC is providing the requisite detail sought.

MMRC and Observer Research Foundation (ORF) convened design competition for Station Area Planning which was concluded with declaration of winners in various categories in the last week of November. The students came up with number of creative planning and design solutions to the given locations of stations and the problem of multi model integration and promotion of non-motorized transport including cycling. These solutions will be reviewed and dovetailed into the final development around metro stations by suitably resizing. This crowd sourcing approach has immensely benefitted MMRC with solutions (to consider) on the table, whereas, the students have also gained greatly in terms of exposure to mega infrastructure planning, implementation besides interactions with multidisciplinary teams of MMRC, ORF and General Consultants.



As quoted by one of the Jury members "The young generation has demonstrated confidence and courage to express their bold ideas of inclusive planning /designing also defended with lot of conviction". The participating institutes, students and their mentors encouraged this concept of competition that engaged students and their ideas in implementation of Metro-3.

The year 2019 will remain to be a **year of accomplishments and many milestones** that gave an opportunity to Team MMRC to raise the bar of professionalism in infrastructure implementation and maintain the same. The team will be moving into the new decade with greater enthusiasm, energy and positivity. The METRO CUBE team will continue to bring updates through 2020 with equal enthusiasm and passion.

I take this opportunity to wish a happy, prosperous and successful new year 2020 to all stakeholders and patrons of Mumbai Metro-3!!



Shri. Eknathji Shinde Hon Min, Urban Development, GoM visited CST Metro Station and took first hand information about the ongoing work. He said, "Metro-3 is a challenging project but team MMRC has handled it perfectly. GoM is committed to complete this project on time."

Metro-3 Station Area Planning/Management Student Competition

Mumbai Metro Rail Corporation Ltd (MMRCL) and Observer Research Foundation (ORF) recently concluded a six-month long student competition for “Metro Line 3 Station Area Planning/Management”. The competition was conceptualized in order to provide a platform for Architecture & Engineering students across the Mumbai Metropolitan Region to work with and for live public infrastructure projects and explore some out of the box ideas shaped up by the young creative minds.

Competition Inauguration: The competition was announced by MD, MMRC in March 2019 and subsequently inaugurated on 21st June 2019. We received an overwhelming response from the colleges of Engineering, Architecture, Urban Planning & Design and 250 students in 51 teams from 13 colleges participated in the two-stage competition. First stage was of concept design followed by second stage of detailed design.

1st Mentoring Workshop: The mentoring workshops conducted by MMRC and ORF Mumbai on 9th, 10th & 11th of July 2019 helped participants attain guidance about the planning methodology and helped them streamline their objectives and approach towards solutions.

Concept Plan Submission: The concept stage plans submitted by all 51 teams in August 2019 were reviewed and assessed by transportation and planning experts from MMRCL, General Consultants and ORF. After reviewing all the entries on compliances to various aspects like identification of station catchment area, impact of the metro station, pedestrian and vehicular movements, existing site conditions, land use & ownership patterns, travel patterns, opportunities, constrains and conceptual interventions, 19 teams were shortlisted for the detailed design stage.



Competition Inauguration



1st Mentoring Workshop for all team

2nd Level Submission: 16 out of 19 shortlisted teams presented their ideas through detailed plans, designs and ideas in front of eminent jury comprising of industry experts like Mr. R. Ramana, Executive Director (Plg.), MMRCL, Mr. Vivek Sahai, Distinguished Fellow, ORF, Architect Ratan Batliboi, Founder-Director, Ratan J. Batliboi Consultants, Ms. Prachi Merchant, Senior Urban Planner, All India Institute of Local Self-Government and Ms. Rejeet Mathews, Head, Urban Development, WRI Ross Centre.



Scrutiny of Concept Stage Plans

2nd Mentoring Workshop: It was conducted for shortlisted teams to enhance their proposals towards 2nd level of competition. In this 3-day workshop, a team of experts in Transportation Planning, Urban Planning, Urban Design and Station Architecture interacted with all shortlisted teams & their mentors. This workshop helped in articulating ideas of students and constructive debates on creative ideas, their validity and implantability to shape up the proposals further.



2nd Level Submission

Continued on Page 5

Metro-3 Station Area Planning/Management Student Competition

Continued from Page 4

For the detailed stage designs, students were assessed on multiple aspects such as data collection and analysis, pedestrianisation and non-motorised transport integration, encroachment-resilient planning, creation of public spaces and alternate entertainment zones, and feeder-system planning to name a few. As the jury members witnessed an influx of ideas, it was decided to award three winning entries followed by category awards for 'Attention to Detail', 'Transformative Ideas', 'Pedestrianisation and Non-Motorised Transport Integration', 'Quality of Presentation', and 'Jury's Special Mention.' The top 3 winning teams received a prize of INR 60,000, INR 45,000, and INR 30,000 respectively, and the 5 category prizes won INR 10,000 each. The award ceremony took place at MMRDA Auditorium. This is the first time a major infrastructure project has taken an initiative to involve college students to be a part of designing for real time project.

Final Jury



Prize	Team Members	College
Winner	Anushre Shetty, Parth Bane, Vaishnavi Iyer, Sumit Gawali, Sushant Nikharge	Rachna Sansad Academy of Architecture
1 st Runner up	Shreya Rathore, Snehal Chaudhari, Shreya Mohan, Sameer Harhare	Pillai College of Architecture
2 nd Runner up	Ameya Kodalkar, Manas Keluskar, Suchetan Sonavane	Rachna Sansad Academy of Architecture (Unaided)
Special Recognitions		
Attention of details	Simran Thakur, Michelle Vas, Tanvi Shinde	Lokmanya Tilak Institute of Architecture and Design
Quality of Presentation	Ishani Pradhan, Sagar Nipurte, Alakh Singh, Tejas vaidya	Bharati Vidyapeeth College of Architecture
Transformative Ideas	Purva Gawde, Pranali Shah, Pijush Mandal	Pillai College of Architecture
Pedestrian and Non-Motorised transport priority	Mohit Srivastava, Aniruddha Kamerkar, Joel Daniel	Pillai HOC College of Architecture
Special Motion Category	Semtika Maurya	CTES College of Architecture

These fresh ideas were a culmination of a six-month long process in which students learned about live projects, and what is required from them, through multiple mentoring workshops conducted by MMRCL and ORF, as well as site visits to the Metro Stations. Involving young bright minds in the planning process was an explicitly revitalizing experience. The competition stands as a unique and important guide for creating avenues for youth participation in infrastructure project planning and public policy processes.

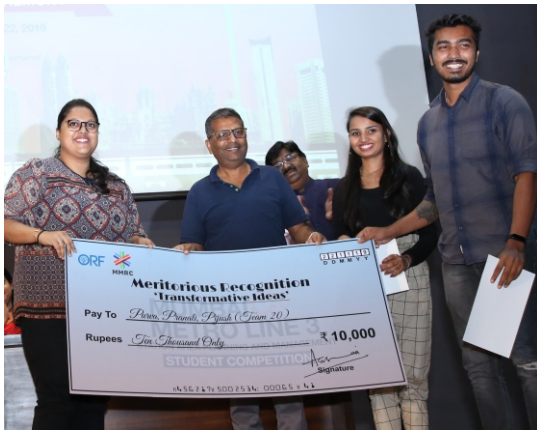
“MMRCL is always open for innovative ideas and new concepts. The young and incredible talent will work with us in designing the future infrastructure. We thank ORF for initiating this competition jointly”.

Ms. Ashwini Bhide, MD, MMRCL

All awarded proposals will be published in forthcoming issues.

Metro-3 Station Area Planning/Management

Special Recognition Award for Transformative Ideas



Team 20 from Pillai College of Architecture was recognised by the Jury for the 'Transformative Ideas' for their proposal on Science Museum Station. This is the 11th station from Colaba. Major landmarks around are the Nehru Science Center, High Street Phoenix Mall, Mahalaxmi Race Course, etc. Station is located at the Junction of Dr. E. Moses Marg and Senapati Bapat Marg.

After studying the all parameters, the vision for the area was framed as “Envisaging the Role of Science Museum Station as a Multi-modal Integrator, Cross-stitching the expanding commercial district while acknowledging the socio-cultural fabric.” Cross-stitching the space made the station as a Multi-modal Integrator and acknowledge the varied characteristics of the space. From Pedestrian and non-motorized transportation to Creation of Public Space, we could strengthen the space and engulf it into a Homogeneous Active Space. Every of the listed parameters had a possibilistic outcome on the Station Area Planning for the Science Museum.

The vision led to further sub-division into six priorities; and they were, Breaking the Edges, Homogeneous Active Space, Enhancing Public Realm, Transportation Hub, Seamless Connectivity and Newer Connections.

Designing of a station area planning and its management started with initial site visits and area study. As the station lies in Mahalaxmi area of Mumbai, the area has seen huge development into residential and recreational sectors in the past 10 years. The station study started with the area delineation which was done based on the natural and man-made edges, which defined its boundary from Ganapatrao Kadam Marg to the north, Madhav Khadye Marg on the south and the Western Railway Line on the east. This extent is about 2 km in radius and covered many major commercial, educational and residential landmarks. This showed a clear division of socio-cultural and commercial characters on either side of the Dr. E. Moses Marg. Further the study continued with the pedestrian footfall, movement pattern, barrier free infrastructure, transportation congestion, etc. Data collected from all this study led us to identify two junctions in immediate design context which can lead to solutions. These were the junctions at Nehru Science Center and Rakhangji Chowk, both at the edges of the proposed Science Museum Station.

Continued on Page 7



Proposed layout of Rakhangji Chowk, incorporating the existing layout and newer connections

Metro-3 Station Area Planning/Management

Special Recognition Award for Tranformative Ideas

Continued from Page 6

As the Study Area has many physically disabled schools, colleges and hospital, a scope to design Barrier Free Infrastructure for the catchment became mandatory. Using the enhanced technology of wireless connectivity, a barrier friendly shuttle service is designed at the exits which were accessible to the handicapped, pregnant women and senior citizens, covered into two loop routes. This similar model can be implemented at every necessary intervention.

The vision will be a successful model, if it is executed in 3 phases.

Phase1 (0-5yrs): Strengthening the connectivity, implementation of Plaza and breaking the barrier

Phase2 (5-10yrs): Identifying the potential land susceptible to change and creating new allied anchors which will help strengthen the existing anchors.

Phase3 (10-15yrs): Proposals for encouraging and incorporating the future modes of transportation.

The Vision for phase 3 is proposed to be implemented in 10-15 years span, where scope for station area is expanded as the Mahalaxmi Race Course land is seen as an opportunity to give a connection to both roads. The Dr. E. Moses road and Lala Lajpatrai Marg will be connected and create a shorter network of movements, thus giving the solution to problems of congestion at Acharya Atre Chowk and Mahalaxmi Station.

All these future possibilities were created only by imagining the metro station as a scope for future planning of the area. Such an opportunity to create and explore a space for the many coming years was a great opportunity provided to students. Entirely the proposed design model would not just cross-stitch the space but at the humane level create inclusivity and scope.



Final Jury



Relief Spaces in Plaza is designed to be kid friendly and barrier friendly



Proposed Non-motorised track along the Dr. E. Moses Road and Plaza



Proposed crossing at the Rakhangji Chowk, incorporating minor details between the pedestrian crossing and the cycle track for smooth movement



Rakhangji Chowk - Dr. E.Moses Road(middle), Senapati Bapat Marg (right) and Plaza Road (left)

All About Construction Package - UGC02

This article is in continuation with the previous article 'All About Construction Package - UGC02', in September 2019, Volume 36.

Package 02 has four stations namely; CST Metro, Kalbadevi, Girgaon and Grant Road Metro. Among these four stations, CST Metro is located beneath Azad Maidan and rest all are beneath the roads. For construction of these three stations, traffic needs to be diverted to other roads to ensure the safe and efficient flow of traffic together with rapid progress of construction activities.

Being a large scale urban infrastructure project, Traffic Management is an essential component and needs to be taken care of especially during the construction phase. Primary objective of traffic diversion plan is to identify alternate action to alleviate congested road conditions during construction activities, which would be efficient, convenient, economical and safe for both pedestrian and vehicular movements.



Traffic Management at Kalbadevi Station: The existing bus routes on JSS Marg from Girgaon to Shamaldas Gandhi Marg junction shall be diverted to R. R. Roy Marg, Maharshi Karve Marg, Shamaldas Gandhi Marg and finally joining the JSS Marg. There is no need for any diversion for buses plying in the opposite direction (Shamaldas Gandhi Marg to Girgaon). The diverted BEST and school buses shall use the existing bus stops along the diverted route. There is no requirement for additional bus stops on the diverted route.

Traffic Management at Girgaon Station: Even when one lane of JSS Marg is closed for construction, with the removal of parking and few traffic management measures it can handle the traffic at an acceptable Level of Service and therefore no traffic diversion is required. Following traffic management measures to be implemented during the entire construction period:

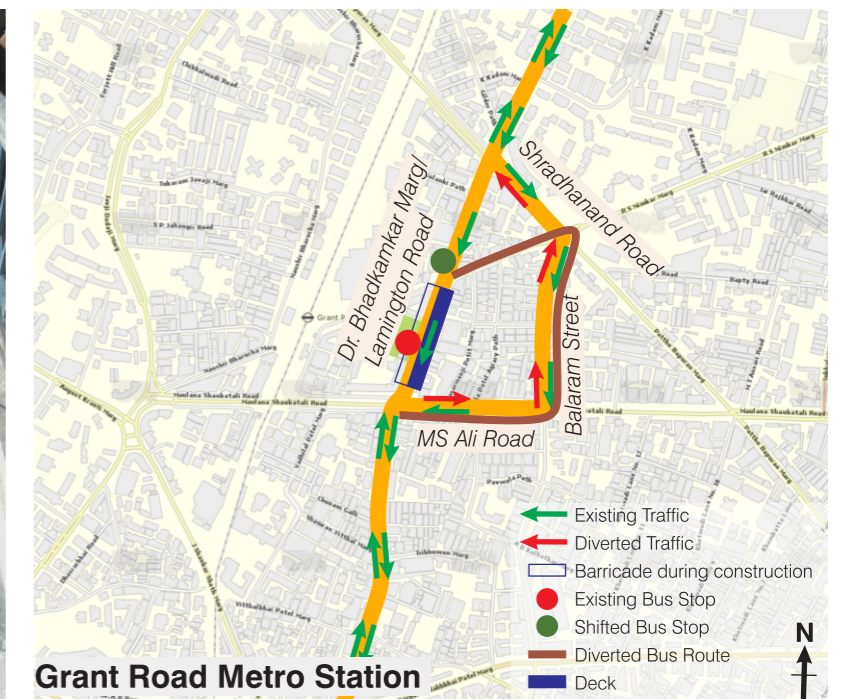
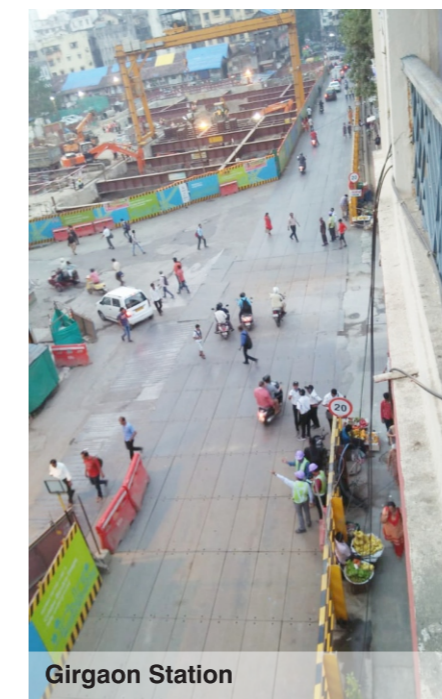
- 1) During both phases of construction, carriage way of 7 m is provided exclusively for the movement of traffic in both direction.
- 2) Removal of parking/encroachment
- 3) Restriction on loading and unloading activities during day time
- 4) Majestic Cinema bus stop is shifted at Pt. Palukar Chowk bus stop.

Trees' Cutting and Transplantation Status (As on 30th November 2019): All civil packages of MMRC have obtained permissions for tree felling for station construction and allied activities under Maharashtra (Urban Areas) Tree Preservation and Protection Act, 1975 by following a due procedure laid down in the act.

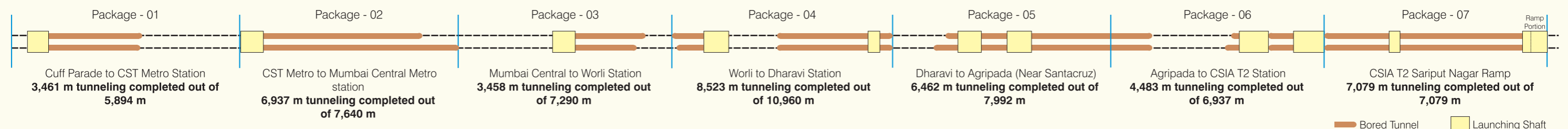
Stations	No. of Existing Trees	Trees to be Retained	Tree Transplantation			Tree Cutting		
			Approved	Transplanted	Completed	Approved	Cut	Completed
CST Metro	301	109	99	66	66%	93	52	56%
Kalbadevi	35	33	00	00	00%	02	02	100%
Girgaon	47	27	09	09	100%	11	10	91%
Grant Road Metro	111	60	23	23	100%	28	28	100%
Construction Depot (WTC plot)	88	82	04	04	100%	02	00	00%

Traffic Management at Grant Road Metro Station: It is proposed to close the traffic plying from Grant Road to Mumbai Central to allow the opposite direction traffic to continue to ply. The traffic from Grant Road to Mumbai Central has to be diverted through Balaram Street and MS Ali Road and joining the alignment at Dr. Bhadkamkar Marg.

Relocation of BEST bus stop: There are two bus stops which are located along Dr. Bhadkamkar Marg and the buses route numbers running along this stretch are 61, 66, 66Ltd, 70, 74, 76 and 82. The bus stop has been shifted towards north.



Tunnel Progress Update - As on 31st December 2019



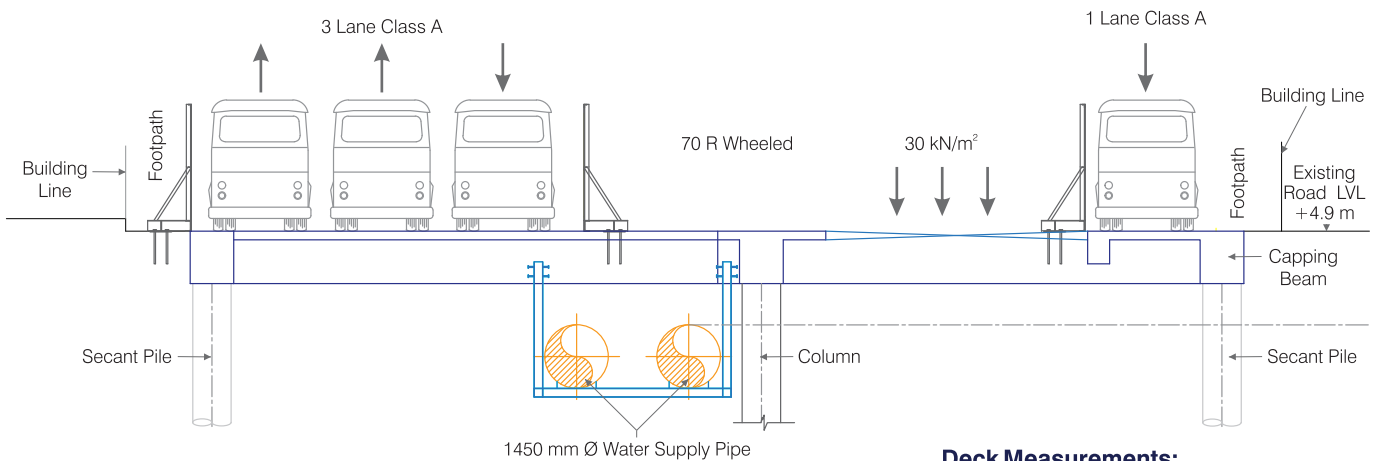
Station Works - Concrete Decking for Road Traffic

Major section of Metro-3 alignment is along the road hence stations are located beneath the roads. To keep the traffic moving while constructing the underground stations, MMRC has adopted the best engineering solutions. Traffic management can be done by either traffic diversion or construction of decks. Decking is more comfortable option for commuters as their route remains the same. Traffic plan for every station is different based on its location.

For underground station construction, the road is excavated and then covered with decks supported by king posts to ensure regular vehicle movement. King posts are central vertical posts that provide support to the decks above them. The deck bridge is slightly elevated above the existing road height so that there will be no water logging during monsoon and it also ensures that water do not enter in the excavation.

Concrete decking comprises of beam & slab system as a frame with cut-outs for equipment lowering and other construction activities. Such decking frame is supported by secant piles at both the ends and concrete king post between secant piles as an intermediate support at certain spacing along the longitudinal direction. Decking is designed for vehicular loads such as Class A & 70R wheeled load as per IRC 6-2014.

Special multi axle hydraulic trailer vehicles are not allowed with speed exceeding 5 km/hr, during the passage of such vehicles no other vehicles are allowed from moving over the deck. And also other utilities like water pipes supported from beams using steel sections are considered in the decking design without affecting the actual position of water pipes. Such arrangement of concrete decking is well planned considering all the difficulties which commuters may face and also to ease the traffic movement during the construction. Once the construction of station box completes, deck will be demolished sequentially followed by reinstatement of road surface.



Deck Measurements:

UGC03	Acharya Atre	29 m X 258 m
UGC03	Worli	31 m X 258 m
UGC04	Dadar	23 m X 325 m
UGC04	Shitladevi	26 m X 245 m

Out of 26 underground stations four underground stations have temporary concrete decking system i.e Acharya Atre Chowk and Worli Stations of UGC03, Dadar and Shitladevi Stations of UGC04.



Concrete deck at Dadar Metro Station



Concrete deck at Shitladevi Station

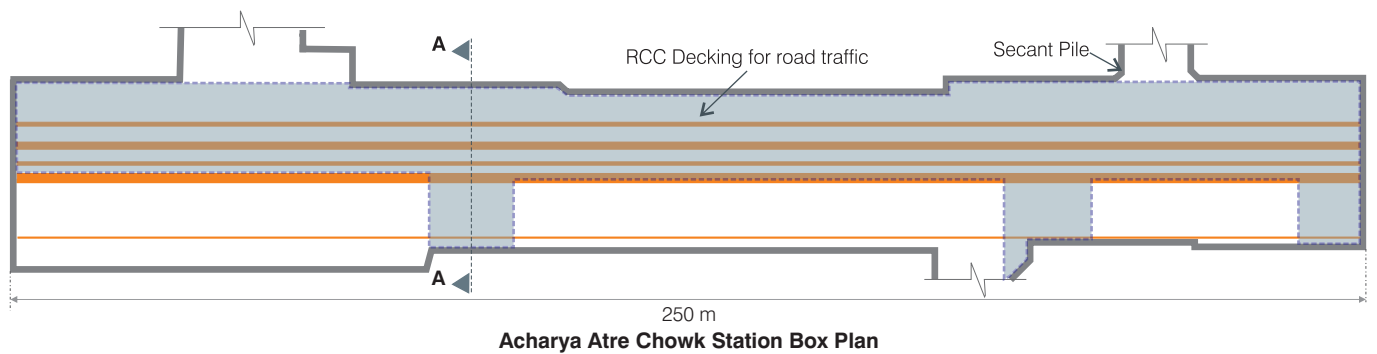
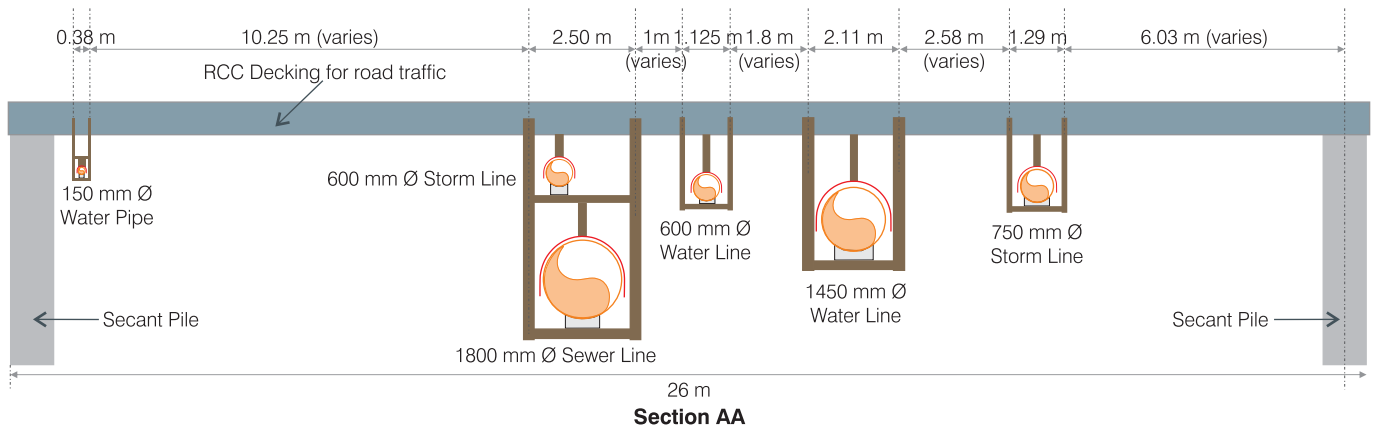
Supporting Underground Utilities

Acharya Atrre Chowk Station

Available land between Acharya Atrre Chowk Station box and property line is not sufficient to divert the existing 1800 mm dia. sewer line. Therefore, it was to be supported in existing position. But the existing sewer line was very old and supporting in existing position was not possible. Therefore, new 1800 mm dia. GFRP pipe was laid adjacent to existing sewer line and the flow was diverted through this line. To facilitate station excavation below the GFRP sewer line, this line is supported from the traffic deck. After the station construction is complete, this supported line will be restored in the same location with manholes as permanent arrangement. During the pipe laying, prefabricated stubs were fixed at approved manhole locations so that once station construction is complete then these stub pieces will be extended up to ground level to form a manhole.



Supporting of 1800 mm Ø GFRP Pipe along with 900 mm Ø SWD at Acharya Atrre Chowk Station



Supporting of existing utilities from traffic decking before taking up station excavation in Acharya Atrre Chowk Station



Supporting of water line, Sewer line and power and Telecommunication cables in Acharya Atrre Chowk Station

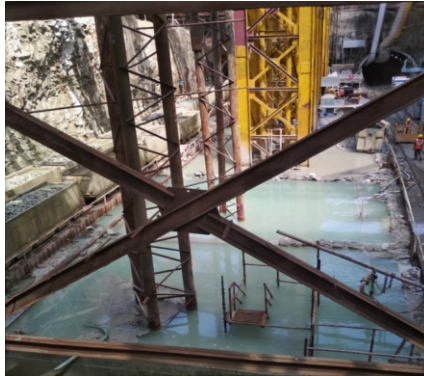
Environmental Management Plan

Waste Water Recycling at UGC02

One of the source of waste water in Metro-3 project is the generation of underground water contaminated with solid particles during construction of launching shafts and tunneling work at site. Daily about more than 100 kl treated water is reused.



Step 1: Tunnel and station Water collected in sump pits in base slab and retained for suitable time for natural settling of solid particles.



Step 2: From sump pit, water is pumped on to shaft sedimentation tank for removal of suspended solids.



Step 3: After primary treatment, the treated water pumped from shaft sedimentation tank to surface sedimentation tank for further removal of suspended solids.



Step 4: Primary treated water is treated with pressure sand filter (tertiary treatment plant)



Step 5: RO Plant for advance treatment and reuse for various purposes.



Step 6: Treated water is being used for gardening, road cleaning, dust control and vehicle wheel wash purpose.

Sedimentation tank capacity details:

- Capacity of sedimentation tank at base slab level (-13.95 m) = 529.51 m³
- Capacity of surface sedimentation tank = 200 m³

Treated water utilisation

Total treated water /day (Approx)	Gardening	Road Cleaning	Dust Control at Site	Wheel Wash	After reusing treated water, additional water is discharged into MCGM SWD line.
150 kl	5 kl	50 kl	30 kl	52 kl	

Lifts/Elevators

Continued from Page 2

In the event of power failure or single phasing, the supply to all elevators will be automatically switched over to the emergency power supply, i.e. to ARD and the elevators will be brought to the designated floor and will be parked there with the doors remain open. In case power supply to the lift is restored through DG set/alternate source before the lift reaches designated floor even then ARD will complete its function and lift's door will open at designated floor to evacuate the passengers.

This battery-operated device will be able to move the elevators with any load from no load to full load at reduced speed to the nearest landing and open the doors upon reaching the landing. After that, elevator's door will remain close until resumption of power supply and the elevator will automatically reset to normal once power supply is restored. The direction of travel will depend upon the load in the elevator. During this operation all safety features of the elevator will remain operational.

The ARD start time can be adjusted from 0 to 30 sec. depending upon resumption of emergency supply from alternative source/DG sets. The landing accuracy will be less than +/- 10.0 mm. The capacity of the battery when fully charged will be capable of operating the elevator at rated load from one landing to another for a minimum of 3 trips without further charging. The batteries are maintenance free, conforming to the relevant Indian or international standard, ARD battery health monitoring device will also be provided to monitor health of the batteries.

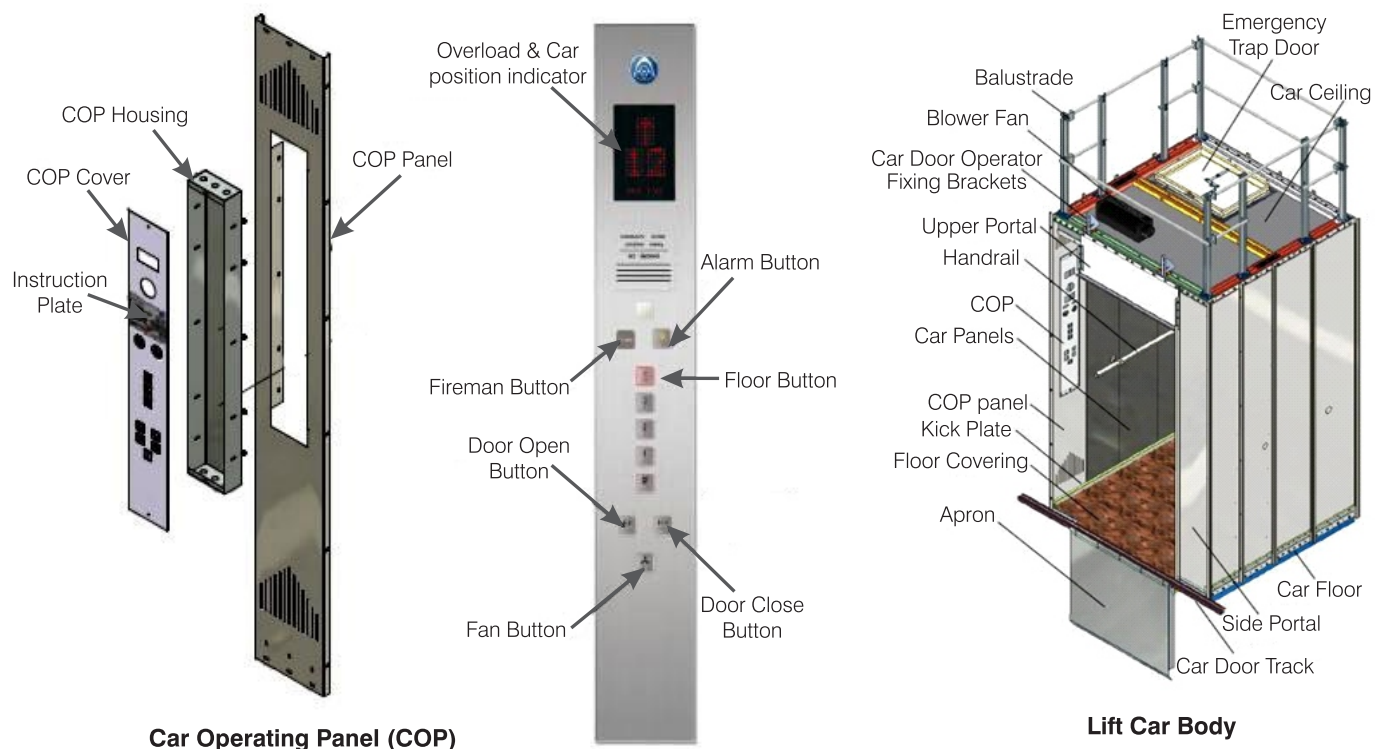
Emergency Operation of Lift/Elevators in the Event of Fire

Two-way communication between the RMS/OCC and the elevator car, smoke detectors, interface between the elevators and the Fire Alarm System as per the requirement will be provided. An audible evacuation alarm tone via elevator speaker will be given once the fire operation mode is initiated. The insulation of all wiring including those within the controller will be of Flame Retardant, Low Smoke Zero Halogen (FRLSZH) free type. In the event of fire when any fire detection device is activated, all elevators will automatically be brought to the designated floor and will be parked there with the doors open.

All elevators will automatically be rendered inoperative after it has been brought to the designated floor. The essential buttons such as "Door Open", intercom and alarm bell, etc. on the car operating panels will remain functional and illuminated. Normal operation of the elevator will be manually reset by the operation of a reset key switch. Announcement along with indication during fire activation inside the elevator cabin for safety of passengers will be available.

Fireman's Lift/Elevator

All Lift/Elevators in MMRC are having Fire Drive. A Fireman's Elevator is a system that, in standard conditions, is used by passengers, while, in event of fire, it is used by Firefighters who can change its operating mode. The Lift/Elevator is equipped with peculiar signs and protective devices and has to work in extreme conditions as described in the norm EN 81-72 & Behaviour of Lifts in the event of fire EN 81-73.



Car Operating Panel (COP)

Lift Car Body

Year 2019 Highlights

100% Tunneling at Package 7



Package 7 becomes the first package of Metro-3 to complete its 100% tunneling with 24th TBM breakthrough of Metro-3 at SEEPZ Station by completing the total tunneling of 7.08 km on December 12, 2019. TBM Wainganga-2 of this package was commissioned on March 14, 2019 from Pali Ground launching shaft and completed its last tunnel drive of 1.67 km at SEEPZ station to see the light at its end by shaping the tunnel with 1196 no. of RCC cement rings.

Total manpower of around 2,600 including civil engineers, contractors, general consultants, labors and a dedicated TBM team of 175 has worked 24x7 in Package 7 to achieve this milestone. MMRC has completed around 72% of tunnelling till date with the help of 17 TBMs and more than 50% of overall construction work has been completed hitherto.

Key Highlights of Package 7:

- Stations: Marol Naka, MIDC & SEEPZ
- Total tunnelling: 7.08 km
- Total segment rings being used: 5090 Nos
- First TBM launch date: January 08, 2018
- Average tunnelling per day: 10.08 m/day
- First TBM breakthrough: September 24, 2018 at CSMIA T2 Station
- Total cement used for tunnelling: 37,326 MT
- Total steel used for tunnelling: 15,187 MT

Aqua Line Mock up



Mock up coach of Aqua Line Mumbai Metro3's Rolling Stock was unveiled by MMRC and Alstom India. 31 Metro trains of 8-car formation will be operated on this corridor. Another milestone accomplished this year is the commencement of manufacturing of Aqua Line train coaches at Sri City in Andhra Pradesh. The life size mock-up of the train with the glimpse of all advance features was unveiled in Bangalore in the month of November 2019. First rolling stock of the project is expected to arrive by November 2020.

Twin Tunnel Completed Sections

- 1) Depot Ramp to Sahar Road Station (Pkg 6-7) = Up Line - 4205 m, Down Line - 4243 m
- 2) CSIA T1 to BKC (Pkg5) = Up Line - 3781 m, Down Line - 3761 m
- 3) Dharavi to Dadar (Pkg4) = Up Line - 3080 m, Down Line - 3061 m
- 4) Churchgate to Cuffe Parade (Pkg1) = Up Line - 1726 m, Down Line - 1735 m



Expert Speaks

Volume Bonus, Public Space and TOD

This article is in continuation with the previous 'Expert Speaks' in September 2019, Volume 36.

I was in Mumbai in 2010 and 2014 and stayed for 4 months. In 2014, I was assigned the study to enhance the pedestrian accessibility and multimodality of the Metro-3 stations. The study pointed out that the walled commercial buildings and apartments without any pathways between next walled buildings hindered accessibility. At that time, the aftermath of the 2008 terror attack remained, and high security concerns hampered accessibility.

Public space to allow the people pass through freely within the city blocks around stations can enhance the accessibility to Metro stations and TOD. The planners should avoid building a large complex with strict physical security which blocks people's movement. The volume bonus with compulsory open public space provision is the way to enhance accessibility around metro stations.

The landowners usually want to maximize the floor size of their building and build their building fully in their land within the volume regulation. The volume bonus (or incentive zoning) is a way of land use improvement. Public deregulate the floor volume and allow volume bonus (e.g., from original 300% floor volume to 500% as volume bonus) instead the landowners must set back its building and provide an open land for public use. The open land would be used for firefighting space, aesthetic functions including open café, as well as accessibility improvement.

Zonal volume relaxation should be considered to realize the TOD. For example, the volume bonus is applied to the area around 500 m radius from major CBD station in major cities in Japan. Pedestrian walkways in such areas comes more than 5 m width due to set-back of the building. The land owner can build larger building, earn more rent, but some of the rent must be expensed for maintenance of the open space.



Rich pedestrian environment around the station with Zonal volume relaxation policy, Kobe

Of course, some may say the open land may be encroached by squatters, and relaxation of security concern may attract another unwelcome risks. However, the physical barriers are not the only way for security and squatters, and now a days surveillance cameras can be applied instead of physical barriers.

Goals for 2020

Year 2019 was the year of major accomplishments and success for Metro-3. In 2020, we are looking forward to more landmarks on this project. Some key achievements in the coming year will include:

- Completion of 100% tunneling by September 2020
- Arrival of first rolling stock by December 2020
- As a part of In-situ development, the tender for first rehab building K3 is expected to be awarded in the month of January 2020 and G3 building tender will be awarded in the month of May 2020.
- Inviting bids for "Operations & Maintenance" work is expected in the month of February 2020.
- Signing and effectuation of 3rd trench loan by JICA is expected by March 2020.
- The track laying work for the main line will be commenced.
- Completion of 70% civil work is expected in 2020.
- Backfilling of cut and cover stations, restoration of station areas and station finishes would be in progress.
- Designs for all the major systems contracts will be completed and Vendors/OEMs for their various sub-systems will be finalized.
- As per the MoU signed with Tata Power for power supply in stations, Aarey and Dharavi are expected to get commissioned.
- Construction of ancillary buildings at some stations will be in progress.
- The MEP work which includes lighting of tunnel, station, fire fighting, etc. will be executed along with civil works.

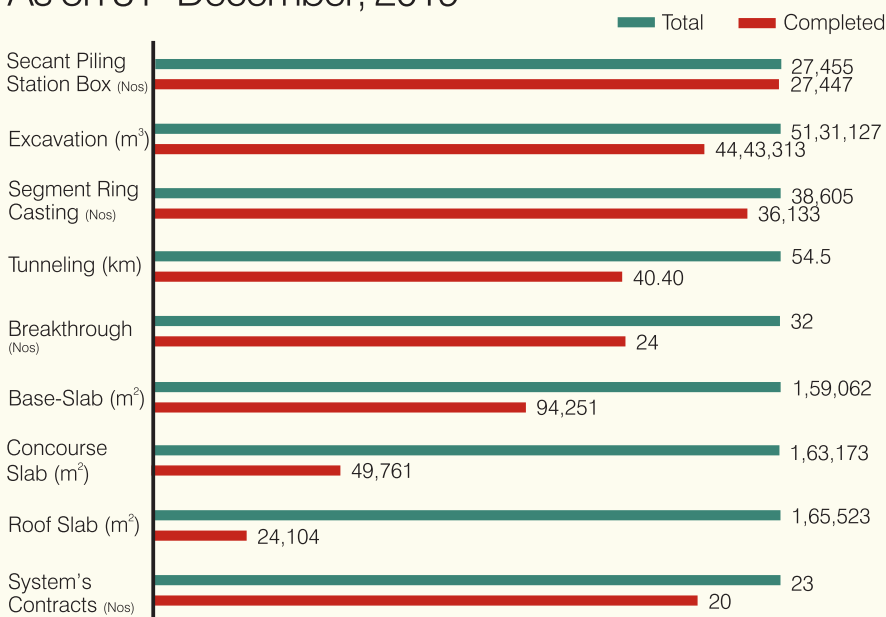
News @ MMRC



The Annual Sports Meet "UDAAN 2019" was inaugurated on October 15, 2019 and concluded on November 28 & 29, 2019. All the employees participated with enthusiasm and made effort to spare their precious time and celebrated the event of togetherness and team spirit. As sports play a very essential part in developing our body and mind, conducting such events also develops team spirit, creates better work environment, improves employees social and cooperation skills which are beneficial in professional life as well.

MMRC participates in 12th Urban Mobility India Conference & Expo 2019 in Lucknow. MMRC has won the 3rd prize as best exhibitor at the Urban Mobility India 2019 Conference & Expo, Lucknow.

Project Progress Update As on 31st December, 2019



Breakthroughs:

MMRC achieved two breakthroughs in November and December months.

22nd Breakthrough: TBM Godavari 2 tunneled a distance of 2867 m downline from Vidyanagari using 2048 rings achieved breakthrough at CSMIA T1 on November 02, 2019.

23rd Breakthrough: TBM Krishna-1 completed tunneling of 589.4 m from Nayanagar to Dharavi with the installation of 421 rings achieved breakthrough at Dharavi on November 21, 2019.

24th Breakthrough: TBM Wainganga-2 completed its last drive of 1.67 km and achieved breakthrough at SEEPZ Station on December 12, 2019. With this, Package 7 achieved 100% tunneling.

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