



MMRC

ADDING NEW DIMENSIONS

METRO CUBE

A MUMBAI METRO RAIL CORPORATION NEWSLETTER

MD Speaks

Ms. Ashwini Bhide, IAS

As part of the Govt. of India bilateral exchange with Govt. of Japan across wide range of sectors; Govt. of India and Govt. of Japan on March 29 have signed 2nd tranche loan agreement for Metro-3. Out of the ₹187.884 billion ODA loan being pledged by JICA for five projects in different sectors in India, the 2nd tranche loan to Metro-3 is ₹100 billion. This would ensure the funding for next 18 months activities for the project.

This month, significant action is seen on the Systems front. The contract agreement was signed with Larsen & Toubro for Power Supply System Package (11A) while the contract agreement for OCS (Traction 11B) with Alstom Consortium was signed in last week of March. Rolling Stock Bids were received from 5 of the shortlisted firms which is a very good response for Rolling Stock received in recent years in India. MMRC will procure 31 metro trains of 8 coaches each and the bid also has necessary provisions promoting "Make in India" initiative stipulating 75% of the Rolling Stock to be manufactured in India. Bid evaluation of remaining system packages is in advance stage.

On the project front, tunnelling work on all fronts is in progress with 2nd TBM (Wainganga2) in Pkg-7 starting its initial drive at Pali Ground launching shaft in Marol. First TBM for Pkg-1 (Surya1), manufactured by Robbins Co. completed its Factory Acceptance Test and the TBM will soon be shipped to Mumbai and lowered at Cuffe Parade launching shaft.

Being most challenging urban infrastructure project in India, work zone safety and environmental compliance by the project team is of prime importance. Keeping this in mind an exclusive review of Operation Safety, Health and Environmental (OSHE) practices followed by all contractors was held in the 2nd week. This has helped the contractors to understand and compare their activities with others and will ensure that all agencies raise the bar.

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Students from IIT Bombay visited Metro-3 site

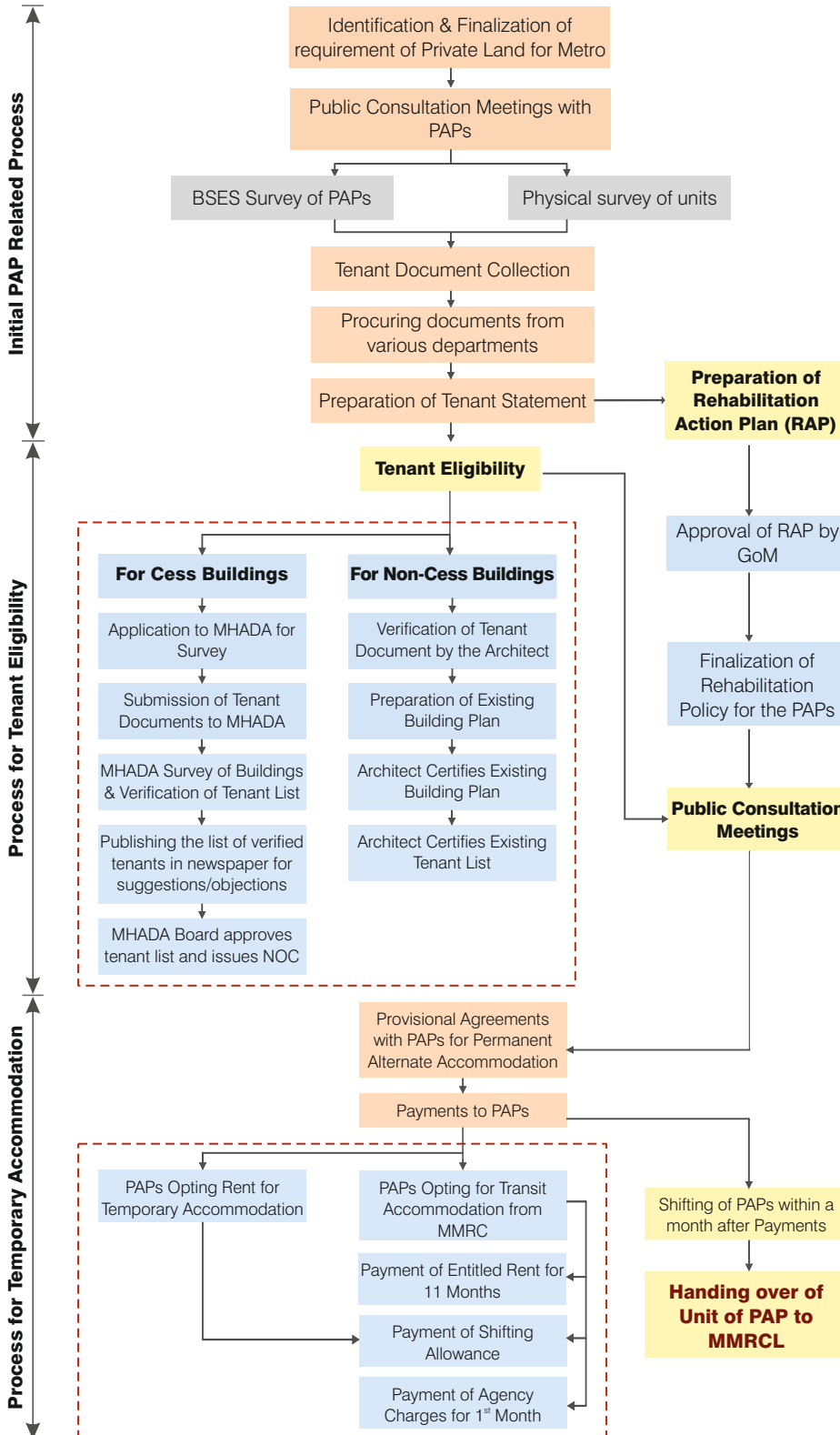
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Rehabilitation of PAPs

Shifting of PAPs in the affected buildings of Kalbadevi and Girgaon is an eminent priority for MMRC in order to implement the construction of metro works and for the redevelopment of the affected properties. In-order to temporarily shift the PAPs, R&R department of MMRC follows the following process:

Process followed for Rehabilitation of PAPs of Kalbadevi and Girgaon



MD Speaks

Continued from page 1

Issues like self-rescuer apparatus for workers entering tunnel to be provided with oxygen supply ensured for one hour in case of emergency, ensuring special safety training such as first aid and basic fire fighting training to the construction workers have also been reviewed. We are proud to say that MMRC has insisted on a stringent labour safety and well-being program for all the construction workers working on this project. Some unique features of our initiatives include emergency medical services, cashless medical facilities at specific hospitals, awareness on prevention of HIV, group insurance and compensation policies etc.

Team of consultants & professionals working on High Speed Rail Project (HSR) visited project sites in BKC including TBM. HSR has proposed station within BKC that will be less than 2.0 km away from BKC station of Metro-3. Appropriate integration plans are being coordinated by MMRDA. We have also announced the Summer Internship Program for Final Year Engineering and other faculties. It has received an encouraging response. Project sites continue to receive newer and inquisitive visitors especially from Engineering fraternity.

My interactions with the residents of Dadar, Siddhivinayak and Shitaladevi areas at an event organised by Manthan Group in Dadar was useful in directly communicating with them about project details, benefits and clear any misconception or misinformation that is in circulation. This helped them convince that Metro-3 is inevitable development that would help ensuring commuting convenience for future generations.

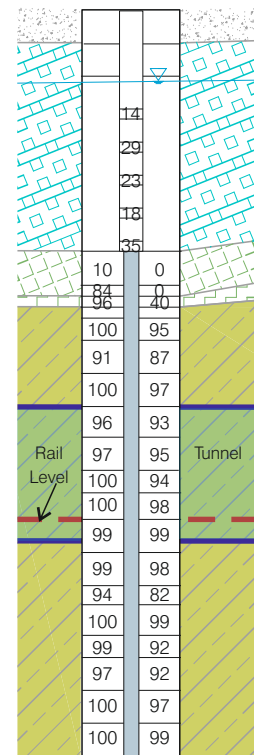
What Lies Beneath The Earth

This is the third article of series of articles on Geotechnical Investigation for Metro-3. Followed by two articles named as Deep Under The Earth and What Lies Beneath The Earth in previous two issues. Earlier, we have covered the Metro-3 Geotechnical Investigation contents on the whole corridor. This article is specific to the package-01 which starts at Cuffe Parade and ends at CST Metro station. It includes four Stations, Cuffe Parade, Vidhan Bhavan, Churchgate and Hutatma Chowk. It extends before Cuffe Parade for a length of about 200 m for the provision of siding lines.

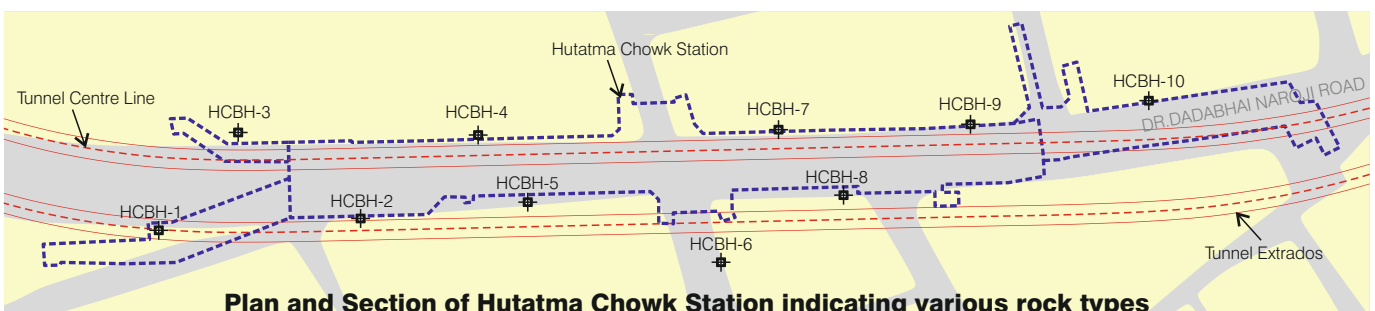
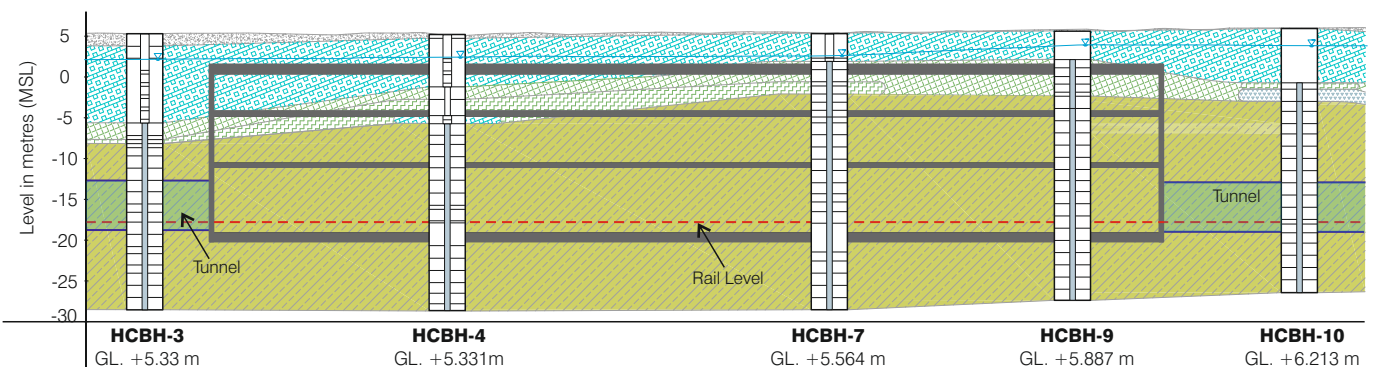
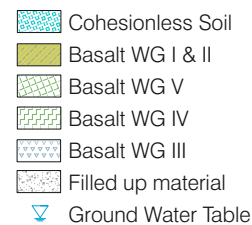
The Rock found in this stretch is predominantly Basalt with different weathering grades. In stretches of Vidhan Bhavan Station, Churchgate Station and tunnel portion from Churchgate to Hutatma Chowk, the rock found is Breccia & Shale along with Basalt. Basalt is harder and stronger variety of rock. Breccia and shale are weaker than Basalt. The construction methodology adopted at Hutatma Chowk Station is New Austrian Tunneling Method (NATM). The tunnel passes through Basalt of grade I & II. This is fresh and competent rock. The rock has high Rock Quality Designation. The working for Tunnel Boring Machine (TBM) Tunnel as well as NATM Tunnel is comparatively safer during construction.

The challenges while working in this area:-

- 1. Rocky Strata:** It is variable and different type of rock e.g. Basalt, Breccia and Shale encountered. Any weak rock layer shall be identified during construction and necessary precautionary measures can be taken if required.
- 2. Strength of Rock:** it varies in similar grade of rock at different locations.
- 3. Ground Water:** Existing ground water in this area is about 2.6 m to 3.5 m below ground level. Therefore, earth-retaining system should be water tight in upper soil and highly fractured rock mass layers.
- 4. Upper Soil and Completely Weathered Rock Mass:** During the station construction, the top soil and weathered rock will be supported by secant piles (earth retaining system), which will be constructed before start of the excavation.
- 5. Heritage Structures:** The presence of heritage structures is a challenge while working underground in hard rock during tunneling operation.



Detail of HCBH-3, GL. +5.33 m
TCR RQD SPT



Plan and Section of Hutatma Chowk Station indicating various rock types



Know Your Station - Dharavi Metro Station



Maharashtra Nature Park



Dharavi Bus Depot



Dharavi Slum



S. L. Raheja Hospital



Xavier Institute of Engineering



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

1. S. L. Raheja Hospital
2. Xavier Institute of Engineering
3. ST Xavier's Technical Institute
4. ONGC (Oil & Natural Gas Company)
5. Dharavi Sports Complex

Dharavi, the 2nd largest slum in Asia subcontinent and the 3rd largest in the world lies on the prime land in the heart of Mumbai. Spreads over an area of just 520 acres, having population of around 700,000 and density of over 277,136/km², thereby Dharavi is one of the densest areas in the world. It is being served by the Sion Station on Central Railway and Mahim Junction on Western Railway. The proposed Dharavi Metro Station is located beneath the Mahim – Sion Link Road and adjacent to Mahim Creek at north.

Dharavi was a large marshy island on the coast of the Mithi River and primarily inhabited by Koli (fishermen) community which was a sparsely populated village before the late 19th century. Later British built a dam on the Mithi River consequently island dried off. The fishermen were impelled to move on greener pastures near the sea and a community of potters moved in here. As Mumbai turned into a hub for textiles, rapid growth of mills brought massive migration into the city from rest of the country and squatter settlement started to take shape.

As Dharavi is located between Mumbai's two main suburban rail lines, most people find it convenient for work. Now this additional Metro connectivity will boost the area further as the State Government has plans to redevelop Dharavi and transform it into modern township with all necessary facilities like proper housing, shopping complexes, hospitals and schools. It will cater landmarks like ST. Xavier's Technical Institute, Xavier Institute of Engineering, S. L. Raheja Hospital and millions of slum residents as well.



Plastic Segregation for Recycling



Embroidery Unit



Potters' Enclave



Tannery



Food Production

Dharavi is home to more than million people. The migrant population over the years had brought in industries like tannery, embroidery, pottery amongst others, and some took on new concepts like segregation and recycling of waste. Most of Mumbai's plastic waste is processed here and supplied back to the plastic manufacturers. Now those are thriving small-scale industries wherein products are made in tiny manufacturing units spread across the slum and are sold in domestic as well as international markets. The annual turnover of business here is estimated to be more than \$650 million a year.

(Photograph source : Internet)

Controlled Blasting



Dr. More Ramulu is a principal scientist at Central Institute of Mining & Fuel Research, Nagpur. L&T-STEC JV appointed Dr. More as a consultant for design and monitoring of controlled blasting for rock excavations at three stations (MIDC, Marol Naka & SEEPZ) and Pali Ground TBM Launching Shaft of UGC -7. CIMFR controlled blasting methodology is designed by Dr. More to overcome all local resistance by adopting habitat friendly blasting techniques. This ensures total control of all the environmental problems due to controlled blasting.

Metro-3, an underground corridor of 33.5 km-long is going to be a 'Game Changer' for heavily packed Mumbai traffic. As the underground corridor is constructed at about 100 feet below the ground, it requires excavation of soil as well as rock at all the 26 of 27 stations below the grade level. The rock is hard basaltic formation at an average depth of 3-4 m at all the stations, which requires blasting for fast and bulk excavations.

All the proposed stations are situated in densely populated localities in the heart of the Mumbai city hence rock excavation by safe blasting for station box cuttings is an essential activity. The proposed blasting zones are surrounded by very sensitive and critical structures like temples, high raise structures, old buildings etc. at a minimum distance range of 10-30 m. The proposed rock excavation required at each station is approximately one lakh cubic metres for construction of a box of 240 m x 24 m x 20 m depth. In case of Marol Naka station, the dimensions are 180 m x 15.6 m x 25 m.

The conventional rock blasting has disadvantageous side effects like fly rock ejection, ground vibrations, air blasts and dust generation, which obviously creates annoyance to the local inhabitants. Meeting the production target at the same time keeping the side effects under threshold limits is a challenging task of this project.



Launching Shaft, Pali Ground

The following measures are proposed to reduce the blasting side effects:

1. Optimum blast design, delay sequence and reduced charge per delay to reduce ground vibrations and air blast
2. Installation of hard barricades to reduce noise and dust
3. Proper stemming column and stemming material to restrict throw of blast fragments
4. Three layered muffling system to control flyrock.
 - Sand bags covering all the blast holes and connecting lead tubes
 - Chain linked wire-mesh with 2.5 cm mesh size, on the sand bags
 - Rubber mats of 1.2 ton weight covering the entire blast area

Apart from the practice of controlled blasting methods like Line Drilling, Bottom Hole Initiation, Pre-Splitting and Smooth Blasting, three safer, productive and innovative blasting techniques adopted at Package -07 will be discussed in detail in the next issue.

Green Drive at Pre-Cast Yard, Wadala

Pre-Cast Yard for UGC 01 is located at Wadala and has the highest production of pre-cast segments. The entire yard is stacked with robust and beautiful segments ready to be assembled into the Metro-3 tunnel rings. While the casting yard team is engaged in the casting / production of the tunnel linings for the Metro tunnel, the team is also busy taking special care of the environment. The team has initiated green drive and sustainability initiatives within the casting yard premises, with a belief that "a healthy mind can work better, produce better results and create new things". The staff here is highly conscious about the environmental concerns. Therefore, the casting yard team has given special attention to develop greenery around the production facilities which helps creating a cooler and soothing environment amidst the concrete wilderness of casting yard.

This has definitely impacted the productivity and efficiency of the staff, while all the departments strive to do their best to contribute to the overall goal. Everyone working in this premise is full of energy, enthusiasm and winning spirit. The team is proud to continue to perform with professionalism and excellence under the leadership of L&T-STEC project management team and learning with this experience, similar initiatives are launched at other site offices and project premises.



Pre-Cast Yard, Wadala



Pre-Cast Segments

Expert Speaks

Potentials around the Metro Stations



Harsh Mistry is an Architect, Urban Designer and Public Policy Expert, based in Mumbai. He works with multidisciplinary teams and is engaged in planning and designing of smart cities, industrial townships, urban public open spaces, transit oriented planning and development. He shares his views on the potentials around the metro station areas in Mumbai and opportunities to create modern public spaces.

Transit Systems have always been a lifeline for Mumbai, be it railways or roads or waterways. Around 88% of the population is depended on Public Transit Systems and any pause in these systems directly or indirectly affects their livelihood.

Due to physical geography of Mumbai, the transit corridors did always expand along north - south extent over the years and hence an east - west connectivity was always at a loose end. Mumbai Metro however is a biggest boon to this city for its connectivity, quality and services. The Phase I connectivity from Ghatkopar to Versova has definitely reduced the commute distance, time and dispersal of crowd on present railway corridors.

The Phase III connectivity from Colaba to SEEPZ is one of the essential contributions to the city after Phase I. This corridor will release tremendous pressure on the present transit systems and provide an efficient mode of transit. The locations identified along this route are the most strategic ones, i.e commercial and business centers of the city and at present fairly connected to the existing transit systems.

These locations will definitely have a major footfall along the transit stations and hence a major pedestrian movement is expected. The present physical conditions along the Phase I stations are very poor w.r.t to physical infrastructure - uneven footpath, open storm drains and uncovered manholes. Also the pick-up - drop off points for autos and taxis are haphazard and disorganized generating conflicts between pedestrians and vehicles at access points during peak hours. Metro stations on Phase III will interface with the Phase I and other future Metro phases.

A comprehensive planning around station areas and multimodal integration is of highest priority to make the Metro and suburban transits operate efficiently. Moreover, a comprehensive planning of these metro station areas will definitely contribute to the pedestrian population of the city. Organization of activities around metro stations like wider continuous footpaths, organized parking for para-transit, street furniture, landscaping, organized hawking vending spaces is needed.

Although Metro is a modern system based on modern engineering design, the areas around the stations continue to work and operate in a traditional manner. What it means is, the way people use footpaths, enter-exit from station areas, saturation of commercial vending-hawking activities around the pedestrian routes is a typical phenomenon and needs to be planned to suit this modern transit system. Metro stations and station areas worldwide have emerged into active city centers and socio-cultural hubs. Mumbai will not be an exception. Activities like open plazas, art galleries, temporal exhibitions can become a new attractions to the commuters.

Thus, the planning and organization of station areas needs to be looked into from a new perspective. As the metro is for future generations of Mumbai, the development around Metro also poses an opportunity to create an environment compatible for the changing needs of the future society.

L&T Bags Power Supply System Contract

MMRC signed System Contract Agreement for the Electrical System works of Power Supply System for Metro-3 project with 'Larsen & Toubro Ltd' on 6th April 2018. This package mainly covers design, installation, testing and commissioning of power supply work. It consists of laying of 110kV cabling work, three Receiving Sub-station at Science Museum, Dharavi and Aarey, Sectioning Post, Traction Sub-stations, Switching Stations, Auxiliary Main Sub-stations, SCADA System and Integration with other Systems. The Contract Agreement was signed by Mr. A.A. Bhatt, Director (Systems) on the behalf of MMRC and by Mr. Puneet Arora on behalf of Larsen & Toubro.



Rolling Stock Bids

MMRC received an excellent response from all the prequalified bidders for procurement of state of art Rolling Stock for Metro-3 corridor. MMRC will procure 31 trains of 8 metro coaches each. Commenting on the same, Managing Director MMRC, Ms. Ashwini Bhide said “We are pleased with the response from the bidders. To cater to heavy passenger traffic and to improve frequency of trains, the state-of-art Rolling Stock will be procured which will also be equipped with the features of driver-less train operations.”

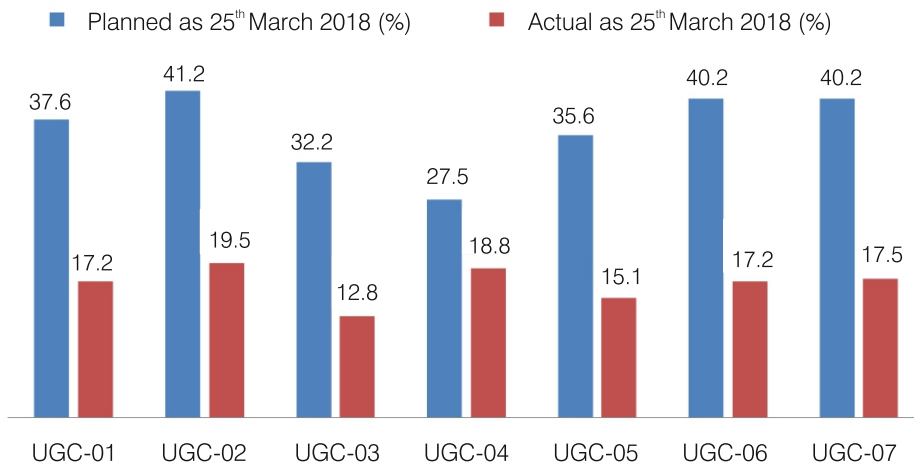
Following companies submitted their bids:

- 1) CAF S.A., Spain
- 2) Consortium of Alstom Transport India Limited and Alstom Transport S.A.
- 3) Consortium of CRRC Nanjing Puzhen Co. Ltd., CRRC International Corporation Ltd. and CRRC Changchun Railway Vehicles Co. Ltd.
- 4) Hitachi, Ltd.
- 5) Consortium of Kawasaki Heavy Industries Ltd. & BHEL

To promote “Make in India” initiative of the Government, a minimum 75% of the Rolling Stock will be manufactured in India by the successful bidder.

Project Progress Update

As on 25th March 2018



Mr. Daljit Singh, Director (Works) DMRC, visited Metro-3 sites of CSIA international Airport and Sahar Road station. Mr. Singh appreciated that the works were being done in highly professional way with quality and safety compliances.

Tunnel Update

Total 17 Tunnel Boring Machines (TBMs) have been estimated to execute the tunnel for Metro-3 corridor, out of which 8 TBMs have started tunneling. All TBMs will be operational by June 2018. Following are the current status of tunneling work-

- FAT completed – 14/17
- Arrived in Mumbai – 11/17
- TBM lowered – 8/17
- Initial Drive started – 3/17
- Main Drive started – 5/17
- Segment Ring Casting – 26 %
- Segment Ring Erection – 4.4 % (~1.5 Km/33 Km)



Website Link

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