



MMRC

ADDING NEW DIMENSIONS

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METRO CUBE

A MUMBAI METRO RAIL CORPORATION NEWSLETTER



Content

- 1 MD Speaks
- 2 TETRA Radio System
- 3 Steel Decking
- 4-5 All About Construction Package - UGC01
Tunnel Progress Update
- 6-7 Handling of Encountered Utilities
- 8 News @ MMRC

MD Speaks

Ms. Ashwini Bhide, IAS

Month of July 2019 received unprecedented more than 1500 mm rainfall making it the wettest July over last 112 years. Despite such heavy monsoon, the project teams assured full scale our construction activities also ensuring rain related protection works, preventing waterlogging in construction sites and surroundings due to monsoon. It is pertinent to mention (for record) that on 2nd July when Mumbai suburbs received one of the highest daily rainfall, some of the Metro sites have deliberately allowed the excess rain water (in addition to stormwater drains capacity) in the station pits to avoid any submergence and flooding in surrounding areas. Though this affected construction activities for two days, as long as the same is dewatered, this has prevented emergency and saved from men and material losses. The emergency response team deployed at each site has been monitoring day to day monsoon related issues and addressing the situation in coordination with MCGM and the utility agencies preventing case of emergencies.

Continued on Page 2

TETRA Radio System

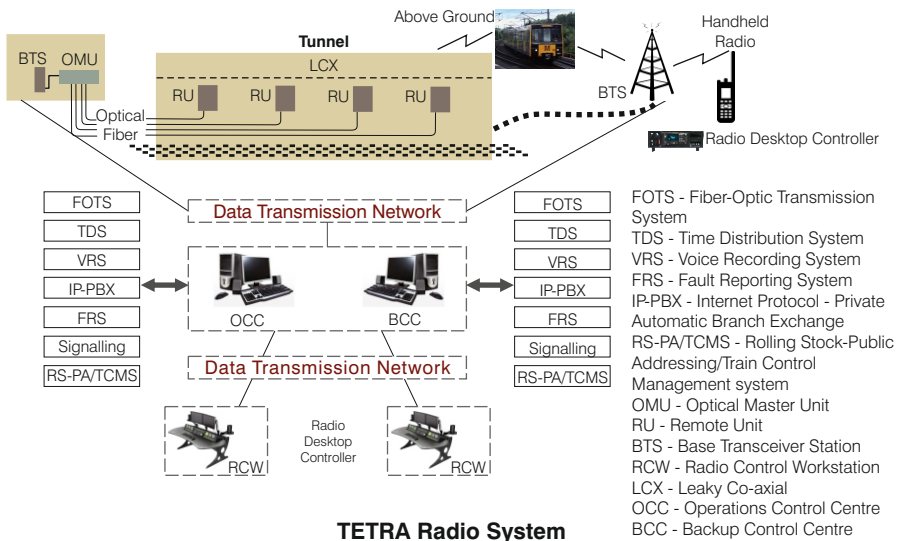
Radio is one of the key systems of telecommunication for instant online voice and data communication between Central Control Room, Trains, and Operation & Maintenance (O&M) personnel in Metro-3. This allows two-way wireless voice communication between handheld and fixed radio users and data communication for signaling and train control.

The proposed system is IP based on Digital Terrestrial Trunk Radio Technology (TETRA). This allows Metro-3 staff and in case of emergency fire, police and disaster management personnel to communicate within group and across the group on direct one to one and one to many call basis.



Features of Radio System

- The UHF (Ultra High Frequency) band for operation of TETRA is 400/800 MHz band as per availability. Usage is subject to obtaining spot frequencies on license from Wireless Planning & Coordination Wing (WPC/Department of Telecommunications (DoT)).
- Solution will be end to end IP based with Leaky Co-axial (LCX) cable for inside tunnel coverage and Distributed Antenna System (DAS) for station premises coverage. There will be pole antennae for Depot and for coverage outside the station (near entry/exits of underground station).
- Voice communication between trains, stations, depots and operational control center
- Voice communication among Operation & Maintenance (O&M) staff
- Authorized passenger announcement (in emergency) on passenger information systems using handheld radio
- Authorized voice communication between subscriber of the internal Telephone System (EPABX) and Handheld Radio Subscribers



TETRA Radio system offers safe and efficient communication in the metro environment. It provides voice, operational data (location, alarm and event management) and signaling data over a single infrastructure and mission critical applications for train protection and passenger safety.

MD Speaks

Continued from Page 1

As part of students design competition launched last month, MMRC urban and transportation planning teams conducted mentoring workshops for the participating students during 9th -11th July. Mentors reviewed preliminary schemes and ideas of students and helped them improve and finetune their approach. The enthusiasm and initiatives shown by the students was remarkable. Formal entries would be received in August 1st week for evaluation and shortlisted for next stage.

On the tunneling front; 31 km of cumulative tunneling length has been completed by all 7 packages. TBM Surya 1 & 2 have commenced their 2nd drive from Vidhan Bhavan towards Churchgate Metro station. Station works are progressing through various stages at Science Museum, Marol Naka, CST, Churchgate, Siddhivinayak, Grant Road, Sahar Road, MIDC stations. The second phase of ITO junction in BKC has been commissioned that would facilitate uninterrupted traffic movement and the cut & cover station works in progress beneath the decking.

Contract for 47 km track work (single line) between BKC Metro station & Cuffe Parade station awarded to L&T. The company will supply, install, test & commission ballast less track on this line. A high attenuation booted twin block sleeper, an advanced track system, will be used in India for the first time.

After a prolonged legal battle, Hon. High Court has declared the reconstitution of Tree Authority with induction of 5 expert members as valid and allowed to function. As directed by the Hon. High Court, Tree Authority of MCGM has conducted the 2nd public hearing in case of tree removal for car depot at Aarey on 8th July 2019 that was attended by about 350 citizens. The report of the public hearing along with responses has also been uploaded on MCGM website. Having completed the Hon. High Court mandated process, the final decision of the Tree Authority is eagerly awaited.

Steel Decking

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 same. The traffic plan for every station is different based on its location.

Out of the 26 underground stations, decks are installed for the construction of 20 stations. Cuffe Parade, CST, Siddhivinayak, Santacruz and CSIA (International & domestic) Metro stations do not require decking as their construction is not obstructing any vehicle movement. Twenty decks are required for twenty stations, out of which sixteen decks are made of steel and four are of concrete. The concrete decks will be constructed at Dadar Metro, Shitladevi, Acharya Aatre Chowk and Worli stations.

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.

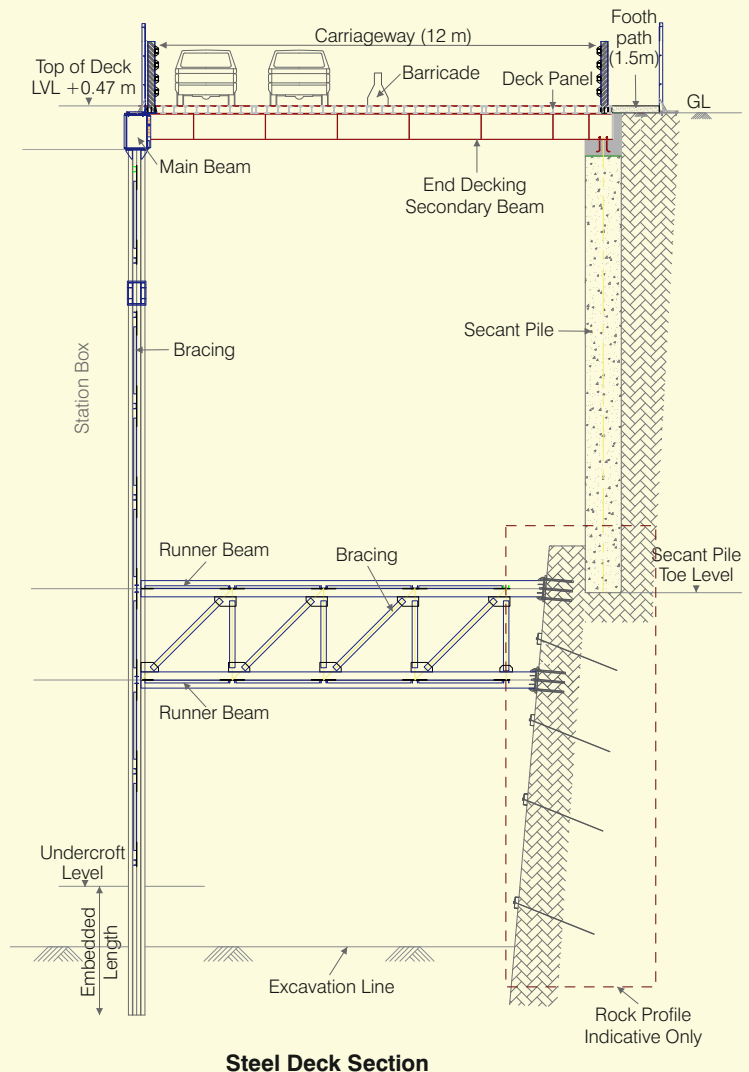
All decks are at a length of about 250 m and width of 7 m. The deck also includes the pedestrian walkway of 1.5 m width with handrails, which is a temporary arrangement made for the safety of pedestrians till the construction of the station is completed. The vehicle speed on these decks is restricted to 15 to 25 km/h. Chequered plates are used for the steel decking. Once the station construction is completed, the contractors will reinstate the road after surfacing it.



Progress update: Decking got completed and commissioned to traffic in package 3 and 7 in 2018. In package 4 and 5 decking work is near to completion and will commence till June end. Work at package 1 and 2 is still in progress. Overall total achievement of decking till date is 80% and 20% is balance.

Following locations of decks in each package:

- UGC-01**
 1. Cuffe parade -Capt. Prakash Pethe Marg, service Rd.
 2. VidhanBhavan road - Free Press Journal Marg
 3. Churchgate - Jamshedji Tata Road
 4. HutatmaChowk - D.N.Road
- UGC-02**
 1. CST Metro - Mahapalika Marg
 2. Kalbadevi - JSS road
 3. Girgaon - JSS road
 4. Grant Road - Lamington Road
- UGC-03**
 1. Mumbai Central - Dr. Anandrao Nair Road
 2. Mahalaxmi - Sane Guruji Marg
 3. Acharya AtreChowk – Dr. E Moses Road
 4. Worli - Dr Annie Besant Road
- UGC-04**
 1. Dadar - Gokhale Road
 2. Sheetaladevi - L. J. Road
- UGC-05**
 1. Dharavi - SionMahim link road
 2. Bandra – BandraKurla Link Road (BKLR)
 3. Vidyanaagri - SwargDwar Marg
- UGC-07**
 1. Marol Naka – Marol Maroshi road.
 2. MIDC - Road No. 16
 3. SEEPZ - MIDC Central road (in front of SEEPZ)



Steel Deck Section

All About Construction Package - UGC01

This article is in continuation with the previous 'All About Construction Package - UGC01', in June 2019, Volume 33.

A platform tunnel construction is started at station Hutatma Chowk by using NATM control blasting. Tunnel is horse shoe shaped of size 10.7 m high and 9.7 m width of length 255.8 m and having 8 cross passage having different sizes for tunnel access. Control Blasting will be carried out by dividing full face in heading, benching and side slashing, heading blast shall be further divided in 3 parts in order to reduce vibration and noise on surface.

This tunnel is most critical stretch as it possess many risk with regards to ground and building. Tunnel is passing through under critical buildings. All road side buildings are heritage structures, over 100 years old. Since the alignment is falling below the buildings, detailed investigation is not possible in that area. As per collected data and samples from geotechnical investigation, tunnel is to be excavated completely in basalt weathering grade (WG) 1 and 2, except for a small patch where basalt WG 3 is encountered as a lens and presence of basalt WG 3 at some pockets increase the risk associated during tunnel excavation.

Instrumentation and monitoring is going to play important role in that particular area which needs to be monitored 24x7. A dedicated team is deployed in order to install instrument and check reading level.



TBM Drive from Cuffe Parade to Vidhan Bhavan: Tunneling from Cuffe Parade to Vidhan Bhavan completed successfully after dealing with critical situation. A stretch of tunnel was falling below Machimaar and Amarpali slums and this is only 20.5 m away from Sea water.



During this stretch water permeability was high but rock quality was okay. So it was decided to drive TBM in close mode to maintain 1.5 revolution per minute and penetration rate of 10 mm/rev with proper grouting at a time, which obviously delayed the tunnel progress.

Also, near fire brigade land to Vidhan Bhavan, condition of rock changes to mixed face (shale + basalt) from full face (basalt). During this transition zone from mixed face to full face or vice versa, TMB operation is getting critical in order to maintain the horizontal and vertical tunnel alignment. For this TBM operational parameter were adjusted and

keep the drive slow as per ground condition to do safe and accurate tunneling.

Trees' cutting and Transplantation Status As on 21st July 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
Cuffe Parade	300	25	110	102	92%	165	156	94%
Vidhan Bhavan	303	112	89	64	72%	102	79	77%
Churchgate Metro	168	70	47	40	85%	51	38	75%
Hutatma Chowk	132	11	76	44	58%	45	43	96%
Tunnel Operation Shaft at Churchgate	08	00	03	01	33%	05	03	60%

Shifting of Utilities

Cuffe Parade Station

- 1040 mm dia. diversion of sewer line 400 m long outside station box
- 600 mm dia. diversion of water line 400 m long outside station box
- 2 no's of 450 mm dia. diversion of water line 350 m long outside station box

Vidhan Bhavan Station

- Supporting of Tata oil filled 110 kV cable 45 m long inside station box
- Diversion and supporting of 230 mm dia. sewer line 45 m long inside station box

Churchgate Metro Station

- Diversion and supporting of 800 mm dia. sewer line 270 m long inside station box
- Diversion and supporting of 600 mm dia. SWD line 110 m long inside station box

Hutatma Chowk Station

- Diversion and supporting of 1200 mm dia. SWD line 350 m long inside station box
- Diversion and supporting of 230 mm dia. sewer line 270 m long inside station box
- Supporting of 220 kV Tata 110 cables 25 m long inside station box

Noise Monitoring: Baseline monitoring was conducted in December 2016 in all stations and casting yards. the baseline results represent the existing ambient noise levels before the onset of construction activities at each location. Comparison of baseline results indicating the percentage increase of baseline values with reference to the permissible limits as per Noise Pollution (Regulation and Control) Rules, 2000 is presented here:

Location	Category of Area	Permissible Limit Leq dBA		Baseline Result Leq dBA		% increase of Baseline w.r.t. Permissible Limit	
		Day Time	Night Time	Day Time	Night Time	Day Time	Night Time
Cuffe Parade	Residential	55	45	70.5	61.7	28.2	37.1
Vidhan Bhavan	Commercial	65	55	77.6	62.0	19.4	12.7
Churchgate Metro	Commercial	65	55	70.5	62.9	8.5	14.4
Hutatma Chowk	Silence Zone	50	40	70.4	61.3	40.8	53.3
Casting Yard	Industrial	75	70	73.1	60.6	-2.5	-13.4
MIDC Yard	Industrial	75	70	70.5	61.7	6.0	-11.9

Land Acquisition Status As on 30th June 2019 (land area is in m²)

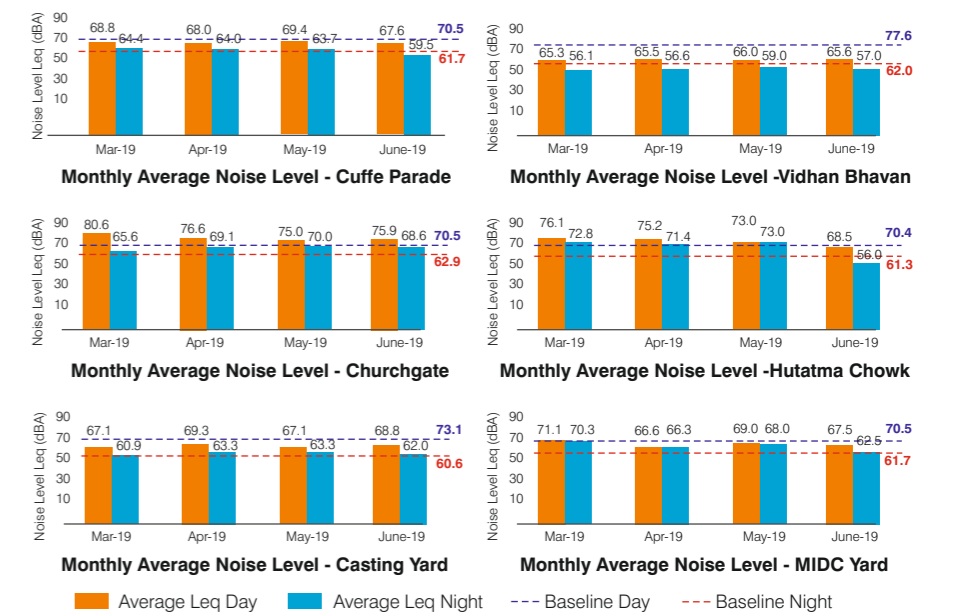
Station	Temporary land Required	Handed over land	Permanent land required	Handed over land	Total Acquired Land
Cuffe Parade	3,870	3,797	9,281	9,281	99%
Vidhan Bhavan	28,824	28,824	7,826	7,826	100%
Churchgate Metro	1,461	1,461	3,138	3,138	100%
Hutatma Chowk	1,354.6	1,344.6	1,319.1	1,311.6	99%



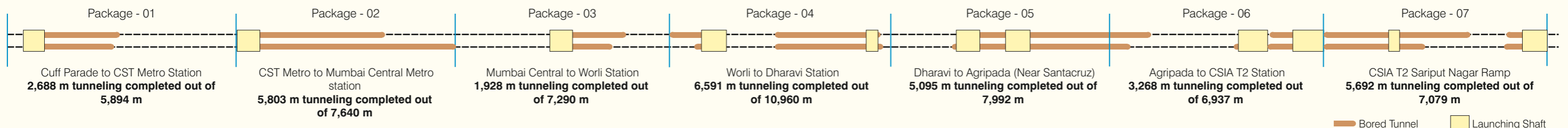
Utilities at Hutatma Chowk Station



Tata oil filled cable supported at Vidhan Bhavan Station



Tunnel Progress Update - As on 31st July 2019



Handling of Encountered Utilities

This article is in continuation with the previous 'Handling of Encountered Utilities', in June 2019, Volume 33.

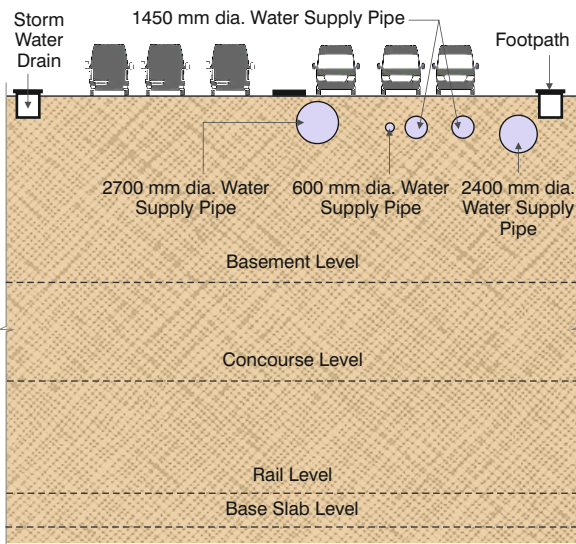
Critical Utilities at Sahar Road

While making way to Metro-3, one of the most critical challenge was to cope with utilities at Sahar Road Station. Five water mains were encountered during excavation which have been supported in existing position.

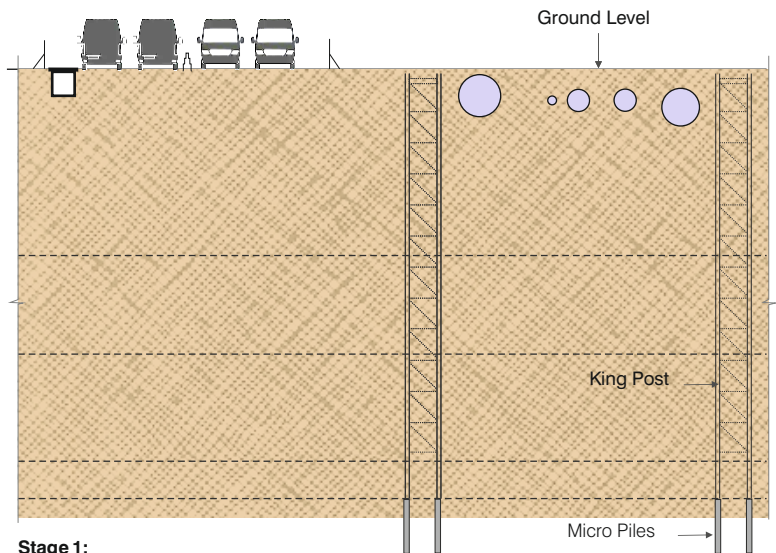
- a) 2700 mm dia. mild steel upper Vaitarna Main about 44 years old and 70 PSL pressure
- b) 2400 mm dia. mild steel Vaitarna Main about 80 years old and 70 PSL pressure
- c) 2 Nos of 1450 mm dia. mild steel Tansa East and Tansa West Mains about 44 years old and 40 PSL pressure
- d) 600 mm dia. cast iron pipe with lead joints Tulsī Mains about 100 years old and 30 PSL pressure



Water mains at Sahar Road Station

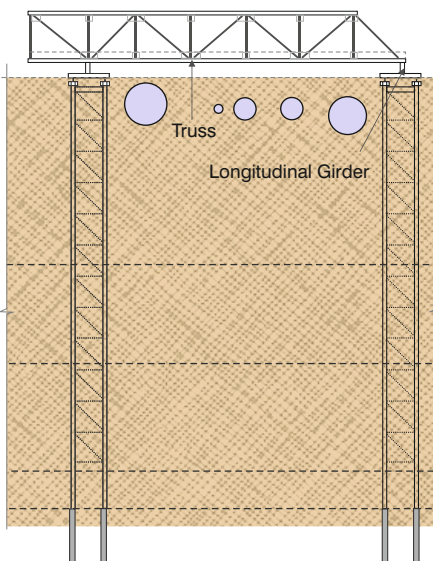


Existing Scenario



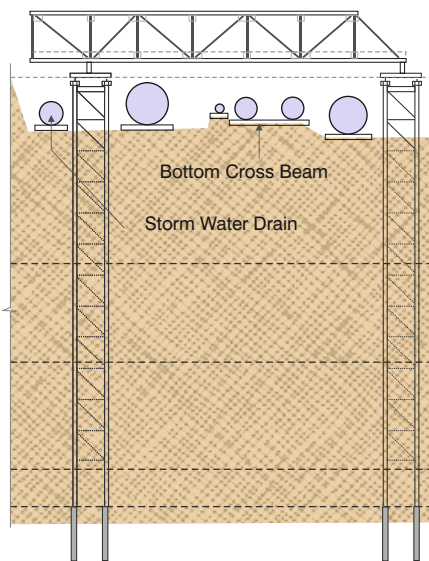
Stage 1:

- 1) Divert traffic as per approved diversion plan
- 2) Installation of Micro Piles and King Post Piles



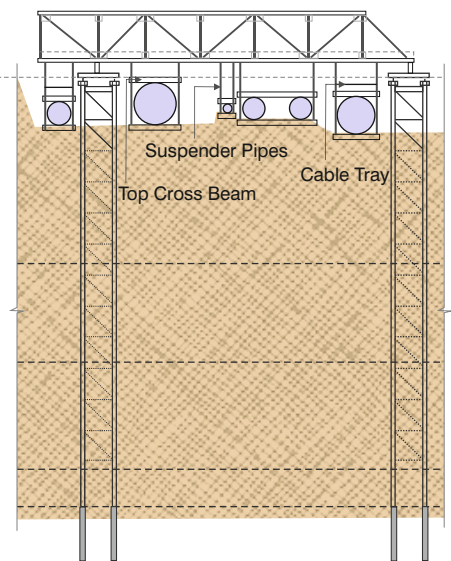
Stage 2:

- 1) Installation of Longitudinal Girder on king post pile
- 2) Erection of truss on top of longitudinal beams



Stage 3:

- 1) Excavation till the soffit of utility pipe
- 2) Sequentially bracing of king post while excavation
- 3) Installation of Bottom Cross Beam for utility pipes support



Stage 4:

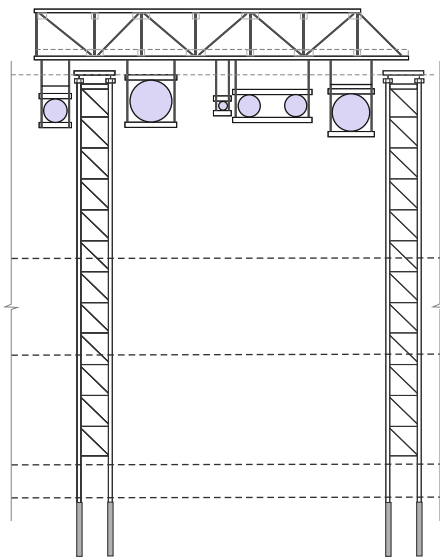
- 1) Installation of suspender pipes connecting cross beam and stringer bar
- 2) installation of cable tray to support the dry utility
- 3) installation of top cross beam for support

Design of Support System

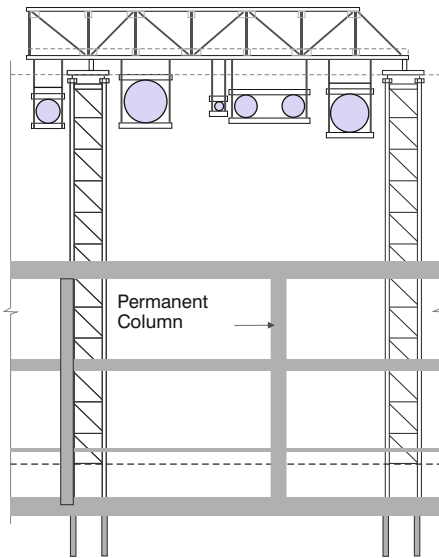
- a) Support system for water mains was designed based on inputs (dead weight of pipe, water pressure, etc.) received from utility owner MCGM.
- b) This is the first time in MCGM history that existing huge diameter water mains are being supported in existing position.
- c) Several consultations, meetings, presentations were carried out to convince the MCGM that there is no compromise on the safety of these utilities.
- c) Mock up of supporting system was jointly inspected by MCGM, GC, MMRC along with Contractor to make sure that supporting design is taking care of dead weight, water pressure, etc.

Reason for supporting in existing position

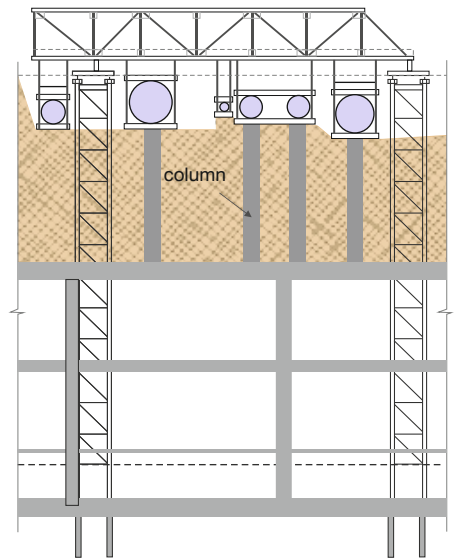
- 1) All these lines supply water directly from dam to south Mumbai and western suburbs so discontinuation of main and connecting diverted line to existing line is not possible.
- 2) No land available for diversion of water mains beyond station box.



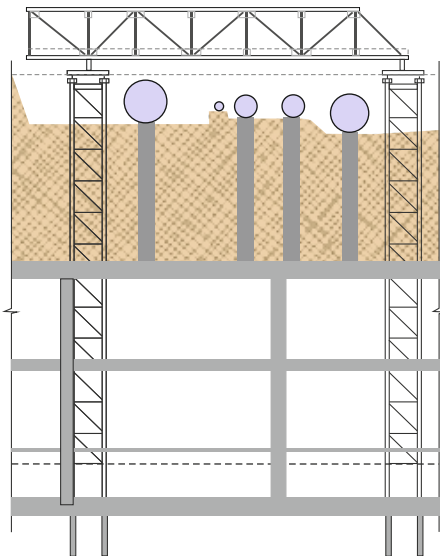
Stage 5:
1) Excavation till base slab soffit



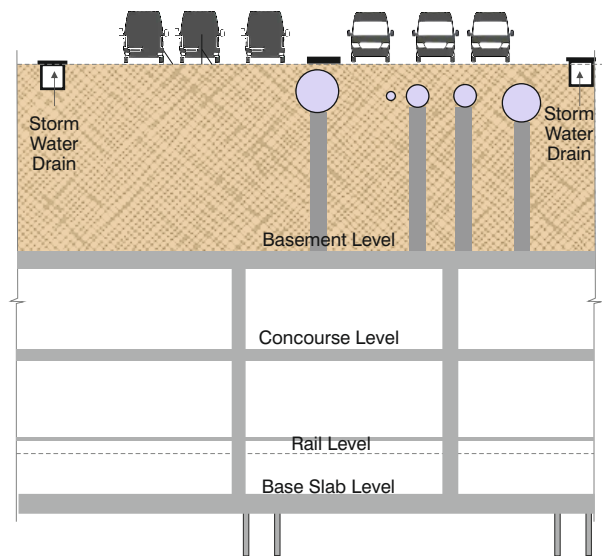
Stage 6:
1) Casting of station box by bottom up approach
2) King post shall be embedded into slab while concreting



Stage 7:
1) Erection of column from top of roof slab to support utility
2) Earth filling above the roof slab



Stage 8:
1) Remove bottom cross & top beam and rest pipes on column
3) Dismantle temporary storm water drain pipe after construction of permanent SWD below road footpath



Stage 9:
1) Back fill till the ground level
2) Remove truss, longitudinal support and king post
3) Lay permanent road and direct the traffic movement

Monitoring of supporting structure

Many water mains are 24 hours supply to South Mumbai directly from dam. To maintain the uninterrupted water supply, monitoring instruments were fixed on supporting structure and monitored on daily basis.

News @ MMRC



The mentoring workshops conducted by Metro-3 and ORF Mumbai on the 9th, 10th & 11th of July helped participants attain guidance about their plans and designs. Such mentoring workshops help them streamline their objectives and approach towards solutions.

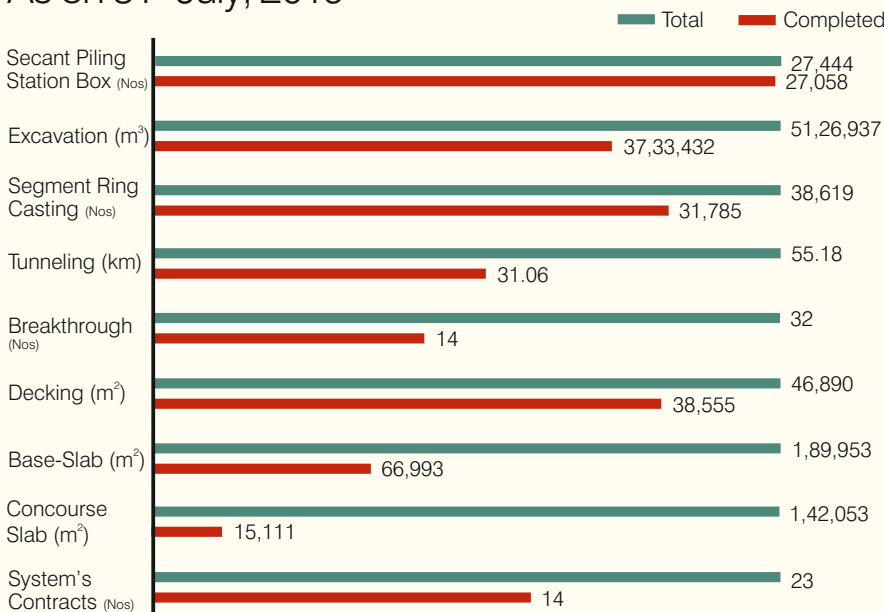


The second phase of ITO junction decking between Kalanagar and Kurla has been commissioned. Now, the traffic movement will be continued while making excavation for BKC Station box beneath it.



TBM Surya-2 of Pkg-1 commenced its second drive from Vidhan Bhavan Station towards Churchgate Metro Station. TBM Surya-1 has already begun its second drive on the same route.

Project Progress Update As on 31st July, 2019



Contract for the track work from BKC Station to Cuffe Parade Station is awarded to Larsen & Toubro Corporation. The total track length in this contract is 47 km including upline and downline. The scope of work includes procurement, supply, installation, testing and commissioning of ballastless track. For the first time in India an advanced track system of High Attenuation Booted Twin Block Sleeper will be used for a metro project.

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