Kolkata- First City in India to have a Metro Rail – Year 1984

Kolkata – First City in India to have a Transportation tunnel under river – Year 2017

Kolkata, the City of Joy, continues to be the pathfinder inthe history of Metro Railway in this country.

Managing Director, KMRCL flagged off the last river tunnel ring segment carrying locomotive In the afternoon of 20th June, 2017, 33 years after the historic day when the 1st Metro train in India had opened its door for public carriage at Esplanade station .

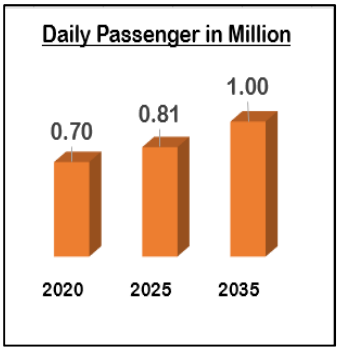
The Journey of Metro Railway in this City

Urban Rail Based Rapid Transit system is a fast, modern, safe and environment friendly public transportation system required for a metropolis like Kolkata where extent of roadway is meagre. At the time of starting of construction of Metro Railway in this City in 1972 , it was only the fifth such rail system in entire Asia . At present, 27 Kms of Metro line is in operation in Kolkata (North- South Line) and109 Kms in execution & planning stage in the city and its sub-urbans with all the projects undertaken within the umbrella of Indian Railways.

East West Metro Corridor

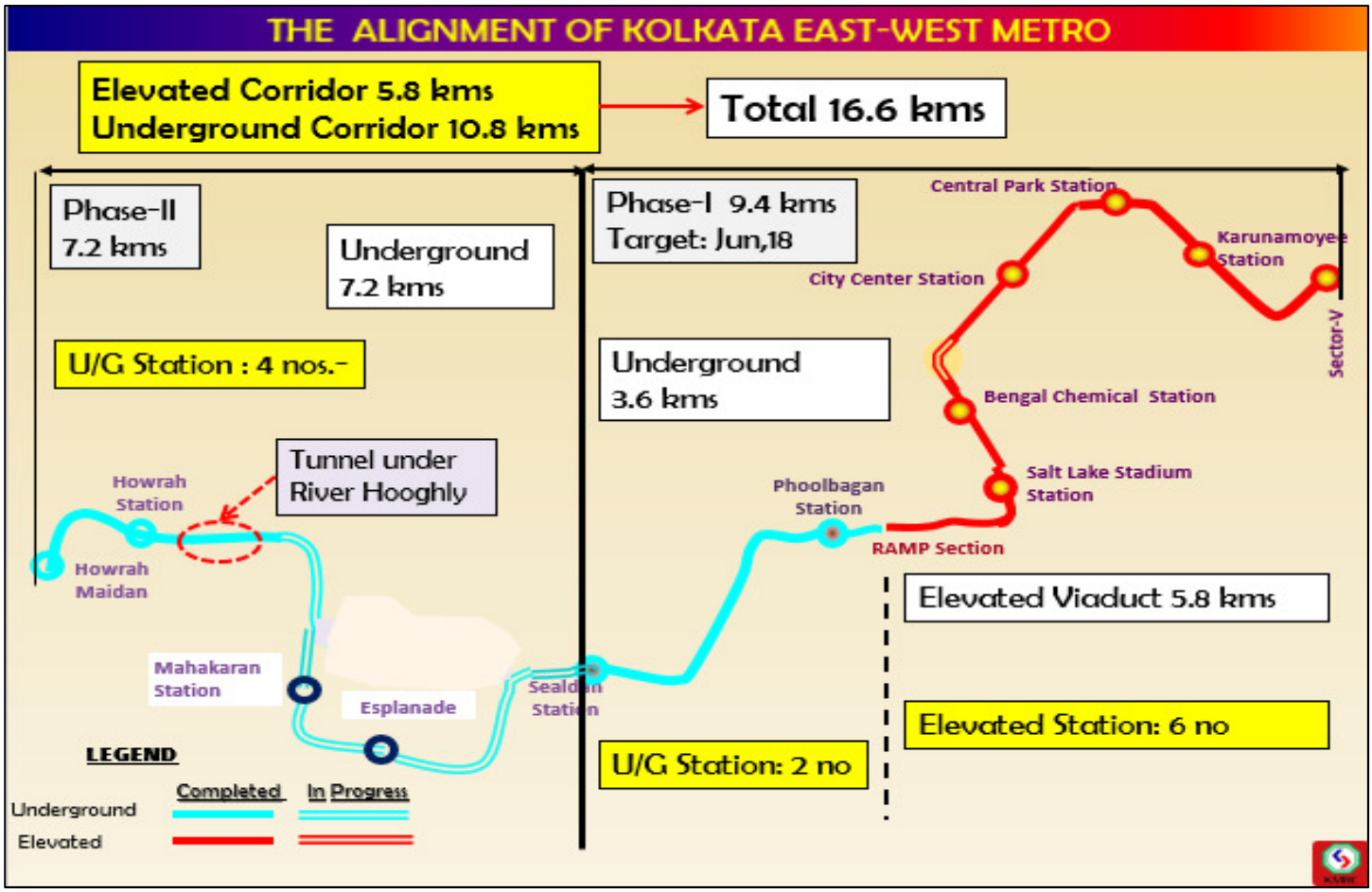
Kolkata East West Metro Line has been initiated by the Central Government in year 2009 as an ambitious MRT project which will impart landmark changes in public transportation in this city.

After solution of the alignment related issue in between Mahakaran and Sealdah, this project has gained momentum and vigour and works have been rejuvenated in all fronts.



The project execution is divided in two phases as below (Total Length- 16.6 Km):

	Phase-I	Phase-II
Scope	Salt Lake Sector-V to Sealdah	Sealdah to Howrah Maidan
Length	9.4 Km (Elevated -5.8 Km, Underground- 3.6 Kms)	7.2 Km (Elevated –Nil , Underground- 7.2 Km)
Stations	8 no (Elevated -6, Underground-2)	4 no (Underground-4)
Target	June, 2018 (upto Phool bagan)	Under review



Unique Features of this Project

- This is going to be the first of its kind metro in India under a river and this remarkable feature makes it superior to any of the existing metros. Depth of crown of tunnel below river bed of Hooghly will be 13m with depth of water in average tide level being 13m. The length of river crossing will be around 520 meters.
- The first transportation tunnel in Eastern India using EPBM Tunnel Boring Machine.
- First Metro in India to connect Mega Railway Terminals like Howrah and Sealdah.
- Esplanade Station will be the interchange for three Metro lines and maximum footfall of 55000 passengers per hour.

Progress Achieved So Far :

- All problems in Phase-I of the project have been solved.
- Project execution is in full swing in Phase-I.
- 95% of the Elevated Viaduct has been completed.
- Balance Viaduct at Duttabad is progressing fast after rehabilitation of affected families and targeted to be completed in October,2017
- Entire twin tunneling of 5.40 KM in Phase-I upto Sealdah is complete and construction of elevated and underground stations are in progress.
- About 3.2 Km of twin tunnel completed in Phase-II as both the tunnel completes journey under the river Hooghly.
- Work of Howrah Maidan & Howrah Station is progressing in full swing.

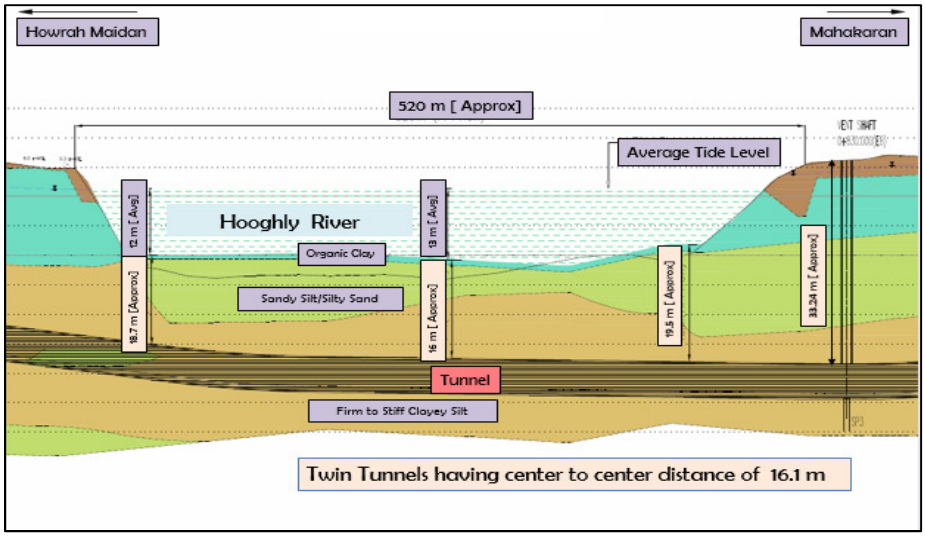
Rolling Stock composition:

- 6 coaches with max capacity of 2068 passengers. Requirement of rakes is 84 considering operational headway 2.5 minute (design headway for the system is 2.0 minute)
- In line with the Make In India initiative of Government of India, Tender for procurement of 84 number of coaches has been awarded to M/s BEML in February,2016 and the 1st rake is expected in December, 2017 .
- Train Depot with modern train maintenance facilities is being set up over 16.5 Hectare land at Central Park, Salt Lake.
- Platform Screen Doors will be provided in all stations which will eliminate the risk of accidental falling or suicide apart from providing huge energy savings towards air conditioning in underground stations.

Environment Friendly Metro

- The Depot is being constructed as an unique Green Depot with superior environment friendly rating. Depot layout has been kept in such a way to use natural lights to the extent possible.
- To reduce consumption of non-traction energy, provision of Platform Screen Door (PSD) has been adopted which would reduce air conditioning requirement of underground stations substantially.
- Rolling Stock planned for procurement for this project envisages regenerative braking so that power generated at the time of braking would be consumed by other powering trains running in the system.
- LED type lighting has been envisaged in all the stations.
- Large banks of Solar cells shall be provided at Maintenance Depot to generate energy for internal consumption.
- Elevated station architecture is designed to maximise natural lights in day time to the extent possible. Use of polycarbonate sheets on elevated stations has been given a fillip to reduce carbon footprint.
- In design of underground station, provisions laid out by IGBC (Indian Green Building Council) are being followed.
- High COP type Air Conditioning units have been envisaged for stations along with energy management system so as to optimize use of chillers, cooling towers, pumps etc.

Tunneling below River Hooghly- tale of two sisters



Starting on the eve of Bengali New year on 14th April, 2017, two sisters Prerana and Rachana have successfully connected two sister cities Kolkata and Howrah under the mighty river Hooghly in 66 days!!!

Yes, it's true…. They are giant earth pressure balancing tunnel boring machines, silently boring through the river bed and creating the history in record time.

Details of Tunneling below River Hooghly

Width of Hooghly River Crossing : 520 meters, Internal diameter of the tunnels : 5.55 m
Spacing between twin tunnels : 16.1 meters Center to Center
Depth of Tunnel : 13 m depth of water plus depth of tunnel crown extra dose 13 m below river bed
Maximum Tunnel Gradient : 3% (Approximately)

The tunnel is being set up using 275 mm thick segmental precast reinforced concrete liners of M50 Grade.
Maximum face pressure below the river shall be approximately 3 times of atmospheric pressure.

Several protective measures are adopted for averting water ingress in tunnel as below :

- Meticulously designed concrete using fly ash and micro silica as admixtures to reduce the water permeability .

- Adequate primary grouting using cement slurry with sodium silicate at the tunnel extra-dose

- Secondary grouting using cement slurry through pre-determined grout port kept in each segmental liners. These grout ports has been designed suitably to cater the requirement in operation stage also.

- Each concrete liner segment is fitted with imported neoprene main gasket and hydrophilic auxiliary gasket. The hydrophilic gasket expands when in contact with water and prevents any water ingress through segmental joints.

Connecting Kolkata with Howrah
Rabindra Setu- Constructed in 6 years
Vidyasagar Setu- Constructed in 13 years
.....
Twin tunnels – Constructed in 1584 hours

Passenger Safety in River Tunnel

- As per NFPA Guidelines, emergency evacuation shafts are required for such tunnels at a distance of not more than 760 meters. Following that guideline, emergency evacuation shafts are being provided in Howrah Station in the west and Strand Road in the east on two banks of the river.

- The tunnel ventilation arrangement is adequately designed using numerical modelling of the tunnel (Subway Environmental Simulation study) and TVS fans are being provided accordingly in Howrah station and strand road shaft to ensure adequate tunnel ventilation arrangement in case of emergent situation.

- The tunnels will be provided with continuous walkways for sidewise evacuation of the passengers in case of emergency.

About 40, 000 Cum of muck has been excavated from twin tunneling below river Hooghly. Total volume of concrete used for tunnel liners for the passage below River was 13000 MT.