

DEHLI METRO-LINE CONTRACTS



Delhi Subway and Mass Rapid Transport System MRTS, Delhi, India

Consultancy and design services for twin bored tunnels, cross passages and underground stations, contracts BC-24, CC-27 and CC-32.

Scope

- **Contract BC-24:**
Consultancy service for the design for twin bored tunnels, total route length 4.1km plus associated cross passages.
- **Contract CC-27:**
Consultancy and design services for the construction of 5 underground stations (cut & cover) plus twin bored tunnel, total route 5.0km, cross-passages and cut and cover tunnels.
- **Contract CC-32:**
Consultancy and design services for the construction of 2 underground stations (cut & cover) plus twin bored tunnel, total route 3.4km, cross-passages and cut and cover tunnels.

Challenges

- Varying stability of ground formation.
- Tunnel above groundwater, coverage 3 – 25m

Amberg Services

- Preparation of geotechnical interpretative report
- Design for segmental tunnel lining with earthquake loading.
- Design of temporary and permanent lining of mined cross passages including temporary bracings in the running tunnels
- Same for ventilation passages/intervention shaft
- Prediction of ground settlements & influence area
- Proposal ground treatment/soil improvement work
- Site supervision all tunnelling works, assistance to client during entire tunnel construction period.



■ View of drilling head of the EPB-TBM



■ View of construction site



■ View of tunnel after completion of structural works

AMBERG FACTS

Contracted value of Amberg

- Total USD 3.32 Mio.

Project phases & Duration

- Contract BC-24 Aug. 2007 - Oct. 2009
- Contract CC-27 Dec. 2012 - May 2016
- Contract CC-32 Jan. 2013 – Apr. 2016

Project details

Contract BC-24:

- Design of segmental tunnel lining (earthquake load)
- Design of lining of mined cross passages including temporary bracings in the running tunnels.
- Design of lining of ventilation passages into Intervention Shaft (IVS) and design of lining for shaft.
- Site supervision for all tunnelling works which included provision of designer's representative providing consultation for construction period.

Contract CC-27:

- Preparation of geotechnical interpretative report.
- Design of segmental tunnel lining (earthquake load)
- Design of station / tunnel interfaces.
- Design of lining of mined cross passages as above plus sump pits and tunnel drainage
- TBM face pressure calculation.
- Design of TBM cradle, TBM thrust frame, foundation for gantry crane / heavy cranes, etc.
- Prediction of ground settlement including settlement contours within the influence zone of works.
- Building damage Assessment.

Contract CC-32:

- Preparation of geotechnical interpretative report.
- Design of segmental tunnel lining (earthquake load)
- Design of station / tunnel interfaces.
- Design of lining of mined cross passages as above.
- Prediction of ground settlement including settlement contours within the influence zone of works.
- Proposals ground treatment/ soil improvement.

CLIENT FACTS

Overall costs

- Constructions approx. USC 300 Mio.

Project overview

- Phase 2 and 3 of the Delhi Mass Rapid Transport System
- Tunnels of total 12.5km length, subsurface stations, cross-passages and auxiliary structures
- Earth pressure shield TBM, EPB
- Single shell segmental lining

Geology

- Older Alluviums (sandy, gravelly, clayey silt)
- Bedrock Quarzite, moderately to highly weathered, occasionally fractured to completely decomposed

CHALLENGES



- Photo of urban area at site, contract BC24



- Geological profile at location of CC-27 contract



- Geological profile at location of CC-32 contract

ENGINEERING APPROACH



- Earth pressure shield type TBM



- Cross-passage construction in progress, CC-27



- Temporary rings at launching shaft, CC-32

TECHNICAL SOLUTIONS



- Erected segmental tunnel lining, contract BC-24



- Completed bored tunnel, contract CC-27



- Bored tunnelling in progress, CC-32