Technical Visit to Pipe Roofing System at Maluri Station

TUNNELLING AND UNDERGROUND SPACE TECHNICAL DIVISION

reported by
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The Tunnelling and Underground Space Technical Division (TUSTD) of IEM organised a visit to the Maluri Station of The Klang Valley MRT (KVMRT) project, in Jalan Cheras, Kuala Lumpur, on 16 January 2016.

The 28 participants, comprising student members, academicians and practitioners, arrived at Maluri at 9.20a.m. and were welcomed by MMC Gamuda staff.

The visit started with a safety briefing and an overview presentation of the project by the section head of the station. Later, Ir. Lim Yean Shong, the section head of underground station for MMC Gamuda briefed members on the construction sequence of pipe jacking works.

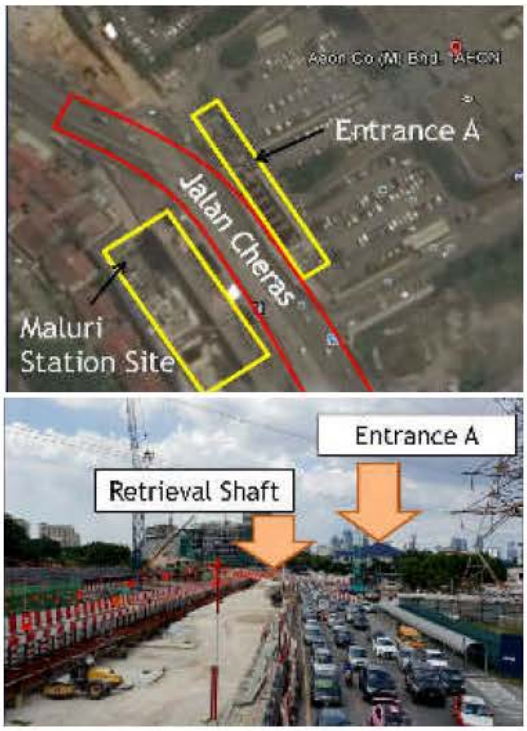


Figure 1: Overview of The Proposed Pipe Roofing System at Maluri Station

PIPE ROOFING SYSTEM

According to an article by Ir. Cheng Kim Hua, who gave a talk in 2010, a pipe roofing system "involves the use of microtunnelling/jacking/ other trenchless machine to install a series of interlocking steel pipes which form a temporary support system, below which the final section of the structure is then constructed".

In the case under study, the pipe roofing system is located between the retrieval shaft and Entrance A of the Maluri Station. The system was chosen in order to facilitate the excavation works and to maintain the traffic flow along Jalan Cheras.

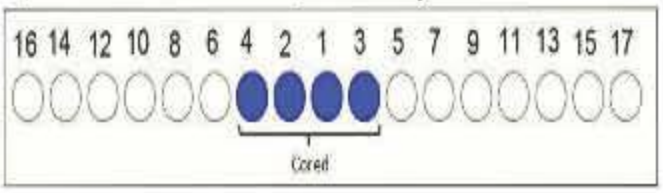
The support system is 780mm diameter steel hollow pipe supported with temporary strut and waler with the size of 400 x 400 x 140 kg/m and 914 x 419 x 253.4 kg/m respectively. The microtunnelling method was adopted during the installation stage.

Figure 2: Pipe Roofing System Site View and Graphical Illustration

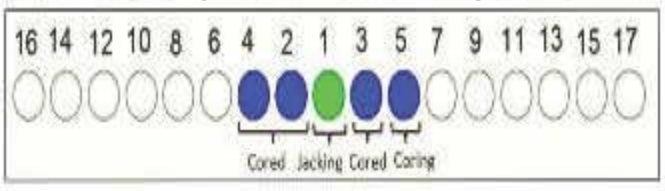
MICROTUNNELLING CORING SEQUENCES

In this project, microtunnelling was executed in the following steps:

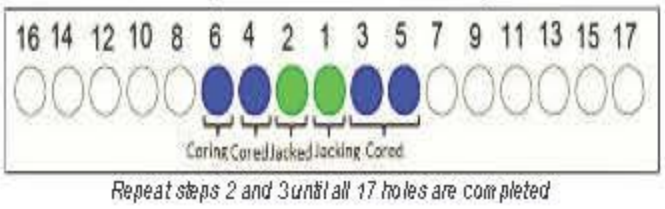
Step 1: Holes No. 1 to 4 were cored prior launching of the micro-TBM



Step 2: Start pipe jacking works at hole No. 1, while coring at hole No. 5 starts



Step 3: Start pipe jacking works at hole No. 2, while coring at hole No. 6 starts



Repeat steps 2 and 3 until all 17 holes are completed

MICROTUNNELLING SEQUENCE OF WORKS

After a brief explanation of the microtunnelling coring system, the sequence of works was explained.

a) Coring of part of the Secant Bored Pile retaining system
b) Setting of Jacking Frame for the Micro TBM Launching
c) Micro TBM Launching
d) Welding of the Steel Pipe in order to join the steel pipe
e) Micro TBM Retrieval after the complete installing the steel pipe
f) Annulus Grouting along the steel pipe
g) Pipe Backfilling

CONSTRUCTION SEQUENCE FOR PIPE ROOFING SYSTEM

The general construction sequence for pipe roofing system was designed using Finite Element (FEM) program, PLAXIS. The proposed construction was modelled in the FEM program.

a) Pipe drilling and installing horizontally from Entrance A toward Station Box.
b) Hack portion of the Secant Pipe wall for mined-through excavation.
c) Carry out first mining excavation work at not more than 2m away.
d) Install temporary support.
e) Repeat steps (c) to (d) until the excavation reaches station wall
f) Hack off the knock off panel at the station wall for entrance construction.
g) Complete the construction works of permanent structure with the temporary support to be removed when the permanent structure achieves required strength.

MONITORING OF PIPE ROOFING SYSTEM DURING THE CONSTRUCTION

Service ability Limit State (SLS) forces from the FEM analysis will be used to design as Ultimate Limit State (ULS). Meanwhile the predicted deformation, such as settlement and lateral deformation, will be used to monitor the pipe roofing system throughout the construction period.

We were informed that the performances of the system were good and that there were no incidents to slow down the construction progress. A short Q&A session followed before members were ushered to the Maluri Station Adit A to witness the pipe roofing installation works. ■