Technical Visit to KVMRT Line 2 Pipe-roofing Arch Tunnel Worksite

by Ir. Khoo Chee Min

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The Tunnelling and Underground Space Technical Division (TUSTD), Institution of Engineers Malaysia (IEM) had successfully organised a technical site visit to the pipe-roofing arch twin tunnel worksite at KVMRT Line 2 project on 30 August 2019. The worksite is located underneath and across the Kuala Lumpur – Seremban Highway near Kuchai Lama, where a 5.8m wide, 5.45m high and 58m long tunnel is being constructed to accommodate one of the two proposed underpass railway tracks. The twin tunnel is being constructed within a so-called pipe-roofing system. This technical visit was aimed to highlight the various aspects and features of the tunnelling works on site, in particular the on-going micro-tunnelling work for pipe-roofing installation. Figure 1 shows a bird's-eye view of the tunnel worksite.

Figure 1: Bird's-eye view of the tunnelling worksite beside KL-Seremban Highway near Kuchai Lama

A total of fourteen participants from IEM attended this site visit. The IEM participants were welcomed by MRTC and MMC-Gamuda KVMRT (PDP SSP), Project Delivery Partner's representatives at the project site office at Seri Gembira Avenue, Kuchai Lama. After a self-introduction session, Pn Nor Farah Linda bt. Mohamed Nasir, Senior Engineer of PDP proceeded with her slides presentation on the project overview, site contexts, tunnel sectional details and scope of works. This was followed by Mr. Konrad Pawnuk from the tunnel specialist contractor who presented on construction-related matters, e.g. construction sequences, machinery requirements, temporary works, instrumentation monitoring, etc.

According to Pn Nor Farah Linda, the shallow soil cover of 3.7m maximum height above tunnel crown level at this one of the busiest and important highway stretch connecting to the Kuala Lumpur city centre proves to be the utmost challenge with respect to both tunnel design and construction at this worksite. Figure 2 shows the typical twin arch railway tunnels cross-section. The pipe roofing system was selected to support the roof of the top heading around the tunnel arch as well as both its sides. The roofing is formed by 800mm dia. by 10mm thick mild steel pipes using Unclemole Super micro-tunnel boring machine (MTBM). The annulus between pipes will be grouted and pipes backfilled with mass lean concrete of Grade 20 prior to excavating the tunnel.

Tunnel excavation is carried out in a sequential fashion by installation of 25mm dia. by 12m long fiberglass face bolting and shotcreting, followed by sprayed concrete lining with steel rib lagging and steel strut at 1m intervals as temporary supports for primary lining. After tunnel breakthrough at retrieval portal, sprayable waterproofing membrane is applied all-round the tunnel while dimpled polyethylene drainage strip is installed from tunnel crown to wall before casting of base slab and permanent/secondary lining. The permanent tunnel lining is formed by cast-in-situ reinforced concrete Grade C32/40-20.

As part of the tunnel work requirements, a comprehensive instrumentation scheme is implemented on-site, which consists of a series of optical prisms installed on ground/road surface for real-time monitoring of ground movements; 5-points optical prisms monitoring array installed at every 5m intervals in the tunnel lining for convergence measurement as well as vibrating wire strain gauges installed in the shotcrete and steel rib for load measurement.

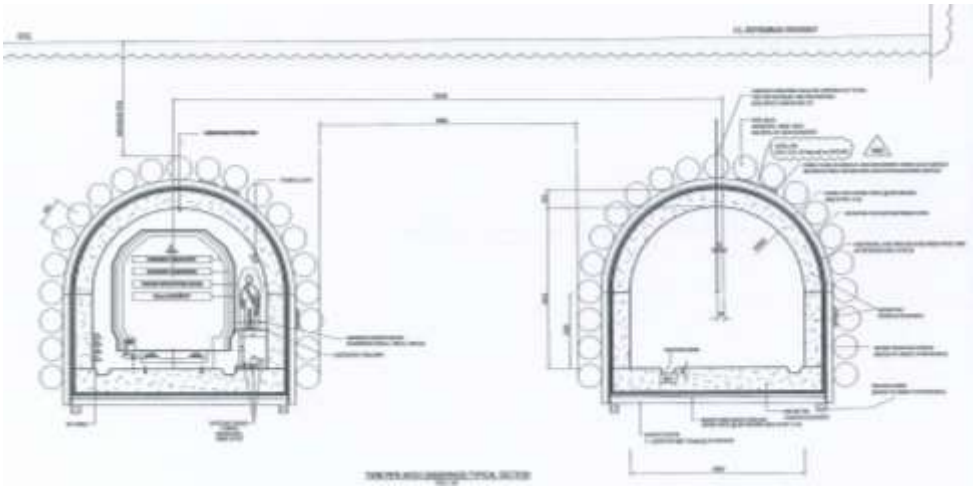

Figure 2: Typical cross-section of the twin arch railway tunnels

During the technical briefing, participants had raised many pertinent questions, which were addressed by representatives from MRTC, PDP, consultant and contractor. After which, the participants proceeded to the worksite.

Figure 3: Technical briefing conducted prior to the site walk

At the tunnel worksite, a safety officer gave the participants a health and safety briefing before the site tour led by Mr. Konrad Pawnuk. It was quite obvious that the site visit had generated much interest amongst the participants as many questions were posed as well as active discussion was conducted on site (see Figure 4). The participants had not only witnessed for themselves the uniqueness of the on-going tunnelling works, but they had also the opportunity to have a closer view of the additional new micro-tunnel boring machine parked at the worksite.

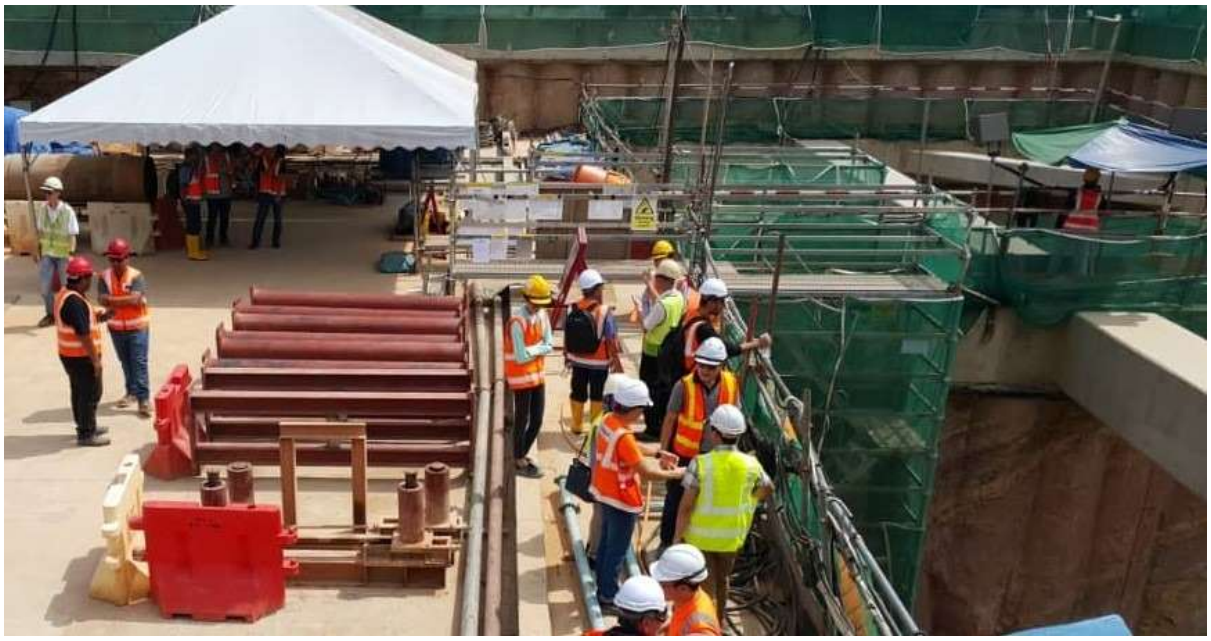

Figure 4: Active discussion amongst the participants at tunnel worksite

After the site tour, the participants returned to the project site office. The technical site visit was concluded with the session chairman, Ir. Khoo Chee Min proposing a few words of thanks and appreciation to both MRTC and PDP for having hosted our IEM participants to this very interesting tunnel worksite.