



Evening Talk on The Gold Line Metro, Doha, Qatar

by Dr Boon Chia Weng

Dr Boon Chia Weng is a senior geotechnical engineer at Gamuda Engineering Sdn Bhd seconded to MMC-Gamuda KVMRT (T) Sdn Bhd, and works in the Klang Valley Mass Rapid Transit (KVMRT) Underground Works Package.

The Evening Talk on Gold Line Metro, Doha, Qatar was organized by the Geotechnical Engineering Technical Division (GETD) on 9th January 2018 at the Tan Sri Prof. Chin Fung Kee Auditorium, Wisma IEM. The evening talk was delivered by Alexander (Sandy) Mackay (CEng, FICE, FHKIE, CGeol). A total of 40 participants attended the evening talk.

The speaker began his evening talk by giving a brief introduction to the Gold Line Metro at Doha, Qatar. The Gold Line Metro, Doha, Qatar consists of twelve stations, connected by 32 km of underground tunnels running from east to west. It intersects with the other, Green and Red, Doha Metro Lines at the Msheireb Station, which retrieved a total of twelve tunnel boring machines (TBM) at different construction phases from all metro lines. It was highlighted that a noteworthy achievement during value engineering was a reduction in the original number of cross-passages from 42 no.s to 27 no.s following a review of the access and egress distances to the ground surface through neighbouring stations based on the fire regulation requirements. According to the speaker, the complexity of interfacing with designers, sub-contractors, and the client was the main challenge for a project of this scale with five contractors forming a joint venture for the project delivery. Sandy explained the role of each party, and highlighted that the smooth delivery of the project was achieved by good teamwork and the capability of each party in overcoming various technical challenges encountered in the project.

From Sandy, we learnt about the geological units along the alignment. These comprised the Sabkha Deposits forming the uppermost layer, with the tunnel drives taken through the underlying Simsima Limestone, Midris Shale and the Rus Formation (Figure 1). According to him, the Simsima Limestone comprised weak rock, with an Unconfined Compressive Strength (UCS) of 20MPa. A challenge for the TBM drive was the presence of very strong (up to 200MPa) chert inclusions within the lower levels of the Simsima formation, which caused significant TBM cutter wear from impact between the weak rock and chert inclusions. The speaker shared that further challenges were the presence of karstic cavities immediately above the Midris Formation. As the Midris Shale had a significant proportion of fine grained constituents, this had a reduced permeability forming an aquitard allowing groundwater to flow and dissolve the Simsima Limestone, often creating a distinct interface boundary between the formations. In addition, the speaker highlighted that the clay within the Midris Formation sometimes causes the clogging of TBM cutterhead. The underlying Rus Formation contains chalky limestones with clay and siltstone layers with a limited presence of karstic features. Based on the anticipated challenges earth pressure balanced (EPB) machines were chosen for tunnelling.

The speaker then discussed about the geological challenges faced during the construction of cross-passages. According to Sandy, probing and grouting was crucial in ensuring a safe excavation with minimal water ingress especially within limestone. The integration of tunnel sumps at the cross passage with the main tunnels was also reviewed to mitigate construction risks.

Sandy also shared with the audience a number of tunnelling related temporary works such as the use of thrust frames for TBM launching, the method for pulling through the TBM across a station, muck disposal without using gantry cranes and the preparation of softeyes for TBM breakthroughs, all of which are key elements of underground construction using TBMs.

At the end of the talk, Sandy addressed a number of questions from the audience in the Question and Answer session. The talk ended with rounds of applause from the audience and a token of appreciation was presented by the Chairman of GETD, Ir. Lee Pier Tien to Sandy (Figure 2). Sandy has now moved to Malaysia, starting an employment with HSS Integrated since 2016.

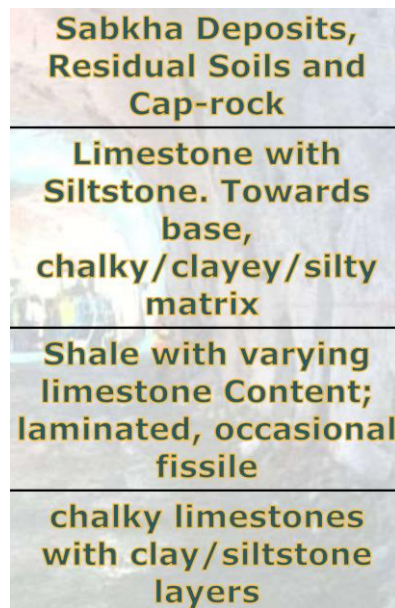


Figure 1: Geological units along tunnel alignment



Figure 2: Appreciation momento presented by the Chairman of GETD, Ir. Lee Pier Tien (on the left) to Alexander Mackay (on the right)