



Geotechnical Considerations for Deep Excavation and Tunneling

by Ir. Lee Peir Tien

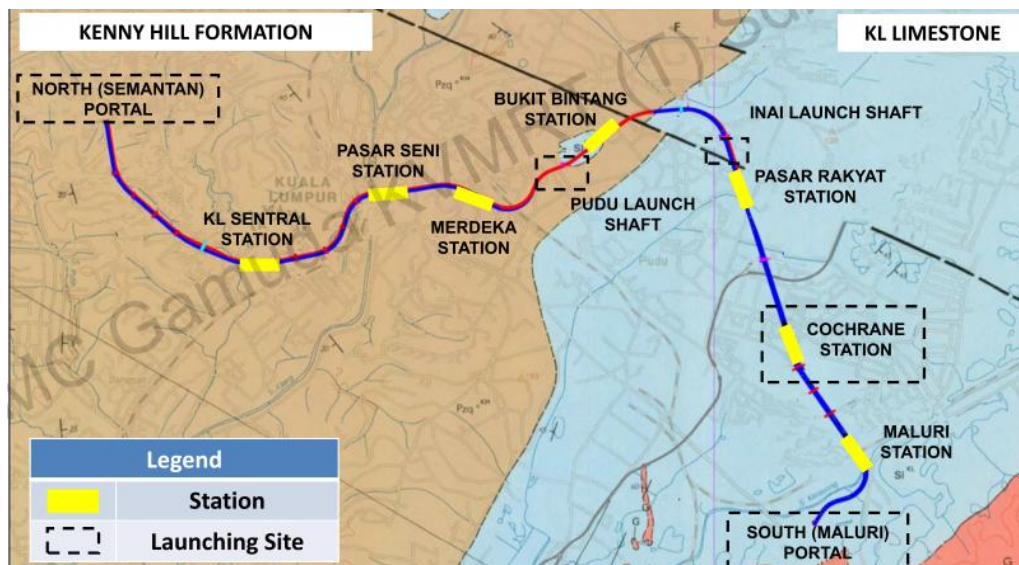
Ir. Lee Peir Tien is currently the Deputy Chairman in the GeoTechnical Engineering Technical Division Session 2015/2016.

The evening talk on “Geotechnical Considerations for Deep Excavation and Tunneling in Klang Valley Mass Rapid Transit (KVMRT) Project” was organized by the Geotechnical Engineering Technical Division (GETD) of IEM on 26 November 2013, at Tan Sri Prof. Chin Fung Kee Auditorium, Wisma IEM.

The talk was divided into two parts. The first part was delivered by Ir. Dr. Ooi Lean Hock, while the second part by Engr Low Yoke Yen. Both worked in MMC-Gamuda KVMRT (T).

Underground section

In the first part, Ir. Dr. Ooi gave an introduction about the KVMRT – Sungai Buloh to Kajang Line. The first MRT line in Malaysia consists of a total of 31 stations and a total length of 51km. The underground section starts at Semantan North Portal and ends at Maluri South Portal with a total length of 9.1km. Ir Dr Ooi explained that the underground section alignment transverses through two major geological formations: Kenny Hill formation; and KL Limestone Formation as shown in the figure below.



Subsurface investigation

Ir Dr Ooi discussed the characteristics of the above-mentioned geological formation. He emphasized on the importance of subsurface investigation (SI) works in order to understand the subsoil condition and to acquire the correct parameters for design. Boreholes were carried out between 30m to 140m spacing at three different stages: PDP stage (preliminary design); tender stage; and detailed design. Other than boreholes, geophysical surveys with different methods were also carried out along the MRT alignment and the underground stations, in particular at KL Limestone area in order to determine the notorious karstic features such as cavity, irregular bedrock level etc.

Ir. Dr. Ooi then highlighted the importance of seepage analysis for the design of diaphragm wall retention system in underground stations within Kenny Hill Formation, amongst other checks. Curtain grouting behind temporary secant piled wall for underground station in KL Limestone was also a requirement. In his view, there were different challenges of the project such as ground anchor installation within low head room under an existing building basement, secant piling under existing pylon with modified machine to comply with safety requirement etc. Progress photos of each underground station were shown to the participants.

Tunneling design

In the second part, Engr Low Yoke Yen discussed the geotechnical considerations on tunneling design. She introduced the two types of tunnel boring machines (TBMs): earth pressure balance (EPB) TBM; and the world's first variable density TBM. EPB was used in Kenny Hill Formation, while variable density tunnel boring machine was specially designed to be used in KL Limestone for boring through the karstic features of the formation.

Engr Low went on to discuss the design of bored tunnel lining that utilized the ratio of horizontal over vertical pressure, K , which was incidentally one of the key parameters to obtain ground loadings for bored tunnel lining design.

At the end of the talk, Ir Dr Ooi answered a number of questions from the audience. As a token of appreciation, a souvenir was presented by GETD to the speakers.

