Technical Visit to Lots L, M and N Construction Site – Proposed New Tallest Building in Malaysia

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The Tunnelling and Underground Space Technical Division (TUSTD), Institution of Engineers Malaysia (IEM) had successfully organised a technical visit jointly with the Geotechnical Engineering Technical Division (GETD), IEM to Lots L, M and N construction site, a.k.a. the proposed new tallest building in Malaysia project site, adjacent to Lorong Kuda, KLCC, which is being developed by Messrs Arah Moden Sdn Bhd and managed by Messrs KLCC Projeks Services Sdn Bhd on 10th October 2019.

The technical site visit aims to allow the participants to have an eye-opening and better understanding on the massive foundation works that had introduced the world's biggest boring rig, Bauer BG72 to construct a world's deepest bored pile of 125m deep from existing ground level. It also gave a good insight into understanding both the difficulties and constraints of a construction site that is in the middle of a busy city centre locality, which is right next to a MRT2 tunnel.

A total of 12 participants of various member grades from IEM attended this technical site visit. Upon arrival at the project site office, Mr. Ahmad Fizal, Project Manager from Messrs KLCC Properties Holdings delivered a welcoming speech and followed with a project briefing of this co-existing project in collaboration with Mass Rapid Transit Corporation Sdn Bhd (MRTCorp). This project is to construct a deep foundation for the proposed "Super Tower" in advance in order to avoid any significant movements when the proposed KLCC East MRT2 Station is completed and put into operation; and its project overall planning and strategy were also highlighted.

Following which, a technical presentation was delivered by Mr. Dimitrios Leventakis, Operation Manager from the appointed Contractor, Messrs BSG Construction (Malaysia) Sdn Bhd who undertakes the major scope of basement retaining wall and foundation piling works. Some interesting constructional aspects were highlighted, in particular on the introduction of the world's biggest boring rig Bauer BG72 to construct deep bored piles of more than 100m deep on site as per design requirements. He also made known that a new world record was achieved in having completed a 125m deep bored pile on site which had bettered a previous record of 120.5m deep on the same site, but "optimistically," this record is expected to be broken on the coming bored pile points. All piles are being installed with full rebar cages with maximum weight of up to 70 tonnes and maximum concrete volume of 537m^3 per pile point. He also emphasized that all massive materials for production require massive machinery, which entails very close coordination and tight planning. And that the Contractor had also undergone "mock trials" during the early stages of the bored piling works to comply with the Consultant's specification to have pile verticality controlled to not more

than 1:100 at pile cut-off level which happened to be at 26m below the piling platform level. Ultimately, a combination of various methods such as koden test, sonic caliper and a 8m long coring bucket were used to monitor the boring verticality and guide it back to the intended verticality in the event of significant deviation had occurred. In view of the tight contract duration, a time-saving measure adopted was to shorten the piling works period, whereby, bored pile rebar cages are fabricated off-site, and they are delivered to site in minimum 24m lengths to minimise multiple cages extension works by welding.

After the technical presentation, a site walk-around was conducted, which was led by a safety officer. Two plots of the site were visited, namely the plot for the proposed Super Tower of 145-storey (taller than KL118) where the ongoing boring works using the massive Bauer BG72 [Figure 1] was in operation and the other plot where the proposed 6-storey retail podium is located. The foundation works for the podium have been completed and the ongoing basement works are being carried out within diaphragm walls strutted with temporary horizontal universal columns (UC) [Figure 2]. The podium also consists of Petronas Gallery (of more than 30m long cantilever structures) and access to the proposed MRT2 Station.

Figure 1: World's biggest boring rig Bauer **BG 72 specially customised to suit project specification for bored pile construction works**

Figure 2: Ongoing Basement Works at 6-Storey Retail Podium Plot

After the site walk-around, a group photograph was taken [Figure 3] and the participants were then led back to the project site office. This was followed with a Geotechnical presentation by Mr. Desmond Lee, Geotechnical Engineer from the Civil & Structural Consultant, Messrs Arup Juruperunding Sdn Bhd. Among the highlights of the presentation was the introduction of a 5m thick pile raft foundation to withstand very high column punching shear as well as to evenly distribute the heavy loadings onto nearby columns. He also shared some experiences and findings from preliminary loading tests done on a bored pile using bi-directional method with both upper and lower jacks installed within the pile. In anticipation of the long hours the very deep pre-bored holes were to be left exposed due to having to accommodate the long periods to be taken to install the full length rebar cages and tremie concreting works, the shaft frictional resistance of the bored piles had to be downgraded in design. Nevertheless, the designed frictional resistance was found to be well fitted with the instrumented test pile results. Mr. Desmond Lee also generously shared the on-site quality control system as well as problems encountered and solved on site, such as tackling of choked tremie pipes. Pertinent questions relating to pile terminating 2m above competent rock surfaces, base cleaning, king-post installation, impact to MRT2 structure and measures taken, etc. from the participants were satisfactorily and well addressed by the project technical personnel.

As a finale, the session chairman, Ir. Loh Wooi Chuan from GETD presented tokens of appreciation to Mr. Ahmad Fizal, Mr. Dimitrios Leventakis and Mr. Desmond Lee. The technical site visit was concluded at about 1.00pm.

Figure 3: Group Photograph in front of boring rig Bauer BG 72