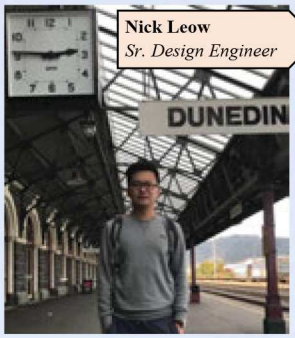
G501 – MK27 @ Mont' Kiara

Written by:



Project Introduction

The development, Residensi Astrea, consists of a 37-storey condominium (240 units) building sitting on a 2.4-acre freehold land, located at the vibrant neighborhood of Mont' Kiara. Prior to commencement of piling works, the project site was originally a land with partially flat topography (EGL ~ 60.5mRL) and hilly terrain (EGL ranging from 61mRL to 95mRL).

With reference to Geological Map of Peninsular Malaysia (**Figure 1**), the project is believed to be underlain by Granite bedrock formation with overlying residual overburden soils and was confirmed by 15 nos. of borehole.

The project duration was approximately 14 months and our scope of works covers earthwork, piling, pilecap, earth retaining structure, soil nailing and basement structures. The proposed foundation system as per the consultant's conforming design was a combination of bored pile (Ø1000mm to Ø2500mm), micropile (Ø150mm to Ø300mm) and caisson pile (Ø1200mm to Ø3000mm). On top of that, there was a stretch of CBP wall (42 nos.) at the north-west of project site, to facilitate earthwork cutting to the intended level. Our design & build proposal (**Figure 2**) mainly focused on foundation conversion among the 3 aforesaid foundation systems, by taking into consideration the piling platform, manpower, machine productivity and site logistic. Intensive study had been conducted on the earth retaining structure where we had proposed to convert some CBPs into Contiguous Caisson Pile (CCP)s to boost site progress, replace steel strutting of CBP with Reinforced Concrete (RC) strutting, and omit waler beam by realigning soil nails through CBP via pipe sleeves, instead of going between piles.

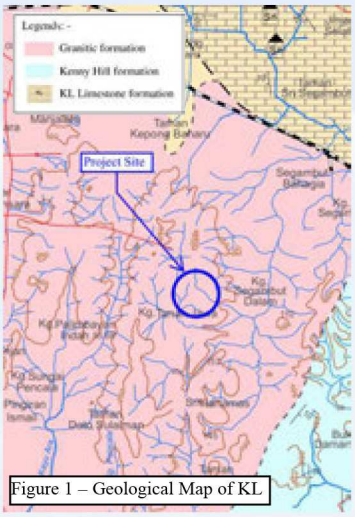
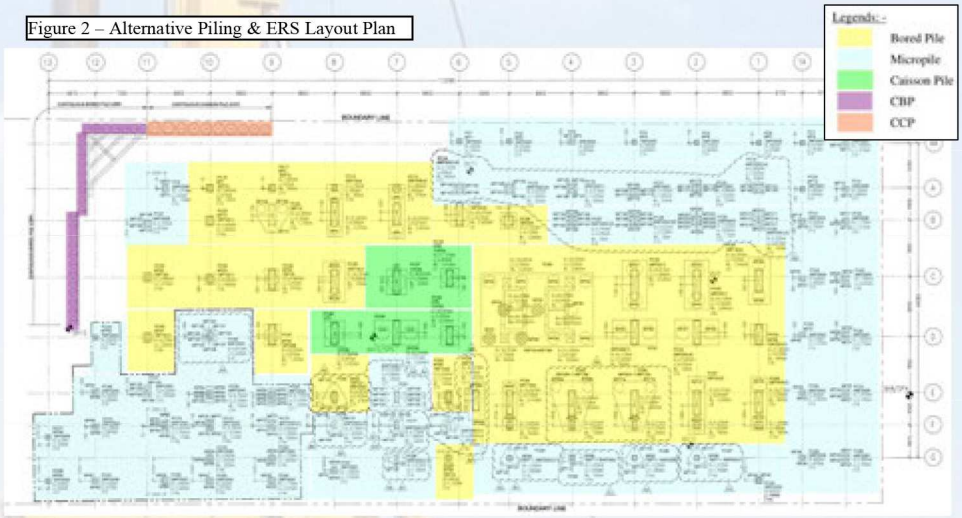


Figure 1 – Geological Map of KL

Figure 2 – Alternative Piling & ERS Layout Plan



Alternative Design Proposal and Construction Challenges

In the alternative foundation design proposal, all deep foundations were designed to socket into Granite bedrock and overburden soil friction was ignored due to insignificant contribution as compared to the igneous rock of Grade II or better. Owing to consultant's requirement on the pile size, the Ø1.8m preliminary test pile was tested with bi-directional load test setup. The design parameters were successfully justified from data derivation of pre-installed instruments where the equivalent pile top settlement was 8mm at 1 time working load (i.e. 1×WL), 16.7mm at 2×WL and 26.1mm at 3×WL. As for the micropile, 2 Maintained Load Tests (MLT)s had been carried out on working test pile and the maximum pile top settlement was 24.5mm at 2×WL, implying that the design parameter was acceptable. On the contrary, small scaled pile load test (i.e. plate bearing test) was conducted to confirm design

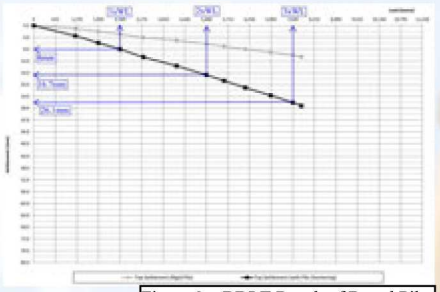


Figure 3 – BDLT Result of Bored Pile

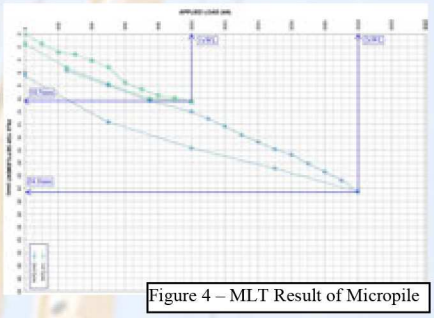


Figure 4 – MLT Result of Micropile

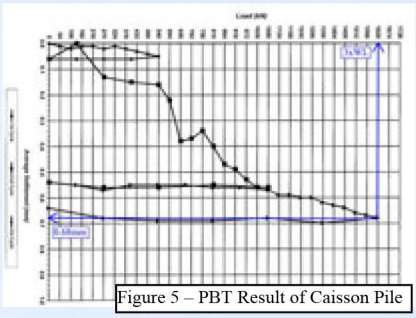


Figure 5 – PBT Result of Caisson Pile

assumption of caisson pile. The resulting plate settlement was generally less than 1mm, suggesting that the ultimate unit end bearing of 18,000kPa adopted was appropriate for this project site.

Figure 6 – Overview of Project Site (May 2019)

Site logistic planning was paramount for this project site due to diverse construction activities carried out simultaneously, limited working space, sloping terrain and shared access with adjacent construction site. The working space constraint was especially pronounced for construction of bored pile & CBP at higher level, approximately differs by 30 meters from lowest ground. The challenges were further extended to concreting works at elevated ground which was inaccessible for concrete trucks. For that reason, such concrete works were either performed using concrete pump or concrete bucket lifted by crawler crane. Besides, quite some numbers of pre-fabricated soil nail pipe sleeve inside CBP wall were found to be deviated from the designed level upon exposure of wall excavation face. In the extreme case, some soil nails were even required to core through the CBP wall as the pipe sleeve was totally strayed. Other construction challenges faced by the site team includes bottom-up guniting works of 12-meter CBP skin wall,

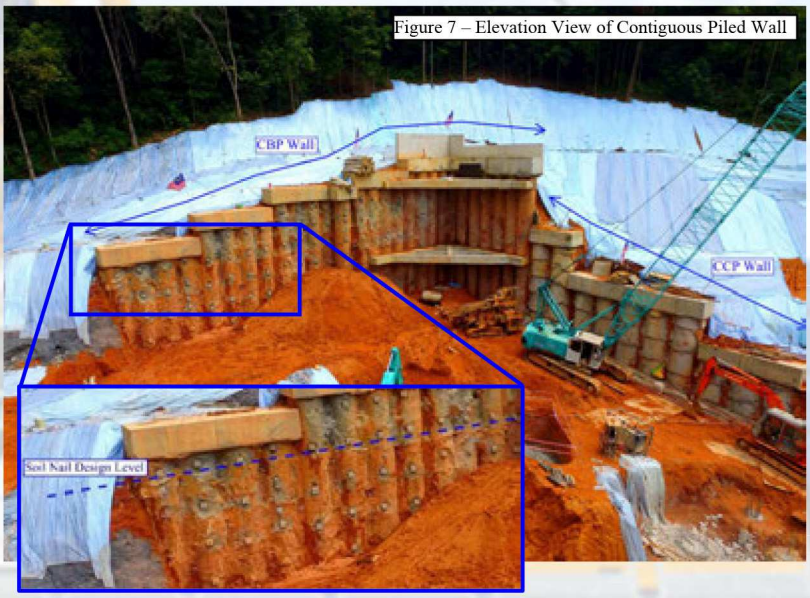


Figure 7 – Elevation View of Contiguous Piled Wall

concrete discharge period limited by design setting-time, lifting of steel cage for bored pile at higher ground, etc.

Amid the various difficulties in executing the design and construction works, the project was able to be completed within the stipulated contract duration, primarily credit to comprehensive planning by project director/ manager, dedication & commitment from project team and extensive collaboration from client, consultant team and sub-contractors.