

## Hampton Residence @Country Heights Damansara

### The Proposed Temporary Anchored Soldier Pile Wall and Challenges

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Aerial View of Construction Site

### Project Introduction

Hampton Residences is a project by Mayland Supreme Sdn. Bhd. The project is located beside the Lebuhraya Damansara Puchong (LDP) Penchala toll plaza, Country Heights Damansara. This development project comprises of 2 blocks high rise condominium with 41 storey including 5 storeys of podium car park with a few unit of retail shops. The foundation and temporary retaining wall is under Contractor Alternative Design which consist of 184 number of bored pile with sizes ranging from 750mm to 1800mm diameter, 18 numbers of Caisson piles ranging from 1800mm to 3500mm diameter, 78 numbers of 250mm diameter micropile (mainly located on slope) and 115 numbers of temporary anchored soldier pile wall. Due to the hilly terrain, a temporary soldier piled timber lagging wall coupled with 3 layers of ground anchors had to be constructed to facilitate the construction works. The total construction duration in contract is 10months which including piling, pilecap works, tie beam and temporary retaining system.

## Alternative Design Proposal



Figure 1 : Alternative Piling Layout

The initial proposal is only a combination of bored pile and micropile foundation system. However, in considering to the availability of our caisson workers and to expedite the overall foundation works, therefore we are proposed the caisson pile system in southern tower area. Based on the soil investigation data during the tender stage, the piling layout was divided into 3 Zones.

### Design Challenges

Based on the subsurface investigation (SI) report, the geological profile of the site is granite formation with varies of bedrock level and inconsistency of weathering grade of Granite rock over the site. The pile is designed to be founded on rock socket or maximum fixed pile length if no rock was encountered.

From the instrumented test pile result, we are able achieved average ultimate soil skin friction of  $3 \times \text{SPT-N}$  (kPa), average ultimate friction of Granite more than 2000kPa and ultimate end bearing capacity more than 12000kPa.

The most challenging of this project during design stage is all piles need to design to cater the lateral load. The pile design is analysed by using software, PIGLET, to estimate the bending moment induced to the pile. Also, some piles with spacing less than  $2.5d$  need to be lengthened to enhance the geotechnical capacity. Mostly, all pilecaps for wall were designed by using SAFE software to get a more accurate pilecap reinforcement and forces.

On the other hand, the proposed temporary soldier pile wall is the replacement of the conforming tie-back sheet pile wall. The design analysis of the alternative anchored timber lagging soldier pile wall which is acting as temporary retaining wall to facilitate the basement excavation and construction .The proposed types of soldier pile wall consist of cantilever

wall and tie-back wall with 1 to 3 layers of temporary ground anchor depending on the height of excavation.



Figure 2 : Anchored Timber Lagging Soldier Pile Wall

The levels of temporary ground anchor have been located at generally 1.2m above the FFL right in front of the basement wall. The maximum excavation height at the proposed temporary soldier pile wall is 12m (PL 73.00, i.e. soffit level of the deep pile cap). The design groundwater table is 4m depth from the original ground level in the wall excavation analysis and the minimum surcharge of 10kPa is imposed on behind the soldier pile wall.

The most challenging during design stage is to assign the anchor level in order to avoid any clashing with slab level and to provide sufficient space for the removal of ground anchor works. All ground anchor level was visualizing and checking using AutoCAD 3D to ensure it is not clashing with each other during drilling and installation.

The wall analysis at Wall Type 2A is the most critical due to shallow rock level. The embedded depth only 2-3m including 1m of rock socket from platform level which much shorter than the original design. However, the said wall was successfully installed with minimum wall deflection from the monitoring data.

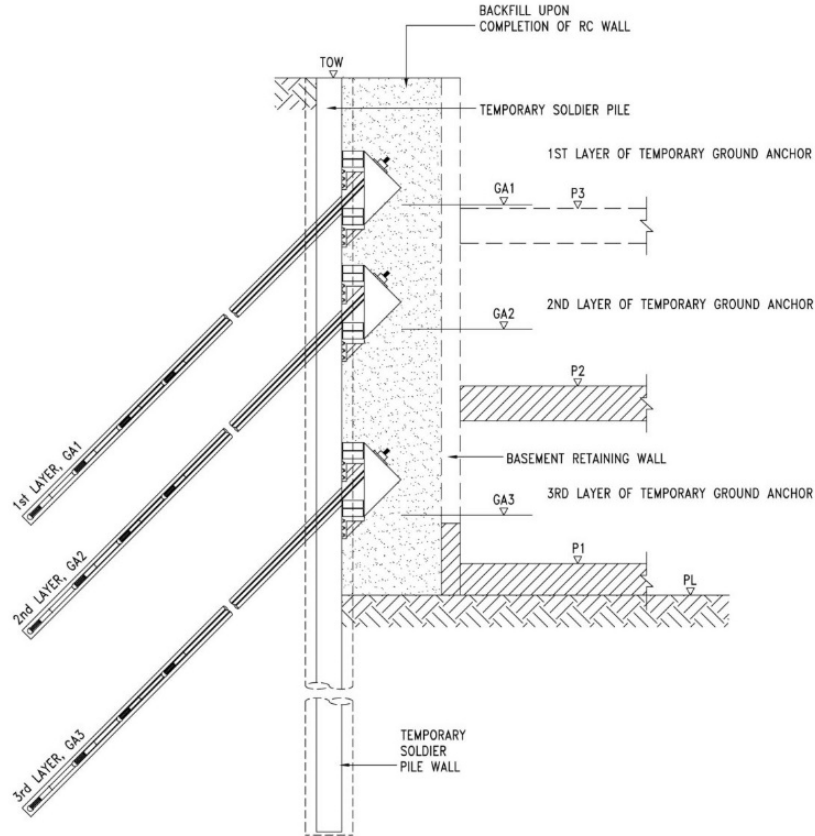


Figure 3 : Typical Wall Section

### Construction Difficulties Encountered

Due to the hilly terrain, an access needed to be created to carry out the construction of the temporary soldier piled wall first. Upon the completion of the soldier piled wall, shelves had to be cut into the hillside to facilitate the construction of the micro piles. Sections of hoarding were removed, Country Heights Residence committee consulted and approval obtained and temporary traffic diversion done to enable the access of a micro pile machine and a crawler crane from Jalan Tecoma (road leading to Country Heights) into the site.

Another construction challenge is the construction of the Sewerage Treatment Plant (STP) located at the centre of the site. The excavation depth of the STP is approximately 9 metres deep. Another temporary soldier piled wall had to be built around the STP to facilitate its construction. It was planned that the STP be constructed early, but because of site logistics and coordination with the M&E specialist contractor, it was pushed to the very end.

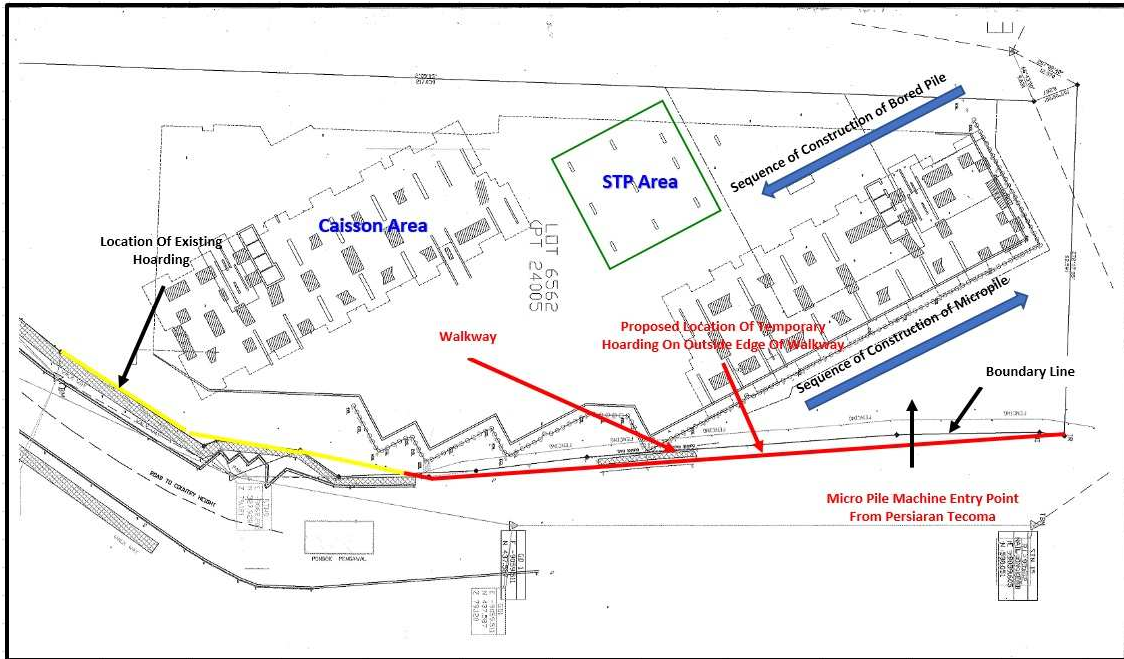


Figure 4 : Construction Challenges

### Overall Performance of The Project

Based on the soil investigation report, it was anticipated that Grade 1 granite would be encountered. Experiences in the Foresta and Rencana projects which are located nearby, suggests that the rock drilling times would be long (0.1 metres per hour). However, on this site, Grade I granite was not encountered. Only Grade II and Grade III granite were present. Initially, 5 bored pile machines were planned to be used to complete the job. Due to the good drilling times achieved, only 3 bored pile machines were mobilised to the site. The Geohan design team also carried out some magnificent engineering to change some bored piles to caisson piles which not only reduced the construction time and cost, but also provided the utilisation of Geohan's caisson team.