

Ascencia @TTDI (on design aspect)

Sheet Pile Wall to Diaphragm Wall

(by Ir. Oh Chin Wah, Executive Director) (2013 Apr-Jun)

Introduction

This development consists of 1 block of 36 storey high end service apartment including 6 level of car park and 2 level of basement car park. The scope of works involves earthwork excavation, basement wall construction and installation of bored pile foundation. The original design of RC wall with sheet pile temporary work has been replaced with the contractor alternative proposal of diaphragm wall with temporary steel strut. The pile foundation is remained as bored pile with the contractor's design too.



Overall Site Layout

Site Layout

A small plot of land situated at existing road junction perpendicular to the existing Jalan Damansara. The land is triangular in shape with both sides parallel with the existing road and the other side abutting against existing building.

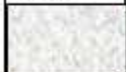
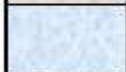

Along the existing road, there is present of water pipe and road side drain which is very susceptible to the sensitivity of ground movement. Extra precaution needs to be taken if carrying out deep excavation adjacent to all these existing services and utility. Due to the constraint of limited space at site, this poses a great challenge to the logistic planning and work sequence arrangement when come to work implementation at site. Therefore, the design of either a temporary wall or permanent wall retaining system should take into consideration of the above constraint especially during the construction stage.



Soil Profile

The existing soil profile is typically granite formation as shown in the SI borehole results. It consists of loose to medium sandy silt from existing ground level until approximately 10m- 12m below ground. Beyond that, the soil is ranging from medium to stiff sandy silt until reaching to the rock head at about 26m - 33m below the EGL. The recorded ground water table from the piezometer reading is around 4m below the EGL.

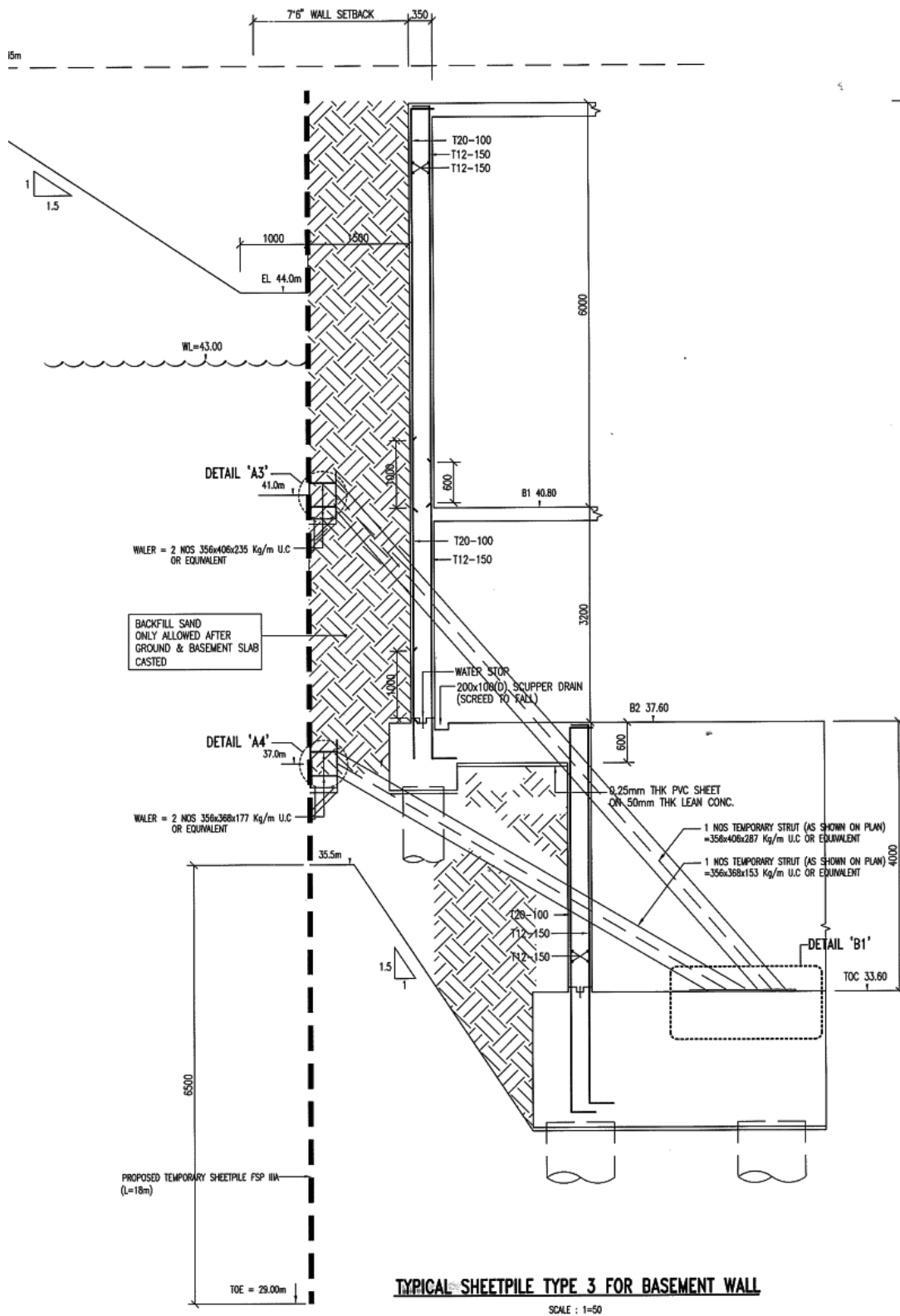
Average SI borehole diagram

Soil	Depth	Description	SPT value
	0.0m – 10.0m	Loose to medium Sandy Silt	0 – 10
	10.0m – 20.0m	Medium to Stiff Sandy Silt	10 – 20
	20.0m – 25.0m	Stiff to Very Stiff Sandy Silt	20 – 50
	> 25.0m	Hard Sandy Silt to Granite	> 50

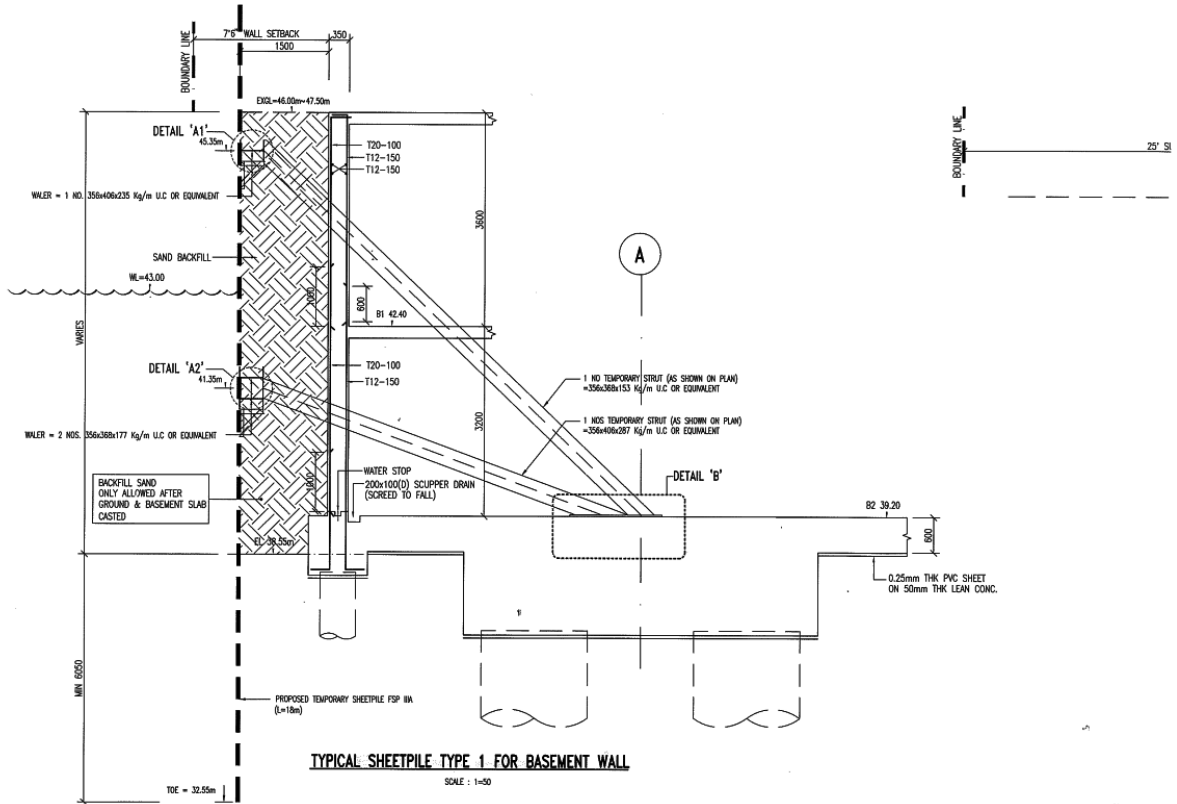
Design Information

The existing ground profile is on flat terrain approximately at RL 46.00m to RL 46.50m and the proposed lowest basement excavation level is at RL 36.95m and RL 38.55m respectively. Therefore, the lowest excavation depth is around 9.0m from the existing ground which taking into consideration of deep excavation for the adjacent pilecap and lift pit excavation too.

The original design is using sheet pile as temporary retaining system with diagonal strut to the lowest basement structure. For the area involving deep excavation for lift pit construction, double layer of sheet pile coupled with double layer of diagonal strut are proposed.

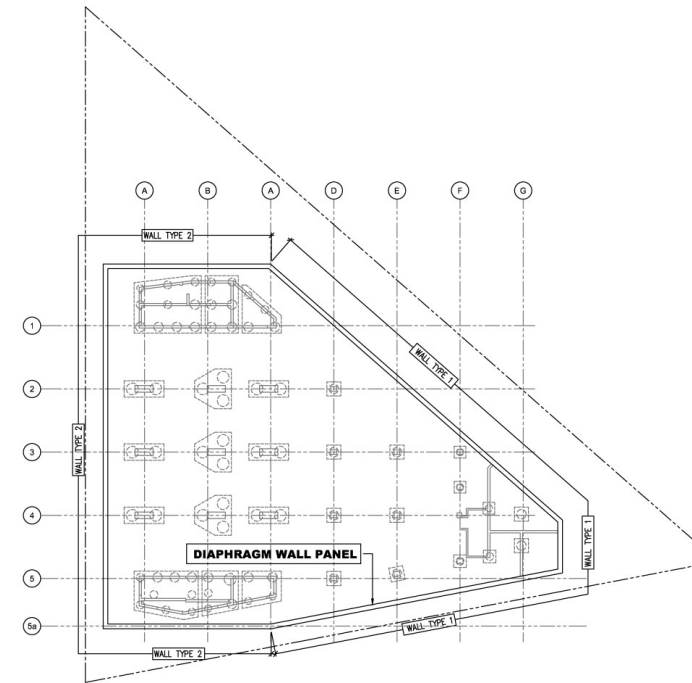


Typical Sheet Pile Type 1

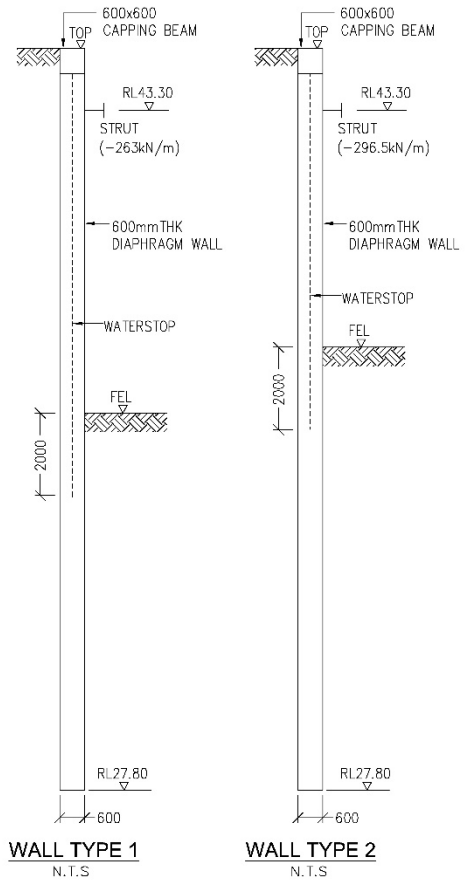


Typical Sheet Pile Type 2

In view of the flexibility of sheet pile in term of rigidity and the sensitivity of existing services to the ground movement, we have proposed a more rigid wall retaining system such as diaphragm wall (DW) system. Two type of diaphragm wall (Type 1 & Type 2) with same thickness of 600mm is proposed as a permanent retaining wall for the basement structure. The proposed DW is propped with single layer of steel strut and preloaded in order to control the displacement of the wall and settlement of the surrounding ground within the permissible value.



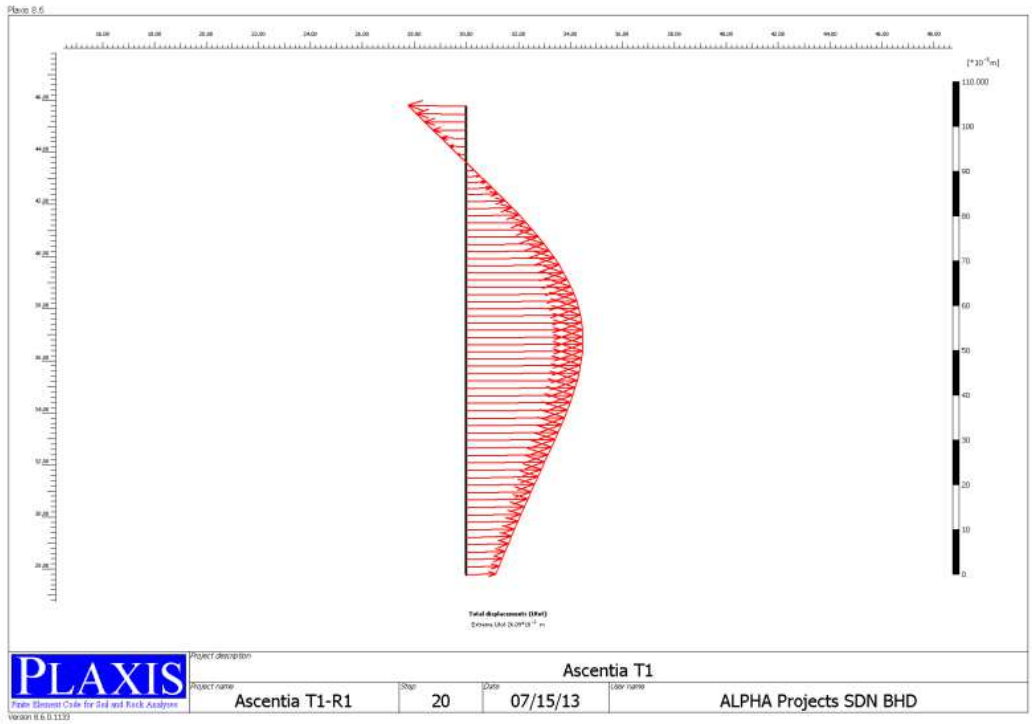
Diaphragm Wall Layout



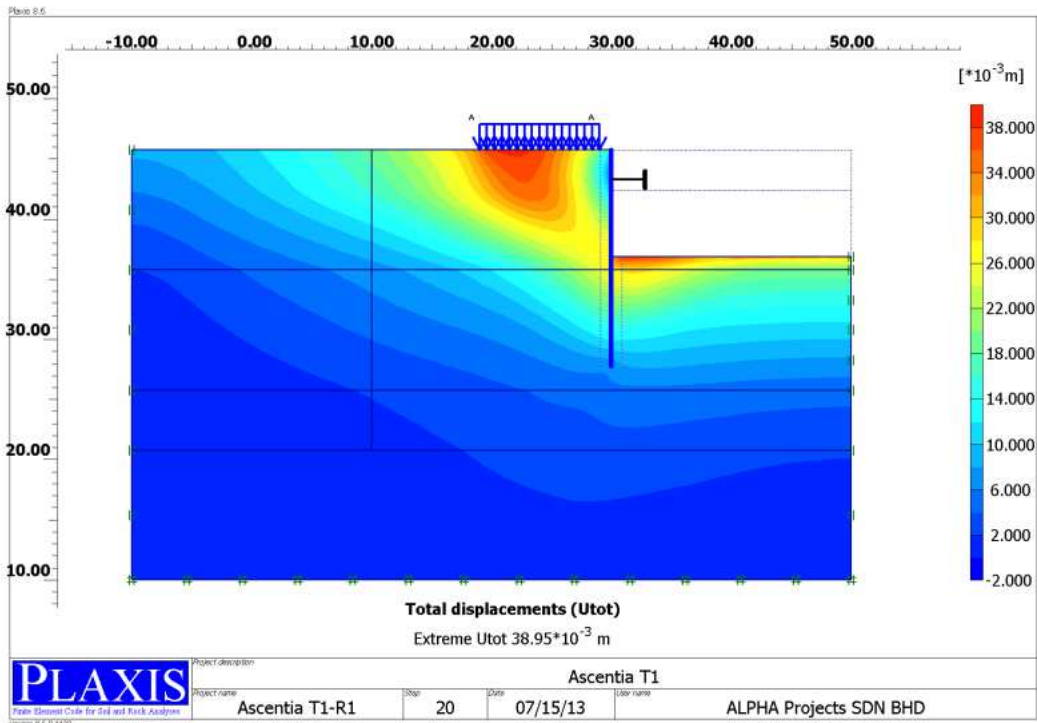
Diaphragm Wall Elevation View

Analysis Output

Append herewith ground displacement profile and wall displacement profile of DW from PLAXIS output:



Total Displacement



Total Displacement