MBJB Tower @Tebrau JB

Guide Wall or Diaphragm Wall Construction and Challenges

(By Patrick Lim, Assistant Project Manager) (2017 Jul-Sep)

Menara MBJB is a project development of the new headquarters of Johor Bahru City Council, its a building with 15 storeys office tower and 7 basement car park. This project is located next to Muzuim Tokoh Johor in One Bukit Senyum, surrounded by on-going project development of five-star hotel, tallest luxurious residential towers in Southeast Asia and shopping mall. Our work scope is to construct basement retaining wall which is diaphragm wall.

Figure 1 : Site Aerial View

<u>Knowledge to share from my first Diaphragm Wall project</u>

<u>Guide wall construction</u>

Prior to excavation of diaphragm wall panel, guide walls are constructed to act as temporary support to guide the diaphragm wall grab vertically and align the final diaphragm wall position. This temporary support is to provide support for the upper soil during panel excavation as the additional surcharge will be imposed from the grab rig movement. Guide wall need to be seated on a firm undisturbed ground to prevent collapse during wall excavation.

Diaphragm wall construction

During excavation, trench was filled up with bentonite slurry to protect the sides of the soil. Bentonite slurry forms an impervious cake like slurry and produce a great lateral pressure enough to retain the vertical soil. Bentonite is recycled and reused throughout the construction period and therefore tests need to be carried out from time to time to ensure bentonite properties are within the acceptable levels (density, sand content, viscosity and PH).

Bentonite slurry cleaning and desanding are carried out after excavation completed to reduce the concentration of sand suspended in bentonite slurry. If is not properly conducted, it may result in slurry pockets getting entrapped within the diaphragm wall concrete and can lead to excessive groundwater leaks.

After completion of desanding operation, stop end is placed into the trench prior to installing reinforcement cage. The purpose of stop end is to form an interlocking shape and watertight connection in between panels. Once the stop end is in place, then only the reinforcement cage can be lowered into position. Tight supervision is mandatory while reinforcement cage is being lifted as every single cage is approximately 10 tonnes and 21m long. Every reinforcement cage has to be hoisted in a balance manner for precise installation.

Figure 2 : Lowering 30m long stop end

Figure 3 : Lowering 21m long reinforcement cage

Placing concrete is done using tremie pipe to prevent segregation of concrete. When concrete is being poured, bentonite will be displaced and screened off in desander.

Challenges

Limited working space

In a very limited space concurrent with on-going foundation, earthwork excavation and strutting. Logistic planning has to be adjusted from time to time to suit site constraints and client's overall project timeline.

Extension of corner panel

Due to the restriction of boundary line, the DW extension corner panel P52 is now consist of a combination of three 'winged' panels (Figure 2) with 2 distinct reinforcement details and length (Type 1 and Type 2). The excavation depth was 49 meters for Type 1 and 38 meters for Type 2 respectively. In view of this deep and tricky configuration, the excavation was carried out in multiple bites, concurrent and in succession until 30m to facilitate the removal of 2 sets of 30m long Stop Ends. Subsequently Type 1 panel excavation continued to complete the required depth of 49m. Trench stability in this asymmetrical panel was a concern, extra care and precaution have been taken during excavation especially on the bentonite performance control.

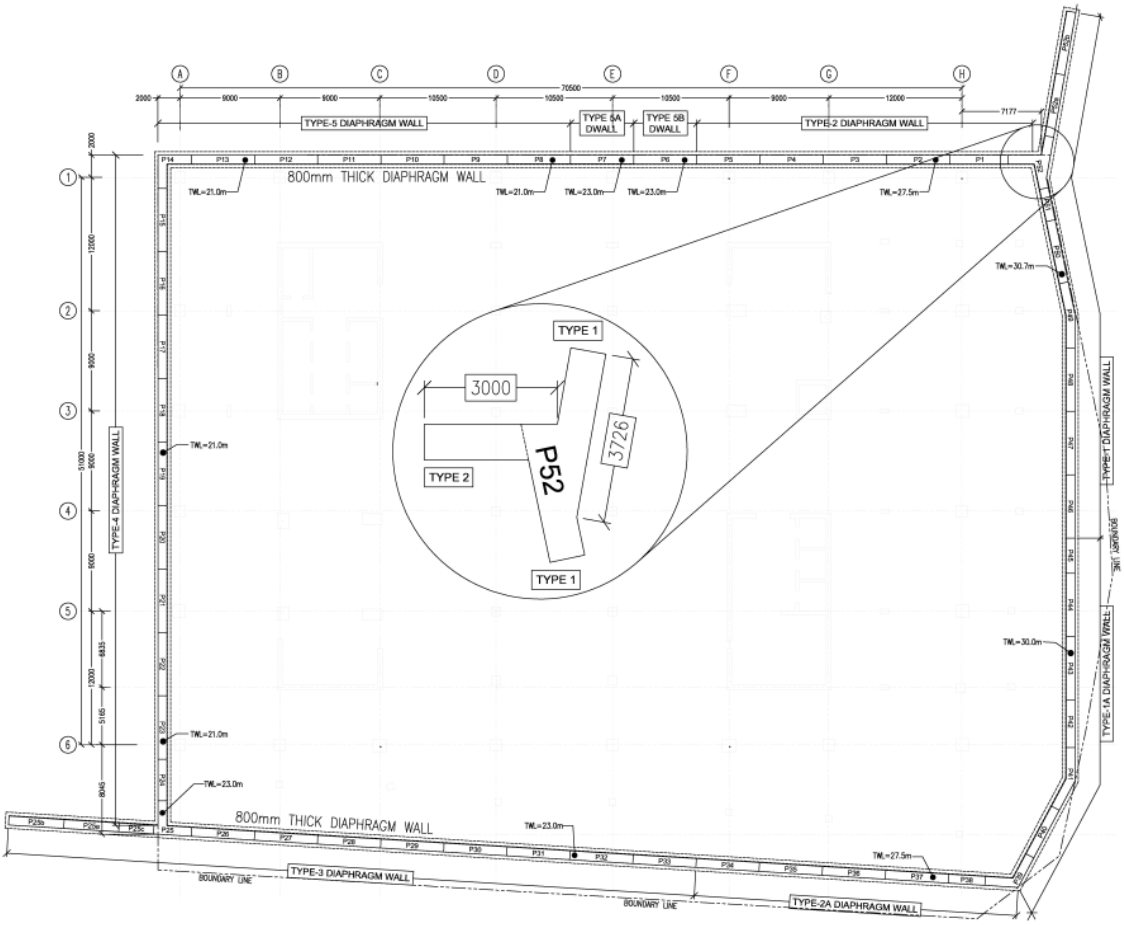

Figure 4 : Corner Panel (Three-Winged Shape)