

## Successful Collaboration A Foundation as Solid as Steel: CSC Holdings Limited

- With experience spanning four decades, CSC is one of the largest foundation and ground engineering companies in SEA
- Other than the private and public residential sectors, CSC has also established track records as a specialist foundation contractor for commercial projects like Marina Bay Sands, Singapore Sports Hub and The Seletar Mall
- The Seletar Mall project was an iconic endeavour for CSC, the appointed specialist foundation contractor

CSC Holdings Limited is one of the largest foundation and ground engineering group of companies in South East Asia. It was established since the early 1970s. CSC's core services include Design and Installation of Diaphragm Walls and Barrette Piles, Large Diameter Bored Piles, Driven Piles, Jack-In Piles, Micro Piles as well as Soil Improvement Works like Jet Grouting, Deep Cement Mixing, Soil Nailing and Ground Anchors. CSC's operations span across Singapore, Malaysia, Thailand and Vietnam.

In the third quarter of 2013, CSC established its newest subsidiary, CS Geo Malaysia Sdn Bhd, with an aim to further enhance the group's presence in the fast growing Iskandar development area within Johor Bahru. CS Geo (M) Sdn Bhd was awarded its first foundation contract by Tropicana Danga Bay Sdn Bhd, a subsidiary of Malaysian listed Developer Tropicana. This contract consists of Diaphragm Wall, Bored Piles, Pile Caps and Basement for the Bora Residences.

The turn of the decade saw a boom in both the private and public residential sectors. CSC has been part of numerous iconic projects in Singapore throughout the years. These include institutional projects such as the Singapore University of Technology & Design and ITE College Central Campus; commercial projects such as the Marina Bay Financial Centre; industrial projects such as Singapore LNG Terminal; various infrastructure projects including the Downtown MRT Line, Marina Coastal Expressway (MCE) and Tuas West MRT Extension Line; prestigious mixed development projects such as Punggol Waterfront; residential projects such as Cluny Residences and Sennett Residences as well as many HDB residential projects all over Singapore.

These projects have enabled CSC to be recognised as the leading specialist foundation contractor for large projects that include the iconic Marina Bay Sands, Singapore Sports Hub and The Seletar Mall.

The Seletar Mall is a family oriented mall that aims to create a comfortable and pleasant environment that encourages shoppers to spend longer quality time in the mall. The mall incorporates many environmentally-sustainable design features that include energy efficient mechanical and electrical systems; using only LED lights within the mall; lift cars and escalators with sleep mode function and carbon monoxide sensors in the car park to regulate demand for mechanical ventilation.

The Seletar Mall project was an iconic endeavour for CSC Holdings Limited, as the appointed specialist foundation contractor by the developers, a Singapore Press Holdings/United Engineers Limited joint venture. The project involved



The Seletar Mall, slated to open in end 2014.



Foundation works on site.



Artist impression of mall atrium.

a number of complex foundation works that included a combination of Diaphragm Walls as basement walls, large diameter Bored Piles and Barrette Piles with Plunge in Columns to facilitate top down basement construction method, all within a tight working area and adjacent to an LRT reserve. It required a very close coordination and concerted effort between two of CSC's subsidiaries, CS Bored Pile System and L&M Foundation Specialist.

The main activities on the site included:

- Installation of 92 nos. of large diameter **Bored Piles** (1,300mm to 1,800mm) as deep as 60 metres from ground level with plunge in column
- 1,200mm x 2,800mm **Barrette Piles** of 48 metres depths from the ground level
- Installation of Plunge in Column into fresh concrete of the bored/barrette piles with a single length of 24 metres long **Plunge in Column** in a single process
- 600mm & 800mm wide **Diaphragm Wall** up to a depth of 40 metres from ground level

"One of the biggest challenges we faced was carrying out the various foundation work simultaneously 6 metres away from the Land Transport Authority (LTA) LRT viaducts. This was achieved by deploying special machineries such as Low Headroom Machines (both diaphragm wall and bored pile machines) with physical barriers in place to restrict the movement of the machineries to minimize possible dangers posed to the operational LRT line.

The National Environment Agency (NEA) also imposed strict working hours of 7am to 10pm, due to residential flats surrounding the site. In order to complete the work on time, we deployed a total of two boring rigs, five diaphragm wall grabs, five cranes and three excavators to the small site (~8,790 m<sup>2</sup>) at the peak of the project. NatSteel's timely delivery of steel cages for casting work allowed for CSC to abide with LTA's strict rules and regulations of working up till 10pm.

Another of the challenges we faced was the space constraint due to the site being packed with machineries as both Bored Piling and Diaphragm Wall works had to run concurrently to meet the tight deadline specified in the contract. This challenge was greatly alleviated by NatSteel's off site pre-fabrication and just in time delivery of steel cages for the foundation elements as there was simply no room for storage of cages on site. Due to LTA's restriction of "no hot-work" within the LRT reserve; "U-Clips" were incorporated to the pre-fabricated cages to eliminate on-site welding, by joining individual 6 metres lengths of pre-fabricated rebar cages to form the required 40 metres length cage. To minimize fabrication work on site, all plunge in steel columns were also delivered to the site in single pieces of 24 metres lengths.

NatSteel should be commended for being able to meet CSC's requirements for this project i.e. Working within the time frame given and ensuring timely deliveries of steel cages based on our schedules. Had the cages not arrive on time, no casting could have been carried out, which would then result in knock on delays to subsequent activities. Both CSC and NatSteel personnel involved in the project were very proactive in ensuring sharing information early by keeping in constant contact with each other which ensured that the project was completed on time."

**Tan Yong Kwang**  
Senior Project Manager

"CSC and its subsidiaries have had an excellent working relationship with NatSteel for more than a decade. In recent years, the transparency and flexibility demonstrated by both CSC and NatSteel has served to strengthen the bond between both organizations and CSC hopes to continue this long standing partnership for many years to come."

**Jimmy Lim**  
Group Chief Operating Officer/  
Executive Committee Member  
of CSC Group

