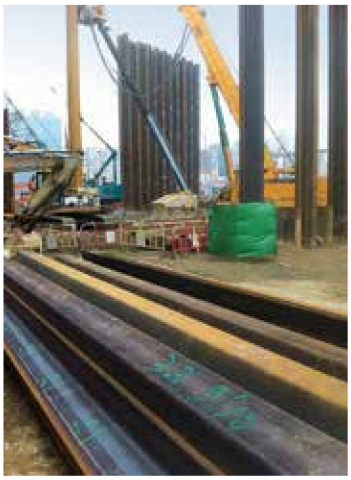
"High tech between tall towers"

Hong Kong – West Kowloon Terminus Station South



The Task

Sheet piles to be driven to depths of 35 m through filled materials and MDR (Moderately Decomposed Rock) layer.

The Challenge

- **Establishing a high-technology alternative to traditional pre-boring by the ODEX method and sheet piling with 12 m single piles**
- **Overcoming obstructions and boulders with little effort**

The Subsoil

The subsoil is composed of a matrix of filled material, gravels and boulders. At some locations, rock mounds and concrete blocks from the old seawall lie on top of the moderately decomposed rock layer.

The Method Chosen

Instead of the ODEX method, pre-boring is carried out by using the Double Rotary Drilling Method. This is the combination of an outer casing with a continuous flight auger. Both are driven into the ground in counter-rotation to loosen the soil. Then they are withdrawn by rotating in the reverse direction so that only a very small amount of soil is extracted. The casing diameter is 813 mm and the bore-holes do not overlap. Using the Double Rotary Drilling Method high capacity compressors are not required. If hard rock, boulders, or large obstructions cannot be drilled through using standard drilling tools, the casing shoe and the auger starter can easily be removed and replaced temporarily by a core barrel.

In this way, cased pre-drilling down to approx. 20 m is possible. Beneath this level down to 32 m, uncased drilling can be carried out by adding a 12-meter auger on top.

As a result, the sheet pile driving is made easier, obstructions and boulders can be overcome and vibration impacts on the environment and noise emissions are reduced.

Sheet piling works are carried out by a PVE Dieseko vibrator 40 VML. Using this high frequency vibrator with variable moment, performance is improved and unwanted external vibration and noise are both reduced, which means less impact on the environment. Accordingly sheet piles can be driven in pairs without difficulty. The carrier unit, a Liebherr LRB 255 rig with pull down (force: 400 KN), is able to handle double sheet piles with lengths of up to 27 m.

To fully benefit from these technological advantages, sheet piles must be prepared before feeding the LRB 255. A separate working team first assembles single piles in pairs and, in a second step, welds two pairs of 12 m to form elements of 24 m. This guarantees that the piling rig is fed without interruption. To reach the required final depth of 32 m, additional 8 m sheet pile elements are welded to the already driven 24 m piles.

For special deep foundation work in Hong Kong, the double rotary drilling method in combination with extended uncased pre-drilling and the driving of 32 m sheet piles in pairs is a fundamental technological advance. It enables an average daily production of approx. 300 m drilling meters and approx. 200 m^2 sheet pile wall.

Maximum profitability is combined with reduced impact on the environment.