SEAFCO, a specialist in deep foundation and piling work in Thailand since 1974, constructs small diameter and large diameter bored piles to suit the types of designed structures. Small diameter bored piles which cover sizes from 350mm to 600mm have a load capacity of up to 180 tons. The large diameter bored piles larger than 600mm in diameter and up to 2,000mm in diameter have a capacity to carry loads in excess of 1,500 tons. With its solid knowledge and experience in bored piling, and collections of up to date equipment SEAFCO can construct large diameter bored piles, as well as barrettes over 60m in depth. SEAFCO also provides design and build services for retaining walls with contiguous piles.

DRILLING EQUIPMENT

The drilling equipment used for bored pile construction are:
- Telescopic Kelly equipped with auger.
- Bucket auger on Kelly.

Selection of drilling tools depends on:
- Dimension of pile.
- Vertically.
- Site and ground conditions.
- Vibration limit.

Drilling in action for a 1.5m diameter bored pile.
SUBSOIL

Construction method and design of pile foundation are influenced by the subsoil conditions. The subsoil condition should be investigated in order to determine the soil parameters for pile design and selection of pile construction process such as wet or dry process.

DRILLING

The drilling of the borehole for bored piles is performed under the bentonite or polymer based slurry in wet process. A casing with an internal diameter the same as the pile shaft to be made, is installed by high frequency-low amplitude hydraulic vibro-hammer to protect top soil and soft soil layer. An auger drills inside the casing, transporting the soil simultaneously upwards out of the casing. Before reaching the bottom of the casing or water bearing cohesionless soil layer, slurry is introduced into the borehole. Then a bucket auger is used for drilling under slurry. For dry process, an auger or bucket auger is used depending on soil conditions without slurry.

STEEL REINFORCEMENT

When the required depth has been reached and the auger has been removed leaving the casing full of drilling slurry, the reinforcement cage with concrete spacers is placed in position. The reinforcement cage usually has a concrete cover of 75mm and clear spacing of 100mm between bars. Any sediment or loose soils at bottom of the borehole must be removed prior to installation of the reinforcement cage.
CONCRETING

Tremie method is used for concreting operation in wet process. Tremie pipes are lower into the depth and plug materials are introduced into the tremie pipe to avoid contamination of concrete with slurry prior to concreting. Concrete is generally poured up to 1-2m above the cutoff level of bored piles. The casing is then removed by extraction force with care not to disturb the poured concrete and the pile is completed.

GROUTING

SEAFCO provides pile base grouting and other grouting services. Pile base grouting with cement milk reduces settlement by compacting the contact area between soil and pile base.

PILE TESTING

Pile testing is carried out for design and construction quality assurance.
- Static or Dynamic load testing with or without instrumentation to determine the load bearing capacity and bearing characteristics.
- Sonic Integrity (seismic) test and sonic cross-hole logging to inspect the integrity of pile and concrete quality.
- Destructive test, if the pile quality is suspected, a continuous core sample is taken to check the quality.

Table: Typical pile sizes and working load capacities in Bangkok Subsoils.

<table>
<thead>
<tr>
<th>Diameter (m)</th>
<th>Perimeter (m)</th>
<th>Section Area (m²)</th>
<th>Working Load Capacity (ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.60</td>
<td>1.88</td>
<td>0.263</td>
<td>80-150</td>
</tr>
<tr>
<td>0.80</td>
<td>2.51</td>
<td>0.503</td>
<td>250-400</td>
</tr>
<tr>
<td>1.00</td>
<td>3.14</td>
<td>0.785</td>
<td>450-600</td>
</tr>
<tr>
<td>1.20</td>
<td>3.77</td>
<td>1.131</td>
<td>650-800</td>
</tr>
<tr>
<td>1.35</td>
<td>4.24</td>
<td>1.431</td>
<td>800-1000</td>
</tr>
<tr>
<td>1.50</td>
<td>4.71</td>
<td>1.767</td>
<td>1050-1200</td>
</tr>
<tr>
<td>1.65</td>
<td>5.18</td>
<td>2.138</td>
<td>1200-1500</td>
</tr>
<tr>
<td>1.80</td>
<td>5.65</td>
<td>2.545</td>
<td>1400-1600</td>
</tr>
</tbody>
</table>

*Note: Working load capacities depend on pile length, subsoil conditions, concrete strength, factor of safety adopted, type of supporting fluid used, etc.
PREFOUNDED STEEL COLUMNS
Staged construction methods such as top down construction methods are adopted for deep basement construction with retaining walls. Steel columns are installed with adequate embedment in single bored piles during piling work to support parts of building structure which has been constructed before excavation reaches the basement formation level. Installation of steel columns accurately in position is done by using SEAFCO adjustable guide frame.

Installing steel reinforcement cage sections for a diaphragm wall panel with pile leg.

BARRETTEs
SEAFCO also provides barrettes (rectangular/strip piles) as an alternative to bored piles to suit the design requirements. Various shapes of foundation elements such as L, T, H, + and overall foundation layout can be formed and arranged with barrettes.

PILE LEGS
SEAFCO also provides bored pile legs under cast in situ diaphragm wall panels as part of foundation system to meet the design requirements. After excavation of a diaphragm wall panel under bentonite slurry, bored piling proceeds. The pile leg and diaphragm wall panel are cast as a single element after installation of reinforcement cage.

General view of bored piling: Siam Paragon Project.

QUALITY CONTROL
Quality control generally covers the following:
- Slurry quality, verticality and dimension of borehole during drilling.
- Borehole base cleaning by slurry recycling under bentonite slurry or using cleaning bucket under polymer slurry.
- Position of reinforcement cage and connection.
- Concrete quality, volume and pouring rate during concreting.