

SPECIFICATION FOR PILED EMBANKMENT

1.0 GENERAL

This specification shall be used for ground improvement purposes only. In piled embankment, the pile acts as settlement reducer and stiffening of subsoil.

2.0 SCOPE OF WORKS

The work comprises the provision of all labour, materials, tools, transportation, instrumentation, etc. necessary to construct the piled embankment in accordance to the Drawings and to the quality standards set in the specifications, inclusive of material and performance tests where these are specified.

The work shall cover the following:

- (i) Supply and install piles to the pile lengths as specified in the Drawings.
- (ii) Strip pile to cut-off level and check pile eccentricity at cut-off level.
- (iii) Construct reinforced concrete slab as per the details in the Drawings.
- (iv) Carry out integrity tests and High Strain Dynamic Load Test on working piles as specified.

3.0 PROVISIONAL NUMBER OF PILES

The provisional number of piles is shown in the tender drawings. The actual number to be installed may vary from this contract. The Sub-Contractor shall allow in his tender for variation in the total number of piles to be installed up to 10% of the provisional number specified at tender stage.

4.0 EQUIPMENT AND LABOUR

The Sub-Contractor shall provide all frames, equipment, lifting devices and labour necessary for the installation of piles.

The Sub-Contractor shall satisfy the S.E. regarding the suitability, efficiency and operational capability of his piling equipment. The Sub-Contractor shall be required to provide adequate numbers of operational piling frames to ensure that the works are completed within the time period stipulated in the approved construction programme. The Sub-Contractor is deemed to have made provision for the availability of standby plant at all times to allow for the contingency of equipment failure. Equipment found to have a consistent record of breakdowns shall be removed from the site.

The S.E. shall order the removal or replacement of any equipment or staff whenever he is of the opinion that such equipment or staff is not suitable for the works. The Sub-Contractor shall comply with the S.E.'s instructions on these matters without extra cost or time to the contract.

5.0 SETTING OUT

The Sub-Contractor shall provide all labour, pegs, rods, survey instruments, concrete posts etc needed for setting out the works. The Sub-Contractor is to ensure that boundary marks defining the limits of the Employer's property are in their correct positions and shall employ a licensed surveyor to check the accuracy of these positions. The Sub-Contractor shall be

responsible for setting out the works from the drawings and boundary marks. The Sub-Contractor shall be responsible for safeguarding the position and level of all reference pegs, boundary and benchmarks used for setting out the works.

The Sub-Contractor shall obtain the S.E.'s prior agreement on the locations and numbers of reference baselines and datum levels required for setting out of piles. The Sub-Contractor shall engage a licensed surveyor to set out on site the positions and levels of each pile.

The Sub-Contractor shall obtain the S.E.'s prior agreement on the locations and numbers of boundary marks. The system of boundary marks shall be employed for cross-checking. Boundary pegs shall be maintained in good condition at all times. While such pegs may be removed temporarily at localised zones to facilitate construction, the Sub-Contractor shall re-install them at the earliest possible time. Boundary pegs shall not be removed without prior consultation with the S.E.

Checking by the S.E. does not in any way absolve or reduce the Sub-Contractor's responsibility to ensure the accuracy of the setting out.

6.0 PILE POSITION TOLERANCE

Ground level refers to the level at which the piling rig is stationed for installation of pile. The tolerance limits specified under this clause shall be taken to apply to pile eccentricities measured at pile head cut-off level. However, an additional tolerance of pile head cut-off below ground level may be allowed by taking into account the permissible deviation in pile verticality between ground and cut-off levels, subject to agreement by the S.E.

The maximum permissible deviation of the centre of each finished pile shall be 75 mm in any direction from the true position of the same pile.

The verticality of each pile shall not deviate at any point below the ground by more than 1 in 75 from the true vertical position.

The Sub-Contractor shall employ a licensed surveyor who shall follow up directly from the stripping of pile to cut-off level to check the eccentricity of pile positions as compared with the positions indicated on the pile layout drawings. If any pile has been installed in a position or verticality not within the specified tolerance, all expenditure to remedy the work shall be borne by the Sub-Contractor. The S.E.'s decision in this regard shall be final.

7.0 FORCIBLE CORRECTIONS

Forcible corrections to the as-installed positions of working piles shall not be permitted in this contract.

8.0 ADJACENT PILES

Piles shall be installed in such a manner as to ensure that no damage is sustained by previously installed piles in adjacent position.

9.0 FAULTY PILES

Any piles cracked, deformed or twisted during installation or testing or otherwise damaged in any way, or not installed within the specified position or verticality tolerance, or failed the specified load tests shall be classified as faulty piles.

Faulty piles shall be rejected at the discretion of the S.E. and replaced or supplemented with substitute piles by the Sub-Contractor at his own expense. At the sole discretion of the S.E.,

any required compensating pile shall be constructed to a modified design proposed by the Sub-Contractor to account for the variation in pile position or alignment. The cost and time of replacement, including all direct and consequential costs in modifications required, shall be borne by the Sub-Contractor.

10.0 STRIPPING OR CUTTING OF PILES TO CUT-OFF LEVELS

Stripping of piles to cut-off level specified in the drawings shall be carried out by the Sub-Contractor.

Starter bars are sometimes provided as per Drawings for hollow section precast pretensioned spun piles. The Sub-Contractor shall cut the pile head with mechanical cutter to form flush cut surface and construct the starter bars bonded to the annulus of the hollow section precast spun pile as per Drawings. In the S.E.'s opinion, if the pile is defective, the Sub-Contractor shall carry out his own expenses on all necessary remedial work as required by the S.E.

11.0 CLEANING UP

The Sub-Contractor shall propose to the S.E. the frequency of his periodic removal of debris from the Site in the course of the work. The Sub-Contractor shall adhere strictly to the agreed program of debris removal and the S.E. reserve the right to instruct the Sub-Contractor to increase his frequency of debris removal at no extra cost to the contract.

Upon completion of the work, all unnecessary plant, cut-off piles, rubbish and debris resulting from the piling operations shall be removed from the Site within a reasonable time agreed with the S.E. Reasonable time is deemed to be the minimum time which the Sub-Contractor can justify to demobilize his plant and arrange the transportation of plant and waste materials off-site, provided always that ensuing construction operations are not hampered as a result of this arrangement.

12.0 PILE LENGTH

All piles shall be installed to the design pile length as specified in the Drawings. In any case, If a particular pile could not be installed to the design pile length, the Sub-Contractor shall inform the S.E.

Where applicable in the contract, the Sub-Contractor shall be paid only for the length of installed pile measured from toe of the pile to the pile head cut-off level. The Sub-Contractor shall make provision in his unit rate for condition of piling commencement level other than the cut-off level.

13.0 MARKING OF PILES

Piles shall be indelibly marked following installation to show their identification number, length and date of installation.

14.0 AS-BUILT DRAWINGS

After the completion of the piling, the Sub-Contractor shall submit an as-built drawing of the pile layout. This drawing shall be prepared by a licensed surveyor. It should include the following:

- a) Location marking of piles.
- b) Size and type of piles.
- c) Eccentricities of piles in both directions.

- d) Depth of penetration of each pile or reduced level of toe of each pile and cut-off level of each pile.

15.0 PILING RECORDS

Complete piling records shall be kept by the Sub-Contractor during pile installation. The Sub-Contractor shall submit in duplicate the following information to the S.E.:

- a) Signed records of all piles as the work proceeds. Individual pile records shall be submitted not later than noon of the next working day after the pile was installed. The signed records shall form a record of the work. Any unexpected installation conditions shall be noted in the record.
- b) Upon completion, compile a record of the work as carried out and as-built drawings. The drawings shall be prepared and endorsed by a licensed surveyor.

The format of the record shall be approved by the S.E. and shall contain but not be limited to the following information where applicable:

- Pile Location Mark
- Pile Type
- Pile Size
- Date and Time of Installation
- Pile Reference
- Driving Record (penetration & blow count)
- Combination of Pile Lengths
- Weather Condition
- Ground Level Before Commencement of Pile Installation
- Working Level of Ground for Pile Installation
- Depth from Working Level to Pile Toe
- Level of Pile Toe
- Pile Cut-off Level
- Depth from Cut-off Level to Pile Toe (Pay Length)
- Type and Model of Plant, Equipment

All records shall bear the names of person who records and person who checks.

16.0 CONSTRUCTION OF REINFORCED CONCRETE SLAB

The reinforced concrete slab shall be constructed as per the details in the Drawings and the Specification for Reinforced Concrete works.

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