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Specification for Geotechnical Site Investigation for Piling

1.0 General

1.1 The Ground Investigation shall be carried out in accordance with BS5930, the 'Code of Practice for Site Investigation', the 'Specification for Ground Investigation' published by the Site Investigation Steering Group. Each investigation shall be carried out under the guidance of a Chartered Engineer or Chartered Geologist with relevant geotechnical experience. The objective of the investigation is to provide information to allow the design of various pile types.

1.2 Our Ground Investigation will not provide geotechnical parameters from laboratory tests in line with Eurocode guidance in table 2.3 of BS EN 1997-2. The nature of screw piling is such that the piles are effectively tested upon installation by measuring the torque readings, hence providing greater confidence. The additional expense involved in undertaking the laboratory test required to be fully compliant is seen to be unbeneficial. As such characteristic design values, as defined in BS EN 1997-1, will be taken as a cautious estimate of the value affecting the occurrence of the design limit state, for screw piling this will be a "lower bound" value with a probability of a worse governing value being no greater that 5%. In some cases, laboratory testing may be carried out, in these cases testing will be compliant with BS EN 1997-2.

2.0 Desk Study

2.1 Prior to commencing work on site, a desk study shall be undertaken to establish expected site ground conditions and potential site hazards. This should include, but not be limited to, a study of existing archival and current geological mapping, a review of published geological information from nearby investigations and BGS borehole records. UXO and Coal Authority reports may be required if indicated by the other desk study items. If unusual features are anticipated this should be reported to FLI Structures prior to mobilisation to site. The desk study may also help determine the appropriate drilling equipment, so ensuring the requirements of this Specification are met.

2.2 The scale of the desk study shall vary according to the types and characteristics of the ground likely to be encountered; the availability and reliability of existing geotechnical information about the site; and the category, size, type and cost of the structure being designed.

3.0 On Site Investigation

3.1 In some cases, the desk study maybe sufficient if existing information including geotechnical parameters and the ground water regime are well known. However, unless otherwise stated, the following minimum investigations shall take place in all cases.

3.2 At each borehole location provide:

- The borehole location in OS co-ordinates and height above Sea Level
- Standard Penetration Tests (SPT) in strict accordance with BS1377 at a maximum of 1.0m intervals, to a depth of 10m unless otherwise instructed
- Description of each strata encountered shall be recorded in accordance with BS5930
- If groundwater is encountered, drilling operations should be suspended for 20 minutes and the resulting rise in water level recorded at 5-minute intervals
- Hand Vane shear tests are optional

A representative sample from the within the top 1m of the profile shall have the following laboratory tests done:

- PH
- BRE SD1 Sulphate Suite
- Generic soil contamination suite for assessing risk to human health
- Asbestos screen and ID

  On occasion the following tests may be specified. Otherwise, they can be omitted.
- *Where Specified* - Direct shear box testing in Laboratory conditions at depths specified by FLI
- *Where Specified* - Bacteriological Testing, Plasticity, liquid limit and swelling clay content laboratory tests at depths specified by FLI

FLI structures
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3.3 The findings of the desk study should dictate the technique or techniques suitable for the ground investigation. In all cases boreholes, DCP's and Window Samples shall be sunk to a minimum of 10m below ground level unless specified otherwise under instruction from FLI. Where the technique is not specified Boreholes shall be performed using shell and auger cable percussive techniques.

3.4 For windowless sample boreholes, where refusal occurs before depth, a dynamic probe shall be undertaken adjacent to the location to a depth of 10m. Small track mounted dynamic sampling rigs may be used.

3.5 For sites where high axial loads are expected (>75 kN working load), if soil strengths of less than SPT N=15 are encountered at 10m depth, then the borehole should be extended to a depth where testing yields consistent soil strength parameters of N $\geq$ 15, for a depth of at least 2m.

3.6 If soil strength parameters are below those specified at depths greater than 15m then this must be reported to FLI Structures for further instruction.

3.7 In cases where a Dynamic Penetration Tests are used the test will be conducted using either DCP Heavy or DCP Super Heavy only, at the locations of the proposed helical piles. The tests shall be carried using equipment and procedures in strict accordance with BS1377. In particular a disposable cone must be used, and rod friction (torque required to turn driving rod) must be recorded at every 1m interval. The presence/depth of smearing/moisture on the extracted rods shall be recorded. DPC Light and Medium tests shall not be used without prior authorisation from FLI.

3.8 Micropile Sites – For sites where either Micropiles are specified beforehand, or where bedrock is expected to be struck at shallow depths (≤5m BGL), Rotary Coring or similar will be required. The borehole should be at least 10m deep, but the result of the desktop study should inform the depth required to penetrate bedrock for at least 5m.

It is necessary to find the Unconfined Compressive Strength (UCS) of the bedrock/underlying strata as part of the investigation. This should be obtained through Triaxial testing or similar. These tests should be conducted at 1m intervals for the top 3m of bedrock (or beyond SPT refusal) and then at 3m intervals or at any significant change in strata.

For the soils overlying the bedrock SPT testing is also required.

4.0 Reporting

4.1 Reports shall include a site location plan showing exploratory hole locations and any features that may have an influence on the pile's performance. Digital photographs shall be taken to record this information and included in the report. Exploratory borehole logs should be provided clearly indicating what methods/techniques were used and compliance with appropriate standards. The reporting of SPT and DCP results should be in strict accordance with BS1377. The desktop study shall also be included.

4.2 The results of the laboratory test results shall be included in the report, testing shall be in accordance with the relevant parts of BS 1377.

4.3 Soil contamination reports shall be compared to the Environment Agency Soil Guideline Values (SGV) and indicate any potential health hazards.

4.4 Any factors, including visual observations, that may give rise to accelerated corrosion of steel piles shall also be noted in the report.

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Stages and Decisions when obtaining GI data: