



GROUND TECHNOLOGY



Cable Percussive Boreholes

We operate a fleet of cable percussion borehole rigs, towed by 4X4 support vehicles throughout the UK using our own NVQ qualified and BDA accredited staff. The purpose of boreholes can range from installing wells for monitoring and/or sampling groundwater, ground gas and ground movement, to obtaining geotechnical properties of the soils to assist in the design of deep foundation solutions.

Using this drilling method, we are able offer a range of disturbed and undisturbed sampling for logging, inspection and laboratory testing purposes. Our undisturbed sampling methods include thin-walled piston sampling in soft sensitive soils and thick walled open drive (U100) or thin walled open drive (UT100) samples in stiff overconsolidated formations. A range of insitu testing can also be completed as the borehole progresses, including Standard Penetration Testing, Shear Vane and Permeability Testing.

In addition to recovering samples for geotechnical testing, cable percussive boreholes can also obtain environmental samples for chemical analysis.

Cable percussive boreholes offer a cost effective way of drilling within a variety of soils ranging from low strength alluvium very stiff over consolidated clays, very weak to weak rock and dense granular soils. Cable percussive boreholes are also capable of advancing boreholes through various Made Ground soils, including engineered fill and landfill materials where obstructions can be encountered. Within suitable ground conditions borehole depths of up to 50m can be achieved.



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Dynamic / Window Sampling

Window sampling techniques offer a way of investigating sites with difficult access or where a high volume of shallow soil samples or monitoring standpipes are required. They are typically suited to environmental applications, but can be used for geotechnical projects where access limits the use of other methods. We are able to carry out window sampling using our own tracked Dando Terrier 2000 rigs, wheeled Geotool rigs or hand held equipment. The Terrier and Geotool rigs are also capable of undertaking Heavy and Super Heavy dynamic probing.

Our tracked rigs are small enough to be driven through doorways / side gates, and are also capable of tracking up slopes of up to 35 degrees. We have developed bespoke systems for working on very steep slopes (with the rig attached to long reach excavators or telehandlers) and also have specialist equipment to enable our rigs to be cantilevered over voids for specialist applications. For more detail information see our restricted access section.

Window sampling involves driving cylindrical steel tubes (In 1m sections of up to a maximum diameter of 113mm) into the ground. Each successive tube recovers the soil it is being driven through as disturbed "core" samples retained in plastic liners. This is suitable for logging and taking environmental samples. In certain ground conditions, depths of up to 12m can be achieved using this method, although depth ranges of 3m to 7m are more common. In unstable ground conditions, duplex casing systems are also available to allow boreholes to be advanced while preventing collapse of unstable sections. Insitu SPT's can also be performed in order to assess relative density of granular soils and provide a guide to strength of cohesive material. We also have the facility to obtain undisturbed samples within cohesive soils to allow geotechnical lab testing.



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Rotary Boreholes

Using our in-house rotary drilling capability, we are able to offer a variety of highly versatile drilling solutions for a wide range of applications. This enables us to employ a variety of techniques in the same borehole, eliminating the need for mobilising different rigs to investigate sites with soils overlying rock strata. All of our rotary drilling staff have an NVQ in land drilling for rotary techniques and are BDA accredited.

Rotary drilling is ideal for any application, ranging from simply forming boreholes (in which to install monitoring instrumentation) to very high quality coring using a variety of core bits, flush media and barrel configurations to suit ground conditions. Most of our rotary work makes use of our Beretta T41 drilling rig, which is compact yet very powerful. Our rotary capabilities include:

Hollow Stem Auguring up to 20m depth. Simultaneous sampling is available if required. Up to 200mm diameter.

- Rotary Open Hole Drilling up to 80m depth. Up to 200mm diameter.
- Down the Hole Hammer (DTH) up to 80m depth. Up to 200mm diameter.
- Rotary Core Drilling up to 60m depth. Up to 100mm diameter.

- Dynamic Sampling (window sampling) up to 20m depth. Up to 113mm sampling in 143mm diameter cased hole.
- Simultaneous casing while drilling using 150mm Symmetrix system. 150mm casing installation up to 15m depth.

Flush Capabilities including:

Air Air-mist
Water Foam
Polymer

Insitu testing capabilities including:

Standard Penetration Testing
Undisturbed Sampling (Thin and Thick Wall)
Packer Permeability Testing
Variable and Constant Head Permeability Testing
Borehole Vane testing

We are also able to hire a variety of drilling rigs enabling us to undertake a variety of deeper and larger diameter boreholes, including water well and geothermal drilling applications.



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Trial Pitting

Trial pits and trenches can be carried out using a variety of excavation plant or by hand digging methods. Observation pits and trenches are logged by appropriately experienced engineers with a thorough knowledge of soil description, geology and soil mechanics.

Machine Excavated

Machine excavated trial pits are used for rapidly obtaining bulk samples of granular materials and detailed logging of the exposed excavation faces. Trial pits are ideal when close visual examination of the soils is required; particularly with respect to recording visual features such as assessing the extent of organic contamination or tracing buried structures and obstructions. Machine excavated trial pits are able to provide exceptionally economic coverage of shallow ground conditions on large sites and are suitable for foundation assessment for most low rise structures. However, advancing trial pits below the groundwater table or in dry unstable soils is usually problematical.

A variety of excavators can be used depending on the final depth required and the access restrictions on the site. Depths of up to 5.00mbgl can be achieved with a 360 type tracked excavator in suitable ground conditions. We are also able to perform a range of insitu tests in excavated pits, including plate bearing tests, CBR tests, soakaway tests and strength testing using hand held shear vanes.

Although entry into excavations by personnel should generally be avoided where possible, entry into a trial pit might be required to obtain block/undisturbed samples or to undertake further works or tests. In these situations we are able to provide suitable shoring, such as a trench box which can be lowered into the pit.

Hand Excavated

Hand excavated trial pits are usually undertaken to: obtain shallow environmental or disturbed samples, expose shallow foundations to structures (or other shallow sub-surface features) or identify buried utility cables. We excavate all hand pits using insulated hand tools.



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Dynamic Probing

Dynamic probing can be used to rapidly profile the relative penetration resistance of the ground between boreholes, on sites with limited access or within buildings. It is particularly useful for identifying voids or areas of weaker strata in the soil profile. The test involves driving a standard cylindrical sacrificial or fixed cone into the ground using a percussive hammer.

We are able to undertake dynamic probing using either our tracked Dando Terrier or wheeled Geotool rigs. Different configurations can be used depending on the ground conditions and the purpose of the dynamic probe. Although we can offer different testing configurations, the most common standards we use are Heavy (DPH) and Super Heavy (DPSH-B) arrays. The tests are carried out to BS EN ISO 22476-2, which requires the energy efficiency ratio to be measured for each hammer. All of our rigs have been tested in accordance with this standard.

The cone is driven into the ground attached to the leading end of a 1m long steel rod. On each successive metre of driving a new rod is added and the driving process continued, until refusal or the required depth is reached. The number of blows taken per 100mm of penetration is recorded along with a torque reading after every metre.

The results obtained from the dynamic probe can be correlated to the Standard Penetration Test 'N' value for granular soils and the undrained shear strength of cohesive soils, using published empirical correlations.



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Cone Penetrometer Testing

Cone Penetration Testing (CPT) is an advanced method of obtaining geotechnical engineering properties of the soil by directly measuring the penetration resistance of the ground, local sleeve friction and pore pressures using electronically instrumented cones. The tests are able to rapidly determine the soil type and layering, allowing an accurate interpretation of the materials encountered. In good conditions on accessible sites it is possible to test between 100m and 150m in a single day. The results obtained can be directly correlated to a number of geotechnical parameters however; soil samples cannot be obtained while measuring penetration resistance. Other methods are therefore required if sampling and direct description of the soil profile is necessary. Samples can be obtained using pushed sampler barrels, but these need to be pushed in discreetly at selected layers.

The testing process involves “pushing” a cone vertically into the ground using hydraulic rams mounted on wheeled drive trucks or track mounted rigs. The cone is pushed into the ground at a constant rate of penetration (20mm per second). An electrical current is utilised to make measurements of resistance at the cone tip and friction behind the cone on the sleeve. Commonly pore pressure (piezocone or CPTu) is also recorded during this process, which allows better interpretation of the data. The measurements are then used to produce a graphical representation of the underlying soils. Pore pressure dissipation tests can be carried out using the piezocone allowing the calculation of soil permeability.

More advanced cones have recently become available which allow a wider range of soil properties and characteristics to be observed and estimated. We are able to provide a range of cone testing services through an approved specialist contractor.