geotechnical and environmental consultants

ground&water

Geotechnical – Foundations

Foundation Solution Proposals

Foundations provide support for structures, transferring their load to layers of soil or rock that have sufficient bearing capacity and suitable settlement characteristics to support them. There are a very wide range of foundation types suitable for different applications, depending on considerations such as:

- The nature of the load requiring support
- Ground conditions
- The presence of water
- Space availability
- Accessibility
- Sensitivity to noise and vibration.

Very broadly, foundations can be categorised as shallow foundations or deep foundations:

- Shallow foundations are typically used where the loads imposed by a structure are low relative to the bearing capacity of the surface soils
- Deep foundations are necessary where the bearing capacity of the surface soils is not adequate to support the loads imposed by a structure and so those loads need to be transferred to deeper layers with a higher bearing capacity.

Our experienced team of engineers and geologists can help provide a good quality ground investigation focussed on obtaining information appropriate to both the geological/geomorphological setting of the site and the proposed development and therefore enable the most appropriate foundation solution be determined.

Preliminary Pile Loads Proposals

Traditionally a piled foundation scheme would have been reserved for large high-rise developments, which required the support of a substantial heavy load upon its foundations. A piled foundation scheme however is not solely reserved for the behemoth city skyscrapers, due to a number factors concerning a site's ground conditions, piling can be employed for even the modest one-bedroomed suburban dwelling.

Scenarios when a piled foundation scheme is recommended:

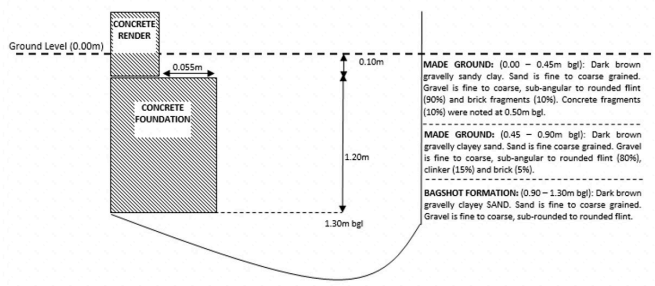
- A high water table causing instability and settlement issues
- Concentrated heavy loads on weak soils
- Unstable and/or variable ground conditions
- Required minimum foundation depths are >2.50m below ground level
- Proposed removal of trees from footprint of development.

Before any piled foundation scheme is adopted, a preliminary pile load proposal should be produced. This report discusses the ground conditions underlying the site to provide preliminary information regarding underlying soil profile, indicative bearing capacities, required depth of piling and settlement/ heave analysis. The preliminary pile load proposal minimises the risk by investigating any uncertainties about the underlying ground conditions. Preliminary pile load proposals can then be provided to your Structural Engineer for a preliminary pile layout. This will ultimately be confirmed by the pile installer.

Foundation Exposures

The excavation of foundation exposures is ideal for determining the foundation depth at a particular location, as well as establishing the ground conditions under an existing building/ structure. It can also provide information on building subsidence and foundation deterioration.

An example of a foundation exposure can be seen to the right. It can be used to determine the building materials used. i.e. If the building has concrete or brick foundations. Soil samples can be taken and tested for any contamination risks that may be harmful to human health.



Additional Loading Assessments on Foundations

When designing foundations, the safe bearing capacity is one of the main considerations and must therefore be assessed thoroughly, particularly when additional loading occurs. Additional loading may come in the form of adding a vertical or lateral extension to a building. When this occurs, an assessment of the new safe bearing capacity of the existing foundations must be carried out to ensure a safe structure.

In order to accurately model these processes, Ground & Water uses software such as PDisp and GeoStru. Both can be used to model additional loading and when used together can create an accurate model of bearing capacity and settlement.

Modelling additional loading with GeoStru can be carried out in two ways: Calculating total load (existing + additional), which requires the assumption that no settlement has occurred, or calculating additional load, which requires the assumption that all settlement has already occurred.

Modelling additional loading with PDisp can be carried out by calculating the current soil displacement for the existing foundations, then modelling the additional and existing loads, which give you a new total soil displacement. Since PDisp considers realistic settlement and is based on elastic analysis, it could be considered to provide a more accurate model of additional loading.

Between these two models, assessing the effects of additional loading on foundations can be done with accuracy and efficiency.

Bearing Capacity Assessment and Settlement Analysis

Bearing capacity is the maximum load that can be applied onto the soil before shear failure or uncontrolled deformation occurs. Knowledge of the bearing capacity of the soils on a site, is crucial in order to safely and adequately design suitable foundations that prevent shear failure or excessive deformation of the soils from occurring. Ground & Water can provide accurate assessments of shallow and deep bearing capacities using a variety of methods including ground modelling, plate load testing or standard penetrometer tests (SPT's).

Settlement Analysis - When loading a foundation, additional pressure to the underlying soils causes settlement and subsequently when a load is removed, heave may be the result. Settlement is the vertical displacement downwards of soil, whereas heave is the vertical displacement upwards. Settlement and heave both occur in short- and long-term periods. At Ground & Water we use PDisp and Geostru software to accurately model these processes.

Geostru uses widely accepted parameters to model a ground profile collected during a site investigation. We create soil profiles based on these parameters and the information gained during

the site investigation to create a model. We then model foundations based upon dimensions and loads provided and find a bearing capacity as well as determining the expected settlement/heave.

PDisp models the elastic properties of soils encountered on-site, as well as the addition and removal of loads. Once analysed, horizontal and vertical soil displacements can be viewed in graphical and tabular form. Soil displacements generated by PDisp are purely based on load/s removal and the elastic properties of soils encountered.

Piling Mat Design

A piling mat is a temporary working platform on which piling rigs and other ground treatment machinery can operate. The piling mat should be designed and constructed in accordance with the requirements of BRE Report BR470.

Pile Mat design can be facilitated following the determination of the density or shear strength of the shallow sub-surface soils either via insitu geotechnical testing, like plate load tests or SPT's (see 'Geotechnical Tests and Methodology Explained' fact sheet).

Piling mat design depends on the ground conditions and loadings. Piling mats are typically constructed using well-graded stone, clean-crushed concrete, or crushed hard rock. Recycled demolition material can be used if the metal and timber debris are removed. They need to be compacted in layers and be free-draining to prevent any build-up of water or slurry on the surface. On sites with a high water table, a membrane will prevent the migration of fine-grained soils.

Inspections must be undertaken by a competent individual following construction to formation level. This inspection must be recorded, including photographic evidence.

Our experienced team of engineers are on hand to design your piling mat.

If you require any of the services described above, please email:
enquiries@groundandwater.co.uk
or call us on 0333 600 1221