FOUNDATIONS, TREES AND CLAY

Introduction

It has long been known that trees cause clay soils to shrink by withdrawing water through their roots in summer.

Changes in the moisture content of clay soils causes shrinkage or swelling, commonly known as heave, which in turn can cause cracking and movement of foundations, floor slabs and hence damage to whole structures. Clay shrinkage is caused during dry spells, generally from water abstraction by vegetation. Clay heave is often caused by the removal of trees and hedgerows or alternatively due to substantial wetting after prolonged dry spells. The potential for ground movement may be determined from a number of factors (e.g. clay type, tree type, distance of trees from a foundation excavation, geological location).

High rainfall replaces moisture deficits caused by trees and hedgerows, and cool damp weather reduces the rate of water loss to the tree, thus reducing the risk of soil movement. As the driest and hottest conditions usually prevail in southeast England, the greatest risks occur in that area and diminish with distance north and west.

Identifying clay types

Clay can be recognised as being smooth and silky to touch with no grains visible to the naked eye. It may also contain silt sized particles (barely visible to the naked eye) together with sand (which will be visible and would give a grittier feel). In general the finer the soil is (more clay particle and less silt or sand sized particles), the greater its shrinkage potential.

Ideally, a suitable site investigation should be undertaken to determine the nature and condition of the underlying clay soil.

Assessing foundation depths

The presence of trees and other vegetation in close proximity to the proposed building can affect moisture content considerably.

The degree to which soil will change in volume will depend greatly on the amount of moisture, which is drawn from and returned to it. Different trees have different water demands and it is important to determine the particular tree type.

It is also important to consider and identify trees on adjacent sites, as trees up to 30m away may still abstract moisture from the soil at the proposed building location.

Whenever clay soils are identified on site and trees are within potential influencing distance the attending Surveyor should request advice on a foundation design from a suitably qualified and experienced expert. The design of foundations should take account of the potential for soil desiccation

No trees present

The minimum depth for a foundation where no trees are present or where trees have been removed within the last 5 years is usually 900mm, this is the minimum depth required to ensure that the natural climatic effects (i.e. drying out and frost) will not affect the stability of the foundation.

Trees removed

Where trees have been removed from clay soils the moisture abstracted by the tree will find its way back into the soil, resulting in the soil swelling. Since there is no longer a moisture demand by trees, assessing a minimum depth of foundation should take account of the present level of desiccation, and hence the potential for future ground movement. Where mature or high water demand trees have been removed, and there has been no soil investigation carried out, it may not be possible to justify the use of conventional trench fill or pad and beam foundations.

Trees present

Predicting a safe depth at which to construct the foundation when trees are present, requires account to be taken of a number of major factors, such factors are: soil type, shrinkage potential of the clay soil, potential water demand of the tree(s), potential mature height of the tree(s) and distance of trees from the proposed foundation. Reference to the attached table should be made to determine the appropriate foundation depth.

Root growth damage

Provided there is room for trunks and roots to grow, there is little risk of them exerting pressure sufficient to displace foundations. However, foundations of light structures such as porches, garages and conservatories can be damaged by the growth of major roots. (For further information on direct damage caused by tree roots, refer to BS 5837: 2005.)

Conclusions

Foundations on shrinkable clay soils must be designed so that the superstructure will not be damaged by differential shrinkage or swelling.

- Establish whether soil is shrinkable clay and determine the plasticity of the clay or assume it has a HIGH volume change potential.
- Identify the species of any trees on or adjacent to the site and establish their likely maximum height. Include any mature trees that have been removed in the last ten years. (Arial photographs from specialist sources can assist in determining whether previous vegetation was present).
- Based on the above information you engineer and/or LABC New Home Warranty Surveyor will determine an appropriate foundation depth.
- Where the appropriate foundation depth exceed 2.5m a specialist design by a structural or geotechnical engineer will be required.
- Ensure the specification includes heave precaution measures to both the foundation and any ground floor slabs.

A suspended floor will also be required unless there is no risk of heave; i.e. where the calculated foundation depth is not greater than 1.5m or where the surface soils have not suffered any seasonal desiccation during the summer or autumn.

Further guidance and advice is available from the Technical Services Department of LABC New Home Warranty (technicalservices@labcnhw.co.uk).

Paul Byrne
Technical Services Manager