Brighton & Hove City Council

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Arboricultural Information Note No. 5

Tree Roots and Structures

Introduction

Hot summers and dry winters may give rise to subsidence-related damage to buildings. In some cases, trees are blamed for this damage.

Many householders have become concerned about trees close to their properties. In reality, tree root damage is less frequent and less inevitable than the publicity would suggest. Even when it is shown that trees may be contributing to damage, removal or severe tree surgery is often neither necessary nor desirable.

This information note describes how a tree may affect buildings and what may be done to reduce the problem.

Trees, Roots and Water

There are many popular misconceptions surrounding trees and roots. These are the facts: there are two types of roots – woody and fibrous.

Woody roots radiate away from the trunk. They store food produced by leaves and anchor the tree. Their girth increases annually but not at the same rate as the trunk or the branches. These may give rise to direct damage to structures (see section on damage roots may cause).

Beyond the woody roots, fibrous roots extract water and mineral nutrients from the soil. They are hair-like (less than 0.5mm in diameter) in appearance and may only last for one year. These may give rise to indirect damage to property (see section on damage roots may cause).

Tree roots extend radically from the trunk. However, their direction and depth is hard to assess or predict. Foundations, roads, impervious surfaces and utility trenches can inhibit or influence their spread.

Roots require oxygen to live and are usually found close to the soil surface. Mature trees rarely have an anchoring “tap” root, or supportive roots, deep in the soil.

Roots can only grow through moist soil. They cannot search for distant sources of water or detect water inside a sound pipe. When a root reaches an area of dry soil it will stop growing in that direction.

Trees need water to grow. Leaves produce the energy for this growth using water largely supplied by the roots. Over time, as a tree produces more leaves, its potential to take up water from the soil is increased. If the number of leaves is reduced, i.e. by tree surgery, the amount of water taken up by that tree is also reduced.

Tree height bears no special relation to its potential to extract water from the soil: this is related to the type of tree, number of leaves and their surface area.

Damage Roots May Cause

Direct damage may be caused by the physical expansion of woody roots as they grow. This can affect light structures with shallow foundations, e.g. porches, boundary walls, patios, driveways or pavements. The solution is usually to modify the affected structure, allowing for any future expansion of the root.

Root pruning should be avoided wherever possible as this may introduce disease, 'rob' the tree of vital food reserves, or make the tree unstable.

Roots may also grow into and block cracked and leaking drains or sewers. Before roots can enter such services, they must be leaking water. If by chance a root encounters the wet soil caused by a leak, increased root growth can occur and may result in entry and blockage of the service. The remedy is to make the service watertight.

Indirect damage may result from the extraction of soil moisture by fibrous roots of trees and other vegetation. This only occurs on certain soil types which are shrinkable, usually clays. The volume of these soils is dependent on their ability to retain the moisture contained within them: a reduction in soil moisture, caused for example by fibrous tree roots, leads to soil shrinkage. If this occurs beneath foundations, movement and damage may occur.

Irrespective of tree root action, shrinkable soils contract and expand during the course of a year as a result of seasonal weather conditions and water abstraction from something as simple as grass. This natural ground movement alone can result in damage to structures.

Subsidence

Movement of built structures resulting from soil shrinkage is termed subsidence.

Roots removing soil moisture beneath buildings may cause damage. However, structural damage can occur for a variety of reasons, including shallow foundations in shrinkable soil; normal seasonal soil movements; inadequate foundations for structures which are tied to the main building (e.g. bay windows, garages and conservatories); overloading of central walls; lack of flank wall restraint; land slip; drainage defects; and vibrations caused by constant passage of vehicles.

Thus the effects of trees are rarely the sole cause of subsidence.

There are thousands of trees in Brighton and Hove, the vast majority of which co-exist happily with buildings.

The presence of a tree near a building does not mean that subsidence is inevitable.

Even if it is established that a tree is affecting a property, removal is not usually necessary. Tree surgery (i.e. reduction in the number of leaves) will reduce the tree's potential to extract soil moisture and allow some soil re-hydration to occur. The soil will then increase in volume leading to some closure of structural cracks. Subsequent tree surgery frequently achieves 'stability' of the foundations, offsetting the need for costly work to the building.

Heave

Movement resulting from soil expansion is termed heave.

This is the opposite of subsidence. It is the result of an increase in soil moisture levels causing an increase in volume.

Heave can occur as a result of leaking drains, overflow pipes or the removal of a tree growing close to a property. Heave is potentially more destructive than subsidence. Therefore advice should always be sought before such trees are removed.