TREE PROTECTION DURING CONSTRUCTION

APPENDIX 7

Protection of retained trees during development

General

Trees are often overlooked during development and as a result many are either lost or given inadequate protection that results in their demise within a few years. The British Standard *BS 5837 Trees in relation to design, demolition and construction - Recommendations* was reviewed and updated in April 2012 and is the benchmark document for how to successfully take account of and retain suitable trees in proximity to development.

Trees have to adapt to their immediate surroundings and any changes will have some effect therefore it is essential that a detailed tree survey that complies with the British Standard is undertaken before a scheme is designed. This will schedule the trees according to their suitability for retention and identify the extent of land required to ensure that they have the best chance of survival. Older trees are more vulnerable and they are often the most desirable to retain for both their amenity and conservation value. The tree survey should be carried out by an arboriculturist as detailed within the British Standard otherwise an application will not be considered valid.

Common damage to trees during development

- abrasion of bark and wounds that leave wood tissue exposed
- crushing of roots be vehicles / plant equipment and / or storage of materials
- severing and removal of roots by excavation
- broken branches leaving wood tissues exposed
- poor pruning
- fire damage
- poisoning of roots from spillage or storage of fuel, oil, chemicals etc
- changes in soil levels around trees resulting in root death
- installation of impermeable surfaces

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BSI Standards Publication - BS 5837: 2012 Trees in relation to design, demolition and construction – Recommendations

The part of the tree most susceptible to damage is the root system because:

- roots cannot be seen and their extent is not realized
- of a lack of understanding of root function and their importance for the health of the tree

The effects of damage can be serious but often it takes several years for this to become evident and is not always linked back to the actual cause during development work. Often by the time the damage becomes evident the developer may no longer own the site leaving the new owner with the problem and the potential need for costly tree work.
Lack of protection can also result in damage to bark and branches that can disfigure a tree and result in disease and decay that also reduce safe life expectancy.

Tree Root Systems

Roots have three main functions:

- absorption of water, oxygen and nutrients
- tree 'food' storage in the form of starch
- structural support

Protection for retained trees on/adjacent to the site

Tree root development is entirely opportunistic and spreads horizontally to a distance and depth entirely dependent upon the ground conditions encountered. Very few trees have a 'tap root' after the first few years. Roots require oxygen and water to function and therefore most will remain close to the surface, research has shown that 90% of tree roots are to be found in the top 600mm of soil. Roots may extend horizontally for considerable distances and where conditions are suitable this distance may be equivalent to two or even three times the tree height.
The majority of roots are the easily overlooked fine, fibrous roots that absorb water, oxygen and nutrients from the soil; these are easily damaged by crushing and removal during soil stripping operations. The main structural support roots are usually found within a few metres of the tree stem and these are linked to the fibrous roots by a network of cable like roots that also provide additional anchorage. **All** tree roots are important.

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Root protection to prevent long-term damage

The guidance contained within *BS 5837 Trees in relation to design, demolition and construction – Recommendations* identifies a Root Protection Area (RPA) based on the stem diameter but protective measures may need to be increased, for example, to the extent of the branch spread to avoid damage to the above ground parts of the tree.

Tree protective measures are detailed within the British Standard, the default specification for a protective barrier is shown in the diagram below.

Typical tree on typical soil, in Britain

More detailed information regarding appropriate tree protection is detailed within *BS 5837 Trees in relation to design, demolition and construction - Recommendations* available from the British Standards Institution, 389 Chiswick High Road, London W4 4AL or visit their website www.bsigroup.com/standards.

Avoiding Tree Damage During Construction

Unless the damage is extreme, the trees may not die immediately but could decline over several years. With this delay in symptom development, you may not associate the loss of the tree with the construction.

It is possible to preserve trees on building sites if the right measures are taken. The most important step is to hire a professional arborist during the planning stage. DALCON SUPERPRIME will consult with an arborist to assist in deciding which trees can be saved and can work with the construction team to protect the trees throughout each construction phase.

How Trees Are Damaged During Construction

Physical Injury to Trunk and Crown. Construction equipment can injure the aboveground portion of a tree by breaking branches, tearing the bark, and wounding the trunk. These injuries are permanent and, if extensive, can be fatal.

Cutting of Roots. The digging and trenching that are necessary to construct a house and install underground utilities will likely sever a portion of the roots of many trees in the area. It is easy to appreciate the potential for damage if you understand where roots grow. The roots of a tree are found mostly in the upper 6 to 12 inches of the soil. In a mature tree, the roots extend far from the

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trunk. In fact, roots typically are found growing a distance of one to three times the height of the tree. The amount of damage a tree can suffer from root loss depends, in part, on how close to the tree the cut is made. Severing one major root can cause the loss of 5 to 20 percent of the root system.

Soil Compaction. An ideal soil for root growth and development is about 50 percent pore space. These pores—the spaces between soil particles—are filled with water and air. The heavy equipment used in construction com-pacts the soil and can dramatically reduce the amount of pore space. This compaction not only inhibits root growth and penetration but also decreases oxygen in the soil that is essential to the growth and function of the roots.

Smothering Roots by Adding Soil. Most people are surprised to learn that 90 percent of the fine roots that absorb water and minerals are in the upper 6 to 12 inches of soil. Roots require space, air, and water. Roots grow best where these requirements are met, which is usually near the soil surface. Piling soil over the root system or increasing the grade smothers the roots. It takes only a few inches of added soil to kill a sensitive mature tree.

Exposure to the Elements. Trees in a forest grow as a community, protecting each other from the elements. The trees grow tall, with long, straight trunks and high canopies. Removing neighboring trees or opening the shared canopies of trees during construction exposes the remaining trees to sunlight and wind. The higher levels of sunlight may cause sunscald on the trunks and branches. Also, the remaining trees are more prone to breaking from wind or ice loading.

Consultation

DALCON SUPERPRIME will consult with a professional arborist prior to starting any construction activities. We intend to save all trees that are not directly within the construction footprint, ie foundation and take all the proper steps.

Dalcon Superprime’s arborist will assess the trees on the property, determine which are healthy and structurally sound, and suggest measures to preserve and protect them.

One of the first decisions is determining which trees are to be preserved and which should be removed. Dalcon Superprime will consider the species, size, maturity, location, and condition of

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each tree. The largest, most mature trees are not always the best choices to preserve. Younger, more vigorous trees usually can survive and adapt to the stresses of construction better. Our arborist will advise us about which trees are more sensitive to compaction, grade changes, and root damage.

Tree adjacent to the construction works may need have some branches removed to facilitate the erection of construction access scaffolding. Dalcon Superpime will consult the arborist to ensure an appropriate plan is in place for the tree surgeon works

Planning

DALCON SUPERPRIME's appointed arborist will work with the construction site team in planning the construction. We will review any small changes in the placement or design which will can make a great difference in whether a critical tree will survive.

We will also consider the option to bridge over the roots may substitute for a conventional walkway. Because trenching near a tree for utility installation can be damaging, tunneling under the root system may be a good option.

Erecting Barriers

Because our ability to repair construction damage to trees is limited, it is vital that trees be protected from injury. The single most important action you can take is to set up construction fences around all of the trees that are to remain. The fences will be placed as far out from the trunks of the trees as possible. As a general guideline, we will allow 1 foot of space from the trunk for each inch of trunk diameter. The intent is not merely to protect the aboveground portions of the trees but also the root systems. Remember that the root systems extend much farther than the drip lines of the trees.

DALCON SUPERPRIME, as part of the project induction, will Instruct construction personnel to keep the fenced area clear of building materials, waste, and excess soil. No digging, trenching, or other soil disturbance should be allowed in the fenced area.

A specific Toolbox talk will also be carried out .

Protective fences will be erected as far out from the trunks as possible in order to protect the root system.

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Limiting Access

Dalcon superprime's site logistics only allows for one site access off Tower Road. All contractors will be instructed where they are permitted to drive and park their vehicles.

Specify storage areas for equipment, soil, and construction materials., cement wash-out pits, and construction work zones. These areas should be away from protected trees.

Specifications

Dalcon Superprime will record it in writing, all of the measures intended to protect the site trees and ensure they are written into the construction specifications. The written specifications will detail exactly what can and cannot be done to and around the trees. Each subcontractor will be made aware of the barriers, limitations, and specified work zones and will form part of their contract T+C's

Dalcon Superprime will also erect signs as a reminder.

Fines and penalties for violations will be built into their contract and the severity of the fines will be proportional to the potential damage to the trees and should increase for multiple infractions.

Maintaining Good Communications

Dalcon Superprime will share clear objectives with the arborist and the site project team, we recognise that one subcontractor can destroy our prudent efforts. Construction damage to trees is often irreversible.

Dalcon Superprime will visit the site at least once a day if possible taking photos at every stage of construction. If any infraction of the specifications does occur, it will be important to prove liability.

Final Stages

It is not unusual to go to great lengths to preserve trees during construction, only to have them injured during landscaping. Installing irrigation systems and rototilling planting beds are two ways the root systems of trees can be damaged. Note, that small increases in grade (as little as 2 to 6 inches) that place additional soil over the roots can be devastating to your trees. Dalcon Superprime will carefully plan and communicate with landscape designers and contractors.

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Post-Construction Tree Maintenance

The trees will require several years to adjust to the injury and environmental changes that occur during construction. Stressed trees are more prone to health problems such as disease and insect infestations. Dalcon Superprime will consult with the project arborist about the continued maintenance for the trees and ensure that the client continues to monitor the trees, and have them periodically evaluated for declining health or safety hazards.