Estates & Facilities Management - Trees and Construction - Policy and Procedures

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Estates Division

Estates and Facilities Management

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This document sets out the policy and procedures for the management and control of Trees and Construction for the Directorate of Estates and Facilities Management

Approval

Deputy Director of Estates

Adrian Stokes  Date 19/07/18

Trees in relation to construction

Trees make a positive contribution to the design of any development and should be regarded as an asset, not a constraint.

Where trees are to be grown, it is vital that every care is taken to protect them and to avoid damage to the root system or structure during any construction process.

Similarly when new buildings are being constructed, trees which are nearby, or inappropriate, due to their size or species, will become a constant source of problems, which may lead to their removal.

The purpose of this document is to explain the steps needed at the planning and design stage and during construction, to ensure that the trees are kept in a healthy state.

The British Standard BS5837, provides guidance, in respect of development sites, for a balanced approach on deciding which trees are appropriate for retention, on the effect of trees on design considerations and on the means of protecting trees during development

The following actions have to be undertaken to meet the above guidance and

BS 5837 Trees in Relation to Construction recommendations.

All of the Oxford Brookes University trees that are above 75mm in diameter must have written approval from the Local Authority before any proposed work is carried out, this includes pruning and trenching.

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Tree Policy
A vision and policy for Oxford Brookes University

Trees

There are in excess of 2,500 trees on Oxford Brookes University's estate, many of which are prime specimens from a wide variety of species.

Oxford Brookes University is committed to developing and improving their trees, as they yield many benefits for our estate:

- they add beauty and character to our landscape
- they absorb atmospheric pollutants thus purifying the air and improving the environment
- they provide a habitat for birds and other wildlife

These benefits contribute towards making our university a better place in which to live, study, work and visit. In order for all these positive attributes to be fully realised, both in the short and long term, Oxford Brookes University will implement a comprehensive tree policy and management programme which will include:

- Managing the age profile - many areas of the University have a high number of over mature trees that will require replacing. In order to ensure the impact of the tree cover is not lost, a removal and replacement programme will be implemented.
- Dealing with associated problems caused by trees which have ended up being planted in the wrong locations - for example, building damage, severe loss of light and leaf litter.
- Tree management – a proactive tree management programme of surveys and remedial action plans will be implemented.

Vision

We will seek to improve the quality, quantity and variety of the University's tree stock by implementing a long term management plan. This will ensure a commitment to our students, staff and visitors alike to enhance Oxford Brookes University's trees. The management plan will stipulate that we:

- ensure safety is the highest priority
- consult stakeholders prior to major tree works
- inspect our at risk mature trees on an annual basis, carry out any remedial works as necessary and record all data to build up a history of this work
- ensure all maintenance work is carried out to the relevant British Standards or current best practice guidelines
- utilise the most modern available equipment to assist in the inspection and surveying of our trees
- introduce a Geographic Information System to identify each tree on digital mapping
- will wherever possible plant new trees as a replacement for those which have been removed and constantly seek out new planting sites
- plant tree species appropriate for the location with a view to attaining a balance between native and ornamental species
- will review all procedures on an annual basis to ensure they remain current and in keeping with the best practice guidelines

Trees & Construction

Section 1 Planning construction work

Tree Protection Plan

When construction works are planned, the Project Manager should produce plans of the site in question and issue them to the Grounds Manager for approval, these scale drawings need to show the construction layout proposal, planned tree retention and tree and landscape protection measurements.

Arboricultural Implications Assessment

The Grounds Manager in conjunction with contractor taking the role of Oxford Brookes University's Arboriculturist will assist as necessary to identify and evaluate the extent of direct or indirect impact on existing trees that may arise as a result of the implementation of any site layout proposal.

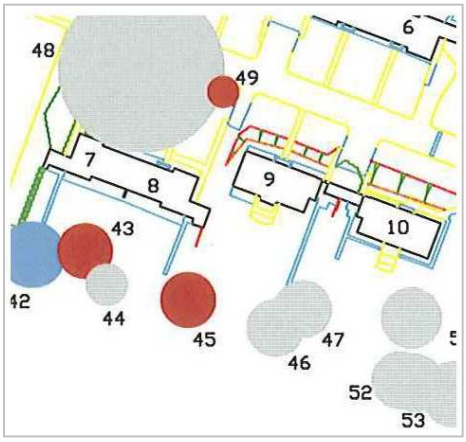
Arboricultural Method Statement

The above will include a methodology for the implementation of development works that has the potential to result in the loss or damage to any tree, again the Grounds Manager in conjunction with Oxford Brookes University Arboriculturist will assist as required.

Root Protection Area (RPA)

The design drawings should also include the RPA, showing areas surrounding the tree that contains sufficient rooting volume ensuring the survival of the tree.

Zones based on the RPA (in m^2), will need to be identified to protect the areas during development, including any temporary construction or pre-construction works, this will be achieved by the use of barriers and or ground protection which will be fit for purpose to ensure the successful long-term retention of a tree.



Services

Services that are planned, whether above ground or piped and ducted underground services including water mains, electricity supply, gas supply, fiber-optic utilities, telecommunications cabling, storm and foul water drainage, including temporary storage for run-off, pumping stations, interceptors and other allied buried structures must be so positioned that they do not impede the canopy and the RPA in any way.

Land Survey

Where trees are present, clearance of vegetation to facilitate any survey process should be undertaken as necessary and with care using hand held machinery. Mechanised flails may be used in more open areas, although soil stripping is to be avoided.

The land survey must include:

a) location of all trees, shrub masses, hedges etc.

b) all relevant features, such as streams, ponds, buildings and other structures, boundary features, trenching scars near to trees and services including drainage runs;

c) the approximate location of trees on land adjacent to the development site that could influence the site or may be important as part of the local landscape character.

Tree Survey

The tree survey includes all trees in the land survey and should categorise trees or groups of trees, including woodlands, for their quality and value within the existing context, in a transparent, understandable and systematic way.

Trees forming areas of woodland or wood pasture, should be identified and considered as groups where the arboriculturist determines that this is appropriate, particularly if they contain a variety of species and age classes that could aid long-term management. It may be appropriate to assess the quality and value of such groups of trees as a whole, rather than as individuals. However, an assessment of individuals within any group should still be undertaken if they are open-grown or if there is a need to differentiate between them.

A schedule to the survey should list all the trees or groups of trees. The following information should be provided:

a) Tree tag or reference identification number

b) species (common and scientific names, where possible)

c) height in meters;

d) stem diameter in millimeters at 1.5 m above adjacent ground level (on sloping ground to be taken on the upslope side of the tree base) or immediately above the root flare for multi-stemmed trees;

e) branch spread in meters taken at the four cardinal points to derive an accurate representation of the crown

f) height in meters of crown clearance above adjacent ground level (to inform on ground clearance, crown stem ratio and shading);

g) age class (young, middle aged, mature, over-mature, veteran);

h) physiological condition (e.g. good, fair, poor, dead);

i) structural condition, e.g. collapsing, the presence of any decay and physical defect;

j) preliminary management recommendations, including further investigation of suspected defects that require more detailed assessment and potential for wildlife habitat;

k) R, A, B & C category grading to be recorded in plan on the tree survey plan. (see 2 below)

The categories should be differentiated on the tree survey plan by colour, or by suffixing the category adjacent to the tree identification number on the tree survey plan. It may be appropriate to assess and list the amenity value of trees as a separate consideration.

Section 2 Categorisation Methods

Category R (dark red)

Trees that are in such a condition that any existing value would be lost within 10 years and which should, in the current context, be removed for reasons of sound arboricultural management

• Trees that have serious, structural defects, such that their early loss is expected due to collapse, including those that will become unviable after removal of other R category trees (i.e. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning)

• Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline

• Trees infected with pathogens of significance to the health and/or safety of other trees nearby), or very low quality trees suppressing adjacent trees of better quality

TREES TO BE CONSIDERED FOR RETENTION

Category A (light green)

Those of high quality and value: in such a condition as to be able to make a substantial contribution (a minimum of 40 years is suggested)

1 Mainly arboricultural value

Trees that are particularly good examples of their species, especially if rare or unusual, or essential components of groups, or of formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)

2 Mainly landscape value

Trees, groups or woodlands which provide a definite screening or softening effect to the locality in relation to views into or out of the site, or those of particular visual importance (e.g. avenues or other arboricultural features assessed as groups)

3 Mainly cultural value, including conservation

Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)

Category B (mid blue)

Those of moderate quality and value: those in such a condition as to make a significant contribution (a minimum of 20 years is suggested)

1 Mainly arboricultural value

Trees that might be included in the high category, but are downgraded because of impaired condition (e.g. presence of remediable defects including unsympathetic past management and minor storm damage)

2 Mainly landscape value

Trees present in numbers, usually as groups or woodlands, such that they form distinct landscape features, thereby attracting a higher collective rating than they might as individuals but which are not, individually, essential components of formal or semi-formal arboricultural features (e.g. trees of moderate quality within an avenue that includes better, A category specimens), or trees situated mainly internally to the site, therefore individually having little visual impact on the wider locality

3 Mainly cultural value, including conservation

Trees with clearly identifiable conservation or other cultural benefits

Category C (grey)

Those of low quality and value: currently in adequate condition to remain until new planting could be established (a minimum of 10 years is suggested), or young trees with a stem diameter below 150 mm

1 Mainly arboricultural value

Trees not qualifying in higher categories.

2 Mainly landscape value

Trees present in groups or woodlands, but without this conferring on them significantly greater landscape value, and/or trees offering low or only temporary screening benefit

3 Mainly cultural value, including conservation

Trees with very limited conservation or other cultural benefits

Note; Whilst C category trees will usually not be retained where they impose a significant constraint on development, young trees with a stem diameter of less than 150mm should be considered for relocation.

The purpose of the tree categorisation method is to identify the quality and value of the existing tree stock, allowing informed decisions to be made concerning which trees should be removed or retained should development occur.

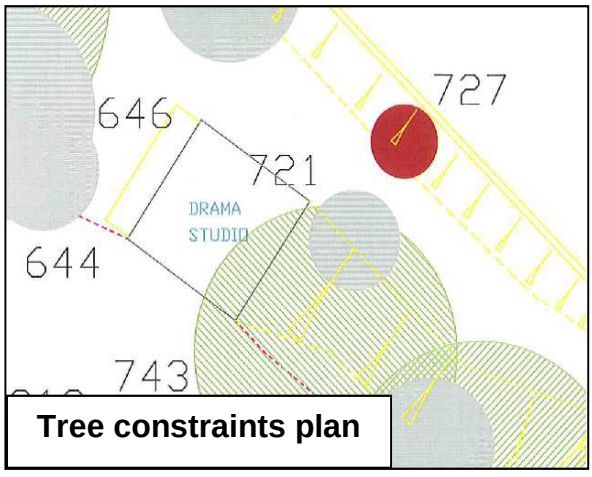
In categories A, B, C, which together deal with trees that should have a material consideration in the development process, the subcategories are intended to reflect arboricultural, landscape and cultural values respectively. Category R trees are those which would be lost in the short term for reasons connected with their physiological or structural condition. For this reason, they should not be a consideration in the planning process.

When determining the appropriate category for any given tree, group or woodland, the Arboriculturist should start by determining whether the tree falls within the scope of the R category. Assuming that the tree can be retained, the Arboriculturist should then proceed on the presumption that all trees are considered according to the criteria for inclusion in the high category. Trees that do not meet these strict criteria should then be considered in light of the criteria for inclusion in the moderate category. This cascade process should be repeated, as required, until the appropriate quality and value assessment is reached.

Tree Survey — Post-Planning

It is recognized that, on occasions, arboricultural advice is not sought until after a preliminary site layout has been prepared. Although this is not the ideal situation, timely and appropriate expert advice can still make a valuable contribution to the process of tree retention and protection. In cases where the Arboriculturist is provided with a layout, the tree survey should be undertaken as described above to provide advice on tree retention, protection, remedial or mitigation works and new landscape design. It is essential that the trees are assessed objectively and without reference to site layout proposals.

Tree Constraints Plan (TPC)



Tree constraints plan

The influence that trees have on and adjacent to the site should be plotted on a plan called the tree constraints plan (TCP). This is a design tool which should show the below ground constraints, represented by the RPA, and the above ground constraints the trees pose by virtue of their size and position.

Root Protection Area (RPA)

In order to avoid damage to the roots or the rooting environment of retained trees, the RPA should be plotted around each of the category A, B and C trees. This is a minimum area in m^2 which should be left undisturbed around each retained tree.

The RPA should be calculated using an area equivalent to a circle with a radius 12 times the stem diameter for single stem trees and 10 times basal diameter for trees with more than one stem arising below 1.5 m above ground level.

Calculating the RPA

Number of stems	Calculation
Single stem tree	$RPA(m^2) = \left(\frac{\text{stem diameter (mm) @ 1.5 m} \times 12}{1\ 000}\right)^2 \times 3.142$
Tree with more than one stem arising below 1.5 m above ground level	$RPA(m^2) = \left(\frac{\text{Basal diameter (measured immediately above root flare (mm)} \times 10}{1\ 000}\right)^2 \times 3.142$
NOTE The 12× multiplier is based on NJUG 10 [9] and published work by Matheny and Clark [10].	

Above Ground Constraints

The current and ultimate height of category A, B and C trees should be annotated on the TCP where this would cause unreasonable obstruction of sunlight or daylight to the development. In practice this could be represented by a segment with a radius from the center of the stem equal to the height of the tree drawn from due North West to due East indicating the shadow pattern through the main part of the day.

The current and ultimate height and spread of a tree is also a constraint due to its size, dominance and movement in strong winds. For this reason, as well as in relation to shading, the existing spread of branches and the future branch growth should be taken into consideration as a constraint in the design phase.

Tree Constraints and Design

Trees can impinge on many aspects of site development. Adequate consideration should be given to the requirements of trees by all members of the design team throughout the development process.

Even if there are no trees on the site, areas for future planting should be plotted on the TCP and protected from damage, especially soil compaction due to construction activity, by the erection of barriers and/or ground protection.

Where such pre development protection is not implemented, prior remediation measures should be employed, such as soil ripping with a winged-tined plough or subsoil aeration.

During the design and planning stages the following factors should be taken into account.

a) the presence of Tree Preservation Orders (**TPO**) or conservation area protection.

b) the effect that development proposals may have on the amenity value of trees, both on and near the site.

c) the above and below ground constraints

d) the construction method of the proposed document

e) whether the design and/or construction of the proposed development can be modified to accommodate retention of trees that would otherwise be at risk or lost. This includes appropriate tree surgery works that acceptably mitigate adverse effects caused by trees.

f) infrastructure requirements, e.g. easements for underground or above ground services; highway safety and visibility splays; and other infrastructural provisions, such as substations, refuse stores, lighting, signage and CCTV requirements.

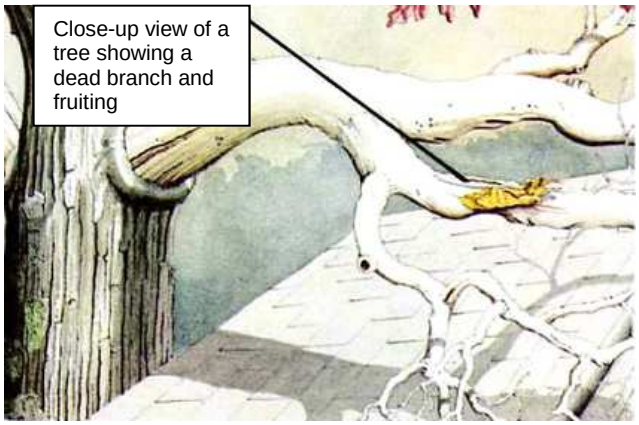
g) the end use of the space.

h) whether tree loss resulting from the development proposals can be acceptably mitigated by new tree planting.

Particular care is needed regarding the retention of large old trees which become enclosed within the new development. Such trees may be less resilient and more likely to die or become potentially unsafe as a result of the pressures associated with development. Even if they survive in the short term, they may die before the new buildings are obsolete. Their subsequent removal can pose technical difficulties and be costly. Where the retention of large, mature or veteran trees is considered desirable, it may be most effective to conserve them by incorporating them into open spaces or large gardens, thereby allowing adequate space for their long term physical protection and maintenance.

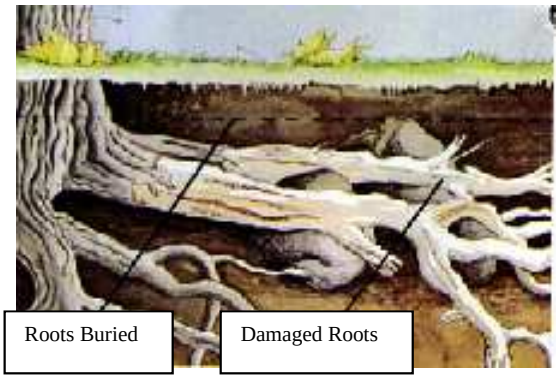
Proximity of Trees to Structures

A realistic assessment of the probable impact of any proposed development on the trees and vice versa should take into account the characteristics and condition of the trees, with due allowance and space for their future growth and maintenance requirements.



Close-up view of a tree showing a dead branch and fruiting

The relationship of windows to trees which may obstruct light should be taken into account. Excessive shading by trees should be avoided, particularly to rooms requiring light. This will vary with orientation and aspect of the building, proximity to the tree and the type of tree as foliage size and density varies with species.



Roots Buried

Damaged Roots

Damage can occur to trees and structures by the continuous whipping of branches. Branch ends may have to be cut back repeatedly, possibly spoiling the shape of the tree. Trees should not be retained on the basis that their ultimate branch spread can be significantly controlled by periodic pruning, unless this is a desired management outcome (e.g. pollarded trees).

Poorly excavated trench

Large trees can cause apprehension to occupiers of nearby buildings especially during windy conditions.

Leaves of some species may cause problems, particularly in the autumn, by blocking gullies and gutters. Fruit can cause slippery patches and accumulation of honeydew may be damaging to surfaces and vehicles.

Arboricultural Method Statements (AMS) and Tree Protection Plan (TPP)

Once the layout proposals have been finalised a **TPP** should be prepared containing the following information:

a) trees selected for retention, clearly identified (e.g. by number) and marked on a plan with a continuous outline;

b) trees to be removed, also clearly identified (e.g. by number) and marked on a plan with a dashed outline;

c) the precise location for erection of protective barriers and any other relevant physical protection measures including ground protection to protect the **RPA** and marked as a construction exclusion zone on the plan. While the root protection area may be plotted as a circle on the constraints plan, the position of the barrier and any ground protection should be shown on subsequent plans as a polygon representing the actual position of the protection. It is helpful during setting out, and for the purposes of enforcement if the plan is annotated with the dimensions of the exclusion zones.

d) design details of the proposed physical means of protection, indicated through drawings and/or descriptive text, including any development facilitation pruning;

e) areas of landscaping to be protected from construction operations to prevent the soil structure being damaged.

All the details above should be incorporated into subsequent drawings and method statements used for design purposes or issued for use on site, to ensure that all interested parties are fully aware of the areas in which access and works may and may not take place.

In order to avoid disturbance to the physical protection forming the construction exclusion zone once it is installed, it is essential to consider, make allowance for and plan all construction operations which will be undertaken in the vicinity of trees, in particular:

a) site construction access;

b) the intensity and nature of the construction activity;

c) contractors' car parking;

d) phasing of construction works;

e) the space needed for all foundation excavations and construction works;

f) the availability of special construction techniques.

g) the location and space needed for all service runs including foul and surface water drains, land drains, soakaways, gas, oil, water, electricity, telephone, television or other communication cables;

h) all changes in ground level, including the location of retaining walls, steps and making adequate allowance for foundations of such walls and back fillings;

i) space for cranes, plant, scaffolding and access during works;

j) space for site huts, temporary latrines (including their drainage) and other temporary structures;

k) the type and extent of landscape works which will be needed within the protected areas, and the effects these will have on the root system.

l) space for storing (whether temporary or long-term) materials, spoil and fuel and the mixing of cement and concrete.

m) the effects of slope on the movement of potentially harmful liquid spillages towards or into protected areas

Pre Development Tree Work

Once a final layout for the development area has been approved, an Arboriculturist should review the relationship of the development to the trees and prepare a schedule of tree works listing all the trees that require work, accompanied by a plan showing where each tree is located. The schedule should include all the trees to be removed to clear the main development area and those remaining that require remedial works.

Working within the RPA

Care should be taken to ensure during tree removal or remedial work that damage to the retained trees and/or disturbance to the RPA is avoided. Appropriate precautions should include dismantling techniques to reduce the risk of accidental damage and ground protection where excessive pedestrian movements or use of plant and machinery may lead to compaction.

Debris from tree work may be removed from site, chipped and left on site, or left on site in an unprocessed form as habitat depending on the site circumstances. Debris should not be burnt where it could damage the crowns of retained trees. Stumps within RPA should not be dug or pulled out but should be ground out, if removal is required, to avoid adverse impact on retained trees. Consideration should be given to leaving standing stumps and debris as habitat for wildlife if the circumstances allow (see BS 3998 Recommendation for Tree Work).

The construction exclusion zone: barriers and ground protection. All trees which are being retained on site should be protected by barriers and or ground protection. Vertical barriers should be erected and ground protection installed before any materials or machinery are brought onto the site and before any demolition, development or stripping of soil commences. Areas of new or retained structure planting should be similarly protected, based on the extent of the soft landscaping as shown on the approved drawings. Once erected, barriers and ground protection should be regarded as sacrosanct, and should not be removed or altered without prior recommendation by an Arboriculturist and approval of the local planning authority.

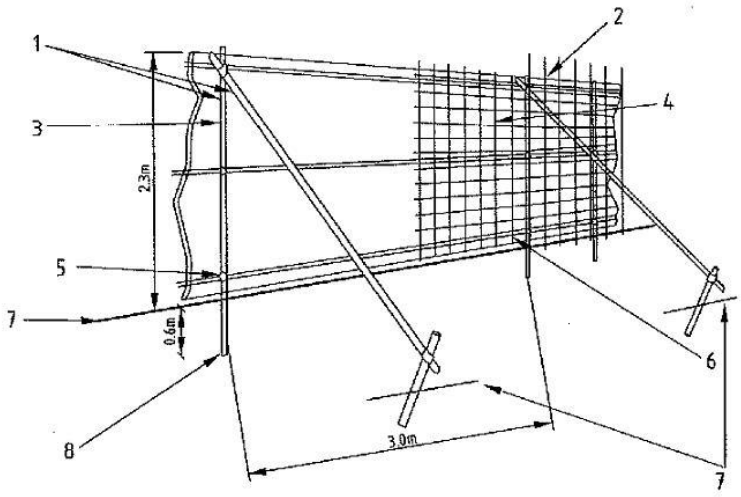
In the case of particularly vulnerable trees or trees sited close to the construction access, the owner or developer should make arrangements for an Arboriculturist to supervise necessary works and the erection of protection before the handover of land to the contractor.

Pre development tree work may be undertaken before the installation of tree protection, where required, with the agreement of the local planning authority.

Section 3 Protection Root protection Area

Barriers should be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s). On all sites, special attention should be paid to ensuring that barriers remain rigid and complete.

In most cases, barriers should consist of a scaffold framework comprising a vertical and horizontal framework, well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3m. Onto this, weldmesh panels should be securely fixed with wire or scaffold clamps. Weldmesh panels on rubber or concrete feet are not resistant to impact and should not be used.



1. Standard scaffold poles
2. Uprights to be driven into the ground
3. Panels secured to uprights with wire ties and where necessary standard scaffold clamps
4. Weldmesh wired to the uprights and horizontals
5. Standard clamps
6. Wire twisted and secured on inside face of fencing to avoid easy dismantling
7. Ground level

NOTE The above is preferred because it is readily available, resistant to impact, can be re-used and enables inspection of the protected area. It may be appropriate on some sites to use temporary site office buildings as components of the tree protection barriers.

Ground Protection

Where it has been agreed during the design stage, and shown on the tree protection plan, that vehicular or pedestrian access for the construction operation may take place within the root protection area, RPA, the possible effects of construction activity should be addressed by a combination of barriers and ground protection. The position of the barrier may be shown within the RPA at the edge of the agreed working zone but the soil structure beyond the barrier to the edge of the RPA should be protected with ground protection. For pedestrian movements within the RPA the installation of ground protection in the form of a single thickness of scaffold boards on top of a compressible layer laid onto a geotextile, or supported by scaffold, may be acceptable.

For wheeled or tracked construction traffic movements within the RPA the ground protection should be designed by an engineer to accommodate the likely loading and may involve the use of proprietary systems or reinforced concrete slabs.

Additional Precautions outside the RPA

In addition the following should be addressed or avoided.

a) care should be taken when planning site operations to ensure that wide or tall loads or plant with booms, jibs and counterweights can operate without coming into contact with retained trees. Such contact can result in serious damage to them and might make their safe retention impossible. Consequently, any movement of plant in close proximity to trees should be conducted under the supervision of a banksman to ensure that adequate clearance from trees is maintained at all times. In some circumstances it may be impossible to maintain adequate clearance thus necessitating access facilitation pruning.

b) material which will contaminate the soil, e.g. concrete mixings, diesel oil and vehicle washings, should not be discharged within 10 m of the tree stem.

c) fires should not be lit in a position where their flames can extend to within 5 m of foliage, branches of trunk. This will depend on the size of the fire and the wind direction.

d) notice boards, telephone cables or other services should not be attached to any part of the tree.

Once the exclusion zone has been protected by barriers and/or ground protection, construction work can commence. All weather notices should be erected on the barrier with words such as: “Construction exclusion zone — Keep out”.

Tree Protection during Demolition

Where demolition is proposed on a site where trees are to be retained, access facilitation pruning should be undertaken to prevent injurious contact between demolition plant and the trees. Any such pruning should be undertaken in accordance with a specification prepared by an arboriculturist.

Barriers should be erected and fit for purpose ground protection installed to the edge of the existing structure.

All plant and vehicles engaged in demolition works should either operate outside the RPA, or should run on a temporary surface designed to protect the underlying soil structure. Where such ground protection is required, it should be installed prior to commencement of operations

Where trees stand adjacent to structures scheduled for demolition, it may be necessary to undertake demolition inwards within the footprint of the existing building (often referred to as “top down, pull back”). Where levels of dust build-up on trees are likely, it may be necessary to seek the advice of an Arboriculturist on remedial measures, e.g. hose down the tree(s) immediately following any significant accumulation of dust.

Where an existing hard surface is scheduled for removal, care should be taken not to disturb tree roots that may be present beneath it. Hand held tools or appropriate machinery should be used (under arboricultural supervision) to remove the existing surface.

The advice of an Arboriculturist should be sought where underground structures present within the RPA may become redundant. In general it is preferable to seal these off as this avoids the need for significant excavation.

Principles for avoiding Tree Root Damage during Construction

Prior to the installation of a new ground surface, existing ground cover vegetation (e.g. grass sward) should be killed using an appropriate herbicide. Herbicides that can leach through the soil, e.g. products containing sodium chlorate, should not be used. Specialist advice should be sought in order to determine the most suitable herbicide treatment.

The soil surface should not be skimmed to establish new paving or other surfaces at the former ground level. Loose organic matter and/or turf should be removed carefully using hand tools. The new surface should then be established above the former ground level, using a granular fill, where required.

If ground levels are to be raised within the RPA this should be achieved by use of a granular material which does not inhibit vertical gaseous diffusion. Examples of suitable granular materials include, no-fines gravel, washed aggregate, or cobbles.

In high concentration carbon dioxide is detrimental to tree root function. Because this gas principally diffuses vertically through the soil, new impermeable surfacing within the RPA should be restricted to a maximum width of 3m and situated tangentially to one side of a tree only, or confined to an area no greater than 20 % of the root protection area, whichever is the smaller.

Any excavations which have to be undertaken within the RPA should be carried out carefully by hand, avoiding damage to the protective bark covering larger roots. Roots, whilst exposed, should be wrapped in dry, clean hessian sacking to prevent desiccation and to protect from rapid temperature changes. Roots, smaller than 25 mm diameter may be pruned back, preferably to a side branch.

Roots larger than 25 mm should only be severed following consultation with an Arboriculturist, as they may be essential to the tree's health and stability. Prior to backfilling, any hessian wrapping should be removed and retained roots should be surrounded with sharp sand (builders' sand should not be used because of its high salt content which is toxic to tree roots), or other loose granular fill, before soil or other material is replaced. This material should be free of contaminants and other foreign objects potentially injurious to tree roots.

The use of a trenching saw reduces the risk of longitudinal root shattering which can often occur where backactors are used to excavate trenches near to trees.

Allowance for Future Growth

Future growth can lift paths or distort light structures such as walls. Where such structures, including surfaces, are unavoidable near to trees, design and construction specification should take account of future growth.

If it is necessary to build a wall or similar structure over a root greater than 50 mm diameter, provision should be made for future diameter growth by surrounding the root with un-compacted sharp sand, void-formers, or other flexible fill materials, and by laying an adequately reinforced lintel or raft over the surface.

Foundations within the RPA

The insertion of structures within RPA may be justified if this allows the retention of a good quality tree. However, it is essential that careful consideration is given to foundation design. In such cases, the use of traditional strip footings, in particular those constructed tangentially across the root zone, can result in severe damage to tree roots and should be avoided.

Root damage can be minimized by using a combination of the following:

— piles or radial strip footings both of which should be located to avoid major tree roots;

— beams, slabs, suspended floors, where all should be laid at or above ground level, and cantilevered as necessary to avoid tree roots.

In order to arrive at a suitable solution, site specific and specialist advice regarding foundation design should be sought from an Arboriculturist and an engineer.

Where piling is to be installed near to trees, the smallest practical pile diameter should be used as this reduces the possibility of striking major tree roots, and reduces the size of the rig required to sink the piles. The latter is particularly important where piling within the branch spread is proposed, as mini-rigs reduce the need for access facilitation pruning. Sheathed piles protect the soil and adjacent roots from the potential toxic effects of concrete.

Underground and Above Ground Services

Trenching for the installation of underground services severs any roots present and may change the local soil hydrology in a way that adversely affects the health of the tree. For this reason particular care should be taken in the routing and methods of installation of all underground services. Wherever possible, they should be kept together and trenchless techniques used. At all times where services are to pass within the RPA, detailed plans showing the proposed routing should be drawn up in conjunction with an Arboriculturist.

Such plans should also show the levels and access space needed for installing the services and be accompanied by arboricultural method statements.

As an alternative to trenchless techniques, a possible solution is to hand excavate a narrow trench passing directly towards a tree along a radius to not closer than 1 m from the trunk, tunnel straight beneath the tree, preferably not less than 750 mm deep, and exit on the opposite side along another radius. Provided the trench is kept as narrow as possible, the amount of root severance will be minimal, and will be far less than if a trench passes close beside the tree. It may be necessary to make provision to facilitate future servicing and repair without further damage to the tree roots.

Consideration should be given to the routing of above ground services in order to avoid the need for detrimental and repetitive pruning. In this regard the current and future crown size of the tree should be assessed.

Low-invasive Vehicular Access in Proximity to Trees

Where the construction of hard surface access cannot be avoided within the root protection area, a no-dig design should be used to avoid root loss due to excavation. In addition the structure of the hard surface should be designed to avoid localized compaction, by evenly distributing the carried weight over the track width and wheelbase of any vehicles that will use the access. Such designs might include the use of a three dimensional cellular confinement system as an integral component of the sub-base, to act as a load suspension layer. Driveways and roadways constructed according to this principle can be designed to be suitable for most types of traffic. Where this type of access is proposed, site-specific and specialist advice should be sought from an engineer and an Arboriculturist in order to ensure that it is fit for purpose.

The use of two dimensional load suspension systems is not recommended.

Where the new access would cover in excess of 20 % of the RPA or be wider than 3 m within it, it should be constructed so as to allow moisture infiltration and gaseous diffusion.

It is an engineering requirement that roads constructed to a standard suitable for adoption by a local authority are waterproof. For this reason, such roads are impermeable and should, therefore, not exceed the 20 %/3 m limit of RPA coverage referred to above.

Types of hard surface and their suitability in proximity to trees

If a hard surface is proposed above the granular material, a permeable and gas-porous finished surface (wearing course) should be installed. In some situations, consideration should be given to constructing the final surface prior to the main building works, so as to provide protection for the roots at subsequent stages. However, it may be desirable to protect the final surface from damage with a temporary covering.