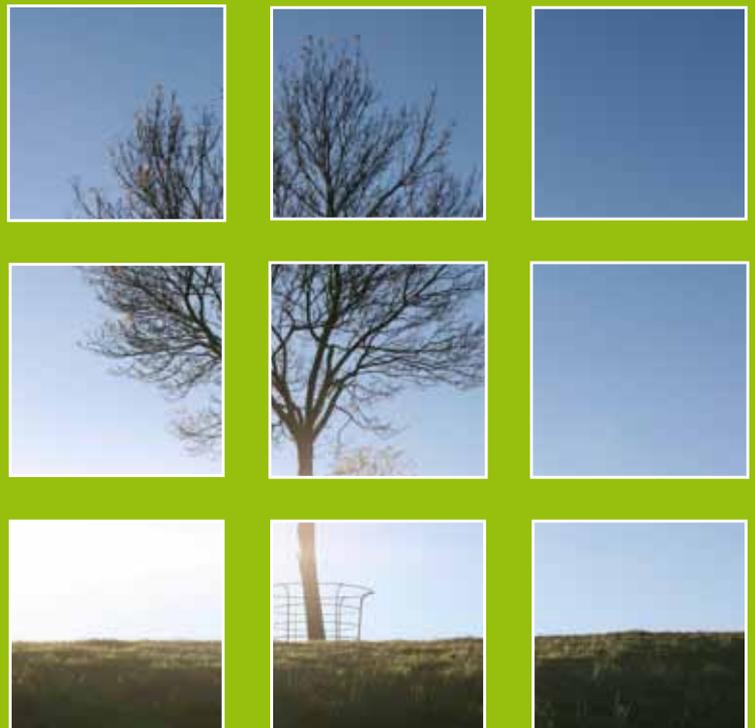


Street Trees in Central Milton Keynes: Guidance on the Development Process

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Milton Keynes Partnership



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Section 1

General Introduction

1.1 Background

The adopted Milton Keynes Local Plan (December 2005) and accompanying subsidiary guidance such as the Central Milton Keynes (CMK) Development Framework provides guidance for all future development and redevelopment in CMK and as such provides the context for Development Briefs. When these are taken forward to the stage of developer agreements, clear provision needs to be included for the inclusion of Arboricultural advice and input. This will ensure that tree issues are not omitted from the process and form a clearly considered constraint from the earliest stages.

1.2 Purpose of Document

This document has been prepared to acknowledge and make it clear that existing and proposed street trees in CMK that are subject to development must be dealt with in accordance with nationally recognised good practice.

The pressure that development exerts on trees is recognised; the British Standards Institute produced a document that encourages and provides a benchmark for best practice: BS5837 Trees in Relation to Construction; 2005. This document has the status of recommendations and guidance on the principles to be applied to secure satisfactory solutions to the combination of trees and resources. This will form the basis of these Requirements and is an important reference when considering existing and proposed trees with regards the development of CMK.

1.3 Aim of Document

To serve as a Development Control tool whereby all new developments and infrastructure projects that may have an impact on existing street trees and or new planting are evaluated in accordance with nationally recognised good practice BS5837. This document will outline what this best practice is and how it should be applied.

The key to quality will be planning; the aim will be to apply the same level of preparation and development control to trees as the built environment. We are planting trees that have life expectancies of more than 100 years into the city for the benefit of future generations. It is important to get it right now.

1.4 Scope of Document

This document is of relevance for existing street trees that may be impacted on by development and/or infrastructure projects as well as new planting that may be required as part of the development.

Techniques for tree protection during development, construction and works adjacent to trees have been detailed. These are aimed at reducing damage to trees and are designed to allow the use of readily available materials in achieving their protection.

The installation of utilities adjacent to trees and the effects of trenching will be detailed along with the importance of surface selection and construction adjacent to trees.

It should be recognised that in some cases tree removal will be approved as part of a Planning consent where the Planning Authority deems it appropriate. In such cases, mitigating measures are usually conditional on the Planning approval. This mitigation can take the form of an enhanced Landscape treatment after development. This will often include tree planting, and it is important that such works receive the same attention and professional approach that is afforded to protection of the retained trees.

It is important to note that this document is not a Strategy and is thus not establishing policy concerning future landscaping of CMK or what the quality of existing trees in CMK is.

1.5 Geographic Area of Cover

This document is relevant for all planning applications and infrastructure projects that have an impact on trees located along the Boulevards, Gates, Streets and Rows within the identified red line area.



Boundary of The Conservation and Maintenance Plan for Street Trees in CMK.

Section 2

Requirements for Developments and Infrastructure Projects

2.1 Introduction

The section outlines a structured approach to the development or infrastructure project through the conceptual, design and implementation stages. A flow chart showing the detailed process is found as Figure 1: Flow Chart Showing the Arboricultural Input during the Development Process. This is the adoption of current best practice with regard to trees and construction processes and is based on British Standard 5837: 2005.

2.2 Planning Process

The fundamental starting point of any development is a thorough understanding of the site and what it contains. Surveys for soils, topography, ecology and existing landscaping are vital in assessing any site. This baseline is crucial if good design is to follow. It allows the retention of important features and ensures these elements are not lost due to bad practice and ignorance.

A survey of trees in areas of future development should be required on all sites. This survey needs to include all trees external to the site that will be influenced by the development, thus ensuring the impact of future construction work is considered fully.

The importance of undertaking a tree survey on development sites has been recognised within the 1App Standard Planning Application Form and a tree survey conforming to local requirements and BS5837 “Trees in Relation to Construction” is required when submitting a Planning Application.

BS5837 details the requirements of such a survey and provides a cascade chart that should be used in tree assessment to categorise the trees so they can be considered for retention or removal in relation to the development aspirations for the site. Initial guidance with regard Root Protection Areas (RPA) can also be calculated from this original assessment. Information gathered during the survey can then be shown on a constraints plan that can then be viewed by both the architects and engineers looking at the site development or used to inform Design and Access Statements and Environmental Impact Assessments.



Tree surveys are essential

The impact of other items such as services and vision splays at junctions should be considered at the design stage so many of the root damage and tree position problems will be resolved prior to start on site.

This should be the starting point in a process of consultation with an Arboriculturist who will be required to comment on proposals and details that could directly or indirectly affect the trees. This process should ensure that when the final design has been approved all tree issues have been professionally considered an Arboricultural Method Statement (AMS) can then be produced to accompany the planning application. This AMS details works required with regards the specific trees on the site and details the final position of proposed Root Protection Area Fencing. The AMS also provides a timeline for the implementation of works with the potential to impact on retained trees throughout the development process, including making provision for the replacement of trees where appropriate.

Root morphology is affected by many physical factors that are associated with the trees' position, protecting areas where natural root barriers occur can be pointless.

Final Root Protection Areas as required by BS5837 will need to be drawn up by an Arboriculturist drawing on their specialist knowledge to make any amendments that will provide realistic root protection boundaries.

2.3 Construction Process

Once the planning process is complete then the construction stage begins. Before any construction work can start the site will need to be prepared. The site boundary will need to be secured and the basic infrastructure put in place.

It is at this time that preliminary tree work identified within the tree survey and assessment needs to be completed. Removal of trees that have been identified within the planning consent and the erection of tree protection fencing as specified by the Arboriculturist should be implemented prior to any soil stripping or initial infrastructure works.

Signage should be attached to the fence line following the guidance given within BS 5837 and this Plan.

Site managers should be made aware of the importance and requirements with regard to tree protection.

Regular inspections by an independent Arboriculturist is recommended to ensure tree protection issues are monitored and any problems resolved quickly. It is recommended that this should be part of the development control requirement for planning consent and should be funded by the developer, thus ensuring that trees become a primary consideration within the development.

The protection of potential planting areas should also be considered as the first option as this will reduce the level of compaction from construction plant. The protected areas can be prepared in advance of any planting and this will ensure the successful establishment of the associated site landscaping.

2.4 Post Construction Landscaping Establishment

Post construction re-inspection of the trees will be carried out by MKC so any tree work identified by the Arboriculturist as being essential can be carried out prior to adoption.

All pre adoption works concerning the planting of trees and landscape works need to be supervised by the Landscape Manager responsible for the site and preferably in combination with the final adoption agency. This will ensure that when final signing off of the site and adoption by MKC is carried out it will be problem free. By this process MKC will need to be assured that all works have been completed as specified and little if any remedial work will be required.

The agreed method and specification for the establishment and future maintenance of the trees will form a key element in the landscape plan. The plan should contain a specification for supervision and signing off of the works that is agreed with the adopting agency (MKC) prior to a start on site. Plant quality and health will need to be checked prior to planting. Details of tree provenance and its country of origin will need to be provided by the landscape contractor prior to start of works. Maintenance schedules can be provided by the Landscape Manager providing guidance on the maintenance regime for the site.

The long term landscape objectives should be included in the landscape plan. This will provide a clear understanding of how the landscape will develop and what elements are key to the design. This will guide maintenance and provide managers with a clear understanding behind the design and its vision.

PHASES	ACTIONS		
<p>PHASE 1</p> <p>Site Appraisal and Analysis</p>	surveys	<ul style="list-style-type: none"> • topographical • ecological • trees • services 	<ul style="list-style-type: none"> • tree positions • existing structures and surfaces • protected species etc • data gathering for BS 5837 report
	reports	<ul style="list-style-type: none"> • BS5837 	<ul style="list-style-type: none"> • utility routes where known • tree data • categorisation • arboricultural impact assessment • tree constraints plan
<p>PHASE 2</p> <p>Accommodating Trees into the Development Design</p>	design	<ul style="list-style-type: none"> • initial design • consultation with arboriculturalist • arboricultural method statement • landscape plan 	<ul style="list-style-type: none"> • aspirations of the client • ongoing throughout design stage identify trees to be retained • deal with construction implications • root protection areas • tree removals and retention plan • new tree positions and mitigation planting
<p>PHASE 3</p> <p>PLANNING APPLICATION</p> <p>Including Impact Assessment of Development on Trees</p>	Approvals	<ul style="list-style-type: none"> • submission • comments 	<ul style="list-style-type: none"> • approval • section 106 Agreement
<p>PHASE 4</p> <p>Development</p>	construction	<ul style="list-style-type: none"> • preliminary works 	<ul style="list-style-type: none"> • fence site • carry out required tree work and • tree removals • erect tree protection fencing
<p>PHASE 5</p> <p>Aftercare of Trees</p>	post construction	<ul style="list-style-type: none"> • ongoing maintenance 	

Figure 1: Trees and Development Flow Chart

Section 3

Approach to Urban Tree Care Best Practice

3.1 Introduction

This section provides information on best practice with regards tree care in the urban environment. It has been compiled from a selection of relevant British Standards and guides that provide the most up to date information on tree establishment and care available. A list of publications used in the production of this note can be found in Appendix B.

The Best Practice Approach has been divided into individual Sections:

- Tree Protection
- Installation of Hard Surfaces in Relation to Trees
- Ground Preparation
- Utilities and Services – Implications for Street Trees
- Tree Management and Future Maintenance

3.2 Tree Protection

Trees will require protection measures both during establishment and when construction or demolition is being carried out adjacent to them.

Both the above and below ground parts of the trees require this protection.

Physical damage to trees above ground is easily identifiable; however internal faults such as cracking and splits caused by physical impacts may produce problems later in the life of the tree. Root damage is however less obvious. Roots provide trees with air, water, nutrients and support, if they are severed or the soil compacted around them then the delicate balance within which they exist will be altered. This can lead to complete failure of the tree due to loss of roots and its associated support system, or slow air, moisture and nutrient starvation.

Tree protection should be seen as a method of shielding the trees' natural balance and an attempt to limit the changes to their current environment.

Conservation of existing trees that are to be retained within CMK can only be effectively achieved with a high level of protection and planning.



Milton Keynes - 'City of trees'



Trees protected during construction

3.3 During Establishment / General

Tree protection during the trees' establishment should be considered on a site by site basis. Currently the need for guarding to prevent vandalism and damage to trees has not been high within CMK. Largely the use of semi mature tree stock and early establishment of trees has been enough to prevent damage. Construction and Demolition

Tree protection is vital for trees being directly affected by demolition or construction, BS 5837:2005 clearly acknowledges this.

Both the above and below ground parts of trees are susceptible to damage from development activities. If RPA zones are not established prior to start on site then the likelihood of damage is high. Once damage to trees has occurred it is difficult if not impossible to remedy. Some damage may take years to manifest itself especially when related to the tree root system. Trees have developed complex survival strategies that allow them to combat adverse conditions and physical damage for a long period before finally expiring.

The design and final position of the RPA exclusion zone should be the work of the Arboriculturist (ref BS5837:2005 Para. 2.8).

The Arboriculturist should be responsible for identifying the final positioning within the Arboricultural Method Statement; some adjustments to fit in with the root morphology can be made based on the Arboriculturists experience and knowledge. She/he should also be consulted and supervise any works within the exclusion zone. These works are very rare but sometimes unavoidable, and need to be carried out using great care and in accordance with best practice.

Root Protection Areas should otherwise be considered sacrosanct and the protective fencing needs to be constructed in such a way that moving it or access to the protected area is difficult. The fencing must also be robust enough to withstand impact from heavy plant and machinery. Storage of any materials within the protected area is not acceptable.

Site managers need to be aware of the requirements of the Root Protection Area and disseminate the information to everyone working on the site.

Notices need to be placed on the fencing emphasising the importance of the exclusion zone.



No protection considered - CMK development site.

3.4 Barriers

The British Standard gives a design detail of fencing recommended for tree protection. The construction detail incorporates a combination of scaffold poles and weld mesh to create the fencing. This can be difficult to erect and is expensive. The ultimate requirement for the design of tree protection fencing is that it should be strong, fixed, secure and suitable for purpose.

Notices need to be placed on the fencing emphasising the importance of the exclusion zone.

This Plan recommends where appropriate the use of an appropriate weld mesh fencing with secured bases (concrete or plastic footings). Steadfast struts and anti-tamper couplers could provide a readily available alternative. By securing the footings to the ground using steel pins the system would provide a stable and effective barrier that complies with all the requirements for fencing. This fencing is readily available and can be hired in for the duration of the construction period.

Alternatively the use of Chestnut Pale supported on a scaffold framework could be considered with the agreement of the Arboriculturist.

3.5 Ground Protection

It is recognised that on occasion's vehicle or pedestrian access will encroach within the Root Protection Area. When this is required ground protection will be required to limit the extent of compaction and physical root damage.

The British Standard gives examples of ground protection measures that allow access and movement through the Root Protection Area.

Access routes for vehicles, both temporary and permanent can be constructed from surface reinforcement systems such as Geo Web. These systems are designed for purpose and minimise root disturbance, whilst incorporating a permeable surface allowing moisture and aeration levels for tree roots to be maintained.

Section 4

Installation of Hard Surfaces in relation to Trees

4.1 Introduction

The construction of hard surfaces near to trees can result in significant harm being caused to the trees root system.

The main causes of damage related to the installation of hard surfaces in relation to existing trees are root severance and soil compaction; additionally if a sealed surface is installed near to trees it will prevent gaseous exchange and moisture infiltration.

If significant harm to trees is to be avoided during the installation, maintenance or renewal of hard surfaces special precautions will be necessary.

4.2 Where are precautions necessary?

As the installation of new hard surfaces is a construction activity the area in which precautions must be taken is the Root Protection Area as specified within BS5837:2005.

Within this area special construction measures will be necessary to minimise damage to the tree.

4.3 What precautions are necessary?

Existing Trees

Where new surfaces are to be installed within the RPA of an existing tree the following requirements should be met:

- The installation of the surface should be done in such a way as to prevent physical damage to tree roots.
- The surface should provide for gaseous exchange and allow for moisture infiltration.
- The construction should be designed in such a way to minimise soil compaction.



New permeable surface around tree base

Where existing hard surfaces are to be repaired, renewed or replaced within the RPAs of existing trees care will still need to be taken to meet the above requirements and it should be recognised that the renewal of existing hard surfaces will present an opportunity to improve local growing conditions for trees.

Techniques that may be employed to help minimise damage to the trees whilst ensuring the surface is fit for purpose include:

- The use of pneumatic excavation to establish the extent of tree roots within the area of proposed construction.
- The use of three dimensional cellular confinement systems to allow shallower construction.
- The use of above ground construction.
- The use of structural soils to allow a compromise between engineering requirements and provision for tree root growth.
- The use of pervious or permeable final surfaces.
- The installation of soil aeration pipes or perforated bollards.

To accomplish the requirements for tree growth whilst also ensuring the surface is fit for purpose specialist Arboricultural and Engineering advice will need to be sought.

4.3.2 New Planting

Specifications for the installation of hard surfaces in areas of new planting are found within the CMK Handbook.

In addition to these specifications provision could be made for increased soil aeration by the installation of soil aeration pipes or perforated bollards.

Section 5

New Planting - Ground Preparation

5.1 Significance of Appropriate Preparation

All tree planting necessitates careful ground preparation however urban trees are often subject to unfavourable growing conditions and therefore particular care is required to promote successful and healthy development.

The appropriate care at the planting stage, and more importantly appropriate preparation for the development of the root system, are key factors in successful tree establishment and have a great impact with regard to future cost implications in terms of future management of trees of poor health and replacement for unsuccessful trees.

5.2 Root Systems

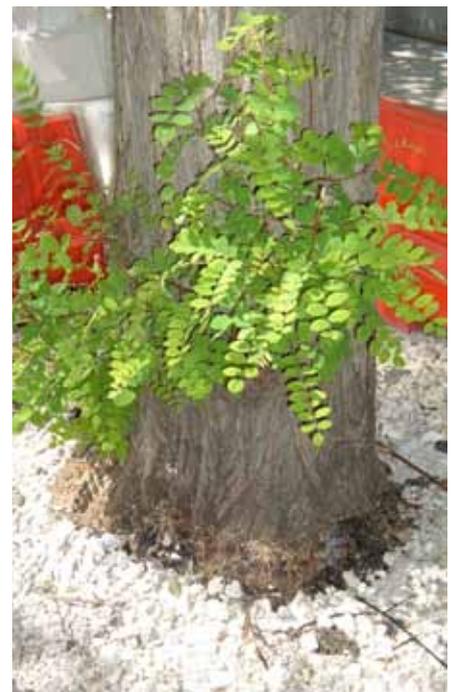
A trees' root system provides: water and nutrient uptake, anchorage and therefore structural stability, and storage of nutrients to be utilised during biological processes for example bud burst and defence against pests and diseases.

Where existing hard surfaces are to be repaired, renewed or replaced within the RPAs of existing trees care will still need to be taken to meet the above requirements and it should be recognised that the renewal of existing hard surfaces will present an opportunity to improve local growing conditions for trees.

5.3 Common Problems

Trees planted in an urban environment commonly suffer from drought stress and lack of available oxygen and nutrients within the ground due to unfavourable conditions and impermeable surfaces. Water, oxygen and nutrients are required to sustain the tree and promote healthy development and root growth. A trees potential for development is directly linked to the size, health and condition of the root system.

Prolonged drought stress can have a permanent effect on the trees ability to photosynthesis, greatly affecting its health and reducing its useful life expectancy. Waterlogging of soils as a result of soil compaction is a problem in urban areas and root death due to asphyxiation can occur as a consequence.



Poor surface around base of tree

5.4 Timing of Operations

Tree planting is most appropriate during the autumn and winter. If it is necessary to plant trees at another time of year watering will be required during at least the first growing season. Deciduous trees are best planted during the dormant season however evergreens favour a warmer temperature to promote root activity therefore early autumn or late spring serve better.

5.5 The Nature of Street Trees

The very nature of landscape design for street trees places constraints on tree development. It is vital that appropriate location with regard to existing structures, utilities and street furniture is considered prior to undertaking any tree planting.

In addition the timing of tree planting in relation to site development is vital to promote a fluent installation of both structure and vegetation, and species selection should be considered carefully to promote a tree stock that is suitable for an urban environment.

The tree species selected within the CMK Handbook takes this into account recommending trees with narrow, columnar crowns or trees that are suitable for pruning regimes that make them more suitable for urban environments.

5.6 Materials Required

It is recommended that the use of ameliorated soils be considered when planting trees in CMK. These products are specifically designed for urban trees that has a good structure, high organic matter and good drainage.

5.7 Specification for Ground Preparation:

Areas designated for tree installation must be able to provide subsoil and topsoil (tree soil) that have a good physical structure, are retentive of moisture and are well drained. Where these factors are lacking cultivation will be required.

The following bullet points set out the procedure, in order of implementation, for ground preparation and tree planting.

- fence off area designated for tree installation (See Tree Protection)
- utilise plant machinery to excavate tree pits to appropriate depths, one individual tree pit per tree (pits should be excavated at the time of planting and not in advance therefore avoiding desiccation of the pit)
- tree pits must be at least twice the size of the diameter of the root spread and 1.5 times the depth of the root stock to be planted
- utilise plant machinery or hand tools to break up the interior walls and base of the pit
- remove subsoil from the pit, and from site
- utilise plant machinery or hand tools to apply good quality soil (see ameliorated soils above) to the pit

Following mechanical excavation and soil addition to the pit all mechanical operations must cease and the actual tree planting must be undertaken by hand.

- All trees should be situated within an individual tree pit so that the top of their root ball is at ground level. (Tree stock should be planted as close to delivery of the stock as is workable, on the day of delivery, and protected at all times by Hessian or a similar material to avoid desiccation of the roots.)
- Once set to the correct level the tree pit should be backfilled by hand with good quality topsoil (tree soil) which is specifically designed for urban trees, and firmed down by the sole of the foot to ensure no air pockets are left around the root stock.
- All trees must be watered in with at least 40 litres of water immediately following planting.

Detailed specification drawings are found in the Central Milton Keynes Handbook.

5.8 Tree Securing

There are various methods for securing new trees that aid the stability of the tree while allowing the development of a strong stem and promoting good stem taper. The CMK Handbook details an underground anchorage system that has proven most effective in all established urban planting within the area and negates the need for above ground appendages such as stakes and securing guards. The installation of this system must coincide with the pit preparation and planting specification as detailed above.

5.9 Surface Treatments and Tree Surrounds

There are several materials selected within the CMK Handbook for surface treatments around trees. Whichever medium is utilised must be porous to allow oxygen and water to penetrate the surface and must be suitable for adjustment to allow for the trees growth.

It must be noted that the trees may develop at different rates within the same species and will develop at different rates across species. It will therefore be necessary during regular tree inspections to check for available spacing around the trees stem bases and adjustment will be required. Trees will include any materials that impede their incremental development.

If weed control around tree bases is necessary then chemical application can be utilised, however selection of appropriate chemicals is vital. Only Approved herbicides should be used and used in accordance with the manufacturers' recommendations. Some weed treatments become active once in contact with the soil and may therefore have a detrimental effect on the tree. Glyphosate is recommended for any weed treatment required however it has been associated with tree damage through use as a herbicide in hard surface situations and when used as a stump treatment. Normally, leaching through the soil will not occur with this chemical and as long as direct tree foliar contact is avoided the tree will not be affected by chemical usage.

In some situations the use of control release fertilisers and mycorrhizal fungi should be considered to aid establishment and improve the rooting and soil fauna.

5.10 Aftercare

A programme of aftercare should be arranged prior to planting and be included within any planning application and handover agreement. Aftercare programmes must incorporate the following: inspection of all newly planted trees checking on health and condition, identifying required adjustments at ground level regarding surface materials, formative pruning requirements and replacement of dead trees.

It is recommended that aftercare is undertaken for a period of 3 years following plant establishment however this period will need to be reviewed dependant on the tree stocks success rates.

N.B. An aftercare regime should be replaced with a regular programme of tree inspections.

Section 6

Utilities and Services Implications for Street Trees



No consideration to existing tree when installing utility services

6.1 Introduction

The aims of this section is to identify best practice in urban tree management in relation to the installation, maintenance and renewal of utilities and services in close juxtaposition to existing street trees. Its relevance in this document is to offer guidance on establishment of new services and the design of those services.

6.2 Implications of Utility and Service Route Works

The installation, maintenance and renewal of utilities and services in proximity to trees presents a number of threats to trees and to tree growth.

To understand properly how activities related to such works can affect tree growth the interaction between tree roots and the surrounding soils must be appreciated. In particular it must be understood that trees rely on soil as a source of air, water and minerals and as medium in which root systems develop to perform the functions of absorption and anchorage. As such soil problems resulting from utilities work can be a serious limitation to the successful growth of trees.

It is important to note that, contrary to popular belief, the majority of tree roots are typically found within the upper metre of the soil profile. In fact broad leaf trees can be expected to have 82% of their total root length within the top 50cm of soil. (Ref: Tree Roots in the Built Environment, DCLG 2006)

Given this it can be seen that tree roots are vulnerable to damage from even limited ground works. The most common implications of utility works on tree health, their causes, effects and methods for avoidance are summarised in the Figure 2 below.

As major damage to a tree's root system can be caused in a short time it is essential that works are planned to avoid damage occurring.

There are several published guidance notes and standards, including NJUG Volume 4, which set out how to plan and undertake utilities works in proximity to trees and whilst it is not the intention of this document to repeat these here, the basic principles for avoiding damage to trees are set out on the next page.

6.3 Main Principles for Avoidance of Damage

Where the installation, maintenance or renewal of utilities and services must be carried out in close proximity to trees the main things to avoid are the severance of tree roots and the compaction of the soil. To achieve this a precautionary area around existing trees needs to be established prior to any works being undertaken.

The extent of the precautionary area needs to take into account many factors and it should be specified in accordance with guidance contained within NJUG Volume 4, and BS5837:2005. Whichever is most appropriate based on the opinion of the Arboriculturist.

The exact extent of the precautionary area may be modified by the Arboriculturist to account for locally specific factors that may have an effect on the morphology and distribution of the tree roots.

Within this precautionary area no mechanical excavation of open trenches is allowable. Alternative techniques for the works will need to be specified.

Such alternatives may include the use of trench-less techniques such as soil boring or drilling, the use of broken trenches with hand dug sections of open trench or a continuous hand dug open trench.

Where hand digging is specified it must be carried out in strict accordance with the relevant guidance and ideally in accordance with a site specific Arboricultural method statement prepared by an Arboriculturist.

As an alternative to hand digging, which is labour intensive and likely to cause a degree of harm no matter how carefully the works are carried out, is excavation of trenches with pneumatic or hydraulic jets.

Such methods or excavation are a relatively new advance and there is little published guidance or methodology for their use as a method for excavation around trees and as such works of this nature should only be carried out in accordance with a method statement prepared by an Arboriculturist.

To prevent soil compaction within the precautionary area no vehicles, plant or machinery should be permitted to enter the area unless suitable ground protection measures are installed or they are restricted to existing hard surfaces within the area.

The exclusion of vehicles, plant and machinery from within the precautionary area will also help to prevent any impact damage to tree branches or stems.

To reduce the potential for damage to trees resulting from renewal or repair of existing services alternative methods of repair such as fitting existing pipes with a new liner could be considered. Such methods of repair may also help to prevent root incursion into pipes.

TYPE OF DAMAGE	POTENTIAL CAUSES	EFFECTS	METHODS FOR AVOIDANCE
ROOT SEVERANCE	<ul style="list-style-type: none"> • excavation of trenches • grading • soil stripping 	<ul style="list-style-type: none"> • increased risk of windthrow • loss of functional root shoot equilibrium • reduction in ability for tree to recover from attack by pathogens or from other injuries 	<ul style="list-style-type: none"> • use trenchless techniques • use airspade • manual excavation • work in accordance with best practice arboricultural assessment and method statements
SOIL COMPACTION	<ul style="list-style-type: none"> • vehicle movements • repeated pedestrian movements • machinery movement/ parking material storage • engineered/purposeful compaction • potential for compaction greater when soils are saturated 	<ul style="list-style-type: none"> • reduced availability of air and water leading to lower growth • increased soil bulk density affecting root growth • soil waterlogging 	<ul style="list-style-type: none"> • avoid using machinery in precautionary area • use ground protection where access is required within precautionary area • avoid working within precautionary area in wet conditions • work in accordance with best practice
SOIL CONTAMINATION	<ul style="list-style-type: none"> • fuel or oil spill from refuelling activities • hydraulic fluid leaks from machinery • cement or plaster spillage 	<ul style="list-style-type: none"> • root death leading to impaired tree growth • higher soil pH affecting root growth 	<ul style="list-style-type: none"> • avoid refilling machinery within precautionary zone • use biodegradable lubricants in hydraulic systems • do not store materials within precautionary zone. Do not mix materials within precautionary zone. • no fires within 10m of trees
BRANCH DAMAGE	<ul style="list-style-type: none"> • collision with machinery • scorching from fires 	<ul style="list-style-type: none"> • branch death • bark damage • branch failure 	<ul style="list-style-type: none"> • crown lift to remove low branches prior to works • no machinery or vehicles within precautionary zone • no machinery or vehicles within precautionary area
STEM DAMAGE	<ul style="list-style-type: none"> • collision with machinery • storage of materials 	<ul style="list-style-type: none"> • bark damage leaving potential infection point • cambium damage 	<ul style="list-style-type: none"> • no materials storage in precautionary area • work in accordance with best practice guidance

Figure 2: Tree Damage from Development

APPENDIX

Relevant British Standards and Guides

British Standards Institution (1991) BS 5837:
2005 Guide for Trees in Relation to Construction.

British Standards Institution (1989) BS 3998:
1989 Recommendations for Tree Work.

British Standards Institution (1984) BS 1192:
1984 Recommendations for Landscape Drawings, Part 4.

British Standards Institution (1989) BS 4428:
1989 Code of Practice for General Landscape Operations
(Excluding Hard Surfaces).

British Standards Institution (1989) BS 4043: 1989 Recommendations for
Transplanting Root-Balled Trees.

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Glossary of Terms

Abiotic Factors -

Nonliving factors of the environment, including temperature & wind.

Age-Class -

A general classification of the tree into either - young, semi-mature/ maturing, mature, over-mature, or senescent.

Apical Bud/Shoot –

The apical bud, also known as the leading shoot, is responsible for shoot extension and is dominant.

Apical Dominance –

A singular, leading shoot remains dominant.

Arboreal -

In connection with, or in relation to, trees.

Arboriculturalist –

Person who has, through relevant education, training and experience, gained recognised qualifications and expertise in the field of trees in relation to construction.

Arboricultural Implications Assessment (AIA) –

Study, undertaken by an arboriculturalist, to identify, evaluate and possibly mitigate the extent of direct and indirect impacts on existing trees that may arise as a result of the implementation of any site layout proposal.

Arboricultural Method Statement (AMS) –

Methodology for the implementation of any aspect of development that has the potential to result in the loss of or damage to a tree.

Note The AMS is likely to include details of an on-site tree protection monitoring regime.

Biotic Factors -

Living factors. For example, animals and pathogens.

Branch Union/Junction -

The point at which a branch joins a larger stem. Can be a point of weakness, especially in certain species.

Canker –

A clearly defined area of dead and sunken or malformed bark, caused by bacteria or fungi. Can have a bearing on structural integrity of infected limb(s) depending on size and location.

Co-Dominant Stems -

A growth characteristic, where two or more stems of similar size grow from the same point. Can create an inherent weakness.

Compaction -

The compressing & hardening of soil around tree root systems, due to vehicular/pedestrian use etc. Loss of pore space between soil granules limits water movement and gaseous exchange, and inhibits root growth.

Competent Person –

Person who has training and experience relevant to the matter being addressed and an understanding of the requirements of the particular task being approached

Note 1 A competent person understands the hazards and the methods to be implemented to eliminate or reduce the risks that can arise. For example, when on site, a competent person is able to recognise at all times whether it is safe to proceed.

Note 2 A competent person is able to advise on the best means by which the recommendations of this British Standard may be implemented.

Condition –

Assessment based on a visual and professional view giving consideration to many factors such as tree health, structural integrity and suitability of its position.

Construction Exclusion Zone –

Area based on the RPA (in m²), identified by an arboriculturalist, to be protected by development, including demolition and construction work, by the use of barriers and/or ground protection fit for purpose to ensure the successful long-term retention of a tree.

Coppice -

The method of managing trees by cutting the stems at between 1.0 inch and 1.0 foot from the ground level on a regular cycle, the cut stumps of the trees or shrubs are allowed to re-grow many new stems.

Crown Spread -

Gives distances between extreme limits of the crown and the stem, usually along the four compass points. Helps to show crown symmetry.

Crown Reduction –

The removal of branch ends to reduce the extreme limits of a trees branch spread and height.

Crown Thin –

The removal of selected branches within the crown to thin the internal branch structure.

Dieback -

The reduction in crown vigour and extension growth progressing to death of distal parts; often associated with decline.

Epicormic/Adventitious Growth - New growth from dormant buds that can often form tenuous attachments. Although some species readily form such shoots, it can be an indication of stress.

Form -

A general assessment of the shape and position of the tree within its' environment.

Included Bark –

Growth characteristic usually caused when two or more stems/branches growing in close proximity 'fuse' together entrapping the bark from when the parts were separate in the middle, creating a structural weakness.

Pathogen -

An agent that causes disease, especially a living microorganism such as a bacterium or fungus.

Pollard –

The removal and subsequent regular re-removal of the crown of a tree above animal browsing height. Can be an effective method of controlling the size of trees in urban areas. This is ideally begun in the trees early stages and maintained throughout its life.

Root Protection Area (RPA) –

Layout design tool indicating the area surrounding a tree that contains sufficient rooting volume to ensure the survival of the tree, shown in plan form in m².

Scaffold Branches -

The main structural branches within the crown.

Services –

Any above ground and piped and/or ducted underground infrastructure including water main, electricity supply, gas supply, fibreOptic utilities, telecommunications cabling, storm and foul water drainage, including temporary storage for run-off, pumping stations, interceptors and other allied buried structures.

Shrinkable Clay –

Clay soil which alters in volume depending on moisture content.

Property sited on shrinkable clay can suffer subsidence damage due to soil desiccation; this can be due to the water uptake of nearby vegetation, including trees.

Special Engineering –

design of a structure with the physiological requirements of trees as the priority.

Standard –

Size of tree for planting, usually ranging from 2m to 3.5m in height.

Structure –

Man-made object, such as a building, carriageway, path, wall, services, and built and excavated earthworks.

Tree Constraints Plan (TCP) –

Plan prepared by an arboriculturalist for the purposes of layout design showing the RPA and representing the effect that the mature height and spread of retained trees will have on layouts through shade, dominance, etc.

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