BS5837:2012
Tree Report

HERITAGE
TREE SPECIALISTS LTD
TREE SURGERY • FORESTRY

Proposed Accommodation Suites & Spa
Twenty 9 Bar & Restaurant
29 Market Place
Burnham Market
Norfolk
PE31 8AF

Contents

Introduction

Trees can offer many benefits, including:

• providing visual amenity, softening or complementing the effect of the built environment, and adding maturity to new developments;

• displaying seasonal change and providing opportunities for wildlife in built-up areas;

• making places more comfortable in tangible ways by contributing screening and shade, reducing wind speed and turbulence, intercepting snow and rainfall, and reducing glare.

Trees are also important elements of green infrastructure, contributing to urban cooling through evapo-transpiration and providing micro-climatic effects that can reduce energy demands in buildings. They therefore represent a key resource that can significantly contribute to climate change adaptation.

Existing trees are an important factor on construction sites, whether on or near the working areas, and trees are a material consideration in the UK planning system (see Annex B). This British Standard is intended to assist decision-making with regard to existing and proposed trees in the context of design, demolition and construction. Root systems, stems and canopies, with allowance for future movement and growth, need to be taken into account in all projects, including those that do not require planning permission. The space required for any proposed new trees to become established is an important consideration.

During their lifetime, trees will be vulnerable to disturbance, injury, environmental changes, pests and diseases. Construction work often exerts pressures on existing trees, as do changes in their immediate environment following the construction. A tree that has taken many decades to reach maturity can be damaged irreparably in a few minutes by actions that might be unwitting, negligent or wilful (see Annex A). The early provision of physical protection from damage is therefore critical.

Where tree retention or planting is proposed in conjunction with nearby construction, the objective should be to achieve a harmonious relationship between trees and structures that can be sustained in the long term. The good practice recommended in this British Standard is intended to assist in achieving this objective.

1 Site Overview

1.1 The area of proposed development is in the North Easterly corner of the gardens to the rear of the property. These comprise

- Existing Accommodation Suites and outside dining areas
- Landscaped gardens
- An existing timber outbuilding

1.2 There is a significant change in level over the site

1.3 The specific area of development is currently laid to shingle with a variety of trees to the borders and is dominated by a large, mature Holm Oak.

2 Client Instructions

2.1 Application
Our clients are currently in the process of submitting an application for the construction of a detached accommodation suite, and the conversion of an existing outbuilding to a Spa.

2.2 Heritage Tree Specialists Ltd have been provided proposed layout plans by ACS Architectural of Unit 3, Poppyfields Retail Park, Poppyfields Drive, Snettisham, PE31 7FR

2.3 This report is intended to accompany Planning Applications and to provide specific information on individual trees, including Arboricultural Implications and Tree Protection Plan.

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 access facilitation pruning
one-off tree pruning operation, the nature and effects of which are without significant adverse impact on tree physiology or amenity value, which is directly necessary to provide access for operations on site

3.2 arboricultural method statement
methodology for the implementation of any aspect of development that is within the root protection area (3.7), or has the potential to result in loss of or damage to a tree to be retained

3.3 arboriculturist
person who has, through relevant education, training and experience, gained

expertise in the field of trees in relation to construction

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

3.5 construction
site-based operations with the potential to affect existing trees

3.6 construction exclusion zone
area based on the root protection area **(3.7)** from which access is prohibited for the duration of a project

3.7 root protection area (RPA)
layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure is treated as a priority

3.8 service
any above- or below-ground structure or apparatus required for utility provision

NOTE Examples include drainage, gas supplies, ground source heat pumps, CCTV and satellite communications.

3.9 stem
principal above-ground structural component(s) of a tree that supports its branches

3.10 structure
manufactured object, such as a building, carriageway, path, wall, service run, and built or excavated earthwork

3.11 tree protection plan
scale drawing, informed by descriptive text where necessary, based upon the finalized proposals, showing trees for retention and illustrating the tree and landscape protection measures

3.12 veteran tree
tree that, by recognized criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned

NOTE These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem.

4 Survey, Assessment & Plans

4.1 General

A Plan is included to show:

- the location of individual trees
- proposed site layout

4.2 Survey

4.2.1 The survey carried out by Heritage Tree Specialists Ltd includes:

a) the position of all trees within the site with a stem diameter of 75 mm or more (see Note), measured at 1.5 m above highest adjacent ground level;

NOTE In the case of woodlands or substantial tree groups, only individual trees with stem diameters greater than 150 mm usually need be plotted.

b) the position of trees with an estimated stem diameter of 75 mm or more that overhang the site or are located beyond the site boundaries within a distance of up to 12 times their estimated stem diameter;

c) for individual trees, the crown spread taken at four cardinal points; for woodlands or substantial tree groups, the overall extent of the canopy;

d) the extent, basal ground levels and height of shrub masses, hedges, hedgerows and stumps;

e) other relevant landscape features and artefacts, such as streams, buildings and other structures, boundary features and means of enclosure, trenching scars near to trees, and overhead and underground utility apparatus, including drainage runs with manholes and invert levels.

4.3 Soil assessment

4.3.1 Heritage Tree Specialists Ltd have not carried out a soil assessment. Soil assessment is recommended as soil type may have an impact upon the following:

• new planting design; and

• foundation design to take account of retained, removed and new trees.

4.3.2 The assessment should determine whether the soil is shrinkable. If it is, trees and other vegetation have the potential to cause indirect damage to structures (see Annex A). In such cases, desiccation assessments should be carried out at a specialist laboratory to check the extent to which existing vegetation has dehydrated the soil.

4.3.3 Soil structure, composition and pH should be included in the assessment for the purpose of designing new planting and landscape proposals.

4.4 Tree survey

4.4.1 Timing

A tree survey was carried out on 14th July 2021 by Heritage Tree Specialists Ltd. Trees were in leaf.

Tree No	Species	Height m	Stem Diameter mm	Branch Spread m	Height of Crown Clearance m	Age Class Young / Middle / Mature / Over Mature / Veteran	Physiological Condition Good / Fair / Poor / Dead	Structural Condition Collapse / Decay / Defects	Management Recommendations and Category Grading	Estimated remaining contribution Years
T1	Holm Oak	15	1350 m.s	N 7.5 E 8.0 S 7.0 W 8.0	1.5	Mature	Good	-	Minor Crown lift to 4 metres A1	40+
T2	Cherry Plum	4	300 m.s	N 1.5 E 1.5 S 1.5 W 1.5	1	Middle	Good	-	Retain B2	20-40
T3	Hazel	4	120 m.s	N 1.5 E 1.5 S 1.5 W 1.5	1.5	Middle	Good	-	Retain B2	20-40
T4	Hawthorn	4	120	N 1.5 E 1.5 S 1.5 W 1.5	1.5	Middle	Good	-	Retain B2	20-40
T5	Rowan	4	150	N 1.0 E 1.0 S 1.0 W 1.0	1.5	Middle	Good	-	Retain B2	20-40
T6	Field Maple	8.5	310	N 2.5 E 2.5 S 2.5 W 2.5	2	Middle	Good	-	Retain B2	20-40
T7	Field Maple	7.5	400#	N 2.5 E 2.5 S 2.5 W 2.5	2	Middle	Good	-	Retain B2	20-40

NOTE – 'm.s' denotes a tree with multiple stems. '#' denotes an estimated measurement due to access constraint

4.5 Root protection area (RPA)

4.6.1 The RPA (see 3.7) has been calculated as an area equivalent to a circle with a radius 12 times the stem diameter.

4.6.2 The RPA's of retained trees have been plotted on a Plan which is included in this report.

4.6.3 The individual RPA's of retained trees on this site are as follows:

Tree No.	Species	Category	S or MS Stem	Diameter (mm)	Minimum radius of root protection (m)	Minimum Root Protection Area (m2)
T1	Holm Oak	A	MS	1350	15	707
T2	Cherry Plum	B	MS	300	3.6	41
T3	Hazel	B	MS	120	1.5	7
T4	Hawthorn	B	S	120	1.5	7
T5	Rowan	B	S	150	1.8	10
T6	Field Maple	B	S	310	3.6	41
T7	Field Maple	B	S	400#	4.8	72

Note – 'MS' or 'S' refers to a Multi Stem or a Single Stem tree respectively.

5 Arboricultural Statements

5.1 Arboricultural impact assessment

5.1.1. Full details and measurements for trees are included within the Tree Assessment (Section 4.0) and the trees are plotted on the plan.

5.1.2 Tree Removal

No tree removal is required on this site.

5.1.3 Tree Pruning

We recommend that T1 (Holm Oak) be crown raised to a height of 4 metres on the North side of the crown in order to provide clearance for work to the existing outbuilding and from the proposed accommodation suite.

5.2 Tree protection

5.2.1 The tree protection plan is included in this report.

5.2.2 The plan indicates the precise location of protective barriers to be erected to form a construction exclusion zone around the retained trees. Following information details the extent and type of ground protection, and any additional physical measures, such as tree protection boxes, that will need to be installed to safeguard vulnerable sections of trees and their RPAs where construction activity cannot be fully or permanently excluded.

5.2.3 To avoid disturbance to the physical protection, once installed, the following guidelines should be followed:

Access to and from the site is to be via the existing rear access point

Construction activity within 1 metre of the physical protection barrier is to be carried out, carefully, using hand tools and low impact machinery.

Contractors vehicles are not to be brought onto site

Construction plant is to work from open ground and must not breach any physical protection barrier

Scaffolding may be installed up to 1 metre from physical protection barriers

Any temporary latrines etc are to be situated no closer than 3 metres from Tree Protection Barrier in order to avoid damage during placement and removal.

Materials associated with the building works are not to be stored within 2 metres of the Physical Protection Barrier. This will minimise the risk of damage to the Root Protection Areas or crowns when loading and unloading. Furthermore, this will also minimise any risks of damage to tree roots through contamination due to spillages etc.

6 Method statements

6.1 Arboricultural method statement

The following methods are to be followed in order to minimise damage to the retained trees prior to, during and following construction.

6.2 Barriers and ground protection

6.2.1 General

6.2.1.1 All trees that are being retained on site should be protected by barriers and/or ground protection before any materials or machinery are brought onto the site, and before any demolition, development or stripping of soil commences. Vertical barriers are to be erected to create a construction exclusion zone. Where, due to site constraints, construction activity cannot be fully or permanently excluded in this manner from all or part of a tree's RPA, appropriate ground protection is to be installed

6.2.1.2 The protected area should be regarded as sacrosanct, and, once installed, barriers and ground protection should not be removed or altered without prior recommendation by the project arboriculturist and, where necessary, approval from the local planning authority.

6.2.1.3 Pre-development tree work may be undertaken before the installation of tree protection measures, with the agreement of the planning authority if appropriate.

6.2.2 Barriers

6.2.2.1 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). Barriers should be maintained to ensure that they remain rigid and complete.

6.2.2.2 The physical protection barrier should comprise a vertical and horizontal scaffold framework, well braced to resist impacts. The vertical tubes should be spaced at a maximum interval of 3 m and driven securely into the ground. Onto this framework, welded mesh panels should be securely fixed. Care should be exercised when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid contact with structural roots. If the presence of underground services precludes the use of driven poles, an alternative specification should be prepared in conjunction with the project arboriculturist that provides an equal level of protection. Such alternatives could include the attachment of the panels to a free-standing scaffold support framework.

6.2.2.3 All-weather notices should be attached to the barrier with words such as: “CONSTRUCTION EXCLUSION ZONE – NO ACCESS”.

6.2.2.4 Physical construction barriers have been set back on this site in order to allow construction to proceed (See Tree Protection Plan to accompany this report).

6.2.3 Ground protection during demolition and construction

Ground protection should be installed in exposed parts of the RPA (those areas exposed due to the set- back in alignment of Protection Barriers).

6.2.3.1 Exposed parts of the RPA outside of the protection barrier should be protected using the appropriate method, detailed below, in order to avoid compaction to the rooting area due to pedestrian or vehicular movements.

6.2.3.2 Temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction

of underlying soil.

a) for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane;

b) for pedestrian-operated plant up to a gross weight of 2 t, proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

c) for wheeled or tracked construction traffic exceeding 2 t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

6.2.3.3 In all cases, the objective should be to avoid compaction of the soil, which can arise from the single passage of a heavy vehicle, especially in wet conditions, so that tree root functions remain unimpaired.

6.2.4 Additional precautions outside the exclusion zone

6.2.4.1 Planning of site operations should take sufficient account of wide loads, tall loads and plant with booms, jibs and counterweights (including drilling rigs), in order that they can operate without coming into contact with retained trees. Such contact can result in serious damage to the trees and might make their safe retention impossible. Consequently, any transit or traverse of plant in proximity to trees should be conducted under the supervision of a banksman, to ensure that adequate clearance from trees is maintained at all times.

6.2.4.2 Fires on sites should be avoided if possible. Where they are unavoidable, they should not be lit in a position where heat could affect foliage or branches. The potential size of a fire and the wind direction should be taken into account when determining its location, and it should be attended at all times until safe enough to leave.

6.2.4.3 Any materials whose accidental spillage would cause damage to a tree should be stored and handled well away from the outer edge of its RPA.

7 Demolition and construction in proximity to existing trees

7.1 General

7.1.1 Construction within the RPA should accord to the principle that the tree and soil structure take priority. The most reliable way to ensure this is to preserve the RPA completely undisturbed. Soil structure should be preserved at a

suitable bulk density for root growth and function (of particular importance for soils of a high fines content), existing rootable soil retained and roots themselves protected.

7.1.2 The ability of a tree to tolerate some disturbance and alteration of its growing conditions depends on specific circumstances, including prevailing site conditions, and in general, the older the tree, the less successfully it will adapt to new conditions.

7.2 Avoiding physical damage to the roots

7.2.1 Construction work within the RPA of retained trees comprises:

- Construction of the Accommodation Suite
- Conversion of the existing outbuilding to a Spa.

7.2.2 We understand that foundations on this site are based upon 'screw piling' using a 'Quickbase' Foundation system. This is ideal in this situation as minimal intrusion into the soil is required and the rooting environment is largely undisturbed. Some manual excavation may be required for services and hard surfacing and in such areas the following guidelines should be followed.

7.2.3 To avoid damage to tree roots during construction of the footpath, existing ground levels should be retained within the RPA. Intrusion into soil within the RPA is generally not acceptable, and topsoil within it should be retained in situ. However, limited manual excavation within the RPA is acceptable, although such excavation should be undertaken carefully, using hand-held tools and preferably by compressed air soil displacement.

7.2.3 Roots, whilst exposed, should immediately be wrapped or covered to prevent desiccation and to protect them from rapid temperature changes. Any wrapping should be removed prior to backfilling, which should take place as soon as possible.

7.2.4 Roots smaller than 25 mm diameter may be pruned back, making a clean cut with a suitable sharp tool (e.g. bypass secateurs or handsaw), except where they occur in clumps. Roots occurring in clumps or of 25 mm diameter and over should be severed only following consultation with an arboriculturist, as such roots might be essential to the tree's health and stability.

7.2.5 Prior to backfilling, retained roots should be surrounded with topsoil or uncompacted sharp sand (builders' sand should not be used because of its high salt content, which is toxic to tree roots), or other loose inert granular fill, before soil or other suitable material is replaced. This material should be free of contaminants and other foreign objects potentially injurious to tree roots.

7.3 Underground and above-ground utility apparatus

7.3.1 Mechanical trenching for the installation of underground apparatus and drainage severs any roots present and can 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 routeing and methods of installation of all underground apparatus. Wherever possible, apparatus should be routed outside RPAs. Where this is not possible, it is preferable to keep apparatus together in common ducts. Inspection chambers should be sited outside the RPA.

7.3.2 Where underground apparatus is to pass within the RPA, detailed plans showing the proposed routeing should be drawn up in conjunction with the project arboriculturist. In such cases, trenchless insertion methods should be used **(see Table),** with entry and retrieval pits being sited outside the RPA. Provided that roots can be retained and protected in accordance with **7.2.2**, excavation using hand-held tools **(see 7.2.1)** might be acceptable for shallow service runs.

NOTE The suitability of these for differing applications is summarized in the following Table.

Trenchless solutions for differing utility apparatus installation requirements

Method	**Accuracy mm**	***Bore* dia.** A) **mm**	**Max. Sub length** B) **m**	**Applications**	**Not suitable for**
Microtunnelling	<20	100 to 300	40	Gravity-fall pipes, deep apparatus, watercourse/ roadway undercrossings	Low-cost projects due to relative expense
Surface-launched directional drilling	≈100	25 to 1 200	150	Pressure pipes, cables including fibre optic	Gravity-fall pipes, e.g. drains and sewers C)
Pipe ramming	≈150	150 to 2 000	70	Any large-bore pipes and ducts	Rocky and other heavily obstructed soils
Impact moling D)	≈50 E)	30 to 180 F)	40	Gas, water and cable connections, e.g. from street to property	Any application that requires accuracy over distances in excess of 5 m

A) Dependent on strata encountered.

B) Maximum subterranean length.

C) Pit-launched directional drilling can be used for gravity fall pipes up to 20 m subterranean length.

D) Impact moling (also known as thrust-bore) generally requires soft, cohesive soils.

E) Substantial inverse relationship between accuracy and distance.

F) Figures given relate to single pass: up to 300 mm bore achievable with multiple passes.

7.3.3 Above-ground apparatus (including CCTV cameras and lighting) should be sited to avoid the need for detrimental tree pruning. In this regard, the current and future crown size of the tree should be assessed. Tree branches can be pruned back with care to provide space, though it is not appropriate for repetitive and significant tree work to be an initial design solution unless this is a suitable management outcome for the tree. Pruning should be undertaken in accordance with BS 3998:2010.

8 Site works, landscape operations and Management

8.1 General

The general treatment of areas around newly planted and existing trees should allow for adequate infiltration of water and free gas exchange, reduction of water evaporation and the retention of an open soil structure to encourage root growth. Care should be taken to ensure that grass or weed growth does not compete with young root growth by intercepting available water supply. Care should also be taken to avoid the risk of damage to the stems of young trees from future strimming or mowing operations. An area with a radius of at least 500 mm from the stem of newly planted trees should therefore be kept free from competing vegetation by chemical weed control or by the more environmentally friendly option of mulching.

NOTE 1 Soft landscape finishes, including mulch and cultivated beds, will generally provide more favourable conditions for young tree establishment than most hard surfaces or grass. The use of ground-cover shrubs with an appropriate organic mulch is particularly beneficial: this treatment suppresses weeds, reduces maintenance, discourages intrusion and maintains a permeable open soil structure.

NOTE 2 BS 4428:1989 provides recommendations for the treatment of soft surfaces, but excludes hard surfaces.

8.2 Drainage

New development can have an effect on the existing drainage pattern and ground water levels of a site, due to level changes, increased areas of hard surface and new drainage installations. The root systems of mature trees do not generally adapt as well as younger specimens to alterations to groundwater. Expert advice on both drainage and trees should be taken where groundwater conditions are liable to change.

8.3 Topsoil quality and amelioration

8.3.1 The quality of topsoil is a critical factor for the establishment and growth of new planting or seeding, and should be assessed by a competent person for depth, structure, texture and content. If there is any doubt regarding the suitability of soil to be used as a growing medium, appropriate samples should be analysed by a specialist soil laboratory for horticultural/landscape use, with particular reference to nutrients, organic content and any potential toxic materials or other contaminants. The report should include an assessment of suitability and any recommendations for appropriate remedial work, including the need for further specialist site investigation if necessary. Imported topsoil to be used in planting or seeding operations should be from a source approved by a competent person, samples should be submitted for analysis, and deliveries should be certified and verified for their consistency with approved samples.

8.3.2 Topsoil depths should be appropriate for, and may vary according to, the type and size of planting or seeding to be undertaken.

8.4 Soil compaction and remediation measures

Guidelines

Soil that has been compacted will not provide suitable conditions for the survival and growth of vegetation, whether existing or new, and is a common cause of post-construction tree loss on development sites. Compacted soil will adversely affect drainage, gas exchange, nutrient uptake and organic content, and will seriously impede or restrict root growth. The risk of soil compaction is greatest in soils with a significant clay content and in wet conditions. It can result from temporary or short-term loadings, such as the passage of a single vehicle, or from longer-term construction activities, including materials storage.

Soil compaction should be avoided around existing vegetation, including trees, and in areas where new planting or seeding is proposed. Where soil compaction has occurred in the vicinity of existing trees, arboricultural advice should be taken before carrying out any remedial or other works within RPAs to mitigate risk of further damage to roots. Remedial works may include sub-soil aeration using compressed air, and the addition of other materials, preferably of a bulky, organic nature (but excluding peat), to improve structure. Heavy mechanical cultivation such as ploughing or rotavation should not occur within the RPA. Any cultivation operations should be undertaken carefully by hand in order to minimize damage to the tree, particularly the roots. Decompaction measures include forking, spiking, soil augering and tilthed radial trenching. Care should be taken during such operations to minimize the risk of further damage to tree roots.

8.5 Use of mulch

NOTE Further guidance on mulching is given in BS 3998:2010.

8.5.1 Open soil and shrub planting areas around newly planted trees should be

mulched to inhibit weed growth, reduce groundwater evaporation, resist and mitigate soil compaction and reduce maintenance requirements, whilst allowing gas exchange and water penetration to roots. The mulch material should be weed-free, easy to apply, containable within the area of application and readily available. The choice of material will be informed by local availability of materials, site characteristics and aesthetic requirements. The mulch should be periodically replenished as it decomposes so that it does not become depleted, and ideally when the soil is warm and moist.

8.5.2 The materials that may be used for mulching include coarsely divided plant matter, such as well-composted wood chip, pulverized bark, leaf mould or green waste conforming to PAS 100, and these may be combined with well-rotted animal manure. If the sole intention is to conserve moisture, a layer of gravel or well-secured sheets of material such as permeable geotextile fabric may be used, and may be covered for cosmetic purposes. Any such sheets should be maintained to avoid damage to the tree (e.g. by clogging, weed growth, restriction of air movement or constriction of the stem).

8.5.3 The mulched area should extend over as much of the root system as can be allowed by other site-usage requirements. The depth of an organic mulch should not be so much as to inhibit aeration of the root system (normally no more than 100 mm). The area around the tree should be well-watered prior to the application of mulching material and the mulch should be periodically replenished as it decomposes, so that it does not become depleted.

NOTE Mulches that retain water encourage the development of roots near the soil surface and in the mulch itself. This can become a disadvantage owing to desiccation if the mulch is removed or not replenished.

8.5.4 Mulches should be kept away from direct contact with the bark of the stem, or of major roots, since this might encourage infection by pathogens by maintaining wet conditions.

NOTE Although, by improving the soil texture and acting as a buffer for rainfall, mulches generally help to prevent extremes of soil wetness and dryness, they can prolong waterlogging on sites where drainage is seriously impeded. This in turn can harm tree roots and make them more susceptible to certain pathogens such as Phytophthora spp.

8.6 Hard surfaces

NOTE Guidance on types of hard surface materials is given in Annex A.

8.6.1 Where surfaces adjacent to new tree planting locations are paved, the settlement of the soil in tree pits which occurs gradually after planting can cause movement of the paved area, including the partial collapse or instability of paving or disruption of flexible surfaces, where these are laid over prepared pits. Adjacent paving should therefore be retained and supported by a conventional edging and sub-base set at a distance where it is unlikely to be affected by settlement. Where this is not feasible, the outer edges of the backfilled area of the tree pit should be treated as a transition zone, using interlocking surface

reinforcement grids backfilled with a flexible surface dressing of a permeable, granular material (e.g. gravels, shingles, other aggregates) which will allow for minor movement and can be topped up if required.

8.6.2 Where load-bearing paving is to be laid over pits, it should:

a) incorporate a below ground structural system; or

b) incorporate a purpose-designed tree grille with appropriate support around the edges; or

c) utilize structural soil from an approved source (i.e. a composite material that is certified as capable of enabling root growth and development while supporting likely surface loadings); or

d) be laid when the soil has settled and the level made good.

8.6.3 Due allowance should be made for the future growth of stem and roots of a tree when determining the finished dimensions and the design of edge or kerb treatments of tree pits and planted areas. Where necessary, precautions should be taken at the time of planting to limit future surface distortion near trunks, e.g. by the use of technical solutions such as root deflectors.

8.6.4 Where there is a risk of damage to the tree arising from intrusion within the tree planting station area (e.g. by vehicles in car parks), an above-ground barrier, such as bollards or fencing, should be incorporated into the design to provide appropriate physical protection.

8.6.5 Where there is risk of a tree pit receiving surface water run-off that might be contaminated by de-icing salt, either species that are known to be sensitive to salt damage should be avoided, or impermeable paving should be designed and laid to fall away from the pit.

NOTE Contamination by fuel spillages, or other materials that might be toxic or harmful to trees, can be mitigated by the incorporation of hydrocarbon capture systems in the drainage system design.

8.7 Use of herbicides

The use of herbicides in the vicinity of existing trees should be appropriate for the type of vegetation to be killed, and all instructions, warnings and other relevant information from manufacturers should be strictly observed and followed. Care should be taken to avoid any damaging effects upon existing plants and trees to be retained, species to be introduced, and existing sensitive habitats, particularly those associated with aquatic or drainage features.

NOTE Attention is drawn to the Control of Pesticides Regulations 1986, as amended [11], the Control of Substances Hazardous to Health Regulations 1994, as amended [12], and HSE publication INDG 257 [13]. Guidance is also available from the Pesticides Safety Directorate (www.pesticides.gov.uk) [viewed 2012-03-26].

8.8 Tree management

8.8.1 Pre-development tree work – Schedule of Works

T1 Holm Oak Crown lift to 4 metres

8.8.2 Working within the root protection area (RPA)

8.8.2.1 Care should be taken when working within the RPA of retained trees to ensure that roots are not affected through compaction.

8.8.3 Post-development management: new plantings - Guidelines

8.8.3.1 Regular maintenance of newly planted trees is of particular importance for at least three years during the critical post-planting period and might, where required by site conditions, planning requirements or legal agreement, be for 5 years or more. A detailed maintenance schedule covering this period should be prepared in conjunction with the landscape design proposals, and appropriate arrangements made for its implementation.

NOTE Maintenance operations would normally include weed control and watering as necessary, inspection and adjustment of support systems and monitoring of growth. Formative pruning might also be required to achieve desired effects or to provide for access or clearance.

8.8.3.2 Defects that become apparent during the maintenance period should be addressed by appropriate remedial works (including replacement planting where necessary) as advised by a competent person.

Annex A
(informative)

General advice for other interested parties

NOTE This annex contains general advice that is expected to be of use to land managers, contractors, planners, statutory undertakers, surveyors, and all others interested in harmony between trees and construction.

A.1 Avoiding damage by trees to structures

A.1.1 General

Buildings need to be designed and constructed to accommodate the current and potential future influence of existing and removed vegetation, as well as planned new planting.

In some situations, trees and vegetation can adversely affect structures either by direct action **(see A.1.2)** or by indirect action **(see A.1.4)**.

A.1.2 Direct damage by trees to structures

Trees can cause direct damage to structures by:

a) the disruption of underground utility apparatus;

b) displacement, lifting or distorting;

c) the impact of branches with the superstructure;

d) structural failure of the tree.

The potential for direct damage needs to be considered throughout the design and construction process.

The growth of the base of the stem or of roots near the surface exerts relatively small forces. Whilst paving slabs or low boundary walls can be lifted or pushed aside easily, heavier or stronger structures are more likely to withstand these forces without damage, as the root distorts around the obstruction before damage occurs. The greatest risk of direct damage occurs close to the tree from the incremental growth of the main stem and the roots, and diminishes rapidly with distance.

It is advisable that new tree planting is kept at distances from structures of at least those in Table A.1.

Where construction work is to take place near to existing trees, allowance for

future tree growth needs to be factored in to the construction process in order to protect the structure. For example:

1) walls or structural slabs need to bridge over roots allowing sufficient clearance for future growth;

2) paving and other surfaces need to be laid on a flexible base to allow movement and to facilitate relaying if distortion becomes excessive.

Water leaking from damaged drains and sewers encourages localized root growth; roots are then likely to enter a drain or sewer through the defect and proliferate, causing blockage and an enlarging of the initial defect. Provided they are further from trees than the distances stipulated in Table A.1, intact drains are not likely to suffer direct damage and will not attract roots. Damage to drains and sewers can be avoided by:

i) re-routeing to conform to Table A.1;

ii) ensuring watertight joints;

iii) in clay soils, use of flexible materials and/or joints to accommodate movement;

iv) not using perforated land drains near trees.

Allowance needs to be made for the swaying of stem and branches during storm conditions. Branches which are liable to strike the structure need to be removed or pruned back to a suitable branching point as appropriate (see BS 3998:2010).

Table A.1 **Minimum distance between young trees or new planting and structure to avoid direct damage to a structure from future tree growth**

Type of structure	**Minimum distance between young trees or new planting and structure, in metres (m)**		
	Stem dia. <300 mm A)	**Stem dia. 300 mm to 600 mm A)**	**Stem dia. >600 mm A)**
Buildings and heavily loaded structures	—	0.5	1.2
Lightly loaded structures such as garages, porches etc.	—	0.7	1.5
Services **<1 m deep** **>1 m deep**	 0.5 —	 1.5 1.0	 3.0 2.0
Masonry boundary walls	—	1.0	2.0

In-situ concrete paths and drives	0.5	1.0	2.5
Paths and drives with flexible surfaces or paving slabs	0.7	1.5	3.0

A) Diameter of stem at 1.5 m above ground level at maturity

A.1.3 Allowance for future growth

Where the installation of paths or light structures such as walls is unavoidable near to trees, the design and construction specification needs to 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 for future diameter growth needs to be made by surrounding the root with uncompacted sharp sand, void-formers, or other flexible fill materials, and by laying an adequately reinforced lintel or raft over the surface.

A.1.4 Indirect damage by trees to structures

Damage by indirect action can occur in shrinkable soils such as clay when vegetation takes moisture from the ground, causing a significant volume change resulting in ground movement. Non-cohesive soils such as sand and gravel are not shrinkable, as their volume does not alter with a change in moisture content, and so structures on these soils are unaffected by indirect damage.

Buildings and drainage need to be protected against the effects of subsidence and heave.

• Subsidence takes place when water is withdrawn from the soil causing it to shrink.

• Heave takes place when previously dehydrated soil takes up water and swells. This can happen after the felling or removal of vegetation. It can also occur beneath a building if roots are severed. These activities make heave more prevalent in new build construction than older buildings. Heave is three-dimensional, exerting both vertical and lateral pressures on structures.

Detailed guidance is given in NHBC Standards Chapter 4.2 [14].

A.1.5 Types of hard surface materials and their suitability in proximity to Trees

*NOTE Materials in common use include those described in **A.1.5.1** to **A.1.5.4**. Other materials are available.*

A.1.5.1 Washed gravel

Washed gravel retains its porosity unless excessively consolidated, and is particularly useful where changes of level occur or an irregular shape is needed around the stem of a tree. Gravel is easily renewed or topped up. Although weeds might become established, they can be controlled by chemical or mechanical means. However, gravel is rarely suitable for use where there is vehicle or pedestrian traffic, e.g. in residential areas. Materials with a high fines content, such as self-binding gravels or hoggin, ought not to be used due to their almost impermeable texture when consolidated.

A.1.5.2 Paving slabs and block pavers

Paving slabs and block pavers are available with built-in infiltration spaces between the slabs or blocks. These are ideal, but need to be laid dry-jointed on a sharp sand or coarse aggregate no-fines foundation to allow air and moisture to penetrate to the rooting area.

A.1.5.3 In-situ concrete

As in-situ concrete forms an impermeable surface, falls and openings need to be provided for water and air to enter the soil (the necessary liner can be penetrated through the falls or openings once the concrete has set). This can be achieved by forming 50 mm diameter holes in the construction of a slab at regular spacings of 300 mm to 600 mm (as determined by an engineer) and backfilling the resulting holes with no-fines gravel or aggregate. A high standard of materials and workmanship is needed if frost damage and excessive wear are to be avoided.

A.1.5.4 Bitumen paving and resin-bonded gravels

These surfaces can consist of porous or impermeable material. As the interstices in unsealed tar paving will eventually become blocked by fines, it is advisable for such surfaces to be laid following the same principles as those for impermeable surfaces, therefore its use within the RPA also needs to be restricted to the 20% RPA recommendation **(7.4.2.3)**.

A.2 Avoiding damage to trees

A.2.1 General

Trees that have good health and stability are well adapted to their surroundings. Any development activity which affects the adaptation of trees to a site could be detrimental to their health, future growth and safety. Tree species differ in their ability to tolerate change, but all tend to become less tolerant after they have reached maturity or suffered previous damage or physiological stress. Planning and subsequent site management aims need to minimize the effect of change.

The part of a tree most susceptible to damage is the root system, which, because it is not immediately visible, is frequently ignored. Damage to, or death of, the root system affects the health, growth, life expectancy and safety of the entire tree. The effects of such damage might only become evident several years later.

Damage can be the result of a number of minor but compounding factors that accumulate over time. Materials such as uncured concrete, diesel oil and vehicle washings can all damage roots and lead to adverse impacts on the tree.

Damage to the stem and branches of a tree is not usually sufficient to kill the tree directly, but can make it unsafe by affecting the dynamics and growth of the tree, or by initiating long-term decay. Such damage can also be disfiguring. The attachment of notice boards, cables and other utility apparatus can all damage trees, as can using trees as anchors for winching.

A.2.2 Extent and form of the root system

Within a short distance of the stem, the roots are highly branched, so as to form a network of small-diameter woody roots, which can extend radially for a distance much greater than the height of the tree, except where impeded by unfavourable conditions. All parts of this system bear a mass of fine, non-woody absorptive roots, typically concentrated within the uppermost 600 mm of the soil.

The root system does not generally show the symmetry seen in the branch system. The development of all roots is influenced by the availability of water, nutrients, oxygen and soil penetrability. As far as these conditions allow, the root system tends to develop sufficient volume and area to provide physical stability.

The uptake of water and mineral nutrients by the root system takes place via the fine non-woody roots (typically less than 0.5 mm diameter) and associated beneficial fungi (mycorrhizae). Their survival and functioning, which are essential for the health of the tree as a whole, depend on the maintenance of favourable soil conditions. The fine roots are short-lived, with the majority dying each winter and new ones developing in response to the needs of the tree.

All parts of the root system, but especially the fine roots, are vulnerable to damage. Once roots are damaged, water and nutrient uptake is restricted until new ones have grown. Mature trees recover slowly, if at all, from damage to their woody roots.

Annex B
(informative)

Trees and the planning system

Under the UK planning system, local authorities have a statutory duty to consider the protection and planting of trees when granting planning permission for proposed development. The potential effect of development on trees, whether statutorily protected (e.g. by a tree preservation order or by their inclusion within a conservation area) or not, is a material consideration that is taken into account in dealing with planning applications. Where trees are statutorily protected, it is important to contact the local planning authority and follow the appropriate procedures before undertaking any works that might affect the protected trees.

The nature and level of detail of information required to enable a local planning authority to properly consider the implications and effects of development proposals varies between stages and in relation to what is proposed. Table B.1 provides advice to both developers and local authorities on an appropriate amount of information. The term “minimum detail” is intended to reflect information that local authorities are expected to seek, whilst the term “additional information” identifies further details that might reasonably be sought, especially where any construction is proposed within the RPA.

Table B.1 **Delivery of tree-related information into the planning system**

Stage of process	**Minimum detail**	**Additional information**
Pre-application	**Tree survey**	**Tree retention/removal plan (draft)**
Planning application	**Tree survey (in the absence of pre-application discussions)** **Tree retention/removal plan (finalized)** **Retained trees and RPAs shown on proposed layout** **Strategic hard and soft landscape design,** **including species and location of new tree planting** **Arboricultural impact assessment**	**Existing and proposed finished Levels** **Tree protection plan** **Arboricultural method statement** **– heads of terms** **Details for all special engineering** **within the RPA and other relevant** **construction details**

Reserved matters/ planning conditions	**Alignment of utility apparatus (including drainage), where outside the RPA or where installed using a trenchless method** **Dimensioned tree protection plan** **Arboricultural method statement – Detailed** **Schedule of works to retained trees, e.g. access facilitation pruning** **Detailed hard and soft landscape design**	**Arboricultural site monitoring Schedule** **Tree and landscape management Plan** **Post-construction remedial works** **Landscape maintenance schedule**

Annex C

Cascade chart for tree quality assessment

TREES FOR REMOVAL				
Category & Definition	**Criteria**			**Identification on Plan**
Category U Those 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 a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other Category R Trees. Trees that are dead or 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.			DARK RED
TREES TO BE CONSIDERED FOR RETENTION				
Category and Definition	**1. Mainly arboricultural values**	**2. Mainly Landscape Values**	**3. Mainly cultural values, including conservation**	**Identification on Plan**
Category A Those of high quality & value: in such a condition as to be able to make a substantial contribution (a minimum of 40 years)	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 (eg dominant/principal trees within an avenue	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 (eg. Avenues or other arboricultural features assessed as a group)	Trees, groups or woodlands of significant conservation, historical, commemorative or other value.	LIGHT GREEN
Category B Those of moderate quality & value: those in such a condition as to make a significant contribution (a minimum of 20 years)	Trees that might be included in the high category, but are downgraded due to impaired condition	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.	Trees with clearly identifiable conservation or other cultural benefits.	MID BLUE
Category C Those of low quality and value: currently in adequate condition to remain until new planting could be established (a minimum of 10 years) or young trees with a stem diameter below 150mm	Trees not qualifying in higher categories.	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.	Trees with very limited conservation or other cultural benefits	GREY
	NOTE: Whilst C Category trees will not usually be retained where they would impose a significant constraint on the development, young trees with a stem diameter of less than 150mm should be considered for relocation.			