

APPENDIX A Tree Retention Categories

- A.1 BS5837, the British Standards document for trees in relation to construction, gives guidelines for ensuring that trees on development sites are retained or removed according to their future potential to become an asset in harmony with the development or an object of resentment and a potential threat to public safety.
- A.2 The early assessment of a site can ensure that trees to be retained can be afforded adequate protection from the onset of construction right through to completion and long into the future.
- A.3 Planning conditions and the Town and Country Planning Act 1990 can be used following a survey to enforce the adequate protection for these trees in accordance with BS5387.
- A.4 Care should be exercised over misplaced tree preservation. Attempts to retain too many or unsuitable trees on a site are liable to result in excessive pressure on the trees during development work and subsequent demands for their removal. The end result is usually fewer and less suitable trees than would be the case if proper planting, selection and conservation had been applied from the outset.
- A.5 Particular caution is needed over retention of large old trees which become enclosed in the new development. Such trees may be less resilient and more likely to die as a result of the development, and even if they survive in the short term, they may die long before the new buildings are obsolete and in this situation the felling and disposal of trees can be very difficult and extremely costly.
- A.6 Although existing trees should be retained wherever reasonable, unless such trees are well suited for incorporating within the new development, it may be preferable to favour new planting. New plantings can then be selected which are ideal for the situation and landscape.
- A.7 The tree survey carried out has assessed and given particular attention to:
 - 7.1 the health, vigour and condition of each tree
 - 7.2 the structural defects in each tree and its life expectancy
 - 7.3 the size and form of each tree and its suitability within the context of the site development
 - 7.4 the location of each tree relative to existing site features, e.g. its value as a screen or as a skyline feature
- A.8 On the basis of this assessment, trees are divided into one of the following categories:

TREES TO BE CONSIDERED FOR RETENTION

Category A	Those of high quality and value: in such a condition as to be able to make a substantial contribution (a minimum of 40 years is suggested).		
Criteria Subcategories			
1 Mainly arboricultural values	2 Mainly landscape values	3 Mainly cultural values, including conservation	
Trees that are particularly good examples of their species, especially if rare or unusual, or essential components of groups, or of formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands which provide a definite screening or softening effect to the locality in relation to views into or out of the site, or those of particular visual importance (e.g. avenues of other arboricultural features assessed as groups)	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture).	
Indication on Plan: Light Green			

Category B	Those of moderate quality and value: those in such a condition as to make a significant contribution (a minimum of 20 years is suggested).		
Criteria Subcategories			
1 Mainly arboricultural values	2 Mainly landscape values	3 Mainly cultural values, including conservation	
Trees that might be included in the high category but are downgraded because of impaired condition (e.g. presence of remediable defects including unsympathetic past management and minor storm damage).	Trees present in large number, usually as groups or woodlands, such that they form distinct landscape features, thereby attracting a higher collective rating than they might as individuals but which are not, individually, essential components of formal or semi-formal arboricultural features (e.g. trees of moderate quality within an avenue that includes better A category specimens), or trees situated mainly internally to the site, therefore individually having little visual impact on the wider locality.	Trees with clearly identifiable conservation or other cultural benefits.	
Indication on Plan: Mid Blue			

TREES TO BE CONSIDERED FOR RETENTION (continued)

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 is suggested), or young trees with a stem diameter below 150mm.	
Criteria Subcategories		
1 Mainly arboricultural values	2 Mainly landscape values	3 Mainly cultural values, including conservation
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.
Note: Whilst C category trees will usually not be retained where they would impose a significant constraint on development, young trees with a stem diameter of less than 150mm should be considered for relocation.		
Indication on Plan: Grey		

TREES FOR REMOVAL

Category R	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.
Criteria	
Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become inviable after removal of other R category trees (i.e. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning).	
Trees that are dead or are showing signs of significant, immediate and irreversible overall decline.	
Trees infected with pathogens of significance to health and/or safety of other trees nearby (e.g. Dutch Elm Disease), or very low quality trees suppressing adjacent trees of better quality.	
Note: Habitat reinstatement may be appropriate (e.g. R category tree used as a bat roost: installation of bat box in nearby tree).	
Indication on Plan: Dark Red	

APPENDIX B

Root Protection Areas (RPA's)

- B1 For the roots to be retained undamaged there must be no excavation, soil stripping or site grading within the protected zone - in other words, NO DIGGING. This means that construction will have to be above the existing ground level.
- B2 The trees to be retained on site must be afforded the maximum protection as specified in Table 2 BS 5837 2005.
- B3 In order to avoid damage to the roots or rooting environment of retained trees, the RPA should be plotted around each of the category A, B and C trees. This is a minimum area in square metres which should be left undisturbed around each retained tree.
- B4 The RPA should be calculated using Table 2 as an area equivalent to a circle with a radius 12 times the stem diameter for single stem trees and 10 times the basal diameter for trees with more than one stem arising below 1.5m above ground level.
- B5 The RPA for each tree as determined in Table 2 should be plotted on the TCP taking full account of the following factors, as assessed by an arboriculturalist, which may change its shape but not reduce its area whilst still providing adequate protection for the root system.
- B5.1 The likely tolerance of the tree to root disturbance or damage, based on factors such as species, age and condition and presence of other trees. For individual open grown trees only, it may be acceptable to offset the distance by up to 20% in one direction.
 - B5.2 The morphology and disposition of the roots, when known to be influenced by past or existing site conditions (e.g. the presence of roads, structures and underground services).
 - B5.3 The soil type and structure.
 - B5.4 Topography and drainage.
 - B5.5 Where any significant part of a tree's crown overhangs the provisional position of tree protection barriers, these parts may sustain damage during the construction period. In such cases, it may be necessary to increase the extent of tree protection barriers to contain and thereby protect the spread of the crown. Protection may also be achieved by access facilitation pruning. The need for such measures, including the precise extent of pruning, should be assessed by an arboriculturalist.
- B6 The guidelines for type and dimensions of protective fencing are given in BS 5837 2005, and are as follows:
- B6.1 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). On all sites, special attention should be paid to ensuring that barriers remain rigid and complete.
 - B6.2 In most cases, barriers should consist of a scaffold framework in accordance with Fig 2 of BS5837, comprising of a vertical and horizontal framework, well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3m. Onto this, weldmesh panels should be securely fixed with wire or scaffold clamps. Weldmesh panels on rubber or concrete feet are not resistant to impact and should not be used.
 - B6.3 It may be appropriate on some sites to use temporary site office buildings as components of the tree protection barriers.

- B7 Where it has been agreed during the design state, and shown on the tree protection plan, that vehicular or pedestrian access for the construction operation may take place within the root protection area (RPA), the possible effects of construction activity should be addressed by a combination of barriers and ground protection. The position of the barrier may be shown within the RPA at the edge of the agreed working zone but the soil structure beyond the barrier to the edge of the RPA should be protected with ground protection.
- B8 For pedestrian movements within the RPA, the installation of ground protection in the form of a single thickness of scaffold boards on top of a compressible layer laid onto a geotextile, or supported by scaffold, may be acceptable.
- B9 For wheeled or tracked construction traffic movements within the RPA, the ground protection should be designed by an engineer to accommodate the likely loading and may involve the use of proprietary systems or reinforced concrete slabs.

APPENDIX C

Trees & Construction

- C1 Construction close to trees can be enormously damaging and detrimental to the tree's health, often leading to their death and eventual removal. Development of a site, including construction of access routes, driveways and parking areas can result in substantial root severance of trees. Traditional driveway construction (excavation and backfilling with a compactable load-bearing sub-base material) can seriously damage tree roots. Such damage occurs because of a lack of understanding that roots mainly grow outwards from a tree's trunk, near to the soil surface, rather than downwards.
- C2 The majority of tree roots are in the upper metre of soil and they may spread outwards, in any direction where soil conditions are suitable, to a distance of up to three times the tree's mature height.
- C3 Any disturbance of the ground within the root spread of a tree can damage its roots, which may severely injure the tree. If roots are damaged close to the trunk, the anchorage and stability of the tree can be adversely affected. If they are damaged anywhere along their length, all of the fine roots which they serve will be destroyed.
- C4 Damage to the fine roots by severance of a main root, or by compaction or alterations in levels, will prevent these fine roots from absorbing the water and nutrients which are essential for the well-being and growth of the tree. The tree may also be made unstable and pose a threat to the safety of people and property.
- C5 The effects of damage from different causes, for instance by successive excavations for different services, or by excavation in one part and compaction in another part of the system, will be cumulative.
- C6 If the root system is damaged, new roots must develop to sustain the tree. These may develop from the damaged root or by increased growth of other parts of the system. It may take years to replace all of the lost roots. Vigorous young trees are the most likely to be capable of rapid root regeneration, but mature trees find it very difficult to recover from major root damage. While roots may regenerate, they will not necessarily provide their original anchorage.
- C7 Trees with damage may not show any immediate symptoms. If the root system is capable of rapid regeneration, the tree may recover without any noticeable ill-effects, but usually the symptoms will take several years to develop. Such symptoms may range from only minor branch dieback to deterioration and ultimate death of the tree, dependent on the severity of damage and the ability of the roots to regenerate.

APPENDIX D

How tree roots can be damaged during construction

- D1 Most trees that have been growing undisturbed on a site for many years will have developed an extensive root system with the roots growing where the soil conditions are most favourable. There will be a balance between the development of the crown (which demands water) and the roots (which supply it). Any sudden alteration in the soil conditions within the tree's rooting area (a circle of radius equal to the tree's height) will therefore upset this balance.
- D2 Root systems can be damaged by:
- Repeated passage of machinery, which will squeeze the soil, closing up the pores causing compaction, especially in the upper levels, and so reducing the amount of oxygen available to roots and preventing them from growing through the soil. Surviving roots may then not be able to grow through the compacted soil. It is essential therefore that all but the immediate area of the development is protected from construction operations by fencing as recommended in BS5837.
 - Placing soil or other materials over the roots of a tree, which will impede air movement into and out of the soil and consequently reduce the availability of oxygen to the roots.
 - The severance of a root, for example by trenching, which will destroy all parts of the root beyond that point. Even roots less than 10mm in diameter may be serving the fine roots over a wide area. The larger the root severed, the greater the impact on the tree.
 - Damage to the bark on the root. The bark protects the root from decay, and is also essential for further root growth. It is loosely attached and easily damaged. If damage to the bark extends around the whole circumference, the root beyond that point will be killed.
 - Alterations in soil level. Lowering the level will strip out the mass of roots near the surface. Raising the levels will have the same effect as soil compaction.
 - Incorrect application of herbicide. There is frequently a need for operational land to be kept clear of weed growth for safety and as a fire precaution and herbicides provide an efficient method of killing both herbaceous and woody weeds. There are several types of herbicide with different modes of action and persistence, the most attractive of which tend to be those that can be applied to the ground, usually as a granule and which remain active in the soil for long periods. The wide-ranging root system of a tree may extend into the operational land from adjoining properties, and may absorb some types of herbicides which have been applied to the ground. Material absorbed in one part of the root system can kill the whole tree.
 - Spillage of oils or other harmful materials, which can leach into the soil can also damage the root system. For instance, oil spilled into the soil is broken down by soil bacteria which deplete the oxygen and so asphyxiate the roots. Other materials may also have a direct toxic effect on roots.