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**GUIDELINES FOR THE PLANNING, INSTALLATION AND
MAINTENANCE OF UTILITY SERVICES IN
PROXIMITY TO TREES**

The National Joint Utilities Group (NJUG) was formed in 1977 to explore ways in which mutual co-operation could overcome difficulties encountered during streetworks. It is jointly funded by its members, the five Utilities: Water, Gas, Electricity and the two Telecommunications companies — BT and Mercury Communications.

GUIDELINES FOR THE PLANNING, INSTALLATION AND MAINTENANCE OF UTILITY SERVICES IN PROXIMITY TO TREES.

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INTRODUCTION

- 1.1 Trees play an essential role in the environment and visual amenity of both rural and urban landscapes. They may take decades to grow, but can be destroyed in minutes. Wherever they are growing, whether in public footpaths, private gardens, rural verges or elsewhere, they require space for the adequate development of their root systems and to allow the branches to develop an attractive and natural shape.
- 1.2 Modern society expects a multiplicity of services† (electricity, gas, water, sewage, telecommunications, cable television) each of which requires an extensive distribution network, both above and below ground. These networks also need space, and they are frequently under tight constraints on their alignment.
- 1.3 The space available for both trees and services is often very restricted, and they frequently share the available space, both above and below ground. Where they are in close proximity, there is the potential for either the tree or the service to be damaged by the other. If they are to co-exist, the needs of each user must be understood and appropriate precautions taken to minimise the risk of damage.
- 1.4 Legislative mechanisms for ensuring that existing trees are safeguarded already exist (see section 7). References to legislation relate mainly to the law in England and Wales, but these guidelines should be applied in Scotland and Northern Ireland where appropriate. The guidelines seek to provide constructive advice on how to minimise damage to trees by utilities and to utilities by trees and will be helpful to utility companies, contractors, arboriculturists, highway engineers, developers and planners. The guidelines have been prepared in a collaboration between representatives of the utilities, the Cable Communications Association, the arboricultural profession and the Department of the Environment. As with all guidelines, their interpretation and application should be tempered at all times by common sense. However, expert guidance on specific instances should be sought from the appropriate utility, local authority or arboriculturist. The emphasis throughout this document is on the need for local liaison.
- 1.5 These guidelines are applicable to all services (underground and overhead) and to trees in any location (public or private, rural or urban). They should be considered when new services are to be constructed adjacent to existing trees and when new trees are to be planted adjacent to existing services; also where services are to be maintained or repaired and trees are to be managed. The principles set out in these guidelines also have relevance in respect of work carried out to highways near trees (e.g. kerbing, footway reinstatement).

UNDERGROUND SERVICES

2. HOW ROOTS ARE DAMAGED

- 2.1 Contrary to popular belief, the root system of a tree is not a mirror image of the branches, nor is there usually a 'tap root'. The majority of the root system of any tree is in the surface 600mm of soil, extending radially in any direction for distances frequently in excess of the tree's height (figure 1). Excavation or other works within this area are liable to damage the roots.
- 2.2 The root system. The base of the trunk typically flares out in buttresses, with these extending into the main lateral structural roots. These rapidly subdivide into the mass of smaller roots which serve to anchor the tree into the soil, and to conduct water and nutrients. Even a short distance (3m) from a large mature tree, most roots will be less than 10mm diameter, but these may extend to well beyond the branch spread of the tree. A mass of fine roots, less than 1 mm diameter, develop off all parts of this root system. These fine roots absorb the water and nutrients which are essential for the growth of the tree.



Figure 1.

Diagrammatic shape and extent of typical root system. (at this scale, most of the root system would be too fine to depict)

† In this document the word 'service' is used to describe both the distribution mains and also the lateral services to properties. Many utilities engineers use the word 'plant' to collectively describe this and other equipment.

2.3 The main structural roots (close to the trunk) develop as the tree grows in response to the need for the tree to have physical stability. Beyond these major roots, root growth is influenced by the availability in soil of water, air and nutrients. The cultivation of soil provides ideal conditions for root growth. Services are often cooler than surrounding soil, encouraging moisture within the soil to condense on the surface, thereby encouraging roots to grow close to the service. For all these reasons, root growth is often most prolific within the backfilled trench and in the soil around the services. The variability of soil conditions and the presence of obstacles to root growth results in a very variable and unpredictable distribution of roots within the general guidance in para 2.1.

Types of damage

2.4 Root systems can be damaged by:-

- 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 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.
- compaction of the soil. Compaction which is avoidable may occur from storage of material or passage of heavy equipment over the roots. This can restrict or even prevent gaseous diffusion through the soil, and thereby asphyxiate the roots. The roots must have oxygen for survival, growth and effective functioning.
- alterations in soil level. Lowering the level will strip out the mass of roots near the surface. Raising levels will have the same effect as soil compaction.
- incorrect application of herbicide.
- spillage of oils or other harmful materials.

2.5 If roots are damaged:-

- i) close to the trunk, the anchorage and stability of the tree can be adversely affected.
- ii) anywhere along their length, all of the fine roots which they serve will be destroyed .

Damage to the fine roots by severance of a main root, or by compaction or alteration 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 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.

2.6 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 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, if at all. While roots may regenerate, they will not necessarily provide their original anchorage.

2.7 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.

2.8 There is frequently a need for operational land (e.g. substations) to be kept clear of weed growth for safety and as a fire precaution. 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 chemicals are 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.

2.9 Other 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 soil of oxygen and so asphyxiate the roots. Other materials may have a direct toxic effect on roots.

3. HOW UNDERGROUND SERVICES ARE DAMAGED

3.1 The delivery of services involves a wide range of different systems and materials. The methods used have evolved over time in response to new requirements and new materials and therefore it cannot be assumed that any service will have either a modern or consistent structure. In general the services fall into three categories: pipes, cables and ducts.†

† More detailed information can be found in NJUG Publication Number 4, 'The Identification of Small Buried Mains and Services'.

- 3.1.1 Gas and water are carried to customers through a network of pipes. These were originally constructed of cast iron or similar materials. They are being progressively replaced or relined with lengths of more ductile plastic piping. Drainage and foul water is carried in salt glazed earthenware, vitrified clay or concrete pipes constructed from short jointed lengths of pipe; the fall on such pipes is usually critical for their efficient functioning.
- 3.1.2 Electricity and telecommunication (including cable communication and television) customers are supplied via overhead wires or underground cables. Cable systems are either laid direct in the ground or installed in a network of ducts. All electricity cables have a metallic sheath or screen and high voltage cables are provided with additional protection afforded by a covering tile, tape or similar means of providing a warning identification. A large percentage of the telecommunication and cable television industries' underground cable network is contained in ducts, a practice reinforced by the terms of licences issued under the Telecommunications Act 1984.
- 3.1.3 Many customer service cables and pipes are laid in ducts. These duct runs were previously constructed with short lengths of earthenware pipes, but are now being replaced by longer lengths of modern plastic ducting which are generally colour coded for each utility.
- 3.2 Recommendations on positioning new services are contained in NJUG Publication Number 7, 'Recommended Positioning of Utilities' Mains and Plant for New Works'. The recommended arrangement of mains in a 2m wide footway which is devoid of trees is illustrated in figure 2. NJUG Publication Number 7 also shows the recommended arrangements for many other situations. In addition to the mains which are shown in figure 2 running parallel to the footway, there will also be

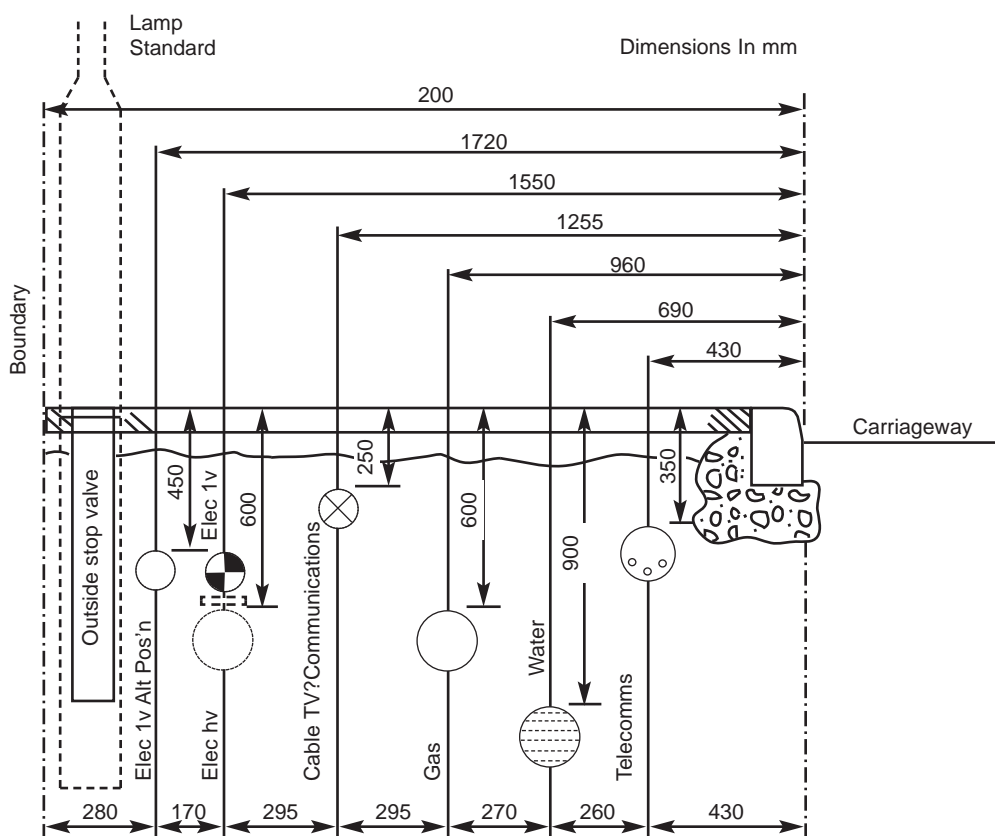


Figure 2.
Recommended arrangement of mains in a 2m footway. (from NJUG Publication Number 7)

side branches to individual properties. The relative depths of lay required for the various mains argue powerfully in favour of the lateral dispositions illustrated, and these are usually the standard locations. The lateral clearances between adjacent utility mains are the recommended minimum and represent the best use of the limited space available. Figure 2 includes the allocation of footpath/service strip space which has been made for cable television/communications.

- 3.3 Although new services beneath footways should follow these positions, older services will be more variable. The current recommendations are based on an Institution of Civil Engineers' Report of 1946 which was widely adopted, so that services laid since that date should generally be similar. Some local planning authorities have their own design guides and local agreements which differ from the NJUG recommendations. In any situation the exact location may vary depending on local circumstances and the available space. All utilities now keep records of their own services both for operational reasons and as required by statute. However for historical reasons these may not be comprehensive.
- 3.4 Underground services, but especially those less than 600mm deep, may be affected by root activity. The risk will depend on the ability of the service, in particular any joints, to resist or tolerate distortion.
- 3.4.1 **Direct damage** is caused by the increase in diameter of a root (annual growth) bringing it into contact with the service. Forces which can be generated in this way by the root are small; it is usually the root or the adjacent soil that will distort rather than the service. The risk of damage will depend on the amount of diameter growth; this is greatest in the main structural roots within 3m of the base of the trunk. Services constructed from short segments, e.g. earthenware pipes,

especially if they rely on gravity to function (e.g. drains), and where it is desirable to keep water out of the duct (e.g. telecommunications) will be most vulnerable to direct damage. Roots may be found sheathing a service but they will rarely compress or strangle and then fracture any service. Surface wrappings which are non-toxic and inadequately attached to a service may become colonised by roots and eventually lifted off.

3.4.2 **Root incursion.** Roots will not penetrate intact services, but they can exploit existing defects, particularly defects in pipe joints, cracks in foul or surface water drains or inadequate pointing of an inspection chamber. If internal conditions are conducive to root growth i.e. moist and aerated, the root may proliferate (divide and grow) and ultimately block the drain or duct. It is only if diameter growth of the root occurs where it passes through the structure that there may be enlargement of the defect, but this is unlikely at a distance of more than 3m from the trunk.

3.4.3 **Indirect damage** is restricted to shrinkable soils especially some clays but also peat. As such soils dry they shrink, and this may distort a service supported within this soil. The presence of a tree may increase this drying and contribute to soil movement and also reduce heat dissipation from cables which can reduce the current carrying capacity. The depth and radial extent of soil drying by tree root activity depends on the species, size of the tree and its management; it is greatest close to the tree and diminishes rapidly with distance and with depth.

The amount of movement caused by drying will depend on the shrinkability of the clay; this varies widely depending on the properties of the clay soil. In most situations the movements merely produce a very shallow bowl-like depression (only a few millimetres deep) around the tree. The stresses this causes can stretch the service but the movement should be within the range of tolerance of all but those services constructed using a short segmented system. However, extreme distortion can be caused if a service passes from a mobile soil into a rigid structure, for instance into a building or an inspection chamber which is founded below the level of soil movement. In some cases, particularly with short segmented pipes, regular seasonal movement can damage the joints even in the absence of tree roots.

3.4.4 **Wind movement of the tree.** The risk of damage to a service close to a tree may be increased by movement of the lower trunk and structural roots as the tree sways in a strong wind. Because of the rigidity of these roots, this may result in pressure being applied directly to a service. In addition, if a tree is uprooted, any services passing across or through the disturbed root plate may also be displaced. Such risks are rare and are restricted to services in close proximity to the trunk of the tree but can be increased if other structural roots are severed. Encasing a service in lean mix coarse concrete may exacerbate this problem because fine roots can penetrate the material providing a greater 'hold' on the service.

4. HOW TO AVOID DAMAGE TO TREES

4.1 This section gives general guidance on methods of work to minimise damage to trees which should be adopted by utilities. The local authority (or for privately owned trees, the owner or his adviser), should be informed about planned work at an early stage prior to commencement.

4.2 Wherever trees are present, precautions should be taken to minimise damage to the root system. As the shape of the root system is unpredictable, there should be careful control and supervision of any excavation, particularly if this involves digging through the surface 600mm where the majority of roots develop.

4.3 The precautions advocated in this section are applicable to any excavations or other works occurring within a distance from the tree equal to 4 times the circumference of the trunk (circumference measured around the trunk at a height of 1.5m above ground level; distance measured from centre of trunk to nearest part of any excavation or other work) (see figure 3). This area around the trunk is referred to as "the precautionary area" hereafter.

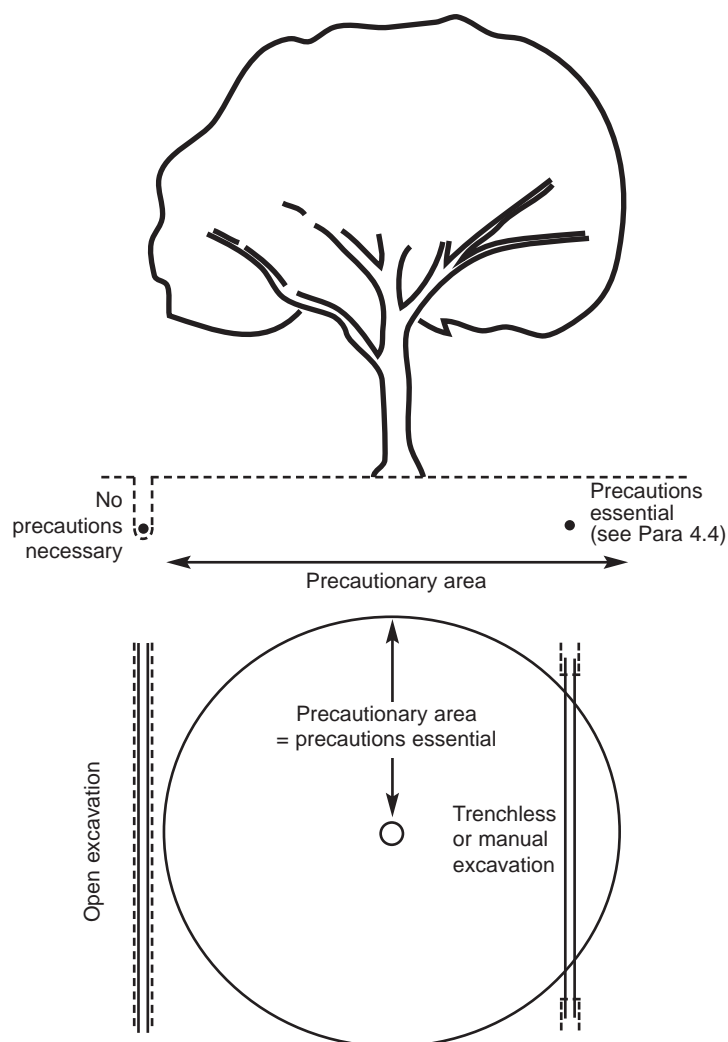


Figure 3.
Precautionary area (=4 x trunk circumference)

4.4 Although, ideally, services should be diverted or re-aligned outside the precautionary area, it is recognised this will not often be practicable. Where works are required for the laying or maintenance of any service within the precautionary area, there are various techniques to minimise the damage. The appropriate method of laying will depend on the circumstances, such as:

- the scope of the works (one-off repair, or part of an extensive operation)
- degree of urgency (for restoration of supplies)
- knowledge of location of other services
- soil conditions
- amenity value of tree
- cost

Acceptable techniques in order of preference are:-

- 1) Trenchless - see section 4.5
- 2) Broken trench - hand-dug - see section 4.6
- 3) Continuous trench - hand-dug. - see section 4.7

Excavation of open trenches by machine is totally unacceptable within the precautionary area.

4.5 Trenchless.

4.5.1 Wherever possible trenchless techniques should be used. The pit excavations for starting and receiving the machinery should be located outside the precautionary area.

4.5.2 In order to avoid damage to roots by the mole, it is recommended that the depth of run should be below 600mm. Techniques involving external lubrication of the mole with materials other than water (e.g. oil, bentonite, etc.) should be avoided, unless precautions are taken to ensure that there is no contamination of the soil within 600mm of the surface within the precautionary area.

4.6 Broken trench.

4.6.1 This technique combines hand dug trench sections with trenchless techniques. If excavation is unavoidable, it should be limited to practical access and installation around/below the roots. The trench is excavated by hand with precautions taken as for continuous trench below. Open sections of the trench should only be long enough to allow access for linking to the next section. The length of sections will be determined by local conditions, especially soil texture and cohesiveness, as well as the practical needs for access. In all cases the open sections should be kept as short as possible.

4.7 Continuous trench.

4.7.1 The object of the exercise is to use manual excavation so as to retain as many roots as possible, bearing in mind the need for working space, access to the service in question and room to install the new service. Hand digging needs to be undertaken with great care, and for this reason is likely to require closer supervision than normal operations and an understanding by all operatives and staff as to exactly what is expected.

4.7.2 After careful removal of the hard surface material, digging should proceed with hand tools. All roots greater than 25mm diameter should be retained and worked around. Where clumps of smaller roots (including fibrous roots) are found these should also be retained. During the excavation great care should be taken to minimise damage to retained roots, including the bark around the roots. Roots with a diameter in excess of 25mm must not be severed without the advice of the owner of the tree or the local authority arboriculturist, who should respond within one working day. If severance is unavoidable, roots must be cut back using a sharp tool (as listed below), leaving the smallest wound.

Suggested tools required: spade, narrow spade, fork, breaker bar, secateurs, handsaw (folding and bow saw), post hole shoveller, hand trowel.

4.8 Backfilling.

4.8.1 Any reinstatement of street works in Great Britain must comply with the requirements of the code of practice approved under the New Roads and Street Works Act 1991 (Specification for the Reinstatement of Openings in Highways). Without prejudice to the requirements of this code as to the specification of materials to be used and the standards of workmanship to be observed, backfilling of any excavation should be carefully carried out to avoid direct damage to the retained roots and excessive compaction of the soil around them.

4.8.2 The backfill should, where possible, include the placement of an inert granular material mixed with top soil or sharp sand (not builders sand) around the retained roots. This should allow the soil to be compacted for resurfacing without damage to the roots, and should secure a local aerated zone enabling the root to survive in the longer term.

4.8.3 Backfilling outside the highway limits should be carried out using the excavated soil. This should not be compacted but lightly "tamped" and usually left slightly proud of the surrounding surface to allow natural settlement. Other materials should not be incorporated into the backfill.

- 4.8.4 Fine roots are vulnerable to desiccation once they are exposed to the air. Larger roots have a bark layer which provides some protection against desiccation and temperature change. The greatest risk to these roots occurs when there are rapid fluctuations in air temperature around them, e.g. winter diurnal temperatures. It is important, therefore, to protect exposed roots where a trench is to be left open overnight when there is a risk of frost. In winter, before leaving the site at the end of the day, the exposed roots should be wrapped with dry sacking. This sacking must be removed before the trench is backfilled.
- 4.9 Additional precautions near trees.
- 4.9.1 Repeated movement of heavy mechanical plant (excavators etc.) should avoid the precautionary area except on existing hard surfaces, in order to prevent unnecessary compaction of the soil. This is particularly important on soils with a high proportion of clay. Spoil or building material must not be stored in the precautionary area.
- 4.9.2 Care should be taken to avoid damage to the trunk and branches from machinery. A tree must not be used as an end-stop for leaning paving slabs against after lifting, nor for security chaining of machinery. If the trunk or branches of a tree are damaged in any way, advice should be sought from the local authority arboriculturist. Any remedial surgery which is necessary should be carried out in accordance with British Standard 3998:1989, 'Recommendations for Tree Work'.
- 4.10 Special considerations when planning services.
- 4.10.1 The potential for future conflict with trees can be reduced at the stage of initial planning approval by the appropriate alignment of services and the provisions for future tree and shrub planting. Appropriate and separate space should be provided for each. Local authorities should liaise with developers.
- 4.10.2 If planning requirements and site constraints dictate that trees (existing or to be planted) and services share the same area, consideration should be given to increasing the depth of services, if possible to a minimum of 600mm, and to laying the service in ducts which will resist root penetration but allow replacements to be laid without extensive excavation. As this may incur additional costs, allowance must be made for these costs and the responsibility for meeting them at the planning stage.
- 4.10.3 When laying new services or replacements, to avoid risk of future direct damage, allowance should be made for future root growth.
- 4.10.4 Services laid in clay or peat should be constructed to tolerate movements associated with swelling or shrinking of the subsoil caused by root activity. Special precautions for differential movement should be incorporated where services join rigid structures founded at a different depth to the service.
- 4.11 Precautions when repairing existing services.
- 4.11.1 Where services require repair, the location of excavation is often defined by the fault. The nature of the work usually requires open excavation. Excavation within the precautionary area should be in accordance with paragraph 4.4, except in emergency or for urgent works (as defined in regulation 2 of the Street Works (Registers, Notices, Directions and Designations) Regulations 1992 (SI 1992/2985)).
- 4.11.2 If emergency or urgent works involve damage to roots with a diameter in excess of 25mm, advice should be sought from the local authority arboriculturist immediately and before the site is reinstated. This will allow a decision on whether any remedial treatment of the tree is necessary.
- 4.11.3 If roots have grown into a drain or duct and proliferated so as to cause a blockage, the removal of the root mass from within the drain or duct will only provide temporary relief. If the root which originally penetrated the drain is still present, it will regenerate and recreate the same problem, or roots of other plants can grow to cause a similar problem. Permanent relief can only be obtained by proper repair of the original defect, e.g. by excavation, pipe bursting or relining.
- 4.12 Avoiding chemical damage to trees.
- 4.12.1 Chemical damage to trees adjacent to operational land should be avoided if:
- the presence of trees on adjacent land is recognised when planning any work involving herbicides or other chemicals. Roots can extend to distances in excess of the height of the tree;
 - appropriate chemicals are selected - particular care should be exercised when considering the use of herbicides recommended for "non crop areas" as many of these also specify "do not use where there may be roots of desirable plants";
 - herbicides are applied only at the rate and in the manner recommended by the manufacturer;
 - follow-up applications are not made until weeds begin to grow again on the operational land;
 - alternative methods of weed control are considered.
- 4.12.2 Additional advice on the use of herbicides can be obtained from ADAS or the British Agrochemicals Association (see section 9).

5. HOW TO AVOID DAMAGE TO SERVICES BY TREES

- 5.1 The inherently variable nature of root systems, and also the generally low incidence of damage to services, makes it neither practical nor justifiable to impose strict limits on the proximity of trees to services.
- 5.2 Before any tree work, including planting, is undertaken, the utilities' records of underground apparatus should be obtained so that damage to services can be avoided. Specifically, care must be taken when removing the stumps of existing trees. In addition, when planning new tree planting, there should be liaison with the utilities, local authority and landowner so that the risks trees may pose in the future are minimised.

ABOVE-GROUND SERVICES

6. HOW OVERHEAD CABLES ARE DAMAGED

- 6.1 Electricity circuits and telephone lines are carried by wires supported on wood poles, however some of the higher voltage electricity circuits are strung between steel structures or towers.
- 6.2 The aerial parts of a tree are constantly growing larger, and are prone to bend and flex in the wind. As a result, parts of a tree may come close to or into contact with above-ground services.
- 6.3 Clearance between the electricity industries' overhead lines at all system voltages and obstructions have been determined to provide safety to the general public and protection against flashover of the line. Local conditions may require an increase in the clearances specified in the Electricity Association publication 43-8 Issue 2 1988. This Standard may be of use to bodies outside the electricity industry as a general guidance document, but in all cases where definitive clearances are required contact must be made with the appropriate electricity company; an appropriate member of staff will then determine the clearance to be adopted.

Part IV of The Electricity Supply Regulations 1988 (as amended) (1988/1057) covers the construction of electric lines above ground. Schedule 4(9) of the Electricity Act 1989 enables electricity companies to require the felling or lopping of trees which obstruct or interfere with the working of their lines or constitute an unacceptable source of danger. For further general information about the construction and maintenance of overhead electric lines, contact the Electricity Association (30 Millbank, London SW1P 4RD: tel: 0171344 5700).

Many telecommunication operators are licensed to run their systems under the Telecommunications Act 1984 in accordance with the telecommunications code (which is set out in schedule 2 of that Act). Paragraph 19 of the telecommunications code enables licensed operators to require the lopping of trees which overhang the street and obstruct or interfere with the working of their lines.

- 6.4 If lines come into contact with trees, they may be damaged as a result of:
- i) abrasion when the tree and/or line move in the wind, bringing them into contact. The resultant rubbing will damage both insulated and uncovered wires which will affect their efficiency and strength and may cause a flashover with consequent loss of supply to customers or the line being brought down.
 - ii) the collapse of a branch or a whole tree which could bring down lines causing an electrical fault and mechanical damage to the electricity system.
- 6.5 The tree may also be damaged by abrasion with a line. Initially this only removes the outer bark, but if the rubbing continues it can expose the underlying wood, which may increase the risk of fire or eventual collapse of the branch or the tree.
- 6.6 If trees are growing in proximity to overhead services, it should be possible to prevent the development of problems by timely pruning and tree management. This requires knowledge of the growth pattern of the many different species of tree, consideration of the effects of the pruning on the appearance of the tree, and application of the correct pruning techniques. All pruning should be in accordance with BS 3998:1989, 'Recommendations for Tree Work'.
- 6.7 Any operation that extends beyond what is absolutely necessary for the maintenance of the service may necessitate either written permission from the local planning authority (tree preservation orders) or to six weeks' notice being given to that authority (conservation areas) (see also paragraph 7.2.2.1).
- 6.8 The potential for future conflict between trees and above-ground services can be reduced by appropriate planning in line with the advice in section 4.10.

LEGISLATION AND OTHER GUIDANCE

7. STATUTORY FRAMEWORK

7.1 Operations of the Undertakers.

7.1.1 In England and Wales, the utilities operate under statutory rights and obligations conferred by the following Acts of Parliament:

Telecommunications Act 1984
Gas Act 1986
Electricity Act 1989
Water Industry Act 1991

The utilities are obliged to provide and maintain services to the public, and in this respect are given various powers by their legislation to ensure that they are able to do so.

7.2 Statutory protection of trees.

7.2.1 The New Roads and Street Works Act 1991.

7.2.1.1 The New Roads and Street Works Act 1991 (NRSWA) controls and co-ordinates work carried out in the street† by statutory undertakers, including all the utilities when exercising their various legislative functions. Part 111 of the Act makes provision for street works in England and Wales; Part IV contains equivalent provisions for Scotland.

7.2.1.2 Before carrying out any work involving the installation, maintenance or alteration of underground services, utilities are required to give notice to the street authority (usually the highway authority). Special provision is made for streamlining emergency works. The notification period gives the street authority an opportunity to liaise with the local planning authority (even though, in some circumstances, the two authorities may not be in the same Council) to consider the likely effects of the proposed work on nearby trees.

7.2.1.3 Street authorities can inspect an undertaker's street works at any stage during excavation or reinstatement. A non-statutory Code of Practice for Inspections has been issued, providing a mechanism for the resolution of disputes between authorities and undertakers in respect of inspections.

7.2.1.4 Undertakers are under a duty to reinstate the street to prescribed standards after they have carried out street works. A Reinstatement Code of Practice has been approved under the Act, giving guidance on the standards required. The Code makes reference to the importance of excavating carefully around trees.

7.2.1.5 The Code of Practice on Co-ordination of Street Works places a duty on highway authorities to organise co-ordination meetings at least quarterly. These meetings provide a forum for street authorities, undertakers and others to discuss any major projects, and annual and medium term programmes, where street works will affect traffic or residents. The meetings are intended to represent all major interests and should be used to discuss planning and other local policies affecting street works, including tree issues. They give authorities an opportunity to draw attention to the advice set out in these guidelines and to seek the co-operation of the utilities and their contractors. It is for street authorities to liaise with local planning authorities to ensure that a responsible officer attends these meetings to raise any tree related concerns.

7.2.1.6 Taken together, the various Codes of Practice issued under the Act give comprehensive guidance for utilities and local authorities from the planning and co-ordination of street works to the reinstatement of the street after works have been carried out. The Codes of Practice currently in force are listed in section 8.

7.2.1.7 NRSWA makes provision for undertakers to pay compensation to street authorities in their capacity as such for damage or loss suffered as a direct result of their street works.

7.2.2 Town and Country Planning Act 1990.

7.2.2.1 Trees may be protected by virtue of this Act in two ways:

i) under section 198, local planning authorities have powers to make trees and woodlands the subject of tree preservation orders (TPOs) in the interests of amenity. The general rule is that trees protected by a TPO cannot be cut down, uprooted, topped, lopped, wilfully damaged or wilfully destroyed without the local planning authority's consent;

ii) under section 211, anyone proposing to cut down, uproot, top, lop etc. a tree in a conservation area is required to give the local planning authority six weeks' notice before doing so. This gives the authority an opportunity of making a TPO in respect of the tree.

7.2.2.2 Most TPOs are made to protect trees on private land, usually when such trees are at some risk of being felled. Trees in the street, which are owned and managed by local authorities, are seldom the subject of TPOs. The fact that a tree is not protected by a TPO does not indicate that it is not an important part of the visual amenity of the local streetscape.

† "Street" is given a wide definition by the Act, and includes highways, roads, lanes, footways, alleys, passages, squares or courts.

- 7.2.2.3 There is no requirement to obtain the local planning authority's consent under a TPO or give notice under section 211 to cut down, top or lop trees in compliance with any obligations imposed by an Act of Parliament. Furthermore, electricity and other licence holders within the meaning of Part 1 of the Electricity Act 1989 do not have to obtain the authority's consent or give notice to carry out work on trees which obstruct the construction of electric lines or interfere with the maintenance or working of an electric line.
- 7.2.2.4 Much of the work carried out by utilities to their underground services will be covered by the notification requirements of NRSWA. This gives local planning authorities an opportunity, if they liaise effectively with street authorities, to consider the effect of proposed work on trees and ensure that their concerns are raised with utilities where appropriate.
- 7.2.2.5 As far as services above the ground are concerned, the relevant utilities should keep local authorities informed of their work programmes. Again, provided sufficient notice is given, local authorities should be well placed to draw to the company's attention the presence of any protected trees, and provide general advice on measures which could be taken to retain the amenity value of trees affected by the works.
- 7.3 Development and Service Provisions.
- 7.3.1 Under section 197 of the Town and Country Planning Act 1990, local planning authorities are under a duty to ensure that they make adequate provision for the protection and planting of trees when granting planning permission. They do this by a combination of planning conditions and tree preservation orders.
- 7.3.2 The utilities need to provide services to new developments, and enjoy permitted development rights to do so under the Town and Country Planning General Development Order 1988 (SI 1988/1813) (as amended). Because these services are an essential and integral part of the development, the availability and location of existing services should be identified at the outset. Developers should ensure that utilities who will provide new services and local planning authorities are consulted at the earliest stage, taking into account the position of existing trees.
- 7.3.3 British Standard 5837:1991, 'Guide for Trees in Relation to Construction' gives advice on the integration of new development amongst trees. It advocates identifying an area around the trees which can remain free of any disturbance, and the erection of protective fencing around this area. Wherever possible the installation of new services should be outside the protected areas. If the new services must pass through the area, they should be laid in accordance with section 4 of these guidelines.
- 7.3.4 When dealing with a planning application, a local planning authority can request the developer to provide additional information about trees on the development site. Regulation 4 of the Town and Country Planning (Applications) Regulations 1988 (SI 1988/1812) enables the authority to direct an applicant to supply further information, including plans and drawings, as is necessary to determine the application. This should normally include a plan showing the route of all services.
- 7.3.5 The Department of the Environment and Department of Transport's guidance note to Architects, Design Bulletin 32 Residential Roads and Footpaths: Layout Considerations (2nd Edition) gives guidance on the design and layout of new residential development. It advocates the inclusion in new developments of service strips adjacent to roads and footpaths for undertakers' apparatus. Provision is made in these strips for the inclusion of trees and shrubs as it is recognised that trees can benefit the visual amenity of an area and act as a screen for the roadway. Specifications for the planting of trees alongside roadways are also provided.
- 7.4 Tree Planting.
- 7.4.1 Under the National Parks and Access to the Countryside Act 1949, local authorities are given a general power to plant trees. More specifically, under the Highways Act 1980, highway authorities may plant trees in the highway, or license others to do so. They need to ensure that trees do not overhang or cause a danger to roads or footpaths, and are given powers to prevent this from happening.

8. OTHER RELEVANT GUIDELINES

- 8.1 BS 5837:1991 Guide for Trees in Relation to Construction.

This British Standard (which updated the 1980 edition) is structured to reflect the progression of site development from land acquisition to eventual completion and hand over to the client. Nevertheless it contains considerable detailed guidance on the protection of existing trees during development and ways of minimising possible interactions between trees and structures.

- 8.2 BS 3998:1989 Recommendations for Tree Work.

Provides general recommendations for tree surgery and other tree work.

- 8.3 NHBC Standards Chapter 4.2. Trees and Buildings.

Information is given on the depth of new foundations in proximity to trees on shrinkable clay soils. Such information is not necessarily relevant to the depths at which services may be affected by soil movements in the proximity of trees, but may provide some guidance.

8.4 Residential Roads and Footpaths: Layout Considerations, DoE and DoT Design Bulletin 32 (Second Edition, HMSO, ISBN 0 11 752641-X, £13.50).

Gives advice on the provision of service strips for utility services and the way in which these strips should be sited so as to avoid either interference with tree roots or interference from them. DB32 in turn refers to NJUG publications which give further advice regarding the protection of both trees and utility services.

8.5 NJUG Publication No. 4. The Identification of Small Buried Mains and Services.

Recommends a colour coding system for small buried mains and services for utilities' plant and highway authority services.

8.6 NJUG Publication No. 7. Recommended Positioning of Utilities' Mains and Plant for New Works.

Provides guidance on the positioning of all new services and plant in a wide range of situations. Section 10 includes reference to planting of shrubs and trees, but is superseded by the more detailed guidelines in this publication.

8.7 Codes of Practice approved under the New Roads and Street Works Act 1991.

- i) 'Co-ordination of Street Works and Works for Road Purposes' (HMSO, ISBN 0-11-551162-8, £7.50);
- ii) 'Specification for the Reinstatement of Openings in Highways' (HMSO, ISBN 0-11-551143-1, £5.95);
- iii) 'Safety at Street Works and Road Works' (HMSO, ISBN 0-11-551144-X, £3.95);
- iv) 'Measures Necessary where Apparatus is Affected by Major Works (Diversionary Works)' (HMSO, ISBN 0-11-551149-0, £6.20);
- v) 'Code of Practice for Inspections' (HMSO, ISBN 0-11-551148-2, £3.15)

9. OTHER SOURCES OF INFORMATION

9.1 Arboricultural advice may be sought from:-

- i) Local authority Arboricultural Officer.
- ii) Arboricultural Association, Ampfield House, Ampfield, Romsey, Hants, SO51 9PA (tel: 01794 368717).
- iii) AAIS, Alice Holt Lodge, Wrecclesham, Farnham, Surrey, GU10 4LH (tel: 01420 22022).

9.2 Information on utilities may be sought from:-

- i) Local utility contact.
- ii) NJUG, 30 Millbank, London SW1P 4RD (tel: 0171 344 5720).

9.3 Information on herbicides and their application may be obtained from:-

- i) ADAS Worcester, Whittington Road, Worcester WR5 2LQ (tel: 01905 767755); or
- ii) British Agrochemicals Association, 4 Lincoln Court, Lincoln Road, Peterborough PE1 2RP (tel: 01733 349225).

DAMAGE TO TREES

(1) Tree roots keep a tree healthy and upright. Most roots are found in the top 600mm of soil. They often grow out further than the tree's height. The majority of these roots are very fine; even close to a tree few will be thicker than a pencil. Most street tree roots grow under the pavement and into front gardens, but they can also grow under the carriageway.

If roots are damaged, for example by trenching, the tree may fall or lose its vigour and decline.

(2) Tree trunks can be easily damaged, so be careful when working near them. For example, **don't** lean paving slabs against trees, **don't** chain machinery to them or nail site notices to their trunks.

PROTECTING ROOTS

(1) Establish a protection zone around each tree: the Precautionary Area. See Fig. 1.

In the Precautionary Area:

- (2) • **Don't** excavate with machinery. Use trenchless techniques where possible. Otherwise dig only by hand.
 - When hand digging, carefully work around roots, retaining as many as possible.
 - Don't cut roots over 25mm in diameter, unless the council's Tree Officer agrees beforehand.
 - Prune roots which have to be removed using a sharp tool (eg. secateurs or handsaw). Make a clean cut and leave as small a wound as possible.
 - Backfill the trench with an inert granular material and top soil mix. Compact the backfill with care around the retained roots. On non highway sites backfill only with excavated soil.
 - Don't repeatedly move/use heavy mechanical plant except on hard standing.
 - Don't store spoil or building material, including chemicals and fuels.
- (3) Frost can damage exposed roots. If trenches are to be left open overnight, cover the roots with dry sacking. Remember to remove the sacking before backfilling.

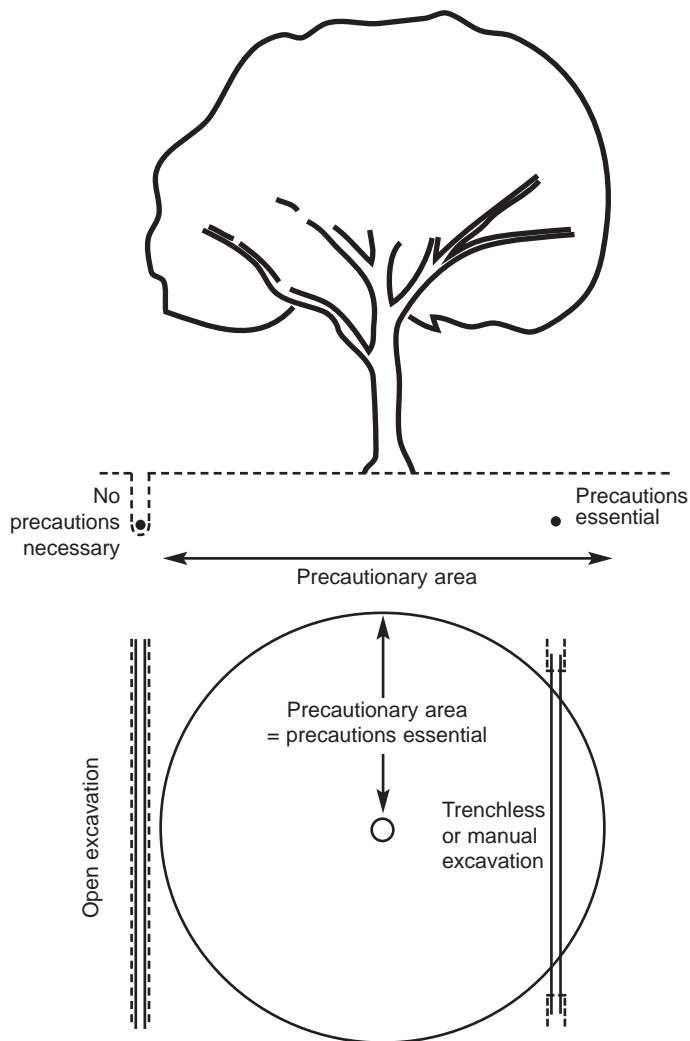


Fig. 1 To determine the Precautionary Area measure the girth of the tree at chest height. Multiply this by 4 and draw a circle of this radius from the centre of the tree.