DESIGN STANDARDS
for
URBAN INFRASTRUCTURE
22 SOFT LANDSCAPE DESIGN

URBAN SERVICES

22 SOFT LANDSCAPE DESIGN

22.1 Introduction

Properly designed and constructed soft landscape treatments such as shrub beds, tree planting and grassing can create interesting and dynamic public spaces within the urban environment. As these elements generally require ongoing maintenance throughout the entire life of the landscape, their design and construction should be carefully considered to ensure that they serve their intended purposes including:

- providing solar screening around buildings
- providing amenity and distinct landscape character for recreational areas
- directing the flow of pedestrian and vehicular traffic along paths and roadways
- providing safe and accessible public spaces
- providing habitat for wildlife
- reducing noise and providing privacy for properties
- creating interest and visual stimulation in public spaces
- defining boundaries between two or more facilities
- screening of undesirable objects.

22.2 Related codes of practice and guidelines

22.2.1 Legislation

Tree Protection (Interim Scheme) Act 2002 (ACT).

22.2.2 Industry Standards

AS 4373 Pruning of Amenity Trees, Standards Australia.

22.2.3 Policy and guidelines

ACT Crime Prevention and Urban Design Resource Manual, Planning and Land Management, ACT Department of Urban Services, Canberra, 2000.

Proposed Policies for Residential Development in the ACT incorporating ACTCode, ACT Department of Urban Services, Canberra, 2000.

The Tree Management and Protection Policy for the ACT, ACT Department of Urban Services, Canberra, 2001.

A Significant Tree Register for the ACT, Environment ACT, ACT Department of Urban Services, Canberra, 2001.

Structural Soils. A New Medium to Allow Urban Trees to Grow in Pavement. Landscape Architecture Technical Information Series (www.asla.org/latis/latisSS.pdf).

22.3 Selection of species

Tree, shrub, ornamental grass and water plant species for use in public open spaces managed by Canberra Urban Parks and Places should be chosen from the approved plant list (see Design Standard 23 Plant Species for Urban Landscape Projects). Designers should also consider the site conditions, maintenance requirements and design intent when selecting species.

22.4 Public safety

When designing soft landscape treatments for public spaces the following principles help improve public safety:

- Locate trees so that minimum clearance requirements from services and sight lines are maintained.
- Locate trees so that they do not conflict with existing or proposed buildings.
- Not using shrubs with sharp or spiky foliage in areas such as pathways and playgrounds where they may cause injuries.
- Ensuring that the design of planting does not restrict or interfere with access.
- Allowing across movement of the disabled.
- Designing shrub beds in shopping centres or pathways so that they do not form a complete screen or enclosure where pedestrians may feel vulnerable.

See the *ACT Crime Prevention and Urban Design Resource Manual* for more information about designing for public safety.

22.5 Design to reduce maintenance

There is no such thing as a maintenance free landscape, however proper planning can keep maintenance to a minimum in public spaces. The following guidelines aim to do this.

- Keep grass areas large enough to manoeuvre ride-on mowing equipment.
- Ensuring that shrub beds and grassed areas have adequate surface drainage.
- Make sure trees in lawn areas are placed so that mowing around them is not impeded.
- Ensure that a mowing edge is constructed against walls and planting beds to avoid hand clipping. Finish edges flush with adjacent grass areas.
- Plant trees and shrubs in beds with a minimum 75–100 mm depth of mulch.
- Plant trees and shrubs in masses.
- Provide more plants than may be required at maturity so that when still young they grow together quickly, thereby restricting weed growth. As plants mature they can be thinned out.
- Choose plants that are long lived, hardy and require minimal maintenance.
- Design paths and paving to accommodate desire lines.
- Allow for adequate preparation of soil for planting and grassing.

22.6 Soils

22.6.1 Soil selection

Soil selection for plants is an important factor when designing for soft landscape elements. The selection of soil can mean the difference between a poorly performing landscape and a thriving landscape. In many urban areas, the existing soil cannot provide trees and shrubs with sufficient nutrients and water penetration for their survival. In these cases soil needs to

be improved or soil imported to supplement the existing site soil. Where plants are failing to thrive or for large or environmentally sensitive sites where importing soil is not an option, soil tests may indicate the most effective way to improve the soil.

In certain urban areas, particularly in places surrounded by paving, normal type 'A', 'B' and 'C' topsoils are sufficient to give trees and shrubs an adequate growing medium. As a general guide use:

- type 'A' topsoil with a minimum depth of 500 mm for plants in raised irrigated beds
- type 'B' topsoil with a minimum depth of 500 mm for plants in irrigated beds at ground level
- compost enriched type 'C' topsoil with a minimum depth of 400 mm for plants in non-irrigated beds.

22.6.2 Structural soils

Structural soils can be used to replace existing soil in areas where soil structure and composition is of poor quality for plant growth and where existing trees have struggled and performed poorly. Typical examples are trees growing in car parks and paved areas. Structural soils may also reduce root disturbance to paving surfaces.

The structural soil material is a gap-graded crushed rock used as a stone skeleton used for strength combined with a clay loam soil and a stabiliser. The blended material creates a ratio of soil to rock that can be compacted in accordance with standard specifications for sub-base materials and still provide soil-filled voids between the stones where roots can penetrate freely. The soil component allows for adequate nutrient, water holding capacity and air movement not provided for in conventional pavement sub-bases. The material will not provide aeration or drainage unless particle size distributions are carefully specified and graded. Adequate drainage must be installed with structural soils. The ratio of soil to stone materials is very important and is determined by local climatic conditions, landscape treatment ie. footpaths or car parks, and plant selection. For more information refer to *Structural Soils. A New Medium to Allow Urban Trees to Grow in Pavement.*

22.7 Permeable paving

Permeable paving is useful where a hard surface is required to be installed near trees. Structural soils and permeable paving, used together, allow water to filter through the paving surface to the soil layers below, providing water and nutrients to the plant's root system while still providing a hard wearing, trafficable surface.

The permeable paving may be pavers with porous material between, special pavers or gravel stabilised with epoxy resin or other bonding agents. Permeable pavers are similar to normal clay and concrete pavers but contain a series of drainage holes in the surface of the pavement. After installation the drainage holes are filled with a freely draining material. Adequate drainage must be installed with permeable paving.

22.8 Root barriers

The use of root barriers can provide protection to the surrounding infrastructure against disruption from tree roots, with minimal impact on the tree. Properly installed root barriers can protect pavement, footings and kerbs from cracking and lifting caused by certain tree species. Root barriers should be installed vertically in a continuous length in a narrow trench dug on the tree side of the pavement or kerb with the top edge flush with the finished ground

surface. If a ribbed root barrier material is used, then the root barrier should be positioned so that the ribs run vertically. The trench should be backfilled and tamped sufficiently to avoid later subsidence. The barrier should not be torn or pierced.

22.9 Mulching materials

The type of mulching material to be used for planting areas should be selected on the basis of its general purpose and location of the bed within the environment. If selecting a type of mulch which is not on the list below, approval is to be obtained from Canberra Urban Parks and Places prior to its use.

When applying mulch to newly constructed shrub beds, it should be applied so its settled depth is 75–100 mm. This will prevent most seed germination in the soil. Fine mulch should not be used as it is prone to being either blown or washed away and decompose too rapidly.

22.9.1 Pine flake

Pine flake is a commonly used mulching material for shrub beds. This mulch can be used to cover both non-irrigated and irrigated planting areas and can be used in almost any location, including shopping centres and open space areas. It is especially useful on sloping sites as the mulch binds to itself and in urban areas and near buildings because it will not cause damage when thrown.

22.9.2 Pine bark

Pine bark is more expensive than pine flake and comes in a variety of sizes. Its attractive appearance suits its use in prestige areas. As larger pieces can be thrown or moved onto pathways, only screened material 1–2.5 cm should be used as a mulch over shrub beds.

22.9.3 Decomposed granite

Decomposed granite is sometimes used a mulch but has a relatively high cost. It is useful in low maintenance areas where some pedestrian traffic across the shrub beds is expected. Decomposed granite should not be used as a mulch on sloping sites greater than 1:30 or in areas where loose material can spill onto pathways.

22.9.4 River stones/pebbles

River stones and pebbles provide a suitable and attractive alternative to traditional mulch along watercourse plantings such as floodways. This type of mulch should not be used in urban areas and close to buildings where there is a possibility of rocks being thrown through windows or spread by mowers.

22.10 Protecting existing trees

Damage to existing trees during development typically occurs through physical and chemical injury and through changes in drainage. This may be caused through:

- level changes – excavation severs roots and filling causes suffocation of the feeder roots
- trenching for underground services, kerbs and gutters and footings, which severs roots, affecting both the stability and nutrient intake of the tree
- drainage changes – causes drought or water logging of the root zone
- compaction – causes physical damage to roots and prevents air and water reaching the roots

- chemicals – including engine oil leaks, hydraulic fluid and a wide range of chemicals that are taken up by the tree roots
- physical injury – wounding affects tree health and can facilitate the entry of disease and decay.

22.10.1 General design considerations

During the design process, all established trees need to be assessed and information recorded showing: species type, size (height, canopy spread and trunk circumference) and location, along with a statement of the potential impact of proposals on trees. When established trees are designated for retention in development areas the canopy, trunk and roots must be protected from damage.

A decision to retain, prune or remove trees should be made at the early design stage with full recognition of their value, potential costs, advantages and disadvantages, and alternative design strategies available to retain the trees (refer to *Tree Protection (Interim Scheme) Act* 2001).

If damage to the roots is likely to eventually kill a tree then removing the tree before work starts will avoid the difficulty and expense of later removal. In any circumstance the retention of large trees in confined areas such as courtyards should be carefully considered in view of the public safety and maintenance implications.

In planning residential estates, the appeal and value of the new suburb can be greatly enhanced by designing services around existing trees (both mature and semi-mature specimens). Techniques for achieving this include:

- road alignment – where good stands of trees occur in the suburban areas, vary the alignment of roads and services to avoid the trees
- open space – incorporate pockets of open space where dense stands of trees occur and retain corridors of trees through the subdivision
- medium density – site medium density housing within scattered clusters of trees for an established character to the development
- playgrounds – locate playgrounds, local and regional parks near mature stands of trees
- residential blocks – site trees to occur on the corners or verges of residential blocks for incorporation into gardens; one mature tree can benefit several blocks for visual and physical amenity
- verges – verge widths may be altered to accommodate existing trees, for up to 10 metres
- traffic islands – dense stands of medium sized trees may be retained in adequately sized islands between carriageways or roundabouts
- laneways – design laneways wide enough to accommodate services, existing trees, paths and overland stormwater requirements
- landmarks – design road layouts to use landmark trees for orientation and aesthetic effect, for example at the top of a hill or in a roundabout.

22.10.2 Protection from soil compaction and physical damage

The simplest and most effective protection for trees is fencing out construction activity. The fences must be maintained for the duration of the project and should only be removed when essential activity such as final landscape shaping is being undertaken.

Maintenance access to each tree must be considered at the design stage. Access for a large travel tower into the site may be required and could cause disturbance to the tree.

As a general rule, feeder roots grow in the top 150–300 mm of the soil. This feeder zone can extend two to seven times the diameter of the canopy drip line (the drip zone). Major structural roots may penetrate to depths of 1–5 metres.

No site sheds, building materials or vehicles are to be placed within the drip zone of existing trees. The drip zone should be fenced off, and all trees must be protected from compaction within the feeder zone. No heavy machinery should be allowed in this area.

22.10.3 Level changes

Any excavation or level build-up around trees must be minimised. Level changes within the feeder zone will affect tree health. Some species are better able to recover from level changes – *Platanus* species for example are better able, and *Eucalyptus* species are among the least able to cope with disturbance.

Where level build-up is necessary, the fill soil should be the same (or a coarser) texture as the original surface soil or downward capillary water flow may be affected. If the ground is heavily compacted some aeration should be provided before the fill soil is added.

Where the change in level is no greater than 100 mm and is restricted to one side of the tree, no specific action is required.

Drainage and aeration must be provided when either of the following situations occurs:

- fill depth greater than 150 mm on one side of the tree and within the drip zone
- fill depth greater than 100 mm within the feeder zone on all sides of the tree.

A decrease in level within the feeder zone involves severing tree roots. This will affect the tree to varying degrees depending on a number of factors such as:

- species and age of the tree
- size and stability of the tree
- depth and location of the excavation
- percentage of feeder roots being severed.

Excavation occurring on one side of the tree, halfway from the drip line to the trunk will eliminate about 30 per cent of feeder roots. Most healthy trees should be able to recover from this loss if proper after care is undertaken.

When a project requires excavation around a tree the specification should observe the following guidelines.

- Make the design documentation adaptable and take into account root locations identified during construction.
- Do not excavate within the feeder zone of mature *Eucalyptus* species except where work is on one side of the tree only and outside the drip zone.

- Keep all excavation at least 1 metre from the tree trunk. If the entire area around the tree is lowered more than 150 mm the tree may not survive unless soil is returned within a fair distance of the trunk. (This distance will depend on the species, rooting pattern, and soil and moisture conditions at the site.)
- The largest possible area should be left at the original level when the grade is lowered on all sides of the tree. Terracing can be used to accomplish this.
- All work within the drip zone must be undertaken by hand.
- Do not sever large roots (>30 mm diameter) closer than halfway from the drip line to the trunk.
- All roots must be cut cleanly with equipment specifically designed to cut roots or other pruning equipment.
- Roots exposed during excavation must be protected from desiccation.
- No heavy machinery is to be used within the feeder zone.

When a project involves a major reduction in ground level, root systems can be given some advance preparation to reduce the impact. A lead-time of at least one year is necessary to make this effective. A percentage (less than 50 per cent) of the roots that will be affected by the project can be severed and new root growth encouraged within the area that will not be disturbed. The greater the lead-time, the more gradual the impact on the tree.

22.10.4 Excavations for services

Trench for services as far from the tree as possible. If services must be placed inside the drip line then tunnelling beneath the tree produces the least amount of disturbance to the root system. It is better to tunnel beneath the centre of the root system rather than to the side. Trenching within the drip line will seriously injure and possibly kill the tree.

22.10.5 Disturbance to the existing drainage patterns

Disturbance to soil moisture levels can result in a decline in tree health, increased susceptibility to pests and diseases, and eventually to death.

Changing the ground level near the tree commonly disturbs surface drainage. This may divert water away from the root system or increase runoff and lead to water logging or collar rot.

Sub-soil drainage is affected when substantial areas of hard paving or buildings are placed near trees, where areas surrounding trees are heavily compacted, or where major changes to ground level occurs. Sub-soil drains should be used where excess water is likely to be a problem.

Retained trees often require remedial action for drainage, aeration and irrigation. It is preferable to retain trees in a group in a large island than a single tree in a small island.

22.10.6 Paving around existing trees

Hard paving surfaces create an impermeable layer preventing air and water from reaching the tree roots. Ideally, to reduce this problem, paving should be at least 20 per cent porous within the drip zone and a minimum of 2 x 2 metres should be left exposed around the trunk. Permeable paving can be used to allow more water and air to reach the roots (see Section 22.7).

The installation of paving around existing trees usually involves a loss of roots and reduced aeration as the sub-base is filled around the tree. To reduce this impact, a gravel diffusion

layer or structured soils should be provided under the pavement. Vents in the paving at the drip line can also be used where less permeable paving materials are used.

The use of root barriers can provide protection to some of the existing infrastructure against disruption by tree roots, and have minimal impact on the tree.

Where root barriers are installed within the existing feeder zone of the tree it involves severing of roots. A total of no more than 30 per cent of feeder roots should be affected.

22.10.7 Tree surgery, pruning and maintenance

The need for remedial pruning or maintenance, and provision of adequate irrigation to compensate for loss of roots should be assessed at the design stage and incorporated into the project. Tree pruning is to be carried out in accordance with Australian Standard 4373 - Pruning of Amenity Trees and should occur prior to, or during construction.

When carrying out tree surgery, pruning or general maintenance on an existing tree the following points should be considered.

- Pruning practices are to comply with Australian Standard AS 4373.
- Pruning is to be done back to the next healthy lateral bud or branch. When branches are removed the final cut must be close to the trunk or main branch; no stubs are to be left.
- The correct tools must be used and they must be sharp to ensure pruning cuts are clean.
- The height of lower branches of a tree should never be greater than 30 per cent of the tree height. The clearance of 2000mm is required under branches of trees in paved areas or areas of pedestrian use.
- General maintenance and pruning should be undertaken on trees where they interfere with traffic sight lines, cycle paths or footpaths. Trees should also be pruned away from car parks and public buildings such as toilets and shopping centres.
- Epicormic growth on tree trunks should be removed.
- Any branches that are damaged, for example, by wind storms or vandalism, or have fallen off should be removed.

Canberra Urban Parks and Places should be consulted for the requirements for future tree surgery maintenance.

22.11 Tree planting

Trees can play many roles in urban areas including:

- aesthetic quality
- visual screening
- solar access
- habitat for wildlife
- street trees
- screening and wind breaks
- vertical scale against other urban elements

- shelter belts and amenity in recreational and open space areas.

If their location within the urban environment is designed thoughtfully and appropriately, the trees will provide urban areas with an ever-changing landscape throughout their life.

22.11.1 Design considerations

Trees in urban areas can face many stresses and thoughtful design will go a long way to minimising this. The following should be considered when designing for trees in urban areas:

- selection of an appropriate species for its intended purpose (see Design Standard 23 Plant Species for Urban Landscape Projects for a list of species)
- the mature height and crown spread of the tree.
- the tree spacing in different types of tree planting, especially in areas of dense planting such as wind breaks and screening purposes, forward tree planting and street tree planting
- clearances from above and below ground services, as well as new and proposed buildings (see Design Standard 4 Road Verges and Design Standard 23 Plant Species for Urban Landscape Projects)
- sight lines for both pedestrian, cycle and vehicular traffic.

Consideration of the above and below ground space required for each tree to reach its mature size is necessary. Designs should allow access for mowing and other maintenance vehicles throughout the life of the tree. As a guide:

- for large trees allow 10 metres for canopy development.
- for medium trees allow 6 metres for canopy development
- for screens, shelter belts or park group planting allow 3 metres
- as an absolute minimum in intensive urban developments (allows restricted mower manoeuvring where mature girth is 500 mm and no head obstructions by branches) allow 2.5 metres.

22.11.2 Trees and services

There is potential for conflict between trees and infrastructure such as powerlines, water pipes, street lights, paving, kerbs and signs. The design and location of services must be coordinated with the design process at an early state to minimise conflict. In developing a landscape design, an awareness of the location of existing services is essential. Conflicts may result in:

- increased maintenance costs
- reduced longevity of the trees and loss of aesthetic value
- reduced public safety.

Beneath power lines, plant only trees that will not encroach upon the acceptable safe distance from the power lines when mature. In open space areas a corridor of 10 metres either side of the power lines should be left.

A clear line of sight must be provided to signs, lights and driveways. Low branching or weeping species should not be selected for use near these items.

Where possible, trees should be planted the maximum distance available away from kerbs, driveways and footpaths to reduce root interference (refer to Design Standard 5 Driveways). A one metre minimum clearance (for desirable deep or fine rooted smaller trees), and a root barrier can be installed to reduce the impact of a tree's vigorous root system. A clear line of sight must be provided.

Careful species selection is very important to reduce impact of tree roots on cycle paths. Clearance, both overhead and underground, is required.

Species selection for use near buildings is important; consider the mature size of the tree. If adjacent green space is available then planting trees close to buildings should be avoided.

Trees with vigorous root systems are able to penetrate and interfere with underground services such as stormwater and sewer mains, and underground cabling such as telephone and electricity lines. Damage to these services can sometimes be reduced by the installation of root barriers, although they should not always be relied upon and may not work where water leaks out of pipes. Species selection is therefore just as important. Select trees that do not have vigorous root systems within service easements.

22.11.3 Functions of urban tree planting

Trees are used for many functions. Species must be chosen carefully to suit the intended purpose, otherwise the trees can become a detraction from the space or even not survive.

Trees can be used to create a visual screen from surrounding urban elements. They can also provide screening from prevailing environmental conditions such as high winds. In this situation, careful consideration should be given to the selection of species and its appropriateness for providing a screen. Selection of species should also take into account the surrounding tree species, so that the trees blend into the surrounding environment when mature.

Forward tree planting is done in anticipation of future residential or industrial development. Screen planting for future developments is usually carried out several years before construction of the development so that the trees have time to mature to fulfil their screening role. Forward tree planting can be used to create a buffer zone between urban districts, for example, screening industrial estates from residential estates.

In urban subdivisions open space areas are provided for the community usually for recreational purposes. These areas are ideal locations for tree planting and if designed correctly can fulfil the following functions within the open space:

- provide shade
- introduce visual interest
- divide the space into a series of spaces
- provide habitat for wildlife
- add scale to an open space.

Street tree planting is one of the most common types of tree planting in urban areas. If designed correctly street trees can provide urban areas with an ever-changing environment all year round during the life of the trees. Street trees can help define the hierarchy of roads by using larger trees on major roads and smaller trees on minor roads. They add colour and interest to the street and the overall urban area. Mature street trees can provide a suburb with a definable character. Species selection is important when selecting street trees, in terms of

the character it will provide to the street and suburb and also in relation to clearances from services. Generally street trees are planted as one tree per residential block, however sometimes two or more trees per block can be planted depending on verge width, length of the residential block, size of trees, services and infrastructure (driveways, streetlights, sumps etc).

22.11.4 Tree staking

In their early life, trees in urban areas need support to help them take on the form of a mature tree and to protect them from wind, vermin, vandalism and urban traffic. Staking is the most common and easiest method of providing a juvenile tree with the support it needs to develop into a mature tree.

Staking provides a tree with support and protection that it needs in its early life in urban areas. If the tree is staked correctly it is more likely to perform well. In urban areas:

- stakes must be placed outside the root ball and a minimum of 300 mm away from the tree to avoid damage to roots, trunk and lower branches
- ties shall only be used when required for establishment support
- ties should be to two or more stakes as necessary with stakes opposite and ties at the same height (between one third and one half of the height of the sapling – higher ties are detrimental to the future support of the tree).

22.11.5 Tree guards and grates

In areas of high pedestrian and vehicular traffic or in formal or prestigious areas, metal tree guards offer the same protection to trees as staking, as well as protection from vandals and add a more decorative urban element. When installing metal tree guards ensure that it allows for the tree to grow without damage to branches or the trunk.

Metal tree grates are also used in areas of high pedestrian and vehicular traffic or in formal or prestigious areas where trees are in paved areas. Tree grates protect the root system of the tree and add a decorative element. When selecting a tree grate ensure that the grate can be adjusted to accommodate the growth of the trunk.

Further information on tree guards and grates for urban spaces can be found in Design Standard 19 Park and Street Furniture and Barbecues.

Mesh tree guards are used to support and protect trees from stock and vehicles in open space areas. After the tree is planted drive 2 x 2.4 metre tall steel droppers 600 mm into the ground, and approximately 300 mm out from each side of the tree. Circle with general purpose mesh (1.8 metres tall) around the steel droppers to form a cylinder and overlap by 300 mm. Secure with tie wire. The mesh will prevent most types of vermin penetrating the guard and damaging the tree. The mesh tree guard also supports the tree so that additional staking is not needed.

Newly planted trees in open space areas can be protected with plastic tree guards. These guards protect the trees from vermin, make the small trees visible and create a microclimate with the guard. The guards are generally placed around the tree with three supporting stakes and the area around the tree is mulched.

Plastic tree guards, which also provide a water holding capacity and slow water release facility, are available. These guards can be used to provide a recently planted tree with a slow release of water, which reduces the need for additional hand watering and lessens the stress on the tree.

22.11.6 Planting trees in paving and car parks

Trees often perform poorly when planted in areas with impermeable surfaces, suffering stress from lack of water and air. When trees do grow well there is often a conflict due to roots damaging the surface. Providing more space around the tree should reduce these problems (see Design Standard 10 – Parking Areas).

The following points should be considered when planting trees in hard surfaced areas.

- Fast growing large trees have the most potential roots to disrupt hard surfaces.
- Trees with nuisance litter drop such as fruit or sap are not suited to paved or car park areas.
- Ensure that the tree has access to adequate moisture and air and that the area is ventilated properly by the way of air and moisture pipes. Permeable paving and structured soils can be used to help achieve this.
- Ensure that a root barrier is installed when trees are planted close to pavement (see root barrier requirements for individual species in Design Standard 23 Plant Species for Urban Landscape Projects).

Avoid the use of hard surfaces too close to the trunk, which may cause girdling as the tree grows. If the surface will last for 15–20 years then potential trunk growth over that period must be accommodated.

22.11.7 Designing to reduce maintenance

- Avoid planting trees in pedestrian ways with unsuitable access for tree surgery equipment.
- Avoid planting trees where their placement imposes significantly on the adjacent leaseholder (that is, trees are too close to the boundary).
- Avoid planting trees in narrow parking islands (see Design Standard 10 Parking Areas).
- Mulch is not to be used around trees planted in irrigated grass areas.
- Mulch should be kept away from their trunks.
- Avoid obstructing northern and eastern solar access to buildings by choosing plant species carefully (consider deciduous and evergreen, foliage density, height, width and distance). The shadow cast at mature height should be used to calculate minimum distance from building.
- Indicate on Work as Executed drawings the intent design for the mature landscape ie. removal of dense planting, support species, inter-plantings and aged existing trees.

22.12 Shrub beds

Shrub beds form an integral part in the development of public landscapes and in the renewal and revitalisation of public open areas. If properly designed they can serve numerous functions, and if properly maintained, will provide amenity and quality to the space.

22.12.1 Design considerations

When designing for shrub beds, be sure that the beds serve their main function which maybe to provide spatial definition, visual interest, treatment of slopes, cohesion in the space and a setting for buildings. Other things to consider are:

- Irrigating shrub beds beneath eaves or other overhangs.
- Spacing shrubs at around three-quarters of their mature width unless forming a screen, where they should be planted closer.
- Fencing shrub beds for the first few years after planting in high use areas to restrict traffic and aid establishment.
- Using shrub beds on steep slopes that are otherwise unsuitable for grass cover and in heavily shaded areas or areas that are difficult to mow.
- Using shrub beds to reduce erosion caused by storm water.
- Designing beds with adequate surface fall to drain excess water.
- Being aware of altered drainage patterns that have occurred due to earthworks and avoiding placing beds in low-lying areas where water cannot easily be removed.
- Providing shrub planting to attract wildlife, particularly in open space and recreational area.
- Avoiding creation of areas that may encourage undesirable activities such as hiding and loitering.
- Planting shrubs in pedestrian ways where they are normally a maintenance problem unless there is a well defined reason such as unmowable grades (hard pavement is preferred for narrow (3 metre wide) laneways).
- Designing the location of shrub beds to allow future vehicular access for mowing, litter removal, tree surgery, pest control and other maintenance.
- Restricting the size of shrub beds while meeting design or functional requirements because they are relatively high maintenance.
- Avoiding the use of spiky shrubs near pedestrian areas, playgrounds and high litter areas.
- Stating in the design intent where formal or naturally evolved beds are desired; formal shrub beds should be restricted to prestigious locations where the high maintenance requirements can be justified while informal, natural shrub beds should be restricted to broad-scale areas and have a full depth of long lasting mulch cover over weed free soil.
- Designing shrub plantings next to paths, buildings, lawns and fences to have a minimum clearance equal to their mature drip-line radius.
- Providing windbreaks where winds are likely to make the space unpleasant.
- Avoid obstruction of access to manholes, valves etc.

22.12.2 Maintenance considerations

Although shrub beds are an important landscape element in open space areas, they can also create maintenance problems if not designed and constructed correctly. These include:

- litter accumulation
- weed competition with subsequent difficulties of control
- damage caused by pedestrian tracks
- plant losses caused by water logging in winter or drying out in summer
- mulch decay and need for replacement
- the need for pest and disease control
- the need to replace dead plants.

Shrub beds can therefore be a high maintenance alternative to other landscape options such as dryland grass. Designers should also aim to design to minimise maintenance of the shrub beds. The following guidelines should be carefully considered.

- Do not plant shrubs along pedestrian laneways except for specific purposes such as providing cover over unmowable grades.
- Ensure that the established size of the shrubs will not obstruct sight lines along paths and roadways.
- Allow sufficient space for vehicular access. Locate shrub beds to enable future maintenance.
- Consider the location of existing services such as gas, electricity and telephone lines when designing shrub beds (see also Design Standard 4 Road Verges).
- Shrub plantings between pathways and buildings should not obstruct building maintenance or encroach onto paths when plants mature. Provide a clearance equal to their drip line radius.
- Ensure that shrub beds have sharply defined edges constructed to prevent mulch migrating onto adjacent pathways or grassed areas, especially after rain or irrigation.
- Shrub species to be selected and positioned so as not to obstruct manholes, hydrants, valves, meter pits, etc.

22.12.3 Dryland shrub beds

Dryland, or non-irrigated beds are the most commonly used method of open space shrub planting. In general, these plantings must serve some useful purpose such as either covering the soil on steep unmowable batters or floodways, providing wind, noise and privacy screening, adding definition to area boundaries, or restricting access.

Construction of this type of planting is relatively simple, and generally requires little or no underground drainage. Weeds should be removed, existing topsoil stockpiled and the subgrade ripped. Where the existing soil condition is poor, the subgrade may be excavated and replaced with better soil. Topsoil (existing and imported) should be placed over the cultivated subgrade. Care should be taken not to heavily compact this soil prior to planting. If any compaction does occur during construction, this should be alleviated by rotary hoeing before planting.

Beds should be graded to facilitate drainage with a steeper gradient at the edge. Edging in open space and less formal areas is usually by spade edge. In areas of higher maintenance or places of importance or distinction, concrete, brick, or treated pine edging can be used in place of a spade edge.

22.12.4 Irrigated shrub beds

The cost to construct and maintain irrigated shrub beds is relatively high, and these beds should only be used in formal areas or around community facilities where their maintenance can be justified. Generally, irrigated shrub beds should be smaller than dryland beds and located close to water mains and drainage lines.

In many cases shrub bed irrigation is only required for the first few years after construction to provide rapid establishment of plants that are able to obtain sufficient moisture without irrigation when mature.

Good drainage is essential in irrigated shrub beds to prevent water logging and decay of mulch. In many cases deep ripping of the subgrade will be sufficient to provide for drainage. If this is not possible, a sub-soil drainage system must be included (see Design Standard 21 Irrigation).

A depth of topsoil sufficient to support vigorous plant growth should be provided and the surface shaped to allow drainage and mulched.

22.12.5 Raised shrub beds

Raised shrub beds are usually expensive to construct, and if not designed and constructed correctly, can be the most troublesome.

The high cost of these beds is such that their use is confined to prestige areas or those with high traffic where beds at ground level would be trampled. Other areas where raised shrub beds can be effectively used are along roadways as a visual and acoustic screen. Areas along lake foreshores or other sites with high water tables may require raised shrub planting. Consideration should be given to the final dimensions of the beds, from both cost and drainage perspectives.

All raised beds require irrigation, and a drainage system.

For raised shrub beds, the subgrade should be consolidated and covered with a sand drainage layer in which drainage pipes are placed. Topsoil is added above the drainage layer and shaped to drain across the width of the bed.

See also information about planter boxes in Design Standard 19 Park and Street Furniture and Barbecues.

22.12.6 Edging

Edging around shrub bed areas can be used to provide visual separation of the shrub bed from the surrounding landscape elements such as grass. It is also used to provide for easier maintenance around shrub beds.

Edging can be created using a variety of methods and materials.

- Concrete – 100 x 150 mm, constructed using formwork around the shrub bed.
- Brick edging – either side ways or length ways, and mortared in place. Brick edging can be used in formal spaces or in prestige areas to add character and visual distinction to the landscape.
- Sleeper edging – durability Class 1 type. Again sleeper edging can be used in areas where the space requires character or visual distinction.
- CCA treated pine logs or timber – logs to be 150 mm minimum diameter and timber to be 150 x 45 mm minimum dimensions. Timber should only be used with the

approval of Canberra Urban Parks and Places as it is prone to warping and lifting from the ground, creating a maintenance hazard.

- 'V' spade edging – generally used for less formal areas such as shrub beds in open space and in areas where a low cost, minimal type of edging is needed to provide visual distinct between shrub bed and grassed areas. A spade edge also allows for easier maintenance, particularly in open space areas.

Concrete and brick edging can also be used against vertical landscape elements such as walls to provide for easier maintenance.

22.13 Grassing

When designing grassed areas, consider the maintenance factors outlined below and aim to minimise the ongoing maintenance requirement.

22.13.1 Irrigated grass

Irrigated grass areas have high maintenance costs and should be limited to areas subject to high usage such as high use parks or to areas with specific visual and design significance such as important approach roads or landscaped surrounds to major buildings.

Requirements for irrigated grass:

- topsoil should be of an appropriate quality
- areas should have grades of no less than 1:70 and be able to drain without ponding
- areas should be mowable with efficient machinery such as a tractor mounted cylinder mower with an extended width of approximately 5 metres and a retracted width of 2.6 metres
- irrigated grass should not be provided in strips less than 2.8 metres wide, have tight corners or be steeper than 1:6
- mowing obstructions should be sited to allow the easy manoeuvring of ride-on equipment (a minimum clearance of 2.7 metres should be allowed in most areas with a 2 metre clearance allowed in tight developments where smaller machinery is acceptable)
- where shrub and tree planting (including low branches) does not allow clearance for mowing equipment, it is preferable to incorporate planting into a mulched bed (self-seeding trees may be a problem in these locations)
- paths or barriers to partition off narrow sections of grass are not desirable but paths can be positioned to define the edge of irrigated grass
- hard surfaces, mulch, granite or shade tolerant ground covers are preferred for shaded areas.

See also Design Standard 21 Irrigation.

Turf areas should be cut and maintained at a uniform height consistent with the ground surface. Prior to mowing, all rubbish must be removed and all exposed irrigation heads depressed in their closed position. The cutting height should be set at 38–50 mm, and the grass maintained between the heights of 38–75 mm. No more than 40 per cent of the height of the existing grass should be removed at any one mowing, and long grass should have its height reduced gradually over a period of several weeks until the desired height of cut grass

is reached. Fertiliser should be applied to irrigated grass and spread evenly with a tractor mounted or hand broadcast spreader at regular intervals. Occasionally topdressing may be carried out to correct surface levels and to fill in depressions resulting from use, equipment, installation of utilities and general subsidence.

22.13.2 Dryland grass

Dryland grass should be used in most public areas such as road verges, traffic medians and neighbourhood parks. The surface should be level and smooth.

Grass should not be sown on slopes greater than 1:4, areas with less than a 3 metre clearance, acute corners, under road signs, or in other difficult to mow areas.

Trees in dryland grass should be spaced far enough apart for mowing by 2 metre wide equipment. A 2.5 metre minimum spacing allows for most mature girths (but not for low branches or excessive manoeuvring). Where this is not possible, then incorporate the planting into a mulched shrub bed. Individual shrubs should not be planted in dryland grass.

The use of bitumen and straw mulch will assist in the establishment of grass and reduce erosion on sloping surfaces.

Mowing is undertaken to provide uniform, well-maintained grass, suitable for community use. The maintained height of the cut grass will depend on the frequency of mowing. To reduce the spread of invasive weeds by grass mowing operations, areas where these weeds occur should be mown before the plant comes to seed.

22.13.3 Native grass

The use or retention of native grass and herb species is encouraged. Designers should discuss possible sites and techniques with Canberra Urban Parks and Places.

Native grassland sites are to be managed using nature conservation principles. Mowing of native grasses will depend on their location. Where native grass is planted along roadways and roundabouts, the grass is to be maintained at a low height and mowed regularly (at least four times a year) to maintain sight lines and keep visibility high. Open space areas and nature reserves need only be mowed once per year. It is necessary to remove any clumps of cut grass following mowing of native grasses to ensure the survival of the native grass species.

Mowing should be undertaken by a whipper-snipper or brush-cutter, and not with a mower. The native grass should be cut to a height of 150–200 mm, and should generally be cut in late August or late February (timing depends on the predominant species).

Native grass plantings that are mulched must be maintained with mulch at a depth of 50–100 mm. All bare areas should be covered and finished level with or below the level of adjacent footpaths, roads and kerbs.

22.13.4 Edge treatment

Grass edges should be stable and able to withstand traffic by maintenance vehicles. They must also be able to withstand mechanical grass cutters.

Edges should be as straight as possible to allow edging equipment to operate at normal speeds.

Serrated paving, metal and small section timber materials are generally not acceptable as edging.

22.14 Further reading

Belconnen's Urban Parks, Sportsgrounds and Lake Ginninderra, Canberra Urban Parks and Places, Department of Urban Services, Canberra, 1998.

Inner Canberra's Urban Parks and Sportsgrounds, Canberra Urban Parks and Places, Department of Urban Services, Canberra, 2000.

Tuggeranong's Urban Parks and Sportsgrounds, Canberra Urban Parks and Places, Department of Urban Services, Canberra, 2000.

Water and sewerage standards, ACTEW Corporation, Canberra, 2000.

Woden and Weston Creek's Urban Parks and Sportsgrounds, Canberra Urban Parks and Places, Department of Urban Services, Canberra, 1998.