

Terra+ Landscape Architects

Unit 20 Sussex Studios
23 - 25 Sussex Street
Woodstock

terraplus.co.za



PREPARED FOR: **BERTHA FOUNDATION**

SITE: **Bertha Retreat, Boschendal Farm 1674/11, Paarl**

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1. INTRODUCTION

Green spaces are of immense environmental and aesthetical value. Aside from softening the often harsh interface between built form and infrastructure, they create micro climates which ameliorate temperature fluctuations and actively improve air quality. Beyond the adding to the physical health of our communities, there is scientific evidence indicating that sensory engagement with trees directly improves our mental wellbeing.

In acknowledgement of the crucial role trees play within the built environment, **TERRA+ Landscape Architects** have developed a tree management document, which forms part of survey procedure mandated by TERRA+ or independent surveys.

The purpose of the survey is to establish a baseline layout of the existing trees in order to develop a management strategy and propose future planting of landscaping elements. The overall objective of this management document (and a tree survey) is to ensure that valuable tree stock is retained, enhanced and increased in the most proactive manner whilst ensuring the health, safety and well being of the public and property.

A survey is conducted to assess the trees' condition and health whilst highlighting any work that may be required to ensure the tree is retained in the best possible condition. When a site is earmarked for development, a tree survey is conducted in order to ascertain any opportunities and constraints posed by existing trees in relation to development plans.

Aside from survey methodology, this document also contains guidelines to tree management during construction; typical root management; and pruning strategies.

2. SURVEY METHODOLOGY

This survey method is designed to assess the trees' condition and health whilst highlighting any work that may be required to ensure the trees are retained in the best possible condition.

The process employed is to do a number of site visits and with existing survey drawings plot the actual trees (refer TERRA+ Dwg. No. **110-01.4 Existing Trees Landscape Survey**). Photographic documentation is taken of each individual tree. These are then identified using existing documentation (books etc.) and local knowledge. A desktop collation of all the material and documentation is then structured into a document consisting of photos, spreadsheet (where applicable) and relevant documentation to provide the client with a complete set of criteria and strategy.

The criteria employed assessing the trees were the following:

- Type (species)
- Height
- Stem Diameter
- Crown Diameter
- Condition (health/presence of structural decay or defects)
- Significance

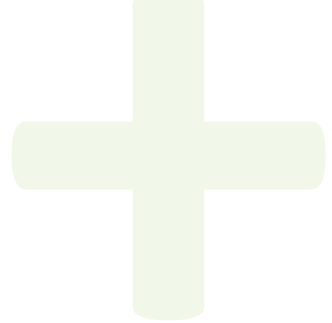
When determining the condition of the trees, it will be recorded whether the trees are dead; dying; diseased; dangerous; or damaging property. When a tree is marked as damaging property technical evidence must be provided to substantiate the claim and proposed response.

Trees taller than approximately 2m are considered for a survey. Any tree shorter than 2m are regarded as insignificant and can be transplanted or replaced without any significant impact on the environment.

It is recommended that a survey be conducted to assess the tree status every 20 years.

Note:

Where it states in the listing that trees must be checked, it refers to the identification that was limited due to lack of flower, foliage or other distinctive identification markers.



3. TREE PRUNING METHODOLOGY

Generally trees occur in forests where the competition for light allows for the shape and health to be determined. This includes the natural shedding and trimming of limbs to accommodate the growth of the tree. In an urban environment this does not occur naturally and the trees then pose a danger to people and property.

Tree pruning consists of the following techniques:

- Removal of crossing, weak or competitive branches
- Crown balancing
- Dead wooding
- Crown lifting
- Crown thinning

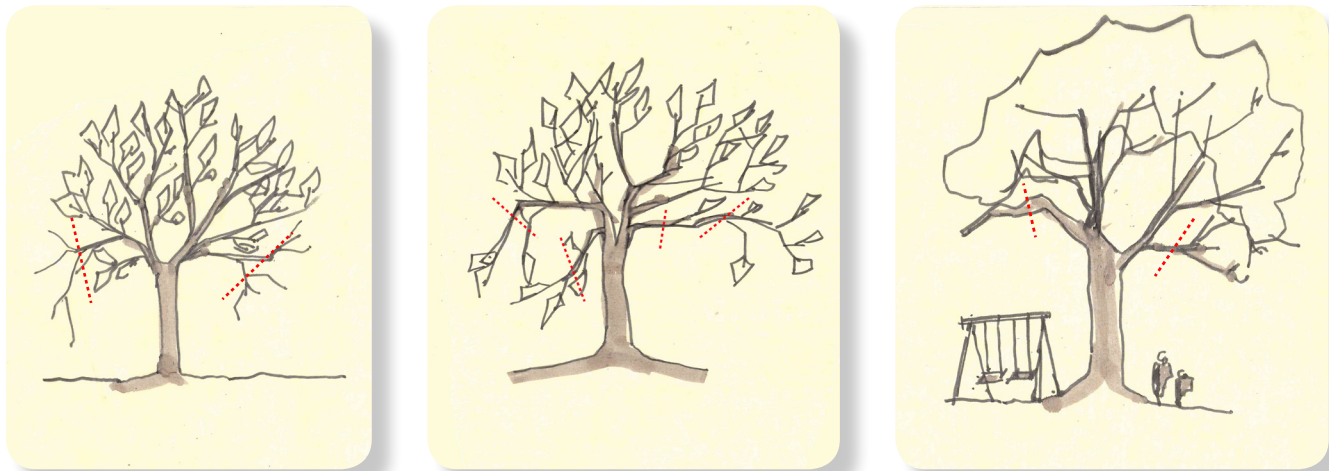


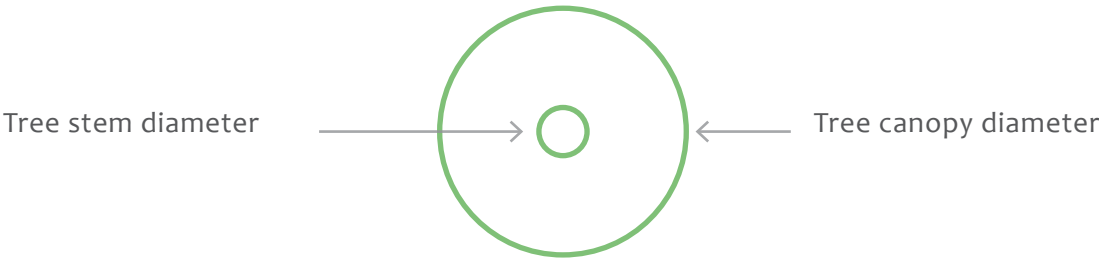
FIG 1. Reasons for pruning: Health, Shape and Safety

Pruning trees is beneficial for the tree if done correctly and will improve the health, structure and beauty of the tree. When done incorrectly the pruning and adversely affect the tree and lead to its demise. (fig.1) It is crucial to determine the purpose of the pruning and intended long-term outcomes before a pruning project is undertaken. It is advised that all pruning be done by an arborist or tree care professional.

Trees of particular significance are clearly indicated with a colour (blue) in the listing and plan. One example would be *Sideroxylon inherme*. Commonly known as White milkwood, this tree is a protected species under South Africa’s National Forest Act, 1998 and would therefor be indicated with a blue symbol (below). In terms of this act, “no person may cut, disturb, damage or destroy any protected tree; or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree”.

TYPICAL TREE SURVEY KEY (please refer to the plan legend too):

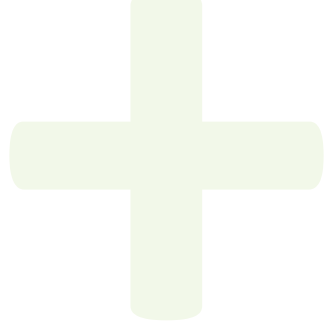
- ⊗ PRESERVE
- ⊙ RETAIN
- ⊗ REPLACE
- ⊙ REMOVE (stockpile for later use)
- ⊗ REMOVE
- ⊙ DEAD



The inner circle measurement represents the scaled diameter of the tree stem, one meter up from natural ground level.

The outer circle measurement represents the scaled diameter of the tree canopy, an estimated measurement of its widest circumference.

The estimated height of the tree will be recorded, along with the stem diameter and canopy diameter, in a Microsoft Excel ledger of the tree survey. The tree survey plan drawing will not reflect the height of the tree.



PRUNING TECHNIQUES							
GOAL	Structural	Crown Cleaning	Crown Thinning	Crown Raising	Crown Reduction	Crown Restoration	Root Pruning
Safety (reduce risk)		X	X	X	X	X	
Provide Clearance			X	X	X		
Reduce Shade and Wind Resistance			X		X		
Maintain Health	X	X				X	
Influence Grown (flower , leaf or fruit production)	X		X		X	X	
Improve View			X	X	X		
Improve Aesthetics	X	X	X			X	
Tree Planting	X						X
Existing infrastructure repair or protection							X

TABLE 1. Pruning Techniques

A clear intention as to the outcome must be communicated prior to the pruning taking place to ensure a satisfactory outcome.

The following table will assist as a guide choosing the best pruning method for the desired goal.

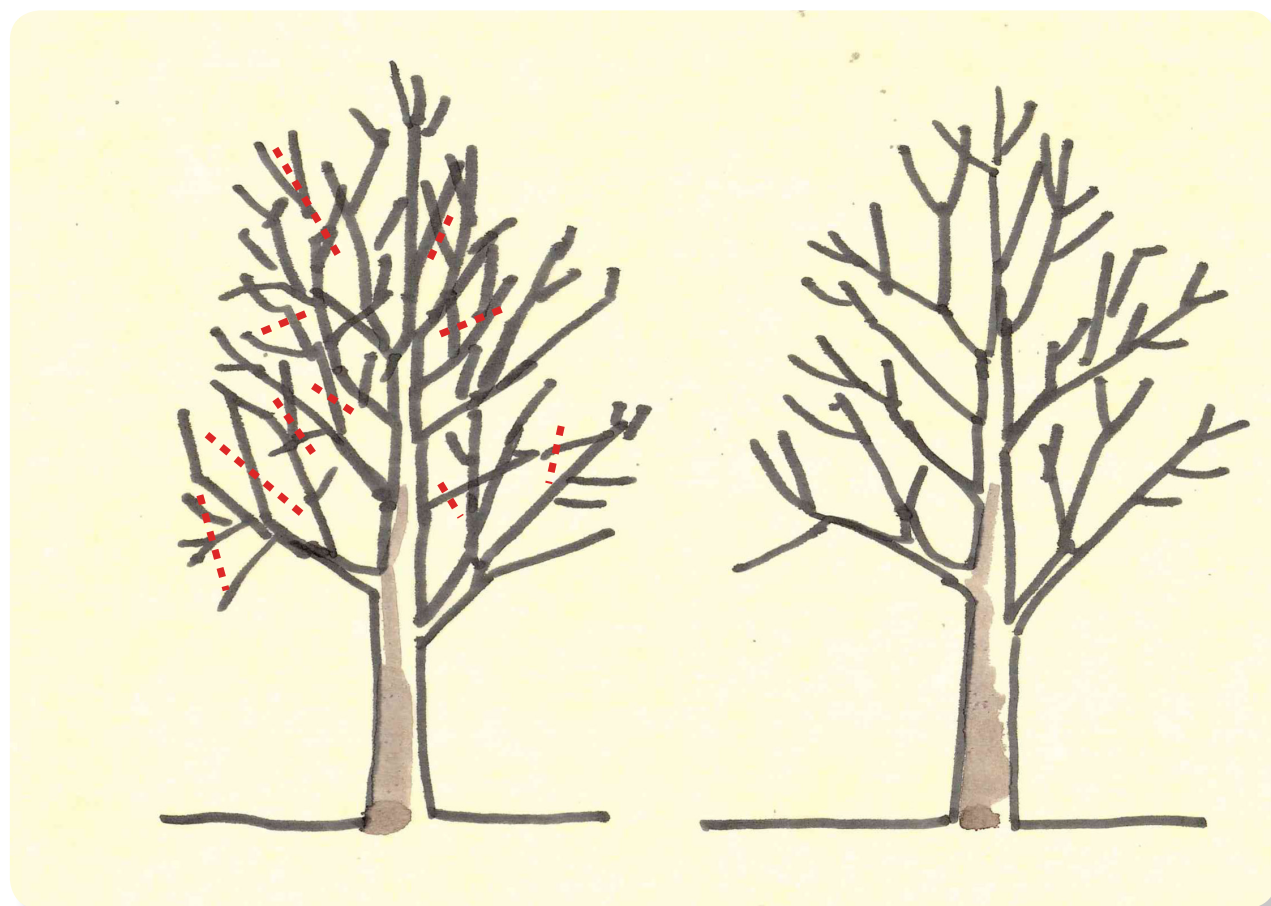


FIG 2 - Crown Cleaning and Thinning, removing dead and diseased branches and removal of co-dominant branches

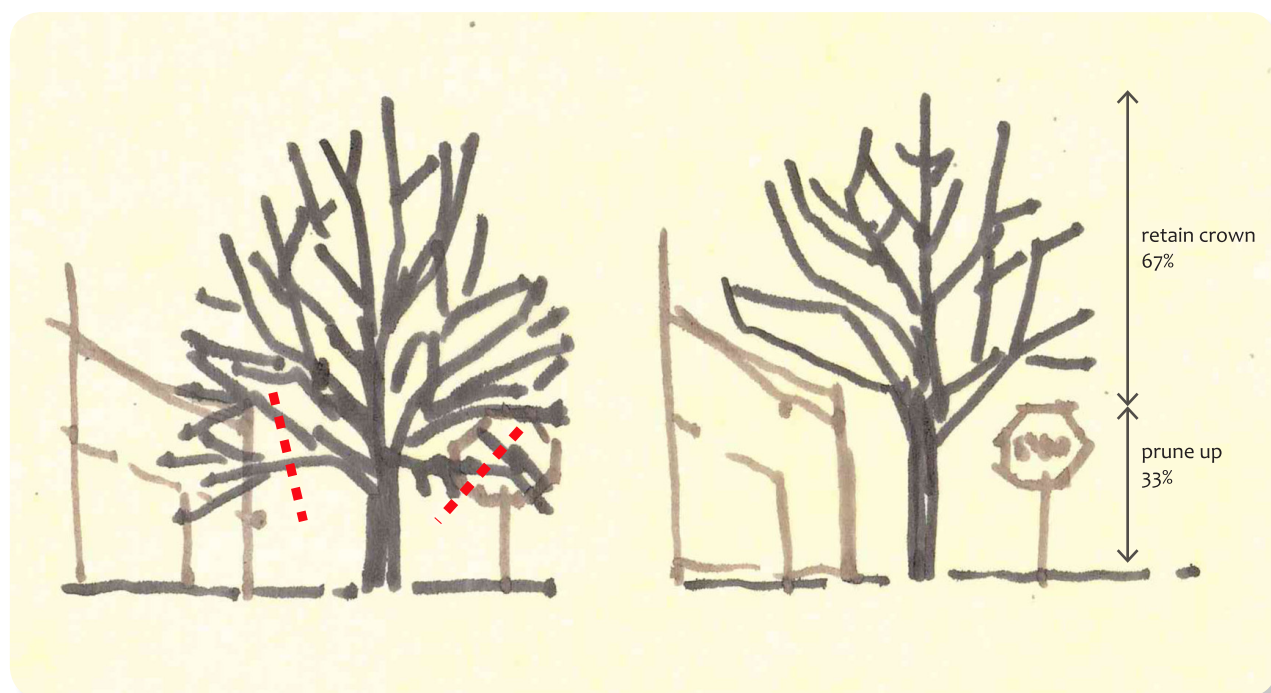


FIG 3 - Crown Raising

4. PRUNING TECHNIQUES

4.1. Structural pruning

Structural pruning is applied mainly on young trees to ensure sound development into mature trees. Trees that have been correctly pruned while young, prevent potential problems and maintenance costs in future. It is imperative to choose trees that are structurally sound when selecting a new tree from the nursery. Trees should have a well formed tapering stem, with well spaced branches, that are smaller in diameter than the stem.

Often it is the case that the branches develop from apical buds at the top of a single stem. These will form co-dominant branches. These branches are each an extension of the stem and one should be removed to ensure a good structure to the tree. The branch that is chosen must be pruned at the correct angle and is best removed when the tree is still relatively young. A good guide is to have branches that are no greater than a half of the stem diameter.

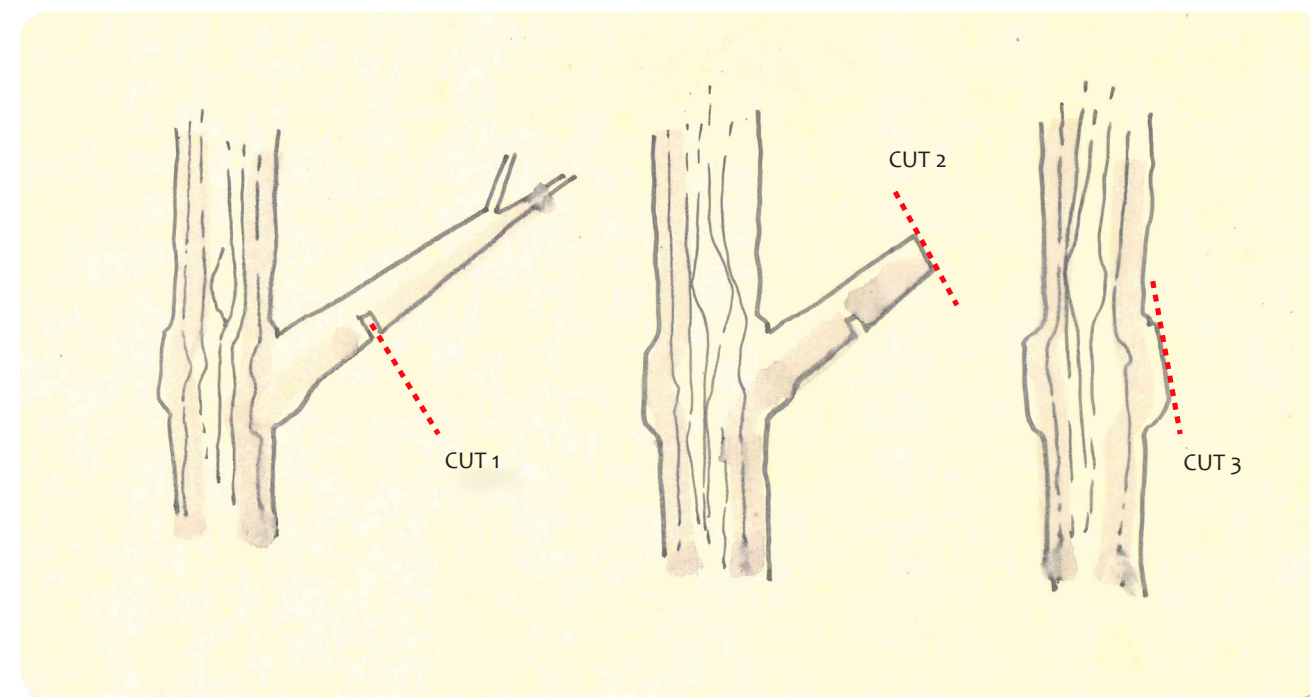


FIG 4 - Correct pruning methods and cuts



4.2. Crown Cleaning and Thinning

Crown cleaning a tree involves a series of cuts to remove branches and/or dead branches that could impose danger to the surroundings. Excessive epicormic branches are selectively removed throughout the tree, leaving the dominant branches intact to ensure good development and shape. Crown cleaning and thinning will reduce any incidences of risk to people and property. It ensures good development of the tree and will reduce maintenance in the long term. Crown cleaning and thinning also provides an ideal opportunity to scrutinise the tree for disease and remove diseased branches. This can be performed on mature or young trees where the need arises.

In the case of crown thinning the size and shape of the tree is not necessarily affected, but thinning allows for better air movement through the branches and better light penetration. This reduces the risk of storm damage. Thinning should be done with an even distribution of smaller

branches so that the weight distribution is even and that interior branches do not have their foliar weight towards the end of the branch.

A well pruned tree where crown cleaning and thinning has taken place should look natural, balanced and have a good form. The intention is that the pruned tree must not look as if it has been pruned but have the most natural look possible. (Fig. 2)

4.3. Crown Raising

Crown raising as implied is the pruning method of removing the lower branches of a tree and provide clearance where the tree might obstruct sight-lines, interfere with architecture, pedestrian and or vehicular traffic. Crown raising should be performed on young trees to avoid the lower branches developing a diameter that is too large. This also ensures that the shape is monitored and developed correctly, and that diseases are limited due to large pruning wounds.

Should the lower branches have a large diameter, these can be shortened to promote growth in the upper branches and then later removed. No more than 30 - 33 % of the lower canopy must be removed. (Fig. 3)

4.4. Crown Reduction

In extreme cases the crown of a tree must be reduced. This would required the branches to be cut back to the point of origin or where a lateral branch is capable of sustaining the remaining limb and can take apical dominance. This pruning method should not be confused with topping. Under no circumstances must a tree be topped. This is not a recommended practice and can severely compromise the tree.

Crown reduction is the reduction of the tree keeping a healthy and aesthetically pleasing shape. The tree specie must also be taken into consideration. Not all species can adequately recover from such a severe practice. It should be noted that crown reduction must not be used to control the height of a tree. It is always best to plant the correct specie for the correct place. (Fig. 4 & 5)

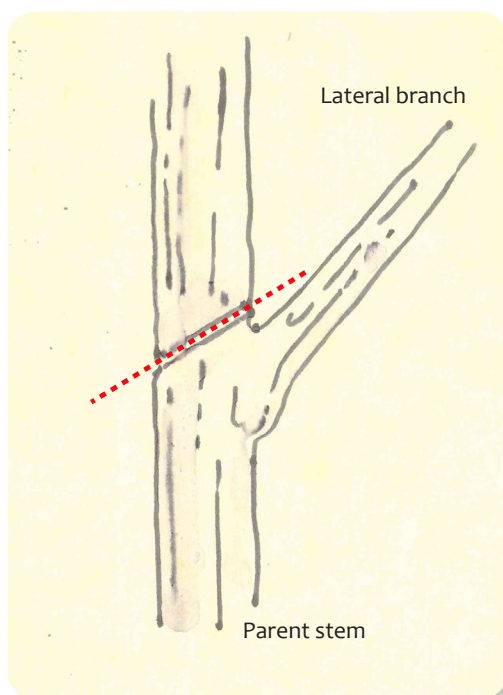


FIG 5 - Pruning to reduce crown height

4.5. Crown Restoration

This pruning method is used when trees have been damaged, vandalised or topped.

This is to improve the overall health and structure. The success of pruning largely depends on the whether the tree can cope with the damage in the first place and then the subsequent pruning. It usually requires a number of prunings before the desired shape and health of the tree is restored. Careful monitoring of the tree must be done by a tree specialist to ascertain whether the tree is recovering. The tree will not recover in all instances, removal and replacing of the tree may be a more viable option.

Crown restoration often includes all the above mentioned pruning techniques.

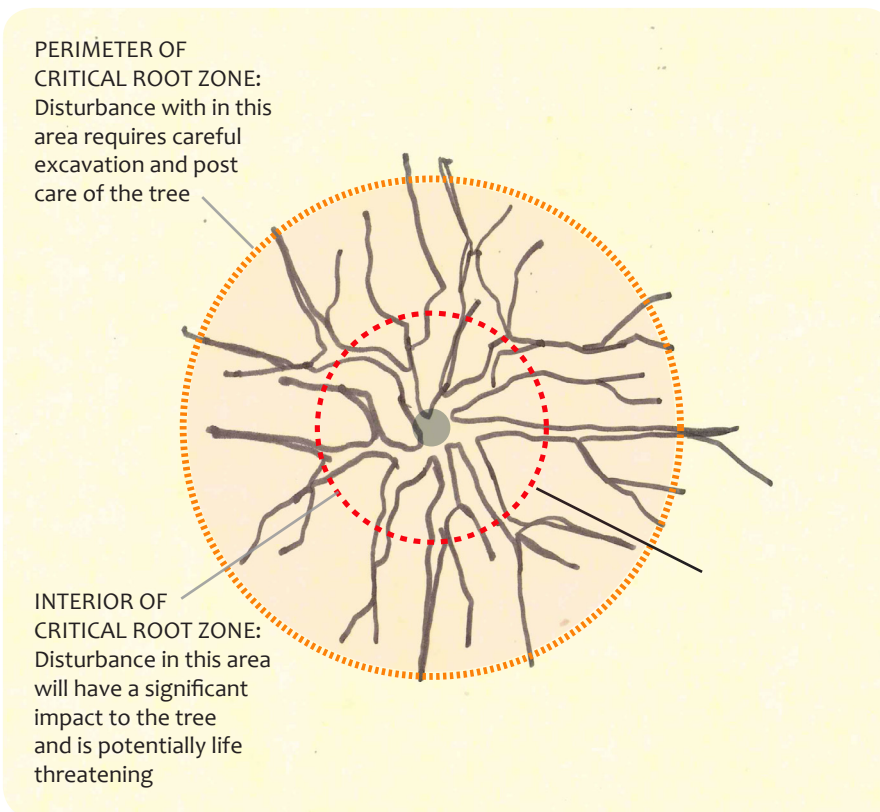


FIG 6 - Plan view of tree indicating critical root zone

A good guide to determine whether a branch should be pruned is the following:

Under 6 cm in diameter : PROCEED

Between 6 and 12 cm in diameter : THINK AGAIN

Larger than 12 cm in diameter : HAVE A VERY GOOD REASON

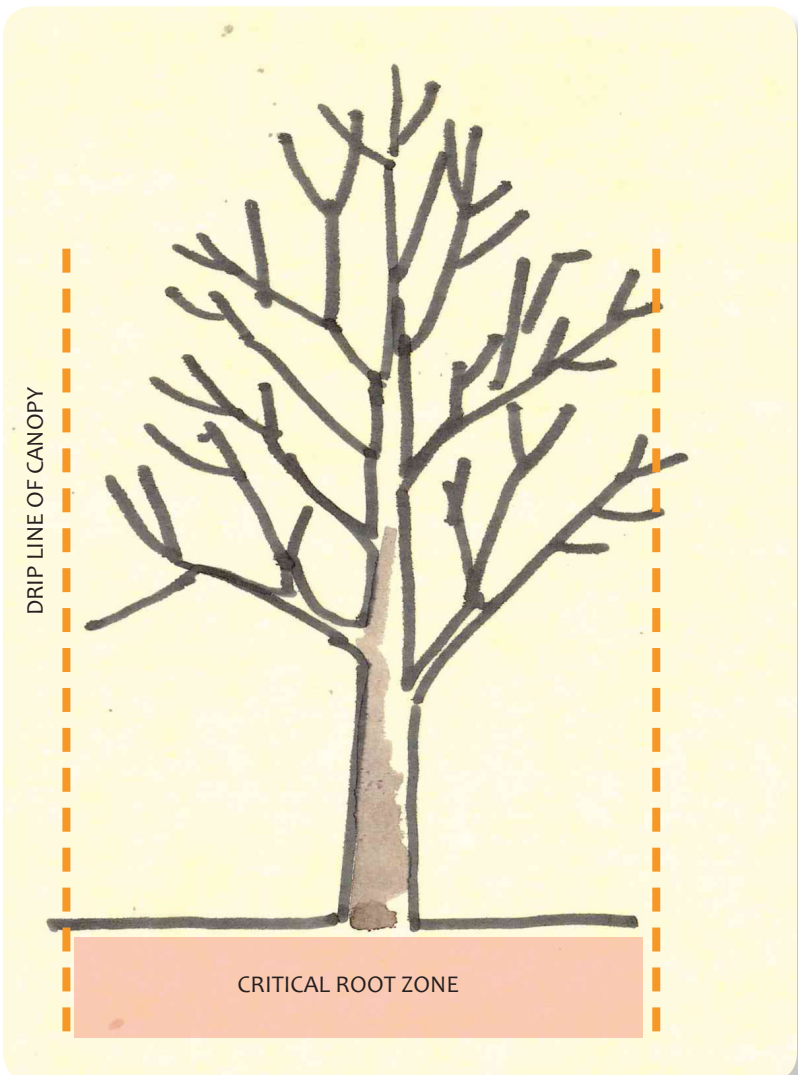


FIG 7 - Elevation of tree indicating critical root zone



5. TREE MANAGEMENT DURING CONSTRUCTION

The tree protection strategy is divided into several stages as outlined below:

5.1 Installation of tree Protection Hoarding:

The Hoarding is to be constructed of a firm and rigid material well bedded in the ground to obviate it falling over in the wind. The proposed material is to be approved by the Landscape Architect.

In relation to the installation of the hoarding within the tree canopy drip line, each condition needs to be individually assessed with a view to minimizing damage to the roots of the trees.

When working around the tree stem, all measures must be taken not to damage the tree branches, bark, roots and leaves. Hoarding must be replaced once work has been completed.

5.2 Works on Site:

The Project Manager is to advise the Landscape Architect when work commences adjacent to the trees.

A line of Communication is to be agreed by, all consultants and contractors' telephone numbers are to be clearly displayed on site.

Mark out the hoarding alignment on site for approval by the Landscape Architect before commencement of installation thereof.

Signs are to be posted on the protective hoarding at frequent intervals explaining in Afrikaans, English, and isiXhosa, that this is a Tree Protection Zone and that no access is permitted.

4.6. Root Pruning

Root pruning is the selective reduction of the roots where they cause obstruction to existing infrastructure. Root pruning may also be carried out where there is an indication that the roots might in future cause a problem.

There is always a risk that the tree suffers severely when pruning the roots and it is often difficult to ascertain the actual extent of the roots. This is determined by the health and maturity of the tree. Younger trees often respond better to root pruning than more mature trees.

All roots must be exposed by hand to determine the extent of the root zone and to allow for clean cuts. All cuts must be done with a clean sharp saw. Do not hack or chop at the roots as these create damaged areas that are prone to diseases.

Should it be determined that the roots will be a problem in the future a root barrier may be installed to ensure limited root growth in the area. Root growth is not always symmetrical around the tree following the drip line. Physical barriers such as infrastructure or the soil conditions can determine the root zone, that is why it is imperative that the area requiring root pruning be carefully excavated.

No more that 25% of the root zone may be pruned . Any more than that may be fatal to the tree. (Fig. 6 & 7)



5.3 Contractual Tree Protection Measures:

The hoarding is to be kept in tact at all times, if any portion of the hoarding becomes damaged it is to be repaired immediately to the cost of the main contractor and reported to the landscape architect.

No fires are to be made at any place within the tree canopies

No materials are to be stored under the trees or against the hoarding.

No hanging of clothing or any items on the trees or the hoarding.

No item, nail, etc may be attached to the trees unless deemed necessary by the approved arborist.

No storm water runoff or/and spilling of materials from site must be directed towards the trees.

No branches or tree roots can be removed without the prior approval of the Arborist, all pruning of trees to be performed under supervision of the arborist.

All trenching within the tree canopies is to be approved by the landscape architect before commencement thereof.

All trenching within the tree canopies is to be performed by hand (spade work), any roots that are exposed during these excavations are to be left intact and inspected by an arborist, Roots can only be pruned by an arborist (or done under the supervision of an Arborist). Not withstanding if any part of the tree is damaged during the said works this is to be reported to the landscape architect immediately (Ankia Bormans: 082 448 4645). This is to ensure that the approved arborist can be instructed to perform any tree surgery if required.

All waste from tree surgery must be recycled, being used in a variety of situations, including: mulches for shrub beds, firewood, habitat piles or dead standing timber where suitable, thereby avoiding the use of landfill sites.

5.4 Monitoring of Trees during the Project Works and Post Construction:

The hoarding and status of the trees will be assessed and monitored on a weekly basis, and supplemented by monthly reports.

Where interference to the tree's root ball or canopy is required (eg. through pruning or excavation), the arborist should assess and recommend appropriate action (eg. the application of suitable wound sealant, fertilizer, soil improver or surface dressing) and monitor the tree's health.

The existing water table around existing trees needs to be maintained during the project works and after completion thereof. An appropriate watering program must be implemented for new trees.

A site journal is to be kept indicating recording dates, people spoken to, any damage to trees and the like.

The hoarding can only be removed on the instruction of the landscape architect.

5.5 Tree Protection Construction Measures:

Excavations within the tree root zone to be implemented by hand.

Potential compaction of soil within the root zone to be ameliorated through methods approved by the Landscape Architect (eg. place boarding or mulch in local area effected and the like).

Pruning to clear for building site or construction works to be done by an Arborist.

In addition dependent on the extent of excavation adjacent to the root zones (to be accessed by the Landscape Architect), retention of the root ball will be required – sand bagging retention method to be used until the pre-construction levels are reinstated.



6. RECOMMENDATIONS

In principle all tree recommendations (the addition, retention, replacement, relocation or removal thereof) must take the overall aesthetic and character of the site into account.

It is the recommendation that a survey be conducted on a regular basis, or where the need to address a particular situation arises that an assessment be done by a Registered Landscape Architect or Arborist.

Please refer to:

TERRA+ Landscape Architects' EXISTING TREES LANDSCAPE SURVEY drawing no. 110-01.4

for further site specific information.