Tree Protection Methodology

Prepared by:

Viridian Consulting (Pty) Ltd

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Viridian Consulting Landscape Architects: Contact information			
Principal Landscape Architect:	René Maria Brett	rene@viridian.co.za	+27 83 4099252
Office Landline / Admin	Ezelle Miller	ezelle@viridian.co.za	+27 21 8581582

1. Trees during construction

Trees can be damaged or killed by a wide variety of construction activities. Such as broken or torn branches and root damage. Broken or torn branches can lead to diseases and insects inserting the trees through the open wounds.

Trees are never the same shape below ground as they are above, so it is difficult to predict the length or location of their roots. Typically, however, approximately 90-95 percent of a tree's root system is in the top 90–100 cm of soil 100 cm of soil, and more than half is in the top 30-50 cm. The part of this root system in which construction damage should be avoided is called the Root Protection Area (RPA).

One common method to identify the RPA is to define it as the "dripline"–the area directly below the branches/crown of the tree. However, many roots extend beyond the longest branches a distance equal to two or more times the height of the tree. For this reason, you should protect as much of the area beyond the dripline as possible.

On most sites space is limited and can't protect the entire area. Just how close an activity can come without seriously threatening the survival of a tree depends on the species, the extent of damage, and the plant' s health. Some healthy trees can survive after losing 50 percent of their roots. However, other species are extremely sensitive to root cutting, even outside the dripline.

2. Minimising Impact of Construction Activities

Protection

High-visible barricades/hoarding (diamond mesh fence with shade cloth) and signs around the trees and areas to be protected. The optimal size of hoarding varies by tree species, size, and construction project. Preferably the hoarding shall be placed at the dripline. The final position of the hoarding shall be confirmed by the Landscape Architect with the Main contractor on site. For additional protection, a layer of wood chips can be placed around each tree prior to placement of the hoarding. Hoarding to be checked at least once a week during construction.

Grade changes

By moving large amounts of soil within the RPA is not advisable and can lead to tree death. Except where absolutely necessary, avoid disruptions to the natural contour of the site or shift them well outside the RPA.

Soil additions compact the soil around a tree and often raise the water table. You may be able to protect compaction-tolerant trees from additions of 15 cm or less of soil by using a porous fill within the RPA. Porous fill can be made by mixing one-part loam, one part coarse sand, and one part shredded bark.

Deeper fills require more expensive measures. A retaining wall beyond the RPA may protect some trees. These walls preserve much of the original root system and redirect excess water away from sensitive plants. However, as a general rule, it is best to remove trees that would be buried by 15 cm or more of fill around the base.

Cutting the soil away from a tree removes vital feeder roots, eliminates nutrient-rich topsoil, and often lowers the water table. Damage caused by shallow cuts (less than 5cm) at least 90 cm away from the base of the tree may be minimal, but still can be a shock to a tree's vitality (health). If possible, avoid making the cut during hot, dry weather; water the tree (undisturbed portions) before, during, and after soil removal; and allow only hand digging inside the RPA. A shallow layer of mulch (pine needles, wood chips, or coarsely chopped twigs and bark) and clean root cuts will help wound closure and regrowth. Deeper cuts within the root zone will require construction of a retaining wall no closer than the limit of the RPA

Soil Damage and Compaction

Tree roots need loose soil to grow, obtain oxygen, and absorb water and nutrients. Stockpiled building materials, heavy machinery, and excessive foot traffic all damage soil structure. Lacking good soil aeration, roots suffocate and tree health declines.

Prevent soil compaction by carefully selecting storage areas and traffic routes and installing protective fences and signs. If you can, reroute traffic, install root system bridges with steel plates suspended over railroad ties or spread a layer (15cm or more) of wood chips on the soil within the RPA. Trees that are pruned or removed during the construction process should be chipped on site and the chips used for soil preservation tactics such as this. Heavy mixing trucks can be kept off tree roots by transporting concrete from the truck through conveyor pipes.

Improper handling or disposal of materials used during construction also can harm roots. All building debris and chemical wastes be hauled away for proper disposal, and not burned or buried on the site.

Avoid changes in soil pH (acidity). Increases in pH are particularly dangerous to many species. Alkaline clays or limestones should not be used for fill or paving, and concrete should be mixed on a thick plastic tarp or outside the site. Mixing trucks should never be rinsed out on the site.

Excavation

40% of a tree's root system could be cut during the installation of a nearby utility line. This however, reduces water and nutrient uptake, and may compromise the stability of the tree. If it is not possible to relocate the utility line outside the tree's RPA, you can reduce root damage by as much as 25% by tunnelling under the tree's root system. When digging a trench near a tree, begin tunnelling when you encounter roots larger than one inch in diameter.
Drilling single holes or bridging critical areas as opposed to cutting deep trenches saves many critical roots.

For all digging operations, insist that exposed roots be cut cleanly to promote quick wound closure and regeneration. Vibratory plows, chain trenchers, and hand tools are preferred than bulldozers and backhoes. Minimize damage by avoiding excavation during hot, dry weather;

keeping the trees well-watered before and after digging; and covering exposed roots with soil, mulch, or damp burlap/hessian as soon as possible.

Paving / Hard surfaces

Sidewalks and driveways located too close to a tree endanger its health and may threaten pavement stability. Factors such as poor drainage and pavement flaws give roots an opportunity to expand, gain a foothold, and cause damage.

These problems can be avoided by considering the spatial needs of a tree and its root system when designing. Ideal location for sidewalks and driveways is outside the anticipated RPA. Driveways may cover up to half the distance from the tree's RPA to its trunk, as long as no excavation occurs. No tree should be boxed into an area less than 2.5 meters by 2.5 meters by 1 meter deep, with larger trees receiving at least 8.5 cubic meters of root/soil volume.

To minimize disruption alternatives to conventional paving materials can be used. Preserve natural contouring by spanning uneven areas with wooden walkways elevated on posts. Elevated decks are excellent alternatives. Where additional pavement strength is needed (e.g., driveways), concrete requires less excavation than asphalt. "Structural soils" may be used under pavement to allow for both adequate pavement base strength and tree root penetration. Structural soils are composed of 80% stone chips, 20% clay-loam soil, and a polymer binding agent

For trees that can tolerate root disturbance, a vertical underground barrier may redirect root expansion away from pavement.

Root Pruning

Trenching and digging in the soil near trees can cut roots, and this can damage the tree resulting in tree decline or the tree falling over. Tree roots greater than about 2.5cm diameter should not by damage. In some cases, roots of 2.5cm – 8cm diameter represent the major structural roots holding the tree upright. When roots greater that 2.5cm are exposed, a trained professional should be contacted. Root pruning only to be done by trained professional.