Ground Protection Practice Note GPPN8/21

Tree Root Protection using Temporary Access Trackways

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Summary

The conservation of existing trees on development sites is of great importance, both to the local authority who specifies their protection as one of the planning conditions for development, and also to the developer who wishes to operate responsibly and minimise the risk of damaging the trees and incurring a substantial fine.

A tree depends upon having a healthy root system to survive. Damage from nearby construction work can include compaction of the soil by construction traffic, which prevents water and oxygen from reaching the roots. Also physical severance of the roots during excavation for temporary or permanent stone based roadways.

This document therefore looks at ways to protect trees and their roots through the creation of "no-dig" temporary access trackways.

Introduction

Two documents often referenced in relation to tree root protection are BS 5837:2012 and Arboricultural Practice Note APN12. Although the latter document dates back to 2007 and has now been withdrawn, much of its content as to the nature of tree roots and the need for their protection is nevertheless still relevant.

APN12 states that: *"The majority or tree roots grow in the upper metre of soil and they may spread outwards in any direction a distance equal to the tree's height. Any disturbance of the ground within the root spread of a tree can damage its roots and may severely injure the tree."*

"Traditional driveway construction (excavation and backfilling with a compactable load-bearing sub-base material) can seriously damage tree roots. Such damage occurs because a lack of understanding that roots mainly grow outwards from a tree's trunk, near to the soil surface, rather than downwards (Dobson 1995). Where there is significant risk of damage to trees by root severance, or changes in soil conditions during construction, local planning authorities may sometimes refuse permission for installation of an access..."

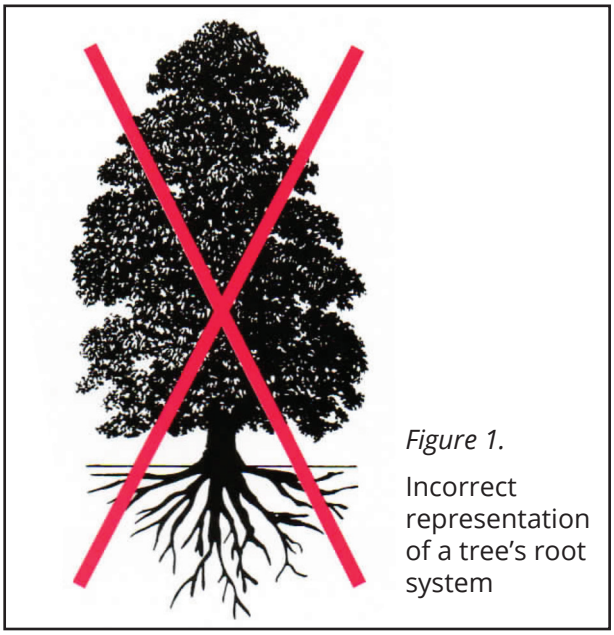


Figure 1.

Incorrect representation of a tree's root system

"Any sudden alteration of the soil conditions within the tree's rooting area (a circle of radius equal to the tree's height (will therefore upset this balance. For example, the single passage of a machine will "squeeze" the soil closing up the pores (causing compaction – especially in the upper levels) and so reduce the amount of oxygen available to roots which prevents them from growing through the soil. With each additional machinery movement the compaction increases and so do the problems for the tree and its roots."

"British Standard BS5837:2005 ***Trees in Relation to Construction – Recommendations*** *recommends*

that on construction sites an area around a tree should be left undisturbed (the Root Protection Area) so that unacceptable damage to the root system is avoided. In the British Standard the Root Protection Area is calculated as the equivalent of a circle about 12x the diameter of the tree's trunk (measured at 1.5m above ground level). The distance from the trunk extending to the branch spread, or half the tree's height, whichever is the greater (Figure 3) is a useful indicator of the typical Root Protection Area for a given tree."

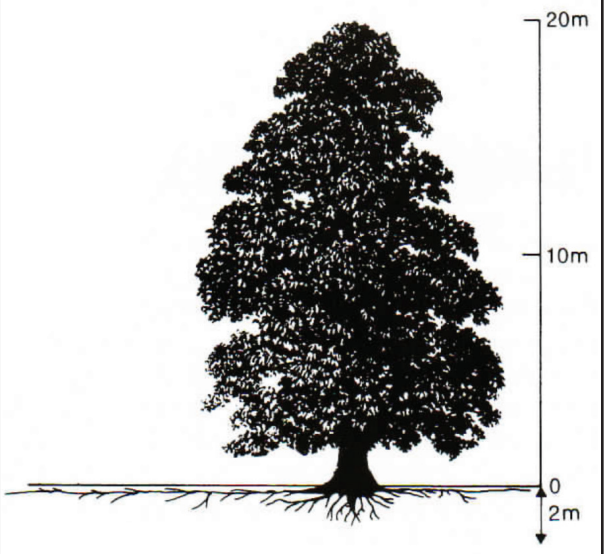


Figure 2.

Trees have a relatively shallow but wide spreading root system

"Passages of vehicles across an unprotected soil surface must also be avoided, particularly where the soil is wet, as this will cause breakage of surface roots, soil compaction and consequently reduced soil aeration. These problems are heightened on clay soils."

Tree root protection for different degrees of traffic

The purpose of this White Paper is to offer up-to-date guidance on the use of *"proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer"* as a means of complying with tree root protection requirements.

BS5837:2012 states that:

6.2.3.2 *"New temporary ground protection should be installed as part of the implementation of physical tree protection measures prior to work starting on site"*

6.2.3.3 "New temporary ground protection should be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil"

6.2.3.5 "*In all cases, the objective should be to avoid compaction of the soil, which can arise from the single passage of a heavy vehicle, especially in wet conditions, so that tree root functions remain unimpaired*"

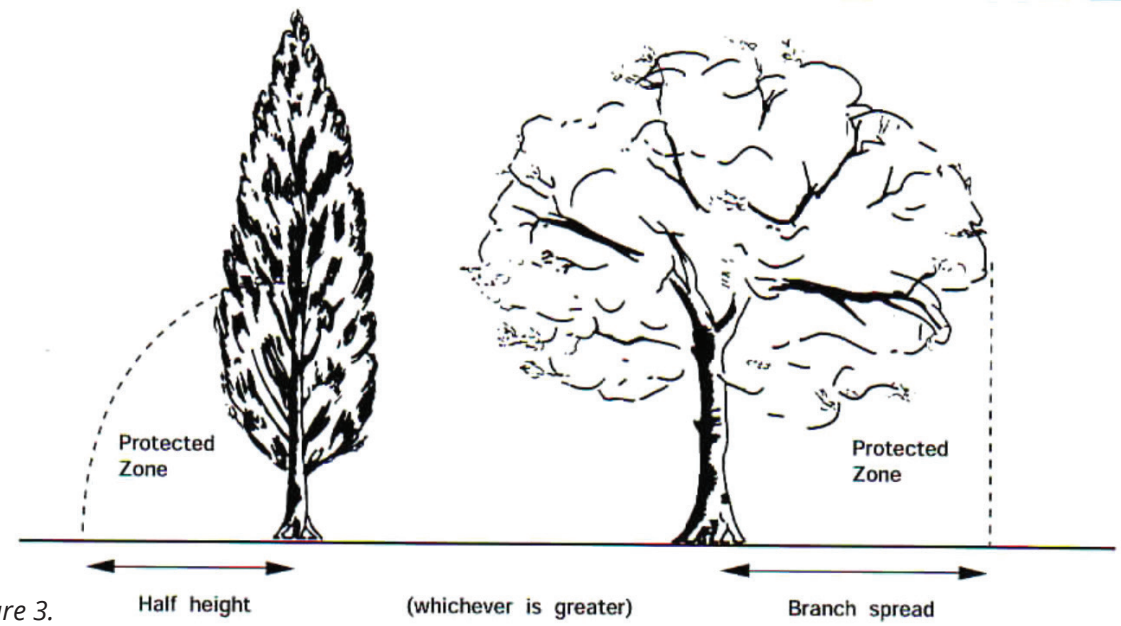
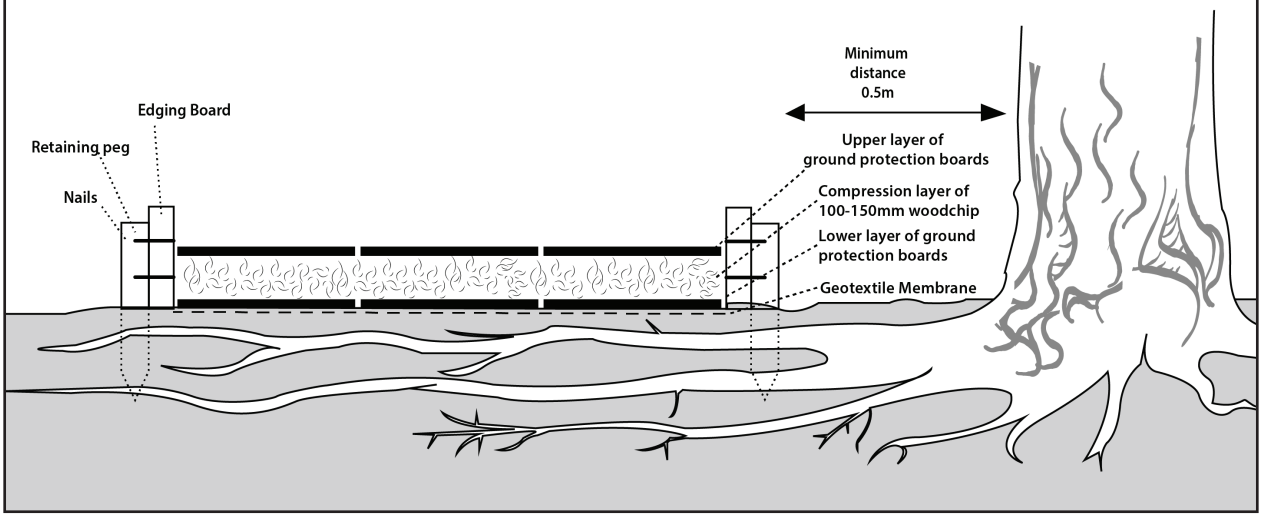


Figure 3.

Distance from a tree which constitutes the zone in which roots should be protected, ie, no digging

Figure 4.

Diagram of a 'no-dig' method for constructing temporary access trackways near to trees in order to minimise damage to tree roots. (Not to scale)



Over the years, tree root protection measures have included various methods, from scaffold boards on top of a driven scaffold frame for pedestrian walkways, to precast reinforced concrete slabs for heavy plant. However, what has become almost universally accepted as the preferred option in recent years is the use of *"proprietary, inter-linked ground protection boards placed on top of a compression-resistant layer".* These boards are an environmentally preferable option, usually made from recycled HDPE (High Density Polyethylene), with a long reusable lifespan, and they are fully recyclable at the end of their life. Their light weight and compact dimensions makes them efficient to transport with the minimum of CO_2 generation, and they are readily available for hire locally throughout the UK.

Such ground protection boards are available in different sizes and specifications, and the following is an overview of the most common implementations. The following recommendations are based on short term temporary access scenarios. For longer term projects or ones with high traffic movements it is advisable to move up the scale to the next level of specification.

BS5837:2012 states the need for "*engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected".*

The following is therefore a general "rule of thumb" which should be tailored to individual site-specific conditions.

a) for pedestrian movements only, a single thickness of 13mm thick proprietary, inter-

Traffic	Gross weight	Ground Protection Boards	Layers of boards	Compression layer	Membrane
Pedestrians only		GroundGuards MultiTrack	1	100mm woodchip	Geotextile
Pedestrian plant	Up to 2 t	GroundGuards MultiTrack	1	150mm woodchip	Geotextile
Vehicular plant	2 - 10 t	GroundGuards MultiTrack	2	150mm woodchip	Geotextile
Vehicular plant	10 - 20t	GroundGuards MaxiTrack	2	150mm woodchip	Geotextile
Vehicular plant	Over 20 t	GroundGuards XtremeMats	1	150mm woodchip	Geotextile

Table 1.

linked HDPE ground protection boards, such as GroundGuards MultiTrack mats, placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

b) for pedestrian-operated plant up to a gross weight of 2 t, a single thickness of 13mm thick proprietary, inter-linked HDPE ground protection boards such as GroundGuards MultiTrack mats, placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

c) for vehicular plant from 2-10 t, a double thickness of 13mm thick proprietary, inter-linked HDPE ground protection boards such as the GroundGuards MultiTrack mats, with a compression-resistant layer (e.g. 150 mm depth of woodchip) sandwiched between the boards, laid onto a geotextile membrane;

d) for vehicular plant from 10 - 20 t, a double thickness of 23mm thick proprietary, inter-linked HDPE ground protection boards such as the GroundGuards MaxiTrack mats, with a compression-resistant layer (e.g. 150 mm depth of woodchip) sandwiched between the boards, laid onto a geotextile membrane;

e) for vehicular plant over 20 t, a single thickness of 100mm thick proprietary, inter-linked HDPE ground protection boards such as the GroundGuards XtremeMats, placed on top of a compression-resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane;

This is summarised in Table 1 above.

Typical Ground Protection Board Systems

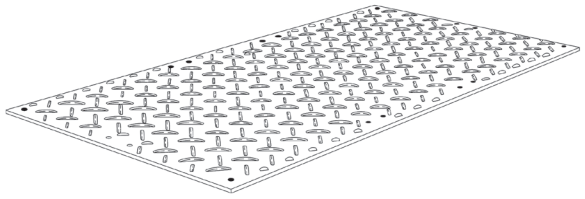


Figure 5.

2.4m x 1.2m x 13mm GroundGuards MultiTrack mat suitable for light and medium construction plant

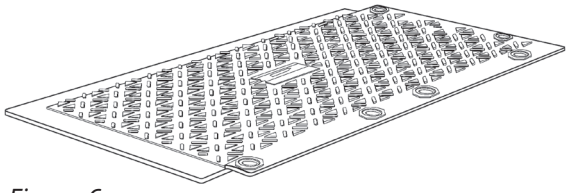


Figure 6.

1.8m x 0.9m x 23mm GroundGuards MaxiTrack mat with overlapping flanges, suitable for heavy construction plant

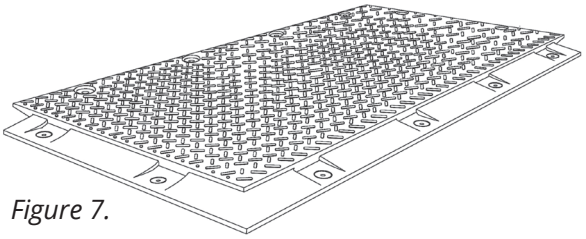


Figure 7.

4m x 2m x 100mm GroundGuards XtremeMat with overlapping flanges, suitable for very heavy construction plant

Further Reading

British Standards Institute (2012). BS5837 – *Trees in Relation to Construction - Recommendations*, BSI, London, UK

Patch, D. & Holding, B. (2007). APN12: *Through the trees to development*. Arboricultural Advisory and Information Service, Farnham, UK

Biddle, P.G. (1998). *Tree Roots and Foundations*. *Arboriculture Research and Information Note I42/98/ EXT*. Arboricultural Advisory and Information Service, Famham, UK.

Dobson, M.C. (1995). *Tree Root Systems*, Arboricultural *Research Information Note 130/ ARB/95.* Arboricultural Advisory and Information Service, Famham, UK.

Helliwell, D.R. & Fordham, S.J. (1992). *Tree Roots and Tree Growth*. Reading Agricultural Consultants, Didcot, UK.

Roberts, J., Jackson,N. & Smith,M. (2006) *Tree Roots in the Built Environment*. Arboricultural Association, Stonehouse, UK