REPORTS 4 PLANNING

A DIVISION OF BROWN FISHER ENVIRONMENTAL LLP

Brown Fisher Environmental
Barley House
Cedar Drive
Snitterfield
Stratford-upon-Avon
CV37 0LJ

tel: 0845 680 1723
e: enquiries@reports4planning.co.uk

Client: Snitterfield Cricket Club, Richard Yendell

Pre-development Tree Survey BS5837:2012

Snitterfield Playing Fields

Wolverton Road

Report Author:

Dr. Stefan Bodnar BSc (Hons) PhD MCIEEM

Contents

1. Introduction and site description 3
2. Arboricultural Survey Method 6
2.1 Condition Status 6
2.2 Root Protection Area 8
3. Results 8
4. Discussion 10
4.1 Tree protection 10
4.2 Tree protection & ground protection 13
4.3 Landscape considerations 21
4.4 Mitigation and compensation 21

Appendix 1: Tree Location Map
Appendix 2: Tree Images
Appendix 3: Cellweb Technical Information

1.0. Introduction and Site Description

Dr. Stefan Bodnar undertook an arboricultural survey (BS5837: 2012) on trees within a site, known Snitterfield Playing Fields, Wolverton Road, Warwickshire, CV37 OHB.

The trees included within the survey and their relationship to the Development Footprint are identified on the drawing in Appendix 2, the aerial photograph relating to the site and photographs of trees involved are included in Appendix 1, together with examples of the trees concerned.

BS 5837:2012 includes an assessment of all trees within the development footprint in addition to those near to the site boundary. The site assessed is indicated in the location plan of trees (Appendix 1). See site plan below in Figure 1.

It is understood that none of the trees are protected via Tree Preservation Orders, though it is recommended that the client fully satisfy themselves that this is the case during contact with the Local Planning Authority.

The site comprises the corner of playing field, with amenity grass, hardstanding parking and access, two buildings, native hedges and mature, in hedge, landscape trees.

Figure 1. Satellite image and topographical of site:

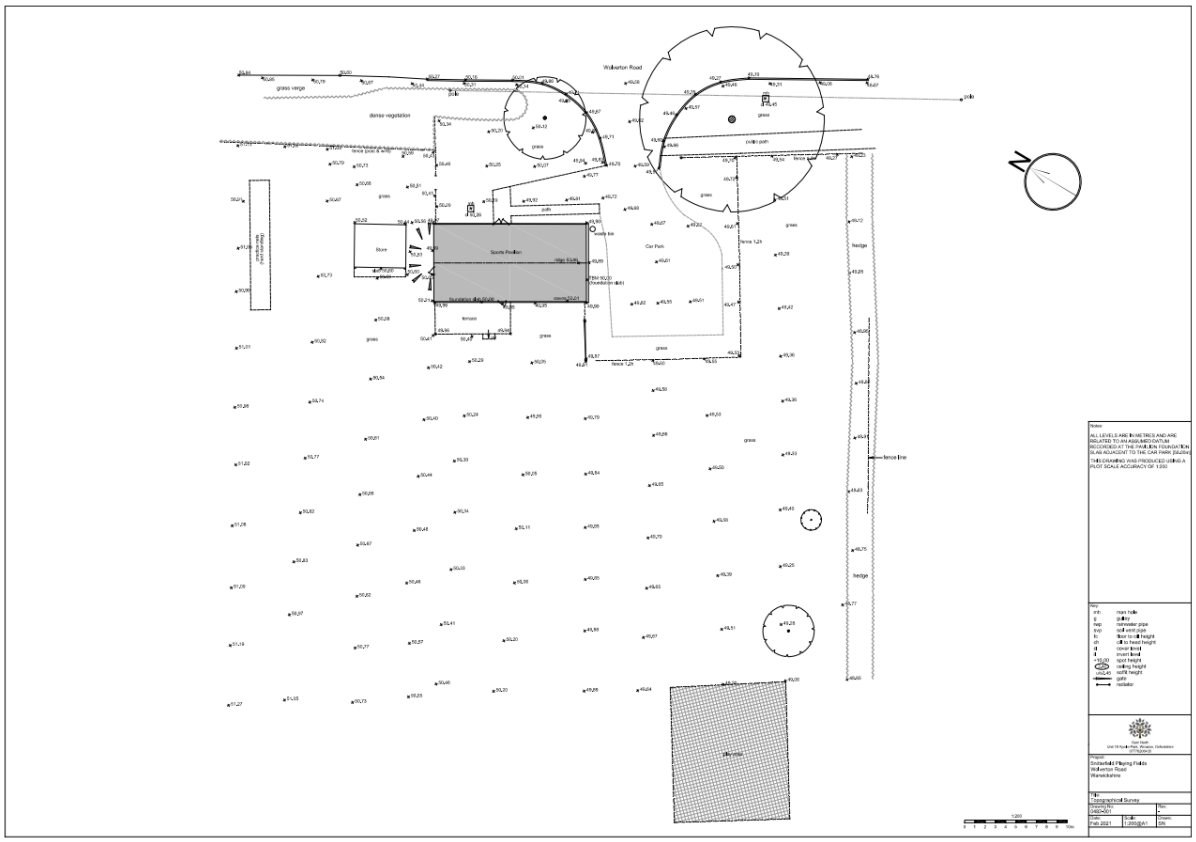
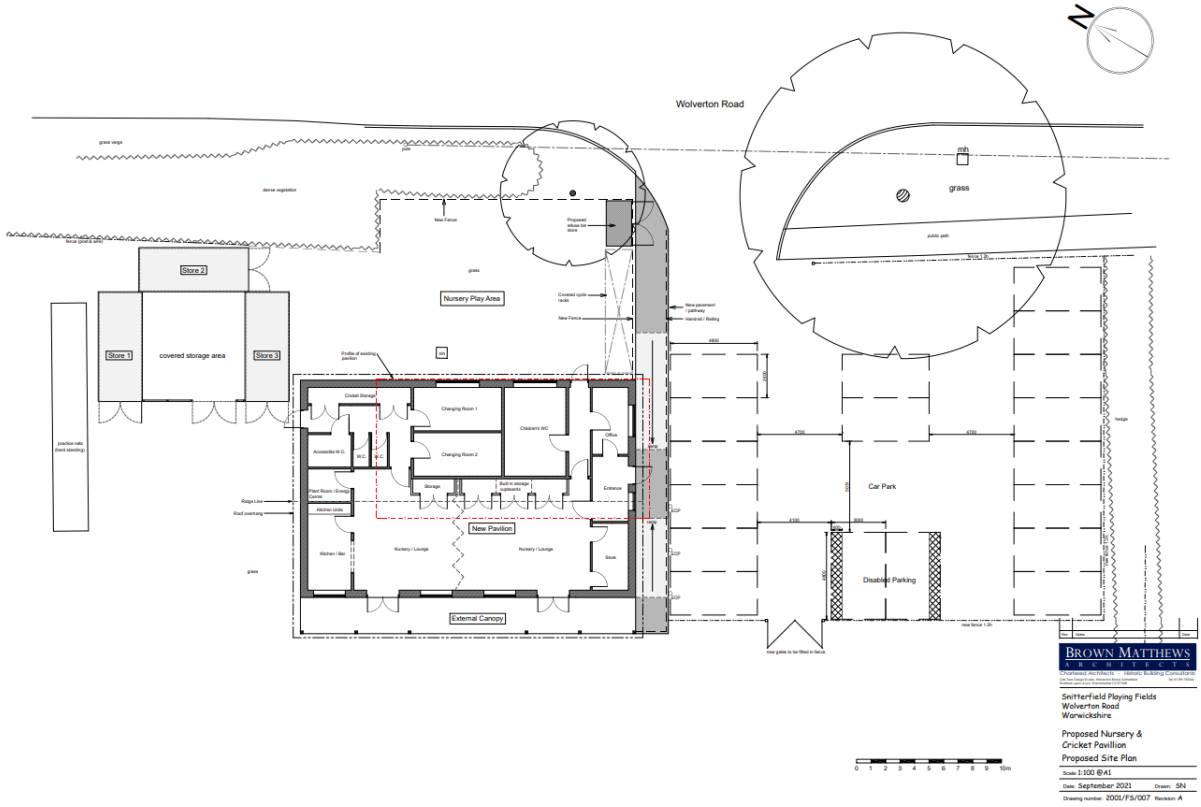


Figure 1b) Proposal for the site



2.0. Arboricultural Survey Methodology

2.1 Condition Status

To determine the status of the trees within the site a full arboricultural survey has been undertaken, assessing species and status of all trees present within the footprint of development. The survey has been carried out in accordance with BS 5837 (2012).

The surveyor has extensive experience of arboriculture, through undertaking BS5837 surveys on many sites between 2005 and 2022. Previous to this, he has undertaken Lantra approved courses for arborists, and is competent to the level of a tree officer operating within a Local Authority, being familiar and having used the systems undertaken by tree officers for undertaking safety and condition surveys for Birmingham City Council. Dr. Bodnar possesses numerous ecological qualifications including a full member of CIEEM and a PhD (Community Forestry, 1998). Recent Certificated BS5837 training (May 2015) from Tree Life Arboricultural Consultancy Ltd.

Individual trees above 75mm (diameter at 1.5m above ground level) have had their position confirmed on the survey drawing. The trees were visually assessed and a schedule prepared listing tree number, species, trunk diameter at 1.m above ground level, tree height, crown spread (radius), age, class and estimated remaining years. Any specific observation or recommendations with regard to management were also noted.

A plan drawing indicating the location of each tree assessed is included in Appendix 2.

The condition of each tree was assessed according to the following categories:

Category A

Those trees of high quality and value. Significant trees that are structurally sound and can be retained in the long term (i.e., >40 years) or trees that can be retained in the long term following remedial tree surgery. Colour code on the plan: pale green.

Category B

Those trees of moderate quality and value. Trees that may live 15-40 years. Trees that may live for more than 40 years, but whose removal may be required in that time frame to allow development of retained trees. Trees that are defective but could be retained in the medium term by remedial tree surgery. Colour code on the plan: mid blue.

Category C

Those trees of low quality and value. Trees that can only be retained in the short term (.e, 5-15 years) and that have little landscape impact due to poor form or condition. Trees having a stem diameter of <150mm at 1.5m above ground level that could be replaced. Colour code on the plan: grey.

Category U

Unsuitable for retention. Trees that are dead, dying or diseased that will become dangerous in the near future (within years). Colour code on the plan: red.

Categories A, B and C have further sub-categories with regard to the reasons for tree retention:

1: Mainly arboricultural values

2: Mainly landscape values

3: Mainly cultural values, including conservation.

2.2 Root Protection Area (RPA)

In order to avoid damage to the roots or rooting environment of retained trees, the RPA has been calculated for each of the category A, B and C trees. This is a minimum area of m^2, which should be left undisturbed around each retained tree.

These figures are calculated using the formula below taken from BS 5837 (2012):

Single stem tree

$$\text{RPA } m^2 = \frac{\{ \text{Stem diameter (mm) @ 1.5 x 12} \}^2}{1000} \times 3.142$$

Trees with more than one stem below 1.5m above ground level

$$\text{RPA } m^2 = \frac{\{ \text{Basal diameter (mm) @ 10} \}^2}{100} \times 3.142$$

During construction works the root protection areas – 'Construction Exclusion Zones' are to be protected by barriers and ground protection in accordance with Section 9.0 of BS 5837:2012 and as specified and indicated on an approved Tree Protection Plan.

Where construction operations (demolition / hard surfacing) are proposed/ permitted within the Root Protection Area precautions should be taken to maintain the condition and health of the root system in accordance with BS5837:2012.

Construction of hard surfacing within the root protection area should be designed to avoid root loss during excavation. The structure of the hard surface should be designed to avoid localized compaction, including the use of three dimensional cellular confinement systems as an integral component of the sub-base.

The hard surfacing in these areas should be a permeable and gas-porous nature such as washed gravel or paving slabs and block pavers (with infiltration spaces). Edge supports such as kerb and edgings on foundations and haunchings are not to be used within the RPA. Consideration should be given to the use of pegged timber edging or propriety or steelpaver or edge restraints.

3.0 Results

There are 2 trees on site, and two hedgerows. T1 is an A2, A3 category mature English oak with high bat potential. T2 is a mature crab apple, category B3 and C2. H1 the native blackthorn and hawthorn hedge is B2, B3 and H2 a section of Elm hedge is considered U and should be removed and replanted with diverse native hedging.

In general, A and B category trees or hedges should be retained and carefully protected during any development work with appropriate root protection fencing. As many C category trees as possible should be protected and retained, although suitable replacement planting within the scheme area could adequately mitigate for losses of category C trees.

A map detailing the location of trees and their BS5837:2012 determined category can be seen in Appendix 1, all other trees on site are noted as being below 150mm stem diameter and therefore, outside the requirements of BS5837:2012. Trees below 150mm stem diameter but above 75 mm stem diameter are included in the topographical survey of the site.

Scientific names for species identified:

Trees & Shrubs

Common Name	***Scientific Name***
Blackthorn	*Prunus spinosa*
Crab apple	*Malus sylvestris*
Elm	*Ulmus minor*
English Oak	*Quercus robur*
Hawthorn	*Crataegus monogyna*

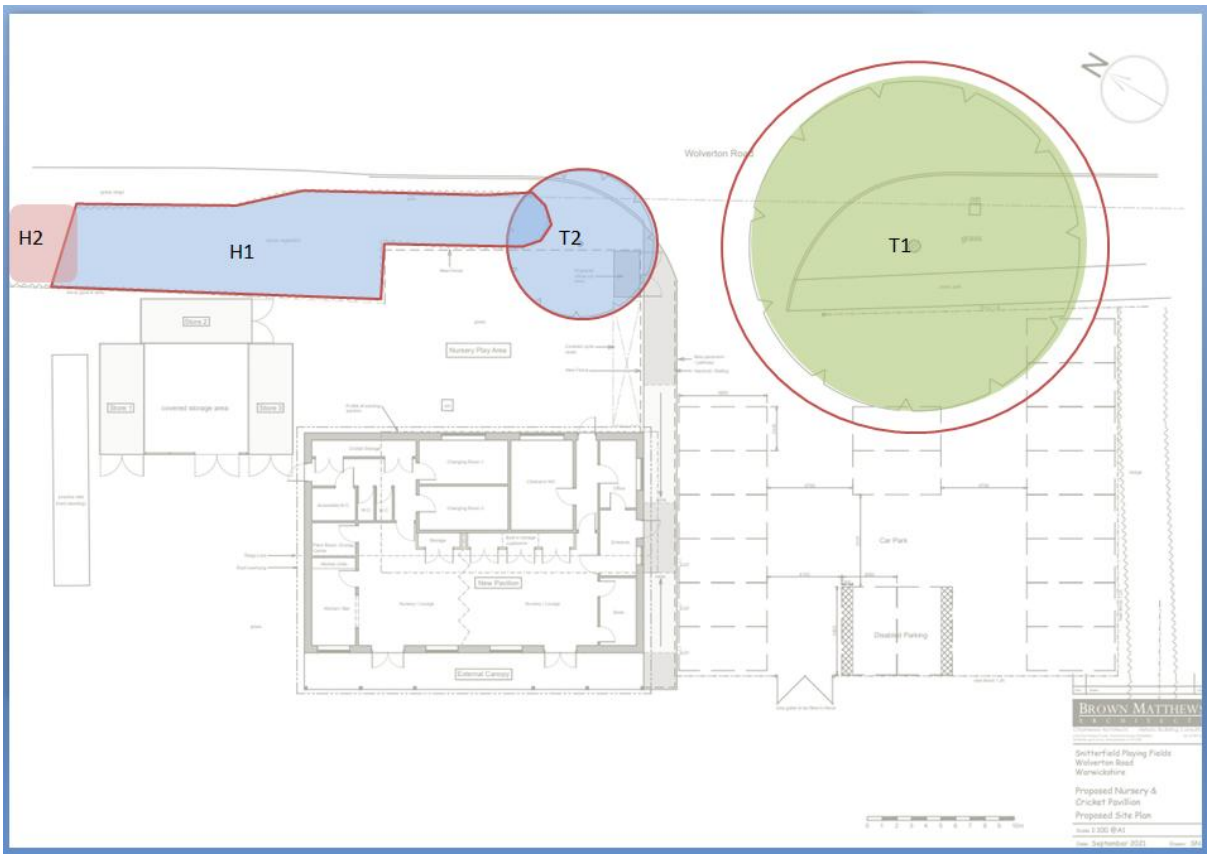
Tree no.	Species	Stem diam (mm)	Crown S (m)	Crown W (m)	Crown E (m)	Crown N (m)	Height (m)	Age Class	Estimated remaining contribution (years)	Physiological and Structural Condition	Category	Radius of nominal circle	Root Protection area (m^2)
T1	English oak	1000	10	10	10	10	15	Mature	40+	Stem cavities, high bat roost potential	A2 A3	12.00	452
T2	Crab apple	300	3	3	3	3	7	Mature	15-40	Twin from near base, partially ivied.	B3 C2	3.60	41
H1	Hawthorn & Blackthorn	To 200	-	-	-	-	4.5	Hedge	15-40	2m width		2.40	18
H2	Elm	To 250	-	-	-	-	-	Hedge	<5	Dead	U	3.00	28

4.0 Discussion

4.1 Tree Protection:

Implications of design on trees:

The plan indicates the following:



4.1.1 Tree Removal and Retention:

Arboricultural Impact Assessment:

The proposed plans for the site indicate the retention of all the significant trees on site, though the new parking area intrudes into the RPZ of tree T1 (an A category tree) and the proposed bin store intrudes into the RPZ of tree T2 (a B category tree). Although, there is some existing hard-standing within the RPZ of T1, which would require careful removal, the BS5837:2012 Best Practice Guidance on this is included below. The creation of the proposed car park area should

utilize 'No Dig' techniques and ensure it is permeable. Similarly, the creation of a hardstanding area for the proposed bicycle parking and bin store, should utilize 'No Dig' techniques and ensure it is permeable, the BS5837:2012 Best Practice Guidance on this is included below.

Care will need to be taken to protect the root zones of these trees during the works

Due to retention and protection of all significant trees, the arboricultural impact of this project is potentially low.

A detailed method statement is recommended to avoid damage to the RPAs of the trees with RPAs within the area impacted.

In general, developments should aim to primarily retain and protect trees in the 'A' and 'B' Categories and as many of Group 'C' as can be retained. Although suitable replacement planting, at minimum of a 1:1 ratio with native nectar rich and berry baring native trees, within the scheme area could adequately mitigate for losses of category C trees. To ensure equilibrium between retained trees, any new trees and the new development, the physiological requirements of trees must be carefully considered within the planting layout.

4.1.2 Avoiding Accidental Damage to Trees: Trees may be negatively affected by the construction period by both direct and indirect actions, which are often borne out of ignorance as to the tress physiological requirements. Careful site planning and management along with the implementation of robust physical protection measures is necessary to ensure the retention of important trees.

4.1.3 Soil and Root Protection: It is essential to safeguard a pre-determined volume of soil around the base of the retained trees to ensure that then ongoing biological functioning of the root system along with the interaction with the soil is not impaired. This requires, that prior to the commencement of development activity on site that a robust protective barrier is erected.

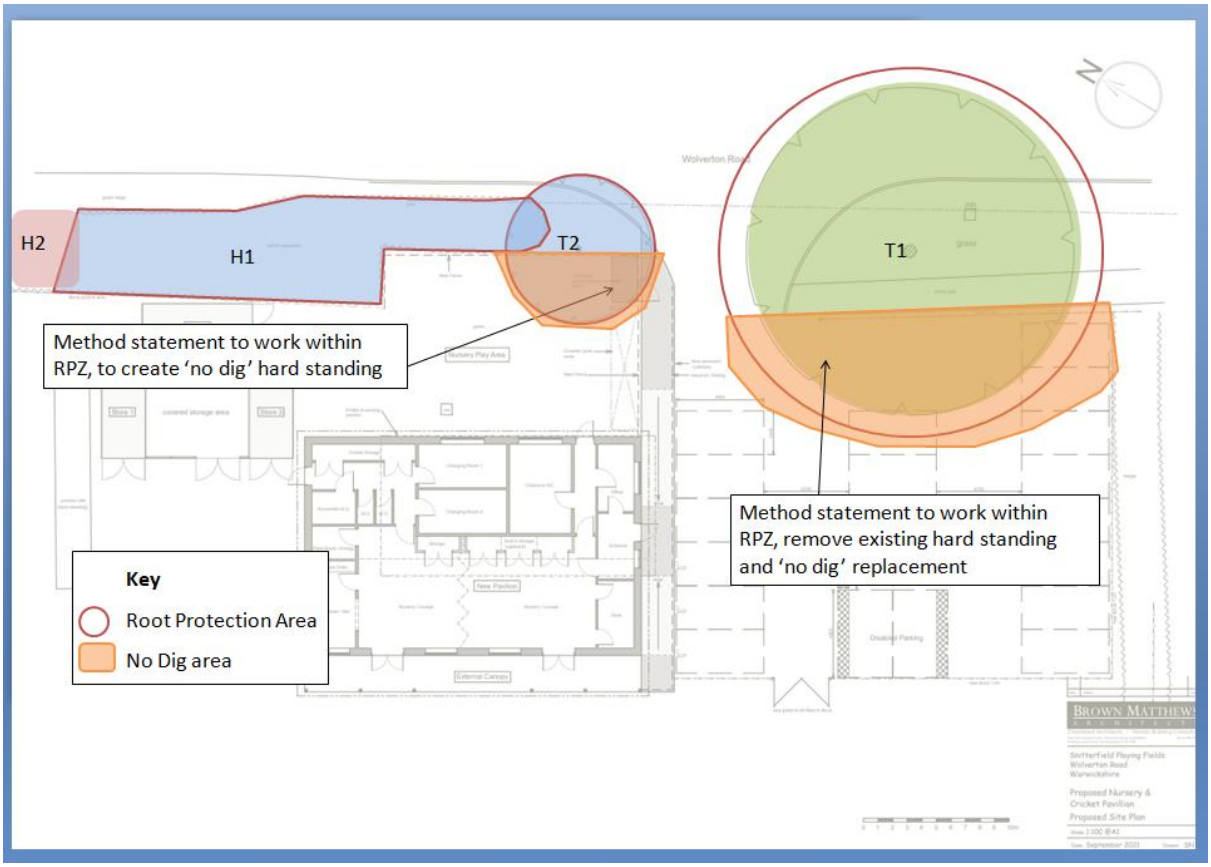
4.1.4 Suitable Barriers: The specifications for this barrier should be as per the British Standard 5837 of 2012 (Trees in Relation to Construction – recommendations). In brief, this consists of 2.3m high panels attached to an adequately braced scaffold structure to deter un-authorized dismantling and robust enough to rebut physical impacts from site plant and machinery. In practice Heras weld-mesh type panels perform well when attached to the above mentioned scaffold structure.

4.1.5 Bird breeding season: All site clearance should ideally take place outside of the bird breeding season. Bird breeding season is between mid March and mid July, although certain species can breed outside these months and if breeding birds are found then work should cease and the advice of an ecologist sought. If clearance is undertaken within the bird breeding season then all site features should preferably be checked immediately prior to clearance by a suitably qualified ecologist.

4.1.6 Shading: The trees are located mainly on the edges of the site, and therefore shading issues are unlikely.

4.2 Tree Protection & Ground Protection

Tree Protection Plan:



Parking areas:

It is recommended that the following method statement is followed to prevent damage to the RPAs of the tree impacted (T1).

Removal Of Existing Hard Surfacing

Prior to the removal of the remainder of existing hard surfacing appropriate tree protection fencing and ground protection is to be installed to protect the existing trees in accordance with BS 5837:2012.

Care is to be taken not to disturb tree roots that might be present beneath the existing surfacing. Handheld tools or appropriate pedestrian operated machinery is to be used (under arboricultural supervision) to remove the existing surface, working backwards over the area, so that the machine is not moving over the exposed ground.

Any exposed tree roots are to be treated in accordance with section 7.2 of BS5837:2012 and as detailed above.

Any sections of the existing hard surface construction that are within the RPA's of any tree to be retained and fall within the proposed parking / access roads areas are to be assessed for their

suitability of reuse, thus negating the need for deep excavations. Such areas of existing hard surfacing that are suitable for reuse are to be reduced and additional base and wearing courses installed as necessary.

No Dig Technique

The development plan above illustrates the proposed hard standing intruding into the root zones of these trees. Therefore it is recommended that the hardstanding access road area is constructed using a No Dig technique, to avoid direct damage to the root systems of these trees. In addition ensuing the new surface is porous with no additional of limestone aggregate, harmful chemicals or salts, to prevent harm to the tree and enable the tree to continue to feed beneath the new surface.

Arboricultural Practice Note 12: Driveways Close to Trees (APN12) gives guidance on above ground, no dig construction techniques in and around trees and advocates the use of geocellular blanket systems. Products such as the TERRAM or Abweb TRP Geocell for tree root protection offers a practical alternative to traditional methods of construction of paths, roads and parking areas in and around trees. These are used to protect the root structure of the tree from damage caused from the compaction of the local soils as a result of vehicular traffic. Traditional methods of construction tend be invasive and can affect tree health by damaging the root structure. Geo-cell systems are no dig solution preventing damage to the tree root structure during the installation process. These systems are quick and easy to install, reduces construction time and in many instances greatly reduces the depth of imported stone required saving time and money and reducing the environmental impact of the project. The geocelluar containment system which confines the fill material within the cell improving shear strength and bearing capacity. This is laid over punched non-woven geotextile which acts as a separation layer preventing material loss whilst allowing the free flow of water and nutrients to the tree root system.

Intrusion into RPZ of Tree 1

Excavations within the RPA: Protocol for working within RPZs of retained trees:

Minimising impacts:

The following methods general principles were agreed to minimise impacts:

1. Use an air-spade to expose roots by removing soil for the area concerned

2. Up to 25mm roots can be severed.
3. Roots above 25mm diameter will be re-aligned. This will require some minimal soil removal to accommodate these (again by air spade) outside the area to be removed.
4. There is to be no major root pruning within 3m of the main stem.
5. As the root configuration in this area cannot be accurately predicted, all work is to be undertaken under direct arboricultural supervision.

Further details BS3998:2010

This will be carried out in accordance with BS3998:2010. BS3998:2010 is a document, revised in 2010, which lays out the way in which all tree work should be carried out. The tree surgeons employed to undertake the arboricultural work will be trained and aware of these procedures.

Root pruning

Root pruning shall be done with a sharp tool, in such a way that does not pull on the roots, but leaves smooth cuts. It is preferable to expose the roots prior to root pruning. After pruning, fill the area with quality topsoil and water until thoroughly soaked. Once exposed, roots must be covered within 8 hours. If roots will be left exposed for longer than 8 hours, they must be kept moist. The project arborist must be onsite during the entirety of root pruning.

Details:

1) Root pruning is when tree roots are cleanly severed from the tree in order to prevent damage which would be caused by excavation
2) The soil around the roots is removed by hand or utilizing an air knife so the roots can be seen before pruning. This is called making a "root pruning trench"
3) Once exposed, the roots are cleanly cut, then top soil is put into the root pruning trench to encourage root regrowth in that area
4) The most important stability roots are found at 3x the diameter of the tree. This is called a tree's "structural root plate"
5) The location of the root pruning trench will be marked on the ground
6) The pruning trench should be cleared in a way that exposes the roots while leaving them intact. i) Use hand tools or an air spadeii)
7) If a root larger than 25mm is exposed, leave this root intact and contact Landscape Services
8) Once the roots are exposed, use a SHARP tool (Root Pruning Saw) to cleanly cut all roots which are up to 25mm diameter to the depth of the proposed disturbance

9) Post Pruning: Tree roots must be kept moist. If roots ends will be left exposed for more than 8 hours, cover the hole with moist burlap. Fill the hole with high quality top soil, mulch the area with triple shredded hardwood to a depth of 3", and water well.

Use of Air Spade

The Air-Spade is a rugged and durable hand-held tool that produces a stream of supersonic air moving at Mach 2. The Air-Spade effectively penetrates and dislodges most types of soil, but is harmless to non-porous objects such as plant roots, buried pipes, or cables. A variety are shown below:

The Air Spade is particularly useful for root investigation and excavations or when working in areas containing services or tree roots, which could be damaged by conventional digging. Using compressed air can expose roots and services without damage, so that they can be located, inspected and bypassed. When root pruning is required, using compressed air allows for pruning without damage to retained roots.

Images of air spade in use below:

Tree Surgeons Qualifications

The tree surgery works detailed below are to be undertaken by a qualified Arboricultural Contractor who must be listed in the Arboricultural Association's Approved Contractors Directory (ref: www.trees.org.uk).

 The Contractor shall hold NPTC (National Proficiency Training Council) Certification.

 The Contractor shall have Chapter 8 Traffic Management Certification.

 The Contractor shall demonstrate at the time of tendering an understanding of Health & Safety Site Specific Risk Assessments & Method Statements for Tree Work. This assessment shall be completed prior to appointment to undertake the works.

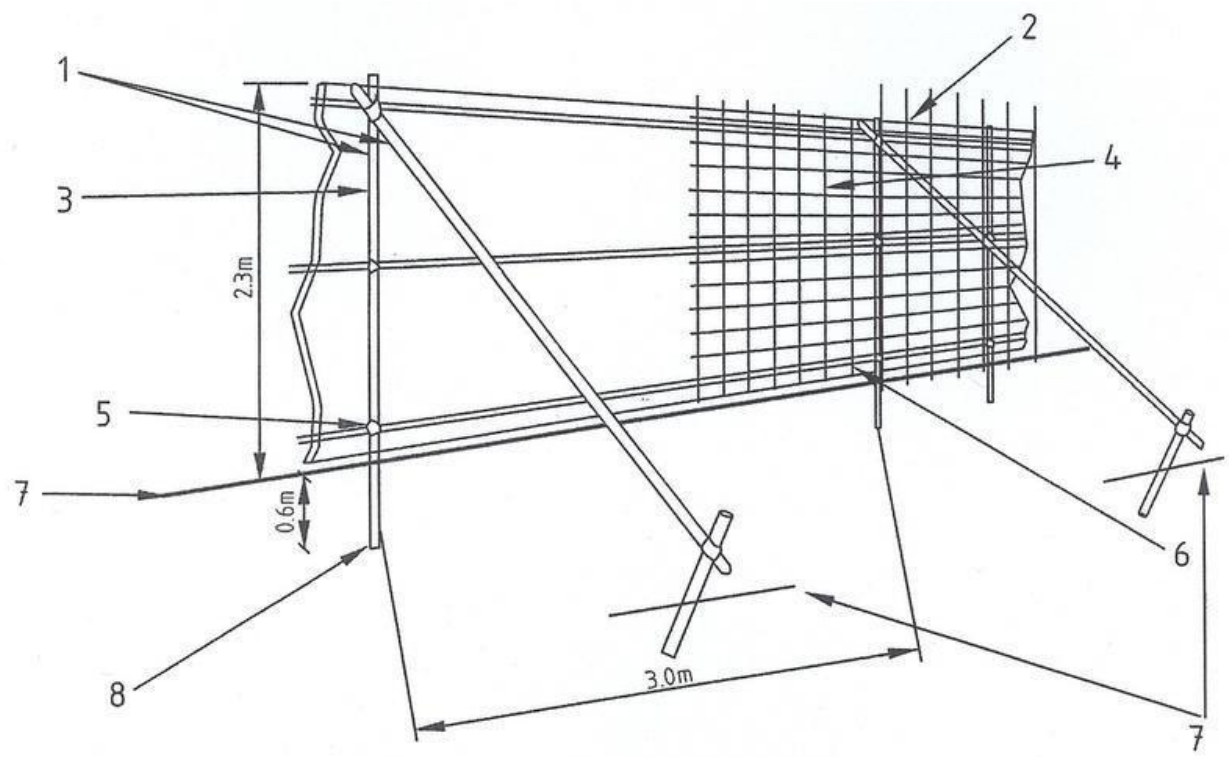
Tree surgery works are to be undertaken in one phase unless otherwise instructed by the client

4.2.1 All trees that are being retained on site are to be protected by barriers and/or ground protection before any materials or machinery are brought onto the site, and before any demolition, development or stripping of soil commences. Where all activity can be excluded from the RPA, vertical barriers are to be erected to create a construction exclusion zone. The

default barrier specification is to be in accordance with BS 5837:2012 'Trees in Relation to Design, Demolition and Construction – Recommendations' as illustrated in Figure 3 below.

4.2.2 The protected area is to be regarded as sacrosanct, and, once installed, barriers and ground protection is not to be removed or altered without prior recommendation by the project arboriculturist and, where necessary, approval from the Local Planning Authority.

4.2.3 All weather tree protection posters (an example is detailed in Figure 4 below) are to be securely fixed to the tree protection fencing in plain view.



1 Standard scaffold poles
2 Uprights to be driven into the ground
3 Panels secured to uprights with wire ties and, where necessary, standard scaffold clamps
4 Weldmesh wired to the uprights and horizontals
5 Standard clamps
6 Wire twisted and secured on inside face of fencing to avoid easy dismantling
7 Ground level
8 Approx. 0.6m driven into the ground

Figure 3. Example of protective fencing required for all Root Protection Areas.

Figure 4. Example of an all weather tree protection poster.

4.2.4 Care is to be exercised when locating the vertical poles to avoid underground services and, in the case of the bracing poles, also to avoid contact with structural roots. If the presence of underground services precludes the use of driven poles, an alternative specification that provides an equal level of protection is to be prepared in conjunction with the project arboriculturist as illustrated within Figure 3 above.

4.2.5 Where the set-back of the tree protection barrier exposes unmade ground to construction damage, temporary ground protection is to be installed as part of the implementation of physical tree protection measures prior to work starting on site.

4.2.6 Temporary ground protection is to be capable of supporting any traffic entering or using the site without being distorted or causing compaction of underlying soil. Detail is shown in Figure 5 below: Scaffolding and root protection within the RPA.

3. for pedestrian movements only, a single thickness of scaffold boards placed either on top of a driven scaffold frame, so as to form a suspended walkway, or on top of a compression-resistant layer (e.g. 100 mm depth of woodchip), laid onto a geotextile membrane.

b) for pedestrian-operated plant up to a gross weight of 2t, proprietary, inter-linked ground protection boards placed on top of a compression resistant layer (e.g. 150 mm depth of woodchip), laid onto a geotextile membrane.

c) for wheeled or tracked construction traffic exceeding 2t gross weight, an alternative system (e.g. proprietary systems or pre-cast reinforced concrete slabs) to an engineering specification designed in conjunction with arboricultural advice, to accommodate the likely loading to which it will be subjected.

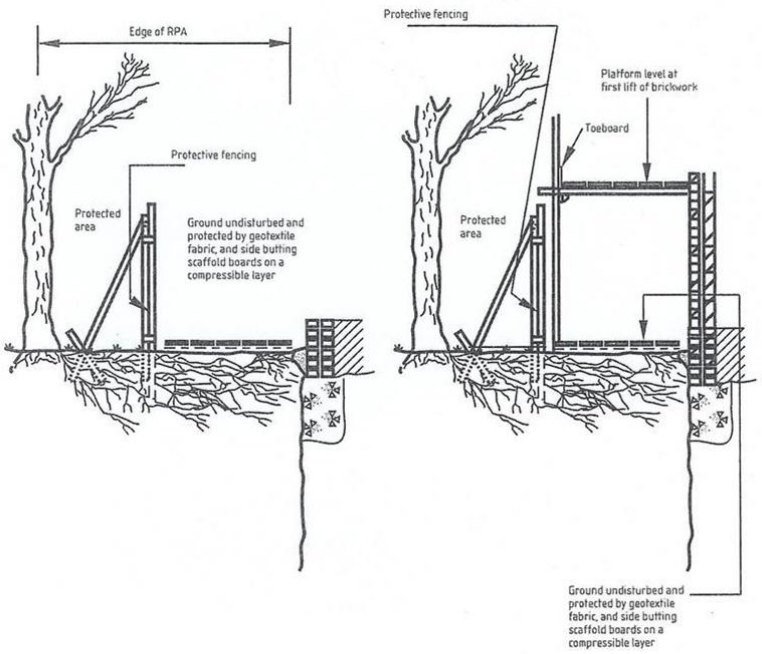


Figure 5. Scaffolding and root protection within the Root Protection Area.

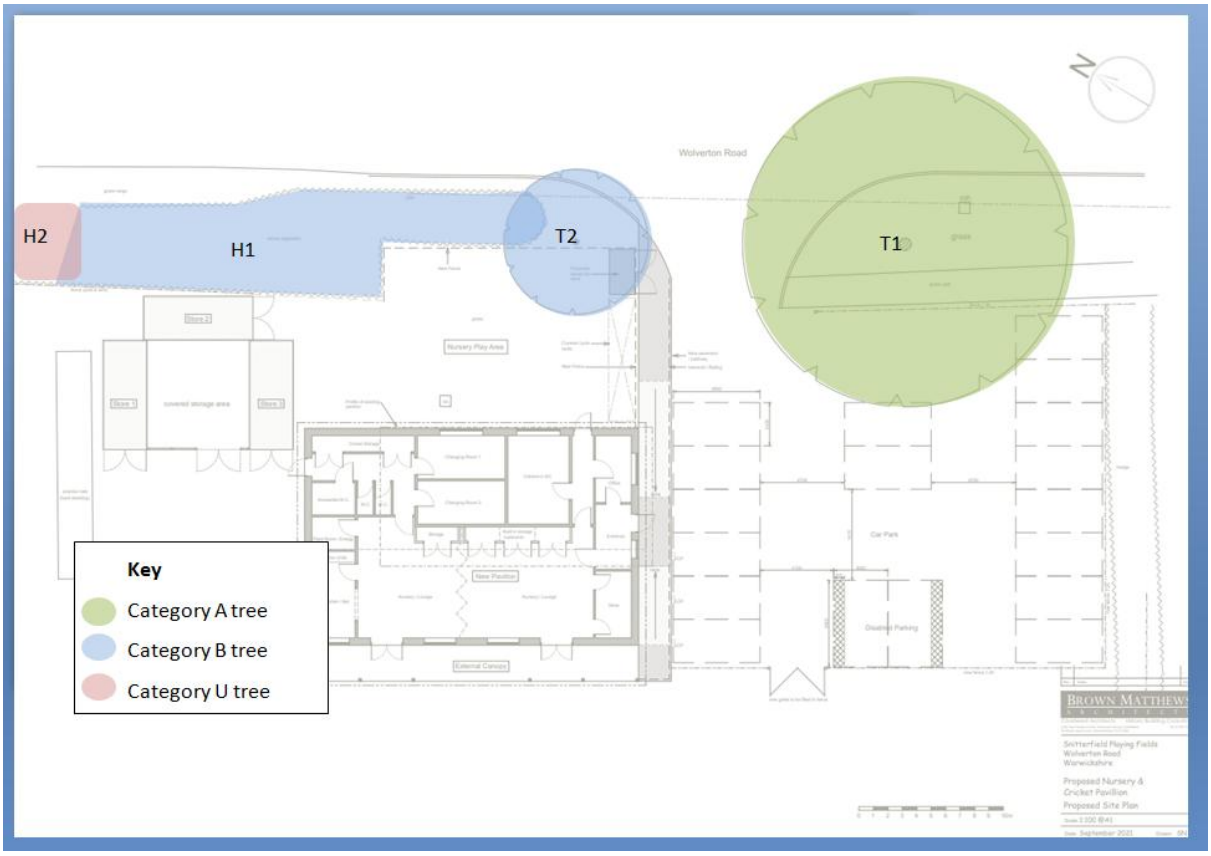
4.3 Landscape considerations:

Consideration should be given to maintaining tree-lined boundary features, landscape impacts, habitat connectivity and reinforcing site boundaries. Further consideration should be given to the appearance of frontages and screening. The appropriate landscape mitigation and compensation will need to be discussed at the pre- application stage with the appropriate Local Authority Planning Landscape Officer. It is recommended that compensation planting is undertaken and located to enable the landscape value of this area to be reinforced, if any trees with landscape value are to be removed from the site. The orchard designation indicates a level of biological value and retention of healthy trees on site and extensive replanting of orchard trees should accompany any proposed scheme.

4.4 Mitigation and Compensation:

In compensation for the loss of any of the existing trees, at least an equal number of native trees should be planted as part of the new development. The trees will be species that have wildlife benefits and are sympathetic both to the existing tree structure and suitable for their likely eventual size limitation, such as apple, cherry, damson, pear. All trees will be planted as 9-10cm Light or Heavy Standards. All appropriate British Standards will be applied in terms of planting specifications. The location of the replacement trees should be determined in a detailed landscape design plan including location and species.

Appendix 1: Tree Location Plan



Category A

Those trees of high quality and value. Significant trees that are structurally sound and can be retained in the long term (i.e. >40 years) or trees that can be retained in the long term following remedial tree surgery. Colour code on the plan- pale green.

Category B

Those trees of moderate quality and value. Trees that may live 15-40 years. Trees that may live for more than 40 years, but whose removal may be required in that time frame to allow development of retained trees. Trees that are defective but could be retained in the medium term by remedial tree surgery. Colour code on the plan- mid blue.

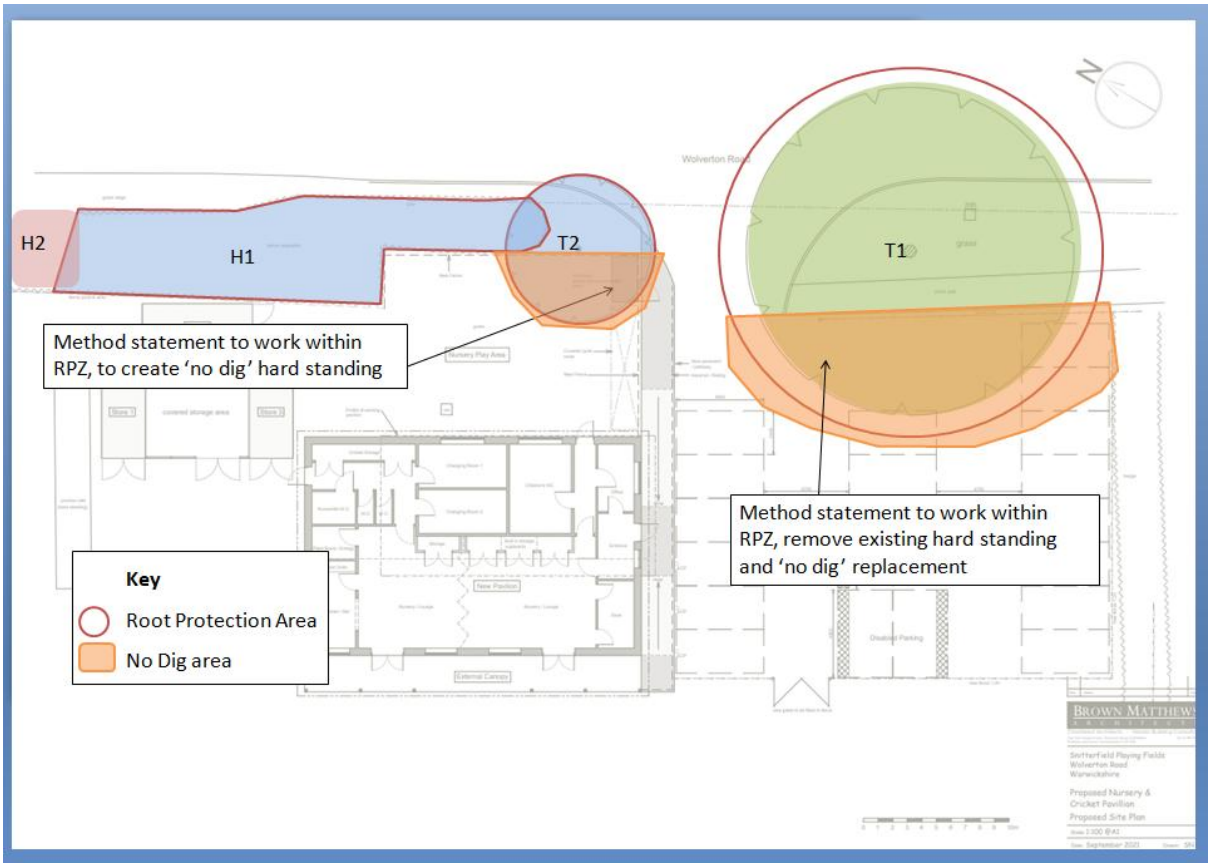
Category C

Those trees of low quality and value. Trees that can only be retained in the short term (.e, 5-15 years) and that have little landscape impact due to poor form or condition. Trees having a stem diameter of <150mm at 1.5m above ground level that could be replaced. Colour code on the plan- grey.

Category U

Trees that are dead, dying or diseased that will become dangerous in the near future (within years). Colour code on the plan- red.

Appendix 1a: Tree Protection Plan



Appendix 2: Images


43 Wolve

Appendix 3: Technical information for Cellweb RPR

Fact Sheet 1: Use of Cellweb TRP® in Root Protection Areas (RPA's)

Introduction

Cellweb TRP® is a cellular confinement system that confines aggregate materials and makes them stronger. This behaviour allows the depth of pavement construction to be reduced. It also minimises compaction of soils below road pavements constructed using the Cellweb TRP® tree root protection system. Cellweb TRP® is used around the world to provide cost effective road and railway construction, as well as Tree Root Protection.

Cellular confinement was developed by the US Army Corps of Engineers during the 1970s to allow construction of roads for military equipment quickly and easily using whatever local soil material was available (especially across beaches). Since then the method has been developed and it is now routinely used in road and rail construction as well as in tree root protection. There is an extensive research base that demonstrates the performance of cellular confinement and it is a method of pavement construction that is recognised by the US Federal Highways Administration.

Characteristics of Cellweb TRP®

Pokharel et al (2009) stated that about one fifth of pavement failures in the US occur due to either weak subgrades or inefficient load transfer from the sub-base. Cellweb TRP® can improve the strength of road pavement construction to deal with these problems. It is a three dimensional interconnected honeycomb of cells made from HDPE. The cells are filled with aggregate sub-base and laterally confine the material when it is loaded, thus increasing the bearing capacity of the layer. This results in a thinner layer of aggregate being required to achieve the same performance.

It also allows uncompacted open graded aggregate to be used in the sub-base construction which is a vital part of any tree root protection system.

Cellweb TRP® is available in a range of height and aspect ratios to suit different load applications.

Use of Cellweb TRP® in RPAs

The use of Cellweb TRP® tree root protection system for building roads, car parks and other vehicular pathways includes a sub-base infill material of clean angular stone which does not need to be compacted. This immediately provides a layer of material that will absorb compaction energy applied to the top of materials placed over it. Compaction of soils by construction machinery does not extend to a great depth. This is the reason why earthworks materials are normally placed in thin layers because compaction only occurs in the top few hundred mm at most. With the lightweight compaction plant used on most development sites the maximum depth that compaction will extend to is between 150mm and 200mm. Thus, if an 80mm layer of asphalt is placed over a 150mm deep Cellweb TRP® system the compaction reaching the base of the construction and the natural soil will be minimal. This effect was demonstrated by Lichter and Lindsey (1994) where a trial area was trafficked by a front-end loader and only suffered significant compaction of the soil to a depth of 100mm.

The use of Cellweb TRP® also spreads the wheel loads from traffic. There has been extensive research published on the performance of these systems from the original work by the US Army Corps of Engineers (Webster 1981) to more recent studies such as that by Emersleben and Meyer (2008).

The research shows that Cellweb TRP® acts as a stiff raft to distribute wheel loads and reduce their magnitude at the base of the construction by 30% to 36% (without any asphalt or other surfacing). Once the surface is taken into account, the pressure applied by traffic to soil below roads or pavements constructed using no-dig methods will be significantly reduced and thus compaction will also be reduced. Note, compaction is not prevented but it is reduced, thus maintaining the soil bulk density at levels that are suitable for tree root growth.

The effectiveness of the Cellweb TRP® no-dig construction in reducing soil compaction has been demonstrated in trials carried out by the Environmental Protection Group Limited. Two parking bays were constructed over a fine sand soil, one with a Cellweb TRP® cellular confinement sub-base. The parking bays were surfaced with asphalt and then used by cars for four weeks on a daily basis. It is well known that compaction of soils occurs in the first few passes of a vehicle, so the maximum adverse effects on compaction of soil below the pavement should have been achieved. In situ density tests were carried out

For The Installation of
Cellweb Tree Root Protection System.

When considering damage to tree roots, in applications of vehicular access and parking, the risk of oxygen depletion caused by compaction of subsoil's, site clearance damaging the root source and type of reinforcement are areas which need to be given due consideration.

Other risk factors are:

- Creating an impermeable surface
- Causing a rise in the water table due to construction
- Increasing ground level
- Contamination of subsoil's

2. Dig (site strip)

Site stripping does damage some root structure prior to construction; however, the use of no-dig construction elevates the access road requiring edge protection.

3. No dig

3.1. Remove surface vegetation	Use a suitable herbicide suitable for the specific vegetation and not harmful to the tree root system
3.2. Place geotextile separation filtration layer	Use a Treetex T300 non woven Goetextile over the prepared sub-grade. Overlap dry joints by 300mm. The three dimensional cell structure, is formed by ultrasonically welding polyethylene (perforated) strips / panels together to create a three dimensional network of interconnecting cells. A high degree of frictional interaction is developed between infill and the cell wall, increasing the stiffness of the system
3.4. Edge restraint	A treated timber edging is usually acceptable.

4. Cellular Confinement and Backfill Material.

Expand the Cellweb 2.56m wide panels to the full 8.1 metre length. Pin the Cellweb panels with staking pins to anchor open the cells and staple adjacent panels together to create a continuous mattress. Infill the Cellweb with a no fines angular granular fill (typically 4-20mm) within each open cell. The use of cellular confinement reduces the bearing pressure on the subsoil by stabilising aggregate surfaces against rutting under wheel loads. Comparisons between cellular confinement and traditional aggregate and geogrid-reinforced structures demonstrate a 50% reduction in construction thickness of the granular material.

5. Surfacing Options

Block Paving:
5.1. Lay second layer of Treetex T300 Geotextile separation fabric over the infilled Cellweb sections
5.2. Lay sharp sand bedding layer compacted with a vibro compaction plate to recommended depth.
5.3. Place block paviors as per manufacturers instructions.

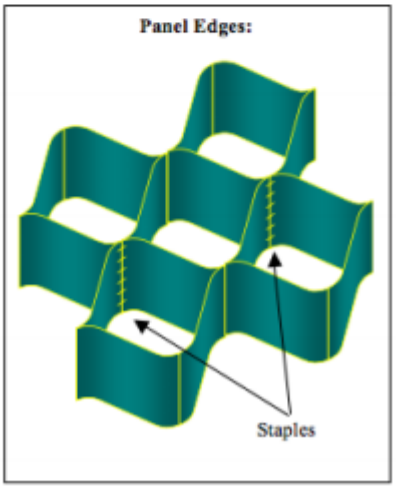
Tarmac:
Place 25mm surcharge of the granular material above the Cellweb system and lay the bitumen base and wearing courses.

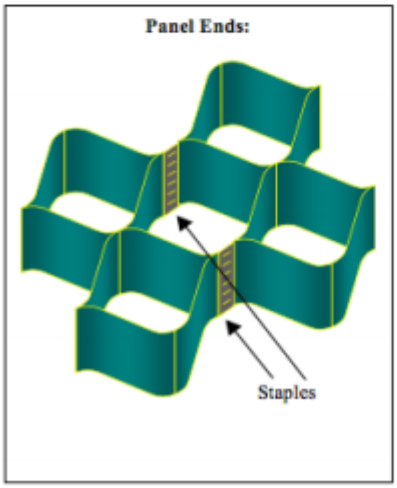
Loose Gravel:
5.4. Ensure Cellweb is completely filled.
5.5. Place decorative aggregate to required depth
NOTE: A treated timber edge should be provided to restrict gravel movement.

Grass Blocks:
5.6. Place second layer of Treetex T300 Geotextile separation fabric over the infilled Cellweb sections
5.7. Place 50/50 rootzone bedding layer to the required depth
5.8. Lay recycled Duo Block 500 Grass Protection System infilled with 50/50 rootzone mix.
5.9. Seed as per architects instructions.
(Alternatively the Grass Blocks may be infilled with gravel.)

Concrete Slab
6.0 Lay Cellweb as previous and place second layer of Treetex Geotextile directly over the filled panels. Pour concrete base as specified.

Below are illustrations of the correct stapling procedure for joining both edges and ends of panels together.





3

Geotextile Separator
Technical Data

DS/EN ISO 9001 QUALITY ASSURANCE

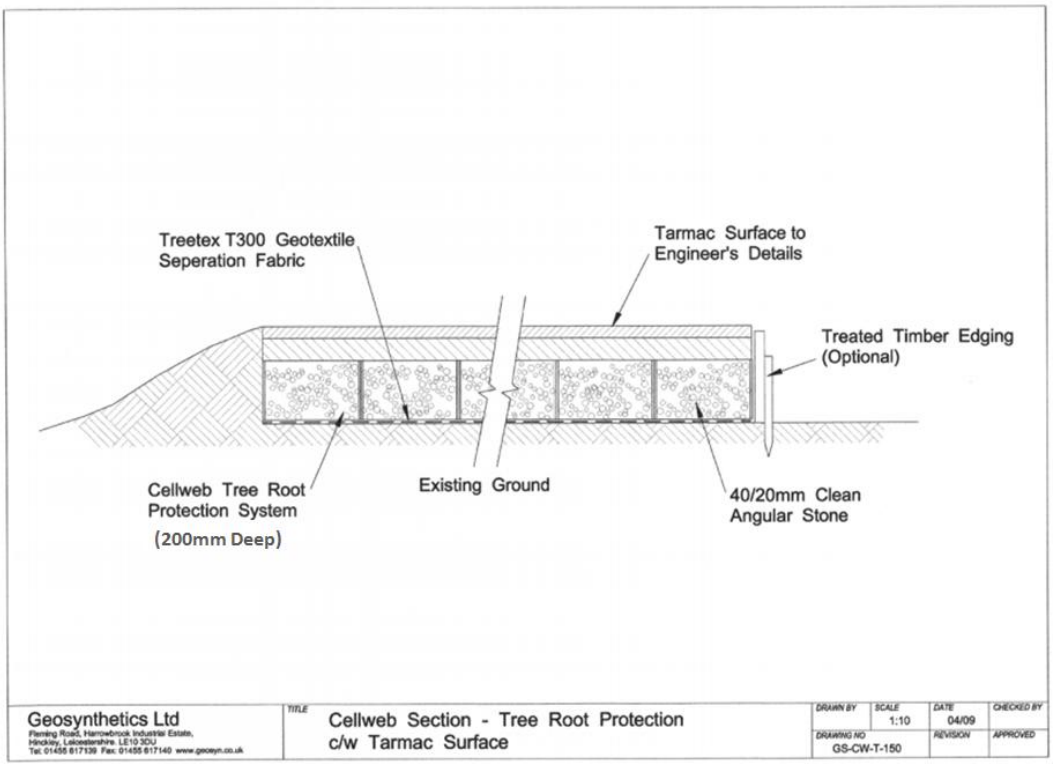
	NORM	UNIT	VALUE length/cross
Static puncture (CBR-test) X	EN ISO 12236	N	**3300**
Wide-width tensile test (Strip-test, 200 mm)	EN ISO 10319	kN/m	**23 / 23**
Elongation at break		%	**60**
Dynamic perforation (Cone drop test)	EN 918	mm	**18**
Water permeability	EN ISO 11058	m/sec	**100 x 10^{-3}**
Pore size $d_{90\%}$	prEN ISO 12956	micron	**901**
Thickness at 2,0 kPa	EN ISO 9863-1	mm	**2.2**
Weight	EN ISO 9864	g/m²	**315**
Fibre bonding	Needle punched only		
Raw material	Polypropylene (PP)		

The above technical values are mean values based on measurements in current production and test results from independent test institutes.

Geosynthetics Limited accept no responsibility for improper use or misinterpretation of the technical specifications published in connection with TREETEX GEOTEXTILES.

Wet or dry, the properties of Treetex Geotextiles remain unchanged, and are resistant to attacks of dry, rot or fungi. Treetex Geotextiles are resistant to acids and alkalis.

REV. 09/2010



Geosynthetics Ltd
Fleming Road, Harrowbrook Industrial Estate,
Hinckley, Leicestershire. LE10 3DU
Tel. 01455 617139 Fax. 01455 617140 www.geosyn.co.uk

TITLE: Cellweb Section - Tree Root Protection c/w Tarmac Surface

DRAWN BY	SCALE	DATE	CHECKED BY
	1:10	04/09	
DRAWING NO		REVISION	APPROVED
GS-CW-T-150			

Geosynthetics Limited Tel: 01455 617 139 Fax: 01455 617 140 Email: sales@geosyn.co.uk

Cellweb® TRP Weight Capabilities

This chart is provided as a guide line for generic average site conditions only. For a site specific calculation, please ask a member of Geosynthetics to provide a questionnaire. This information will provide our engineers the capability to produce a site specific technical recommendation and CAD detail.

- **75mm Cellweb confinement system**
  For foot and cycle traffic. This also provides a control measure for crust compaction
- **100mm Cellweb confinement system**
  For domestic traffic, such as cars and transit vans up applicable up to a 6t gross weight
- **150mm Cellweb confinement system**
  For emergency access and refuse collection applicable up to a 30t gross weight
- **200mm Cellweb confinement system**
  For H.G.V and construction traffic applicable up to a 60t gross weight

In some specific conditions 2 layers of Cellweb 100mm can be installed for the construction phase of traffic. On completion of the construction phase, the top 100mm can be removed. The bottom 100mm can remain insitu to provide a permanent access for cars and transit vans.
For higher demand weight applications, the Cellweb system can be layered to create a 300mm system.

Depth of Cellweb	Unit	Gross Vehicle Weight (GVW)	Application
200 mm	Kg	< 60,000	HGV & Unusual – Crane / piling rig
200 mm	Kg	< 50,000	Heavy Construction Traffic
150-200 mm	Kg	< 30,000	Standard Construction Traffic & Refuse vehicle
150 mm	Kg	< 16,000	Emergency Access & Tractors
100-150 mm	Kg	< 9,000	Delivery Vans
100-150 mm	Kg	< 6,000	Car Park: Cars & Light van
100 mm	Kg	< 3,000	Domestic Traffics: Cars
75 mm	Kg	< 1,000	Pedestrians (with cyclist) path

Note: This is a general guidance for the depth of Cellweb according to Gross Vehicle Weight for a firm and stable subgrade (CBR>3%). If the ground conditions are poor and/or unstable please Geosynthetics Ltd to provide a site specific design.

Cellweb®TRP

Why protect trees?

Trees provide a wealth of benefits within the urban environment including cleaning the air, prevention of flooding and moderation of the climate.

As a result within the UK it is an offence to cut down, lop, uproot, top, wilfully damage or destroy a protected tree without authorisation. Fines, if the defendant is found guilty in a Crown Court are unlimited.

To minimise the environmental impact and avoid legal proceeding we offer the, independently tested Cellweb®TRP system.

What is Cellweb®TRP?

Cellweb®TRP is a cellular confinement system specifically designed for tree root protection. The system creates a stable, load bearing surface for traffic or footfall whilst eliminating damage to roots through compaction and desiccation.

The Cellweb®TRP system comprises of the three specific elements, Cellweb®TRP, Treetex™ pollution control geotextile and an infill of clean angular stone. The system has been designed combining the best possible product to create an unparalleled solution to tree root protection applications.

Cellweb®TRP is a no dig solution that ensures that the load placed upon it is laterally dissipated rather than transferring to the soil and roots below. The use of Treetex™ pollution control geotextile allows for drainage and separation whilst preventing contaminants from reaching the roots.

Clean Angular Stone

Type 4/20

Specification for open graded sub-base for use as storage below pervious pavements (also Type C filter material for filter drains and soakaway backfill in accordance with SHW Clause 505) Type 4/20

Material to BS EN 13242 or BS EN 12620

Material to comprise crushed rock, concrete or blast furnace slag or similar approved. Crushed gravel is not permitted.

Properties	Test Method	Value
Grading	BS EN 13242	Grading 4/20 (Preferred) or 4/40, Gc 80/20, GTc 20/15
Fines Content	BS EN 13242	f_4
Shape	BS EN 13242	FI_{20}
Resistance to Fragmentation	BS EN 13242	LA_{30}
Durability:		
- Water absorption to BS En 1097-6:2000, Clause 7	BS EN 13242	$WA_{24}2$
- For WA > 2%, magnesium sulfate soundness	BS EN 13242	MS_{18}
Resistance to Wear	BS EN 13242	$M_{DE}20$
Acid-soluble sulfate content:		
- Aggregates other than air-cooled blast-furnace slag	BS EN 13242	$AS_{0.2}$
- Air-cooled blast-furnace slag	BS EN 13242	$AS_{0.1}$
Total Sulfur:		
- Aggregates other than air-cooled blast-furnace slag	BS EN 13242	$\leq$ 1 % by mass
- Air-cooled blast-furnace slag	BS EN 13242	$\leq$ 2 % by mass
Volume Stability of blast-furnace and steel slags:		
- Air-cooled blast-furnace slag	BS EN 13242	Free from dicalcium silicate and iron disintegration in accordance BS EN 13242:2002, 6.4.2.2 V_5
- Steel slag	BS EN 13242	
Leaching of contaminants	BS EN 13242	Blast furnace slag and other recycled materials should meet the requirements of the Environment Waste Acceptance Criteria for inert waste when tested in accordance with BS EN 12457-3

If compaction is required should be in 150mm layers with 4 passes of a smooth wheeled roller max weight of 1000kg/m width **without vibration**.

Aggregate gradings for sub-base materials to BS EN 12620

Sieve Size (mm)	Percentage Passing (%)	
	Coarse aggregate 4/40	Coarse aggregate 4/20
80	100	-
63	98-100	-
40	90-99	100
31.5	-	98-100
20	25-70	90-99
10	-	25-70
4	0-15	0-15
2	0-5	0-5
1	-	-

DR: 97/V2/16.12.14

Geosynthetics Limited Tel: 01455 617 139 Fax: 01455 617 140 Email: sales@geosyn.co.uk

Cellweb® TRP Installation Guide

Step 1: Prepare Surface

Step 2: Lay out Treetex™

Step 3: Lay out Cellweb® TRP

- Cellweb® TRP is a NO DIG tree root protection measure and it is recommended that no excavation be performed without prior approval and guidance from the Local Authority Arboricultural Officer.
- Soil compaction from vehicles, machinery and materials is to be strictly prohibited during construction within Root Protection Areas (RPAs).
- Approval must be obtained from the Local Authority that the design and the method of construction is acceptable.
- Further information is available from the following two documents;
  - British Standard BS5837: 'Trees in Relation to Design, Demolition and Construction' (2012).
  - Arboricultural Advisory and Information Service: Practice note 12 – 'Through the Trees to Development' (APN12).

Installation Method

1. Prepare the Surface

- Remove the surface vegetation using appropriate hand held tools or herbicide (see Note 1).
- Remove any surface rocks, debris and organic material.
- Create a level surface by filling any hollows with clean angular stone or sharp sand.
- Do not level off high spots or compact the soil through rolling.

2. Lay out the Treetex™ Non-Woven Geotextile

- Lay out the Treetex™ over the prepared area, overlaying the edges of the required area by 300mm.
- Overlap any joins by 300mm minimum or more, depending on soil structure (see Note 2).

3. Lay out the Cellweb® TRP Cellular Confinement System

- Lay out the collapsed Cellweb® TRP on-top of the Treetex™.
- Place one of the supplied J pins into the centre cell at the end of the panel and secure into the ground.