

# TECHNICAL RECOMMENDATION



**APPLICATION**  
**[11 RUR-CEL]**

**Reinforcement of Roads  
with Cellweb**

**PROJECT:**

**LAND TO REAR OF NEWCASTLE ROAD**

**DESIGNER/SPECIFIER:**

**PSD ARCHITECTURAL SERVICES LTD**

**Mr. Paul Sehmi**

**PLANNING AUTHORITY:**

**READING BOROUGH COUNCIL**

**Reference:**

TR22-4038\_RUR\_CEL\_Land to rear of  
newcastle road

**Version:**

V1

**Location:**

19-29 Newcastle Road,  
Reading, RG2 7TN

**Date:**

02 August  
2022

## PROJECT DESCRIPTION

Construction of a cycle/pathway over the existing ground, over a tree root protection zone with the use of Cellweb to help reduce the compaction of the existing ground. The project is located at the rear of 19-29 Newcastle Road, Reading, RG2 7TN. Cellweb is a no dig tree root protection measure and it is recommended that no excavation be performed without prior approval and guidance from the tree officer.

This document TR22-4038\_V1 provides the preliminary calculation of the reinforced areas over Tree Root protection zone, according to email and information delivered by Mr. Paul Sehmi on the 26/07/2022.

- **Ground conditions:**
  - Soil Info: Cohesive, assumed.
  - CBR: 1% assumed.
- **Area: Total = 24.17m<sup>2</sup> + 30.016m<sup>2</sup> = 54.2m<sup>2</sup>** as calculated from document "Land to Rear of Newcastle Road".



## CONSTRUCTION

- **Traffic Information:**
  - Traffic design: Pedestrians & Cyclists.
  - Maximum Gross Vehicle Weight GVW = Max 1,000 kg
  - Maximum axle load = 10 kN/axle.
  - Maximum wheel load = 5 kN/wheel
- **Infill material for Cellweb:**
  - 4mm to 20mm clean angular stone, Type 4/20 due to tree root protection requirement. Specification according to BS7533-13
- **Surface:**
  - Type & depth TBC by client

## OBJECTIVE

To propose a technical solution of reinforcement using the minimum required thickness of subbase Type 4/20 and Cellweb TRP and non-woven Geotextile Treetex for separation.

Due to tree root protection requirements, the solution has to be a no-dig and no-compaction system to protect tree roots. The Cellweb TRP with subbase Type 4/20 provides a stable structure to distribute the loads and reduce the pressure at the ground level. The system promotes the migration of water and nutrients, maintaining the soil bulk density at levels that are suitable for tree root growth.

## DESIGN METHOD

The methodology used is based on the design methods of reinforcement of unpaved roads proposed by Webster (1981). The first step in the design of a Cellweb reinforced pavement is to consider the ultimate bearing capacity of the pavement system under the greatest wheel load that it will have to support. This is undertaken following the guidance provided by Webster which uses conventional bearing capacity analysis to determine the applied and allowable pressure below the road pavement. The equations were derived for unpaved road design and make no allowance for the surfacing over the Cellweb. They are therefore considered to be conservative when permanent surfacing is placed over the Cellweb reinforced sub-base.

When additional sub-base is required beneath Cellweb the depth of this material may be reduced by placement of surfacing material above. If the thickness of surfacing is equal to or greater than the required sub-base, then the sub-base may be omitted.

## PARAMETERS AND CONSIDERATIONS

In order to perform the calculations, we used the methodology for reinforcement of unpaved roads, not taking account of any permanent surfacing that may be provided.

Standards and Specifications according to application:

- BS5837:2012
- APN 12
- BS7533-13:2009 for infill material

In the following tables, we present the parameters and assumptions used for the preliminary calculation. All parameters need to be verified by the client for final design.

## SOIL PROPERTIES

### SUBGRADE SOIL

|                                     |                      |
|-------------------------------------|----------------------|
| Soil Type:                          | Cohesive, assumed    |
| CBR:                                | 1% assumed.          |
| Undrained shear strength $C_u$ :    | 23 kPa               |
| Internal friction angle, $\phi_u$ : | 0 deg                |
| Unit weight, $\gamma$ :             | 18 kN/m <sup>3</sup> |

### FILL MATERIAL: CELLWEB AND SUBBASE

|                                         |                      |
|-----------------------------------------|----------------------|
| Soil Type:                              | Clean angular stone  |
| Type BS7533-13:                         | Type 4/20            |
| Internal friction angle, $\phi'_{pk}$ : | 35 deg               |
| Unit weight, $\gamma$ :                 | 18 kN/m <sup>3</sup> |
| Particle size:                          | 4 mm to 20 mm        |

### TRAFFIC DESIGN:

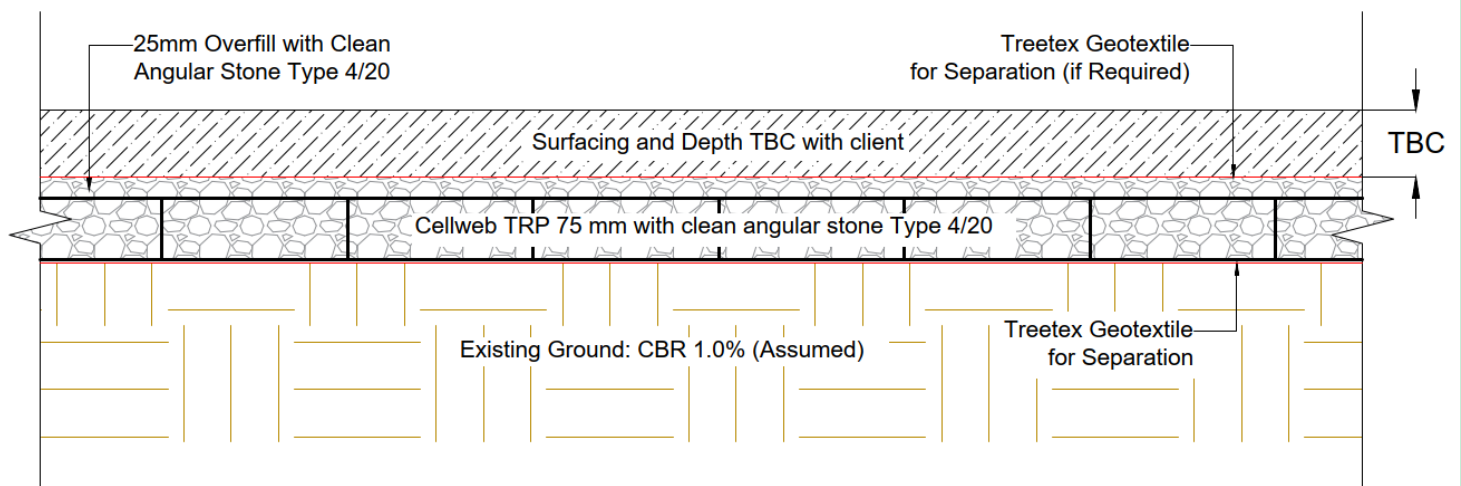
|                             |                 |
|-----------------------------|-----------------|
| Type of Traffic:            | Pedestrians     |
| Gross Vehicle Weight GVW:   | $\leq 1,000$ kg |
| Max Axle load:              | 10 kN/axle      |
| Wheel load, P:              | 5 kN/wheel      |
| Tire inflation Pressure, p: | 125.00 kPa      |

## SOLUTION: ACCESS ROAD OVER TREE ROOT PROTECTION AREA

|                                                                        |                                                             |
|------------------------------------------------------------------------|-------------------------------------------------------------|
| Surface:<br>(design by others accordingly to the appropriate standard) | Type and Depth TBC by client                                |
| Separation: Above overfill and beneath the surface                     | 1 layers of Geotextile Treetex                              |
| Overfill: above Cellweb: clean angular stone Type 4/20                 | Overfill: 25mm Clean Angular Stone Type 4/20                |
| Cellweb TRP: fill with 4 to 20mm clean angular stone Type 4/20:        | Cellweb TRP: 1 layer of 75mm Cellweb                        |
| Subbase: 4 to 20mm clean angular stone Type 4/20                       | Structural purpose: N/A                                     |
|                                                                        | Installation purpose: Maximum 80mm to match levels on site. |
| Separation: beneath Cellweb or Subbase                                 | 1 layer of Geotextile Treetex                               |

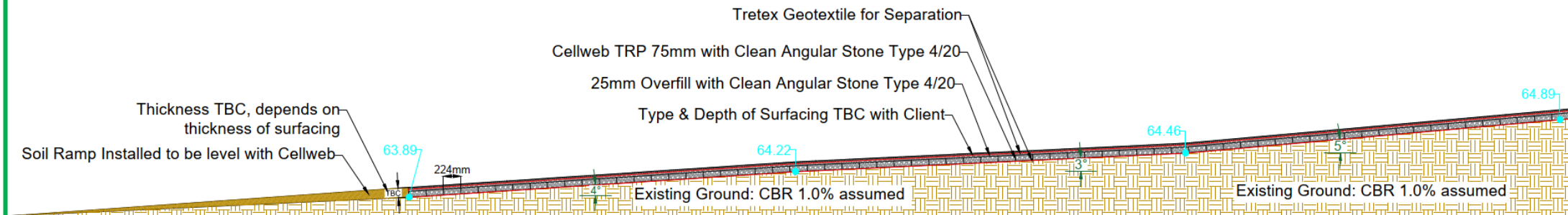
## CROSS-SECTION: CELLWEB OVER TREE ROOT PROTECTION – BUILD-UP

### INDICATIVE CROSS-SECTION BUILD-UP



## CROSS-SECTION: CELLWEB OVER TREE ROOT PROTECTION – LONGITUDINAL SECTION

### LONGITUDINAL SECTION THROUGH THE PATH



## RECOMMENDATIONS

**Granular Fill:** Clean angular stone Type 4/20. Please refer to BS7533-13:2009 and to the Design Manual for Roads and Bridges (DMRB), Volume 4 Geotechnics and Drainage, Section 1 Earthworks, HA44/91, Volume 7 – IAN 73/06 Design Guidance for road pavement foundations and Manual of Contract Documents for Highway Works (MCHW), Volume 1 Specification for Highway Works for the construction and maintenance of the fill material.

**Soil Properties:** All the properties of the soils have been assumed in order to perform the calculations. It is necessary to check the properties with the actual soil test results and the actual soils at the project site, so as to refine the calculations.

**Traffic information:** The traffic information has been extracted from the information sent by the client and the values have been assumed in order to perform the calculations. It is necessary to check the information with the actual traffic at the project site, so as to refine the calculations.

**Drainage systems:** Appropriate drainage systems need to be advised if applicable by the client/designer prior to final design. If drainage systems are required those needs to be designed and specified by others. Geosynthetics should be advised on the results of the drainage assessment, so it can be taking into account in the layout of the Cellweb System.

**Geotextile for separation:** we recommend the installation of a Non-Woven Geotextile Treetex under the Cellweb or under subbase if installed.

**Geotextile:** Overlapping between adjacent rolls of Geotextile: CBR > 3%: 300mm minimum, CBR between 1% and 3%: 500mm minimum, CBR ≤ 1%: 750mm minimum.

**Herbicide:** According to BS5837:2012 “The use of herbicides in the vicinity of existing trees should be appropriate for the type of vegetation to be killed, and all instructions, warnings and other relevant information from the manufacturers should be strictly observed and followed. Care should be taken to avoid any damaging effects upon existing plants and trees to be retained, species to be introduced, and existing sensitive habitats, particularly those associated with aquatic or drainage features.”

**Loose Gravel surface:** - Particle sizes, gradation and thickness to be specified by others according to the appropriate specification of the project. Regular use will cause movement and displacement of granular particles, giving as a result superficial deformation (rutting) and settlement of the surface. Therefore, regular maintenance is very important when using loose gravel surface, including the replacement of gravel to keep the required minimum thickness of the surface.

## CONTACT INFORMATION

For further information, please contact our technical department



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