

TECHNICAL RECOMMENDATION



APPLICATION
[11 RUR-CEL]

**Reinforcement of Roads
with Cellweb**

PROJECT:

CALDYNE PARK - ROWFANT

CLIENT/END USER:

DIDACIOUS DESIGNS ARCHITECTS

Contact:
Mr. Conrad Howard

PLANNING AUTHORITY:

MID SUSSEX DISTRICT COUNCIL

Reference:

TR21-3680_RUR_CEL_ Caldyne
Park, Wallage Lane_V1

Version:

V1

Location:

Caldyne Park, Wallage Lane,
Rowfant, Crawley, RH10 4NQ

Date:

07 May 2024

PROJECT DESCRIPTION

Proposed an access road for a site to be constructed over a tree root protection zone with the use of Cellweb. The project is located at Caldyne Park, Wallage Lane, Rowfant, Crawley, RH10 4NQ. 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 TR21-3680_V1 provides the preliminary calculation of the reinforced areas over Tree Root protection zone, according to email, questionnaire and information delivered by Mr. Conrad Howard on the 28/04/2021.

Ground conditions:

- Soil Info: Assumed Cohesive.
- CBR: Assumed 1.0%.
- **Total Area:** TBC by the client.

Traffic Information During Construction:

- Traffic design: Trucks /Std construction traffic up to 30ton
- Maximum Gross Vehicle Weight GVW = Max <30,000 kg
- Maximum axle load = 100 kN/axle.
- Maximum wheel load = 50 kN/wheel

Traffic Information After Construction:

- Traffic design: Bin lorries, Occasional fire, emergency vehicles
- Maximum Gross Vehicle Weight GVW = Max <20,000 kg
- Maximum axle load = 80 kN/axle.
- Maximum wheel load = 40 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:**
 - **During Construction:** 50mm Loose Gravel (see overfill)
 - **After Construction:** Porous surface, type and depth TBC.

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:	Assumed Cohesive
CBR:	1.0% assumed for calculation
Undrained shear strength C_u :	23 kPa
Internal friction angle, ϕ_u :	0 deg
Unit weight, γ :	18 kN/m ³

FILL MATERIAL: CELLWEB AND SUBBASE

Soil Type:	Clean angular stone
Type BS7533-13:	Type 4/20
Internal friction angle, ϕ'_{pk} :	35 deg
Unit weight, γ :	18 kN/m ³
Particle size:	4 mm to 20 mm

TRAFFIC DESIGN

	During Construction	After Construction
Type of Traffic:	Trucks /Std construction traffic up to 30ton	Bin lorries, Occasional fire, emergency vehicles
Gross Vehicle Weight GVW:	< 30,000 kg	< 20,000 kg
Max Axle load:	100 kN/axle	80 kN/axle
Wheel load, P:	50 kN/wheel	40 kN/wheel
Tire inflation Pressure, p:	625.00 kPa	606.06 kPa

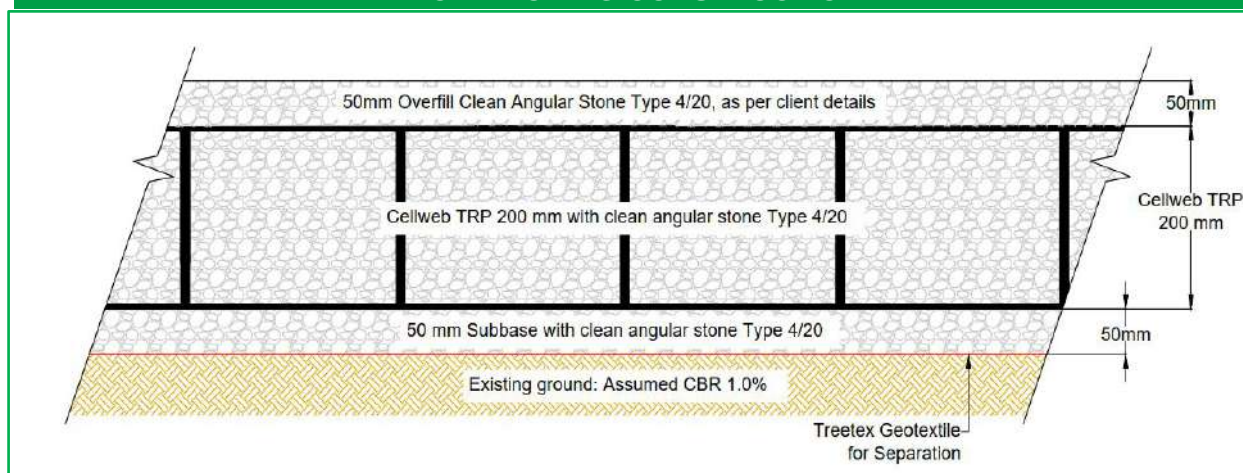
SOLUTION ACCESS ROAD OVER TREE ROOT PROTECTION AREA

Construction Stage:	During Construction	After Construction
Surface: (design by others accordingly to the appropriate standard)	50mm Loose gravel (see overfill).	Porous surface, Type & depth TBC
Separation: Above overfill and beneath the surface	N/A	1 layer of Geotextile Treetex (if required)
Overfill: above Cellweb: clean angular stone Type 4/20	50mm Clean Angular Stone Type 4/20.	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 200mm Cellweb TRP	
Subbase: 4 to 20mm clean angular stone Type 4/20	Structural purpose: 50mm clean angular stone type 4/20	
	Installation purpose: variable subbase for levelling of foundation if required	
Separation: beneath Cellweb or Subbase	1 layer of Geotextile Treetex	

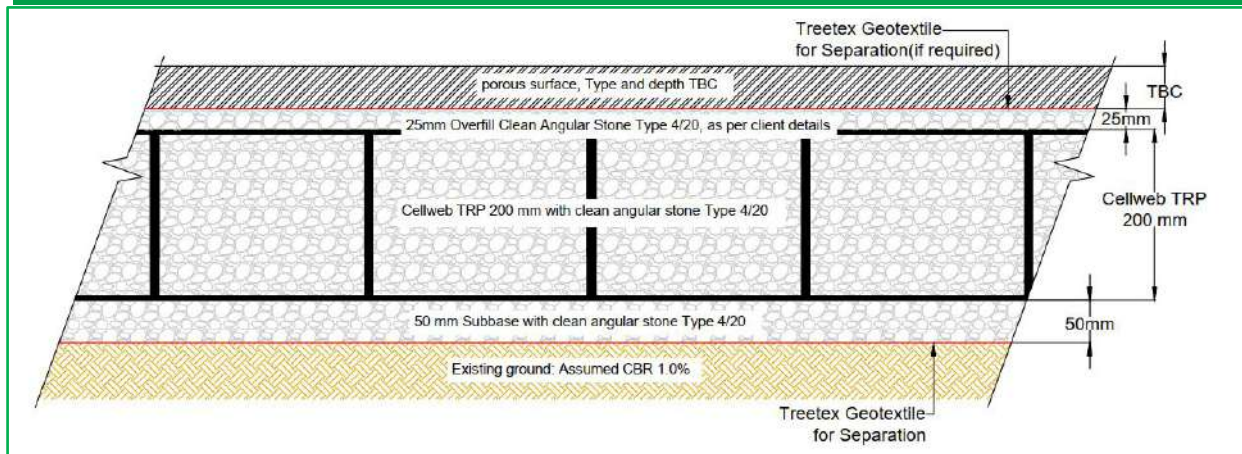
Note: Loose Gravel surface: Particle sizes, gradation and thickness to be specified by others according to the appropriate specification of the project.

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.

CROSS-SECTION: OF CELLWEB OVER TREE ROOT PROTECTION ROAD DURING CONSTRUCTION



CROSS-SECTION: OF CELLWEB OVER TREE ROOT PROTECTION ROAD AFTER CONSTRUCTION



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 during construction phase:

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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