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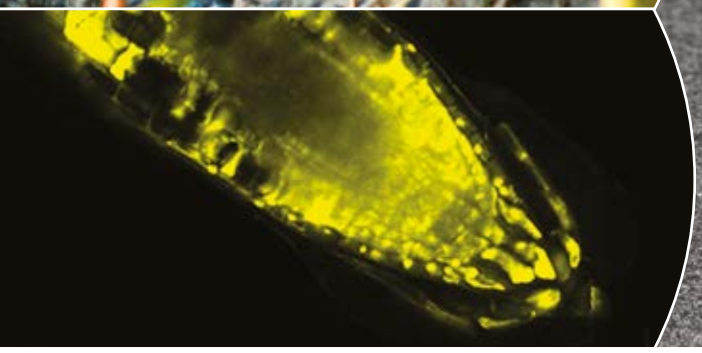
GEOfabrics®

CuTeX

Copper Composite Root Barrier



High-performance geosynthetics

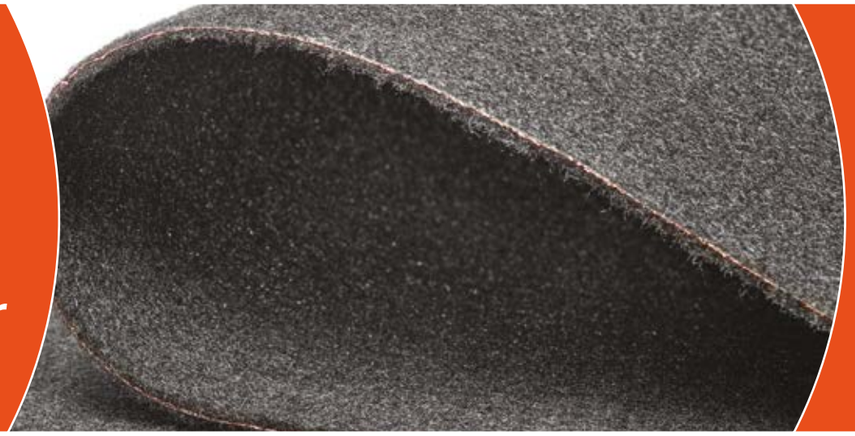
Geofabrics and CuTex

Geofabrics Limited is a British manufacturing company established in 1992. From the outset the objective was to manufacture high-performance geosynthetics to the highest possible standards and provide engineering support to ensure a value engineered solution to complex problems within civil applications.

The company's ethos is to exceed the expectations of our customers with our products and support services. Product development is achieved by analysing the customers application, determining the properties that are required, manufacturing the solution and testing it to prove it meets those performance criteria. Today the company manufactures a diverse portfolio of class leading geotextiles and geocomposites supplied into a wide range of civil engineering and construction applications.

The introduction of CuTex into the Geofabrics product portfolio supports this approach.

CuTex
The copper composite root barrier



CuTex is a permeable geocomposite root barrier system consisting of a specially formulated copper sheet mechanically encapsulated between two high strength geotextiles. CuTex acts by safely releasing Cu2+ ions to inhibit root growth. The copper ions create a localised zone of inhibition which when approached by root tips causes them to undergo a progressive collapse.

The copper acts as a signal layer that all plants avert their growth from. CuTex only releases minute quantities of the copper ion and is a safe, yet effective root growth blocking material.

CuTex can provide direct protection from invasive weeds and plants. Particularly the risk posed by Japanese Knotweed to environments such as utilities' infrastructures and foundations, across a wide range of industries including construction, highways, rail and water.

Cross section of CuTex showing the mechanically encapsulated copper layer.

CuTex Testing

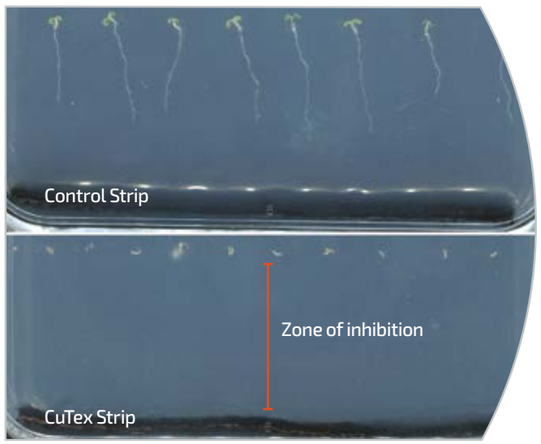
The Centre for Plant Sciences at the University of Leeds independently assessed the effectiveness of CuTex as a root barrier to Japanese Knotweed, and other invasive plant species. The research was designed to answer three principal questions:

- **Does CuTex inhibit root growth?**
- **Does the effectiveness of CuTex increase with time?**
- **Is CuTex safe?**

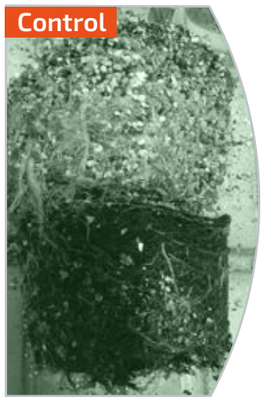
Does CuTex inhibit root Growth?

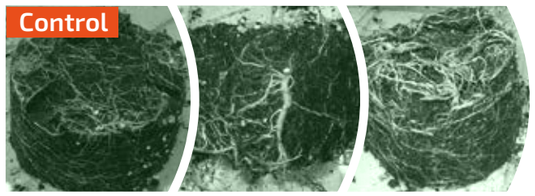
Answer: YES

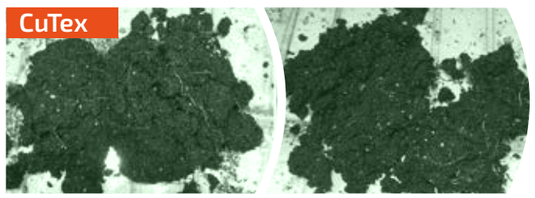
In order to assess whether CuTex can effectively inhibit root growth the University used a range of approaches with different plant species. Testing in a sterile culture using Arabidopsis Thaliana demonstrated how CuTex creates a 'zone of inhibition' whereby roots grow towards this zone, but then ceased at a distance of approximately 1.5cm from the composite. Even when seedlings were established at different distances all roots stopped at this zone, and seedlings trying to establish within the zone failed to do so.



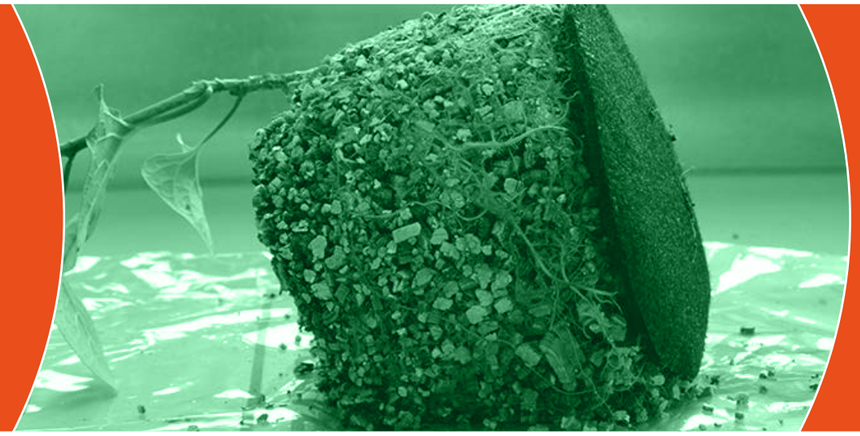
The most effective demonstration of CuTex was a setup using an upper layer of vermiculite and a lower compost layer separated by CuTex. The vermiculite contains no nutrients to support the development of the plant, and thus the long-term growth and survival of the plant depends on growing through the CuTex. The experiment was conducted using a number of plant species, including Japanese Knotweed, with the CuTex being assessed against a control fabric.







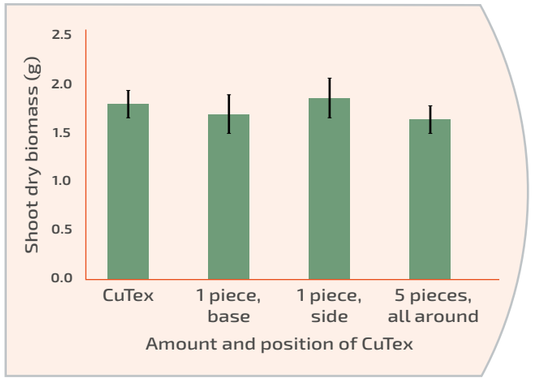
CuTex Testing



Does the effectiveness of CuTex increase with time?

Answer: YES

CuTex in soil will effectively form a chemical barrier as the Cu2+ ions diffuse into the soil. It was hypothesised that the effectiveness of the CuTex increases with time. This was tested by pre-incubating CuTex in an agar media for a period of 4 weeks following which time seeds were sown. The plates where the CuTex had been allowed to incubate indicated a much stronger and larger zone of inhibition abolishing the growth of the seeds.



Is CuTex safe?

Answer: YES

The bio-safety of CuTex was tested by assessing how it affects the overall health and growth of plants. Whilst CuTex prevents plants from growing through the composite and within the zone of inhibition, the effects were shown to be relatively localised. CuTex was not shown to negatively affect the biomass of surrounding plants.

Japanese Knotweed

Japanese Knotweed is a strong-growing herbaceous plant native to Japan, Taiwan, China, and the Korean peninsula. It was introduced into Europe in the mid-19th Century as an ornamental plant. The plant has thrived in fertile European soils and is now classified as an aggressive weed species. The plant has a significant negative impact on the environment where it occurs. Japanese Knotweeds stout rhizomes can push through asphalt, building foundations, cracks in concrete, retaining walls and even drains.

It out-competes other species affecting landscaping programmes, it disturbs the aesthetics through the accumulation of litter in dense thickets which encourages vermin and it increases the maintenance costs of buildings. It can also disturb local ecosystems by blocking migration of native plants and animals. This can add huge costs to development and regeneration schemes.

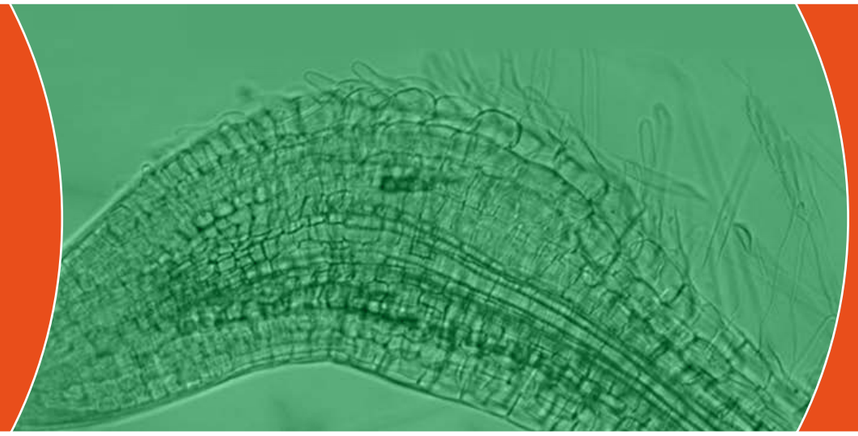
Contaminated soil must be treated as controlled waste. Additionally, the plant is capable of obscuring railway signals and road signs as well as causing trip hazards in paving. Hence, Japanese Knotweed can cause excessive costs for remediation, lead to prosecution and/or compensation claims, especially from neighbouring sites, physical damage to buildings, hard surfaces and harm to the environment (through the repeated applications of herbicides).

It is not illegal to have Japanese Knotweed on your land; however, legislation requires that you:

- Prevent invasive non-native plants on your land from spreading into the wild and causing a nuisance
- Prevent harmful weeds on your land from spreading on to a neighbour's property

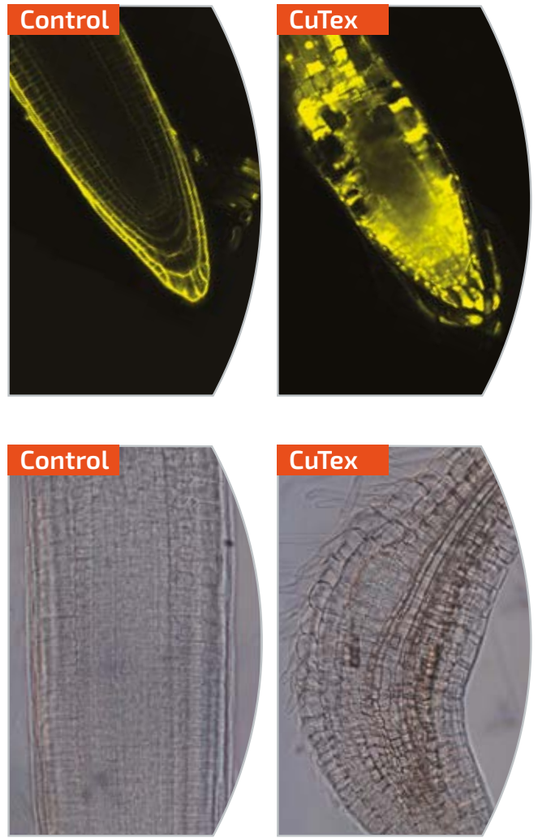
You can be fined up to £5,000 or face a prison sentence of up to 2 years for allowing contaminated soil or plant material from any waste you transfer spreading into the wild.

CuTex How does it work?



CuTex functions not only as a physical barrier, incorporating strong and durable geotextiles, but also as a chemical barrier. It acts by releasing Cu2+ ions into solution. Confocal laser-scanning microscopy and differential contrast interference microscopy was used to analyse the morphology of root tips grown in the presence and absence of CuTex. The results demonstrated that when root tips approach the zone of inhibition they undergo a progressive collapse. The dividing cells at the very tip of the root (the meristem) die off and the cells above the meristem differentiate.

The localised copper toxicology only affects the root exposed to the zone of inhibition making CuTex a safe and effective material for blocking root growth. Over time CuTex releases Cu2+ ions into the soil creating an effective chemical barrier.



Laser scanning microscopy and differential contrast microscopy show progressive collapse of root system.

GEOfabrics®

GEOfabrics Limited
Skelton Grange Road
Stourton
Leeds
LS10 1RZ
United Kingdom

T: +44 (0) 113 202 5678
F: +44 (0) 113 202 5655
E: info@geofabrics.com

www.geofabrics.com

CuTex

Copper Composite Root Barrier

Protect your assets today with CuTex

pba solutions

PBA Solutions are manufacturer appointed distributors for CuTex.
Contact us on 01202 816134 or email info@pba-solutions.com

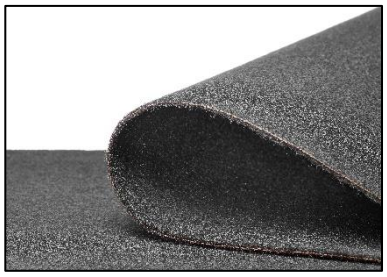
PBA Solutions (Landscape) Ltd
5 Yeomans Way
Bournemouth
BH8 0BL

CERTIFICATE NO. QM 1001 1773 0338

Designed and printed by ICM Creative Communications 11137/04/18

CuTex
Copper Composite Root Barrier

1. DESCRIPTION A geocomposite root barrier system consisting of a copper sheet mechanically encapsulated between a woven polypropylene geotextile and a high strength nonwoven polypropylene geotextile. The copper acts as a signal layer that all plants avert their growth from. The copper foil only releases minute quantities of the copper ion. These do not constitute an ecosystem burden, or impact on groundwater.



2. APPLICATIONS CuTex geocomposite can provide a direct protection of utilities' infrastructures such as foundations and drains from root intrusion, landfill caps and "green roofs". It will also provide a protection to roads, railways and dams.

3. FEATURES Plant shoot/root primordia (growth tips) are averse to growing into the vicinity of copper concentrations. In essence, the roots/shoots turn their growth in a different direction when confronted with the copper foil. These principles make CuTex a suitable barrier for Japanese Knotweed growth as well as all other plants. The majority of the Japanese Knotweed rhizome exists in the upper layers of topsoil. It has been established that, in an infected area, 14,000kg/ha dry weight of Knotweed may exist in the top 250mm (Brock, 1994).

	Test	Unit	MEAN VALUES
4. MECHANICAL PROPERTIES			
Static puncture (CBR)	EN ISO 12236	kN	2.5
Tensile strength (MD/CMD)	EN ISO 10319	kN/m	20
Tensile elongation (MD/CMD)		%	35
5. FILTER PROPERTIES			
Water permeability v_{H50}	EN ISO 11058	l/(m²·s)	3.10^{-4}
6. PHYSICAL PROPERTIES			
Copper thickness (nominal)	EN ISO 9863-1	µ	18
Carbon black content (geotextile)			1% active carbon black
Standard colour			Black
Polymer			100% virgin polypropylene

Notes:

a) Mean values indicate the arithmetic mean derived from the samples taken for any one test as defined in the standard – usually an overall mean of five samples. Mean values are subject to tolerances based on 95% confidence limits as published on the product CE declaration of performance.
b) Nominal Value (indicates an average manufacturing norm and not a controlled performance parameter).
c) MD: Machine Direction (longitudinal to the roll).
d) CMD: Cross Machine Direction (across the roll).
e) Tensile testing is performed using extensometers.

	Test	VALUES
7. DURABILITY		
Weathering 50 MJ/m² (1 month)	EN ISO 12224	>90% Retained Strength
Microbiological resistance	EN ISO 12225	No loss in strength
Resistance to acids & alkalis	EN ISO 14030	No loss in strength
Oxidation at 112 days (100 years)	EN ISO 13438	>90% Retained Strength

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8. TESTING

All materials are tested every 6000m² in an UKAS accredited ISO 17025 laboratory to all mechanical properties prior to release.

In order to demonstrate the bio-barrier performance of the proprietary CuTex barrier system a laboratory test was undertaken by REC Ltd. The test was performed on a mixture of plant species including mustard, docks, meadow grass and Japanese Knotweed within a peat and compost based soil matrix. The trial was monitored over a duration of six months in which period it was evident that the rhizome fragments of Japanese Knotweed were actively growing beneath the Cutex barrier. The field trial was conducted within a climate controlled environment (20°C) with daily addition of moisture to the surface of the soil.

Upon careful exhumation of the CuTex barrier, it was evident that none of the plants were able to grow through the bio-barrier. Typically, the roots that made their way down to the copper foil were either stopped or took lateral route. None of the rootlets penetrated any of the needlepunched holes, demonstrating the growth inhibited effect caused by the chemical properties of the copper foil insert. It should be noted that the CuTex barrier is a permeable system capable of transferring moisture through the geotextile sandwich and copper foil and therefore not prone to water logging in field conditions. The laboratory trial proved that there was no water logging of the soil above the barrier.

9. STORAGE

The geocomposites are supplied in packaging designed to protect the product from damage during handling, storage and degradation as a result of UV exposure. The product should be kept in appropriate packaging until such time that it is required for installation. The product is clearly and indelibly marked with the product name along the edge of the roll at regular intervals no greater than 5m. The packaging is labelled clearly to identify the product supplied in accordance with EN ISO 10320: Geotextile and Geotextile related products – Identification on site. Use slings where provided. Product weights are given on roll tickets. Use equipment appropriate to weight and dimension. Store and handle in accordance with good occupational hygiene and safety practice.

	Unit	VALUES			
10. DIMENSIONS					
Standard roll length	m	25	25	50	50
Standard roll width	m	2.6	5.2	2.6	5.2
Approximate roll weight	kg	38.5	77	77	154

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Declaration of Performance – CuTex®

CE

0338
No088-DoP-2017-04-19

Standard Number	Title	Intended Uses
EN 13249:2014	Geotextiles for roads and other trafficked areas	F,F + S
EN 13250: 2015	Geotextiles for railways	F,F + S
EN 13251:2014	Geotextiles for earthworks, foundations and retaining structures	F,F + S
EN 13252:2014	Geotextiles for drainage systems	F,F + S
EN 13253:2014	Geotextiles for erosion control works	F,F + S
EN 13254:2014	Geotextiles for reservoirs and dams	F,F + S
EN 13255:2014	Geotextiles for canals	F,F + S
EN 13257:2014	Geotextiles for solid waste disposal	F,F + S
EN 13265:2014	Geotextiles for liquid waste disposal	F

Essential Characteristics	Method	Units	Performance	Confidence Limit
Tensile strength	BS EN ISO 10319	kN/m	MD 20 / CMD 20	-2
Elongation	BS EN ISO 10319	%	MD 35 / CMD 35	±15
Dynamic perforation	BS EN 13433	mm	18	+4.5
Resistance to static puncture	BS EN ISO 12236	kN	2.5	-0.25
Opening size	EN ISO 12956	µm	60	±30
Water permeability	EN ISO 11058	m/s	3.10^{-4}	-3.10^{-5}

Durability
To be covered within 1 month after installation (EN 12224)
Predicted to be durable for more than 100 years in soils pH >1.5 or <12.1 on the basis of a durability assessment
(Reference Geofabrics document D1)

System 2+: Notified factory production control certification body No. 0338 BTTG performed the initial inspection of the manufacturing plant and of factory production control (FPC) and the continuous surveillance, assessment and evaluation of FPC and issued the certificate of conformity of the FPC.

The performance of the product Cutex is in conformity with the declared performance in the table above. This declaration of performance is issued under the sole responsibility of the manufacturer Geofabrics Limited.

Signed on behalf of the GEOfabrics Limited by:

C. M. Harvey

Clare Harvey - Laboratory Manager

Place and date of issue:
Leeds, West Yorkshire 19/04/2017

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Please contact us on 01202 816134 or email info@pba-solutions.com

GEOfabrics Limited, Skelton Grange, Stourton, Leeds LS10 1RZ, United Kingdom
T: +44 (0) 113 202 5678 F: +44 (0) 113 202 5655 E: info@geofabrics.com
www.geofabrics.com