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PCA Property Care ASSOCIATION

Guidance Note

Root Barrier and Japanese Knotweed Remediation

January 2019

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1. BACKGROUND

Root barriers act as a physical barrier to root growth and are often specified and used to stop invasive weed species, including Japanese knotweed, growing from one location into an area which needs to be protected. The objective of using a root barrier is to segregate land impacted by Japanese knotweed from that which is free of Japanese knotweed rhizome.

A root barrier on its own will not normally provide adequate knotweed control. Best practice in root barrier installation suggests that a barrier can be used as part of a remediation strategy where the primary method of control significantly reduces the residual risks associated with Japanese knotweed. Such risks primarily concern the capacity for Japanese knotweed rhizome regrowth.

Therefore, other methods of knotweed remediation would need to be employed along with a root barrier installation to provide a robust, lasting solution. *Typically, herbicide treatment and/or excavation of knotweed impacted land should be employed as part of a root barrier installation unless root barrier is merely being used as a temporary protective measure.*

There are various forms of root barrier. For the purpose of Japanese knotweed remediation, the common products used include:

Flexible barrier
Reinforced polypropylene flexible sheet normally sold in roll form. A cost-effective barrier with a good tensile strength/elongation. Such material can be prone to puncturing from sharp objects.

Barrier containing copper foil
Micro-perforated copper foil indicator layer sandwiched between layers of woven polypropylene geomembrane. Composite material format produces a robust barrier, whilst the use of copper has been shown to inhibit root growth. These barriers are permeable allowing moisture to pass between the segregated materials.

LDPE/HDPE
Low or high-density polypropylene of 1.0 mm gauge or greater which forms a durable non-woven barrier with good puncture resistance due to its thickness but lower tensile strength /elongation break. LDPE is easier to work with than an HDPE.

Other materials which are not suitable for use in knotweed remediation include: interlocking panels, low grade (DPC) polythene, single layer semi-permeable membranes (weed mat).

Other Guidance Notes are available concerning aspects of Japanese Knotweed Excavation and burial and we recommend these are consulted alongside this document (available at https://www.property-care.org/professionals/invasive-weed-control/invasive-weed-control-technical-document-library/).

2. ADVANTAGES OF ROOT BARRIER

Root barriers can allow land, once impacted by Japanese knotweed, to be immediately utilised.

There are several distinct advantages of utilising root barrier in conjunction with other methods of remediation:

- On property boundaries root barriers are used to **physically segregate** impacted land from that which would typically be free of Japanese knotweed.
- Root barriers can be used to **cap land** impacted by rhizome when deep excavation is not practical
- Root barriers are used to line **burial pits** enabling impacted land to be excavated and the arisings then buried, on site, at a shallower depth. This is generally seen to be more practical than deep burial alone.
- **Within a site** a root barrier can be used to **contain** knotweed. For example, in locations where excavation of knotweed is not possible e.g. within tree exclusion zones where trees need to be retained on a site or where Badgers or other protected species are present and disturbance through excavation would be prohibited.
- Root barriers can be used to provide **temporary protection** allowing access across land which contains or may contain knotweed.
- Root barrier can be used as a **geotextile (also known as geosynthetic) layer** and incorporated into the design of foundations, removing the possibility of problems associated with regrowth from any knotweed rhizome remaining in the ground.

To be used in conjunction with
herbicide application programs and excavation of knotweed impacted land.

3. ROOT BARRIER INSTALLATION

Consideration needs to be given to how a root barrier is installed.

Services breaching the root barrier: Where possible, services should not breach a root barrier. Where this is unavoidable this may be a weak point in the installation. Additional barrier with appropriate adhesive,

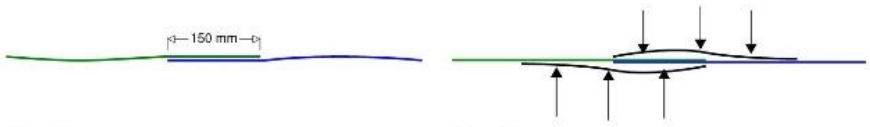
silicon sealant or similar must be used to bond the barrier to the service pipe. Known weak points should be noted in any report, particularly when a guarantee is given.

Joints/Seams in a root barrier: Joints or seams can be avoided through the purchasing of barrier preformed to the correct size. Where two or more pieces of barrier need to be joined together on site these can be welded or taped. Generally, a welded joint will be more reliable than a taped joint.

Welding is completed using specialist heat-welding equipment following the root barrier supplier's recommendations. Such work must be completed by a competent person and works must comply with health and safety legislation.

Where a root barrier is joined together using a heavy-duty tape, the barrier must overlap by 150 mm minimum (lapped joint, see Figure 1) or as specified by the root barrier supplier. The barrier should be taped on both sides. Where possible a prayer fold should be used as this is thought to be more robust (prayer fold joint, see Figure 2).

Figure 1: Simple lapped joint



Stage 1
Overlap both sections of root barrier by at least 150mm.

Stage 2
Tape each side of the joint with 300mm wide duct tape or similar. The joint must be taped along the whole length of the root barrier.

Figure 2: Prayer fold

1. Position root barrier sections so that each piece has a 150mm upstand.

2. Fold upstand back on itself so that the whole reduces in height by half.

Fold the whole upstand again so that the folded section is flat with the main barrier section.

3. Use a suitable tape to secure the fold - a 300mm wide duct tape or similar with a strong adhesive backing is recommended.

Installation and jointing must always follow manufacturer's guidance. Both welded and taped joints should be completed in dry conditions.

Avoiding damage to the root barrier: Puncture from sharp objects within the soil profile is an inherent problem with all barriers. The soil profile must be free of sharp or angular rocks or stones and/or other foreign objects that could potentially damage the barrier. Best practice is to improve the soil profile with a

sand layer to a minimum thickness of 25 mm. On vertical or battered faces, a protective fleece material, for example; non-woven needle punched geotextile is recommended to provide protection.

Additional sheet material can be used as an indicator layer for the purpose of warning others who may excavate in the future. This is important in a cell burial situation. An indicator sheet should be a minimum of 100 mm above the cell barrier.

Bonding to walls/structures

Where a root barrier needs to be attached to a structure or wall it should form a permanent water tight seal. This can be achieved if the surface that the barrier is being bonded to is structurally sound, clean, free of loose material and of a smooth finish.

A typical bond will require a silicone sealant and adhesive to be used (Figure 3) and must conform to the root barrier supplier's recommendations.

Where a root barrier needs to be fitted to a new structure the barrier can often be bonded into structural concrete foundations or lapped into brickwork. Figure 4 shows a typical bond into brickwork.

Figure 3: Typical bond to a wall

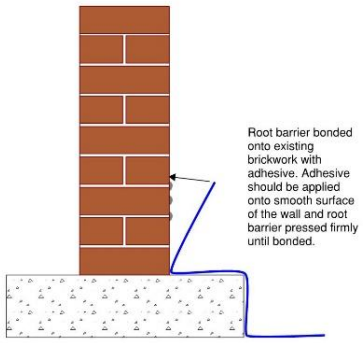
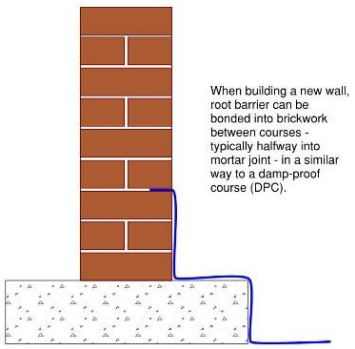


Figure 4: Typical bond in to brick work



Root barrier and foundations

A root barrier can be used to protect foundations, expansion joints and joints in concrete structures. The use of root barrier for this purpose would form part of an overall remediation strategy where the residual risk of knotweed would have already been reduced by excavation or screening.

It is important that herbicide control or another method of reducing the residual risk of Japanese knotweed is employed as part of a root barrier solution at foundation level. Provided that this is the case the following recommendations would apply.

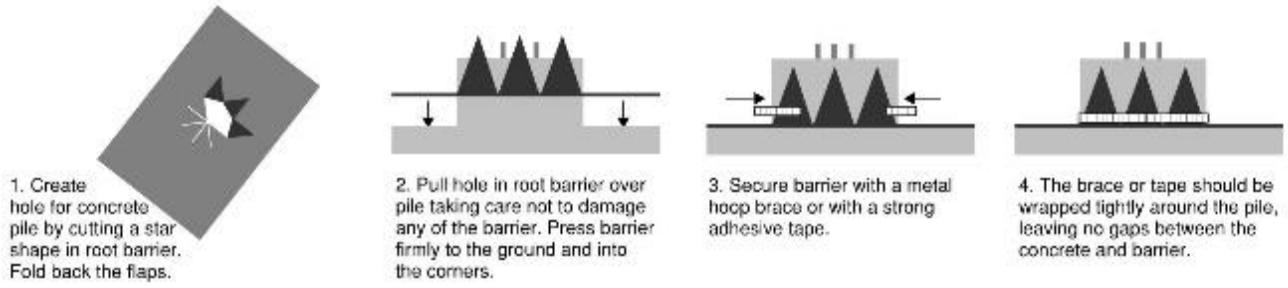
Horizontal barrier and piles

Laying a horizontal barrier between piles and capping beams requires that the root barrier is suitably sealed to the piles, ensuring that the rough surface finish of a pile does not weaken the integrity of the barrier (Figure 5). Clamps, preformed "top hats", expanding foam, adhesive and silicon sealant can assist. The detail

should be agreed between piling/concreting contractors and building specifiers. Where the root barrier is placed at the base of the pile capping beam the presence of structural concrete above the barrier will act to cancel out any potential joint weakness in the root barrier.

Horizontal barrier and foundations
Lining with a root barrier can be specified as a precautionary measure to protect foundations. The primary purpose of such a barrier should be to protect joints and/or expansion joints in a concrete foundation. Consideration should also be given to any service penetrations in the concrete foundations.

Figure 5: Typical joint to pile foundation



4. SEGREGATION ON PROPERTY BOUNDARIES

To be used in conjunction with
herbicide application programs and excavation of knotweed impacted land.

In a boundary situation the objective of using a root barrier is to stop rhizome from entering a property by installing root barrier to a depth and length where any remaining rhizome within the immediate soil profile would not have the capacity to breach the extents of the barrier.

Minimum recommend depth
Where burrowing animals are known or thought to be present, a 3-metre minimum vertical depth is desirable.

Where it is not practical or possible to achieve the desired depth, the barrier can be turned out horizontally into the site being protected. When turning out a barrier horizontally consideration should be given to drainage.

A horizontal barrier must also cap any knotweed rhizome not excavated and extend laterally to a suitable distance to ensure rhizome does not breach the barrier.

Guidance on vertical root barrier length
In most situations vertical root barrier should be installed so it extends beyond the depth of the rhizome by 1 meter. Root barrier must be extended laterally to a suitable distance to ensure rhizome does not breach the perimeter of the barrier.

Provided a program of ongoing monitoring and herbicide treatment is in place, the length of the barrier should be extended by a minimum of 3 metres horizontally past any visible sign of knotweed rhizome. Where there is any uncertainty to the location of knotweed rhizome or where the presence of knotweed cannot be fully determined the root barrier should be extended further, the distance being determined by and subject to specific site conditions.

Common considerations
Since foundations for boundary walls and fence posts may breach or impact upon the integrity of a root barrier the design and installation of such boundary finishes must be agreed with the building specifier. Installation methodology must also be agreed with the installation team responsible for creating any boundary finishes. Such methodology would typically avoid root barrier damage through excavation and/or avoid working in knotweed impacted areas when installing boundary finishes.

5. CAPPING OF LAND IMPACTED BY JAPANESE KNOTWEED

When using a root barrier as a capping layer and where complete remediation is required, other control methods such as excavation and herbicide treatment need to be used so that the residual risk of knotweed is minimised.

Capping knotweed below ground would normally be considered as a secondary option to full excavation where full excavation is impractical e.g. when services prohibit deep excavation. Similarly, a root barrier cap may be considered when the residual risk of knotweed is low for example where knotweed is not actively growing but the land may have previously been, or thought to have been, impacted by knotweed.

The minimum depth for a root barrier cap is normally at subgrade level. Consideration must also be given to drainage as with all horizontal root barriers.

The role of a root barrier cap must be fully understood. There are two alternative principles that can be adopted:

1) The root barrier cap is used to **block** knotweed growth. The barrier must extend far enough so that any rhizome below the barrier exhausts itself prior to finding the perimeter of the barrier.
2) The root barrier cap is used to **deflect** knotweed growth where the barrier extends to a predetermined distance so that rhizome below the barrier is deflected to the perimeter of the barrier for treatment with herbicide.

With a root barrier cap, post-installation monitoring must be maintained for a minimum of 2 years to ensure that the root barrier is effective and meets client expectations. Where knotweed regrowth is anticipated i.e. where the barrier has been used to deflect regrowth, then a program of treatment must be implemented, generally lasting in excess of three years (see PCA Code of Practice: *Management of Japanese Knotweed* available at https://www.property-care.org/professionals/invasive-weed-control/invasive-weed-control-technical-document-library/).

6. CELL BURIAL

The use of a root barrier is prescribed by the Environment Agency (EA) to create a below ground cell to hold knotweed impacted soil. The Regulatory Position Statement 178 details requirements that need to be complied with.

In addition to the EA requirements it is advisable to:

- Use a sand layer or fleece to ensure that the root barrier does not inadvertently become damaged.
- Install a signal layer or membrane 100 mm above the horizontal cap to indicate to others in the future that a barrier is present.
- Segregate or sift out rhizome in order to reduce the residual risk of the impacted material. The resulting rhizome should be placed either at the base of the burial pit or removed off site as knotweed impacted waste.

Burying knotweed waste under buildings and other structures would require consultation with structural engineers as they would need to define compaction thresholds for knotweed material and confirm appropriate methodology. The development of a remediation strategy in this instance must be signed off by a suitably qualified engineer.

7. CONTAINMENT OF KNOTWEED IMPACTED LAND

To be used in conjunction with
herbicide application programs and excavation of knotweed impacted land.

When using root barrier to contain knotweed within a site that is otherwise going to be designated as remediated from knotweed, it is important to ensure that the location and extent of the barrier physically stops the knotweed from re-infesting the site.

An herbicide treatment programme should be implemented within the contained area to remediate knotweed.

When installing a barrier near trees (see PCA Guidance Note: *Dealing with Trees*) there may be a construction exclusion zone. Ordinarily a root barrier should not be installed within the construction exclusion zone. A tree protection plan would be provided by a qualified arboriculturalist to determine the exclusion zone location. A qualified arboriculturalist should be consulted when designing a root barrier solution near to trees.

When using a barrier to contain knotweed in locations where Badgers have been found to be present, advice should be taken from an ecologist to determine the position/location of root barrier.

8. TEMPORARY PROTECTION

Third party access is often required across land impacted with knotweed. A root barrier laid on the ground with an additional layer of material can be used to prevent rhizome being picked up and spread. The following recommendations for protective layers apply when using root barrier in this way. The listing of materials is from base to top layer:

Pedestrian use only: 25 mm sand or fleece, root barrier, 25 mm sand or fleece, and a final surface layer being an option of either Type 1 compacted, >20mm ply board, bark mulch.

Heavy pedestrian use/scaffolding: 25 mm sand or fleece, root barrier, 25 mm sand or fleece, and a final surface layer being an option of >20mm ply board with additional timbers used under scaffolding poles.

Light trafficked areas: 50 mm sand or fleece, root barrier, 50 mm sand or fleece, and a final surface layer being an option of >100 mm Type 1 road stone or similar.

Heavy trafficked areas: 50 mm sand or fleece, root barrier, 50 mm sand or fleece, and a final surface layer being an option of >300 mm Type 1 road stone and/or consulting engineers' recommendations.

9. GENERAL INSTALLATION PROCEDURE

The company installing the root barrier should be experienced and be able to demonstrate that they have completed root barrier installations within the last 24 months. Ordinarily the company should be PCA-accredited.

A PCA knotweed qualified technician must be present on site and be suitably experienced in the installation of root barriers. The technician would ensure that the root barrier installation is effective and meets the design objectives.

The location, design and material specification sheets must be provided to and agreed with the client prior to installation and such documentation should be available on site.

Where specialist on-site welding of a root barrier is required it is expected that technicians are trained and experienced and that relevant training and experience can be evidenced.

Prior to placement of a root barrier the installing technician must indicate in writing to the client that the subgrade receiving the barrier is adequately prepared.

Where sand layers or fleece have been specified the installing technician must confirm in writing that these layers have been installed and meet the design requirements.

The root barrier should be designed and installed to minimise seams/joints.

When working immediately over the barrier, footwear must be clean and free from sharp objects. Other personnel should be kept off the barrier and, if needed, temporary fencing should be installed to create an exclusion zone.

When using a barrier vertically, a mechanism for temporarily securing the barrier prior to back filling must be agreed. Sand-bags and tyres are ideal for weighting down root barriers. Sand-bags can be left *in situ* when covering the barrier. Other methods of trenching the barrier or using concrete slabs can be considered. Road pins or anything that would puncture the root barrier within the area to be protected by the barrier must not be used.

On completion and prior to the barrier being covered by soil, concrete or other materials, the installation should be photographed and plotted, e.g. using GPS and the information captured accurately in an appropriate report.

Marker pegs can be used that are offset to a known distance. This helps ensure that root barrier extension past a known location of rhizome can be accurately determined.

The installation technician must also supervise or complete the covering of a root barrier until such time they can confirm in writing that current site activities would not ordinarily be a threat to the root barrier installation.

The client and their onsite representative must be appropriately briefed regarding post installation aftercare and provided with appropriate documentation.

10. ROOT BARRIER AND GUARANTEES

Regulatory Position Statement 178 (https://www.gov.uk/government/publications/treatment-and-disposal-of-invasive-non-native-plants-rps-178) suggests a root barrier should be guaranteed for 50 years.
The types of barrier stated in this document are made from material which would not ordinarily degrade when used below ground and therefore the use of such barrier would be expected to far exceed the EA stipulation of 50 years.

Any known weak point within a root barrier solution must be documented. If such a weak point presents itself as a potential threat to remediation, this should be stated as a caveat to any guarantee offered.

This document is intended to enable CSJK-qualified surveyors to design and use root barriers as an integral part of a knotweed remediation strategy which may be covered by an insurance backed guarantee (with special thanks to Jon Barton of PBA Solutions).

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