



## Site Guidance Note 10: Installing structures in root protection areas

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## SGN 10: Summary guidance for site operatives

### Administration

1. **Unauthorised damage to protected trees is a criminal offence and could lead to enforcement action.**
2. **Work under the normal site risk assessment procedures and comply with the wider site safety rules.**
3. **Brief operatives entering root protection areas (RPAs) by the supervising arboriculturist before work starts.**

### Other relevant SGNs

4. **Monitor works in RPAs by the supervising arboriculturist (See SGN 1 Monitoring tree protection).**
5. **Design access to avoid soil compaction (See SGN 3 Ground protection).**
6. **Reduce the risk of chemical contamination from poured wet concrete (See SGN 4 Pollution control).**
7. **Minimise excavation into original undisturbed soil (See SGN 7 Excavation in root protection areas).**
8. **Install any surfacing acting as support for light structures directly onto the soil surface with minimal excavation (See SGN 9 Installing/upgrading surfacing in root protection areas).**

## SGN 10: Summary guidance for site operatives

### Important Reminders

9. Hand-dig pile, pad, or post locations down to a depth of 60cm and, if necessary, adjust location to avoid cutting roots greater than 2.5cm diameter.
10. No excavation into existing soil levels except where authorised for supports. Note: This specifically applies to ground beams sitting above supports.
11. Make provision for ventilation and watering beneath substantial structures.
12. Where feasible, keep in place existing below ground structures where they can be reused to support new structures, e.g. new walls built on existing wall footings.

## SGN 10: Explanatory notes and examples

### Purpose

SGN 10 describes the practical requirements for installing new structures in RPAs, based on the recommendations in BS 5837 (7.5 & 7.6).



### General principles and clarifications

Conventional installation of new structures using strip foundations is unacceptable in RPAs because the excavations can damage roots and adversely disturb the soil. Additionally, the covering created by the new structure over the soil can impede water and gaseous exchange. Adverse impact on trees will be reduced by minimising the extent of these changes in RPAs.

#### ***The installation of pile, pad, or post supports***

Substantial structures such as heavy walls, garages, and larger buildings, will sit above ground level, supported by piles, pads, or posts, with provision for water and gaseous input into the covered area. The risk of harm through soil compaction during the construction activity will be reduced using ground protection as described in SGN 3 (Ground protection).

## SGN 10: Explanatory notes and examples

The risk of chemical contamination will be reduced by following the guidance in SGN 4 (Pollution control). The risk of direct root damage from excavation will be reduced by following the guidance in SGN 7 (Excavation in root protection areas). If feasible, careful consideration should be given to retaining existing footings, especially relating to walls. This will allow the installation of new structures without the disturbance required to excavate and install new footings, as explained in SGN 8 (Removing surfacing and structures in root protection areas).

All support locations will be hand-dug to a depth of 60cm to identify if any roots over 2.5cm diameter are in the way. Sufficient flexibility will be built into the design to allow support locations to be moved to avoid roots over 2.5cm diameter.

Additionally, the diameter and the distribution of the supports will be

minimised to reduce the risks of disturbance during the installation. The bases of such structures will allow for air and water input beneath through ventilation and irrigation provision.

### ***The installation of no-dig surfacing supports***

An alternative for lighter structures such as small sheds, carports, and bin stores, is to support them on custom designed no-dig surfacing, installed directly onto the soil surface, as described in SGN 9 (Installing/upgrading surfacing in root protection areas).

### ***Basements***

It is also feasible to install subterranean structures (basements) beneath RPAs if the volume of soil forming the RPA can be retained without significant disturbance. The detailed design and specification of all these solutions is an engineering issue, to be informed and guided by tree expertise.

Support locations should be hand-dug to a depth of 60cm to see if there are any significant roots in the way, with provision to move the location if roots are found (note the pile in this example was finally installed to avoid the root).



SGN 10-01

## SGN 10: Explanatory notes and examples



SGN 10-02

Ground protection should be used to spread the load of the piling rig once excavation has confirmed that no substantial roots are in the preferred pile location.



SGN 10-03

Piles can also be used to support bridges across sensitive RPAs, but the temporary ground protection must be removed before the main structure is either imported in or cast on site.



SGN 10-04

The RPA for the trees behind the fencing extends across the whole view. The soil surface is protected by heavy duty ground protection to prevent compaction during the work and the poured concrete piles were sleeved to prevent RPA contamination.

## SGN 10: Explanatory notes and examples

This RPA was protected from compaction from the piling rig by a three-dimensional cellular covering. The cellular covering was cut away from the pile locations, which were then hand-dug down to 60cm to make sure that no roots over 2.5cm were damaged. The piles were a screw type to avoid soil contamination from poured concrete.



Small diameter piles (less than 15cm) are an effective means of supporting structures in RPAs with minimal disturbance. The wooden formwork provides the receptacle for the steel reinforcement and the poured concrete that will form the building slab.



Where the slabs for larger structures are cast on site, a biodegradable void-former can be used to temporarily support the weight of the liquid concrete until it sets. The void-former can then be wetted and washed away to leave a void, or left to degrade naturally, both of which allow movement of air beneath the slab.



## SGN 10: Explanatory notes and examples



This garage was supported on piles with a concrete ground slab poured on site using a biodegradable void-former. Note the drainage downpipe feeding into a perforated watering pipe laid below the slab to provide water input into the RPA.



It is possible to support very large structures on piles within sensitive RPAs.



This building is supported on piles, with ground beams above onto which the floor is laid. The beams are above ground level and the pipes are perforated with a shingle surround to provide water input into the RPA once the structure is completed.

## SGN 10: Explanatory notes and examples

These carports are formed by wooden posts above a three-dimensional cellular no-dig and load-spreading surface of permeable crushed stone.



The workman is standing within the outline of a free standing concrete slab that is to be installed above the existing ground level within an RPA that was previously covered in tarmac as parking.



This raised deck extension is supported on wooden posts, hand dug to avoid significant roots.



## SGN 10: Explanatory notes and examples



SGN 10-14

The original church wall was displaced towards the pavement and had to be removed for safety reasons. The replacement structure was built on a new concrete reinforced footing installed without cutting any significant roots.



SGN 10-15

This covered bin store was constructed within RPAs by placing block paving on a levelled sand base directly onto the existing ground level, with the posts in hand dug holes to support the roof.



SGN 10-16

This church extension was built on a concrete beam and block floor slab supported on piles located in hand dug holes. Ground protection around the margins protected the RPA of the adjacent tree during construction.

## SGN 10: Explanatory notes and examples

Where significant roots cannot be cut, a bridging lintel of concrete or steel can be used to support the wall slightly above the roots to be retained.



Hand excavation of soil and shrub roots allows preformed steel or concrete lintels to be installed as a solid base for the curved wall construction, raised slightly above ground level, sitting on small diameter piles.



The voids beneath the wall and between the piles can be filled with soil/permeable fill leaving no indication that the finished wall is supported above the ground, allowing important tree roots to be retained intact.



## SGN 10: Explanatory notes and examples

### Technical reference

*Due to copyright restrictions, the relevant British Standard clauses are summarised, not quoted, as follows:*

1. **BS 5837 (2012) Trees in relation to design, demolition and construction – Recommendations:** Clauses 7.5 (Special engineering for foundations within the RPA) and 7.6 (Subterranean construction within the RPA) recommend:
  - 7.5.1 Traditional strip footings can result in extensive root loss and should be avoided, but specially engineered structures may be justified if this allows good quality trees to be retained. Foundation designs should consider existing levels, proposed finished levels, and cross-sectional details. Site-specific and specialist advice regarding foundation design should be sought from the project arboriculturist and an engineer.
  - 7.5.2 Root damage can be minimised by using piles supporting beams, laid at or above ground level, with site investigation down to a minimum depth of 60cm to determine their optimal location. Alternatively, structures can be cantilevered to avoid roots identified by site investigation.
  - 7.5.3 Slabs for minor structure should bear on existing ground level, and should not exceed an area greater than 20% of the existing unsurfaced ground.
  - 7.5.4 Slabs for larger structures should be designed with an irrigation system and a ventilated air space between the underside of the slab and the existing soil surface. The design should take account of any effect on the load-bearing properties of underlying soil from the redirected roof run-off and prior approval should be sought from the building control authority.
  - 7.5.5 The smallest practical pile diameter should be used to reduce the possibility of striking major tree roots. Small piles also reduce the size of the rig required and can reduce the need for access facilitation pruning. The pile type should be selected to protect RPAs from the potentially toxic effects of uncured concrete, e.g. sleeved bored pile or screw pile.
  - 7.6.1 Where subterranean basement are proposed within RPAs, it is essential to avoid excavating down through rootable soil. It might be technically possible to form the excavation by undermining the soil beneath the RPA.