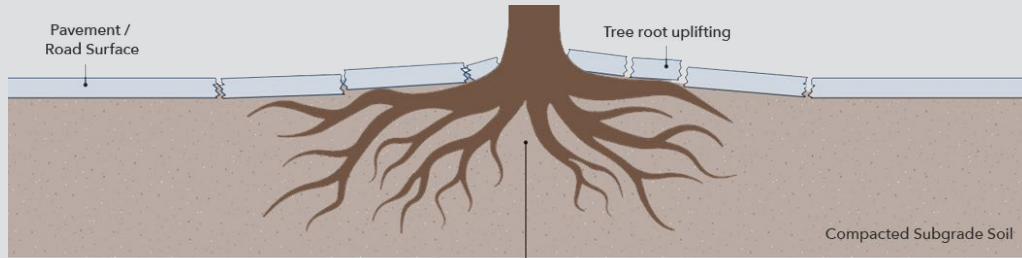


PERMEABLE PAVING AROUND TREES

WHAT'S THE ISSUE?

When trees are planted as part of our urban spaces and streetscaping infrastructure, tree root damage to footpaths and roads can often occur over time. The issue of tree root uplift is not only costly and damaging to local infrastructure, but is also unsightly for local residents and detrimental to the tree's health.¹

Tree root uplift occurs when tree roots seek out moisture and nutrients too close to the pavement surface. For impermeable pavements such as asphalt and concrete slabs, the issue of tree root uplift is often exacerbated when water condensates on the underside of the pavement surface, causing roots to reach upwards in search of water.

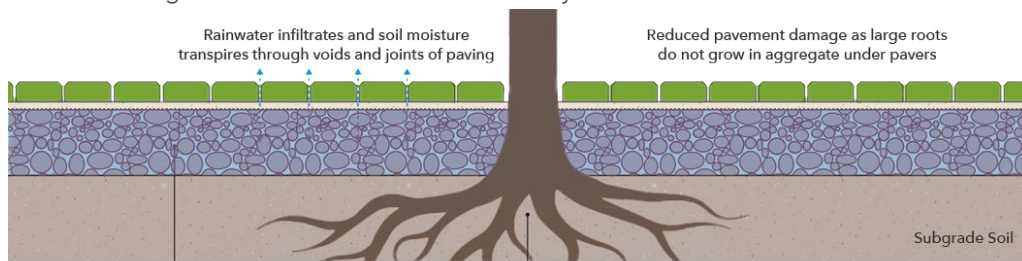


TYPICAL ROOT GROWTH PATTERN WHEN PAVEMENT IS LAID DIRECTLY ON SOIL²

SOLUTION

Permeable paving provides a simple yet effective solution to this common issue of tree root uplift. Permeable paving allows water and air to travel more deeply and freely under the surface, resulting in deeper root growth and minimising damage to the pavement surface. Field experiments and excavations conducted by Johnson (2017) found that the use of permeable paving with a gravel basecourse layer was an effective solution in preventing pavement damage.³

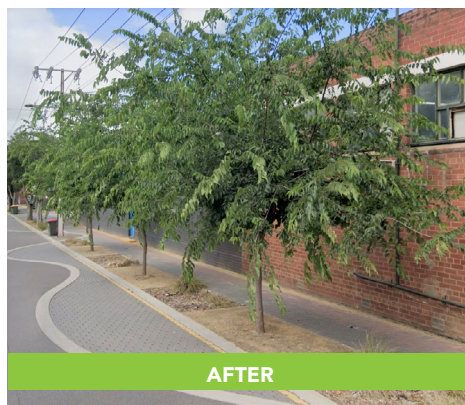
The use of gravel provides a two-pronged strategy to minimise tree root uplift. Firstly, the permeable gravel layer allows water to flow deeper under the surface, causing deep root growth for nutrients.⁴ Secondly, the gravel material acts as a difficult medium for thick root development, thereby acting as a buffer and preventing any prospect of thick root growth near the pavement surface as well.⁵ Refer to the illustration below for further details. A similar gravel-like structural soil such as a no-fines 20mm single sized crushed rock basecourse may also be used.



TYPICAL ROOT GROWTH PATTERN WHEN PERMEABLE PAVING AND AGGREGATE BASE USED



BEFORE



AFTER

Holland Street, Thebarton, South Australia

There is no single solution for paving around trees. Good practice and design requires a strong collaboration between designers, engineers, arborists, and scientists.

Things to Consider:

- ▶ Whether the tree is juvenile or mature. Permeable paving designs are dependent on the age of the tree.⁶
- ▶ The size, predicted growth and hydrological requirements of the tree with respect to the pavement.
- ▶ The need for compaction will be dependent on the hydrological requirements of the tree species.
- ▶ The selection of basecourse material with respect to its corresponding structural and hydrological capabilities.
- ▶ The extent of root pruning for paving around existing trees.
- ▶ The condition and climate of the surrounding area must be appropriate for the tree species.⁷
- ▶ The expected traffic load in proximity to the tree, as compressive loads may stifle growth in the sapling.

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CONSTRUCTION PROCESS

1. EXCAVATION

Excavate the topsoil in accordance with the design depth of the pavement. Depending on the characteristics of the tree, swales can be excavated under the expected paving area.⁸ At this time, a tree pit must be excavated for the root ball of the tree. The depth of excavation will be dependent on the species of tree.

2. TREE PLANTING

The sapling is then planted in the space made for it. Note that the allocated area of pavement surrounding the tree should also account for future growth.⁹

3. PAVEMENT SUBSTRUCTURE

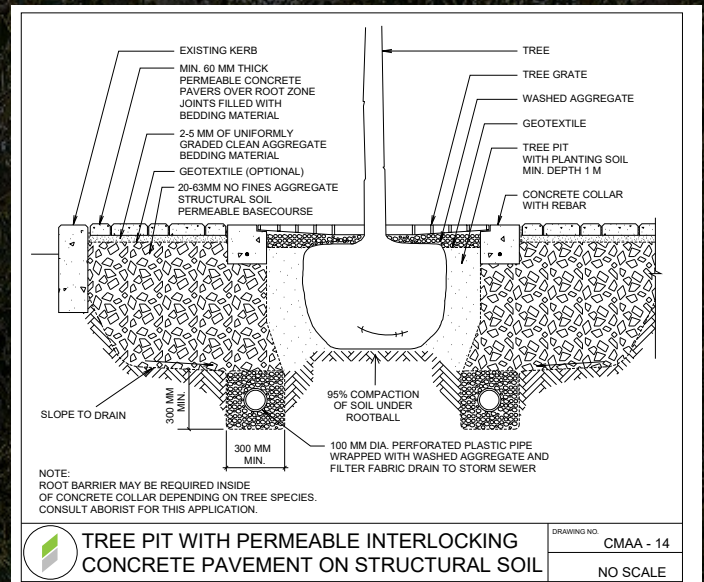
A no-fines granular fill is then settled in the excavated area. This will provide a permeable layer for the pavement. Note that this layer will be exposed in the space allocated for the tree. If the design load is increased, a more uniformly graded granular fill shall be used instead. With engineering judgement, no compaction of the subgrade and basecourse may be specified for the benefit of the tree.¹⁰

4. BEDDING LAYER

A thin bedding layer of clean, uniformly graded aggregate is then applied – conventional bedding sand shall be avoided due to its low permeability.¹¹ This layer is not to encroach into the space allocated for the tree – leaving the granular material exposed.

5. PAVEMENT SURFACE

The permeable paving surface (i.e. pavers with widened joints) is then laid on top. Note that the spacing allocated for the tree must be maintained to minimise root invasion. Light compaction is recommended after the pavers have been laid. Appropriate edge restraints must also be constructed to ensure pavement durability.



6. ADDITIONAL CONSIDERATIONS

Any provisions for tree grilles, coverings, or tree guards must then be installed to limit the displacement of the exposed basecourse.

For pre-existing trees, a tree protection zone must be established as per AS 4970 *Protection of Trees on Development Sites*, whereby paving should occur around the root crown of the tree. It is generally best practice to consult with an arborist or the local government ecology team before conducting any work that may jeopardise the tree or root structure.

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