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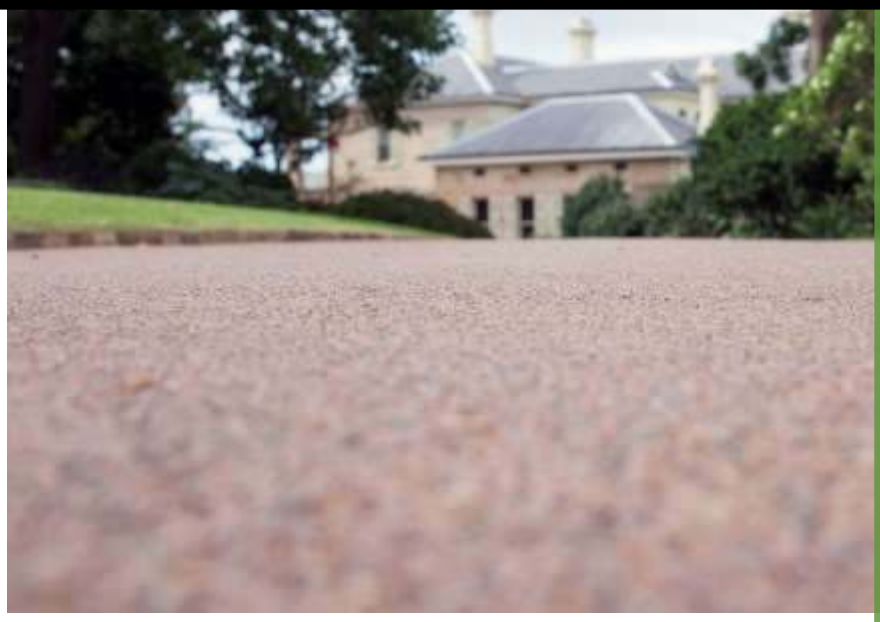
What is Permeable Paving
What are the benefits in Australia?



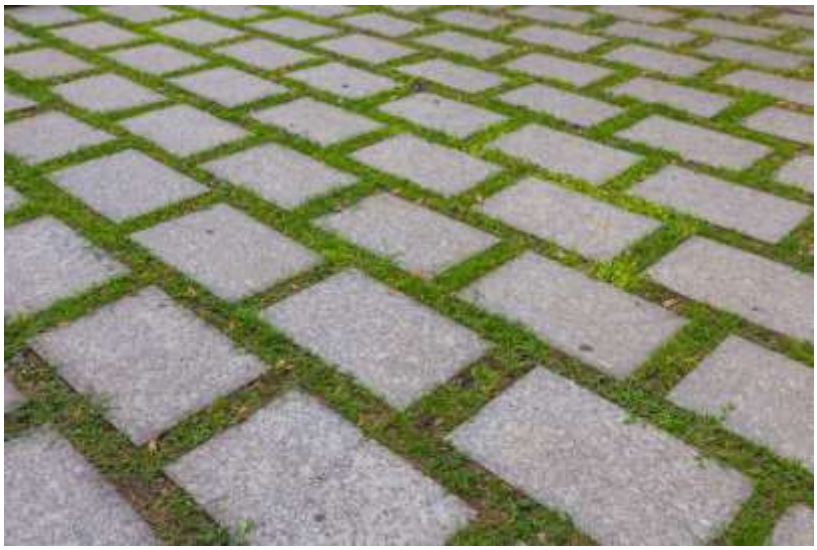
What is permeable paving and what are the benefits in Australia?

Go to a nearby park, a commercial development, or a recent residential construction and look down. There is very little chance that permeable paving is either under your feet or within your line of sight, which is a regrettable: this type of paving performs the same load bearing function as traditional paving but it is also permeable to water. Permeability to water is the defining feature of all types of permeable paving and the key to its growing popularity in Australia.

This feature creates opportunities to add environmental, engineering, and aesthetic value to urban design projects. The benefits of permeable paving go beyond the particular building project and seep into the surrounding community. As a result, planning application processes at all levels of government in Australia typically favour designs with permeable paving. In this article, we will explore why this is true and how you can use permeable paving to add value to your design and to advance your planning application.

Permeable Paving Options

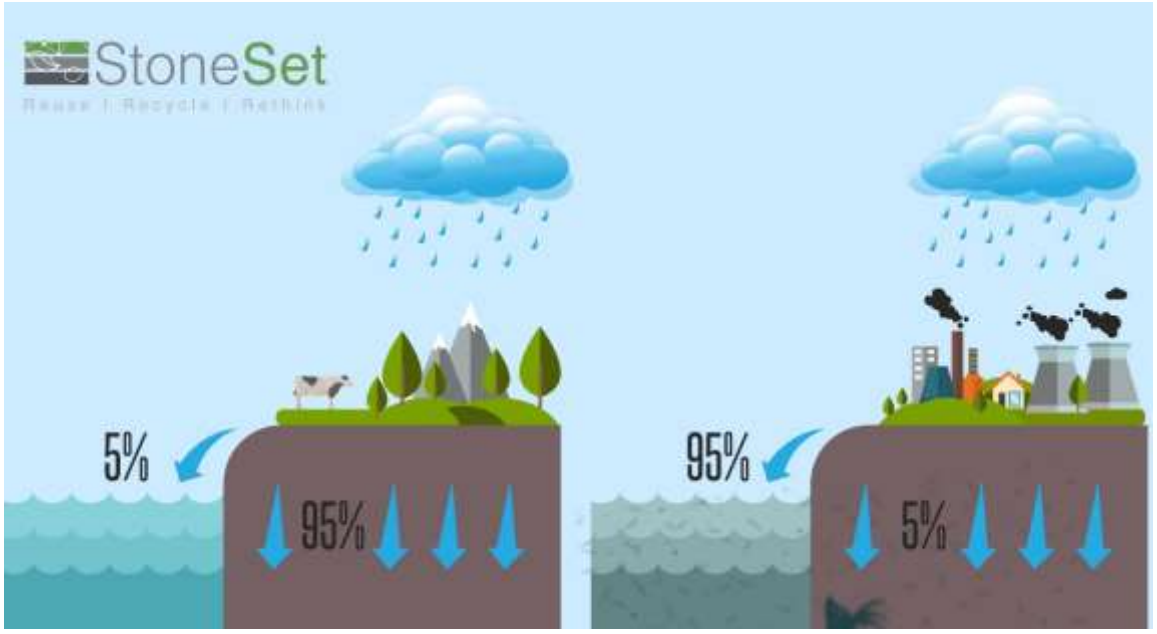
Broadly speaking, two different types of permeable paving are commonly available. The most basic type of permeable paving is modular and consists of paving blocks made from an impervious material. The paving modules are arranged in patterns with gaps between each block to allow water to penetrate. The paving blocks may also have a hollow form, such as a tube, to allow water to drain through aggregate contained in the block. This type of permeable paving has been available for many years and has been in common use in urban design since the 1960s.



More recently, there have been innovations in the material science and the engineering of permeable paving. These innovations have enabled permeable paving to be made from a single highly porous surface. More modern forms of permeable paving offer greater environmental sensitivity, engineering flexibility and aesthetic appeal. Later in this article, we will take a look at innovative permeable paving options in Australia.

Permeable Paving in Water Sensitive Urban Design

Also known as pervious pavement, or porous paving, this design innovation is an important feature of modern building practice. Permeable paving has important environmental, engineering and aesthetic benefits and it can make the difference between approval and rejection for planning applications. To support best practice in building design and construction, Australian governments at federal, state and local levels publish detailed guidelines on Water Sensitive Urban Design (WSUD). Planning applications at state and local levels are more likely to advance if they adhere to WSUD guidelines. Permeable paving is a key feature of WSUD according to many of these guidelines.



In addition to permeable paving's widespread specifications by government in planning guidelines, there is widespread use of permeable paving in public building projects by all levels of government. This surely demonstrates the centrality of permeable paving to best practice in WSUD. For example, Melbourne City council is trialling permeable paving and roads in two projects on Collins Street and near St Kilda Road. It has started installing "rain garden tree pits", which capture stormwater and direct it to the bottom of street trees. Speaking in *The Age*, Councillor Arron Wood, the council's environment committee chair, said the top of CBD towers were also in their sights to turn into gardens or vertical forests. "It's about removing as much of the hard surfaces as possible," he said.

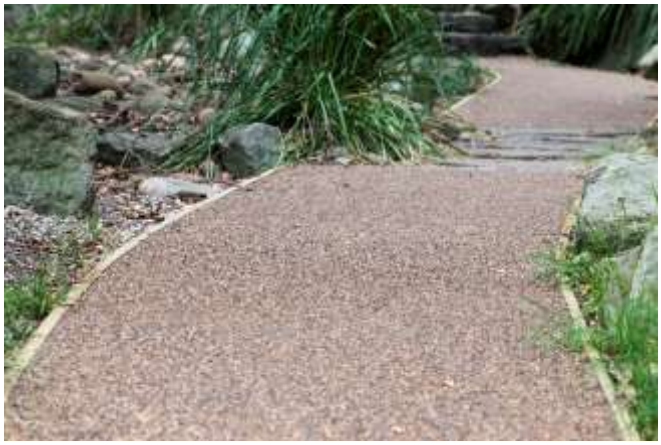
Permeable Paving, Development Applications and Soft to Hard Landscape Ratios

As we have seen, there is widespread recognition of the benefits of permeable paving in best practice WSUD planning guidelines around Australia. However, the prescriptiveness of planning regulations varies considerably and so, inevitably, does the concept of best practice. You should check with the relevant approval authorities for any project but it is unlikely that the use of permeable paving will be required, however it's not mandatory. Why is permeable paving so useful for securing approval for development applications?

The simple answer is – soft to hard landscape ratios. The soft to hard landscape ratio is a design specification that mandates the proportion of permeable surfaces compared to the proportion of impermeable surfaces as a condition for development approval. Local government authorities are unlikely to require permeable paving specifically as a condition of approval. However, permeable paving is often the best solution if a proposal exceeds the minimum permeable/impermeable ratio. Permeable pavements can solve problems created by driveways and footpaths, for example. Installing permeable paving means that these thoroughfares will add to the permeable surface area and improve the soft to hard ratio. Utilising traditional impermeable materials can tip the balance against your development approval.

The sample guidelines below (from The Hills Shire Council) indicate some of the many opportunities permeable paving will provide to advance your application. Permeable paving can help:

- To minimise stormwater runoff and provide the opportunity for on-site groundwater recharge.
- To ensure a high standard of environmental quality in multi dwelling housing developments and the overall visual amenity and character of the neighbourhood.
- To ensure that landscaped areas can be efficiently maintained.
- To avoid the creation of drainage and runoff problems through minimising the amount of impervious area.



The Three Key Benefits of Permeable Paving

The utility of permeable paving for development applications is clear. It may even be the primary driver of its growing popularity. But there is more to permeable paving than soft to hard landscape ratio compliance. Once you commit to using permeable paving to achieve best practice in Water Sensitive Urban Design, you gain access to other compelling benefits.

1. Environmental Sensitivity

By maximising permeable surfaces and minimising impervious ground, your building project will mimic the natural environment. This will reduce the harm to the environment onsite through flooding and erosion. The increased groundwater recharge will mean that maintaining gardens and trees will be less water intensive. Permeable paving will improve runoff quality by filtering some sediments and pollutants and this will reduce pollution by limiting run off which carries pollutants into the waterways.

2. Engineering Flexibility

Intelligent use of permeable paving can reduce the area of land needed to manage runoff, creating more space to be creative with your building design. Reduced (or even zero) peak runoff volumes from paved areas, or even delayed runoff peaks, create the potential to harvest runoff for reuse. Water is a precious resource in Australia and permeable paving can provide storage capacity and reduce flow velocities to enable you to use this resource effectively.

3. Aesthetic Appeal

The Water Sensitive Urban Design Technical Manual for the Greater Adelaide Region lists “being more aesthetically pleasing than conventional paving areas” as a benefit of permeable paving. The range of colours, styles, textures and surfaces available mean that permeable paving can be totally in tune with the surrounding environment or a creative design feature in itself.

Recent Innovations in Permeable Paving

Stoneset, an Australian market leader focussed on sustainable permeable paving, has developed a mixture of resin and recycled car tyres to form a seamless, porous, flexible surface. The resin is blended with high quality aggregate to form the highly permeable surface layer and the recycled car tyres support sub-strata to allow drainage.

- **High void rates from a single seamless surface**

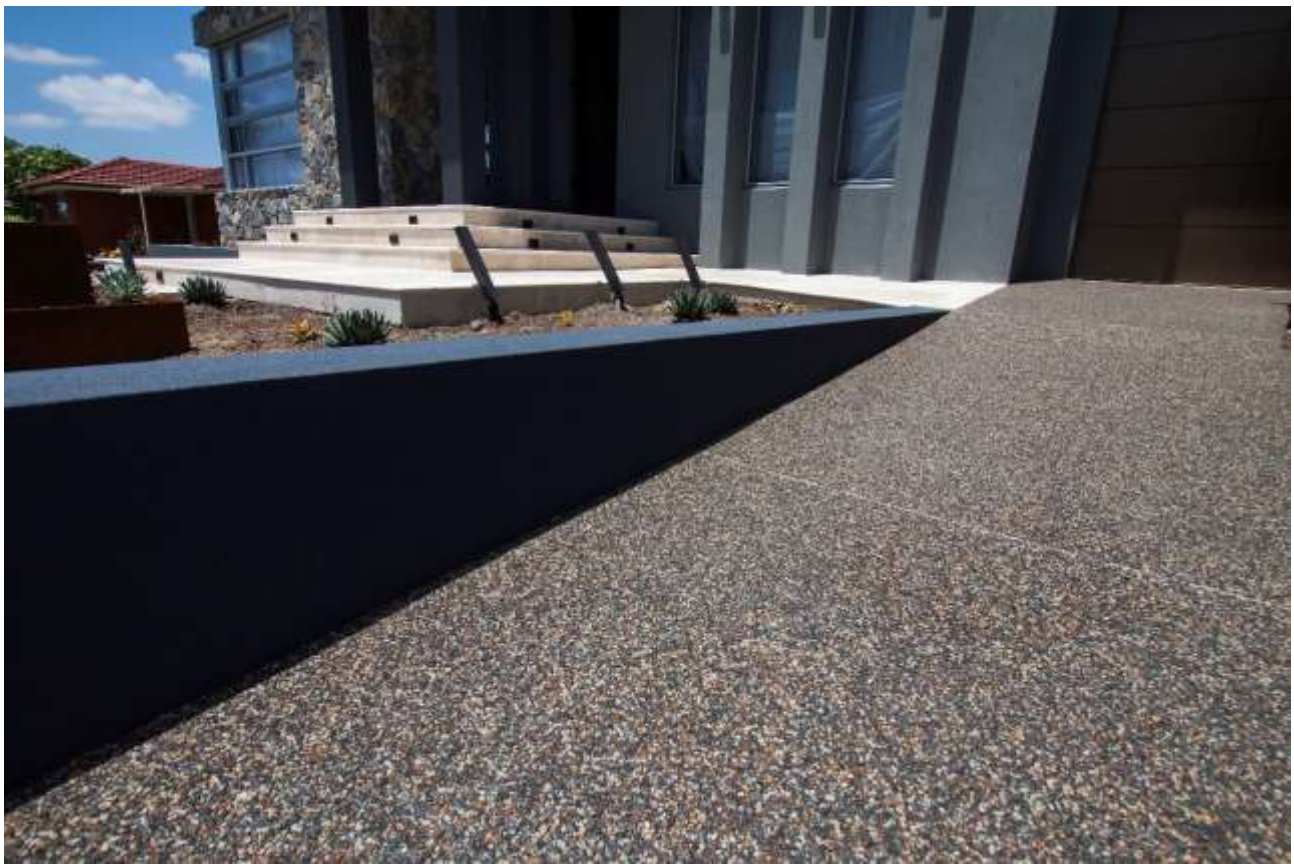
The resulting surface allows rain water to permeate very efficiently, with rates of void approaching 60 litres/m2/second depending on local environmental factors. To cope with these high rates of void, Stoneset supports the innovative permeable surface with 3 compact layers of low fines road base. These layers are covered by a layer of 52 mm recycled plastic gravel/drainage cell filled with 6-10mm recycled aggregate, to provide a load bearing layer. The innovative StoneSet permeable surface is applied over the top of this drainage cell at 25 mm depth.

- **Seamless surfaces for new builds and existing, damaged surface courses**

The Stoneset mixture of resin and high-quality aggregates can provide a new seamless surface or cover an existing surface. Even if the existing surface is impermeable and damaged, StoneSet can provide a new, permeable surface course with minimal preparation and reduced landfill and wastage, which is another environmental benefit. Cracked or undulating concrete, asphalt or tiles can be covered by an attractive new surface course based on Stoneset's mixture of resin and aggregate.

- **Attractive, durable and slip resistant (rain or shine)**

StoneSet's innovative resin aggregate surface layer is available in a wide range of colours and textures. This creative freedom means that Stoneset permeable paving can complement most modern designs. The resin in Stoneset products is UV stable and flexible. The products have been designed with the extremes of the Australian climate in mind. They do not soften in the heat of summer and they do not crack or lift in the cold of winter. The all-weather resin sustains colour and flexes with tree roots and pre-existing concrete, holding the aggregate in place and maintaining void rates, rain or shine. An added bonus is that StoneSet can be mixed to meet the strictest slip resistance standards, which can assist in moving your development application forward. This can be as simple as casting glass dust or sand over the surface as it cures. For challenging terrain such as steep slopes, this can involve the engineered use of sand and crushed rocks.



Permeable Paving Installation and Maintenance: Four Tips for Development Approvals

Choosing permeable paving products involves consideration of the same factors as choosing traditional paving materials, such as breaking load and slip resistance. Additional factors that are unique or particularly significant for permeable paving are provided below. Careful consideration of these factors will ensure that the permeable paved area functions well and looks good. Demonstrating awareness of these factors may also assist with planning approvals.

- **Infiltration capacity**

Clogging, soils with poor infiltration capacity and designs with insufficient storage volume can lead to poor performance. Fortunately, there is a range of modern design techniques to help with potential problems you identify. A retention trench below the sub-base, an overflow to the street, or limiting the runoff area are a few examples.

- **Aquifer contamination**

Shallow aquifers have the potential to become contaminated by toxic materials derived from asphalt, traffic and road use. If you cannot avoid building over a shallow aquifer, consider installing a sand sub-base over a retention trench. Adding a geotextile fabric lining will assist further in capturing contaminants.

- **Structural integrity**

On slopes greater than 5 degrees (10%), consider an engineering assessment of the impact of the paving system on downstream. Consider a similar assessment if you plan to build in an area with high water-table levels, wind-blown or loose sands, shallow soils or clay soils susceptible to collapse in contact with water, or soils with a hydraulic conductivity of less than 0.36 mm/hr. Rock that has little or no permeability is not ideal for permeable paving but severely weathered or fractured rock such as sandstone may enable water infiltration.

- **Vacuuming, High-Pressure Hosing and Resurfacing**

It may seem counter-intuitive to vacuum outside your home or office but recall that permeable paving works like a filter for rain and storm water flows. If the filter becomes clogged, it will be compromised and the permeable paving cannot perform optimally. Regular vacuum sweeping or high-pressure hosing will remove sediments and ensure optimal performance. Permeable paving will benefit from occasional resurfacing from time to time and replacing the sub-strata will remove contaminants. As with traditional paving materials, this will increase the lifetime of permeable paving.

More Information on Permeable Paving

The growing popularity of permeable paving means that basic, modular permeable paving is widely available, as is advice and information on selecting the right materials for optimal performance. For more recent innovations, such as the Stoneset mix of resin and aggregate discussed here, we recommend contacting the manufacturer or a reputable supplier with experience. This will ensure that you have the right advice, whether installing yourself or choosing a builder. A list of references has been provided below to help identify useful information sources. Stoneset can be contacted by phone on 1300 392 155 or by email: mail@stoneset.com.au.

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