# GUIDE TO PERMEABLE PAVING

Concrete Pavers • Stone Pavers • Tiles • Garden Walls & Edging

Retaining Walls • Concrete Sleepers • Concrete Blocks • Wall Cladding

# PERMEABLE PAVERS: A Sustainable Solution for Water Management

Permeable Pavers are growing in popularity due to customers searching for more sustainable paving options. There is now a much larger range of permeable paving options to choose from. Selecting a permeable paver means you are making an eco-conscious decision that benefits your property and the environment.

## What are Permeable Pavers?

Permeable pavers are a remarkable solution that allows rain or surface water to infiltrate through the pavement surface making it an eco-friendly alternative to traditional paving. When these pavers are laid, they create small drainage voids in the pavement surface, enabling rainwater to pass through and into the base below. This innovative design helps alleviate common issues related to water runoff, such as flooding and erosion, while simultaneously promoting groundwater recharge.

Already widely regulated and adopted in countries dealing with overburdened drainage systems, permeable paving helps mitigate the effects of urbanisation on our waterways. As land development increases, impervious surfaces contribute to higher volumes of stormwater runoff, putting stress on drainage and river systems. This can lead to downstream flooding, erosion and other environmental issues.

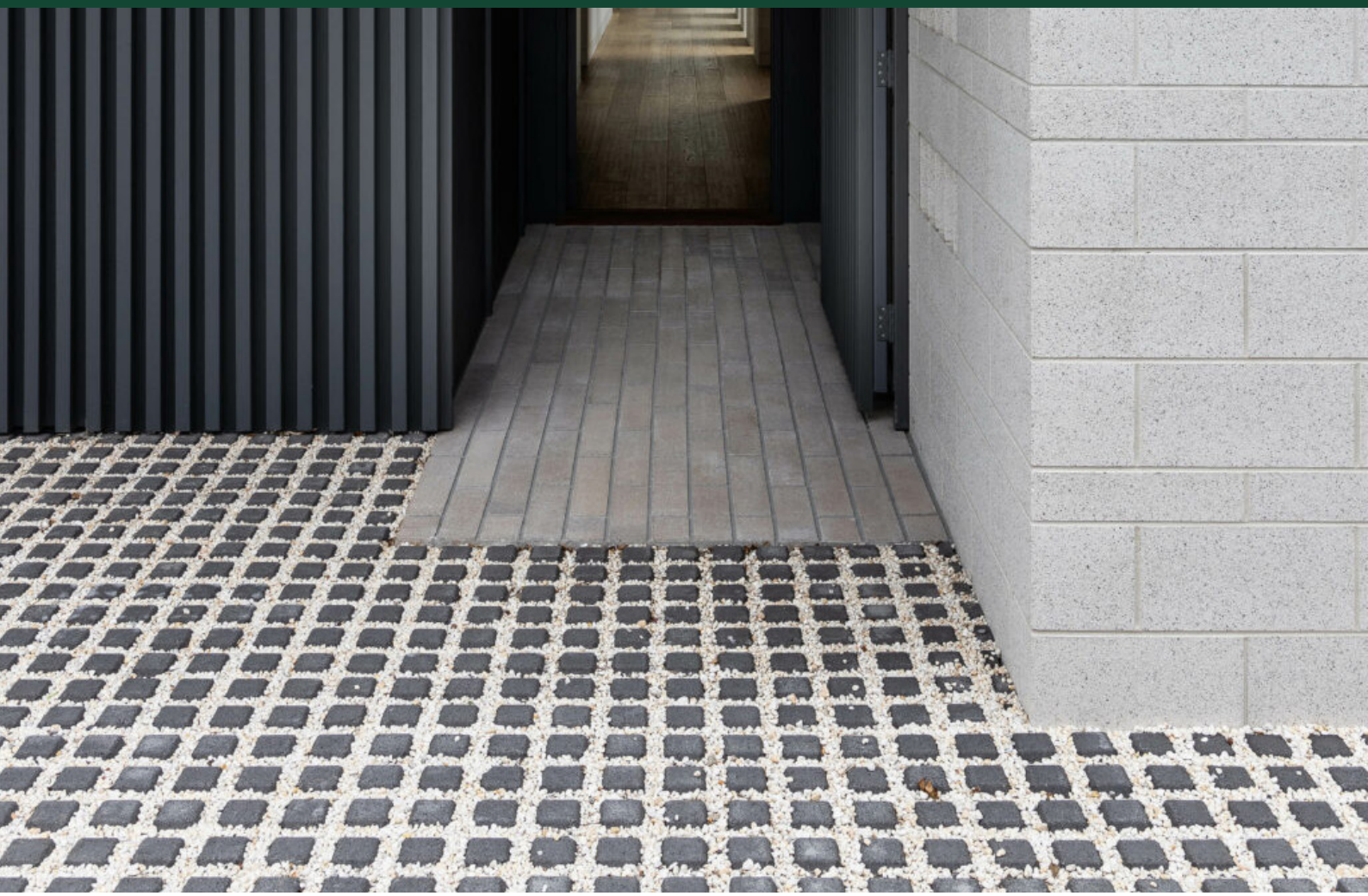
Unlike conventional paving, which channels water and pollutants into existing drainage systems, Australian Paving Centre's range of permeable pavers encourages water to seep into the ground below. This alleviates pressure on drainage infrastructure while benefiting the environment.

## Proper Drainage is Key

To make the most of your permeable pavers, it's essential to ensure that the correct base materials are utilised and installed in the right way. Proper installation guarantees that water is efficiently drained through the pavers, helping to maintain the integrity and performance of your surface. Our team of experts at Australian Paving Centre are here to assist you in choosing the perfect paver and guiding you through the installation process to achieve the best results.

## Benefits of Permeable Paving

- Reduces surface runoff: Minimises stormwater entering overloaded systems.
- Promotes vegetation growth: Allows water and air to reach plant roots.
- Recharges groundwater: Helps replenish underground water tables.
- Reduces heat island effects: Improves air and water circulation.
- Immediate usability: Can be used right after installation.
- Traps pollutants: Prevents harmful substances from entering waterways.
- Mitigates localised flooding: Minimises the risk of flash flooding.
- Reduces downstream erosion: Protects riverbanks and streams.
- Aesthetic appeal: Offers stylish, functional designs.
- Facilitates pollutant decomposition: Supports natural breakdown processes.
- Minimises detention basins: Can reduce or eliminate the need for retention structures.
- Durable and pre-cured: Pavers are shrink-resistant and don't require control joints.



## Why do we need Permeable Paving?

Managing stormwater runoff is becoming increasingly critical in urban areas. Traditionally, stormwater was treated as waste to be quickly disposed of. However, in residential developments, impermeable surfaces prevent water from being absorbed into the ground, overwhelming stormwater systems and waterways.

In natural landscapes, most stormwater seeps into the ground, replenishing groundwater reserves and reducing runoff into local rivers. By contrast, urban environments divert the majority of stormwater into already strained infrastructure.

Permeable paving offers a practical solution to restore this natural balance. By enabling water to filter into the ground, it helps reduce the environmental impact of urbanisation, protect waterways, and manage stormwater sustainably.

## Why Choose Permeable Paving?

Permeable pavers are more than just a functional solution for water management – they also add to the curb appeal of your home. Available in various styles, colours and sizes, these pavers can be customised to suit your aesthetic preferences, seamlessly blending with your landscape.

By choosing permeable pavers, you're making an eco-conscious decision that not only benefits your property but also contributes to a more sustainable environment. The reduced runoff and improved water filtration provided by these pavers can lead to a reduction in water pollution and help conserve precious natural resources.

# DRIVEWAY COBBLES

Driveway Cobbles are a natural stone made from volcanic stone making it extremely hard and durable.

They have a tumbled look with a textured finish and rounded edges where water is able to filter through. Being a natural stone, they are a sustainable option.

These must be laid with a 3-5mm gap and filled with a 1-3mm aggregate to make this permeable.

Do not use paveset.

## Features

- Basalt, hard volcanic stone
- Tumbled cobble
- Lightweight
- Easy to install
- Great for DIY projects

## Suitable For

- Driveways
- Patios and courtyards
- Pathways
- Garden edging
- Garden walls

# ECO GRASS PAVE

Eco Grass Pave is a highly permeable paver that combines functionality with environmental benefits.

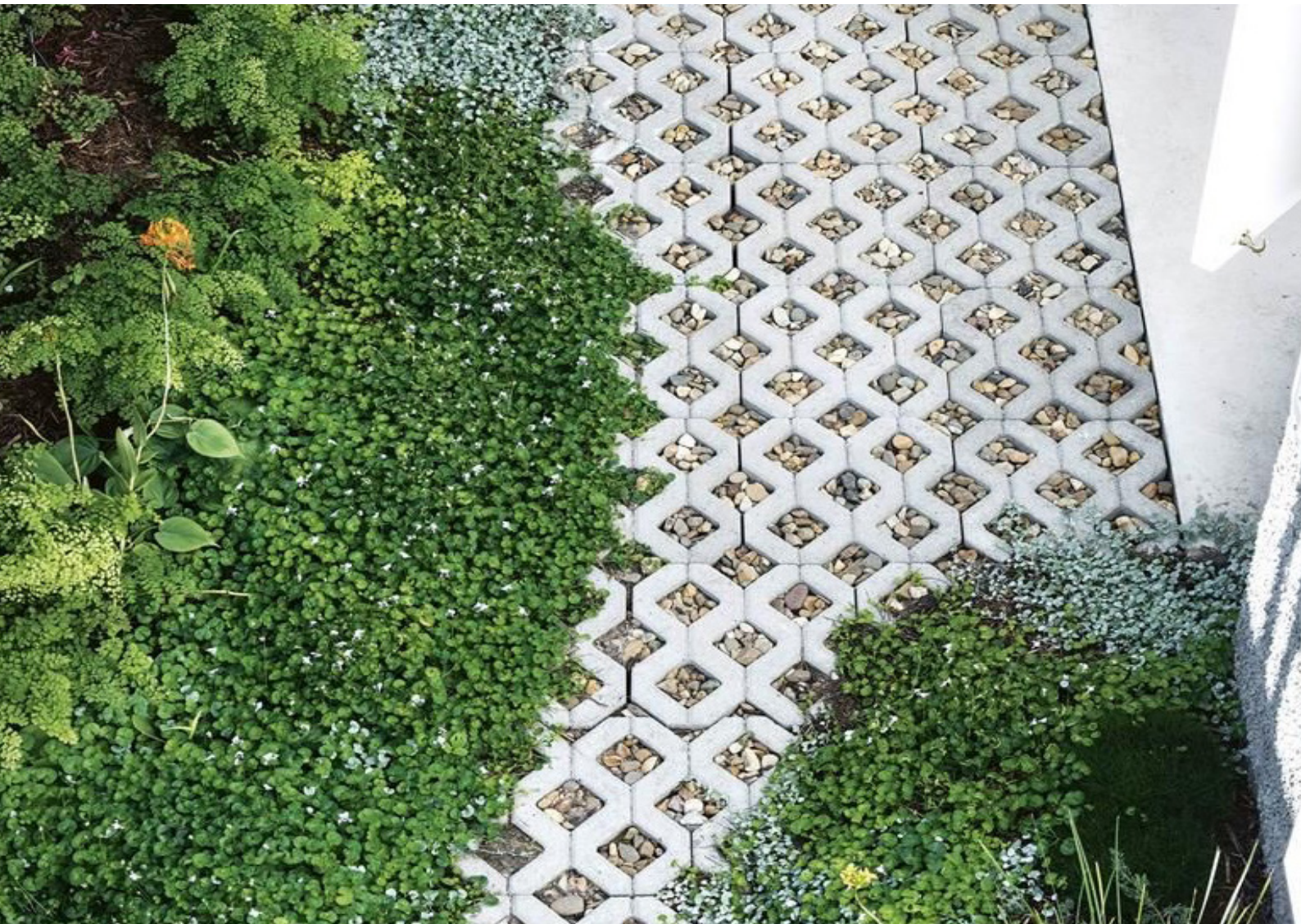
These are specially designed for residential driveways, high traffic pathways and areas with high water content.

## Features

- Grass is able to grow through the paver
- Can use stones in gaps
- Slip resistant
- Strong and durable
- Easy to lay

## Suitable For

- Driveways
- Holiday homes
- Pathways
- Areas where water pools
- Environmental homes



# ECO VILLASTONE®

Eco Villastone® are used for both residential and commercial use.

With its interlocking design, these low maintenance pavers comes in two colours.

## Features

- Low maintenance
- Slip resistant
- Easy to lay
- Strong and durable
- Two colours

## Suitable For

- Driveways
- Holiday homes
- Pathways
- Areas where water pools
- Environmental homes

# ECOPAVE®

Ecopave® is designed for residential, multi-residential and commercial paving applications where water management should be considered.

## Features

- Low maintenance
- Slip resistant
- Easy to lay
- Strong and durable
- Can lay in various paving patterns

## Suitable For

- Streetscapes
- Permeable pavements
- Driveways
- Roadways
- Residential and Commercial

# ECOTRIHEX®

Ecotrihex® is a paver designed for residential, multi-residential and commercial paving applications where sustainable water management should be considered.

## Features

- Select from smooth, honed or shotblast textures
- Unique shape eliminates set lines
- Interlocking style
- Can be used with Trihex® pavers
- Strong and durable

## Suitable For

- Pedestrian footpaths
- Vehicular traffic
- Paved roads
- Carparks
- Commercial and Industrial pavements

# PERMEABLE BRICK PAVER

Permeable Brick Paver are the ideal paving solution for driveways. Perfect for paths through your garden where the grass is often left muddy after rain.

Use for walkways around the house to allow water to seep through. A great sustainable and eco-friendly choice.

## Features

- Low maintenance
- Slip resistant
- Easy to lay
- Strong and durable
- Cay lay in various paving patterns

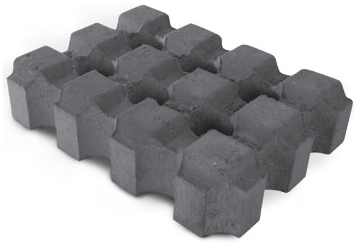
## Suitable For

- Driveways
- Footpaths
- Garden paths and walkways
- Garden edging
- Permeable paving areas

# TURFGRID™

Turfgrid™ is a land stabilisation paver that is a simple solution to control soil erosion around your home

Strong and versatile, these pavers are ideal for driveways and paths where grass is often left muddy.



## Features

- Allows grass to grow within
- Functional land stabilisation
- Can be used with stones or crushed rock
- Tough and durable
- Ideal for muddy areas

## Suitable For

- Driveways
- Garden paths
- Cattle troughs and barns
- Walkways
- Carparks

# DESIGN CONSIDERATIONS

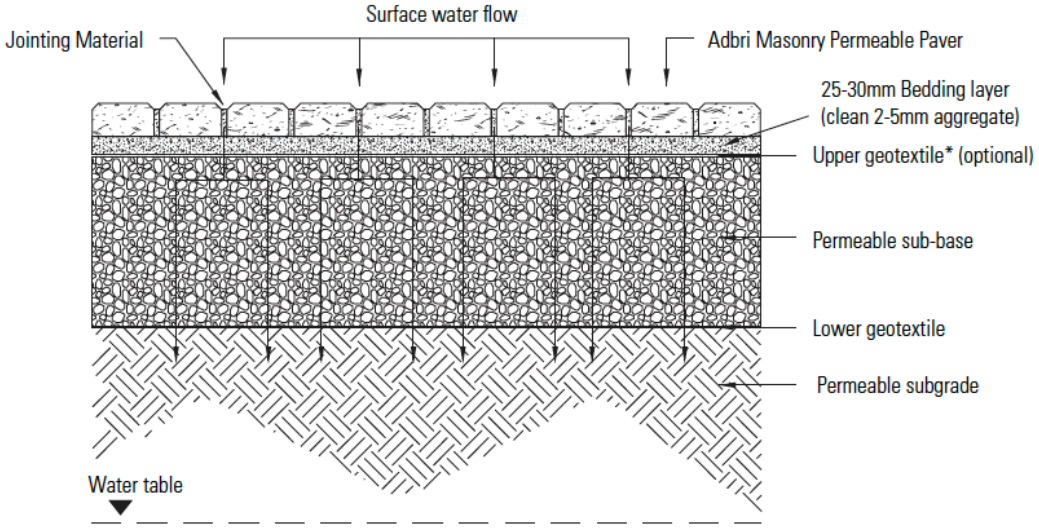
There are three principal systems considered, when designing concrete paving as a wearing surface for permeable pavements. These are designated as Systems A, B and C, and are defined below. The below drawings are for conceptual purposes only and full engineering drawings must be sought before laying commences.

## SYSTEM A: TOTAL FILTRATION

System A allows all water falling onto the pavement to infiltrate down through the joint or voids between the paving and pass through the sub-base layers below and into the subgrade. Depending on the design requirement some water may be temporarily stored in the bedding and sub-base layers prior to passing through into the subgrade.

This is also know as a 'Zero Discharge' system, as no additional water from the pavement is discharged into traditional drainage systems, eliminating the need for pipes and stormwater pits. This system is used wherever the permeability of the existing subgrade material is suitable to absorb the captured volume of water, typically where the natural subgrade material has a CBR exceeding 10%.

* Refer notes on Page 22

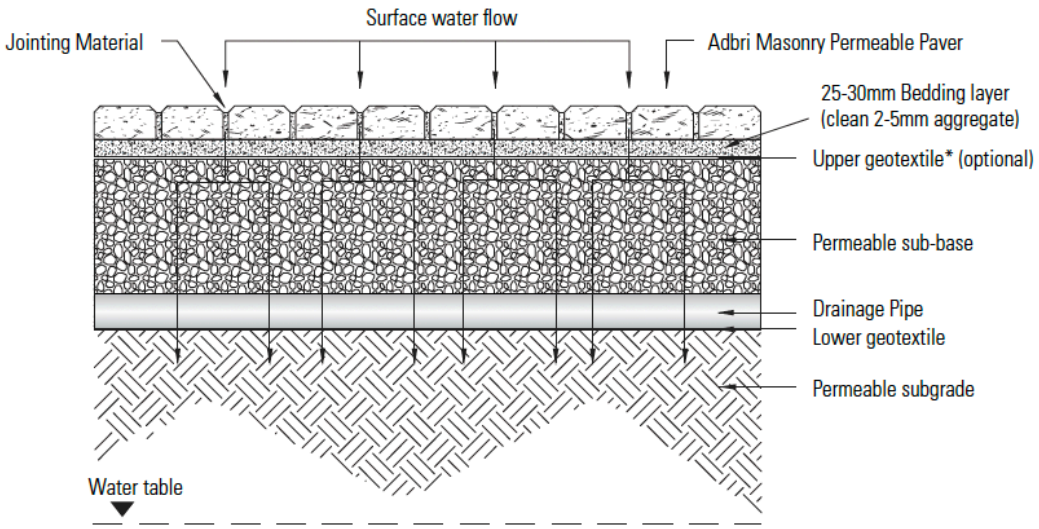



## SYSTEM B: PARTIAL FILTRATION

System B will normally be used where the existing subgrade may not be able to absorb all of the water. As you can see below, outlet pipes are connected to the permeable sub-base and this allows excess water that can't be absorbed to be drained into other devices such as stormwater pits, swales or watercourses. This typically applies where the natural subgrade material has a CBR exceeding 6%.

This system normally only allows a fixed amount to infiltrate down through the system, which normally represents large percentages of the design rainfall. The excess is then collected and discharged, in accordance with local regulations, into stormwater infrastructure or watercourses. This is one method that reduces the volume of runoff, and will likely remove the need for long term storage.

* Refer notes on Page 22




***Jointing material needs to be permeable.***

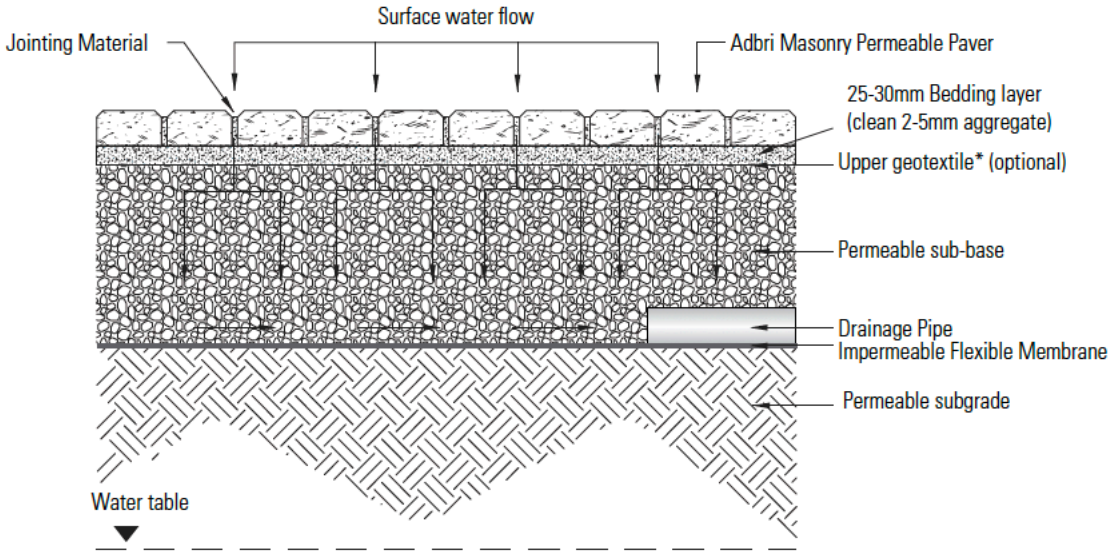
# DESIGN CONSIDERATIONS

## SYSTEM C: NO FILTRATION

System C allows for the complete capture of the water using an impermeable flexible membrane placed on top of the subgrade level and up the sides of the permeable sub-base to effectively form a storage tank. It is used in situations where the existing subgrade has a low permeability or low strength and would be damaged by the introduction of additional water, or where the desire is to harvest the water that enters the system. Outlet pipes are used throughout the impermeable membrane at suitable locations to transmit the water to stormwater infrastructure, treatment plants or watercourses. This system is recommended wherever the natural subgrade material has a CBR lower than 6%.

System C works perfectly for contaminated sites, as it prevents pollutants from entering down into the subgrade and eventually getting washed into the groundwater. This system can also act as an underground retention/detention zone, and sometimes the stored or captured water can be harvested and reused for other purposes such as irrigation.

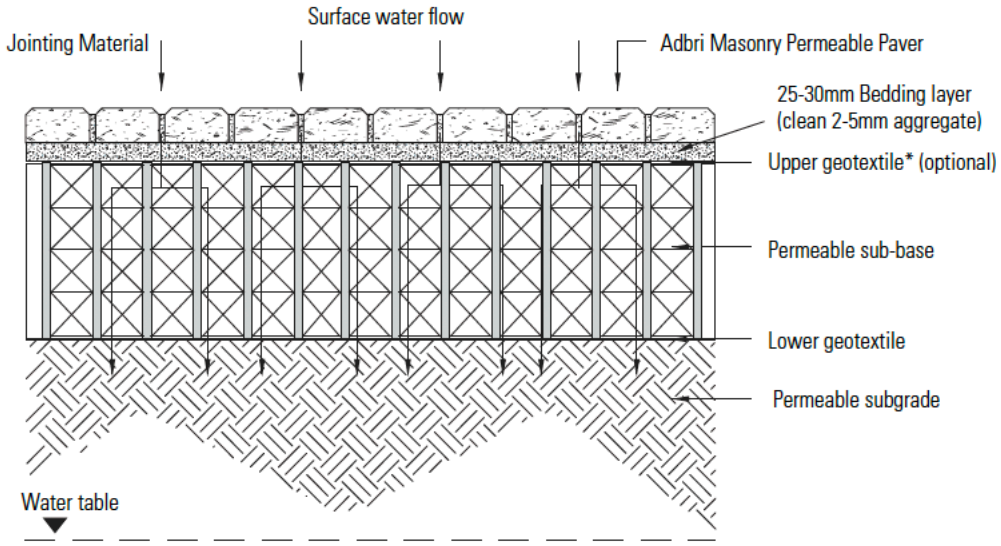
* Refer notes on Page 22




## PERMEABLE SUB-BASE REPLACEMENT SYSTEMS

Another option which can be considered is a permeable sub-base replacement system that can be incorporated into the permeable pavement. The permeable sub-base will normally consist of a series of latticed plastic cellular units connected as a modular structure replacing some or all of the permeable sub-base, depending on the traffic load.

* Refer notes on Page 22




***Jointing material needs to be permeable.***

# DESIGN CONSIDERATIONS

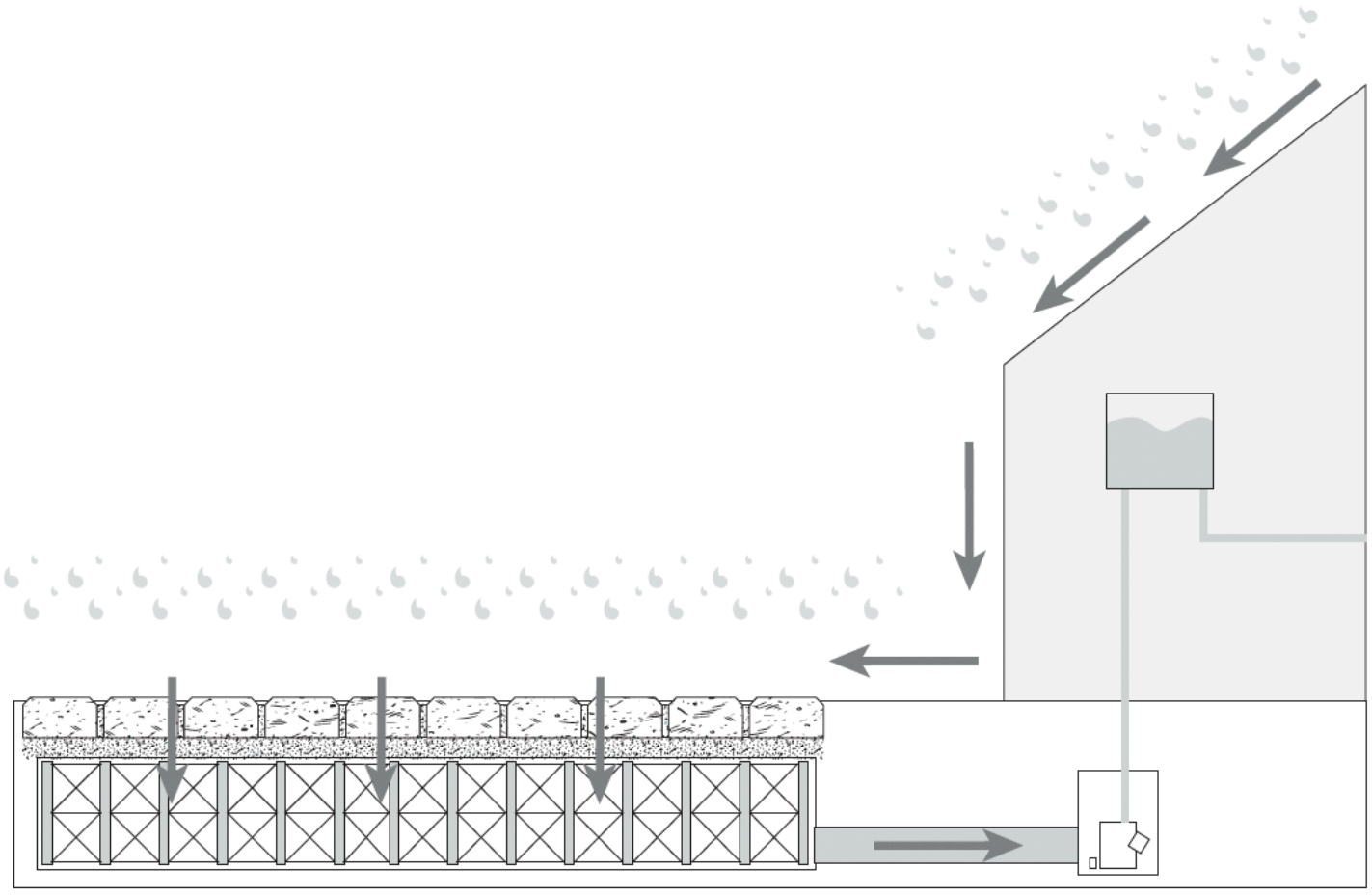
## RAINWATER HARVESTING

This system involves harvesting rainwater from roofs and hard surfaces and using it in or around buildings. The water can be used for a large variety of non-potable uses including, but not limited to, landscape irrigation. This runoff however must be of reasonable quality and free from debris and sediments. Permeable pavements will provide filtration to achieve this. The stormwater can then be stored in the permeable sub-base below a permeable concrete block pavement, or in a tank installed specifically for this purpose. Rainfall detention storage volumes are very different to that of reuse volumes as they both have different requirements

Rainwater Reuse - Needs to be full most of the time to allow the water to be readily available.

Stormwater Detention - Needs to be empty to allow it to temporarily store water from the deluge of rainfall events.

The use of a tank in conjunction with the sub-base will accommodate both of these needs. If, however, you opt only to use the base, this will still be effective, it may just result in runoff occurring if numerous rainfall events occur in close proximity to one another.



# DESIGN CONSIDERATIONS

## SELECTING A PAVEMENT SYSTEM

### Subgrade Permeability

The most important consideration when selecting a Permeable Pavement System is the permeability of the subgrade, which is able to be determined by appropriate testing of the site itself. An infiltration test should be carried out as close to the final formation level of the pavement as possible, which normally means that a lower head of water is to be used to replicate the performance of the permeable pavement.

| | | System A Total Filtration | System B Partial Filtration | System C No Filtration |
|---|---|---|---|---|
| Permeability of subgrade defined by coefficient of permeability k (m/s) | $10^{-6}$ to $10^{-3}$ | ● | ● | ● |
| | $10^{-8}$ to $10^{-6}$ | - | ● | ● |
| | $10^{-10}$ to $10^{-8}$ | - | - | ● |
| Highest recorded water table within 1000mm of formation level | | - | - | ● |
| Pollutants present in subgrade | | - | - | ● |

| Soil Classification | Typical range of coefficient of permeability K (ms) | Typical range of CBR Values |
|---|---|---|
| Heavy Clay | $10^{-10}$ to $10^{-8}$ | 2 to 5 |
| Silty Clay | $10^{-9}$ to $10^{-8}$ | 3 to 6 |
| Sandy Clay | $10^{-9}$ to $10^{-6}$ | 5 to 20 |
| Poorly Graded Sand | $5 \times 10^{-7}$ to $5 \times 10^{-6}$ | 10 to 40 |
| Well Graded Sand | $5 \times 10^{-6}$ to $5 \times 10^{-4}$ | 10 to 40 |
| Well Graded Sandy Gravel | $10^{-5}$ to $10^{-3}$ | 30 to 80 |

### Other Criteria

Concrete block permeable pavement (CBPP) systems are extremely useful where the proximity of trees and other planting is in close contact with the hard surface, as it allows for water and air flow to continue back into the roots of the surrounding flora.

However, as with any drainage system, overflow routes need to be planned in order to cater for extreme circumstances. In addition to this, it is important to maintain statutory service runs in correspondence to the permeable and impermeable paved areas to cater for future maintenance of these specific services

In order to obtain the best possible performance and minimise the issues during construction the following should be considered:

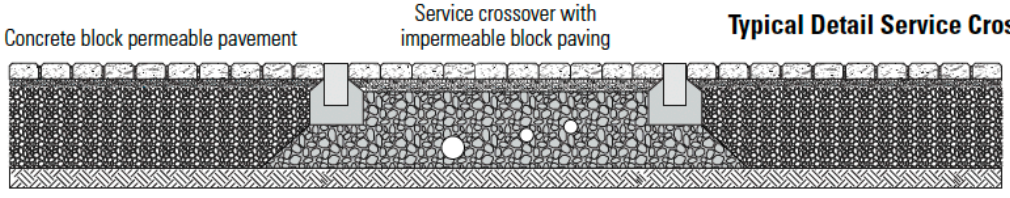
> DO NOT use permeable pavements where there is potential for heavy silty loads from the proposed use.

> It is possible to construct part of an area in impermeable materials that will run off onto the permeable pavement.

> Design of permeable pavements must take account of the overland flow routes of water when the design capacity is exceeded.

### Service Corridors

It is not necessary to design all surface areas as permeable, as CBPP can cope with runoff from adjacent impermeable areas including roofs, up to a ratio of 2:1 impermeable:permeable, depending on anticipated rainfall intensity and base depths.




**Typical Detail Service Cross-over**

## STRUCTURAL AND HYDRAULIC DESIGN

### Design Criteria

Permeable Pavements must be designed in order to achieve two objectives:

> Support the traffic loads

> Manage surface water effectively (i.e. provide sufficient storage)

Design tables have been provided on the following pages for both objectives. The designer should ensure they have used the most conservative value from each table relevant to their design.

### Water Storage Design

In the majority of cases it is not plausible to provide a system which will withstand the greatest rainfall that has ever occurred. It is more economical to tolerate a periodic overflow than to design for every intense storm recorded. A periodic overflow would involve the captured storm water exceeding the storage capacity of the base resulting in water flow over the surface of the pavement.

The table below provides the minimum required base depths for the nominated storm events for each capital city. A deeper base depth may be required for structural adequacy (refer to pages 19 and 20)

| | Required permeable base thickness (mm) | | | | | |
|---|---|---|---|---|---|---|
| Rainfall Data | 10% AEP 30 min storm duration | 10% AEP 2 hour storm duration | 20% AEP 30 min storm duration | 20% AEP 2 hour storm duration | 50% AEP 30 min storm duration | 50% AEP 2 hour storm duration |
| **Location** | | | | | | |
| Adelaide | 100mm | 150mm | 100mm | 120mm | 100mm | 100mm |
| Brisbane | 220mm | 380mm | 190mm | 310mm | 130mm | 190mm |
| Canberra | 110mm | 180mm | 100mm | 150mm | 100mm | 110mm |
| Hobart | 100mm | 130mm | 100mm | 110mm | 100mm | 100mm |
| Melbourne | 100mm | 150mm | 100mm | 140mm | 100mm | 100mm |
| Sydney | 180mm | 300mm | 160mm | 260mm | 130mm | 210mm |

Design Notes:
- Thickness assumes base has void ratio of 25% or greater
- Thickness assumes no additional contributing catchment area
- Limited discharge rate of 0.5L/s applies
- Values are based on ARR 2016 IFD's for nominated capital cities
- Values based on no pre-burst event
- Values are based on minimum required depth for nominated storm event and location
- Values indicate required pavement depth to facilitate stormwater storage for nominated storm events
- Designs have been carried out using the Permpave design software, available to download from www.cmaa.com.au as part of the Designpave package

# DESIGN CONSIDERATIONS

## INDICATIVE PAVEMENT DESIGNS

| Load Category 1 | Load Category 2 | Load Category 3 |
|---|---|---|
| No large goods vehicles | One large goods vehicle per week | Five large goods vehicles per week |
| Private driveway | Small business parking | Local access only street |
| Domestic parking | Motel parking | Parking area residential development |
| Footpath | Major pedestrian thoroughfare | Railway station car park |
| Patio | Sports stadium pedestrian access | Parking small local shopping centre |
| Maximum Design:<br>20 year design life<br>maximum 10 vehicles per day | Maximum Design:<br>20 year design life<br>maximum 200 vehicles per day | Maximum Design:<br>20 year design life<br>maximum 500 vehicles per day |

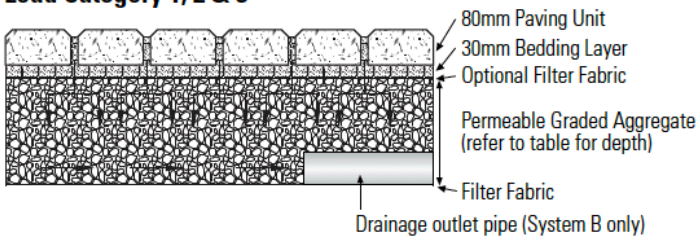
These pavement designs are indicative only and based on conservative assumptions for the nominated design parameters. Adbri Masonry can provide site specific preliminary designs, or preliminary designs for projects where the nominated CBR values or vehicle loadings are not applicable to you projects. To obtain such a design please contact Adbri Masonry on 1300 365 565 and have readily available the following information:

# CBR of subgrade material
# Required design life
# Vehicle types and number of daily vehicle passes
# Purpose of using permeable paving (ie water management, water quality, water harvesting)

## SYSTEM A AND B DESIGNS

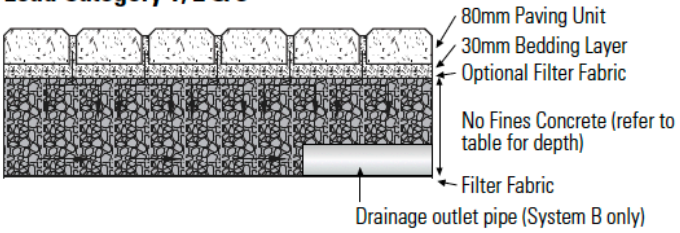
**Depth of coarse graded aggregate**

**Load Category 1, 2 & 3**




**Depth of No Fines Concrete**

**Load Category 1, 2 & 3**




**Mechanistic Design Values**

| CBR of Subgrade | Depth of Permeable Graded Base and No Fines Concrete | | | | | |
|---|---|---|---|---|---|---|
| | Graded Aggregate | | | No Fines Concrete | | |
| | LC1 | LC2 | LC3 | LC1 | LC2 | LC3 |
| 1%* | 400 | 450 | 500 | 200 | 250 | 300 |
| 2%* | 325 | 375 | 425 | 180 | 225 | 250 |
| 3%* | 300 | 350 | 375 | 160 | 200 | 225 |
| 4%* | 280 | 340 | 410 | 150 | 180 | 200 |
| 5%* | 250 | 310 | 380 | 140 | 170 | 190 |
| 8% | 200 | 240 | 300 | 130 | 165 | 185 |
| 10% | 175 | 220 | 280 | 125 | 160 | 180 |
| 15% | 160 | 200 | 250 | 100 | 135 | 175 |

*It is recommended that System C (see page 20) is adopted with an impermeable membrane, due to the potential of reactive clays for CBR of 5% or lower.

Refer table on page 18 for permeable base thickness due to storm water events - if extra depth is required to facilitate anticipated rainfall event, this depth should be utilised in lieu of the mechanistic design values provided above.

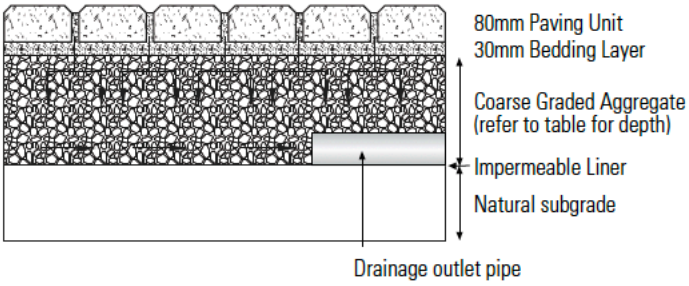
*Designs have been carried out using the Permpave design software, available to download from www.cmaa.com.au as part of the Designpave package

# DESIGN CONSIDERATIONS

## SYSTEM C DESIGNS

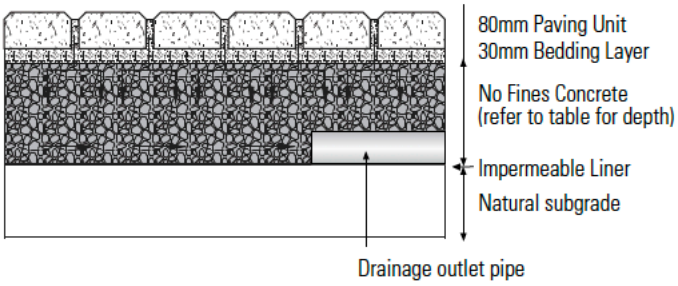
### Depth of Coarse Graded Aggregate - System C

**Load Category 1, 2 & 3**




### Depth of No Fines Concrete - System C

**Load Category 1, 2 & 3**




### Mechanistic Design Values

| CBR of Subgrade | Depth of Permeable Base (mm) | | | | | |
|---|---|---|---|---|---|---|
| | Graded Aggregate | | | No Fines Concrete | | |
| | LC1 | LC2 | LC3 | LC1 | LC2 | LC3 |
| 1%* | 425 | 475 | 525 | 225 | 275 | 320 |
| 2%* | 350 | 400 | 450 | 200 | 250 | 280 |
| 3%* | 325 | 375 | 400 | 175 | 240 | 250 |
| 4%* | 300 | 360 | 375 | 160 | 220 | 230 |
| 5%* | 275 | 325 | 350 | 150 | 200 | 215 |
| 8% | 250 | 250 | 325 | 140 | 190 | 200 |
| 10% | 200 | 225 | 310 | 130 | 175 | 190 |
| 15% | 175 | 210 | 300 | 115 | 150 | 180 |

*Designs have been carried out using the Permpave design software, available to download from www.cmaa.com.au as part of the Designpave package

# SPECIFICATIONS OF CONSTRUCTION

## SPECIFICATIONS AND MATERIALS

### Base Material

A base material with sufficient strength and void capacity to both support the proposed pavement loads, but also allow the water to penetrate through or be captured within the base zone, is extremely important. Base materials may comprise single sized aggregates, or graded permeable aggregates. The higher the proposed loads on the pavement, the more fines will be required to carry the loads, this may result in an increased pavement depth to facilitate water storage in the reduced voids. An alternative method of increasing the strength of the base materials, but maintaining void capacity is to instead use no fines concrete, a cement bound, single - sized 20mm aggregate mix.

### Grading recommendations for unbound basecourse for use in permeable pavements

| Sieve size (mm) | **Dense Graded Granular Base**<br>Heavy Vehicle loads, high traffic loads | **Open Graded Granular Base**<br>Delivery vehicles, regular access by commercial vehicles | **Single Size (uniform) Granular Base**<br>Carparks, limited service vehicles | **Single Size (uniform) Granular Sub-Base**<br>Pedestrian / residential vehicle loads only |
|---|---|---|---|---|
| 80 | | | | 100 |
| 63 | | | | 98-100 |
| 40 | | | 100 | 85-99 |
| 31.5 | | | 98-100 | |
| 26.5 | 100 | 100 | - | |
| 19 | - | 95-100 | 85-99 | 20-70 |
| 13.2 | 71-84 | 70-93 | - | |
| 10 | | | 20-70 | |
| 9.5 | - | 55-85 | | 0-15 |
| 4.75 | 42-60 | 20-75 | 0-15 | 0-5 |
| 2.36 | 27-45 | 10-50 | 0-5 | |
| 1.18 | - | 0-25 | - | |
| 0.6 | - | 0-12 | - | |
| 0.425 | 13-27 | - | - | |
| 0.3 | - | 0-8 | - | |
| 0.15 | - | 0-6 | - | |
| 0.075 | 5-12 | 0-5 | - | |

### Suggested gradings for no-fines concrete base

| Sieve size (mm) | 20mm maximum size |
|---|---|
| 25.5 | 100 |
| 19 | 85-100 |
| 13 | 0-10 |
| 9.5 | 0-5 |
| 4.75 | 0 |
| 2.36 | 0 |
| Typical Cement Content (kg/cu m) | 210 |

### Bedding Layers and Jointing Material

A sufficiently coarse bedding layer is require to allow the vertical flow of water whilst preventing its intrusion into the underlying coarse graded aggregate, yet sufficiently fine to permit the accurate installation of the pavers. The bedding layer and jointing material would fall into the Particle Size Distribution table below.

| Sieve Size (mm) | Percentage Passing (%) |
|---|---|
| 9.5 | 100 |
| 4.75 | 85-100 |
| 2.36 | 10-40 |
| 1.18 | 0-10 |
| 0.3 | 0-5 |

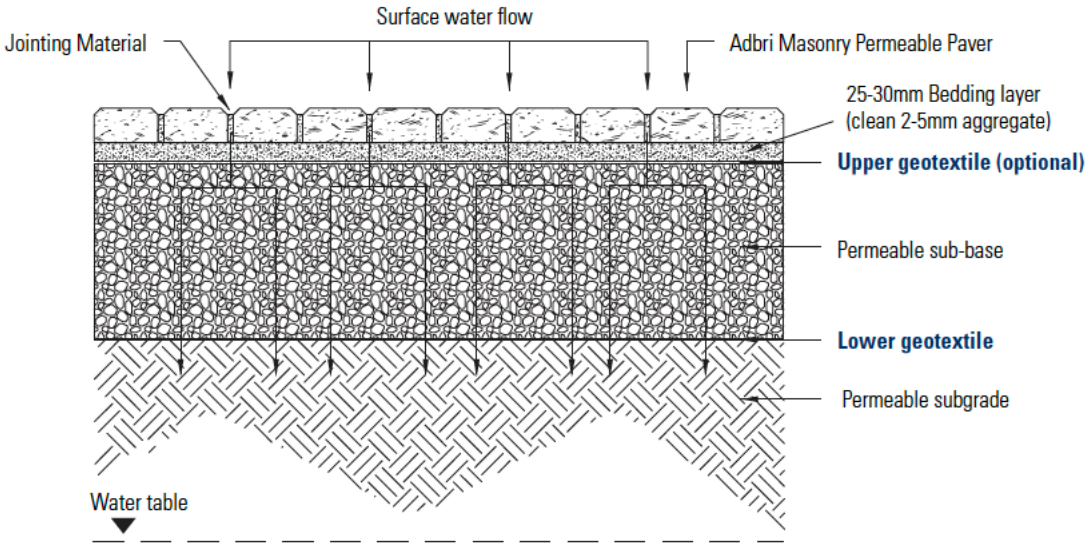
If a geotextile fabric is not used between the sub-base and bedding layer, the different layers of materials must meet conventional soil filter laying course criteria in order to stop the flow of the finer bedding layer material into the sub-base.

### Geotextiles

Geotextile fabrics may be used in two locations within a permeable paving system

> An upper geotextile (optional) at the bedding layer to base course intersection may be included. Adbri Masonry do not recommend installation of this layer in pavements subject to vehicular traffic as it can cause or create a lateral slip failure plane.

> Between the permeable subgrade and subbase for type A and B pavements.



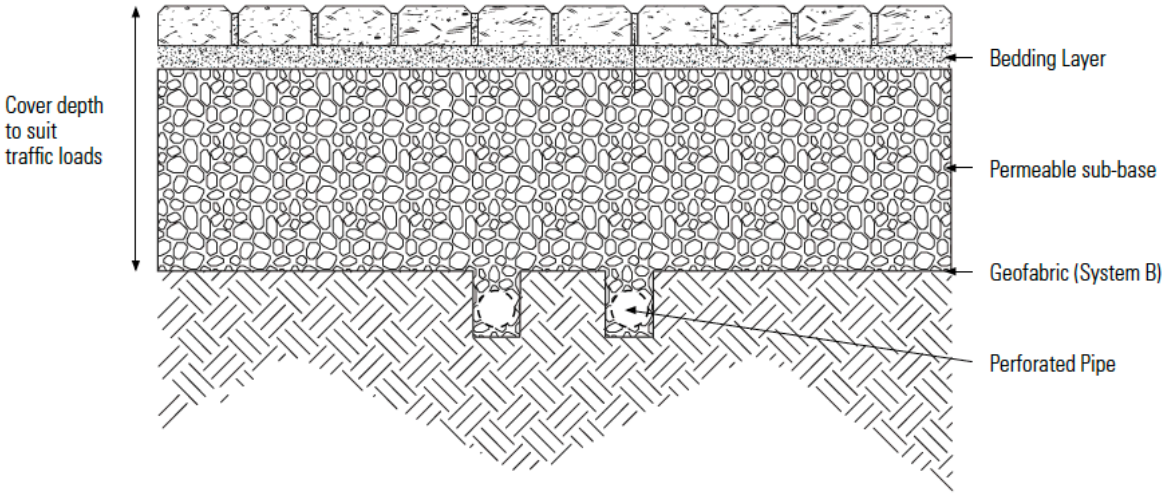

**Jointing material needs to be permeable.*

## DETAILING

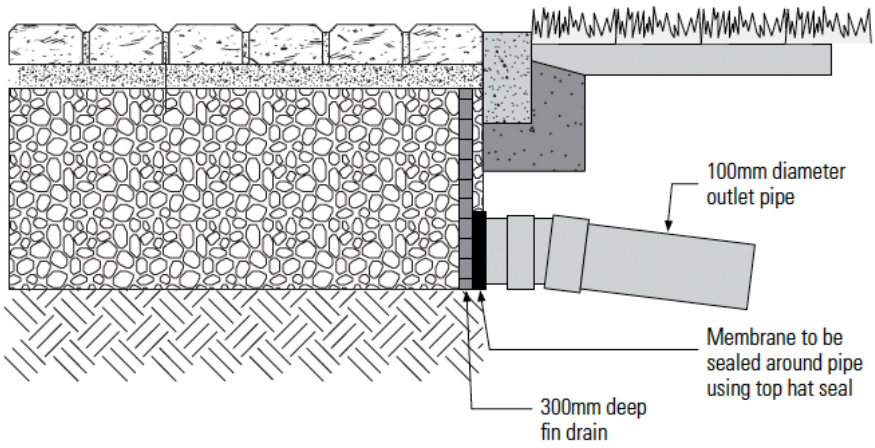
### Outlets and Conveyance

In System B and C, the most effective way of connceting the permeable sub-base to the drainage system is to use fin drains or perforated pipes. If using this method however, the pipes will need sufficient cover in order to carry vehicle loads and may need to be installed in a trench below the permeable sub-base to achieve this.

### For Large Areas of Permeable Paving Perforated Collector Pipes in Trenches can be used to Collect the Water

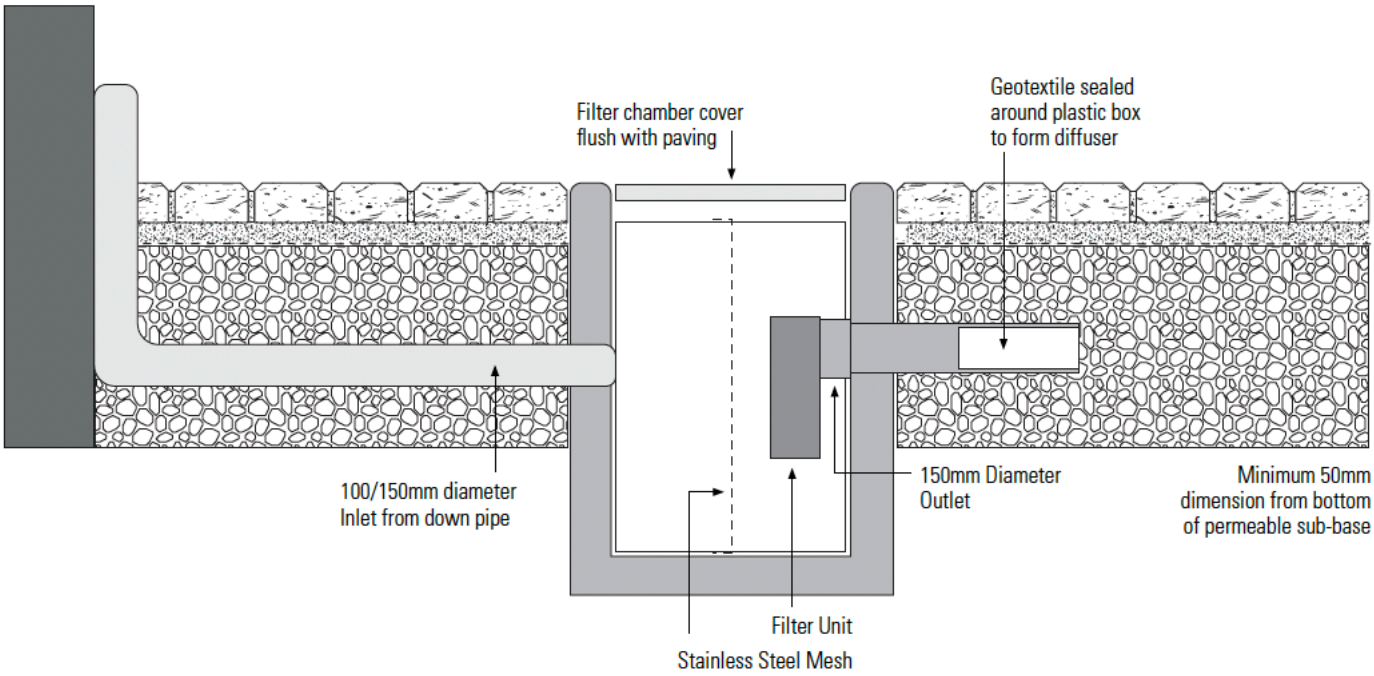



### Collection of Water by Fin Drains

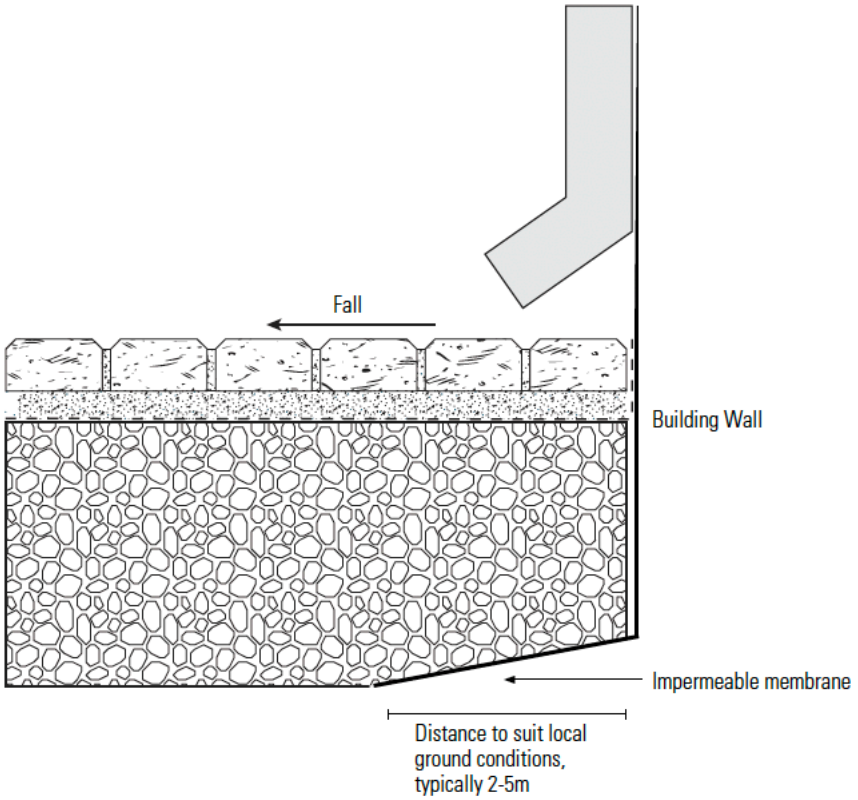


## SPACING OF OUTFLOW PIPES

### Typical Roof Drainage Outlet




### Typical abutment to building



# SPECIFICATIONS OF CONSTRUCTION

## CONSTRUCTION

**Permeable Base Materials**

Due to the fact that the permeable sub-base materials lack fines, there is a potential for segregation in the aggregates during transportation and construction. Remedial, corrective action is required if this occurs. The best way to minimise the chance of segregation occurring is to use a clean, angular, crushed material with a high surface friction.

The nature of grading of the permeable base materials will vary depending on the source, however it is best to undertake a site trial to determine the best construction methodology.

Laying of the sub-base should be completed in 100-150mm layers and compacted throughout to ensure maximum density is achieved for the particular material type and grading, permeable graded aggregates are usually fairly self compacting so heavy compaction is not normally required.

## UNITS OF MEASURE

One of the most common mistakes made when designing permeable pavements is the use of incorrect units. This is because the common parameters are quoted in different units and require conversion when carrying out calculations. The common units and conversions are provided below.

| | Units | | | |
|---|---|---|---|---|
| Parameter | mm/h | m/h | m/s | l/s/m$^2$ |
| Rainfall | 20 | 0.02 | $5.6 \times 10^{-5}$ | 0.0056 |
| Infiltration rate of soil | 3.6 | 0.0036 | $1 \times 10^{-6}$ | 0.001 |
| Flow rate into block surface (through joints) when new | 4500 | 4.5 | 0.0013 | 1.31 |
| Adbri's 10yr Design Value | 324 | 0.324 | 0.00009 | 0.09 |

## PERFORMANCE CHARACTERISTICS

**Surface Infiltration Rates and Clogging**

The percolation through joints will vary depending on the blocks laid, and the aggregate used, however a standard value for a newly laid system is 4,500mm/hour. The aggregates in the system will have a much higher value, at least 40,000 mm/hour. The infiltration rates will decrease from the newly laid value, however, this will stabilise with age, due to the build-up of detritus in the jointing aggregate. Through studies the recommended infiltration rate over a 20 year long design life without maintenance will be roughly 10% the initial value, all designs provided in this literature have allowed for this reduced infiltration rate.

## MAINTENANCE

**Maintaining the Pavers**

It is recommended that the paving system be swept down twice a year as a precaution against clogging, which is no greater than what is recommended for a traditional pavement system.

If the pavement does clog completely over time it may be possible to be able to rehabilitate the area using a road sweeper. Through international tests it has been shown that use of a brush and suction sweeper is less effective then a jet wash and suction sweeper, in cleaning silt from the joints between the blocks.

Soil and other fine materials must always be prevented from contaminating the pavement surface. Water ponding on the surface will almost certainly indicate that the filtration has reached an insufficient level and the joints/voids may require urgent attention, either sweeping clean or in extreme cases replacement. Research has proven that most clogging of the joints or openings in permeable paving only occurs in the top 30-50mm. In extreme circumstances the paving units can be lifted and then relaid with fresh jointing material to create an “as new” pavement.

As with all concrete block pavements, depressions, rutting and cracked or broken blocks, that are considered to be of detriment to the structural performance of the system, or a hazard to users, will require appropriate corrective action.

## INDICATIVE PAVEMENT DESIGNS

| Load Category 1 | Load Category 2 | Load Category 3 |
|---|---|---|
| No large goods vehicles | One large goods vehicle per week | Five large goods vehicles per week |
| Private driveway | Small business parking | Local access only street |
| Domestic parking | Motel parking | Parking area residential development |
| Footpath | Major pedestrian thoroughfare | Railway station car park |
| Patio | Sports stadium pedestrian access | Parking small local shopping centre |
| Maximum Design:<br>20 year design life<br>maximum 10 vehicles per day | Maximum Design:<br>20 year design life<br>maximum 200 vehicles per day | Maximum Design:<br>20 year design life<br>maximum 500 vehicles per day |

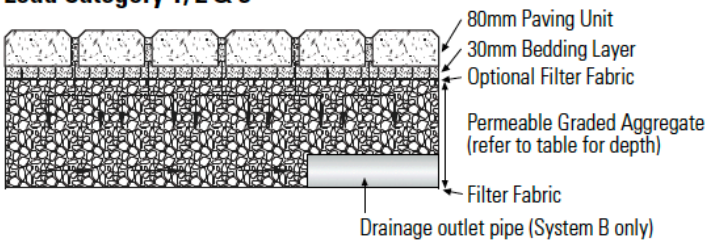
These pavement designs are indicative only and based on conservative assumptions for the nominated design parameters. Adbri Masonry can provide site specific preliminary designs, or preliminary designs for projects where the nominated CBR values or vehicle loadings are not applicable to you projects. To obtain such a design please contact Adbri Masonry on 1300 365 565 and have readily available the following information:

# CBR of subgrade material
# Required design life
# Vehicle types and number of daily vehicle passes
# Purpose of using permeable paving (ie water management, water quality, water harvesting)

## SYSTEM A AND B DESIGNS

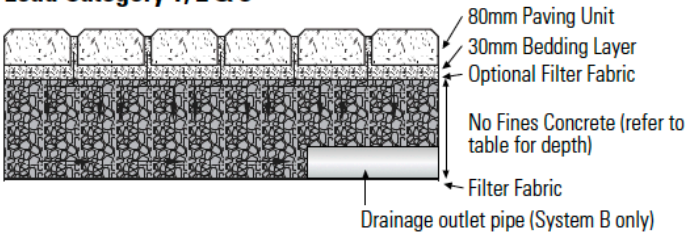
**Depth of coarse graded aggregate**

**Load Category 1, 2 & 3**




**Depth of No Fines Concrete**

**Load Category 1, 2 & 3**




**Mechanistic Design Values**

| CBR of Subgrade | Depth of Permeable Graded Base and No Fines Concrete | | | | | |
|---|---|---|---|---|---|---|
| | Graded Aggregate | | | No Fines Concrete | | |
| | LC1 | LC2 | LC3 | LC1 | LC2 | LC3 |
| 1%* | 400 | 450 | 500 | 200 | 250 | 300 |
| 2%* | 325 | 375 | 425 | 180 | 225 | 250 |
| 3%* | 300 | 350 | 375 | 160 | 200 | 225 |
| 4%* | 280 | 340 | 410 | 150 | 180 | 200 |
| 5%* | 250 | 310 | 380 | 140 | 170 | 190 |
| 8% | 200 | 240 | 300 | 130 | 165 | 185 |
| 10% | 175 | 220 | 280 | 125 | 160 | 180 |
| 15% | 160 | 200 | 250 | 100 | 135 | 175 |

*It is recommended that System C (see page 20) is adopted with an impermeable membrane, due to the potential of reactive clays for CBR of 5% or lower.

Refer table on page 18 for permeable base thickness due to storm water events - if extra depth is required to facilitate anticipated rainfall event, this depth should be utilised in lieu of the mechanistic design values provided above.

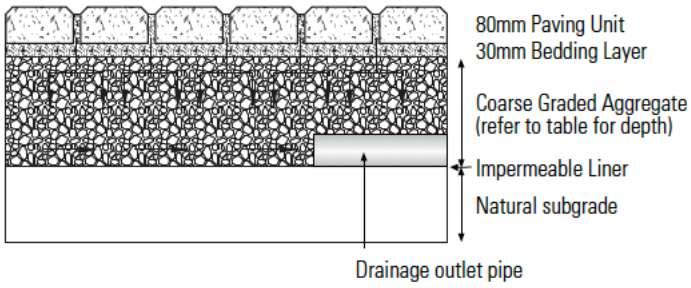
*Designs have been carried out using the Permpave design software, available to download from www.cmaa.com.au as part of the Designpave package

# SPECIFICATIONS OF CONSTRUCTION

## SYSTEM C DESIGNS

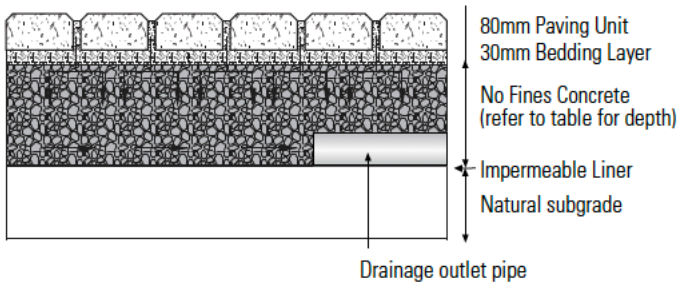
### Depth of Coarse Graded Aggregate - System C

**Load Category 1, 2 & 3**




### Depth of No Fines Concrete - System C

**Load Category 1, 2 & 3**




### Mechanistic Design Values

| CBR of Subgrade | Depth of Permeable Base (mm) | | | | | |
|---|---|---|---|---|---|---|
| | Graded Aggregate | | | No Fines Concrete | | |
| | LC1 | LC2 | LC3 | LC1 | LC2 | LC3 |
| 1%* | 425 | 475 | 525 | 225 | 275 | 320 |
| 2%* | 350 | 400 | 450 | 200 | 250 | 280 |
| 3%* | 325 | 375 | 400 | 175 | 240 | 250 |
| 4%* | 300 | 360 | 375 | 160 | 220 | 230 |
| 5%* | 275 | 325 | 350 | 150 | 200 | 215 |
| 8% | 250 | 250 | 325 | 140 | 190 | 200 |
| 10% | 200 | 225 | 310 | 130 | 175 | 190 |
| 15% | 175 | 210 | 300 | 115 | 150 | 180 |

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# MAINTENANCE

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