Strol™

# SmartPave

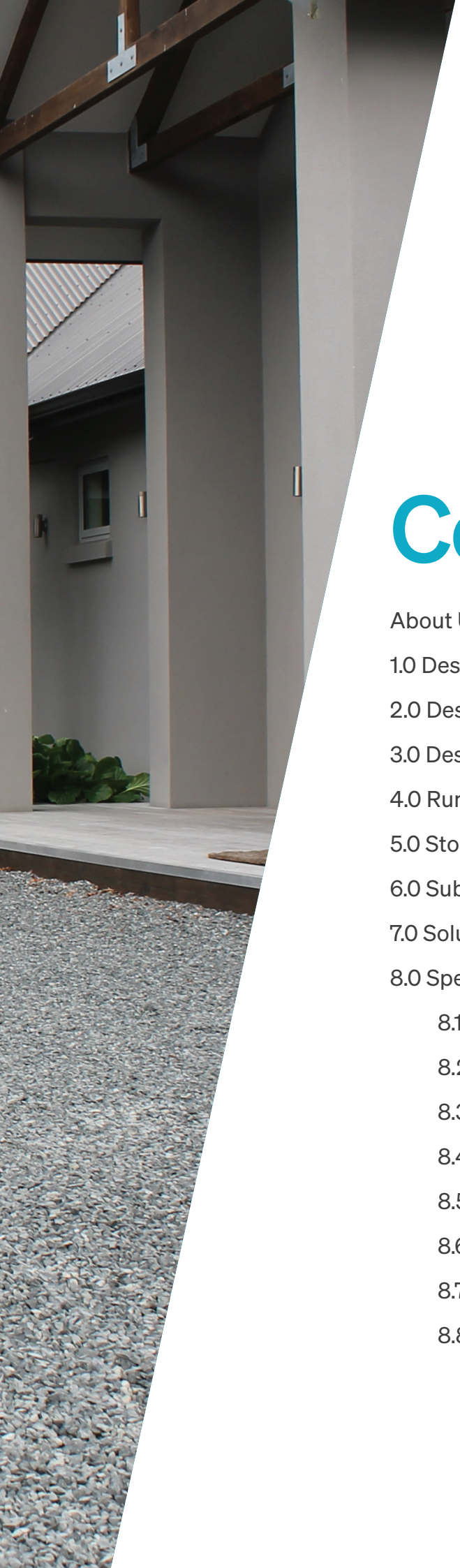
## Technical Specification Guide

ISO: 507253

September 2023

Version 1

- Smarter water management
- Reduce your environmental impact
- Mimic natural water flows
- Prevent scour and erosion
- Supports compliance with regulations
- Customise your style



# Contents

# SmartPave

## ABOUT

SmartPave is an innovative pavement surfacing system consisting of a honeycomb cellular matrix bonded to a non-woven geotextile. It is ideal for creating permeable surfaces with a range of infill stone materials to replace hard systems such as concrete and pavers with a sustainable solution, while providing long term serviceability.

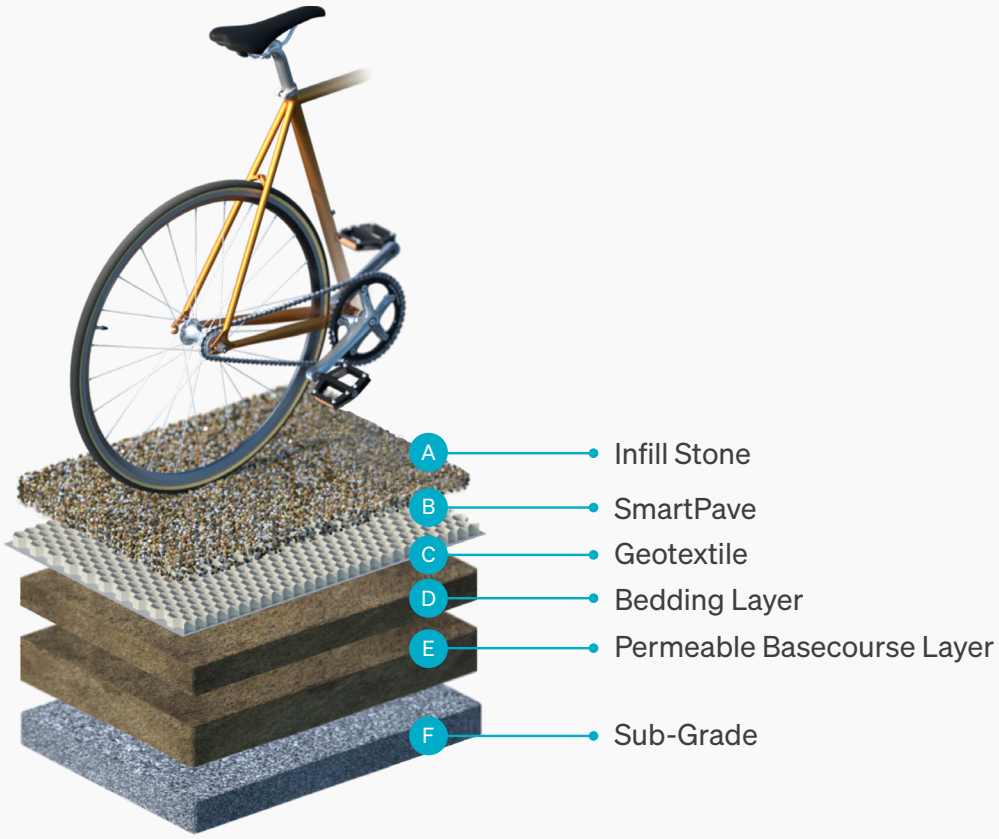
SmartPave allows for Sustainable Urban Design Solutions (SUDS) by providing a system for the design engineer and architect to create permeable spaces with enhanced aesthetic appeal while also providing serviceability for pedestrians and light traffic. SmartPave can be designed for either permeable surfaces, stormwater storage and attenuation, or a combination of both to facilitate compliance with the latest urban design requirements and regulations.

# 1.0 Designing for permeability

Permeable surfaces are defined as a finished surface which provides the required design functionality while allowing rainfall to naturally flow into the ground. The effectiveness of a permeable surface is ultimately governed by both the permeability of the paving system and the soakage rate of the existing subgrade. A smart permeable pavement design will ensure that the paving system has a higher flow rate (or hydraulic conductivity) than the subgrade and a lower runoff coefficient than the predevelopment surface so that the development of the site has a net neutral effect on stormwater runoff.

When used as part of the SUDS for the whole site, SmartPave not only provides sustainability benefits, but can also reduce costs significantly by removing or minimising the need for expensive and disruptive attenuation storage tanks and ponds.

The following detail shows the conceptual installation configuration for a SmartPave installation for permeable paving. For loading conditions and subgrade types see section 6.0

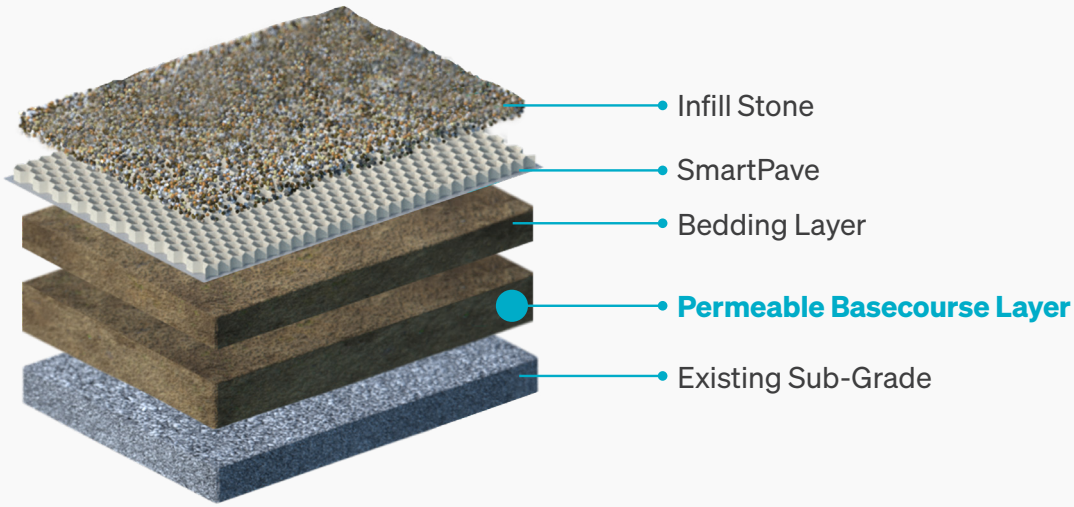



1.1 TYPICAL CONFIGURATION OF PERMEABLE PAVING SYSTEM

# 2.0 Designing for permeability and storage

SmartPave paving systems can also be used for storage of rainfall either to compliment an underground retention system or in some cases to provide the full retention volumes required for a site. This utilises the stone within the cellular structure as well as the storage volumes available within the pavement layers below the surface. In this application, the designer can either utilise the natural soakage of the ground if sufficient or collect and pipe the stormwater from the pavement to a slow-release orifice away from the pavement area depending on the design requirements and the permeability of the subgrade.

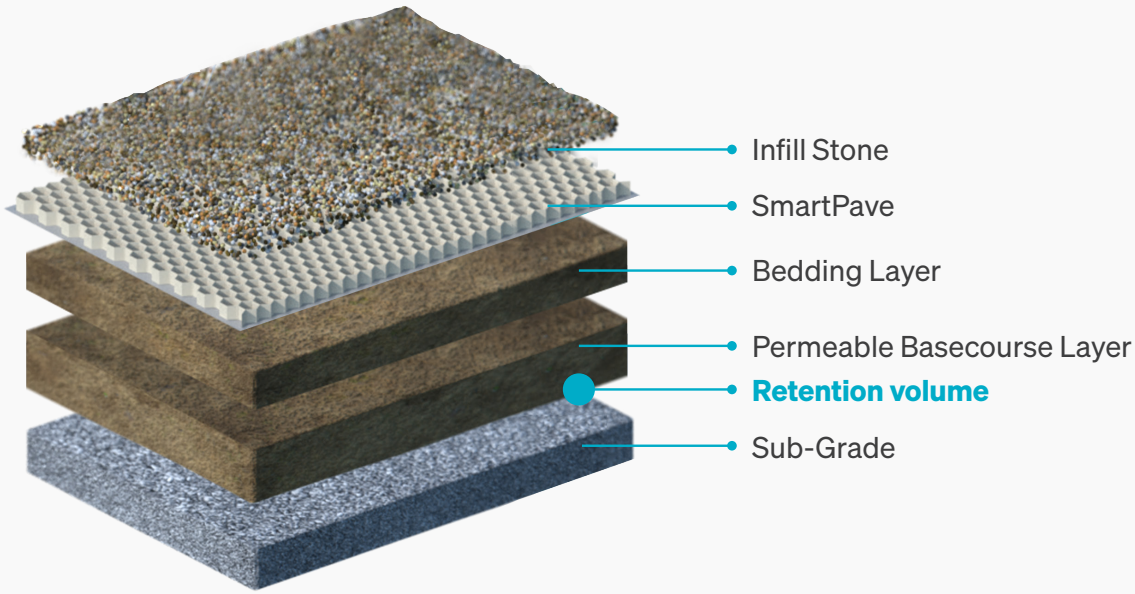
The following detail shows the conceptual installation configuration for a SmartPave installation for permeable paving with additional storage. For loadings and subgrade types see section 7.0




2.1 TYPICAL CONFIGURATION OF PERMEABLE PAVING SYSTEM WITH ADDITIONAL STORAGE

# 3.0 Designing for retention

Some local authorities require a certain amount of water to be retained on site from each rain event then the balance discharged. This can be accommodated by having the discharge from the permeable basecourse set above the subgrade level to allow a predetermined amount of water to remain in the pavement and slowly soak away.




3.1 TYPICAL CONFIGURATION OF PERMEABLE PAVING SYSTEM WITH RETENTION

# 4.0 Runoff co-efficient

The runoff co-efficient is used by the stormwater design engineer to estimate the volume of water that will run off the site in a given design storm event, and therefore the amount that can be expected to soak into the ground or be retained on or within the ground surface. For permeable pavement design we must consider the runoff coefficient of the infill stone material to calculate the total stormwater effects of the site. The stone recommended for infill on SmartPave can be considered to have a runoff co-efficient of 0.2 - 0.3. Other figures may be required by specific regulations in the project area.

# 5.0 Storage volumes

A significant advantage of a permeable pavement system is the ability to store water within the pavement. The amount of water storage is dependent on the aggregate type and grading, and this figure will be available from the aggregate supplier, often called the porosity value. For the SmartPave system the following can be assumed in the absence of specific data.

| | |
|---|---|
| Recommended infill material | 30% void |
| Permeable basecourse material | 30% void |
| Washed 20/40 drainage aggregate | 38% void |
| Compacted sand | No significant storage |
| GAP Foundation materials | No significant storage |

The available storage can then be calculated as the total volume of stone times the porosity value. For example, a 50 square metre pavement area with a 150mm permeable pavement and SmartPave would contain the following volumes.

| | |
|---|---|
| Infill within the pavers | 50 × 0.038 × 0.3 = 0.57 cubic metres of storage |
| Permeable pavement layer | 50 × 0.15 × 0.3 = 2.25 cubic metres of storage |
| Total Storage within the pavement | 2.82 cubic metres or 2820 litres |

# 6.0 Subgrade strength

Knowing the strength of the underlying ground is critical to establishing the correct pavement thickness. For residential and commercial paving applications, and low volume roads, the strength of the existing ground to 0.5 – 0.75m below the surface is considered in establishing the subgrade strength to use in design. Whilst pavement engineers often use the Elastic Modulus of the subgrade, it is more common for low volume paved areas to consider the Californian Bearing Ratio (CBR) This can be measured with a direct CBR test or inferred from DCP testing. In the absence of reliable test data, the following correlations may be useful.

### Approximating CBR Value from a Dcp (Dynamic Cone Penetrometer)

| mm/blow | Inferred CBR |
|---|---|
| 100 | 2% |
| 50 | 4% |
| 30 | 6% |
| 20 | 10% |
| 15 | 15% |

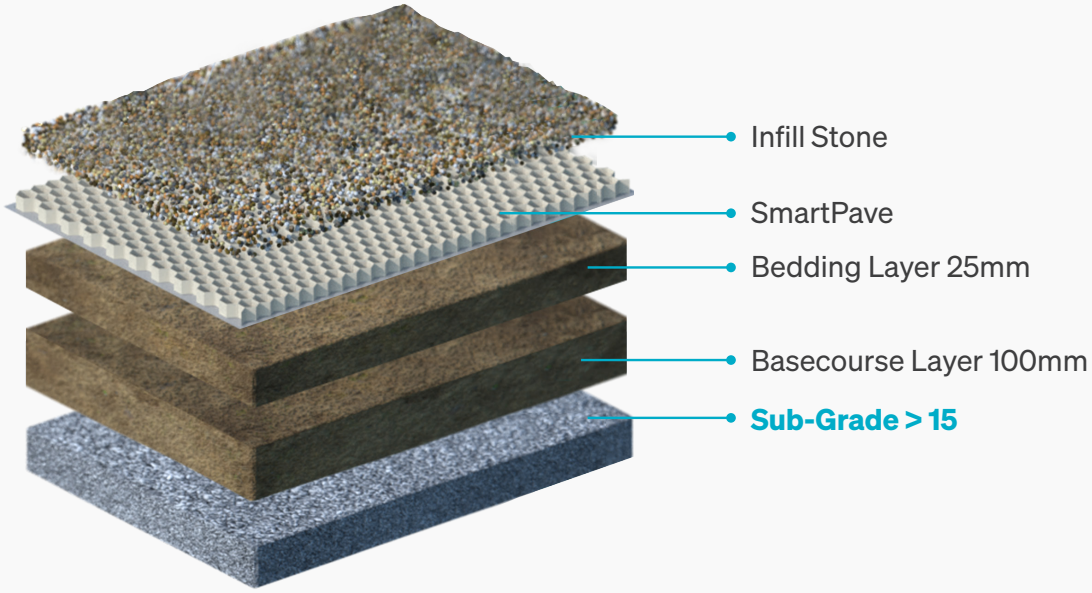
# 7.0 Solutions for poor subgrades

A suitably qualified pavement designer should be engaged to select the correct pavement thickness and materials based on the site conditions and traffic loads. The following information can assist in the design process.

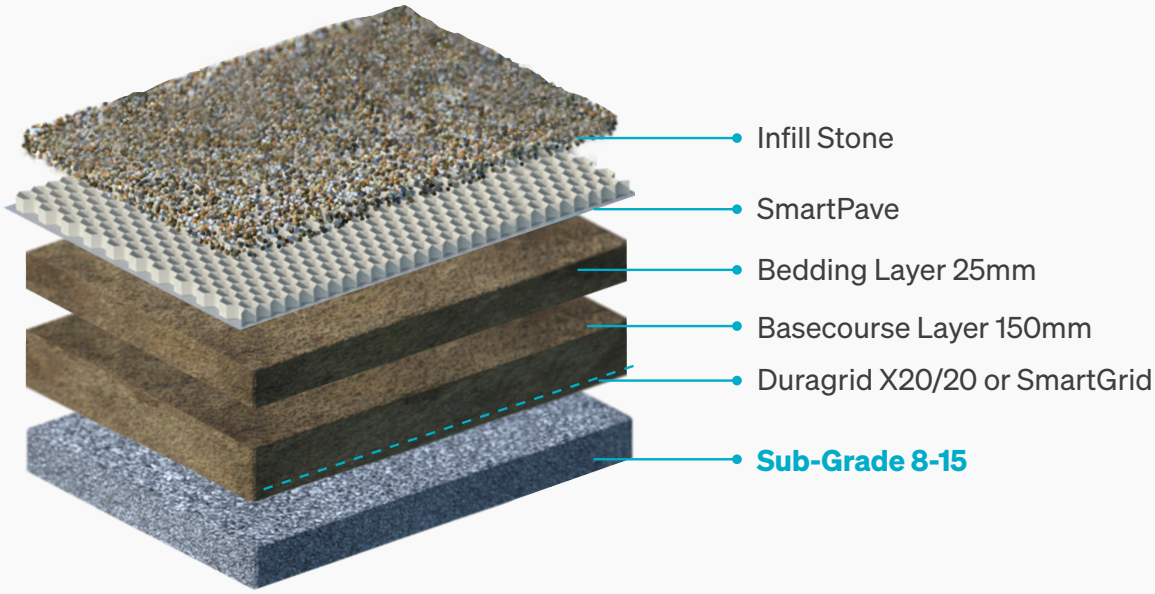
Any pavement configuration which uses a GAP40 or GAP65 sub base layer for additional strength will require a piped outlet for the water as per figure 1.2

The following layouts assume predominantly light vehicles with the occasional heavy vehicle such as would be expected in a residential of commercial parking area.

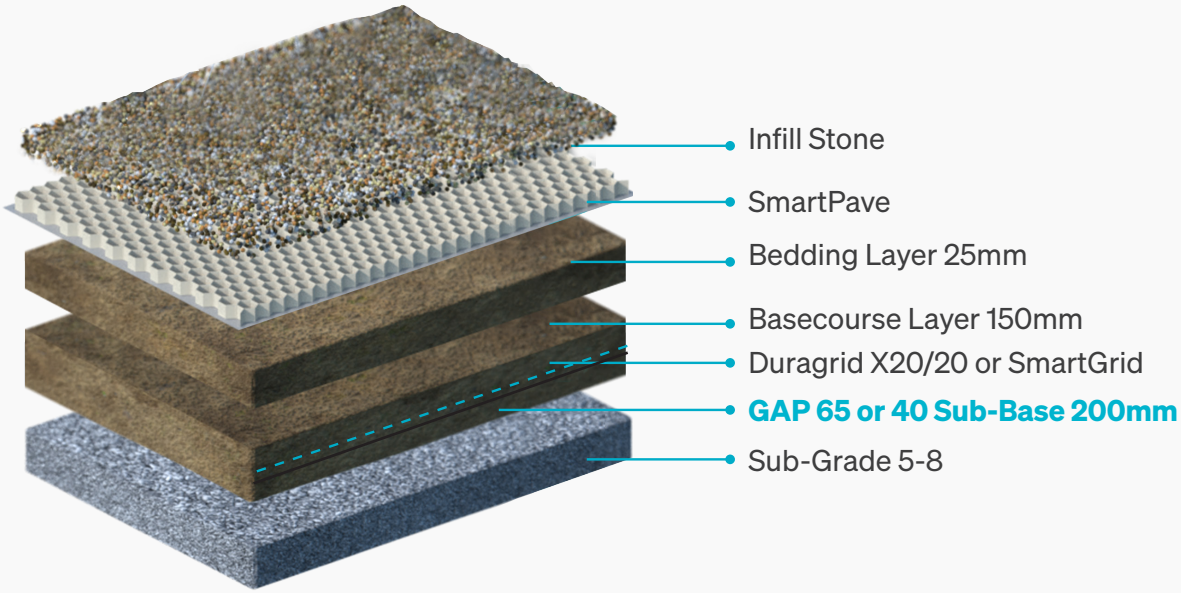
## 6.1 PAVEMENT LAYOUT FOR SUBGRADE CBR > 15%



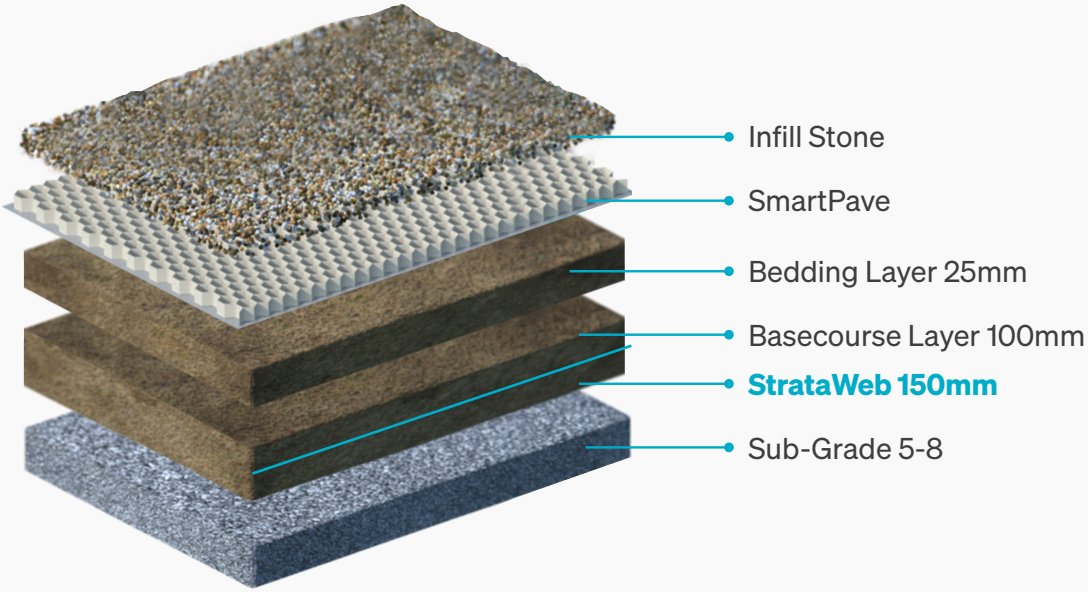

## 6.2 PAVEMENT LAYOUT FOR SUBGRADE CBR 8%-15%



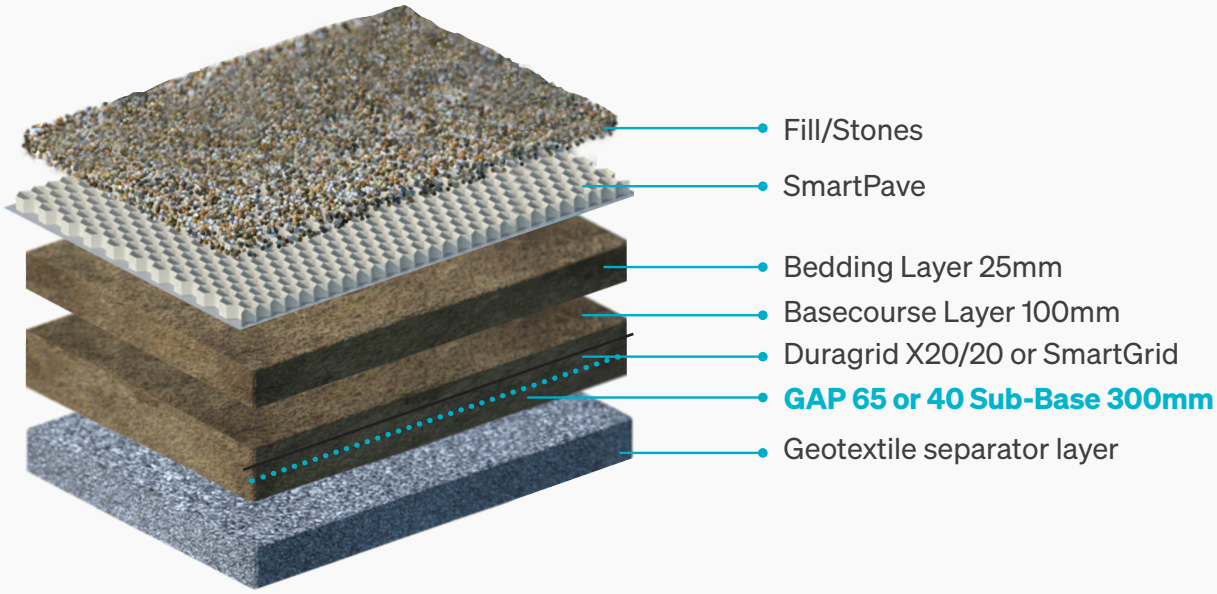
## 6.3 PAVEMENT LAYOUT FOR SUBGRADE CBR 5%-8% WITH SUBBASE



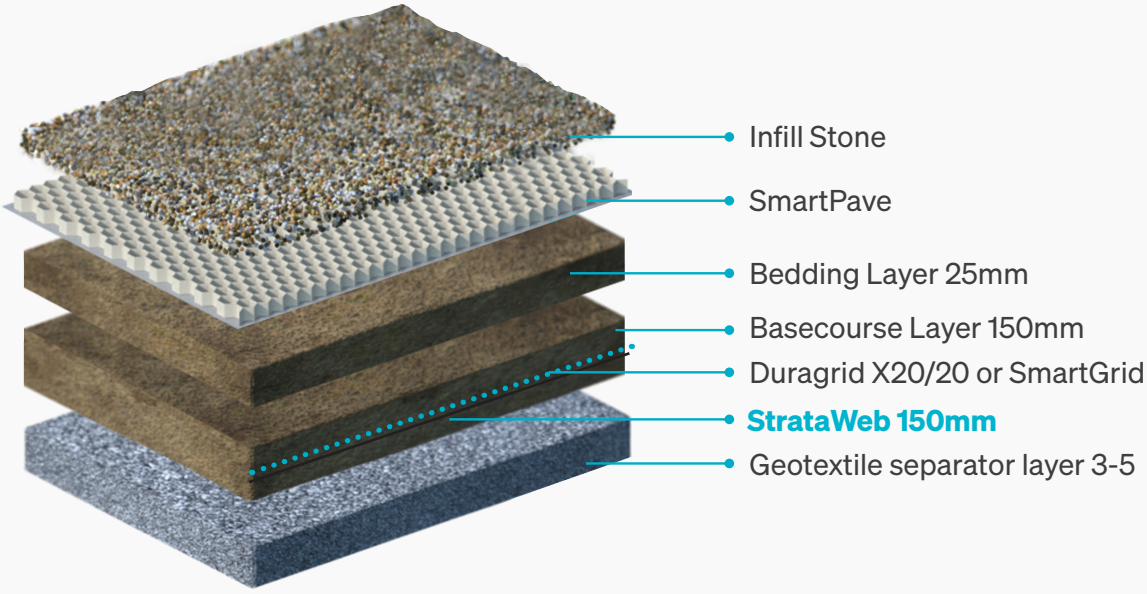

## 6.4 PAVEMENT LAYOUT FOR SUBGRADE CBR 5% - 8% WITH STRATAWEB



## 6.5 PAVEMENT LAYOUT FOR CBR 3%-5% WITH SUBBASE




## 6.6 PAVEMENT LAYOUT FOR CBR 3-5 WITH STRATAWEB




## 6.7 ANY CBR < 3% WILL REQUIRE SITE SPECIFIC DESIGN

# 8.0 Specifications

## 8.1 SmartPave

The Permeable Paving system shall be SmartPave supplied by Cirtex Industries Ltd or Cirtex Industries Pty Ltd. The Paving system must be manufactured in a facility accredited to an ISO 9001:2015 quality assurance system and be 100% recyclable PET or PP. All product shall be checked upon arrival on the site to ensure it is free from defects and damage.

## 8.2 Basecourse aggregate

The basecourse aggregate must be a hard angular chip with majority of broken faces. The aggregate shall be well graded with a maximum particle size of 20mm and a minimum particle size of 2.36mm.

An example of a suitable grading is given here.

| SIEVE SIZE (MM) | WPB12 | |
|---|---|---|
| | UPPER LIMIT | LOWER LIMIT |
| 19.0 mm | 100 | 100 |
| 13.2mm | 95 | 100 |
| 9.5mm | 75 | 90 |
| 6.7mm | 50 | 75 |
| 4.75mm | 30 | 50 |
| 2.36mm | 0 | 10 |

SPECIFIC REQUIREMENTS:

- The material shall produce less than 10% fines under a load of 120kN when tested in accordance with NZS 4407:1991 Test 3.10
- The material shall contain no deleterious material such as organic or clay material.
- The broken face content shall be not less than 70% by weight and have 2 or more broken faces when tested in accordance with NZS 4407:1991 Test 3.14

## 8.3 Surface fill aggregate

The stone used to fill the pavers must have a maximum particle size of 20mm and a minimum particle size of 3mm. A large variety of decorative stone types can be used.

## 8.4 GAP Base aggregate

The subbase material may be either GAP40 or GAP65. This is required for soft subgrades and is not considered permeable. When GAP products are used, additional drainage is required to discharge to water stored in the pavement. The grading envelope must comply with the following requirements.

| GAP 65 | PERCENTAGE PASSING | |
|---|---|---|
| APPERTURE SIZE (mm) | LOWER LIMIT | UPPER LIMIT |
| 65 | 100 | 100 |
| 37.5 | 80 | 90 |
| 19 | 50 | 70 |
| 9.5 | 30 | 55 |
| 4.75 | 20 | 40 |
| 2.36 | 15 | 30 |
| 1.18 | 10 | 22 |
| 0.6 | 6 | 18 |
| 0.3 | 4 | 14 |
| 0.15 | 2 | 10 |
| 0.075 | 0 | 7 |

| GAP 40 | PERCENTAGE PASSING | |
|---|---|---|
| APPERTURE SIZE (mm) | LOWER LIMIT | UPPER LIMIT |
| 37.5 | 100 | 100 |
| 19 | 61 | 80 |
| 9.5 | 38 | 57 |
| 4.75 | 23 | 43 |
| 2.36 | 10 | 33 |
| 1.18 | 7 | 25 |
| 0.6 | 2 | 19 |
| 0.3 | 0 | 14 |
| 0.15 | 0 | 10 |
| 0.075 | 0 | 7 |

## 8.5 Bedding material

Bedding material must be a course angular granular material such as a sharp sand or fine well graded material with maximum particle size of 5mm and no fines passing the 75 micron sieve

## 8.6 Geotextile

Geotextile where required must be Duraforce or SureTex needle punched non-woven fabric designed for separation and filtration

## 8.7 Geogrid

Geogrid must be SmartGrid or DuraGrid X Polypropylene UV stabilised geogrid.

## 8.8 StrataWeb

StrataWeb is an HDPE cellular web with a textured surface for enhanced frictional interaction with the soil, and integral drainage features to prevent pore pressure build up. Alternative products are not permitted in SmartPave designs.

Strol™

+61 2 9066 6716
sales@strol.com.au