

Paving a Residential Driveway

Concrete segmental pavers are the ideal material for constructing suburban driveways.

Strong, durable, and aesthetically appealing, a correctly laid concrete paver driveway will stand up to almost anything you can drive on it.

Although they are not difficult to install, the need for driveways to cope with vehicles means that they require a bit more thought and planning than a standard residential pathway.

This flyer outlines some of the things you may need to consider if you plan to build your own segmental pavement driveway.

SOME USEFUL TERMS

SUBGRADE	The ground on which the pavement is to be placed
SUB-BASE	An optional layer of soil placed between the excavated subgrade and the basecourse material
BASECOURSE	The layer of material placed on either the subgrade or sub-base to support the surface course
SURFACE	The layer that includes the pavers and a course of bedding material
EDGE RESTRAINT	A row of pavers or other material that provides an edge to the pavement, and ensures that the pavers do not move
JOINTS	The gaps between pavers, which are usually filled with sand or grout to prevent displacement

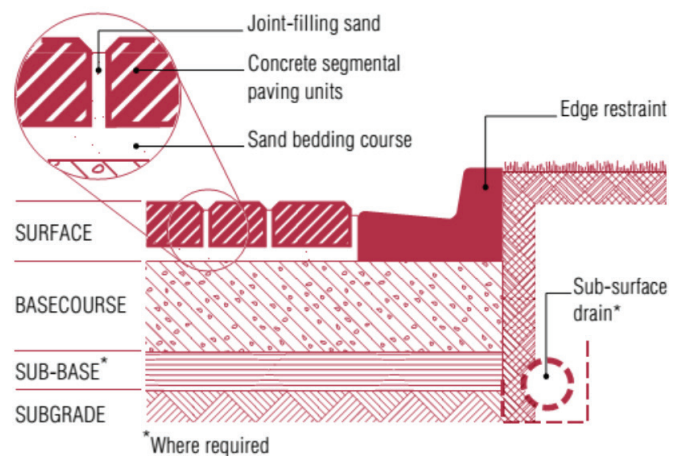


Figure 1: Pavement structure

BEFORE YOU START

DO YOU NEED A PROFESSIONAL?

A well-laid driveway will last for decades and survive any regular vehicle, but if it is a poorly installed driveway it is liable to move or warp.

If you think that your construction skills are not up to the task, talk to your supplier – they may be able to recommend a professional installer to do the job for you.

CHECK WITH YOUR COUNCIL

While residential pavements can usually be laid without council approval, driveways are a different matter, particularly in areas where water runoff may be an issue.

Councils and/or developers (in areas covered by a design covenant) should be consulted before you start planning your driveway, to confirm:

- the designs and materials allowable for your area (in particular cross over details);
- the surface elevation and drainage requirements;
- the location of public utilities in the area; and
- whether you need to obtain permission before commencing work.

Consultation up-front will save you time, money, and potential problems with local inspectors.

DESIGN YOUR DRIVEWAY

HOW MANY PAVERS WILL YOU NEED?

1. Grab a pencil, paper, and a tape measure.
2. Measure the length and the width of the area to be paved, then multiply one by the other to determine the total area in square metres.
3. Increase the total area by 2% to account for cuts and any repairs required.
4. Divide this total by the area of a single paver to determine the total number of pavers required.

PAVER SPECIFICATION

Pavers are manufactured to strict tolerances, and the minimum paver thickness is typically 50mm for a flexible pavement, for more information, ask your supplier or consult the Concrete Masonry Association of Australia (CMAA) manual – PA 03 *Concrete Segmental Pavements – Specifying Guide*.

Pavement Applications	Minimum characteristic breaking load (kN)		Work size minimum thickness (mm)	
	Pavers	Flags	Pavers	Flags
Relevant Australian Standard	AS/NZS 4455.2 AS/NZS 4456.5		AS/NZS 4455.2	
<i>Pedestrians only (paths, patios, outdoor areas)</i>	2	5	40	40
<i>Pedestrian and light vehicles only (eg driveways)</i>	3	7	40	50

CHECK THE SUBGRADE

The soil in the subgrade will affect the thickness of the basecourse and can be identified through physical assessment:

- non-cohesive soils, such as sand, feel sharp or gritty when rubbed between fingers; and
- cohesive soils such as clay can be easily moulded into simple shapes and will stain fingers.

The cohesiveness of the soil in the subgrade will influence the need for a sub-base and the thickness of the basecourse.

DO YOU NEED A SUB-BASE?

It is advisable to use a sub-base for driveways in order to give it more strength, particularly if the local subgrade is cohesive.

A typical thickness for a sub-base is 100mm.

The sub-base should be formed from a well-graded granular material such as sand, gravel or crushed rock, that has a maximum particle size not more than one-third of the sub-base layer thickness.

DON'T FORGET!

GRADIENT

Driveways with a gradient of up to 1:10 (10%) can be achieved without difficulty. For steeper gradients consult a professional on design and installation.

SLIP RESISTANCE

The surface texture of concrete pavers generally has sufficient slip resistance for gradients up to 10%. For steeper gradients consult a professional on how to design and install the pavement.

PREPARING THE BASECOURSE

The basecourse is usually made of well-graded crushed rock or gravel, with a maximum particle size of 26.5mm, and a maximum clay content of 6% by mass. Basecourse materials can generally be sourced from landscaping suppliers.

The thickness of a typical basecourse for a site consisting mostly of sand is 100mm, while a clay site would be 150mm. Generally, the basecourse should be finished to within 25mm of the design level except where it abuts existing structures where it should be within 10mm. The surface of the prepared basecourse should not deviate by more than 10mm over a 3m length of the design profile.

Traffic	Granular base thickness (mm)			Concrete base thickness (N20) (mm)	
	Most sand & rock sites	Most silt & some clay sites	Moderately reactive clay sites	Pavers	Flags
<i>Pedestrians only</i>	Not required	Not required	75	75	75
<i>Pedestrians & light vehicles</i>	Not required	75	100	75	100
<i>Pedestrians & commercial vehicles</i>	75	100	150	100	150

PREPARING THE BEDDING COURSE

Once the basecourse has been compacted, a bedding layer should be laid on top of it. This will be made from coarse, well-graded, washed sand, that is free from organic materials.

The bedding course should be laid with a uniform thickness, and not exceed 30mm after compaction.

WHAT ABOUT EDGE RESTRAINTS?

The entire perimeter of the pavement should be provided with an edge restraint. Edge restraints should be placed within 100mm of the compacted subgrade and basecourse.

Suitable edge restraints include:

- vertical edge bricks laid in a small concrete trench;
- exposed or concealed concrete beam; and
- barriers constructed using pre-mixed concrete with 20MPa strength and 14mm aggregate size.

WHAT LAYING PATTERN SHOULD YOU USE?

It is recommended to lay pavers for a driveway in an interlocking pattern such as herringbone with either a 45 or 90-degree configuration. This is the strongest pattern and it will minimise the movement of individual paving units due to traffic.

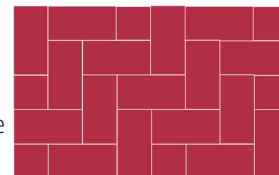


Figure 3: Herringbone pattern

DRAINAGE

The pavement should slope away from buildings to a minimum gradient of 2% so water run-off can flow to an appropriate channel or drain. The surface of the pavers should not sit less than 150mm below the damp-proof course.

MOVEMENT IN PAVERS

Generally, the sand filled joints between pavers facilitates interlocking and promote controlled movement. However, for large format pavers (surface area greater than 0.08m²) it is better to have a 10mm gap between pavers placed every 8 metres to compensate for the lower number of joints between pavers.

HITTING THE TOOLS

REMEMBER: SAFETY FIRST!

As with any DIY job, make sure you have the appropriate safety gear and following instructions correctly. This means:

- wearing eye protection, particularly when splitting or cutting pavers;
- wearing work boots to protect your feet and gardening gloves to protect your hands;
- bending your knees when lifting heavy pavers or moving bedding materials;
- wearing a hat, using sunscreen, and maintaining your fluid levels;
- getting help when many hands might be needed; and
- making sure you have all the tools and materials you need before you start work, so that you don't have to interrupt the installation.

STEP 1: PREPARE THE SITE

- Mark out the area to be paved, allowing a little extra for working room.
- Remove all forms of vegetation from the area.
- Excavate to a depth that will allow for the installation of the total pavement thickness (including sub-base, if required).
- Compact the excavated ground using overlapping passes of a vibrating compactor.

STEP 2: LAY THE SUB-BASE

- If you're laying a sub-base, distribute the sub-base material evenly over the compacted subgrade.
- Compact the sub-base in maximum layers of 100 mm, with at least three passes of a vibrating plate compactor.

STEP 3: LAY THE BASECOURSE

- If required, distribute the base course material evenly over the sub-base or subgrade to the required thickness.
- Compact it in maximum layers of 100mm, with at least three passes of a vibrating plate compactor.

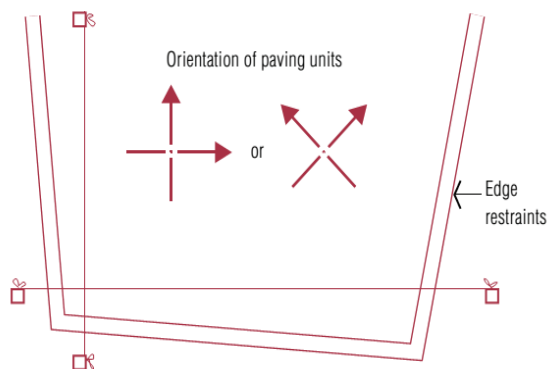


Figure 4: Setting out with stringlines

STEP 4: INSTALL EDGE RESTRAINTS

- If using manufactured edge restraints, place them within 100mm of the compacted basecourse, at a depth that allows the edge restraint's surface to be 5mm below the pavers.

STEP 5: PLACE THE BEDDING COURSE

- Spread the bedding sand over the compacted road base to a thickness of 25-30mm.
- Level the sand with a timber float to an equal thickness.

STEP 6: LAY THE PAVERS

- To keep pavers straight as they're laid, set out two stringlines from a corner of the pavement, which cross at 90 degrees, as shown in Figure 4.
- Lay the pavers from this corner and work outwards, ensuring that there is a 3mm gap between each paver.
- If pavers need to be cut, completely wet the paver first, then cut the paver to the required shape using a saw or disc cutter.
- Pavers should not be cut to less than 25% of their original size.

STEP 7: COMPACT THE SURFACE AND FILL THE JOINTS

- Spread a thin layer of fine sand over the pavement and sweep it into the joints.
- Cover the pavement with a piece of carpet or timber board.
- Compact the units with at least three passes of the compactor on top of that carpet or timber board.

STEP 8: USE THE DRIVEWAY

As soon as your driveway is down, you can use it – no need to wait for materials to settle or dry, the pavers are ready as soon as you are.

FINAL INSPECTION

The completed pavement should be in line with the following performance objectives:

STEPPING	The surface level of adjacent pavers should not deviate by more than 5mm
CHIPPING AND SPALLING	There should be no more than 10 units in any adjacent 100 segmental pavers that are chipped
PONDING	Following rainfall, there should be no pond on the pavement deeper than 10mm
SUBSIDENCE	Soil compression should be limited to 15mm

MAINTENANCE

Concrete segmental pavements require very little upkeep, and even if any faults occur they are easy to repair.

Following is a table which shows how to deal with some common complaints – for more information, ask your supplier or consult the Concrete Masonry Association of Australia (CMAA) manual – *PA 04 Concrete Segmental Pavements – Maintenance Guide*.

SYMPTOMS	PROBABLE PRINCIPAL CAUSES	EXTENT	PRINCIPAL MAINTENANCE OPTIONS
Occasional cracked pavers	Poor construction quality control of the base layers	A few individual isolated pavers	Replace cracked pavers only if aesthetics are impaired
Occasional chipped pavers	Pavers laid with inadequate (too narrow) joint widths	Individual pavers	Replace chipped pavers only if aesthetics are impaired if joint widths < 2mm, lift and re-lay so that all joints lie between 2 and 5 mm
Worn or abraded pavers	Incorrect specification or poor quality control during manufacture/delivery	Individual or groups of pavers	Replace affected pavers only if aesthetics are impaired
Pavers are standing proud of surface	Poor control of paver thickness	Upstand ≤ 5 mm	≤ 5 mm, ignore but continue to monitor surface
		Upstand > 5 mm	> 5 mm, replace proud pavers with correct-height units
Joints have lost sand	Joints were not completely filled during construction, vacuum sweepers or water jets were used or insufficient chamfers were provided on pavers	Sand loss ≤ 10 mm deep	≤ 10 mm, suspend vacuum sweeping/water jetting until problem is fixed
		Sand loss > 10 mm deep	> 10 mm, refill joints using dry jointing sand and re-compact entire surface Consider use of proprietary bonded jointing sands
Surface is stained	Normal service conditions or insufficient routine cleansing	Individual or groups of pavers	Clean or replace individual pavers if aesthetics are impaired
Surface has been trenched	Normal service conditions	-	Check and compact trench backfill, reinstate original pavers and compact
Surface exhibits rutting along wheel paths	Sub-structure is inadequate due to poor design, sub-standard base materials, or insufficient compaction	Ruts are continuous along pavement	If aesthetics or riding quality is impaired then lift affected pavers, remove bedding sand, repair sub-structure and re-lay original pavers on fresh bedding sand

FOR MORE INFORMATION

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