

GET IT RIGHT

7. Laying Ibstock Clay Pavers for Permeable Pavements

This leaflet highlights the basic requirements for laying Ibstock Clay pavers to form a permeable pavement.

Ibstock clay pavers are intended for domestic use only i.e. patios or private driveways for light vehicle parking only.

Pavers suitable for permeable application differ in design to our existing range of flexible and rigid lay products. They can also be referred to as a Sustainable Drainage System (or **SuDS**).

There are three methods of laying permeable pavements dependant on the ground conditions and local authority requirements.

A. Total infiltration – all water passing through the paved area is to be absorbed into the ground.

B. Partial infiltration – some of the water will pass into the ground but some will be channelled to drain away elsewhere.

C. No infiltration – complete capture of the water under the pavement for drainage elsewhere.

Ideally application method C is for level ground. Consider how water may flow and accumulate on gently sloping sites. For more significantly sloping sites terraced areas with compartmental walls may be necessary.

There is no need to design falls into the pavements as all rainwater should soak in and drain away naturally.

PLEASE NOTE - MATERIALS USED IN ASSOCIATION WITH PERMEABLE PAVING SYSTEMS DIFFER FROM CONVENTIONAL FLEXIBLE PAVER LAYING.

Hardcore will not be suitable for this type of application nor MOT 1 as it compacts, giving insufficient water storage capability. Laying and jointing sands traditionally used to brush into conventional flexible laid paver joints are also not suitable. Joint stabilising solutions are not required with this system.

Always seek expert guidance before embarking on a project of this nature.

Preliminary study

Before you begin you will need to seek advice from your local Planning Office as to the most suitable method, for systems B and C drainage into Local Authority water systems may need permission.

Subgrade assessment

The bearing capability of the soil should be established ideally by a CBR (Californian Bearing Ratio) test described in BS 1377-4+A2:2002. This will determine the ability of the ground conditions to transmit load evenly, and indicate the required depth of the sub-base layer. A capping layer may be required to stabilise certain ground conditions. (A CBR estimation guide is shown on page 4). Preparation of the sub-grade and laying should be in accordance with BS 7533-3 however basic guidance follows.

Seek professional help to establish the nature of the sub-grade and expected water volumes.

For systems A and B the highest recorded groundwater level should be at least 1 metre below the bottom of the sub base. This allows filtration of pollutants from the driveway and also means the storage capacity of the system is not reduced at times of high groundwater.

Assessment of likely volume

Be mindful of the amount of rainfall that can fall in any given period and if other sources of run-off may affect the storage capacity and drainage potential of your drive, i.e. down-water pipes,

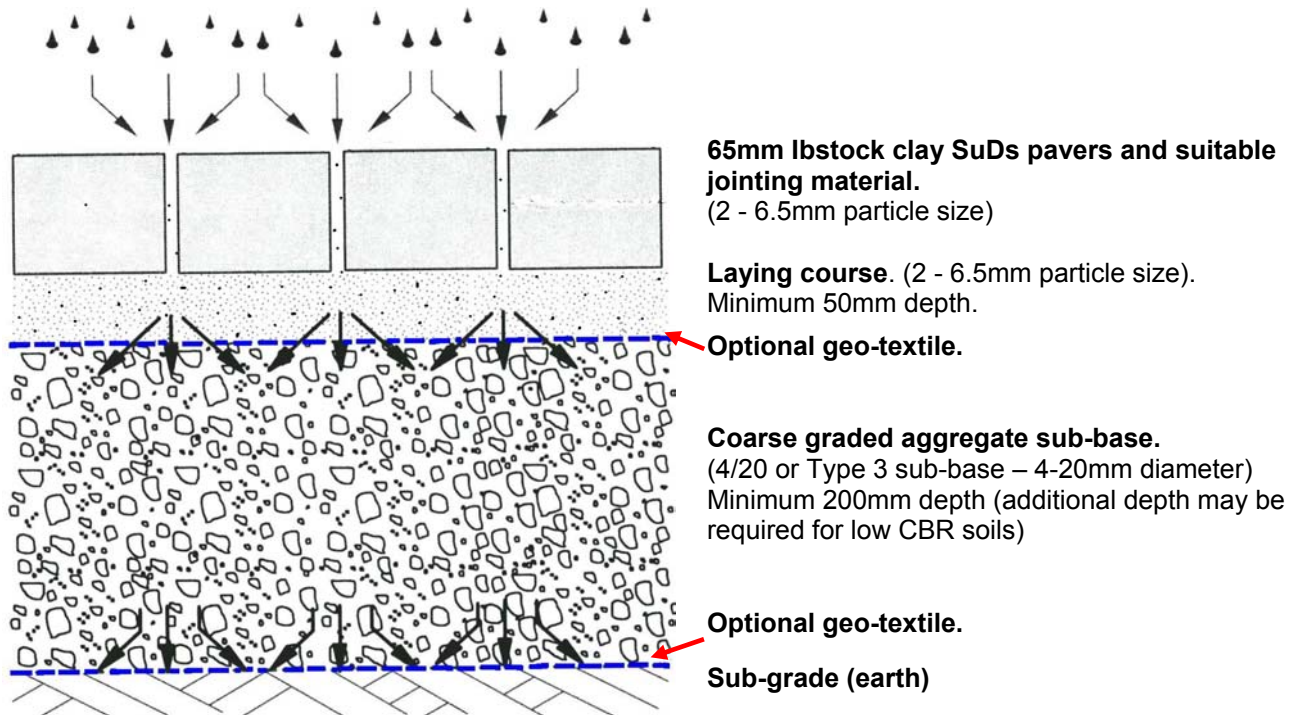
other surfaces adjacent to the drive and their level and direction of fall. The amount of increased run-off expected will increase the depth of the coarse graded sub-base to enable it to cope. Geo-cellular box systems incorporate a greater storage capacity and may reduce the required depth of the granular sub-base. Consult the manufacturer for further advice.

Some soils or degrees of gradient may not be suitable for permeable paving. Do not construct soak-away close to buildings to prevent damage to foundations. For driveways sloping towards the house a drainage channel will be needed to direct any excess surface water away.

A. Total infiltration

Laying pavers where the intention is all water will drain into underlying ground.

This method is most suited for free draining soils and may require no additional drainage system.



Laying Guidelines System A

Excavate to design depth, remove soft spots and make good.

Lay concrete edge restraints and allow setting material to harden before commencing laying.

Lay optional geo-textile to prevent migration of material into subgrade.

Lay coarse graded sub-base to required depth, use plate vibrator to ensure compaction during and after.

Place another optional geo-membrane to prevent smaller layer migrating into coarse material.

Add laying course using a levelling screed, place the pavers whilst working.

Use a plate compactor to level.

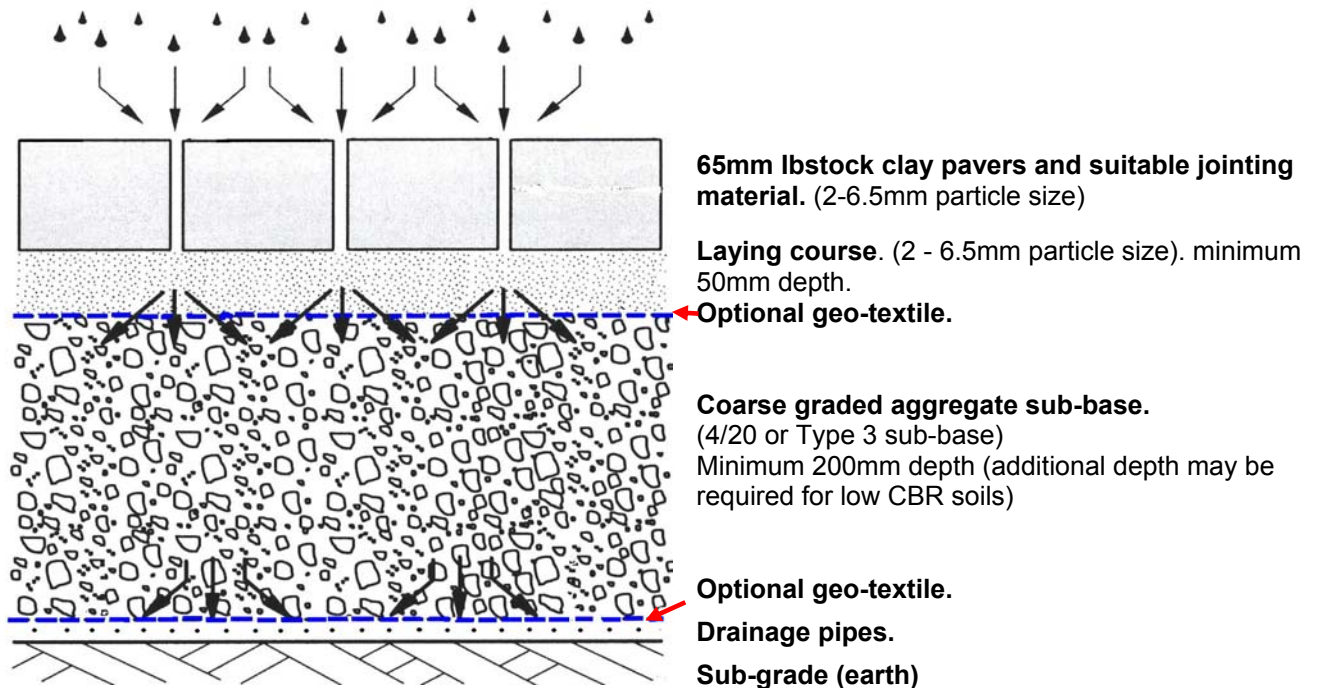
Brush in jointing material of suitable sized particles.



B. Partial infiltration

Laying pavers where the intention is some water will drain into underlying ground and some is channelled away.

This method can be used where the existing ground condition may not be capable of absorbing water quickly. Where the existing sub-grade may not be able to absorb all of the water, a network of drainage pipes are laid on the sub-grade to aid water dispersal.



Laying Guidelines System B

Excavate to design depth, remove soft spots and make good.

Lay concrete edge restraints and allow setting material to harden before commencing laying.

Lay optional geo-textile to prevent migration of material into subgrade.

Lay perforated or fin pipe cloaked in geo-textile.

Lay coarse graded sub-base to required depth, use plate vibrator to ensure compaction during and after.

Place another optional geo-membrane to prevent smaller layer migrating into coarse material.

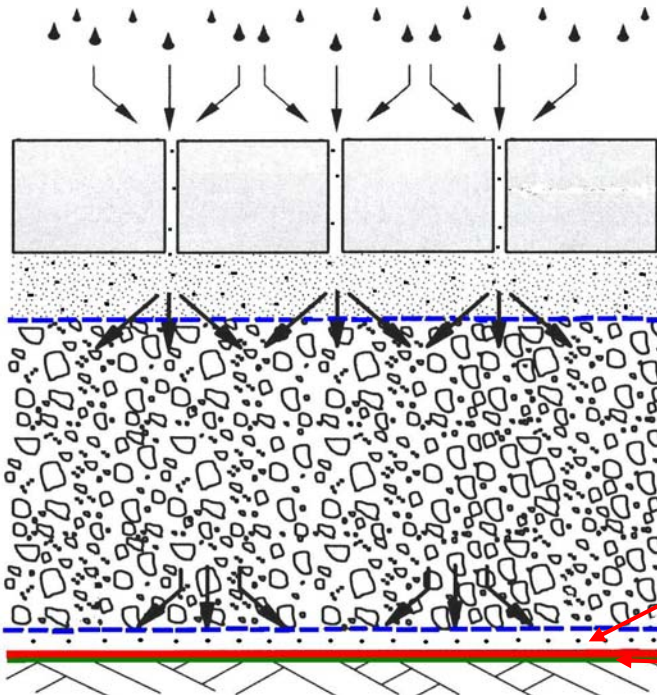
Add laying course using a levelling screed, place the pavers whilst working. Use a plate compactor to level.

Brush in jointing material of suitable sized particles.



C. No infiltration

Laying pavers where the intention is to capture all water and channel to suitable drainage or harvesting area.



65mm Ibstock clay pavers and jointing material.

Laying course. (2-6.5mm particle size). Minimum 50mm depth

Optional geo-textile.

Coarse graded aggregate sub-base.

(4/20 or Type 3 sub-base)

Minimum 250mm (additional depth may be required for low CBR soils)

Drainage pipes wrapped in geotextile.

Impermeable membrane (puncture resistant HDPE or EPDM with welded joints).

Optional fleece geotextile.

Sub-grade (earth) – may need stabilising with a capping layer.

Where the existing sub-grade has low permeability or low strength this system allows total water entrapment and controlled drainage. This system can also be used in conjunction with water harvesting systems.

System C relies on an impermeable membrane lining the excavated area to capture water. It should be laid on the excavated sub-base and the sides brought up to just beneath the paving level.

The drainage pipe should extend to at least 1m into the tanked area and be completely wrapped in geo-textile. The inlet hole made in the impermeable membrane must be sealed around the pipe.

The outflow is then connected to a suitable harvesting or drainage system.

Laying Guidelines System C

Excavate to design depth, remove soft spots and make good.

Lay concrete edge restraints and allow setting material to harden before commencing laying.

Lay optional heavy duty geo-textile protection fleece if concerned about the possibility of ground material puncturing membrane.

Lay, robust welded waterproof membrane typically 1mm thick polypropylene.

Lay perforated or fin pipe cloaked in geo-textile.

Lay coarse graded sub-base to required depth, use plate vibrator to ensure compaction during and after.

Place another optional geo-membrane to prevent smaller layer migrating into coarse material.

Add laying course using a levelling screed, place the pavers whilst working. Use a plate compactor to level.

Brush in jointing material of suitable sized particles.



Clarification of terminology;

Subgrade – upper part of the soil, natural or constructed, that supports the loads transmitted by the overlying pavement.

Capping layer – layer of material placed on the subgrade to stabilise its performance under load if required.

Sub-base – one or more layers of open graded material placed immediately above the subgrade.

Coarse graded aggregate – main structural and hydraulic functional layer with particle size within the range of 20 to 4mm to BS 12620.

Laying course – layer of material on which pavers are bedded. Typical particle size 2 - 6.5 mm.

Jointing material – material applied to fill the joints between paving units, typical particle size 2 - 6.5 mm.

Geotextile – permeable textile, mesh, net or grid that allows water to flow through and prevents migration of particulates between construction layers.

Impermeable membrane – membrane which is intended to contain all water entering the pavement controlling its flow

Estimated CBR assessment and material depth guidelines; FOR DOMESTIC APPLICATIONS ONLY

Assessment of soil should be in saturated conditions.

Rock or soil		Simple Field Test	CBR %
Type	condition		
Rock	hard	Requires mechanical pick for excavation	Above 5
Sand/Gravel	Compact	50mm square peg hard to drive in 150mm	>5
Clay/Sandy clay	Stiff	Cannot be moulded by fingers, need pick for excavation	2-5
Clay/Sandy clay	Firm	Can be moulded by fingers, need spade for excavation	2-5
Sand/ Silty clay/ Clayey sand	Loose	Dry lumps easily broken down, 50mm square peg driven in easily	2
Silt/Sandy clay/ Silty clay/Clay	Soft	Can easily be moulded by fingers	<2
Silt/Sandy clay/ Silty clay/Clay	Very soft	Exudes between fingers when squeezed	Seek specialist advice

CBR of subgrade %	Coarse graded material mm	Capping layer mm System C only	Laying course mm	paver depth mm	Hydraulically bound base (not necessary for domestic applications)
1	550 *	600*	50	65	n/a
2	425	350	50	65	n/a
3	375	250	50	65	n/a
4	350	200	50	65	n/a
5	250	150	50	65	n/a
Above 5	250	150	50	65	n/a

*seek expert guidance

Refer to;

BS 7533 - 13:2009 -Guide for the design of permeable pavements constructed with concrete blocks and flags, natural stone slabs and setts and clay pavers.

BS 7533 - 3:2005 –Pavements constructed with clay, natural stone or concrete pavers –Part 3: code of practice for laying pre-cast concrete paving blocks and clay pavers for flexible pavements.

BS 1377- 4:1990+A2:2002 – Methods of test for soils for civil engineering purposes- Part 4: Compaction related tests.

Local Authority Planning Office.

The Environment Agency.

www.theconstructioncentre.co.uk

For further help and advice visit www.ibstock.com or contact Ibstocks Design & Technical Helpline on 0844 800 4576