

PAVING MAINTENANCE AND REPAIR GUIDE



Introduction

As with other forms of pavement surfaces, judicious preventive maintenance and early repair can help to save time, be more cost effective as well as minimising inconvenience to both the operators and public. This guide will refer only to flexibly laid concrete block and flag paving laid on an aggregate laying course, not on a rigid mortar bedding. For rigid laying please contact our technical service team.

The common problems with flexibly laid block paving and flags requiring structural maintenance and repair options are summarised in Table 1.

Advice regarding the reuse of materials and re-construction techniques are summarised in Table 2.

Before any repair work is undertaken it is imperative to firstly determine and quantify what the problem is. All work should be undertaken in compliance with current health and safety legislation. Information and guidance addressing safety issues associated with this industry sector, such as handling and cutting, can be downloaded (free of charge) from the Interpave website: www.paving.org.uk

The appropriate corrective action can be planned and undertaken as necessary. Maintenance and repair work should be categorised into two groups:

- The first involves the maintenance and repair of the surface, such as cleaning, re-filling and compaction of the joint aggregate.
- The second covers repair of the base structure below the surfacing and re-installation of the paving surfacing.

Table 1 Maintenance and Repair Options

Symptom	Probable principal cause	Extent	Principal maintenance/repair options
General dirt and detritus	Inadequate drainage (not usually applicable to permeable pavements)	A few individual pavers	Hand sweeping. Scrubbing with soap and water or proprietary cleaners and/or water jetting.
	Lack of general maintenance	More extensive areas	Sweeping with a mechanical or road sweeper (subject to the pavement being suitable for such traffic). Mechanical scrubbing and or jetting with water or proprietary cleaners and/or water jetting.
Moss, lichens and algae growth	In a shaded location such as under trees, between buildings with no direct sunlight. Inadequate drainage. This is not usually applicable to permeable pavements	General	Clean with a proprietary cleaner suitable for the purpose. This must be used in accordance with the manufacturer's recommendations.
Weed growth	Lack of traffic allowing wind blown seeds to propagate	A few individual pavers or more extensive area	If the problem detracts from the aesthetics, mechanically remove and/or treat with weed killer. Do not apply weed killer if there is a chance of rain within 48 hours. Care for dispersal of weedkiller in case of damage to other vegetation in the area.
Rust stains	Action must be taken to eliminate the sources of staining such as rusting gutters and down pipes.	General	Clean with a proprietary cleaner suitable for use on concrete paving. This must be used in accordance with the manufacturer's recommendations. Consideration must be given to the disposal of the run-off from this operation.
Oil stains	Leakage from vehicles	A few individual pavers	Hand cleaning with detergent or de-greaser. Care must be taken with degreasers as these may stain the paving. A small trial on a less visible area is recommended to ascertain the effectiveness of degreasers.
		More extensive areas	Mechanical scrubbing and or jetting with a suitable proprietary cleaner or degreaser. This must be used in accordance with the manufacturer's recommendations.

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Table 1 Continued

Symptom	Probable principal cause	Extent	Principal maintenance/repair options
Efflorescence	Efflorescence is a transitory phenomenon which can affect concrete or clay paving and masonry.	Efflorescence will usually disappear in time under abrasion by pedestrian or vehicular traffic	Fluffy surface efflorescence can be removed by using a stiff brush. Hardened efflorescence can be removed with a proprietary efflorescence cleaner suitable for use on concrete paving and should be used in accordance with the manufacturers recommendations. Consideration must be given to the disposal of the run-off from this operation. This must be used in accordance with the manufacturer's recommendations.
Chewing gum deposits	Pedestrian traffic	General	Chewing gum can be difficult to remove from any pavement surface. Freeze the gum with ice, carbon dioxide aerosol, or dry ice then remove with a scraper. Undertake removal with a scraper during cold or freezing weather. Alternatively, use a proprietary cleaning method in accordance with the manufactures recommendations.
Cracked pavers	Poor construction - may not have been corrected during initial construction	A few individual pavers Larger areas	Replace if there is a trip hazard, or affects structural integrity or detracts from the aesthetics. Investigate the likely causes e.g. cracking caused by impact point loading and if necessary modify work practices.
Spalled pavers (usually at locations of paver to paver contact or nib to paver contact)	Pavers without nibs - laid too tight and/or excessive pavement flexing Excessive pavement flexing, deformation	A few individual pavers More extensive areas	Replace individual pavers if there is a trip hazard, or they adversely affect structural integrity or detract from the aesthetics. In all cases, check for pavement flexing/deformation that may indicate there is a problem with the pavements construction. This will need more extensive investigation and correcting.
Worn or abraded pavers	Incorrect paver selection / specification	A few individual pavers or more extensive areas	Replace individual pavers or the complete area if there is a slip/trip hazard or it detracts from the aesthetics or structural integrity.
Lipping (pavers standing proud)	Poor construction - may not have been corrected during initial construction Pattern formed with pavers manufactured at different times, resulting in variable thicknesses	A few individual pavers or more extensive area	If there is a trip hazard, or it detracts from the aesthetics, remove offending pavers, check paver thickness before replacing and/or adjusting the laying course so that the pavers are level after re compacting.
Little or no jointing aggregate	Poor construction - inadequate filling and compaction of jointing aggregate Joint aggregate washed out Joint aggregate pumped out Joint aggregate sucked out by road sweeper/jetting	A few individual pavers or more extensive area	Re fill joints with compliant aggregate and re compact. Re fill joints with compliant aggregate and re compact. See Pumping below. Review/modify maintenance procedure, re fil joints with compliant aggregate and re compact.
Pumping out of jointing aggregate	Water trapped within the laying course Flexing of the pavement when trafficked Incorrect laying course selection/specification	A few individual areas or more extensive area In locations of traffic loading	Provide adequate laying course drainage. Investigate performance/suitability of the base course and repair or replace if required. Investigate performance/suitability of the laying course and replace if required.

Table 1 Continued

Symptom	Probable principal cause	Extent	Principal maintenance/repair options
Depressions/ subsidence	Soft spots within the pavement structure caused by incorrect design and / or construction methodology	A few individual areas or more extensive area	Investigate and repair pavement structure and relay pavers.
		Settlement around pits/manholes, along the length of a service trench or excavation	Compact and correct base levels and relay pavers.
Rutting - channellised in traffic locations	Soft spots within the pavement structure caused by inadequate design and/or construction.	A few individual areas or more extensive area	Investigate and repair pavement structure and relay pavers
	Incorrect laying course thickness and/or specification		Investigate and replace with correct compliant laying course
Joints/alignment creeping	Shunting caused by horizontal forces generated by traffic action, such as at roundabouts, downhill braking etc	Usually at locations of high horizontal loads imposed by traffic turning, braking etc.	Relay and adjust lines of existing pavers if it affects structural integrity or detracts from the aesthetics. Re-cut in at edges if required
	Inadequate edge restraints		Investigate and repair/replace edge restraints
	Inadequate jointing aggregate		Re fill joints with compliant aggregate and re compact
Large joints	Poor construction - may not have been corrected during initial construction	A few individual pavers or more extensive area	Investigate and re lay the pavers if required.
	Joints/alignment creeping - see above		
Silting of joints and surface	Non permeable - Nominal surface falls. In areas with no direct sunlight, and/or receiving run off from adjacent areas	A few individual pavers or more extensive area	If the problem detracts from the aesthetics, remove surface detritus and/or joint aggregate and refill joint as required
	Permeable - In areas with no direct sun light, and/or receiving run off from adjacent areas		If the problem detracts from the aesthetics and/or impedes surface permeability, remove surface detritus and/or joint aggregate and refill joint as required

Material Re-Use and Repair Techniques

Block and flag paving is unique when compared to asphalt or in-situ concrete, paving in that it is possible to re-use the pavers assuming they are not damaged or worn out. Care therefore needs to be exercised to minimise damage when removing pavers if it is intended to be reused.

It is not recommended to reuse jointing or laying aggregate if these materials have been removed, as these may be contaminated with pollutants, detritus and silt and should be disposed of in line with legal requirements.

If paving is to be re used it is imperative that all traces of the materials used for laying and jointing the pavers are thoroughly removed from the paving as this will make the relaying and achieving compliant joints easier

Brett Landscaping Sibley Road Barrow upon Soar Leicestershire LE12 8LX

Commercial Support Phone: 0845 60 80 579 Fax: 0845 60 80 575

Email projectdesigner@brett.co.uk

www.brett paving.co.uk

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In addition, when designing projects under BREEAM we are also holders of BES 6001 Responsible Sourcing of Construction Products (Very Good) All of these can help significantly when designing for sustainability.

Table 2 Re-use of Materials and Re-Construction Techniques

Type of repair	Paver	Joint Aggregate	Laying Course	Maintenance /Re-Construction Techniques
Re jointing small isolated areas		Use new aggregate		Sweep in aggregate and compact the jointing aggregate into the joints, either with a plate compactor or by "vibrating" using rubber or dead shot hammer.
Re jointing larger areas		Use new aggregate		Sweep in aggregate and vibrate using plate compactor
Replacing individual or isolated areas of damaged pavers	Use new pavers to replace damaged or worn pavers	Use new aggregate		Remove and replace paver(s). Compact the pavers using rubber or dead shot hammer. Sweep in new aggregate and vibrate using rubber or dead shot hammer. If a significant quantity, use a plate compactor for the compaction process.
Areas that require repair to the base i.e trench settlement	Re-use un-damaged pavers.	Use new aggregate	Use new aggregate	Remove pavers. Undertake the base repair. Re install as per the installation guidance in BS7533 - 3 for blocks and BS 7533 - 4 for flags.
	Use new pavers to replace damaged or worn pavers			Relay, re using paving as close as practical to the locations from where they were removed. Mix replacement pavers randomly with the reused pavers to ensure a uniform appearance.

Replacement Paving

If it is intended to re-use the paving after it has been removed to allow repairs to the pavement structure below, it is preferable to re-install the paving as close as practical to the locations from where it was removed because it will be compatible in size to adjacent undisturbed areas, hence easier to re-fit.

Any replacement paving should be evenly distributed and mixed with the existing paving that will be re-used over the whole area and not placed together unless complete areas are to be replaced. This is to help colour blend new paving with the existing paving and minimise any size compatibility issues.

The manufacturing standards allow for size variation, caused by variability of production process and mould wear. For example the plan variability on concrete block paving is ±2mm. Generally pavers manufactured when the mould is new would tend to be smaller than those manufactured at the end of the life of the mould. To quantify the size compatibility between existing and replacement paving a simple site test can be undertaken.

- i. Lay out a number of existing and the same number of new replacement pavers, side by side, ensuring that they are pushed tight to each other.
- ii. If the cumulative length of the replacement blocks is the same or shorter, it would indicate that the replacement pavers are smaller and should fit easily into the reinstated area.
- iii. If the length of the replacement paving is longer, it would indicate that these blocks are larger and this may cause difficulties when relaying the paving, and alternative "smaller" replacement pavers may need to be sourced from the block supplier. Alternatively, it is possible to reduce the plan dimensions by removing spacer nibs, with a skutch hammer, or cutting a small slice off some of the pavers.

Note: the example shown below and on the following pages, is for rectangular blocks, but the same principals and procedure apply to shaped blocks and flags



Pulling up Paving

Isolated paving or small areas

If the individual paver, or small areas of pavers are to be removed and it is intended to reuse these pavers, it is important not to damage them during the removal process.

Before attempting to remove pavers, as much of the jointing aggregate as possible must be removed by flicking out with a hand tool such as a flat blade screwdriver, hacksaw blade or similar tool.

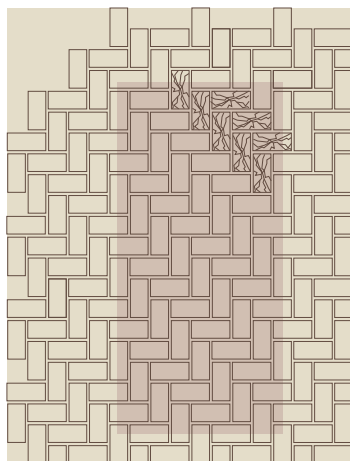
The paver/s can then be extracted using a block extractor tool or levering out with two flat blade screwdrivers. Care must be taken not to damage the paver being removed or adjacent pavers. The use of a vacuum lifter would assist in removing flag paving.

If it is not intended to reuse the paver then an alternative method is to break the paver in situ with hand tools, crow bar or pneumatic braking tools.

Long narrow areas (Trench reinstatement)

The boundary of the area to be replaced can be saw cut to isolate the paving to be removed. The remaining half blocks or cut flags will have to be removed individually.

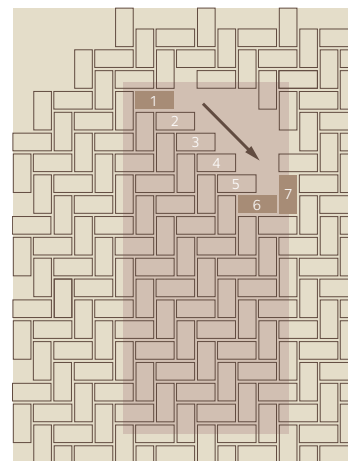
If the area is not saw cut to isolate it from the surrounding paving, then certain individual pavers will have to be removed, as described above in removing Isolated paving, to allow the paving to be pulled up in the opposite sequence to when it was originally laid. This technique is particularly suited to blocks laid in herringbone pattern.



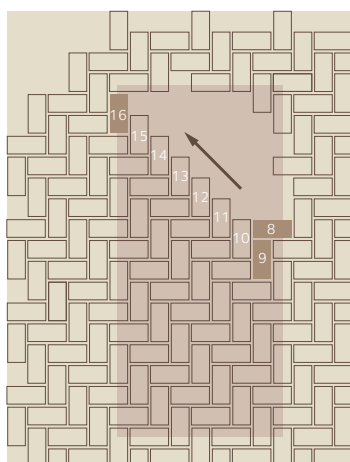
Take up the pavers in the order shown



Due to the interlock it is usually necessary to break these pavers first



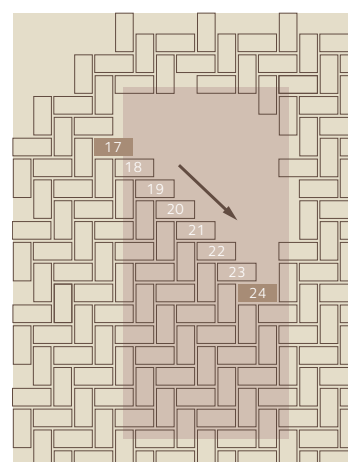
These blocks may need careful prising out with the aid of flat-bladed screw drivers or special paver removal/extractor tools



Take up the blocks in the order shown



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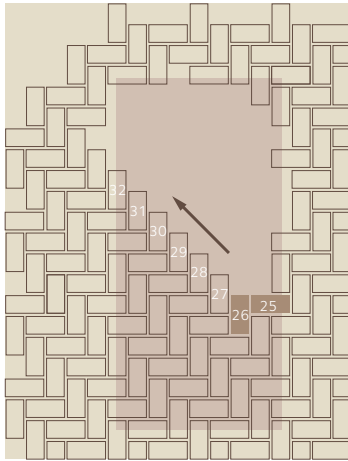
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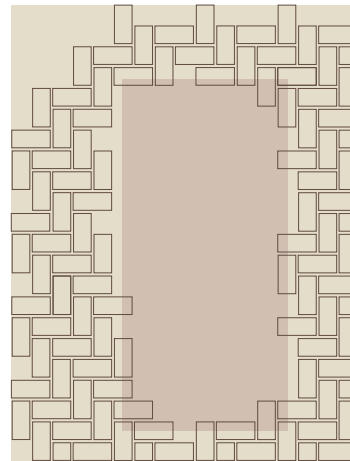
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Take up the blocks in the order shown



These blocks may need careful prising out with the aid of flat-bladed screw drivers or special block removal/extractor tools



Continue in this way until the required area has been opened up

Large areas

The paving in large areas can be removed in a similar manner for long narrow areas, but the bulk on the paving can be lifted up with appropriate site plant such as a skid steer loader or excavator. Care must be taken not to damage the paving if it is intended to re-use it or damage and lift paving in the adjacent areas. Care must also be taken not to damage the pavement structure and in the case of a permeable pavement not to contaminate the aggregate with detritus or other materials that will clog the permeable aggregate.



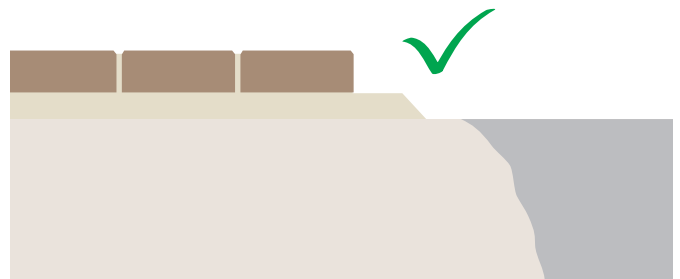
Site Preparation

Keep the area clean and tidy.

Avoid walking or driving near un-restrained edges to minimise the potential for the existing paving to creep and open up joints.

After completion of any base repairs, sweep the adjacent area clean and prepare to re-lay.

Ensure that the adjacent paving has not rotated or dipped down into the laying course. Adjust if required.



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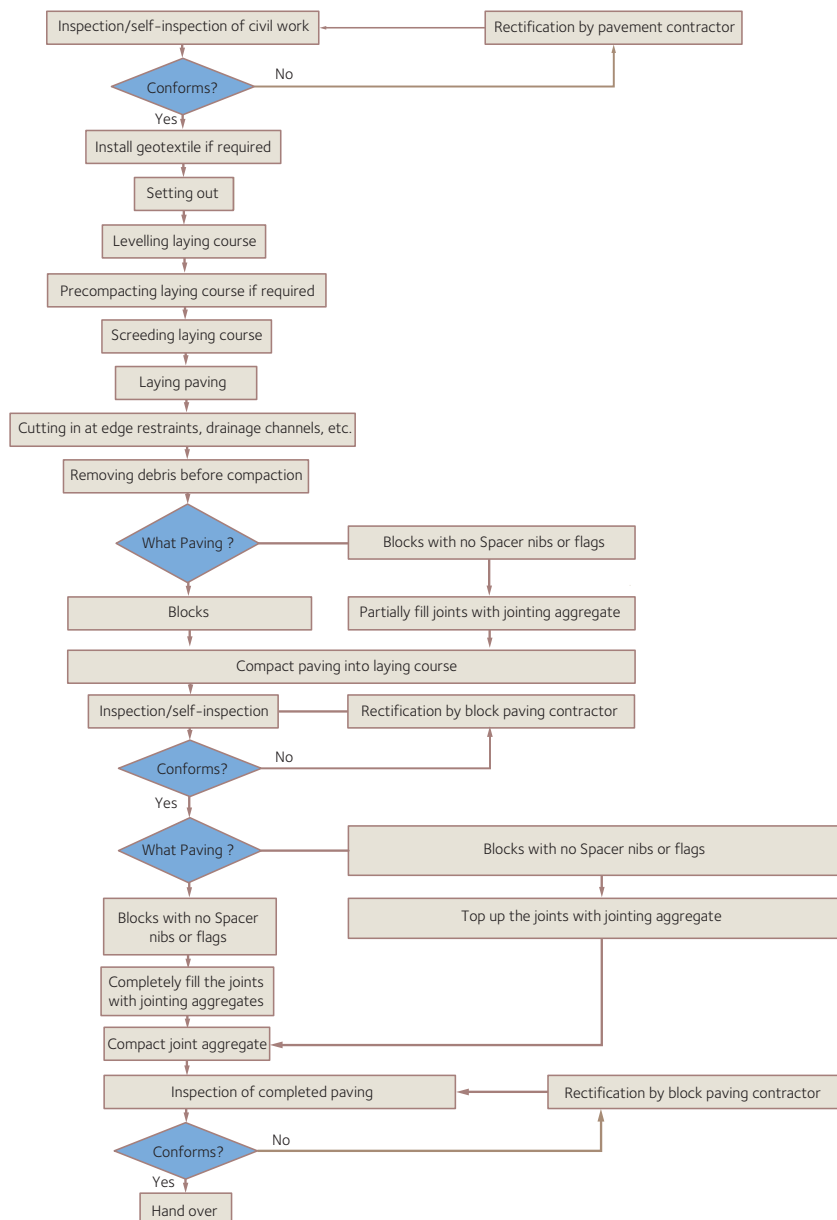
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Re-installation

Generally for individual or isolated areas of paving, the relaying should be undertaken with the methods shown in Table 2. Ensure that the screeded laying course is of sufficient height so that after laying and compaction of the paving into the laying course, the paving is level with the adjacent paved areas.

For more extensive areas, or replacement of the complete area, re-installation of the block paving should be undertaken in accordance with the BS 7533 - 3 and flags in accordance with BS 7533 - 4.

A summary of the installation procedures are shown in figure below.



Note BS 7533-11: 2003 recommends that reinstatement should have a cambered surface with paving slightly proud of the existing for future settlement. Experience shows this to be unnecessary if repairs and relaying are all carried out correctly.

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