

- 
- Guidance for designers, contractors and installers
  - Efficient detailing and site practices
  - Mechanised handling and installation
  - Minimised and safer concrete cutting
- 

# MODULAR PAVING DETAILED DESIGN & INSTALLATION



# INTRODUCTION

Precast concrete paving meets today's Modern Methods of Construction (MMC) ethos with fully engineered, prefabricated, modular products. The use of mechanised on- and off-site processes linked to good design will enhance MMC benefits, improve the end result and optimise safety as well as efficiency. This guidance aims to help designers, contractors and others to optimise this technology and to meet their obligations under Construction (Design and Management) Regulations (CDM) and other requirements.

Although a well-proven and established technology, precast concrete paving continues to develop with mechanised handling, installation and related operations, increasing efficiency and safety – including social distancing. It is important to remember that the key to attractive, durable, cost-effective precast concrete paving is to optimise its modular nature. By careful design and use of compatible products, cutting can be minimised, planned for and executed off-site in controlled conditions.

There are numerous techniques and products readily available to help designers and contractors realise successful paving schemes safely. Consideration of all the product alternatives and sizes available at the design stage, and careful setting out can generate real efficiencies and eliminate the need for manual handling or on-site cutting. As with any construction operation, the devil is in the detail – with edges, insertions, level changes and junctions – which should not just be left to on-site operatives but resolved within the design.

This guidance does not replace the designer's or contractor's obligations under current CDM Regulations and work should be carried out in accordance with all relevant, current legislation. Separate guidance documents on the design, detailing and installation of concrete block paving (including permeable paving), kerbs and paving flags are available from Interpave via [www.paving.org.uk](http://www.paving.org.uk)



# EFFICIENT DESIGN WITH BLOCK PAVING

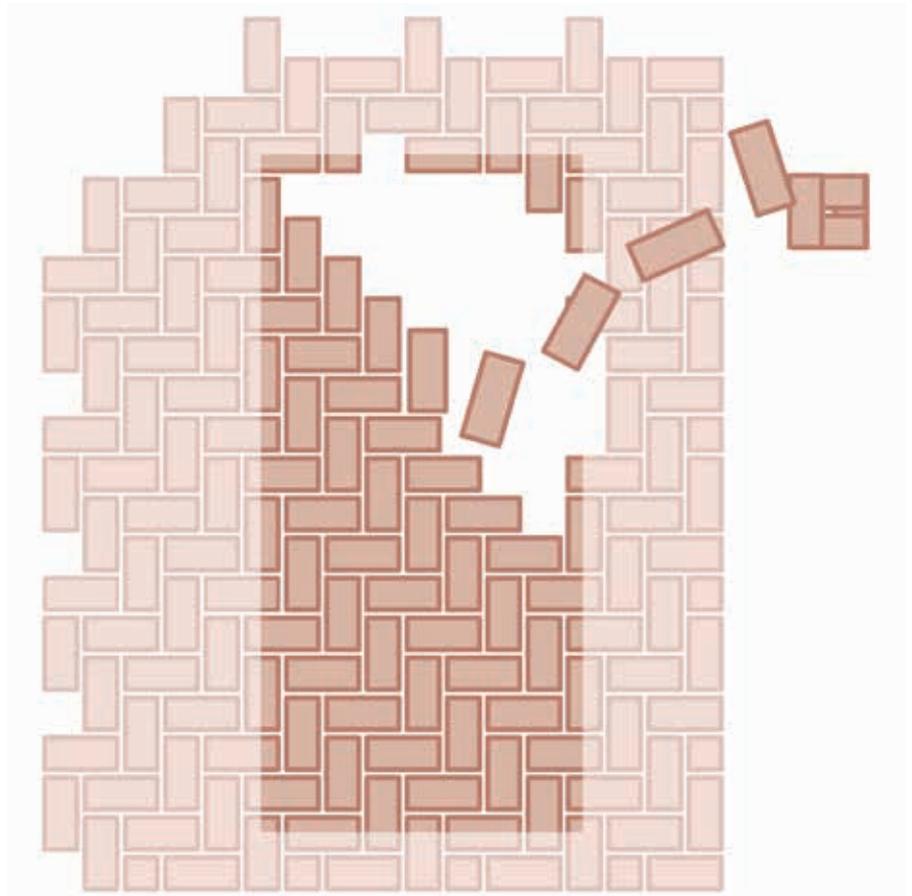
There are a number of techniques and products readily available to help with the design of block paved areas – including permeable paving – created with minimal or no cutting, including the following. Information on availability of specific products and accessories is available from individual Interpave members.

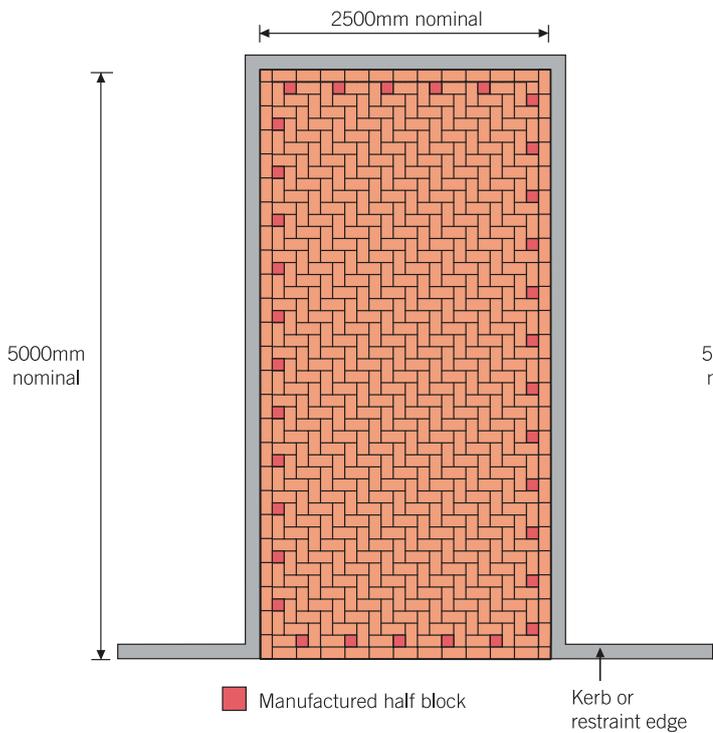
**Modular dimensions** – design and set-out the layout for paved areas using modular dimensions (paving block width) and also apply them to penetrations or obstacles needed within the paved area.

**Starter Blocks/Closure units** – with 45° herringbone, use manufactured units (known as Bishop's Hat or Mitre blocks) instead of cut units to complete the laying pattern.

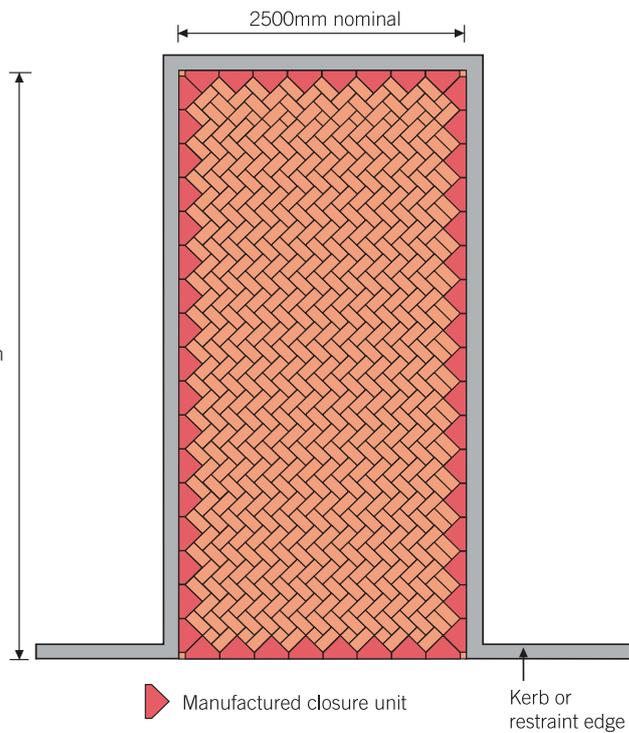
**Orientation of Laying Pattern** – careful consideration of orientation during design and setting-out can eliminate the need for cutting, for example with herringbone pattern at 90° to edges rather than the popular 45°, as shown on page 4.

**Half blocks** – use manufactured half blocks instead of cut units to complete the laying pattern, for example as shown on page 4.

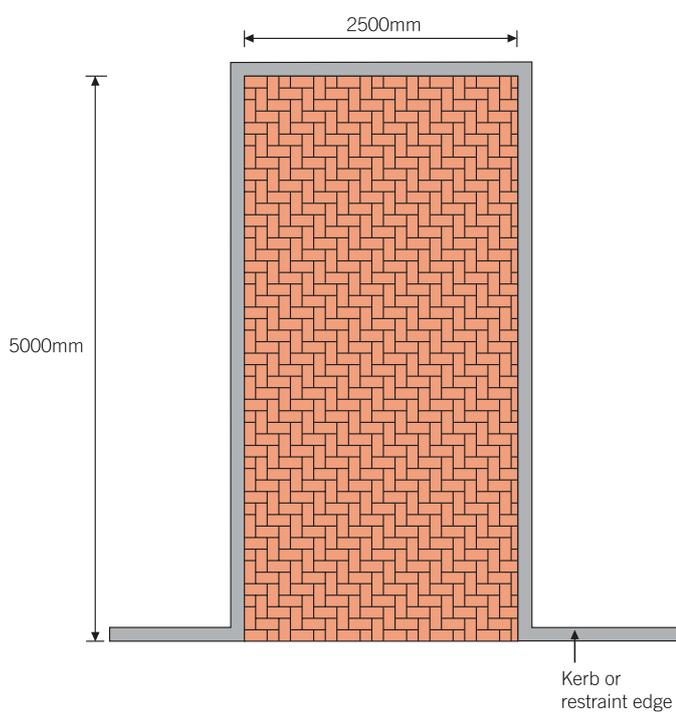




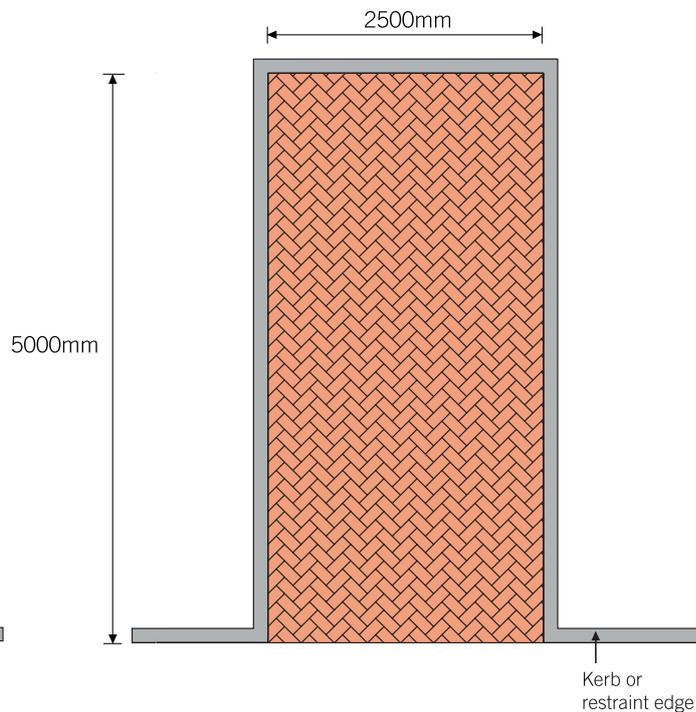
**No cutting required**



**No cutting required**



**Cutting will be required at some boundaries**



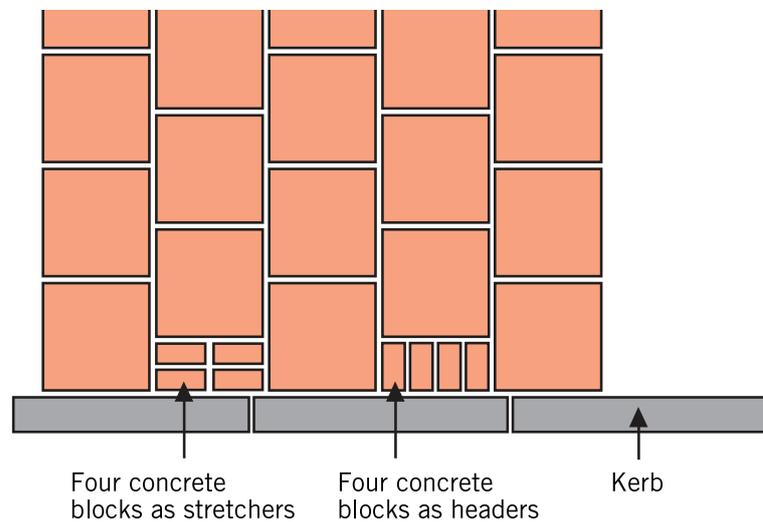
**Cutting will be required at all boundaries**



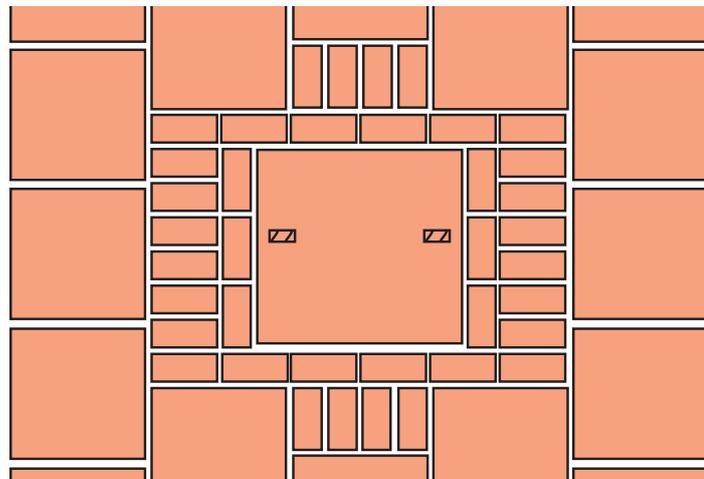
# EFFICIENT DESIGN WITH FLAGS

There are a number of techniques and products readily available to help with the design of flag paved areas, created with minimal or no cutting, including the following. Information on availability of specific products and accessories is available from individual Interpave members.

**Modular dimensions** – design and set-out the layout for paved areas using modular dimensions (multiples of standard flag sizes) and select a flag size to suit.



**Block Paving in-fills** – block paving can be used successfully to finish the flag laying pattern in place of cut flags, for example as shown above and below.



**Consider Contour Changes** – where rapid changes in contour or levels are needed, that require diagonal cuts, as an alternative select a smaller flag size or block paving, or redesign contours to accommodate bigger flags.

# EFFICIENT DESIGN WITH KERBS

Extensive ranges of kerbs, channels and other components are manufactured by Interpave members including those scheduled in the British Standard BS EN 1340 and specials for a variety of applications. In particular, small unit 'kerbing blocks' (as shown below) are well-suited to forming curves, corners and transitions without cutting. Consideration of all the product alternatives and sizes available and careful setting out can reduce or eliminate the need for cutting.



# MECHANISED INSTALLATION WITH BLOCK PAVING

Used for decades on projects ranging from the most demanding heavy-duty to the purely decorative, block paving is uniquely placed to satisfy both practical and aesthetic demands. Its potential is enhanced with permeable paving, a uniquely flexible SuDS (sustainable drainage systems) technique providing an inherent drainage system. Whether conventional or permeable, concrete block paving is particularly suited to mechanised installation techniques.

## Machine laying principles

Basically, a hydraulically operated clamping system is used to lift a 'cluster' of concrete paving blocks, about 1 square metre in area and already in the required laying pattern. Clamps can be fitted to a variety of site equipment or form an integral part of a dedicated machine designed for good site manoeuvrability. While the machine does all the work, there is sometimes an operative guiding the cluster into place, as well as the machine driver.

There are various shapes available, as well as standard rectangular blocks in various patterns, including herringbone which some manufacturers offer ready for machine laying. The speed of laying depends very much on site organisation, travel distances, machine types and other factors. 1,500 square metres or more per day is easily achievable – contrasting with no more than 50 square metres per person for manual laying. Productivity is comparable with asphaltting operations. The ability to deploy a block laying machine and crew at short notice to meet 'just in time' demands on sizeable projects is a major benefit. There are also benefits in using the technology on modest sized projects, as well as larger schemes.

Faster installation means earlier completion and less operational downtime of the paved area – not forgetting that block paving can be used immediately after completion without curing times. Machine installation also makes it easier to consistently achieve accuracy and uniform joint widths as machine laying is less tiring on operatives. To maximise the efficiencies of mechanical laying, installers are examining all the other site processes, such as those shown here.



Mechanised screeding of the bedding course.



Machine laying of clusters of blocks.



Linked vibrating plate compactors.



Machine-mounted plate compactors.

# MECHANISED INSTALLATION CASE STUDIES

## Newquay Cornwall International Airport

The ability to deploy a block laying machine and crew at short notice to meet 'just in time' demands is a major benefit – demonstrated by a recently completed airport project.

The new aircraft 'Parking Pan' at Newquay Cornwall International Airport forms an essential component in this busy airport's expansion plans. Designed to meet the needs of more flights and larger aircraft, such as the Boeing 737 and 767, the Parking Pan was the final phase of current airport expansion and needed to be ready to meet operators' strict schedules. The 3,500m<sup>2</sup> area was installed in just 10 days maximising the capabilities of machine installed concrete block paving techniques. Fast, efficient mechanised block laying means earlier completion and less operational down-time of the paved area.



## Orpington Bus Depot

This replacement of unsightly asphalt and insitu concrete with machine laid concrete block paving offers another example of the capabilities of the technology to minimise operational 'down time' in critical applications.

Some 7,000m<sup>2</sup> was laid in sections without disruption to bus services because block paving can be used immediately after completion without the curing times demanded by some other materials. Also, the ability for block paving to be lifted and re-laid without scarring was demonstrated when additional barrier work was required after paving completion. The blocks were removed, barriers installed and the blocks replaced without the unsightly reinstatement associated with other formless paving materials.



## National Exhibition Centre Car Parks

Mechanised techniques enabled tight deadlines demanded by the NEC's event schedule to be comfortably met. The project involved transformation of 57,000m<sup>2</sup> of car parking from an uneven loose compacted aggregate to a high quality, consistent concrete block paved surface.

Two different contractors worked in tandem to achieve the challenging 12-week construction period for the NEC's N10, 11 and 12 car parks. Up to four block laying machines were in use at any one time achieving some of the fastest installation rates ever completed in the UK, with up to 2,000m<sup>2</sup> being installed per day. Coordination and mechanisation of all the construction processes – not just block laying – was essential for this impressive performance to be achieved.

Sustainability was also important with block deliveries on re-useable pallets and approved recycling contractors with on-site equipment for shrink-wrap disposal.



# MECHANISED INSTALLATION WITH FLAGS & KERBS



There has been continuing growth in the use of mechanical lifting devices in the UK over recent years, providing greater efficiency than manual handling – saving time and money. Mechanical installation regimes also help meet regulations to protect workers from risks associated with musculoskeletal disorders and work-related upper limb disorders resulting from manual handling and installation. They include the Health and Safety at Work etc., Act, 1974, Manual Handling Operations Regulations 1992 (as amended 2004) and CDM Regulations.

Elimination of manual lifting should be considered at the design stage so that kerbs and flags are always handled and laid mechanically using vacuum lifting gear, mechanical grabs or similar devices. Where manual handling is unavoidable, workers should be trained in good handling techniques. The use of lighter weight kerbs or devices that allow two people to share the lift will reduce the risk of injury. Using smaller and lighter kerbs or flags, or substituting flags with block paving will further reduce the risks from any residual manual handling.

The following guidance covers safe handling of concrete kerbs and flags, and illustrates examples of available equipment. It complies with HSE Construction Information Sheet No.57, *Handling Kerbs: Reducing the risk of musculoskeletal disorders (MSDs)*. It highlights the responsibilities of both designers and contractors and how to minimise risk.



# HANDLING & INSTALLATION WITH FLAGS & KERBS GENERAL GUIDANCE

It is important that work procedures are drawn up before commencement to identify any hazards. Failure to do this can result in lack of co-ordination of materials and multiple handling of product. Correct Personal Protective Clothing should be used.

## Planning the work

- Work should be planned and coordinated to avoid unnecessary handling.
- For operations where it is proposed to carry products around site, forklift vehicles are used, kerbs and flags should be delivered on timber pallets. Ensure that pallets are robust as the failure of a pallet could allow kerbs or flags to fall.
- Strapping and wrapping of packs should only be removed just prior to use of the kerbs or flags.
- Care should be taken when cutting bands and/or removing wrapping to avoid kerbs or flags falling.
- Accurate placement of the laying course will minimise shovelling operations
- Accurate preparation of the concrete bed and any excavated trench will reduce the amount of adjustment to kerbs once laid.
- Consideration should be given to avoiding on-site cutting and, if it is necessary, to its safe execution. Comprehensive guidance is available for both kerbs and flags via <http://www.paving.org.uk>

## Return to work

Employers should consider how to manage workers who have suffered manual handling injury, in particular their work. For most lower back injuries, staying mobile can assist recovery. With an employer's good management, including a 'back-to-work' plan, in most cases the affected person will be able to return to work. Good management would include reviewing the risk assessment and obtaining medical advice. Further information is available on the HSE Back Pain and Sickness absence web pages.

# HANDLING & INSTALLATION WITH FLAGS & KERBS PRECAUTIONS

All those involved in the specification, manufacture, supply and installation of kerbs and flags can help to reduce the risk from manual handling.

## **Designers, Principal Designers and Clients**

The design and planning stage should consider:

- Solutions which eliminate repetitive manual handling.
- When kerbs or flags are used they are compatible with mechanical handling solutions.
- Identify the risks during the lifetime of the product including issues relating to maintenance and repair.
- Plan the work to allow the maximum number of kerbs or flags to be laid at one time to realise the economies of scale and promote the practicability of mechanical handling.

## **Contractors and Principal Contractors**

Contractors need to plan the work to ensure risk is kept to an acceptable level. This may involve the following actions:

- Rethink the phasing of the installation to maximise the number of kerbs or flags being laid at one time.
- Lay direct from the pack or pallet rather than double handling.
- Use mechanical solutions for the handling of non-standard kerb details such as feature kerbs, transition kerbs, drop kerbs, quadrants (cheeses) and radius kerbs.
- Provide for the safe storage and secure transport of kerbs and flags.
- Ensure that workers are trained in the safe use of mechanical lifting equipment.
- Provide training in safe lifting techniques.

# HANDLING & INSTALLATION SAFETY CONSIDERATIONS

## Concrete Paving Blocks

Paving blocks, whether conventional or for permeable pavements, are generally supplied in packs comprising several layers. In some cases, each layer is produced in the specified laying pattern, ready for direct machine installation. Packs may be strapped, shrink-wrapped or palletised.

Paving blocks range in thickness from 50mm (typically for driveways) to 100mm (for heavy duty applications). A typical 100 x 200 x 60mm rectangular paving block weighs 2.8kg.

## Concrete Paving Flags

Each Interpave member has its own method of packaging but it is common for paving flags to be stacked vertically. The majority of packs are supplied palletised, although some are supplied in strapped packs.

Flags can be divided into three main categories: Standard, Small Element and Decorative. Traditionally the range of sizes of flags has remained consistent and the following units are recognised as the British Standard preferred sizes. As a guide to calculating individual weights of different size paving units a density of 2300kg/m<sup>2</sup> is used here.

Designation	Nominal Size mm	Thickness mm	Weight kg
A	600 x 450	50 or 63	32 or 39
B	600 x 600	50 or 63	43 or 52
C	600 x 750	50 or 63	53 or 65
D	600 x 90	50 or 63	64 or 78
E (small element)	450 x 450	50 or 70	23 or 33
F (small element)	400 x 400	50 or 65	19 or 23
G (small element)	300 x 300	50 or 60	11 or 13

## Concrete Kerbs

Concrete kerbs are generally supplied horizontally laid on pallets.

They can be divided into three categories: BS EN 1340 standard kerbs, BS EN 1340 accessories (e.g. quadrants, angles and radii) and non-BS products (e.g. containment and combined drainage kerbs). BS standard kerbs are 450 - 915mm long. The following weights are for 915mm length straight standard kerbs:

Profile Designation	Weight kg
Half battered HB1	97
Half battered HB2	69
Half battered HB3	42
Splayed SP	64
Bullnosed BN (150x305mm)	100
Bullnosed BN (125x255mm)	70

The weights of other specific products should be provided by the manufacturer. For example, traffic containment kerbs and combined drainage kerbs units can weigh in excess of 250kg.

# HANDLING & INSTALLATION WITH FLAGS & KERBS RISK ASSESSMENT

The Manual Handling Operations Regulations 1992 (as amended 2004) apply to all construction work. They set out a framework for employers to tackle the risks from manual handling. Under these regulations, if employers cannot avoid manual handling where there is a risk of injury, they must assess their manual handling operations and take steps to reduce the risk of injury to the lowest level reasonably practicable.

Kerb and flag laying by hand, particularly if repetitive, involves a serious risk of injury to those who are doing the work. Therefore employers need to take action to control this risk. When tackling the risk, the best solutions will be those which address all three main hazards: the weight of the kerb or flags; the repetitive nature of the operation; and posture during work. To help find the best solution, the following 'hierarchy of control measures' is suggested. You should try to adopt the solutions nearest the top of the hierarchy first, as these will give the best level of risk control.

## Hierarchy of Control Measures

**Total Mechanical** - ensure kerbs and flags are always handled and laid mechanically (e.g. using vacuum devices, mechanical grabs, etc). This is the preferred solution for new build and refurbishment work.

**Partial Mechanical** - ensure that the maximum amount of the kerb or flag handling process is undertaken mechanically (e.g. using mechanical solutions to get the kerb or flag near its final position). Using smaller/lighter kerbs or flags, or substituting with block paving, or using handling aids will further reduce the risks from any residual manual handling.

**Manual Handling** - in rare cases where it is not possible to use any of the above solutions, short stretches of kerb and flags may be laid manually. Where this is necessary, workers should be trained in good handling techniques. The use of lighter weight kerbs or devices that allow two people to share the lift will reduce the risk of injury.

# HANDLING & INSTALLATION WITH FLAGS & KERBS MECHANICAL LIFTING EQUIPMENT

Lifting equipment is generally based on mechanical or hydraulically operated clamps, or vacuum lifting systems. Suitability should be determined through a risk assessment of the operation. Equipment is available from Associate Members of Interpave: details available on [www.paving.org.uk](http://www.paving.org.uk)

## **Scissor Clamps**

A simple clamping attachment fitted to existing site plant designed for lifting, or used manually by two operatives. Manual clamps are lifted and controlled by handles which must be located safely away from pivot points to avoid risks of trapped fingers. Scissor clamps are generally only used for handling kerbs, but clamps are available to handle and lay flags. The clamping action relies on the kerb mass to activate the gripping action. Gripping may be assisted by rubber blocks fixed to the clamps.

## **Hydraulic Clamp Systems**

A simple clamping attachment to existing site plant designed for lifting. The clamping action relies on the kerb mass to activate the gripping action. Gripping is assisted by rubber blocks fixed to the clamps.

## **Vacuum Lifters**

A simple suction lifting system suitable for a two-man lifting device (battery driven) or an attachment to existing site plant designed for lifting or mounted on a lorry or trailer. Vacuum lifters utilise a motorised pump to generate suction through a pad that attaches to the kerb or flag. It is essential to ensure that the suction pad type is suitable for the kerb or flag type to be lifted. Vacuum equipment may incorporate filters that require cleaning and replacement to ensure efficient running.

## **Maintenance and Safety**

Although all of these options offer safe methods to move heavy product on site, the equipment must be well maintained. The failure of any equipment during lifting operations could cause serious injuries if the load is allowed to drop. Particular attention should be paid to the maintenance requirements of those areas that are most prone to wear and tear and which require repair or replacement from time to time. Care should also be taken with the handle grips which, when worn or loose, may allow operatives' hands to slip on the equipment.

### **Selecting Lifting Equipment**

- Consider the various differences between equipment available in the context of the proposed work.
- Check for the appropriate manufacturer's certification / guarantees to ensure that the equipment has been designed for the intended use and determine the lowest safe working load of any component of the equipment.
- Ensure that the equipment is in good working order and not damaged.
- For vacuum lifting equipment, vacuum heads/ pads are available to suit different kerb and flag sizes/weights and surface profiles. Ensure that the lifting vacuum heads/pads are suitable for and compatible with the kerbs or flags to be lifted.
- Ensure that the equipment is the most appropriate for the job before purchasing or hiring. If the equipment is used inappropriately or not in accordance with manufacturers' recommendations, accidents may occur.
- For manual lifting equipment, make sure that it will allow the worker(s) to lift and lower the load without undue bending or twisting and to hold the equipment comfortably without excessive wrist deviation.
- Equipment continues to be developed with increased adoption by the industry and discussions with the equipment manufacturers before purchase may enable modifications to be made to suit any specific requirements.

### **Practical Considerations**

- Make sure that the work is appropriate for powered machines, e.g. that the machinery can manoeuvre around the site.
- Check with the kerb or flag manufacturer that products can be delivered to site packed and loaded in a way that is compatible with the operational characteristics of the equipment, i.e. with drainage channels or tactile/riven/ textured paving the right way up.
- Operators of the equipment must complete training as laid down by the equipment supplier. Manual handling training is also required to deal with any unforeseen manual handling of products and pallets.
- When manually handling ensure personnel have received training on team lifting and manual handling, and carry out the work in such a way as to reduce manual handling risks to an absolute minimum.

### **Use and Maintenance of the Equipment**

- The equipment must be used, maintained and tested strictly in accordance with the equipment manufacturer's and supplier's requirements.

# HANDLING EQUIPMENT FOR BLOCK PAVING



## Mechanised Installation

Dedicated, powered laying machines **1** have been used successfully for many years, offering a wide range of benefits (see pages 7 & 8). A hydraulically operated clamping system is used to lift each 'cluster' of concrete paving blocks about 1 square metre in area. If possible, blocks are supplied in layers already in the required laying pattern. Clamps are also available which can reposition blocks delivered in 'stack bond' layers to 'stretcher bond' and other patterns.

Alternatively, fully-functional clamps can be added to appropriate site machinery. **2**

Interpave manufacturers can supply layers in patterns ready for laying, such as herringbone. **3**



## On-site Handling

To ensure efficient installation, blocks should be delivered close to the laying face. A range of dedicated equipment is available including pallet trucks for attachment to site vehicles. **4**

For hand-laid applications, manual block carts can be used. **5**



# HANDLING EQUIPMENT FOR FLAGS

## Mechanical Lifting and Installation

Examples of lifting equipment currently available for use with precast concrete flags follow:



### Self contained vacuum lifter

Self contained trailer unit with vacuum system

- swinging boom arm
- efficient and cost-effective
- particularly suited to larger areas



### Vacuum attachment

Vacuum operated lifter attachment for a suitable fork lift or excavator with suitable capacities

- hydraulics powered by host machine
- swinging beam arm
- flags for use carried by the equipment



### Vacuum lifter - trailer or truck mounted

Vacuum operated self powered lifter

- trailer or lorry mounted
- swinging boom arm
- flags carried on board trailer or lorry



### Self powered vacuum lifting attachment

Vacuum operated lifter attachment to an existing construction machine, self powered

## Mechanical Lifting of Tactile and Textured Surfaces Flags

Various types of vacuum lifting heads are available to lift any tactile, riven or other textured surface paving flags, such as the examples that follow. It is essential to select the appropriate head for the flag and surface involved.

**Tactile – Corduroy Hazard Warning**



**Tactile – Platform Edge (Off-street)**



**Tactile – Platform Edge (On-street)**



**Textured Surface Flag**



## Mechanical Turning of Stacked Flags

Attachments are available to pick up flags vertically stacked on a pallet and rotate them to a horizontal position ready for installation.



# HANDLING EQUIPMENT FOR FLAGS

## Mechanical Lifting and Installation

Examples of lifting equipment currently available for use with precast concrete flags follow:



### One person manual lifting vacuum system

Battery driven vacuum lifter – no manual lifting is necessary as raising and lowering the boom is powered.



### Single person vacuum lifter

Manual operation both to control and to lift is achieved by the operative pushing down via a long lever-arm to minimise the effort needed.



### Two person vacuum lifting system

Battery driven vacuum lifter - may be used as an attachment to existing construction plant, or manually as illustrated.



### Two person manual lifting clamp

Simple scissor action operated by two persons.

# HANDLING EQUIPMENT FOR KERBS

## Mechanical Lifting and Installation

Examples of lifting equipment currently available for use with precast concrete kerbs follow:



### Mechanical grab attachment

Simple scissor attachment to an existing construction machine.



### Hydraulic grab attachment

Hydraulically operated grab -attachment to an existing construction machine, hydraulics powered by host machine.



### Self powered vacuum lifting attachment

Vacuum operated lifter attachment to an existing construction machine - self powered.



### Vacuum fork lift attachment

Vacuum operated lifter attachment for a suitable fork lift or excavator fitted with forks

- hydraulics powered by host machine
- swinging beam arm
- kerbs for use carried by the equipment



### Vacuum lifter

Vacuum operated self-powered lifter with wheeled base and swinging boom arm.

# HANDLING EQUIPMENT FOR KERBS

## Mechanical Lifting and Installation

Examples of lifting equipment currently available for use with precast concrete kerbs follow:

### One person manual lifting vacuum system

Battery driven vacuum lifter.



### Two Person manual lifting clamp

Simple scissor action operated by two people - (Two clamps and persons required to lift kerb)



### Two person manual lifting clamp

Simple scissor action operated by two persons.



### Two person vacuum lifting system

Battery driven vacuum lifter - may be used as an attachment with existing construction plant



# CUTTING CONCRETE ADOPTING SAFETY

As with many materials, incorrect cutting of concrete paving blocks, flags or kerbs can be problematic. Elimination or reduction of cutting through careful design, or risk management of cutting where it is necessary, can resolve this issue, as well as offering cost and efficiency benefits.

Silica is a natural component found in many construction products. Crystalline silica is found in sand, sandstone, granite and products such as concrete. Health hazards can result from breathing in the fine dust of crystalline silica. This can lead to the development of silicosis, a scarring of the lung tissue which can result in breathing difficulties. Progressive silicosis is the more common form resulting from exposure over a longer period. The following guidelines will help you eliminate this health hazard when installing precast concrete paving blocks, flags and kerbs, either by removing the need to cut concrete products or by recommending safer cutting practices and equipment. They do not replace the employer's legal responsibilities to ensure a safe system of work.

## Risk assessment

Particular dusts, including respirable crystalline silica (RCS), carry a greater risk of ill health and have their own Workplace Exposure Limits (WELs). Since October 2006 the WEL for RCS has been  $0.1 \text{ mg/m}^3$ . Exposures controlled to below this level carry a very low risk for developing silicosis. Above this the risk increases significantly.

On-site research has shown that cutting with a hand-held power saw which lacks dust suppression produces a level of RCS exposure many times the WEL within seconds. Not only does this have potential for the user to be exposed but also innocent bystanders, such as work colleagues and the general public. Other research has highlighted the rapidly increasing dangers for those who smoke and are exposed to respirable silica.

In contrast, by using a power saw with water suppression the operative would require continuous exposure for some time before reaching the maximum allowable limit. However, it is important to note that, even though the exposures are drastically reduced, the operative must still wear respiratory protective equipment for full protection.



## Essential Measures

Remember that cutting kerbs, flags and paving blocks produces dust that:

- cannot always be seen
- can damage your lungs and cause health problems
- may affect workmates or members of the public standing near you.

When planning work -

**A**void cutting

**M**inimise cutting

**C**ontrol dust generation during cutting

Remember... **AMC** – **A**void, **M**inimise, **C**ontrol.

Also, note that activities that could expose workers to silica are subject to the 'Control of Substances Hazardous to Health Regulations 2002' (COSHH). These Regulations require the health risk to be assessed and then prevented or controlled. Silica must be controlled to an extremely low level (COSHH (workplace exposure) limit of  $0.1\text{mg}/\text{m}^3$ ). You are at risk if the dust you breathe in over a full shift contains more RCS than the amount shown next to the penny!



Photograph courtesy of the Health & Safety Laboratory

Further advice on minimising the risk to health from exposure to RCS can be found in 'Safe Working with Precast Products' via:

<http://www.safeprecast.com/hotview.aspx?kHotTopic=297>

Best-practice advice is also available in: HSE Leaflet CN6 - *Cutting blocks, paving and kerbstones with a cut-off saw*, 2016

# CUTTING CONCRETE

## GENERAL GUIDANCE

It is advisable to wash any residual slurry from the surface of the blocks, flags or kerbs to avoid staining. Ensure that slurry water or dried slurry cannot contaminate drains and that its disposal is in accordance with good site practice.

Remember that cutting kerbs, flags and paving blocks produces dust that:

- cannot always be seen
- can damage your lungs and cause health problems
- may affect workmates or members of the public standing near you.

When cutting cannot be avoided, it is important to damp down or extract the dust and you must always wear breathing protection. Remember, avoid cutting if possible, minimise the cutting if you can't but always control dust generation if you do.

Remember **AMC**:

**A**void cutting

**M**inimise cutting

**C**ontrol dust generation during cutting

As with all construction work, the appropriate personal protection equipment (PPE) should be used. Even with water suppression you will need to wear a suitable dust mask (respirator). Nuisance grade dust masks do not protect your lungs. Use one with an assigned protection factor of at least 10, even when your water suppression equipment is working effectively. Use either FFP3 filtering face-pieces or orinasal respirators with P3 filters. Guidance on PPE is available from HSE Leaflet INDG174 (rev1) – *A short guide to the Personal Protective Equipment at Work Regulations 1992*.

# CUTTING EQUIPMENT FOR BLOCK PAVING

Selection of the right cutting equipment can minimise generation of respirable crystalline silica dust and its availability for inhalation.

**Mechanical Splitting** – in many situations, block splitters can give satisfactory results and do not disperse excessive dust.



**Power Saws with Dust Suppression** – only bench power saws (not hand held) with dust suppression should be used for block saw-cutting.



# CUTTING EQUIPMENT FOR FLAGS

Selection of the right cutting equipment can minimise generation of respirable crystalline silica dust and its availability for inhalation.

**Mechanical Splitting** – for small flags which can be manually handled, block splitters can give satisfactory results and do not disperse excessive dust.



**Power Saws with Dust Suppression** – only bench power saws (not hand held) with dust suppression should be used for block saw-cutting.



For larger flags, use a handheld power saw with dust suppression. Ensure that the flag to be cut is placed on a firm, level surface and that it can be safely held in place. Preferably, use a thick timber board or pallet to avoid damage to the blade by the surface below when cutting through the flag. Do not cut flags placed directly on the ground.



# CUTTING EQUIPMENT FOR KERBS

Use a hand-held power saw with dust suppression. Ensure that the kerb to be cut is placed on a firm, level surface and that it can be safely held in place. Preferably, use a thick timber board or pallet to avoid damage to the blade by the surface below when cutting through the kerb. Do not cut kerbs placed directly on the ground.



Ideally, kerbs and other concrete paving items should be cut under factory controlled conditions.



# GETTING IT RIGHT

## CASE STUDY

### Blackbird Leys Estate, Oxford

Modest sized areas of concrete block permeable paving provide attractive, self-draining, retrofit parking on unused areas of open land around this large housing estate. High quality installation, by Interlay member Andrew Henderson (Paving) Ltd., included modular setting out prior to installation, optimising precast concrete products including small-element kerb units, with any necessary cutting carried out off-site under factory conditions.



# MORE INFORMATION

More information on all aspects of precast concrete paving can be found at the Interpave information resource: [www.paving.org.uk](http://www.paving.org.uk)

Details of specialist paving installers are available via the independent association of paving contractors, Interlay: [www.interlay.org.uk](http://www.interlay.org.uk). Both Interpave and Interlay support the National Highway Scheme NHSS30: 'The Quality Management of the Installation, Maintenance and Repair of Modular Paving'. This scheme aims to improve the installed quality of all types of modular paving including concrete blocks, flags and kerbs. It provides an industry benchmark, ensuring that project processes are planned and use properly trained and competent installers.

## Further Reading

- Health and Safety at Work etc., Act 1974
- Management of Health and Safety at Work Regulations 1999
- Construction (Design and Management) Regulations 2015 (CDM)
- Manual Handling Operations Regulations 1992 (as amended 2004)
- Provision and Use of Work Equipment Regulations 1992
- Lifting Operations and Lifting Equipment Regulations 1998
- Control of Substances Hazardous to Health Regulations. 2002
- The Personal Protective Equipment at Work Regulations 1992
- The Personal Protective Equipment Regulations 2002
- HSE booklet L23 - Manual Handling; The Manual Handling Operations Regulations 1992 (as amended)
- HSE Leaflet INDG174 (rev1) – A short guide to the Personal Protective Equipment at Work Regulations 1992
- HSE leaflet MISC 383, the Manual Handling Assessment Chart
- HSE Leaflet C100 – Time to clear the air!, 2008
- HSE Construction Information Sheet No 36 Revision 1 – Silica, 2004
- HSE Leaflet CN6 - Cutting blocks, paving and kerbstones with a cut-off saw, 2016
- British Precast leaflet - Safe working with precast products, v2 - 2017

## Further Websites

- <http://www.hse.gov.uk/msd/backpain/index.htm>
- <http://www.hse.gov.uk/sicknessabsence/index.htm>
- <http://www.hse.gov.uk/index.htm>
- <http://www.safeprecast.com>



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