handling kerbs and flags

Guide to the Handling of Precast Concrete Kerbs and Paving Flags

October 2011

Interpave
THE PRECAST CONCRETE PAVING AND KERB ASSOCIATION
www.paving.org.uk

HANDLING KERBS AND FLAGS

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Published by Interpave
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Interpave is a Product Association of the British Precast Concrete Federation Ltd.

Introduction and Context:

This document from Interpave combines and updates two previous, separate publications. It provides guidance on safe handling of kerbs and flags, and illustrates examples of available equipment. The following guidelines comply with HSE Construction Information *Sheet No 57, Handling Kerbs: Reducing the risk of musculoskeletal disorders (MSDs)*.

Concrete kerbs have been in use for around 70 years and concrete flag paving for even longer. Regulations have been in place for some time to protect workers from risks associated with musculoskeletal disorders and work related upper limb disorders resulting from manual installation of these products. They include the Health and Safety at Work Act, etc., 1974, Manual Handling Operations Regulations 1992 (as amended 2004) and 2007 CDM Regulations. There has been continuing growth in the use of mechanical lifting devices in the UK over recent years.

Some contractors and designers may not be aware of their responsibilities and how to minimize risk. In addition to health and safety considerations, mechanical installation regimes offer greater efficiency than manual handling, saving time and money.

These new guidelines are intended to help with the reduction of risk resulting from installation of highway kerbs and paving flags, and relate to currently available equipment. They do not replace the contractor's obligations to carry out risk assessments in accordance with the Construction (Design and Management) Regulations 2007 and work should be carried out in accordance with all relevant, current legislation.

Separate guidance on the design, detailing and installation of concrete kerbs and paving flags is available from Interpave via **http://www.paving.org.uk**

Health and Safety Considerations:

Precast 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 250 kg.

Precast 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^2 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

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 Control Measures

- **Elimination** - Eliminate manual lifting of kerbs and flags at the design stage.
- **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.

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, CDM Co-ordinators 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

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.

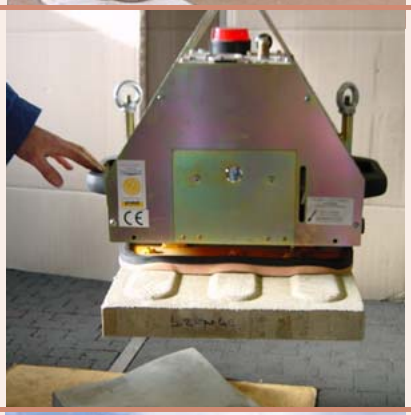
Mechanical Lifting Equipment Summary - Kerbs:

The following table illustrates examples of lifting equipment currently available for use with precast concrete kerbs.

	TYPE	ILLUSTRATION
MECHANICAL HANDLING EQUIPMENT	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 - trailer or truck mounted. Vacuum operated self powered lifter - trailer or lorry mounted - swinging boom arm - kerbs carried on board trailer or lorry	

Mechanical Lifting Equipment Summary - Flags:

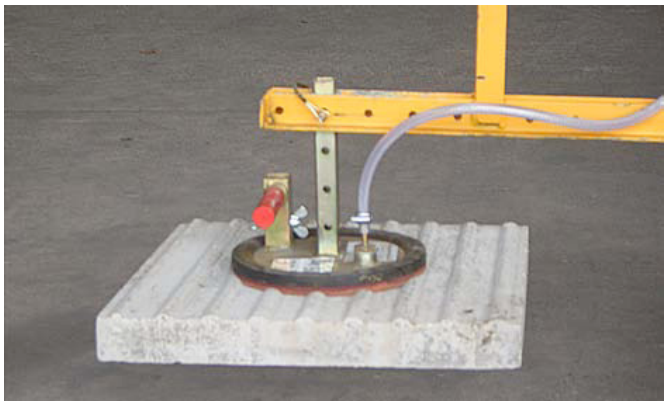
The following table illustrates examples of lifting equipment currently available for use with precast concrete flags.

	TYPE	ILLUSTRATION
MECHANICAL HANDLING EQUIPMENT	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.

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

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 handing 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

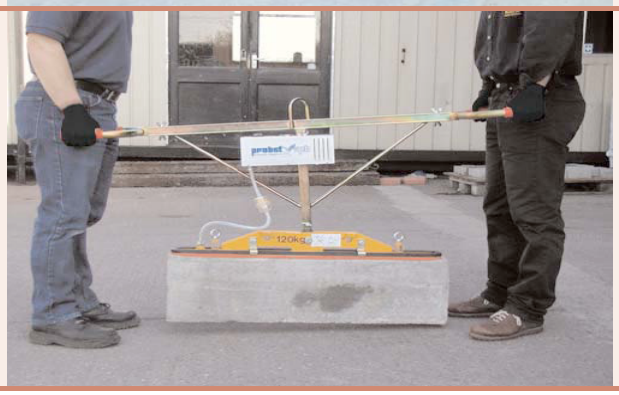
- Make sure that the work is appropriate for powered machines, e.g. that the machinery can manoeuvre around the site.
- Check with the kerb or flag manufacturer that products can be delivered to site packed and loaded in a way that is compatible with the operational characteristics of the equipment, 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.

Manual Lifting Equipment Summary - Kerbs:

The following table illustrates examples of lifting equipment currently available for use with precast concrete kerbs.

	TYPE	ILLUSTRATION
MECHANICAL HANDLING EQUIPMENT	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	

Manual Lifting Equipment Summary - Flags:

The following table illustrates of lifting equipment currently available for use with precast concrete flags.

	TYPE	ILLUSTRATION
MECHANICAL HANDLING EQUIPMENT	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.	

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.

Further Information:

Publications

- Health and Safety at Work Act etc 1974
- Management of Health and Safety at Work Regulations 1999
- Manual Handling Operations Regulations 1992 (as amended 2004)
- Construction (Design and Management) Regulations 2007 (CDM)
- Lifting Operations and Lifting Equipment Regulations 1998
- Provision and Use of Work Equipment Regulations 1992
- HSE leaflet MISC 383, the Manual Handling Assessment Chart
- HSE booklet L23 - Manual Handling; The Manual Handling Operations Regulations 1992 (as amended)

Websites

- http://www.hse.gov.uk/msd/backpain/index.htm
- http://www.hse.gov.uk/sicknessabsence/index.htm