



paving

for sustainability

A GUIDE TO SUSTAINABLE PAVING
WITH PRECAST CONCRETE
EDITION 2



Interpave

THE PRECAST CONCRETE PAVING
AND KERB ASSOCIATION



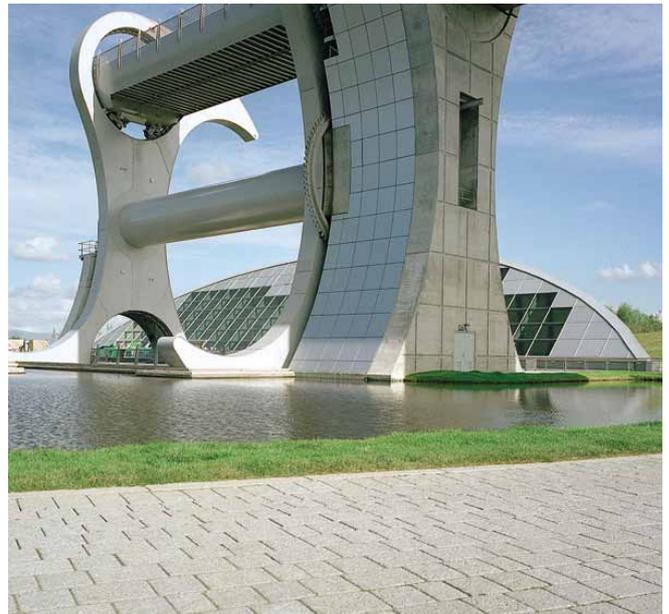
Introduction

A widely used and accepted definition of sustainable development is: “...meeting the needs of the present without compromising the ability of future generations to meet their needs” (the Brundtland report, 1987). The UK Government, Scottish Executive, Welsh Assembly Government and the Northern Ireland Administration have agreed upon a set of principles that should be respected:

- Living within environmental limits
- Ensuring a strong, healthy and just society
- Achieving a sustainable economy
- Promoting good governance
- Using sound science responsibly

All these principles are centred around the three known pillars of sustainable development. These pillars are Environmental Protection, Social Progress and Economic Growth. In order to focus efforts to improve, the UK has identified these four priority areas for immediate action:

- Sustainable Consumption and Production
- Climate Change and Energy
- Natural Resource Protection and Environmental Enhancement
- Sustainable Communities



Sustainable Paving

This document aims to show that precast concrete paving and kerb products from Interpave manufacturers meet all these demands and other sustainability requirements. It has been updated with the latest information on BREEAM, *The Code for Sustainable Homes* and other issues. It provides an overview, with links or downloads for further detail, covering:

INTERPAVE AND ITS MEMBERS – commitments and procedures for environmental improvement

A LOCALLY BASED INDUSTRY – national coverage while minimising transportation and supporting local economies and communities

A SUSTAINABLE MATERIAL – precast concrete benefits and improvements

SUSTAINABLE PAVING PRODUCTS – special environmental characteristics of precast concrete paving from Interpave manufacturers

ENVIRONMENTAL IMPACT – independent assessment with the BRE Green Guide

SUSTAINABLE PAVING IN USE – including sustainable drainage systems (SuDS) and impacts on BREEAM assessment

PAVING FOR SUSTAINABLE COMMUNITIES – playing a major role in shaping external spaces for the enjoyment of all

Further Information

<http://sd.defra.gov.uk/>

Interpave and its Members

Interpave is the Precast Concrete Paving and Kerb Association, promoting and providing the central information resource for concrete block paving, paving flags and kerbs – ranging from domestic uses to the most taxing heavy industrial applications. Interpave represents the UK's leading manufacturers and is a product association of the British Precast Concrete Federation Ltd (BPCF). It works closely with The Concrete Centre – the central development organisation for the UK cement and concrete industry.

Interpave's primary role is to communicate with the building industry, providing definitive guidance – in the case of sustainability issues, working closely with BPCF's own in-house sustainability team, as well as the Concrete Centre. Interpave also contributes to the development of British Standards, and industry guidance (via organisations such as CIRIA), training and improving health and safety, in liaison with the Health and Safety Executive.

All Interpave block paving manufacturers have committed to the **British Precast Concrete Federation Sustainability Charter**. More information is available via www.britishprecast.org/sustainableprecast/sustainability-charter.php. This is supported by key performance indicators which provide an overview of the precast industry. The first review demonstrates that it is being managed responsibly and it is envisaged that the set will be expanded in time to include all of the sustainability issues facing the industry.

Interpave manufacturers all have senior managers and directors specifically tasked with executing sustainability policies and continue to explore ways of improving performance in all areas and demonstrating that performance to stakeholders. Recycling, reducing waste and responsible use of resources all form part of this ethos, as demonstrated in this area of the website. Ongoing investment in plant, automation and processes not only improves efficiency but also continues to improve the health and safety of Interpave manufacturers' workers. Interpave manufacturers are working towards or have achieved BS EN 14001 compliance in all manufacturing plants – see individual member's websites for current status.

Full details of Interpave members' sustainability policies can be found on their individual websites. A list of manufacturer members, their products and links to their websites can be found at: www.paving.org.uk/manufacturer_members.php



Investment in state-of-the-art robotic equipment and related processes by one Interpave member avoids workers handling product and has reduced the lost time injury frequency rate by over 65%.



An Interpave member has been working in partnership with the local wildlife trust group since 1999 to help carry out Great Crested Newt surveys at one of its quarries.

Further Information

www.britishprecast.org/sustainableprecast/index.php

A Locally Based Industry

A key principle of sustainability is that a product should be manufactured as close as possible to where it will be used to:

- minimise the need for transport and the associated environmental, economic and social impacts of transportation
- support the local economy and create local employment
- prevent the export of the associated environmental impacts of production to another location with less stringent environmental and social protection legislation.

Interpave manufacturers have production plants located around the UK, offering effective national coverage minimising product transportation. Similarly, production plants have historically been sited to optimise local sourcing of manufacturing materials. Unlike imported precast concrete, granite or sandstone products, or plastic based materials of unknown origin or requiring reprocessing, no trans-world shipping is involved. But Interpave manufacturers are also working on other improvements, for example with truck efficiency including driver training, use of bio-fuels and tyre pressure monitoring.

Interpave manufacturers use the latest, automated plants which are clean and quiet, making them good neighbours. They employ an ethos of responsible materials sourcing, taking particular account of the impact of extraction on the environment. As substantial employers, they play an essential role in the economic and social well-being of local communities throughout the UK.



An Interpave member is working with The Wildlife Trusts in their part in the BBC's Breathing Places campaign, aiming to mobilise the public to become more actively involved in nature conservation.



A Sustainable Material

Precast concrete offers a range of important, inherent material characteristics, being:

- durable – being inorganic it will not rot or burn or need treating with chemicals to maintain it
- inert – it can maximise industrial ecology and does not release harmful substances such as volatile organic compounds (VOCs)
- flexible – it can be engineered to give different properties and can replicate natural materials so that their finite reserves are protected
- long-lasting and durable
- Recyclable – it can be made of recycled materials and the concrete itself can also be recycled
- local – produced in the UK, with locally sourced materials under strict environmental and social legislation, for local supply.

The main industries supplying Interpave manufacturers continue to drive forward with environmental improvements. With the Climate Change Act, the UK is committed to reducing carbon emissions by 80% by 2050. Many cement companies are aiming for significant reductions in their global CO₂ emissions and all are implementing the Cement Sustainability Initiative developed through the World Business Council for Sustainable Development (WBCSD). The cement industry has also signed up to the UK Government Climate Change Agreement and will deliver an energy efficiency improvement

across the sector of 25.6% between 1990 and 2010. The industry also actively recovers the energy from wastes by using them to replace fossil fuels.

The quarrying industry is also keen to address environmental issues and works closely with relevant government agencies to ensure continuous improvement. All quarries have rehabilitation plans and the aggregates industry operates within tightly regulated environmental planning constraints. Around 28% of aggregates used in the UK are from recycled and secondary sources – the highest aggregates recycling rate in Europe.



In 2007, an Interpave member achieved the Wildlife Trusts' Biodiversity Benchmark for Land Management at one of its works – the first active manufacturing site in the UK to do so. The company also promoted the understanding of biodiversity by joining the 2010 United Nation's International Year of Biodiversity hosting Open Days at its quarry and works.



An Interpave member has won 38 awards in 32 years for the quality of its restoration and aftercare of its quarries, promoting biodiversity.

Further Information

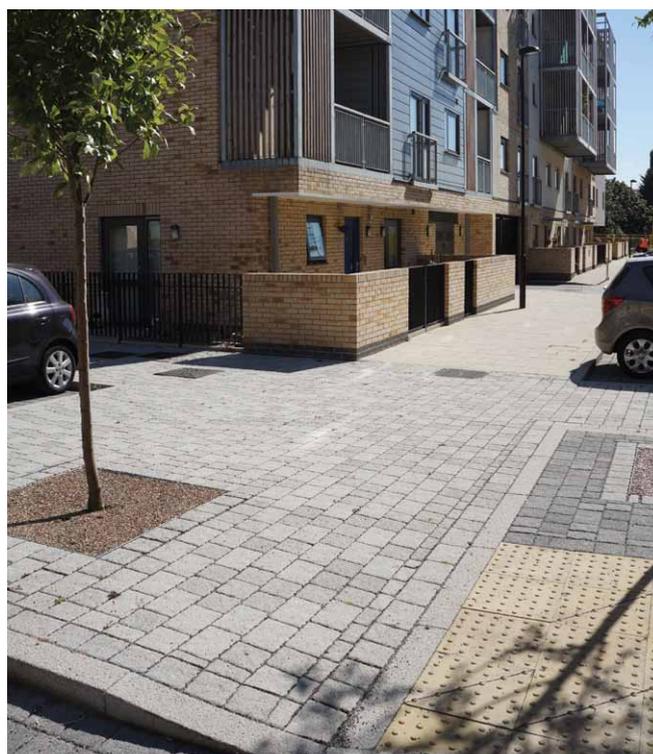
www.sustainableconcrete.org.uk and www.concretecentre.com

Sustainable Paving Products

A precast concrete block or flag pavement comprises a relatively thin layer of concrete supported on a sub-base, compared with the equivalent in-situ concrete pavement requiring a greater thickness of concrete. Also, precast concrete paving and kerbs from Interpave manufacturers use less cement than site-poured concrete pavements and kerbs. This is because products are manufactured on modern, automated plant under factory conditions using concrete with low cement/water ratios that is pressed and vibrated to ensure full compaction of the concrete mix and then cured in controlled conditions, maximising strength and durability characteristics, with minimal waste.

Harvesting and recycling of water for manufacture is a growing trend – in fact some Interpave manufacturers' plants use no mains water. Interpave manufacturers are also reducing cement in their processes and maximising cement replacement products – involving extensive research and testing – with no performance disadvantages.

Recycling is well established in the precast concrete paving industry with reuse of some products where practical, enabled by their long life span. This is particularly common with reinstatement following below-ground work, for example to services without leaving evidence, in contrast to the patched areas always apparent in an asphalt reinstatement. Alternatively, precast concrete paving products can be crushed as aggregate for reuse where it is sustainable to do so – with the aim of saving energy, carbon footprint and waste.



An Interpave member reduced the use of water from mains and boreholes by 30% between 2003-2005 by greater use of recycled water and harvested rainwater.



Further Information

www.paving.org.uk/manufacture_members.php

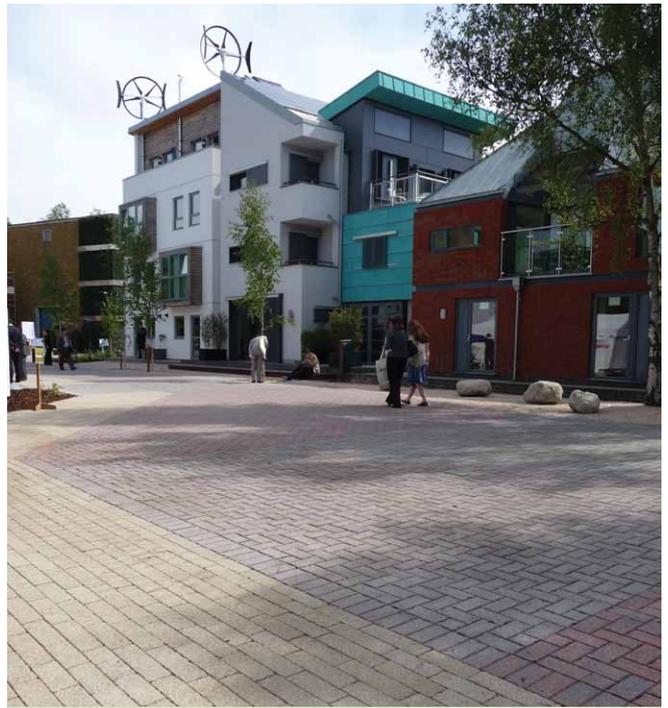
Environmental Impact

The BRE 'Green Guide to Specification' provides independent endorsement of the low environmental impact of precast concrete paving, particularly in comparison with imported materials. It rates and compares a range of specifications within various construction elements, with summary ratings ranging from 'A+' for best environmental performance to 'E' for the worst. Three different paving scenarios (together with 'boundary protection') constitute the Landscaping category of the Green Guide and cover: Pedestrian Areas, including communal spaces, walkways and garden paving; Lightly Trafficked Areas, such as car parking; Heavily Trafficked Areas, for heavier vehicles or repetitive traffic. The same three scenarios – with identical results – are applied across the six different building types considered by the Green Guide. But the ratings also provide essential guidance for local authorities to exercise their responsibilities for sustainable materials on roads and public spaces unrelated to particular buildings.

The summary environmental ratings for a range of precast concrete paving specifications – covering blocks, flags and 'grass concrete' units – are generally 'A' or 'A+' across all three scenarios. The Green Guide also recognises the environmental importance of concrete block **permeable** paving – with the same rating as equivalent conventional paving. The Green Guide and related issues are discussed fully in the *Environmental Impact of Paving* document, available via: www.paving.org.uk/sustain

These ratings provide independent endorsement of the low environmental impact of precast concrete paving, particularly in comparison with imported materials, helping specifiers and local authorities to make responsible material choices. They also reflect the on-going environmental investments and improvements made by Interpave manufacturer members, as well as by the cement industry generally. Although not considered in the Green Guide, precast concrete kerbs will have similar environmental characteristics to concrete flags, whereas the environmental characteristics of alternative kerbing materials such as plastic remain an unknown quantity.

Local material sourcing and product supply is also a key element of sustainable construction, and equivalent paving products shipped into the country bear a substantial CO₂ emission load over those locally supplied. Some imported stone paving products are also included in the Green Guide – generally with much poorer environmental ratings than their precast concrete equivalents and half with the worst 'E' rating.



Concrete block permeable paving at the BRE Innovation Park.



The latest products from Interpave manufacturers make use of the most sustainable resources while retaining impressive performance and visual characteristics. For example, here copper slag – a by-product from copper smelting – is used to create the decorative finish, while china clay stent – a by-product of the china clay industry – is used as an aggregate instead of quarrying virgin materials.

Further Information

www.paving.org.uk/downloads.php or visit www.thegreenguide.org.uk

Sustainable Paving in Use

Permeable Paving and SuDS

Undoubtedly, one of the most important environmental benefits of precast concrete for hard landscape is in the form of permeable paving, generally as part of sustainable drainage systems (SuDS).

Concrete block permeable paving meets all three of the core criteria for SuDS:

- Quantity – eliminating or controlling run-off
- Quality – removing pollutants
- Amenity – improving the environment and biodiversity.

At the same time, it offers attractive, durable and safe hard surfaces suitable for a wide range of applications.

Concrete block permeable paving deals with surface water close to where rainfall hits the ground. This is known as 'source control' and is fundamental to the SuDS philosophy. It also reduces the peak rate, total volume and frequency of run-off and helps to replicate green-field run-off characteristics from development sites. It is one of the most space-efficient SuDS components available, as it does not require any additional land take, and can handle run-off from roof drainage and adjacent impermeable surfaces as well.

It is also very effective at removing pollution from run-off, so improving water quality. Permeable pavements provide diffuse dispersion, enabling effective water treatment, and are unlike soakaways which concentrate pollutant loads. As a result of its unique capabilities, concrete block permeable paving offers designers the exciting potential of a gradual supply of clean, treated water. This can be integrated with landscape design, including natural water features for education, adventure and play, as well as to promote biodiversity. The treated water can also be used for irrigation and harvesting (for example, toilet flushing).

Interpave case studies explore several schemes that demonstrate these approaches and the European funded Lamb Drove SuDS monitoring project in Cambourne, Cambridgeshire, records the water quality benefits of permeable paving used at the head of a management train and its impact on biodiversity.

Other Implications

There are a number of other – perhaps surprising – environmental implications of using precast concrete paving.

Precast concrete paving products are inherently thin with a large relative surface area enabling them to re-absorb significant

amounts of CO₂ from the atmosphere during their lifetime. In our towns and cities, using materials with a high albedo, such as concrete block or flag paving, in place of asphalt can reduce the impact of development and the urban heat island effect. Urban heat island occurs where an urbanised area is significantly warmer than its rural surroundings.

Precast concrete paving also differs substantially from asphalt in terms of luminance, or the amount of light reflected off the paving. For asphalt, luminance is only about 7% whereas block paving achieves between 15% and 30%. This often-overlooked area has implications for street lighting design and safety in terms of contrasting pedestrians against paving at night.



Water controlled and cleaned by extensive permeable paving feeds directly into a planted canal, then to a river.



Run-off from a car park and road provides clean water for this wildlife pond and planted rills running next to homes.

Further Information

www.paving.org.uk/commercial/research_and_case_studies.php

BREEAM

BREEAM 2011

BREEAM (Building Research Establishment's Environmental Assessment Method) is a widely used environmental assessment method for buildings. For new buildings, several versions have been consolidated into *BREEAM 2011 New Construction*, used to assess the environmental life cycle impacts of new non-domestic buildings at the design and construction stages and covering a wide range of building types.

There are a number of elements that determine the overall performance of a new construction project:

- The BREEAM rating level benchmarks
- The minimum BREEAM standards
- The environmental section weightings
- The BREEAM assessment issues and credits.

Rating levels range from:

- 1. Outstanding:** an 85% score representing less than the top 1% of UK new non-domestic buildings (innovator) to:
- 5. Pass:** 30% score representing the upper 75% of UK new non-domestic buildings (standard good practice).

Precast concrete paving – particularly permeable paving – can play a significant role in gaining BREEAM credits and meeting other criteria to improve BREEAM scores in the following areas (with maximum credits available shown):

Water consumption and efficiency (Wat 01 & 04)

Permeable paving can be used for rainwater harvesting (generally for WCs) to offset potable water consumption (5 credits) and for irrigation (1 credit).

Hard landscaping and boundary protection (Mat 02)

Precast concrete paving products generally can be selected to give at least 80% of all external hard landscaping (by area) achieving an A or A+ Green Guide rating (1 credit).

Responsible sourcing of materials (Mat 03)

Locally sourced precast paving from Interpave members can form part of the specification of responsibly sourced materials for key building elements – including hard landscaping if it exceeds the gross floor area of the building (3 credits).

Designing for robustness (Mat 05)

This includes robust protection of the building near car parking, drop-off points and delivery areas from vehicle damage – ideally suited to precast concrete kerb products (1 credit).

Protecting and enhancing ecological value (LE02 – LE05)

By providing a controlled source of clean water as part of SuDS, concrete block permeable paving can play a key role in protecting ecological features, minimising impact – both short and long term – and enhancing site ecology (credits vary with building type). Research on the Cambourne project (discussed earlier) has recorded clear biodiversity enhancements compared with conventional paving and drainage.

Surface water run-off (Pol 03)

Concrete block permeable paving is central to avoiding, reducing and delaying rainwater run-off to watercourses and sewers, minimising the risk of localised flooding on and off site, watercourse pollution and other environmental damage (3 credits). BREEAM 2011 goes on to say: *“Where it can be demonstrated that a permeable paving system designed to retain silts and degrade oils has been used, then this will meet the assessment criteria for minimising watercourse pollution for car parks and access roads.”*



At this pioneering school, a terraced sequence of concrete block permeable paving car parks feeds two ponds intended to encourage long-term population by wildlife – notably the ‘protected’ great crested newts indigenous to the site. In addition, water collected from the permeable paved playground is used for toilet flushing in the school.

Code for Sustainable Homes

The Code for Sustainable Homes replaced Ecohomes and government requires all new homes to have a rating 'Level' against the Code. Ratings range from Code Level 1 – “above regulatory standards”, up to Code Level 6 – “aspirational standard based on zero carbon emissions for the dwelling and high performance across all environmental categories”.

The 2010 Code for Sustainable Homes applies In England, Wales and Northern Ireland. It is not a set of regulations and was intended to be a voluntary means of promoting sustainable development above Building Regulation standards. However, local planning authorities can – and do – require specific minimum Code Levels as policy, as part of their local plan. In Wales alone, from 2010 all new homes seeking planning permission are required to reach Code Level 3 as a minimum.

As with BREEAM, precast concrete paving – particularly permeable paving – can play a significant role in gaining credits and meeting other criteria to achieve higher Code levels, in the following areas (with maximum credits available shown):

Indoor and External Water Use (Wat 1 & 2)

Reduced water consumption through various measures (including rainwater harvesting) is mandatory for specific levels (also 5 credits). Collection from hard surfaces such as concrete block permeable paving for use in WCs and/or washing machines is specifically mentioned. Similarly, collection of rainwater for external use is encouraged (1 credit).

Surface Water Run-off Management (Sur 1)

This section will be revised when the National Standards for SuDS come into force. The mandatory elements consider the complete SuDS management train and alternative means of compliance for Peak Rate and Volume of run-off. As discussed earlier, concrete block permeable paving can play a key source control role in SuDS. Permeable paving can also help achieve zero discharge from the site for rainfall up to 5mm (1 credit) and treat run-off from all hard surfaces in line with the SuDS Manual (1 credit).

Ecological Enhancement and Change in Ecological Value (Eco 2 & 4)

As discussed earlier, by providing a controlled source of clean water as part of SuDS, concrete block permeable paving helps in enhancing site ecology (credits vary). Research on the Cambourne project (discussed earlier) has recorded clear biodiversity enhancements compared with conventional paving and drainage.



Code Level 6 Barratt Green House (shown here) and the adjacent Level 4 Hanson EcoHouse at the BRE Innovation Park use concrete block permeable paving for rainwater harvesting.



Further Information

www.paving.org.uk/commercial/research_and_case_studies.php

Paving for Sustainable Communities

An essential characteristic of precast concrete products is that they are fully engineered, manufactured and tested to British Standards under modern, controlled conditions. This means that they all exhibit the same slip resistance and many other characteristics, ensuring consistency, safety and accessibility for all users across the whole surface whichever combinations of products is used. Precast concrete paving and kerbs from Interpave manufacturers comply with all aspects of test procedures stipulated in the latest British Standards, designed to replicate performance in use over time, thus ensuring long-term performance and minimal replacement. This reassurance may not be available with imported natural stone or other materials such as plastic.

Interpave manufacturers have completely transformed precast concrete paving and kerb products with a palette of designs, colours and textures offering a visual richness and huge design choice atypical of mass production – and with a quality suitable for the very best in current urban design, whether traditional or modern, as demanded by current planning guidance. Paving blocks, flags and kerbs can undergo secondary processes in the factory to give different textures, some exposing their inherent aggregates. Surfaces can be honed for a flat finish or polished, or products shot blasted to look weathered or tumbled for a more rugged, natural appearance. This design flexibility also enables clear differentiation – particularly within shared surfaces – to help visually impaired people to make full use of the paved environment. Precast concrete is also best-suited for the

prescribed range of tactile paving to guide blind and partially sighted people.

Therefore, precast concrete paving offers a unique combination of predictability and a single material with scope for endless variety in shape, scale, colour and texture to enrich the urban environment and facilitate accessibility for all.



An integral element of this London regeneration project was community engagement, giving the initiative back to residents. The community chose a limited palette of precast concrete paving, applied to junctions and other nodal points to reduce traffic speed and give defined character to the area.



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