



pave-it

news from **interpave**

April 2005 > issue five

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news from Interpave and the world of precast concrete paving

quality streets

Pave-It finds out all about home zones, looks at a case study and interviews an expert

then we review the history of paving and its design directions today – both in the UK and the Netherlands

quality water

we take a worldwide view of permeable pavements and their contribution to sustainable drainage and water quality

quality information

we launch our new and extensive web-based design and construction information resource – and update on the latest paving standards



Interpave

THE PRECAST CONCRETE PAVING AND KERB ASSOCIATION



www.paving.org.uk

the latest on concrete block paving, flags and kerbs >>

When it rains it's porous



Porous, pervious or permeable – call them what you like but concrete block permeable pavements are today's sustainable alternative to sealed-up hard surfaces, overloaded drainage systems and flooded rivers.

Concrete block permeable pavements not only combine efficient source control drainage with an attractive loadbearing surface, so optimising land-use, but also remove pollutants. They are one of the main Sustainable Drainage System (SUDS) techniques and recognised as a preferred method in the Building Regulations and Technical Standards.

For the full story, take a look at our introductory document 'Sustainable Paving' then, for more detail, edition two of 'Permeable Pavements' – our guide to design, construction and maintenance' – both downloadable PDFs on our website.

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below: A concrete block paved Home Zone in Portsmouth (pages 6-7).



about Interpave

Interpave – the Precast Concrete Paving & Kerb Association – represents the leading manufacturers of concrete block pavings, flags and kerbs. Its main objective is to expand the use of these materials through education, technical and marketing campaigns.

Interpave is a product association of the British Precast Concrete Federation.

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welcome...

to another busy issue of **Pave-It** covering a wide range of topical subjects

The government's recent 'Sustainable Communities' summit in Manchester provides a theme for us in this issue. Using the widest possible definition of 'sustainability', the summit took forward the ODPM 'Liveability' initiative for improving our day-to-day lives – particularly in higher density communities. The clearest examples of this concept are the recent, government backed 'Home Zones' (page 6) where paving quality plays an essential role in enabling spaces shared by vehicles and pedestrians to work safely without excessive signage.

This philosophy of deregulation to free our urban environment of superfluous signs, road markings and clutter, while improving its character, is being advocated by other organisations including our corporate partners 'Living Streets'. We also welcome

the English Heritage 'Save our Streets' campaign but question their guidance on paving materials (see page 9). The current UK trend towards subtlety in the design of our paving is not shared in other countries and the Dutch experience (page 11) offers an interesting contrast.

Where there does seem to be international agreement is the popularity of concrete block permeable paving, as demonstrated by Dr Shackel (page 12). The government's proposed 'Code for Sustainable Buildings' was also raised at the summit, albeit still in outline form and we shall continue to lobby for the recognition of concrete block permeable paving as an important Sustainable Drainage System (SUDS) technique in the Code. Finally, on page 14, we explain all about our

new design and construction resource on the Interpave website. This is the most up-to-date, detailed technical information on precast concrete block and flag paving and kerbs available – essential for all pavement designers.

I hope you enjoy this issue of **Pave-It**. Do let me have your feedback – with letters commenting on the articles, suggestions for future topics or projects which we can include – and, of course, your registration for future issues. If you haven't registered already, just visit the Interpave website.

John Howe
Development Director
Interpave



Internationally renowned block paving expert Dr Brian Shackel (centre) – a contributor to this issue (page 12) – in discussion with Interpave Development Director John Howe (standing) and **Pave-It** editorial consultant and architect Chris Hodson (left). They are joined by Aziz Shafi who was Section Engineer at the Hong Kong International Airport paving project, and contributed to the case study on the Interpave website.

news >>>

sustainable paving training

Following the excellent response and success of last year's seminar programme, Interpave, CIRIA, Sustainable Drainage Associates and The Concrete Centre have joined together to deliver a series of informative and interactive training seminars on permeable pavements. These events will be presented by Steve Wilson and Professor John Knapton, both of whom have vast experience in civil engineering and impressive reputations for their research on pervious surfaces as well as practical experience in designing systems. John has been involved in Sustainable Drainage Systems (SUDS) and pervious surfaces for ten years and has worked with numerous consultants and organisations on providing solutions and design guidance. Steve – as well as designing systems – is co-author of the CIRIA publication *Source control using constructed pervious surfaces* and is lead author for *SUDS hydraulic, structural and water quality advice*.

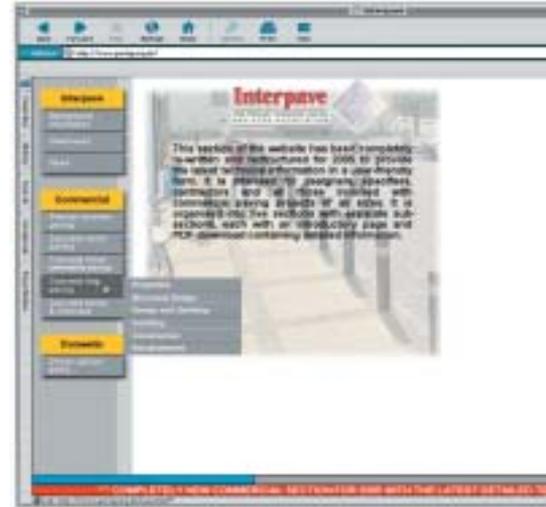


The training will build on guidance produced by Interpave and CIRIA, facilitating the effective implementation of concrete block permeable pavements in the built environment. In particular it will assist construction professionals with the specification and design of pervious pavements. Each seminar will include: an introduction to pervious pavements; design considerations; hydraulic design with a design example; pollution removal mechanisms in pervious pavements; designing for traffic loads with a practical session; developing a specification and a case study. Three seminars are planned so far, on May 5 2005 at The Concrete Centre, Camberley, Surrey; 19 July in Manchester; and 23 September in Edinburgh. These Interpave events are delivered by CIRIA and SDA in conjunction with The Concrete Centre. For further information, visit the CIRIA website: www.ciria.org or the Interpave website.



handling kerbs

Updated, detailed guidance on the handling of concrete kerbs has been developed by Interpave in partnership with the Health and Safety Executive (HSE). These guidelines are available to download from both the Interpave and HSE websites.



concrete evidence of CPD

As the central development organisation for the UK's concrete and cement sector, The Concrete Centre has been formed to enable construction clients, designers, engineers and contractors to realise the full potential of concrete. They offer a selection of regional or in house CPD Seminars covering a wide range of topics including general guidance on the design and construction of concrete block and flag pavements, permeable concrete block pavements and kerbs. These seminars are available via The Concrete Centre's regionally based advisors.

If you would like more information or to book a seminar, please contact Roger Makinson on 07904 117555 or email rmakinson@concretecentre.com.

Further information is available at www.concretecentre.com.



Interpave
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Interpave in partnership

- with CIRIA, actively involved in developing the latest comprehensive SUDS design guidance
- with BALI, CITB and Interlay in delivering training for precast concrete paving installers (page 10)
- with HSE in developing common industry guidance on safe handling of concrete kerbs and flags
- with The Concrete Centre in offering CPD seminars and dedicated training courses
- with Living Streets to improve our urban environment
- with other organisations both here and abroad to drive forward precast concrete paving technology

more information from Interpave

Interpave has been busy fulfilling its primary aim of supplying designers, specifiers, contractors and others with the latest information in the most useful form. A series of concise, colourful guidance brochures is under way, each covering a topical issue of particular importance today. Three are already available covering:

- **Accessible Paving** – with design guidance for compliance with BS 8300, Part M of the Building Regulations and the Disability Discrimination Act
- **Urban Paving** – in response to the government's Sustainable Communities initiative for regeneration
- **Sustainable Paving** – an essential introduction to concrete block permeable pavements and Sustainable Drainage Systems.



A further document will be produced shortly on Home Zones (also featured on page 6) – resident friendly community streets which the government is actively promoting at present. All these brochures are available free of charge from Interpave or can be downloaded from the Interpave website. Interpave has also produced detailed technical design and construction guides available on the website, discussed in more detail on page 14.



zone home

Home Zones are growing rapidly in popularity, encouraged by government drives towards 'Liveability' and 'Sustainable Communities'. Pave-It explains what they are, talks to the author of an important design guide and looks at one successfully completed Home Zone.



Home Zones are residential streets or groups of streets where people and vehicles share the whole road space safely and on equal terms – although the motorist should feel like a 'guest' in the area. They are designed so that quality of life takes precedence over ease of traffic movement and they aim to promote neighbourliness and a sense of security. Home Zones need to be designed as vibrant public spaces to accommodate play, exercise and relaxation by residents including children, the elderly and disabled people. They should be individually designed to give a sense of identity and community. They must create a safe and secure environment while enabling vehicle access and parking.

Detailed guidelines are now available including *Home Zone Design Guidelines: 2002*, from the Institute of Highway Incorporated Engineers (IHE) and *Home zones – A planning and design handbook: 2001* by Mike Biddulph (interviewed opposite), published by the Joseph Rowntree Foundation. Interpave will also shortly publish a design guide focusing on paving Home Zones. An essential ingredient of Home Zones is street resurfacing – frequently with precast concrete block and flag paving. The various guidelines recognise the need of paving materials to give each Home Zone individual visual appeal and definition of a specific character. Most of the paving in Home Zones will be shared surfaces but without traditional stepped kerbs to identify the carriageway. So, a variety of colours, patterns and textures is needed to clearly differentiate various

surfaces such as parking, junctions and non-vehicular areas without the clutter of signs and painted lines common to our streetscape.

Precast concrete block and flag paving, with related products such as dished channels, are ideally suited to Home Zones – whether created within existing streets or as part of new residential developments. They meet the criteria set out in the guidelines by providing a firm, even surface enabling ease of movement by wheelchair users and others and offer proven long-term performance, durability and minimal maintenance while offering endless variety in shape, scale, colour and texture. With existing streets, the Home Zone surface will generally be created by raising the carriageway level up to meet the footway, eliminating stepped kerbs. This can be easily and economically achieved using an overlay construction of block or small element flag paving. In addition, weather independent 'dry' construction methods without curing optimise available working times to fit in with the requirements of residents and, as only small plant and equipment is needed, disturbance is minimised.

HOME ZONE CASE STUDY

North Portsea, Portsmouth

Designed by The Terra Firma Consultancy for Portsmouth City Council, these extensive environmental improvements make wide use of precast concrete paving within the Home Zone concept. A complete Square was constructed as a raised table with road and pavements at the same level, and traffic calming measures such as chicanes, pinch points and ramps incorporated along streets. Contrasting surfaces were achieved with different forms of block paving and tactile paving used at crossing points.

Robyn Butcher of Terra Firma said:

"Whilst the concept of a Home Zone is to give equal priority to all users, the redesign of a complex existing residential area with its parking problems, through-routes for lorries, pavements and budgetary constraints, made this very difficult. Differentiation between vehicular areas and those



equally shared between pedestrians and vehicles was important. As a contrast to the predominantly bitmac surfaced road, block paving in raised tables was used in key spaces where the surfacing was to be perceived as a higher quality and where the car is a 'guest' in the pedestrian environment with pavements obsolete.

Where below-ground service runs are regularly altered and upgraded, block paving was the obvious choice. We believe the flexibility of the surfacing will avoid patchy 'making good' and ensure a continuing, consistent finish. Unsurprisingly, value for money was also an important factor. In a scheme covering a large residential area, the design had to be carefully costed in order to meet the budget. With the use of concrete block paving, rather than natural stone, the project achieved maximum impact whilst still satisfying financial constraints."

home zone update



Pave-It talks to Mike Biddulph, Senior Lecturer in Urban Design at the School of City and Regional Planning, Cardiff University and author of *Home Zones: a planning and design handbook*.

Pave-It: Where did the Home Zone concept originate?

MB: In the Netherlands during the 1970s. It was applied initially as part of area-based traffic calming initiatives where one or two streets would be treated as “woonerfen” or “living yards”. Visiting these schemes has convinced practitioners in the UK that these places work. The idea has since spread to become normal practice for residential street design in a number of countries in northern Europe, including Germany and Sweden.

Pave-It: How well are they being received here in the UK?

MB: Home Zones have been received with mixed emotions. Some residents campaign vigorously for the idea to be applied to their street, whilst others are concerned about the loss of parking or the prospect of a lot of children playing outside their home. But home zones are typically just pleasant, quiet and safe residential environments where you can park your car as you always did. Professionals are very keen on the concept and there is evidence that housebuilders are building them into new schemes – although we still need to make sure that local authority highway engineers are supportive.

Pave-It: How do shared external surfaces work in practice?

MB: I always like to say that people already know how shared surfaces work, as most car parks are shared surfaces – although a home zone would be a lot quieter. Essentially there is no footway, which means that a pedestrian can use the whole width of the street. Vehicles drive and park in designated areas just as they do now, although a street may be redesigned to slow the traffic. Residents have a little more space to move around. This is important for children and the elderly in particular, as these are groups who often feel hemmed in by traffic.

Pave-It: What are the essential characteristics for shared-surface paving materials?

MB: They must convey the message that this is not a normal “black top” street dominated by traffic, but rather a residential area and living space of which the street space forms a part. One of the key ways in which this meaning can be conveyed is by the use of visually stimulating paving. Additionally, designers often want to more subtly designate parts of the streetscape for particular functions – highlighting parking areas or a vehicular path and, of course, variation in paving also serves a role here. Finally, it is often thought that home zones might be more individual, and some variation in character can be achieved in the paving, through use of pattern and colour. Cost remains a big issue though, and designers are looking for materials that are robust and easy to replace, so that maintenance doesn’t become an issue.

Pave-It: How do you see the future for Home Zones?

MB: Now that we have home zone legislation there is the opportunity to develop more interesting and safer streets, but that opportunity mustn’t be lost as it did for example with “play streets”. House buyers and tenants should demand more home zones as resident expectations are gradually raised.

I would love to live in a home zone and I would pay a premium for living in such a place. That’s a message that needs to be conveyed to housebuilders in particular.



a short history of paving

Today, attention is being focused on improving our street environment and there is much talk about use of ‘traditional’ paving materials. To put the issues in context, it helps to look back at how paving developed historically.

The use of segmental paving laid to create a hard surface for roads can be traced back to about 4000 BC with the stone-paved streets of Ur in modern-day Iraq, while the royal processional roads of ancient Babylon had limestone slabs laid on burnt brick foundations. The practice continued in Greek and Roman times, with the Romans becoming sophisticated builders of roads between settlements as a military expedient. Their roads were built up with layers of crushed rock decreasing in size from the bottom up and usually surfaced with large stone setts retained by edge abutments – much as our modern roads are with concrete kerbs. The pattern of street design established in the earliest planned towns of



An illustration of Roman road construction

ancient Egypt endured almost up until the last century. This consisted of local stones laid across the street in courses with a central drainage channel and was adopted by the Romans, who established our first real towns and cities. Although there was sometimes a distinction between footway and carriageway, streets frequently ran from building to building and medieval streets, where they were paved at all, continued this tradition.

Perhaps the most important event to influence the development of urban paving was the passing of the 1762 Westminster Paving Act which set up a Paving Commission to improve the city's streets. This was widely copied throughout the country and established the use of distinct footways, usually constructed with stone or concrete slabs, separated from the carriageway by kerbs. A much wider variety of materials was then used on the carriageway itself including stone setts and, from the 19th century, asphalt – as well as more unusual choices such as cast iron

blocks, wood blocks, rubber and cork attempting to provide a better surface for wheeled vehicles. In the 18th century, John McAdam used tar to bond together crushed stone to give a smooth surface, followed by asphalt during the 20th century. With the rapidly increasing demands of wheeled traffic, the use of asphalt for carriageways has become almost universal. This uniform, lifeless material has eroded the character of many towns and cities, exacerbated by a proliferation of road marking and signage attempting to control the invasion of vehicular traffic.



Roman roads survive today

Finally, we shouldn't forget that precast concrete paving products have a tradition of their own. Concrete paving flags have been used as a lower cost alternative to stone for at least 100 years and concrete kerbs in place of granite for 70 years. Use of concrete blocks for paving started in Germany at the end of the nineteenth century, although just as a substitute for stone setts. They were also used in Holland after the Second World War as a substitute for traditional brick paving but it was here that cost-effective mass production led to a rapid growth in their popularity, copied in Germany from the 1950s. At this stage, concrete block paving technology flourished and fundamentally departed from that of stone setts and bricks. In essence, concrete paving blocks are engineered products, factory manufactured to give consistently



Concrete block paving from the 1970's

high strength and close tolerances. This enables installation by semi-skilled labour or machines – unlike stone setts, cobbles and bricks which demand highly skilled tradesmen. It also allows substantially higher performance levels to be achieved and designed for, particularly with heavier duty pavements. Concrete block paving was introduced into the UK in the 1970's from mainland Europe and has continued to develop here both as a decorative surface with numerous designs, colours and patterns, and as a strong, durable pavement for the most taxing applications.



Concrete block paving in an historic Conservation Area

...in practice

paving and conservation

'Conservation' is a difficult term to define. It is not preservation, refurbishment or copying historic features – but could include any of these. We have a particularly rich architectural and urban heritage in the UK and few would disagree with the general principle of protecting it for future generations. But to ensure this protection over the long term, our heritage must remain viable and largely usable in the modern world. This applies particularly to paving which needs to be accessible for all pedestrians as well as vehicle traffic. How do we reconcile the conflicts that this situation often generates?

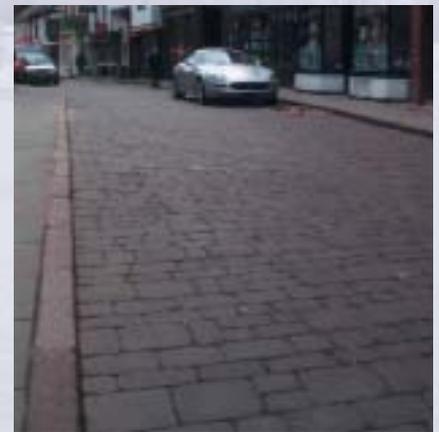
Numerous sites are designated for conservation in the UK including over 9,000 'Conservation Areas' and nearly 400,000 individual 'Listed Buildings', not to mention Scheduled Monuments and World Heritage Sites. Alterations to these buildings and areas require formal consent from local authority Conservation Officers and/or government agencies such as English Heritage, CADW (in Wales) and Historic Scotland – and this consent generally extends to the external paving. But discussion of what are appropriate paving materials is expanding beyond the controlled historic environment, targeted at all our streets and public spaces, for example with English Heritage's 'Save our Streets' campaign. Initiatives such as this are admirable in their drive towards removal of unnecessary signs, road markings and general clutter from our streets and a desire to enliven and 'humanise' the urban environment. However, the guidance offered on paving materials is open to question – particularly with a generalised preference towards stone paving as a 'traditional' material.

Visually, stone setts and cobbled pavements provide a richness and diversity which remain very appealing today but they cannot provide acceptable levels of technical performance in many situations. These requirements could well include vehicle passenger comfort, noise control, skid resistance and surface uniformity. In particular, accessibility – notably for disabled people, the elderly and those using pushchairs – is substantially compromised with stone setts and cobbles.

It is the segmental nature of stone setts and cobbles which makes them so attractive, compared with formless asphalt, and so concrete block paving offers potential for a cost effective, technically superior alternative bringing texture back to the wider urban environment. However, the use of uniform sized pavers in single pigment colours seen on some 1970's projects is not the answer. Today, the precast concrete industry offers a huge range of different block paving styles, surface finishes and colour blends, generally taking a more subtle approach. Some of these products seek to replicate natural materials including stone, with the flexibility to cater for traditional laying patterns incorporating varying row widths, whilst others have an individual character and integrity of their own, further developing precast concrete paving's own long tradition.

Styles include blocks of varying sizes which can be 'rumbled' to give a random edge, finished with a more engineered profile or embossed to give a textured surface. Other surface finishes can be achieved with shot-blasting, grinding and bush hammering. Close replicas of granite setts

are available as well as other subtle uses of exposed stone aggregates. These finishing techniques can also apply to concrete paving flags and kerbs to give a similar texture and richness to their natural stone equivalents but with better performance. In particular, concrete alternatives are available derived from the random, riven profiles of old stone flags and rough-hewn kerbs.



Rumbled concrete block paving laid in varying row widths

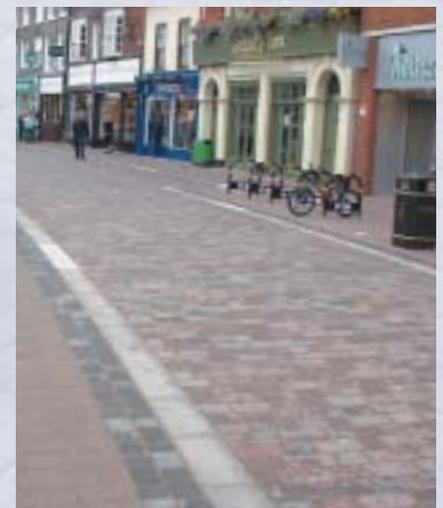
While in some instances stone paving may still be justified in terms of historic integrity, for many projects the cost and availability of stone is simply prohibitive and an insistence on its use unrealistic. Here, budgetary pressures, usability, accessibility and long-term viability clearly point towards precast concrete paving. So, urban designers are increasingly utilising the huge choice available from the latest products as part of an holistic approach to urban design – incorporating traffic management measures and the needs of all users from the start and enriching the environment.



Concrete setts with granite aggregate give a quality finish



A huge range of styles, patterns and colours is available with concrete



Precast concrete paving allows demarcation without level changes

the Interlay page

beating the skills shortage in barrow



Nine unemployed young men recently became the first candidates to participate in a radical approach to training in the construction sector.

Barrow Training Partnership has been set up to provide a quality training and assessment service for the construction industry in the Barrow area and has a mission to ensure that local workers have the skills and qualifications required to work in an ever changing industry and that local employers have sufficient trained and qualified workers to meet their business needs.

A two week intensive practical course gave participants an insight into such things as kerb, flag and paving block laying as well as drainage installation prior to them being placed in industry. Over the coming months

their work will be assessed and should lead to the achievement of a National Vocational Qualification (NVQ). Further training courses are being planned to meet the growing demand for skilled labour.

Barrow Training Partnership Managing Director Keith Dymond said “The regeneration of Barrow is now underway and there are already worries over a shortage of skilled construction workers. The skills these young men will develop over the coming months will enable them to get into the job market and play a vital role in the changing face of the area. We would like to thank Interlay and Interpave for their help with this exciting initiative, particularly in providing technical information packs, as well as an Interpave manufacturer member which supplied products for the course”.



training with BALI

Interlay and Interpave – as product associations of the British Precast Concrete Federation (BPCF) – aim to set up a Specialised Training Group jointly with the British Association of Landscape Industries (BALI) under a Construction Industry Training Board (CITB) initiative. The launch of the Hard Landscape

Training Group at BALI HQ is planned for 13th April and we aim for the commitment of both Interlay and BALI members. BALI has already appointed a dedicated Training Officer, Kath Walker.



The scheme will offer Interlay members a wide range of benefits including: a single contact to organise all their training requirements; quality Instructors from within the industry; training carried out either at their own premises or at a local venue; Training Needs Assessments to identify staff training needs; practical and ‘hands on’ courses with individual attention; a closer link to the qualifications and qualification structures; compliance with Health & Safety requirement to ‘Train & Assess’ staff, as well as meeting insurer’s demands and future ‘CPD’ requirements.

RAISING THE STANDARD

for clients

- ✓ maintaining the highest standards of laying practice
- ✓ developing new techniques and influencing standards
- ✓ increasing the pool of competent tradesmen
- ✓ maintaining an up-to-date list of specialist installers

for installers

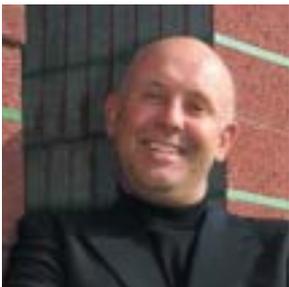
- ✓ detailed website listing recognised as the reliable source of specialist installers
- ✓ helping with training, qualifications and the CSCS card
- ✓ keeping up to date with a regular newsletter
- ✓ access to Interpave, CITB and The Concrete Centre



Join Interlay today – call Christine Farmer on 0116 222 9840

paving the world – Holland

let's go dutch



Mark Swinkels

Next month the International Bureau for Precast Concrete – BIBM – holds its 2005 International Congress in Amsterdam. To celebrate, Mark Swinkels, a Board Member of the Dutch association for the producers of concrete paving materials and street furniture (BeST) takes us on a 'paving tour' of the host city to see some of the latest developments in Holland.

Producers of concrete paving products in the Netherlands are continually introducing new

products and processes such as iron oxide colours, natural stone mixes, additives for new colour tints and designs that create three-dimensional and other eye-catching effects. The use of attractive stone aggregates on the surface and the various types of secondary treatment available – such as washing to expose the aggregate, shot-blasting, grinding and bush hammering – make it possible to produce virtually any desired surface effect. Concrete block permeable pavements are also becoming more commonplace here, as well as 'Green' block paving which enables water drainage and air infiltration to the subsurface, with the natural appearance of grass areas combined with a hard-wearing pavement.

Our designers are, very deliberately, employing the full range of colours, shapes, sizes, textures, designs and patterns now available. They are increasingly looking for architectural coordination between horizontal and vertical surfaces. This may be between building facades and paving or between paving and a wide range of street furniture. In the Netherlands we have enjoyed shared

surfaces for pedestrians and vehicles – and of course cyclists – for many years now. Today, even more use is being made of variety in colour and texture of concrete paving blocks and flags to emphasise and clarify separation of different areas and uses, without creating obstacles to accessibility for pedestrians. We are committed to promoting quality in the design of our public spaces and precast concrete paving is playing a major role in this.

To register for the BIBM congress go to www.bibm2005.com.



permeable pavements

worldwide progress in



Dr Brian Shackel has conducted research into concrete block paving since the 1970's and is the author of numerous publications on this topic. His book *The Design and Construction of Interlocking Concrete Block Pavements* has been republished in German, Japanese and Hungarian editions. He has lectured on block paving in more than 25 countries, has acted as a consultant to major paving projects worldwide and is Professor of the School of Civil and Environmental Engineering, University of New South Wales in Sydney, Australia.

“Worldwide, the usage of concrete block permeable pavements is increasing steadily... and is the fastest growing area in the world paving market.”

Although concrete block permeable pavement (CBPP) concepts only began to emerge in Germany and Austria some 25 years ago they have subsequently spread rapidly throughout the UK and Europe, Australia, Japan and the Americas to become a viable option for sustainability in most developed countries worldwide. This article identifies some of the factors that have driven this growth.

Originally in Europe, CBPPs were seen principally as a means of flood mitigation and control that minimised the very high land use costs associated with installing retention ponds and soakaways by combining these with the paving already required on site. This concept remains a powerful argument for using CBPPs in highly urbanised societies such as Australia where government enforced urban consolidation is placing ever increasing demands on existing and often barely adequate stormwater infrastructure. However, it was soon demonstrated that CBPPs could also make significant contributions to trapping, removing and treating pollutants from stormwater “at source” and therefore at

minimal cost to communities. This has been a strong incentive in the USA where the Environmental Protection Agency (EPA) places its main priority on controlling stormwater pollution. For more than 2 years the EPA has required developers of projects greater than 1 acre in size to apply for permits for stormwater management. Although in practice some projects smaller than 5 acres may receive waivers, about 97% of all development now proceeds under EPA permits which must conform to recognised Best Management Practices (BMP). BMPs approved by the EPA include CBPPs.

The EPA's use of permits and BMPs for stormwater management is typical of the worldwide response to environmental challenges. Almost invariably, the uptake of CBPPs has been a response to national or local regulations for achieving sustainability and managing the environment. The UK concept of Sustainable Drainage Systems (SUDS) and its Australian equivalent, Water Sensitive Urban Design (WSUD), both aim to manage stormwater and pollution at either the site level or on a regional basis. As

such they are referenced by planning guidelines and drainage regulations, and provide a rational framework for incorporating CBPPs into urban design. Elsewhere, the adoption of CBPPs has been assisted by the increasing use of environmental rating systems such as LEED (Leadership in Energy and Environmental Design) or LCA (Life Cycle Assessment). In North America the LEED system administered by the US and Canadian Green Building Councils has been adopted by many cities which now require LEED certification of their projects. LEED uses a point system for measuring sustainability. CBPPs can earn up to 13 points for such factors as stormwater and pollution control, high albedo (the ability to reflect heat and light) and the use of local and/or recycled materials. This score, in itself, is half the minimum number of points required for project certification and is a powerful argument for using CBPPs. The LCA system is a more sophisticated “cradle to grave” rating system. Significantly, in the UK, the BRE Green Guide to Specification rates all forms of concrete block paving ahead of granite setts and bricks and far



sustainable paving

superior to asphalt in terms of life cycle assessment.

The benefits of CBPPs not only embrace stormwater management and pollution control but are increasingly being demonstrated to have economic advantages by minimising the costs of surface drainage works, reducing the demands on stormwater sewerage and optimising land use. Initial concerns about the long term maintenance costs of CBPPs due to clogging have largely been allayed by tests in Europe, North America and Australia. These indicate that CBPPs can achieve service lives in excess of 25 years even without maintenance and, more importantly, that pollutants accumulate mainly in the uppermost 25 to 50 mm of aggregate used to fill the joints or drainage apertures. Such polluted material can be easily and economically removed and replaced if necessary. In this respect it is worth noting that, except where block paving manufactured from permeable concrete has been used, no special needs for maintenance have been demonstrated. For CBPPs relying on water movement through vertical drainage apertures or joints, several projects have already been in service for periods of around 15 years without the need for anything but routine maintenance.

It may be seen that, for CBPPs, the role of the pavement designer needs to be expanded to consider environmental and

sustainability issues. The EPA has listed unfamiliarity by pavement engineers with the concepts of permeable pavements as an obstacle to the wider adoption of such techniques. It is significant, therefore, that the countries that are most advanced in the use of CBPPs are those such as Germany, Austria, Canada, the UK, Australia and the USA that have invested in fundamental research into CBPPs. Such research normally includes pollution, infiltration and stormwater management studies. These have been supplemented by studies of structural performance in Australia, Austria and the UK. From this substantial body of information industry-based recommendations for the design and construction of CBPPs have emerged in the USA, UK and Europe whilst a National Standard is in preparation in Australia. Software is also available for both the structural design and stormwater management of CBPPs. The main problem has been to bring these design aids to the attention of practitioners and substantial efforts are now being made to educate designers through seminars and publications in the UK, Europe, North America and Australia.

An interesting factor to emerge from the worldwide research into CBPPs is that, structurally, their performance is similar to that of conventional block pavements. This means that CBPPs have the potential to be used in many types of application

where conventional block paving has already become well established. Examples of CBPPs around the world cover footpaths and pedestrian plazas including large areas at the Sports Ground and in the Olympics Precinct in Sydney (reviewed in *Pave-It*, Issue Four). Car parks, often combined with bio-swales, have become a major application of CBPPs worldwide, a good example being the Arboretum in Chicago. Roadways and residential streets are also becoming a staple use of CBPPs in the UK, Europe and Australia. In Europe and North America, factory and truck loading areas increasingly use CBPPs to achieve both environmental and land use/cost benefits. In both the USA and Brazil CBPPs have been successfully used in container handling areas and ports subject to high wheel loads, including the Howland Hook container facility in New York State and the Port of Santos.

Worldwide, the usage of concrete block permeable pavements is increasing steadily and is attracting the attention not only of landscape architects and environmental engineers but also municipal and civil engineers. Overall, whilst CBPP is the fastest growing area in the world paving market, its full potential is still to be achieved. Nevertheless, it already provides a powerful tool for both environmentalists and designers seeking to achieve a sustainable future.



the latest guidance

Interpave has just published a series of detailed design, construction and maintenance guides covering all aspects of concrete block paving, flags and kerbs – offering the most up-to-date information on precast concrete paving available today.

This essential resource – designed for civil engineers, architects, landscape designers, contractors and all those involved with the paved environment – brings together the very latest standards and industry experience. It can be found on the updated Interpave website www.paving.org.uk – designed for ease of use and simple navigation. Specific guidance is available for block paving – including the latest sustainable permeable pavements – flag paving and concrete kerbs, channels and similar products.

For each product type, introductory web pages lead directly to individual PDF downloads each covering – where appropriate – Properties, Structural Design, Detailing, Handling, Construction and Reinstatement. These PDF downloads replace the old Interpave publications *Precast concrete paving: a design handbook* and *Precast concrete paving: installation and maintenance*. Edition Two of *Permeable Pavements – guide to the design, construction and maintenance of concrete block permeable pavements* is also available as a PDF download on the website, replacing the previously published Edition One.

Why not explore this wealth of information on the new COMMERCIAL section of the website? Before the product specific detailed information, the Precast Concrete Paving section includes information on applications of particular importance today, such as

urban regeneration, accessible paving, home zones and sustainable permeable pavements. Elsewhere on the site, the Interpave Information and News sections have also been substantially updated with the latest on paving.



the latest standards



Dr Allan Dowson, technical consultant to Interpave, reports on the latest standards for precast concrete paving and kerb products.

Three new European Standards – BS EN 1340: 2003, BS EN 1339: 2003 and BS EN 1338: 2003, covering Requirements and Test Methods for Concrete Kerb Units, Paving Flags and Paving Blocks respectively – introduced a different approach to the old British Standards that will give specifiers and suppliers more confidence in the use of these products. The BS EN stipulates that the manufactured concrete must conform to a wider range of performance characteristics, determined on actual manufactured concrete products. Additionally, instead of having “one size fits all”, the performance

characteristics are classified into classes, which the manufacturer must declare, so that the specifier and supplier have the relevant information needed to make informed selections.

Before any product is launched it is subjected to the rigours of ‘Initial Type Testing’ which demonstrates conformity to the BS EN for a product family. A family of product types is best described as covering those manufactured to give a similar surface using the same equipment, process and raw materials, irrespective of dimensions or colour. Each manufacturer will declare their definitions of product families if requested.

The continuing conformance to the BS EN is supported by ‘Routine Type Testing’ and additional measures established under ‘Factory Production Control’. The BS EN describes how the performance characteristics are to be assessed with detailed test methods and procedures. These methods are to be used in all cases of dispute resolution. Other methods can be used routinely to check compliance with the BS EN provided correlation is established with the standard method. The tests for concrete paving blocks, for example, cover:

Splitting Strength – a measure of the ability of the concrete block paving to withstand load. It is determined under laboratory conditions applying a tensile splitting test.

Weathering Resistance – a measure of the ability of the concrete paving block to withstand weathering where specific conditions exist such as frequent contact of the surfaces with de-icing salt under frost conditions.

Abrasion Resistance – a measure of the ability of the concrete paving block to withstand erosion caused by trafficking in service.

Slip/Skid Resistance – a measure of the ability of the concrete block paving laid in service to resist relative movement between a pedestrian’s foot or a vehicle tyre and the trafficked block surface.



Current standards for precast concrete paving and flags

PROPERTIES

- BS EN 1338: 2003, *Concrete Paving Blocks – Requirements and Test Methods*
- BS EN 1339: 2003, *Concrete Paving Flags – Requirements and Test Methods*
- BS EN 1340: 2003, *Concrete Kerb Units – Requirements and Test Methods*

STRUCTURAL DESIGN

- BS 7533-1: 2001, *Pavements constructed with clay, natural stone or concrete pavers, Part 1: Guide for the structural design of heavy duty pavements constructed of clay pavers or precast concrete paving blocks*
- BS 7533-2: 2001, *Pavements constructed*

with clay, natural stone or concrete pavers, Part 2: Guide for the structural design of lightly trafficked pavements constructed of clay pavers or precast concrete paving blocks

- BS 7533-8: 2003, *Pavements constructed with clay, natural stone or concrete pavers, Part 8: Guide for the structural design of lightly trafficked pavements of precast concrete flags and natural stone slabs*

CONSTRUCTION AND INSTALLATION

- BS 7533-3: 1997, *Pavements constructed with clay, natural stone or concrete pavers, Part 3: Code of practice for laying precast concrete paving blocks and clay pavers for flexible pavements*

- BS 7533-4: 1998, *Pavements constructed with clay, natural stone or concrete pavers, Part 4: Code of practice for the construction of pavements of precast concrete flags or natural stone slabs*
- BS 7533-6: 1999, *Pavements constructed with clay, natural stone or concrete pavers, Part 6: Code of practice for laying natural stone, precast concrete and clay kerb units*

REINSTATEMENT AND MAINTENANCE

- BS 7533-11: 2003, *Pavements constructed with clay, natural stone or concrete pavers, Part 11: Code of Practice for the opening, maintenance and reinstatement of pavements of concrete, clay and natural stone*

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