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Uniclass L534:L217

permeable paving

CASE STUDY
ADOPTION IN OXFORDSHIRE

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

Introduction

Oxfordshire County Council has taken a positive and pragmatic approach to adopting streets and other areas using concrete block permeable paving for some 15 years. This case study discusses lessons learnt from this extensive experience, which will help to reassure and inform other authorities including 'SUDS Approving Bodies', and demonstrates the long-term successful application of this important Sustainable Drainage System (SUDS) technique.

It is usual for all highway infrastructure in a development – including roads, footways, drainage and verges – to be adopted by local authorities without charge. Some SUDS techniques may still be considered as 'unusual drainage systems' raising maintenance issues and other adoption concerns with some authorities. However, concrete block permeable paving uses established engineering technology and has predictable performance proven over decades in the UK and abroad. For example, in Germany – where over 20,000,000m^2 of permeable pavements are installed annually – it is treated as standard highway construction.

Taking the lead

Several local authorities – including Oxfordshire CC – have taken the lead and embraced the adoption of SUDS and permeable paving, successfully using existing legislation, such as Section 38 of the Highways Act, 1980 and Section106 of the Town and Country Planning Act, 1990.

At Oxfordshire, SUDS is considered an essential component of any development and concrete block permeable paving as mainstream technology. Highways Adoption Officer Barry West explained: *"With hundreds of permeable paved schemes around the County now, we have developed real confidence in the technology and how it performs. We have had no problems with any permeable pavements – even during the 2007 summer floods.*

Insisting on SUDS

In fact, in 2008, a decision was made at County level to insist on SUDS for all developments – irrespective of type, location or density. This ties-in with current national planning policies, as well as the draft National Planning Policy Framework, and is also seen positively by many designers in helping to meet the Code for Sustainable Homes and BREEAM."

"With hundreds of permeable paved schemes around the County now, we have developed real confidence in the technology and how it performs."

Saunders Road in Oxford is a large, new-build housing development built on the city's former bus depot site, over impermeable clay. It makes extensive use of concrete block permeable paving to treat and attenuate surface water runoff before gradual discharge to local sewers.

Planning Ahead

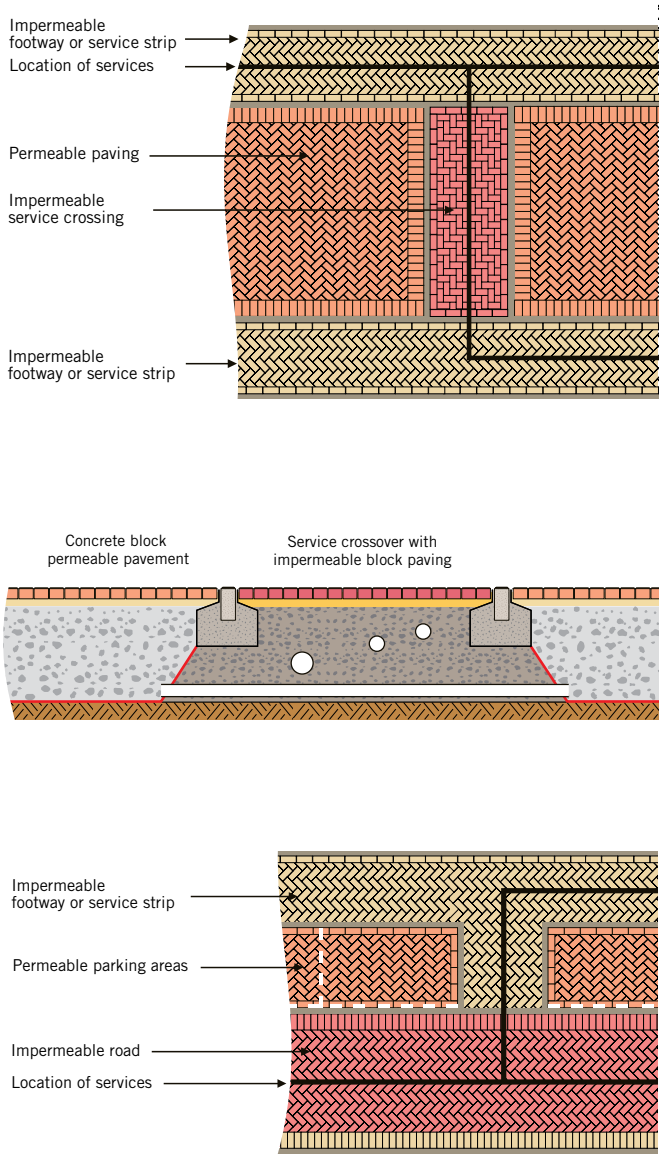
At Oxfordshire CC, a realistic and practical approach is taken with each project from the start, covering key issues. Full liaison and discussion between all stakeholders is essential from the earliest stage – and certainly before a planning application – which must include adoption officers. Local planners should remember their key role as SUDS coordinators, required by governmental guidelines.

Designing for Services

Layouts for statutory and other services are of fundamental importance to the long-term performance of permeable paving. Service runs can be a major issue and routes for statutory undertakers' plant outside the permeable pavement should form part of the initial design. Barry West continued: *"The Fairways development illustrates how to keep service runs out of the permeable paving. Instead, they run in verges or impermeable paving. Impermeable block paved service crossings, which we like to highlight visually, then cross the permeable pavement. Another permeable paving benefit demonstrated on this scheme is the absence of standing water on level areas such as pedestrian crossing points."*

All services on this project - 'The Fairways', Kennington - run in verges or paving to the road sides then cross within distinctive impermeable block paving areas within the permeable pavement.

It is important to remember that all surface areas don't have to be permeable, as concrete block permeable paving can cope with runoff from adjacent impermeable surfaces, including roofs, based on a rule of thumb ratio of 2:1, impermeable : permeable. With careful layout design, services and utilities can be located within conventional impermeable areas, service corridors or verges, avoiding the permeable paving, negating the need to excavate and removing the risk of disturbing it to access these services. This approach can also form a key part of the overall layout design both visually and technically, allowing designers to use their imaginations and realise the aspirations of the 'Manual for Streets'.



Typical alternative layouts of service runs avoiding permeable paving – plans and section.

Avoiding Problems

Apart from careful design, Interpave recommends other straightforward measures which have generally been adopted by Oxfordshire CC.

Landscaping

Landscaping should be designed so that it does not allow soil and mulch to be washed onto the permeable pavement and cause clogging. Detailing of the landscape edge is especially important.

This project at Tower Hill, Witney, includes concrete block permeable paving within a conventional layout and used with raised footways and concrete kerbs which also retain soft landscaping.

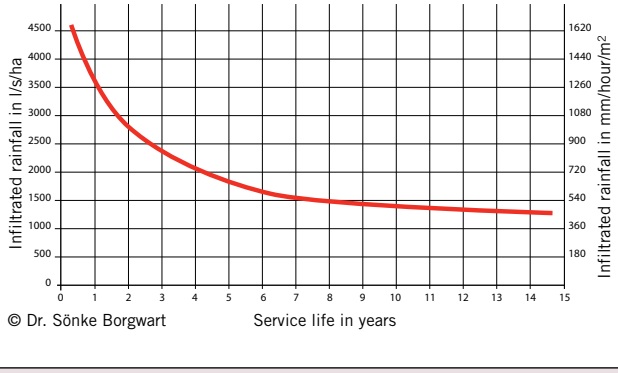
Construction

Preventing and diverting impermeable contaminants such as soil and mud from entering the base and pavement surface, both during and after construction, are essential to ensure permeability throughout the pavement's design life. Contractors should be encouraged to employ simple practices such as keeping muddy construction equipment well away from the area, installing silt fences, staged excavation and temporary drainage swales which divert runoff away from the area.

Often there is a need to use roads and hard-standing areas as temporary routes during construction. Obviously, this would quickly block the open graded permeable sub-base with mud. There are various solutions available, all described in Interpave's guidance, available via **www.paving.org.uk**.

Maintenance

Concern is sometimes expressed about the potential for clogging up with permeable paving. Research and experience shows that the infiltration rate will decrease but stabilise with age, as shown in the graph, due to the build-up of detritus in the jointing aggregate. Good design allows for this factor and studies have shown that the long-term infiltration capability of concrete block permeable pavements will normally substantially exceed UK hydrological requirements without maintenance.



Monitoring the long-term infiltration performance of concrete block permeable paving – summarised here – has been carried out in Germany and discussed in Interpave's magazine e:Pave, January 2011.

Some manufacturers do recommend sweeping twice a year as a precaution against clogging, but this is no greater than is normally undertaken on traditional pavements. Even with this maintenance, similar or even lower whole life costs than conventional paving in various materials with piped drainage have been demonstrated in recent independent research, available at: **www.paving.org.uk**. However, Interpave's experience suggests that with many permeable paved projects around the country this maintenance is rarely carried out anyway.

Barry West commented: *"Maintenance is far less of an issue for us as well, now that we have seen how permeable paving behaves over time. For example, The Fairways scheme (discussed earlier) is not adopted and has never been swept in the 5 years since installation – but there have never been any problems with it. We do currently charge a 'commuted sum' for maintenance of permeable paving but aim to reduce this based on our growing experience and the minimal maintenance actually required."*

"Maintenance is far less of an issue for us, now that we have seen how permeable paving behaves over time."

Long-term management

Oxfordshire CC require 'as constructed' drawings to be provided so that areas of permeable paving can be identified in future. Currently, permeable paving is also designated a 'Road of special engineering importance' to protect it from abuse during later road works. This is necessary with the current limited awareness of permeable paving by contractors and others, and should become less of an issue as the technology becomes more mainstream.

Penlon in Abingdon is a high-density housing scheme where space is at a premium. Here, concrete block permeable paving provides a lively, attractive surface, and sustainable drainage with no additional land-take.

This modest scheme in the Thames-side village of Standlake has ground water just 18" below the paving surface and is immediately adjacent to the river and some lakes. During its 10-year life, the paving has been cleaned just once but it remains completely problem-free.

While maintenance requirements are minimal, Interpave recommends that basic programmes should be put in place – whether for the local authority's own staff or outside management company – for inspection every six months for the first 2 years of use. Inspection should look out for:

- adequate quantity of jointing material in the joints
- silting up of joints
- weed growth
- discharge (where appropriate)
- general structural integrity.

Latest Developments

Design Diversity

In Oxfordshire, concrete block permeable paving is particularly popular for high density, urban projects, combining paving and drainage in a single attractive hard landscaped area with no additional land-take. Barry West added: *"The Penlon project in Abingdon (discussed earlier) is a clear example of this benefit. Of course, permeable paving can be used wall-to-wall as a shared surface on high-density schemes such as this and the Littlemore housing. But permeable paving is equally applicable to low density rural developments, such as the live/work, rural barn style development in Kirtlington.*

Wall-to-wall application of concrete block permeable paving with tree-pits provides sustainable drainage at this high-density development in Littlemore.

Permeable paving is also used in low-density rural developments like this live/work scheme in Kirtlington.

"Another benefit of concrete block permeable paving is its adaptability to fit into different urban designs, with a wide choice of styles and colours. We see it applied to traditional, raised-kerb layouts as well as shared surfaces and home zones. There is no need to worry about surface cross-falls and the paving can be laid level without puddles forming."

A shared surface approach has been used extensively throughout Shilton Park, a growing area of Carterton near Brize Norton. Much earlier phases have block paving for attractive shared surface areas, but with conventional drainage. Later phases are permeable paved but give a similar character and, again, areas of impermeable block paving are used for footways containing services.

Early-phase shared surface areas at Carterton with conventional drainage.

Later phases at Carterton use concrete block permeable paving.

Pavements and crossing points at Carterton use impermeable paving for services, with visually matching permeable carriageways.

An earlier phase (foreground) at Carterton, conventionally paved with gulleys, has now been extended with concrete block permeable paving (background).

Major Projects

Oxfordshire is experiencing considerable growth with several major projects in hand. SUDS, utilising concrete block permeable paving, forms an essential component in the masterplanning, detailed design and implementation of each. In Didcot, the first phases of the new Great Western Park development – comprising 3,300 homes, 3 schools and 3 commercial areas – started on site in 2011 with concrete block permeable paving already in use. The new NW Bicester Eco Town of 5,000 homes also started during 2011, as did Kingsmere in SW Bicester. Interpave will be reporting on the application of SUDS on each of these projects as they develop.

"We are turning our attention to making use of the clean water from permeable paving for other uses – treating it as an asset."

An impermeable service crossing through permeable paving under construction on the first phase of Didcot's Great Western Park.

Rethinking Rainwater

It is now well-recognised that there is more to concrete block permeable paving than just meeting the latest legislative demands to help reduce flooding. It can also provide a controlled source of clean water as a sustainable amenity for landscaping, ecology and water harvesting, adding to its potential for helping to meet the Code for Sustainable Homes and BREEAM. Permeable Paving is particularly effective as a source control tool at the head of the SUDS management train, treating the water for pollutants, reducing and slowing flows then feeding other SUDS features.

Oxfordshire CC have also recognised this extra potential. Barry West said: *"In fact we are turning our attention to making use of the clean water discharged from permeable paving for other uses – treating it as an asset, rather than a problem. For example, at Great Western Park in Didcot, water from permeable paving will be used for irrigating allotments as well as feeding wildlife ponds. In Bicester Eco Town, lined permeable paving will collect and treat water to recharge natural ditches on the site. In future, we shall be actively looking out for opportunities to improve landscape, biodiversity and amenity."*

The Flood and Water management Act

Once the 2010 Flood and Water Management Act finally takes effect – following implementation of National Standards for SUDS – 'SUDS Approving Bodies' (SABs) will be formed to both approve and adopt SUDS schemes. Again, Oxfordshire CC have taken a lead, as Barry West explained: *"We have been using Section 38 agreements to adopt concrete block permeable paving for a decade or so – and it works well, particularly when all parties are involved from the very start of the planning process. We have already put in place what is needed to operate as an SAB, so that when the new Act does take effect, it will simply be business as usual.*

At Bicester Avenue Retail Park all the extensive car parking is permeable paving, at the head of the SUDS management train.

"We see real potential for SUDS and permeable paving to make a major contribution to improving the built environment in future."

"When the new Act does take effect, it will simply be business as usual."

Then, inside the massive garden centre complex, the concrete block permeable paving continues throughout sales and storage areas – a truly sustainable paving solution.

"Developers and SABs have nothing to fear with permeable paving as there should be initial cost savings without conventional below-ground drainage and minimal ongoing maintenance costs. But it is essential for SUDS to be integrated as part of the project design from the very start with all parties on board.

Under the Act, single ownership SUDS schemes will not be adopted but the SAB still has a regulatory role in approving proposals in line with the National Standards for SUDS. This is effectively the same as our current policy of requiring SUDS on all new developments – Bicester Avenue Retail Park is one example of how this works. At Oxfordshire, we see real potential for SUDS and permeable paving to make a major contribution to improving the built environment in future."

Acknowledgement

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