October 2013

Uniclass L534:L217

- RIBA Award Winner
- Permeable Paving
- Full SuDS Management Train
- Handling Water on the Surface
- Concrete SuDS Details

paving
case study

ST GEORGE'S PRIMARY SCHOOL KIDDERMINSTER

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

Introduction

Architects Howl Associates were appointed by Worcestershire County Council to design a replacement primary school on the site of the existing St. George's School in Kidderminster. Completed ready for the teachers and pupils to begin the 2012/2013 school year, the building was the Winner of the RIBA Architecture West Midlands Award 2013 and BREEAM rated 'very good'.

The new school displays an exemplary approach to sustainable drainage, with a SuDS and landscape scheme designed by Robert Bray Associates integrated into the overall project from the very start, enabled by a close working relationship between all those involved in the design. Solving complex issues, the drainage scheme utilises several SuDS techniques – including concrete block permeable paving – within a fully developed management train.

The design embraces the SuDS ethos of handling water on or near the surface and maximises opportunities for education and amenity within the landscape. Concrete block permeable pavements providing water storage are used extensively, surrounding and butting up against the building, as an integral part of the architectural design. But the project also exhibits a range of clever SuDS details using other readily available precast concrete products.

Photo Howl Associates

Photo Chris Hodson

Building Design
by Howl Associates

Various design options were considered including the evaluation of alternative sites, before the brief was finalised as a 1 (with scope to easily be extended to 1.5) form entry primary school and nursery. Given the occupied nature of the site (by the original school) and preference for a single storey building, the developed design solution takes the form of a compact, efficient and deceptively simple arrangement. Two wings create a southerly aspect, private, enclosed play area which all the classrooms open onto, while enjoying views out to the already well-established boundary planting and habitat areas.

Classrooms are provided with a generous covered cloister, providing both shelter and solar shading. This cloister returns around to the nursery and early years part of the building where nursery and reception classes share an open plan arrangement. Here, external spaces overlap with those for older children to enable greater interaction with reception classes. The line of the main cloister continues as a circulation route through the building – lit by generous roof-lighting and an internal, landscaped court – to the entrance.

While the design allows clear control of public and private areas, the teaching staff wished to actively encourage parents to enter the cloistered courtyard space and drop off or collect children at individual classroom doors. This provides an opportunity for parents to discuss issues with the teachers. During the school day the play area courtyard becomes a private space, bounded on two sides by the classrooms and on the other two sides by the established forest schools and habitat areas.

External spaces for reception classes overlap with those for older children.

Photo Chris Hodson

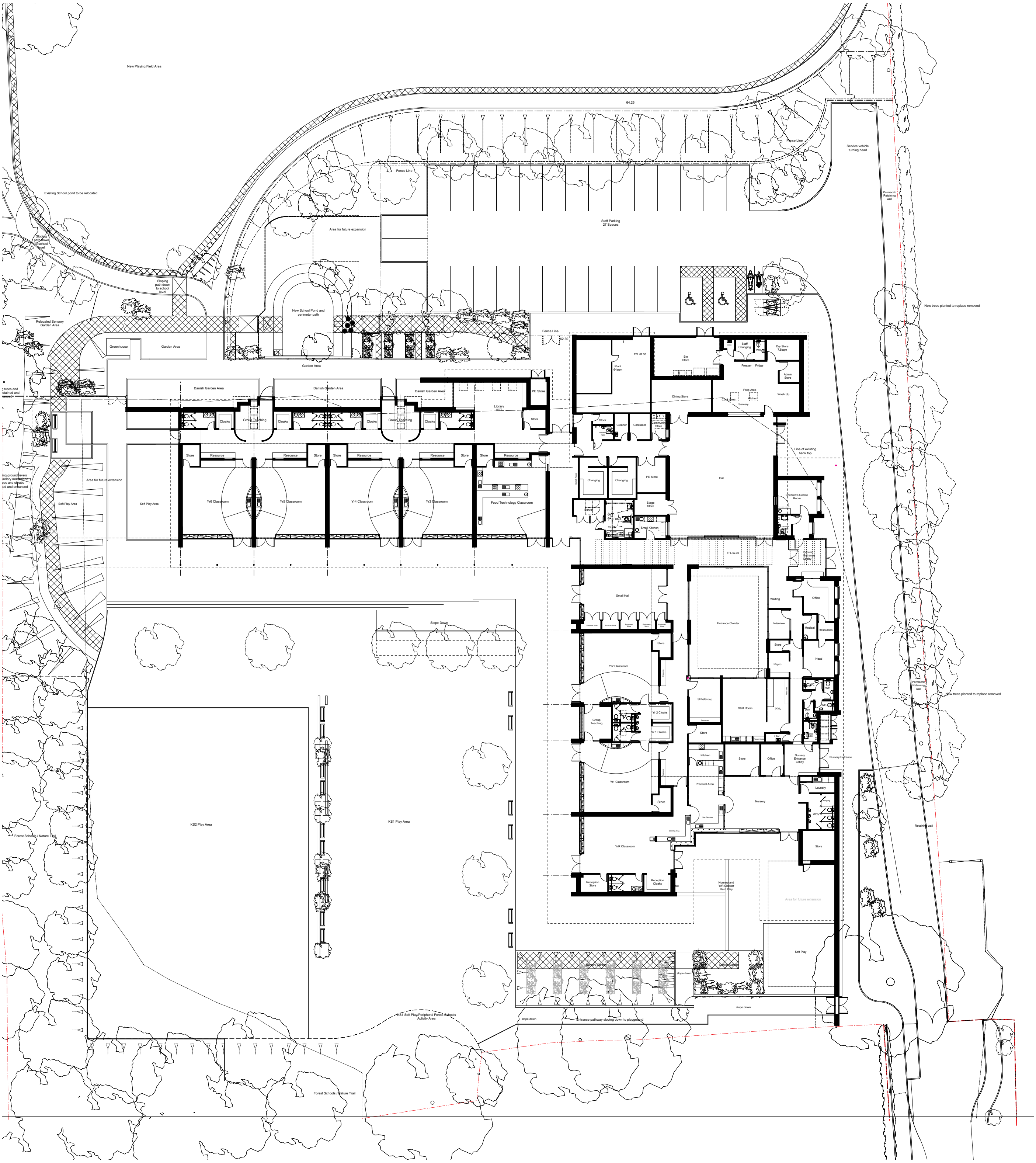
During the school day the play area courtyard becomes a private space.

Photo Howl Associates

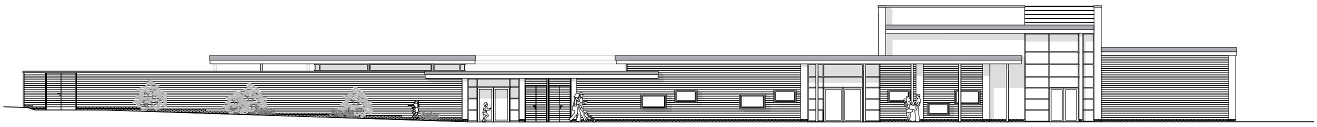
The main cloister continues through the building – lit by generous roof-lighting and an internal, landscaped court.

Photo Howl Associates

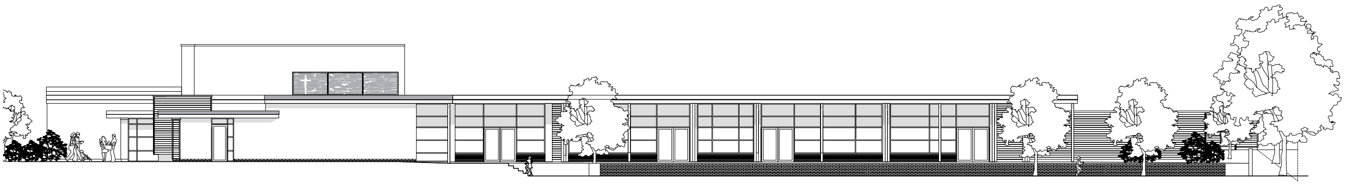
Plan



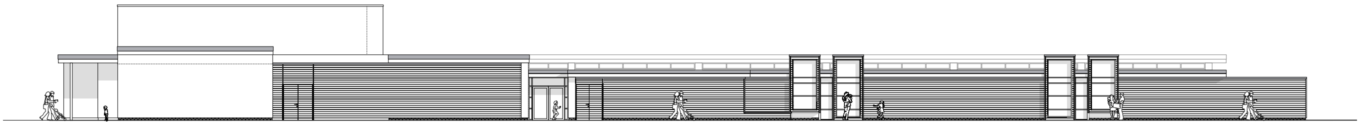
Elevations



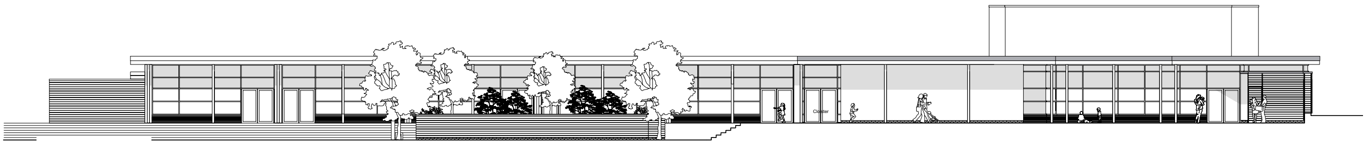
East Elevation



West Elevation



North Elevation



South Elevation

Site Layout Design
by Howl Associates

The site ground conditions prevent the use of any rainwater infiltration, requiring limited, controlled flows into the storm drainage system. The solution is a fully integrated landscape and SuDS strategy, starting with water attenuation on the living roof, then site features such as concrete block permeable paving – used extensively for car parking and access roads, as well as play areas outside classrooms – permeable asphalt, planted swales and a pond.

The proposal to move the primary access to the southern boundary introduced the main planning constraint, over and above the normal considerations for overlooking, parking, lighting and the like. The access from the southern boundary is tight and is adjacent to a mature oak tree. Measures had to be put in place for root protection as well as irrigation from concrete block permeable paving and the access road swale.

Permeable paving and a swale help irrigation of the mature oak tree. Photo Bob Bray

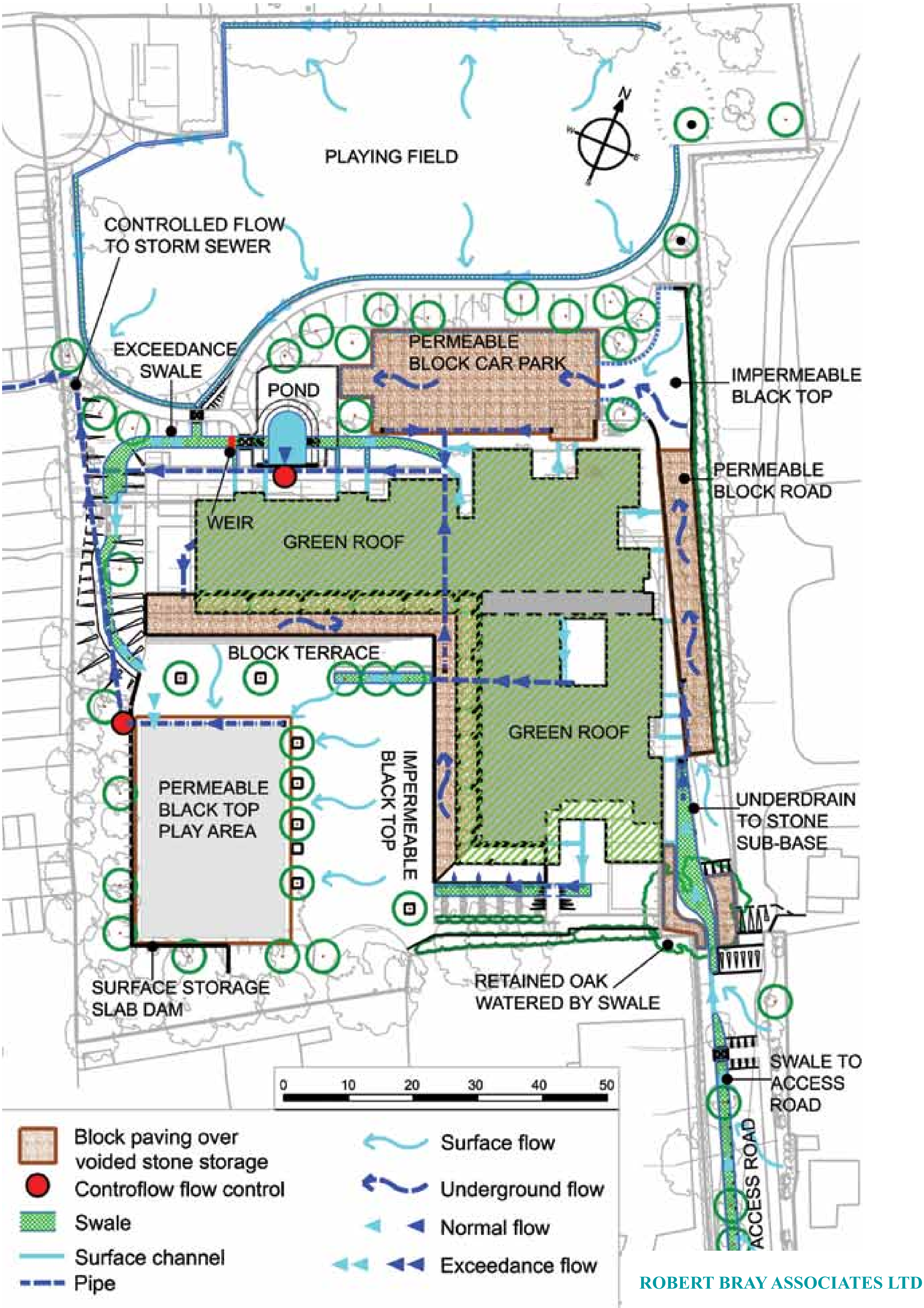
SuDS Strategy & Landscape Design
by Robert Bray Associates

The drainage scheme has been designed to manage water on the site for the 1:100 year storm plus 30% allowance for climate change effects. As the site is on impermeable soils, surface water is stored near the school building and released at a controlled rate to the surface water sewer. The selection of SuDS techniques for the development allows for an initial loss on site of 5mm, called 'interception storage'.

Most of the school has a green roof providing approximately 40% reduction in runoff from the sedum roof areas. The remaining volumes of runoff from the site will be stored underground in voided stone below permeable paving, on the surface or in landscape features. There is no 'safe' exceedance route off the site, so an allowance has been made for storing excess water that might run off the upper playing fields, on the lower part of the site (in addition to that normally allowed for in SuDS schemes).

Photo Chris Hodson

SuDS Management Train



SuDS Design –
by Robert Bray Associates

Site Topography and Discharge

The upper half of the site where the previous school stood and a narrow band of land on the eastern boundary are virtually level. The rest of the site slopes westward into a valley, with the lowest point on the western boundary. The northern edge of the site is approximately 4m above the lowest point. The building, road and car park sit on a new terrace approximately half way between the highest and lowest levels of the site. The whole site is drained by a controlled flow discharging to the surface water sewer in the adjacent housing area to the west of the site, at an agreed maximum rate of 5 litres per second.

The capacity of the drain is limited and cannot be used for overflows, and there is no 'safe' exceedance route from the site as housing now occupies the natural route.

Catchment and Containment Areas

Water is stored in lined or un-lined paving sub-bases, on areas allowed to flood over appropriate paved surfaces, in swales and in a pond. There are three containment areas:

- Top – the swale adjacent to the access road to the south of the building, which overflows to the Middle containment. Its catchment area comprises the access road and paths.

Photo Chris Hodson

- Middle – stone sub-bases under the road and terrace, and on the surface of the car park, pond and a swale. These are all linked and form one storage compartment, discharging at 3 litres per second through a control chamber. Its catchment area comprises the building roofs, access road east of the school, terrace west of the school, car park and paths.
- Lower – within the stone sub-base of the permeable asphalt court and on it and the adjacent play area surface, discharging at 2 litres per second through a control chamber. Its catchment is the court, play area, overflow from the Middle containment area and overland flow from the playing fields north of the school.

Photo Chris Hodson

Pollution Control

The roads and car parks are considered to be medium risk areas for pollution and have two treatment stages while roofs and play areas are low risk and have one treatment stage.

The upper section of access road to the south of the building is drained to a vegetated swale beside the road and a second swale leading to a voided stone sub-base under concrete block permeable paving, providing two-stage cleaning. The surface water on the lower section of access road and car park drains through the permeable block paving into a voided stone sub-base. This form of filtering has been found to be very effective with this level of pollution risk and is considered the equivalent to a two-stage cleaning. Water from roofs and all other paved surfaces either flow across vegetated surfaces or through permeable surfaces providing the required single stage cleaning.

SuDS Detailing

In addition to concrete block permeable paving, ingenious use of other standard precast concrete products has been made to enable long-term, effective performance of the SuDS scheme. Concrete flags, kerbs and edging have been used for carefully detailed water conveyance and inlet/outlet structures, dispersing water and maintaining low flows. For example, a standard 'bull-nose' concrete road kerb allows runoff to trickle gradually onto grassed swales.

Photo Chris Hodson

Ribbed concrete flags simply channel downpipe discharge across a footpath straight into the pond.

Photo Chris Hodson

Kerb quadrants direct water straight off the impermeable access road into a swale, softened by a concrete flag. Rainwater downpipes from the building roof discharge directly over ribbed concrete flags which channel the water across a footway.

Photo Chris Hodson

Here, a standard dropped kerb disperses runoff from impermeable asphalt onto concrete block permeable paving, as well as providing wheelchair access.

Photo Chris Hodson

Bullnose kerbs to the road and edgings to the footpath allow runoff to flow gently into a swale without erosion. A simple pedestrian crossing is formed with concrete paving flags.

Photo Chris Hodson

For the internal court, downpipes also discharge onto ribbed flags, set within concrete paving flags, onto a cobbled channel.

Landscape and Paving

From an amenity perspective, water is carried on the surface in channels, swales and rills, providing animation and interest. Multifunctional hard and soft landscape SuDS features provide interesting places for play and are usually dry, except when it is raining – and even then, permeable paving surfaces are generally clear of standing water. Small-scale bridges, rills and other play features are provided to maximise opportunities for play and education, while the pond has been designed to have easy and safe access for study. Aquatic plants, wildflower areas, living roofs and native trees and shrubs provide biodiversity.

External paving has been considered as an integral part of the architectural design, with rectangular concrete blocks in a herringbone pattern flowing into the generous covered cloister play areas on the south side, while providing continuity in the car parking and access areas elsewhere. The charcoal coloured blocks combine with buff paving flags and areas of black asphalt, as part of the restrained architectural palette of materials.

Photo Bob Bray

Photo Chris Hodson

Precast Concrete Paving Principles

With precast concrete paving and kerbs, distinct, modular units and designed variations in colour, texture and shape can break up areas giving visual interest and a human scale not possible with monotonous, formless materials such as asphalt. In recent years, Interpave manufacturers have transformed this concept, moving away from simple, regular patterns and colours to expand an extensive palette of styles, shapes, colours and textures to meet current demands in urban design, matching – and often exceeding – the visual qualities of materials such as stone. This is a valid and sustainable interpretation of the requirement for 'local materials' in adopted guidelines. It is generally unrealistic on cost, availability and accessibility grounds to specify locally extracted stone which may have been used in the past, while imported stone fails to meet sustainability criteria.

Essential requirements for paving materials, from Manual for Streets and other guidelines, can be summarised as follows:

- visually attractive able to deliver distinctive local character
- capability for visual or tactile differentiation between distinct areas
- durable and maintainable with reliable product supply
- accessible to all with consistent slip and skid resistance
- well drained to avoid standing water and compatible with SuDS
- sustainable – in the widest sense

More information on how precast concrete paving is uniquely placed to satisfy all these requirements can be found in *Planning with Paving*, via www.paving.org.uk.

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