

# CONCRETE QUARTERLY

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## THE HUMAN TOUCH

The fluid, organic forms of Kisho Kurokawa's Maggie's Centre offer a warm and reassuring welcome for Swansea's cancer patients

## HOME GROWN

An unusual concrete structure and four storeys of foliage turn a Ho Chi Minh City townhouse into an oasis amid the pollution

## LIKE HOLMES AND WATSON

Squire and Partners' dynamic white concrete office block is the perfect foil to Baker Street's Portland stone facades



## A GRAND CANVAS



**You may notice some design changes to this issue of Concrete Quarterly.** Keen to keep things fresh, but aware of CQ's strong visual heritage, we felt that a "refresh" would be more appropriate than a full redesign. Most significantly, we've introduced a new masthead, bringing up to date a logo that has been in place since 2003. There's a more subtle colour palette too, but beyond this, little else has changed, and our emphasis remains on clarity and making the most of great images of concrete.

Which is fortunate because concrete continues to reach new aesthetic heights. Its visual appeal and versatility is demonstrated throughout these pages, by the curved and cut-out precast panels of the Maggie's Centre for cancer care in Swansea, and by the crisp white facade of 11-15 Baker Street in London. Manchester's National BMX Centre shows the material's smooth and rough faces side by side, inside and out, while the columned gateway of south London's Vauxhall Pleasure Gardens is a sculpture of dark pigmented concrete and LEDs.

We shouldn't be surprised that a new generation of designers are also cottoning on to concrete as an artistic material – what other medium is as adaptable, robust and aesthetically striking?

[Guy Thompson](#)

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The Concrete Centre is part of the Mineral Products Association, the trade association for the aggregates, asphalt, cement, concrete, lime, mortar and silica sand industries. [www.mineralproducts.org](http://www.mineralproducts.org)



Photo: [www.tristanpoyser.co.uk](http://www.tristanpoyser.co.uk)

## Velvet-concrete tower wows Ecobuild exhibition

Tactility Factory's fusion of textiles and concrete drew much admiration at London's Ecobuild event in March, with a 6m-high velvet-concrete tower exhibited as part of the Cool Concrete feature by Lafarge.

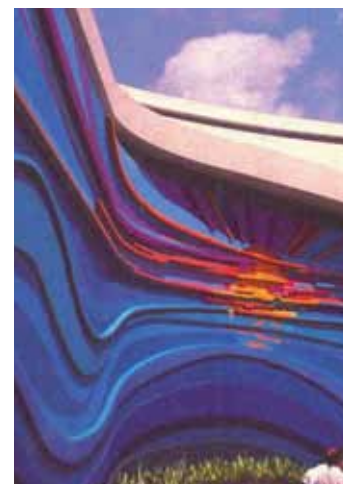
"Amazing", "fascinating", "beautiful form and function" were just some of the reactions from attendees over the three-day show, and many architects flocked to find out how they could use the company's innovative wall

finishes in their projects.

Belfast-based Tactility Factory was established in 2005 by architect Ruth Morrow and textile designer Trish Belford, and has since patented a number of technologies for combining the two materials. Yarns and fabrics are fully integrated within the concrete, creating surfaces that are warm, colourful and acoustically soft.

[www.tactilityfactory.com](http://www.tactilityfactory.com)

## ARCHIVE



#### RETRO CONCRETE: SUMMER 1988

**CQ goes to Disney World ...** Our correspondent's trip to the Orlando theme park took in the Magic Kingdom ("a masterpiece of reproduction and fake"), Space Mountain ("a domed and pinnaled concrete building of elegance and drama") and the odd ride or two ("riveting stuff"). But what really blew him away was the Pavilion of The Living Seas (above), "a building of flowing concrete curves brilliantly painted in wave patterns of vivid marine blues. As an example of the effects that can be achieved with painted concrete, it is outstanding."

## Concrete reliefs chosen for new arts venue

Graphic Relief's finely detailed concrete tiles have been installed in the Old Vic Tunnels under Waterloo station in London, an underground performance venue acquired by the theatre in 2010 under the leadership of actor Kevin Spacey.

The "Concrete Tigers" tiles (right) are one of a number of artistic collaborations undertaken by Graphic Relief, having been designed by London-based illustrator Yehrin Tong.

Using specially manufactured moulds, Graphic Relief creates a wide range of concrete surface designs and graphic effects, including photo-quality imagery. Its products are suitable for interior or exterior use.

[www.graphicrelief.co.uk](http://www.graphicrelief.co.uk)



Photo: Agnese Sanvito

## Loughborough 'prints' concrete

Loughborough University is developing a ground-breaking technology that enables the creation of complex concrete forms at the touch of a button.

Under the Freeform Construction project, a specially developed concrete is deposited precisely under computer control, layer by layer, from

a 3D CAD model. With each piece being tailor-made, the technology combines the potential of bespoke customisation with the efficiency of mass production.

Examples of the project's work can be seen in the Building Technological Habitats exhibition in Valencia, Spain until 1 July 2012.

## CONCRETE ELEGANCE EVENT



Haworth Tompkins' Dyson Building at the Royal College of Art is conceived as a creative "factory"

## THE BUILDING CENTRE'S ALL-STAR CAST

The next Concrete Elegance event will focus on the "Art of Casting", featuring two educational buildings that offer inspiring spaces moulded from smooth concrete forms.

The Dyson Building at the Royal College of Art's campus in Battersea, south London, designed by Haworth Tompkins, is conceived as a creative "factory", with a mix of teaching facilities, workshops and gallery and lecture spaces. Graham Haworth will discuss how the practice conceived the spaces, and how the use of concrete contributes to this blending of the institutional and the commercial. Justin Nicholls from Make Architects will also talk about the practice's Old Road Campus Research Building for the University of Oxford, which is expressed as a single block with entrances, atrium and lightwells carved from its fluid concrete.

Concrete Elegance takes place on 26 September from 6.30-8pm at the Building Centre on Store Street in London. To book your place at the event, go to [www.concretecentre.com/events](http://www.concretecentre.com/events)

## OTHER EVENTS

### CONCRETE INNOVATIONS

24 October, 6-8.15pm

Theme: Formwork and fine finishes

The Building Centre, London

### CONCRETE ELEGANCE

21 November, 6.30-8pm

Theme: To be confirmed

The Building Centre, London

### CPD IN YOUR OFFICE

The Concrete Centre has a full programme of events to help construction professionals fulfil their CPD obligations. [www.concretecentre.com/cpd](http://www.concretecentre.com/cpd)

# KISHO'S GIFT

Before he died in 2007, the legendary Japanese architect Kisho Kurokawa sketched out a swirling, 'dragon-tailed' cancer care centre in Swansea. Now the UK's 13th Maggie's Centre has been completed by Garbers & James in titanium-studded concrete. Tony Whitehead reports

Photos: Thore Garbers, Lorenz Haarmann



**There is no reception desk to greet visitors to the new Maggie's Centre at Swansea's Singleton hospital.** Instead there is a log fire and a large kitchen table, complete with well-stocked kitchen. Tubular steel and hospital green are notably absent. No wonder the first thing visitors tend to do when they arrive is relax, sit down and have a cup of tea.

This is, of course, the whole idea. Maggie's Centres were conceived by the late writer and garden designer Maggie Keswick Jencks and her husband, the architectural critic Charles Jencks, to offer cancer patients non-medical support within a restful and pleasant environment away from the harsh functionality of hospital. The centres – Swansea is the 13th to be completed – have been designed by a who's who of international architecture (see box, overleaf), and the latest comes from a concept design by the late Kisho Kurokawa, one of the founders of Japan's postwar metabolist movement.

The metabolists' vision seems to fit neatly with the Maggie's philosophy, their buildings being far more organic than the functional and mechanistic European modernism of the same era. And the Swansea centre follows in this tradition, using concrete to create a fluid, natural structure that is also reassuringly solid.

Thore Garbers, who with partner Wendy James was executive architect for the scheme, says: "I felt the centre needed a weight, a permanence. Some of the buildings you see around hospitals look like they could be blown away by the wind. Some actually are temporary. We wanted something different."

The centre's robustness, says Garbers, creates the feeling that those inside are protected, and from more than just the weather which sweeps in from Swansea Bay. "See the centre in the evening," says Garbers, "with the light shining out through the windows, and it is something like a castle. You know that inside there is warmth, light – safety, if you like."

In fact there is much about the design of the centre which works to give the building its kindly aspect. The exterior concrete, for example, is inset with hundreds of triangular titanium plates that sparkle in the sunshine or, perhaps more likely in South Wales, glisten in the rain. But most obviously it is the centre's extraordinary shape: a vortex or swirl on plan – two tapering dragon's tails snaking left and right in elevation – which amuses rather than threatens. Curves are everywhere, and they substantially soften the building's appearance.

The foundations at least were pretty straightforward, says Garbers. "The site was previously occupied by four small doctor's residences which had been constructed on a filled bank. Two were demolished to make space for the

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**SEE THE CENTRE IN THE EVENING AND IT IS SOMETHING LIKE A CASTLE. YOU KNOW THAT INSIDE THERE IS WARMTH AND LIGHT**

## Solving the panel puzzle

The Maggie's Centre certainly provided a stern test of the capabilities of precast concrete supplier Thorp Precast. The job involved creating 56 precast panels, and although many of these were similar, very few were identical.

The walls of the central, elliptical drum-shaped area of the centre, for example, were made from just two large curving precast panels, one of which had a "letterbox" cut out to make the panoramic sea-view window on the first floor.

"These two large convex [from the exterior] elements were made from the same mould, but with a plug cast in one of them to form the letterbox," explains Harvey Thorp, managing director of Thorp Precast.

The challenge then, he says, was to find the most efficient way of casting all the other wall panels when they differed from each other in at least four ways.

He says that the curving wall panels vary first in height – from over 4m to less than 1m high. "They also vary in that some are convex and some concave. In addition, the top of each panel features a kind of cornice that runs all the way along the top edge of the walls."

Crucially, says Thorp, this cornice, or troughstein, changes in profile, becoming slimmer as the panels reduce in size towards the end of the building's "dragons' tails".

Finally, the panels have irregularly positioned punched window openings, many of which span across two adjacent panels.

Instead of creating more than 50 bespoke moulds, which would have added to the cost of the project, Thorp set about creating two master moulds – one to produce the panels for the two concave walls, the other to produce panels for the two longer, convex walls such as the one to the left of the main entrance.

"The building's symmetry meant that each panel, concave or convex, has a 'twin' on the opposite side," says Thorp. "So each panel was cast twice."

Achieving the different heights required to make the walls taper down was relatively straightforward: "We introduced a former at the base of the mould, and once two panels had been cast we would move this some 200mm or so to produce the next two, slightly shorter, panels."

Creating the flaring cornice detail at the top of each panel required even more problem-solving. Thorp explains that the shape of the cornice had first to be cut from a plywood grid using a computer controlled (CNC) router. Thin strips of plywood were then attached to this framework to create the subtle curve of the cornice. This then formed a specialist "top" to the master moulds.

"We would adapt the top, move the former at the base, and then cast a pair of panels," says Thorp. "We then had to remove the top end of the mould, replace it with another specially made



Above: The building comprises 56 irregular precast panels  
Below: Temporary jambs were cast in the window openings to ensure the structural integrity of the panels



top in which the cornice shape would be a little different, shift the base former again, and then cast another two panels."

The final challenge was the need to create the punched hole window openings. "Although these are not big windows, they would make gaps big enough to compromise the structural integrity of an individual panel," says Thorp.

"Obviously we didn't want any breaking, which could happen during demoulding, transport to site or installation. So to prevent this we cast in sacrificial jambs which were only removed when the panels were firmly fixed into position on site."

This technique involves creating thinner, less reinforced shapes within the panel which can be easily cut out on site to create the windows. Thorp admits to some anxiety as to whether the window openings on adjacent panels would exactly match, and whether the cornice detail at the top would flow smoothly from panel to panel.

"Until you see it on site you can never be sure," he says. "Achieving the result we did was really a nice combination of very traditional techniques – making the cornice moulds was a little bit like boat-building – married to the latest 3D computer modelling techniques. It takes a bit of extra effort, but it's very satisfying when it works."



### TOP

The exterior is inset with hundreds of triangular titanium plates

### ABOVE

A large "letterbox" was cut into one of the precast panels to create a panoramic window

### PROJECT TEAM

**Architects** Kisho Kurokawa, Garbers & James

**Contractor** Sir Robert McAlpine

**Precast concrete supplier**

Thorp Precast

**Structural engineer** Arup

**Landscape architect** Terra Firma



new centre and two were converted for use as a temporary place for Maggie's to set up in."

Main contractor Sir Robert McAlpine poured the floor slab in late autumn 2009 and then set about constructing an in-situ reinforced-concrete frame comprising columns and a ring beam at first-floor level. A first-floor slab was then cast with a large cut-out for the elliptical central entrance area with its wide curving staircase.

The 56 precast panels that clad the centre, cast in a self-compacting concrete with a pale cement and limestone mix to give a light, smooth finish (see box, left), were installed in June 2010.

Garbers says: "To prevent cold bridging between the frame and wall panels, we covered the frame in 50mm of rigid insulation. Delivery of the panels was carefully timetabled because, this being a hospital site, you can't have lorries queuing up and blocking the entrances. It worked very well and we dropped them into place in just two days."

Behind each precast panel is timber studding and 100mm of Kingspan insulation. The interior is painted plasterboard.

Considerable effort went into the panels' titanium decoration. "Each plate had to curve with the radius of the panel," says Garbers. "In all, there are nine different shapes, but these are flipped and rotated to give the appearance of many more."

The titanium plates fit into shallow recesses in the concrete, and these were cast into each panel by fitting into the moulds pieces of acrylic sheet, cut to match the titanium. "It required a lot of

coordination between us, the precaster and the US-based titanium manufacturer."

The roof also required a bespoke approach. Garbers explains that a long tubular steel spine runs from the end of one dragon's tail to the other via an elliptical loop, which supports the roof around a central circular rooflight. "Timber rafters come off this spine like fishbones, and these were covered by a plywood 'stress skin' before the zinc cladding was applied. We then blew particle insulation into the voids between the rafters through specially drilled temporary holes."

Inside, the interior is surprisingly efficient and practical. Within the "tails" on the ground floor are two large multi-purpose spaces which are used for anything from yoga classes to meeting rooms. Nearer the heart of the building are two smaller counselling rooms and two WCs. The first floor is somewhat smaller, due to the slope of the tails, but there is still room for an office, a small counselling room and a library. There is also a panoramic window looking out to sea – a popular spot where people can simply sit, rest and enjoy the view.

"You can actually see the effect this building has on people as they walk through the door," says the centre's head, Debbie Horrigan. "Their shoulders relax and they almost sigh with relief as they walk into a building that is spacious, light and airy."

"And the funny thing is that it doesn't matter whether it is fully occupied and busy, or with only a few people around, it is always a calm, comfortable place to be. It's got a lovely vibe about it."

## The 'cosmic whirlpool' and other Maggie's Centres

When writer and garden designer Maggie Keswick Jencks was diagnosed with breast cancer in 1993, she, together with her husband, the architectural writer Charles Jencks, set about her creating a charity project to provide cancer sufferers with expert support within a more sympathetic built environment.

Although Maggie died before her first centre was opened in 1996, her vision has flourished and there are now 13 Maggie's Centres, of which Swansea is the latest. Others have been designed by such architectural notables as Frank Gehry, Zaha Hadid, Richard Rogers and Rem Koolhaas.

The Swansea Maggie's started life as a concept design by the legendary Japanese architect Kisho Kurokawa. At a dinner in London with Charles Jencks and Thore Garbers, he conceived the centre as kind of "cosmic whirlpool", responding to and tapping into the natural life and energy of the planet. Aged 74 and resident in Japan, Kurokawa never intended to be the on-site architect for the centre – but in between courses he produced a "napkin sketch" and agreed to help Garbers work up a design he could take forward.

Shortly afterwards, in 2007, Kurokawa died unexpectedly, but Garbers and his partner Wendy James felt they had enough to work with, and after



visiting Japan to view existing Kurokawa buildings, began to produce detailed designs.

"It had to be bare concrete for the exterior," says Garbers. "Render, for example, would not have done justice to Kurokawa's vision."

The Swansea centre is not the first to make extensive use of concrete. Rogers Stirk Harbour + Partners specified a concrete structural frame and a high-quality exposed concrete for the columns, ceilings and floors of its centre at Charing Cross hospital in west London, which won the 2009 RIBA Stirling prize. The use of concrete naturally moderated the peaks and troughs of temperature, creating a more pleasant environment for patients.

And Rogers appears to have started a trend. Koolhaas' centre in Gartnavel, Glasgow, which opened last year, also makes full use of exposed concrete inside, as well as dramatic full-height concrete panels on the exterior. Norwegian practice Snøhetta's design for an Aberdeen centre, meanwhile, is a continuously curved concrete structure, described by Charles Jencks as a "protective shell" embracing the interior.

From top: Other architects have made extensive use of concrete in their Maggie's designs, including Rogers Stirk Harbour + Partners, Rem Koolhaas and Snøhetta

# THE ROUGH WITH THE SMOOTH

Ellis Williams Architects has used concrete to create two very different effects at the UK's first indoor BMX arena in Manchester



**The National Indoor BMX Centre in Manchester is the second-largest purpose-built BMX stadium in the world, boasting a 2,000-seat clear-span arena.** The £24m project, which was designed by Ellis Williams Architects and completed last autumn, provides the only permanent indoor facility in the UK, and the track itself is a replica of the one that has been built for the 2012 Olympics in London, enabling the country's top riders to train at the highest level in the run-up to the Games.

Two sides of concrete's visual potential are on display at the BMX arena. Outside, the hard landscaping imitates a rough natural terrain, while inside the exposed concrete aggregate provides an elegant contrast in smooth white polish.

Meanwhile, some 3,000m<sup>3</sup> of clay that was excavated from the site has been reused for the earth mounds of the 7,000m<sup>2</sup> BMX track.

A 10,000m<sup>2</sup> building links the centre to the existing Manchester Velodrome, providing common access and shared facilities, including a reception area, retail facilities, a cafe and the new headquarters for British Cycling.

The use of heavyweight concrete for the link building creates a robust backdrop to the lightweight structure of the stadium. But it is the contrast between the external and internal finishes that demonstrates how concrete can be a visual and tactile chameleon, left rough and untamed, or taking on a more refined and polished quality.



## ABOVE

The external landscaping has been left with a natural finish

## LEFT

The mounds of the BMX track are made from 3,000m<sup>3</sup> of excavated clay

## BELOW

The polished interiors contrast with the hard landscaping outside



## PROJECT TEAM

**Client** Manchester City Council

**Architect** Ellis Williams Architects

**Project manager** Davis Langdon

**Contractor** Sir Robert McAlpine

**Concrete supplier** Lafarge

# 4-STOREY PLANT POT

Two walls of this house on one of Ho Chi Minh City's busiest streets are composed entirely of cantilevered concrete planters



**This house, named “Stacking Green”, offers a leafy refuge from the chaos of Ho Chi Minh City, the most densely populated city in the world.**

Architect Vo Trong Nghia has taken its inspiration from the local residents' fondness for potted plants. Indeed, in many parts of the city the proliferation of potted plants in doorways, on balconies and on rooftops means that some of Ho Chi Minh City's most populated streets are also its most verdant.

This tall, narrow home has been created on a typical Vietnamese “tube plot”, measuring 4m wide and 20m deep. The structure is a reinforced concrete frame, with the front and back facades consisting of layers of concrete planters cantilevered from the side walls. The distance between the planters ranges from 250mm to 400mm in order to accommodate different plant heights. The effect is of a living green wall of tropical plants, softening the rectangular edges. Cross breezes through the facades cool the internal spaces, further assisted by the shading

provided by the plants.

Internally, there are few partition walls, and the fluid spaces mean that a view of the green facades is offered from every corner of the house. The internal layout is typical of the city's homes. On the ground floor there is a bedroom, a pantry and an exit to a courtyard. The first floor has the living room and kitchen. On the second floor is a further bedroom and bathroom. An office is located on the third floor, together with a worship room and roof terrace garden. The cool bareness of the reinforced concrete stairs connecting each of the floors contrasts with dark wood floors and the internal granite walls, which are composed of tightly stacked 2cm stones.

The green facade and rooftop garden, made possible by the strength and robustness of concrete, protect the occupants from direct sunlight, street noise and pollution. Natural ventilation saves energy and the aesthetic is uplifting. This project may be a single house in Ho Chi Minh City, but the principles are universal.

## ABOVE LEFT

Internal walls are made from stacks of 2cm-high granite stones

## MIDDLE

The distance between the planters ranges from 250mm to 400mm

## TOP

The green facade shades the open-plan interior

## BOTTOM

The four floors are linked by reinforced concrete stairs

Photos: Decon Photo Studio

# STREET SMART

Squire and Partners keeps up appearances on one of London's most celebrated thoroughfares with a sharp white-concrete facade that echoes its Portland stone neighbours



**11-15 Baker Street is a mixed-used development replacing two post-war buildings.** Given its location just outside a conservation area, the challenge for architect Squire and Partners was to provide a modern visual statement while echoing the Portland stone of adjacent buildings.

The solution is an elegantly formal arrangement of slender, uniform precast columns that frame cassette glazing units. The primary office elevations are split into three discrete elements. The glazing to the central three floors is flush with the spandrels and beams, while above and below the windows are recessed. Within this framework, two additional areas of large flush glazing are introduced along with adjacent recessed colonnades, supplying a lively and asymmetrical composition to the streetfront.

The architect wanted to avoid traditional vertical structural lines in order to maximise the effect of the ground-floor colonnade and the sixth-floor terrace. Squire achieved this through the use of a hybrid system with structural precast columns. This solution reinforces the architectural concept because, as the building rises, the structural loadings, and therefore the amount of structure required, decrease.

The precast concrete columns also play an important role in maximising the net area. The two-storey columns that pass through the ground-floor arcade would have needed to be much wider had they been made from steel and clad in Portland stone. As it is, all of the precast columns and beams are 350mm wide, which enhances the sense of lightness of the facade.

The quality of the concrete is also key. The precast



units were manufactured using a special mix incorporating limestone aggregate and Spanish Dolomite fines with white cement. The finish has a texture and sparkle that emphasises the crispness of the design, as well as strongly resembling the stone of the surrounding buildings, both in colour and texture.

The precast columns demonstrate how concrete can be integral to a minimal aesthetic, and contribute to a high specification appropriate to such a prominent location.

## PROJECT TEAM

**Client** Brittain Hadley Group

**Architect** Squire and Partners

**Structural engineers** Scott Wilson, Taylor + Boyd

**Main contractor** McAleer & Rushe

**Concrete contractor** Evans Concrete Products



## TOP

Limestone and Spanish Dolomite fines create a concrete reminiscent of Portland stone

## ABOVE

The asymmetrical facade creates a lively effect

## ABOVE LEFT

The facade is in three discrete sections, with the glazing of the central floors flush to the beams and spandrels

# POLE TO POLE

DSDHA's illuminated, pigmented-concrete columns rise to 18m, forming a grand entrance to a long-neglected 17th-century park in south London

**Architect** DSDHA has designed a striking gateway for the restored Vauxhall Pleasure Gardens, with two 18m-high reinforced-concrete columns marking a new chapter for one of London's oldest public parks.

Dating back to 1661, the Vauxhall Pleasure Gardens reached the zenith of their popularity in the 1880s as one of London's most fashionable, and sometimes debauched, places of mass public entertainment. But they were levelled to make way for housing in the 19th century, and only reinstated as a public space in the 1970s. Now the redevelopment of the Vauxhall – Nine Elms – Battersea (VNEB) area includes a major landscaping project to recreate the gardens, as part of a network of green spaces stretching from Lambeth Palace to Battersea Park.

The new entrance frames views into and out of the gardens. The two columns were cast in situ using pigmented "raven grey" concrete, which gives an almost black finish, and rise from an area of granite paving surrounded by trees and planting. Designed in collaboration with Martin Richman, the columns incorporate a curved vertical cut that is lit from within at night by coloured LEDs.

Despite their apparent simplicity, the columns involved major design and construction challenges, not least how to manage the risk of thermal cracking, as the concrete pour took place during a winter freeze. This was addressed by incorporating a polyform core in the centre of each of the 1.2m-diameter columns and specifying aggregates and a cement combination that was able to reduce the temperatures caused by hydration. The formwork was wrapped in reflective insulating jackets with thermal sensors that monitored changing temperatures. Each column was cast in three sections, with the same formwork being reused after one week's curing time.

The result is a grand entrance to the Vauxhall Pleasure Gardens, heralding their rebirth as an important open space for south London. And the process of reinvention continues, with a proposal that the columns be used as plinths for public installations by up-and-coming artists.

## PROJECT TEAM

**Client** London Borough of Lambeth

**Architect** DSDHA

**Structure engineer** Structure Workshop

**Artist** Martin Richman

**Lighting designer** Enigma Systems

**Concrete contractor** White Rock Engineering

**Landscape contractor** Blakedown Landscapes



## TOP

A curved vertical cut runs down each column

## ABOVE

The cuts contain LEDs that light up the columns at night

## LEFT

The 18m-high columns were cast in three sections



### THE FINAL FRAME

Stanton Williams' University of the Arts London Campus for Central St Martins has been named Public Building Project of the Year at this year's Building Awards. Exposed concrete was chosen to give a raw, industrial finish that would allow each department to assert its own identity, while providing robust, monumental spaces flooded with natural light.