CONCRETE QUARTERLY

WINTER 2014 | ISSUE NUMBER 250

PLAYTIME!
Heneghan Peng creates a "24-hour living toy" for architecture students in the heart of historic Greenwich

SHELTER FROM THE STORM
Loyn & Co builds a castle from concrete and glass on a brooding Welsh hillside

FLOORING IT
How to specify screeds, plus a focus on the many techniques for finishing concrete floors

Everyman steals the show at the Stirling Prize

The Everyman Theatre in Liverpool has seen off a strong – and concrete-heavy – shortlist to win the RIBA Stirling Prize 2014, the UK's most prestigious architectural award.

The RIBA said that architect Haworth Tompkins had created "a building that instinctively you want to reach out and touch", praising a materials pallet which includes board-marked concrete, reclaimed bricks, timber and steel mesh: "This is a building that breathes quality in its choice of materials, in its lighting and its signage."

The judges also recognised the "exceptional" sustainability of the Everyman, which used 90% of the materials from the old theatre and includes one of the UK's first naturally ventilated auditoriums, where "clever, out-of-sight concrete labyrinths supply and expel air whilst maintaining total acoustic isolation".

Photo: Philip Vile

Read about the Everyman's board-marked concrete in CQ 248, available in the CQ archive at www.concretecentre.com/cq. You can also watch videos about two of the shortlisted buildings, Zaha Hadid Architects' Aquatics Centre and the Saw Swee Hock student centre at the London School of Economics by O'Donnell + Tuomey, at www.concretecentre.com/videos

Photo: English Heritage

London skatepark lands listed status

English Heritage has awarded a grade II listing to Rom Skatepark in Hornchurch, east London, the first such facility to achieve national listed status.

The skatepark was completed in August 1978, and features 4,000m² of bowls and hollows surfaced in seamless shotcrete.

English Heritage admitted that the listing did raise some interesting questions: "What type of designation would be appropriate, given that this is a concrete surface and not a building?" it wondered.

The park's listing recognises its importance as an icon of the British skateboard scene and its historical interest as the best, and most completely preserved, of a small number of purpose-built skateparks devised by Adrian Rolt of G-force in the late 1970s.

Photos: Nick Kane, Hufton + Crow

CONCRETE GRADUATES WITH FLYING COLOURS

December's Concrete Elegance event in London will focus on higher education buildings, providing an in-depth look at just two of the many recent architectural successes in this sector that have made a prominent structural and aesthetic feature of concrete.

Richard Jobson of Design Engine Architects will explain how meticulous attention to detail achieved impressive results at Oxford Brookes University. The John Henry Brookes Building (above left) combines a concrete frame of precast, twin-wall and in-situ concrete construction with a range of high-quality finishes to create a robust, flexible space with excellent environmental credentials.

In addition, the event will reveal the secrets of Zaha Hadid Architects' Issam Fares Institute at Beirut's American University. The building features an astonishing 21m cantilever, as well as ZHA's trademark sinuous forms in fair-faced concrete.

Concrete Elegance takes place on 2 December at The Building Centre in London. Talks are free to attend but booking is essential – go to www.concretecentre.com. Read about both these buildings in CQ 249 at www.concretecentre.com/cq

STRUCTURAL CONCRETE COMPETITION 2015 OPEN FOR ENTRIES

Structural design students are invited to enter the 2015 Structural Concrete competition, supported by The Concrete Centre and Laing O'Rourke. The brief is to design a civic centre, comprising a library and council offices, in a new town in the north-west of England. Entry forms are due by Friday 12 June 2015.

For more information and to download the brief, visit www.concretecentre.com/competition

LIVING PLANET CENTRE SCOOPS TOP PRIZE AT CONCRETE SOCIETY AWARDS

The Living Planet Centre, Hopkins Architects' headquarters for WWF-UK, has named overall winner at the Concrete Society's 2014 awards. Judges described the use of concrete at the BREEAM Outstanding building as "exceptional".

Other winners included AHMM's Burntwood School, the Saw Swee Hock student centre by O'Donnell + Tuomey and Stormy Castle by Loyn & Co, which is featured on page 11.

CONCRETE QUARTERLY

On the cover:
Stormy Castle in Gower, Wales by Loyn & Co. Photo: Charles Hosea

mpa The Concrete Centre

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www.mineralproducts.org

THIS IS CONCRETE

Never looked better

This is the 250th issue of Concrete Quarterly – and for me, it is a striking testament to how far concrete has come. When the magazine began in 1947, in the immediate post-war era, its focus was often necessarily on function ahead of form. Issue 1 featured bridges in Scotland, sewage works in Rochdale, power stations in Blackburn and Oregon, mass housing in the UK and Brazil and a motorway in Paris.

Concrete has historically been regarded as a cheap and cheerful material, and sold as a commodity. But CQ 250 shows that it is increasingly chosen by building designers for the added value that it offers, not just aesthetically but technically. New developments in materials and techniques are continuing to offer better performing, more sustainable and better looking buildings.

At 240 Blackfriars Road, for example, a switch from a steel to a concrete-framed solution meant that two extra floors could be added without an increase in the tower's height. Meanwhile, at the University of Greenwich's new school of architecture, concrete provides not only robustness and sustainability, but saves the client money – and delights its users – by performing the role of structure and finish at the same time (a structure and finish, it should be added, that sit comfortably beside Hawksmoor and Wren within a Unesco World Heritage Site).

This wide and varied role is aptly summarised by our Lasting Impression contributor, John Tuomey of RIBA Royal Gold Medal winner O'Donnell + Tuomey, who derives inspiration from concrete's ability to be both the "elevated ordinary" and the most timeless expressions of form or refinement. I think CQ 250 provides ample evidence of that.

Guy Thompson
Head of architecture, housing and sustainability, The Concrete Centre

CQ ISSUE 1 FEATURED BRIDGES IN SCOTLAND, SEWAGE WORKS IN ROCHDALE, POWER STATIONS IN BLACKBURN ...

THE ASPA'S ASPIRATIONS

The creation of any new team provides an opportunity to start with a blank piece of paper, writes This is Concrete blogger Andrew Minson. And that's exactly what he did with the newly launched Architectural and Structural Precast Association (ASPA).

"When I joined The Concrete Centre from a large engineering practice, I marvelled at the knowledge and expertise available in the industry," recalls Minson. While The Concrete Centre's remit is to communicate this to practising designers, Minson's other role at British Precast has shown him how such groups can improve the performance of industry itself. "Balancing the needs of industry and designers was key when we started with our blank piece of paper for the ASPA," he says, inviting potential members and designers to get in touch. "We want to build an association that supports industry to produce quality products in a safe and sustainable manner, and provides designers with guidance on their safe and sustainable use."

Join the debate at www.thisisconcrete.co.uk

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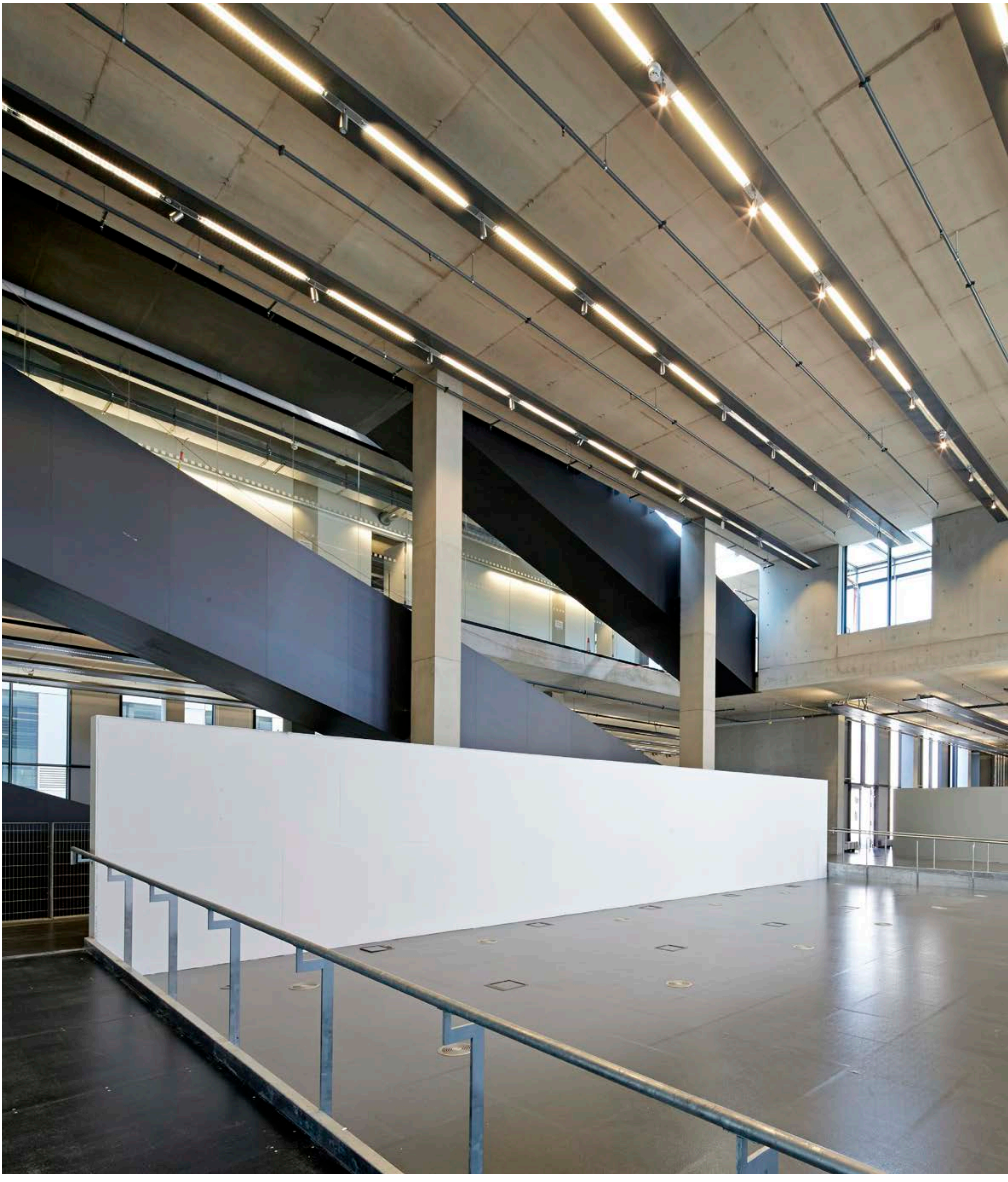
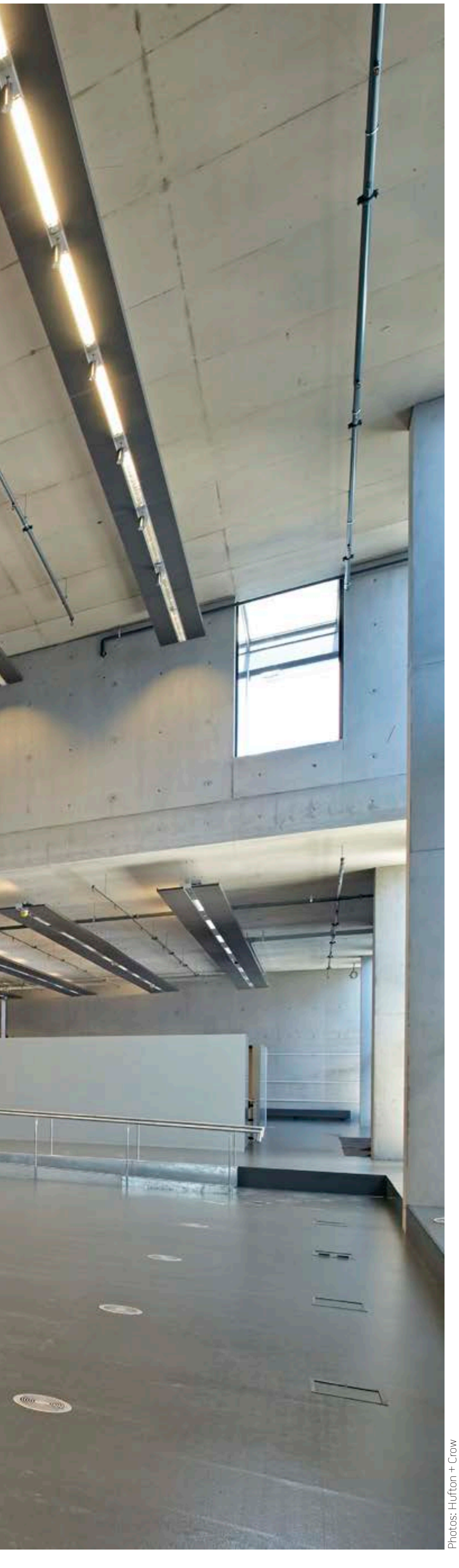




Photos: Hufton + Crow

CONCRETE TIGHTROPE

At the University of Greenwich, Heneghan Peng has somehow created a building that's both a robust, industrial workspace and a sympathetic addition to a Unesco World Heritage Site. By Tony Whitehead

If not exactly a poisoned chalice, some designers might have thought twice about taking on the University of Greenwich's new building.

First, one of its main functions is to contain the School of Architecture and Construction – a potentially awkward client if ever there was one. Secondly, it had to nod to the university's illustrious neighbours and appease local conservationists and heritage bodies, but without being cowed by the fact that it is situated within a Unesco World Heritage Site, sandwiched between Sir Christopher Wren's Old Royal Naval College, the National Maritime Museum, the Cutty Sark and Nicholas Hawksmoor's Church of St Alfege. Thirdly, it had to fit in with a busy working high street, one of the key thoroughfares in this distinctive London borough.

It would have been easy to freeze in the crossfire of competing expectations. However, architect Heneghan Peng has succeeded superbly, producing a building that one newspaper's architectural critic praised as "generous and confident". The £76m facility seems to have pleased just about everyone, including its design-minded occupiers.

Inside, an exposed in-situ concrete frame supports 15,200m^2 of relaxed and spacious accommodation. Outside, the building is clad in stone and precast concrete, and follows the curve of the busy Stockwell Street. A substantial side elevation features precast glass-reinforced concrete "fins" which angle occupants' views away from adjacent railway tracks and towards the historic centre of Greenwich (see box, overleaf).

"There were quite a few reasons why we chose concrete for this building, but primarily we wanted a robust and durable interior with an exposed frame to allow us to make use of every inch of space available," explains architect Róisín Heneghan. "Concrete was the cost-effective option. When you try to achieve something similar in steel, it quickly gets expensive."

The building has raised floors but no suspended ceilings, allowing the concrete soffit to be left exposed: "That gives us the ceiling height we needed over the four floors. Although we didn't have a height limit as such, we didn't want the building to be out of step with the scale of the four-storey shops and buildings on the streets around."

The concrete conferred another important benefit, in that its exposed thermal mass provides highly effective passive temperature control for the building, which has a BREEAM Excellent rating. "Minimising mechanical services not only saves money and energy, it also frees up space," Heneghan notes.

Having opted for concrete, the practice has certainly made the most of it. The frame has been described as "industrial" and it is certainly hefty – the 720 x 480mm reinforced concrete columns combine with the exposed ceiling slabs to give a chic yet engineered feel to the interior spaces.

"I guess it does have an industrial aesthetic," Heneghan agrees. "The concrete is not painted, and naturally has quite a rough, raw feel to it. But the fact that it is self-finishing helps keep costs down. And of course, with much of the building being used by architecture and construction students, they can see how it is put together."

At the centre is a spacious forum containing the "crit pit" – the space where architecture students display their designs for others to dissect. Galleried walkways overlook this and lead to a mix of large and smaller spaces. There is a library with 670 study spaces and 10 study rooms, two lecture theatres, seminar rooms and, in the basement, a TV studio and a sound studio.

With so much exposed concrete, the construction team worked hard to ensure that this rather cool designer interior was not compromised by the finish. This involved adjusting the mix as construction progressed. "We started off with concrete containing 50% GGBS [ground granulated blast furnace slag] and 20mm aggregate, and used some of the basement areas to test the mix,"

WE WANTED A ROBUST AND DURABLE INTERIOR WITH AN EXPOSED FRAME TO ALLOW US TO MAKE USE OF EVERY INCH OF SPACE AVAILABLE explains structural engineer Adam Sewell, of Alan Baxter Associates.

One issue with this was that the aggregate size appeared to impede the flow. "The design calls for clean edges. The columns, for example, are rectangular and don't have rounded corners. But that first mix was not flowing into the corners sufficiently well to give the sharp, clean look we were after."

The solution was to switch to 10mm aggregate. "This gave us the flow we needed without having to use self-compacting concrete," says Sewell. "The result is a finish which is much more regular and neat with clean edges."

He adds that formwork created from phenolic resin boards was used for much of the walls while medium density overlay boards were used for the ceilings: "You can still see the board marks and the tie holes, but thanks to careful workmanship and real attention to detail on the part of the contractor, it all looks great. There are dummy tie holes, for example, to ensure a consistent patterning."

The building's floors comprise in-situ concrete slabs of various depths, some up to 450mm thick. Heneghan wanted the soffits to be as uncluttered as possible, so upstand beams have been concealed beneath the raised floors.

"This not only this gives a better aesthetic, it improves buildability," says Sewell. "The clear ceilings mean formwork is simpler, and lighting and other services are easier to install. It also gives the building flexibility as future users won't be constrained by downstand beams."

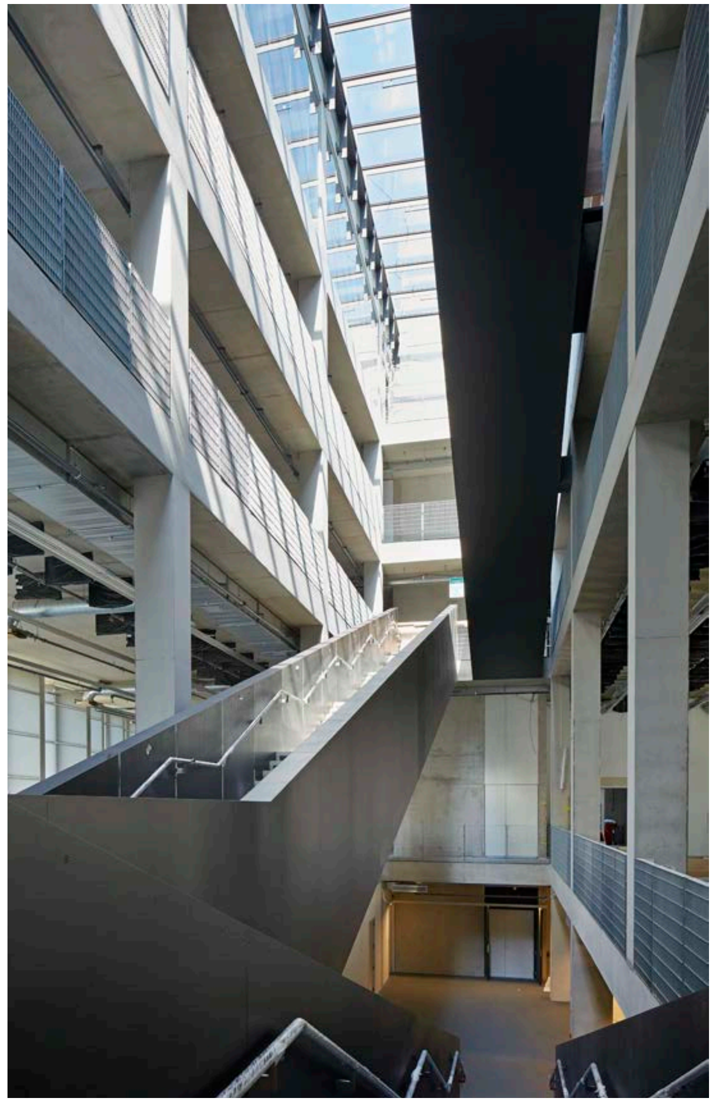
This adaptability has already found favour with the architecturally aware residents. The concrete frame is what the head of the school, Neil Spiller, calls a "big rig – a 24-hour living toy". Or as Heneghan puts it: "The frame has hooks to hang things off. It's sturdy enough to attach things to if you want, and yet the interior has the flexibility to

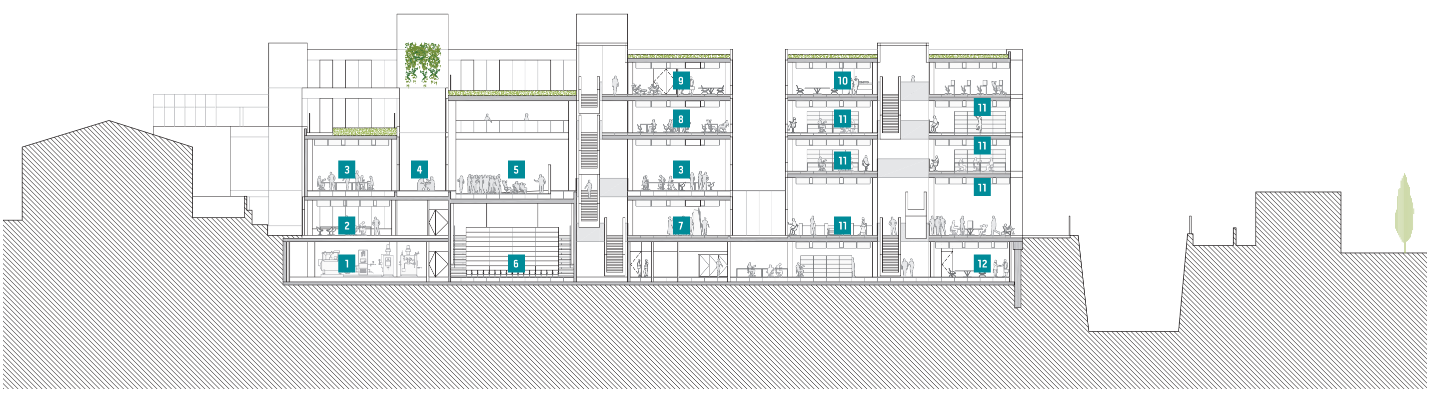
RIGHT
The clean-edged concrete frame required 10mm aggregate

OPPOSITE, BOTTOM LEFT
Almost all of the building's 2,800m² roofspace is landscaped

OPPOSITE, BOTTOM RIGHT
The building follows the scale of the surrounding four-storey shops and townhouses

PROJECT TEAM
Architect Heneghan Peng
Structural engineer Alan Baxter Associates
Contractor Osborne
Precast supplier Techrete
GRC supplier GRCUK
Landscape architect Allen Scott





IN SECTION
1 Boiler plant
2 Model workshop
3 Design studio
4 Patio
5 Crit space
6 Lecture theatre
7 Exhibition area / foyer
8 Seminar room
9 Head of school's office
10 Staff room
11 Library
12 Video conference room

allow people to play around with the space."

It is also sturdy enough to support the building's extraordinary array of roof gardens. There are 14 of these in all, arranged on three levels as the roof cascades down to avoid overshadowing houses to the building's rear. Almost all the roof's 2,800m^2 is landscaped. Soil depths vary depending on the flora involved, but in some areas they are as much as 600mm. As well as beehives, greenhouses and a weather station, some of the gardens contain wetland features and ponds – also up to 600mm deep. The gardens will act as living classrooms for students of landscape architecture as well as laboratories for carrying out research – into producing fuel from algae, for example.

All of this rooftop activity inevitably adds to the loading on the building and Sewell agrees that the weight of the gardens needed careful consideration: "Each garden was assessed for the loading it would put on the frame. Because of the way the building is laid out, the spans vary quite a bit – from 8m to up to 12m. The solution was simply to ensure that the heavier, more built-up gardens were placed over the shorter spans, with the longest spans supporting only the lightest gardens." Upstand beams supporting the roof have also been incorporated into the layout of the gardens.

So was designing the building as daunting a prospect as some have suggested?

"You can't think like that," says Heneghan, though she admits some trepidation about having an architecture school for a client. "We were worried that there would be an excess of opinions. But it didn't happen – really. They were great with us and allowed the design to progress." Neither is Heneghan Peng a stranger to sensitive sites, she adds laughing: "We designed a museum on the site of the Great Pyramids in Egypt – although there was actually much more discussion about the appearance of this building …"

The art of misdirection

While Greenwich is awash with architectural interest, it is fair to say that very little of it is immediately to the north of its new university building. Heneghan Peng's ingenious solution has been to use angled concrete blades or fins to direct views away from an unprepossessing stretch of railway track, guiding the eyes of its occupiers instead towards the rather more beautiful Church of St Alfege to the west.

The northern elevation comprises some 55 of these precast glass-reinforced concrete (GRC) fins, which are of two main sizes: 3.25m high and either 4m or 3m wide. There are also a few larger panels at ground-floor level, which are 4m x 5.5m. The panels were formed with a crank in the middle, which gives the impression of a diamond section.

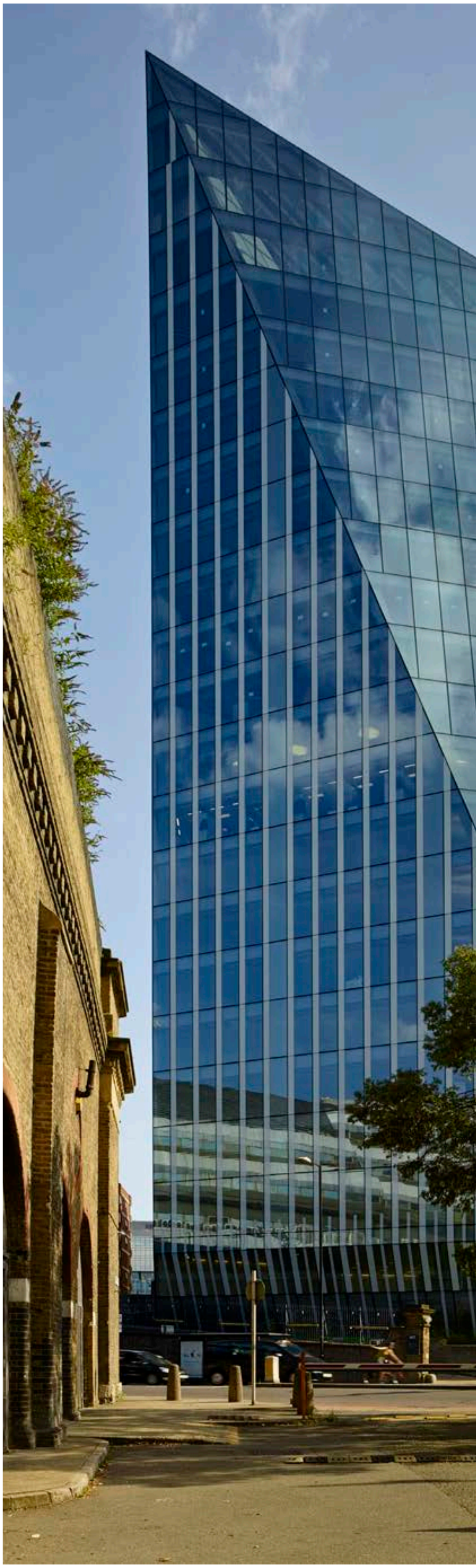
Heneghan Peng says that GRC panels were selected as they could be formed in a thinner profile than alternatives and could achieve crisp edges. However, even for the specialist that supplied them, their manufacture presented a challenge. Miles Cobley, general manager at GRCUK, explains: "What makes these panels unique in my experience is that they comprise both spray and premix GRC. The main body of the panels is hollow, having been created by spraying GRC into the bespoke timber moulds. However, the tips of the panels are made from premix GRC which has been bolted onto the main panels afterwards."

Spray GRC panels are created by first spraying the forms with a mist or facing layer containing the aggregate which will be visible on the finished product, but which does not contain glass fibre. This layer may only be 3mm thick. At Greenwich, this was then built up by spraying layers of Grade 18 GRC which contains 4.5-5.5% alkali-resistant chopped glass fibre.

"We used timber to create the moulds, but they were highly finished. We used varnished fair-faced birch ply, and all holes and joints were meticulously filled with two-part car body filler. This produced moulds with a surface more akin to glass than ply."

The completed fin is hollow, with an exterior shell 18mm thick (including the mist layer). Thicker, stronger areas of shell were formed around fixings or lifting points. But because the pointed edge of the panels was so fine, it was not practical to create it through spray layers alone – hence the use of an additional element. "The premix GRC is formed in the same way as ordinary precast, but with glass in the mix," says Cobley. "These elements were designed to fit into the spray-mix panels to give the fine edge required."

Like the more traditional precast panels that have been used to form the walls of the light wells and some of the rear elevations, the GRC fins had to be made to match the limestone cladding that adorns the building's front elevation. "We tried a variety of mixes for the mist layer aggregates, comparing them with a sample of stone until we got a good enough match. In this case we used a mix of 0-1mm and 1-2mm dolomite aggregate with three different types of pigment to get the effect that was required."



A TALE OF TWO STOREYS

Andy Pearson reveals how AHMM and AKT2 increased their new London tower from 17 to 19 floors – without adding an inch to its height

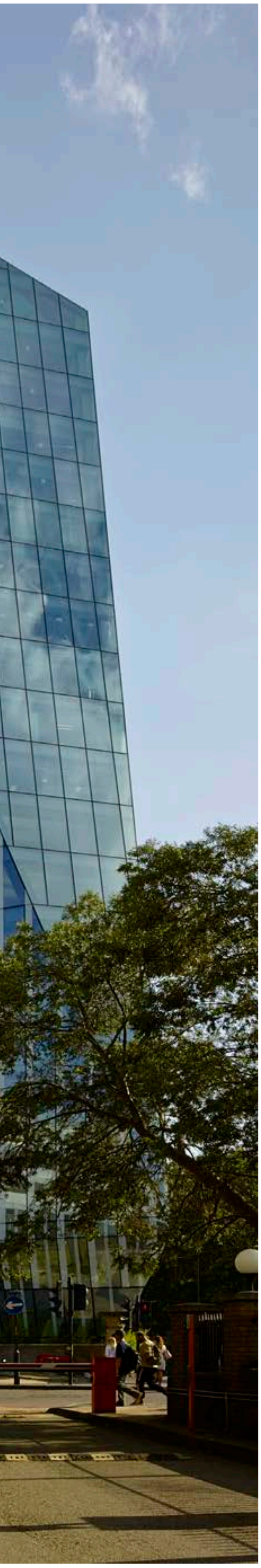
An 85m-high tower with a striking crystalline facade pierces the skyline just south of the Thames in Southwark. The faceted appearance of Allford Hall Monaghan Morris' 240 Blackfriars Road is designed to exploit views over the river to the City beyond, while reducing the tower's impact on its neighbours' access to daylight. But behind its glazed surface, a clever and highly efficient structural solution has played an equally important role in maximising values for developer Great Portland Estates.

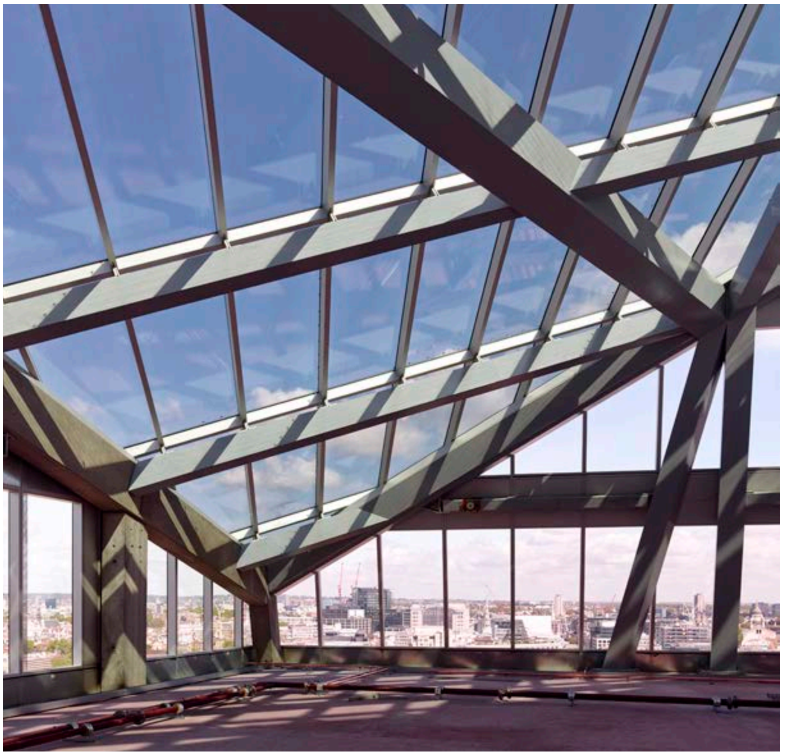
Concrete has been the key to making this new London landmark happen. The initial design was for a 12-storey, speculative office building supported on a conventional steel frame. That all changed, however, when a post-recession rethink by the developer prompted a request for an additional five storeys. AHMM and structural engineer AKT2 revisited the original structural proposition and found that, by replacing steel with a concrete-framed solution, they could do even better, adding a further two floors of offices. This increased the total number to 19, without an increase in the tower's overall height.

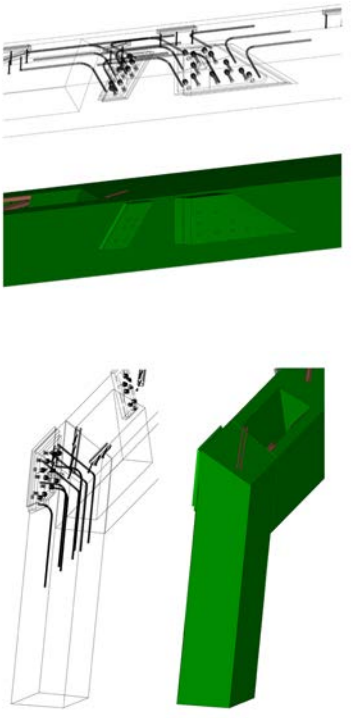
The additional floors were made possible through the use of slender, 270mm-deep, post-tensioned concrete floor plates. "The building works harder because we can achieve the same 2.7m clear head-height with a minimum floor-slab thickness," says Haydn Thomas, associate at AHMM.

The parallelogram-shaped floor plates are supported on an in-situ concrete structural frame. This comprises a concrete core, positioned at the eastern edge of the floor plates, and a series of columns rising up through the building and around the rest of the perimeter. On the ground and first floors, where the base of the facade has been undercut on the north and west elevations, these perimeter columns are exposed as they rake outwards to overhang the pavement. "There is a lot of concrete that is not seen that is very efficient structurally," says Thomas. "Alongside that, we wanted to emphasise the beauty and simplicity of those bits of concrete that were exposed."

To ensure these 9m-high inclined columns achieved the "matt, paper-smooth" finish demanded by the architect, concrete contractor Byrne Bros cast each in a single pour. The size of the columns and the volume of concrete needed increased the hydrostatic pressures on







Photos: Rob Parrish, Timothy Soar. BIM images: Byrne Bros

FAR LEFT
In-situ concrete columns flank the perimeter of the building

LEFT
The chamfered form is designed to maximise views across the Thames

ABOVE
The triple-height roof structure is formed from precast concrete beams

ABOVE RIGHT
A BIM model was used to work out the position of the fixings in the precast beams

the formwork to such an extent that steel, rather than timber, had to be used. The inside face of the formwork was cleaned and shot-blasted to ensure the smooth finish. In addition, the contractor used self-compacting concrete, rather than risk having site operatives damage the surface using vibrating pokers. The solution worked: "The quantity of concrete in the moulds was so great that it forced out every last bubble of air," says Thomas.

In addition to the columns, the floor plates are supported on an innovative, highly efficient, slip-formed concrete core structure at their eastern edge. Because this core is positioned off-centre, and since some of the facades are undercut at their base, the loads on it are uneven. However, rather than strengthen the core by increasing the amount of concrete and reinforcement in its walls, the engineers opted instead to pre-camber it, with the intention of making it lean away from the building. Then, as the office floors were added, their additional weight straightened the core little by little until it reached vertical with the completion of floor 19 – the slip-form core was jokingly referred to as "the banana" among the project team, says Thomas.

The core rises up from a basement structure that had been constructed well in advance of the superstructure works. The solution enabled any issues associated with the groundworks to be resolved without impacting the construction programme. It also allowed work on the superstructure to get underway quickly when the office market did eventually improve.

A laser point-cloud survey was undertaken to check the accuracy of the basement before construction of the superstructure commenced; this also formed the basis of a BIM model of the building. BIM has been used extensively on this project, and proved particularly useful for Byrne Bros when constructing its formwork: "They took the structural model and placed it inside their BIM formwork models to check there were no clashes," Thomas says.

BIM was also used to help precast the visual concrete elements on the triple-height top floor. The floor is topped by an inclined hybrid roof structure of exposed concrete and concealed steelwork. BIM enabled fixings for the steelwork and the cladding to be accurately positioned in the precast elements. "The structural gymnastics taking place inside the raking concrete roof beams is incredible, but the reality is that the concrete structure just looks effortless."

In addition to being structurally proficient, the fully glazed building also has impressive sustainability credentials. The original scheme was designed to achieve an Excellent rating under BREEAM 2008, but by the time the building was revisited, a more onerous version of the environmental assessment method had been published, requiring 25% lower emissions than Part L 2010. In addition to revamping the structure, the designers incorporated more efficient servicing, lighting and plant strategies to maintain the tower's Excellent rating under BREEAM 2011.

Thomas is pleased with the way the building's form and structure complement each other in a highly efficient, cost-effective solution. "We've ended up with something that has pure geometric forms for the columns; clean, flat, open floor plates; and a vertical core. That means the building not only works well now, but the legacy of this pure design is that it could easily be transformed for a different use in 20 or 30 years' time."

PROJECT TEAM
Architect AHMM
Structural engineer AKT2
Contractor Mace
Concrete contractor
Byrne Bros

CAST WIDELY

West London's new Hindu temple combines a precast concrete facade with ornate GRC details designed and cast in India, writes Nick Jones

The Shree Swaminarayan Temple in Kingsbury, west London is the first BREEAM Excellent temple in the UK. It is also almost certainly the first precast concrete temple in the world. And it's definitely the first to have some of its concrete elements designed and cast in India before being shipped to Brent.

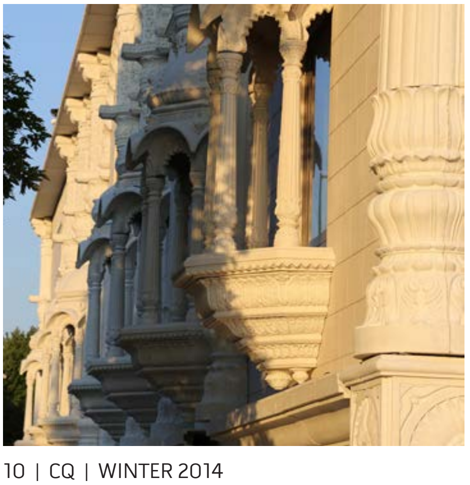
The man responsible for treading the tightrope between tough sustainability requirements, material experimentation and the rules governing Hindu religious architecture was Greg Shannon, director of LTS Architects. "It's been quite a complicated piece of coordination," he admits.

When Shannon came on board 10 years ago, the plan was to build the temple in the traditional manner, out of solid marble with hand-carved ornamentation. "It would have been carved in India and shipped and erected over here," he explains. However, India's building boom soon put paid to that: "We found out pretty soon after visiting a number of stonemasons that that was never going to happen – there was too much demand locally."

Instead the plan changed to using an in-situ concrete frame and composite precast concrete internal and external panelling, with a high Portland cement content to give the impression of stone. This brought a number of additional advantages. Unlike a porous stone, concrete's imperviousness meant that the white facade would stay white, even on a busy, polluted London artery – a key factor in a temple that's meant to last for at least 200 years. It was also far cheaper than shipping a marble temple from India, and clearly more sustainable, making the planning requirement for BREEAM Excellent far more achievable. The client was also happy with the change to reinforced concrete. "Temples are ordinarily made with no ferrous metals," points out Shannon. "But the client was fairly flexible."

The only problem was that the simple precast system was "basically a shoebox with holes in" – to transform this into a Hindu temple required huge amounts of intricate ornamentation on the facades, towers, dome and throughout the interiors. Which is where the coordination came in. The details were all hand-carved from wood, moulded and cast in lightweight glass-reinforced concrete by manufacturer Birla White in Baroda, Gujarat, before being shipped to the UK. They were then fixed to the precast system – samples of the Indian GRC having been shipped across and checked to ensure uniformity. "You probably wouldn't guess there were two methodologies there," says Shannon.

Photos: Shree Swaminarayan Mandir; Federico Redin



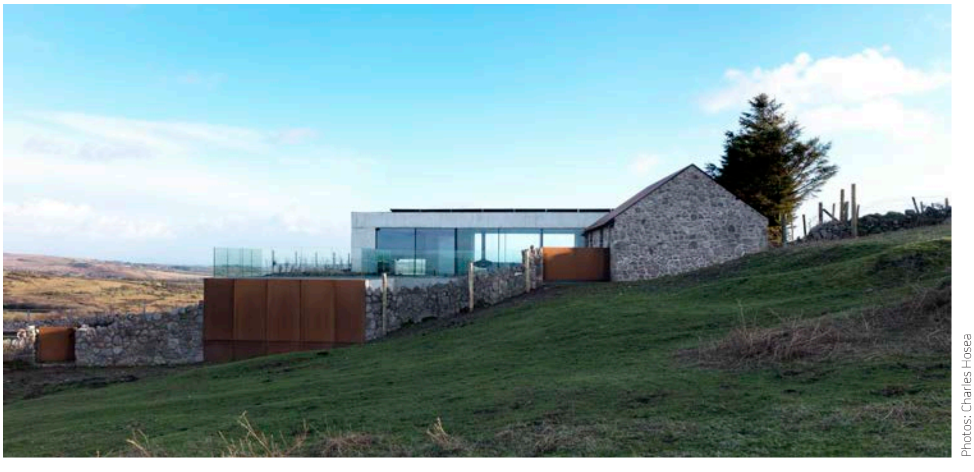
TOP TO BOTTOM
The temple features many traditional elements of Hindu architecture; there is space for 750 worshippers; the GRC detailing is attached to the precast concrete cladding using stainless-steel fixings

PROJECT TEAM
Architect LTS Architects
Structural engineer Engineers HRW
Contractor Shree Hari Construction
Concrete contractor FDL Group
Precast supplier Techcrete

It's a neat symbol of this £11m project's seamless mix of old and new, eastern tradition and western urbanism. Features such as combined heat and power, an airtight concrete shell and a sophisticated BMS have helped to ensure the highest levels of sustainability, but crafts honed over centuries have elevated it to a higher realm.

SILENT STORM

Loyn & Co has made extensive use of concrete to anchor a modernist house in the brooding Gower landscape, writes Pamela Buxton



Photos: Charles Hosea

Some 700m³ of concrete, cast in situ on a remote Welsh hillside, forms the structure of Stormy Castle, an award-winning private house designed by Penarth-based architect Loyn & Co.

Remarkably, although the house is four times the size of the 2,000sq ft farmhouse it replaced, it is less visible as a result of the architect's strategy of sinking the building into the hillside to create an earth-sheltered house, with only the upper pavilion prominent in the landscape. But from the inside, the 180° views over the Gower countryside are tremendous, courtesy of extensive pavilion glazing.

Concrete proved the logical framing and finish choice, meeting not only structural requirements but the client's desire for a contemporary aesthetic – the phenolic board-cast concrete is about as far from a traditional cottage vibe as it's possible to get.

"They wanted something warm but not 'olde worlde cosy' warm," says architect Chris Loyn. "That was one of the reasons we went with concrete because it achieved that as well. It's absolutely fabulous. The patterns and swirls on it are beautiful." Less obviously, the material is also a nod to the surrounding environment. "Concrete is used by farmers extensively and we felt the house should have an agricultural anchor," Loyn says. "We've expressed it throughout the design."

Loyn's design inserts three concrete boxes into the hillside to create three interlinked wings, at the same time using the roofs as flat terraces. "We felt that the real beauty of Gower was not the built heritage but its landscape. We wanted the project to read like a carpet laid over the contours over the hill."

The scene is set at the entrance, where the concrete forecourt was cast in panels with movement connections that reflect the contours of the landscape as well as providing drainage channels. Inside, the concrete is exposed as flooring, walls, stairs and soffits, and links the different wings. The entrance is in the split-level living room wing; from here, stairs lead down to the bedrooms, and up to the upper pavilion/study.

Retaining walls are 250mm thick with 300mm insulation. For the above-ground pavilion, where a concrete finish was required both internally and externally, the 450mm cavity walls have a 150mm outer and inner skin with 150mm of insulation.

Use of locally sourced concrete with 50% cement replacement helped the house to reach Code for Sustainable Homes level 5. Concrete supplier Hanson states that the use of Regen cement replacement saved 98 tonnes of embodied carbon dioxide, and says it is particularly suitable for earth-sheltered installations, because its chemical structure reduces the permeability of the concrete.

Installation was particularly challenging because of the sometimes extreme weather, and the need for high-quality finishes. "We wanted it to be an expression of concrete both inside and out – it's not easy to get it right on both," says Loyn.

But clearly they did. Stormy Castle has won a string of prizes, including a Concrete Society award, a RIBA regional award and the 2014 Manser Medal for the best new individual house in the UK.

PROJECT TEAM

Architect Loyn & Co
Structural engineer Vale Consultancy
Contractor Dawnus Construction
Landscape architect Camlins

TOP TO BOTTOM

The interiors include exposed floors, walls and soffits; only the upper storey rises above the hillside; paved courtyards surround the rooms on the upper level

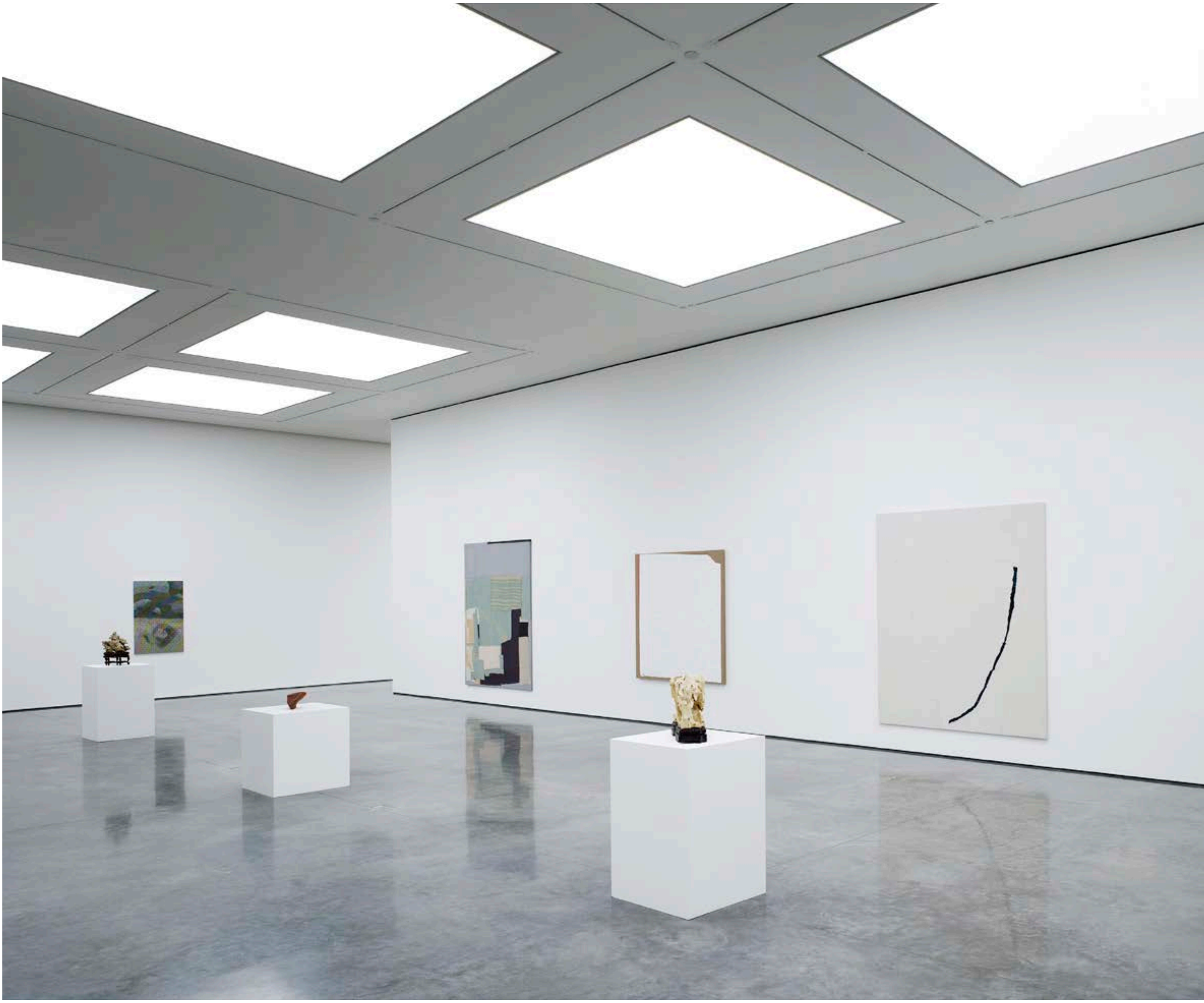


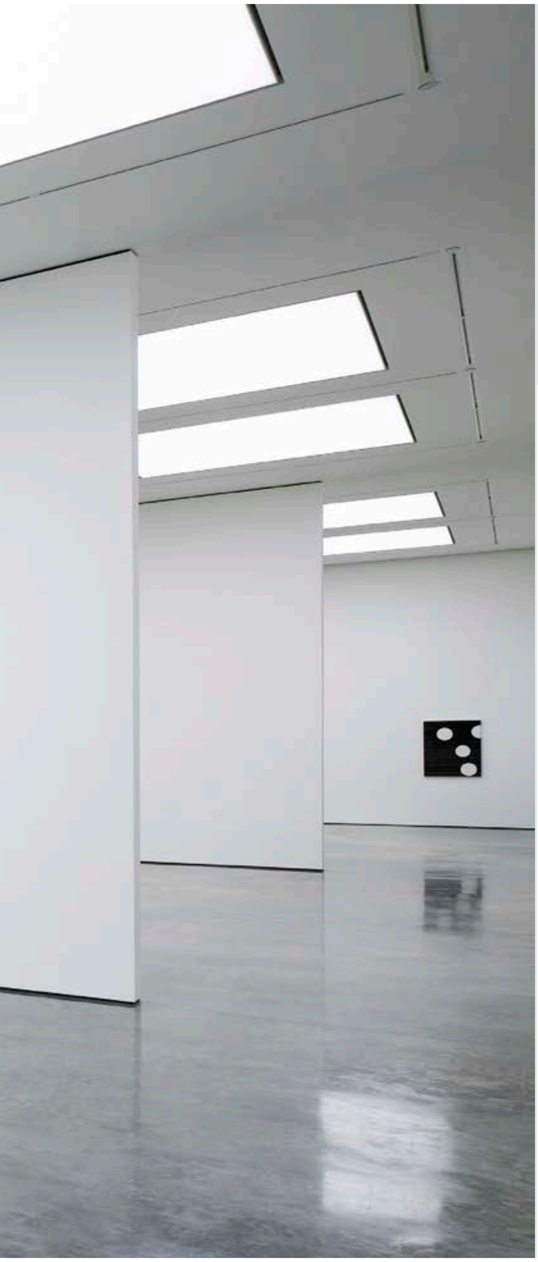
Photo: Paul Riddle

SURFACES, IN DEPTH

Concrete can be polished, textured, coloured, washed, brushed or blasted to give a huge range of aesthetic and hardwearing floor finishes. Elaine Toogood explores the options

Exposed concrete floors are durable, hardwearing and useful for all sorts of applications, from warehouses to art galleries, and from garages to living rooms. They are particularly useful for heavy loads or traffic or, when combined with underfloor heating, for continuous and efficient space heating. As a finish they can appear utilitarian or luxurious depending very much upon the chosen materials and installation techniques. This article considers some of the different textures, colours and even patterns available for concrete floors and the techniques used to achieve them.

Technically, the upper face of a concrete floor is called an "unformed" face, in contrast to "formed" concrete faces which obtain their shape and texture from the moulds or formwork in which they



1 **Polished natural concrete**
White Cube Bermondsey, London (2011)

Architect Casper Mueller Kneer decided to let concrete's natural beauty shine through in this south London gallery. It is made of reinforced readymix concrete with no additional pigments or additives, and no finish applied. The 150-200mm structural floor slab was simply power-floated and burnished, though it has subsequently been cleaned and polished with an oil-based product. The contractor was Steyson Floors.

are cast. Unformed faces are typically flat and need post-finishing techniques to achieve the required texture. The most prevalent texture or finish for internal exposed concrete floors is polished – either power-floated for a smooth solid appearance or diamond-ground to expose the aggregates. A requirement for greater slip resistance is often a driver to explore other options, such as the inclusion of retardants or shot-blasting. Some of the techniques more commonly used for external surfaces, such as imprinting or brushing, can also be used to good aesthetic effect inside.

This article focuses on finishes for internal concrete floors, but the same techniques are commonly used for exposed screeded floors too. Wearing screeds (formerly known as high-strength concrete toppings) are usually installed once the space is enclosed, unlike a structural floor slab. They are specifically designed to serve as a floor finish, often incorporating pipes for underfloor heating, and require care and expertise to execute correctly. Designers are advised to seek guidance from specialist installers at early stages of design development when specifying screeded floors (see page 16).

Polished concrete

There are two ways to create a smooth, polished patina to concrete floors, but each achieves quite a different visual appearance.

■ **Diamond-polished, or ground and polished** This technique creates a smooth finish, with varying degrees of shine and exposed cross-sections of aggregate. The top millimetres of the concrete are mechanically ground away to expose the aggregate, often using diamond grinders. The surface is then polished with increasingly fine-grade buffers to achieve the desired finish.

Diamond-polished concrete can take on the appearance of terrazzo depending upon the colour of cement, pigments and type of aggregates used – specialist suppliers and installers offer a huge range of colours and aggregate combinations. The depth of grind will determine the degree of aggregate exposure – that is, larger aggregate sections will be revealed with a deeper grind.

More commonplace mixes of in-situ concrete can also be finished in this way. This is often a technique used to level and finish existing floors, although the final result is unlikely to be as consistent as a floor designed and placed to be polished in the first place.

■ **Pan-floated or trowelled** Unlike the mechanically abraded system, this technique takes place before newly placed concrete is fully cured, and timing is critical to achieve a successful finish. The surface is floated, using a pan floater, and then trowelled progressively to produce a polished sheen. This is most commonly achieved using power tools but it is also feasible to trowel small spaces by hand. Further degrees of polish can then be obtained by using different surface sealants if required.

The resulting floor has a more solid colour, sometimes described as mottled, or a natural patina but with minimal visible aggregate. The colour of the floor is determined primarily by the fine content of the concrete mix – that is, the cement, sand fines and any pigments in the mix.

Alternatively, this technique can be used to install a pigmented dry-shake finish, creating the desired colour on the top surface of the concrete.

Texture and pattern

Exposing the aggregate in concrete can also create grain, texture and pattern in floor surfaces, which is particularly useful for areas requiring greater slip resistance. The uppermost layer of concrete, or surface mortar, can be removed in a number of ways, each with subtly different results.

A key consideration is the practicality of application and the degree of control required for the specific project. Appropriate specification of the concrete mix is essential for a high-quality exposed aggregate finish, since "normal" concrete is unlikely to contain sufficient aggregate at the surface once compacted. A range of proprietary mixes are available with different combinations of coloured aggregates and binder.

Common techniques include the following:

■ **Exposure by washing or brushing** Washing or brushing away the surface mortar of the concrete is in principle the simplest method of exposing aggregate in newly poured concrete. However, skilled execution and timing are critical to ensuring that the concrete is sufficiently stiff to hold the coarse aggregate in place while the surface is sprayed or brushed, but not so hard that it is difficult to remove the surface layer.

■ **Use of surface retardants** Surface retardants offer a more controlled method of exposing the aggregate. Liquid surface retardant is sprayed onto the surface of the wet concrete, preventing the uppermost layer, or mortar, from setting and allowing it to be washed or brushed away. The depth of mortar removed, and therefore amount of aggregate revealed, is determined by the choice of retardant.

Texture patterns can be created in the floor surface by using stencils to mask areas of the concrete before the retardant is applied. The protected areas remain smooth alongside the more grainy texture where the aggregate is exposed. The effect is intensified when the pigment and/or cement colour contrasts with the sands and aggregates. As with all techniques, timing and skill is important for effective execution.

■ **Shot, grit or sand blasting** This is a simple technique for mechanically removing the top layer of hard concrete to create a stippled surface, often

EXPOSING AGGREGATE CAN ALSO CREATE GRAIN, TEXTURE AND PATTERN – PARTICULARLY USEFUL FOR AREAS REQUIRING GREATER SLIP RESISTANCE

2 Diamond polished
Residential project (2014)

Steysons created this floor using natural concrete into which additional 20mm Scottish pebbles and a blend of 40mm coloured stones were added. It was then diamond polished to expose the aggregate.

3 Patterned
Lazenby office, London

The smooth dry-shake surface has been removed using a stencil to expose the textured aggregate below. In this instance, an acid wash was applied in layers before being washed off. A similar but deeper reveal can be achieved with shot blasting.

4 Sandblasted
Sample, Cornish Concrete Products

This is greystone natural concrete which has been sandblasted. If this mix was to be polished, it would take on a dark blue colour, but sandblasting tends to dull colours and reveal trapped air holes, which will be more prominent in darker mixes.

5 Brushed
Beach walkway, Whitstable

This concrete has been brushed while wet to add texture and slip resistance. A wide, stiff-bristled broom was dragged in one direction, with care taken to apply even downward pressure. Different effects can be achieved depending on the implement used.

used to improve adhesion for supplementary finishing layers. If intended to be a final finish, careful control is required to ensure consistency. A test patch is recommended so that the degree of shot blast can be agreed. As with depth of polish, the heavier the abrasion, the larger the pieces of aggregate that will appear. There are many fine examples of patterns created using stencils with this technique.

Imprinting wet concrete is a common technique for creating texture in external areas and can be a cost-effective way of improving slip resistance. A tamping beam is progressively lowered and raised along the face of the floor to imprint freshly placed and levelled concrete. This creates a surface with ridges, the frequency and width of which depend on the size of the beam. It can be specified as light, medium or heavy tamp, but these descriptions are not clearly defined and a benchmark or test panel is advised.

Brushed or dragged concrete is a similarly cost-effective finish for adding slip resistance and is best suited to utilitarian areas where aesthetics are less important, due to the difficulty of obtaining a uniform finish. It does offer opportunities for pattern and variety depending on the direction of drag and the material used. Stiff bristled brooms give a coarser texture than those with soft bristles, for example. While actual sweeping brooms can be used, a purpose-made brush with steel bristles or tines is more appropriate for commercial applications. Other dragged finishes include “turf drag”, “hessian drag” or “tine finish”, which use different materials to create textured effects.

An alternative method for adding texture to wet concrete is stamped or pattern imprinting using mats or rollers. Usually used externally, standard systems are most likely to be in the form of patterns with stone, cobbles or herringbone for paths and patios, but the technique offers opportunities for unique textures and patterns through the creation of bespoke mats.

The use of tamped, brushed and imprinted concrete on internal spaces may be restricted by the ability to gain access to create the finish in the wet concrete. This therefore requires consideration of sequencing early on.

Colour

The colour of a concrete floor will be determined by the through colour of the mix, which will itself vary in appearance depending on the surface texture employed and how much aggregate is exposed. It is also possible to add permanent colour, but only to the upper surface of the concrete.

■ **Dry-shake toppings** These toppings are powder or granules broadcast onto the surface of the concrete before trowelling and floating. Once pan-floated into the floor, this results in a hard, durable surface. There is a wide range of coloured pigments available, including grey, and toppings can be selected to suit the specific performance requirements of the floor. Many include a surface hardener to improve the durability of the finish, but they can also provide abrasion resistance and are often used to improve the surface finish of large pours when steel fibres are included.

■ **Colour stains** These can be applied to either power-floated or diamond-ground polished floors and offer the advantage of colour variety and a controlled application to create pattern, allowing the natural tonal variation of the concrete surface to show through.

Precast

Robust floors can also be created using prefabricated concrete elements. Inherently strong concrete sets and paviors are typically used outside but can also be specified internally and are particularly suitable in heavily trafficked areas such as foyers. A huge range of proprietary products are available in all manner of sizes, shapes, textures and colours, including very large format concrete "tiles" specifically designed for internal use.

Key references

"Indoor Decorative Concrete Floors", Concrete Advice Sheet 45, Concrete Society

"Visual Concrete: Finishes", CS170, Concrete Society

"Assessing the Slip Resistance of Flooring", Health and Safety Executive

BS 8204-1:2003+A1:2009 "Screeds, bases and in situ floorings. Concrete bases and cementitious levelling screeds to receive floorings. Code of practice", British Standards Institution (BSI)

BS 8204-2:2003+A2:2011 "Screeds, bases and in situ floorings. Concrete wearing surfaces. Code of practice", BSI

For further guidance on screeds, go to the Technical Information section at www.concretecentre.com, and click on "Building solutions"

BELOW Lazenby installed this floor in an apartment at the Talisman building in London. A dry-shake topping in Mayfair grey was applied and the concrete polished to achieve a satin finish

Photo: Jeremy Philips

THE LOWDOWN: BREEAM 2014

Concrete stays in credit in latest BREEAM update

Elaine Toogood explains the key revisions to the BRE's eco standard for new construction, including new credits for material efficiency and adaptability to climate change

At the end of May, BREEAM UK New Construction 2014 replaced the 2011 version of the standard. Feedback from BREEAM assessors indicates that the revisions are not as fundamental as those experienced in 2011, though there is a marked shift towards availability of credits for early consideration of BREEAM issues and adoption of processes – for example, credits are available in the Management section for the early adoption of a sustainability champion. It will be more difficult to achieve high scores if those early wins are not bagged from the outset.

BREEAM and concrete

So what impact will this new version of BREEAM have on the use of concrete? Concrete continues to offer ample opportunity for achieving the very highest BREEAM scores. The use of a concrete structure – exposed internally to use its thermal mass as part of a low-energy servicing strategy – continues to attract substantial numbers of credits in many areas of BREEAM, not only in the Energy section. This includes newly introduced credits for "material efficiency" and "adaptability to climate change", in the Waste (Wst) and Materials (Mat) sections respectively, rewarding the natural resilience and all-round performance of exposed concrete.

The specification of concrete continues to be assessed and rewarded in a variety of other credits within the Materials category and through the "recycled aggregate" credit in the Waste category, but some of the criteria have been revised. The use of concrete also influences scores in other categories where either sustainability performance in use or during construction is rewarded.

Recycled and secondary aggregate

The minimum percentage levels of recycled or secondary aggregate required to earn the "recycled aggregates" credit in Wst 02 have been lowered to 15% in the structural frame and 20% in the foundations, compared with 25% under BREEAM 2011. This is technically more achievable with current British standards for concrete specification, but will remain aspirational for many projects as there is an additional requirement to exceed a 25% replacement overall.

Also in Wst 02, the delivery distance for the supply chain has been changed. The credit no longer requires that recycled aggregate be sourced from within 30km of the site. To achieve the additional exemplary credit in this section, however, neither the recycled nor secondary aggregate should be transported more than 30km by road.

TO ACHIEVE THE ADDITIONAL EXEMPLARY CREDIT, NEITHER THE RECYCLED NOR SECONDARY AGGREGATE SHOULD BE TRANSPORTED MORE THAN 30KM BY ROAD

Responsible sourcing

In Mat 03, up to four credits are available for specifying and procuring responsibly sourced materials. Under BREEAM 2011, materials rated "very good" and "excellent" under the BRE's own responsible sourcing scheme, BES6001, attracted scores of 3 and 3.5 respectively, with 3.5 representing the highest score of any recognised scheme. Curiously, under BREEAM 2014, most of the recognised schemes have been given exactly the same score, irrespective of their rating ("pass" through to "excellent").

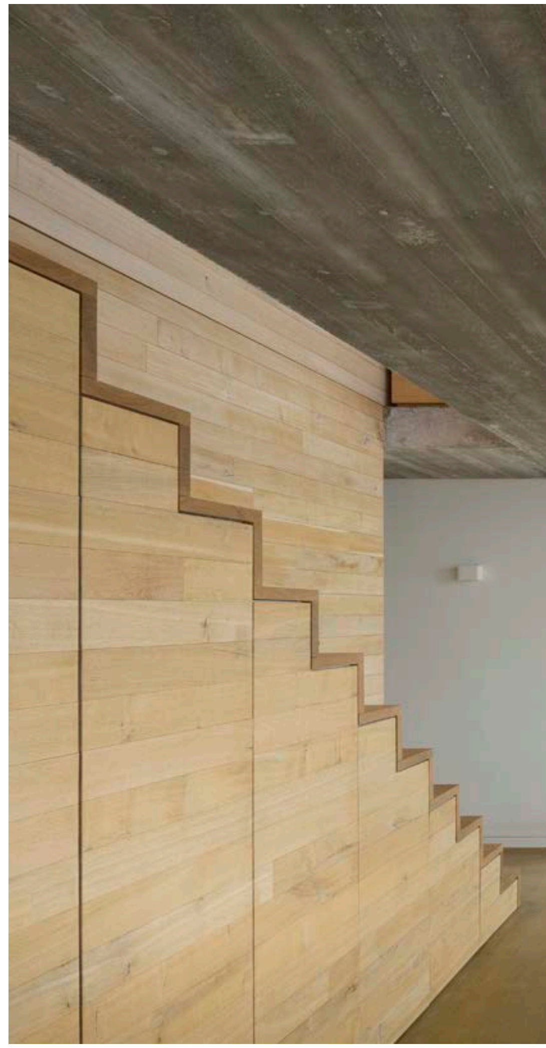
This is a disappointing revision that potentially undermines the effectiveness and credibility of both BREEAM and BES6001, so I am reassured that BRE has advised that it is only an interim position. There is undoubtedly a sustainability benefit in sourcing materials accredited to BES6001, and the concrete industry currently reports that 89% of concrete produced in the UK is responsibly sourced, with 99% of this rated "very good" or "excellent" under BES6001. More details can be found in the Sixth Concrete Industry Sustainability Performance Report, which can be downloaded from www.sustainableconcrete.org.uk.

A new Concrete Centre publication, Concrete and BREEAM, will soon be available to download from www.concretecentre.com/publications. It will provide guidance on how concrete can be used to achieve credits across many categories under BREEAM UK New Construction 2014.

Elaine Toogood is an architect at The Concrete Centre

HOW TO SPECIFY SCREEDS

There are a number of options when it comes to selecting screeds, and choosing the wrong one could cause a floor to fail. Jenny Burridge outlines the essential considerations



ABOVE
This house by Stocker Dewes in the Black Forest, Germany has a high-strength anhydrite screed, which has been sanded and finished with parquet wax

RIGHT
At the Edison Residence in Montreal by KANVA, the in-situ concrete slab was ground and sealed with two coats of epoxy and one coat of polyurethane

The Concrete Centre is frequently asked for advice about screeds – indeed, it is the most searched-for term on our website. This is understandable as there are a bewildering number of screeds and toppings, with a wide range of applications. Fundamentally however, there are two types: bonded and unbonded. These can be formed from different materials, but in many respects the basic rules apply.

A bonded screed is bonded to the slab or substrate below. If it fails, this is usually because the bond between the screed and the substrate has failed. This is more likely to happen if the screed is too thick. An unbonded screed is separated from the slab or substrate below, and the main way that it will fail is to lift or curl. This is more likely to happen if the screed is too thin. Bonded screeds should therefore be thin, normally less than 50mm. Unbonded screeds should usually be 70mm or more, and 100mm or more if curling must be avoided.

Specifying the correct depth and type of screed starts early in the design process. The screed design will be dictated by a range of factors, including architecturally specified floor finishes, construction tolerances and provision of falls. There may also be structural requirements such as preventing disproportionate collapse and the development of composite action with the concrete slab below.

Sometimes the use of a screed can be avoided. This might be achieved by specifying a concrete floor with tighter construction tolerances and/or structural finishes to receive the flooring materials directly. If a screed is needed, it can be either of a traditional cement sand variety or – developed more recently – a proprietary pumpable self-smoothing screed. These types are explained below, together with a list of related definitions and guidance on screed depths.

THE DESIGN WILL BE DICTATED BY A RANGE OF FACTORS, INCLUDING ARCHITECTURALLY SPECIFIED FLOOR FINISHES, CONSTRUCTION TOLERANCES AND PROVISION OF FALLS

WHAT TYPE OF SCREED?

Cement sand screeds

These are traditional screeds and are suitable for all applications, provided they are specified correctly. Guidance on the drying time for cement sand screeds is given in BS 8203 "Code of practice for installation of resilient floor coverings", which has a rule of thumb of one day for each millimetre of screed thickness up to 50mm. Further guidance on drying times can be found in the code.

Calcium sulphate pumpable self-smoothing screeds

These can be bonded or unbonded, and can be laid in much larger areas than cement sand screeds – around 1,000m^2 a day. However, they should not be used with reinforcement because the calcium sulphate is corrosive to steel in damp conditions, and they are generally unsuitable for use in damp conditions or where wetting can occur. These screeds are all proprietary products and therefore vary from one supplier to another. The guidance given here is therefore generic and the manufacturer should be consulted before specifying. The manufacturer should also be consulted before specifying a particular product as a wearing (structural) screed.

THICKNESS OF LEVELLING SCREED

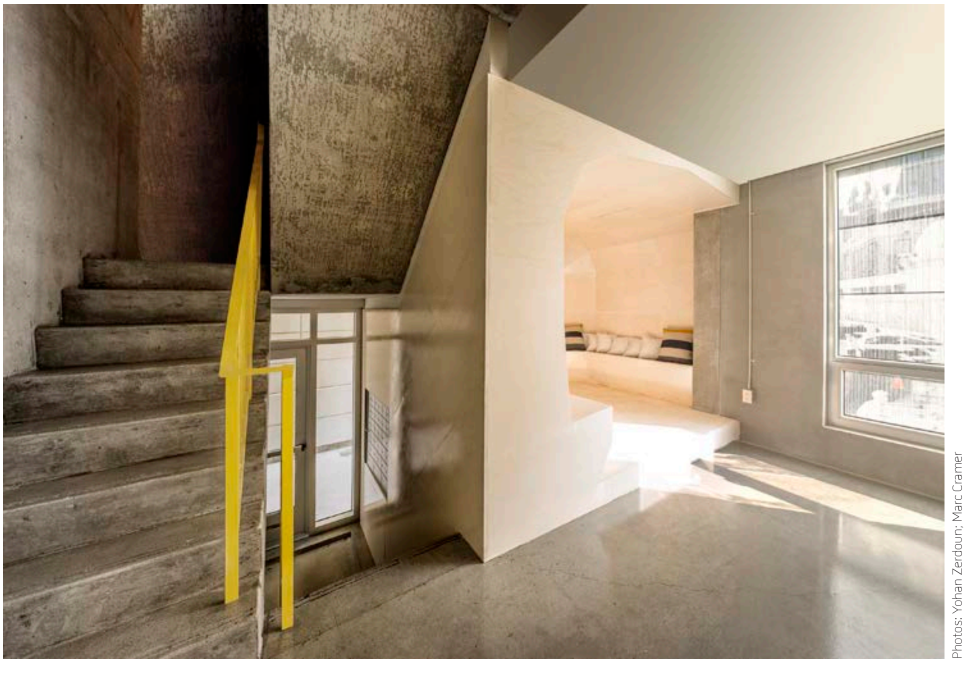
A levelling screed may be chosen for various reasons. This might be to provide a smoother, flatter surface than can be achieved economically with just the structural slab; to provide falls or a finishing zone in which different types of flooring may be adopted; or to accommodate underfloor heating.

Bonded cement sand screed

Recommendations for levelling screeds are given in BS 8204-1, which states that the minimum thickness of a bonded levelling screed should be 25mm. To accommodate possible deviations in the finished levels of the structural concrete, the specified thickness should normally be 40mm (with a tolerance of ±15mm). However, CIRIA guidance document R184 recommends a nominal depth of 35mm with a tolerance of ±10mm. This minimises the risk of debonding, but it should be noted that the tolerances specified for the top surface of the base concrete should be compatible.

Where the bonded screed needs to be greater than 40mm, the following options can reduce the risk of debonding:

- Using modified screed or additives to reduce the shrinkage potential
- Using fine concrete screed, which also reduces the shrinkage potential. This has been used successfully up to 75mm.



Photos: Yohan Zerdoun; Marc Cramer

Bonded calcium sulphate pumpable self-smoothing screed

Recommendations for pumpable self-smoothing screeds are given in BS 8204-7, which states that the minimum thickness of a bonded screed should be 25mm. Manufacturers quote maximum thicknesses of up to 80mm and therefore there are fewer restrictions on the overall thickness. A nominal depth of 40mm with a tolerance of ±15mm can be comfortably specified.

Unbonded cement sand screed

Here, the thickness should not be less than 50mm, and to allow for deviations in the finished levels the specified design thickness should be a minimum of 70mm. However, BS 8204-1 emphasises that there is a high risk of screed curling with unbonded and floating screeds. In order to minimise this, the screed should be either reinforced across the joints or made more than 100mm thick.

Unbonded calcium sulphate pumpable self-smoothing screed

The screed thickness should not be less than 30mm, so to allow for deviations in the finished levels the specified design thickness should be a minimum of 45mm with a tolerance of ±15mm.

DEFINING SCREEDS

There are particular definitions that are used when specifying screeds. In this article, we use the definitions contained in BS 8204 and BS EN 13318:2000.

Levelling screed Suitably finished to obtain a defined level and to receive the final flooring. It does not contribute to the structural performance of the floor.

Wearing screed Serves as flooring. This term was formerly known as a high-strength concrete topping. It is also used to refer to structural toppings as well as wearing surfaces.

Bonded screed Laid onto a mechanically prepared substrate with the intention of maximising potential bond.

Unbonded screed Intentionally separated from the substrate by the use of a membrane.

Floating screed Laid on acoustic or thermal insulation. This is a type of unbonded screed.

Cement sand screed Consisting of a screed material containing sand up to a maximum aggregate size of 4mm.

Fine concrete screed Consisting of a concrete in which the maximum aggregate size is 10mm.

Pumpable self-smoothing screed Mixed to a fluid consistency. Can be transported by pump to the area where it is to be laid and will flow sufficiently (with or without some agitation of the wet material) to give the required accuracy of level and surface regularity. Often known as a self-levelling screed.

Curling An upward deformation of the edges of the screed caused by differential shrinkage.

THICKNESS OF WEARING SCREED (STRUCTURAL TOPPING)

Bonded screed

Recommendations for wearing screeds are given in BS 8204-2, which states that the minimum thickness of a bonded wearing screed should be 20mm (in contrast to the 25mm given for a levelling screed in part 1 of the standard).

To accommodate possible deviations in the finished levels of the structural concrete, the recommended thickness is 40mm. However, CIRIA R184 recommends a tolerance of ±10mm with a nominal depth of 30mm. The specification for the base concrete surface should be compatible. In some circumstances, the design thickness will have to be increased above 40mm, but it should be noted that there is a heightened risk of debonding.

For hollowcore units, which often have an upwards camber, especially for longer spans, a nominal thickness of 75mm, rather than 40mm, should be specified. The risk of debonding is mitigated because it is usual to use a concrete of class C25/30 or above and mesh reinforcement. Using concrete rather than sand/cement screed reduces the shrinkage potential, and the reinforcement in particular controls the drying shrinkage. This should ensure that there is sufficient depth at mid-span (that is, the point of maximum camber) to allow for lapping of the reinforcement while still maintaining cover to both surfaces. Even so, loose bars or mesh reinforcement with "flying ends" may be required to allow lapping of the reinforcement near the point of maximum camber.

Unbonded screed

The wearing screed should be at least 100mm thick, but designers should consider increasing the depth to 150mm to minimise the risk of curling.

OTHER DESIGN CRITERIA FOR SCREEDS

Sector guidance is focused on selecting the correct thickness for the screed, but other criteria may have an impact on the design including:

- Slip, abrasion and impact resistance
- Type of traffic the floor will take
- Levels and flatness
- Appearance and maintenance
- Type of flooring to be used or applied
- Drying out moisture in screed
- Location of movement joints.

BS 8204 parts 1-3 and CIRIA R184 provide ample guidance and should be referred to.

BASE PREPARATION

For all types of bonded screeds (both sand/cement and calcium sulphate), preparation of the base is of paramount importance. The structural concrete base should be at least C28/35 concrete with a minimum cement content of 300kg/m^3. The surface of precast units should be left rough during production and thoroughly washed and cleaned (for example, by wire brushing) to remove all adhering dirt. Where required, the joints between the units should be grouted at least one day before the screed is placed. Where the levelling screed is designed to act compositely with the units and additional preparation of the units is required, contained shot-blasting equipment should be used to avoid damage. Where a screed is required over in-situ concrete, then all contamination and laitance on the base concrete should be entirely removed by suitable mechanised equipment to cleanly expose the coarse aggregate. All loose debris and dirt should be removed, preferably by vacuuming.

Jenny Burridge is head of structural engineering at The Concrete Centre

Photo: Edward Sumner

ABOVE At the St John's Orchard project in south London, John Smart Architects specified a 100mm screed for the kitchen floors in a converted convent. A white GGBS mix was applied by trowel and then diamond-ground to create a polished surface

KEY REFERENCES

BS 8204-1:2003+A1:2009 "Screeds, bases and in-situ floorings. Concrete bases and cementitious levelling screeds to receive floorings. Code of practice", British Standards Institution (BSI)

BS 8204-2:2003+A2:2011 "Screeds, bases and in-situ floorings. Concrete wearing surfaces. Code of practice", BSI

BS 8204-7:2003 "Screeds, bases and in-situ floorings. Pumpable self-smoothing screeds. Code of practice", BSI

BS 8203:2001+A1:2009 "Code of practice for installation of resilient floor coverings", BSI

"Screeds, Flooring and Finishes: R184: Selection, Construction and Maintenance", CIRIA, 1998

"Screeds", Data Sheet 22, Mortar Industry Association

LASTING IMPRESSION
JOHN TUOMEY

FROM THE PROFOUND TO THE 'ELEVATED ORDINARY'

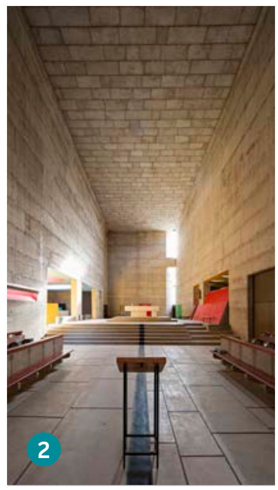
My interest in concrete is to do with it being cast in situ. I absolutely love the feeling that the building is made in the place or even right out of the place.

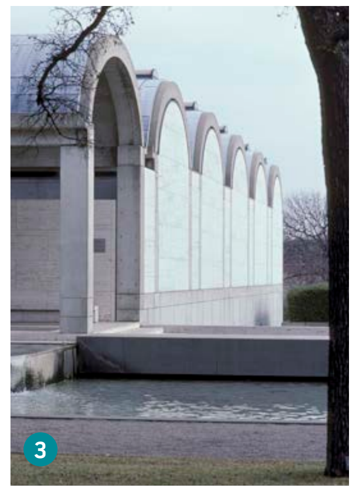
When I try to think about that, two things come to mind. One is an everyday anonymous concrete that you might find in any Irish handball alley or municipal swimming pool or Atlantic pier – the whole thing of concrete as a landscape consolidated halfway between topography and geology. My exemplar for that would most certainly be Àlvaro Siza's swimming pool 1 at Leça (1966) just outside Porto in Portugal. It takes concrete architecture to a high poetic form but it comes out of trying to make something like seawalls and benches – landscape works, in a way. Siza was very young when he made it but it's just one of those in-situ topographical concrete buildings that never ceases to inspire me. It's a beautiful piece of work.

At one level I like that feeling of what I might call the "elevated ordinary". At the other, I like the feeling of profundity or even weightiness or timelessness that you get in concrete structures, such as you find in the chapel by Le Corbusier at La Tourette 2 (near Lyon in France, 1960). It feels like a Romanesque interior, it's so powerful in its physical presence. It's also cast in situ but it shows the highly formal aspect of what you can make out of concrete.

So I have a divided inspiration between the highest expression of form or refinement you might find, such as at La Tourette or in Louis Kahn's Kimbell Art Museum 3 (in Fort Worth, Texas, 1972), and at the other end, I really like the elevated ordinary, exemplified in Siza's swimming pool.

John Tuomey is one of the founders of O'Donnell + Tuomey





Photos: 1.Fernando Guerra/VIEWpictures.co.uk; 2. Javier Callejas, F.L.C./Adagp; 3. Hans Muenchhalfen/Artur/VIEWpictures.co.uk

FROM THE ARCHIVE: SPRING 1987

A MEETING OF TECHNOLOGY AND RELIGION

The Shree Swaminarayan Temple (page 10) is not the first house of worship to combine modern concrete techniques and traditional Indian elements to stunning effect. In 1987, CQ was similarly struck by a vast Baha'I temple in New Delhi. "There is something immensely appealing about the Baha'I faith," wrote then-editor George Perkins, "an independent world religion stressing the oneness of mankind." Perkins clearly felt a little of this oneness had rubbed off on the project team: "The building is a shining example of the combination of computer technology, human craftsmanship and more than a little inspiration … It represents a striking marriage of architecture and engineering."

The building derives its form from the shape and symmetry of the lotus flower, with the overlapping petals created from 200mm-thick "shells" of white concrete, cast in situ and clad externally in white marble. The lotus form, which involved spherical and toroidal surfaces and both inward and outward curves, shows the extent to which computer technology was reshaping design by the mid-1980s. As Perkins wrote: "Ten years ago it would have been impossible to realise the design so faithfully and elegantly."

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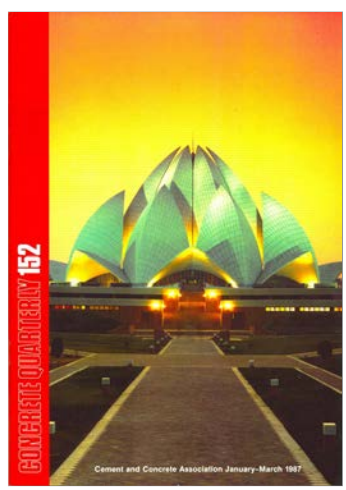

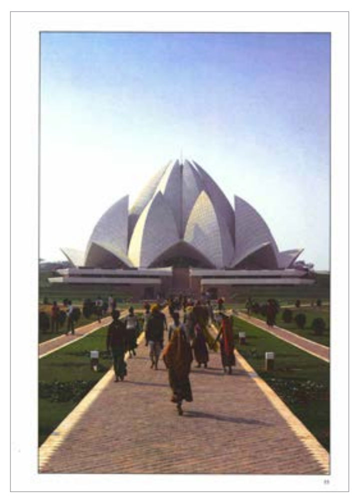

FINAL FRAME: TEXTILMACHER BUILDING, MUNICH
Textilmacher is a company specialising in printed fabrics, so it is appropriate that architect Tillicharchitektur has given its new office building in north Munich a crisply folded facade – albeit one made of precast concrete. Only four different formworks were needed for the panels, which gain their dark, satin appearance from anthracite pigments in the concrete. The pigmented facade is said to change character with the weather, season and time of day.

Photo: Michael Compensis