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CONCRETE QUARTERLY

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ZAHA IN MONTPELLIER
Has there ever been a council building quite as spectacular as Hadid's Pierresvives?

IN THE SHADOW OF GIANTS
The Northern Irish visitor centre that follows in some famously large footsteps

WHAT LIES BENEATH
First-century Roman remains meet 21st-century structural engineering in Chichester

WELCOME

PILLAR OF SOCIETY

Public buildings – the theme of this issue – are inherently long-term projects. Designed to be landmarks at the heart of their communities, they are also retained and used by their original clients, who therefore have a strong interest in ensuring that running costs are kept as low as they can be.

Public clients are increasingly impressed by concrete's performance benefits, not least its ability to produce buildings that are energy-efficient over their whole lifespan. In a recent lecture, Dr Julian Allwood, engineering reader at Cambridge University, stressed the importance of using materials for longer, rather than tinkering with processes and seeking alternatives that can never meet future demand. The long life of concrete, coupled with its thermal and energy efficiency, creates a powerful argument for its wider specification.

There is another argument too, as demonstrated by the astonishing geometric facade of Zaha Hadid Architects' Pierresvives council building in Montpellier and the cool, industrial-style interiors of Haworth Tompkins' Royal College of Art building in Battersea. Concrete looks great – and that matters to all clients, whether public or private.

Guy Thompson
Head of architecture and housing
MPA The Concrete Centre

NEWS ROUND-UP

Pilot projects show thermal mass is key to future design

Thermal mass will play a vital role in passive strategies as hotter summers and more frequent heatwaves add to the challenge of maintaining comfortable internal temperatures.

This was one of the conclusions of a series of 26 projects funded by the government's Technology Strategy Board (TSB) to assess how building designers should respond to climate change, with dramatic changes predicted within as little as 30 years.

The projects covered a wide range of building types, from offices to extra-care facilities. Teams identified the most pressing issue to be keeping occupants cool without relying on energy-guzzling systems. All conducted extensive thermal modelling, which highlighted the impact that thermal mass can have.

"The projects show that thermal mass can be highly beneficial, particularly in avoiding mechanical cooling," said architect and sustainability consultant Bill Gething, author of a book on the lessons learned by the TSB teams, to be published in January. "If you can avoid installing active systems in the first place, not only do you save the initial cost of the installation, but running costs are minimal or non-existent."

But the projects also highlighted the need for better understanding of the relationship between ventilation and thermal mass. "Thermal mass is only effective if incidental gains in the day are minimised and there is enough ventilation at night to cool the mass down, ready for the process to start again. Designers aren't necessarily familiar with the levels of ventilation they need to provide to do this properly," Gething added.

Designers can access a free passive design software tool by Arup, AHMM and MPA The Concrete Centre at www.arup.com/Publications/Passive_Design_Assistant.aspx

IN THIS ISSUE

On the cover: Pierresvives in Montpellier, France, designed by Zaha Hadid Architects

CONCRETE QUARTERLY

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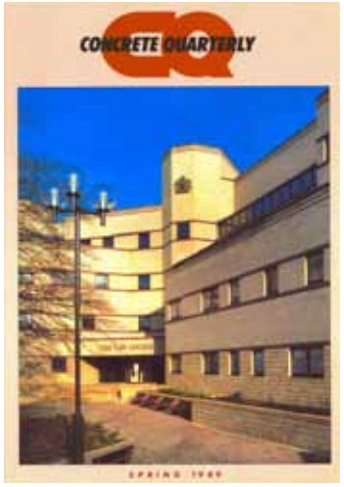
www.mineralproducts.org

FROM THE ARCHIVE



SPRING 1989: WHAT ELEMENTS MAKE UP A 'CIVIC' BUILDING?
That was the question that CQ asked in its review of Croydon Courthouse, before suggesting that gravitas and dignity were perhaps the overriding characteristics. The architects in Croydon certainly had their work cut out on a site sandwiched between a railway line and an underwhelming Holiday Inn. The answer lay in a type of concrete blockwork called "Flagreca", which had the bearing of stone cladding without the prohibitive pricetag, and seemed to have the desired effect: "Croydon Courthouse is strangely reminiscent of a castle," noted CQ's correspondent approvingly. **www.concretecentre.com/cq**

Inside the Sainsbury Laboratory

A new video reveals the secrets of the Sainsbury Laboratory in Cambridge, the winner of this year's RIBA Stirling prize, including exclusive interviews with the project team on site.

The film features architect Alan Stanton of Stanton Williams – who reveals that the choice of concrete was made right at the start of the process – engineer Albert Williamson-Taylor of AKT II, and Louisa Finlay of contractor Kier.

They discuss the design, specification and construction of this extraordinary building, with a focus on how they achieved its stunning concrete forms, cantilevers and spans, and very high-qualty finishes.

Watch the video at www.building.co.uk/cq

"Everybody sees concrete as a solid material. It's actually a liquid material"

Albert Williamson-Taylor, AKT II

Back to the floor for cooling strategies

A new publication from MPA The Concrete Centre focuses on how concrete floors can provide both passive and active cooling in offices, offering building designers a comprehensive guide to specifying a range of systems.

This is an increasingly common approach to minimising the cooling load in speculative developments, and is driven by tougher building regulations, the rising cost of energy and a growing appreciation of the visual appeal of exposed concrete surfaces.

The guide, Concrete Floor Solutions for Passive and Active Cooling, explains the role of fabric energy storage (FES) in stabilising internal temperatures and details all systems currently available, with case studies of recent projects where they have been installed.

Approaches range from the entirely passive, where only natural ventilation is used to meet the needs of occupiers, to high-load environments that require active slabs with water and/or mechanical ventilation.

To download a copy, go to www.concretecentre.com/publications

CONCRETE ELEGANCE EVENT

Photo: Kilian O'Sullivan

CONCRETE AT ITS COSIEST

"Intimate spaces" was the subject of the most recent Concrete Elegance event at the Building Centre in London, with videos of the presentations now available to view online.

At Lawn House in Snaresbrook, east London (pictured above), architect Hayhurst and Co refurbished and extended a family home to fulfil the owners' desire for modern, open-place spaces with strong links to the garden, that nevertheless provided areas for the family to engage in separate activities within the same room. Hayhurst's solution was a staggered plan with projected canopies and cantilevered eaves, allowing the garden to enter the house. Polished in-situ concrete in the cooking and dining areas, meanwhile, provides a crisp, robust canvas for the patterns of family life.

The event also featured the Novium museum in Chichester (see page 9).

Go to vimeo.com/album/2099560 to watch the presentations

Photo: Construction Photography

FIRST POSITION

Seven bespoke concrete T beams have been lifted into position at the new home of the Rambert Dance Company, currently taking shape on London's South Bank. The pre-tensioned, precast double T beams will create the very large ceiling span for the main, double-height dance studio; each is 16m long and weighs 20 tonnes. Designed by Allies & Morrison and under construction by Vinci, the building is due for completion in 2013. Watch a live feed of the site at **www.rambertmoves.org.uk/live-feed**

THIS IS CONCRETE

Cavity defiant ... Rumours of the demise of the cavity wall have been greatly exaggerated, argued This Is Concrete blogger Tom de Saulles, fresh from making the case for masonry at a Zero Carbon Hub event.

"That got me thinking about the place the cavity wall occupies in the collective minds of the housing sector," he wrote. "Maybe its longstanding, traditional qualities make it seem outmoded in a sector that has seen a lot of new ideas and change in recent years. The majority of UK homes continue to have masonry cavity walls, and 88% of these were built before 1990 [so] the thermal performance of most cavity walls in existence today falls some way short of current Part L standards for new build, a fact that may well influence perceptions, whether consciously or not." But this is to ignore a great deal of technical innovation over recent years, he says. "Cavity wall construction has evolved to meet changing requirements, and is easily capable of meeting the 2016 zero-carbon challenge."

This is Concrete is a campaign to champion concrete projects, sustainability and innovation. Join the debate on twitter at @thisisconcrete and online at www.thisisconcrete.co.uk

"Evalulated in the round, traditional masonry still offers a great deal, which is probably why it continues to dominate the housing market"

Tom de Saulles, MPA The Concrete Centre

this is concrete

JOIE DE VIVES

Zaha Hadid's Pierresvives council building in the French city of Montpellier relies on concrete to solve a range of structural and environmental challenges, as well as providing a spectacular geometric facade. By Andy Pearson

Photos: Hélène Binet

"Concrete made a lot of sense for a number of different reasons." So says Sophie Le Bourva, associate director at consultant Arup and structural engineer for the spectacular Pierresvives building in Montpellier, France. Designed by Zaha Hadid Architects (ZHA), this giant, £100m rhomboid-shaped edifice relies on concrete for its structural, aesthetic and environmental properties. Even the building's name Pierresvives, which translates from the French as living stones, was inspired by the concrete of the architectural concept.

ZHA, working with engineer Arup, won the competition to design the scheme back in 2002. Montpellier is the capital of the department of Hérault and the project was instigated to provide a new home for three departmental functions: its archive, a multimedia library and the sports administration offices. Most of the competition entries proposed a campus-style solution to the brief, but ZHA's was very different. "We suggested that the three functions could be contained within one, very large, building envelope," says Stephane Hof, project architect at ZHA. "That is why we won the competition."

Concrete is fundamental to the architecture of this huge rectilinear block. From the outside, stripes of warm-grey concrete line the facade. Between these pale striations, streaks of azure curtain walling add colour and help to accentuate the concrete's geometric forms. "We knew that in France the material of choice is concrete – contractors prefer it and it is the cheapest way to build," Hof adds.

As if to make his point about the ubiquity of concrete, Hof's design even has the public enter the building beneath a mass of the material cantilevered out from its western facade. As well has sheltering the entrance, this lozenge-shaped projection houses the building's auditorium.

Once inside, the foyer opens out into a zig-zag shaped void. This opening rises up through the heart of the 24m-high, 46m-wide building to reveal the accommodation for all three of its functions. North of the foyer is the three-storey archive, its first-floor entrance facing the auditorium lobby; the library is to the south, with the sports offices beyond.

Each area required a different structural solution. The building sits on 480 bored piles, each approximately 12m deep, which support a reinforced concrete frame. Five concrete cores are lined along the central spine of the three-storey building. The cores slot between five evenly spaced rows of square columns and these run the length of the 195m-long building.

The rows of 600mm x 600mm columns are set 8.1m apart. While the spacing between rows remains constant, the distance between the columns in each row varies in response to loads

WE KNEW THAT IN FRANCE THE MATERIAL OF CHOICE IS CONCRETE – CONTRACTORS PREFER IT AND IT IS THE CHEAPEST WAY TO BUILD

Safe storage: Why the archive had to be concrete

Concrete is fundamental to the environmental strategy for the archives at Pierresvives, which contain valuable and delicate materials and need to be maintained in a stable environment.

The archive has been designed with circulation corridors around the perimeter to act as buffers to the external climate. Inside, the archive's temperature and humidity are carefully regulated. The concrete surfaces provide inertia by absorbing and releasing heat and moisture to minimise fluctuations. The mass of the concrete also helps to reduce the cooling and heating loads on the mechanical services, saving energy. "One of the big advantages of using concrete for the construction of the archives is that its thermal mass enables the environmental solution to be as passive as possible," says Sophie Le Bourva, associate director at consultant Arup.

imposed by the building. "The structure is defined by the different uses – archive, foyer, library and offices," says Le Bourva at Arup.

The closest column spacing, at 5.4m, lies in the area north of the lobby, where the archive is located. At 1.5 tonnes per m^2, the floor load here is six times that of a typical office. Archive material is stored on wheeled racks, and successful operation is only possible by limiting deflections in the floor. The columns are linked by 800mm-deep downstand beams, to form a regular orthogonal grid.

This grid supports the concrete floor slabs. These are cast in situ on precast concrete shells, or "biscuits" as Le Bourva terms them. The shells act as formwork for the floor slab above. Once positioned, the shells are propped to support them during construction. Steel reinforcement is then positioned on top of this layer before the concrete is poured to form the 150mm-thick structural floor slabs.

Main contractor Vinci proposed this precast formwork solution to ensure that the exposed concrete soffit had a consistent finish. Using the pre-cast shells also helped to reduce the amount of formwork and propping needed for the floor construction, which reduced the build programme. The exposed soffits also added thermal mass to the archive to help with environmental control (see box, above).

The southern half of the building housing the library and office areas was constructed in the same way. The only difference between the two halves is that the lighter loads at this end of the building enabled a larger structural grid of, typically, 8.1m x 8.1m to be used.

But the real structural gymnastics take place in the full-height foyer that fills the void between the archive and the library. "Once you've created the idea of a big entrance void, then you want as little structure as possible in that void," Le Bourva says. As a result, the only structural elements above the foyer are a series of 25m-long, 3m-deep steel trusses, which span the length of the foyer to support the roof. These trusses are the only structural steel on the project.

Beneath this series of colossal trusses is another impressive piece of structural engineering: the cantilevered auditorium. This projects a spectacular 10m from the glazed facade so that its bulk appears to float above the building's entrance. Le Bourva says one of the key objectives of the structural design was "to achieve an impression of lightness and levitating blocks of concrete". With this element in particular, there can be no doubt that the engineers have succeeded.

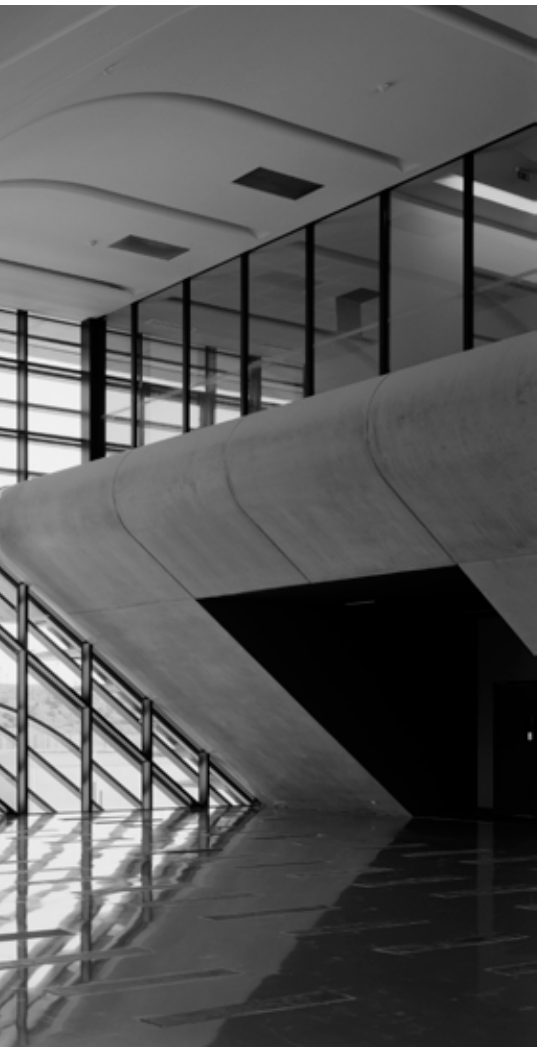
This enormous cantilever is supported on two giant 600mm-thick reinforced-concrete walls, one of which is pre-stressed to limit its deflections. Le Bourva calls these 10m-span cantilever beams "megawalls". The walls are the only large structural elements to run perpendicular to the spine of the building. Together these beams enclose the auditorium with north and south-facing vertical walls and enable this projecting element of the building to be supported from the structural grid. They also support the additional sloping side walls that cantilever out north and south of the auditorium beyond the megawalls.

Movement joints separate the lobby from both the archive and the library structures. Two additional movement joints also subdivide the longer archive section of the building. The joints are 20mm wide – the same width as the joints between the precast concrete elements forming the facade. This careful attention to detail has ensured these joints merge seamlessly.

The facade itself is constructed from giant precast

PROJECT TEAM

Client Département de l'Hérault
Architect Zaha Hadid Architects
Structural and building services engineer Arup
Main contractor Vinci
Structure and floor slab contractor Groupement Sogea Sud/ Dumez Sud/ GTM Sud
Prefabricated concrete facade Delta Prefabrication



LEFT
The full-height foyer contains few visible structural elements

BELOW LEFT
The colour and finish of the pale concrete cladding was carefully controlled throughout the manufacturing process

BELOW
The auditorium cantilevers 10m through the glazed facade to create a dramatic entrance canopy

concrete sections interspersed with areas of glazed curtain wall. The precast elements are suspended from cantilevered beams supported by columns typically set back 2,700mm or 5,400mm from the panel's face. The feat is all the more impressive given that some of the 1,153 precast cladding elements weigh up to 21.5 tonnes and measure 13m high, 2.7m wide and 0.6m deep. "When you look at the facade, you can see that every single precast concrete element is cantilevered over the curtain walling," says Le Bourva.

Originally Arup had proposed that the facade be cast in situ. The contractor, however, argued that precast concrete would ensure the best possible finish. As a result of the change, the structural engineer had to modify the design of the primary reinforced-concrete structure. "The solution had a few drawbacks because the original intention was to use the cast-in-situ facade as part of the main structure, particularly for some of the larger cantilevers," Le Bourva says.

The challenge in using such huge precast sections is in positioning them accurately. Vinci developed an innovative jig specifically for the project. The device comprised a series of angled jacks, which allowed movement in every possible direction to ensure the precast elements were properly aligned. Once in place the cladding was attached to floor slabs (see box, right).

With concrete forming the bulk of the facade, a flawless finish was essential. A number of prototype panels were produced by the panel contractor, Delta Prefabrication, to enable the designers to check the uniformity of colour and quality of finish. The prototypes also enabled the architect to ensure the panels matched the colour of the exposed structure inside the building. Uniformity of colour was maintained throughout construction by carefully controlling the origin of the cement and other materials. The manufacturer even painted the panels with a water-repellent finish so that when it rains, the facade will retain its pale, flawless appearance.

Clearly this attention to detail has paid off. The building looks spectacular. In fact it has attracted such attention that a surprising number of the burghers of Hérault have developed a sudden interest in visiting the archives. "Many more people have visited the building than we anticipated," says Hof. "It has been a very big success."

Perfecting the panels

Great care was taken to ensure that the 1,153 precast cladding elements were finished to the highest possible standard. For the moulds, both steel and wood (particle/laminate) were used, along with polystyrene for the double curvature elements. About 155 elements required specially manufactured double-sided moulds. The most complicated elements to produce were the three-dimensional corner units.

High-strength concrete, mixed with super-plasticizers, was used to accelerate the manufacture and improve the concrete finish, and the colour of the precast elements was derived using pale-coloured cement and limestone aggregates. No pigments were used. A number of samples were produced at the outset to develop and agree the concrete mix and colour.

To achieve a flawless finish, moulds were carefully prepared. Preparation included the application of the paint inside the mould to mask the surface texture and ensure a smooth, consistent finish. Careful preparation also ensured the panels did not need to be mechanically polished.

In most locations, the panels are fixed using reinforcement projecting from the precast elements; this is lapped and grouted on site. However, on the inclined facades or where the precast elements are supported on a steel structure, cast-in fixings were used.

The joint between panels is 20mm to cater for thermal movement. Each joint incorporates two waterproofing barriers: one within the depth of the precast unit, the other at the outer surface. The colour of the mastic was selected to match the colour of the concrete.

All elements were treated with a hydrophobic solution to prevent water staining. In addition, anti-graffiti paint was applied on site to all exposed concrete at ground floor level.

Photo: Iwan Baan

Above: A hydrophobic finish was added to the cladding to prevent staining from rainfall

A CASTLE FOR THE COUNTY

Wexford's new civic headquarters projects an image of strong but open government from its vantage point high above the Slaney river

There is no doubt about the purpose of Wexford County Council's new glass-shrouded headquarters. Situated on the edge of Wexford town, this is a building with a strong civic presence that aims to promote more open engagement between council departments and their users.

The 11,500m² building houses six departments, which were previously scattered throughout the town. Although each service is housed in a separate block, Robin Lee Architecture, in association with Arthur Gibey and Partners, has given them a unified identity. The blocks are divided by courtyards, filled with planting and pools of still water, which helps to draw light into the deep-plan building. And they are all accessed from a contained "street", composed of cantilevered concrete boxes supported by reinforced-concrete walls. Exposed concrete soffits feature throughout the building, providing thermal mass as part of a fabric energy storage strategy. All the working spaces are naturally ventilated, contributing to a BREEAM rating of Excellent.

The building's most prominent feature is its double-skin glass facade, formed of structurally bonded low-iron glass on anodised aluminium mullions. This wraps around the building to provide protection on an exposed site, regulating internal temperatures by allowing cooling air to circulate during summer and providing an insulating layer in winter. For those looking in, it offers a clear view of local government activity, and for those looking out, it provides clear, unobstructed views of the Slaney river to the east and the mountains on the Carlow and Wicklow borders to the north and west.

Internal walls and floors are clad entirely with slabs of Kilkenny blue limestone, a material synonymous with civic buildings in Ireland. This creates a serene atmosphere and a sense that the interior volumes have been hewn from the rock itself.

This building exploits the nature of glass, stone and concrete, celebrating the transparency of one, while emphasising the solidity of the other two. But instead of putting stone and concrete on the exterior and glass inside, the architects here have done just the opposite. The result is a building with great clarity of design and purpose.

Photos: Andrew Lee

CLOCKWISE FROM TOP
Exposed concrete soffits have contributed to a BREEAM Excellent rating; a double-skin glass facade screens the concrete walls; the six blocks are divided by courtyards with pools of still water

PROJECT TEAM
Client Wexford County Council
Architects Robin Lee Architecture, Arthur Gibney & Partners
Structural engineer Buro Happold
Main contractor Pierse

FAR LEFT
The reinforced-concrete facade panels are finished to blend in with major stone structures in the city

LEFT
A long, narrow window slit above the switchback stair lets light into the ground floor

BELOW
Inside, the pale concrete is made from white granite aggregate and GGBS

PROJECT TEAM
Client Chichester council
Architect Keith Williams Architects
Structural engineer Techniker
Main contractor Vinci Construction
Concrete structure Duffy Construction
Precast cladding Techcrete

Photos: David Grandorge

RUIN WITH A VIEW

An impressive feat of structural engineering has enabled a 2,000-tonne concrete viewing gallery to be suspended over Chichester's Roman baths

Roman Chichester – or Noviomagus Reginorum – has a new lease of life. The Novium, a museum charting the history of Chichester, opened in July 2012 on the site of a former car park, with a structure built above and around the remains of a series of Roman baths from the 1st century AD.

The £6.9m museum spans the hypocaust – the baths' underfloor heating system – which has been incorporated in situ into the main entrance gallery as a permanent exhibit. In addition to the baths, the Novium contains geological exhibits, ephemera and photographs from the town's history, as well as many other archaeological artefacts, including the Chilgrove Mosaic and the Jupiter Stone.

Designed by Keith Williams Architects, the museum is the first part of a phased plan for this part of the city, and a residential scheme by the same architect is scheduled to complete the block.

Covering 1,100m^2, the building has been constructed on high-capacity bored piles, which penetrate the shallow gravels and bear on to the underlying clay. This meant the archaeology beneath could be perfectly preserved, even while 2,000 tonnes of reinforced concrete structure, envelope and finishes were suspended above the Roman remains. Through meticulous design, the foundation footprint was reduced to less than 3% of the plan and threaded between the old walls.

During construction, a working platform was created by adding a granular fill above the remains, which also provided a base on which the formwork could rest. The RC40 in-situ concrete frame – a slab and beam arrangement with slabs spanning up to 9.5m – was cast in this and enclosed with a precast panel system.

The public galleries are stacked vertically on three levels, linked by a hovering switchback stair, also in in-situ concrete, and culminating in a rooftop view across the city to the cathedral. A long, narrow window slit between two of the flights allows light into the ground floor. The concrete frame successfully navigates the complicated geometry, while helping to maximise daylight and ventilation.

The museum is designed to respect its setting at a point in the cityscape where the historic buildings are replaced by more modern architecture. The facade is made from large 150mm-thick reinforced-concrete panels with integrally reconstructed stone outer surfaces. As each of the panels was factory cast in a bespoke mould, the architect was able to detail each one with precision, so that the etched finish and colour of the surface aggregates harmonise with major stone structures in the city.

Internally, the exposed fair-faced concrete is of a very high quality, made from white granite aggregate from Derbyshire and ground granulated blast-furnace slag (GGBS) to achieve a pale shade. This was then softly sand-blasted with limestone grit to reveal the subtly sparkling mica and quartz components.

AN EXHIBITION OF ITSELF

The factory-like interiors of the Royal College of Art's Dyson Building make an impressive display of the process of construction. By Elaine Toogood

With sleek black polished concrete facades and pale, earthy matt interiors, the Dyson Building demonstrates the very different effects that can be achieved using concrete. These bespoke, high-quality finishes reflect the care and consideration taken over this project, and express through their detail the very process of making.

The Dyson Building is the second of three phases of development to create a Battersea campus for the Royal College of Art. Opened in autumn 2012, it houses the printmaking and photography programmes and includes a 220-seat auditorium, gallery, retail space and business incubator units.

Structural cores, frame and soffits are all exposed internally, providing visual continuity between spaces as well as high thermal mass. Other lightweight, more temporary elements, such as services, are set against the backdrop of permanence and robustness provided by the concrete. The apparent seamlessness between wall, column, stair and floor provides a sculptural quality to the spaces, particularly in the main triple-height foyer and adjacent staircase.

The design team took great care throughout the project to establish and communicate the desired quality of finish. Complex junctions were fully modelled and each condition drawn to understand the imprint of the formwork on the final finish through board and tie bolt locations. The tender documents also included careful specification of the aggregates and cement, which included 40% ground granulated blast-furnace slag cement replacement for a paler, creamier concrete. Pre-contract interviews included visits to other exemplars of visual concrete to set quality benchmarks and ensure that the requirements were understood and costed by subcontractors.

An important dialogue between designer and maker was established to develop the architects' panel layouts into efficient solutions. Full-scale mock-ups of walls, columns and soffits provided an opportunity to test all aspects of the specification and fully establish the approach to construction on site.

The process of construction is evident throughout the finished building. For example, in the detail of junctions between walls and stair, small recesses express the walls and balustrades as separate elements through the introduction of a small piece of moulding into the formwork.

Careful attention to detail is similarly evident in the precast concrete panels that form the street facades. Highly polished, 4m-tall black concrete panels sit flush with aluminium-framed glazing to create a sleek, reflective surface. This detail required the development of an innovative hidden waterproofing seal and almost zero tolerance on site. Full-sized mock-ups were also built in a factory for testing. The exact colour and finish of the concrete was established through discussion with the specialist precast manufacturer and includes a subtle sparkle to bring life to the panels.

It seems highly appropriate that an organisation dedicated to the development of creative processes has established a home that celebrates the process of making itself. The third phase of the development is due to start on site in January 2013 for completion late 2014.

Photos: Hélène Binet, Philip Vile

LEFT
The facade includes 4m-tall polished black concrete panels

BELOW LEFT
The robustness of the concrete in the foyer contrasts with more lightweight elements

BELOW
Exposed soffits, stairs and walls provide visual continuity throughout the spaces

PROJECT TEAM

Client Royal College of Art
Architect Haworth Tompkins
Structural engineer Price & Myers
Main contractor Wates Construction
Concrete frame subcontractor Toureen Mangan
Facade subcontractor GIG Fassaden
Precast concrete supplier Decomo

Photos: Marie-Louise Halpenny

LEFT
The centre includes 186 columns made from locally quarried basalt

BELOW
The floors are polished concrete with basalt chips, while the ceilings are a rougher exposed concrete

BOTTOM
Strip skylights allow natural light into the centre

TREADING LIGHTLY

The new Giant's Causeway visitor centre merges serenely into its famous landscape, thanks to a sloping concrete roof and columns hewn from the same rock as the steps themselves

About 60 million years ago, County Antrim was the scene of furious volcanic activity. Today, it is the home of Northern Ireland's most popular tourist attraction, the geological marvel that is the Giant's Causeway, nearly 40,000 hexagonal columns of solidified basalt lava stepping down from the foot of the cliff to beneath the waves. This dramatic landscape, a UNESCO World Heritage site since 1986, continues to inspire scientists, artists and mythmakers alike.

Now it can claim credit for inspiring a building that echoes the geology itself while making a very modern architectural statement. The new Giant's Causeway visitor centre, by Dublin practice Heneghan Peng Architects, opened this summer, replacing a building destroyed by fire in 2000. The £18.5m centre contains exhibition spaces, a cafe, gift shop and toilets, spread over 1,800m^2.

The architects describe it as a "sculpted intervention" to the landscape, using the dramatic height difference across the site to create two "folds" in the ground. The first forms the centre itself, which is further merged into the landscape with a sloping grass-planted concrete roof over which visitors can climb. A second, more angular fold, creates a car park and entrance at the level of the access road. The result is a building that does not so much sit on the landscape, as lie absorbed into it.

PROJECT TEAM
Client National Trust
Architect Heneghan Peng Architects
Structural engineer Arup
Main contractor Gilbert-Ash

The most striking feature of the building is its series of 186 hexagonal columns, which were made from basalt taken from a local Kilrea quarry, created from the same lava flows that built the Causeway. The simplicity of the columns belies a carefully engineered solution which developed out of the properties of the stone itself. The stone, although strong in compression, has little tensile strength. To counter this, steel tensions rods are passed through them to provide permanent tension.

Internally, the folds manifest themselves as a series of stepped concrete floor plates, linked by ramps. This allows visitors to wander from one part of the building to another unimpeded, and for the different activities to follow one other seamlessly. The floors are polished concrete with basalt chips, while the exposed concrete ceilings have a rougher finish, with strip skylights interspersed to allow natural light, and the curious glances of visitors on the roof, into the exhibition spaces.

The centre also performs strongly from an environmental design point of view, achieving a BREEAM rating of Excellent. Both the green roof and exposed concrete surfaces contribute significantly to its thermal efficiency, and the concrete has a high recycled aggregate content. In addition, 4.5km of pipework under the car park provide geothermal energy for heating, while 1km of earth pipes next to the centre are used for cooling. Air is introduced at a low level and extracted at high level to provide a comfortable and energy-efficient internal temperature. Grey water is also recovered and used within the centre.

The Giant's Causeway visitor centre demonstrates a successful integration between geology, geometry and landscape. The result is a seamless addition to this remarkable location.

FINAL FRAME: LIBRARY BUILDING
Studio Egret West's Library Building in Clapham, south London, was completed in June and is already a serial award-winner, charming all with the playful shapes cut from its concrete walls and its sparkling white concrete facade. As well as the library, the mixed-use development includes a leisure centre, GP surgery and almost 200 homes. The architect is a finalist for Building Design Architect of the Year, to be announced on 4 December.

Photo: Gareth Gardner