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CONCRETE QUARTERLY

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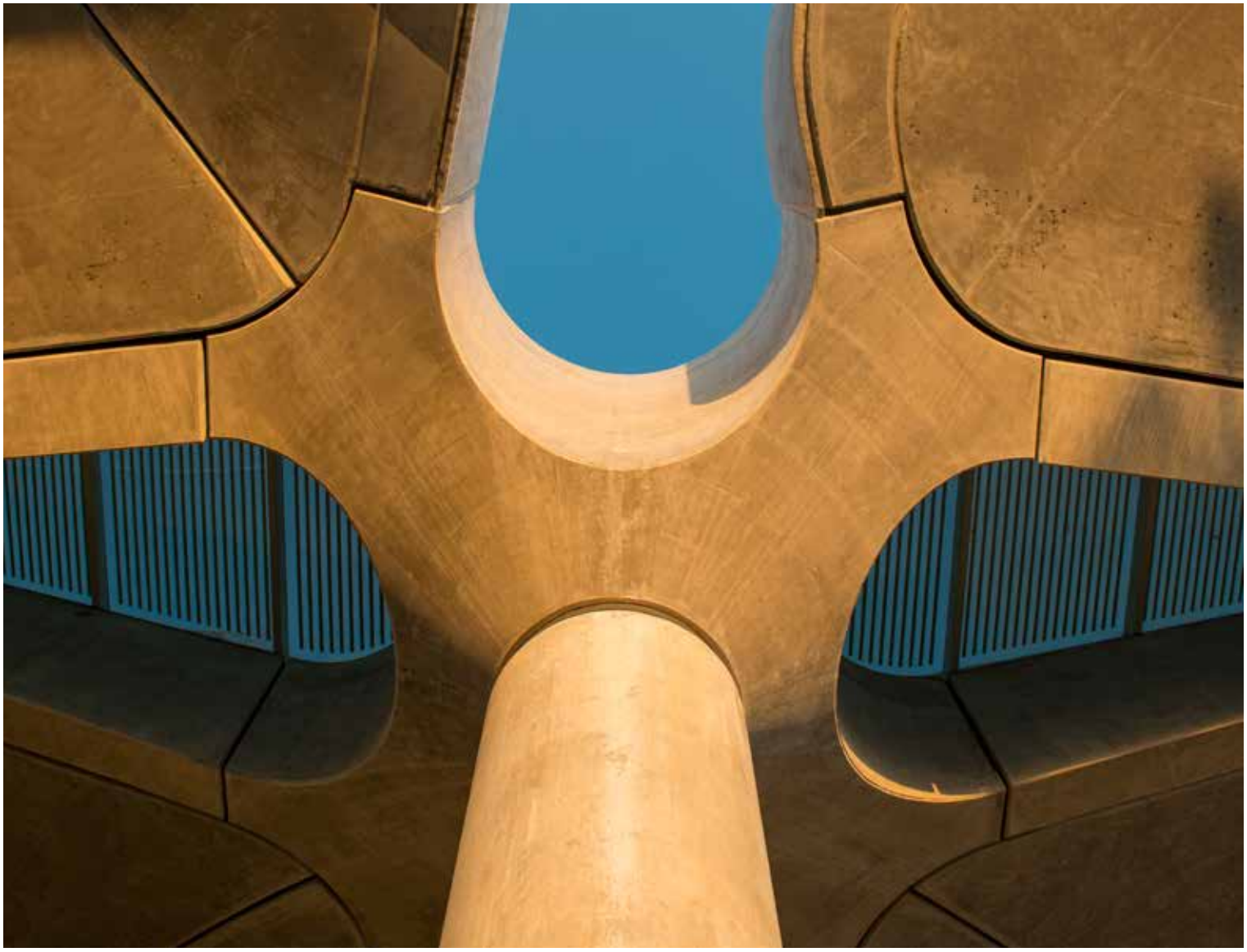

FOSTER'S DESERT QUEEN
How the British architect created an Arabian palace for Jordan's Queen Alia airport

CONCRETE ON THE CATWALK
All the latest trends in decorative concrete, from fabric formwork to pollution-eating patterns

READ ALL ABOUT IT
The book-themed Munich hotel that's happy to be judged by its cover

WELCOME

WORLD OF POSSIBILITIES

This summer issue of CQ is packed with stunning examples of concrete's versatility as both a visual and tactile finish for buildings of the highest quality and artistic merit.

Concrete provides a varied palette with extensive possibilities for the designer and user to enjoy, view and touch. It not only offers extraordinary fluidity – just look at the curves at Jordan's new Queen Alia Airport (page 4) – but also finishes from soft to hard, smooth to rough, with rich colours and soft greys. It is hard to believe the imposing rock-like formation of the Perot Museum in Dallas (page 9) and the delicate lightweight facade of the Book Hotel in Munich (page 8) are formed from one material. This issue also highlights an interesting trend towards hybrid solutions, as shown by Queen Alia Airport's mix of precast and in-situ products.

Of course, concrete is often chosen for its inherent practical benefits: reducing energy use and avoiding overheating without expensive mechanical solutions, and providing substantial whole-life savings by withstanding the ravages of time and hard wear. But it never has to compromise on designers' artistic vision or the "delight" factor.

Guy Thompson
Head of architecture and housing
The Concrete Centre
www.concretecentre.com/cq

IN THIS ISSUE

On the cover: The new terminal at Queen Alia airport in Jordan designed by Foster + Partners. Photo: Nigel Young

CONCRETE QUARTERLY

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

NEWS ROUND-UP

Tate Modern masters the art of passive cooling

The floors of the Tate Modern extension, now under construction, were the star of the latest evening seminar from The Concrete Centre, held on 9 May at the Building Centre in London.

The event's theme was the role concrete can play in active and passive cooling strategies to optimise comfort, energy efficiency and whole-life carbon performance. Henry Luker, a building services engineer and a senior partner at Max Fordham, described the practice's work to minimise the gallery's energy use while keeping visitors comfortable and precious artworks preserved.

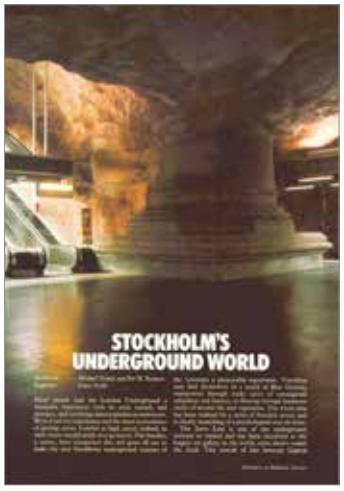
The secret is passive and active environmental control systems, including activated thermal mass and ground coupling – and lots and lots of concrete. "As well as being an important part of the architectural expression, the exposed concrete is seamlessly integrated with natural ventilation as part of our passive environmental control strategy," he explained. "In areas where internal loads are high we have also enhanced its benefit through the use of embedded pipework fed from the groundwater cooling system."

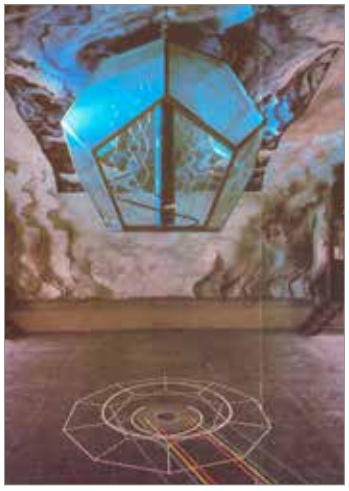
Luker was joined by Gareth Roberts, partner at Sturgis Carbon Profiling, who explained the essential art of assessing and measuring whole-life carbon, providing a guide for clients and designers on how they could analyse embodied and life-cycle carbon in their own projects.

The Concrete Centre's Tom de Saulles, a specialist in building physics and thermal performance, also outlined latest best practice in engineered concrete floor solutions.

Download The Concrete Centre's best practice guide, "Concrete floor solutions for active and passive cooling", at www.concretecentre.com

FROM THE ARCHIVE





OCTOBER 1978: THE LONGEST ART GALLERY IN THE WORLD

CQ was in little doubt that the revamped Stockholm Metro beat rush hour on the Piccadilly line. "Travellers may find themselves in a world of Blue Grottos, transported through caves of unimagined splendour and fantasy, or floating through luminous vaults of marine life and vegetation," it reported. The 11 new stations on the Jarva line were part of a continuous cave blasted out of rock. Its surfaces were sprayed with 70mm of concrete, creating a 14km-long canvas on which Swedish artists were invited to let their imaginations run wild. "It is clearly something of a psychological tour de force," CQ concluded.

Rolfe Judd takes a big step for light-emitting concrete

Light-emitting concrete panels are to be used as a flooring product for the first time in the UK, in the lobby of an office building in the City of London. Architect Rolfe Judd's refurbishment of 36 Queen Street, originally designed by Terry Farrell, will include a double-height vestibule with a rear feature wall and floor.

The translucent panels, from German company Lucem, are made of fine-grained marble sand and a cement-based matrix in which light-transmitting optical fibres are embedded. Large blocks of the material are produced, cured and cut into panels. When backlit, pin-pricks of light make the material glow.

At 36 Queen Street, currently on site, 32m^2 of panels in the walls and floor will create a "waterfall" effect. "We looked for suitable materials to enhance the drama of this space, which would also convey modernity and function practically," says Martin Touška, director at Rolfe Judd. "The Lucem concrete satisfied the waterfall concept perfectly. The wall panelling is arranged with vertically oriented optical fibre lines, and the irregular illuminated patterns convey the idea of flowing water. The pattern is continued onto the floor, which will produce changing visual effects as one moves across it."

Lucem's products have already been used in interior walls and furniture, and in late 2012, for an interactive facade at the RWTH Aachen University in Germany.

EVEN THE WALLS ARE ON THE RAW SIDE ...

This stunning double-height feature wall was created for the Exeter branch of Japanese restaurant chain Yo! Sushi by MASS Concrete. It was constructed from 30 textured concrete panels in Portland mid-grey, into which the cherry blossom design was cast to varying depths, with some elements jet-cut and others debossed. Pink perspex and LED light fittings add colour and sparkle, accentuating the smoothness of the concrete finish.

CONCRETE ELEGANCE EVENT

PARIS IN THE SPRINGTIME

Concrete Elegance's April line-up whisked attendees off for a (virtual) Parisian getaway, with a presentation on the HEC business school (above), designed by David Chipperfield Architects. Speaking at the Building Centre in London, project architect Andrew Philips introduced the École des Hautes Études Commerciales, situated 16km south-west of the French capital near Versailles. HEC is one of the top business schools in Europe and the new building was intended to cement its status, combining state-of-the-art teaching facilities, an auditorium, cafeteria and offices across a series of staggered blocks. Acting as a new main entrance for the 1960s university campus, its palette of materials complements the existing buildings, with exposed concrete interiors throughout and aluminium curtain walling.

Mike Hitchmough of 3DReid also provided attendees with an insight into the BREEAM "outstanding" headquarters building it created for the Co-operative Group in Manchester (featured in CQ 243, spring 2013), and in particular how the practice used the thermal mass of concrete to outperform every office built in the UK to date.

For details of future Concrete Elegance evening events, and to watch videos of previous presentations, go to www.concretecentre.com. A range of CPDs from The Concrete Centre is also available at www.thebuildingacademy.com

THIS IS CONCRETE

Concrete has long been considered a creative material, discovers This is Concrete blogger Nick Jones, who delved into CQ's extensive archive to turn up concrete artworks by some of the 20th century's most creative minds. Picasso appears surprisingly regularly during the 1960s and 70s with his vast murals sandblasted on to concrete facades, created using a technique known as Naturbetong (natural concrete). "Picasso was immediately struck by the possibilities and collaborated on a number of works with the Norwegian artist Carl Nesjar, who would project the master's drawings onto a wall using a lantern before sandblasting the lines into the concrete," Jones writes.

Picasso was not alone: "Many artists during the 60s were both inspired by developments such as Naturbetong, and in turn inspired further technical advances themselves. A seven-page article on concrete murals in summer 1963 praised the innovative work not just of Picasso, but also of British sculptors such as Eric Peskett and William Mitchell (who later developed Faircrete, which could be cut and formed when wet)."

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

"The exciting thing about the murals was that they were not mere adornment, but intimately related to the architecture of the building itself"

this is concrete

QUEEN OF THE DESERT

Foster + Partners' new airport in Jordan uses a mix of in-situ and precast concrete techniques to create a mesmerising, repeating pattern of shallow domes, curving beams and gently tapering columns. Tony Whitehead reports

Functional, imposing, even quirky – buildings can be many things in the eye of the beholder. But in truth very few contemporary buildings aspire to the ultimate accolade – that of being beautiful. Foster + Partners' recently completed project in Jordan is certainly one of that select group, and it is, of all things, an airport.

Emerging from the desert 35km south of the capital Amman, Queen Alia airport is an Arabian Nights fantasy of arches, domes and pillars stretching in tessellated patterns across the palatial expanses of its floorspace. Outside, palms sway in the desert breeze and beneath them families gather to greet or bid farewell to travellers. Aesthetically, this is as far from the identikit tubular steel terminals plonked outside many a UK provincial city as it is possible to get.

That the airport is built almost entirely from concrete is hardly a surprise. In this part of the world, where temperatures soar by day and plummet at night, stone and concrete have been the building materials of choice for hundreds of years. Concrete's thermal mass is essential to even out the diurnal extremes of temperature, absorbing the desert's heat in the day and releasing it slowly throughout the freezing night.

But even if passive temperature control were not the priority that it is in the Middle East, it is hard to imagine that any other material could achieve what has been accomplished here – because this is a building with curves.

The central terminal building is roofed with more than 50 shallow domes, each supported by four gently curving x-beams. These sprout like palm fronds from enormous column heads which top the gently tapering supporting pillars.

The curves do much to explain why Queen Alia airport is so easy on the eye, and also why concrete, with its ability to be moulded into almost any shape, had to be the material of choice. But there were other reasons too, as Foster project architect, Jonathan Parr, explains: "In the Middle East there is no real tradition of steelwork. But because concrete works so well with the climate, the resources to build with it – the materials and the skill sets in the local workforce – are all in place and well developed. And using a local material works environmentally on a number of levels and also helps the building to fit into its surroundings."

Indeed, it is the use of local aggregates, says Parr, that gives the concrete at Queen Alia airport its distinctive colour: "It is a light beige – a warmer shade than the greys we are used to in northern Europe." This also gives the building the feel of having been sculpted from the local terrain – an effect the builders of ancient Petra, 200km to the south, might have appreciated.

Unlike Petra, however, Queen Alia has been constructed using an intriguing mix of in-situ and precast concrete technology. "The structure is supported by substantial columns made from reinforced concrete," says Parr. "The airport comprises two, or in places three, storeys and in the lower ones these columns have parallel sides. But in the upper storey they taper gently outwards so the top, which supports the column heads, is wider. Structurally they work rather like the tapered legs of a dining table."

Circular in section, these columns were cast in situ, using self-compacting concrete to give a naturally smooth finish. To ensure a regular shape, steel formwork was chosen to minimise deformation caused by the weight of concrete.

Because the roof was constructed from a selection of precast elements, the column heads had to be very precisely located and levelled if all the elements were to fit together properly. This was achieved by means of a self-levelling mortar, and steel plates. The column heads were fixed to the columns by welding a steel ring, fixed to the bottom part of the column head, onto the steel plate on top of the column.

Nearly 4m wide, more than 7m high, and weighing up to 20 tonnes, these precast column heads were central to the whole construction process. "They had to be large to take the substantial stresses placed on them by the weight of the roof, and have sufficient height to allow them to blend into the curving x-beams," says Parr. "In fact, the column heads were cast hollow, and had relatively thin walls. This made them much lighter than if they were solid, and allowed them to be lifted and manoeuvred into position more safely and easily."

Once welded in place on top of the column, more reinforcement was placed inside each column head. An in-situ pour was then used to cover exposed reinforcement sticking out of the column top, in-fill the column head, and bond it to the column.

"Each column head is a four-pointed shape providing corbels to rest the x-beams on," says Parr, explaining that the beams were, like the column heads, hollow to reduce weight.

"They are precast, with each beam split into a Y or wishbone shape, and the split ends engaging into two of eight 'female' pockets on the column head. The beams were supported on scaffolding – the non-split end meeting its counterpart coming the other way from an adjacent column."

These beams were some 11m long in order for two, along with the column heads themselves, to span the 25m between columns. Once in place, reinforcement was dropped inside the beams and more in-situ concrete was used to in-fill and glue the beams to the column heads.

This process left each column with four beams "sprouting" from its head. Where the beams split as they near the column, they have left a series of tear-shaped gaps, which have been glazed to provide an elegant natural light.

By this stage, the beams, forming rough squares on plan, were ready to accept the precast dome segments. Each dome comprised eight segments which, after being lifted into position, were supported on scaffolding. "These rested on an invisible ledge coming off the beams," explains Parr.

He adds that while the appearance of the

USING A LOCAL MATERIAL WORKS ENVIRONMENTALLY ON A NUMBER OF LEVELS AND ALSO HELPS THE BUILDING TO FIT INTO ITS SURROUNDINGS

Precast precision

Creating steel moulds that precisely conformed to the curving geometry of the precast elements called for a high degree of collaboration between the designer, manufacturer and contractor.

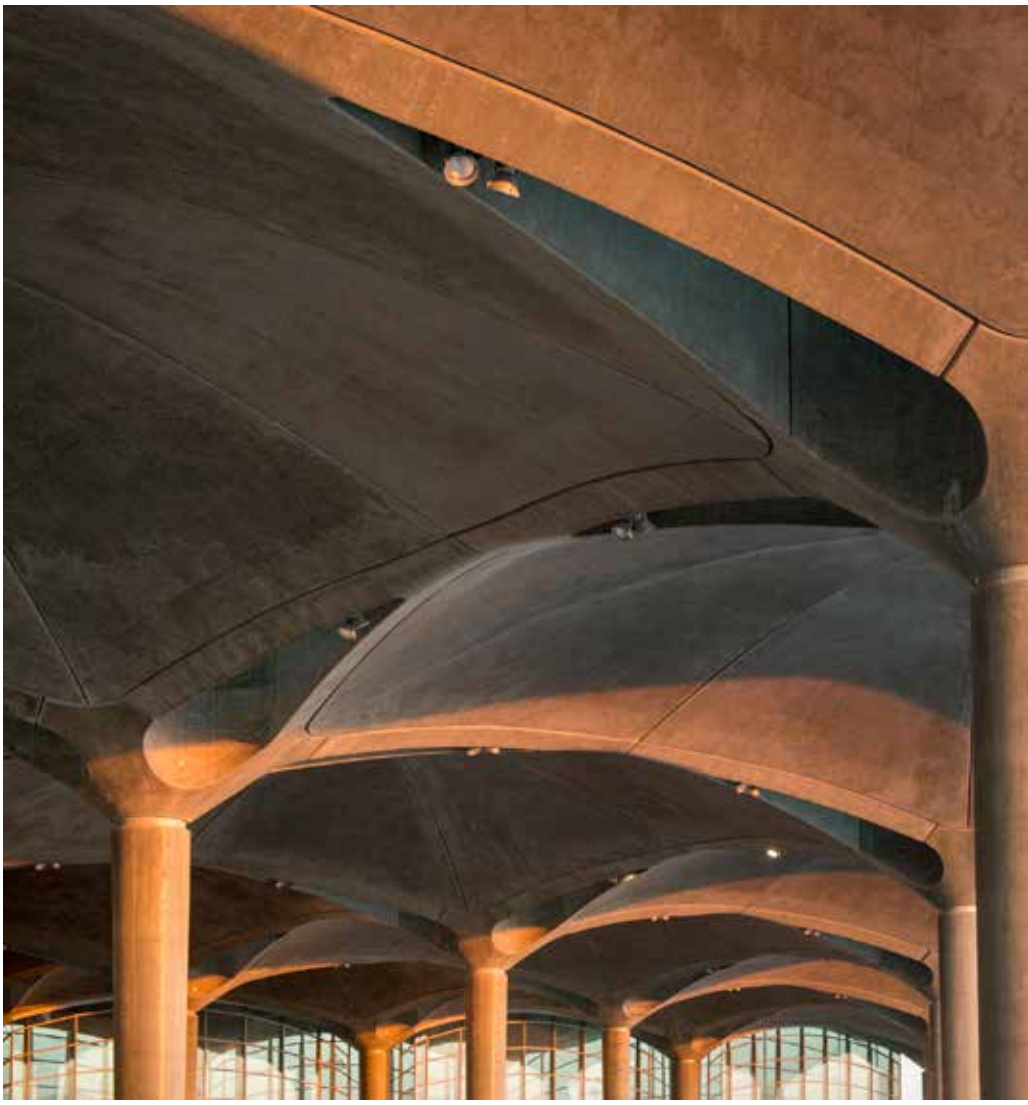
"This was a really interesting process," says Foster + Partners' project architect Jonathan Parr. "We were able to offer a specialist architectural service – for example, we provided the geometrical information and cutting sheets for the steel sections to be made."

The moulds were fabricated in Athens where specialist shipbuilding skills were used to create the curving shapes. "The moulds then had to be taken apart, shipped to Jordan and reassembled on site. We had to allow for that process in the design and try to avoid visible join marks."

The fact that the elements were all large and yet hollow, with relatively thin walls, provided the second major challenge of the precast process. With wall thickness generally around 100-200mm, but as little as 40mm in places, strength was a priority. "The mix chosen was highly specialised as it had to be extremely strong, and yet able to produce a smooth finish suitable for the interior surfaces," says Parr.

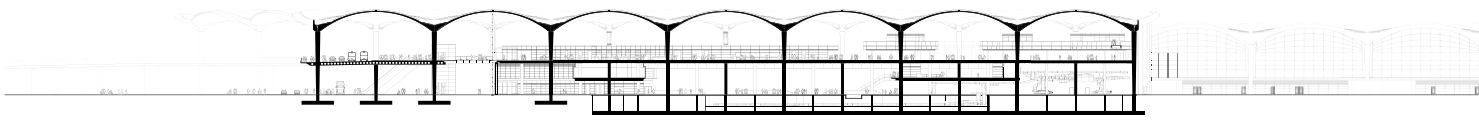
In the event, a steel fibre reinforced mix with a maximum aggregate size of 3/8 inch was chosen with 2% by weight of cement super-plasticizer and a high cement content. Because of the quantities involved (some 100 column heads and 720 dome segments), a dedicated production facility was set up close to the site with its own batching plant. Some 200 people worked at the plant producing up to two beams, one column head and eight dome segments daily.

Casting was performed by means of a steel bucket to control the flow, and the concrete was compacted with pocket vibrators. A steam-curing process was then used to ensure the concrete quickly gained sufficient strength to be demoulded onto specially designed supports.



concrete was vital to the overall architectural effect, it could not be considered independently from the construction and structural requirements: "For example, we spent a lot of time testing various concrete mixes to ensure a smooth interior finish with no stress lines, but the top surface of the segments was left deliberately rough and with steel hoops sticking out." This provided a key for a topping of in-situ concrete, which was poured like icing over the dome segments to increase their thickness and strength, and to create a joint-free roof surface. "A dryish mix was used, and this, together with the rough top surface, prevented the in-situ from slumping off the domes."

Each dome is protected from the desert sun

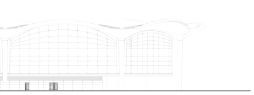


ABOVE
A tear-shaped gap is left where the x-beam meets the column head

RIGHT
The use of local aggregate gives the concrete a warm tone and helps the building to blend in with the landscape

LEFT
The central building's roof comprises more than 50 shallow domes

BELOW LEFT
Sectional drawing of the two-storey terminal



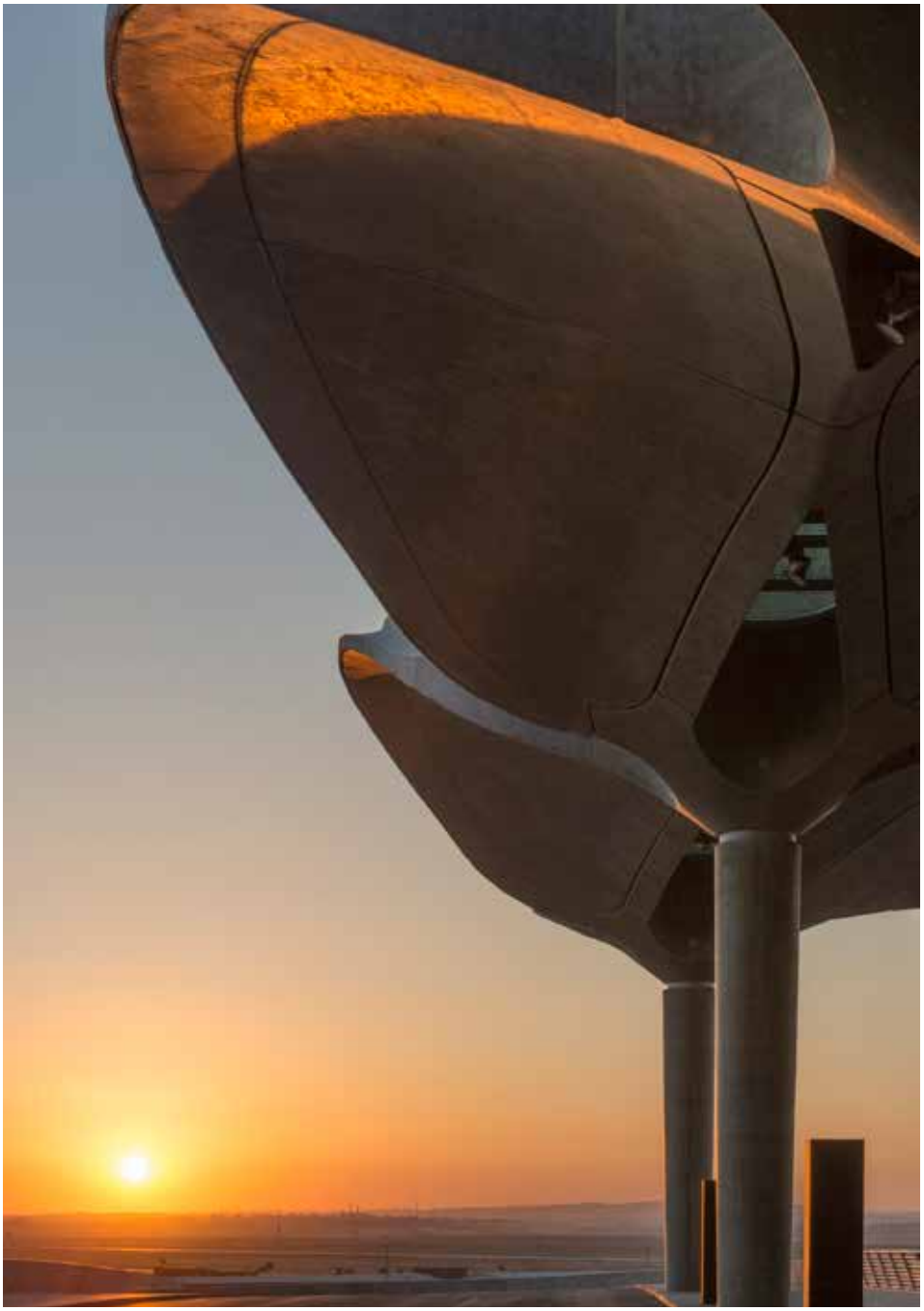
by a layer of insulation and an aluminium shade sitting on upstands: "Because there is a gap of free-flowing air between the concrete and the aluminium, it helps keep the building cool," says Parr.

Apart from an anti-dust coating on the columns, all of the concrete at Queen Alia has been left with a natural bare finish. "To us, concrete is a lovely material, and it should be left as such," says Parr. "We were adamant it should stay untreated – especially because of the colour of the concrete. Such making good as was necessary we tried to keep to just cleaning and sanding smooth."

The result is undeniably impressive, as the pattern of beams and domes repeats and repeats, calling to mind the many-pillared audience halls of bygone Eastern rulers. Jordan hopes its $960m (£624m) airport redevelopment will result in Queen Alia becoming something of a regional hub, handling up to 12 million passengers per year. They will, one feels, have much to admire.

PROJECT TEAM

Client The Hashemite Kingdom of Jordan Ministry of Transport
Architect Foster + Partners
Structural and MEP engineer Buro Happold
Quantity surveyor Davis Langdon
Contractor Joannou & Paraskevaides



Photos: Nigel Young

Main photo: Florian Holzherr

FULLY BOOKED

Inventive use of glass fibre reinforced concrete has allowed a Munich hotel to indulge its literary leanings

In the age of the Kindle and the iPad, the Eurostars Book Hotel in Munich is a bibliophile's dream – a hotel dedicated to the joy of books themselves. Each floor is devoted to a literary genre, with the 201 guestrooms hosting an eclectic group of characters including Anna Karenina, Sherlock Holmes and Cyrano de Bergerac.

Designed by Barcelona-based Capella Garcia Arquitectura and Munich's Schmid Architekten, it is the hotel's facade that pays the most striking homage to the book. It comprises panels of glass fibre reinforced concrete (GFRC) representing open pages fluttering in a breeze. The lightness of the leaves is captured by the Reider-fabricated fibreC panels, which are just 13mm thick. This also reduces the load on the building frame. Despite their lightness, the panels are very durable and strong, and provide high resistance to frost and fire.

GFRC itself has considerable tensile strength and malleability. High-strength glass fibres act as the load-carrying members, protected and held in place by the concrete. GFRC can also be formed into any shape and creates the impression of a building that has been cast in one piece.

For the Eurostars Book Hotel, the GFRC panels serve not only an aesthetic purpose but an important functional one as well. The upturned pages turn the hotel's facade into a seamless shading system, thereby avoiding the need for additional electronic or manual systems and the accompanying costs.

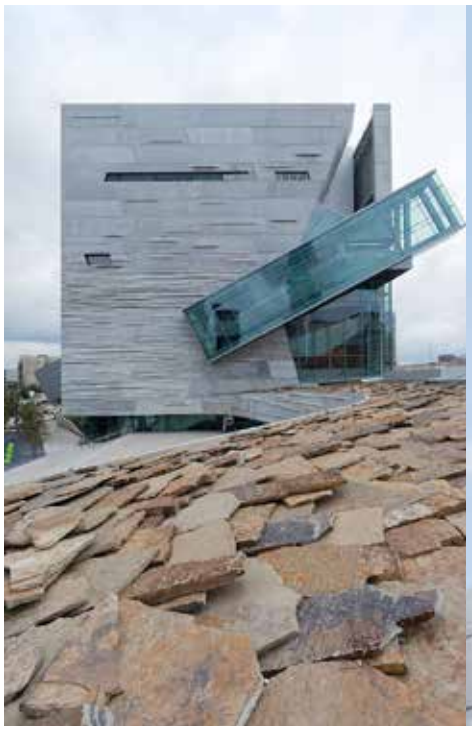
Books are said to feed the imagination – the Eurostars Book Hotel shows that advances in concrete can, too.

PROJECT TEAM

Client Eurostars Hotel Group
Architects Capella Garcia Arquitectura and Schmid Architekten
GFRC fabricator Reider

CLOCKWISE FROM TOP

The GFRC panels are turned back like book pages; the panels also act as a shading system; the reception area continues the literary theme



BIG BANG THEORY

With its hulking, geological facade and giant test-tube-like elevator, Thom Mayne's science and nature museum has made a startling impact on the Dallas cityscape

The Perot Museum of Nature and Science in Dallas is exactly the type of landmark architecture that divides opinion. Some applaud its dynamism and stature; others find it tries just a little too hard. But love it or hate it, you cannot deny the artistic panache of its concrete.

Designed by Pritzker Prize winner Thom Mayne, of the Los Angeles firm Morphosis, the $185m (£120m), 16,700m² museum rises as a four-storey cube, with a glazed tube attached to the outside housing an escalator.

The play between science and natural history is the driving force behind Mayne's design. The precise geometry of the glazed tube, exposing the escalator workings, nods to the science exhibits within, while the striated precast concrete cladding of the exterior and the shape of the plinth on which the cube sits echo a rocky natural landscape, hinting at the Perot's natural history collection.

From far away, the grey concrete appears smooth and uniform. It is only close up that it reveals itself as a complex interplay of more than 650 varied precast concrete panels, providing a flinty, textured geological reference. The patterned strata may seem random but are actually the result of precise 3D modelling and the use of a range of textured moulds. The panels are puckered at the base of the cube and become smoother with height, and, unusually for precast cladding, they are cast entirely using natural cement with no added pigmentation.

The precast panels not only cover the facade and the plinth, but extend into the plaza and museum building, lining the atrium space and uniting the exterior and the interior. On the plinth and within the atrium, nine out of 10 panels have a convex or concave curve either horizontally or vertically, which gives the concrete a fabric-like fluidity.

This is not shrinking-violet architecture. It does not seek to provide a bland backdrop to the museum's exhibits, but to expand the visiting and learning experience by becoming an exhibit in its own right. It has undoubtedly succeeded.

PROJECT TEAM

Client Perot Museum of Nature and Science
Architect Morphosis
Contractor Balfour Beatty Construction
Precast cladding Holcim US

CLOCKWISE FROM TOP LEFT

The glass tube reveals the elevator's workings; the grey concrete has no added pigmentation; the precast panels extend into the museum interior

Photos: Iwan Baan

SEVEN WONDERS

Elaine Toogood selects a handful of the many projects that are propelling concrete to new heights of creativity, tactility and beauty

Recently I was asked to give a presentation on innovative, decorative concrete. As I sought out examples, it struck me just how much creativity concrete does inspire as a medium. Not just in the development of new products – such as the gorgeous fabric concrete composites of Tactility Factory (opposite) – but for designers and architects too. Permanent bespoke patterns can be achieved through a range of techniques, including acid etching or the use of retardants.

There are also numerous examples of bespoke formwork designs, either through the use of form liners, as in Niall McLaughlin Architects' Elgin Marbles at the Olympic village (CQ 237, autumn 2011) or using unusual materials such as fabric, rubber or even trees, as illustrated by Peter Zumthor's magical Brother Klaus Chapel near Cologne. In fact, every piece of in-situ visual concrete or bespoke precast concrete is effectively a unique design, a direct result of the creative decisions made by the designers and engineers regarding the mix of material, finish and form.

Of course, typical construction methods and geometries dictate that most concrete is created in a more conventional manner than many of the examples here, but even then the consideration of joint details and panel layouts can provide opportunity for expression. The following examples are just a tiny snapshot of the creative endeavours that concrete is inspiring around the world.

Elaine Toogood is an architect at The Concrete Centre. For more examples of inspirational concrete go to www.thisisconcrete.co.uk

1 'Crushed Wall'

Art installation at Heartlands, Cornwall by Walter Jacks Studio, 2012

Crushed Wall is probably the most sensuous piece of concrete I know of. The shiny, smooth surface was created by casting self-compacting concrete against folded rubber. The folds were created by bolting rubber sheets to plywood, and held in place using sprayed insulation that set hard around the back of the form. The crumpled sheet was then cut into sections, laid horizontally and framed in timber to create six moulds into which the concrete was poured. Since self-compacting concrete does not need to be vibrated, the shapes could be retained without risk of movement. The pieces were tilted up and transported to site where they were craned into position with extreme precision.

While rubber is rarely used as concrete formwork, self-compacting concrete has produced some beautiful fair-faced finishes, such as the interiors of The Collection in Lincoln or the Angel Building in London.

2 Fabric formwork

Hanil Visitor Centre Guest House, Chungbuk, South Korea by BCHO Architects with the University of Manitoba, 2009

Part of the interest and delight of using fabric as formwork is not knowing exactly what shape will be created, as the fabric stretches in three dimensions under the weight of the concrete. Mark West at the University of Manitoba in Canada has developed a resourceful method for the construction of an unusual undulating, single-storey concrete facade on site in South Korea. Fabric was draped over a series of PVC pipes of varying diameters to form concave curves, while convex curves were formed by the free-hanging fabric between these supports. Cast on the ground, the concrete panels were then tilted up into position. The final elegant form belies the clever, low-tech construction solution that was communicated through just a few simple sketches to an unskilled team on the other side of the world.

3 'Three Waves'

Esplanade in Dover by Tonkin Liu Architects, 2010

This sinuous walkway is comprised of sections of bespoke white precast concrete. Through the clever arrangement of just a few moulds, the architects were able to create a series of asymmetrical curves. The textured face of the concrete was made using formwork from layers of flat MDF boards, like a fan of playing cards.

The foundations for the walkway show further ingenuity. Prefabricated hollow concrete pipes were simply pushed down under the beach and filled with shingle.

4 Hidden treasures

Dundee City Council Offices by Reiach and Hall Architects and Gareth Fisher, 2011

The provision of public art was part of the brief for the development of the new council offices in Dundee by Reiach and Hall, and they chose to incorporate the art into the building literally. Emerging from the cast in-situ concrete of the internal walls are delightful small reliefs of objects or motifs representing the city's cultural and historic heritage, from coils of flax to implements used in keyhole surgery. These little treasures are located at hand height at selected places around the building, some covered in gold or silver leaf. The artist was given sheets of standard formwork within which to create the cut-outs and moulds before they were used to construct the fair-faced finished structure of the building.

The architect described the use of concrete in the building as a means to "imbue absolute permanence". It also provided the thermal mass necessary for the building's low-energy efficiency strategy and BREEAM excellent rating.

5 Crystal, velvet and linen

Tactility Factory, ongoing

I love the surprised reaction of someone encountering velvet concrete for the first time. One doesn't usually expect to feel soft fabric within a piece of concrete, but this is exactly what Tactility Factory has been developing over the last few years, designing fabrics specifically to embed into the face of concrete. Often these are "skins" of concrete about 10-12mm thick, but more recent collaborations feature thicker structural concrete panels. I look forward to seeing the finished effects when the buildings in which these are currently being installed are complete.

6 Photo finish

Hämeenlinna Archive, Finland by Heikkinen-Komonen Architects and Graphic Concrete, 2010

The Hämeenlinna Archive shows the potential of photographic concrete. Durable patterns are produced by carefully controlling the relationship between pale concrete fines on the surface and exposed dark aggregates. This is achieved by lining the formwork with a screen-printed digital image in concrete retardant. Where there is more retardant, more of the darker aggregate is exposed to produce the darkest parts of the image.

7 'Polluted Lace'

Artwork by Alessia Giardino for Lost in Lace, 2011

Textile and surface designer Alessia Giardino's amazing pollution-eating panels demonstrate an imaginative way of creating patterns on concrete. Invisible patterns are screen-printed on to a concrete that contains a photocatalytic white cement. This reacts with toxins in the air when exposed to sunlight, effectively cleaning the air and itself in the process. The masked areas gradually darken to create the pattern as they absorb pollutants, in contrast to the exposed white surfaces, which remain clean. Tests are underway to develop a series of urban furniture, but one can imagine many possible uses. This is the same technology employed by Richard Meier at Jubilee Church in Rome (CQ 207, spring 2004).

Photos: Simon Burt (Crushed Wall); Yong-kwan Kim (Hanil Visitor Centre); Gareth Fisher (Dundee City Council Offices)

FINAL FRAME: SEINÄJOKI CITY LIBRARY
Seinäjoki in east Finland is a small town with a big architectural legacy: all of its main civic buildings were designed by legendary architect Alvar Aalto. Now Helsinki practice JKMM has risen to the challenge of extending Aalto's 1967 library. Raw, textured concrete surfaces, created using uneven plank moulds, are a dominant feature of JKMM's often quirky, open-plan interiors, which are crowned by a vast column-free concrete ceiling.

Photo: Mika Huisman