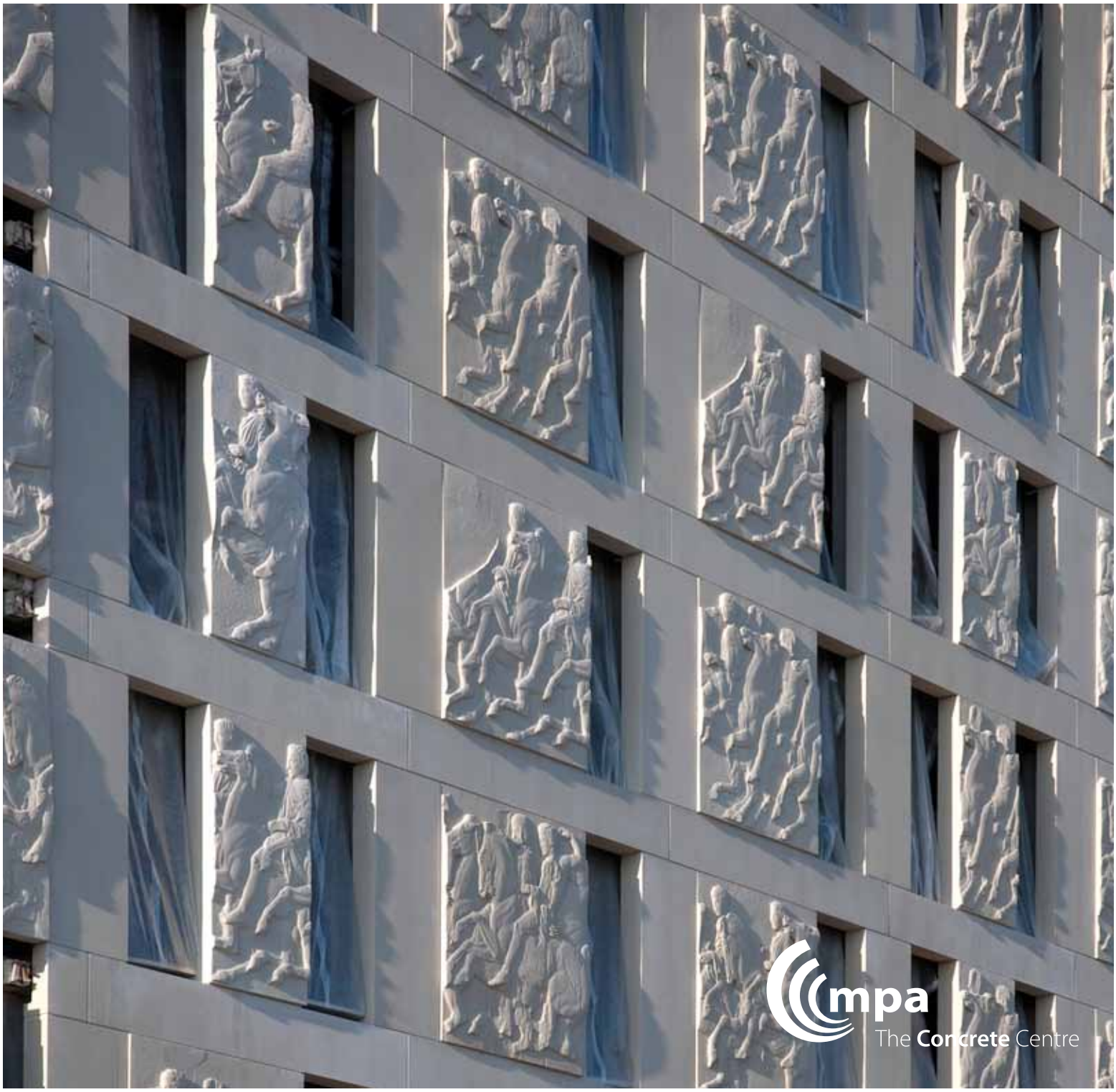
CONCRETE QUARTERLY | AUTUMN 2011 | ISSUE NUMBER 237

BIG FRIEZE
What are the Elgin Marbles doing on a housing block in London's Olympic village?

STAR WITNESS
A new courthouse in Portugal makes a compelling case for the simple elegance of concrete

NOW IN COLOUR ...
David Chipperfield builds a fortress in pigmented concrete on Wakefield's waterfront



WELCOME

FLAIR AND FUNCTION

The phrases "thermal efficiency", "structural robustness" and "long-term durability" may not immediately bring to mind visual flair. Yet concrete has the potential to provide all of those things in a way that is increasingly exciting to designers.

A 10-storey residential block at the London Olympic village is a good example of this aesthetic functionality. Here, precast concrete is used to create a carved facade of reliefs based on the Elgin Marbles. The result is a building animated by light, shadows and movement. One of the Olympic park's more prosaic projects has been given a dash of pizazz in a similar way: the precast concrete walls of the sewerage pumping station feature a relief pattern derived from the engineering drawings of Victorian engineer Sir Joseph Bazalgette.

Concrete can provide a visual declaration of a building's purpose in other ways, too – the sense of civic pride evoked by the white purity of the Gouveia law courts in Portugal being just one example. Ways of marrying artistic aspiration and functional requirements will be examined at a forthcoming conference (see opposite page). We look forward to seeing you there.

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

NEWS ROUND-UP

Concrete makes its mark on Stirling Prize shortlist

Concrete appears in many forms in the shortlist for the 2011 RIBA Stirling Prize, the UK's most prestigious architectural honour, which is awarded annually to the best new European building built or designed in Britain.

Allford Hall Monaghan Morris' Angel Building in Islington, north London, is a dramatic refurbishment of a concrete-framed 1980s office block, while the An Gaelaras cultural centre in Derry by O'Donnell + Tuomey uses high-quality boardmarked concrete on its facade and throughout the internal courtyard. Both have been the focus of former issues of CQ, the Angel Building in CQ Spring 2011, and An Gaelaras in CQ Spring 2010.

Also shortlisted is Zaha Hadid's dynamic Evelyn Grace Academy in Hackney, north London, which incorporates reinforced concrete slabs and fair-faced in-situ concrete. Hadid's MAXXI Museum in Rome was last year's winner.

The shortlist also includes the Olympic velodrome for the 2012 Games by Hopkins Architects, Bennetts Associates' Royal Shakespeare Theatre in Stratford-upon-Avon and David Chipperfield's Folkwang Museum in Essen, Germany. The winner will be announced on Saturday 1 October.

Zaha Hadid's Evelyn Grace Academy

IN THIS ISSUE

On the cover: Friezes by Niall McLaughlin Architects on housing by Glenn Howells Architects at the Olympic park

mpa The Concrete Centre

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www.mineralproducts.org

ARCHIVE

RETRO CONCRETE: AUTUMN 1951

Concrete comes of age at the Festival of Britain

A young CQ is in celebratory mood as the bold forms of the brand-new Royal Festival Hall replace the Victorian iron and glass of the 1851 Crystal Palace in the national consciousness: "The South Bank is a revelation of what British architects and engineers can do, and their freshness of imagination has nowhere been more sincerely expressed than in the concrete structures ... No longer a material to be hidden ... the South Bank's concrete is proud of itself, proud of its form-marks, proud of its texture."

IN FULL BLOOM

This intricately patterned hand-cast concrete tile is one of a new range from Graphic Relief, which creates moulds that produce very finely detailed concrete surface designs, textures and effects. Spring Blossom is based on original artwork by print and textiles design practice Timorous Beasties. Available in black, white or grey, it is one of four patterns currently in production, with more planned over the coming months. **For further information, visit www.graphicrelief co.uk**

SPECIFYING VISUAL CONCRETE

In October, a major one-day conference, "Specifying Visual Concrete", will examine how to combine visual inspiration and function using in-situ and precast concrete.

The conference from The Concrete Centre and Building Design, will be held on Wednesday 19 October 2011 at the Southbank Centre, London.

Speakers include Toby Lewis from Feilden Clegg Bradley Studio, Steve Smith from Allford Hall Monaghan Morris and Alex Wraight from Allies and Morrison.

In addition to case studies on award-winning projects, there will be presentations on pioneering visual concrete techniques and potential finishes, on how to achieve sustainability through innovative finishes and designs, and an examination of clients' perceptions of concrete.

For further information, go to www.concretecentre.com/conference

CONCRETE ELEGANCE LECTURE

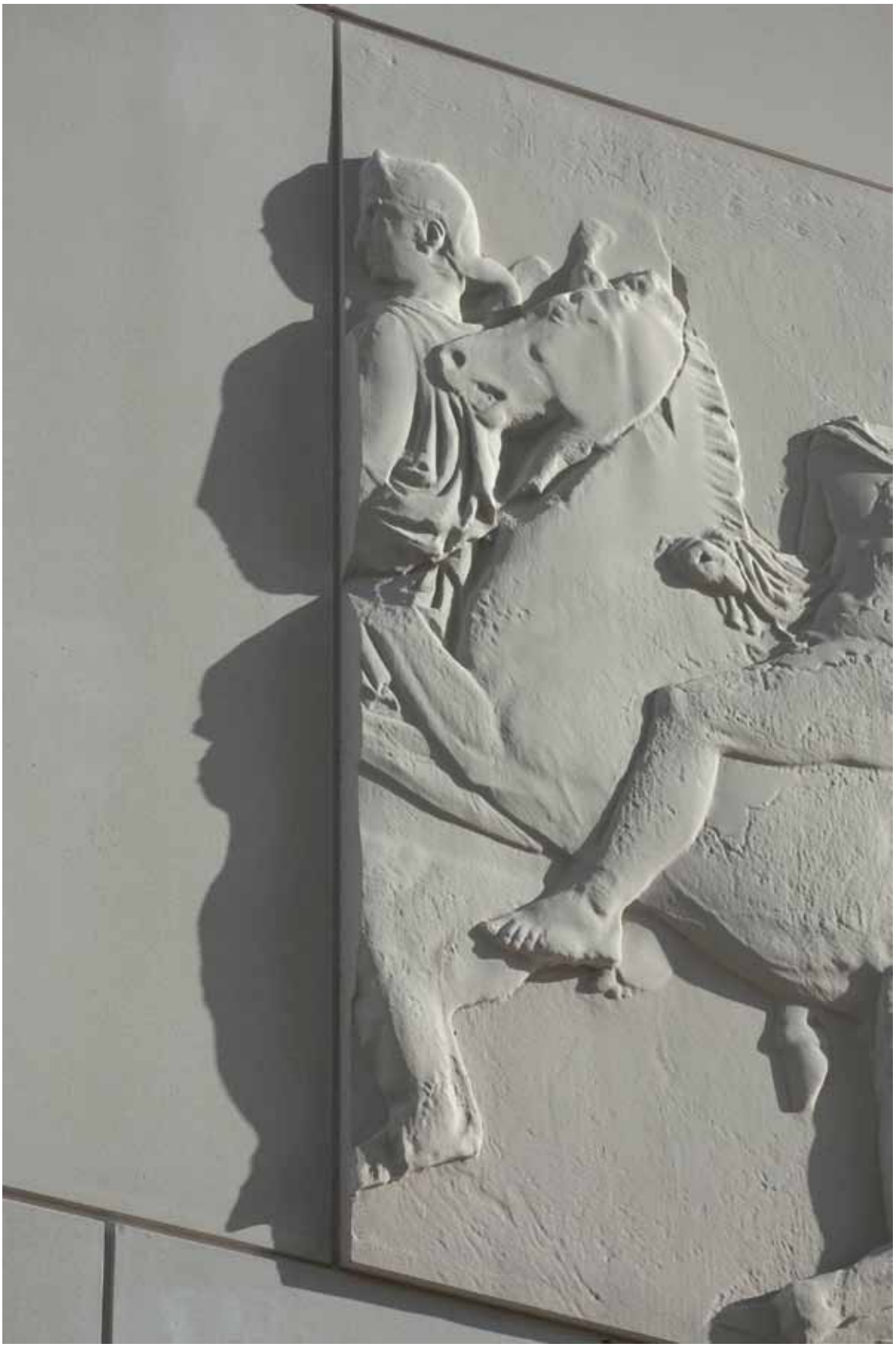
LEARNING THE HARD WAY

Two education projects that demonstrate the visual and tactile potential of concrete architecture and construction will be the focus of the next Concrete Elegance evening lecture, to be held, in September, at The Building Centre in London.

Jessica Mentz of Schmidt Hammer Lassen Architects will discuss City of Westminster College (pictured), a new seven-storey building designed from the inside out. A series of horizontal floors are linked to produce interlocking single and double-height spaces and terraces, oriented around a full-height rotating atrium. The internal exposed concrete surfaces are complemented by a restrained palette of materials, with splashes of vibrant colour.

Next, Michael Corr of Pie Architecture will describe the practice's approach to extending St Joseph's Primary School, a 1970s school building in Highgate, north London, constructed from a concrete frame with bush-hammered precast concrete panels. The two new extensions are of double-skinned in-situ concrete construction, with both skins poured simultaneously around a sandwich of rigid insulation. Externally, the concrete's board-marked finish echoes the vertical lines of the existing cladding, while internal surfaces are smooth and matt, giving the sense of a dialogue with the older building.

Concrete Elegance takes place at The Building Centre, Store Street, London WC1 on Wednesday 21 September from 6.30pm. For further information and to register, go to www.concretecentre.com/events



CLASSICAL GOOD LOOKS

Niall McLaughlin Architects has taken the Olympics back to their roots by cladding one of the housing blocks in the 2012 athletes' village in friezes cast from the Elgin Marbles. Graham Bizley finds out how – and why ...

Carved by Greeks, blown up by Venetians, transported to England by Lord Elgin and the subject of heated debate ever since, the sculptures of the Parthenon have had a traumatic history. But for a residential block at the London 2012 Olympics athletes' village, they have been part of a creative rather than a destructive process. Sections of the frieze have been digitally scanned, made into moulds and cast in concrete to clad the building in a bold attire of light, shadows and movement.

The athletes' village is a residential development on the east side of the Olympic park that will provide 17,230 beds for competitors and officials during the Games, before conversion into 2,818 flats, half of which will be affordable. Most of these will be in 10-storey courtyard blocks, the first now nearing completion. The scale is unusual – more like something you might find in continental Europe than in London, where tall housing development has generally been limited to widely spaced slab blocks or towers.

So far, 16 architectural practices have been appointed to work on the village, ensuring variety across the 60 buildings. As part of the Olympic Delivery Authority's commitment to include emerging talent, a number of up-and-coming practices have designed facades for buildings planned by more established names. To some, the idea of designing only the facade of a building overseen by others would be abhorrent. Niall McLaughlin however has seized the opportunity to experiment with precast concrete. "With a cast material you can very accurately lift detail off other things, like in brass rubbing," he says.

Working on a base building by Glen Howells Architects, McLaughlin has indulged his interest in Gotfried Semper's theory of dressing (bekleidung), according to which the origins of architecture are thought to lie in the cloaking of a frame with woven hangings as protection against the elements.

The theme of the Parthenon frieze is a procession towards the Acropolis that took place every four years in ancient times as part of the Great Panathenaic Festival. This also included sporting games, so the analogy with the modern Olympics is apt. But McLaughlin plays down this obvious reading and points instead to the iconic status of the Elgin Marbles and the different processes involved in their production. "The Parthenon stones were made in a particular place at a particular time. Their deracination and constant re-idealisation has made them into something else – something iconic that people recognise, like a picture of Elvis."

On the building the elevations have been composed so that the relief panels appear to be the infill between smooth-cast column and beam elements of a trabeated structure. "We wanted to design facades that would express in a very direct way the frame behind," McLaughlin says. Despite this apparent clarity, the panels are actually made in various different larger forms with false joints in places. McLaughlin revels in the variety of the

Photos: Niall McLaughlin Architects

ABOVE
The reliefs are always projected in front of the adjacent smooth panels

LEFT
Negative glass-fibre-backed rubber moulds were made of five sections of the frieze

BELOW LEFT
The panels were cast in a variety of large forms, with false joints in places

PROJECT TEAM
Client Olympic Delivery Authority
Facade architect Niall McLaughlin Architects
Lead architect Glenn Howells Architects
Contractor Bovis Lend Lease
Precast concrete subcontractor Techrete
Historical consultant Dr Ian Jenkins, senior curator – Ancient Greece, British Museum
3D scanning Chris Cornish (sample and hold), Tom Lomax
Positive relief machining Metropolitan Works

precast elements, likening it to the juxtaposition of order and difference in Sol LeWitt's 122 Variations of Incomplete Open Cubes.

Five different sections of the frieze depicting horses were chosen for the relief panels with the help of British Museum senior curator Ian Jenkins. These sections were scanned digitally while the museum was closed one night by Tom Lomax of the Slade School of Fine Art and Chris Cornish of 3D filming company Inition.

Positive "plugs" were then cut out of a polyurethane model board using a 5-axis router at London Metropolitan University. Using a 5-axis rather than a 3-axis machine allowed the board to be undercut, as a sculptor could do working by hand, which meant the strong shadows of the original are more accurately reproduced. After the initial scanning, the process was managed by specialist precast contractor Techrete.

Negative glass-fibre-backed rubber moulds were made, two from each plug, to allow the concrete casts to be created more quickly. Five different-sized panels were cast from each mould by fixing a temporary stop-end, making a total of 25 panel types. To achieve a white finish, the concrete incorporates white cement with a white Malaga Dolomite aggregate and buff sand from Gloucestershire. The choice of colour is ironic considering the various attempts in the 19th and 20th centuries to "restore" the Elgin Marbles to their assumed original white – the stones would in fact always have had a honey-coloured patina.

The panels are fixed using stainless-steel brackets with tolerance for adjustment in three directions (see drawing). According to Techrete production manager Henry Clifford, the process on site was very carefully planned: "The panels were delivered in a sequence so they could be lifted straight off the trailer on to the building in a single operation."

A random number generator was used to order the panels on the elevation and there is just enough variety that the repetition is not apparent. The reliefs are always projected in front of the adjacent smooth panels, expressing the primacy of the construction system over the decoration, but they are cut abruptly at the panel edges so the horses seem to jostle in a continuous procession across the facades. By embracing the restrictions of the brief, and the possibilities of precast concrete, McLaughlin has produced a work of dignity and joy.
Graham Bizley is a director of Prewett Bizley Architects

Fixing the frieze

A prosaic housing block at the athletes' village in east London has been brought to life by a sculptural facade of precast concrete panels decorated with reliefs based on the Elgin Marbles. The 10-storey building will contain 113 flats in a new residential community on the edge of the Olympic park.

The structure is an in-situ reinforced concrete frame consisting of 500 x 250mm columns around the perimeter with two central cores. The 225mm flat floor slabs are post-tensioned to eliminate the need for down-stand beams, thereby maximising the floor-to-ceiling heights.

The precast concrete panels span the full storey height and are fixed top and bottom into the floor slabs via stainless steel brackets. Where space permits, a concrete corbel was cast into the back of the panel to transfer the load down to the floor. In tighter spaces where fixings were required next to columns, for example, a narrower stainless-steel bracket was cast into the rear of the panel. A 75mm-diameter hole in the floor slab allows tolerance to locate each bracket with a stainless-steel dowel which was then glued in place.

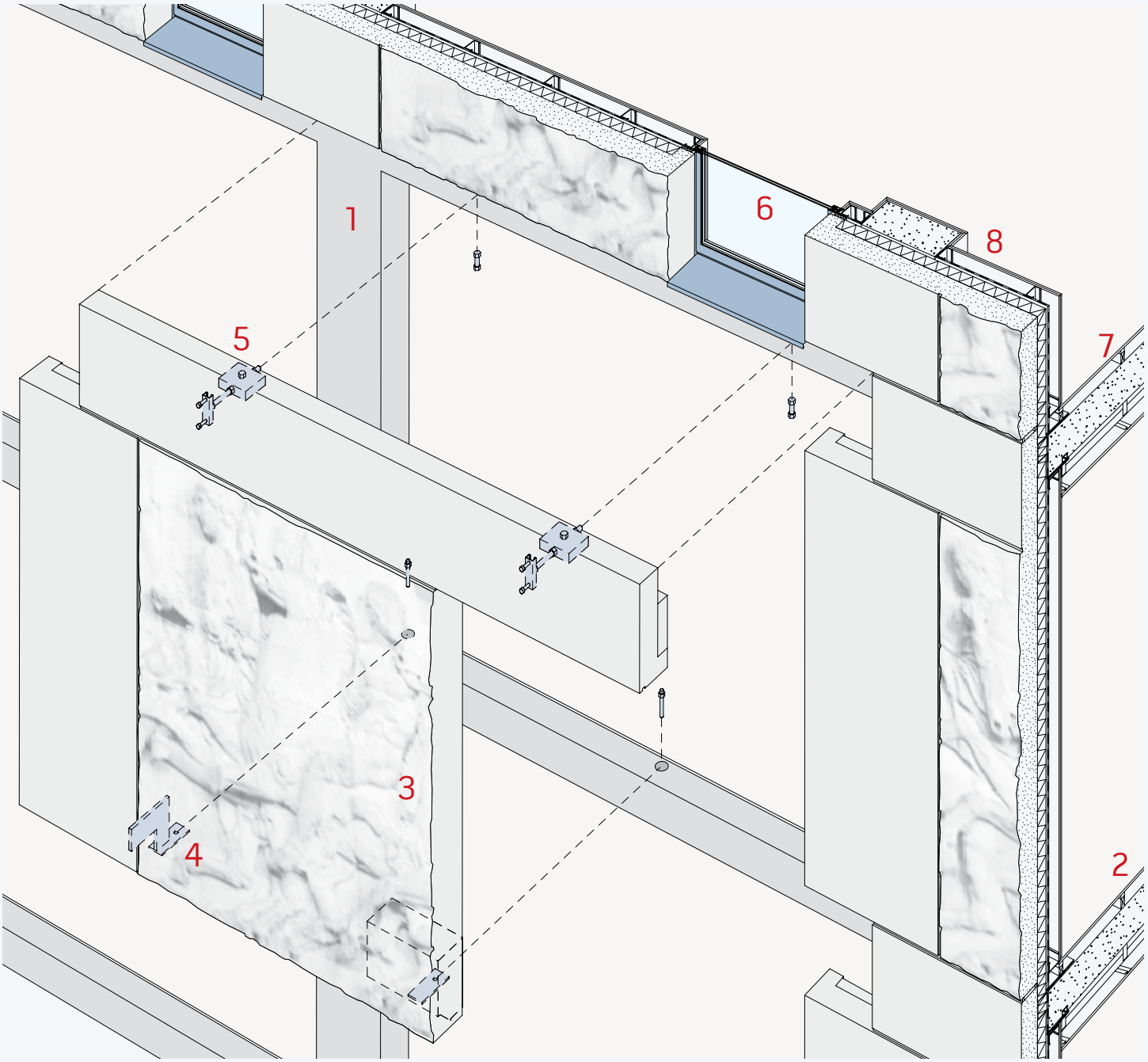
At the head the panels are restrained using precast concrete subcontractor Techrete's own adjustable fixing. Metal channels cast into the panel and the soffit of the slab allow adjustment in three dimensions; 20mm recessed joints between panels allow for up to 8mm of incremental movement. Adjacent panels are pinned together with stainless-steel dowels.

Insulation was pre-bonded to the precast panels prior to installation. Internally a metal studwork frame supports a plasterboard lining that wraps around the columns.

1. Structural frame
500 x 250mm in-situ reinforced concrete columns at nominal 4m centres.

2. Typical floor
15mm tongue-and-grooved particle board floor.
75mm void with acoustic battens at 600mm centres.
225mm post-tensioned in-situ reinforced concrete floor slab.
165mm ceiling service void.
Taped and jointed 12.5mm plasterboard ceiling on proprietary suspended hanger system.

3. Cladding panels
Precast concrete panels with cast relief on some faces.
20mm shadow gaps between panels, allowing for a maximum of 8mm incremental movement.



DETAIL: CUTAWAY SECTION THROUGH TYPICAL BAY

Joints sealed from both sides with rebated mastic bead.
20 x 10mm false joint recesses within panels.
Stainless-steel dowels between adjacent panels.
EPDM (ethylene propylene diene monomer) membrane bonded to rear of panels behind joints.
90mm rigid insulation fixed to rear of panels.

4. Lower fixings
Concrete corbel cast into rear of cladding panel carrying dead load where there is sufficient space.
Stainless-steel fixing bracket to locate corbel bearing on floor slab.
Stainless-steel brackets bolted to channel cast into rear of cladding panel where space is insufficient for the concrete corbel.
Brackets fixed with stainless-steel dowels resin-glued into 75mm-diameter, 100mm-deep holes in slab.

5. Upper fixings
Stainless-steel fixing brackets to restrain cladding panels to floor slab.
Brackets bolted to galvanised steel channels cast into underside of floor slabs and to rear of cladding panels, allowing for vertical and horizontal adjustment.

6. Window
Inward opening PPC (polyester powder coated) aluminium window frame mounted on galvanised steel bracket fixed to floor slab.
Window restrained to reveals of precast concrete panel with M8 bolts in six locations.
Double-glazed sealed unit.
PPC pressed aluminium cill fixed with clips to top edge of cladding panel.
Painted MDF blind box above window.

7. Floor edge
Continuous 90-minute proprietary mineral-fibre fire stop and acoustic barrier between slab edge and rear of cladding panels.
Insulation board to be installed locally after sealing of cladding panel joints.

8. Internal lining
100mm-wide proprietary light-gauge galvanised-steel studwork frame fixed to floor slabs at top and bottom.
Two layers of 12.5mm plasterboard taped and jointed with paint finish.
Air-tightness and vapour control membrane wrapped over outside of metal studwork frame and taped to columns and floor slabs.

Detail drawing by Graham Bizley

WHERE THERE'S MUCK, THERE'S CLASS

A sewerage pumping station for the Olympic park proves that infrastructure projects can have architectural sparkle

ABOVE
The patterns are taken from Victorian drawings by Sir Joseph Bazalgette
LEFT
The images were cast on 3m-high panels
BELOW
The cylinders of the odour control system are finished in Olympic logo pink

Photos: Rob Scott; Olympic Delivery Authority

John Lyall Architects did not have the most glamorous of briefs for the Pudding Lane pumping mill. A vital part of the extensive infrastructure under construction at London's Olympic park, it will act as the primary foul pumping station, connecting the site's new sewer system to the existing northern outfall sewer. But the result is a functional building with surprising architectural elegance.

Outline planning permission was originally granted for a rectangular shaft and with a box sitting on top, but the architect decided instead to design a circular concrete shaft ring, continued and collared above ground with the same exposed concrete shaft rings. There is a pleasing contrast between the exposed concrete finish of this core and the large cylinders of the odour control system, finished in Olympic logo pink.

Meanwhile, the pigmented grey-black precast concrete walls of the building and the perimeter feature a relief pattern inspired by the Victorian drawings of Sir Joseph Bazalgette – the civil engineer who devised London's sewer network.

To create the effect, digital images of drawings of pumps and pistons from the nearby Abbey Mills pumping station were translated into 3m-high ribbed rubber formwork moulds. These images were then cast into the precast concrete panels to provide a subtle graphic grooved texture.

The curved walls are themselves 6m tall, and the visual impact is further heightened by the use of two-tone pigmentation, the top band lighter than the bottom. The architects predict that as the concrete weathers and lichen grows on its surface, the precast concrete surfaces will develop further interesting patination and effects.

There is no doubt that this is a more modest building than many in the Olympic park, but it demonstrates that function is no enemy of form, and that in the right hands, even the most uninspiring of facilities can be accomplished with a little architectural pizazz.

PROJECT TEAM
Client Olympic Delivery Authority
Architect John Lyall Architects
Structural engineer Hyder Consulting
Main project contractor Barhale
Main building contractor Hutton Construction
Precast concrete Thorp Precast

Deep-angled window recesses create a play of shadows

Undressed internal concrete contrasts with rich wood panelling

Photos: Arqf

LAW AND ORDER

The intelligent use of concrete on the new courthouse in the Portuguese town of Gouveia creates a sense of quiet dignity and a solid civic presence

Barbosa & Guimarães' law courts in Gouveia are a robust departure from the Portuguese practice's playful offices for Vodafone in Oporto, as seen in CQ's last issue. Whereas in Oporto the structural potential of concrete was used to express a fluid dynamism, here the material provides a dignified, solid civic presence.

The Palácio de Justiça replaces an existing building located between two parks, and is raised on four substantial pillars so that the spaces are connected beneath it via a new plaza – a clever solution for lightening what might otherwise have been a rather formidable box. The mass of the building is also reduced by deep-angled window recesses that create a play of abstract shadows across its surface.

A generous flight of concrete stairs leads up from the lower plaza into the heart of the building, the stairwell left open so that sunlight floods the space below. The external facades are gleaming white, but the internal concrete is left undressed, its sombre grey hue grounding the building and giving it an appropriate sense of gravitas. But any suggestion of austerity is undercut by the high-quality finish of the interior surfaces, which gives it a contemplative tactility, and by the contrast with the rich, dark wood panelling and furniture and the polished marble floors.

Like the window recesses of the facade, all the detailing throughout the building is clean and sharp. In the public areas, this is offset by the strong natural light, while vertical skylights in the courtroom provide a more diffuse and subtle effect.

This is a striking and intelligent building with a simple, ordered approach to space, exuding a quiet dignity. The sharp visual contrast between the two different concretes, brilliant white outside and grey within, works well because of the quality of the finish achieved with each.

PROJECT TEAM

Client Department of Finance and Justice, Portugal
Architect Barbosa & Guimarães
Main contractor Jose Coutinho SA

The main staircase leads up from the lower plaza into the building

FLOATING FORTRESS

David Chipperfield's Hepworth Gallery in Wakefield is an imposing concrete citadel that seems to rise straight out of the River Calder. But this imposing exterior conceals a surprisingly flexible space

David Chipperfield's £35m Hepworth Gallery is the focal point of the regeneration of Wakefield's River Calder waterfront, an imposing citadel-like form that uses an unusual concrete finish to great effect.

Located on the site of a former mill and facing a weir, the gallery has an eclectic mix of neighbours including Victorian warehouses, modern low-rise industrial units, a motorway slip-road ridge and the rather fine medieval Chantry Chapel. At 5,000m^2, it is the largest gallery to be purpose-built in the UK for 50 years, and houses the Hepworth Family Gift, which comprises 30 previously unseen models and prototypes by Wakefield-born sculptor Barbara Hepworth. Also included in the gallery are works by other artists including Jacob Epstein, Henry Moore, Anthony Caro, LS Lowry and David Hockney.

The gallery consists of 10 double-height trapezoidal concrete blocks, each with independent mono-pitched roofs. The blocks' monolithic presence gives the building a real sense of identity and purpose and, despite rising straight from the river, the gallery feels firmly rooted to the ground.

While the choice of self-compacting concrete serves to emphasise the building's solidity, the use of a coloured pigmentation gives it a rich, shimmering quality and complements the tones of the exhibits within. The shade is a hard-to-pin-down greyish aubergine, described by the architect as "Hepworth Brown".

The addition of pigment to self-compacting concrete had never been tried in the UK, and bespoke pour techniques had to be developed to achieve the desired patina and ensure an even colour distribution. Following a range of tests, limestone fines were chosen to replace fly ash (FA).

The structure sits on a 400mm raft slab on piles. More than 100 piles were sunk across the site, with their caps connected by a continuous ring

BELOW The walls have been built to reservoir standard and sit on top of more than 100 piles sunk into the Calder

beam upon which the walls were cast in situ. The 300mm-thick walls have been constructed to reservoir standards, with a dense reinforcement mesh of 20mm rebar at 150mm centres, because they not only face the full force of the weir but also serve as a flood defence for the area.

The designers have also taken advantage of the Hepworth's riverside setting for an integrated approach to the building services, with river water directed through the line of an old mill race at basement level to provide cooling. The building has been designed to achieve a "very good" BREEAM rating, and potential heating and cooling demands have already been mitigated by the heavyweight thermal mass of the concrete structure.

Visiting the galleries on the upper of the two storeys provides an insight into how the demands of the internal spaces have determined the external concrete structure. The 10 gallery spaces reach up into the inclined roofs, lit by generous clerestory glazing, and no two are the same. Each has its own shape and dimensions and, therefore, its own character. The high, pitched ceilings allow the monumental – a prototype of Hepworth's enormous "Winged Figure", for example – to exist alongside more intimate displays of drawings and sketches.

On the lower storey there is a learning suite, cafe, lecture theatre and support facilities, and here too large windows provide a visual link to the outside, dispelling any sense of a hermetically sealed space. The gallery allows the visitor to look out upon the landscape of swirling water and industrial buildings, and then to look back at the exhibits and contemplate the relationship between the two.

The Hepworth Gallery is one of a series of new museums and galleries in the UK – including another Chipperfield project, the Turner Contemporary in Margate – but thanks to its concrete walls it already has a sense of history.

Photos: Jaap Dekkes, courtesy of Ramboll

RIGHT The gallery consists of a series of linked trapezoidal concrete blocks
BELOW The high ceilings allow space for larger exhibits, such as Barbara Hepworth's "Winged Figure"
BELOW RIGHT Pigment has been added to the self-compacting concrete for the first time in the UK

PROJECT TEAM

Client Wakefield Council
Architect David Chipperfield Architects
Structural engineer Ramboll UK
Main contractor Laing O'Rourke Northern
Self-compacting concrete Lafarge Agilia