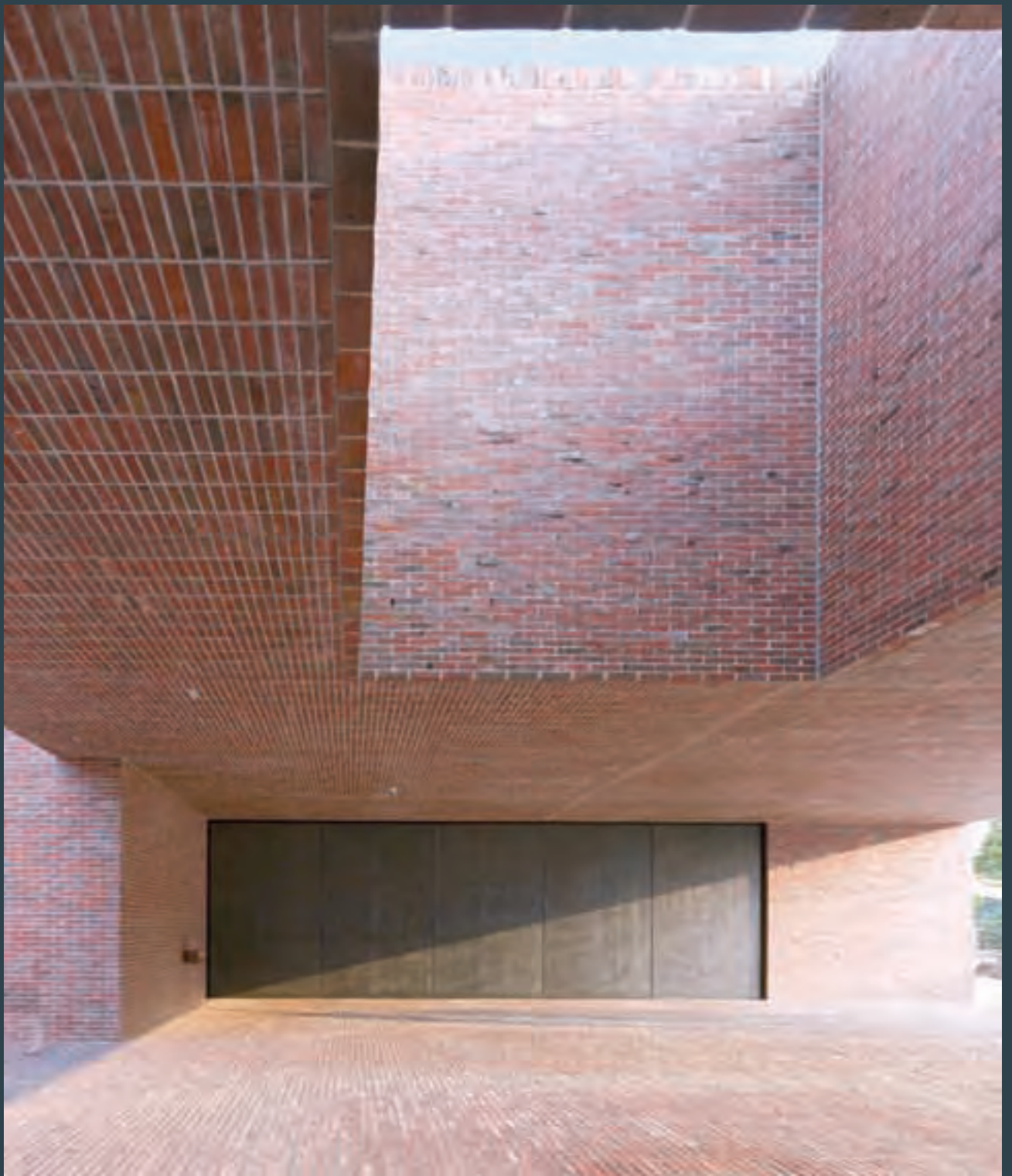


BRICK BULLETIN



Meck Architekten in Munich
Martin Pearce profiles Hopkins Architects
DSDHA's Pond Meadow School in Guildford
John Pardey on Jørn Utzon's early brick projects
Ortner & Ortner's garden city of house types
Testing times for unfired clay bricks

SPRING 2009

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Frontispiece The late Jørn Utzon's Kingo housing at Helsingør, Denmark (1956-59). Photo: Seier + Seier.

Cover Dominikuszentrum, Munich, by Meck Architekten. Photo: Michael Heinrich.

Back cover One of 12 pavilions, designed by Erwin Heerich on Hombroich Island, an arts foundation located on a former NATO missile base near Neuß in Germany. Photo: Stiftung Insel Hombroich.

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Complex simplicity

Historically, leaner times have often resulted in buildings of austere beauty. Limited funds tend to concentrate the minds of designers to achieve more with less and a 'limited palette' of materials becomes a creative virtue. The fact that no other construction material offers the creative potential of brick is amply demonstrated by a number of projects in this issue of the Brick Bulletin – from Ortner & Ortner's catalogue of house types in its latter-day 'garden city' at Merschkamp to Meck Architekten's masterly fusion of spiritual and social values in the Dominikuszentrum north of Munich.

Katherina Lewis

To find out more about the bricks or pavers in featured projects, or to submit projects for possible publication, email brick@brick.org.uk or phone 020 7323 7030

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The BDA represents the United Kingdom and Ireland's clay brick and paver manufacturers and promotes excellence in the architectural, structural and landscape applications of brick and pavers. The BDA provides practical, technical and aesthetic advice and information through its website www.brick.org.uk, in its numerous publications and over the phone.

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RMJM campus for West Lancashire

RMJM has designed a new £35m campus for Skelmersdale and Ormskirk College in West Lancashire. Forming a key part of the wider regeneration of Skelmersdale, the 12,500 square metre scheme will provide state-of-the-art facilities for 4000 students and the local community. The main accommodation will be sited on a natural plateau, allowing the south-facing entrance elevation to form a bounded square at the end of a pedestrian high street. The scheme is planned along a north-west to south-east axis, with the east elevation addressing the urban context of Skelmersdale and the west elevation addressing the woodland setting of Tawd Valley. Within its semi-urban context the building presents a timber face to the town and a brick face to the valley, so it sits comfortably on its site when viewed from either side. A timber box houses the specialist teaching spaces. This element is held in place by a flowing ribbon of brick, which



MOS villa is one of a hundred

MOS Architects – one of a hundred emerging practices picked by Jacques Herzog to design 100 houses for a site in the Ordos desert, Inner Mongolia – has released designs of a masonry villa inspired by traditional Chinese courtyard houses

and nomadic yurt typologies. Planned around six courtyards, the 1000 square metre dwelling comprises 11 rooms ranging in height from four to ten metres. Each living space is conceived as an individual volume with its own roof. The rooms are connected at the corners to remove the need for hallways and excessive

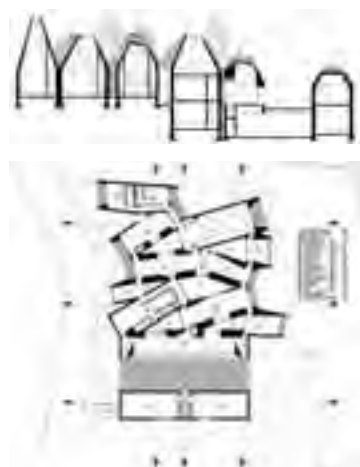


Gehry completes Lewis Library

Frank Gehry's Lewis Library has been completed at Princeton University, New Jersey, after four years on site. Distinguished by a curving roof and 30-metre high tower, the 8100 square metre building is clad in brick, stucco, glass and stainless steel. The library, which houses the university's science collections and technology spaces, will anchor a new precinct on the east campus that includes designs by Hopkins Architects and Rafael Viñoly (photo: Brian Wilson).

Brick Awards 2009 launched

The Brick Development Association has launched this year's Brick Awards. The principal criteria for entry is that projects feature clay bricks or pavers made by BDA members (unless they are entered in the worldwide category). There are 13 awards split into three categories: housing, building and landscape, and technical and craft.



There is also the BDA Building of the Year award for the overall winner. Entries are judged on design, choice of brick, brick detailing and craftsmanship. The awards will be presented at London's Marriott Grosvenor Square Hotel on 4 November. The closing date for entries is 19 June 2009. Entry forms are available from www.brick.org.uk/2009awards, or by emailing brick@brick.org.uk or by calling the BDA on 020 7323 7030.



Who is Tyler Rozicki?

Tyler Rozicki, an architectural student with a passion for masonry construction, is the man behind the Brick Blog. The website documents a number of inspirational masonry projects – discovered by the author during the course of his studies – including Eladio Dieste's Cristo Obrero Church in Atlantida, Uruguay (above), and carved brick sculpture at the University of Florida (below) by Partin Studios (details: <http://brickmasonry.blogspot.com>).



circulation space. Using regional materials, each unit will be constructed from in-situ concrete and faced with brick. A combination of solar chimneys, skylights, thermal mass and carefully positioned windows is intended to optimise comfort and natural lighting despite dramatic daily temperature swings throughout the year.



About Face winners announced

Perth-based practice Pental & Neille has been announced as the joint-winner and peer winner of About Face 2008, Think Brick Australia's prestigious invitation-only design ideas competition. The design is for a new arts building in the centre of Perth, which draws on the city's rich tradition of brick architecture. Located in Wolf Lane, a thoroughfare connecting King, Murray and William Streets, the four-storey structure is constructed using light grey/buff coloured



Green light for Allies & Morrison

Allies & Morrison has obtained planning approval for a £100m office building at King's Cross Central in London. Featuring robust brick columns and concrete beams with deep reveals, the scheme is designed to achieve a BREEAM Excellent rating.



bricks externally and white glazed bricks inside. Unusual facade treatments, window openings and skylights produce varied and shifting light effects throughout the building. The ground floor is occupied by gallery spaces, the first and second floors house administration and archive functions, while the third floor is given over to an artist-in-residence programme. All four levels are connected by a circular staircase. Both the gallery and studio spaces feature barrel and parabolic brick arches, which are naturally lit from above using 'snorkel-like' funnels.



Greyhound triumph for RHM

Riches Hawley Mikhail Architects has won the RIBA's Greyhound Opening housing competition ahead of Make, Shed KM and Maccreeor Lavington. The brief was to design 100 affordable mixed-tenure homes on a 1.2 hectare brownfield site in Norwich.



'Bricks are so durable,' says architect Stephen Neille. 'They provide a permanent base against which the ephemerality of light can play. They can also, as individual units, be used to configure spaces that surround you, spaces that vault, spring, curve and move, where light plays on the surface.' Adds Neille, 'brick has quite a powerful ecological direction, if we don't build poorly and have to knock buildings down.' The other winning design was by m3architecture for a community centre in Brisbane (details: www.thinkbrick.com).



A history of brick down under

As an alternative history of Sydney, The Brickmasters 1788-2008 by Ron Ringer, explores the impact of social, economic, technological and architectural change on one of Australia's oldest industries. Beginning with the discovery in 1788 of workable clays at Cockle Creek in what is now Darling Harbour in Sydney, this richly illustrated book traces the development of brickmaking during early colonial times, noting the industrial transformations that carried the trade forward into the age of mass production. Central to the narrative is the story of The Austral Brick Company which, under the stewardship of 'King of Bricks' William King Dawes (1898-1981), became Australia's longest surviving manufacturer of clay products since federation in 1901 (Dry Press Publishing, ISBN 9780646488257, photo: Josh Hill). • To purchase a copy of The Brickmasters phone Chris Blanchett on 01903 717648 or email sales@bucklandbooks.co.uk.

50th anniversary for the Lego brick

A perennial favourite of children and architects alike, Lego has celebrated the 50th anniversary of the day it filed its first patent for the iconic plastic brick. To celebrate, the company has released a commemorative version of Lego Town Plan, which was one of the first themed elements of the 'system of play'. Although updated, the set includes 1950s period elements, such as a gas station, movie theatre and, of course, a town hall. The original Town Plan box from 1955 featured Lego founder Ole Kirk Christiansen's grandson Kjeld as a boy. The new box features him again, this time as a grown man (details: <http://cache.lego.com>).



Ortner & Ortner's Garden City revival

Ortner & Ortner, architect of the celebrated Vienna Museum Quarter, has completed the Merschkamp residential district near Münster in north Germany. The competition-winning scheme develops the idea of a compact garden city and is conceived entirely in brick, referring to the brick houses of Mies van der Rohe and Heinz Bienefeld as well as farmhouses in the region. The seven basic house types extend the language of brick from walls to carports and paved patios to create something akin to a courtyard house and suggest complexity and variety within the project as a whole. A central 'ring' road provides access to all 27 houses which range from 106 to 174 square metres. Water-struck bricks with flush pointing are employed throughout, with a variety of bonding patterns.

While the residential area is tightly planned, the development includes an open play and sports area to the south that is shared with the residents of nearby houses. The neighbourhood is landscaped with plants chosen for their colour. Pyrus calleryana provides shade for the parking areas and prunus accolade structures the park; beech hedges define the front gardens.

Credits Architect: Ortner & Ortner; design team: Manfred Ortner; Laurids Ortner; Markus Müller (project manager); client: Wohn & Stadtbau Münster; Wohnungsunternehmen der Stadt Münster; photos: Christian Richters.



- Garden court house west (8)
170sq m, plot 350sq m
- Garden court house east (9)
140sq m, plot 325sq m
- Garden house (5)
130sq m, plot 250sq m
- Court house (3 units)
140sq m, plot 250sq m
- Gate house (2)
110sq m, plot 220sq m



Site specific: DSDHA in Guildford

Brick is used to integrate yet subtly differentiate a special needs school from its surroundings.

DSDHA has completed a special needs school for 92 pupils aged two to 19 for Surrey County Council in Guildford. Pond Meadow School is part of a £33m flagship educational campus shared with Christ's College, a Church of England secondary school.

Designed around the concept of an evolving journey through the building, every classroom is different. The layout is organised around three courtyards with classrooms located around the perimeter. The undulating form is designed to accommodate the progression of large and small spaces.

Buildings in the surrounding area are predominantly pitched-roofed red brick houses. The school responds with high quality brickwork with intricate detailing, which the architects suggest gives it a more civic appearance. A high quality engineering brick was selected, with an elongated module size (290x90x52mm) and a colour which slightly differentiates it from the predominant local brick.

A third-lap stretcher/running bond was used to reinforce a sense of horizontal movement across the facades. A semi-glazed finish ensures that light and shadow contrast to highlight the angled elevations. In shadow the bricks are a deep maroon, but when reflecting light they appear silver.

Windows and doors sit flush with the facade. At the building ends, the brick skin stretches to envelop the four metre cantilevered canopies. By contrast, the entrance is defined by a carved recess, cutting into the



smooth, sheer surface of the external walls.

Brick specials were developed with the sub-contractor to allow the bonding to continue seamlessly around the angled corners. Intricate brick setting-out meant that only 1/3, 2/3 and whole bricks were used throughout the project, avoiding the need for cut

bricks of different sizes. This careful setting-out extended to the prefabricated brick-faced concrete panels that clad the cantilevered canopies, ensuring a visual consistency with the site-laid bricks. Site tolerances were key, and the prefabricated 'flying brickwork' units were hoisted into place in a matter of days.

Careful consideration was given to the choice of mortar and movement joint mastic. A variety of sample panels was offered by the contractor to enable an informed decision by DSDHA and, after deliberation, a bespoke grey mortar colour was produced by mixing two of the standard ranges.

Credits Architect: DSDHA; structural engineer: Adams Kara Taylor; services engineer: Atelier Ten; cost manager, project manager: Davis Langdon; collaborative artist: Martin Richman; landscape consultant: Townshend Landscape Architects; fit&e: Building Design Partnership; planning consultant: Alliance Environment & Planning; acoustics: Sandy Brown Associates; fire: Fire Design Solutions; main contractor: Wates Construction; client: Surrey County Council; photo: Tim Soar.

Keep on trucking

A theatre by Wright & Wright Architects resonates with Hull's traditional brick warehouses.

Due to open later this Spring, the £10m Hull Truck Theatre by Wright & Wright Architects comprises a 444-seat auditorium, a 138-seat studio theatre, rehearsal and workshop spaces, education facilities, bars, corporate areas and offices. An industrial aesthetic permeates the design, with robust and durable materials considered both conceptually appropriate and practically necessary for the building. A combination of smooth blue and glazed gloss bricks are used to clad the building both inside and out. This resonates with the grand warehouses of Hull – an indigenous building form from when the city was a prosperous, cosmopolitan port.



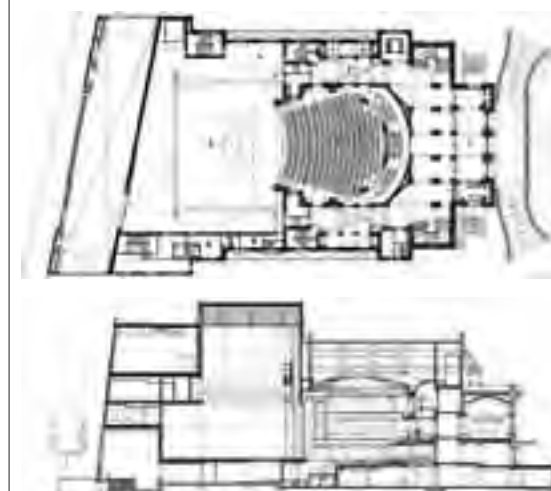
In order to avoid cuts and unsightly junctions, the project team drew every brick in the building in elevation. Brick specials were carefully identified and detailed on the layout drawings. Great care was taken to ensure that the mortar colour, joints and coping harmonised correctly with the brickwork. Several large, full-size sample boards

were made and inspected before the preferred combination was chosen.

Brick walls and paving extend into the public foyers at ground- and first-floor level, allowing these areas to become part of the street. While it is not unusual for glazed bricks to be used in theatres, in this instance they form a sensuous, tough and tactile

storey-high plinth to the street, which is carried through into the foyer.

Credits Architect: Wright & Wright Architects; m&e: Max Fordham; structure: Alan Baxter & Associates; qs: Davis Langdon Cost Consultants; planning supervisor: Buro Happold; project manager: Davis Langdon Project Management; contractor: Quarmby Construction Company; theatre consultant: Anne Minors Performance Consultants; client: Hull Truck Theatre Company.



An extension to one of Holland's oldest theatres is rendered in brick, ceramic and glass.

Designed by JAG van der Steur and built in 1918, the Municipal Theatre in Haarlem is one of Holland's five oldest theatres. After almost a century of use, the listed structure no longer met contemporary requirements for theatre techniques, production facilities and building accessibility. This led to Erick van Egeraat Architects being appointed to undertake a major programme of renovation and extension.

The most striking intervention is a new flight tower. The visual impact of this element is minimised through careful massing and the layering of different materials. Brickwork (similar in colour and hue to the existing building), together with ornamented porcelain and partially screen-printed glass, forms a clear connection with the historic facades.

The use of lighter materials towards the top of the tower further reduces its visual impact. The ceramic ornaments, which make reference to the porcelain featured in the original facade, were developed in close collaboration with Dutch ceramic artist Babs Haenen.

Credits Photos: Christian Richters.



PROFILE

Hopkins Architects has produced a strong and consistent body of work in brick whose iterative development shows an engagement with the 'timeless verities of architecture', says Martin Pearce.

There was a time when to be called a 'lightweight' architect was a compliment. 'How much does it weigh?' was what Buckminster Fuller wanted to know when he visited Michael and Patty Hopkins' own modular steel and glass house in Hampstead, at the bleeding edge of constructional technology in the late 1970s. Michael Hopkins' architectural outlook had been formed in the 'white heat' technophilia of the Architectural Association in the preceding decade, a time that saw buildings as assemblages of lightweight industrial prefabricated components, borrowing from aircraft engineering. Buildings would become transitory consumer products; some would be able to walk, others would even be able to fly! The impact of these fantastical ideas was very real and led to the high-tech school of architecture which has produced some of the great buildings of our age: Piano + Rogers' Pompidou Centre in Paris and the Willis Faber Dumas insurance office in Ipswich, on which Hopkins and Norman Foster collaborated.

Today Hopkins Architects is strongly associated with the ultimate of lightweight materials, the tensile fabric structures developed to enclose the Schlumberger Research Centre near Cambridge (1982) or the Dynamic Earth project in Edinburgh (1999). Buildings such as these and the Lord's Cricket Ground Mound Stand canopy of 1987 have become a much-copied leitmotif, now a familiar sight in shopping malls the world over.

Charles Jencks has observed that Hopkins' work, while light in weight, has an extreme gravitas. Jencks describes gravitas as an architectural system which demonstrates completeness or finality, a concept embodied by the great buildings of the classical past such as the Parthenon or the Pantheon. This timeless order and architectural clarity are the qualities that Le Corbusier and Louis Kahn so admired and sought to capture in their own work.

At Lord's this underlying gravitas is quite literal: the canopy and seating are built upon Frank Verity's



elegant Soane-inspired arches of the original pavilion. This grounds the building in the language of the Roman arch and counterpoints the floating structure above. Working against Verity's structure marked a point when Hopkins' architecture took a greater interest in the use of masonry construction which came to the fore in the 1989 commission for the new opera house at Glyndebourne.

Rather than simply juxtaposing traditional with modern materials and forms, Glyndebourne celebrates the engineering potential of traditional materials, as high technology and age-old craftsmanship seamlessly combine. A Hampshire red brick – handmade to imperial sizes to match the existing house – is employed in generous arcaded apsidal forms. The simple flat arches and tapered brick piers expressing classical entasis and referring to Kahn's Exeter Library are brought to life by changing light modelling deep reveals, the sense of movement, rhythm and intrigue – an appropriately theatrical

Top left: Directors at Hopkins Architects. Left to right: Andrew Barnett, David Selby, Chris Bannister, Henry Buxton, Ernest Fasanya, Michael Taylor, James Greaves, Simon Fraser, William Taylor, Pamela Bate, Edward Williams, Patrick Nee, Patty Hopkins, Michael Hopkins (ph: Tom Miller).
Left: Hopkins House Hampstead, London (1976). Construction techniques developed for larger commercial buildings were used (ph: Martin Wienreb).
Above: Haberdashers' Hall, London (2002). Headquarters for a City livery company arranged around a cloistered courtyard. Timber-screened offices are behind a brick loggia with the hall above (ph: Peter Mackinven).



architectural device. Simple yet moving in its effect, one is aware of the gravitas.

As with Kahn, Hopkins' buildings often employ the repetition of a bay element frequently resulting, to the extent of being classical, in a refined symmetrical plan arrangement affording absolute clarity in form and legibility in use.

This clarity is apparent through to the detail at Glyndebourne. As a student Michael Hopkins bought a timber-framed house in Suffolk and in order to repair it had to discover how it was originally constructed. 'This gave me real insight into timber frame construction,' he says. 'And immediately, as a flash out of the blue, I realised that there was a strong relationship between the way that buildings were put together and the way they finished up looking'.

Glyndebourne, one might suggest, has something of the clarity of medieval timber-frame construction but here translated into brick and concrete.

The Glyndebourne language is developed in Hopkins' 2007 addition to Bryanston School in Dorset, new science and maths departments housed in a three-storey building of soft red brick. The horseshoe plan is extremely economical – this is not an expensive building – and here is used to form a semicircular courtyard at the focus of which is a geodesic dome, perhaps paying homage to Buckminster Fuller.

The economy of the science block is in marked contrast to the school's main building, Richard Norman Shaw's 1895 Queen Anne-style house for Viscount Portman – a project where Shaw, with an unlimited budget and six million bricks, produced by his own admission one of his least accomplished works, thus proving that architectural quality is not necessarily dependent on the finances available.

As at Glyndebourne the sweeping brick-and-a-half solid lime-mortared facade with flat arches works

structurally to support the floors, but the emphasis is on the flatness and grid of the elevation rather than the tapering expression of vertical load paths. The use of thick, solid loadbearing masonry walls today presents certain challenges with regards to Part L performance and here results in a thermal break between the wall and concrete floor, the tenoned point connections expressed as a net of white squares across the elevation. In contrast the outer elevation, being cavity construction, is laid to stretcher bond and using cementitious mortar requires expansion joints, here set to correspond with the pattern of fenestration with concealed steel lintels following the line of the curved plan, in contrast to the flat arches of the courtyard. Thus, the brick bond is not a matter of decoration, but a direct expression of the building's construction. The comparison of these two elevations offers a profound lesson in the appropriate, but fundamentally different use of the same material

Facing page Bryanston School science building, Dorset (2007). A new school science department is housed in a three-storey building arranged around a semicircular courtyard. The classrooms are arranged as fingers which project from the main body of the building into the landscape behind, allowing daylight and fresh air to penetrate into their heart. The form of the new block aims to make a coherent series of spaces that will form a natural continuity with the original Norman Shaw house and the more recent technology block (ph: Anthony Weller).

Above/left Glyndebourne Opera House, Sussex (1994). Hopkins' building replaced a private opera house that had reached the end of its useful life. The new auditorium adjoins an Edwardian country house, set in mature gardens. It occupies the same site as the old, but has been rotated 180 degrees so that the front of house areas now lead naturally onto the gardens. The bulk of the building was disguised by digging it 10 metres into the site. The 1200-seat auditorium, fly tower, stage and back stage are in the centre of the building with foyers wrapped around on three levels. Glyndebourne combines traditional loadbearing brick walls, which match the adjacent house, with highly finished precast concrete ceiling panels. The roof and fly tower are clad in lead panels while a fabric canopy shelters the foyer (ph: Martin Charles).

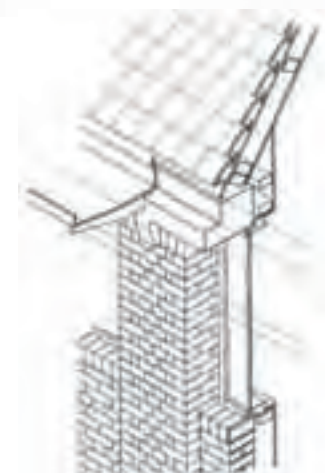


won planning permission with a scheme that sees two pavilions frame the Grade II* listed Institute building. Each pavilion comprises two volumes set at right angles and locked around an L-shaped brick colonnade. This creates new intimate quadrangles while linking to the existing grounds and building, a seemingly simple yet brilliant planning device and a model of compositional refinement and clarity. This rigour extends to the eaves condition and draws on Lutyens to create strong line of precast lintels to form a contrasting entablature. A projecting gutter tray supported on slender steel brackets forms a cornice that will cast strong shadows, serving to model the brick reveals and piers below. Above, a steep plain clay-tiled roof draws from the language of the Arts & Crafts in Hampstead Garden Suburb, the top-lit oast house section accommodating drama and art studio spaces at first-floor level. An enclosing 215mm solid brick wall is to be of handmade bricks, slightly narrower than standard to match the existing building and the intention is that the masonry will be lined internally with hemp batts to create a sustainable breathing envelope.

The Henrietta Barnett School follows several projects by the practice that make extensive use of brick – a sheltered housing scheme for Charterhouse at a former Carthusian monastery in London (2000) and the Haberdashers’ Hall (2002) designed for one of the livery companies of the City of London, are wonderful examples of exquisite material beautifully detailed. Michael Hopkins once said that ‘Our architecture comes out of our engineering and our engineering comes out of our engineers’ and it is true that he has collaborated with the very best engineering minds of our time. But we are perhaps minded to think of engineering as a product of reduction, the paring down too readily associated with the use of so-called high-tech materials – steel, glass and concrete. Great engineering is ultimately about the rigour, clarity and logic of how a building is made, transcending the particularities of individual materials and equally applicable to the use of traditional materials as to the latest composite polymer.

Great engineering is also a product of refinement over time. The Romans perfected the arch over a period of decades, and the medieval masons did not achieve the refinements of the high Gothic overnight. Those architectures were concerned with principles not personalities and today, in contrast with the early modernist avant-garde view that each scheme should be revolutionary, we are perhaps again getting comfortable with the idea that good design is an evolutionary process requiring the iteration of core ideas through different projects. It seems that only in this way can one ever truly strive for these timeless qualities of building. Over the three decades that Hopkins Architects has been in practice, architecture has been plagued by the ephemeral, yet this office has remained consistent, pursuing an architecture of gravitas founded on enduring principles. This concern with materials and making, of iteration and refinement gives the work a remarkable authenticity. It is perhaps an approach that above all touches on the timeless verities of architecture.

Martin Pearce is an architect and teacher at the University of Portsmouth School of Architecture.

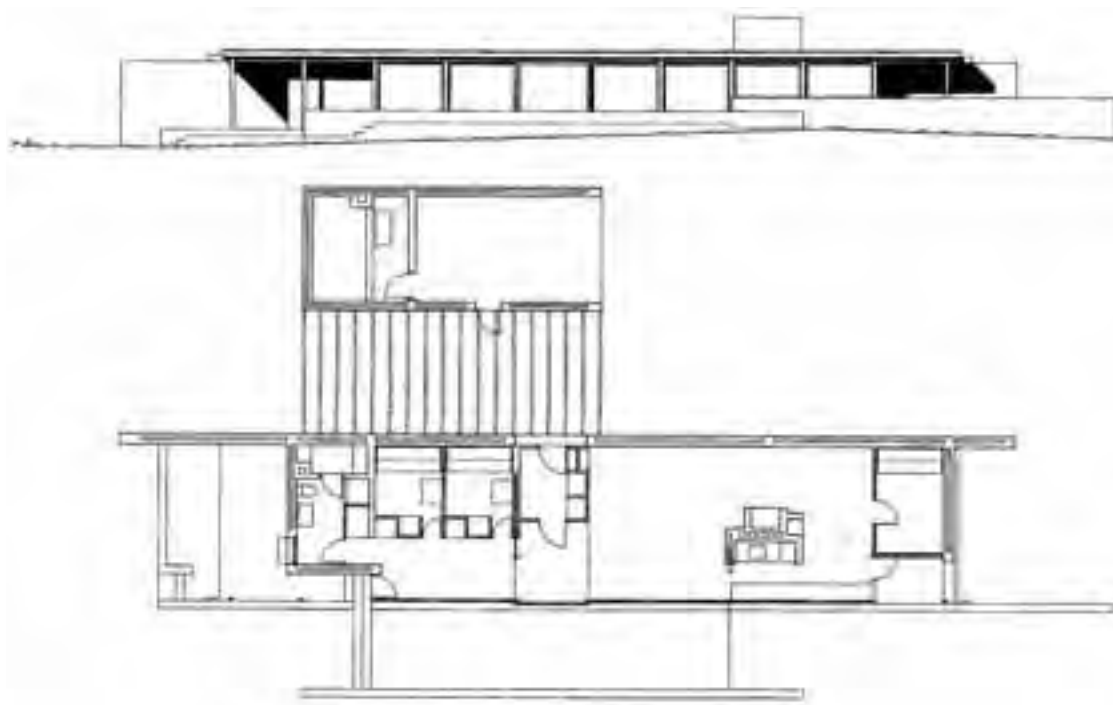


in dissimilar conditions, and all in the same building.

Hopkins’ current project to extend the Lutyens-designed Henrietta Barnett School at Hampstead Garden Suburb in north London is soon to commence on site and returns Hopkins to the area 33 years after his canonical early house. Outwardly these seem radically different, the former glass and steel, the latter brick and tile, yet the gravitas remains.

After 17 previous applications failed to proceed over a period of four decades, Hopkins Architects

Above Charterhouse Sheltered Housing, London (2000). Sheltered accommodation for elderly monks in an early nineteenth century court. Founded as a medieval monastery, the Charterhouse developed as a school and almshouses in a series of collegiate quadrangles. The two new buildings restore the south-west corner of Preacher’s Court, replacing those lost to bombing in the second world war. Both have arcades along the court, off which are the entrances. The walls are of solid, loadbearing, English bond brick. Their openings, including the arcading, are structural brick flat arches (ph: lanthe Ruthven).
Facing page Henrietta Barnett School, Hampstead Garden Suburb (2010). Founded in 1911, the main body of the school is a Lutyens-designed Grade II* listed building, with some later additions. Since the early 1960s, 17 schemes have been developed for the site of the Hopkins building, but all failed either to reach planning or to achieve it. In this case, extensive consultation was carried out with bodies including the Lutyens Trust and the Victorian Society as well as the local authority and English Heritage.



PRECEDENT Poetry from materials – Jørn Utzon’s brickwork beginnings

Utzon House, Hellebæk, 1950-52
 'The simple, primitive life in the country, treks into the mountains with skis or guns, sailing trips, some weeks spent with Arabs in the mountains and the desert, a visit to North America and Mexico, the lifestyle of the Indians – all this has formed the basis for the way of life my wife and I wanted to lead, and this follows in the design of the house'. Fifty kilometres north of Copenhagen, near the coast and in the centre of a beech forest, Utzon found a site accessed by road, though he is reputed to have persuaded the local forester to allow him to cut an entrance route through the forest instead. Built in yellow bricks in a Flemish bond with deep recessed mortar joints, the house reveals the influence of Kay Fisker, Utzon's professor at the Royal Academy in Copenhagen, and P.V. Jensen-Klint as well as the brick houses of Frank Lloyd Wright and Mies van der Rohe. The long, narrow house is raised on a brick plinth, setting it apart from the gently sloping site and giving a horizontal dimension that belies its modest 130 square metre floor area. The glazed south elevation brings plentiful light to the open-plan living room with its freestanding fireplace, whereas the bedrooms are simple spaces lit by skylights.

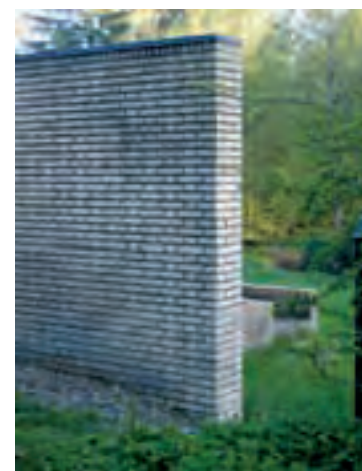
The late Jørn Utzon should be celebrated equally for his work with the humble brick as with reinforced concrete, says John Pardey.

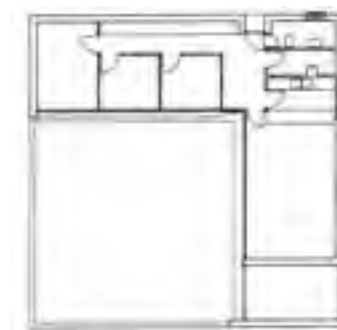
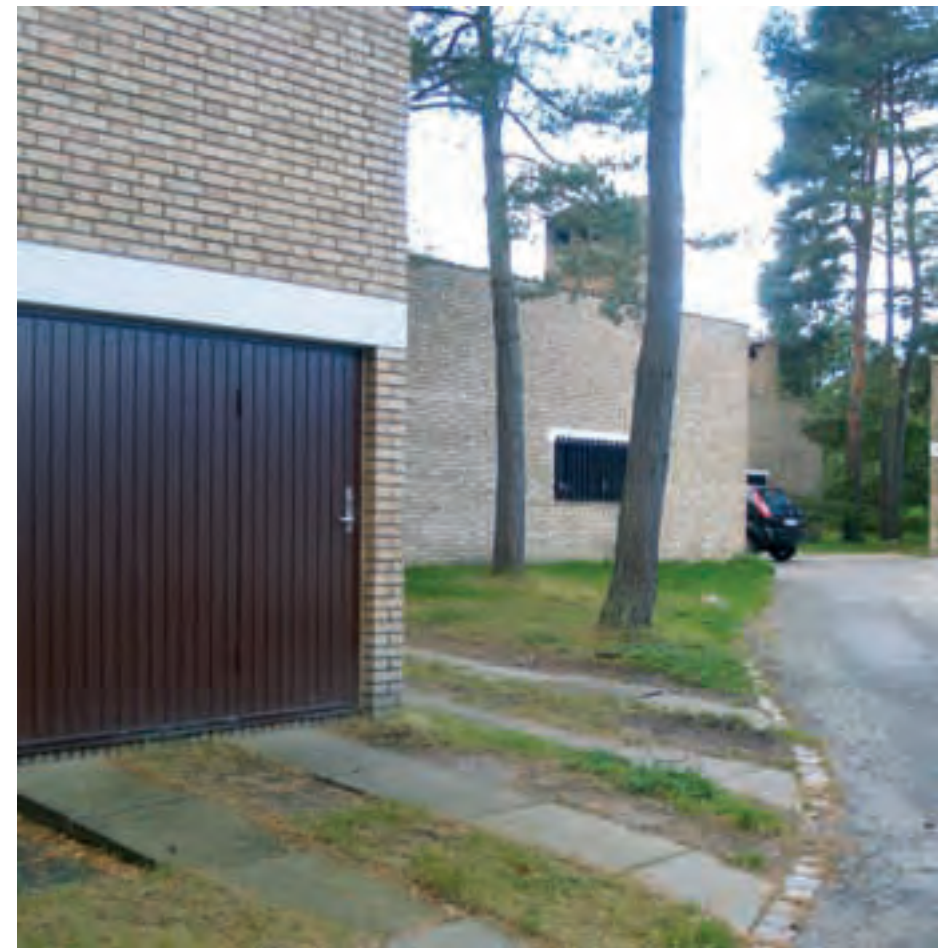
Jørn Utzon, who died last November aged 90, was among the greatest architects of the twentieth century and will forever be remembered for the expressive shells and free forms of Sydney Opera House and, back in his homeland of Denmark, the sublime Bagsværd church with its billowing vaults of concrete. Yet he had made his mark on the international scene well before these masterpieces with the design of his own modest family house in 1952, built in brick and timber in Hellebæk, just outside the town of Elsinør, home of Hamlet's castle.

Working with the simple elements of brick and timber for his home, Utzon wrote: 'viewing architecture as abstract sculpture or painting for the sake of shape... can easily become determined by fashion and appear formalistic, whereas the purely constructive and functional basis combined with sensitivity to light, shade, colour and space opens

up infinite possibilities'. This attitude may seem surprising coming from the man who inadvertently began the cult of 'signature' building with the striking and memorable form of the Opera House, yet Utzon was wedded to the idea of design being the product of 'built' elements rather than free form. The shells of the Opera House in fact comprise 2250 prefabricated concrete ribs, and these are clad with some 4253 tiled 'lids' making the building one of the largest examples of concrete prefabrication on earth – Utzon was always convinced that a building should evolve from its elements of construction.

With the Hellebæk house, brick became a prefabricated module that must not be cut and this rigour was also applied to the standard timber sections employed – the house was equally uncompromising in plan, with its unbroken rear wall turning its back to the cold north winds, punctured only by





the entrance, and fully glazed to the south beneath an over-sailing roof. The house, based on the Danish tradition of brick building that had been revived with the 1940 Grundtvig church by P.V. Jensen Klint and influenced by Frank Lloyd Wright's Usonian houses, came to represent what was to become known as Scandinavian Modernism, whose influence was destined to ripple through the world in subsequent decades.

In 1959, seven years after building the Hellebæk house, Utzon completed another essay in brick with the 'Kingo' houses – a group of sixty-three homes just outside Helsingør. Using the same logic of construction, set within individual boundaries of 15 by 15 metre square enclosures, each house is planned as two wings, one for living and one for sleeping, enclosing a courtyard. The Kingo houses simultaneously evoke Danish farmhouses and Chinese and Islamic courtyard dwellings – small wonder the development came to be nicknamed 'Arab city' and 'Roman town'. In creating a community of houses all built in brick with matching tiled roofs and chimneys that rise directly from the walls resembling the wind-catchers common in Islamic settlements, the impression is reminiscent of the town in Iran that Roland Rainer described as 'made in one casting'.

Within this uniform materiality, each house was given a unique imprint by Utzon setting the exact amount of bricks to be used for the walls of each courtyard with the simple rule that the bricklayer should build each to deal with its individual needs for privacy, shade, view and enclosure. The houses were built with state funding that set a limit of 104 square metres for a three-bed house.

The Kingo houses were to form the prototype for the courtyard housing project Utzon built in 1965 at Fredensborg, another essay in brick and tile that remains one of the most perfect housing projects in a natural and convincing order of the twentieth century.

Kingo housing, Helsingør, 1956-59

Frustrated in his attempt to build an earlier housing development, Utzon persuaded the mayor of Helsingør to give him a 3.6 hectare undulating site with a pond on which to build courtyard-style houses within government low-cost restrictions. With a local contractor and backed by his father, Utzon built a showhouse which proved successful, and the development proceeded in phases. Eventually 63 houses were built, following the contours and arranged to maximise views, sunlight and shelter from the wind. Utzon, quoting Alvar Aalto, described the plan of the houses as 'like flowers on a cherry tree branch, each turning to the sun'. Four similar L-shaped house types were designed, with a living room and study in one wing, and the kitchen, bedrooms and bathroom in the other. Perimeter walls of different heights contain the other two sides of the 15 metre square plots. While the intended market for the development was workers at the nearby Elsinore shipyards, some of Utzon's employees moved here shortly after its completion, when the Sydney Opera House competition was won.

Credits Photos: Seier + Seier; plan drawings: John Pardey.

The heat is off

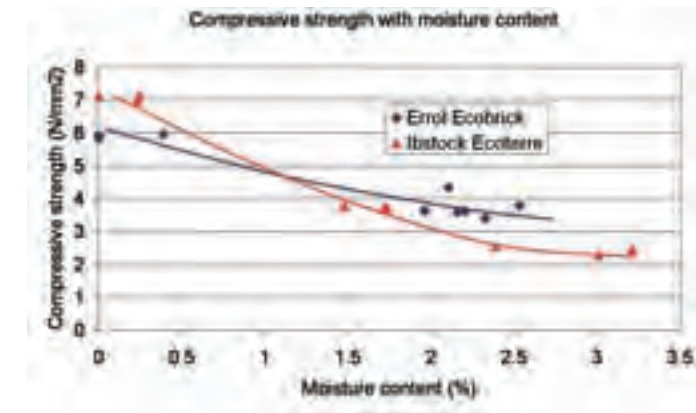
Can unfired clay bricks offer a low-energy alternative in masonry construction? Dr Ali Arasteh of the BDA reports on the initial findings of a research project led by the University of Bath.

Unfired clay bricks were first used in Mesopotamia around the third millennium BC although the use of ‘earth masonry’ predates this by far. Almost a third of the world’s inhabitants live in houses made of earth and in Germany alone there are more than two million buildings in which earth has been used as a construction material.

The use of earth masonry declined after the end of the nineteenth century with the development of new construction materials. However, the level of energy use associated with the production of masonry units has created interest among manufacturers, researchers, architects and engineers to develop further the properties of earth masonry or unfired clay units. Furthermore the ability of unfired clay to act as a buffer in controlling the humidity and temperature changes that typically occur within dwellings, together with its low environmental impact, makes it an attractive construction material in dealing with the environmental challenges that lie ahead.

The Project

The Brick Development Association and three of its member companies, Istock Brick, Hanson Building Products and Errol Brick Company signed up as partners to a technology research programme funded by the Department of Trade & Industry in November 2006. The project leader is the University of Bath and the other partners are Lime Technology and ARC Architects. This feature reports on the project and its findings to date.



Materials

The project began by collating information from the project partners and obtaining brick samples in order to develop an evaluation plan to establish the material properties.

Most of the materials used in the manufacture of unfired clay units are low-plasticity clays with low sulfate and chloride levels and a large variation in the organic content. Due to differences in the shrinkage characteristics of clay, dimensional measurements showed considerable variation. Linear shrinkage was found to be a function of ambient moisture and could vary from around 6.5 per cent to just over 10 per cent. The net bulk density of the units was around 2000kg/m³. The compressive strengths of the units were determined in accordance

with EN772-1:2000 on 18 samples, four moulded and the rest extruded, and values of 1.5N/mm² to 2.25N/mm² were recorded.

Other findings

- Compressive strength is a function of moisture content; the higher the moisture content the lower the strength (see diagram above).
- There is a trend towards increasing compressive strength with increasing clay content.
- Moisture content affects the expansion or shrinkage of unfired clay.
- Denser unfired clay bricks exhibit greater length change than less dense bricks.

It should be noted that the expected equilibrium moisture content of unfired clay units is 3-5 per cent in a domestic environment.

Next step

The next step was to look at masonry made using different mortars. Past experience had shown that some brick/mortar combinations worked well and some did not, and this was mainly due to differences in the surface characteristics of different bricks. Different mortars, including some provided by the unit manufacturers, were tested and although some worked with different bricks the average bond strength was less than 0.1N/mm² (values less than about 0.2N/mm² are considered low for structural applications). Some thought was given to the use of mechanical fixings but this idea was abandoned for reasons of practicality, cost and lack of harmony with the concept of earth buildings. The findings included:

- Lime mortars do not achieve 0.2N/mm².
- Lignosulfate mortars have a tendency to deteriorate with time, causing cracking at brick/mortar interface.
- Lime/starch and lime/casein were not fully satisfactory in terms of strength and long-term performance.
- Initial tests on sodium silicate mortars proved encouraging.
 - With high contents, bond was stronger than flexural tensile strength at 14 days.
 - Further tests with 8% concentration showed that bond strengths of about 0.2N/mm² at seven days were achievable.

Other advantages of sodium silicate mortar are that it is much cheaper and more environmentally friendly than cement; performance is not affected by the amount of water in the mix (mortars can be knocked up when stiff as

setting is through drying); there is no strength deterioration after 180 days; and powder form is cheaper to transport than the liquid form, giving a lower carbon footprint. Therefore, it was decided to adopt sodium silicate as the bonding material for the remainder of the project.

Wall tests

Walls made with unfired clay units and sodium silicate mortar were tested in compression and flexure. The results were:

Compressive strength tests to BS EN 1015-1

- Mean value: 2.49N/mm²
- Characteristic value: 2.07N/mm²
- Compressive strength: 2.99N/mm²

Flexural strength tests to BS EN 1052-2

- *Tests perpendicular to bedjoints*
 - Mean value: 0.43N/mm²
 - Characteristic value: 0.38N/mm²
- *Tests parallel to bedjoints*
 - Mean value: 0.57N/mm²
 - Characteristic value: 0.44N/mm²
- *Bond strength at 28 days*
 - Mean value: 0.435N/mm²
 - Characteristic value: 0.375N/mm²

It is worth noting that the variation in compressive strength is remarkably low and in other tests quite acceptable. This results in a ‘low’ standard deviation which is very beneficial for low-strength construction materials. Furthermore the compressive strength of the wall is close to the compressive strength of the units, which proves the suitability of sodium silicate mortar; its role is to bond the units and not to affect the strength disproportionately.

Shrinkage tests

Tests were carried out on some walls over a gauge length of 200mm, with horizontal and vertical changes measured (see diagram below left). Shrinkage values in the two directions follow the same trend and magnitude and appear to have stabilised at about 0.37 per cent after a period of two months. Around half of ‘final’ shrinkage occurs one day after construction and therefore the magnitude of shrinkage after construction is only half as high. For example, a 2.4 metre high wall of unfired brick would be expected to shrink by about 9mm; half of this would have occurred in the first day.

Clay plasters

Clay plasters led the development of the market for commercial mass-produced clay products in Germany over the last 15 years. As well as aesthetics there are technical benefits such as the regulation of internal air humidity, an important factor when upgrading the environmental performance of many twentieth century buildings. The use of clay plasters in the UK has been limited to expensive imported materials from mainland Europe. Recent research at the University of Bath in collaboration with ARC has shown that many dry ground clays currently used in brick manufacture in the UK can be easily adapted to form workable clay plasters, with perhaps 10 per cent having the natural qualities of fine grading, workability and colour needed to produce a high quality commercial material.

Conclusions

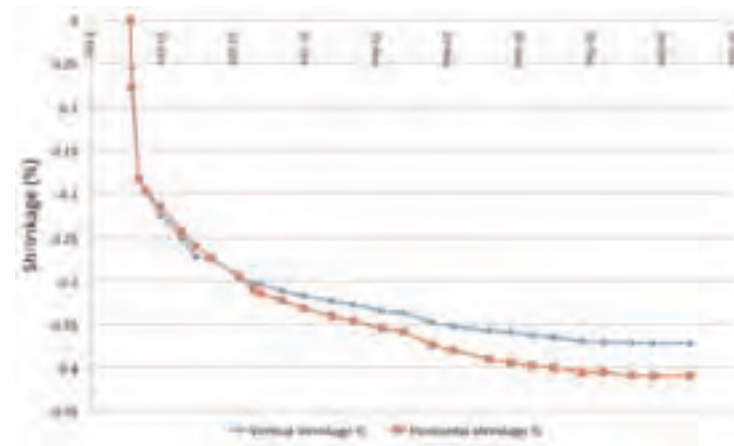
The findings to date have demonstrated that unfired clay units can be used in the construction of domestic loadbearing walls as well as partitions. Such walls will effectively control internal moisture and humidity and provide a healthier living environment. Their thermal mass can effectively store and release heat out of phase with the outside temperatures, thus providing more comfortable indoor temperatures. And they have a low carbon footprint.

Further information BDA tel 020 7323 or email brick@brick.org.uk

Below Typical UK-produced unfired clay bricks.

Right Unfired brick construction is a tradition that stretches back as long as man has built shelter.

Far Right Chart showing percentage shrinkage of unfired brick over time.



Below left Home using unfired brick internally. **Below middle and right** Walls were tested to failure in different modes.

