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Building envelope supplement

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# FROM THE EDITOR

Across the globe, building envelopes are becoming increasingly diverse as architects, designers, planners and developers explore fresh, creative ways of expressing a building's individuality through the design, interpretation, application and combination of exterior building materials.

Technological advancements in building envelope materials are also driving improved performance to ensure the rigorous function of the building envelope as a sustainable and effective weather, air, noise and thermal barrier, is meticulously met.

To find out if architects designing Passivhaus envelopes are making aesthetic and other compromises to achieve what is often considered the ultimate energy performance standard for buildings, in a special report we asked architects about their experiences when working on Passivhaus projects of different building types, scales and construction materials.

According to Arup's Cities Alive: Green Building Envelope report, building envelopes can also be more than an outer skin structure, providing a barrier. Their report looks at how the application of green infrastructure to the surfaces of both new and existing inner-city buildings in five worldwide cities has produced interesting results.

In this issue, Arup tells us more about how living walls applied to any building envelope roof, facade or connecting interior to exterior area are not simply green decor but a way of reducing air pollution, lowering energy consumption, decreasing noise, cooling cities, shielding and storing rainwater and making towns and cities healthier and more attractive places for people to visit, work and live in.

To illustrate how some cutting-edge projects are pushing the building envelope design boundaries, our three project reports examine different international approaches, all with eye-catching results.

In Rio de Janiero, Brazil, architects Bernardes Arquitetura created a low-rise office block with a three-layered facade comprising aluminium-framed glazing, white metal lattice brise soleil and live plants. Whereas in Locarno Switzerland, Buzzi Studio Di Architettura used pioneering robot technology to form panels of a wave-like brick facade design whilst architect Anne Démians included 200 km of reconstituted wood strips sourced from Japan in her facade design for Société Générale's trio of office blocks, Les Dunes, in eastern Paris.

Along with expert comment, reports on the latest technology and a round-up of brick trends from the BDA awards, we hope you enjoy the read!

**Sarah Johnson**
**Editor**


**ON THE COVER...**
The Anibal Building in Rio de Janeiro may be a low-rise office building, but its facade designed by architects Bernades Arquitetura provides a striking take on brise soleil. The distinctive white metal diamonds that are created help keep users cool and give the building a strong identity. For more information, go to page 19.

AWARD

# Shanghai Tower wins global facade award

Architect Gensler was the recipient of the 2016 WAN Facade Award for its curvy and twisting Shanghai Tower, triumphing over a host of international projects.

The overlapping inner and outer glass facades of the 121-storey, 632 metre 'megatall' building impressed the jury, leading them to call it an "overwhelming project and a just winner" at the ceremony held at BAU in Munich last month.

Gensler's scheme was chosen ahead of 3XN Architects' whirpool-shaped National Aquarium in Denmark, Nieto Sobejano's extension to Bristol Royal Infirmary, ODA's brick-clad residential tower 371 Broadway in New York, and Allford Hall Monaghan Morris' 1 New Burlington Place in London.

Created by Gensler with Chinese architect Jun Xia leading the design team, Shanghai Tower is organised in nine 'vertical neighbourhoods' rising from a light-filled garden atrium.

The building twists by about one degree per floor to offset the wind effect and withstand typhoons and incorporates 'green' elements that have earned it sustainability certifications from the China Green Building Committee and the US Green Building Council.

The tower was awarded its 'megatall' status by the Council on Tall Buildings and Urban Habitat, becoming only the third building globally to breach the 600 metre requirement.

Gensler principal Ben Tranel collected the prize at BAU, and commented on the event: "BAU 2017 was an incredible panoply of cutting edge exhibitions and speakers. I came away not only with creative new ideas but also energised to tackle some of our toughest design challenges. And of course, receiving the WAN Award for The Shanghai Tower was a big highlight!"


**ABOVE:**
Crystal Houses, Amsterdam

**RIGHT:**
10 Burlington Street London

AWARD

# From complex refurbs to glass brick frontages – the year's top facades

The Society of Facade Engineering revealed the Facade 2016 winners for facade engineering excellence at the society's annual 'Glass Supper' in London.

Arup was the big winner for its work on the high-profile retail scheme at 10 New Burlington Street in west London, picking up the Facade of the Year award in the refurbishment category, while TU Delft & ATB Consulting Engineers' Crystal Houses in Amsterdam was named Outstanding Facade Innovation winner, being described as "quite exceptional" by the awards' judges.

Arup's New Burlington Street refurbishment incorporates a complex curved glass facade, while Crystal Houses utilises glass bricks glued together in an attempt to echo the city's architectural heritage.

Chris Macey, who is chair of the Society's judging panel, said of New Burlington Street: "London is the refurbishment capital of the world and Arup is reigning supreme, with this project a trophy to the skills and commitment of the team behind it."

Macey also described Crystal Houses as "beautifully crafted example of a small but precisely executed commercial building."

Special commendations went to Buro Happold Engineering in the Facade of the Year New Build category for their work on Columbia University's Vagelos Education Centre, New York, to Octatube for the Glass Entrance Building of the Van Gogh Museum (Facade of the Year, New Build), Amsterdam, and lastly to Volker Gienke & Company for Great Amber, Liepaja, Latvia (Facade of the Year, New Build).

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PROJECT

# A facade of two faces for London refurb

A striking facility with two distinct facades designed by Campbell Architects is under construction in central London.

Located at the corner of Hanover Square and Oxford Street, the eight-storey project for investment management firm Aviva Investors includes retail and office space with a high-quality reception, stone walls and a roof garden.

The redevelopment required the architects to join two separate properties into one unit, but also to design different facades on either elevation.

The building facade towards Hanover Square is somewhat restrained, clad in Piedro Falls charcoal brickwork and Portland stone, while a large shopfront with bay windows and faience cladding made of 14 types of tiles was created for the more flamboyant Oxford Street-facing elevation.

Campbell Architects and Watermans Structural Engineers worked alongside precasters Sterling Services to develop the design of the structure and units of the Hanover Square elevation, while a supplier of Italian terracotta and faience delivered the tiles for the Oxford Street cladding, which then had to be fixed mechanically to the precast.

The architects had to revisit the design of the Hanover Square elevation as the original structure was not suited to support a precast facade. The solution involved a combination of stacked and fully supported panels with mounting points incorporated.

On the Oxford Street elevation, mounting the tiles to the surface of the concrete panel did not fall into any British Standard, so the precaster developed a method to mechanically connect each tile to the panels.

PROJECT

# Newcastle's green future

Architect SimpsonHaugh and Partners have completed Verde, a striking 543-room student accommodation complex opposite St James' Park stadium in the centre of Newcastle, consisting of two buildings.

The main 11-storey building's glazed, green facade is combined with a prow which rises to a create a "focal point at the northern gateway to the university's Science Central site," said the architects. They added: "Its crisp angles help to define views and capture changes in reflected and refracted natural light."

A landscaped courtyard has also been created with elevations comprising silver aluminium panels rising two storeys in two different finishes, resulting in a checker-board pattern.

Designed for student accommodation provider Downing, the development

contains a total of 431 bedrooms with en suite bathrooms, plus 112 studio flats.

GUIDE

## BSRIA tackles building efficiency in new guide

Independent building testing body BSRIA has released a new guide to performance evaluation in domestic buildings in a bid to help architects make homes more energy efficient.

The organisation stated that despite "genuine intentions" to create efficient homes, the industry is still "missing the mark," as buildings do not always perform as designed. The guide is a general introduction to BPE that explains its benefits, how it can be carried out and what activities and methods can be used on projects to address issues related to energy efficiency and occupant comfort. Copies can be obtained at bsria.co.uk

*Photography by Carl Woodall, Attingham Park, National Trust.*

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## COMMENT

# The mother of invention: metal comes of age

Lee Davies from CA Group discusses what is claimed to be ground-breaking technology that enables metal buildings to compete with brick when it comes to fire protection

Over the past few years, demands on the construction industry have resulted in wet trades struggling to deliver on time. Whether through issues relating to manufacture (many kilns were mothballed during the last recession), or on-site labour (the well documented skills shortage), the need to look at alternatives to brick and block walls has never been greater.

Brick has been the go-to construction material for residential as well as many commercial, industrial and retail buildings due not only to its aesthetics but also the robust passive fire protection it affords. The brick shortage has therefore posed a significant challenge for the construction industry. Delays of up to four months have been reported, which have had a significant knock on effect on project timings. This has led architects and developers to look for alternatives.

Metal cladding systems have long been used in construction in various guises: twin skin systems, composite insulated panels and rainscreen cladding, manufactured using steel or aluminium. Other metals can also be used, including stainless steel, zinc and copper. Architects often choose metal due to the design flexibility and variety of finishes it can deliver, enabling them to put their stamp on any given building.

Furthermore, cladding systems such as those listed above meet most of the technical requirements needed for modern construction: compliance with CDM and building regulations, weather tightness, air permeability and durability, plus thermal, acoustic and structural performance.

However, one area in which it can be difficult to achieve compliance is fire protection.

On balance, the metal cladding industry was a natural alternative for architects faced with delays from the wet trades. The challenge of fire protection was a problem to which the industry would have to find a solution.

### Fire performance considerations

Two key areas must be considered when measuring the fire performance of any envelope solution; structural integrity and insulation integrity. The first is governed by the period the cladding system will remain in place when subjected to fire, and the second by the time it takes to reach a specific temperature on the other side of the cladding from the fire.

Structural integrity is relatively easy for designers to specify with built up metal cladding systems available that can achieve over four hours (the point at which tests are stopped). Insulation integrity with this method, however, has always been limited, due to the heat transfer through the components used to connect the outer skin to the structural steel frame. Typically, achieving more than 30 minutes was challenging and as a result more costly alternatives were needed which carried more onerous safety requirements.

Clearly this was not an acceptable solution, and research teams have continued to develop systems which achieve better performances in insulation integrity. From a specification point of view, 60 minutes of insulation integrity has always been desired for these types of buildings.

There are several aspects of system design which need to be looked at when considering fire performance – including the predominantly metal spacer system, and the overall construction methodology – factoring in the insulation. As part of any fire wall system, a robust, thermally insulating separation layer is required and it is in this area that the greatest degree of innovation has been possible.

**The brick shortage has posed a significant challenge for the construction industry**

Lee Davies, technical director at CA Group

To understand whether new products are suitable, indicative fire tests are undertaken at companies such as Exova Warringtonfire in which both the old and new products are compared, in order to establish the difference in performance.

Products have been developed that deliver on all fronts. Metal cladding systems now offer robust fire protection on a level which is comparable with brick and block (tests have demonstrated that 120 minutes of insulation integrity is achievable, alongside an overall structural integrity performance of 240 minutes). This means that architects don't have to compromise on design in favour of fire protection. If they don't want to wait, or if they want the flexibility that metal affords, thanks to innovation, they can now have both.■

*Lee Davies is technical director at building envelope manufacturer and installer CA Group*

# Greening the envelope

Senior landscape architect at Arup, Sally Armour discusses weaving health and resilience into our cities through green building envelopes

Increasingly, the human population is becoming more urbanised – and by the end of the century it is estimated that 7 billion will live in cities and towns. As cities become denser there is less space for 'green infrastructure' including parks, trees and other green spaces, which are vital for creating healthy cities and providing protection from climate change. So the need to explore new applications for green infrastructure within the built environment is imperative and our buildings provide a vast untapped potential.

The 'building envelope' refers to roof space, facades and any other areas that connect inside to outside, usually representing 20-25 per cent of a building's total external area, so providing large underutilised surface areas within cities. Both new and existing buildings can be used to form green building envelopes and so provide significant space for green infrastructure which could be effective in limiting the depletion of green within cities.

The potential benefits that green envelopes can provide are compelling – reducing urban stress, mitigating noise, slowing down and storing stormwater, cooling down cities and decreasing energy consumption. By moving away from more traditional and inwardly focused performance considerations for buildings, and shifting our focus towards green envelopes, we can harness nature's inherent ability to reduce the challenges of air and noise pollution and urban heat effects to create a positive, healthier and better quality of life for city residents, workers and visitors.

## Making cities more liveable

As we apply greater stress to our cities through increased urbanisation and climate change, we need to make our cities more liveable and resilient. Green building envelopes can help by providing space for horizontal and vertical green infrastructure that provides 'softer' benefits in terms of well-being, improved quality of life, place-making, aesthetic enhancement and increased biodiversity.

Green infrastructure on roofs and walls that enhances the public realm has the potential to create new destinations where people congregate, turning harsh urban environments into something more natural without need for large open spaces.

They can also provide for urban agriculture and food production. Growing your own food has been shown to reduce obesity in adults by connecting people to healthy produce. Food

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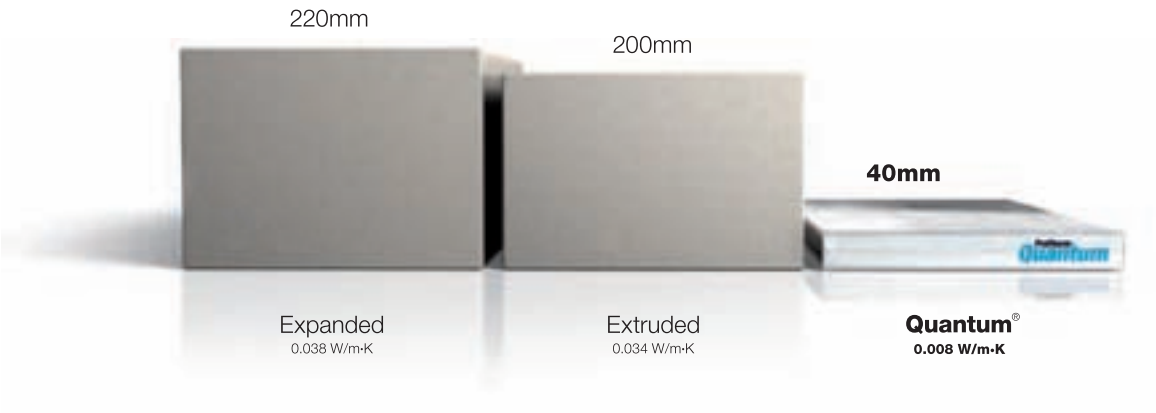


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BBA

**When used appropriately, green facades and roofs can significantly improve the visual aesthetic of buildings**

miles are also a major contributor to pollution. Producing locally helps reduce pollution from food transport as well as connecting urbanites with their food.

When used appropriately, green facades and roofs can significantly improve the visual aesthetic of buildings and built infrastructure by helping them blend into the surroundings, or by giving the facade an uplift. Views and immersion in nature have been shown in studies to reduce stress in people. The symbolism of bringing nature into the built environment has many positive connotations making occupants think the environment is better.

The decline of biodiversity in our cities has led to the domination of certain species of flora and fauna leading to pest problems. Increasing biodiversity in our cities manages this naturally helping support a greater variety of species. Bees, an essential part of our ecosystem, are in decline and urgently need more food sources.

## Reducing energy

Green roofs and walls help lower ambient temperatures. When placed below photovoltaic panels they can improve their running efficiency by helping to reduce their temperature. The lower ambient temperatures around green infrastructure can also be used as part of a free cooling strategy in summer. Capturing renewable energy using wind turbines and bio-reactive facades such as SolarLeaf in Hamburg, can drive sustainability in built-up environments.

## Reducing air pollution

Fine dust pollution generated by the traffic is now a major health issue in cities around the world. Green facades can result in local reduction in pollution of around 10-20 per cent as vegetation filters fine particles from the air. The principle concern are PM2.5 & PM10 levels which regularly exceed recommended levels by the World Health Organisation. Green infrastructure, when selected and placed appropriately, can reduce particulate matter levels by deposition on flora and subsequent precipitation and cleaning into drains.

## Creating cooler cities

Metropolitan hardscapes, such as concrete and glass, have a huge impact on the ambient temperature of the environment as solid surfaces radiate rather than absorb heat. This increased heat takes a toll on urban spaces, and can affect water quality, causing heat-related illnesses and an increase in mortality rates. The temperature in city centres is considerably warmer than surrounding suburbs and rural areas. This leads to overheating problems in summer, which will be further exacerbated by climate change.

Research shows that the quantity and quality of vegetation within a city can reduce temperatures and the Urban Heat Island effect. Green infrastructure used appropriately can reduce both surface and ambient temperatures. Retrofitting cityscapes with green infrastructure, such as moss walls and tree facades improves aesthetics, well-being, and the cooling potential of buildings. CapitaGreen in Singapore demonstrates how green building envelopes can reduce solar heat gain and lower surface temperatures. Even in the height of summer, interventions like vegetated roofs can help bring down the temperature to ambient levels, whereas a conventional roof can be up to 50 degrees hotter.

## Forming quieter surroundings

Noise also poses a significant risk to health and well-being in urban societies. The World Health Organisation cites noise as a leading environmental nuisance that reduces work productivity, disturbs sleep, impairs cognitive functioning, and can contribute to mental illness.

Residential developments are already showing how green facades can mitigate urban noise. While street canyons are typically made up of dense materials that reflect sound, green facades can absorb sound, reducing noise. In fact, our research finds that green building envelopes can reduce sound levels from emergent and traffic noise sources significantly. Green walls when selected and placed appropriately can reduce noise reverberation by up to 10 dB(A). Studies have also shown that people with views of nature have a lower perception of noise.

## Reducing stormwater runoff and flooding

Surface runoff in cities is a major source of urban flooding. With climate change more intense, rain events are expected which will exacerbate this problem. Green roofs and walls used appropriately act as a buffer slowing down the speed that water travels into the drains from initial precipitation.

We call for architects, planners and the building industry not to consider green infrastructure as 'green architectural decoration' or 'green fuzz', but as an important and multifunctional aspect of our built environment, that can effectively be retrofitted to existing or integrated into the design of new buildings. This way, we can deliver significant improvements to the wellbeing of urban residents, workers, tenants and visitors now, and help cities build a legacy of resilience for the future.■

*Cities Alive: Green Building Envelope, report produced by Arup shows how a collaborative team of Arup specialists from across the world, set out to tackle these issues head on. The report explores the application of green infrastructure to the surfaces of both new and existing inner-city buildings in five major global cities – Berlin, London, Los Angeles, Melbourne and Hong Kong – to create a positive future for inhabitants. The report is available as a free download from www.arup.com/greenbuildings*

## SITE LINES

# Going for the 'gold standard'

How 'zero compromise' do architects need to be when designing envelopes to the Passivhaus standard and are aesthetic, and other compromises necessary? Sarah Johnson reports on the challenges involved

The Passivhaus standard is often seen as the 'gold standard' for building performance. Passivhaus buildings provide a high level of occupant comfort while using very little energy for heating and cooling. They are built with meticulous attention to detail and rigorous design and construction per principles developed by the Passivhaus Institute in Germany.

The fabric, or envelope, of a Passivhaus, needs to achieve high thermal and airtight performance while providing structural stability and weather protection. For building durability, the building also needs to eliminate the danger of interstitial condensation forming within the structure.[1] The key principles of Passivhaus design include:

- continuity of super insulation;
- minimising thermal bridging;
- maintaining airtightness;
- minimising thermal bypass.

A rigorous approach is needed when it comes to designing building envelopes which will provide the necessary performance for a project to achieve Passivhaus accreditation. Passivhaus buildings can be built out of any construction material and therefore a wide variety of building envelope details are required to deal with the challenges of limiting thermal bridging and creating an airtight layout to meet Passivhaus criteria.

Passivhaus criteria do not dictate what construction methods should be used, but the following case studies of certified Passivhaus projects illustrate a range of scales, materials and typologies. In each example, the architects were asked three key questions about their project.

### CASE STUDY: THE UNIVERSITY OF LEICESTER

The University of Leicester's Centre for Medicine building is currently the largest commercial Passivhaus in the UK. It consists of a concrete frame and curtain walling.

#### Architect's View: Jonathan Chadwick – Associated Architects

Why were the materials and the construction method adopted?

Brick was chosen as the predominant material for the facade as it respected the character of the neighbouring building and the site's location on the edge of a conservation area. The use of curtain walling modules to panelise the brick facade provides a contemporary architectural language whilst remaining sympathetic to the surrounding context.

Curtain walling lent itself to the rigours of achieving Passivhaus levels of facade performance as it reduced the number of interfaces between different subcontractors' work packages and provided a high degree of certainty that levels of workmanship would remain consistent. The use of 'tried and tested' building components also gave the client confidence that long-term appearance and performance would be maintained without significant additional ongoing costs.


The University of Leicester © Martine Hamilton-Knight

What was the main challenge in meeting Passivhaus?

Refining the details of the curtain walling to minimise thermal bridging and to integrate the controls for the external shading blinds was complex and hadn't been done to Passivhaus levels of performance in the UK before.

Extensive design development was carried out by the contractor's design team in conjunction with the facade sub-contractor, Passivhaus specialist, curtain walling manufacturer and facade engineer to ensure the design was robust and repeatable whilst maintaining the required aesthetic.

A large mock-up panel was produced off site at a testing facility to enable the technical resolution of the details to be refined and weather tested to CWCT standards prior to inspection by the client.

How 'zero compromise' was the design and were any aesthetic compromises made?

The Passivhaus standard of performance is very exacting and numerous detail design refinements were reviewed and thermally modelled prior to the curtain walling going into manufacture. This extended detailed design period is necessary with Passivhaus projects to ensure that aesthetics are not compromised in the pursuit of technical performance where new technologies are being pursued.

Wilkinson Primary School
©DennisGilbert/VIEW

## CASE STUDY: WILKINSON PRIMARY, BILSTON

A second generation Passivhaus Primary School that addresses the future needs of a 21st century learning environment, including various improvements to performance and sustainability. The timber frame is partly clad in Corten steel and polished clay tiles.

### Architect's View:
### Project Architect Lee Fordham – Architype

Why were the materials and the construction method adopted?

The construction is timber frame sourced from domestic FSC timber which is exposed internally. The industrial heritage of the site provided inspiration for the exterior cladding of Corten steel. Corten is a sustainable choice as no maintenance is required, as the surface develops to a stable rust-like appearance. Allowing the steel to rust makes the rust itself form a protective coating that slows the rate of future corrosion.

The smooth dark grey cladding of polished clay tiles provides a striking contrast to the Corten which weathers to a vivid orange patina while complementing the design aesthetic and also linking the school with the site's industrial past.

What was the main challenge in meeting Passivhaus?

Sharing the site with the occupied portacabins involved careful planning and logistics to ensure the utmost safety and compliance with the programme. Separate access was created, with the close proximity of the temporary accommodation cut off by a fire-rated site hoarding boundary wall.

The site itself is the former Iron Works of John Wilkinson, the namesake of the school and a Black Country industrialist from the industrial revolution. Coincidently, an old forge was identified that restricted the location of the foundations and mine shafts were speculated on initial surveys but never discovered, however an archaeological watching brief was employed for the first stages to ensure site safety.

How 'zero compromise' was the design and were any aesthetic compromises made?

Passivhaus certification was a top priority of the design made very clear in the client's brief. With this commitment from the client, we did not need to compromise the design. Clearly, aspects such as shading and solar-gain influenced the design in terms of form, but of equal importance was the school's requirement for space and layout.

## CASE STUDY: LANSDOWNE DRIVE, EAST LONDON

A zinc-clad two-storey Passivhaus home located in a Conservation Area in east London was erected in a few days from pre-fabricated structural cross laminated timber (CLT) panels.

### Architect's View:
### Bernard Tulkens – Tectonics Architects

Why were the materials and the construction method adopted?

Early on we chose to use a combination of CLT and wood fibre insulation. This was based on the ease of construction (prefabrication) the sustainability of the natural materials, the good airtightness provided by the base CLT structure and the desire to use breathable construction.

The choice also helped provide a clear layering structure where


Lansdowne Drive
© Tectonics Architects


Cre8 Barn
© Green Building Store

continuous air tightness and elimination of cold bridges could be achieved. The simple layered logic of the construction system at upper level was also used on the lower ground floor concrete structure, the external EPS insulation and the foundations (Isoquick).

What was the main challenge in meeting Passivhaus?
Direct sun gains from the south were not possible due to the presence of the adjacent Victorian terrace. Additional insulation, efficient MVHR and elimination of the thermal bridges contributed to meeting the standard.

The feedback from the PHPP (Passive House Planning Package) analysis on decisions, and how a response can be found to meet the challenge of Passivhaus, is most important. For instance, as a result of the orientation, the glazing to the west facing windows have a higher g-value (proportion of heat transmitted) as this was more important than their U-value – they are the only windows receiving sufficient quantities of sunlight. Being west-facing windows, external shading was also necessary to control heat gain in summer.

Another challenge is the on-site supervision required. Careful and regular checks, as well as communication to the building team of the Passivhaus principles, are essential.

How 'zero compromise' was the design and were any aesthetic compromises made?
We did not begin the project design as a Passivhaus but the principles of the building in terms of form and concept were well suited to being adapted to Passivhaus.

Eliminating thermal bridges made detailing simpler and zero compromise on that aspect is essential.

The PHPP leads to questioning the use and number of elements in a project, and that is also a positive aspect of the Passivhaus analytical process. I was keen to have a skylight in part of the upper level; the PHPP indicated that a skylight at the upper level was not contributing to the energy performance (and Passivhaus-certified skylights were not very developed at the time).

The principles had an impact on the number of windows and guided their form (windows rather than large sliding screens in this case). In the end, they were positive contributions to the design project, and made the building better.

## CASE STUDY: CRE8 BARN, YORKSHIRE

Retrofit with a super-insulated timber frame structure built inside the existing building to preserve the appearance of the cow byre.

### Architect's View: Bill Butcher – Green Building Store

Why were the materials and the construction method adopted?
Yorkshire Wildlife Trust (YWT) wanted to convert an existing barn at Stirley Community Farm into an education centre. To achieve the required insulation levels and make the airtightness and thermal bridging detailing easier, we decided that a 'box within a box' construction offered a practical solution on this project. This was achieved with an inner timber frame construction with a ventilated cavity within the existing masonry barn walls.

What was the main challenge in meeting Passivhaus?
A considerable amount of work was needed to stabilise the walls and underpin the foundations of the barn. To address this problem,


the inner timber frame structure also helped support and shore up the outer masonry barn wall, using specially adapted wall connectors with low thermal conductivity.

How 'zero compromise' was the design and were any aesthetic compromises made?
The form and orientation of the building were obviously fixed, which impacted on the passive solar gains available in the building. The high ceiling height and reduced level of treatable floor area meant that the project would not have achieved EnerPHit through standard certification using PHPP (Passive House Planning Package) methodology. Fortunately, the Passivhaus Institute had then developed a 'component' route to EnerPHit, with set criteria for individual building elements (e.g. walls, roof, floor etc), which the Cre8 Barn could fulfil.

## CASE STUDY: BURNHAM OVERY STAITHE

A coastal terrace of three Passivhaus units forming part of a mixed development of affordable and open market housing on a planning exception site within the North Norfolk AONB, reflecting the local vernacular of traditional fishermans' cottages.

### Architect's View: Chris Parsons – Parsons + Whittley

Why were the materials and the construction method adopted?
In fact, materials here led the choice of construction method. We wanted to respect the character of Burnham Overy Staithe, not least because the whole area is designated as an Area of Outstanding Natural Beauty but also because it was adjacent to the Conservation Area. We studied materials and traditional features to ground the development in its location, and that suggested the use of flint, red brick and clay pantiles, as well as the simple form of the buildings. Given the predominance of masonry type solutions and our previous experience of delivering Passivhaus through masonry construction, the scheme utilised a traditional masonry cavity wall. The increased thermal mass also influenced our decision as did the use of Gypsum plaster (Hardwall) as an airtight membrane.

What was the main challenge in meeting Passivhaus?
The scheme received planning approval in 2009 but had not originally been proposed as a Passivhaus development. Nonetheless, the form of the building and orientation leant itself so the modifications were easily assimilated, with a thickening of wall constructions and a slight height adjustment. Thankfully the planners were very helpful in approving these amendments. This left us short of space for MVHR and other equipment but the use of compact units containing exhaust air heat pumps enabled the whole of the kit to be fitted with the former airing cupboards and still leave enough room for linen storage.

How 'zero compromise' was the design and were any aesthetic compromises made?
As always with Passivhaus, the approach starts with 'zero compromise' but inevitably there were some on the way. The main compromise was around the heating/MVHR system which is more complicated than we would prefer. The location of the combined units forced us to site the inlet and exhaust for the MVHR through different roof slopes, which is probably not ideal. The overheating strategy couldn't utilise deeper roof overhangs because of the aesthetic and so we had to resort to electrically operated external blinds to control overheating.

Aesthetic compromises were not admissible given the sensitive nature of the site and the extant planning consent but this did not cause us any real performance issues. Given that the design was based on traditional building forms found in the area, I think it demonstrates that our forebears instinctively understood the principles of Passivhaus design.

### The Passivhaus Trust

The Passivhaus Trust is an independent, non-profit organisation that provides leadership in the UK for the adoption of the Passivhaus standard and methodology. Passivhaus is the leading international low energy, design standard. Over 65,000 buildings have been designed, built and tested to this standard worldwide.

The Trust aims to promote the principles of Passivhaus as a highly effective way of reducing energy use and carbon emissions from buildings in the UK, as well as providing high standards of comfort and building health. The 2017 UK Passivhaus Awards take place in July.■

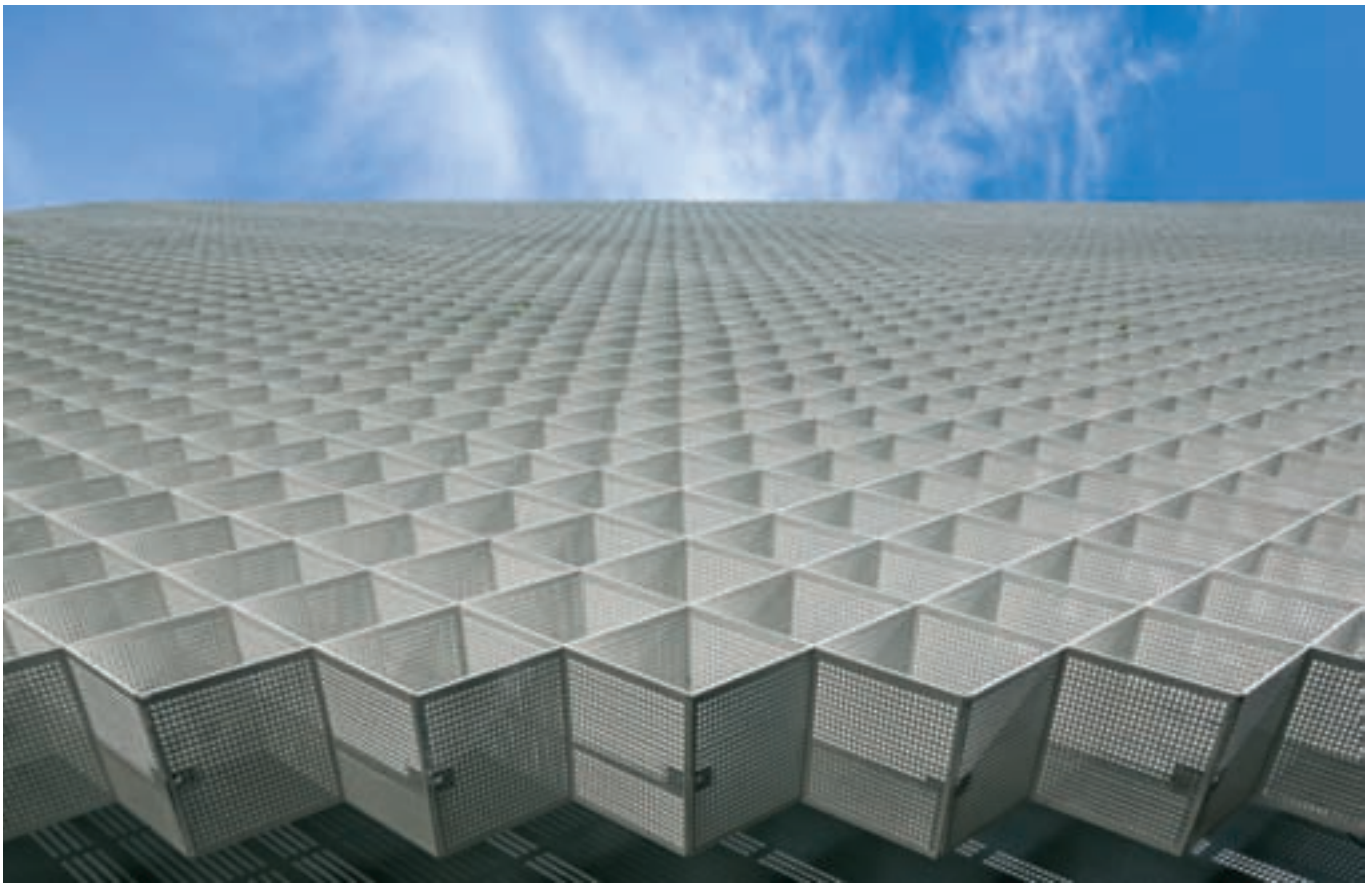
[1]*How to build a Passivhaus: Rules of thumb. Chapter 3: Building Fabric*
*www.passivhaustrust.org.uk*

BUILDING PROJECTS

## ANIBAL BUILDING RIO DE JANEIRO

# The grill from Ipanema

The Anibal Building in Ipanema, Rio, is a low-rise office block that neatly reflects the Brazilian city's flair for original and unusual building facades, as Ray Philpott discovers

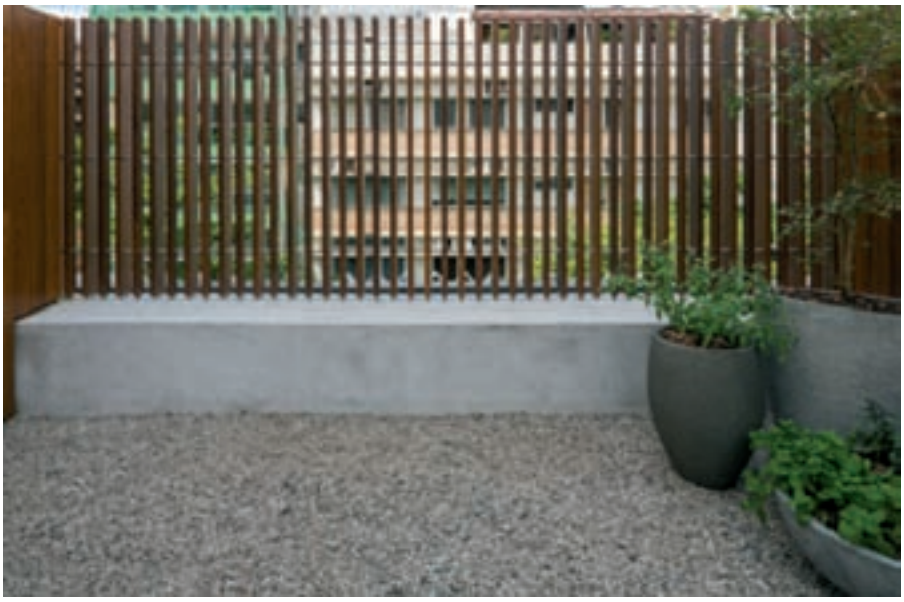


Architects Bernardes Arquitetura faced some complex challenges when they set out to design a modern office block in the upmarket coastal neighbourhood of Ipanema in Rio de Janeiro.

Commissioned for the work by a private family firm, the team were tasked with creating a spacious contemporary, stylish and light-filled five-storey business hub called the Anibal Building.

The clients, who place a high value on privacy, wanted an outstanding building in terms of design and quality – without being overly flamboyant – to replace an unspectacular concrete and ceramic residential block.

Anibal is 'terraced' between two taller buildings – a 1970s 'traditional-style' apartment block and an uninspiring 1980s residential block – in a largely residential area of fashionable, well-touristed Ipanema.



It also backs directly onto a school building, making a glazed rear facade unviable.

The architects faced the difficult task of designing a stylish, relatively narrow-fronted, five-storey building extending far back, with three solid walls and just one facade suitable for glazing.

This and the specific requirements for discretion and privacy, meant creating an envelope that would let in sufficient light without excessive solar gain wasn't straightforward.

Bernardes Arquitetura was founded in 2012 by established and respected Brazilian architect Thiago Bernardes. With offices in Rio, Sao Paulo and Lisbon, it has a reputation for residential and commercial architecture and interior design of hotels, condominiums, leisure and entertainment establishments, as well as master and urban planning.

For Anibal the practice created a five-storey concrete-framed design set back from the street, with three particularly interesting elements in the envelope – the attractive triple-layered street facade, the inner 'library' facade of the rear wall, and the roof garden.

Concrete waffle-slab floors and ceilings are supported by columns on the outer edges of the structure that are infilled with non-structural concrete blocks to form the back and side walls sitting on the existing foundations.

On the ground floor a small exterior concourse of small-stoned 'Portuguese paving' leads to the unobtrusive entrance and reception and enclosed parking area. Above it are three levels of open-style offices and smaller meeting rooms. Within the envelope, the circulation areas, stairwells and lift, services, other meeting rooms, concrete stairs, kitchen, cloakrooms and bathroom facilities are situated on the left and right peripheries of the building. A private roof terrace for staff leisure time and informal meetings adds a neat touch to the block.

The side walls abut the neighbouring buildings on each side and are finished internally with sprayed, textured render and no additional insulation due to the warm Brazilian climate.

## Light prism

Project Architect Francisco Abreu explains the practice's approach: "Planning regulations meant we could not go any higher than the previous building.

"Additionally, our clients, who were

going to occupy part of the building themselves, clearly wanted an attractive, outstanding office building that is simultaneously fairly private and discrete."

To meet these seemingly conflicting expectations and counter the visual impact of the higher surrounding buildings, the architects envisioned a structure with differing aesthetics to its neighbours.

"We sought to transmit a sense of quality and originality combined with an element of discretion," he says. "However, the first practical issue we had to resolve was getting enough daylight in because even a fully glazed front facade would not let in enough light."

The solution was the Anibal 'library', an eye-catching interior feature running vertically down the interior of the rear wall of building, lit directly from above via 10 $m^2$ of coated, solar-controlling skylights on the roof.

Light cascades vertically down from the skylights through a series of 40mm-thick toughened glass 'walkways' and glass panels below, located at each level of the library, and illuminates the interior spaces. The open office areas and meeting rooms on each floor are divided by glass partitions, enabling good interior daylight penetration.

"The library forms what we call a 'light prism', distributing daylight while filtering out unwanted solar radiation," explains Abreu. "The floor glazing is supported on a grid of metal beams firmly anchored into the columns in the wall structures and also columns supporting the slab floors."

Additionally, the library transforms a potentially bland, functional supporting rear-wall into an attractive inward-facing facade comprising shelving and display systems containing books, magazines and other visible materials, while dark-grey aluminium sheet clads the spaces between. The outside of the wall is simply rendered and painted.

## Defining feature

The major light source and the defining design feature of the building envelope is undoubtedly the front facade – in particular the trio of visually different layers fronting the three office floors. Specifically, soundproof aluminium-framed glazing, fronted by a distinctive white metal, diamond-lattice brise soleil with live plants forming a soft, calming green layer in the space in between.

Anibal's side walls project 40 cm beyond the front glazing plane, forming a

**FAST FACTS**

**Location:**
Ipanema, Rio de Janeiro, Brazil
**First phase completed:**
2015
**Final phase completed:**
late 2016 (roof terrace)
**Footprint:**
230 $m^2$
**Total floor area:**
1,012 $m^2$
**Height:**
five storeys, 16 m
90 per cent of lighting is LED
**Glass flooring:**
4 cm thick

continuous vertical mounting surface for the metal element and creating the space for the planting between the two layers.

"Our feeling was that a lattice-style brise soleil opened up more interesting design opportunities than glazing," says Abreu.

"This design offers effective solar shading from the early sun and filters out sound, yet allows plenty of light into the three business floors of the building throughout the day. It looks visually interesting, whether viewed internally or externally, and it looks impressive from outside in the evenings, when it is back-lit."

Abreu adds: "Adding a self-watering planting layer between the brise soleil and the glazing provides a visual stimulus that, seen from inside, softens the rigidity of the latticework and creates a more natural-feeling work environment."

Planting is in long, deep, glass fibre troughs resting on projecting, specifically-shaped concrete floor beams running across the front at each level and also pinned to the wall just below the glazing. The outside of the troughs are clad with powder-coated, dark-grey aluminium extending down and wrapping under the beams to form a soffit for the level below.

A horizontal run of toughened and soundproofed aluminium-framed glazing overlooking the troughs on each office floor and forms the third and final layer, complete with opening access windows for maintaining the greenery.

Above and slightly set back from the metal facade, a neat palisade of red-brown cumaru hardwood, commonly used in Brazil, linked with subtle, horizontal stainless steel rods forms the softer looking front of the rooftop terrace.

At ground level, a similar wooden

**Our clients tell us they're happy with the way the building looks and works, and tenants say they find it a pleasant physical environment to be in. So, it looks like we got the design right**

Project Architect Francisco Abreu

palisade creates a narrow screen in front of the discrete, small glazed entrance to a small lobby. To the left of the entrance a large up-sliding electric door, made from perforated aluminium to allow light to penetrate, which provides access to the internal parking.

## Fabrication

The 10.7 metre by 11.5 metre metalwork lattice was the most complicated element to design and execute and the team worked closely with Sao Paulo-based metal fabrication specialists Tecnosystem to create it.

"While it's a bespoke design, it's made from off-the-shelf, commercially available 4 metre-long, 5 mm- thick and 15 cm-wide aluminium strips with round perforations," says Abreu. "Tecnosystem customises the strips with precision-cut slots for accurate onsite assembly, enabling them to be fitted and bolted together at the required angles using tiny, almost invisible, brackets.

"Technosystem installed the structure – attaching it to the building with support pegs deep-set into the projecting side walls and shaped floor beams in a fairly tricky, six-week assembly programme involving scaffolding. It was a difficult process to get right.

"All strips are electrolytically painted white, using a highly weather-resistant product. The white helps define the diamond pattern of the aluminium and provides strong colour and textural contrast with the dark aluminium panels and wood elsewhere. All materials are salt-resistant as the ocean is just a couple of blocks away."

## Roof terrace

Anibal's roof terrace features a small gravelled garden in front of pleasant seating and eating area for tenants, complete with simple outdoor kitchen facilities.

Overlooking the front of the building, it is bordered by a combination of low concrete walls clad in granite and tall cumaru fencing with the same granite tiling on the floor.

Abreu continues: "While the building is 90 per cent LED lit, the roof has no photo-voltaic panels as it is too small to make it viable to install them.

"This gave us the opportunity to create the roof terrace, a pleasant exterior space for rest and relaxation or casual meetings. To maximise its usability we included an electronically controlled canvas sliding roof to provide shower protection and shade when needed.

"The building is mechanically heated, cooled and ventilated, so we placed the plant and skylights out of sight beyond the roof terrace perimeter, within open-topped, concrete partitions. Integral rooftop gutters drain any rainfall away through internal, concealed downpipes."

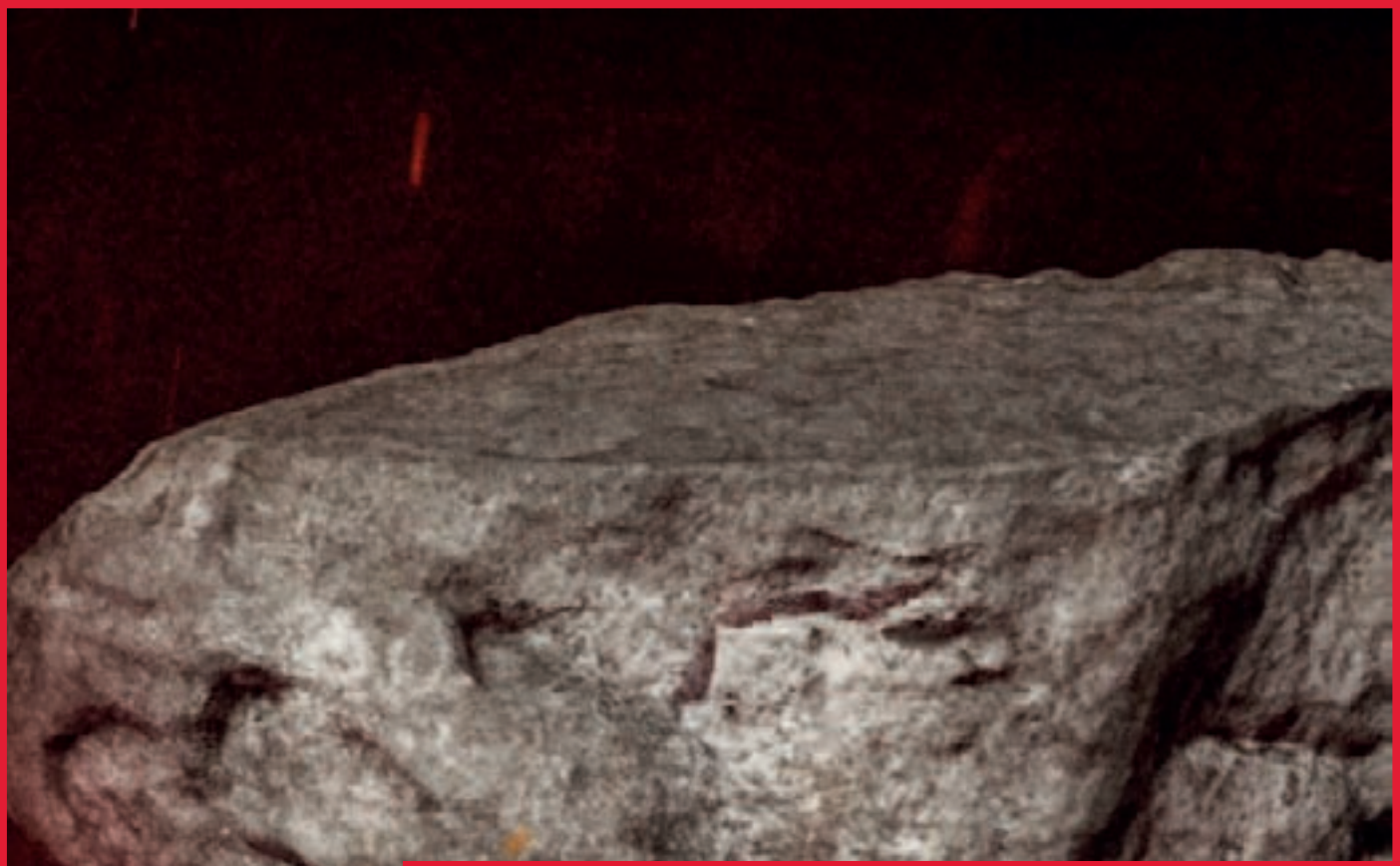
The concrete slab that forms the roof is covered with single-ply membrane and insulating styrofoam, apart from the garden's gravelled area. On other levels the main interior flooring is made from reclaimed hardwood.

Concluding, Abreu comments: "We are pleased with the aesthetics and functionality we have achieved for the Anibal Building envelope, particularly given the constraints we faced,

"Our clients tell us they're happy with the way the building looks and works, and tenants say they find it a pleasant physical environment to be in. So, it looks like we got the design right."■

### PROJECT DETAILS

**Architects:**
Bernardes Arquitetura
**Location:**
Rio de Janeiro, State of Rio de Janeiro, Brazil
**Aluminium facade fabrication:**
Tecnosystem
**Glazing:**
Panoramah
**Interior design:**
Claudia Moreira Salles
**Landscape design:**
Daniela Infante
**Lighting design:**
ILuz
**Acoustics:**
Roberto Thompson Motta
**Air conditioning:**
Frioterm
**Construction:**
São Bento
**Electrical & plumbing:**
Efficienta
**Structural engineering:**
Abilitá
**Ceilings:**
OWA (work spaces), Carpinta (wet areas)
**Lighting:**
Lumini, Erco, Foscarini



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BUILDING PROJECTS

## VAL-DE-FONTENAY BANK PARIS

# Origamitecture

The new office complex for bank Société Générale in Val-de-Fontenay, eastern Paris, resembles three folds in a giant sheet of paper – formed from over 200 km of reconstituted Japanese wood strips. Stephen Cousins investigates

Faced with the task of cramming 90,000 m² of new office space onto a 23,000 m² plot of land, in the Fontenay-sous-Bois district of eastern Paris, the last thing architect Anne Démians wanted to do was create an unsightly glass and metal high rise.

The client, prominent French banking group Société Générale, was eager to transform the dour image of the banking profession, and provide its employees with a people-centred building, catering to modern technological working methods, with a futuristic aesthetic and strong credentials of environmental sustainability.

The solution was to fold up the terrain, like a sheet of paper, to create three sensual, wave-shaped blocks that appear to emerge directly from the landscape. The new division of Société Générale at Val-de-Fontenay,

**ABOVE**
The wood strips run in continuous bands and at several locations sweep outwards to form canopies

**RIGHT**
The building's distinctive curving form was inspired by folded paper and the shapes of sound waves

referred to as Les Dunes, is wrapped in over 200 km of 100 per cent reconstituted, 100 per cent recyclable wood strips, formed into aluminium framed panels.

The strips run in continuous bands over the walls and roof, at several locations they sweep outwards to form canopies, over balconies and doorways, and appear to merge into the ground at the base of the buildings.

Démians has refered to the project as a new and daring experiment in workplace design, she told ADF: "Les Dunes offers a new image of modernity through innovations in construction, in a gentle rupture from what has been done over the past 30 years. The entity as a whole is more than a building, it is a landscape."

## Clued-up client

Société Générale has a long history of commissioning innovative architecture. Its head office, at 29 Boulevard Haussmann in Paris, was redesigned in the Art Nouveau style, in 1912, by architect Jacques Hermant. The twin tower offices in the La Défense business district of western Paris, were designed in the 1990s by Michel Andrault and Pierre Parat, the brains behind some of the largest skyscrapers in the district. They connect to the slender triangular prism of the Granite tower, designed by Christian de Portzamparc, the first French architect to gain the prestigious Pritzker Architectural Prize.

**Les Dunes offers a new image of modernity through innovations in construction, in a gentle rupture from what has been done over the past 30 years. The entity as a whole is more than a building, it is a landscape**

Anne Démians

Démians' 2011 competition-winning design for Les Dunes has a much less angular appearance than its forebears, and a strong horizontal emphasis. The blocks are oriented east/west, to take advantage of transversal light and to allow for the creation of the communal outdoor areas in the 'valleys' in between. These south-facing gardens include a herbarium and trees to increase employees' connection with nature.

The project is bordered on one side by the Val-de-Fontenay suburban train station, which handles roughly 30,000 passengers a day, and on the other by the broad avenue of Maréchal de Lattre de Tassigny. The

hemmed in plot suggested a very different treatment from the one devised, Démians says: "You might have expected the creation of a traditional closed garden courtyard, a confiscated urban space surrounded by re-assembled corner buildings. But I moved away from this idea very quickly, instead opening up the space completely at both ends to create a form of 'headless' project without beginning or end."

The buildings are served by a long, double height, interior street, containing a business centre and cafes, that runs below ground and connects into the rail station.

A key client aim was to deliver an atmosphere conducive to calm and concentration, with natural light and outside views. Workspaces benefit from very large 4 metre x 3 metre windows that look out onto planted greenery of the 'valleys' between buildings. The easily accessible outdoor areas have a semi-tropical climate and provide areas suitable for quiet individual contemplation or group meetings.

The brief required an office with clean energy performance and spaces that can be adapted to the needs of the future generations of workers, enabling reversibility and modularity, and enhancing collaboration.

This sentiment was expressed in a company manifesto, published in the Journal of Financial Economics in 2015, it states: "We must observe how the digital relationship has changed our physical relation to work. Coming to a soulless office in the morning to plunge head first into a computer alone behind a desk, or worse, in the middle of an open space, no longer makes any sense. Coming to the office has to provide something more. New workplaces will respond to the human need for warmth and sharing. To meet this challenge this gigantic project must integrate the concepts and methods of our digital age: co-creation, collaboration and cooperation."

## Sound waves

The specific curved profiles of the three buildings are based on three frequencies of sinusoidal wave, their inflections were stretched upward until they met the spatial real estate targets set by the programme.

Where previously, glass and metal facades were used to express the power of the company, a shift towards "a more individual expression" led to the specification of undulating wood strips on the outer surfaces. As Démians poetically notes: "With the evolution of a facade, there may be new materials to explore other than those with which we have been filling our sketchbooks for years."

The 'valleys' between blocks are densely planted courtyards intended to induce a feeling of calm and contemplation among staff

**We must observe how the digital relationship has changed our physical relation to work**

Journal of Financial Economics in 2015

The wood is mounted on an extruded aluminium subframe, and forms part of a layered curtain wall solution, including windows, corridors and balconies, detailed and supplied by Italian envelope specialist Permasteelisa.

The wood/aluminium shell is raised above an underlying glass/aluminium Alucobond curtain wall. This gives the facade a thickness intended to mimic that produced in buildings built in stone and concrete. The rear curtain wall incorporates blinds, the large sliding glass windows intended to maximise views.

The wood strips are highly durable, require zero maintenance throughout the building's lifespan, and function principally as sun shades. In addition, the material imbues the facade with a natural, rustic tone and the slatted arrangement increases its transparency.

The wood was sourced from Japanese

All images © Jean-Pierre Porcher

supplier Sekisui and was formed from recycled wood crushed into a pulp in an industrial process that removes the oil content.

"This particular wood does not exist in Europe and it was only after several months of research, in Japan, that I could fully understand all its qualities," says Démians. "The manufacturer, perhaps because of its insular fragility, is several years ahead of Europe in terms of industrial research. It was a new material for us, but has been used in Japan for more than 30 years."

The material was mounted onto an extruded aluminium profile, which was bent as a single unit to create the finished 50 mm-deep panels ranging in size from four to seven metres tall. The use of micro-strips of wood helped increase adhesion and improve resistance to deformation over time.

The more acute curvature of the roof was created using three separate module types with different radii and tangents designed to ensure perfect continuity between panels.

## Climatic Facade

The facade solution was a key element of the project's environmental performance and "a major and communicative symbol of the project". The design achieved LEED 'Gold' Certification and an excellent rating under the Haute Qualité Environnementale standard for green building in France.

The timber blades shield against direct sunlight and reduce associated heat gain. Wood has inherent high levels of sequestered carbon, the product is 100 per cent recyclable and its durability avoids issues related to maintenance and replacement. If maintenance or replacement are required, due to damage, the panels can be easily removed.

Large sliding windows in the underlying aluminium facade guarantee optimal daylight for each floor and frame views of the gardens below, enhancing the comfort and wellbeing of employees.

In more general terms, the building was designed to minimise energy consumption, exposed concrete soffits help smooth temperature peaks caused by thermal inputs, such as ICT equipment and building occupation. Some doors are motorised to allow for controlled natural ventilation.

The low-impact environmental approach aligns with the concept to create a building that forms part of the landscape of the city, its undulating hills and valleys a new landmark on the Parisian skyline.■

**The facade solution was a key element of the project's environmental performance and "a major and communicative symbol of the project"**

**LEFT**
The timber strips are formed from recycled wood, native to Japan, crushed into a pulp in an industrial process that removes the oil content

**PROJECT DETAILS**

**Client/end user:**
Société Générale
**Architect:**
Architectures Anne Démians
**Cost consultant:**
Alain Mazet and Associates
**Structural engineer:**
VP & Green
**Facade engineer:**
VP & Green
**Environmental engineer:**
Alto Ingénierie

BUILDING PROJECTS

## RESIDENZA LE STELLE LOCARNO, SWITZERLAND

# Riding the crest of a brick wave

Francesco Buzzi's architectural studio has won an international award by covering apartment blocks in Switzerland with a wave-like brick cladding system built by robots. Jess Unwin finds out more

When architect Francesco Buzzi persuaded his client that he could design something special in a suburb of the Swiss city of Locarno, the remarkable result was something that is now winning international praise.

The focus of the plaudits is the robot-built brick cladding that is woven in an interlaced pattern around each of three six-storey buildings at the mixed residential and commercial development of Residenza Le Stelle.

Designed by Buzzi's company, Buzzi Studio Di Architettura, the brick facade resembles a patchwork of pixels – the minute component blocks of colour in an electronic image that together form a whole picture.

But this cladding system is not designed to sit flat against the exterior of the buildings – in fact, it forms a wave-like facade as the brick panels bend inward and outwards. Even more unusually, in some places this wave partially covers the buildings' windows and loggias.

### Like a curtain moving in the breeze

The effect is probably best summed up by the Buzzi Studio team, who describe it as being like "a curtain swelling and contracting in the breeze".

The story of how this unusual building envelope design came into being begins with Buzzi's intimate knowledge of Solduno, the Locarno neighbourhood it now graces.

"I grew up nearby and so know the area well. The playful design and quality of the 60s-built structures I knew when I was

younger have now largely been replaced by rather dull buildings – a great loss to the neighbourhood."

So Buzzi was determined the design of the new Solduno buildings for which he was responsible would certainly not be dull. Buzzi Studio's aim was to design something modern, yet still "merging with the fabric of the neighbourhood". Fortunately, says Buzzi, the client shared that ambition and was "open to new ideas."

It turns out that practicality was one driving force for the innovative brick cladding that was eventually developed. Buzzi explains: "The birth of these buildings was very long, between five to seven years for various different reasons, and the requirements and specifications were changing. We needed to find a solution to deal with these unpredictable changes."

## Inspiration for a wave-like brick facade

"We decided to make the changing requirements a quality. That's when we came up with the idea of a wave-like brick facade. Normally, when building with brick you need to be very precise with your measurements but this would mean the coincidence between the brick and openings for windows didn't have to be exact."

Inspiration also came from the Casa Beretta building adjacent to Residenza Le Stelle – a structure designed by influential local architect Rino Tami. "He was a pioneer of modern architecture and this building, from 1964, uses brick so we wanted to connect our building with it."

A third motivation, says Buzzi, was "to employ techniques that were very much 21st century". "We knew of some research being done in Zurich by a company called ROB Technologies that was about enabling an architect to design a facade using 3D software. We felt this technique would say we are part of the present epoch. But then every architect in history wants to use the latest techniques."

## Built by robots

So, how did the cladding system actually come together? After the brick facades had been designed, the individual sand-coloured bricks – created by Swiss manufacturer Keller using Jura clay – were carefully glued together by robots to form panels.

The panels were then fixed to the buildings onsite using stainless steel brackets and hooks. The final part of the process was to weave the panels together

**Inspiration also came from the Casa Beretta building adjacent to Residenza Le Stelle – a structure designed by influential local architect Rino Tami**

Francesco Buzzi, Buzzi Studio Di Architettura

by the manual insertion of just a few connective junction bricks. Behind the cladding sit weatherproofing and insulating materials plus a reinforced concrete frame.

The positioning of holes in the facade so that they don't exactly match the position of windows and loggias is very much deliberate. Says Buzzi: "We wanted it to be very clear the brick was perceived as cladding, not a brick wall. But we also liked the idea that rather than just something only superimposed on the exterior of the structure it can be perceived from the interior too – that's why the bricks are sometimes partially or almost entirely in front of windows."

Returning to descriptions of the cladding that make comparisons with fabric, the Buzzi Studio team point out that the way the bricks have been cut to accommodate the openings for windows and loggias produces a final appearance with "textile ornamental qualities, like fraying fabric."

## Buildings positioned to respond to surrounding environment

The positions of the three buildings that make up this development are also carefully thought out to respond to their location. Filling the full width of the site, there's a block that faces onto Via Bartolomeo Varenna, a busy street with heavy traffic. Behind this are two freestanding towers that face sloping ground down to the Maggia river and offer views of the surrounding mountains.

Buzzi explains that the landscaped spaces between the buildings help to visually connect the complex with the surrounding scenery, their Rino Tami-designed neighbour and the enclosed gardens of other adjacent buildings.

## Changeability outside & inside too

Apartments in the two river-facing towers take up a full floor each, but have slightly different floor plans and window arrangements. Buzzi says: “We drew on the idea popularised in Milan and known in Italian as villa a piani – reproducing a whole house on one floor and to have these ‘houses’ stacked on top of each other.”

This gives occupants a greater range of views outside, while, according to Buzzi, the absence of the corridors that are often found in apartment blocks means residents can “fully perceive from the inside the true dimension of the building”.

The changeability of the brick cladding facade is a design theme repeated inside by the organisation of spaces in the apartments. "We wanted every apartment to be different, which is not always the case

## I'm proud that we played a part in designing a special building

Francesco Buzzi, Buzzi Studio Di Architettura

in an apartment building," says Buzzi.

This is partly achieved by three different interior floor heights – 2.31 metres for the kitchens, 2.62 metres for the bedrooms and 2.93 metres for the reception rooms. Where necessary, two steps take you up and down between the different levels.

Varying configurations give each apartment different character too. Some reception rooms face the internal landscaped court, others the river side of the development. Even the loggias, which were conceived as external space, can be turned into an enclosed conservatory if the occupants prefer.

Use of changing window shapes adds to the seemingly random diversity; however, because 90 per cent of them are of just three standard sizes there is still a sense of unity.

### More ordered street-side design reflects one-way traffic flow

The architecture of the apartment block facing Via Varenna presents a more linear structure, both in more regular floor plans and the arrangement of the brick cladding facade. This was Buzzi Studio's design response to the one-way traffic flow of the street.

Another difference is the fully glazed ground floor on its street side, which is occupied by shops. The first floor of this building is meant for office space with the remaining floors all apartments. The two river-facing blocks at Residenza Le Stelle are entirely apartments.

### Proud to play a part in creating an award-winning building

Completed in 2015, Residenza Le Stelle was one of the winners in the Multi Unit Housing – Mid Rise category of the prestigious Architizer A+Awards 2016. Entries are judged by a panel of luminaries and thought leaders from fields as diverse as fashion, publishing, product design, real estate development and technology.

"We were very pleased to win the award – a great surprise," says Buzzi. "Sometimes you get rewarded for courage in what you're doing. As far as I am aware I think we've done something that's a first on this scale."

He explains that using the robot-built cladding was partly a response to growing sector pressure to cut costs through quicker non-manual construction methods. However, Buzzi Studio had also taken the opportunity to explore the creative and expressive potential of imprecision and lack of visual alignment.

"I'm proud that we played a part in designing a special building. Together with the client we wanted to show that you could do better without having to spend too much."

Judging by the plaudits from his architectural peers, they've succeeded in that aim.■

**PROJECT DETAILS**

**Architect**:
Buzzi Studio Di Architettura
**Brick facade design:**
ROB Technologies
**Structural engineer:**
Anastasi SA, Locarno
**Main Contractor:**
Garzoni SA, Lugano
**Brick manufacture:**
Keller
**Steel bracket system:**
Pfungen
**Windows:**
Baumgartner Ag, Hagendorn

# Fire safety in multi-storey buildings is a hot issue

Tim Vincent of Rockwool explains why specifiers should consider non-combustible stone wool insulation in multi-storey buildings

Edward Woods estate in Shepherd's Bush, west London – a combination of products helped extend the life of three 1960s residential tower blocks

Buildings over 18 metres in height present numerous challenges when it comes to insulation requirements and fire safety standards. Given that most fires occur in domestic dwellings, high-rise residential buildings over 18 metres have a high safety risk potential in the event of a fire due to the long escape time for occupants to travel from the top of the building to safety. Meanwhile, today's modern multi-storey buildings tend to offer a complex mix of occupation, including offices, hotels, residential, retail and leisure facilities, which can present further challenges in the event of a fire.

## Increased fire risk in high-rise buildings

The time to evacuate a high-rise building is extended due to the large volume of people attempting to escape at one time, especially as lifts and escalators are usually inaccessible in the event of a fire. This not only presents problems in terms of the speed of evacuation, it can also put those with mobility issues at an increased risk.

In this type of building, fire can quickly spread through the material of an external cladding system or through the cavities. Typically, the source of ignition may be flames issuing from windows or other openings due to a fire within the building, or there may be an external fire source – for example, fire radiation from another building or from a source immediately next to the cladding, such as refuse set alight by arson. Flames in cavities can extend 5 to 10 times original length, regardless of materials present. They can flash over and break out through windows, spread up over or through the cladding or extend over 2 metres above a window opening. There is also increased risk during construction when the insulation is exposed.

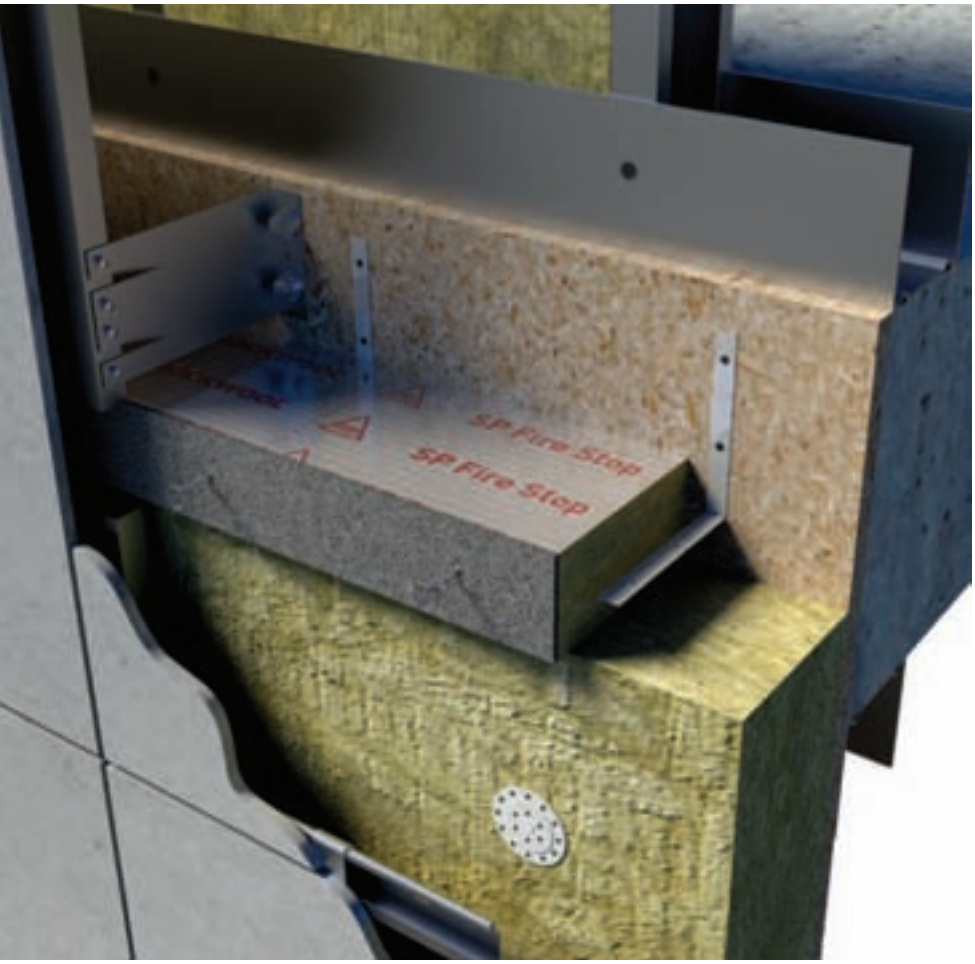
Careful consideration of the design and products specified to reduce the fire risk in such buildings is required with particular emphasis on containment to allow safe evacuation, reduce the risk of fire spread to other buildings and to enable access for fire fighters.

## BR 135 and fire safety standards

Fire safety standards, embodied in Building Regulations Part B Fire Safety and associated Approved Documents, are designed to ensure that adequate fire safety provisions are incorporated in tower blocks of whatever type. Regulation B4 requires the external walls of a building to adequately "resist the spread of fire" with functional requirements given in Approved Documents. In any building, the cladding system and materials must conform or exceed the regulation for limited combustibility defined in BR 135: "Fire Performance of External Insulation for Walls of Multi-Storey Buildings", when tested in accordance with BS 8414-1:2002 and BS 8414-2:2005 for its range of external wall insulation systems. This testing satisfies building regulations in England & Wales and Scotland pertaining to fire for buildings over 18 metres tall. The BR 135 classification is called for as an alternative guidance to non-combustibility compliance for domestic and commercial applications.

With the completion of a number of construction projects not compliant with Approved Document B or the guidance under BR 135, the Building Control Alliance in conjunction with its members looked to readdress misunderstandings

**Flames in cavities can extend 5 to 10 times original length, regardless of materials present**

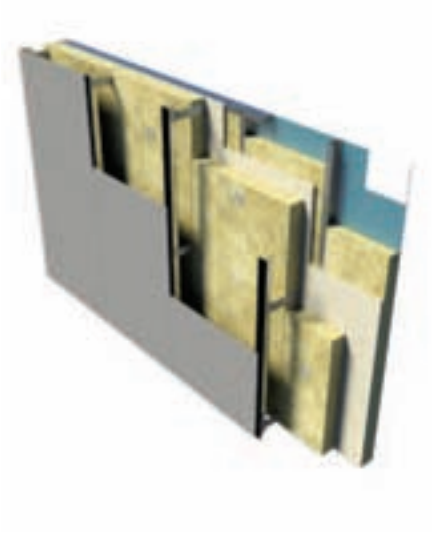



Some stone wool insulation products can tolerate temperatures of up to 1000°C

within the market. In June 2014, the BCA published the first issue for guidance note 18, which addressed the key issues surrounding external wall materials, including 'Class O' performance and the various routes for compliance. Following this revision, the NHBC now include a fourth option for compliance, published in their technical bulletin echoing the risk of fire spread within external wall constructions.

As a publicly available document, Guidance Note 18 is useful to everyone within the construction process looking to mitigate risk and advises that "As a guide, insulation of limited combustibility should be used e.g. Rock mineral fibre type, stone wool, slag wool or man-made mineral wool/fibre."

The straightforward route to demonstrating compliance with BR 135 and Guidance note 18 in our view is to use stone wool insulation that is non-combustible. Non-combustible products will not contribute in any stage of the fire,



including a fully developed fire according to the European reaction-to-fire classification standard BS EN 13501-1.

## Stone wool insulation

Stone wool insulation products are used to create a firewall that slows down the spread of fire from room to room, improving safety, buying valuable time for occupants to safely escape as well as reducing the risk of property and asset damage. In addition, the insulation does not produce toxic smoke and therefore reduces the effects of smoke damage to the building too. As the biggest cause of death during a fire, this is a key advantage for many specifiers when choosing specified products.

Manufactured from basalt rock, stone wool insulation consists of layers of bonded, water-repellent-treated multidirectional stone-wool fibres formed into a resilient batt using a resin binder. It can achieve a reaction-to-fire rating of A1 under the British and European standard for the fire classification of construction materials BS EN 13501-1: 2007, or "non-combustible."

## Resources

To support this BR 135, Rockwool has produced a technical publication entitled Routes to Compliance in High Rise Buildings over 18 metres. There is also a Rockwool RIBA Accredited CPD, entitled "Fire safety compliance: Rainscreen Cladding Systems".

*Tim Vincent is head of technical for Rockwool*

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# Solid credentials

Brian Newell of Shackerley explains how ceramic granite can transform buildings thanks to a mixture of durability and design versatility

Ventilated facade cladding is well proven and widely used as an aesthetically versatile approach to completing the building envelope, also offering benefits in terms of building lifecycle, thermal performance and maintenance. Specified for new developments and existing properties, this method of construction is seen across all sectors.

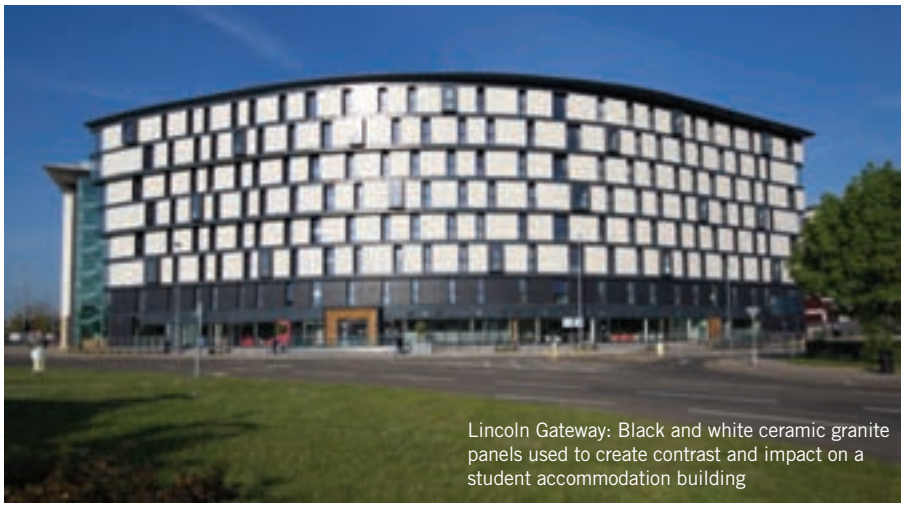
Not all ventilated cladding systems are the same, however. Architects working on conservation schemes which require natural or sympathetic materials are benefitting from the specification of a ceramic granite ventilated facade. This type of cladding was introduced to the UK in the early 2000s and continued innovation has led to the availability of increasingly large ceramic granite panels, up to 3200 mm x 1600 mm (11 mm to 20 mm deep) along with an ever increasing choice of colour palette, styling options and textures.

Ceramic granite is a versatile and technically-advanced material, is produced from natural elements to provide a finish that combines practicality and quality with the beauty of natural quarried stone.

Clays, feldspars, minerals and metal oxides are amalgamated and subjected to intense hydraulic pressure to create large format slabs fired at 12,600°C until fully vitrified. This fuses all the material's constituent parts, so no bonding agents are required. The finished product can be specified with a natural, honed, or highly polished finish and can be produced in a remarkable range of contemporary styles and patterns in addition to traditional stone-like options.

Ceramic granite panels are engineered to be impermeable and exceptionally strong; panels of just 11 mm thickness can be relied upon to provide outstanding building protection. They are lighter and easier to handle and install compared to their quarried stone counterparts, and the loads on the building and the sub-structure are much lower.

For contemporary buildings, ceramic granite can offer a modern finish, for example with highly polished black, white and coloured panels providing striking contrast with curtain walling and glazing. Body veining and graining, highly polished, honed, satin lustre or natural finishes can be further enhanced by mixing panel sizes and orientation.



Lincoln Gateway: Black and white ceramic granite panels used to create contrast and impact on a student accommodation building

Advanced manufacturing technology has made it possible to produce ceramic granite panels that resemble other materials, including natural timbers. Ceramic granite can also be manufactured with a natural stone-like finish such as granite, marble or limestone.

## Performance

As well as offering high aesthetic quality on completion, UV, weather and algae growth resistance will allow facades to retain their looks throughout the lifecycle.

Whereas most types of quarried stone are porous, ceramic granite is impermeable, which also contributes to the lifecycle performance of the building. Zero porosity ensures facades are resistant to all climatic conditions, and they comply with international standards for freeze-thaw resistance. The material is also impervious to airborne pollutants, most acids, alkalis and graffiti.

The longevity and performance of a ceramic granite facade will depend on the support system used to install it. The material can accept anchored undercut fixings which are invisible from the front of the facade. When used as part of the dedicated cladding support system with aluminium brackets, stress free anchorage results in a facade that is exceptionally resilient to structural movement, surpassing mandatory requirements for facades in earthquake zones.

Like all ventilated facade systems, ceramic granite facades allow a continuous flow of air in the cavity between the outer facade and the building exterior, creating a micro-ventilation effect that allows the building to 'breathe'. This cavity allows for the installation of thermal and acoustic insulation to boost the building's energy performance and interior comfort levels. Enhancing a building's sustainability credentials in this way, as well as its service life expectancy and low maintenance durability has contributed to many project's BREEAM ratings.

As architects come under increasing pressure to consider specification on a whole life costs basis and select products that will minimise maintenance and optimise aesthetics across the building's lifecycle, ceramic granite ventilated cladding is becoming a popular choice.

*Brian Newell is founder and chairman of Shackerley (Holdings) Group*

the Maxwell centre, university of Cambridge, UK - architect: BDP

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# Adhering to the principles of rainscreen cladding

Rainscreen cladding is now a familiar feature, seen throughout our built environment. Ged Ferris of Cembrit provides an overview of the benefits of fibre cement for use a cladding material in this context

Rainscreen cladding in large sheet format has been around for over seventy years. Inspired by timber framed constructions with planks, bark or hide coverings, today there are a wealth of other systems and cladding materials for the architect and specifier to choose from – one of which is fibre cement.

Historically, in parts of the world where slow growing softwood is abundant, buildings have been designed and constructed with some kind of structural frame which is then 'clad' in boards, sheets, or in more traditional societies – hides. This cladding protects the construction, provides thermal insulation, creates design features and as the name suggests, is a screen between the elements and the building. Becoming known as rainscreen cladding, this method became extremely popular in areas where timber is in plentiful supply. For that reason, Scandinavia is where the technique evolved and for many years the 'Scandi-look' has been created and been imitated the world over.

With advances in manufacturing materials, however, North America took up the mantle and this is where the technique matured, quickly developing for other modern manufactured materials. In fact, the first building to feature 'modern' rainscreen cladding was the 1952 Alcoa Aluminium headquarters in Pittsburgh.

## In the frame

The key function of rainscreen cladding is to screen the building structure from the elements, particularly precipitation. Incorporating an airspace and insulation between the rainscreen and the structural frame, means extremes of temperature, damp, sunlight and wind are dissipated helping to maintain equilibrium in the inhabited spaces of the structure.

There are several important considerations when designing a rainscreen cladding installation. One of the key factors is the location of the building and its exposure to the elements. The reason for this is that buildings and their cladding will be expected to withstand the worst that the weather has to offer, without the risk of failure or loss of function. However, this level of performance is only possible if there is attention to detail during the manufacture and installation of the building envelope. Of all the elements that the building envelope is likely to encounter, the wind has the greatest potential to cause damage – both to the cladding and possibly even the building structure. The height and location of a building will affect the wind-loadings. For calculating wind-loadings, specifiers should always consult appropriate standards. Although withdrawn the suite of BS 6399 Part 2: 1997 standards are still commonly used as a basis for wind loading calculations in combination with BS 8104: 1992

On smaller projects, it is common for

**TOP**
An office in Cembrit's 'home town' of Aalborg in north Jutland shows Cembonit AKA Patina through coloured cladding

**ABOVE**
A combination of warmer 'earth' coloured Cembonit on a low rise building

**TOP LEFT**
A hotel in Poland uses Cembonit also in a conventional landscape format

**BOTTOM LEFT**
A modern, flush finish with no interruptions in the facade to distract from the sleek surface, at Acland Burghley school in Camden

**RIGHT**
A project in Finland shows that even a relatively small area of strong or vivid colour will be eye-catching

the cladding to be to be installed on a framework of timber battens and counter battens. For larger projects, both steel, and more commonly aluminium are used. Metal brackets and rails allow for greater flexibility in the cladding zone to accommodate the wide thicknesses of insulation now available. Metal frameworks are also secure and energy efficient through the incorporation of thermal stops and other features.

## Design perspectives

The use of modern materials such as aluminium and fibre cement can provide a consistency in size, shape and colour that is not achievable with traditional materials. This is important from a design perspective as first impressions count and the vertical face of any building is usually the first element that is seen and usually the mental image of the building retained by the viewer.

Fibre cement rainscreen cladding is a lightweight versatile facade construction that allows specifiers to achieve greater creativity, shorter construction lead times and improved thermal performance for their projects. Although fibre cement cladding is manufactured as large format panels – generally as a 4 ft x8 ft' module – it is a surprisingly versatile material as demonstrated by varied applications.

**The key function of rainscreen cladding is to screen the building structure from the elements**

With imaginative design and good collaboration between cutting specialists, support system suppliers and installers, striking effects can be created with fibre cement cladding. Colour is one of the important tools in the arsenal of the designer looking to make a statement. However, geographical regions tend to vary in their views on colour. In Finland, Denmark and Sweden there are many projects that demonstrate the design possibilities that colour can offer. Elsewhere in Europe design and colour create remarkably different building effects with the same basic material. The design and architectural community in the UK has yet to fully embrace the potential that colour can offer, but with or without colour, fibre cement is here to stay as a cladding material.

*Ged Ferris is marketing manager for Cembrit*

# Showcasing key brick trends

The annual Brick Awards celebrate every aspect of brick design and construction and showcase some of the key trends. These trends were evident in the Brick Development Association's 2016 awards held in November, particularly these highly commended and award winning project examples

## Contrast

Architects Virgile and Partners' work on the prestigious Birmingham department store Harvey Nichols, was acknowledged for its innovative use of brick and clay.

The architects were keen to challenge the expectations of a traditional luxury shopping experience. The use of brick with other unconventional materials makes an eye catching interior and one that is sure to be replicated in both the retail and domestic sphere.

The wide variety of materials used in the wall, which uses plywood boxes and marble finishes, forms a dramatic contrast. The brick slips and pistol slips form a smooth wave which is combined with other elements to create a three-dimensional, stand-out feature.

The feature makes a strong contribution to the overall ambience of the store, and truly fulfils the architects' brief of an atmosphere of 'controlled disruption'.

## Inside out

Out of the 15 Brick Awards, Newport Gallery was the notable receiver of four, scooping the BDA Craftmanship, Best Public Building, and Specialist Brickwork Contractor awards, as well as being crowned the Supreme winner.

Designed by Caruso St John Architects, the building exemplifies the radical effects that are being achieved with brick in modern buildings, and was also recently awarded the highest accolade in the British Architectural Landscape, the RIBA 2016 Stirling Prize.

The project involved remodelling three purpose-built former theatrical set painting workshops into a terrace with new buildings clad in a matching pale red semi-glazed Gloucestershire brick. Northcot brick, together with a darker brown bespoke brick, were used to mark the entrance piers and soffit.

The existing facade was restored and extended either end with bricks laid in lime mortar carefully chosen to match the existing for size colour and texture, and incorporating bespoke brick arches, numerous handmade special bricks and feature 'saw tooth' gable ends.

Internally the magic really comes to life using Oslo Pearl White bricks as an interior design feature. Also laid in lime mortar, they were used to construct four Ellipse staircases from ground level to roof. The setting out and control tolerances were at an absolute minimum as the staircases incorporated feature brick lintels and soffits, bespoke inset curved stone hand rails and wooden stairs, all finished to the highest and most exacting standard, creating a crafted quality rarely seen today.

## Texture

Architecture studio Project Orange has reinterpreted the traditional London mews to create a row of contemporary brick studio buildings with residences above.

Foundry Mews, recipient of the Brick Awards' 2016 Best Small Housing Development, replaces a dilapidated car repair workshop, creating a mix of workspaces and homes that are hidden behind a row of high-street shopfronts in west London.

Brick facades and slate roofs reference the surrounding buildings, but also feature contemporary additions including perforated and protruding brickwork details, producing a modern textured look. The perforated pattern is referenced elsewhere on the facade where the bricks protrude outwards to create decorative dimples that create a pattern of light and shadow.

## Bespoke brickwork

Recognised for its bespoke brickwork, the Gagosian Gallery is a remarkable example of this customised craft that is

Foundry Mews, west London

Peabody St John's Hill
©Jack Hobhouse

becoming ever more popular in the design of modern structures. Bespoke irregular sized handmade bricks were laid in lime mortar to produce a unique facade incorporating feature lintels and louvered design.

The bricks were also laid in 'random' bond, with the architectural vision being that no two adjacent course be laid in the same way as the course immediately above or below, thus completing the transformation of this 1960s building into a contemporary new art gallery with adjoining offices in the heart of London's Mayfair.

## New architectural motifs

The St John's Hill development near Clapham, South London, was met with high praise at the 2016 Brick Awards, receiving the Best Large Housing Development Award for the project's first completed phase.

The development, instructed by London housing association, Peabody, was conceived by architectural practice Hawkins\Brown. Works have seen 300 sub-standard homes demolished to make way for almost twice as many, new community-centred homes.

Working with local artist Rodney Harris, the development showcases the ability of brick to provide an artistic means of expression alongside its obvious merits as a highly-functional facade material. Harris, who produced four brick reliefs, referenced elements of the local community based on the site's heritage. This beautiful design was brought to life through a diverse palette of Wienerberger brick and the craft of Lee Marley Brickwork.

# Sealing the deal of airtightness

Iain Fairnington of the A.Proctor Group, discusses how the performance of the building envelope can be improved through airtight membranes

The need for airtightness is driven by the global challenge to reduce carbon emissions and the drive to create more energy efficient buildings which waste less energy, reduce costs and protect both the building fabric and well being of its occupants.

The Government's long-term carbon reduction strategy set out in the Climate Change Act means by 2050 the UK must achieve a reduction of 80 per cent against 1990 levels. While changes of government and the scrapping of the Zero Carbon Homes Policy have created some uncertainty, the need to follow through with these plans remains a fundamental part of the design and construction of the UK's building programme.

Around 45 per cent of UK $CO_2$ emissions come from the built environment, (27 per cent from domestic dwellings and 18 per cent from non-domestic), and space heating is accounted for much of this energy. The Building Regulations' increasingly stringent performance criteria for building envelope has led to higher standards of insulation being specified for roofs, walls, windows and floors. However, identifying localised areas of reduced insulation or thermal bridging causing air leakage has become even more crucial.

Air leakage through cracks, gaps, holes and improperly sealed elements such as doors and windows can cause a significant reduction in the performance of thermally insulated envelopes, in some cases reducing their effectiveness by up to 70 per cent. Discrepancies between 'as built' and 'as designed' performance are largely attributable to uncontrolled air leakage, prompting architects and developers to increasingly turn to air barrier membranes as an essential part of the design process in achieving the most effective means of controlling and reducing air leaks.

A common misconception regarding airtightness is that well-sealed buildings mean uncomfortable, 'stuffy' indoor environments, which are in fact created by poor ventilation. Buildings with very low rates of air leakage require correspondingly higher levels of ventilation as part of a balanced design approach. It is a myth that increased ventilation hampers overall efficiency, because ventilation is controllable and can be accounted for within the design.

## Guidance, legislation and compliance

The key guidance relevant to airtightness compliance is outlined in the Building Regulations Approved Document Part L1A Conservation of fuel and power in new dwellings and Part L2A Conservation of fuel and power in new buildings other than dwellings. However, it is also important to take a holistic approach when considering compliance with Building Regulations. Both reducing the rate of air leakage and increas-

**Identifying localised areas of reduced insulation or thermal bridging has become even more crucial**

ing the thermal insulation will contribute to lowering the building's $CO_2$ emission rate, but the implications of each approach can be substantially different.

Air leakage is measured in $m^3/m^2/hr$ - the quantity of air moving through the building fabric ($m^3$), for a given building floor area ($m^2$) over a given time period (hr). The measurement method commonly used is either pressurising or depressurising the building, and measuring the airflow required to maintain the test pressure (50 Pascals in the UK). The Building Regulations require the level of air leakage to be no greater than $10m^3/m^2/hr$ ($7m^3/m^2/hr$ in Scotland).

Although building regulations provide a framework to achieve minimum airtightness levels [via dwelling emission rate (DER) in Standard Assessment Procedure (SAP), and building emission rate (BER) in SBEM], the Code for Sustainable Homes (CSH) offers guidance on how to substantially exceed this.

If we consider the 'notional dwelling' used within the SAP calculation, and vary the levels of thermal insulation (in terms of U-values) and air leakage, the benefits from exceeding base requirements for airtightness become clear. By varying the U-value from 0.15 to 0.05, with an air leakage rate of 7, the DER will drop by 6.7 per cent, but achieving this reduction in U-value will require almost three times the thickness of insulation. By contrast, retaining the 0.15 U-value, but dropping the air leakage rate from 7 to 1 will achieve a similar improvement in DER, but with little or no corresponding increase in thickness, allowing a reduction in building footprint, or an increase in internal space, while reducing build costs considerably.

## Designing for airtightness

There are two main ways to achieve airtightness in the building envelope, internally or externally. One way of thinking about this is 'inside of the services zone' or 'outside of the services zone.'

Traditional use of internal air barriers can be more complex and costly to install due to the need to accommodate building services such as electrical, lighting, heating and drainage systems. An internal air barrier is only as good as its installation. If all of the service penetrations are not adequately sealed, performance will be compromised.

A huge variety of 'airtight' accessories will be required when using an internal air barrier system. These include airtight VCLs, pipe and cable gaskets, junction boxes, extractor fans, switch boxes, light fittings and sealing tapes. These accessories are generally more expensive compared to standard non-airtight versions, and take more time, care and attention to install correctly.

However, moving the air barrier system to the external side of the structural frame can allow for an almost penetration-free layer that can be installed faster and more robustly when comprising self-adhesive and mechanically-fixed vapour-permeable air barrier membranes and sealing tape. In essence, an external air barrier system prevents trapped moisture and air leakage and can be simpler to install than internal options, with less building services and structural penetrations to be sealed.

## Best practice air barrier product solutions

The Anchorage at Dibden Purlieu is one of five buildings being built for Hampshire County Council to Passivhaus standard, which will help to achieve a significant reduction in energy bills for each property.

The development required an airtightness level of less than 0.5. Wraptite-SA was applied externally to the timber frame panels in continuous pieces by chartered building company Raymond Brown Building creating a highly-insulated finished building, and achieving the required standard. Initial air test results of 0.43 were achieved coming well below the 0.5 air permeability target. All the more impressive, since this was recorded even before the installation of the internal VCL Procheck 500, also provided by the A. Proctor Group, whose recommendation is that advice is sought when detailing Passivhaus to assess whether a VCL is required. This will be dependent on the building system, insulation used and the standard of workmanship.

The use of self-adhering vapour permeable membranes makes a significant contribution to a building's thermal performance by preventing lateral air movement. It also provides high vapour permeability, which allows any water vapour to escape the wall construction efficiently thereby avoiding any interstitial condensation problems.

*Iain Fairnington is the technical director of the A.Proctor Group*

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Located in Dungannon, the McAvoy Group is an off-site construction provider specialised in modular and panel system builds. Since 2015, it has been working with Trespa Pura NFC® cladding on several school projects across the country.

When The McAvoy Group was chosen to build the new Rise SEN School in Feltham, the project planning already included detailed requirements on the materials that had to be used to clad the façade. "The project had been passed by planning with a 'timber effect' composite board," says Keith Anderson, McAvoy's Contracts Buyer.

The cladding needed to be easy to maintain and to install, be available in various colours and to have a high impact resistance and colour stability. It also needed to have a fast delivery programme.

"Trespa Pura NFC® was one of the materials that could meet all the requirements. With Trespa, we had the expectation that this product would come with an excellent service

and client management," explains Anderson.

As with other projects, The McAvoy Group was able to reduce the construction lead times for the Rise SEN School by using a modular build. The company considers this method to be the future of construction. "With the UK government's 2025 vision for the construction sector, the strategy is 33 per cent lower costs, 50 per cent faster delivery timescales, 50 per cent lower emissions and 50 per cent improvement in exports. To achieve this, modular construction will be at the forefront of this change," says Anderson.

For McAvoy, Trespa Pura NFC® proved an "excellent fit" for this modern method of construction. "With its ease of installation and flexibility, we are able to choose to fit the cladding within factory conditions when applicable, or we can install on site if required," adds Anderson.

By working jointly with Trespa, the Dungannon based company managed to meet the tight timescales, from date of order to delivery of the product.

The Rise SEN School was completed in April 2016. Since then, McAvoy has finished three other modular school buildings clad with Trespa Pura NFC®. They are located in Salisbury, Dagenham and Lynch Hill, respectively.

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## Cavity barriers helping to protect Axis

Axis is a new luxury housing development located on North West London's Finchley Road. The project is due to consist of fashionable and modern apartments. Following direct consultations with **Envirograf®**, Product 55 (RS range of foil-coated cavity barriers) has been used to improve the fire protection rating of the cavity walls. It consists of a 30mm or 40mm strip of non-fibrous fireproof sponge, covered with a layer of foiled, reinforced craft paper, which can be easily cut to size with a sharp knife. It also provides insulation and is fully water resistant, making it ideal for use in rainscreens and other types of cladding.

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## Parex for university accommodation

Newly built accommodation for students at the University of Derby features the **Parex** Monolith brick panel system to provide a traditional 'brick built' appearance as part of a fast track construction project. Cathedral Court in the centre of the city provides 350 en-suite bed spaces in a complex. The development features modern methods of construction including a modular Fusion steel framed core and the Parex Monolith brick panel system installed to all external facades to provide high insulation values and an aesthetically pleasing exterior.

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# A complete roofing system guaranteed to stand the test of time

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Gavin White, product manager at Marley Eternit, discusses how specifying a comprehensive, high quality roof system can provide architects with the reassurance and protection encompassed in a single 15 year system guarantee.

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Firstly, our unrivalled roof system comes complete with the reassurance that all elements are designed and tested to work seamlessly together, ensuring the finished building performs to the original design; helping to reduce risk to an architect's design liability. Secondly, getting the most comprehensive system from one single source and limiting how many suppliers are involved, frees up valuable time as architects and specifiers do not have to deal with multiple product suppliers for a project. Furthermore, a roof system covering so many products gives maximum control of the supply chain, which can minimise the risk of unmonitored product choice or substitution further down the supply chain. For example, anything specified by type and not by product name, such as roofing battens does allow the opportunity for products to be sourced down the line by contractors involved.

Yet, the benefits of a complete roof system from Marley Eternit extend far beyond installation, 15 years beyond in fact.

Every complete roof system from Marley Eternit also delivers additional peace of mind with a 15 year system guarantee now available. Not only reducing liability, but also helping to further enhance an architect's reputation for selecting complete roof systems which will stand the test of time.

As pressure mounts to increase construction output and work to tight timescales, the potential gap between design and actual performance of a finished property continues to be a concern. One reason for this can be the substitution of materials during the build programme due to cost, time or personal preference, which can result in under performance of the building in that area. With this in mind, specifying a comprehensive roof system from one manufacturer can help architects to reduce this performance gap, taking more control of specifications and minimising the risk of unmonitored product choice or substitution further down the line.

In addition, the 15 year system guarantee offers underwritten performance on each bespoke project specification, incorporating National Building Specification clauses which adhere to the latest British Standards.

When it comes to the elements of a roof system, Marley Eternit's range of roof coverings such as tiles and slates to fittings and accessories, right through to battens and underlays, are all of the highest quality, designed and tested with maximum performance and durability in mind. This means architects can be assured of the quality of the entire system and all its component parts, and that it will achieve maximum performance as all parts are purpose made to work seamlessly together.

Accessing a complete, high-performance roof system from Marley Eternit provides greater control in specification, unequalled performance, and ultimately, peace of mind, so architects are able to focus on other areas of a project. Producing a bespoke and tailored specification for each project is important because not only is reusing old specifications a dangerous practice, but each one will be unique with its own set of requirements under the British Standard. This is why we pride ourselves on having a range of easily accessible specification services, including online self service tools designed to take the hassle and complexity out of producing brand new specifications for each project.

In addition to expert technical support throughout the installation process, Marley Eternit also offers its Roof Systems Selector to help architects uncover the potential options available when specifying roofing solutions from its range of roof products, fixtures and accessories.

Covering more pitched roofing elements than any other manufacturer, our 15 year system guarantee gives the ultimate assurance that our integrated roofing solutions can be specified and installed with complete confidence.

**01283 722588**
**www.marleyeternit.co.uk/roofsystem**

MarleyEternit

# Lightweight materials show their appeal as Vertigo delivers distinct aesthetic in London

As the trend for dry, lightweight construction continues to grow, so has demand for lightweight construction solutions. One such solution is Vertigo, the first range of fibre cement slates on the market that have been specifically designed for use on vertical facades.

A recent project in London demonstrated how the innovative Vertigo system from Marley Eternit has helped to create a distinctive, contemporary dormer conversion.

The home owner specified the Vertigo fibre cement slates to create a clean cut, precisely engineered, slate panel aesthetic for his dormer loft conversion and roof extension, forming a contrast against the riven tiles used on the existing roof and differentiating it from other roof extensions in the area.

The first of its kind in the UK, Vertigo consists of small 600mm by 300mm slate like panels which can be quickly fixed onto battens, with the desired amount of insulation in between. The fibre cement slates perfectly adapt to the contours of the building, providing a second protective skin.

As the home owner explains: "There are hundreds of similar roof extensions in Chiswick, all determined by the same stringent local planning requirements. We appointed PRS Builders to carry out a flat roof dormer conversion for us but we wanted something different, we didn't want a 'me-too' extension. The idea was to create as modern an aesthetic as possible, using an innovative material, not the same type of vertically hung tiles used on other conversions in the area, but still working within the planning constraints.

"We originally chose zinc but it proved to be too expensive and not eco-friendly enough. When we heard about Vertigo, we changed the specification as it offered the stand out aesthetic we were looking for but was a more cost effective and sustainable option."

The Vertigo slate range is very easy to fit and has three different installation methods to give more design flexibility and freedom. On this project, PRS Builders fitted the Vertigo fibre cement slates using a panel installation, so that the regular bond panels give geometric precision. However, it can also be fitted using a traditional method of installation, which gives a natural slate appearance with slate hooks or another option is broken bond, where panels are staggered to give a close boarded effect.

The home owner adds: "We're really pleased with the finished effect, the extension blends in with surrounding roofscapes but at the same time, the Vertigo finish offers something a little bit different - a distinctive, yet under-stated, aesthetic that sets ours apart from all of the other similar dormer conversions in the area."

Charlotte Hughes, marketing product manager from Marley Eternit, comments: "As architects, specifiers and self builders look to create stand out residential designs in urban areas, fibre cement is becoming an increasingly popular material, not only for the roof but also for vertical slating as it offers a striking aesthetic, is lightweight and easy to fit. We developed Vertigo to give more flexibility to specifiers and designers who want to use fibre cement slates across the whole building envelope. This innovative method of vertical slating uses invisible fixings to provide clean lines and a modern aesthetic and is perfectly suited to new build or refurbishment work."

Lightweight, weather and temperature resistant and available in eight different colours from blue/black to terracotta, Vertigo slates can be used to create beautiful, distinctive and elegant vertical cladding solutions for a full range of building types. Perfect continuity between the roof and facade can be achieved by using Vertigo in combination with Marley Eternit's Birkdale or Rivendale fibre cement roof slates.

Vertigo also boasts superb sustainability credentials, helping to achieve environmental credits with a 'very good' BES 6001 Responsible Sourcing accreditation and its own Environmental Product Declaration (EPD). Fibre cement also offers sustainability benefits throughout its whole life cycle, as it can be fully recycled at the end of its use. Waste fibre cement can be ground down and used to replace limestone and shale in clinker production, the essential ingredients for Portland cement.

The options for architects using lightweight materials are becoming greater, and in this case Vertigo has proved its versatility, blending a non-traditional material into a traditional aesthetic. Fibre cement, alongside other lightweight materials will continue to be seen in greater frequency on buildings across the UK, as architects continue to seek effective ways of achieving stand out results.

**01283 722588**
**www.marleyeternit.co.uk/vertigo**

## Metal Technology exemplifies practice

Architectural aluminium systems company **Metal Technology** has contributed to achieving the desired ascetic for the flagship Leeds College of Building Campus designed by Fuse (Leeds). As a leading educator for construction, the College wanted a building that would reflect its purpose and encompass the use of modern materials and methods. The scheme utilised Metal Technology's System 17 High Rise capped curtain walling and incorporated manual and automatic 4-20Hi+ casement opening vents. System 5-20D Hi+ doors completed the range of products used.

**028 9448 7777 www.metaltechnology.com**

## Office enhanced with Siberian Larch

Sheffield-based architectural panel manufacturer **Panel Systems** has supplied Siberian Larch timber clad panels to provide a striking effect to the facade of a new office and warehouse facility in Wells, Somerset. Panel Systems fabricated the 37 insulated timber panels, which had a Styrofoam core, to achieve a U Value of 0.34 W/m$^2$K. The building is faced with aluminium cladding and the Siberian Larch panels were specified for their appealing aesthetics and to ensure the building complements its semi-rural surroundings.

**sales@panelsystems.co.uk**

## Glasgow Primary School gets a facelift

Glasgow's Cadder Primary School has specified *VIVIX*® by **Formica Group** for a commissioned facade renovation project, helping frame a backdrop to the school's playground. The facade not only created an inspiring multi-coloured aesthetic for the pupils and teachers, but with the sustainable panels being reversible they also help reduce maintenance and upkeep costs making them suitable for school budgets. Since the cladding was placed on top of an existing brick facade, it was vital to have ease of application, a quality afforded by *VIVIX*®.

**0191 259 3512 www.formica.com**

## Trivaus Garenne Campus, Clamart

The new sports hall in Clamart, France has benefitted from **BEMO** standing seam products to both roof and facade. The unique design, by architects Gaetan Le Penheul, demanded a complex free-flowing shape to the building. BEMO-MONRO was chosen as it allows complex geometry to be achieved using patented roll-forming technology and in-house 3D engineering; 417 unique panels were produced and supported by the BEMO-DOME substructure. BEMO were involved in the early design stages, and this strong collaboration ensured the desired form could be easily achieved.

**01773 853694 www.bemoprojectengineeringuk.co.uk**

## Advanced glazing helps 'Blue Skies'

The recently completed £26m Maxwell Centre is the centrepiece for the University of Cambridge's physical sciences and engineering industrial engagement activity. As part of the goal of providing industry-grade working spaces for occupants, the university wanted the building to deliver cutting edge performance in terms of sustainability. **Pilkington** Insulight™ Sun double-glazed units were specified throughout the building. The glass helps keep heat inside the building during the colder months and prevents excessive heating during the summer, helping to reduce solar-energy entering the building.

**01744 692000 www.pilkington.co.uk**

## VMZINC engraved facade for University

The BREEAM Excellent-rated, £26m Maxwell Centre at the University of Cambridge was designed by BDP as a centrepiece for research and industrial partnerships in the physical sciences. Located on the West Cambridge science campus, it has a flat lock and standing seam **VMZINC** facade in a mix of dark ANTHRA-ZINC® and AZENGAR, a newly developed engraved finish. The 5,000m$^2$ building will house around 230 people and is next to the Physics of Medicine building which has a flat lock ANTHRA-ZINC PLUS facade.

**01992 822288 www.vmzinc.co.uk**

## Stunning brick facade from Ketley

A blend of light and dark red **Ketley** brick slips have been used in conjunction with a range of bespoke Ketley Class A red bricks to create a stunning brick facade for the new Victoria Gate Arcade in Leeds. The outstanding design by Acme Architects uses brickfaced precast panels in a complex geometry with steps and pleats to form an innovative 3 dimensional masonry facade. Ketley's Class A bricks were selected for the project because of their high technical performance of very low water absorption, very high strength and unrivalled frost resistance.

**sales@ketley-brick.co.uk**

## Cembrit cladding achieves top marks

**Cembrit's** through-coloured Cembonit cladding boards have been installed on a ten storey mixed use development in the heart of Merseyside, providing accommodation to students of Liverpool John Moores University, Liverpool Hope University and the University of Liverpool. Due to its central location, the appearance of the external envelope was extremely important, and one which led to the specification of a cladding solution that could achieve a varied finish. For more information email Cembrit.

**sales@cembrit.co.uk**

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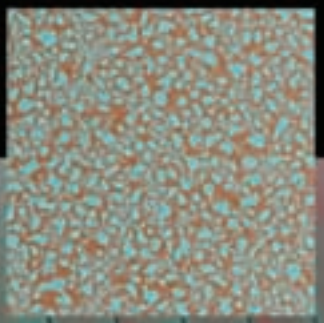

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