GLASS & TRANSLUCENT MATERIALS

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adf materials for architecture

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Glass and translucent materials supplement

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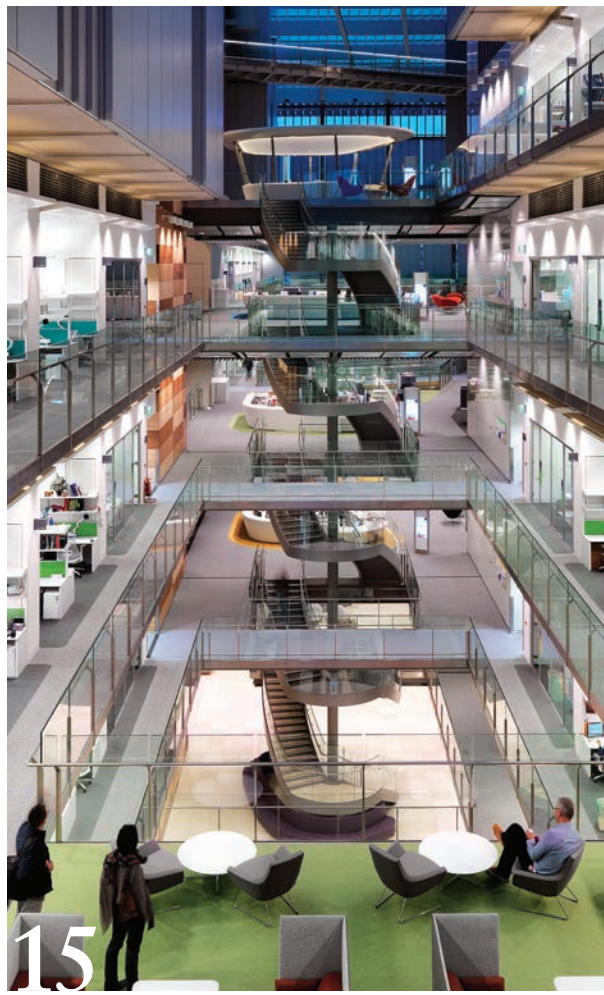

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FROM THE EDITOR

It's arguable that glass has been the dominant material when it comes to building facades, at least in the non-domestic sectors, since the middle of the 20th century.

Particularly exemplified by the construction of shining canyons of commercial buildings – from skyscrapers in New York City's Avenue of the Americas in the 70s and 80s, to Dubai, Shanghai and the London Docklands cluster in the 90s and 00s – glass (alongside its life partner concrete) has been the chief weapon for creating light, fast buildings.

Not only has it been the chief player in commercial buildings however. Many new house designs have tried to bring in light with wider expanses of glass that ever before. In tandem, glazing specification is refining sightlines to exacting levels – which manufacturers are helping to deliver. This is being seen even in fairly modest schemes such as Hush House, a surprising home tucked away in Finchley by architects Ashton Porter – and which will be reported on in June's *ADF*. The resulting living spaces can offer almost zero visual indication of a frame; the outside appearing to blend seamlessly with the inside.

While daylighting is essential for wellbeing in work and living space, light needs to be controlled, particularly with the need to limit cooling requirements and achieve sustainability targets. We are now beginning to see major buildings eschewing wall-to-wall glass, but also employing 'smart' glazing to control the tint at the touch of an app.

Such innovations may be beyond the means of most owners, but they are showing what can be achieved by combining the world's continued love for glazing with a focus on harnessing technology to create efficient spaces. Necessary outlay on such systems will reap rewards over time financially in energy savings which will go a long way to helping offset that cost.

We feature an array of inspiring schemes in this special supplement, which will help to show you why glass and translucent materials are still at the forefront of architects' thinking. We hope you find it an illuminating read!

James Parker
Editor

ON THE COVER...

The Francis Crick Institute was created to investigate diseases with a 'transparent' building layout aided by copious glazing, plus an innovative glass and aluminium roof design by HOK/PLP.
For the full report on this project, go to page 15.
Image © Paul Grundy

AIRPORTS

Pascall+Watson appointed to design new arrivals terminal at Stansted Airport

Pascall+Watson have been appointed by the owners of Stansted Airport, Manchester Airports Group, to the next two phases of the airport's £600m Transformation Programme, including the design of the new £130m arrivals terminal for which the firm developed the concept design, and the redevelopment of the existing terminal.

The scope of the project includes the development and delivery of the concept design for the 34,000 m^2 arrivals terminal, which relocates all arrivals functions to a separate "state-of-the art" facility.

The bespoke design by Pascall+Watson complements the architecture of the existing building, which will be reconfigured into a dedicated departure only terminal. This will include the expansion of the check-in, security and retail areas, along with a new 'airside' coaching facility, aircraft stands, taxiway infrastructure and car parking facilities.

The design for the new arrivals terminal will provide a "high quality passenger environment" with an "enhanced" immigration and baggage reclaim area, spacious arrivals concourse and a welcoming public forecourt.

The concept for the arrivals terminal focuses on a modular sky-lit roof floating above generous double height spaces. The soffit design reflects the "single directional nature of the facility," said the architects, which combined with the building's functional planning, provides "an intuitive passenger journey".

Pascall+Watson added that its contribution to the Stansted Transformation Programme "supports the airport's future growth and will transform the travelling experience for millions of people passing through the airport".

Pascall+Watson have been involved in Stansted's evolution for almost 30 years. They have completed numerous schemes of varying scale and complexity with services ranging from masterplanning, airport planning, concept, detail and production design, wayfinding and construction support.

Paul Willis, programme delivery director for the Stansted Transformation Programme, said: "Pascall+Watson have already played a key role in the Stansted Transformation Programme, so we're delighted to announce they have been appointed to develop the design for phases two and three."

Willis added: "Over the next five years, we're investing £600m at Stansted, which will see the biggest upgrade in passenger facilities at the airport since the iconic Sir Norman Foster terminal opened in 1991. This investment will transform the experience for millions of passengers and help unlock Stansted's spare runway capacity, providing passengers with a wider choice of airlines and destinations."

CO-LIVING

PLP's co-living hub opens in west London

The Collective Old Oak, believed to be one of the world's largest co-living spaces, forms a new hub for urban professionals in west London.

The design by PLP architects creates a new "hybrid typology," said the firm, "redefining the architecture of living and working to suit the unique community of people". The building takes the form of two slim volumes sitting on a large podium and sliding across one another, on a central core. This central hub increases opportunities for interaction between residents, and makes circulation between floors as simple as possible. The building's upper stories are lifted up above a public plaza facing onto the canal by a dramatic branching column in 'fire engine' red.

A series of amenity spaces for all the building's residents fills the central hub. A games room, spa, secret garden, cinema, library and disco launderette, many of which are directly connected to adjacent communal kitchens, which offer facilities above the kitchens in individual units. A key element of the design is the windows at the ends of each connecting hall, which provide views out over the surroundings. The building is clad in glass, which reflects the lighting conditions at any given time of day. The grey cladding also supports the modern appearance. The 'luminescent' structure 'shines' on the skyline as a 'beacon' of the area's regeneration, and as a thesis for the future of collective living.

COMMERCIAL

Floor-to-ceiling glazing installation for new Leeds Urban Village scheme

A floor-to-ceiling glazing installation has been created to offer "the ideal balance between form and function" at a new multi-use development in west Yorkshire.

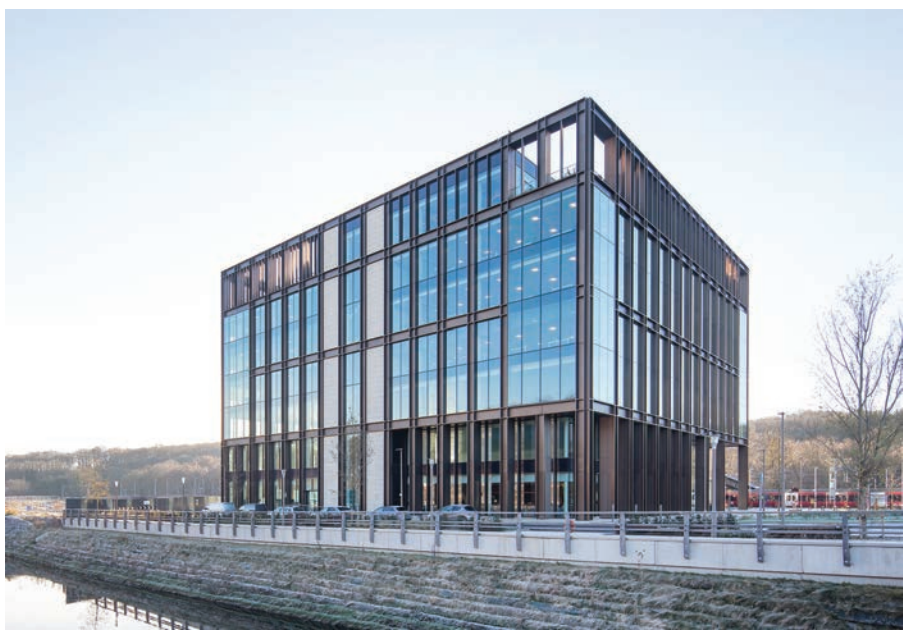
Located to the north-west of Leeds, Number One Kirkstall Forge is part of the 57-acre, £400m Kirkstall Forge 'urban village' scheme which on completion will offer Grade A office buildings, contemporary housing, green spaces, cafes, bars and restaurants in a beautiful riverside location. One Kirkstall Forge, the first commercial development on the site, is an office building offering over 110,000 ft² of highly flexible workspace over seven floors, with floor-to-ceiling glazing at 2.8 metre height and a glazed entrance atrium.

The glazing installation was required to be compliant with the highest environmental sustainability standards, as the client aims to achieve a BREEAM 'Outstanding' rating. Additionally, Number One Kirkstall Forge's proximity to the development's own railway station gave rise to the need for acoustically-enhanced glass, to limit noise transfer and allow residents to enjoy the tranquillity of Kirkstall Forge's woodland location.

To give Number One Kirkstall Forge the ideal balance between aesthetics and functionality, a combination of aluminium systems integrating with high performance insulating glass units, spandrels and sandwich panels were specified. The 'stick' curtain walling was fabricated using Wicona's Wictec 50 systems, which provide a slim 50 mm face width and ensure thermal insulation through the incorporation of a PVCu thermal break.

For the glazing specification, it was vital to choose products which would help the building adhere to the high efficiency standards it was aiming to achieve, with low levels of heat transmission and solar gain.

Work on the scheme began in July 2016 and the building was completed in November 2017, with the first occupants moving into the development in December last year.



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SMART GLASS

App-controlled glazing gives full control of light at Dubai library

The Mohammed bin Rashid Library, currently being built in Dubai, will feature a substantial area of special glass in its construction which has been specified to control sunlight.

The largest library and cultural project in the Arab world, it was developed by the Dubai Municipality. SageGlass, a Saint-Gobain "dynamic glass" product, will make up 72 per cent of the project's total glass elevation and can be programmed to tint automatically to the appropriate level of transparency in response to the sun, controlled manually via a smartphone application.

Alain Garnier, manager, sales and business development, SageGlass Middle East said: "The product will greatly enhance the interior environment of this great building, contributing to what will become a highly sophisticated cultural facility, when complete."

TRANSPORT

London Bridge gets a new lease of life from OAG

One of the capital's oldest railway stations, handling over 50 million customers a year, London Bridge has been extensively renovated as part of a multi-million-pound collaboration between Costain, Network Rail, and architectural glazing experts OAG, delivering the design by Grimshaw Architects.

Planned in three phases over four years, OAG said it helped "revolutionise" the station as part of a broader refurbishment project totalling £1bn. The High Wycombe firm installed a 275 metre bespoke glass facade along the station's Tooley Street entrance, with a stylish curved upper tier, and a lower tier consisting of double-height bomb-proof glazing. Each pane of 5.6 m glass installed in the station's lower tier weighed in at 350 kg.

Internally, OAG were tasked with installing all 26 glass archway shopfronts as part of the station's Western Arcade, giving a sleek, modern touch to the building's barrel-vaulted Victorian architecture.

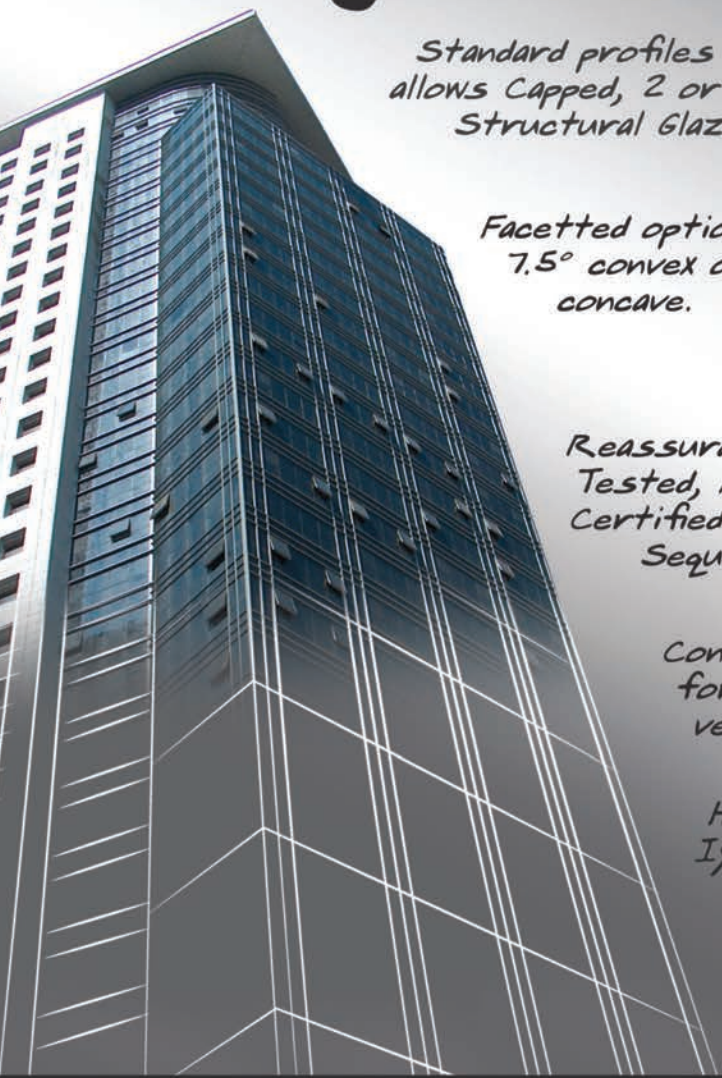
Director at OAG Gary Evans commented: "We were delighted to work on such a demanding and prestigious project. There's no doubt it was challenging at times – London Bridge is one of the most vital components of London's overland and underground rail infrastructure, and was kept in full use throughout the refurbishment. It's extremely rewarding to see the work completed."

Grimshaw Architects had a bold vision of how to revitalise London Bridge for the 21st century, while retaining its existing Victorian charm – it's been incredibly exciting to see that vision brought to life

Gary Evans, OAG

"Grimshaw Architects had a bold vision of how to revitalise London Bridge for the 21st century, while retaining its existing Victorian charm. It's been incredibly exciting to see that vision brought to life."

Notes from the Comar design team...



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COMMENT

Clear innovation

Adrian Adams of Saint-Gobain Building Glass outlines the current and future 'megatrends' that are influencing architectural glazing specification

Architectural glazing is an exciting area, and there are always new trends and product developments. However, there are also a wide range of global 'megatrends' that are impacting consumers and the built environment, and so in turn specifiers.

Comfort and well-being

The latest 'megatrend' is to ensure that spaces deliver comfort and positively impact the health and wellbeing of users. Where glazing is concerned this means ensuring the inside temperature is comfortable and constant – not too hot in summer or too cold in winter.

This is where thermally controlled energy efficient glass has had a huge impact. But comfort and well-being also relates to solar control, acoustic glazing and visual comfort (reducing glare from the sun whilst maximising the use of natural light). We spend up to 90 per cent of our time in buildings, so it's important that the experience is positive – glass plays a major role in achieving this goal.

Light transmittance

Access to natural daylight has widely understood health and wellbeing benefits, so solar control glazing that limits the glare and heat of the sun yet has high light transmittance is in growing demand. Recent product developments in solar control glazing are helping architects achieve this balance of light transmission versus solar heat gain.

Glass as a structural element – large expanses & curves

The use of glass as a structural element in large areas (larger than 18 metres in some cases) is creating iconic light-filled buildings. The 32-foot glass cube that forms the entrance to the Apple store in New York is a great example. The cube is self-supporting and is totally free of structural steel. Daylight pours in and stunning views are offered of Central Park. A key innovation has been the ability to remove the need for transom and mullion systems for better sightlines.

There continues to be a trend to move away from designing glass 'boxes' and a desire to incorporate more fluid designs into today's architecture. The latest technological advances in glass and structural engineering are making more adventurous architectural concepts become a reality in both the commercial and residential markets.

Dynamic facades

Facades can now change with the climatic environment rather than providing static performance all year round. A dynamic facade reacts to changes in outdoor and interior conditions, such as light or temperature, and makes a significant contribution to improving the energy efficiency of the envelope and reducing operating costs.

Glass that tints on demand is able to reduce glare and heat while letting natural light in. This allows users to create better thermal and visual comfort. It also means that they don't need blinds or shutters.

Fire safety & security glazing

All elements of safety and security glazing continue to be a factor driving specification, with key examples including ballistic and fire glass. This trend will continue as countries look to protect their citizens and enhance their safety and comfort.

Modern working life & access to information

Architects now work flexibly and often work outside the traditional 9 to 5 work day. This has led to a need for access to information 24/7 and the onus is on product manufacturers – including glazing – to provide a wide range of technical information, specification tools and specifications online.

Rapid urbanisation

Urbanisation is forcing architects, developers and governing bodies to apply new thinking, and design differently. For example, cost and speed are often key issues, and we are seeing the increased use of modular and prefabricated housing solutions, impacting how glass is supplied. High rise accommodation is being increasingly used to maximise urban density, with specifications needing to take into account issues like wind loading and noise pollution, and we are seeing further development of acoustic glazing products to address these.

Automation

'Industry 4.0' is the current emerging trend of automation and data exchange in manufacturing technologies. Computers and automation will work together in a completely different way, with robotics operating with very little input from humans. The way we manufacture glass will certainly develop and change in line with this trend.

Adrian Adams is the facades market manager at Saint-Gobain Building Glass

COMMENT

An introduction to specifying self-cleaning glass

Phil Brown of Pilkington UK offers a guide to the benefits of self-cleaning glass, and the science behind the product

Glass is the one of the 'go-to' materials used to create modern commercial and residential developments. Its ubiquity is a result of the range of new technologies that mean it can be used for much more than just windows and conservatories.

Innovations in coatings mean glass can be given a range of beneficial properties such as thermal insulation, as well as solar and noise control. One of the most popular – but perhaps misunderstood – properties which coatings can add to glass is that of self-cleaning.

Ever since self-cleaning glass became commercially available, it's become prevalent in building designs, especially because the technology can help architects ensure that their buildings look immaculate without 'lumbering' landlords with a high level of window maintenance.

Considering the long history of float glass, self-cleaning glass is still a relatively new product. For anyone who may be unaware, self-cleaning glass is exactly what it sounds like. Marks and dirt that would normally build up and make glass look unclean are removed by rainwater and sunlight in day-to-day weather conditions.

While it can be a great feature to include in building designs, there are some things worth considering to get the most out of self-cleaning technology. The first thing to note is that not all products on the market are the same. Those considered 'superior' are dual action, i.e. where the cleaning process works in two stages.

Stage one uses a 'dirt eating' photocatalytic reaction. This breaks down organic deposits such as mud and dirt into smaller particles that can be more easily removed. The second stage involves the hydrophilic (or 'water-loving') coating. When rainwater hits the glass it spreads evenly over the surface to form a thin film instead of forming into droplets. This washes dirt away and reduces the formation of drying spots and streaks.

When it comes to the application itself, there are a number of factors to bear in mind. The most important is the minimum recommended angle for a roof containing self-cleaning glass. Anything less than 10 degrees from horizontal and the rainwater may not run off and wash dirt away effectively.

Secondly, it's important to consider the local environment. In most parts of the UK the glass won't need to be manually cleaned often – the frequency depends on the amount of rain its exposed to and how dirty it is. In long dry spells, for example, it might need to be rinsed with a hose or with a soft cloth and soapy water.

Self-cleaning coatings are one of many technologies that have helped boost the number of potential applications of glass in building design

Wind-blown spray in coastal areas can cause salt crystals to adhere to the surface of self-cleaning glass. As salt is an inorganic contaminant, it can't be broken down by the photocatalytic action of the glass itself. The technology will, however, make the glass cleaner than ordinary glazing after a light hosing or rainfall.

After self-cleaning glass has been installed in a building, care must be taken during any further construction work to avoid staining or damage to the coating. On sites with multiple phases or when a number of schemes are being delivered together, architects should remind developers and contractors that plaster products or adhesives can affect the glass coating. A simple rinse with water is enough to remove dust and abrasives that might have accumulated, but it should be done as soon as projects have completed.

Crucially, architects should always design with self-cleaning glass that has been tested to the necessary standards. A new European standard EN 1096-5 has been introduced that evaluates the self-cleaning performance of coated glass. This standard highlights glass that uses hydrophilic or photocatalytic functions to self-clean.

Self-cleaning coatings are one of many technologies that have helped boost the number of potential applications of glass in building design. By understanding the science behind it as well as the optimum applications, properties can be made to look spotless for longer.

Phil Brown is the European regulatory marketing manager at Pilkington UK

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FRANCIS CRICK INSTITUTE LONDON

Transparently innovative

The Francis Crick Institute is a unique research hub, dedicated to discovering how diseases behave. Larry Malcic of HOK explains to Jack Wooler how the building's 'transparent' design benefits the vital work of the facility

A massive state-of-the-art facility now sits behind St Pancras Station, inaugurated in 2007 to consolidate biomedical research in the UK and put it at the forefront of world science.

Set up in response to the Cooksey Report, which set out a vision for the future of medical research in the UK, the facility (originally entitled the UK Centre for Medical Research and Innovation) was funded by the Government with a build cost of £700m.

In the summer of 2011, when foundations were about to be laid, the project was given its current title of The Francis Crick Institute. Named after the

We wanted to convey the wonder and excitement of science by making the building as transparent as possible

British microbiologist and co-discoverer of the structure of the DNA molecule in 1953, the project is a partnership between six of the world's leading biomedical research organisations – the Medical Research Council, Cancer Research UK, the Wellcome Trust, University College London, Imperial College London and King's College London. Amongst its seven key aims are researching into pathogen behaviour, how cancer responds to therapy, and the behaviour of the immune and nervous systems.

HOK was appointed as the lead architect for the project in 2008, following a rigorous selection process. PLP Architecture joined the design team in 2010, to collaborate with HOK on the building's external envelope. BMJ Architects was also appointed and retained as a biological research facilities consultant.

A sense of order

Its dimensions are colossal – 170 metres long, with 93,000 m^2 of floor space, four floors below ground, eight floors above, and 1,553 rooms, the Crick was at one point the biggest single building being constructed in the UK.

The man responsible for driving the design forward amid some controversy around locating some potentially nightmarish pathogens in the heart of London was Larry Malcic, design principal at HOK. He reveals to *ADF* that the building is located in London "for several reasons."

He continues: "Its location is central to more than three dozen other important scientific and academic research facilities within a five mile radius, encouraging dialogue and collaboration, as well as major hospitals."

Being a research hub "not just for the UK, but for Europe as well," the location's near-unrivalled transport links are vital to allow some of the best minds of Europe easy access to the facility. He added that there was also strong evidence that many talented young researchers head for the capital city, "with its many museums, theatres, sporting events and institutions of learning."

The building is located cheek by jowl with two distinct urban typologies. These are very large civic buildings – including the British Library and St Pancras Station – and residential flats to the north and west.

According to Malcic, "the design is intended to mediate between the two scales, with the overall volume divided into four blocks, linked by fully glazed atrium spaces."

The body of the building is composed of two long laboratory wings that run east to west, separated by a glazed-ended atrium that flares out spectacularly to the east. The wings are bisected by a north-south atrium, which divides the building into four distinct science 'neighbourhoods'. "The resulting cruciform atrium introduces daylight deep into the laboratory quadrants through its glass roof and four glazed end walls, offering views into the workings of the building from the external public spaces," says Malcic.

The cathedral-like scale of the main atrium is interrupted by the transverse atria where, on each level, a third of the floor area is left open to create a double-height relationship with the adjacent floor plate, creating further visual connectivity between the floors.

Unlike many other scientific or clinical buildings, The Crick is open by design. The junction of the two atria is dedicated to informal meeting, with break and administrative areas that are designed to "facilitate serendipitous encounters that support exploration, collaboration and discovery". These central areas are further connected by a "continuous" open stair.

The labs

In order to support the research undertaken within the general laboratories, a wide range of shared specialist core laboratory facilities have been provided within the

building, strategically distributed around the building to promote interaction among the researchers.

"Wherever appropriate, the laboratories were designed to provide a high level of flexibility, from individual casework elements to large reconfigurable zones, to support rapid conversion as teams expand, contract and evolve," says HOK's design principal.

Each quadrant of the floor plate provides a large contiguous modular laboratory "neighbourhood" with a linear arrangement locating open shared secondary support on the central spine, with zones of open primary and enclosed dedicated secondary labs on each side.

At the edges of the floors are 'write up' spaces for researchers, and offices of 'Principal Investigators,' with direct access to the perimeter personnel circulation routes, separate from central lab material routes. "This linear arrangement optimises visual permeability," explains the architect, "with views across the whole width of the building, connecting write-ups and the labs, and filling them with daylight."

Shedding light

The scheme provides copious natural light to interiors, including a demonstration lab at the entrance and a glazed exhibition space on the ground level, with openness and transparency for both external and internal users the key design drivers. "Especially given its central location," says Malcic, adding, "our vision was to put science on display."

He continues: "We wanted to convey the wonder and excitement of science by making the building as transparent as possible."

Floor to ceiling glazing was utilised in order to provide a visual continuity, and further encourage collaboration and communication. External glazed walls and internal glazed screens allow for daylighting in virtually all areas of the building, with views out to the surrounding cityscape.

He continues: "The labs and write-up spaces become illuminated wings of light, with sunlight coming from both exterior walls and the skylit cruciform atria.

"Daylighting studies were performed to identify the impact the building would have on its surroundings, as well as the extent of natural daylight entering the buildings."

Offering further natural light to interiors, large, cantilevered bay windows and tall glass atria maintain natural light in workspaces and public areas, while reducing the building's immediate impact at street level.

This linear arrangement optimises visual permeability with views across the whole width of the building, filling spaces with daylight

It's the outside that counts

The building's complex exterior required the same meticulous attention to detail as the rest of the project. Malcic explains the key features: "The east atrium facade is an eight storey high building element with a primary steel structure of tubular grid sections at six metre centres and at each floor level, with wind loads taken back to the cross atrium bridges which act as a beam in plan.

All structural penetrations through the facade are thermally broken using high-load isolator plates. The weather skin is five metre high double-glazing, fixed back to vertical glass fins at 0.75 metre centres spanning floor to floor.

The fins are predominantly on the outside of the glazed wall, but where the atrium facade abuts the main body of the building, the system reverses, with the fins being on the interior. "This leads to an unusual detail," continues Malcic. "The glass fin becomes part of the thermal envelope, which is achieved by adding a further layer of glass to make it a double-glazed unit."

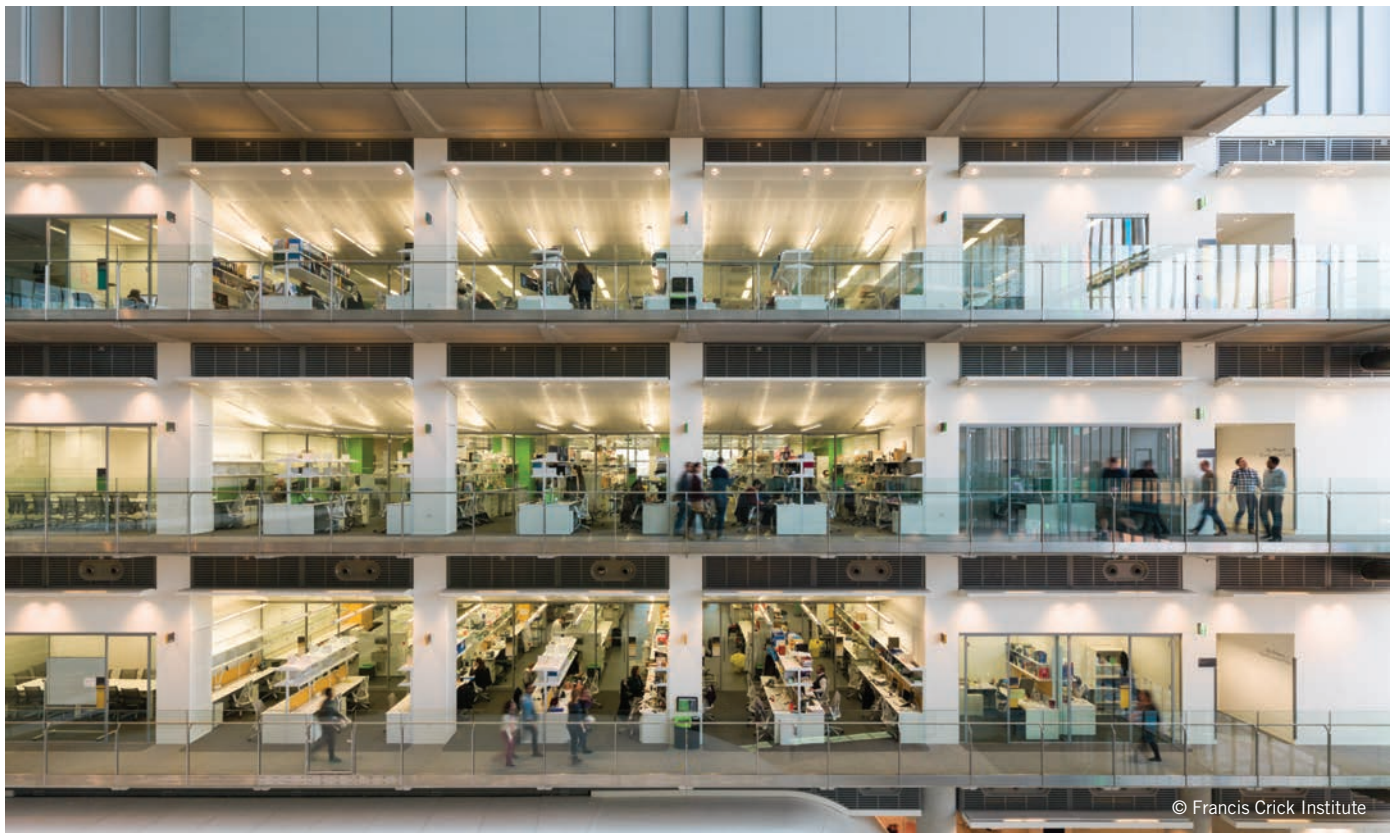
The low-iron glass fins (4.6 metres high and 0.45 metres deep) comprise three structural layers bonded together with resilient Dupont Sentry Plus interlayers, with the visible edges polished.

"To introduce flashes of colour in a random pattern across the facade," Malcic explains, "an additional dichroic interlayer is incorporated to the outside of many of the fins, protected by a thin glass sheet." The glass fins are bonded into stainless steel shoes, fixed back to the atria facade's tubular steelwork.

The double-glazed units are argon-filled and have a low-E coating to minimise heat loss. "They are also manufactured with a continuous stainless steel strip bonded to their inner face," adds Malcic, "providing the fixing back to a minimal anodised carrier frame, which is structurally bonded to the glass fin. The vertical glass-to-glass joint is then face-sealed with silicone."

To conceal the floor-to-floor deflection joint, the horizontal joints have an expressed nosing detail. At low level, the facade includes glass revolving door drums, pass doors and glazed make up air vents. A large laminated glass canopy is supported off the primary structure via plate beams and tubular suspension members through the glazed facade.

The laboratory blocks and solid areas of the facade at the lower levels are wrapped



in mortared terracotta, paying regard to its grand neighbours in the form of St Pancras Station, the British Library, and the wider local vernacular.

Staying on top

The building's distinctive vaulted roof recalls the form of the adjacent Barlow Shed at St Pancras International, and is constructed in a bespoke combination of aluminium, steel and glass elements. "This roof form is intended to help visually shield and unify the large amount of plant space in a form that both minimises the building's visual impact on the sensitive surrounding streets, while allowing it equal standing to the adjacent library and station," says Malcic.

He explains that the roof form was derived from a parametric BIM model, "allowing for a great number of iterations to be tested and analysed quickly for form-finding, street view assessment and plant volume clash detection."

The resulting roof surfaces are a combination of flat, single-curved or double-curved elements. The latter elements form a partial torus – the key driver for the exterior face of the steel structure, which is covered with 2400 aluminium and glass fins.

"The precise location, size and geometry of each louvre blade, blade brackets and spine tubes are also derived from the model, and form the basis of the information issued for tender," says Malcic.

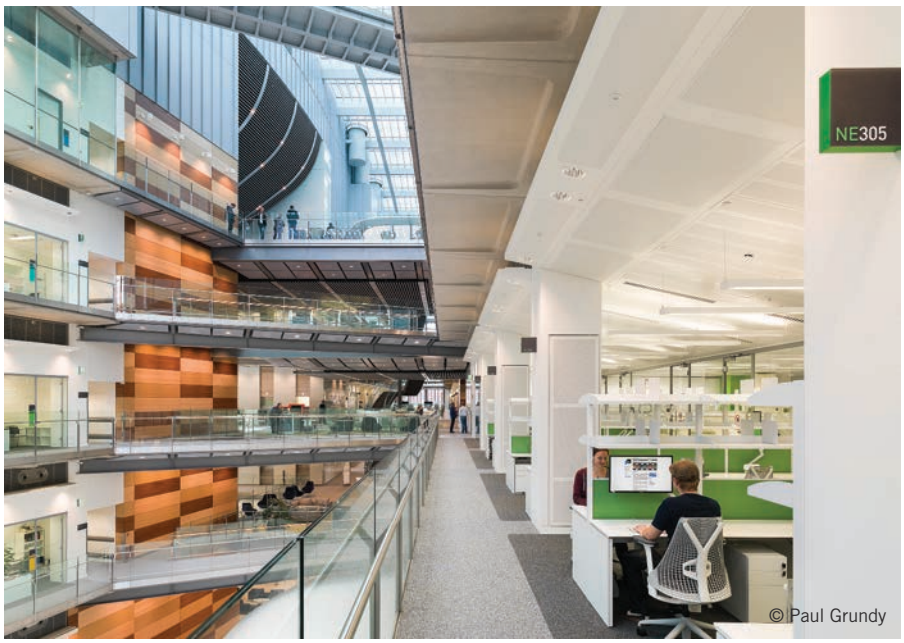
Utilising painted steel, the underlying structure of the roof is hooped north-south, and gently curved in an east-west direction. The grid is braced back to the main building frame for stability, and is capable of large cantilever overhangs at the east and west ends and on the north side of the higher roof.

Malcic summarises the screening structure: "The visible surface of the roof is an extensive kit of different louvre blades which are attached via transverse brackets to an extruded aluminium tubular spine spanning between the main roof hoops.

"These include solid and perforated aluminium and laminated glass blades, all of different widths, and photovoltaic blades, all angled at 15 degrees to the tangent of the hoop to which they are fixed."

Levolux worked collaboratively with the project design team to develop and install a custom roof screening solution, including for the PV blades. The enormous resulting structure is 160 metres x 80 metres wide

The vaulted roof is constructed in a bespoke combination of aluminium, steel and glass elements



The attention to detail present in the architecture is mirrored in the approach to boundary-breaking scientific research

PROJECT FACTFILE

Lead architect: HOK
External envelope: PLP Architecture
Biological research facilities consultant: BMJ Architects
Floor area: 93,000 m²
No. of rooms: 1,553
Contractor: Laing O'Rourke
Structural engineer: AKT II
MEP/project management: Arup
Cost consultant: Turner & Townsend

and extends up to 43 metres above street level, divided into two interlocking shells. Each shell is formed from a variety of louvres, included solid, perforated and twisted aluminium, and glass fins, ranging from 150 mm up to 750 mm and lengths of up to nine metres.

The south-facing photovoltaic louvres comprise up to 144 mono-crystalline cells per blade, laminated into low-iron glass with integral micro inverters. The BIM model was also used to assess the total output of the PV cells on each blade.

A total of 1,700 m² of solar photovoltaic panels were incorporated into the southern roof facade. This will produce approximately 31 per cent savings compared with a "baseline" scheme, equivalent to 9,950 tonnes of annual carbon emissions.

Construction challenges

Contractor Laing O'Rourke had to remove 185,000 m³ of soil from the site, over 100 km of mains power cables and 120 km of pipework had to be installed, and over 1,200 workers were on site during the most intense phase of construction. With such a complex and wide ranging build, covering multiple typologies and themes, challenges were a given.

Construction of one of the largest basements in London, with a 16 metre excavation that makes up almost a third of the development, was one of the biggest challenges. "This called for a bespoke construction methodology which was key to unlocking the holistic programming, cost and risk profile of the project," reveals the architect.

A multitude of below-ground obstructions were discovered, including the Thameslink station box and a pair of 120-year-old cast-iron gas mains, necessitating the use of complex 3D ground modelling linked to real-time movement monitoring. The construction programme balanced top-down construction from the second basement level with the logistical efficiencies of 'blue-sky' construction above, avoiding temporary obstructions, thanks to a 1 metre thick cantilevering retaining wall.

The basement imaging suite presented another challenge. Materials with magnetic properties were prohibited within the vicinity of MRI and NMR scanning equipment due to the risk of electromagnetic interference. Malcic says the team came up with a reported first in UK construction to address this: "The innovative solution included concrete plunge columns with low-ferrous stainless steel reinforcement, rather than more traditional steel sections."

As part of the design development, prototyping was undertaken in an offsite environment to build full-scale mock-ups of key areas of the project, to identify interface and technical issues. "In this way, through collaboration with the Crick and their consultants, solutions were tried and tested before being introduced into the main building."

Going forward

The Francis Crick Institute has strong sustainability goals, and the building has achieved a BREEAM Excellent rating. On its completion, the project was called "another jewel in the UK's crown as a knowledge economy," by Science Minister Jo Johnson on completion, and Health Secretary Jeremy Hunt said it "promised huge strides" in health research.

This major science project is also a major architecture and construction achievement. It is exceptional in its volume of social and collaborative spaces, including the areas it opens to the public. The project utilises glass innovatively an as visually stunning, porous, and integral part of the building's roof structure.

The attention to detail present in the architecture of the Crick is mirrored in its approach to boundary-breaking scientific research. It is sure to be the scene of many breakthroughs in the future which will benefit the whole of humanity.■

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Making an understatement

BDP's new shopping complex in one of the UK's most historic and rigorously-planned cities features copious glazing, as subtly as possible. Roseanne Field reports

FOUR PRIMARY SPACES
These are tied together by glazed roofs that also create the public squares © Gareth Gardner

Oxford is renowned for its architectural as well as academic heritage. Home to one of the oldest and most esteemed universities in the world, the city's distinctive classical architecture dates back centuries.

It was therefore always going to prove a challenge to redevelop a dated 1970s shopping centre to meet the expectations of the 21st century customer. Westgate, so named due to its entrance where the medieval West Gate into the city used to sit, eventually reopened in October last year after an incredibly protracted and complicated planning process.

It was vital that the building didn't look out of place among the local architecture. Oxford's planning structures are such that while initial plans for the redevelopment were released in 2004, several rounds of adaptations had to be made and final plans weren't adopted until 2010, with full planning permission not granted until 2014.

"It's in the centre of Oxford, so minimising the impact to the skyline was critical," explains BDP's Neil Hayward, who worked as part of the masterplanning team. In fact, a particular building within Oxford – the 12th century Carfax tower – sets the height limit for all developments within the city centre.

So stringent was the planning that BDP had to prepare a range of different drawings and images for weekly planning meetings that took place over two years. "We had to do lots of verifiable views which defined the extent of where we could build," Hayward explains. This situation is unique to Oxford and as well as the planning meetings – which are still ongoing despite the development having opened some months ago – there were three CABE reviews.

Westgate is predominantly the brainchild of BDP, who was the lead architect and responsible for the masterplan and common elements, but the scheme also saw the involvement of Panter Hudspith, Allies and Morrison, Glenn Howells, and Dixon Jones. The developer for the project was Westgate Oxford Alliance, a collaboration between The Crown Estate and Landsec.

The development is broken into four primary spaces – the flagship John Lewis building and three other 'blocks'. These are tied together by glazed roofs that also create the public squares. This glazing is a compromise to satisfy both Westgate Oxford Alliance, who wanted weather protection, and the local authority who wanted open streets. It was important that the development didn't feel like a shopping centre. "We were allowed to cover the streets, but not enclose them," explains Steve Downey, architect at BDP who worked on the roofs' designs.

Leiden Square

In order to adhere to planning, the glass roofs have been designed to have as little impact as possible. "It was important that they didn't become 'features,'" says Hayward. "The first design approach with these roofs was to design something that wasn't fancy, something that didn't draw

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attention to itself," Downey adds.

BDP designed three separate glass roofs to create the public spaces – Leiden Square, South Arcade and Middle Square. Each of these areas presented its own challenges, but arguably none more so than Leiden Square.

The curved roof that covers the square is a somewhat different design to BDP's initial idea. Describing the approach, Hayward says: "There's a hierarchy of elements and that really started with the building blocks themselves, and then the streets and spaces in between, then these covering elements just needed to be calm and quiet, aesthetically speaking." This therefore led to the idea that they would use the biggest pieces of glass possible in order to reduce the number of supporting elements.

BDP focus a lot of their work on glass and are always keen to push the boundaries and explore new technologies. Leiden Square, which is 25 metres wide, was designed so that the buildings either side follow an eight metre grid. This naturally led BDP to look at a covering that conformed to the same gridlines. "We started off trying to keep it as simple as possible so it was a flat, rectilinear roof with 8 m x 1.5 m wide panels," says Downey.

They looked at using cold bent glass in order to allow the rainwater to run off either side and not just sit on the flat roof. However, as Downey explains, "there was only one specialist contractor that could do it so we were encouraged to design something that was more standard and practical." The design therefore evolved so that the roof was vaulted slightly to create the curve.

Of course arching the roof increased its height and put it right at the maximum stipulated by ancient planning rules. This therefore left the roof with a relatively "flat" arch, which meant it "needed a tie in the form of a steel rod," Downey says. "It's so flat it almost wants to turn inside out so you've got to have that extra element."

The practicality issues surrounding such large pieces of glass also became a challenge. "In the end things like cost, how easy it would be to replace panels, and safety came into it," Downey explains.

They therefore divided each eight metre panel into three. "Within that there's a hierarchy of structure as well – there's the main primary beam and then the purlins which are a much smaller element," says Downey. These box beams ended up deeper than a standard beam so were specially fabricated out of steel, as opposed to buying a standard rectangular beam and bending it. "They actually look better because a standard beam has got rounded edges whereas this is really crisp with sharp edges," Downey explains.

The covering is raised above the top of the buildings either side by 1.5 metres. The glass is single glazed, but is strong enough for it to be walked on for cleaning and maintenance purposes.

As a general rule BDP incorporate as many safety features in their designs as possible. On Leiden Square this included handrails and walkways discreetly integrated into the gutters – everything was designed to have as little visual impact as possible.

The roof spans across and attaches two buildings, it's actually only fixed on one side. "In terms of engineering, the buildings are moving differently so it's fixed on one side and slides on the other,"

Hayward explains. "To create something as simple as this roof is very intensive. We used parametric modelling – in terms of geometry and making it work there's quite a lot involved."

South Arcade

The 110 metre long South Arcade presented BDP with a different set of challenges. With Leiden Square and Middle Square, ventilation – in order to allow any smoke to billow out in the event of a fire – was more or less taken care of by the spaces' open form. South Arcade however, which connects the two, presented a much "tighter space" explains Downey.

"We couldn't float the roof like we did on Leiden Square because it started to get too high for the height restriction," he says. The roof was therefore broken up into three sections running down the space – a main section that runs down the middle with two raised elements either side, allowing them to halve the required gap for ventilation.

The design for the main glazed roof section that runs down the centre of the arcade progressed from utilising cold bent glass to a more cost-effective sawtooth design, which minimised its height and allowed for the run off of rainwater. Each piece of single-glazed glass – laminated with a PVB interlayer – is at a three-degree fall and rises up 150 mm, supported by struts placed underneath and fixing to a main beam at either end. BDP built the gutters into these beams, which "minimised the detail by using elements for multiple things," says Hayward.

The two raised elements on either side were initially going to be glass as well. However Allies & Morrison's design for the louvre elements that run up above the shop fronts progressed, so instead of stopping at the roof they continue and extend partially across it. "These were value engineered and because you can't really see them the decision was made that they could be ETFE," Downey explains. Rather than the usual 'pillows', this is a single layer kept tight by cables running through it.

Middle Square

The smallest of the three spaces, BDP's work on Middle Square consisted of covering the square itself plus two lanes either side. "It started off as a continuous glazed element, but that was further broken down as a design development," explains Hayward. "We worked with Dixon Jones to redefine it and it became a very simple, strong parallelogram."

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The parallelogram aspect is fixed to the two buildings either side and pitches up slightly at two points. The two roofs over the lanes sit at a lower level and "there are overlaps of 45 degrees to prevent rain ingress." The glass is supported by "strong, deep steel beams which define the parallelogram, then secondary steel beams to split up the glass," Hayward explains.

A collaborative development

An extensive project involving so many contractors and architects naturally required a substantial amount of collaboration. "When you're integrating the common elements into the individual buildings it's critical that there's a level of understanding of what each other is doing," says Hayward. Supporting this aim, BIM proved key to the success of Westgate, allowing updated drawings to constantly be shared.

To create something as simple as this roof is very intensive – we used parametric modelling

Neil Hayward, BDP

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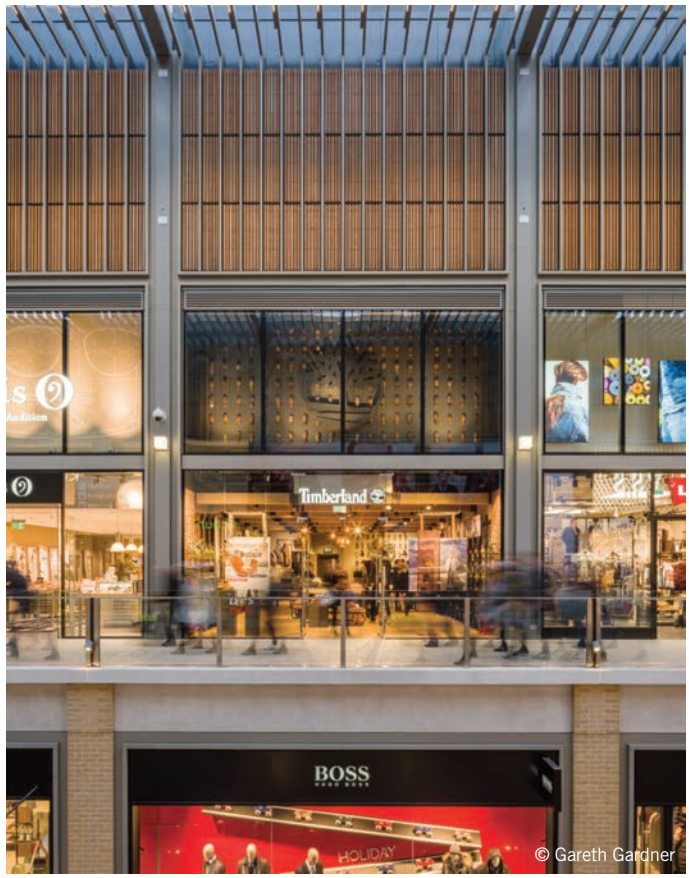

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PROJECT FACTFILE

Client and developer: Westgate Oxford Alliance
Masterplanner, lead architect and common elements architect: BDP
Block architects: Glenn Howells, Panter Hudspith, Allies and Morrison, Dixon Jones
Services engineer: Hoare Lee
Structural engineer: Waterman
Main contractor: Laing O'Rourke
Delivery architect: Chapman Taylor / Hawkins Brown
Glass roof structures: Seele
Glass roof: Roofglaze
Glass canopy: UMG
Laminated glass supplier: Tough Glaze

All the buildings used precast facades which meant cranes were required for almost everything – at one point there were a total of eight onsite. Coordinating all the various elements is "quite a logistical exercise," says Downey. "Part of my role was working with the architects for each of the blocks, making sure they're working within the constraints and getting information together at the right time."

BDP defined the base materials and tones that could be used on the buildings, ensuring they were in keeping with the existing city. In particular, the entrance wall at Bonn Square, created by Dixon Jones, uses a local stone, while the brick facade of the John Lewis building was inspired by the Bodleian Library.

BDP's lighting designers also worked on the project, who, says Hayward, "successfully fulfilled the brief by integrating subtle lighting throughout the scheme." There was also collaboration with Hoare Lea, who helped develop the cleaning and maintenance strategies, and also on a study which ensured the various glass roofs weren't going to cause unwanted glare at verifiable view points outside the city, as well as an environmental study for weather ingress and smoke ventilation.

Seele manufactured and installed all the glass elements. "They fixed netting below all the roofs which is quite unusual," explains Hayward. "It allowed everyone else to continue with the work below." They used a nearby plant area to store everything so it was easily accessible. Downey adds: "When they put the glass panels in, they apply mastic to the joints between the glass; they were amazing craftsmen."

Various other factors also threw challenges at BDP – an existing road had to be rerouted around the development and the project included nine months of archaeology recording during the site works. Findings included Greyfriars bodies and tiling from a 700-year-old monastery.

Despite the project's complexities, overall the development was "smooth and efficient," says Hayward, and since the opening it's received "very good footfall". "Oxford is one of the most sensitive cities in the world," he adds. "Working on a project like this was a truly unique experience." ■

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The many faces of polycarbonate

With a plentiful range of benefits, not least its versatility, James Patrick from Kingspan Insulated Panels explains why designers can view polycarbonate as an architectural material in its own right

Introducing as much natural light into a building as possible is a key maxim of good design. It helps to reduce energy consumption, creates healthier environments, and has been proven to have beneficial effects on occupants such as increasing productivity, speeding healing and reducing the risk of depression. Too much glass on the other hand, can lead to uncomfortable levels of glare and over-heating. Enter polycarbonate – a material that can allow excellent levels of daylight through both roof and walls, without the same risk of too much glare and heat.

Characteristics

At a fraction the weight of glass or acrylic, polycarbonate is nevertheless extremely strong – so much so that it is a material that is used to make bulletproof police shields. It is easy to mould and extrude, so it can be manufactured to integrate seamlessly with other building components such as insulated panel systems. Best of all, it can admit the same amount of natural light as glass, but offers high levels of thermal resistance, helping to reduce solar heat gain, as well as the capacity to reduce glare and increase uniformity of illumination through light diffusion.

Unlike some alternative materials that are commonly used for the same kind of applications, polycarbonate is highly resistant to UV degradation, so will not yellow or lose translucency over time, barely reducing its levels of light transmission for decades. Together with its strength, this adds durability to its list of virtues. Tints can also be added to the normally clear material to add a whole new design dimension through the use of colour and enhance light diffusion.

There is a perception that polycarbonate is sensitive to thermal expansion when through fixed, increasing the possibility of stress cracking in roof and wall light applications. However, multiwall

polycarbonate products are available which greatly reduce the potential for thermal expansion, resolving this issue.

Last, but not least, polycarbonate is one of just four materials that have been identified by the World Economic Forum as having the capacity to be 100 per cent remanufactured with no loss in material quality, no matter how many times it is recycled, making it a truly circular economy product.

Polycarbonate in action

One of the most instantly recognisable uses of polycarbonate is in rooflight products, where its excellent light transmission coupled with light weight and high levels of non-fragility make it an ideal material for roofing applications. Most often associated with warehousing and industrial type buildings, rooflights allow natural light to be introduced deep into the heart of large buildings where normal side glazing simply cannot reach. With the growing interest in the benefits of daylight on health and wellbeing, there is also an increasing use of rooflights to illuminate areas of buildings such as schools and hospitals that would normally rely on artificial lighting.

The proportion of rooflights must always be balanced to achieve a thermally efficient building envelope, and polycarbonate products can also help here, achieving U-values as low as 0.8 W/m^2.K. If you are looking to achieve a high BREEAM rating, there are up to six credits available for visual comfort under Hea 01 of the latest scheme – BREEAM UK New Construction 2018. Areas for consideration include glare control, daylighting and internal lighting levels.

Polycarbonate products are not restricted to rooflights. Wall polycarbonate solutions can be used to great effect, not only to introduce clear light into buildings but also to bring visual life and colour to both the exterior and interior. The impact of light through tinted panels can be energising or restful, playful or cathedral like, creating new dimensions to the spaces where people live, learn or work.

Let the light in

With so many beneficial characteristics, and so much versatility, it is time to recognise that polycarbonate does not just provide useful products for industrial buildings; it is an architectural material in its own right. It can be shaped and coloured, recycled and made anew, it can be subtle or striking. Most importantly of all, it can bring natural light flooding into all kind of buildings, without glare and without overheating.

James Patrick is technical services manager at Kingspan Insulated Panels

ABOVE
The impact of light through tinted wall panels can be energising or restful, playful or even cathedral-like

ABOVE LEFT
At a fraction the weight of glass or acrylic, polycarbonate is nevertheless extremely strong as well as being easily moulded

Creating a sound workplace

Poor acoustic performance can detract from an otherwise brilliant workplace design, so it needs consideration in the early planning stages of a project, explains Kye Edwards of Ocula Systems

Large gains are made by utilising twin glazed partitions with assorted combinations of toughened, laminated and acoustic laminated glass types

People respond differently to design of their working environment – some focus more on the look, some on the feel, and others are more affected by the sounds around them. A modern open-plan working environment, designed to positively encourage collaboration, can therefore prove to be a challenge to the more auditory-oriented person, as they are inherently noisy. A succession of reports have shown that these noisy offices can result in absenteeism, affect staff retention levels, cause distraction and have a physiological impact on workers that can reduce work productivity by up to 66 per cent.

Architects today therefore not only have to produce a great visual design, but consider the sound effects too as a critical factor. This is a key consideration in the design of offices and educational space in particular. As well as looking good, they must enable concentration and reduce the unwanted noise that has a huge impact in the workplace.

Getting it right isn't easy, as the technicalities of sound, absorption and reverberation have to be considered, and hearing is a complex sense as everyone is different in terms of their sensitivity to noise. Understanding sound, how it behaves in rooms, and how it impacts us has however become an important consideration for an architect so that they can control sound and vibration using materials and design principles when space planning. At its simplest level, a minimalist interior can be a 'hard' environment – sound echoes and bounces around, so it is not absorbed or contained and that can have a negative impact on most people that work within it.

The advent of fully glazed partitioning systems is one of the products that the architect should consider. It gives an immediate solution to many of these issues in spaces like offices, educational premises, health centres etc. Glazed partitioning, particularly frameless systems, have grown massively in popularity over the past few years and companies supplying them have continued to develop the choice of products in this category. Partitioning systems now combine design aesthetics with outstanding fire and acoustic performance.

As sound waves meet a piece of glass, they are partly reflected back towards the source, and absorbed within the glass. The sound energy that isn't reflected or absorbed is transmitted through the glass. Acoustic laminate glass uses an interlayer principally to provide enhanced damping by absorbing more of the sound energy – this is most effective at reducing different frequencies, particularly those that human ears are most sensitive to.

Large glazed areas within a commercial design not only maintain but encourage natural light into an area – they can give the same aesthetic spacious feel as open plan but can be used to create office spaces for more practical activities like meetings that require privacy for interviews, appraisals etc. The current requirement for conference calls can be carried out in meeting rooms where people can talk over speakerphones without concerns of distracting others. Separate working areas can be created with glass corridors to maintain the desired climate and keep noise out.

Today, glass partitions can be specified with various levels of acoustic performance, dependent on the requirement. Acoustic laminate glass gives incremental improvements to otherwise modest performing configurations, but large gains are made by utilising twin glazed partitions with assorted combinations of toughened, laminated and acoustic laminated glass types. Choosing a reputable supplier for glass partitioning is key, one that has the documentation to demonstrate the performance, not only of the glass, but also of the whole system. An acoustic rating can be affected by application and installation so it's important that an acoustic rating is based on the complete onsite assembly, not the individual components or products.

Kye Edwards is business development director of Ocula Systems

Glass – displaying the character of our future cities

Orhan Ertughrul from G-Smatt Europe explains how media facades will see glass supporting the rapid development of our cities in the near future

The next 20 years will bring huge change to our expanding and densely populated urban areas. The Internet of Things is already impacting how we work, rest and play, and the data generated by these activities will be critical to the management and utilisation of these urban spaces. As we move around these city spaces, large glass media facades are going to provide a powerful new way of communicating up-to-date transport information, weather warnings and emergency services advice. This innovative technology, which incorporates LEDs and their electrical circuitry into architectural grade glass, provides fresh opportunities for buildings and the spaces around them.

Making futuristic fantasy a reality

One example of glazing for such applications is G-Glass, composed of a 4 mm base glass coated in fluorine tin oxide (FTO), which is both conductive and transparent. Each panel has an FTO surface layer into which is etched the circuity, using one of the world's largest etching machines.

The LEDs are then attached in exact positions. The cover glass is typically a heat soaked, tempered 6 mm glass, allowing the finished unit to be rated as a safety glass. A resin is then poured between the plates and hardened using UV light. The finished assembly is connected to drivers hidden in an aluminium frame by flexible printed circuit boards (FPCBs), which are connected to DVI controllers and an external power source.

The controllers determine the orientation of the panels, and how video files will play across the glass. The media display's resolution is determined by spacing of the LEDs, coverage of the glass facade, and the distance from which the screen is viewed.

Uptake of the technology is at an early stage, but already architects, designers, app-developers and organisations are coming together and developing ideas that will transform the digital cityscape.

A sophisticated media facade allows an architect to create an aesthetically beautiful design using a combination of the physical form and light. Buildings could change colour throughout the day, or by playing with the perspectives, architects could create stunning visual illusions and merge the structure seamlessly into its environment. An outdated, 'ugly' building could be rendered far more pleasing and acceptable; making it a fix for failing architecture. It also gives buildings the power to share externally experiences that previously have only be accessible to those inside. For example, while a work of art is being created in a gallery, its actual production could be shared on the exterior for those outside to witness. This gives the building a new energy and enables it to engage with a wider audience.

With digital signage, facades already lend themselves to image-based advertising with products replicated on a huge screen – but there is scope for even greater creativity. Imagine a car launch where the vehicle could be seen to be 'driving' around the city, using the media facades on buildings and smaller, temporary, pop up installations. Target audiences could be encouraged to 'Take a photo of the car' at a particular site perhaps to win a prize.

Such displays are becoming increasingly interactive – it is not hard to foresee a time when a media facade could react to the presence of individuals enabling them to receive a personalised message.

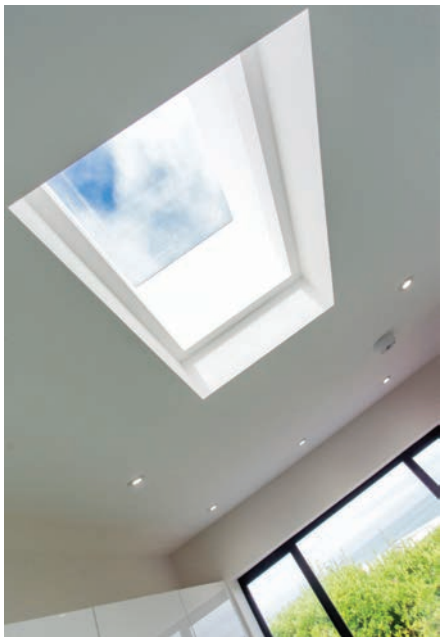
Alternatively, architectural gaming could see a game taking place on the side of a building. A glass facade upon which teams of players could interact and play games could drive regeneration in a run-down area.

Orhan Ertughrul is executive vice president at G-Smatt Europe

FACADES OF THE FUTURE
Large glass media facades are going to provide a powerful new way of communicating in cities

Inspiration from above

Tony Isaac of Brett Martin Daylight Systems delves into the key recent trends in rooflights, from 'designability' to ensuring safety for users



The desire for the latest products is not uncommon in the world of rooflights, and the urge for sleek, modern-looking products is something that rooflight manufacturers seek to serve. This is particularly the case when it comes to the choice of glazing, with many different options, colours and features available, from polycarbonate to GRP.

The benefits of daylighting have been reported widely for many years, particularly in the world of health and education. Glass has become prominent within today's designs, and has become a driver across the rooflight industry. Many resulting options exist, from flat glass rooflights, to curved glass, mono pitches, dual pitches and atria.

Designability

When glass is combined with a quality rooflight system it can look exceptional, be energy efficient, and offer a host of additional features and benefits. From stunning architectural installations snaking their way across a roof to huge atria systems, which catch your eye the moment you are beneath them; to the more commonplace flat glass, and modular systems available, glass rooflights play a major part in contemporary architecture.

Designed to meet a myriad of project requirements, glass rooflights offer versatility so it's imperative that specifiers look at the options available to assess the most appropriate product for a project. Product credentials to look out for include thermally broken frames, U-values, acoustic performance and even self-cleaning glass.

Glass rooflights may look the same to the untrained eye but there can be stark differences between the cost of these units. There is usually a good reason for this and more often than not, if you dig a little deeper, you'll find significant differences in the glazing specification, which makes big differences to both thermal performance and safety. The most economic solution is often not the best, or as efficient as you first thought.

Safety first

When trying to find the best product at the best price, it's important to take time to understand that rooflights should always be specified to consider the safety of both building users beneath the rooflights, and anyone above who may inadvertently step and fall onto the rooflight.

Industry guidance states that all glass rooflights should have a laminated inner pane to minimise risk of any glass falling if the inner pane should break, even though BS5516 does set out certain circumstances when a toughened inner pane can be used, subject to satisfactory risk assessment.

In addition to using a laminated inner pane to protect building users, rooflights can be specified and designed to be non-fragile in accordance with CWCT Technical Note 92, and ACR[M]001. This is intended to ensure the safety of anyone on the roof in the vicinity of the rooflight and to ensure that anyone accidentally walking or falling onto the rooflight will not fall through, even if the glass is broken or the rooflight is damaged. The preferred specification should always be for rooflights which are both non-fragile and which have a laminated inner pane, protecting both anyone beneath the rooflight and anyone on the roof in the vicinity of the rooflight.

Across the industry, there is now an infinite variety of rooflight shapes, sizes and glazing options to suit flat, pitched and curved roof applications, whether it is a small dome-light in a domestic kitchen or polycarbonate and GRP sheeting used in stadium canopy applications.

To summarise, choose a rooflight manufacturer that provides a great looking product at a reasonable price and one that can back up and support their claims of performance and service. The time required is far outweighed by the safety and longevity benefits of a great product.

Tony Isaac is the national sales manager, commercial rooflights at Brett Martin Daylight Systems.

Healing daylight at Benenden

Kalwall® translucent cladding is the architectural focus of the new £55million development of Benenden Hospital in Cranbrook, Kent.

The scheme, designed by architects C A Vaughan Blundell with assistance from SR Architects Ltd, has created a wonderfully light and airy entrance atrium designed to welcome and create an enhanced patient and visitor experience with maximised natural daylight. The main contractor was Willmott Dixon Construction.

The Kalwall skylights provide additional light in the large atrium projecting it deep into the interior. They were specified complete with highly insulating Nanogel which achieves an impress U value of 0.28W/m²K, helping the project attain a Breeam status of 'Good'.

The skylights have a unique ability to bathe interior spaces with diffused and glare-free daylight, which creates a stimulating and healthy environment. In addition, their heavily insulated composition eliminates glare and hotspots.

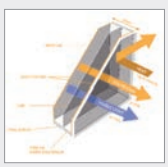
Geoff Holden, Senior Technician at C A Vaughan Blundell comments, "The use of Kalwall represented the best value balance of energy saving and cost and provided us with the ideal way to achieve spatial daylighting within the requirements of Part L".

Kalwall is a popular choice for projects where performance, long life cycle and low maintenance are required, coupled with an aesthetic finish. The lightweight system reduces the need for supporting structures while offering the highest protection in terms of wind-borne debris and resistance to impact, abrasion and point loads.

Case studies and technical information are available from Structura UK Ltd.

01233 501 504
www.structura-uk.com/kalwall

Lowest U-values available



A new agreement between steel window specialists **Crittall** and Crystal Units involves an exclusive deal for the sale of CUIN insulating glass units that utilise a thin film inserted in the mid-point of a double-glazed unit so as to convert it to provide triple-glazed performance. CUIN's innovative design results in a thinner and lighter construction compared to traditional triple glazing, as well as being superior in performance. Quite simply it is one of the most thermally efficient insulating glass units available on the market today requiring up to 33 per cent less glass.

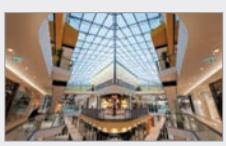
01376 530800 www.crittall-windows.co.uk

New 80 page brochure

Architectural Bronze Casement's new brochure showcases their range of bronze windows, doors, screens and secondary glazing. This comprehensive brochure includes over 190 photographs showing you examples of projects from historic renovations to striking contemporary new builds. Technical pages guide you through each of their window and door systems and detail specific options for your own project. Bespoke, hand-made bronze windows and doors are aesthetically striking and an exciting alternative to steel and aluminium. 'Architectural bronze' is a manganese brass alloy which is extremely strong.

0845 6000 660 www.bronzecasements.com

Leading skylights and atrium glass roofs



The new Glass Rooflight F100 SG ("Structural Glazing") is the innovative next generation of the successful flat roof skylight from **LAMILUX**. Featuring a flush glass to frame edge detail, the Glass Rooflight F100 SG boasts a visually appealing seamless design while achieving maximum energy efficiency and thermal insulation. The Glass Architecture PR60 features virtually free shaping for atrium glass roof designs from pitches as low as 3° making it possible to implement more or less any aesthetically pleasing and technically complex daylight construction.

01284 749051 www.lamilux.co.uk

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01952 581100 www.frameXpress.co.uk

Comar 7P.i CDE Commercial Door

Comar Architectural Aluminium Systems, part of TPG – The Parkside Group Limited, announce the launch of Comar 7P.i CDE, a Commercial Swing Door with Electronic Locking, that now holds a Secured By Design Licence. The Comar 7P.i CDE is an electronic lock option for the thermally broken commercial swing door range, which offers access control integration for both single and double leaf door sets. Secured by Design Homes 2016 requires that occupants, of a residential building with 10 or more distinct dwellings, must be able to remotely control the main entrance door from their apartment to allow access to known visitors. The Comar 7P.i CDE is ideal for multi-dwelling apartment applications, where the electronic lock suites in with most access control panels and includes panic exit hardware options. The solution can also be used in all manner of public buildings where occupant safety is required, such as Health, Education and other Public Buildings.

Comar specifiers and fabricators can be reassured by Comar 7P.i CDE's secure, flexible design options. Achieving PAS 24:2016 in double leaf swing doors is particularly challenging to pass on a test, as the doors resist a 4.5kN loading as well as a manual attack tests. Double leaf doors are often called for on residential buildings as they allow facilities teams and occupants ease of access for bulky objects such as furniture, yet still provide uncompromised security and convenience for day to day access where only a single leaf is commonly used, the Comar 7P.i CDE provides this solution.

Comar 7P.i CDE has been added to Comar's BSi's Kitemark for Enhanced Security which incorporates testing to BS

6375 Parts 1, 2 and 3, for a high traffic entrance door this means that the Comar 7Pi CDE has been tested and certified to 50,000 open and closing cycles, which is a requirement of the Secured by Design Licence.

The Comar 7P.i CDE lock uses magnetic triggers, located in the keeps, tripping the sprung loaded locking points, which snap 'locked' almost instantly when the door is closed. This provides a 'fail locked' environment that immediately protects a vulnerable resident returning home, even in the event of a power failure or vandalism.

Not only does the Comar 7P.i CDE integrate with access control systems, it also has been tested with the Fuhr's Panic Exit crash bar, helping designers meet fire safety demands while providing PAS 24:2016 level of security and high traffic resilience. Comar's lever door handles also integrate with the lock, their operation manually reloading the sprung mechanical locking points. Together with the magnet triggered instant locking, which helps prevent criminals following occupants into their building, the Comar 7P.i CDE offers unparalleled functionality.

Comar 7P.i CDE has a comprehensive range of accessories, available direct from Comar, including a remote-control key fob, a wireless push pad and hard-wired switches.

The Comar 7P.i CDE also presents advantages in fabrication, including the need for only four machined 'pockets' in the lock and keep stiles, plus a one piece lock, thereby speeding up assembly times and reducing workshop errors. A single cable provides the lock with power and signal simplifying the routing in the frames. To cater for structural tolerances on site, adjustable raised keeps are available to ensure the locks engage correctly.

The Comar 7P.i CDE door solution is available today via our Secured by Design Group Scheme of approved fabricators. Our Project Managers will help designers best specify the most appropriate options for their projects, while our highly responsive Technical Support Team are always on hand to give in detail support.

020 8685 9685 www.comar-alu.co.uk
projects@parksidegroup.co.uk

Secured by Design Flatglass Rooflights now available

Roofglaze Rooflights is happy to announce that it has been awarded the Certisecure accreditation and qualified for Secured by Design membership with its Fixed Flatglass Protect+ rooflight range, demonstrating that these are fully compliant with Building Regulations Approved Document Q. At Roofglaze, the company feels that your home's security is something that should be taken seriously and not left to chance. With this in mind, Roofglaze has tried to do its part by engineering a specialist rooflight, utilising a laminated inner glass pane to maximise security. Alongside the added security of the laminated inner pane, its Flatglass Protect+ rooflights will still have the same sleek and contemporary profile that makes the standard Fixed Flatglass rooflights so pleasing on the eye. Roofglaze's Protect+ range of Flatglass rooflights have been extensively attack tested against STS 202 by a leading test house Exova to determine their compliance with Build Regulations Part Q – Security in Dwellings. The stock range of Fixed Flatglass Protect+ rooflights are now available to buy online for delivery to you in three-five working days.

01480 474 797 www.roofglaze.co.uk

Glass Through the Ages

Some 40 years ago a balustrade would have been wrought iron with a wooden handrail or steel posts. While these did the job, they definitely didn't add much to the aesthetics of modern architecture.

Fast forward some years and the use of toughened or laminated glass came to the attention of architects who wanted to use the product in their projects and C. R. Laurence rose to the challenge to develop architectural hardware products suitable for the purpose. Initially the company created balustrades systems that had posts to support the glass, but the desire and push for a completely frameless look has led to the creation of products that can fix the glass safely, but which are virtually invisible.

With one purpose in mind – to provide good quality, hard-wearing hardware that is safe, strong and on-trend CRL has developed Taper-Loc® frameless glass balustrade system from CRL is the leader in this field. It is a dry-glazed system comprising a base shoe and a handrail (optional), negating the need for posts. The base shoe can be surface, side-mounted or even installed inside the substrate

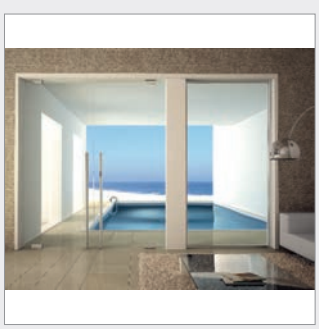
so tiles run up directly to the glass and it looks as though the balustrades are magically coming directly out from the floor. It can accommodate glass thicknesses from 17.52 to 25.52mm and it is very strong and very safe as it complies with all the major European standards such as BS 6180:2011, ICC-ES and ABP in Germany.

The patented horizontal Taper-Loc® system makes things easier for the installer too. Allowing installation and removal of glass panels within minutes, the system reduces fitting time by more than 50 per cent as it is a unique design that uses precision tension to secure the glass in the aluminium base shoe without the use of cement. Using CRL's exclusive TLK12 installation and removal tool, the Tapers simply slide horizontally in the base shoe before being compressed, where it expands and locks into place. A new fast seal gasket has just been added to the range to enable the entire installation to be carried out from the 'safe' side of the balustrade. This includes all aspects of the installation such as fixing the base shoe, external safety seal gasket, the glass and internal gasket. This is particularly useful when replacing a broken or scratched glass panel as it eradicates the need for expensive scaffolding altogether and the tapers can simply be unlocked to free the old glass panel and then relocked to secure the new glass panel into place.

With 1 million square feet manufacturing plant CRL is the world leading supplier of architectural hardware, frameless shower doors, door hardware, office partition systems and glass and glazing tools and accessories to the glass industry.

01706 863 600 www.crlaurence.co.uk

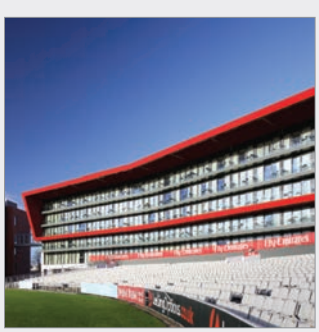
Barrier Partners Colcom®



Barrier Components Ltd has partnered with leading Italian component manufacturer Colcom, adding quality glass accessories for interior architecture to their product portfolio for UK customers. Barrier Components now hold a wide selection of Colcom hardware, available from stock at their Purfleet facility or on special order for UK distribution. The popular BILOBA, EVO and UNICA stainless steel hinge systems for glass offer a minimalist styling to both internal and external frameless glass door installations in a variety of setting. BILOBA is a collection of self-closing +90° -90° opening hydraulic hinges. It includes a selection specifically designed for damp bathroom environments, shower doors, saunas or Turkish baths. The Biloba Evo is a revolutionary oil-dynamic hinge offering a 180° opening. It is the first hinge to have an adjustable closing and constant braking control to all door opening angles up to 180. UNICA is an Oil Dynamic hydraulic hinge for installation on exterior doors and is ideal for installing in any type of setting. It is extremely quick and easy to install in floor and pivot doors as well and matches to every type of patch fitting existing on the market.

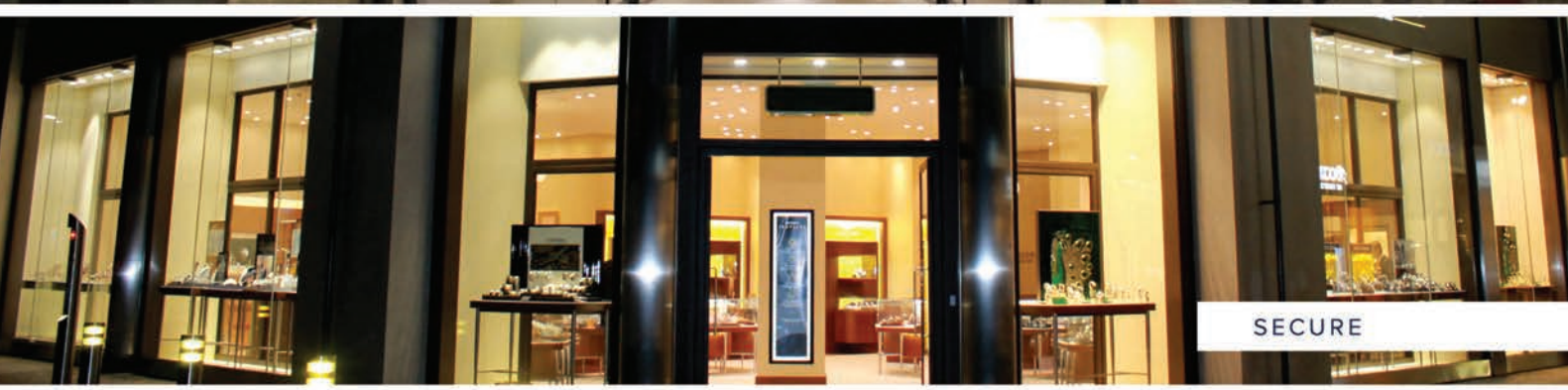
sales@barrier-components.co.uk

Senior provides the perfect match for Manchester's new pitch-side hotel



Enjoying a prime location overlooking the Lancashire Cricket pitch at Emirates Old Trafford, the stunning views enjoyed by the residents of the new Hilton Garden Inn hotel have been framed by high-quality aluminium windows, doors and curtain walling supplied by **Senior Architectural Systems**. Through early engagement and collaboration with main contractor Galliford Try, Senior's specification team were able to advise on the most cost-effective solution to delivering a glazing package that met with both the desired aesthetic and performance requirements of architects ICA and the client. To create the bright and welcoming entrance to the new hotel, Senior's slimline SF52 aluminium curtain walling was used alongside the manufacturer's SPW600 aluminium casement windows and robust SPW501 aluminium commercial doors. The rooms at the rear of the hotel, which directly overlook the cricket ground, feature Senior's patented, thermally-enhanced PURe® SLIDE aluminium sliding doors which open onto individual balconies that can be also be used as private corporate boxes during events at the cricket ground.

www.seniorarchitectural.co.uk



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