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Glass & translucent materials Supplement

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Managing Editor
James Parker
jparker@netmagmedia.co.uk

Publisher
Anthony Parker
aparker@netmagmedia.co.uk

Editorial Co-ordinator
Shelley Collyer

Editorial Assistant
Laura Shadwell

Editorial Contributor
Roseanne Field

Studio Manager
Mikey Pooley

Production Assistants
Georgia Musson
Kim Musson

Account Manager
Sheehan Edmonds

Sales Executive
Steve Smith

PR Executives
Suzanne Easter
Kim Friend

Managing Director
Simon Reed

Advertising & Administration
t 01435 863500
info@netmagmedia.co.uk
www.architectsdatafile.co.uk

Press Releases
editorial@netmagmedia.co.uk

Subscription circulation enquiries
info@netmagmedia.co.uk

netMAGmedia Ltd
Cointronic House
Station Road, Heathfield
East Sussex, TN21 8DF

FROM THE EDITOR

Glass remains the material of choice for many architects in creating building envelopes which provide intriguing and welcoming transparency, often offsetting what might be otherwise forbidding commercial buildings. With the attendant need to moderate solar gain and therefore reduce cooling, in the age when climate change is at the centre of everyone's minds, all-glass facades might not be the go-to option they once were.

However, as our fascinating project report by Roseanne Field in this special glass supplement shows, when it comes to creating a tall building with a curved, transparent facade, there's very little alternative. SOM's Manhattan West project not only addresses one of the last undeveloped sites on the island using a striking scheme that centres around two towers, it also clad them in curved glass to create a sculptural new landmark in the city.

The $5bn development occupies seven million square feet, and comprises six buildings, two of which are towers around 70 storeys. As well as their sleekly curved, monolithic exteriors, structural glass also enables vast, open lobby areas to be created, virtually free of columns, making the buildings, at ground level at least, feel like a continuation of the plaza outside.

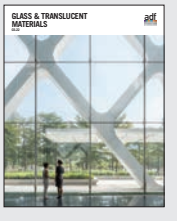
SOM's solution is a pragmatic as well as impressive one, given the scale – despite the countless square metres of curved glass, only 22% of the curtain wall panels needed to be bent to achieve the result. Also, the glass is specially coated to deal with overheating, but also potential heat loss in colder weather, obviating some of the issues of glass facades.

Across the Pacific, SOM has also been active in innovating attractive glazed facades, but this time placing large expanses of glass behind a diagrid for a 158 metre tower in Shenzhen (profiled in our news section). Here they opted to frame views rather than provide the limitless transparency of the Manhattan West towers.

Also in the supplement, we have thought leadership from Sunsquare on the dangers of not specifying rooflights correctly, and from Kingspan Light + Air, on why polycarbonate can provide the benefits of glass facades without some of the complications.

Among our product features, ID Systems looks back at a challenging 2021 for the glazing industry, Lamilux discusses futureproofing rooflights against our changing climate, Promat describes how internal glazing meets fire safe requirements, and ESG looks at why more clients are opting for high-tech privacy glazing in a range of settings.

James Parker, Editor



ON THE COVER...
Building on architects SOM's tradition of innovative engineering, the design for Shenzhen Rural Commercial Bank's 158 metre tall, 33-storey headquarters incorporates a distinctive external diagrid that significantly reduces solar gain.
Cover Image © Seth Powers Photography
For the full report, go to page 5.

Images © Seth Powers Photography

GLASS WALLING

SOM's 'Breathing' Shenzhen Tower

Building on Skidmore, Owings & Merrill's (SOM) tradition of innovative engineering, the design for Shenzhen Rural Commercial Bank's new 158 metre tall, 33-storey headquarters incorporates a distinctive external diagrid that significantly reduces solar gain. Inside, responsive solar shading technology and natural airflow enhance staff wellbeing.

The tower's facade is defined by an external diagrid, which serves as both the building's structure as well as an important solar shading element. At its base, the diagrid widens to create framed openings and views to the surrounding park and South China Sea. Inside, responsive solar shading technology and natural airflow enhance staff wellbeing.

Drawing upon principles from Feng Shui, in which water and wealth are intrinsically linked, the lobby is encircled by a reflecting pool and features a rippling wall of water adjacent to the main entrance. A 15 metre high "rain curtain," with droplets of water that 'cascade' down small translucent filaments, lines the lobby's transparent glass walls. On hot days, these water features provide an evaporative cooling effect for the entire building. Suspended lighting fixtures mimic droplets of rain and the lobby's marble walls shift from a textured to honed finish to 'evoke' water's effect on stone.

Earth, water and air figure prominently in the building features, from the multistory rain curtain to the striated marble cladding, and the natural ventilation system. Reflecting pools, grey granite paving and seating areas, as well as an array of trees and ground cover define the main entrance spaces and small gardens at the base of the tower. This tactile experience at ground level transitions and becomes more atmospheric as one progresses up the tower to the open floor plans and "floating" diagrid above. At the crown of the tower, operable walls and an outdoor deck blur distinctions between indoor and outdoor spaces.

Two vertical atria span the height of the tower. On each floor, employees can use louvres to open and close vents, accessing fresh air from the atria. This allows the building to "breathe" when Shenzhen's climate is pleasant, filling the entire building with fresh air. By functioning like airways in a body and cycling fresh air throughout the building, these features generate significant savings in environmental and energy efficiency. This system prioritizes tenant comfort and wellbeing to a degree typically unheard of in office environments. Interior spaces are defined by a minimal glass perimeter wall and a daylight-responsive shading system, with a communicating stairway running the height of the tower, fostering connectivity and collaboration among coworkers.

The Shenzhen Rural Commercial Bank Headquarters is LEED Platinum and is targeting China Green Star certification.

COMMENT

The final curtain?

Alex Cooke of Kingspan Light + Air looks at why polycarbonate curtain walling solutions are being specified as an alternative to glass across various building types

Glittering glazed buildings are a popular sight in many of our towns and cities. Whether they house offices, homes, shops, healthcare, education facilities or public spaces, curtain wall facades are a popular design choice for projects looking to increase internal daylight levels, offer external or even internal views, and present a clean, contemporary overall aesthetic. However, glass-based systems can present challenges both onsite and during operation and therefore may not be suitable for every building. Polycarbonate may offer a viable alternative that resolves these dilemmas.

Why polycarbonate?

Used in everything from car parts and bicycle helmets to riot shields and bullet-proof glass, polycarbonate is one of the most widely used engineered materials in the world. However, it is when it is applied to glazing that its architectural design potential is really illustrated to the full.

Polycarbonate is celebrated for its extreme impact resistance and long-lasting durability. As a glazing product, these properties are not only beneficial during transportation and installation but also when it is in use, safeguarding against extreme weather, falling branches and vandalism. It is also often formulated to retain its translucency for the lifetime of the product, ensuring it does not degrade, discolour, or lose its excellent light transmission properties. Typically a fraction of the weight of glass, it offers clear structural benefits whilst being easy to handle and install, improving onsite safety and speed of build.

Of course, without consideration, high levels of light transmission can lead to issues with solar heat gain or visual glare. To resolve this, polycarbonate products can be manufactured using prismatic layers to diffuse incoming light, creating a uniform illumination that avoids hot spots and enhances visual acuity. Formulations are also available with additives that reflect infrared (IR) radiation and coloured tints can also be added to give architects more design options.

Polycarbonate is also one of the few materials that can be completely recycled at end of life and remanufactured to create a range of new products with no loss of material quality.

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This makes it an ideal material to choose for projects seeking to be more sustainable.

Thanks to these properties, we are seeing it commonly used in standard daylighting products such as rooflights. However, modern vertical wall light solutions are now emerging in the market, showing how polycarbonate can be used to create real architectural impact in the form of sleek, modern designs.

What comprises a unitised translucent polycarbonate wall system?

Unitised translucent polycarbonate wall systems have been designed specifically for buildings where providing daylighting without glare or reduced thermal performance is key. They consist of double-skin, dense-cell polycarbonate insulated panels that are joined by a mechanically interlocking aluminium structure that eliminates the need for wet seals and adhesives. These units are designed to provide excellent light transmission of up to 33% and U-values as low as 0.49 W/m²K. They can also be supplied with additional acoustic or thermal performance enhancing insulation where required.

These systems can be used to create a variety of glazing features, such as clerestory bands along the top of a space, to create sightlines or intermittent/targeted views, or even for full 'light-box' style applications. The panels are scalable and able to span long distances between supports with minimal visible substructure and a wide range of skin colours and combinations. This gives architects complete creative freedom to design unique and striking facades, especially when used in conjunction with backlighting, adding drama and presence even if the building is not in use.

Due to the way they are fixed, these systems can also benefit from Removable Skin Technology (RST). This enables just the outer skin of the system to be removed and replaced, providing easy future renovation or repairs throughout the building's lifecycle. As it is mostly made from polycarbonate and aluminium, the system components can be recycled at end of life.

These polycarbonate wall systems have proven success in the USA, where they have been used on projects in sectors such as education, public sector, sport and leisure, offices, and even industrial buildings. Below is one example, from education.

Case study: Eagle Centre Public Charter School, Washington DC

Home to more than 900 students, the Eagle Centre is the first early childhood public charter school in Washington DC. Its design aimed to create an intellectually stimulating environment with excellent sustainable credentials. Meanwhile, the urban city location also meant physical security was crucial, and vandalism prevention was a key concern.

Shinberg Levinas Architectural Design specified over 1,200 m² of Kingspan UniQuad 120 unitised translucent curtain walling system for the project. The facades were designed without any exposed aluminium connectors and included blue and white panels to reflect the school colours. The outside panels were matte finished for added security and daytime privacy.

"We picked a system that would give them the daylight they wanted without having to use windows. The UniQuad 120 provides an interesting effect inside, durable material, and a great aesthetic," explained project architect Carlos Talero. Additionally, the panels' Removable Skin Technology (RST) allows the exterior panel to be replaced as needed in the event of vandalism.

The project received LEED Gold, with the UniQuad 120 supporting the achievement of points for both daylighting and glare control. Its excellent airtightness and weatherproofing were also key benefits for the project, protecting the internal environments from draughts and water ingress.

Alex Cooke is managing director at Kingspan Light + Air UK and Ireland

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COMMENT

The sky's the limit with glass, but play it safe!

Justin Seldis of Sunsquare looks at why glass has become the building material of choice for architects, but also explains why it's never been more important to put safety and security first as designs get bigger and more elaborate

Glass remains 'on trend.' Natural light and ventilation have become increasingly important to all buildings over the last 20 years, and that's why glass is now everywhere you look. Architects are always keen to use elements from nature where they can, and glass lets them do this. It's a fantastic, natural, recyclable material that also brings a host of benefits to any building, big or small.

Since the pandemic started, the popularity of glass has only accelerated, and there's been a huge surge in demand for skylights and walk-on indoor panels. This is because people are re-evaluating the functionality of their homes as they spend far more time in them. Aside from the aesthetic benefits, skylights are helping people to transform their homes – bringing in natural sunlight, providing access to rooftops, and allowing for a fresh flow of air to create comfortable living and working environments. Genuinely 'thermally broken' skylights are also helping to keep rooms warmer, drier and more energy efficient all year round, saving people money on energy bills and reducing their carbon footprint.

The benefits of glass are clear, and the rise in its popularity has led to increasingly bigger and more elaborate specifications. The good news is that architects can 'dream big' with glazing, and there is a great deal you can do with it – in fact, the sky's the limit! However, they must ensure they're selecting skylights that meet the highest quality, safety, and efficiency criteria. This is, after all, glass hanging over people's heads.

Bigger, more elaborate designs

As glass continues to be a more prominent feature in buildings, architects are dreaming up ever more extravagant ways to use it. It's all about size – they're looking for bigger panes of glass, covering larger areas of buildings. However, the bigger the pane, the thicker it needs to be – otherwise there's more chance of it 'ponding' due to gravity. This is when a dip forms in the glass, allowing water to collect. For architects, this is a big design consideration, and robust calculations need to be made to minimise any possibility of bowing.

Designed to maximise natural light

Commonly thought of as a commercial product, curtain walling is becoming increasingly specified for homes to create a light and airy living space. The architect specified the Kestrel Aluminium100mm box and plate curtain walling system incorporating Kestrel 60mm windows to maximise natural light and give a dramatic frontage to this prestigious development on the Coton House Estate, near Rugby.

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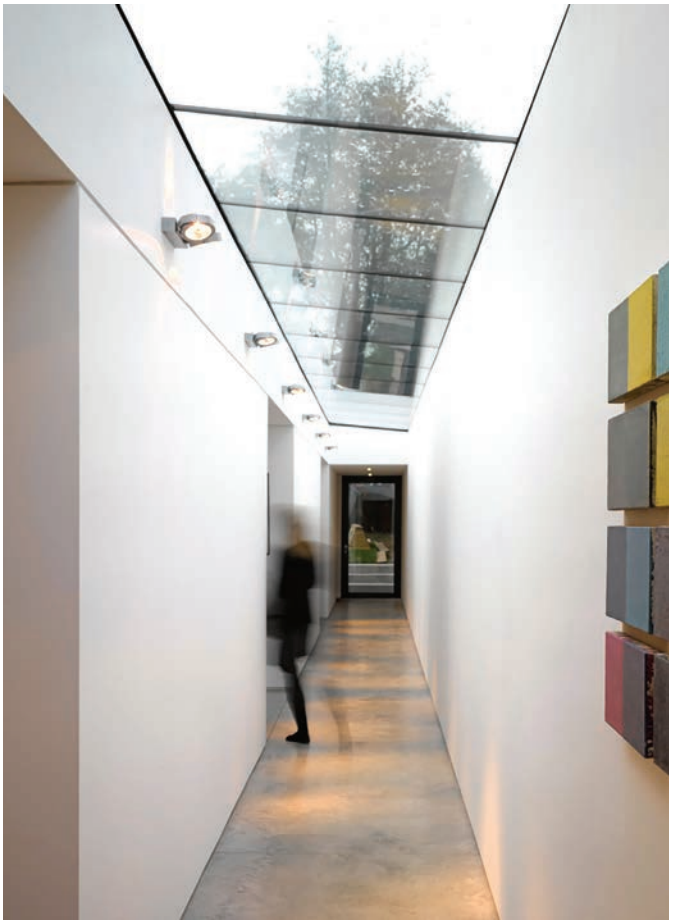

Architects are continuously testing the boundaries of what glass can do – not only with size, but also shape and function. Nowadays, we're seeing requests for interesting, eye-catching shapes, like circles or triangles, and enhanced security features such as fire-rated glass and tamper-proof or even bullet-proof glass. Walk-on panels are incredibly popular, both indoor and out, and opening panels are helping people maximise roof space in ways they couldn't before. We're even seeing a sudden trend for glass boxes which can open fully so you can walk straight out of them.

Now that we're all living more 'digitally,' architects are also requesting smart glazing. This is new for the skylight industry, but there are smart switches now available, giving people complete digital control. They can now ask Siri or Alexa to operate their skylight, or they can use an app and programme it to automatically open or close based on weather conditions, humidity or inside temperature.

Specifying quality

While the opportunities are endless with skylight design, quality and safety remain a core necessity. Specifiers are often surprised to find there are no mandatory standards for flat-roof skylights in the UK, and while there are regulations for individual components, like glass, there's nothing covering the assembled product. This means specifiers need to be able to recognise genuine quality products and performance – people living or working underneath depend on it.

Unfortunately, the 'regulation gap' means there are sub-standard products out there. For example, ill-fitting wooden upstands (instead of sturdy, insulated aluminium frames), or lower-cost 'toughened' glass that can present a serious risk of injury if they break – which they do. Laminated glass is the safest you can get, and aside from making it extremely hard to penetrate for burglars, and blocking out harmful UV rays, it holds together even when broken, helping keeping the people below safe.

Specifiers also need to watch out for misleading marketing claims. Common ones include understated, miscalculated U-values or the use of the term 'thermally managed.' For an effective barrier between indoor and outdoor temperatures, specifiers need to seek out properly 'thermally broken' products. Without this, thermal bridging can occur, and this can cause irreparable damage, compromising a rooflight's overall safety and effectiveness.

A stamp of approval

Despite the lack of mandatory standards there are still companies out there putting quality and safety first. Credible manufacturers are seeking their own third-party accreditation, providing customers with the quality assurance they deserve. For example, Sunsquare is working with quality assurance leader the BSI, to set a standard for flat-roof skylights in the UK to make sure products are regularly and rigorously tested for air permeability, weather tightness and wind resistance to ensure ultimate durability and performance levels.

Justin Seldis is managing director of Sunsquare

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BUILDING PROJECTS

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A clear vision

The versatility of glass made it the right choice for SOM to create curved facades with maximum transparency, in a complex mixed-use development on one of Manhattan's last undeveloped sites. Roseanne Field reports

Manhattan's West Side Yard, a rail yard located on the 'Far West Side' of the island, had been the subject of various speculative development discussions since the 1950s. A portion of the site was bought by development company Brookfield Properties in the 1980s, who gradually acquired the rest of the site over subsequent years, covering an area between Ninth and Tenth Avenues, and West 31st and West 33rd Streets.

Despite the site's clear potential, it wasn't until 2005 when New York's City Council approved a 'rezoning' – changing the 'use' of the land and thereby what restrictions it falls under — that developing on it became a real possibility. A plan was therefore submitted by Brookfield for a mixed use scheme which would work within the site's designated 'air rights,' creating a 'neighbourhood' here, on what was "one of the most underdeveloped sites remaining in Manhattan."

The developer had a good relationship with the masterplan's architects Skidmore, Owings & Merrill (SOM) from previous projects, and the practice has "a very long history and expertise in designing tall buildings and planning new neighbourhoods," explains SOM principal Julia Murphy. She adds: "The project was a perfect fit for us", detailing how it's enabled them to rethink several consecutive blocks of the city. It encompasses a handful of new buildings around a plaza that will connect to the landscaped route known as the High Line via a new elevated pedestrian link in 2023.

The practice knew from the outset that the project wasn't going to be straightforward. "It was always going to be very complex, given its scale, the lack of buildable land, and the active railroad tracks underneath," Murphy explains. "The vision was to create a vibrant new place offering everything from workspaces to hospitality and residences, with vast public space and retail on the ground to bring people into the site."


© Jakob Dahlin

By 2008 the practice had completed an early iteration of the masterplan, but the majority of the development stopped when the financial crisis hit. Construction of the pedestrian platform over the railroad tracks

To give the building a unified, monolithic expression, the practice used a tinted outer glass substrate

continued however, before SOM picked the masterplan design back up again in 2010.

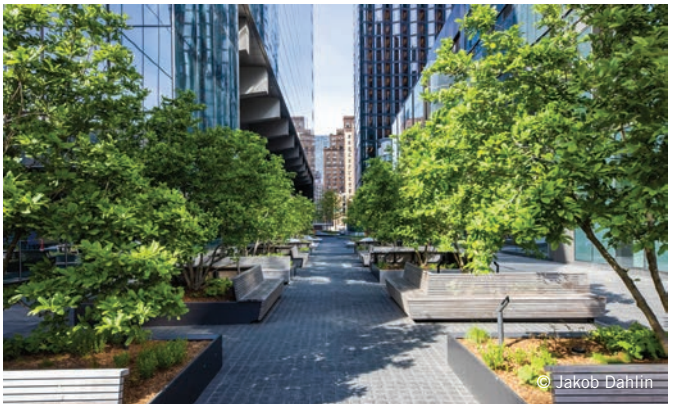
The $5bn development occupies seven million square feet of space and comprises six buildings including One and Two Manhattan West, twin glazed towers both housing offices and 303 metres and 67 stories/285 metres and 69 stories respectively). There's also the Pendry, a 164-room hotel; The Eugene, an 844-unit residential tower; and Five Manhattan West and The Lofts, two former industrial buildings repurposed as offices. As well as the masterplan, SOM designed three of the buildings, and engineered four of them. The buildings are located around a central plaza lined with 225,000 ft² of retail space.

Creating an overall vision for the site was the first hurdle to overcome, explains SOM principal Kim Van Holsbeke. "The first challenge was creating a holistic vision for a new neighbourhood where none really existed before," he says. "The area was mostly empty parking lots, approach roads to the Lincoln Tunnel, and some isolated industrial buildings, all in the midst of railroad infrastructure. We had to envision what its new identity would be." Not only is the development crucial for the revitalisation of the Far West Side, it's described as a "gateway" by SOM, connecting the district to Hudson Yards to the west and Penn Station to the east.

Structural considerations

The second major challenge was to solve the complex engineering challenges that came with building over active railroad tracks. This wouldn't have been possible, says Van Holsbeke, without the firms' collective experience, it being one of the most complex projects undertaken in New York City in recent memory." The practice's designers, engineers, and planners had to collaborate closely to come up with the best solution for the site.

This solution had to allow the buildings and public space to exist – and be constructed – over the live railroad tracks without disrupting their operation. They designed a 2.6 acre building platform to sit over the tracks, and planned various construction phases. Van Holsbeke illustrates the tolerances they were working within: "One Manhattan West, for example, had only about 130 feet between the northernmost track and 33rd Street – an office tower generally requires about 150 feet to have appropriate lease spans, so we had to design the building on



a foundation that was considerably smaller than its footprint." The building's central core was anchored on the city's bedrock, but perimeter columns on the south side couldn't be, so the building was designed with the perimeter columns on all four sides sloping down into the central core above the lobby. This consequently allowed for a column-free lobby which has been clad in vein-cut travertine marble.

At Two Manhattan West, only one half of the central core could reach solid ground, so SOM designed two 'mega-columns' at the perimeter, inserted into spaces between the train tracks to create what the architects call a "table top" supporting the tower above.

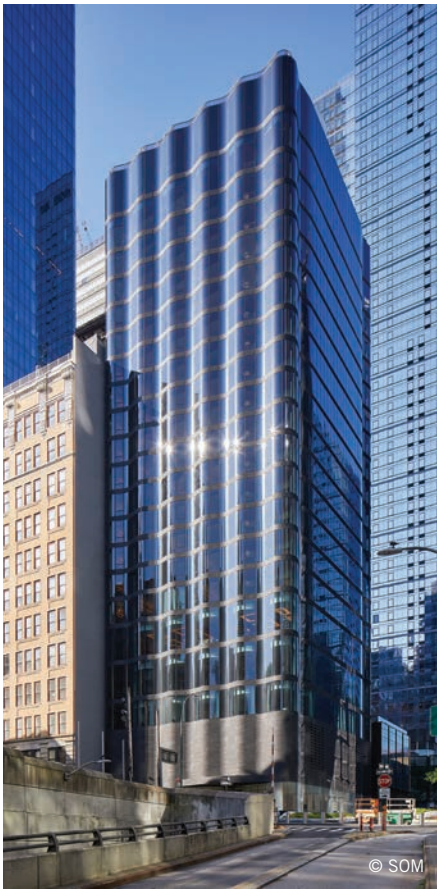
Invisible enclosures

With a "vast open lobby space" being created for both towers, glass enables a column-free perimeter at One Manhattan West to be an "almost invisible enclosure that blurs the line between the lobby and the plaza," explains Van Holsbeke. The perimeter columns of Two Manhattan West are minimal, spaced 60 feet apart, "creating large window portals that are filled in with a glass cable wall system," he says. "This system itself creates a strong visual connectivity between the indoor lobby and surrounding public space."

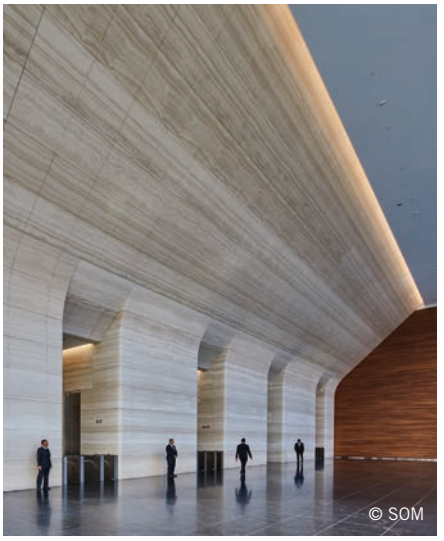
The overall aim with the two towers was to "create an abstract composition, with two volumes in the New York City skyline that create a dynamic relation with each other and their surroundings," Van Holsbeke explains. Each tower features one curved elevation, overlooking bustling parts of the island – One Manhattan West's facing Penn Station to the east, and Two facing Midtown traffic heading south. "Together, the two buildings form a gateway to Midtown West and into the public space of the Manhattan West development," says Van Holsbeke.

Glass' physical characteristics made it the right material for creating these forms, explains Van Holsbeke: "To create these monolithic, sculptural buildings, with a very tight skin and that softly curved massing, glass has the bendability that most materials do not have," he says. "It also helped us create these very transparent, triple-height lobbies that visually seem to dissolve at ground level, so you can see into the buildings and from one part of the public space to another. It offers a permeable connection to the central plaza."

SOM principal Christoph Timm reaffirms



Glass' versatility made it the perfect choice for achieving the sculptural quality the architects were after



this, saying glass has a versatility other materials don't – making it the perfect choice for achieving the sculptural quality they were after. "Glass was the only enclosure material that could make this possible," he says. "The vision and spandrel zones on the facade have few differences in appearance." This also has the added benefit of allowing plenty of natural daylight and maximising views for the users of the buildings.

Glass also formed a key feature of the design of the adjacent Pendry hotel, where it has been used alongside granite to form an undulating facade which, says Van Holsbeke, gives the building a distinct identity and "subtly indicates the building's role." The "repeating, sinuous character" helps it stand out, adds Timm.

The designers' thought process behind this facade was a contemporary take on the bay window – a "perfect" element for a boutique hotel in Manhattan, says Timm. "It allows the interior spaces to visually connect with the surroundings – such as the Empire State Building – to help guests feel the essence of New York, while also bringing in more natural light." The curved floor to ceiling windows in each room give hotel guests views they wouldn't have had with a flatter facade, as well as giving the practice a chance to create floorplates that are a little different from the norm. Externally, granite spandrels balance the glazing and "emphasise the curves of the exterior," Timm adds.

Although it appears as though the glass facade curves continuously, this is something of an illusion, as "strategic geometric design" meant only 22% of the curtain wall panels required bending on the hotel's facade. "To further reduce unnecessary complexity and enable the use of a low-environmental impact bending process, just three radii were utilised to generate the curves of the bent panels," Timm explains. To give the building a "unified, monolithic expression" – as well as provide environmental benefits – the practice used a tinted outer glass substrate, "minimising the visual delta between the convex and concave surfaces," Timm says.

Working with such high volumes of glass meant potential overheating, cooling, and acoustics were all issues to be considered. A coating was used on the glass to control heat loss and gain, though the practice faced the added challenge of ensuring this was bendable for the Pendry and the curved elements of One and Two Manhattan West. The acoustic transmittance of the glass for the Pendry was also thoroughly tested before they settled on the final curtain wall design. The tinted glass substrate used on the hotel also assists with minimising overheating, and subtle flat, operable vents were installed. "They don't distract from the facade's beauty," assures Timm.

It was also decided from early on in the project that One and Two Manhattan West would target LEED Gold certification, which Van Holsbeke describes as an "aggressive goal. We had to thoughtfully design and plan the enclosure, systems, materials, and construction," he says.

The project as a whole was "planned holistically", Van Holsbeke continues. "We were taking essentially a brownfield site and adding density and extensive landscaping. Outdoor space, access to nature, for all the building's users and anyone entering the site, were essential to the vision," he says. The outdoor space was not only important for the development, but its connection to the wider area. "We're starting to see that already with the elevated pedestrian connection to the High Line we've designed."

The public space as a whole forms a series of "urban corridors" running along West 31st and West 33rd Streets. Manhattan West's central plaza then picks up where West 32nd Street ends, at Penn Station on Seventh Avenue. "Together, these urban connections redefine the streetscape and help bring a new destination to life," Van Holsbeke says. This has been bolstered by other improvements locally, including concourse upgrades at Penn Station and the transformation of the James A. Farley post office building into Moynihan Train Hall, which SOM also designed.

Manhattan West had its formal opening in late September 2021, after just over a decade of work. The majority of the development had been completed prior to the pandemic, and the elements that weren't – Two Manhattan West, the Pendry, and retail podium and plaza – remained on schedule thanks to Brookfield's quick response and organisation establishing necessary safety protocols to allow work to continue.

So far, says Murphy, the response has "certainly been positive. The development is very much designed and planned with people in mind – as a place that makes public space its centrepiece. It will serve New Yorkers and visitors year-round." ■

A clear set of challenges

The glazing industry, like many others, faced unprecedented issues with availability of materials and extending lead times during 2021. David Clarke of ID Systems explains why these challenges are likely to continue for the foreseeable future

The Covid-19 pandemic saw an unforeseen surge in all home improvement products as people were at home more and spent less on things like holidays and new cars.

When the pandemic hit the UK in March 2020 nobody could have predicted this demand, indeed most of the retail glazing sector shut down expecting a nationwide slowdown. Why would anyone want new windows during a lockdown? The opposite happened and demand was higher than ever. At a time when most in the supply chain prepared for less work, demand shot up.

Glass shortages

There are critical glass shortages across the entire supply chain. While the double and triple glass unit manufacturers are ready to make the glass, their stock comes from the global glass processors – supplying float glass in various thicknesses. These top-level suppliers have been hit, especially in 2021, by the container shortage and shipping price issues.

This issue has affected the whole world, but the fact that most of the major float glass plants in the UK have closed over the past decade has certainly left us more susceptible to global supply chain issues than other countries.

Component shortage

Beyond the glass and even the aluminium frames, there has also been a shortage of component materials including plastics. Top-end producers of the raw-materials that make the plastics in the glazing industry were locked down at the start of the pandemic – particularly in China. In addition, the global move towards alternatives to plastic for consumer goods has also impacted the wholesale production as those top-level producers begin to diversify their product range.

Laminated glass, required under Building Regulations for security in new build homes, is in high demand, and the plastic interlayer needed for this glass type is in short supply. This plastics shortage is

Beyond the glass and even the aluminium frames, there has also been a shortage of component materials including plastics

having an effect on PVCu windows of course, but also critically in the polyamide thermal breaks used in every aluminium door and window.

Thermal breaks

Polyamide thermal breaks that prevent cold bridging between inner and outer aluminium window and door frames, are in short supply. This shortage comes as a result of a reduced production of a critical raw material Adiponitrile (ADN), that is impacting a huge number of industries globally.

The shortage extends back before the pandemic, and while alternative plastics are being introduced this is another issue that the glazing industry is facing.

2022 & beyond

The outlook for 2022 and beyond is more positive, however while the raw material supply is beginning to return to something that more closely resembles 'normal,' the time scales for this to filter through to finish products is long. Just as the initial impact of the pandemic on the glazing supply chain was only really felt 12 to 18 months after it began, a similar timeframe for recovery is likely.

What will complicate matters is that the return to normality will likely be hugely fragmented. While certain products from some suppliers may be available quicker, other systems and suppliers may be impacted for a longer period – particularly those from smaller scale fabricators or for more niche products.

The fragmented outlook is also further complicated by larger companies 'hedging' their supplies of components over the past six to 12 months. These larger companies with the capability to stock-hold reserves of components will be best placed to provide stability, however that could come at the expense of smaller suppliers – particularly those who rely on third-parties to fabricate and install on their behalf.

Communication

Now more than ever, communication between architect and supplier is crucial. Factoring in likely product availability even at the initial design stage is a question well worth asking and may influence specification and even design of projects.

Going further up the supply chain is also an option, identifying companies that fabricate, supply and install products is a useful step because not only does it take out some of the uncertainty, it also means the information you receive regarding availability is likely to be more timely and accurate.

While there has been a surge in demand for residential and domestic projects, it is still best practice to identify those tried and tested suppliers whose experience and capabilities are not only best placed to support your designs and manage the progress of your project, but are also ideally placed to offer advice and ideas for alternate solutions should the need arise.

David Clarke is marketing manager of ID Systems

Internal glazing, safely

Cath McLean of Promat UK gives a technical breakdown on why the latest generation of fire resistant glazing allows internal glass elements to be designed to deliver multiple performance benefits – without compromising safety

Creating safe buildings is an absolute priority and strictly governed by the Building Regulations in all four UK nations. However, internal spaces still need to be comfortable, energy efficient, fit for purpose and aesthetically pleasing to be most practical, sustainable, popular with users and – in commercial terms – a valuable asset on which a healthy return can be yielded.

This is where today's fire glass products and fully tested fire rated glazing systems can help; ensuring architects and specifiers do not have to compromise on design goals while meeting the required passive fire protection standard. This reduces the risk of the finished installation – whether a glass partition, screen or many other types of interior feature – falling short in terms of meeting the client brief.

Frameless and slim-frame internal glazing, typically butt-jointed to maximise light transmission, is a defining feature of contemporary interior design. Despite this trend running in parallel with a continuous toughening of fire safety standards, innovation in glazing technology has ensured that architects can still achieve their design intent.

Specified for a reason

There is no margin for error with fire rated glazing. To have complete assurance on the fire resistant glazing specification's performance, the design must be supported by credible evidence that it will perform as promised. This is why a fully tested system approach has major advantages.

When a design is agreed, it is important to remember that any deviation from the assembly, such as substituting just one element with a supposed like-for-like product, could undermine performance. This would mean no certainty of the system's ability to meet the specified fire rating in the event of a fire.

But this need not be a barrier to tailoring the glazing design to suit the building requirements. The multi-functionality of advanced glass products and an understanding of how to combine them can give interior spaces greater flexibility and perhaps, new purpose.

Better acoustic performance

Acoustic insulation is a key specification goal in many commercial and public spaces. Fire rated glazing already offers a higher acoustic rating than standard glazing due to the way it is manufactured. Promat Pyrosec 16 glass, for example, has a thickness of 17.3 mm which gives it an acoustic rating of 39 dB Rw (compared with 30 dB Rw for a 'standard' 16.8 mm acoustic glass).

But the acoustic rating can be improved even further with enhancements to the glass specification. Adding a PVB layer in a single glazed application such as a glass partition, for example, will enhance the sound reduction performance. So too would opting for a double glazed unit which utilises an intumescent fire-resistant gel within the cavity.

Added thermal benefits

Certain applications may need the design to achieve a higher level of thermal insulation as well as fire resistance. For example, vision panels between a warehouse and office areas overlooking production/operational spaces, or where the fire rated glass is on the outside of the building to prevent fire spread from one building to another.

Here, the specification could be adapted to become a fire rated double glazed unit,

with either an intumescent fire resistant gel cavity, or an argon filled cavity. A sealed unit comprising 6 mm glass, a 15 mm argon filled cavity and fire resistant glass, for example can offer a Ug value of 1.0 W/m²K in combination with an EI60 fire rating.

Internal climate & solar control

The role that today's glass products can play in preventing summertime overheating and providing a stable internal climate is becoming increasingly important and valued, particularly given the recent introduction of Approved Document O to address this issue in domestic properties. Adding solar control functionality within the fire rated glazing specification is easily achievable, primarily by creating a double glazed unit which features a performance solar control product on the external face.

This was the requirement for a recent mixed use development on Kensington High Street in London. Glazing for this high profile building was specified to balance a 60-minute EI60 fire rating with solar control in very colour neutral double glazed units, which allow daylight maximisation (Lt 64) and achieve a solar factor of 35%.

Enhanced security & safety

Impact resistance, blast resistance and other design goals can also be incorporated into a fire resistant glazing specification. This is one of the most common types of enquiry from architects given how glazing must often protect people, and high value and sensitive assets in many commercial and public environments.

By combining different products, many different performance goals can be achieved in this area as two recent architectural specifications demonstrate. The first was for a data centre where a 120-minute fire rating was required along with a BS EN 356 P6B rating to protect key areas of the building in the event of a fire or security threat. Another project required a two-hour fire rating in combination with blast resistance for a major transport hub.

Understanding glazing's potential & limitations

The key to developing an effective fire resistant glazing specification that meets other performance goals is to understand how to combine different products, the maximum sizes possible and framing arrangements, along with any limitations that could prevent targets being achieved. This is why it is crucial to consider how the glazing will help achieve the design intent at the earliest stage as the resulting specification could impact on the aesthetics, size and orientation of a glass feature – and even add functionality to a space that had not been previously realised.

The key is to think in bespoke terms about the glazing. Doing so will enable you to capitalise on the opportunity to create high quality internal environments which offer assured protection in the event of a fire and provide a high level of client satisfaction.

Cath McLean is segment manager – glass at Promat UK

Switch up your space

Whether you favour open plan living or more defined living spaces, most building users are fans of natural light. Susan Sinden from ESG looks at some clever ways to allow maximum light and best use of space, by using switchable privacy glass

Since the start of the pandemic, many organisations are taking the opportunity to downsize their premises in favour of smaller, more flexible spaces. At the same time, more people are working from home and need to find a longer-term workspace within their homes. Undoubtedly the challenge for interior designers will, in the future, need to help us achieve the correct balance between defining workspaces and making the best use of the available space. One way to tackle this puzzle is with clever use of the increasingly popular technical glass known as 'switchable' or 'privacy' glass.

As 'privacy' suggests, this innovative glass product can be used to screen distinct areas for specific purposes to provide privacy and, in a work context in particular, confidentiality. However, as the 'switchable' part implies, the screening effect doesn't have to be permanent. It can literally be switched on and off.

How does it work?

Switchable glass is created by laminating two panes of glass together, using a LCD interlayer. When an electrical current is passed through the interlayer, it allows light to pass through, creating an optically clear glass pane. If the current is switched off, the glass becomes instantly opaque, creating an innovative room divider, or entire walls of an internal room.

In a commercial setting, switchable privacy glass has many applications, including the viewing windows in hospital or consulting room doors, retail display windows and even high security settings, where it is often mixed with intruder resistant options, to foil would-be perpetrators. It can now be used in otherwise open plan offices, for breakout areas, meeting rooms and boardrooms.

As a home feature

In a domestic setting, switchable privacy glass is fast becoming a favourite with interior designers, as it allows light to flood through from one living space to another, but also provides privacy on demand.

Switchable glass can be used to great effect in areas such as bathrooms, ensuites, bedrooms and dressing rooms where privacy is essential. In conversion projects, vast floor spaces in buildings such as former warehouses and mills can present a particular challenge when it comes to natural light. Much as we may love open plan living, most of us still like to sleep in a separate bedroom. One solution is to create a mezzanine for bedrooms. Using switchable glass, these areas can be created to provide a permanent solution, but with a changeable appearance. The plan will often be to place bedrooms on the upper level with access to a window. This would inevitably reduce the amount of natural light for the living space below, so an obvious solution is to construct the inward facing wall of the bedroom or bathroom out of glass panels, so that light can continue to spill through. The drawback with this would be the potential lack of privacy, were it not for the use of switchable glass.

If the bedroom or bathroom mezzanine wall is made from switchable glass, it can be switched on to allow light through when desired, but switched off to provide privacy when needed – all at the touch of a button. Further advances in glass processing mean that stair treads, balustrades and mezzanine walkways can also be constructed from glass products, to allow even more daylight into the property's interior.

The kitchen is often a key area in which to consider using glass, not only for shelving and splashbacks. Although open plan living is still increasing in popularity, there are times when it is desirable to contain the sounds made by kitchen appliances and the smells from cooking.

In conclusion

The post pandemic trend towards working from home, especially at the kitchen table, has also increased the need for more defined and screened-off areas. Switchable glass partitions are ideal to help to keep the feel of space and open plan, while providing a more defined space to work or study.

Even more helpful to concentration and productivity can be a quiet space. Because switchable glass is created using interlayer technology, it can also incorporate other characteristics, such as sound attenuation. A bespoke product, incorporating both privacy and sound proofing may yet revolutionise the way in which we work and plan our spaces – both at home and in the office.

Speaking to your glass processor at the planning stages of your project can help enormously. The advances in technology now mean that your glass expert can often suggest one cost-effective bespoke product which will answer a whole range of challenges. Switchable glass is definitely one option to explore.

Susan Sinden is commercial manager at ESG

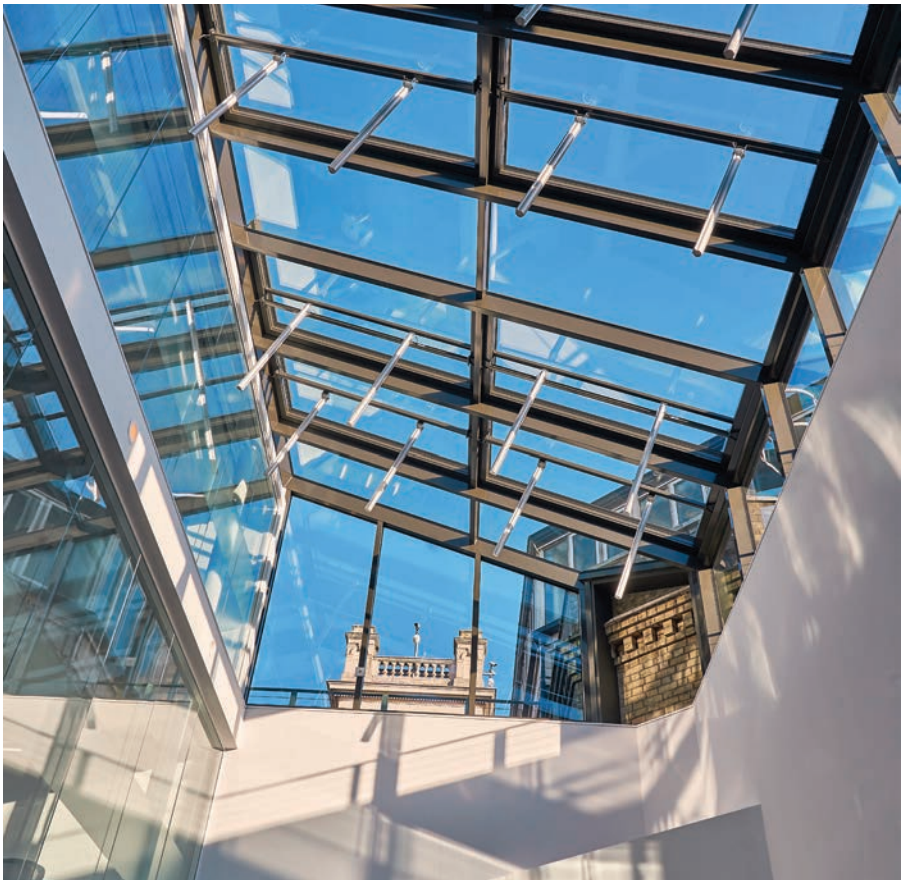
Keep an eye on the sky

With climate change at the forefront of everyone's mind, Natalie Goodridge of Lamilux UK looks at how buildings and their components – such as skylights – need to be futureproofed and designed to withstand extreme weather events

Residential, industrial and commercial buildings must all adapt to an increasing change in weather conditions. Due to climate change, extreme weather conditions such as heat waves, stronger storms and colder winters are becoming more frequent. It is also important to remember that although solar gains may be considered desirable during winter, this can result in overheating of the building during the warmer periods and a subsequent increase in the building's energy usage to cool the internal space.

The use of skylights within the overall building design enable greater use of natural daylight and are becoming increasingly important in architecture. On flat roofs, skylights such as rooflight domes, barrel vault rooflights and flat glass skylights are specified to introduce both natural daylight and ventilation into buildings. The benefits of well-designed daylight and ventilation levels to the internal environment of a building are well documented and include improved productivity and performance within education and workplace settings.

In order to futureproof against climate change, water tightness, air tightness, resistance to wind loads and thermal performance are all important factors to consider when specifying rooflights or roof glazing for your project.



Water & driving rain

Water and driving rain tightness is an important criteria to consider when specifying rooflights for the future. Tests confirming this requirement are described in EN 12208. This standard classifies windows and facades according to their resistance to pressure, the method and the duration of the test. In addition to the application of water on all sides and at different angles, the pressure difference inside/outside is also tested in order to simulate the impact of wind. To simulate possible scenarios with storms and heavy rain as realistically as possible, standing water is sucked in on weather seals or on profiles deformed under wind load.

Air tightness

High performing thermal insulation within the exterior walls is of no use to the building if the skylights or other building components and their connections are extremely permeable to air. There are special test standards for individual building elements such as windows to determine and classify their air tightness. EN 12207 describes a test procedure in which the air volumes related to the area and perimeter of the product are determined in various positive and negative pressure stages. The products are then categorised into Classes 1 to 4, with Class 4 representing the highest air tightness. The standard does not apply exclusively to glass skylights, however rooflight companies such as Lamilux choose to prove the achieved airtightness, and therefore test the glass skylights following the window standard. The same applies to glass roofs which are tested using the facade standard.

Wind load

Strong winds will introduce stresses to the components of buildings, and can cause them to weaken over time. In addition to the geographical location, building shape and height, other influences such as the type and distance of surrounding buildings also play a major role. Skylights and their fastenings must therefore be sufficiently resistant to wind loads with performance

testing to EN 12210 and EN 12211. For this testing, wind deflection results are grouped into Classes of A, B and C, with A being the lowest standard. Pressure, meanwhile, is grouped into 5 Classes: again, Class 1 is the lowest level of performance.

Thermal protection

Another relevant property of skylights regarding environmental impacts is thermal protection. The total energy transmittance, or g-value for short, is used as a measure of the energy transmittance of components such as glazing. This common value expresses what percentage of the energy striking a glazing unit reaches the inside. Simply put: How much of the heat radiation reaches the inside of the building.

The g-value is a number between 0 and 1 – the lower the total energy transmittance, the lower the heat input. There is a difference between summer and winter thermal insulation. This is because in summer the heat should be kept outside, whereas in winter the heat radiation of the sun should be let in. That's why it is desirable to have the lowest possible figure in summer, whereas in winter, the opposite is necessary. In addition to the possibility of using special sun protection glass, interior and exterior shading can also be considered.

Ventilation

The benefits of well-designed ventilation levels to the internal environment of a building are well documented. Due to the variety of skylight designs and combined opening options now available to use within an overall building construction, skylights are an extremely efficient method of introducing adequate ventilation to an internal space. Natural ventilation improves the quality of air within a building. Good levels of ventilation impact directly on individuals' performance and health and well-being. This is particularly beneficial during hot summers. Both natural ventilation, and smoke ventilation can be implemented in any type of building with vented roof lights such as modular skylights, glass atria or barrel vault rooflights.

With climate change increasing the chance of extreme weather events, architects should ensure that specified building components are both durable and function in a way to protect against such environmental impacts by conforming to relevant standards.

Natalie Goodridge is marketing manager at Lamilux UK

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