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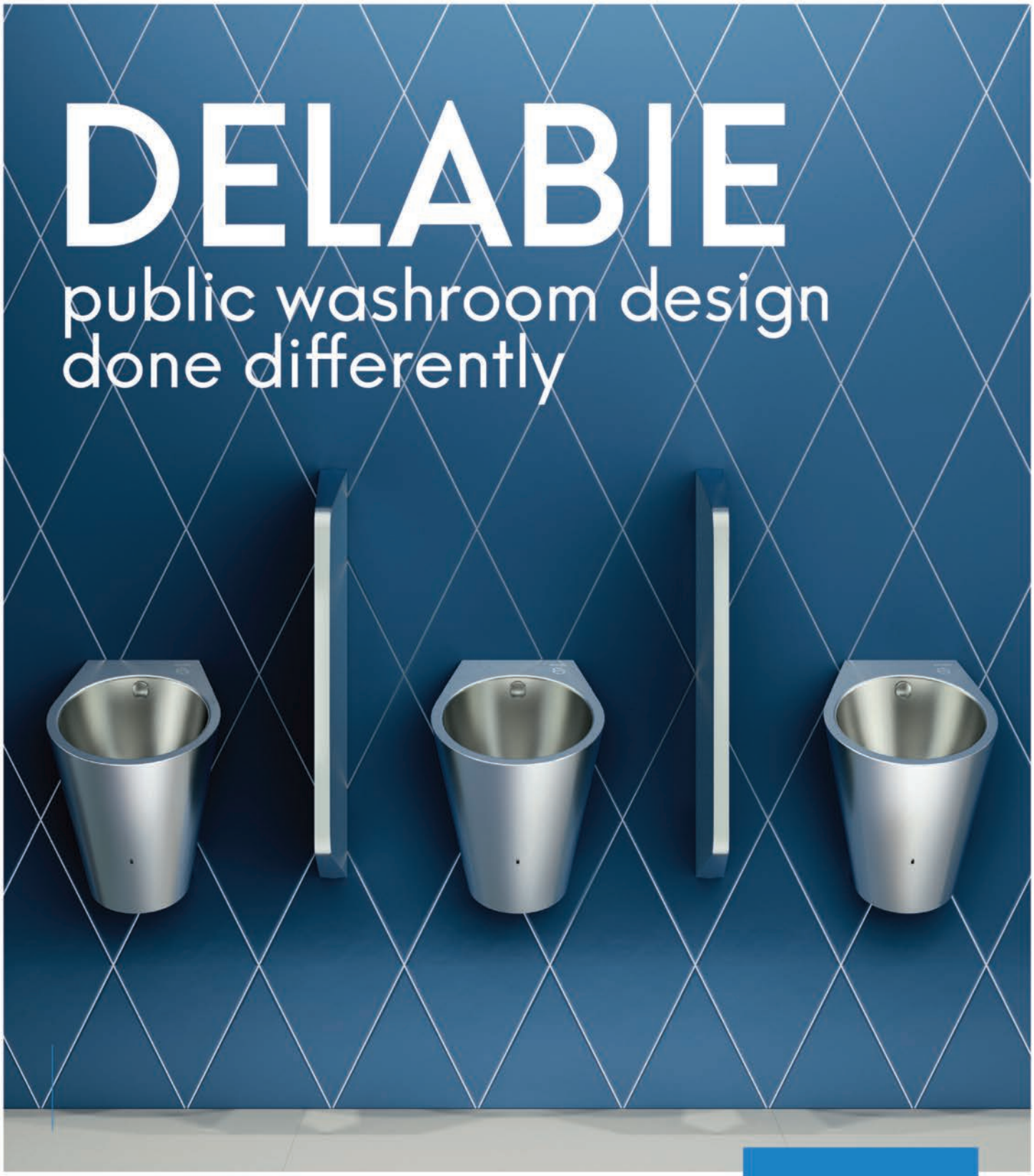

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Metal in architecture supplement

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FROM THE EDITOR

With the pandemic and various other forces continuing to wreak havoc across society and our economy, it's reassuring to see a major residential project in London with some architectural flair reach fruition. And with the housing market seeing the most sluggish performance for years in the capital, it's good the developers held their nerve on the 'Newfoundland' scheme in Canary Wharf, the financial district's first build to rent project, and one which brings high-end, high-rise living within the reach of more people.

The new building designed by Horden Cherry Lee (HCL) on the western flank of the dock follows on from Herzog and de Meuron's One Park Place, a 58-storey residential cylinder completed earlier this year, formed of an ingenious arrangement of concrete bay windows. In the eastern end of Canary Wharf (actually the adjacent Wood Wharf), this building however broke the dominance of the rectilinear, very business-like mould of most of the development around the area in the past decades.

Newfoundland continues the architectural innovation, but with a different approach that celebrates its metal structure. Its finished form looks great, with a Gherkin-like external diagrid of aluminium-clad steel – as you can read in our project report by Jack Wooler. The diagonal members aren't just efficient, they frame the expansive floor-to-ceiling views within apartments in a variety of interesting ways, enhancing the sense of 'specialness' of living in this prime site for residents.

It's also the tallest build to rent property in London, not surprising given the need to maximise every square inch of such a site, and the relative lack of height restrictions. As well as the physical differences with One Park Place, Newfoundland offers the opportunity to rent an apartment in a very desirable location (although a three-bedroomed one would stretch most families' resources at around £1,600 a week).

There are 9,500 tonnes of structural steelwork in the project, making it a major user of metal in recent times in the capital. It also enhances the aesthetics of such large-scale facades, making them oddly (i.e. despite the steelwork's mass), seem lighter than the building's nearby counterparts. It demonstrates how metal facades can be employed as architectural tools to avoid the 'hegemony problem' which can occur with glass curtain walling.

We hope you enjoy the report on this key new scheme, as well as the rest of this supplement. Also, look out for our *Building Insights* podcast on tall buildings, coming later this year on all the major podcast channels!

James Parker
Editor

ON THE COVER...
Newfoundland, for Vertus in Canary Wharf, is a new addition to London's skyline, with an external diagrid braced tube structure, forming a 'hollow cantilever' perpendicular to the ground.

For the full report on this project, go to page 16.

TRANSPORT

Interior design partners named on Studio Libeskind's Nice station

MDI Architecture has named its partner firms for the design of the interior of the East Thiers Station in Nice, an innovative metal and glass structure which has been designed by Daniel Libeskind.

The architectural practice will be working with fit out specialists Agilité Solutions, Zatti Interiors, and ESA Engineering as partners for the implementation of the development.

Once complete, the €100m, 6000 m² building will house the new headquarters of Hilton Hotels, and the offices of a start-up firm listed on the French stock exchange, real estate company Les Agences de Papa.

The project has been "inspired by technological innovation and modernity," said the architects, with a strong focus on sustainability. It will include flexible spaces designed to foster collaboration, with a rooftop designed to be used for activities such as recording podcasts and other business communications.

With offices in Paris, Milan, and Luxemburg, Agilité Solutions counts the likes of LinkedIn, LVMH, Deutsche Börse, Fred Perry, Five Guys, and The Instant Group among its client portfolio. The firm has been appointed to manage all work co-ordination activities as the general interiors contractor on the project.

The station forms part of a wider 20,000 m² development – set to house commercial space including two levels of shops, a 120 room hotel, offices, and a "sculptural" entry pavilion, as well as a 200-seat auditorium, and a restaurant offering an open roof terrace with views towards the sea on the top floor.

The project is due for completion in July 2022.

FACADES

White paper published on the architectural effects of metal facades

Alanod, developer and manufacturer of specialised coated metals and supplier of standard and customised aluminium materials aims to "take exterior decorative surface panels to the next level," with the help of a new white paper it has produced on the subject.

The firm commented that decorative metal surfaces for facades have "come a long way over the past century," and we are now at a point where there is "a surface to suit a range of exterior applications."

As well as giving some background on the history of metal facades, the white paper details the "key things architects need to look for when choosing a specialist metal surface producer." The document also looks at the wide range of effects that can be achieved when using different anodised aluminium metal surface finishes.

Stuart Tranter, general manager of Alanod, commented: "Ever since the end of the Second World War, when metal and glass curtain wall systems were fastened to structural skeletons on commercial and institutional buildings, architects have been looking to manipulate the exterior surface of buildings using light and reflection." He continues: "This white paper not only gives an overview of the visual effects that can be achieved, but it also signposts architects as to what to look for when specifying specialist metal facades."

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COMMENT

Rolling out offsite benefits

Marian Kubisz of Adept Consulting (UK) looks at the increased specification of cold rolled steel frames in the current push for offsite construction solutions, and why system design considerations need to be brought into projects at the earliest stage

Hot rolled steel frames are generally being considered as the original offsite framing solution, but the advent of cold rolled and formed steel products has seen them play a much bigger part in delivering panelised and volumetric modular construction solutions.

Steel Framing Systems (SFS) are now commonly used supporting cladding facade materials, as infills or oversailing the hot rolled steel or concrete frame. They are replacing blockwork solutions, being much quicker and cleaner and eliminating wet trades.

The systems are generally designed at the last stage of the project – either by the manufacturer or in most cases by the subcontractor. This process can be lengthy and painful however, as too many people are involved, notwithstanding the client team's expectations that it will be short and straightforward.

By involving a specialist structural engineer/detailer in the early stages as part of the client side design team this problem would be eliminated. Another advantage is that by fully developing the design as early as RIBA Stage 2 or 3, an early dialogue with the supply chain can be established that will ensure lead times are adhered to. Delays on site can occur when the preferred supplier has reduced time to order materials or allocate labour, and these can be extremely costly.

By discussing and co-ordinating the process based on the end goal (the handover date), all parties – architect, structural engineer, detailer and principal contractor – can ensure the SFS system is 3D modelled and detailed before the manufacturer and or subcontractor is involved. The more complicated details and structures that require hot rolled steel in hybrid form (parapets, large openings, wind posts etc) can be identified and detailed prior to the tender process.

The tender, based on a generic design, can then be priced very accurately – so the cost difference is in the subcontractor 'prelims,' rather than a design variation. This eliminates misunderstandings and boosts post-supply chain selection, hence giving client and contractor cost certainty.

We have in recent years seen cold rolled replacing hot rolled steel in areas, such as small to medium portal-framed and beam and column structures within the retail, commercial, agricultural and leisure industries. The increase in panelised framing means

Involving a specialist structural engineer/detailer in the early stages as part of the client side design team would eliminate the problem

better quality factory assembled units that can include sheathing boards and insulation, speeding up the programme onsite.

Light approach

Light Gauge Steel Framed (LGSF) structures are made up of cold rolled or pre-formed 'C' and 'U' sections bolted together in factory jigs to ensure accuracy. Onsite assembly often utilises rolled formed metal decks within the structure – load bearing solutions that can be used up to 15 storeys. These are increasingly common in private and social housing as well as student accommodation. We are also seeing an acceleration in the use of

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LGSF across the new schools programme therefore supporting the Government's push for greater use of offsite, as well as the "Build Back Better" initiative.

LGSF challenges traditional methods of construction in low rise residential as well, with more and more builders looking to use this system for two or three storey individual houses on schemes across the country. Major firms who have had the foresight to adopt this method are seeing the benefit in terms of reduced remedial work post-completion, thanks to the lack of shrinkage and movement (preventing cracking at plasterboard seams and fixings).

LGSF is a regular contributor to the volumetric modular sector, with components used as floor and roof joists, as well as wall infills supporting the inner and outer leaf treatments. Either loose or panelised, these bring a lot of advantages, starting with the component itself being rolled in different depths and using different gauges – allowing the system to be precisely sized to fit.

The growth in the UK has been exponential, and so have the engineering and detailing support resources. Standard methods of connection are Tec screw, bolt or rivet depending on the manufacturer's preferred solution, but all are accepted within the industry.

Co-ordination within the engineers and detailers can be seamless with the deployment of BIM throughout the design process; production of a 3D model shared easily in IFC format. This allows the consultants to check for clashes and co-ordination, reducing or eliminating issues onsite. This also applies when there is a requirement to combine with hot rolled steel (either as individual components, steel frames or cages).

Early involvement

When considering offsite construction methods, it is crucial there is early discussion between the architect and structural engineer about the system to be adopted, even prior to the decision on choice of material. LGSF systems are incredibly flexible, but not universal; all have their advantages and disadvantages. Involving a specialist engineer early on provides the project team with various key advantages:

- Structural issues can be identified and discussed, avoiding later costs of any changes required
- Accurate early 'loading down' information cuts delays in getting the information to the foundation engineer (if going the subcontractor route you will need to wait for the information until after appointment, they will then have to appoint an engineer to produce details)
- Accurate structural information can then be shared with all subcontractors
- Changes during the design process can be discussed with other parties in the design team, saving on cost.

There are specific advantages for architects of this approach:

- Identifying right system for the project (not all are fit for the same purpose)
- Understanding of the system from the outset – being able to discuss the benefits and limitations should help define the structure
- Identifying any potential issues before final decisions are made.

System limitations & further considerations

LGSF is a very flexible system suitable for different structure types, from small extensions, SFS infill or oversailing wall systems, and open plan portalised frames, to multi-storey structures. With LGSF

We have in recent years seen cold rolled replacing hot rolled steel in areas such as small to medium portal-framed and beam and column structures within the retail, commercial, agricultural and leisure industries

structures being required to go higher, hybrid solutions need to be considered to overcome systems' individual limitations. The higher you go, the greater the requirement for racking (X-braces, K-braces or portalised frames), therefore walls that can accommodate those are needed within the floor plan.

Large open areas within a building (such as hotel entrance lobbies, kitchens, restaurant dining rooms) require a deeper supporting structure, affecting overall floor depth and overall floor to floor distance. LGSF systems also require secondary fire protection in the form of fire rated board.

Despite these considerations, systems have compelling benefits, such as their exceptional light weight, greatly reducing load on foundations. LGSF structures are made using cutting edge technology with material rolled and cut to in a bespoke 3D modelled way, reducing wastage significantly. The technology also minimises any occurrence of human error.

LGSF elements have been refined over time to maximise their structural capacity, again meaning wastage is minimised, and projects with the highest strength to weight ratio possible. Lastly, section profiles can be recycled meaning the systems can help meet green goals.

Marian Kubisz is managing director and owner of Adept Consulting (UK)

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COMMENT

Fire safety in the frame

David Atkinson from Metsec discusses the increased focus on through-wall fire testing post-Grenfell, and how steel framing systems can contribute to improved performance as well as thermal efficiency

Light gauge galvanised steel framing systems (SFS) are primarily used for wall constructions such as infill walling, continuous walling, high bay walling and load bearing structures in low to medium rise situations.

Their light weight and versatility deliver benefits to the entire construction team, providing the designer, developer and end client with cost-efficient, sustainable design solutions for a wide variety of residential, hotel, student accommodation, social housing, healthcare and education projects.

Whilst efficiency, versatility and sustainability are desirable attributes for any building system, they count for little without certified proof of the system's ability to meet the required technical performance standards in the areas of acoustics, thermal efficiency, load bearing, and fire protection.

Walls' fire performance

Fire performance and thermal efficiency are achieved through the combination of materials that are used in conjunction with SFS to construct the wall. For external wall constructions, from inside to out, this would typically consist of dry lining, SFS (possibly including insulation), sheathing board, and insulation. The final wall construction can vary according to the external facade materials that are used. These can range from brickwork to insulated render, timber cladding, composite panels, ventilated rainscreen and many others that might be selected to achieve the desired exterior finish or budget.

With so many exterior facade materials available, it would be impossible to test every possible wall construction

Traditionally, performance of the wall construction could be assessed by compiling the technical data from manufacturers of each of the materials used in the construction; boards, sheathing, SFS and insulation. Since the Grenfell Tower fire, there has been increasing recognition amongst SFS manufacturers of the need to undertake fire testing of the wall construction itself.

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By carrying out a 'through-wall' performance test, designers and contractors can have added assurance of the product's performance capabilities.

The through-wall concept

While there is currently no strict definition of what 'through-wall' means, it is widely regarded as the area from the inside face of the internal dry lining to the outside face of either the sheathing board or insulation. This part of the wall provides the majority of its fire, thermal and acoustic properties.

The reason for the emergence of the 'through-wall' concept is that with so many exterior facade materials available, it would be impossible to test every possible wall construction. The 'through-wall' approach to performance allows manufacturers to test a meaningful number of material combinations (SFS, internal and external boards plus insulation). The tested solutions will either be from the dry lining through to the sheathing board or from the dry lining to external insulation.

This approach provides the design team with the freedom to choose the desired external facade, provided the necessary performance requirements are met.

Measuring performance

Building Regulations set out requirements for time performance, particularly with regard to integrity (passage of smoke and flame), insulation (temperature on the opposite side of the wall) and load bearing capacity where the wall is being used in a structural capacity.

Efficiency, versatility and sustainability count for little without certified proof of the system's ability to meet the required technical performance standards

In order to achieve 'through-wall' fire performance data, SFS manufacturers construct different complete wall build-ups measuring 3 metres x 3 metres, comprising light gauge steel frames fitted with various combinations of boards and insulation materials to UKAS-accredited laboratories for testing.

Each build-up is tested using a large-scale, high heat test (reaching up to 600°C in 5 minutes), which measures the performance of the whole wall by simulating fire trying to break out through a solid wall. Tests are conducted to British Standards BS EN 1364-1 and BS 476-22 (for non-loadbearing walls) to achieve the 120 minute, 60 minute and 30 minute fire ratings typically required by Building Regulations.

In most cases, fire performance is an inside-to-out requirement, aiming to prevent the spread of fire from its source to adjacent compartments. Where buildings are in close proximity to each other, fire resistance will also be required from outside in.

Whatever the circumstances, 'through-wall' fire testing and the performance data it returns for the combinations of materials used in wall constructions is a positive step forward from SFS manufacturers. As more manufacturers commit to this approach, the array of certified wall constructions available to designers will increase – providing greater choice and flexibility in the solutions they can use. This will not only meet fire performance requirements but will also achieve other performance criteria – such as thermal and acoustic insulation – as well as meeting aesthetic and budgetary targets.

David Atkinson is specification manager for Metsec's framing division

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BUILDING
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NEWFOUNDLAND, CANARY WHARF LONDON

Diamond life

Newfoundland, the first residential project in Canary Wharf – and London's tallest build to rent scheme – has been completed, and it's an architectural landmark in its own right. Lead architect Billie Lee spoke to Jack Wooler about its distinctive structure

The first residential building on the main Canary Wharf estate was completed this spring. At 218 metres, Newfoundland is a prominent addition to London's skyline, and currently the tallest purpose built build to rent apartment block in the capital.

Designed by Horden Cherry Lee (HCL) for Vertus, the residential arm of the Canary Wharf Group, the project has been hailed by its owners as an "architectural and engineering masterpiece." This is largely based on the external diagrid structure, which allowed the team to overcome challenging site issues while making the building a recognisable landmark across the city.

Rising 58 storeys, the building contains 636 apartments, ranging in size from studios to three-bedroom family homes. Vertus intended to stand out from the competition by kitting the building out to a standard that would make it "the pinnacle of the BtR sector." This is manifested as a certain level of luxury plus 13,000 m^2 of amenities which should appeal to its demographic, including rentable gaming and dining spaces, fitness studios and even 'wine dispensers.'

Situated on the western edge of the Canary Wharf estate, residents have been able to snag a prime dockside setting – and be able to walk the length of the dock to the underground station away from traffic. They will also enjoy many restaurants, bars, shops and events spaces situated minutes away from their home.

The scheme has been designed to save over 8,000 kg of CO_2 emissions with the installation of PV solar panels on the roof alone, and it also features a variety of wildflowers to bolster biodiversity in the estate.

Setting a precedent

Founded in 1993, the Canary Wharf Group has taken great strides to regenerate what was a deprived area, and owns nearly 100 acres of property at Canary Wharf as well as elsewhere in London. They have over 1,000 staff working 24/7 running the Wharf day to day, including landscaping, arts, events, and even security – and have been central to transforming the area into the major business district it is today.

While the group's new residential 'neighbourhood' (the adjacent Wood Wharf) has created housing in the area – including the Herzog & de Meuron-designed One Park Drive – Newfoundland is the first scheme to be granted residential consent in the central business zone itself.

The site had previously been zoned to allow a tall building to be developed, but it had reportedly been overlooked for redevelopment as it had been considered too small to make an office scheme viable. Equally, a previous planning permission for a 140-room hotel wasn't able to be brought to fruition.

When HCL were brought on to the project in 2010, they were tasked with converting the permission – which was "not making the most of the zoning it benefitted from" – and to maximise the site's potential.

"Building heights in the area were only governed by London City Airport, and so this was clearly an exciting opportunity – and a tower was the clear choice," says Billie Lee, lead architect and director at the practice. "It was obvious from the outset

FRAMING DIAGRID
The tubular steel, alu clad diagrid exoskeleton frames views of the London skyline

that this tower would be residential, being the most financially viable option, making the best use of the footprint, and having the benefit of introducing housing to the area."

He tells *ADF* this idea was well received: "Everyone was keen to deliver homes in the heart of Canary Wharf to make it a more socially sustainable community." He says the London Planning Authority "warmly welcomed" the proposal.

Challenges & opportunities

Besides the potential to design a tall building, Lee explains that the site offered significant opportunities, including the "naturally generous" public realm around it, its north-south site orientation for optimising daylighting, and open views to the east and west. "Of course," adds the architect, "it had its landmark location next to the river, and its high visibility."

The site did however also come with a number of constraints, including being next to the listed dock, its compact size, irregular shape, and the fact that its western position leaves it exposed to the elements. Lastly, and "most importantly, there are two London Underground tunnels running directly below it."

These Jubilee Line tunnels were the key design issue to contend with from the get go, and ultimately prevented the structure rising as high as initially desired. "As they converge towards the station," Lee explains, "they create a V-shape directly under the site, limiting options for ground piling in the narrow space between the tunnels."

He says that while a standard central core plan would have been "the most efficient building layout" for a high-rise building, this would have meant the core would be placed directly over these tunnels.

In order to work out how to tackle this conundrum, the team established the maximum piling capacity possible – including the prospect of working into the exclusion zones around the tunnels. An agreement was struck to work within restricted areas but also certain times – and, with commitments to Transport for London to carefully monitor the effects of the works, they were given the go ahead to begin.

Braced tubes

Lee explains that with the limited ground bearing capacity around the tunnels, "it was clear that the construction would not only have to be relatively lightweight, but that a solution was needed to accommodate the necessary building loads."

"Our solution was an external diagrid, a naturally stable structure," he details," and which allowed us to transfer the forces away from the tunnels."

This external diagrid is based on a braced tube structure, where lateral loads are resisted due to the design working as a hollow cantilever perpendicular to the ground. In effect, by using an assembly of columns and beams, a rigid frame is formed that constitutes a "dense and strong" structural wall. It is designed to be sufficiently strong to allow the interior of the building to be simply framed for gravity loads.

Lee tells me that as opposed to using a traditional core-loaded building, the design resulted in the building being "30% taller, 30% lighter, and 10% quicker to build." He comments: "This is clearly the most important innovation, and allowed us to effectively maximise the height of the building with great potential for the architecture."

A hybrid

The rest of the above ground structure is a hybrid steel and concrete frame, constructed in eight-storey lifts that required close tolerances. According to the architect, this core was constructed "quite rapidly," with the diagrid structure following close behind, providing structural stability as the tower progressed.

As the team moved up the building, they utilised a number of different types of construction to create the varying floor plates inside this structure – all catering for the differing needs of the building's functions. On the intermediate floors between the nodes, for example, a post tension concrete solution was utilised, which allowed for thin slabs and a reduction in the amount of reinforcement necessary, and weight.

Then, at the node floors, the team used a steel beam solution with precast concrete slab units. This created a deck between the buildings, which performed as a platform from which to create the next four floors of the diagrid, and separated the work above from the construction on the intermediate floors.

"Although none of the techniques we have used are unique on their own, bringing them together made for a very innovative solution, resulting in a hybrid building that is very efficient," says Lee.

A sculpture for the city

Just as their work on the structural solutions, HCL carefully curated the

With only four internal columns, all near the building's core, the clear-span structure allowed for large open plan layouts

"Everyone was keen to deliver homes in the heart of Canary Wharf to make it a more socially sustainable community"

Billie Lee, HCL architects

building's aesthetics and the housing of its various functions, the former inherently dominated by the external structural design itself, as well an aim to "make a statement," given its unprecedented nature in the area.

"We wanted to create a sculpture for the city," says Lee. "To achieve this, we desired a tall and slender structure that has a clearly defined silhouette, alongside an elegance and grandeur befitting its place as a landmark in the capital."

The architect says that visually, this shape had to work on many scales, with its function and identity needing to be clear at long range, while attention to detail and high quality materials were required to "provide a texture" at close range, and make it "a fine building to move around, enter, touch, and use."

The aluminium cladding to the exterior diagrid manifests this most prominently; designed to continually catch the sunlight as it moves around the building (allowing each facet by facet to be illuminated as the sun moves). Also, on a smaller scale, it provides a subtle texture "that sometimes sparkles."

Lee says the building's facade design, as well as its orientation, is a "direct response" to the listed dock setting and riverside location, with a "strong axial arrangement with the water, and to the direct axis of the Canary Wharf Underground Station entrance."

He explains further: "This orientation also reduces directly facing north or south aspects – avoiding undue solar gain or heat loss." The building's diamond external language also provides a relationship to the nearby rectilinear office buildings, and the angled facades give the building "elbow room, alongside glimpsed views between its neighbours," says the architect.

'Tripartite' design

In order to further strengthen its recognisability and legibility from a distance, the building uses a "modern but classic tripartite design," says Lee, with clearly defined zones of a base, a middle and a top, each reflecting their functions.

On the ground floor, the building is set back underneath the above-ground transfer structure, making for an inviting entrance. This base is three double stories high, with the ground floor occupied by a grand entranceway, lobby, waiting areas, post delivery, lift lobby, and back of house facilities. The lobby has two entrances, one at each end, with open frontage over the dock, and the desk itself continues the diamond concept on the building's exterior, in characterful marble.

Going up, there is a public "world-class" restaurant at level one, and at level two, a varied amenity space, including a lounge, private group dining, meeting spaces, fitness areas, and internal and external children's play areas.

In the middle is the residential accommodation, located within the diagrid part of the building and covering over 56 floors. This section houses a gross external area of 76,000 m^2 of apartment space, all of which is served by four passenger lifts travelling at 6 metres a second.

Lastly, the top of the building houses a screened plant area. Among the many necessities of a building of this size and function is a tuned mass damper to reduce mechanical vibrations across the building.

Framing views of London

Discussing the interior design, the architect argues that the external architecture also "significantly benefits the internal environment" of apartments, with the diagonal columns "like sculptures, sometimes framing views."

"The lean design brought many such benefits to the apartments," continues Lee, listing among other elements, a reduction in the energy requirements. This meant systems required to heat and cool the apartments "are minimal."

"The high perimeter ratio means there is lots of frontage, and the radial planning ensures the apartments open out to the light and views," he adds.

All the apartments are generously sized to include an element of amenity space, and all have openable windows and their own ventilation system with built in heat recovery.

With only four internal columns, all being near the building's core, the clear-span structure allowed for large open plan layouts, with generous areas of uninterrupted glazing. A further benefit introduced here, as the party walls are non structural, is that the building is open to reconfiguration any time in the future.

An amazing result

Looking back on the process that achieved all this, Lee says "it has been an amazing project to design and deliver," and was "most grateful to everybody involved, who have given a tremendous amount of enthusiasm."

He believes the design has achieved the practice's key aim of making the most of the space, while creating the landmark building the Canary Wharf Group desired.

"It was important to all of us to set a high standard for this new icon, with its prominent position on the edge of the estate, and I for one think it sets a fantastic example." He concludes: "It has not always been easy, but it's a wonderful project." ■

A 1970s revival

A controversial 1970s building in the historic heart of Cheltenham has been transformed by AWW Architects to provide a contemporary mixed-use commercial development. Neil Smith from AluK reports

Once a 1970s landmark in the centre of Cheltenham, but later becoming an underused and run-down building, the Quadrangle has been completely transformed into a contemporary mixed-use commercial development with aluminium window, door and curtain walling systems.

Designed by AWW Architects from their Bristol studio and completed by Beard Construction, it now features an inner courtyard, ground floor retail space, four storeys of open plan workspace, and the town's first rooftop restaurant.

The fenestration package was key to retaining the design language of the original building within a more contemporary aesthetic, while also meeting the requirement for improved thermal efficiency, more natural light and better natural ventilation.

Fenestration system

The architects specified a comprehensive mix of curtain walling systems at the Quadrangle, including a capless curtain walling system to give a frameless appearance to the retail facade, as well as a more conventional capped curtain walling system for the courtyard area and rooftop restaurant. In addition they specified a system for the entrance doors, and a separate one for the 400+ windows fitted into the existing openings around the facade.

The whole fenestration programme was carried out by fabricator Aluminium Sashes, which used its extensive experience

in the repair and replace sector to overcome the challenges inherent in surveying, fabricating and fitting windows into openings. In many cases these were irregular in shape and form, and not aligned with the concrete slab finish.

Some fabricators avoid commercial repair and replace projects like the Quadrangle because of the complexities involved. However when Aluminium Sashes were faced with challenges such as a downstand beam within the structural opening of some windows, creating an awkward head detail, they were able to integrate areas of fritted glass to disguise it.

Getting the details right

The firm worked closely with AluK at the planning and detailed design stage to achieve the contemporary look for the facade that the client and architect wanted. For example, where the original windows had a transom and modesty spandrel panel below, the slimmer sightline replacements replicated the line of the transom but with fritted glass below, to provide a similar level of privacy but with more natural light.

They also designed a solution for fixing the anthracite grey windows to the metallic bronze louvre sections specified to break up the uniformity of the facade, give users the option to open windows, and to provide fresh air and exhaust points for the AHUs. The reinforcing bar in the windows has effectively become the carrier bar for the louvres, and gives the impression that there are two colours in one window panel.

The architect's view

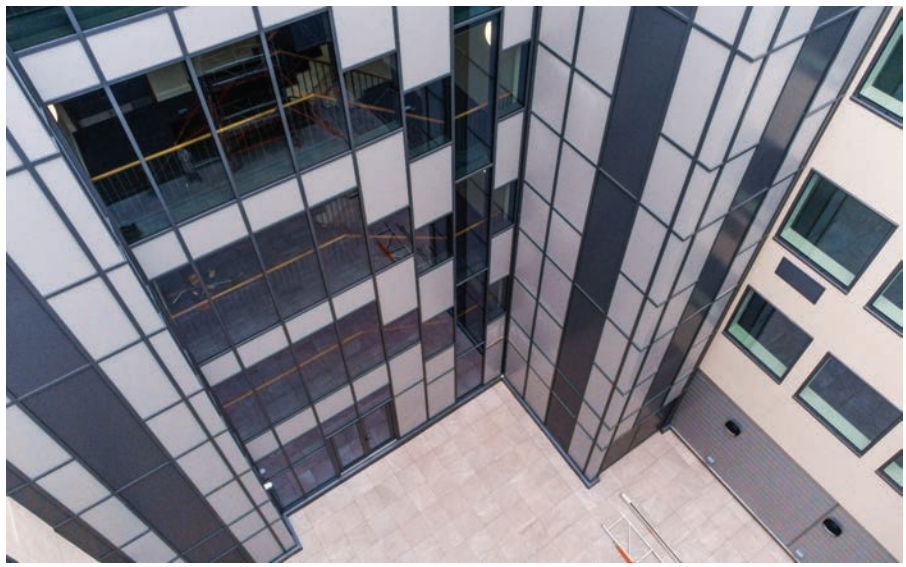
Dan Basey, project architect commented on the project: "Being able to work so closely with the manufacturer and fabricator at both design and construction stages enabled us to realise this project. The integration of the distinct colour palette and finishes was a key driver of the scheme. The metallic bronze finish works really well with the more neutral anthracite grey, whilst also being sympathetic to the existing colour palette of the Regency-era buildings in the context of Imperial Square."

He continued: "An integration of both natural and mechanical systems to the rear of the windows' louvre system is a simple but effective detail that seeks to improve the user-experience of those working in office spaces. This will hopefully become a well utilised feature as more attention is given to improving the air quality of our internal workspaces going forward."

The fenestration choices were integral to the project's being awarded a BREEAM Very Good rating, explains Basey: "The recyclable aluminium windows contributed to a BRE Green Guide A materials credit, while the 1.4 W/m²K U-Values reduced the energy demands. The glazed facade with integrated louvres helped achieve both the HEA 01 Views Out and Daylighting and the HEA 02 Indoor air quality ratings."

Quadrangle is a showcase for our collaborative approach with customers and specifiers. The planning, precision and attention to detail shown at every stage ensured that it delivers on the design intent, yet it has still proved a practical, and cost-effective choice.

Neil Smith is the national sales manager from AluK



The building now features an inner courtyard, ground floor retail space, four storeys of open plan workspace, and the town's first rooftop restaurant

A copper-bottomed sustainability case

As well as wide applications in contemporary architectural design, there is more to copper than meets the eye when it comes to recyclability, sustainability and longevity, explains Graeme Bell of Aurubis

RAVENSWOOD SCHOOL FOR GIRLS, SYDNEY
Solar screen of pre-patinated copper with perforation pattern echoing gum tree seedlings. Photo: Tom Ferguson

Copper is a natural element found within the earth's crust, and which has been incorporated into living organisms throughout evolution. The wide range of architectural copper surfaces and products available today replicate natural 'mineralogical' changes that otherwise occur over time in response to the local environment. They are produced in modern plants with strictly monitored environmental performance, and well-established recycling routes. The solutions available to architects include high levels of recycled materials, saving on energy and greenhouse gases, and contributing to the circular economy.

Long life

While offering a lightweight and flexible covering for building facades, copper can also reduce structural support demands, resulting in lower carbon and 'whole of life' costs. Then, at the end of a building's life, the material retains a high scrap value which drives recovery and recycling. Copper can be recycled again and again without any loss of performance or qualities, and its lifespan can be regarded conservatively as 200 years when correctly installed. When copper roofs or facades are replaced, it is generally due to substrate or structure failure, rather than the copper.

Copper requires no decoration, maintenance or cleaning – saving resources, cleaning chemicals and cost. Its interaction with the environment has been assessed under the European REACH policy on chemicals, and has no classification or restrictions under that process.

Architectural & practical

The material's unique architectural qualities are defined by its naturally developing patina which cannot be replicated successfully using other materials with

surface coatings. Within a few days of exposure to the atmosphere, a copper surface begins to oxidise, changing from the 'bright' mill finish to a chestnut brown, which gradually darkens over several years to a chocolate brown. Continued weathering can eventually result in the distinctive green or blue patina seen on older roofs.

The patina film provides impressive protection against corrosion, and can even repair itself if damaged, which accounts for the material's longevity. A complex combination of factors determines the nature and speed of development of patina over time and this is much slower on vertical surfaces. It is not surprising that factory-applied surface treatments are popular to provide 'straightaway' oxidisation and patination of copper to a required level, particularly for facades.

Safety

Having an A1 (non-combustible material) fire classification to EN 13501-1, copper is suitable for cladding tall buildings, using appropriate constructions of course. Low thermal movement makes it safe and straightforward to use in any climates and locations. Also particularly important today, copper is non-toxic and its inherent antimicrobial qualities make it ideal for touch surfaces, including interiors.

Natural processes

Many of the processes involved with copper are very similar to those already taking place in the environment. Copper mineral compounds, rather than chemical interventions, bring forward environmental changes without taking away the integrity of copper as a natural, living material. They form an integral part of the copper (and are not coatings or paint). Ongoing changes will continue over time, depending on the local environment, defining copper's 'living character.'

These surface treatments include pre-oxidised copper, where the thickness of the oxide layer determines the colour lightness or darkness. Alternatively, pre-patination utilises the same 'brochantite' mineralogy found in natural patinas all over the world. In marine climates, the natural copper patina contains some copper chloride giving it a blue-green colour, and this is emulated using 100% brochantite mineral. Alternatively, using a hint of iron sulphate yellow replicates greener natural patinas. With pre-patination, the process can be accurately controlled so that, as well as the solid patina colours, other intensities of patina flecks can be created revealing some of the dark oxidised background material to give a 'living' surface.

DEPTFORD LOUNGE, LONDON
Copper alloy cassettes in stretcher bond pattern with varying levels of perforation, providing transparency
Photo: Chris Hodson

Copper alloys

Copper alloys have been used throughout history, with bronze and brass – which can also be pre-weathered – remaining popular for architectural applications. Innovative copper alloy gives a rich golden through-colour which is retained without developing a blue/green patina. It simply loses some of its sheen as the oxide layer thickens with exposure to the atmosphere, creating a protective matt finish.

Apart from traditionally jointed, rolled material supported by a substrate, various other forms of copper are increasingly being explored by designers. For example, copper can be supplied in profiled sheets or extremely flat honeycomb panels, pressed to provide surface textures and modulation, or perforated, expanded or woven as mesh, enabling transparency.

Graeme Bell is Nordic Copper sales and marketing manager at the Building, Construction and Architectural division of Aurubis

Copper can be recycled again and again without any loss of performance or qualities

DELTA CENTRE, TARTU UNIVERSITY, ESTONIA
Copper alloy fins with triangular perforations
Photo: Maris Tomba

Wood you believe it?

Richard Besant of Powdertech Corby on how developments in wood finish powder coatings on aluminium are providing a popular and realistic alternative to wood, as materials shortages increase

We have witnessed the increased use of architectural powder coatings to a point where powder coated metal is now a 'dominant' building material. Available in thousands of colours and textures, today's architectural powder coatings can also transform metal into wood, stone or terracotta.

Emotional ties to natural elements

Architects and designers retain an understandable attachment to traditional building materials, and this is particularly evident with respect to wood. Wood has been the material of choice for building since time immemorial and our adherence to it is innate.

It could be argued that the appearance of wood, over and above any other qualities it possesses, prompts this emotional response. Other materials such as aluminium and steel may offer far better credentials for a particular building project, but do not inspire the same kind of 'warm feelings'. The suggestion is that if these materials could be made to look like wood, then those crucial feelings of stability and security could be re-kindled.

The key factor is the accuracy with which the material can be made to resemble wood, however, since our eyes are very discerning. The latest 'wood finish' powders provide a very good representation with random, non-repeated patterns. The metal may not feel like wood, but to a large extent, 'seeing is believing.'

Wellness benefits of wood

Planet Ark, based in Australia comments: "An increasing body of research is beginning to show that being surrounded by wood at home, work or school has positive effects on the body, the brain and the environment, and can even shorten hospital stays through reduced recovery times."

The design of the Baptist Health and MD Anderson Cancer Care Centre, in Jacksonville, USA, adopted an holistic approach to the building design, using natural materials extensively. It was found that where wood was impractical to use, the designers retained the overall natural look on aluminium aerofoil blades, providing a credible substitute.

Building safety

Safety is critical in building design and the flammability of wood makes it a specification choice with various added considerations. Treating wood to

If tropical deforestation were a country, it would rank third in carbon dioxide-equivalent emissions, behind China and the U.S.

reduce flammability is expensive, and the chemicals used are not particularly environmentally friendly.

Safety is compromised when wood deteriorates over time, for example timber sliding shutters across the windows of an apartment block in north London became dilapidated and posed a danger to people walking below; Aluminium replacements were designed to avoid deterioration, and to retain the appearance of wood, a particular shade was chosen to coat the metal panels.

Preservation of trees

The World Bank estimates that between 1990 and 2016, the world lost 502,000 sq miles of forest, an area larger than South Africa. The argument over whether it is 'environmentally responsible' to use wood or not is a complex one. The timber industry may state that since wood can be regrown, it is sustainable and renewable; that trees store carbon dioxide as they grow and after harvest. However, National Geographic has argued that cutting down trees both adds carbon dioxide to the air and removes the ability to absorb existing carbon dioxide. According to the World Resources Institute, 'if tropical deforestation were a country, it would rank third in carbon dioxide-equivalent emissions, behind China and the US.'

Powder coatings' credentials

Powder coating has no effect on the recyclability of aluminium or steel, but has clear environmental advantages over wet paints and liquid wood treatments. Being a dry powder, it emits no volatile organic compounds (VOCs).

Wood on a building looks attractive when clean and free from lichen and mildew, but requires a long-term maintenance routine. Products designed to prevent lichen and mildew are not generally environmentally friendly, whereas powder coatings are developed to only need a quick wash over with water and a basic detergent.

Specifiers need to ask whether it is possible to use alternatives to timber which offer similar aesthetics, but without some of the issues. If one of the most important features of wood is its appearance, powder coating on aluminium or steel could be a useful and practical compromise.

Richard Besant is sales director at Powdertech Corby

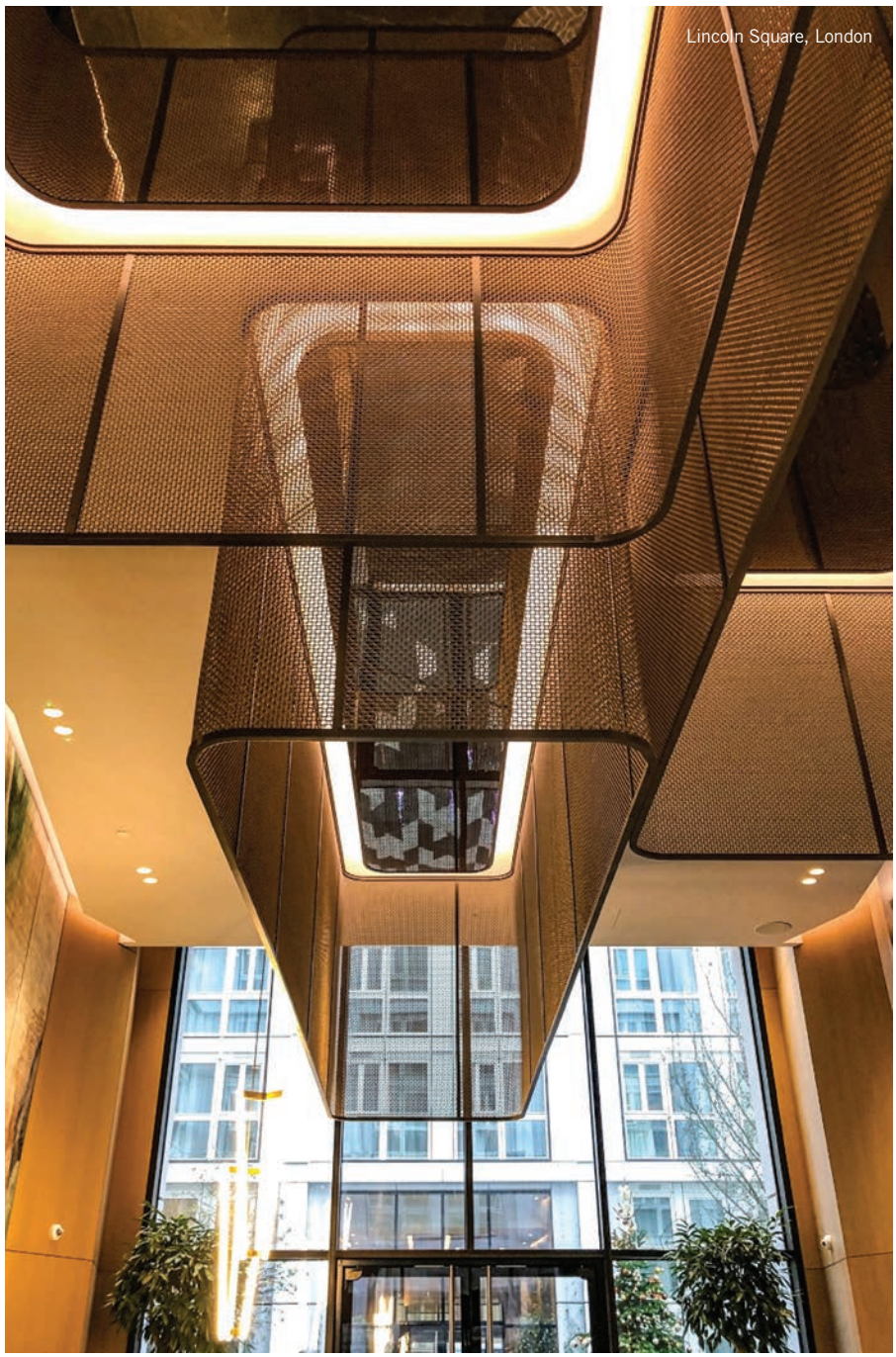
Meshing with design goals

Bringing bespoke creativity to life in applications from cladding, ceilings and roofs, to staircases and balustrades, metal mesh is being used to push design boundaries safely and sustainably. Anthony Millington of Amron Architectural explains further

Architects and designers are always looking to provide inspiring and inviting interiors. We are seeing an increase in the use of metal meshes, both on the basis they are generally made from recycled material (in the case of aluminum and steel), but also their look, offering that 'upcycled' feel that many clients are looking for.

Metal mesh is an extremely versatile product with its own unique functionality. It works well as a safety element on balustrade infill panels and radiator grilles, but also for decorative purposes like ceilings, wall coverings and partitions. It is also a great solution for smaller applications like cabinets, bars, and shop displays. Mesh is also being seen as an alternative to bulky, opaque materials in functional areas of restaurants, lobbies, and office spaces without making the space look smaller.

Colour is one of the main attractions when it comes to the finishing of metal mesh and in particular, how the mesh can be coloured without it corroding. Having researched a number of finish processes for the commonly used architectural meshes (woven, expanded, and perforated), powder coating is the most cost-effective way to apply an almost unlimited range of colours, applied evenly across all surfaces of the material. The powder-coating process sees the mesh go through an oven so that the powder adheres permanently to the mesh. After curing, the mesh has a durable coating that contributes in a big way to the desired aesthetic of the project.



Lincoln Square, London

Inspiration from above

In the past, ceilings would not have necessarily been a core consideration within the design aesthetics of a commercial space. The importance of a ceiling's look and style may often have been overlooked, but it's now increasingly being considered as the 'fifth wall' in terms of aesthetics.

Suspended ceilings with mineral fibre tiles are long established as a

Product Madness, London

Colour is one of the main attractions, and in particular, how mesh can be coloured without it corroding

cheap, and relatively acoustically good solution. However, with the option to now use metal mesh in ceilings, a suspended ceiling with benefits including improved airflow, lighting, and vastly improved aesthetics can be achieved.

Metal mesh ceilings fall into two categories; Rigid and Flexible. Within these there are multiple applications for the products, and understanding their suitability for each application is extremely important when specifying mesh in a project.

Rigid mesh, such as pre-crimped woven mesh, expanded mesh and perforated sheet, is ideal for ceiling panels. Panels can be manufactured or fabricated into pre-designed shapes and sizes, and powder coated or anodised due to products' stiffness.

Mesh ceilings can be either manufactured as modular tiles, or bespoke to a size or shape. The tiles are light and developed to be easy to install with no extra tensioning or bracing as it is often needed with flexible meshes. They are also incredibly hard wearing and can withstand impacts far better than fibreboard tile, and with minimal maintenance needed.

Lincoln Square

Situated in a prime spot between the the City and Covent Garden, Lincoln Square comprises a 10-storey, luxurious residential building containing apartments, studios and penthouses designed by PLP Architects. Interiors were designed by Bowler James Brindley, while the amenities space was created by Patricia Urquiola.

For the two lobbies, metal mesh was specified for custom-made chandeliers which dominate the high ceilings, and define the height of the contemporary spaces, whilst allowing light to pass through.

Specified in a stainless steel and bronze configuration, the warmth of the mesh complements its surroundings including furnishings and flooring, and combined with the shape of the chandeliers create a reflective surface that projects a stunning visual statement. The chandeliers also act as a screen and a visual filter, giving privacy without segregating them from the rest of the space. Throughout the building other metal mesh features are used in the hallways, suites, and the library.

When designing modern spaces, it is almost unanimously agreed that sustainability is key. With the use of recycled and ethically sourced products, we are seeing ceilings are now being designed to adhere to this approach. By contrast mineral fibre tiles, although very affordable, can crack, stain and mildew over time, necessitating replacement – not to mention the aesthetic impact a tired and dilapidated fibre tile has on a room.

Raft of playfulness

Amron Architectural worked closely with the designers at Oktra to choose a creative mesh solution when asked to redesign and fit-out the new office space at Product Madness – a games developer based in London.

The brief centred around Product Madness' manifesto – passion, creativity, collaboration – and their tagline: 'Come and play in the Madness.' Expanded mesh ceiling rafts were specified in bespoke sizes and finishes to match the corporate colours. Each raft was designed to have a simple installation method, utilising the existing 'unistrut' system, enabling a quick installation on site. The rafts were installed in the main breakout areas and each corridor to help hide the exposed services and provide a better ceiling height.

Whether you choose to use metal mesh for its functional or decorative virtues, the material provides a variety of thicknesses, patterns, and shapes to inspire architects working on interior designs.

Anthony Millington is creative director at Amron Architectural

Performance through time

Jonathan Lowy of VMZinc looks back at how changes in technology have improved the manufacture of zinc over the decades to enable greater versatility and durability in today's projects

The first zinc roof was installed on St Bartholomew's Church in Liege, Belgium in 1809. Over the coming century Baron Haussmann made zinc 'the' roofing material of Paris and the metal's use extended to the UK, USA, Japan and even Notre Dame Cathedral in Saigon (now Ho Chi Minh City), Vietnam, as well as many other parts of the world.

Prior to the second half of the 20th century – while highly skilled installers created technical documents showing how zinc could be installed using techniques such as batten cap, flat lock wall panels and even sine wave panels – the actual standards pertaining to the zinc itself were somewhat limited.

Over the last 50 years, the technology used – not only to refine but also roll zinc – has changed considerably. Initially a factory in Viviez, southern France built the first electrolysis hall in 1922, thus allowing far purer zinc to be produced. This has now become Special High Grade Zinc BS EN 1179. This plant still exists and supplies the majority of pre-weathered zinc used in the UK and Ireland.

By using SHG BS EN 1179 and combining it with small amounts of titanium and copper, the modern BS EN 988 alloy was created. This zinc not only contains non toxic impurities such as cadmium, but is also more resistant and allows easier continuous rolling, enabling manufacturers to produce large coils. Before the 1970s, all zinc sheets were only two metres in length. The coils produced by the continuous rolling process allow long sheets to be used with 13 metres being a standard maximum, although on some very specific projects this has been exceeded.

Durability & sustainability

BS EN 501 and Code of Practice 143-5 address traditional fully supported, vented zinc roofing and wall systems. However, over recent years designers have requested a little more third party accreditation. An example of this is durability. For many years it has been known that a zinc roof can last over 100 years, and there are case studies to demonstrate this. Zinc is also a material that is easy to recycle.

The BRE EN 15804 Environmental Product Declaration is a way for designers

Over the last 50 years, the technology used to refine and roll zinc has changed considerably

to see the performance of zinc with regards to sustainability. A number of UK wall panel manufacturers have also carried out CWCT tests (Centre for Window and Cladding Technology) on zinc rainscreen panels, demonstrating a safety resistance of 3600 Pa.

Fire performance

Post-Grenfell, fire performance has obviously been at the forefront of many designers' minds. Zinc is classed as non-combustible following EN 13501-1. By adding backside coatings – which are often used on non-vented warm roofs – the material becomes A2 (following EN13501-1). Non vented warm roofs do fall outside the traditional code of practice documents. It is for this reason that such structural systems carry a BBA certificate as well as testing covering BS 476-3 and CEN/TS 1187 Brooft4 for no flame penetration or spread.

Traditionally, many fully supported zinc facade systems such as standing seam and flat lock panels relied on vented timber as a substrate and this can still be used on many buildings. For facades where only A1/A2 materials following EN13501-1 are required the timber can be replaced with a 0.7 mm thick galvanised steel deck. It is also important that the appropriate fire barriers are used in the cavities and an A1/A2 insulation.

Aesthetic considerations

As far as aesthetics are concerned, the nature of the panels used are critical: small elements, horizontal/vertical panels or the standing seam panels, with the use of interlocking panels giving a higher level of flatness. Another important choice is the nature of the zinc used. Until 1978, the only option was mill finish, natural zinc. Over the last 40 years, the choice and availability of pre-patinated zinc has expanded and now includes colour and engraved options.

Jonathan Lowy is operational marketing manager of VMZinc

Photos © VMZinc

Refresh your designs with Powdertech ‘Zest’

Powdertech Corby has launched ‘Zest’, a vibrant range of powder finishes adding an exciting fresh new look to architectural metal work. Suitable for exterior and interior use on steel and aluminium, Zest finishes have excellent colour durability as well as the usual high protective performance against corrosion and abrasion that all Powdertech’s architectural finishes provide.

Zest shades reflect the wonderful colours on fruit stalls, and in gardens and parks. ‘Blueberry Sherbet’ and ‘Tangerine Crush’ are just two of the finishes waiting to be plucked off the shelves to bring vitality to your project. The finishes are not a flat colour but have texture, with lighter and darker shades of the one colour (in the case of Sherbet) or of two colours (for Crush) almost as though they are frosted. ‘Sherbet’ shades are fizzy and bright and as mouth-watering as the name suggests. ‘Crush’ hues are rich and deep and embrace the trend for colours that ‘pop’.

Asked about the inspiration behind the new range, Richard Besant, director, Powdertech Corby explained: “We have developed powder ranges that add more than just colour and protection to metal, over a number of years, starting with our Wood Finish Collection in 2000. Our Collections enable designers to bring metal to life in new and exciting ways for their architectural exterior and interior creations.”

Powdertech will be exhibiting at London Build on November 17th & 18th stand H101. Please visit the website to order free swatches.

01536 400890 www.powdertechcorby.co.uk

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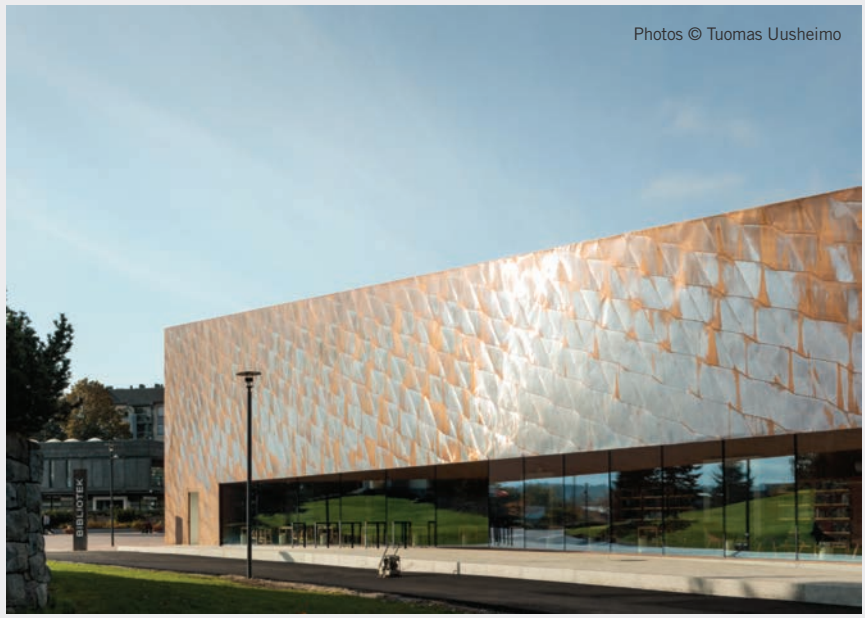
A new generation of libraries defined by copper

Nordic Brown Light pre-oxidised copper cladding, in the form of large shingles and vertical fins structuring glazing, creates a strong civic identity for the expanded and remodelled library in Kirkkonummi, Finland.

The revitalised building exemplifies a new generation of Finnish libraries which its architects, JKMM, have been active in shaping. As JKMM founding partner Teemu Kurkela explained: "The library typology in Finland has changed. They are no longer solely about books but also getting together to share knowledge and experiences through multiple channels. They are not unlike community halls, which is why Finns today refer to libraries as public living rooms."

The project is a sustainable, adaptive reuse of the original 1980s concrete library building, utilising its embodied carbon. JKMM have remodelled it and doubled its size, introducing new spaces for community uses such as toddler groups, youth clubs, exhibitions, events and performances.



Photos © Tuomas Uusheimo

Nordic Brown Light Skin

Externally, the library is now clad in Nordic Brown Light pre-oxidised copper enwrapping the building and giving it a unity and strong presence as a civic landmark. Teemu Kurkela said: "The neighbouring medieval church has a distinctive green copper roof and we created a dialogue between the old and the new. Libraries have a very long lifespan, so it is sustainable to use a facade material with an exceptionally long life. It is an inherently timeless material that ages beautifully and we expect the library to look even better in 50 years".

Nordic Brown provides the same oxidised brown surface that otherwise develops over time in the environment. The thickness of the oxide layer determines the colour of the surface finish, with darker or lighter (Nordic Brown Light) shades of brown. Nordic Brown Light gradually changes over time to a stable dark chocolate brown.

Unified by materiality

Nordic Brown Light copper is used in several architectural forms – unified by their materiality – notably, distinctive shingles generating diagonal wave-like patterns. Teemu Kurkela added: "The shingle patterns bring to mind images of fishing nets, particularly fitting for a city with an extensive and beautiful coastline, and maritime heritage. Previously, we used similar Nordic Brown Light shingles to clad our extension to Alvar Aalto's landmark Seinäjoki Library. But at Kirkkonummi, we used slightly larger shingles to make the pattern stronger, and arranged them at a more dynamic angle".

Living copper surfaces

As well as Nordic Brown, the extensive Nordic Copper range also includes Nordic Standard 'mill finish' plus Nordic Blue, Nordic Green and Nordic Turquoise, developed with properties and colours based on the same brochantite mineralogy found in natural patinas. In addition to the solid patina colours, 'Living' surfaces are available for each colour with other intensities of patina flecks revealing some of the dark oxidised background material.

Nordic Copper alloys include Nordic Bronze and Nordic Brass – which can also be supplied pre-weathered. The innovative Nordic Royal is an alloy of copper with aluminium and zinc, giving it a rich golden through-colour and making it very stable.

A growing series of 'copper stories' building studies exemplify the best in contemporary architecture and showcase the diversity of surfaces, forms and applications available with Nordic Copper today.

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