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Metal in Architecture Supplement

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FROM THE EDITOR

As with so many things in the endlessly complex world of architecture and design, the renowned and seemingly self-evident sustainability of aluminium is not as simple as 'what it says on the tin.' In every facet of the industry, there's a bottomless well of detail!

Yes, there is a good chance that the aeroplane you fly in in may well partly consist of ex-Coke cans, with (one is assured) no degradation in performance despite multiple recycling processes. This does of course mean that its scrap value is virtually the same as new, not making life easier for specifiers and their clients in the current environment.

The 'infinite' recyclability of aluminium is something to be cherished, and yet this doesn't get to the heart of the real issue when it comes to defining its sustainability.

Two of our articles in this special metal supplement tackle the subject of why and how to scrutinise the sustainability credentials of your aluminium, but each from a slightly different angle. Phil Slinger from the Council for Aluminium in Building (CFAB) explains how the demand for 'low carbon' aluminium has meant that producers have worked out how to offer a mix of virgin material with 60%-70% recycled, and have started to employ greener, hydrogen-based production.

He outlines the big issue with a material that not only has infinite recyclability, but a very long in-use life expectancy – getting your hands on the scrap in the first place. Cities are now being seen as 'urban mines' for aluminium reuse, with demand being further stoked by Environmental Product Declarations, which are adding to the increasing transparency of available info on products' credentials.

Another feature – from Gareth Evans of Technal UK – delves further into the key differences between post-consumer recycled aluminium and that which has come from production waste – essentially that the former is the greener of the two. He also explains how third-party accreditation can help provide you with the clear information you need on the material.

A good first step has to be contacting bodies like the CFAB.

James Parker, Editor

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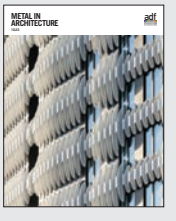
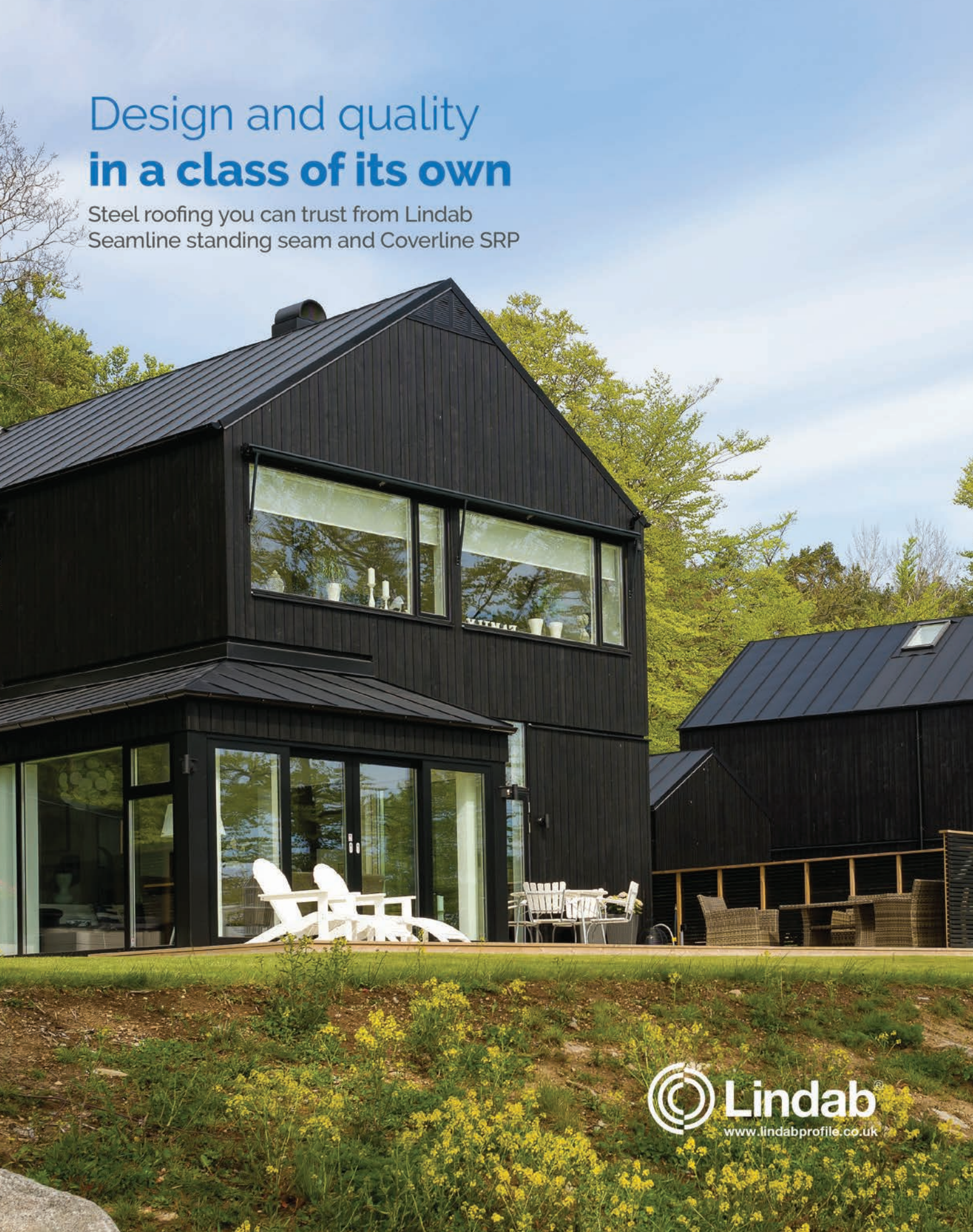


ON THE COVER...
The Berlin-based practice behind a mixed use project in Düsseldorf containing healthcare, hotel and residential functions, speaks to Tom Boddy about its first high rise building – and its zip-like aluminium facade
Cover image © David Franck For the full report on this project, go to page 14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COMMENT

How green is your aluminium?

Phil Slinger from the Council for Aluminium in Building provides expert insights on the current green credentials provided by aluminium production, and how EPDs and collaboration are supporting its specification

Aluminium has enjoyed an extensive recycling lifespan since its commercialisation in the 1880s with the advent of the Hall–Héroult process for the economic production of aluminium, in fact, 75% of all the aluminium produced since that time is still in active use today. Aluminium has an enviable scrap value and 'clean' scrap can cost almost the same as new 'prime' aluminium. The industry demand for recycled aluminium today is driven by the demand for 'low-carbon' aluminium, as recycling aluminium uses just 5% of the energy needed to produce 'prime' aluminium from surface mined bauxite.

Today 'low-carbon' aluminium can be produced at less than 3.0 tCO_2e (tonnes of CO_2 equivalent per production tonne) when prime is mixed with 60% to 70% of recycled aluminium. The process of reducing carbon in production is ongoing with some producers now gearing up to produce aluminium using hydrogen energy. No more than a couple of decades ago we were specifying the use of 'prime' aluminium for projects at 20.0 tCO_2e carbon content.

As you would expect, there is a high demand for this 'low-carbon' billet which comes at a premium. In reality all new aluminium used globally, across all industries, on average contains by volume one third recycled aluminium. The dilemma we face, is the difficulty in obtaining scrap, which is due to the aluminium product still being in active use which is down to aluminium's in use life expectancy. Some of the oldest installed aluminium windows, installed at the Bodleian Library in Oxford, are over 80 years old and still going strong.

Today we recycle a higher percentage of our scrap aluminium as extraction rates from deconstruction of our structures has increased to almost 100%, such is the value of the metal. In fact, many aluminium supply chains now see our cities as 'urban mines' for the future extraction and re-use of aluminium used in both construction and transport infrastructure.

What is new today is the ability to easily recycle aluminium back into their original 'grades'. Pure aluminium is relatively soft and rarely used in production, it is normally formed into an aluminium alloy which contains other materials that give the alloy special characteristics. The typical alloying elements are copper, magnesium, manganese, silicon, tin, nickel and zinc. There are

Selfridges, Birmingham, designed by Future Systems
Photo by Simone Hutsch on Unsplash

many globally recognised grades of aluminium alloy which are placed into a long list or 'series' of different characteristics which are used in various applications. For wrought aluminium used in the architectural aluminium extrusion process, we generally use an alloy grade 6063. The ability to recycle in a single grade is helped by using modern, handheld alloy analysers. These XRF (X-Ray

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Fluorescence) analysers perform a quick, non-destructive analysis of scrap so grades can be grouped together for recycling.

Keeping the grades segregated means that the scrap aluminium has a higher value to a reprocessor ensuring that former architectural installations can be collected and made back into windows, doors and curtain walls. CAB (Council for Aluminium in Building) introduced the first 'Closed Loop Recycling' initiative for aluminium used in construction in the UK. The scheme has since been adopted by other Associations.

Environmental Product Declarations (EPDs) are now becoming more widely accepted and indeed being requested from product manufacturers by main contractors during the tendering and design processes. An EPD is designed to inform the recipient about a product's environmental and human health impacts during its life cycle, and should follow recognised standards such as the 'core rules' in BS EN 15804+A2. Based on a product's Life Cycle Assessment (LCA), the aim of an EPD is to inform the reader about a product's environmental impact in a standardised and transparent format for specified life cycle stages and a given performance.

While it is possible to develop EPDs for any type of product or service, it is the construction sector that has one of the most advanced EPD systems. EPDs can be based on a company's 'specific product' or compiled to offer an 'average product' EPD from a range of suppliers of similar products, such as provided by a membership association like the Council for Aluminium in Building.

As stated above, an EPD is a standardised document produced from a Life Cycle Assessment (LCA). An LCA is defined as a 'systematic analysis of the potential environmental impacts of a product or service during its life cycle'. Often a company's 'specific product' LCA can carry sensitive company data which cannot be made public. However, the resulting standardised and independently verified EPD produced from the LCA should not divulge this sensitive information, so is usually safe to promote and circulate.

As an association, CAB also continues to develop to meet the rapidly changing fenestration landscape that seeks to achieve thermally efficient fenestration systems to meet our need for sustainable 'low-carbon' homes, businesses and public spaces. Aluminium can be easily and cheaply formed into intricate shapes that together with thermal insulation strips and infills allows Passivhaus certified products to be easily produced to meet future demand for thermally efficient products, but it is not only material and product development that need to be sustainable, businesses also need to be sustainable. A further recent CAB initiative 'Journey to Net Zero' forms the path ahead for the Industry both in business processes and products. There are significant challenges adopting this challenge and the time has never been better for the Industry to draw together to drive achievable change in the coming years.

The membership drive explains the support services offered by the Association, but more importantly, it is about belonging to a 'family' where businesses meet and network, to the benefit of the whole industry creating one voice for future change.

Should you wish to learn more about the use of aluminium, please contact CAB directly, and why not consider joining the association and be recognised as being involved in supporting your industry and helping to shape its future? More information is available on our website (c-a-b.org.uk).

Phil Slinger is CEO at the Council for Aluminium in Building (CAB)

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COMMENT

Durability is the key to sustainable building envelopes

Clare Fenton of the Metal Cladding & Roofing Manufacturers Association (MCRMA) explains why durability must be a priority when specifying metal roofing and cladding panels and systems to deliver sustainable buildings

As the physical separator between the interior and the exterior, it is no surprise that steel and aluminium are used by the vast majority of roofing and cladding panel and system manufacturers to ensure specifiers have access to highly durable solutions.

Most products and systems are manufactured from mild steel which is protected by a coating taking the form of a sacrificial metal (i.e., hot-dip galvanising (HDG) with zinc or other metallic coatings which include a range of formulations) and in most cases organic paint coatings for both the external and internal surfaces. These help to prevent corrosion and provide a level of durability dependent on the coating applied and the environmental conditions where the building is located, ranging from 10-15 years up to 40 years.

Aluminium does not corrode in the same way as steel as a result of oxidation. It is a very durable material and grades can be specified for a range of applications. However, generally it does not require any coating for protection purposes, except in some particularly aggressive environments where additional protection may be beneficial or where aesthetics may be a consideration.

Regardless of the material choice, however, the level of durability offered by the finished envelope will depend on a number of factors. Therefore, it is important to understand how these will impact on the design life, and thus overall sustainability goals.

It is important to understand how the material choice of the finish envelope will impact on the design life, and thus overall sustainability goals

Carbon cost vs value for money

Sustainable buildings have a long design life and utilise materials, products and systems to match the intended lifespan, but the carbon cost also has to be aligned with value for money. Hence why buildings are assessed in terms of their Whole Life Costing (WLC) or Life Cycle Costing (LCC), taking into account the costs associated with construction, operation and occupancy, maintenance, renewal, and the end of its life. However, the impacts of climate change and the increasing urgency to act mean environmental and carbon costs are more important than ever.

While a building's life expectancy is typically regarded as 60 years, the actual design life can be very different, depending on factors such as the building's location, the type of building, its use, method of construction and materials used. It is important,

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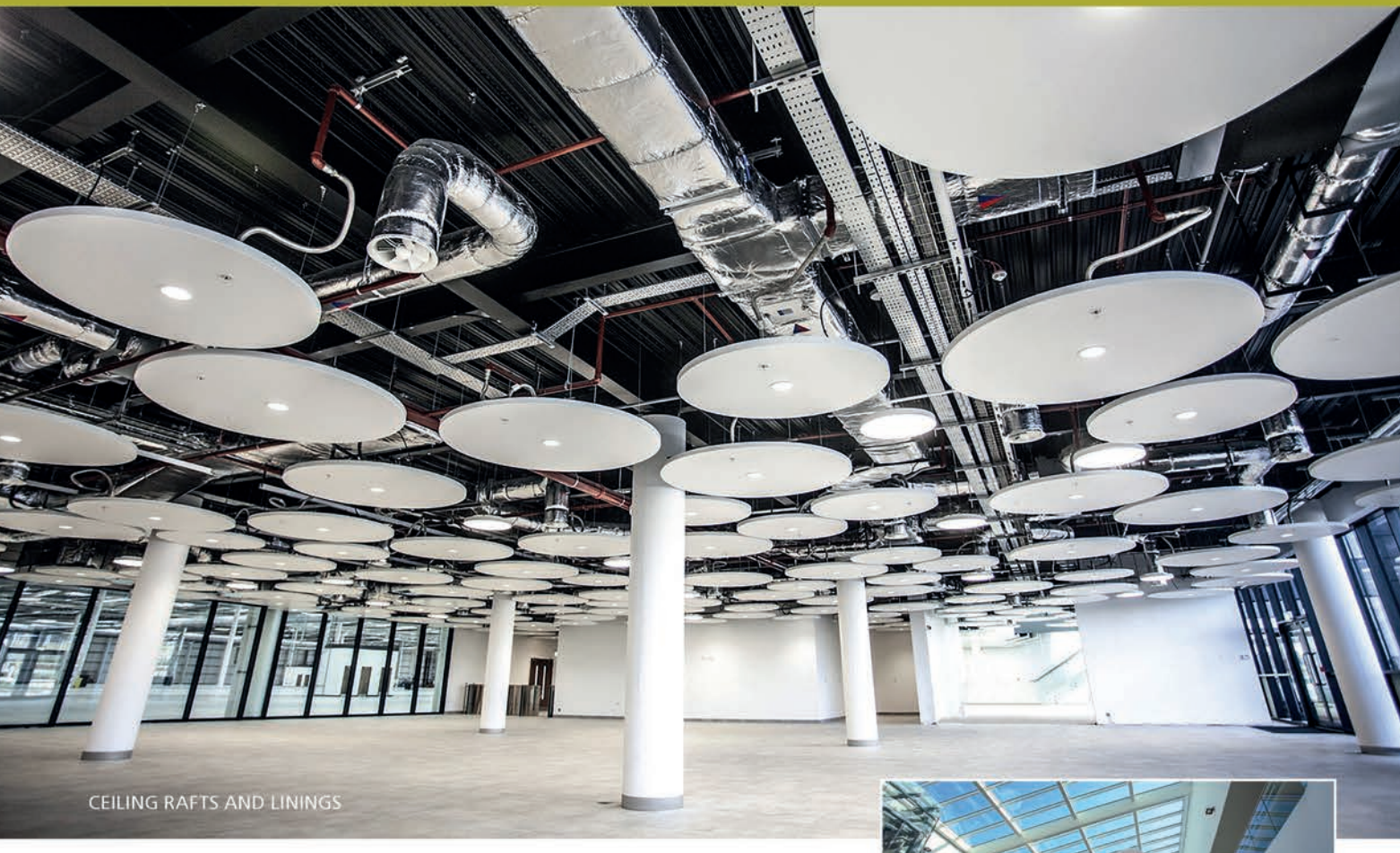

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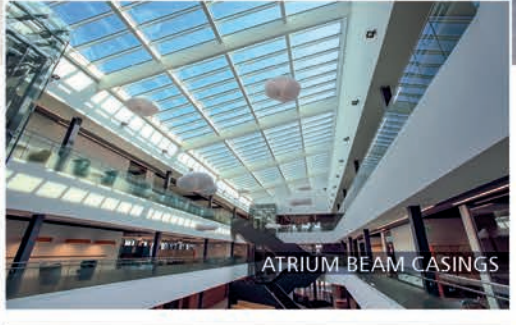

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BUILDING LININGS

therefore, to refer to BS EN 1990 (Eurocode 0) and the UK National Annex to find the indicative design life of various building types and structures in the UK.

This could be as short as 10 years for Category 1 'temporary structures' or 15-25 years for agricultural and similar buildings, up to 120 years for Category 5 'monumental building structures, bridges and other civil engineering structures'.

The indicative design life, however, can only be fully realised if the materials, products and systems specified for the external building envelope have the durability in the given use, location and surrounding environment, not forgetting the necessary cleaning, maintenance and repairs.

Maintainable, replaceable or lifelong?

Another useful reference point here is BS 7543. This guide to durability of buildings and building elements, products and components can be used to provide guidance on design service life planning and the means of communication of information on materials durability (including metals) for all members of the construction and facilities management teams. The standard also gives guidance on climatic agents that can affect durability of materials.

Under BS 7543's categories, metal roofing and cladding systems are generally classed as 'maintainable', meaning they offer a very durable building envelope solution, capable of meeting the life of the building with the appropriate material and component specification and maintenance regime.

It is worth noting that the building envelope is increasingly being 'systemised', giving specifiers the peace of mind that comes with installing a roofing or cladding system that has been tested as a complete assembly, backed by performance data.

Some components of these systems, such as flashings, rooflights and profiled fillers, may be classified as 'replaceable' on buildings with long life expectancies and where the component is easily accessible to undertake the replacement. However, other components, such as fasteners, are not easily accessible for maintenance or replacement and would be classified as being 'lifelong' to the design life of the material or system within which they are used.

Design life data and categorisation are important in the main environmental assessment methods – BREEAM and LEED – and metal cladding and roofing systems and products can be easily assessed in line with their criteria. To assist specifiers here, the MCRMA has produced guidance document GD39 which is split into eight sections, some of which are CPD approved, to show how different metal roofing and cladding systems and products are appropriate according to the design goals and enable the accumulation of credits to achieve high ratings.

In an era when new technologies are often heralded as the solution to decarbonisation of the built environment, we must not overlook how important it is to select durable materials for the building envelope, which are properly designed, installed and maintained, to maximise the building lifespan. After all, any carbon savings achieved through the installation of technologies such as ground source heat pumps and MVHR systems would be quickly cancelled out if the metal envelope needs repairing or replacing prematurely given the carbon cost involved in that process.

View the MCRMA's guidance documents on this topic and find out more at www.mcrma.co.uk.

Clare Fenton is chair of the Metal Cladding & Roofing Manufacturers Association (MCRMA)

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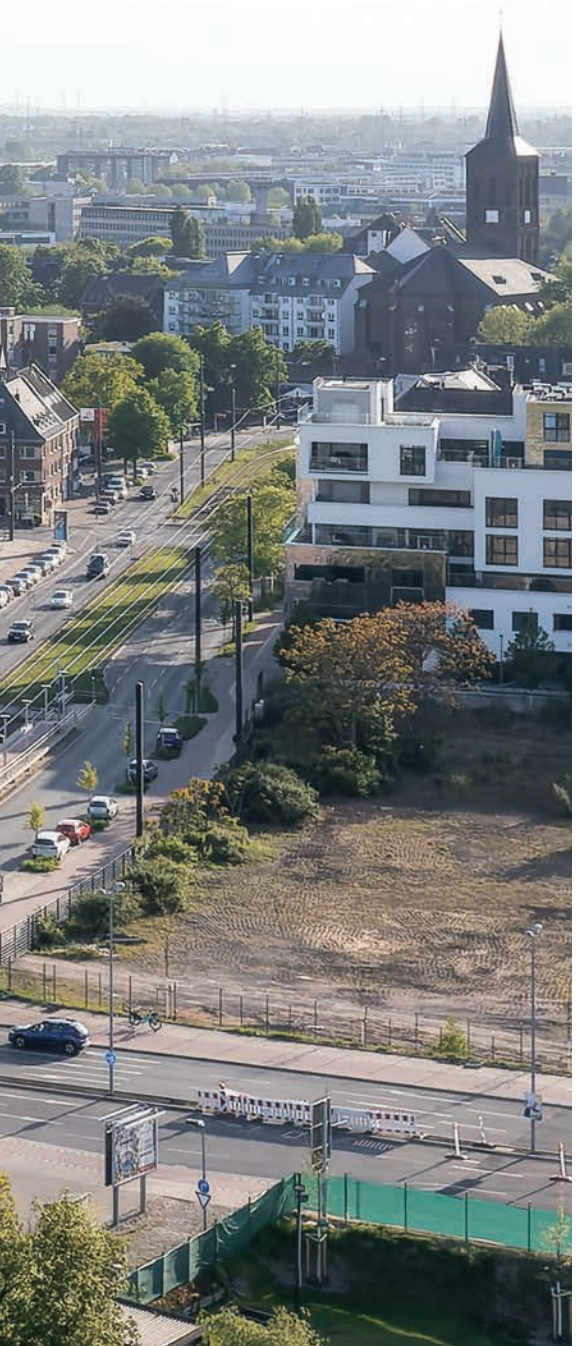
BUILDING PROJECTS

THE ZIPPER DÜSSELDORF

Unzipping an unusual mix

The Berlin-based practice behind a mixed use project in Düsseldorf containing healthcare, hotel and residential functions, speaks to Tom Boddy about its first high rise building – and its zip-like aluminium facade



Rising 19 stories above the grounds of the historic Düsseldorf healthcare institution of Dominikus-Krankenhaus, the Zipper RKM 740 Tower stands as an impressive and innovative hybrid high-rise structure, reflecting an equally unusual mix of uses.

Designed by international practice J.MAYER.H. (JMH), the tower sits on the left bank of the Rhine, which winds through the heart of Düsseldorf. The building's presence is enhanced by its perforated aluminium facade, which alludes to a series of horizontal zips in different stages of openness, resulting in a dynamic series of curved forms.

This stacked series of varying facades enables a "gentle arrangement" of open and closed areas, say the architects. As well as the already unique design of this building, it offers panoramic views to users, encompassing both the famous river and the vibrant cityscape.

The white, wave-like elements semi-organically delineate the building's levels on the otherwise glazed facades. They mirror the ripples of the Rhine, creating a strong sense of movement.

The mixed use building, which was completed in 2022, stacks a range of medical facilities beneath residential levels and 'hotel"-style provision. According to the architects, the arrival of the Zipper Tower elevates the pre-existing hospital to a level of national significance, positioning it as the "prototype of a hospital for the future."

Context

The project represents a pivotal addition to the city's urban landscape. In recent years, Düsseldorf's increasing urban density has led to the development of new varieties of hybrid high rises to serve demand while maximising the use of land. The Zipper is part of the latest generation of these mixed-use concepts, and helps align with the local context by introducing the new medical facilities alongside residential spaces.

The opportunity to design the tower came to fruition when JMH won an international design competition for the project back in 2011. For the architects, this project holds "special significance," as it marks their first high-rise design.

The project is an integral part of a broader vision aimed at "maintaining and modernising" the hospital on the historic grounds of the former Dominikus-Krankenhaus. Originally established in 1892 as the successor to a Dominican hospital, the healthcare institution underwent a fundamental transformation in 1972-73 with the construction of a new building and the demolition of the old hospital. The architects explain that over the past decade now, the facility has been in the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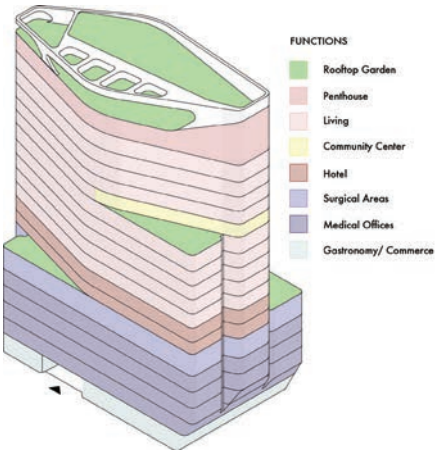
The perforated aluminium curtain facade alludes to a series of horizontal zips

UNUSUAL USE MIX
The lower levels contain restaurants and retail (ground level), medical offices above, and a single level of operating theatres; upper levels have a hotel and nine residential stories



process of a transformation, over a series of iterative changes under its new ownership.

Given the site's long medical history, it was a priority to incorporate commercially sustainable medical facilities into what could otherwise have been a purely residential development. The architects also saw it as an opportunity to revitalise the site and introduce a new generation of high-quality residential spaces. Consequently, the building was designed to accommodate medical supply shops, doctors' offices, and even a dedicated floor for operating theatres.

Despite its bold, striking design, the project has focused on its commitment to integrating into its surroundings and harmoniously coexist with neighbouring buildings. The Zipper, in conjunction with the Vodafone Tower, a nearby high-rise structure, "takes up the traffic from the West like a city gate and serves as a counterweight to the striking existing buildings of the hospital," says the architects.

Facade design

The exterior of the Zipper Tower has been created to deliver a clinical yet playful impression. The wavy shell "generously" unfolds on the east, south, and west sides of the building where the various terraces offer striking views of the Rhine. In contrast, the northern side is enclosed to ensure effective noise insulation from the busy nearby traffic from that side.

To create the impression of 'real' zips, the facade has been designed to create "seamlessly gradual" transitions between the open and closed sections, along long curves. This also allows "flexible adaptation during the process of development over the years," asserts the architects.

The facade comprises a fairly complex arrangement of features, including a double-skin aluminium curtain wall, all-glass balustrades, sliding glass units, and a special lattice girder structure for the pergola.

Notably, the curtain wall, glass railings, and slide-turn glazing systems all share a common substructure. The architect's comment: "Here, therefore, was a possibility to constructively compensate for the construction tolerances," however adding that "a high assembly accuracy was required." The material used for the curtain wall was a "barely visible" brown powdered smooth sheet metal.

The overall facade amounts to an array of 4,500 distinct waves, each characterised by varying heights, protrusions, and recess sizes. Behind the wave-shaped curved and perforated aluminium elements, sits a further facade with integrated aluminium window elements forming the thermal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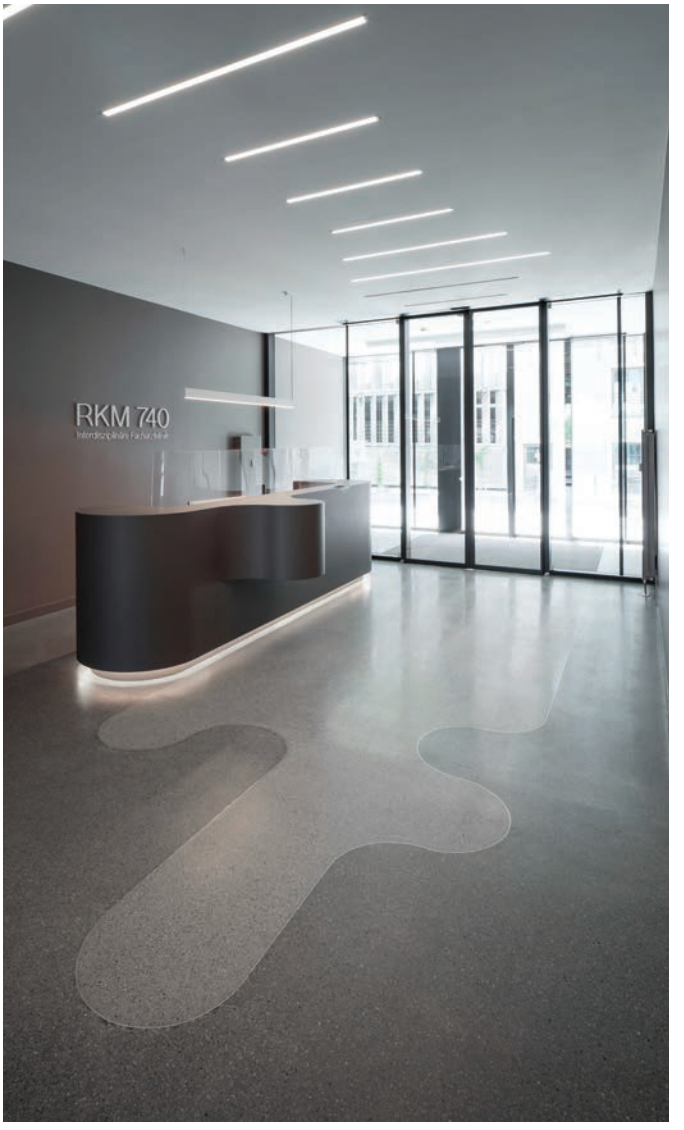


FACING PAGE
The facade includes a special lattice girder structure for the pergola topping the tower
Images on spread © David Franck

building envelope.

The facade has been carefully designed to respond to the site conditions. The southern window fronts are shaded by the terraces in front, and are fitted with glass railings across the whole facade. These windows can be fully closed by sliding and rotating all-glass elements. As a result, the terraces act as a buffer against the wind on all floors, providing optimal climate control for the apartments.

All rooms on the south, east, and west facades are equipped with highly reflective interior solar shading. The surrounding wave elements offer sun, wind, and noise protection.

Every component of the facade, from the aluminium shafts to other elements, was carefully affixed to the structure, like the facade construction itself, with "high precision." This was helped by the application of the same universal steel brackets throughout. "This innovative approach not only ensured a high level of accuracy but also simplified both the planning and assembly processes," say the architects.

To achieve the desired aesthetic impact of the metal exterior, similarly precise design techniques were employed. The rotating shaft elements were generated "parametrically," and standardised in order to ensure cost-effective production. This involved the use of a three-dimensional virtual model, which was processed parametrically for integration into the data-controlled prefabrication process at the cladding supplier's factory.

Programme

The tower's internal programme encompasses what the architects call a "well-thought-out blend of functions" to cater to both the healthcare and residential needs of its occupants. Spanning the first six floors of the building, a diverse mix of group practices, specialists, and therapists collaborates with the existing hospital, to support a "medical health centre of regional significance," say the architects, the integration also "extends the institution's influence beyond the local region."

Given the site heritage, having hosted a hospital since 1892, the project was a deliberate effort to introduce commercial medical facilities into what was previously essentially a "residential space." The building also houses a dedicated floor for operating theatres, doctor's practices, and medical supplies retail outlets.

The 14 upper floors feature various residential layouts, resulting in light-filled living spaces with spacious terraces, balconies, loggias, and a rooftop garden. The green spaces and vertical gardens are integrated into the design, enhancing the tower's aesthetic appeal.

The residential section was originally planned to incorporate around 60 spacious apartments on 12 floors for sale or rent. However, shortly before completion, the private developer decided to convert the residential use into a hotel-like boarding house use with around 180 units. Among other things, the smaller apartments will serve to accommodate international patients of the medical centre

Using a highly-tailored approach, the team anchored the aluminium 'waves,' installed floor-to-ceiling balcony glazing, and added a glass balustrade on a stainless steel platform

and participants in international medical training courses.

The tower incorporates advanced building management systems that optimise energy usage, lighting, and climate control, making it an "environmentally-conscious structure."

Structural challenges

Achieving structural stability on the building's upper floors from challenging wind conditions posed a significant design challenge to the project team. Using a highly "tailored" approach, the team successfully anchored the aluminium waves, installed floor-to-ceiling balcony glazing, and added a glass balustrade – on a stainless steel platform.

For AWD Engineering Company, tasked with the structural planning of the project, the incorporation of loggias and balconies presented a unique challenge. This was because they each had folding and sliding glass doors, serving as wind protection, while offering residents the flexibility to transform their loggias into winter gardens. However, incorporating these features introduced a substantial 'dead weight,' meaning they were included as special loads in the structural calculations.

Beyond these features, the challenges posed by the project structurally were further heightened by its diverse functions, spanning from the technical facilities in the basement to the medical areas and residential spaces, particularly on the top two floors. Here, the design incorporated soaring rooms exceeding eight metres in height, tailored for luxurious penthouse use, complete with expansive roof terraces that imposed specific static requirements.

Additionally, AWD faced the intricate task of calculating for a distinctive architectural geometry on the building's lower levels, where the structure recesses like the bow of a ship.

The Zipper RKM 740 Tower represents an unusual fusion of innovative architecture and practical functionality, as an addition to healthcare but also residential provision in Düsseldorf. The unique combination of functions showcases how such hybrid high rises can integrate into its context, and use facade innovation to contribute significantly to the wider urban landscape. ■

Terms of engagement with the circular economy

With project teams increasingly pursuing circular economy goals, the more stringent specifiers are looking for clarity on the types of recycled aluminium available. Gareth Evans from Technal UK explains the subtle but important differences in terminology

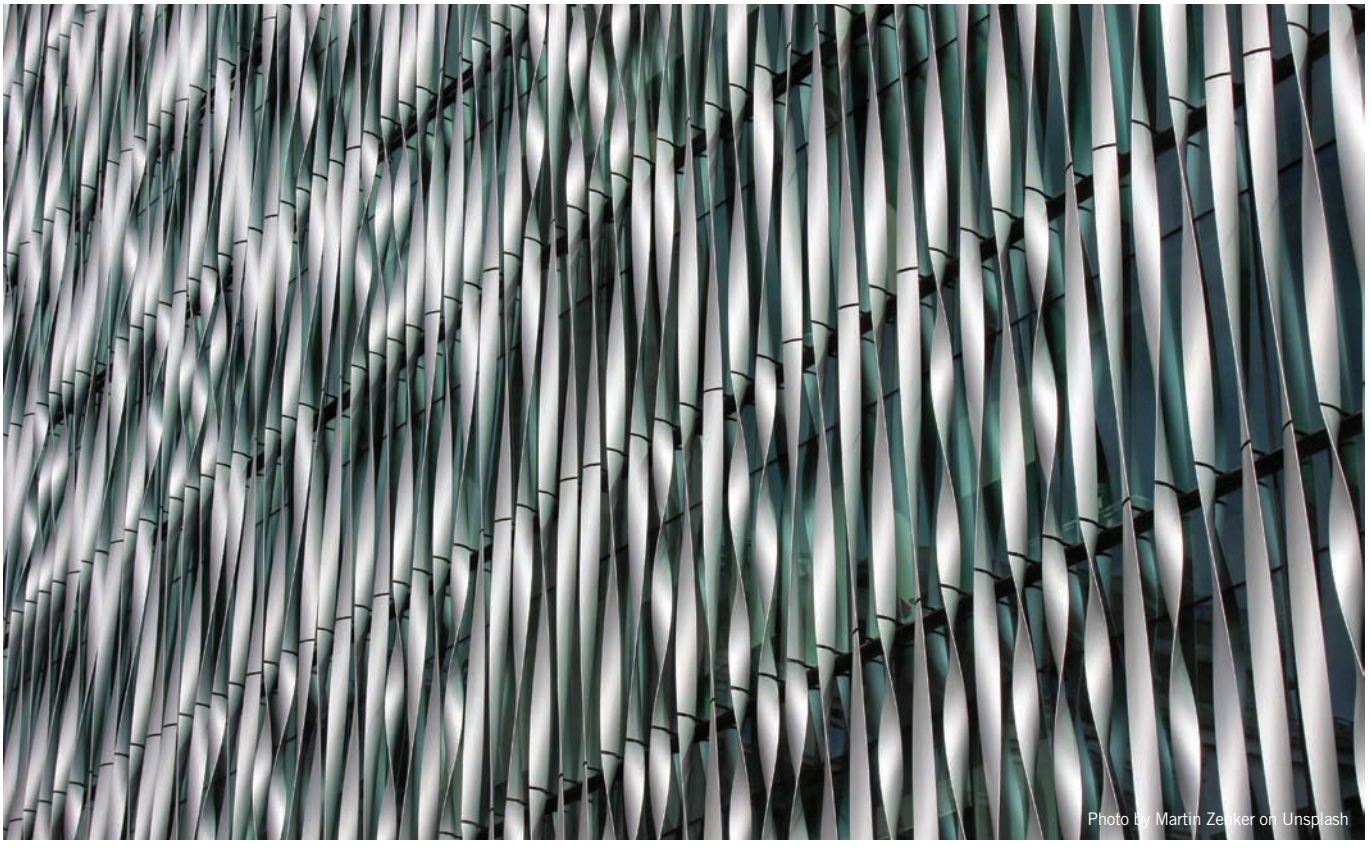


Photo by Martin Zenker on Unsplash

How do you know whether the recycled aluminium systems you're specifying are made from aluminium that's actually been used before or is simply 'clean' waste from the production process? More to the point, why should you care?

Aluminium is one of the few materials that keeps its properties after recycling. It can be remelted and used again and again in new products, making it an environmentally friendly metal and sustainable building material.

However, not all of what is termed 'aluminium' is the same – the same goes for 'recycled content.' The incorrect use of such terms may lead to confusion by overstating the environmental benefits – with the potential risk of undermining the credibility of the aluminium industry.

So, when manufacturers talk about their systems being produced with recycled aluminium content using terms like 'pre-consumer' and 'post-consumer' scrap metal, it helps to know the difference. It's a pretty significant one.

The minimum 75% proportion of this post-consumer material (≥ 75% EoL material) must be verified by means of independent certification

Aluminium can be remelted and used again and again in new products, making it an environmentally friendly metal and sustainable building material

Pre-consumer versus post-consumer scrap

Firstly, 'recycled content' covers both the pre-consumer and post-consumer waste within the product. One source is aluminium process scrap. This is waste produced from manufacturing processes, such as extrusion, where the metal has not yet been made into a consumer product. It may have been anodised or painted, but it hasn't actually been 'used,' so is 'pre-consumer.' It is collected from the production process, returned to recycling plants, and then melted again to create something new. This is a positive, considering that when we recycle aluminium, we save about 95% of the energy used in the production of primary aluminium.

Post-consumer aluminium scrap is metal that has gone through its full life cycle and is ready for disposal, recycling or reuse. An aluminium window frame in a building, for instance, can be considered post-consumer scrap when the building is demolished and the aluminium is obtained and sent on to be remelted, then applied in a new product.

Differences in footprint

The higher the post-consumer recycled content, the lower the carbon footprint. It is more difficult to produce top-quality metal that has a high content of post-consumer scrap. However, it yields a lower carbon footprint, so is therefore more appealing from a sustainability perspective.

Going back to the window frame – an aluminium frame has probably been anodized and painted. It may also contain a thermal break – ie. the insulation within the frame. Conversely, process scrap is basically 'clean' metal.

Recycling the aluminium from a window frame is a complex process, with many steps; namely inspection, separations, shredding, and de-coating. The metal also needs to be x-rayed (to determine alloying elements), and then segregated – as different types of alloys should not be melted together if you want to obtain a similar quality of alloy back from the recycling loop.

A post-consumer rescue mission

In a move that prevents this aluminium waste going to landfill, Technal parent company Norsk Hydro has created a range of aluminium products made with recycled, post-consumer aluminium scrap, such as facades and windows that have been dismounted from buildings and fully recycled.

The range includes products with at least 75% recycled aluminium from post-consumer scrap – featuring material with one of the smallest CO_2 footprints in the sector – 2.3 kg CO_2 emissions per kilo of aluminium. This is seven times less than the global average for primary extraction.

The company is working to launch new products with an even higher content of recycled aluminium in the future, with two projects in Europe due to feature aluminium that contains 100% recycled post-consumer material. This will lower the CO_2 emissions per kilo of aluminium to just 0.5.

When specifying aluminium curtain walling, windows, doors and sliding systems in a credible sustainable way, a good starting point is checking the aluminium product process is fully traceable, and that an independent third party, such as DNV-GL, certifies the product. Systems may also have passed other certifications such as the ift Rosenheim, an EPD (Environmental Product Declaration) or the international Cradle to Cradle certification. In addition, there are aluminium system products on the UK market that meet standard green building certifications such as LEED, BREEAM and DGNB.

How to raise recycled aluminium content

If your next build has a requirement for a sustainable aluminium system package, making sure to specify that the system uses recycled material in the tender document will provide clear direction for your supply chain. For example, this would mean aluminium with material usage of at least 75% end-of-life (EoL), e.g. EN AW-6060 T66. For aluminium with EoL recovery, material that has already been installed in and removed from a building is recycled once again.

The minimum 75% proportion of this post-consumer material (≥ 75% EoL material) must be verified by means of independent certification. To avoid misleading customers, a manufacturer marketing higher than average recycled content of above 90% in their products should disclose what fractions of post and pre-consumer scrap are included.

Gareth Evans is specification sales manager at Technal UK

Maximising resources

How are you adapting to the ever-changing metals market? Simon Walker from SIG Zinc and Copper looks at how, as availability causes shifts in specification, architects need to adapt not only their understanding but also their designs

As we move into the latter part of 2023, a scenario suppliers are coming across more often in design and specification is the need to highlight the impact the metals market is having on architects' designs.

For many years copper represented the ideal material for roofing and cladding. It's easy to work with thanks to its malleability, and for designers, it offers a unique visual finish. Copper ages over time, acting like a living metal, with the colour changing as the initially bright and shiny material acquires a patina over the course of its life.

This is a win-win for both architect and contractor. However, in the latter stages of 2022, volatility in the metals market started to bring challenges into the specification of metals. Prices began to rise as demand shifted and stock reduced. We predicted this would continue into this year, and unfortunately, it's a prediction which has come true.

What does that mean for architects looking to incorporate traditional metals such as copper into their designs?

The immediate challenge is to accommodate the impact of specifying a metal which has traditionally been cheaper and now commands a higher price than previously seen. Right now, availability for copper is more restricted, which is feeding into this pricing.

We've seen – in particular – constraints coming from agreements over minimum order quantities. Both suppliers and contractors are looking to purchase minimal amounts to hedge their bets against rising prices. This leads to ongoing confusion and difficulty in purchasing the required stock.

Shifting demands

Markets are ever-evolving, and we've seen a repositioning taking place, with zinc and aluminium coming to the front.

Markets are ever-evolving – and we've seen a repositioning taking place, with zinc and aluminium coming to the front

Interestingly, zinc last year experienced a similar price hike which softened demand for the metal. This year, factors such as increasing stock levels due to low usage, has led to price falls and now demand is starting to grow once more.

Aluminium has seen the biggest shift, taking a huge leap forward in popularity, and it's easy to understand why. Aluminium combines the benefits of being lightweight and easy to work with – making it ideal for efficient installations. For architects and specifiers, it's available in a wide choice of colours and with unique surface patterns or effects which can easily match the needs of designers.

Our supply partnership with PREFA Aluminium has seen architects able to make excellent use of the material. Compared with metals that age over time, aluminium has a more immediate process to reach the final colouration. Aluminium cladding is available in 16 shades as standard, with bespoke colours available upon request. This flexibility, durability, and product cost have made it a highly sought after solution.

Battling the elements

While the enthusiasm for aluminium is great to see, we have issued a word of warning for architects who are utilising the metal in coastal projects. It's easy to be caught out by the effects this environment can have on cladding. Galvanised steel is typically used where saltwater exposure, high humidity, wind, and temperature variations can affect corrosion.

For those using aluminium, our advice is to ensure the specification allows for protective coatings or aluminium alloys which are more resistant to corrosion. Even zinc requires an additional coating to ensure the weathering effect isn't too damaging to the cladding.

This approach was put into practice at the Lady Bee Marina development, designed by architects ECE Architecture. The striking development comprises three quayside blocks, with elZinc cladding and roofing to add a unique aesthetic, and achieve performance needs.

Specified with the appropriate coatings, zinc was ideal for use on the coastal location, giving the material increased resistance to salt and other pollutants. The protective coating on the zinc reduces salt damage by providing a surface that allows the mineral to be washed off the surface of the metal. This was a huge benefit for the architect and client as it ensured the long-term appearance and performance of the cladding.

Minding the business

So what should architects take into consideration for metals as we head to the end of 2023? First and foremost, it's about looking at metal cladding and roofing with a commercial mindset. The choice of metal used will have a big impact on cost especially for large scale projects where order volumes will be high. If you're using a metal which is currently priced higher or has limited availability, consider an alternative which might achieve the same effect over time. We've seen plenty of architects adapt their designs to use different materials yet still achieve the same desired outcome for the project.

Consider your options and weigh up the benefits of switching to an alternative – such as aluminium for cladding – which will meet budget constraints without limiting design options.

And as always, consider early engagement with suppliers to help manage the stock and pricing of the products you're proposing to use. Not only can this help ensure you keep designs within budget, it can also allow you to make any early design changes to the specification and still keep the original intent. Suppliers are best placed to advise on viability and, where appropriate, alternatives.

Simon Walker is category manager – hard metals at SIG Zinc and Copper

The medium rise of zinc

Jonathan Lowy from VMZinc explains how zinc, in the context of its long heritage as a familiar material on Parisian roofs, is slowly becoming in vogue in the UK for specifiers on mid-rise urban residential projects

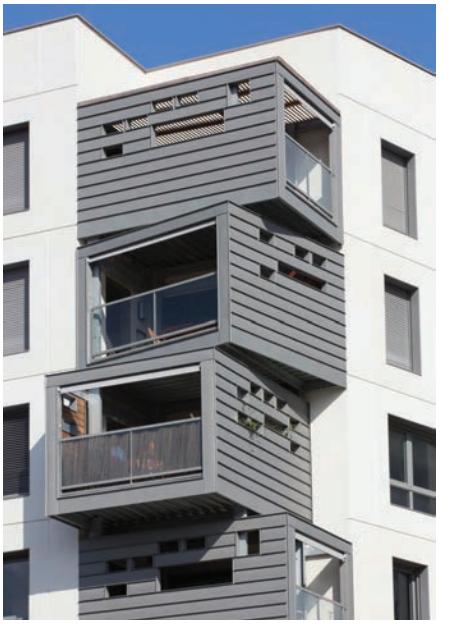
Zinc has a long history of association with mid-rise residential projects. It was, after all, Baron Haussmann`s grand project to rebuild Paris in the middle of the 19th century that gave a massive boost to the use of the material not only for mansard roofs, but also for taking rainwater off those roofs. Slightly ironically, one of the traditional Parisian gutters is called a 'cheneau a l`anglaise,' translated as 'English gutter'!

Fast forward to 2022, and certain architects had begun to make zinc a more common sight in contemporary-designed urban residential schemes in England. In Beckenham in south east London, Stolon Studio designed six dwellings using timber frame structures, clad in colourful cementitious planks. The zinc roof (of Anthra-zinc Plus standing seam panels installed by SH roofing) features easily-installed PV panels using seam clamps, which blend into the roof.

Archway Road in north London, designed by pH+ architects, also has a colourful aesthetic. However this time it is achieved by combining Pigmento Red standing seam zinc wall and roof panels with vibrant red brick; some of which had been retained from the original structure. The result is a mixed use building with 25 apartments, with the zinc installed by metal cladding specialist Full Metal Jacket.

In the Old Market conservation area of Bristol, Arturus Architects extended a block of 31 small flats outwards and upwards, to become an elegant building housing 63 larger flats. Again, a combination of brick and standing seam zinc were used on the facades. The design does also capture

In the Old Market conservation area of Bristol, Arturus Architects extended a block of 31 small flats outwards and upwards, with a combination of brick and standing seam zinc used on the facades



some of the character in a modern take on the mediaeval gabled street frontage. Here both pre-weathered Quartz-Zinc and Anthra-Zinc are used, and as in Parisian examples, all of the rainwater is dealt with using matching zinc gutters, downpipes and hoppers, fitted by Architectural Metal Roofing.

Back in south London, Shed KM worked with Greenwich council to create a development of one and two bedroom flats on old garage sites. This affordable housing is 100% for social rent but still uses a number of elegant design elements to create attractive homes including large picture windows and durable materials such as Pigmento Red zinc standing seam panels on the facades.

And in Paris itself, while much of the city centre continues to respect Baron Haussmann's original designs, just outside the centre there are a number of residential developments that have used zinc in a more contemporary fashion. These include the Carre Seine by Pietri Architects, a group of new seven storey blocks that accommodate a 175-bed hotel and 69 flats.

As with the mansard roofs of Paris, all of these projects benefit from the attractive aesthetic of zinc roofs and facades and indeed its durability, which the BRE estimates at 100 years in the Environmental Production Declaration EN 15804. At the end of this long service life, zinc is also 100% recyclable – in western Europe over 98% of old roofing zinc is recycled.

Pre-weathered zinc comes in a wide number of attractive finishes, but for these to be successfully transformed into a finished roof or wall, not only must correct design be followed, it is imperative to use skilled specialist installers. It is for this reason VMZinc works with partner VMZinc@Work installers, who have a known track record of successfully installing the material, and can provide a 50 year material warranty.

Last but definitely not least, while fire protection has always been important, it has for obvious reasons been under increased scrutiny and focus in recent years. Zinc is non-combustible following EN 13501, and applying certain coatings and finishes can take this to a limited combustibility rating of A2. By using a galvanised steel deck and stone wool insulation, zinc can be used on high-rise residential projects. Furthermore VMZinc standing roofing and cladding systems show no flame spread or penetration following Brooft4 testing.

Much of this performance is summarised in a BBA certificate for a non-vented warm structural roof, while the more traditional zinc systems follow EN BS 501 and BS Code of Practice 143-5. As a firm we offer office-based RIBA-accredited CPDs to support specifiers, so please do not hesitate to contact us for more information.

Jonathan Lowy is operational marketing manager at VMZinc

Protect the future with aluminium facades

Simran Thiara from Sotech highlights the opportunities and reasons for building a 'greener future' with aluminium rainscreen cladding, as part of an environmentally-conscious approach to futureproofing buildings

Sustainability is no longer a mere buzzword; it's a global imperative towards carbon neutral practices and the sustainable use of resources that transcends sectors. As we stand at the crossroads of architectural innovation and environmental consciousness, architects hold immense power to shape the world in which we live.

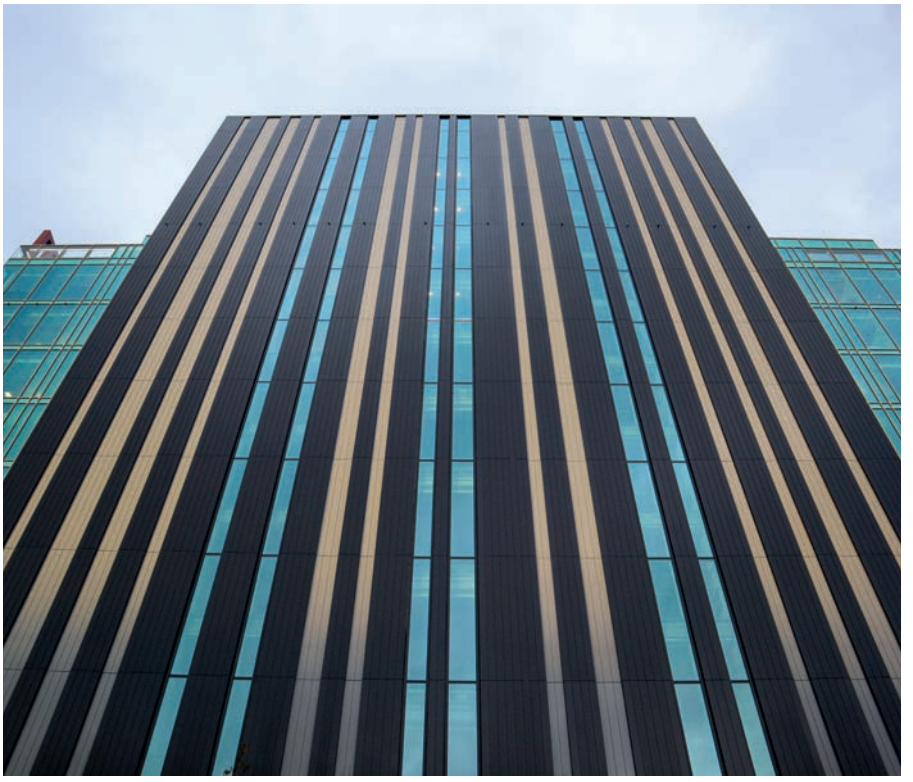
Rainscreen cladding: one sustainable solution

Rainscreen cladding, in simple terms, is intended to be a weathe-resistant facade that protects the building from water damage. The systems are designed to allow adequate water drainage from rain and reduce the risk of long-term water damage within the building structure.

Over time, rainscreen cladding has matured and has become an integral part of a building's aesthetic appeal, with architects choosing from an incredible range of materials, finishes and panel profiles to create a unique and personal design.

For a sports facility at Leeds Beckett University, PPC aluminium was used in flat and concave panels, and then contrasted against bold red etched anodised panels.

In Kelaty House – a student accommodation and hotel in Wembley, London – perforated panels in anodised



Choosing sustainable materials, like aluminium, is just one of many ways architects can use rainscreen to develop eco-friendly designs

aluminium were produced to create the captivating 'tree' designs which cover the entire building.

Aluminium: the sustainable material of choice

Aluminium, which was used in both case studies above, is a popular choice for architects and is only growing in popularity due to its unrivalled durability, versatility and recyclability. It also requires minimal maintenance and has proven lifetime performance.

Anodising, as used in both projects in very different ways, enhances the natural qualities of aluminium and allows for a strong contemporary finish with incomparable corrosion and abrasion resistance.

Choosing sustainable materials like aluminium is just one of many ways architects can use rainscreen to develop eco-friendly designs. Materials like this can also prolong the building's life cycle and reduce maintenance and repair work.

Futureproofing: the architect's role

It's clear that architects are the curators of materials, systems and even finishes that make a difference in the sustainability of a building. But they're not alone in their endeavour. It is always advisable to engage with manufacturers' design teams early on in the process, where expertise often extends beyond product specification. They can assist architects and designers in making well-informed design-decisions that have a positive environmental influence.

Three key themes have emerged over time: materials – choosing those that reverse climate change, like 'future-proofing' building design; lifecycle – examining a building's entire lifespan with 'environmental product design'; and key processes – minimising the environmental impact of construction, e.g. transportation and packaging.

To help make the options clear, we have created a checklist to help architects develop a holistic approach to a sustainable future. Each point in the checklist offers insights and tools for making informed, eco-conscious decisions that align with our global sustainability goals.

The architects' call to action: building for the future

Looking at the whole building life cycle and taking such a cradle to grave approach, architects and designers are able to dramatically reduce emission and help meet government targets as an industry. This does not land squarely at the feet of architects. This is an industry wide challenge, and one that manufacturers and engineers must rise to meet, collectively.

Together, we shape a greener footprint by embracing low-carbon technology, environmentally friendly infrastructures, and by specifying more sustainable systems, materials and finishes in our work.

Your partner in a greener tomorrow

Today's choices echo through future generations. Manufacturers are not confined to discussing materials alone and in many cases can offer safe, sustainable, facade solutions that can change the carbon footprint of a building and help architects realise their vision – while making sustainable choices.

From 'hook on' rainscreen solutions to bespoke extrusion, experts are available to offer the critical advice on systems, materials, finishes, fire safety, design, and production to ensure the right facade solution for your project.

Simran Thiara is regional specification manager for Sotech

Metal Technology

Passive House Institute

Leading the way in Passive House Education

Following an extensive R&D and technical development process, Metal Technology's System 17 Hi+ Curtain Walling and System 5-45 Hi+ Window have been certified by the Passive House Institute (PHI). Further Passive House products are under development as we continue our drive to reduce our carbon footprint on our road to Net Zero.

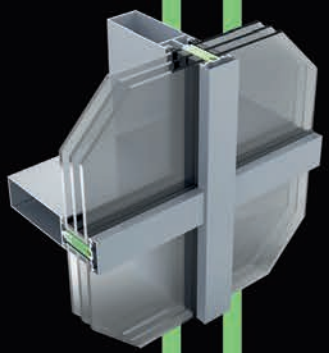
Currently, 35% of global energy consumption stems from the building sector alone and the operational stage is the largest contributor to carbon emissions, the majority of which is from heating and cooling demand. Passive House buildings provide a transparent, quality assured approach to meeting our climate goals, whilst also creating a sustainable built environment.

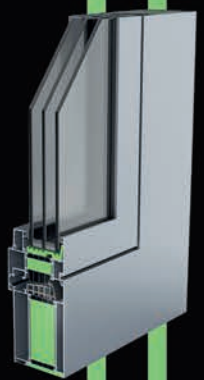
Metal Technology played an an intrinsic role in the design process of Erne Campus at Enniskillen's South West College (pictured) - the world's first educational Passivhaus Premium building and the first non-domestic Passivhaus Premium in the UK.

Metal Technology also supplied its high performance glazing systems for the recently completed Riverside Primary School in North Perth, built in the grounds of North Muirton Primary School. Riverside is Scotland's first Passivhaus Primary School and will accommodate pupils from both North Muirton and Balhousie Primary School.

We are also currently on site at what is believed to be one of the largest Passivhaus buildings in the world, Dunfermline Learning Campus, delivering our Passive House products for two new high schools: St Columba's RC High School and Woodmill High School. The schools form part of AHR's and Fife Council's journey to reduce energy use and carbon emissions.

Furthermore, Metal Technology has secured four new Passive House education projects which will be on site later this year and through 2024: Perth High School, Currie Community High School, Montgomerie Park Primary School in Irvine and Tain Community Campus in Highland.





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We've got you covered

Metal mesh is a versatile product and has a functionality like no other. It works well as a safety element including balustrade infill panels and radiator grilles, but also for decorative purposes like ceilings. Jonathan Reed, Managing Director at **Amron Architectual** explains why metal mesh ceilings are being considered within the design aesthetics of a commercial space: Suspended ceilings were first introduced around 100 years ago, they were a novel idea to hide building infrastructure such as ducting and pipework and creating a space to allow access for maintenance – this is where the mineral fibre tile came in as the most cost-effective way of creating the suspended ceiling. However, now with the option to use mesh in ceilings, it allows a suspended ceiling whilst offering benefits including improved airflow, lighting, and vastly improved aesthetics. We were approached by Ravi and Hiral at Kotak Designs to supply a ceiling system at the Rasa restaurant in London. We supplied a system with open mesh panels which allowed plants to be hung for guests to enjoy. We achieved the vision that was desired to create a truly stunning open space full of colour and foliage.

01795 228 583 www.amronarchitectural.co.uk

ASWS answers fresh call from County Hall

Associated Steel Window Services (ASWS) carried out a comprehensive, yet carefully considered repair and replacement contract at County Hall on behalf of Cast Interiors, which specialises in sustainable refurbishments, whereby as much as possible of an old building is reused or repurposed to minimise waste. All the work was completed within a very tight timescale; including additional works not originally envisaged. ASWS was duly tasked with repairing and easing a total of 134 faceted bay windows, many of which had suffered heavy corrosion.

www.asws.co.uk

More than just a helping hand

With a need for multi-functionality, industry specialist **SFS** has developed its offering on rainscreen cladding support systems to enable architects, design engineers and cladding contractors to achieve an installation which delivers the required thermal, structural, fire and other performance targets in a safe and economic manner. The manufacturer's NVELOPE range supports concealed and visible fastened systems to meet most project's aims while SFS Thermal Solutions ensures that the crucial challenge of closing the 'Performance Gap' can be adequately addressed.

uk.sfs.com

Refurbishment of steel windows specialist

The UK-wide **Steel Window Association** members are the established, proven experts in the renovation and sympathetic refurbishment of steel windows and doors in both domestic and commercial premises. One of the best qualities of a steel window or door is its longevity and this is where refurbishment and servicing are vitally important; this is where SWA members can help. Options range from a very basic ease and adjusting, where the windows and doors remain in-situ and are serviced, to a full in-situ overhaul involving significant paint removal and redecoration, where possible.

www.steel-window-association.co.uk

Dorset County Hospital MSCP, Dorchester

As the main provider of acute hospital services ample parking space is required at all times. It was decided that a multi-storey car park (MSCP) should be built to keep pace with demand. Due to new and stricter public regulations combined with the desire for aesthetic freedom, the task presented several challenges that required extensive teamwork within our organisation. **RMIG Ltd** succeeded to merge the creative wishes of the architects to give residents a great impression of the Dorset landscapes.

01925 839610 www.city-emotion.com

Metal Technology shortlisted at awards

Metal Technology has been shortlisted for Supplier of the Year at the Learning Places Scotland Awards – a celebration of excellence and achievement in education. Metal Technology Ltd has been a trusted and key supplier for a wide range of universities, colleges, schools and student accommodation developments. This year saw the launch of the company's Passive House accredited systems. Metal Technology will be showcasing its Passive House portfolio of high performance, architectural aluminium fenestration solutions at this year's Learning Places Scotland Exhibition.

metaltechnology.com linkedin.com/company/metal-technology-ltd

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Nordic Copper Inspiration

Nordic Copper from Aurubis offers an extensive range of natural surfaces and alloys that can be applied in numerous ways for architectural cladding and roofing on any building typologies.

Copper's unique architectural qualities are defined by its naturally developing patina – which cannot be replicated successfully using other materials using surface coatings. The patina film provides impressive protection against corrosion and can repair itself if damaged, giving exceptional longevity.

With exposure to the atmosphere a copper surface begins to oxidise, changing from the bright 'mill finish' to a chestnut brown, gradually darkening over several years to a chocolate brown. Continued weathering can eventually result in the distinctive green or blue patinas seen on older roofs.

Natural Living Surfaces

With the 'Nordic Copper' range all these surfaces are available straightaway. The factory processes involved are similar to those taking place over time in the environment, utilising copper mineral compounds, not alien chemical processes.

So, all these surfaces form an integral part of the copper, generally continuing to change over time, and are not lifeless coatings or paint.

The Nordic Copper range includes Nordic Standard 'mill finish' and Nordic Brown pre-oxidised copper offering lighter or darker shades of brown. The extensive Nordic Blue, Nordic Green and Nordic Turquoise ranges have been developed with properties and colours based on the same brochantite mineralogy found in natural patinas all over the world. As well as the solid patina colours, 'Living' surfaces are available for each with variable intensities of patina flecks revealing some of the dark oxidised background material.

Copper Alloys

Copper alloys are also growing in popularity, including Nordic Bronze and Nordic Brass – which can also be supplied pre-weathered. In addition, the innovative Nordic Royal, an alloy of copper with aluminium and zinc, provides a rich golden through-colour that is very stable.

All Nordic Copper products are suitable for internal applications, as well as exteriors. Apart from traditionally-jointed, rolled material supported by a substrate, various other forms of copper for architecture are increasingly being explored by designers. For example, Nordic 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 for transparency.

Fire-safe Cladding

With an 'A1 (non-combustible material)' fire classification to EN 13501-1, Nordic Copper is suitable for cladding tall buildings, using appropriate constructions. Low thermal movement makes it appropriate for any climates and locations, and it is non-toxic and safe to handle, as well as non-brittle and safe to work. Importantly today, its inherent antimicrobial qualities make it ideal for touch surfaces internally as well.

In addition, Nordic Copper requires no maintenance or decoration. As a lightweight and flexible covering, structural support demands are reduced, resulting in lower carbon and 'whole of life' costs. Copper is also fully recyclable utilising long-established practices – 97% of copper in construction comes from recycling – and has other impressive sustainability and environmental credentials. And, of course, copper retains a high scrap value at eventual demolition, ensuring recycling.

An expanding series of building studies showcase the diversity of surfaces, forms and applications available with Nordic Copper today.

NordicCopper@aurubis.com
www.nordiccopper.com

A new aesthetic for commercial washrooms

Already familiar in domestic kitchens and bathrooms, the trend for black fixtures and fittings is now spreading to commercial washrooms. Specifying black sanitary ware, that matches the water controls and accessories, is a sure-fire way to bring style to washrooms. A timeless, classic look, offering retro-chic with an industrial edge.

However, non-domestic washrooms face very different challenges to the domestic setting. Aesthetics are only one element of the specification mix, and other factors to take into account are intensity of use, vandal-resistance, user safety and hygiene. Specialist products are required that will withstand high footfall and cleaning routines.

Intensive use and regular cleaning in highly frequented washrooms quickly degrade surfaces. Stainless steel is well-established as a durable and unbreakable alternative to porcelain sanitary ware. Even in its natural state, the surface can withstand any impact from daily use, as well as regular and thorough cleaning. It remains hard and smooth, with reduced dirt retention due to its uniform, non-porous surface.

Domestic style trends are creeping into commercial washrooms

Specifying sustainable products

To achieve the matte black finish, Teflon® is applied to the stainless steel. Teflon® or PTFE (polytetrafluoroethylene) is a chemical-resistant material, and one that is already familiar, since it is the same finish found on the pots and pans in domestic kitchens. Its non-stick properties means there is very limited scale adhesion, supporting improved hygiene. Cleaning is easier and more sustainable, requiring less cleaning product. And, since washbasins, WCs and urinals are not subject to the same challenges as kitchen ware i.e., high temperatures or sharp knives, the black finish remains intact over the long term.

Mix and Match: contrasting finishes create a strong visual impact

As the trend for black fixtures and fittings gains in popularity, it is possible to bring a whole new aesthetic style to commercial washrooms. Rather than rely on service contracts and value-for-money accessories to complete the washroom specification, washrooms can be equipped with products that are stylish, on trend, and that meet the needs of the public domain. Manufacturers now offer complementary product ranges that coordinate, allowing specifiers to choose their decorative style: adding a black waste for a totally black ensemble, or a chrome-plated waste for a black/chrome mix-and-match look.

Design for accessible washrooms

This design trend includes products for people with reduced mobility. There is a whole new generation of assistive products that are more attentive to comfort and well-being, which erase the medical aspects of accessible washrooms with ergonomic designs, fluid shapes and a strong aesthetic sense. Designed to adapt to every stage of life, and to provide safety and comfort, these accessories also contribute to making the shared use of sanitary washrooms pleasant for all.

Washrooms in non-domestic environments no longer need to compromise on aesthetics. It is possible to incorporate stylish designs that will withstand intensive use while upholding user safety and hygiene standards. In environments subject to intensive use, attractive products and well-maintained fixtures with easy-to-clean surfaces are more likely to elicit respect and care from users. There is no need compromise on form or function.

01491 824449
www.delabie.co.uk

DELABIE's TEMPOFLUX 3 WC valve features a classic black glass flush plate with a chrome-plated button

Building Systems UK products used for new Kohler Mira distribution centre

Kohler Mira Group wished to create a world-leading distribution centre, where the building envelope would support in three key areas. The first of these areas was to ensure a comfortable working environment for its employees. The second was to create a protected space for the complex systems and processes handling thousands of products every day for Mira's customers all over the world.

Finally, in line with the company aim to become a carbon neutral company by 2035, the design needed to deliver an energy efficient, sustainable building envelope with the capacity to generate renewable energy to power both the facilities and return unused electricity to the grid.

The solution

Building Systems UK (A Tata Steel Enterprise), worked with UMC Architects and were able to offer them a wide range of responsibly sourced, sustainable walling and roofing products from one single source UK manufacturer. This enabled the creation of an optimum building envelope solution to meet structural, energy efficiency and air tightness requirements, as well as offering a wide choice of aesthetic colours and finishes to create the visual impact required.

Building Systems UK's Trisobuild® site assembled roofing and cladding system was chosen with over 19,000 linear metres used for the roof and nearly 5,800 linear metres to form the walls. The Trisobuild® system can be tailored to meet the specific requirements of a project by offering design flexibility of internal and external profiles ranging from 19 mm to 46 mm deep. For this project, R32 and C32 profiles were chosen for most of the roof and wall profiles respectively and came with Colorcoat® prefinished steel in a range of colours. By specifying wall and roof products from Building Systems UK with Colorcoat® products, Mira Showers were reassured by the supply of the 40-year Confidex® Guarantee covering the long-term performance of the finish. As the roof was going to be housing 1,560 solar panels, Trisobuild® with Colorcoat HPS200 Ultra® pre-finished steel was chosen. The Colorcoat HPS200 Ultra® pre-finished steel included a Galvalloy® metallic coating for the ultimate corrosion resistance and cut edge performance and, as the Confidex® guarantee covered its use under a PV array, it was the perfect choice for the project.

Walling solution

In addition to Trisobuild®, Building Systems UK's 70 mm thick insulated Trimapanel® was also selected for around 3,000 linear metres of wall on the project. These insulated, secret-fix wall-cladding panels are manufactured in accordance with BS EN 14509 'Self-Supporting Double Skin Metal Faced Insulating Panels – factory made products' and allow quick and easy installation for fast build times. The secret fix joint design of the Trimapanel® product allows the primary fixings to be hidden from view enhancing the external aesthetics of the building. Trisobuild® also comes with Loss Prevention Certification Board (LPCB) approval to LPS 1181 part 1 for fire performance, helps to lower insurance premiums.

Liner profiles from Building Systems UK were also used on the project to provide an attractive and clean internal finish to the walls and ceiling. Over 13,000 linear metres of RL32 liner was specified and this was able to offer the additional benefit of acting as working platform during the construction stage of the project.

By specifying all the roof and cladding products through BSUK, the architect and client could be confident that the walls and roof of the distribution centre would work together seamlessly to provide a robust external envelope. Both Trisobuild® and Trimapanel® are third party certified for quality, fire safety, acoustic and thermal performance, as well as air tightness and water penetration. In addition, due to Tata Steels commitment to sustainable practices, both products are also certified to BRE's framework standard BES 6001, allowing maximum credits to be obtained in the responsible sourcing of materials section in BREEAM.

The details

Building Systems UK could also offer a wide range of flashing, ancillary items and fabricated corners to add the finishing touches to the distribution centre to deliver the desired aesthetic look of the project.

The correct installation of all panels and ancillary products is vital and Building Systems UK supplied a raft of standard junction details as a step-by-step guide to ensure that all interfaces were correctly constructed. In this way the wall and roof panels could be joined correctly to form a building envelope for the distribution centre with low air permeability to help enhance its energy efficiency and lower its CO_2 emissions.

For extra reassurance the Kohler Mira distribution centre is covered by a Platinum Plus 25-year building system envelope guarantee.

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