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### 09.17

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# FROM THE EDITOR



The primary job of a building's facade is to protect the building it covers, and therefore the occupants inside, but for many years, the aesthetic properties of functional metal facades such as curtain walling were arguably not universally appreciated. However building designers in recent decades have been keener to exploit and celebrate the charms of metal, from ABK's late 1980s stainless steel-clad St Mary's Hospital, Isle of Wight, to Tengbom's district court clad entirely in zinc, in Alingsås, Sweden, which won that country's metal-focused Plåt prize in 2016. Such buildings move the stereotype away from 'metal sheds' towards a materiality and purity that many can enjoy.

This supplement features a couple of great examples of architects using metals to provide a functional but lively counterpoint to other facade materials to give buildings a particular vitality of their own. The Vendsyssel Theatre in Hjørring, northern Denmark, combines boxy elements of bright rusty orange corten steel with counterparts in translucent frosted glass over pastel cladding to impressive effect. Read our report on the building by Stephen Cousins on page 28.

And in Brussels some new giant zinc pebbles have emerged, representing a new 'gateway' to the city as it begins its journey into a new era freed from the UK. Although ostensibly a shopping mall and events venue, Docks Bruxsel feels a lot more than that, with beautiful zinc shingles forming futuristic shapes, their subtle sheen used to contrast with warmer timber cladding, and other natural materials such as brick. Visiting this project was a real pleasure - and you can't say that about most shopping malls! (see page 14).

**James Parker** Editor



PRIZE-WINNING ZINC Extension to Alingsås District Court, Sweden (architects: Tengbom)



#### ON THE COVER... MAERSK TOWER. COPENHAGEN

A major new research building designed by CF Møller has now been shortlisted for the European Copper in Architecture Awards For more information, go to page 20.



© Adam Mørk

#### AWARD

# "Visionary architecture and engineering" – the GAGAs reward excellence

The annual Galvanizing Construction awards, better known as the GAGAs, were held at the Royal Aeronautical Society in London on 29 June, with 100 industry professionals from across the UK and Ireland in attendance.

The organisers said: "The entrants proved that a simple and robust technique – which is over 200 years old – can still be harnessed to produce visionary architecture and engineering that integrates innovative design with the benefits of sustainability."

Among the winners was the Greenwich Low Carbon Energy Centre by CF Møller Architects, which received the Galvanizing in Architecture Award. The centre is the largest new build residential heat network in Europe and forms part of a major urban development initiative on the Greenwich Peninsula. It will save over 20,000 tonnes of carbon every year. "Cultural value was added to the accompanying visitor centre by the reimagining of a standard flue stack as a galvanized work of art."

Snug Architects took home the Galvanizing in Detail Award for their Milford-on-Sea beach huts design. The best use of a Duplex coating was awarded to Ian Ritchie Architects for the Sainsbury Wellcome Centre at University College London, where galvanizing and painting were used to provide visual consistency and a durable and robust fire protective system plus a 60-year lifespan.

The Galvanizing in Engineering Award went to the £14.2m rebuild of Hastings Pier, which saw the replacement of 90 per cent of the historic structure. Galvanized trusses, cross beams and ties were all used in an "ambitious" reconstruction of the pier, which had been neglected for decades before being severely damaged by fire in 2010. The galvanizing is particularly suited to the coastal environment and has secured the pier against future degradation.

Another notable winner was Global Rail Construction, who took home the Sustainability Award for its developments in steel signal structures. The design demonstrates significant cost efficiencies and promises new strategies for reuse and recycling of galvanized steel structures.

Speaking of the winning project, Iqbal Johal, marketing manager of the Galvanizers Association said: "Judging was exceptionally difficult this year due to the calibre of entrants and it is unfortunate that some excellent projects did not cross the winning line. Our winners reinforce the fact that galvanizing is all around us and plays an important role within our built environment."





#### FLYING CARS

### **BMW** sculpture shortlisted for Structural Awards 2017

A sculpture by structural engineers Stuart Holdsworth, Hooman Baghi and Bruno Postle has been shortlisted for this year's Structural Awards, organised by The Institution of Structural Engineers.

The sculpture comprises three swooping, entangled sculptural steel pieces and was created for the 2016 Goodwood Festival of Speed to celebrate BMW's centenary. The hollow steel shell is "surprisingly lightweight and rigid, pushing the boundaries of form, curvature,



span and slenderness. Everything had to be flawless and perfectly smooth, without so much as a single ripple in the steel."

Now in its 50th year, The Structural Awards showcases the world's best engineering structures, highlighting the ingenuity and creativity of structural enginners. The shortlisted 43 projects were selected from 119 projects across the world.

The winners will be announced at a ceremony on 17 November.

#### **BRIGHTON MIXED USE**

# Construction begins on £130m "innovation quarter"

Construction has begun on Circus Street, a £130m innovation quarter on the site of the old municipal market in Brighton. Architects ShedKM in collaboration with developers U+I have created an ambitious new development masterplan.

ShedKM's masterplan is conceived as a rich composition of distinctive buildings and public spaces woven together to create a new destination. The design draws on the "patchwork" of building styles within the Brighton cityscape and reinterprets them as part of a "progressive and sustainable new quarter."

Situated on Circus Street at the edge of Brighton's academic district, the ambitious new 0.73 ha mixed-use development includes plans for 142 new homes, 450 student bedrooms, 30,000 ft<sup>2</sup> of business and start-up space and an international Dance Space.

ShedKM has conceived a "sensitive" material palette that references the tones and hues of neighbouring buildings to ensure that Circus Street will harmonise with its urban context. This includes the use of galvanised metal cladding (on The Dance Space), plus black cladding on townhouses, white brick on offices, and red brick on student accommodatio. The palette in its entirety can be viewed from Circus Square events space.

Circus Street will be urban rather than suburban in scale while avoiding a 'megablock' approach to massing. Instead, most of the individual buildings will rise to between six to eight storeys in height with the exception of a number of taller 'marker' buildings up to 13 storeys high. Pedestrian routes through the site will refer back to historic street patterns prior to the development of the market. These will provide permeability and help break down the impact of the dense new development.

ShedKM's design guardian and consultant architect Helen Misselbrook said: "Circus Street will be a beautiful and inspiring place that keys into the creative lifeblood of Brighton. We can now make tangible our design and realise our vision. A place for Brighton. A place to live, learn, dance, nurture and grow."

Hazel Rounding, director at ShedKM commented on the development: "The start





on site is a major milestone in our journey to create a new urban quarter in Brighton which, through the belief and dedication of all stakeholders and individuals, has become a significant placemaking venture in our portfolio."

ShedKM won a competition for the project in 2012 and successfully obtained planning permission in September 2014. Construction is expected to complete in spring 2020.

#### WORKING TOGETHER

### Farmer and Fusion collaborate on offsite futures

Mark Farmer – author of the 'Modernise or Die' construction industry report – and Fusion Building Systems, a national offsite light gauge steel superstructure manufacturer have met to discuss ways of developing new training and career opportunities within the offsite construction sector.

Taking their lead from the Construction Industry Training Board (CITB)'s report 'Faster, Smarter, More Efficient: Building Skills for Offsite Construction', Farmer and Fusion reviewed the issues currently affecting the UK construction industry and discussed the routes which could be opened up to develop a skilled offsite workforce.



Their discussions centred around key findings of the CITB report which noted the low levels of industry awareness of the skills needed for offsite construction and how future, nationally-recognised training should deliver a diverse range of skill sets. The report also highlighted the need for industry-wide education in so-called "softer skills", such as an awareness of behaviours and attitudes in the workplace.

Mike Fairey, Fusion Building Systems director said: "There are already a handful of colleges and universities who are offering courses in modern methods of construction (MMC), but considering the startling findings of Mark's report which looked at the desperate future of UK construction as a whole, there need to be many more. The industry needs to turn to offsite, but as the CITB report has shown, awareness, understanding and acceptance of MMC needs to catch up."



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### COMMENT

# Metal gutters fit for the future

Carlton Jones of the Metal Gutter Manufacturers Association (MGMA) explains the improvements brought by a new standard for metal guttering in the context of climate change

E streme weather is now an all-year-round likely occurrence in the UK, ranging from flash floods one day to heat waves the next. Average wind speeds are rising faster than predicted and, according to the latest reports from the Meteorological Office, the UK could soon see a repeat of the sort of flooding that has hit in recent years. Forecasters have said that there is a one-in-three chance that a new record will be set for monthly rainfall during coming winters.

Climate change is one of the key drivers for improving roof drainage and water management; developing new standards, regulations and testing methods to ensure products and solutions align with worst-case climate model scenarios is essential.

Rainwater systems are integral to protecting our buildings, and channelling water from roof to ground. Therefore gutters, outlets and downpipes must be able to demonstrate in situ strength and structural capability when handling increasing volumes of rainfall and wind loadings.

The recently published BSi standard is BS 9101:2017 – 'Steel and Aluminium rainwater systems. Specification'. It specifies the requirements for the design and manufacture of metal gutters on industrial, commercial and residential buildings. This includes the materials, tolerances, mechanical properties and surface conditions, coatings, laminated surfaces, jointing methods and fixings for rainwater systems, including fittings and accessories for assembly or support.

BS 9101:2017 puts particular emphasis on the design strength of the metal gutter. This is determined by loading capabilities in the form of downward rain, wind uplift and snow. Products require either Finite Element Analysis (FEA) or physical testing to ensure they meet the new standard. FEA is a computer based method of analysing the behaviour of engineering structures and components under certain conditions. It is an advanced engineering tool that is used in design and to augment or replace experimental testing.

Before BS 9101:2017, standards such as BS 8530:2010 were developed to establish the requirements of traditional cast systems. However, the standard for pressed and extruded gutters was still open to interpretation.

The industry had referenced BS 612 for pressed gutters, covering 'Eaves gutters and rainwater down-pipes of metal sheet', as it was the only standard that came close. In 2005 this was updated and defined as 'Eaves gutters with bead stiffened fronts and rainwater pipes with seamed joints made of metal sheet'. A beadstiffened front is defined as a rolled section rather than a pressed sheet. As such, pressed sheet gutters are covered under the new standard (BS 9101:2017).

With regards to extruded gutters, the industry used to reference



**BOX** Aluminium box gutter and rainwater pipes – image courtesy of ARP



CAST Cast aluminium rainwater hopper – image courtesy of Guttercrest



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GALVANISED Galvanised steel gutter system Image courtesy of Lindab Building Products

BS 1474 – 'Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections' – this standard was withdrawn in 1987 and replaced by EN Standards, which apply to the material and not in-situ structural strength. As a result, the new BS 9101:2017 standard is far more comprehensive and detailed to meet specific metal sheet and extruded gutters, and has been developed to cover gutters that are excluded from the previous BS 8530. Setting new British Standards is a time consuming and detailed process. The BSi depends on expert advice from leading UK manufacturers with regards to design parameters, loadings and specifications. A diverse group, representing all parts of the metal gutter industry, as well as consultants, was drawn together by the Metal Gutter Manufacturers Association (MGMA) to work in partnership with BSi to review current standards for rainwater products, and advise on new developments and technologies for the benefit of the industry. Developing new standards also helps eliminate bad practices among manufacturers producing inferior or unsafe products.

The new BS 9101:2017 standard raises the bar for metal rainwater specifications and will prove invaluable to metal gutter manufacturers. But often new standards are complex and the implications on project designs are not always clear.

Many architects, specifiers, design engineers or installers may not be aware of the latest developments or the significance to their projects. Members of the MGMA can offer the relevant support and technical advice to their specifier and installer customers so that metal rainwater gutter systems are correctly specified across all projects. At a time when the demands put on our buildings by major factors such as climate change are increasing, it is essential that they benefit from the best solutions to protect them for the future.

Carlton Jones is director at the Metal Gutter Manufacturers Association (MGMA). Detailed advice on the specification of metal rainwater systems from the MGMA can be found at its website www.mgma.co.uk



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### COMMENT

# Get specification right first time

The Metal Cladding and Roofing Manufacturers Association explains the importance of approved cladding systems and the dangers of changing specifications

these systems can be compromised when specifications are changed under the disguise of 'value engineering' by someone who is looking to achieve the cheapest price or maximise profit and source materials and associated components from companies who may not operate to the highest standards.

It is imperative that specifiers have confidence in the capabilities of their chosen suppliers, and it therefore makes sense to specify an MCRMA charter-compliant member company.

However, the current economic climate can make it tempting to cut business costs. In an effort to achieve the lowest price, less reputable cladding contractors will source materials and associated components from different manufacturers and then assemble them as a cladding system when it is nothing of the sort.

Unfortunately, this results in a system that has no approved design, no U-value calculation confirmation and no tested fire boundary rating. This raises serious issues for the structural integrity, thermal performance, fire performance and lifespan of the materials and has serious implications for the building owner; in the event of a problem there is no recourse to a sole manufacturer and there is no system warranty.

It is essential in each step of the materials selection process to understand that any one choice of a material type or component does not exist in isolation and has potentially far-reaching implications for other aspects of the performance of the completed building envelope.

For example, the effect of thickness (gauge) on the performance of metal systems in building applications cannot be underestimated and the responsibility for not only ensuring that appropriate materials are specified, but selected and used correctly, belongs to all parties within the supply chain.

One of the issues associated with the specification/cost link is the term 'equal or approved'. For those downstream of the initial design process it usually provides a loophole to initiate change and perhaps remove an element of cost, remove a degree of quality or improve margins.

Such design changes should not be made in isolation and any proposed change should involve the knowledge and agreement of those at the start of the design chain. Without their involvement or that of the client, a simple and perhaps misunderstood change can lead to disappointment.

Problems are likely to arise when components and materials are sourced from various different manufacturers, assembled and then passed off as a complete cladding system. This is commonly known as 'pick-n-mix' and is a conglomerate of incompatible products,



Logistics North Business Park, Bolton - image courtesy of C A Group

brought together to form an assembly, but not a system. This can have serious consequences for the main contractor, cladding contractor, building owner and those involved with subsequent operation and maintenance. For example, the person sourcing the individual items within this construction process will be regarded as the principal designer under the Construction (Design and Management) Regulations 2015 and the 'designer' will need to provide PI and/or PL insurance.

These assemblies are put together without any consideration for design constraints, compatibility, long term performance and sustainability, or health and safety issues. This has implications for those who attempt to assemble the parts and those who ratify or condone their use, as subsequent failures will without doubt result in claims and may result in criminal proceedings if negligence is a factor.

This approach can show up incompatibilities with guarantees and warranties and also health and safety issues such as 'fragility rather than non-fragility' because the system may not have been tested.

All these problems can easily be avoided by specifying a fully designed and manufactured system from MCRMA members who understand the needs of the project and who can design a fully engineered system for a specific application.

By using an MCRMA charter-compliant company, specifiers



CUBRIC Centre, Cardiff - image courtesy of Eurobond Laminates

have the reassurance of knowing that all member companies are carefully vetted to ensure that they have a good trading record, adequate levels of the relevant liability insurances, comply with health and safety legislation, and meet their responsibilities with regard to environmental issues. It also ensures that the member company has the knowledge and technical expertise to deliver a robust and workable solution.

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### BUILDING

#### DOCKS BRUXSEL BRUSSELS

# **Giant pebbles in Brussels**

Marking a bold new entrance for Brussels, Docks Brussel is a mixed-use project with a difference, creating an urban mini-district which also turned out to be a test bed for a new zinc panel. James Parker visited the project



#### CONTRASTS

The design plays with the contrast between materials such as openwork timber cladding and three 'pebbles' clad in engraved zinc panels © Georges de Kinder Built on the site of former warehouses alongside the main Willebroeck canal in Brussels is a group of buildings which form a fascinating new landmark for the city. As well as being a new take on a major retail and leisure development, far from the traditional covered 'mall' approach, the €214m Docks Brussel is also a curvaceous showcase of various cladding materials and metal craftsmanship allied to high-tech design.

According to Brussels-based architectural practice Art & Build, the new commercial

development sitting at the north-east gateway to the country's capital is "by no means a conventional commercial centre."

Looking around the finished scheme, the key aims of creating a strong new entry point to the city, offering a varied array of attractive buildings and routes in a new urban quarter, and blurring the lines between exterior and interior, have been fully realised.

#### A strong heritage

As is typical, the ability to create something of this magnitude (61,000 m<sup>2</sup> in total above ground, over up to five stories), has occurred in an area which as project architect Lilia Poptcheva describes it, was previously a "no-man's land". Despite a tram line and a major road catering for connectivity, the neighbourhood had a fairly bleak urban quality, which the new development helps to resolve by creating a great new destination.

What the area does have is a rich industrial heritage, which the development also harnesses to its benefit. Late 19<sup>th</sup> century 'utopian' industrialist Jean-Baptiste Andre Godin had his manufacturing base casting innovative iron stoves here, but he also paid attention to workers' needs, creating community-oriented housing on the site.

The Belgian client for the Docks project is the Equilis Group, real estate subsidiary of Belgian food company Mestdagh Group, which had a strong desire to achieve resource sustainability on the site. The architects also managed to preserve two of the pre-existing buildings Godin created, the 'Familistere' housing building with its sociable internal gallery decks, now



turned into a museum. In addition the listed 'Cathedral' building, a timber-framed, brick clad four-storey textile factory, now houses restaurants and a function suite.

Architect at Art & Build Luc Deleuze comments that the 'Cathedral' building "sets the direction for the plans, and is a really important part of the composition." The mix of old and new buildings is a key part of what gives the project its architectural interest, further enhanced by the mix of materials, such as timber planks cladding ground floor forms, and zinc and steel to internal and external cladding.

David Roulin, CEO of Art & Build, says the client's ambition was to "revitalise" this brownfield site, although he admits it was "an improbable location from the start." However, the architects "created a debate around the urban restructuring of this location, with the additional wish expressed by the client to exploit the natural resources of the site."

This BREEAM Excellent development includes a pipeline linking the nearby incinerator to the retail area of Docks, which supplies recovered heat that was previously cooled and dumped into the canal. This means that all of the area's heating is provided by recovered heat, which is impressive. There is also a substantial array of PV panels mounted on green roofs and rainwater harvesting, plus avoidance of air conditioning in favour of natural ventilation.

#### A new neighbourhood

According to Roulin, the overriding aim of the design response was to avoid a traditional shopping centre and instead create a "neighbourhood, with squares and streets." Lilia Poptcheva explains further: "It resembles a town, we have created unobstructed views from the mall to the canal. You are not just surrounded by buildings, you can see the town, the tram as it goes past, and the trees changing over the seasons." She adds: "It's a living place, much more about the quality of perception and contact with the exterior, light and shadows, the sun changing over the course of the day."

The public walkways through the site have been carefully planned to resolve level changes across the development, and

#### ALL THE TRIMMINGS

The curved geometry of the futuristic new events venue meant zinc panels had to be trimmed on site © Georges de Kinder



INTERIOR DESTINATION One of the zinc 'pebbles' houses a cinema © Georges de Kinder reinforce the continuity of access through this new urban quarter. As Roulin explains, "The entire project revolved around solving the seven metre height difference between the level of the quay and that of the road – we created a towpath." Two routes have been created, one from the quay and one from the main road, and each connecting to one of the two floors of retail. These run between a varied mix of buildings, some curved and organic and some more linear around the pedestrian walkways. This mix was key to the architects' wish to create a "piece of the city, not a shopping centre," as Poptcheva puts it.

Marco Da Col, concept designer at the practice, describes the materials mix: "There are very contemporary metal-clad buildings, and there are more monolithic, calm buildings clad with terracotta. We wanted to recreate the effect you have when you walk through a town, so we designed different buildings, each with its own architecture."

#### Pebbles & an 'exterior interior'

The first of three zinc-clad ovoid 'pebbles' forms the left flank of the glorious main entrance, housing shops and eateries.

Here, the enormous 10,000 m<sup>2</sup> undulating glazed roof that covers the spacious walkways between shops cantilevers spectacularly out over the entrance and a terrace cafe, reaching fair distance over what is a decent-sized public square. Through the main entrance doors, the rich and unexpected variety of materials continues, echoing the industrial past by continuing the clay brick paving from the square into the building, forming an attractive and robust floor.

This blending of interior and exterior is most apparent in the internal walkways, which feel 'outside', to the extent that it's not immediately obvious you have entered an enclosed space at all. They are light and airy, helped by a smart natural ventilation system which operates skylights in response to temperature changes. Materials such as cladding are continued from outside to inside to increase the feeling of separate, distinct buildings for distinct functions, all however still connected and protected by the glass roof floating above. The lightness of this unifying white-framed structure is enhanced by the minimal amount of columns, Art & Build having maximised the

spans so that only three tree-shaped columns are needed for a walkway running the length of the site.

The second 'pebble' houses an eight-screen cinema complex sitting at the centre of the building, which offers a completely "atypical" level of projection quality for such a site, according to Roulin. The final zinc pebble is the main attention-grabber in the whole development, sitting at the corner of the site next to the canal, main road and tram line, and forming the new 'entrance' to the city. Housing a 2500-capacity events venue it sits side-saddle on top of a larger second curvy form clad in orange-red openwork Lauder PAREA timber panels, and containing major retail brand outlets. This unusual but characterful composition, playing off the contrast between timber and zinc, is the new focal point for the north east of the city.

#### A testing installation

The installers of the zinc, which is a new panel by VMZinc tested for the first time on the project, were really put through their paces to make the cladding fit the pebbles' curved design, such as where it curves in towards the base of the events venue.

Each panel had to be carefully attached to the next using fixing clips, and nailed to a timber framework, but many also had to be cut to size to fit the curved geometry. This meant that many panels near the more extreme curved sections had to be precisely cut once on site to smaller sizes by the roofing contractor Jacobs & Sohn as they went, to match the architects' 3D modelled design.

This hand-finished aspect helps to add a certain organic quality to the otherwise fairly plain although attractive light grey, gently reflective zinc forms. The four kilogram shingles appear like scales, due to being arranged diagonally, and their surface grain is only apparent when you inspect from fairly close range, but they are subtly effective. Given there are 19,360 zinc shingles on the three buildings, their malleable, easy-to-fold nature was crucial. However while it's a fairly time-consuming process, zinc is claimed to be a cost-effective way to achieve complex roof designs such as this.

Thanks to the efficient working of the installers to a predefined schedule, and the flexibility of VMZinc's Bratislava factory, the whole zinc envelope was installed in 10 months, with 30 installers working on the buildings at the project's peak.

This mix of buildings was key to the architects' wish to create a piece of the city, not a shopping centre

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#### **PROJECT FACTFILE**

Client: Equilis Architect: Art & Build Zinc installation: Jacobs & Sohn Surface area (entire project): 61,000 m<sup>2</sup> Opened: October 2016 Surface area of zinc installed: 6,650 m<sup>2</sup> Engineer: TPF Contractors: BPC, BESIX Project manager: ABSSIS

The fact that architect, manufacturer and client were willing to go ahead with the new panel months before its official launch speaks volumes for the close collaboration and trust between the parties involved on the project. "We had to work closely together," says Phillipe Gustin, area sales manager, Benelux and UK at VMZinc, "the product's materiality was right for the designers, but it was difficult to convince the developer it was the right product for them." Poptcheva adds: "It's not very easy for someone investing so much into such a big project to just say "we're with you." She adds: "We had to convince the client to go with something that did not yet exist."

#### A subtler shine

The flat lock panels are made from natural zinc that has undergone a physical and chemical treatment to provide a slightly engraved look, softening some of the shine

# We had to convince the client to go with something that did not yet exist

that untreated zinc has (as seen on some of the downpipes on buildings on the development). The original choice of the architects was aluminium however, with the idea being to reuse recycled aluminium from aeroplanes, but this proved too costly in the event according to Poptcheva.

In addition, she says, "we wanted something that was brilliant, but not too much, something that was natural, and something that would reflect light." The architect says the client also had to be persuaded a more subtle variant was a good idea: "They wanted something much shinier because it's a commercial development, but architecture makes people love the place because of the light, form and materials; you don't have to have light and music everywhere." Another thing in zinc's favour was that it is fully recyclable, and with roughly around 20 per cent recycled content typically.

The choice of the new VMZinc panel largely came down to aesthetics in the end, says Poptcheva: "We were looking for a texture that was matte, heterogeneous and luminous. The bright and naturally pre-weathered aspect of this product is reminiscent of Parisian roofs."

There is 7000 m<sup>2</sup> of office space within the development, including the Belgian headquarters of French food brand Danone occupying the contrasting square building at the corner of the site, bookending the main pedestrian thoroughfare.

This is another showcase for the aesthetic possibilities of metal, being clad in an filigree white steel brise soleil structure which like the zinc extends inside to connect inside and out.

The new development has transformed what was a downtrodden and neglected part of the city and given it a new life and entrance point, its contrasting building forms central to this vitality.

However, the former buildings on the site have not been forgotten. The ghosts of Godin's warehouses are present, with engraved metal strips running, often at unexpected angles, across the new external and internal paving, marking their original perimeters. Docks Bruxsel looks both back and forwards, with time-honoured cladding materials married to cutting-edge design.

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Shortlisted entry Maersk Tower, Copenhagen © Adam Mørk

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#### EUROPEAN COPPER IN ARCHITECTURE AWARDS

# **Rewarding copper architecture**

Eight very different entries have been shortlisted for the 2017 European Copper in Architecture Awards, reports architect and judging panel moderator Chris Hodson

he European Copper in Architecture Awards programme celebrates the beauty and versatility of copper and its alloys through some of the best contemporary architecture. It also seeks to expose to a wider international audience inspirational projects, some of which might otherwise go unrecognised. The judging panel for this eighteenth iteration of the biennial awards consisted of four architects, all recipients of previous awards: Ebbe Waehrens (BBP ARKITEKTER, based in Copenhagen), Maxime Enrico, (LAN, Paris), Ville Hara (Avanto Architects, Helsinki) and Craig Casci (GRID Architects, London).

Entries were assessed from photographs, drawings and descriptions submitted by their architects. Considerations included overall architectural design, response to programme and context, importance of copper to the scheme, and its detailing. The judges were impressed by the quality of entries generally and the range of copper applications displayed. Choosing a shortlist from the 35 entries, with major public buildings alongside modest domestic schemes, presented a real challenge and generated lively debate. But the judges eventually agreed on eight projects, summarised here in no particular order. They stood out from the rest with a diversity of typologies and design approaches and some exceptional architecture.

#### Row of six houses in a barn, Italy -Studio Roberto Mascazzini Architetto

Located on the edge of an ancient rural village now absorbed into Milan's suburbs, a collapsing barn has been replaced by this new building. Use of the same location, size, shape and materials as the original building was a planning requirement and presented the architects with fundamental challenges. Their response envisaged some of the demolition material, taken from solid brick walls and porphyritic floors, having new life within a shell for the new building.

The crushed material is contained within metal net gabions of corten steel, distributed uniformly across both roofs and walls, creating a 'legacy' aesthetic. This technique also provides continuity between facades and roofs, defining the monolithic shape of the original barn, reinforced by an absence of gutters, downpipes, window sills and other traditional details.

The recycled material gabions alternate with sections of copper of varying heights, again linking facades to roofs. All the openings of the houses are contained within the copper zones where they cannot compromise the integrity and strength of the building. They can be hidden by vertically folding, copper-clad shutters that open and close mechanically, offering shelter against the sun and rain.

#### Lahti Travel Centre, Finland -JKMM Architects

The New Travel Centre - located at the heart of Lahti and next to the existing. historic railway station - forms a transport hub connecting the rail network to both long-distance and local bus lines. It consists of a 60 metre canopy for the bus terminal, enclosed lift and stair structures, local bus stops on the street and supporting landscape elements. There is also a road tunnel underneath the centre. Together,





Lahti Travel Centre © Mika Huisman



#### Choosing a shortlist from 35 entries, with major public buildings alongside modest domestic schemes, generated lively debate

these copper-clad elements create an easily perceived and high quality urban entity in the complex city environment, managing various changes in level.

The new terminal for intercity buses has a canopy and pillars clad in perforated copper. Next to it, the delicate and airy elevator tower uses glass in both the outer walls and load-bearing structures. Inside the glass box, the elevator shaft is covered in copper sheet and copper wire mesh: an elegant counterpart to the powerful and streamlined silhouette of the canopy. This and two other elevator towers, also made of glass and copper, connect the lower level street to the northern bus stop shelters on the street above. The side walls, parapet and face of the bridge structure create an impressive copper portal.

A full report on the terminal was included in ADF's Metal in Architecture supplement published in September 2016 – this can be found at www.architectsdatafile.co.uk/adfsupplement-archive

#### Hydropolis, Poland – Pracownia Projektowa ART FM

A new copper entrance pavilion with an innovative "water printer" sculpture

celebrates the regeneration of a remarkable 19th century reservoir in the Polish city of Wrocław. One of only a few well-preserved historical water supply plants in Europe and a protected monument, the redundant reservoir structure has now been converted into 'Hydropolis' – the only 'knowledge centre' in Poland devoted entirely to water.

The new pavilion is roofed and clad in copper, intended to oxidise naturally and harmonise with the brickwork, including perforated panels – some sliding – in front of the glazed entrance. The sculpture is made up of twelve modules concealed behind the copper facade, each with controlled solenoid valves and nozzles creating effects with the water. The pre-programmed patterns and captions are a prelude to the theme of the exhibition, enabling visitor interaction and first contact with water.

Copper – this time pre-oxidised – also adds the finishing touch to the entrance hall, illuminating the interior and harmonising with matt black metal and concrete surfaces. Sunlight penetrates through irregular holes in the perforated panels, fills the space and creates a unique interplay of light and reflections.

### Suvela Chapel, Finland – OOPEAA

This new complex is located in one of the most multicultural districts in the metropolitan area of Helsinki. The needs of this culturally diverse community form a core principle of the project. All spaces are on one level and the complex wraps into a single U-shaped entity forming an intimate central courtyard. The various functions orientate themselves around the courtvard. ranging from kindergarten and childcare to youth spaces and local community clubs. The building also provides office space for employees as well as social workers and family services, and a soup kitchen provides low-cost food. Finally, the chapel itself is used for concerts as well as religious ceremonies.

The exterior shell of the whole complex is entirely clad in copper to emphasise the unity of the various volumes of the building. Copper was an ecological choice, being durable and recyclable, easy to maintain and therefore sustainable. The architects particularly valued its patina, which will develop over time and allow the age of the building to show, giving it a sense of being 'alive'. Local spruce timber is predominant throughout the interiors, creating a warm and peaceful atmosphere.





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#### Bosruck Tunnel, Austria – Riepl Riepl Architekten

The 5.5 km Bosruck Tunnel passes through the Ennstal Alps, connecting Upper Austria with Styria in the south east. The original, two-way traffic tunnel has been renovated and a second, new tunnel built alongside. Now part of the A9 Pyhrn motorway, it is used by around 18,000 vehicles each day.

This impressive engineering feat is announced by new portal structures at both ends of the tunnel. The highly architectonic approach taken is unusual for projects of this kind, suggesting a new building typology in celebration of transport infrastructure. The architecture is thoroughly modern and the design strategy almost theatrical. A series of screens – made up of perforated brass cassettes, profiled and arranged to reflect the verticality of the surroundings – partially conceal buildings and equipment essential to the tunnel's operation and safety.

The rhythms of the vertical brass screens highlight the experience of travellers as they approach and drive straight through the building, via the dramatic 'flying roof' entrance and exit galleries, acting as transition spaces between inside and out.

Brass was chosen for its long-life and durability, including resistance to road salt, following trials simulating the exposure of the material over 30 years.

#### Walmer Yard, London – Peter Salter Associates

A modestly-scaled scheme of four houses, Walmer Yard is intriguing and intimately designed and detailed. Copper is used to clad various roof forms, relying on the expertise of craftsmen to successfully

#### The choice of copper on this prominent building anticipates the natural colour and surface changes that will occur



execute the shingle and standing-seam styles, numerous roof pitches and complex junctions. Seen from above, the pyramidal copper roofs of one house traces its form through its changing gutter systems that span between light-wells and the copper-clad entry canopy.

Two of the houses facing the courtyard have surface-mounted fascia gutters in copper, shaped to falls and forming a cornice to the shutters below. The underside of the gutter forms a belly that projects in front of the window as a hopper, connecting with a copper downpipe that similarly crosses the window on its way to the ground. Rainwater can be heard trickling through the system of copper pipes which acts as a 'weather register'. Each front door has an enlarged push plate in copper as part of a viewing panel assembly, containing door-bell, locking escutcheon and purposemade pull handle in copper and brass which hides a letter plate.

### Maersk Tower, Copenhagen – C F Møller

This major research building was designed as a sustainability landmark, in dialogue with the city and university, acting as a catalyst for positive urban development. The 15-storey tower rests on a series of low buildings containing common functions: three auditoriums, classrooms, canteen, show lab, conference rooms and a 'book cafe'.

The tower's exterior appearance enters into a dialogue with the existing research complex and other surrounding buildings, where red brick dominates. The facade is a grid comprising storey-height window fields that break up the building's substantial scale. These storey-height bands are fitted with over 3,000 vertical copper fins. The choice of copper on this prominent building anticipates the natural colour and surface changes that will occur over time.

A third of the fins move, enabling the facade to constantly change character as they open and close, responding to the sun's path around the building. When activated, each section splits in two with one half remaining static while the other half slides in front of the window glass, limiting heat gain into the laboratories. This approach adds to the building's sustainability credentials, alongside the choice of copper as an exceptionally longlife material that will eventually be recycled.



#### Hverdagsscene (Communal Stage), Norway – HUS arkitekter AS

The project was part of a larger plan to renovate and upgrade Torvet, Trondheim's town square, as a whole. The architects' vision was to create a new, lively space focused on activity rather than form – a space bursting with people and life.

The stage itself is multifunctional without any dedicated use and is dominated by the main attraction – the cylindrical stage 'loft'. With a skin consisting of perforated and patinated copper, the stage canopy is transformed from its rich green patina in daylight to an animated beacon at night by artificial lighting from the inner circle reflected throughout the screen.

The cylinder consists of three layers: the inner reflective surface is polished stainless steel with a random pyramid pattern; the middle screen is copper with clear lacquer to keep its natural colour over the years; finally, the outer skin is made of hand-patinated green copper. The two copper layers are perforated for transparency in a random pattern of hexagons of varying sizes. Between the middle and inner layers, multi-coloured LED lighting is arranged in five height zones, facing inwards. Between the outer and middle layers, on top of the structure, LED wall-washers face downwards.

#### **Further information**

The Overall Winner, Commended projects and a Public Choice Award will be announced later in the year. More information and images of the shortlisted projects, all the other entries and previous awards can be viewed at copperconcept.org/awards



VENDSYSSEL THEATRE HJØRRING, DENMARK

# Breaking the fourth wall

Designed as a 'city within a city,' Vendsyssel Theatre in Hjørring, Denmark, is also a new corten-clad cultural landmark where performers and audience members exist in close proximity. Stephen Cousins reports



ike an actor preparing to get into character before going on stage, there are two very distinct facades to Vendsyssel Theatre in Hjørring, Denmark. Approach the building during the day and you will see elevations clad in a mixture of weathered brown corten steel and frosted glass over pastel hues of green and pink.

Visit at night, and the corten steel disappears entirely from view, consumed by the darkness, while the glass comes vividly to life, illuminated by red and violet LED light.

This dynamic juxtaposition reflects the intent of lead designer Schmidt Hammer Lassen Architects (SHL), to create a building that manifests itself as a "new living organism in the cityscape", which is subject to constant change, both aesthetically and in use.

It is also a radical response to a once-in-a-lifetime brief to deliver Denmark's first newly built theatre outside of the capital Copenhagen in over a century, a modern cultural facility that also had to integrate with the local architectural tradition.

Rasmus Kierkegaard, associate partner and head of concept development at SHL comments: "We had to stop and think, what does it mean to design a cultural building like this which is so rare, especially The corten steel's natural patina and matt surface closely matches materials found on old buildings surrounding the theatre



in Denmark. In the past, people tended to express the cultural power of theatre in architecture, today we are in a completely different world, so we had a lot of thoughts on what that might mean. We also had to take into account the fact that Hjørring is a holiday location, in the northern part of the country, and not necessarily associated with theatre and culture."

The 4,200 m<sup>2</sup> building is conceived as a "theatre and experience house", a multifunctional complex with a ground floor concert hall, 'black box' theatre, a rehearsal hall, and a 430-seat flexible hall able to switch between an 'in-the-round' theatre in the mode of Shakespeare's Globe in London, and a theatre with a more conventional layout with the stage at the front of the auditorium.

The ground floor also accommodates a spacious foyer with a cafe, backstage area, a workshop and dressing rooms. The first floor provides office, admin and technical support space.

The designers took a pragmatic view of culture as an opportunity and experience for all. Therefore, space has been created for both scheduled and ad hoc events in a plaza at the front of the building, inside the foyer and on a grand staircase, where visitors can choose to be spectators or even participate in activities.

#### Miniature metropolis

Another design concept is the notion of creating a "city within the city" by dividing the building into a series of separate cubic volumes, connected by generous circulation and meeting areas, similar to the streets and squares of a city.

Actors and staff are able to flow between the different blocks, as easily as blood in an artery. The theatre's location, between the main train and bus stations and a main shopping area, encourages the general public to pass through from one side to the other, and maybe stop to meet or buy food at the cafe.

Creating a microcosm of a city made practical sense in terms of the building's internal logistics – exploding the large volume into cubic blocks helped streamline pathways for the complex services for electrics, air conditioning, lighting etc.

The less imposing massing helped merge the theatre into the local urban context, says Kierkegaard: "Had we designed the theatre traditionally, as single volume, it would have been very dominant compared to the site and the surrounding buildings. Breaking the



form down into cubic blocks allowed us to create a more satisfying composition that blends much better into the cityscape."

#### A building that manifests itself as a new living organism in the cityscape

SHL wanted to blur the boundaries between publicly accessible areas and more traditional theatre functions so that spaces interconnect to bring actors and audience members into closer proximity.

It's possible to visit during the day and see actors and technical staff moving stage sets around, and performers can glimpse the public from their lounge on the top level. All the major halls can be opened to the foyer, while the use of glass and windows in different rooms creates visual connections.

"The client had a very different approach from the traditional split between actors and the audience. We were very inspired by that and tried to open things up to enable the public to see some of the things that go on backstage," says Kierkegaard.

Increasing levels of transparency enabled more light to enter the building. Glass curtain walls running along the entrance allow large amounts of daylight into the foyer and cafe area, which is topped by a long skylight.

#### Innovate & integrate

In terms of the theatre's external appearance, the designers saw the need to dare to be different while maintaining a focus on the city's existing qualities. The rusty reddish-brown corten steel is an

#### ABOVE

The 'black box' theatre space

#### LEFT

Frosted glass over pastel coloured walls provides a soft contrast with the corten steel by day, but glows at night lit by LEDs



#### MINIMAL SHADOW

Several tests were done on the glass facade to minimise bearings and reduce visible shadows

#### **PROJECT TEAM**

Architect: Schmidt Hammer Lassen Architects Client: Hjørring Municipality Realdania Local architect: Arkitektfirmaet Finn Østergaard Engineer: Brix & Kamp Landscape architect: LIW Planning Aps Acoustic consultant: Gade & Mortensen Akustik unmistakable contemporary material, yet its natural patina and matt surface closely match materials in surrounding old buildings. The steel will become stronger as the surface oxidises to form a protective layer more resistant to wear and tear.

The illuminated elevations are a modern twist on the bright-coloured signage seen in London's West End, New York's Broadway, or the Moulin Rouge in Paris. In contrast, during the day the pastel colours behind the glass mimic those seen on existing plaster and brick facades in the surrounding area.

"We wanted to create a modern expression with its own architectural language, rather than simply imitate the surrounding city; something totally different that would also be recognisable as a theatre, not another typology like housing or an office block," says Kierkegaard.

The sharp corners where the glass and corten steel come together

were particularly tricky to detail. The metal panels have a very thin profile, but the frosted glass panels are thick and incorporate a void with colour-changing LED lights sandwiched in between.

Several tests and mock ups of the glass facade were required to reduce the size of the bearings to minimise the amount of shadow visible on the coloured walls.

#### **Aesthetics & acoustics**

Vendsyssel Theatre is envisaged as a cultural hub, a meeting place of people of all ages, and a place to nurture local youngsters wanting to excel in theatrical art. Hjørring has a strong tradition for theatre, particularly theatrical experimentation and a thriving scene of small amateur theatre clubs.

Each hall employs a different aesthetic and acoustic approach. "Just as in the city each house has a different attitude and atmosphere," says Kierkegaard. The flexible main theatre is all black inside with a shifting pattern of triangular panels on the walls that conceal perforated acoustic absorbers.

During the transformation process from a round theatre with a central stage into a semi-circular theatre with a stage at one end, sophisticated technical tricks are required to lower a section of seating into the floor then cover it over. According to the architect, designing the theatre to function in both modes was a challenge in terms of the spatial geometry and configuring the theatrical machinery, sound and lighting equipment for each mode.

The curved end of this theatre juts into the lobby space and features wooden benches carved into its lower level. In the future it can be used as a screen to project images and films onto.

The music hall's acoustics are specially customised for classical music and it has a much lighter interior with projecting timber blocks lining the walls. On one side of the hall, the lower part of the wall is open to reveal pink LED lights slotted behind the facade.

SHL's innovative approach to theatre design, which splices together ideas of the theatre as a living organism and a microcosm of the city, has proved a major hit with the public. Since the theatre opened in January it is already a popular social hub and all shows for the current season have sold out, spurring on actors to experiment even more with their craft.

# Changeable weathering forecast

Ian Sutherland from Benchmark by Kingspan discusses how the use of corten steel can create a facade that will change over time to provide visual interest for years to come

Gontrolling the interaction between the natural world and the built environment is one of the most fundamental concerns for designers and architects. In most cases, this simply means ensuring the elements are kept out. Building facades, however, present an opportunity for much greater interplay and experimentation. Through the use of corten steel, architects are increasingly harnessing the weathering process, creating vibrant canvasses which naturally change over time.

#### **Composition for change**

Corten, or weathering steel, derives its unique character from a carefully balanced composition – incorporating low alloy elements, such as copper and nickel, during the smelting process. As with all steel, when exposed to the natural elements the surface of corten metal oxidises and forms a patina giving the sheets a distinctive "rusted" look.

The oxide layer is porous, causing it to retain moisture. In standard steel products, this will inevitably lead to further corrosion over time. The alloys within corten steel, however, help to form secondary layers which are resistant to water ingress and help to limit further corrosion of the metal. As a result, it can be used in outdoor applications without the need for a protective paint layer.

Much like the changes the autumn leaves are currently undergoing, when the patina first forms it takes on a yellow shade. If the corten is left uncoated, this colour will gradually shift to a vibrant orange before settling to a dark red after several years of exposure. The speed of the colour transition is dependent on the frequency of wet and dry cycles the steel undergoes.

#### Constructing a corten timeline

The American Society for Testing and Materials first began conducting tests to clarify the benefits of incorporating a low percentage of copper and phosphorous into steel in 1916. Building on this research, United States Steel began testing its own steel and alloy composites in 1929 and in 1933 it patented Cor-Ten A (subsequently joined by Cor-Ten B). Corten products took their name from an abbreviation of two of their main properties – corrosion resistance and tensile strength. These benefits, in addition to their relatively cheap pricing, originally saw the materials used in a variety of industrial applications such as rail carts in collieries.

Eero Saarinen is often credited as the first designer to make use of weathered steel within an architectural context. In shaping the headquarters for John Deere, an Illinois based farming equipment manufacturer, Saarinen wanted to create a building which reflected the rugged, honest nature of the men who'd formed the company. His solution was a modernist design, blending glass with a corten steel frame which would develop a "deep hue, similar to that of the oak trees" which surrounded it.

Since then, corten steel has been used in an increasingly wide variety of applications, from shipping containers and bridges to garden furniture and iconic sculptural pieces such as the Antony Gormley's Angel of the North. The material can be incorporated within a structure in a number of ways, but one of the simplest and most popular remains its use as a rainscreen facade.

#### **Rust-ic facades**

Corten rainscreen facades are available in a wide range of sizes and styles. Corten steel is non-combustible and has excellent tensile strength – allowing them to be fitted in long lengths. The panels work particularly well with secret fixings which maintain a clean aesthetic and maximise their visual impact.

When specifying corten facades it is important to consider the potential



#### AUTUMN HUES

If the corten is left uncoated, its colour will gradually shift to a vibrant orange before settling to a dark red



#### CONTRASTING

The corten facade of the extension to the Henry Moore Foundation provides contrast with the traditional style of the original archive building © Hufton+Crow downside of this unusual medium. Run-off can cause staining on surrounding materials, so careful planning of guttering and drainage channels is vital. Powder coated cladding can also be used to recreate the look and feel of the material where use of actual corten proves challenging – for example, in sub-tropical environments or for low-level applications where clothing could be marked.

#### Stand out from the crowd

Corten-clad buildings have a high visual impact that evolves and then settles into the landscape. Perhaps one of the most iconic examples in the UK is the award-winning Broadcasting Tower in Leeds, which won the 2010 Best Tall Building in the World award by the Council on Tall Buildings and Urban Habitat. Designed by Feilden Clegg Bradley Studios, 9200 m<sup>2</sup> corten steel hook-on cassettes were used to create the distinctive facade with its cantilevered projections.

The colourful, industrial appearance can also be used to great effect in refurbishment or extension applications. For example, at Kennington Park in London, architects Carey Jones utilised corten rainscreen facades as part of the refurbishment, conversion and extension of a Victorian warehouse.

The cladding was installed as part of a new, four storey entrance unit to Chester House, which now offers Grade-A office space. The material reflects the building's rich industrial heritage while, through its appearance and modern design, simultaneously providing a clear visual reference point to draw visitors from the forecourt into the main entrance area.

#### Under control

Corten structures always promote a good deal of debate, both in architectural circles and among the general public. As with any distinctive facade material, corten specifications require considerable thought and planning, however, as a growing number of projects have shown, when used well it can deliver truly iconic buildings which will continue to change and surprise over time.

Ian Sutherland is area sales manager and chartered architect at Benchmark by Kingspan

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# **Rolling out the benefits**

Darren Tutt of the Lead Sheet Association looks at the dos and don'ts of working with rolled lead sheet that will enable architects to get the best out of it

R olled lead sheet is a beautiful material to work with, and the Lead Sheet Association (LSA) spends a lot of time supporting and advising the architectural community to ensure they get the best out of this product.

As well as the obvious aesthetic merits of lead, you can also expect tremendous longevity from a well-installed lead roof. Its life cycle costs and green credentials – it is fully recycled in the UK – are further benefits.

However, to make sure you get the longest life out of a lead roof there are a few steps that need to be followed. Here are our key tips to get you started.

### Ventilation – the key to a long-lasting roof

Lead roof and cladding ventilation is one of the most common design flaws dealt with in the LSA's technical department so we can't stress enough how important is to get the ventilation detail right.

The LSA recommends the use of a ventilated warm roof for most new roof details as it allows through ventilation above the insulation to disperse any moisture that may percolate through the vapour control layer. Although recommended, it is usually difficult to achieve a 100 per cent effective vapour control layer and without ventilation, any moisture penetration could be trapped in the insulation area.

When looking to renovate existing leadwork, the underside of the old lead will give an indication as to whether there has been a condensation problem. If corrosion is minimal, the existing roof construction will usually be satisfactory for new lead sheet, provided that there is to be no change in the use or heating levels of the building in the future for the life of the lead sheet.

#### Definition - flat to pitched

A lead roof changes from flat to pitched at 11 degrees; joints across the fall become laps instead of drips and the lead is nailed directly to the substrate. The length of lap required is related to the roof pitch,



however, a 75 mm vertical lap must be maintained at all times. The LSA would recommend that a minimum fall of 1 in 80 be used for any flat roof design.

The joints used in the direction of the fall may be wood cored rolls, hollow rolls or welts and the size of each bay is limited in relation to the thickness of the lead sheet used. Bays are secured in position with two rows of copper or stainless steel nails at the top of each sheet, and in the top third of an undercloak if wood cored rolls are used.

The lap length is related to the roof pitch and always measured from the lowest fixing. However, a 75 mm vertical lap must be maintained at all times.

The substrate must always be a fully supported roof construction which conforms to the current Building Regulations, and the recommendations of British Standards 5250, 6229 and 6915.

#### The importance of good guttering

A well-designed lead gutter will help to minimise the chance of water ingress. Gutters should be designed with a minimum fall ratio of 1 in 80. Lead-lined gutters are used where a flat or pitched roof

BS EN 12588 code no	Maximum length between drips (mm)	Maximum overall girth (see section above) (mm)
4	1500	750
5	2000	800
6	2250	850
7	2500	900
8	3000	1000

#### **GUTTER DIMENSIONS**

The maximum length and girth for the five codes of lead sheet used for linings of box and tapered gutters



#### RECOMMENDED

The LSA recommends the use of a ventilated warm roof for most new roof details as it allows through-ventilation above the insulation to disperse any moisture abuts a vertical wall, where two pitched roofs are joined by a horizontal valley gutter and between adjacent areas of lead roofing. To allow for thermal movement, lead gutter linings must always be divided into separate pieces (bays).

As with all lead sheet installations thermal movement must be accounted for

#### You can expect tremendous longevity from a well-installed lead roof

when specifying the dimensions of the gutter. To allow for thermal movement the LSA recommends that gutters are divided into bays with the size of each bay dependant on the code of lead sheet used.

The table shows the maximum length and girth for the five codes of lead sheet that are used for linings of both box and tapered gutters.

By following these guidelines, you and your clients should have peace of mind and a roof that stands the test of time. All the technical details referred to in this article can be found in 'Rolled Lead Sheet – The Complete Manual' which refers to the use of Rolled Lead Sheet BS EN 12588. The LSA has also recently developed an app that brings together some key details that can be easily accessed.

Darren Tutt is technical officer at the Lead Sheet Association





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# The art of facades

Simon Gregory of Proteus Facades looks at how advances in facade materials and finishes are allowing architects to 'sell the dream' to clients of integrating art and design in our cityscapes, as demonstrated on a new research unit in London

Ver the last few years there has been much discussion about how building design is being influenced by art. As a result, art, design and architecture are becoming more closely integrated and the introduction of new facade materials and finishes is helping with this. Extending the options available to designers with finishes such as patinated brass and weathered steel gives them an ability to engage the observer and make them look beyond the basic 'four walls and a roof'.

If we pause and examine the facade of any building we pass by, inhabit, work or live in we might see that architecture can often be a form of visual art. An example of this is Imperial College's new Molecular Sciences Research Hub in London. The striking perforated panels in were manufactured in TECU Brass with a Capisco patinated finish, helping the designers create a dynamic aesthetic.

#### Molecular facade

Perforated brass cladding with patination applied by Capisco was chosen for the Hub because the designers Aukett Swanke felt it reflected the molecular science that takes place inside. Alongside this, the designers chose a combination of other materials for the facade including concrete and glass curtain walling. They specified Capisco's CAP 55 finish for the Proteus SC perforated panels early in the design process because they were looking to complement the flat bare concrete facade and glazed elements.

The CAP 55 effect was hand-applied, giving the perforated panels an enhanced flow, feel and texture. The appearance of the panels changes depending on the level of sunlight and the angle at which they are viewed from. The end result is a strikingly beautifully building that appears to move and shimmer across the visually flat facade beneath. In that respect, it achieves what the designers set out to do – integrating art, design and architecture to create a building that inspires the viewer.



This design theme flows to internal areas, too, with the perforated panels seamlessly transitioning through the entrance glazing to form a striking feature within the atrium. This creates an impressive solar composition, accentuated by spotlights, when visitors cast their eyes upwards.

Commenting on the development, Elias Niazi, design principal at Aukett Swanke, said: "The contrast between the concrete, glass and patinated brass couldn't be more complementary and, with it, aesthetically pleasing to the eye. The visual outcomes on this project have exceeded expectations. The perforated patterns on the brass panels with artistic patinations add a sense of mystery and mirror the innovative research works carried out inside the building."

The project also included the manufacturing of the window flashings, again in a matching patinated finish. Initially conceived as a simple window flashing, a real technical challenge had to be overcome – the profile of the window reveal is a narrow box that tapers across the width to make it appear as though the window

#### IMPERIAL COLLAGE

Perforated and patinated brass panels complement concrete and glass on the facade of Imperial College's new Molecular Sciences Research Hub, designed by Aukett Swanke



#### PICTURED

The perforated patterns on the brass panels add a sense of mystery to the facade Images courtesy of Aukett Swanke www.aukettswanke.com blends into the concrete. An ability to overcome this challenge is an indication of just how adaptable metal facades really are. For example, the maximum depth of the window reveal was too large for traditional manufacturing processes and so a multi piece flashing that could be stud-welded and bolted together was designed. This avoided any distortions that would have resulted from traditional welding processes, while creating a bespoke element that could be easily installed on site.

The perforated panels were developed in conjunction with the supporting composite panel behind. These had a maximum capacity to support the perforated panels, with the required cavity zone, at 750 mm centres. A perforated hook-on panel system was used, set off from the  $125 \times 50$  mm mullions. The panels encompass a PPC black stainless steel bird mesh, carefully integrated into the back to ensure there was no visual impact to the panel face.

The Molecular Sciences Research Hub incorporates technical and laboratory areas clustered around a full height atrium, and the striking new hub forms the centrepiece of the Imperial West campus. Laing O'Rourke commenced construction works at the end of 2014 with completion in 2016. The facade was installed by its in-house team, Laing Facades.

Recent advances in metal facades mean that designers are choosing to show off the construction and materials rather than masking them, and Imperial College's Molecular Sciences Research Hub is a good example of this. It also shows that an increasing number of building designers are creating structures that give a nod, externally at least, to art.

In some respects, architecture has always done that, from the elaborate carvings of medieval stonemasons, through to stained glass used by Victorians. They all have one thing in common, which is that the quality of materials should be emphasised in design, not hidden away. Advances in metal cladding allow building designers to do just that, ensuring the ongoing vibrancy of our cityscapes and enabling architects to 'sell the dream' to clients of the next awe-inspiring design.

Simon Gregory is sales manager at Proteus Facades





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# Sustained support for aluminium glazing systems

Mark Robinson of Sapa Group puts the case for aluminium as one of the most versatile as well as sustainable materials available to specifiers, explaining why the metal is increasingly featuring on the UK's cutting-edge architectural projects

hain of custody' is a term normally used in relation to timber products, by manufacturers seeking to show that their wood comes from 'well managed forests' – and to distance themselves from illegal logging and other dubious practices.

Some specifiers might be surprised to learn that there is another material available to them which is arguably even more environmentally-friendly than timber; as well as stronger, more versatile and 100 per cent reusable at the end of a building's life. Then, rather than being burnt as biomass, it can be reworked in the same manner as newly extracted material.

Aluminium is initially produced from bauxite, one of the planet's most plentiful resources, and turned into everything from household goods to cars and cladding panels. It is in doors, windows and curtain walling, though, where building designers can access the biggest benefits from aluminium: including squaring the 'recyclability circle'.

A drop-off in demand from China has meant scrap metal values have eased in recent times, yet nearly all waste aluminium is routinely recovered and reused. In fact it has been forecast that the world could reach the point, within a few decades, where no new bauxite mining is necessary.

Already, where consultants and their clients are targeting the top BREEAM ratings, some aluminium system manufacturers can offer them certification on ingots which comprise 100 per cent recycled metal. Embodied energy is also significantly reduced and at the end of a building's working life, all of the aluminium will be recovered and the process begun again.

Meanwhile there is no reduction in aluminium's amazing strength to weight ratio and – unlike PVCu – extrusions do not need to be cloaked with virgin material. Whether anodised or polyester powder coated, aluminium frames offer a very long, low maintenance life as well as strong aesthetics.

#### Educating the market

The education and student accommodation markets are proving to be very strong sectors at present for those able to provide top-performing aluminium glazing systems, with one recently completed project in Nottingham vividly illustrating the multiple benefits to the solutions available.

Located in the city's Eastside district, the Discovery Building is part of the University of Nottingham's BioCity development and has been part funded by the East Midlands Development Agency, working with Nottingham City Council and the D2N2 Local Enterprise Fund, which contributed £6.5m. Willmott Dixon was the main contractor with locally based Bonam and Berry the specialist fabricator, supplying and installing the fenestration package.

Apart from its scale, the four-storey bioscience building is prominent because of the sculpture across the main facade whose aluminium tubes carry fibre-optic lights controlled by NASA measurements of solar activity. Forming the backdrop to this, Sapa's NRGY 62 system had to be engineered to take the large loads created by long spans and very heavy, acoustic glazing units.

Project architect for CPMG, Matt Greenhalgh, commented: "The system proved very adaptable while Bonam and Berry were proactive in coming up with ideas to realise our aspirations for the glazing. Because of the wide, large format units and the heavy glass, the system provided extra structural support or diagonal bracing; while for the glass-toglass junctions at high level, Bonam and Berry used a special rod to tie the



Aluminium frames offer a very long, low maintenance life as well as strong aesthetics



transoms together, which provides a very attractive, bespoke finish."

The main area of glazed facade is 45 metres long and 15 metres high, within which NRGY 62 fixed lights measure up 4,000 mm x 1,500 mm tall. The 34 mm thick Saint-Gobain solar control glazing, supplied by System 3, delivers a centre pane U-value of 1.0 W/m<sup>2</sup>K, meaning the system can perform to Passivhaus standards.

During the early stages of the project, one of Sapa's facade specialists worked alongside Bonam and Berry's designers to help devise a solution to how the very high loads from the centre of the transom could be transferred back to the mullions. Consequently, bespoke 45 degree brackets were manufactured, which were bolted back to the system members, all concealed within the spandrel area.

Whether fulfilling the aesthetic design aspirations for different developments or matching the most challenging environmental and performance standards, aluminium systems are proving themselves capable of keeping up with the pace of change.

Mark Robinson is technical director at Sapa, part of the Sapa Group

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# The sky's the limit for zinc

Jonathan Lowy of VMZinc explains how Zinc can now be specified far more easily for a wide range of projects, whether it's for a transformation of a tower block or creating a vibrant interior

ast your mind back 15 years and zinc roofing, cladding and rainscreen projects were still relatively uncommon. Today, however, the variety of projects in which it can be seen is almost limitless – from schools and hospitals to retail, social housing and self-builds. The material is now seen so regularly that, for many, it has become instantly recognisable.

The ability to specify zinc in a variety of colours adds a fresh context to its use. Sustainable, pre-weathered colours and distinctive, highly evocative shades are available from manufactures. These lend themselves to both rural and urban environments and can provide a level of colour retention which sustains the 'as-installed' appearance. For older buildings, often of no architectural value, upgrading can also introduce a highly contemporary visual aesthetic.

#### Zinc's muted colours and texture provide a step away from the neutral tones favoured for so long

A good example is Cambrian House in the centre of Shrewsbury where, as part of a  $\pounds$ 3m renovation, an interlocking panel facade was specified in conjunction with a standing seam and flat lock panel roofing system. This has enabled a dreary 1960s office block to be converted into what has become a highly sought after apartment building.

Zinc was installed to the principal elevation and existing concrete frame, with contrasting dark and engraved finishes being used to complement oak and render in the creation of 17 apartments and penthouses.

In much the same way, the regeneration of Friars Mill, Leicester's oldest wool mill, came at a time when the building had lain





#### TOP

Abdullah Gul University, Kayseri, Turkey

#### BOTTOM

Offices for La Chocolaterie Levallois-Perret, Isle de France, Paris

derelict for many years after a fire destroyed the roof. The Grade II-listed building was considered ideal for creation of high quality, creative workspaces within a £4m conservation framework. Externally, Levitate Architects' design saw new services housed in a zinc and glass extension in order to reduce impact on interior spaces. The project establishes a sustainable and appropriate use for buildings previously considered to be at high risk.

The scope to create curved profiles and complex detailing has made zinc a highly practical option. Projects as diverse as Red Box Design Group's transformation of Newcastle College's Parsons Tower and de Rijke Marsh Morgan's Hastings Pier redevelopment (shortlisted for this year's Stirling Prize) show its effectiveness in both modern and traditional designs. Domed, natural zinc roofs spanning covered seating areas of the £14.2m pier are particularly eye catching and complement facades, all of which will take on the natural patination for which zinc is renowned.

At Parsons Tower in Newcastle (pictured

on previous page), zinc played a pivotal part in the rejuvenation of an ugly tower block, the visual impact of which was all the more obtrusive given its position on one of the main approaches to the city. Being such a dominant feature of the local landscape, a key element of the design brief was to transform the building into one with a distinctive and positive visual aesthetic. This was achieved in large part by extending the facade into the roofline using two contrasting shades of zinc. The overall effect has been to provide a thermally efficient structure which extends the usable life for student accommodation by at least 40 years.

Zinc is less well known for its use in interiors but this too is beginning to change with specifications for areas such as hallways, stairwells and hotel foyers. Its use as an intrinsic element of design can also be seen in restaurants, bars and public buildings such as museums and libraries.

Zinc's muted colours and texture provide a step away from the neutral tones favoured for so long in such environments and not only create a greater sense of identity but can add sensory value too. They blend well with wood, stone, ceramic, slate and fabrics in the creation of highly contemporary and atmospheric settings. With lengths of up to 2.5 metres and the light weight and resilience of panels there is no compromise in terms of fabrication or installation, available time for which can often be very limited.

Zinc cassettes have a simple yet innovative fixing system that makes assembly and disassembly quick and easy, while bespoke sizes, colours and shapes are now very much the order of the day. The degree of customisation available extends to stamped images and perforation of panels to meet corporate design requirements, to allow for back-lighting and to meet levels of acoustic performance.

The first engraved zinc is also now available for use in construction. It has provided further discernible refinement for the metal and resulted from consultation with more than 400 architects throughout the world. In conjunction with the first BBA approval for both non-vented standing seam structural warm roof and compact roof systems, and availability of BIM objects through NBS Plus, the ease with which zinc can be specified has never been greater.

Jonathan Lowy is operational marketing manager, VMZinc





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# Retrofit

Throughout VMZINC's 180 year old history its products have been used not only to give attractive and durable roofs and walls to new buildings but also to many old buildings needing a fresh exterior. The wide range of VMZINC systems and finishes available provide endless opportunities for the architect.



#### Contemporary copper in Australia



A World Architecture Festival Finalist in 2016, this apartment building designed by SJB, in a prominent Sydney location is defined by its restrained palette of quality materials, including Nordic Copper from **Aurubis**. Commanding expansive views over Sydney Harbour, 10 Wylde Street is a seven-storey contemporary building set in an urban fabric originating from early colonial grand residences and the first apartment buildings in Australia. The northern facade elevated above neighbouring buildings is characterised by its transparency and fineness of detailing. Distinctive copper 'wings' to the rear facade enable small triangular balconies to project from the monolithic masonry, screening them from the south and directing views towards the city and harbour. A subtle pattern of perforations in the Nordic Standard copper screens provides solar shading and privacy from adjacent buildings. Nordic Standard copper was selected as a natural material that will age gracefully. Nordic Standard is produced by Aurubis, part of the world's leading integrated copper group and largest copper recycler.

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#### SSAB launches the greenest portfolio



Metal Solutions have formed an exclusive UK partnership for the sales and distribution of GreenCoat PLX Pro BT manufactured by SSAB, the pioneer and innovator in color coated steel products for exterior building applications. The commissioning of a custom-built coil to coil processes line

allows tailored coil lengths and weights. Metal Solutions are located in Bolton and hold stocks in standard GreenCoat colours in large coil format for processing exactly to customer requirements.

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#### Fastrac coating from Bradite



Fastrac from **Bradite** is a single pack fast drying, high gloss coating which also contains rust inhibiting pigmentation for extra protection. Direct to metal Fastrac is surface dry in two hours and its fast drying time combines with a tough flexible finish which is resistant

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has been used to stunning effect on the new Convention Centre in Baku, Azerbaijan. **BEMO** engineered the standing seam geometry for the 18,000m<sup>2</sup> roof and facade, taking advantage of the thermal bridge free GFK halter and a project-specific top hat sub-construction.

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#### Another Gold Standard from Metalline



Metalline's glazed in Ultima insulated panels have provided a specialist touch to the recently completed Weybridge Business Park in the Borough of Runnymede. The bespoke glazed in panels which feature on the window

surrounds were coated in ppc golden beach metallic and feature a fluted design that met the architects vision for the external envelope of the building. The aluminum outer face was fitted with extruded box sections to give the fluted appearance. Ultima panels are traditionally specified in aluminium with either an anodised finish or in a range of polyester powder coated RAL and metallic colours.

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#### BIM objects added to NBS Library



BIM objects for VMZINC roofing and facade systems are now hosted by the NBS National BIM library. They include build-ups for composite, interlocking, overlapping, flat lock panel and sine wave profile facades and standing seam roofs. Operational Marketing Manager Jonathan

Lowy commented, "We are pleased to be part of the largest and fastest growing library of BIM objects. Any update to those already downloaded is immediately highlighted to the specifier and all can be accessed directly from the NBS plug-in for Autodesk<sup>®</sup> Revit<sup>®</sup>"

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# Full house for Metal Technology at Premier Inn Maidenhead

esign and Build contractor McAleer & Rushe and architect White Ink specified a comprehensive suite of Metal Technology architectural aluminium products at the new, 124-bedroom Premier Inn and adjacent Pearce Building Class A commercial office space in Maidenhead.

The development, on a brownfield site, utilised System 17 curtain walling in both standard capped and silicone pointed formats, complemented with system 5-35Hi+ windows from Metal technology's THERMAL range and System 23 Louvres. The building also featured System 10 and System 5-20DHi+ doors.

System 17 SP (silicone pointed) was used to create a large feature glazed facade delivering an impressive visual impact. The combination of Metal Technology's high-performance curtain walling, windows and doors offered not only a pleasing aesthetic but also structural integrity, weather performance and thermal enhancement.



Metal Technology's System 23 Louvre system complemented the overall appearance while also providing natural ventilation and preventing water ingress.

The discovery of 50 ancient graves was an unexpected feature of the project, with the delicate process of removing the



remains entrusted to the Museum of London. For more information visit Metal Technology's website or contact them by calling.

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#### Introducing Lindab Seamline



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#### Aluminium glazing systems are the future



The UK's aluminium glazing industry is expanding at a rate of knots. A sustainable building material, aluminium-framed glazing systems also offer excellent thermal performance and outstanding contemporary style. Suffolk-based Livingwood is experiencing an

impressive growth curve after opting to become sole manufacturers of Reynaers' cutting-edge aluminium window and door systems. Following £100,000 investment in state-of-the-art CNC machinery, Livingwood operates in sync with Reynaers' software system to manufacture its products to the millimetre.

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# Powdertech Corby celebrates the beauty of metal

Over recent years Powdertech Corby has developed unique ranges of powder coating materials that follow trends in style and developments in technology. Two ofthe company's 'Collections' range make a point of using powder coatings to reflect the natural aesthetic appeal of metal itself, in addition to protecting it from corrosion and abrasion.

Metal, in its natural state, can offer a variety of 'looks' to the designer and architect. Stainless steel evokes a clinical, modern, technological feeling. Lead-dull or spangled zinc can look minimalist or rustic. Copper and brass have a warm and homely appearance. Oxidised copper and rusted iron look vintage, or stylishly 'grungy'.

Evolution<sup>TM</sup>, launched in March 2017, addresses the last of those 'looks' - stylishly and colourfully 'aged'. In the natural environment, oxidation occurs on the surface of metals such as copper and bronze, resulting in beautiful patinas, but the metal itself is



compromised, its strength and inherent properties weakened. Using Evolution powders, designers can achieve stunning effects on metal which is intact and protected. These polyester resin powder coatings create the effect of patination on the surface of the metal and provide excellent weather protection and durability.

Another specialist powder coating range, Anomatch<sup>TM</sup>, enhances the metal with a lustrous sheen, creating an alternative finish



to anodising. Anodised aluminium has a reputation for its 'living' quality, with natural metallic radiance. Anomatch creates the same effect, on aluminium and galvanized steel and the metal has high protection from corrosion and abrasion. Anomatch achieves a homogenous appearance within and between batches of material which is difficult to achieve with anodising, and across different materials which is impossible for anodising.

Where once, powder coatings, in their primary role as metal protectors, firmly hid the underlying metal from sight, the ability to protect and at the same time celebrate the natural beauty of metal has made many more design choices available to architects, designers and fabricators.

Visit the website for more infomation.

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#### Midland Lead ahead of the game



Lead sheet manufacturer Midland Lead is one of the first in the lead industry to have been awarded the new ISO 14001 2015 Environmental Management accreditation by the BSI. With a high commitment to reducing environmental impact, the company received the updated ISO ahead of schedule in December 2016. In a bid to support emissions reductions in the UK, Midland Lead's recent

improvements include investment in a new energy efficient crane, truck upgrades, purchasing five Autogas (LPG)-operated forklifts and replacing halogen light bulbs with LED light bulbs across the factory.

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#### Architects Datafile website



The Architects Datafile (ADF) website is an online provider of past and present products and news items for the architect or specifier. architectsdatafile.co.uk is a one-stop source for all the latest press releases providing any visitor with access to information about products and services that they may require. From the website, you can find links to digital

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#### Senior sets the standard with PURe®



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