COPPER ARCHITECTURE FORUM

Editorial Comment

We make no excuse for giving over a substantial part of this issue to the European Copper in Architecture Awards, the results of which were announced at the end of September. Now in its twentieth year, the 2011 Awards exceeded all our expectations with 66 entries – the highest so far. But more importantly, we often hear from architect-judges and others involved with the Awards that the standard of design is unusually and consistently high for an architectural competition focused on a single material. Clearly, copper brings out the best in architects.

In particular, the 7 shortlisted projects this year, from which the winners were chosen, give diverse displays of the highest quality contemporary architecture and the impact that copper has on modern design. We have already looked in detail at 3 of these projects in recent issues of Copper Architecture Forum but the other 4 are covered here, with the results and judges' critiques.

Away from the Awards, this issue includes the usual wide range of articles and project case studies, each with a different focus including solar energy technology, copper in the environment, new surfaces, detailing and sustainability. We also report on the re-launched and greatly improved website *www.copperconcept.org* which is closely associated with both Copper Architecture Forum and the Awards. This is where you can register to continue receiving your free copy of Copper Architecture Forum and download back-issues.

We hope you enjoy reading this issue and look forward to your feedback and comments.

Editorial Team

Front cover – St Lawrence
Photo: Matti Kallio

Back cover – Roslin
Photo: courtesy of NJM Roofing Ltd.

Copper Architecture Forum, November 2011

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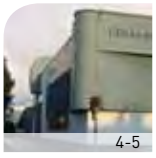
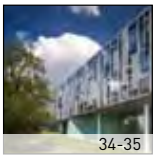
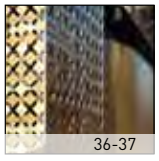
european copper in architecture campaign

www.copperconcept.org

Contact us now. We do want to hear from you, both with your comments on Copper Architecture Forum and suggestions for projects or topics that we can cover in future. Simply email the editorial team or your local editorial panel member, listed above.







CONTENTS

Energy Collecting Copper

The first commercial application of an innovative, fully integrated solar thermal copper façade system is now operating at the new Pori Public Swimming Complex. The solar energy initiative came from the client – the City of Pori – as an urban example of environmental protection and carbon emissions reduction in Finland. The solar façade works in conjunction with roof collectors and this sustainability initiative is supplemented by roof-mounted photovoltaics as well.

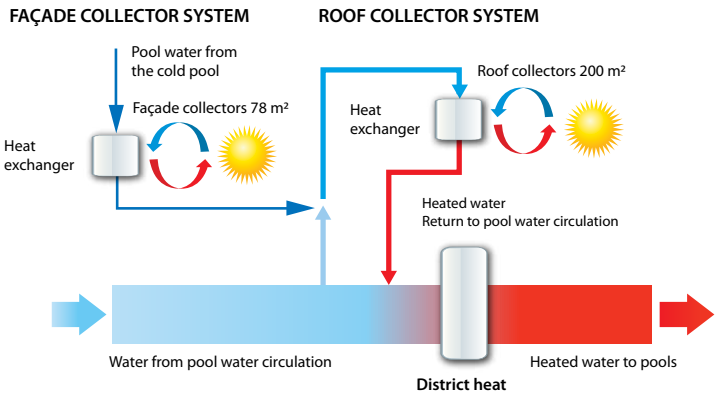
Some 1000 m² of prepatinated copper is used as the main material for all four facades, applied in horizontal bands of panels and elegantly handling the curves which are central to the design. It was considered important to maintain a consistent appearance for all the copper panels, although those on the south elevation are equipped with the fully-integrated solar thermal function behind (shown light blue on the elevation drawing).

South Elevation with solar collectors shown in blue.

Together, some 80 m² of façade collectors, working in conjunction with 200 m² of roof collectors, provide around 120 000 kWh of heat – as much energy as six average family houses use in the cold Finnish climate annually. This provides about 5% of the annual heat demand of the Swimming Complex. The solar system is used to preheat 4°C cold water coming from the cold pool. This preheated water is then mixed with a larger amount of water coming from the main circulation. The mixed water then passes through the roof collectors before joining circulation from the district heating system.

In summertime, when the Swimming Complex is closed and an open pool used instead, the combined solar thermal system is enough to maintain the pool water temperatures at normal levels without any additional heating. This enables the pool to remain full throughout the year, rather than have to empty and refill it, saving substantial amounts of water. In future it should also be possible to keep the Swimming Complex open for use throughout the summer. Copper is especially well-suited to solar thermal façade systems because it has the best thermal conductivity of all the usual façade and roofing materials. It also enables architectural design freedom with the invisible integration of collectors behind the copper. In principle, any copper surface is suitable – whether prepatinated or oxidised copper or alloys – although there are some differences in energy production.

Solar Heating process flow chart



Architects: Tapio Antikainen, Arktes Oy
Copper Product: Nordic Green™
Copper Installer: KT-Tähtinen Oy
Photos: Esa Kyyro
Text: from an article by Dr. Petri Konttinen

CORPORATE COPPER

Architects Studio Ricatti discuss the design of their Diesel Headquarters, a slick corporate building characterised by copper cladding, in Breganze, Vicenza, Italy.

The new Diesel Headquarters can be defined as a low-rise hybrid building which pulls together different functional programmes including: offices, warehouses, exhibition spaces, an auditorium, a kindergarten, a canteen and a fitness centre – in addition to covered car parking and plant for services.

We conceived it as a real urban project, crossed by streets and articulated into several squares, giving a state of exceptional functional density within the scattered sprawl that characterises the entire region. The result is a small creative 'town' whose community shares working spaces and also common ones, developing the full meaning of working together and sharing different skills.

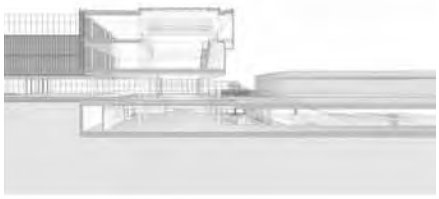
The project deals not only with programmatic and formal issues but also with environmental necessities. The resulting building is particularly sustainable thanks to reduced energy needs, use of renewable resources, recovery of energy and the increased efficiency of the technical systems.

We followed the same logic for the choice of the cladding: we were looking for a material able to ensure sustainability and superlative aesthetic qualities. Copper delivers these attributes far better than any other. Copper cladding led us to stress the formal abstraction that we used in the volumetric composition. Moreover its reddish, vibrant tonality suggests a convincing chromatic dialogue with the surrounding green areas.

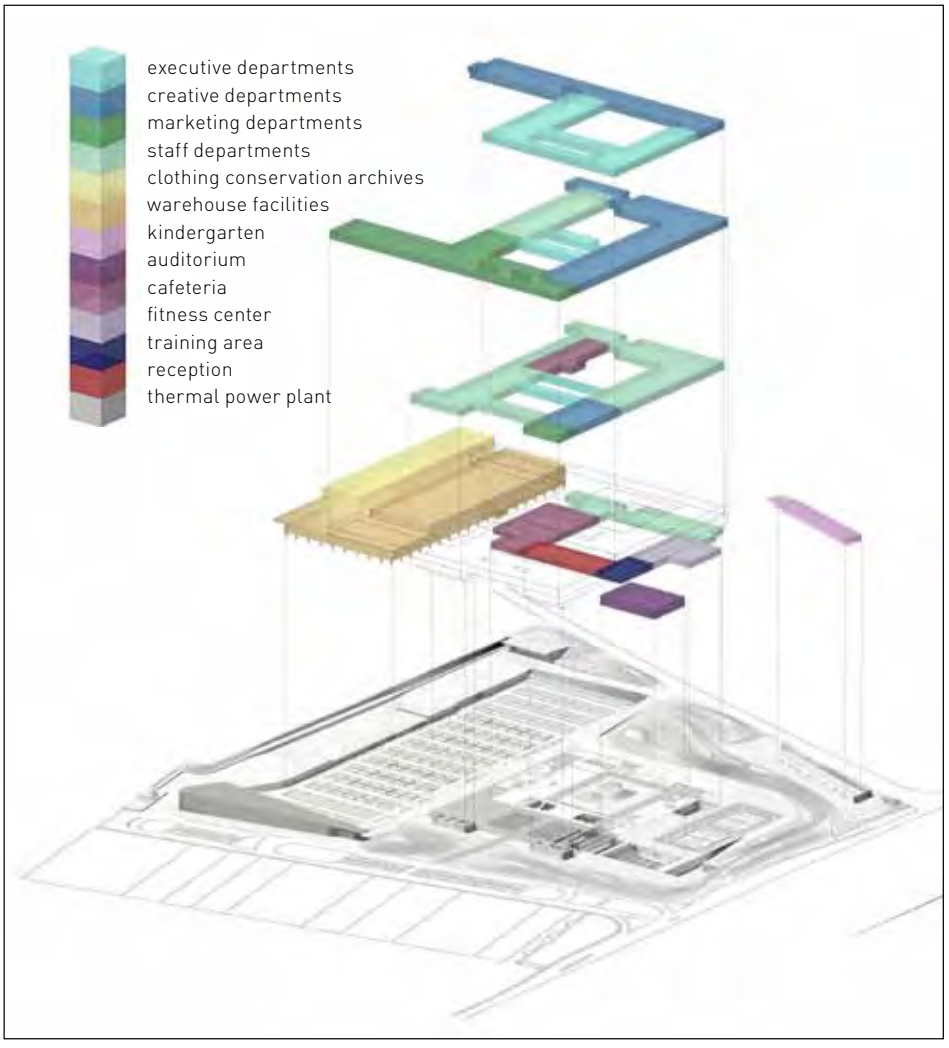
Copper confers elegance, sobriety and a sense of durability: it is an ancient material, whose gradual ageing gives an additional quality. Finally, the potential for recycling and the low emissions of the production process contribute to achieving a highly sustainable cladding solution.

Architect: Studio Ricatti
Copper Product: TECU® Classic
Copper Installer: AVZ – Noventa Padovana
Photos: Daniele Domenicali

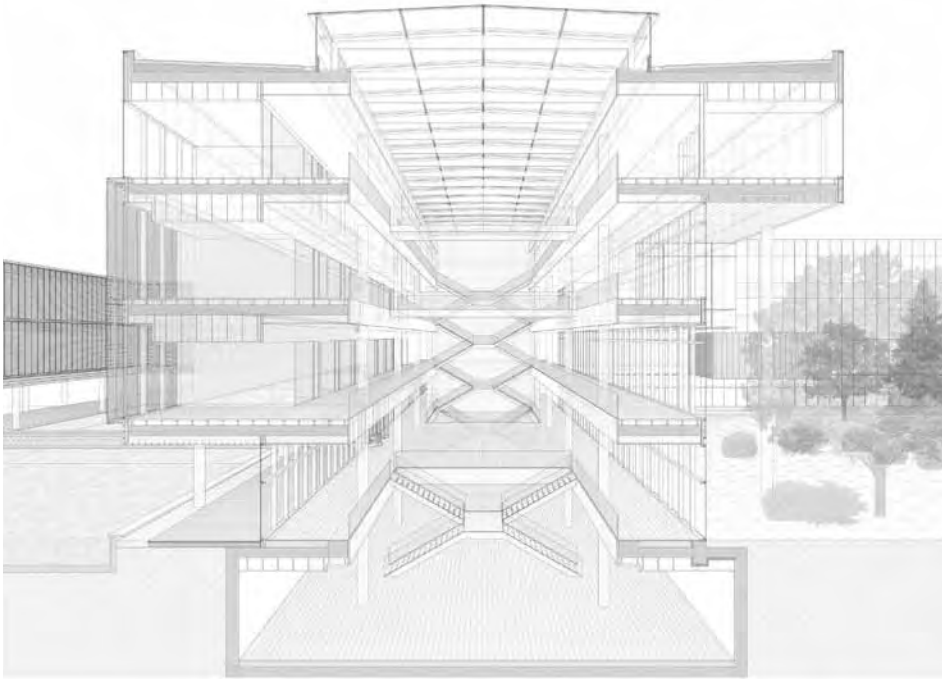
CORPORATE COPPER – Diesel Headquarters



The Foyer, Auditorium and Showroom



The Reception



Sven-Harry's Museum

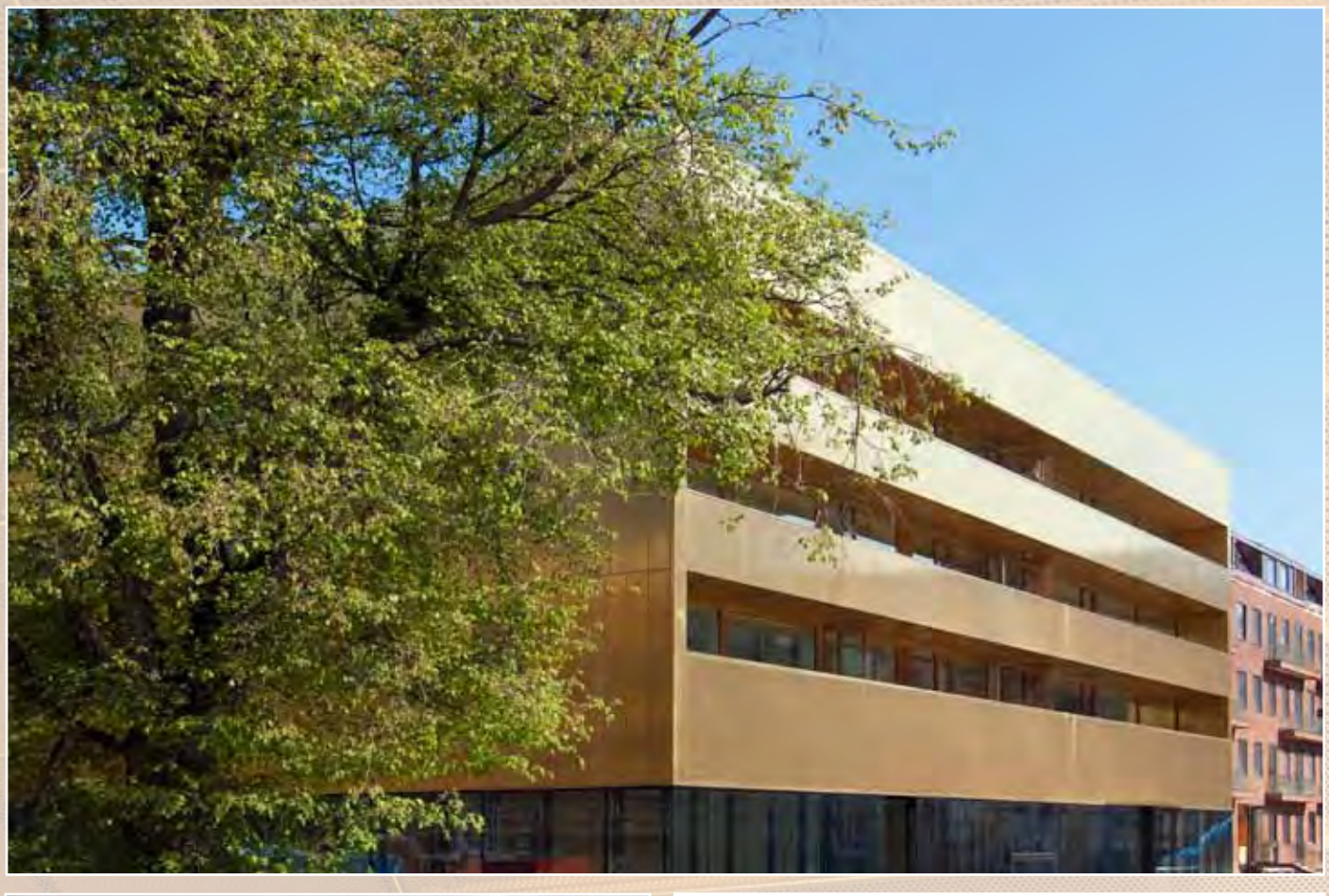
Conceived as a shrine, securing its valuable content behind solid sheets of metal, stands the museum for Sven Harry Karlsson next to Vasaparken in Stockholm. Karlsson is the founder and owner of Folkhem, a housing company operating mainly in and around Stockholm. The museum fuses his lifelong passions for art and architecture.

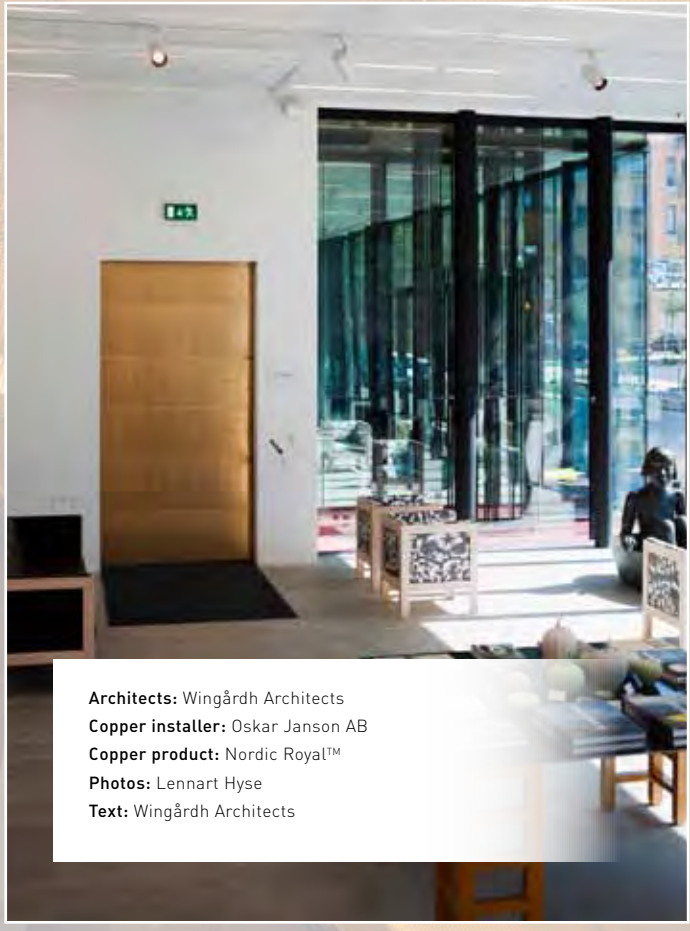
The double functions of the building – housing and museum – work independently of each other, with separate entrances to Eastmanvägen. The ground floor houses galleries, a café and exhibition rooms. The exhibition spaces are placed in the basement and core, with housing in the perimeter on the upper floors. The building in crowned with a penthouse, where the Karlsson collection, primarily focused on Scandinavian 20th century art, will be placed in mimicry of the interiors of his old mansion.

A tower for the arts

Architect Gert Wingårdh explained the design concept: *"The Museum relates to its surroundings and context like a piece of precious metal jewellery with a sparkling diamond on the top. Rigorous on the outside but with an interior full of surprises. Art, food, living and culture all meet everyday life on the street."* The program and disposition is a response to the plan for the area. It stated that a new building on this prominent location could be five stories tall plus a retracted top floor, with a public content on the lower floors. This 40/60 proportion was transformed into a public ground, centre and top, which enabled a range of daylight in the exhibitions.

This multi-purpose building in the heart of the city demonstrates different manifestations of a single material covering – a golden alloy of copper. The penthouse replicates the form of Karlsson's beloved home in Ekolmsnäs but is wrapped with perforated cassettes in front of metal-clad façades and roofs – all in the golden alloy, providing material continuity. Lighting in the void between creates dramatic effects through the perforated golden metal at night. Below, the main facades are clad with storey-height golden alloy cassettes of varying widths, and perforated panels with lighting above are used extensively for ceilings both inside and out. Some internal walls and doors are also clad with the alloy.





Architects: Wingårdh Architects
Copper installer: Oskar Janson AB
Copper product: Nordic Royal™
Photos: Lennart Hyse
Text: Wingårdh Architects

Golden Copper Alloy

This material is an alloy of copper with aluminium and zinc, which is very stable and keeps its golden shade over time. It behaves differently to pure copper, which develops a dark brown colour with oxidisation followed by its distinctive green patina. The golden alloy has a thin protective oxide layer containing all three alloy elements when produced. As a result, the surface retains its golden colour indefinitely and simply loses some of its sheen as the oxide layer thickens with exposure to the elements, with a matt appearance.

As well as exuding a sense of visual richness and quality, the golden alloy offers outstanding mechanical abrasion resistance, extremely high corrosion resistance and durability as well as excellent stability and material rigidity. The material can be easily cold-shaped and processed using standard techniques. Both leading copper fabricators offer very similar versions of the golden copper alloy.

Golden Christmas Market Stalls

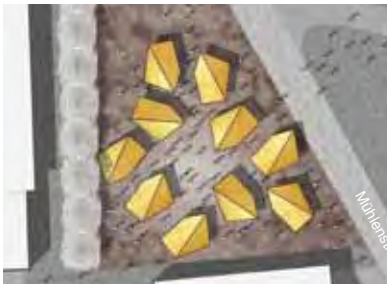
A new concept for Lübeck's Christmas Market

This project received a 'Special Prize' for innovation in a design competition to promote Lübeck as the 'Christmas City of Northern Germany', with the aim of attracting more visitors.

It proposes a series of seasonal, temporary kiosks - each resembling a bevelled amber washed up on the 'shores' of Lübeck's Christmas market. A poetic diversity is intended by sprinkling a number of these stalls within the city, rather than creating a monotonous linearity of cubicles. The multi-faceted shapes of the stalls will generate exciting spaces and alleys between and there are no unattractive backs. The stalls will all open in all directions, communicating with each other and with Lübeck's historic architecture. Their disposition within the city will create expanded entry points to the alleys of the Christmas market leading to a pivotal central square. Like islands within the flow of visitors, the golden shapes create wide and narrow spaces to pass through.

Each 'Golden Christmas Stall' can be subdivided for flexible space allocation. When open, counters are illuminated, giving a clear signal of activity and open shutters become sheltering canopies. Panels of a golden coloured copper alloy clad the stalls in panels, subdivided vertically for ease of erection and transportation. Each panel surface is embossed with a pattern of bubbles giving it a lively texture. As a result, the warm colour and light reflections help in creating a festive feel. The roof and fifth surface is made of translucent polycarbonate, back-lit panels, illuminating the sky above the Christmas market. When the stalls are closed, the light from the roofs is pulsating, anticipating the dawn of the next day.

The first 'Golden Christmas Stall' was built for the 2009 market, a tangible symbol of this new concept, still awaiting full realisation.



Exploring layouts of stalls to generate urban spaces.

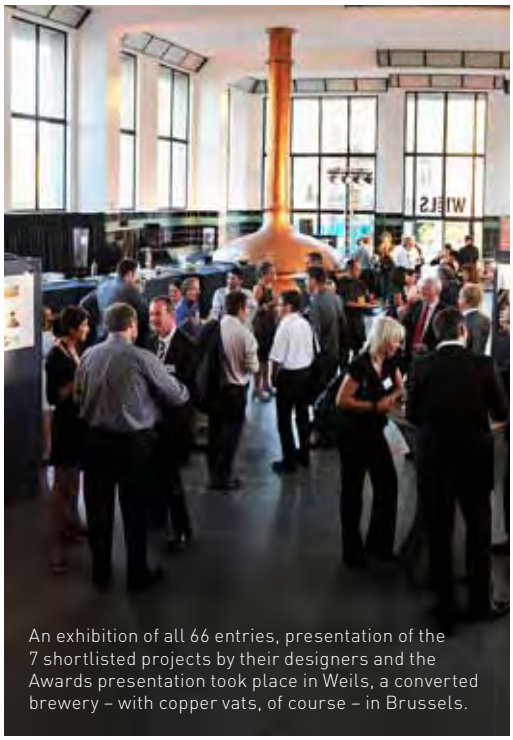
Creating seasonal alleyways and routes into the central square.

Architects: ARCHTM Ingenieure
Copper Installer: Cavier + Sohn
Copper Product: TECU® Gold
Photos: Joern Simonsen / ARCHTM Ingenieure

And the Winner is…

Results of the European Copper in Architecture Awards 15 were announced at a lively presentation event in Brussels on 27th September.

Anu Puustinen of Avanto Arkkitehdit receives the winner's award from Nigel Cotton of the European Copper Institute, watched by event presenter Chris Hodson.



An exhibition of all 66 entries, presentation of the 7 shortlisted projects by their designers and the Awards presentation took place in Weils, a converted brewery – with copper vats, of course – in Brussels.

The expansion and development of these awards over the last 20 years mirrors a fundamental change in the use of copper on buildings over recent years, from a practical roof covering historically, to a highly architectural material for any building element – particularly facades - with endless opportunities for diversity. And the process continues with the copper industry responding to architects' exploration of new forms of expression.

The event presenter, architect Chris Hodson, summarised the status of the awards today: "These are exciting times for copper in architecture. The awards really belong to European architects who have made them the continuing, growing success they are now. The number and quality of entries this year bears witness to their growing enjoyment of working with copper. This is also reflected in the willingness of many architects to join our pool of judges which plays an essential role in giving the awards real kudos."

There is more about the judges on page 17.

Seven buildings were shortlisted from the 66 entries this year, and presented by their designers at the ceremony event, from which the award winners were chosen. They are shown here with the judges' comments, then discussed in more detail elsewhere in this, or previous issues of Copper Architecture Forum. More information on the awards and all the 2011 entries can be found on the Copper in Architecture website:
www.copperconcept.org/awards.

HIGHLY COMMENDED – Villa Vauban, Musée d'Art de la Ville de Luxembourg – designed by Philippe Schmit architects

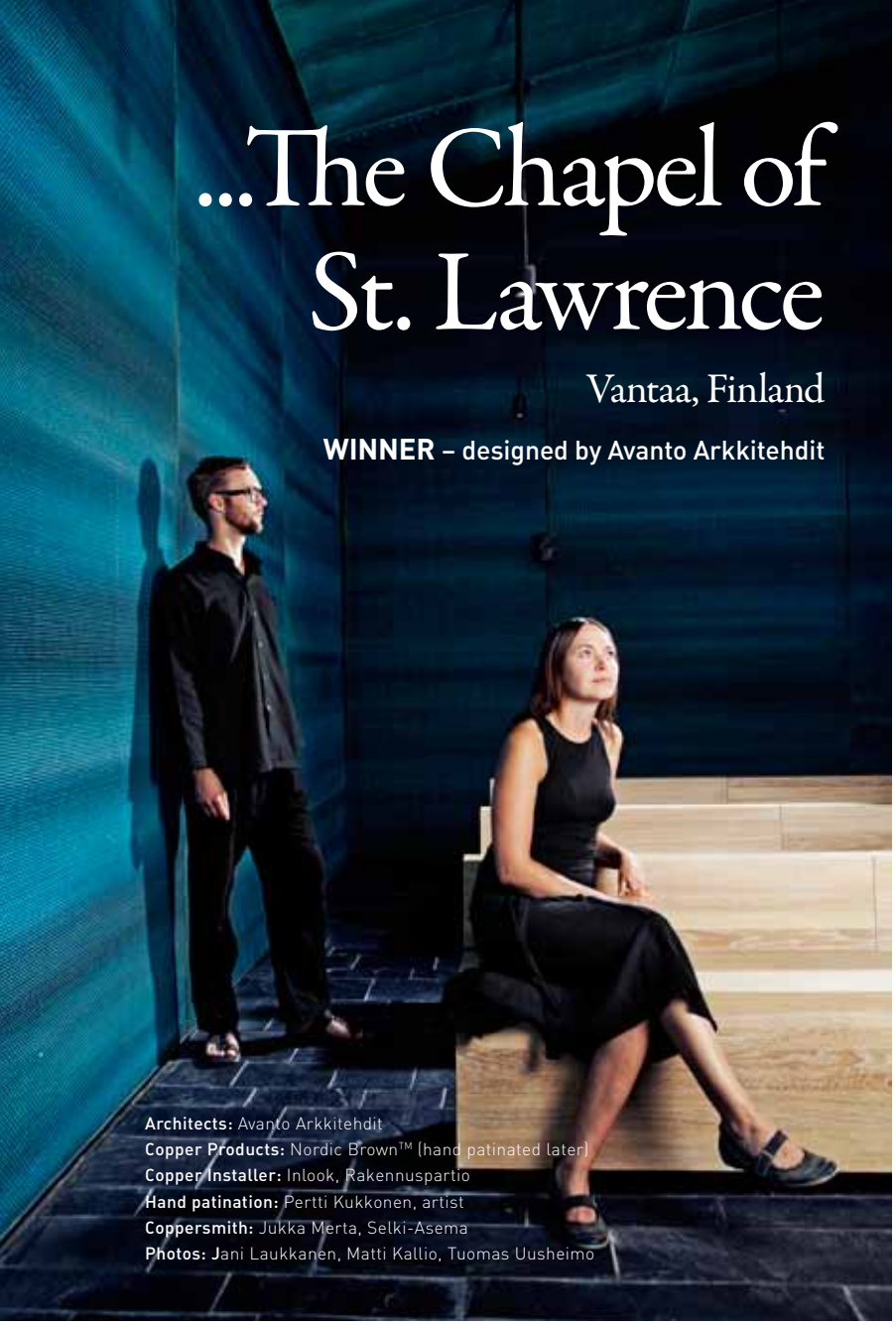
The jury was extremely impressed by this new addition to an existing art museum. Though the new parts are conspicuously of their time, they form a sensitively judged counterpoint both to the original historic building and the surrounding parkland landscape. The new extension is wrapped in delicately perforated panels of brass, and the jury especially admired how this metal skin appears to dissolve when viewed at night, changing from an opaque surface to a sensuously glowing, translucent veil. The combination of aesthetic refinement and technical skill made this a stand-out project.

This project is covered in detail on page 20–23.

...The Chapel of St. Lawrence

Vantaa, Finland

WINNER – designed by Avanto Arkkitehdit



Architects: Avanto Arkkitehdit
Copper Products: Nordic Brown™ (hand patinated later)
Copper Installer: Inlook, Rakennuspartio
Hand patination: Pertti Kukkonen, artist
Coppersmith: Jukka Merta, Selki-Asema
Photos: Jani Laukkanen, Matti Kallio, Tuomas Uusheimo

The jury found this project for a funeral chapel a highly compelling and atmospheric study in the handling of space, light and materials. White walls are counterpointed by roofs and ceilings made of patinated copper. Each panel was patinated by hand, so the copper has exquisitely sensuous colour and texture. Patinated copper mesh panels also screen the glazed walls overlooking an adjoining churchyard. The jury was very impressed by the high level of craft and technical skills involved, and how the material was used to evoke a tranquil sense of the numinous, creating an appropriately solemn yet nonetheless uplifting setting for the rituals of death and parting. *This project was discussed in detail in the last issue of Copper Architecture Forum (30/2011).*

COMMENDED – House in Seeheim, Germany – designed by Fritsch und Schlüter Architekten

The jury responded to the bold geometry of this house, which abstracts the traditional archetype of the gabled, suburban villa. They also admired the way in which the house connected its inhabitants to its surroundings, through a series of glazed cuts in the wall and roof planes. There was evident skill in the way that pre-oxidised panels of copper were used to clad the exterior, creating an elegantly smooth carapace which enhanced the project's sense of formal and material refinement. *This project is reviewed on page 26–29.*

COMMENDED – Weymouth Street, London – designed by Make

Wrapped in a skin of brass cladding, this project for residential development in the heart of London attracted the jury's attention with its imaginative approach to materials, especially how they age and weather. Differences in the proportions of copper and zinc used in the alloy mixtures create a range of different hues, from brown to gold, so the panels will patinate at different rates over time. The jury was also seduced by the perforated balcony frames which filter light and cast a pattern of rippling shadows around the interiors of the flats.

This project is covered in detail on page 18–19.

JUDGES' SPECIAL PRIZE – Freya's Cabin – designed by Studio Weave

This was one of the more unusual submissions – more an artistic intervention or sculpture, than simply a building – but the jury enjoyed the folk tale narratives woven around this compact, jewel-like cabin on the edge of a lake. The attention to detail in the choice and use of materials was especially lyrical and imaginative. Plywood sheeting is delicately cut and shaped to form an arboreal bower inside the cabin, which is clad in shimmering 'gold' panels made from a copper and aluminium alloy. The richness of the metal exterior forms an evocative contrast with the rustic simplicity of the plywood interior. The architects have created a modern folly that chimes beautifully with the landscape.

This project was discussed in Copper Forum 28/2010.

Photo: Peter Sharpe

SHORTLISTED

ZIV, Fire Brigade, Ambulance and Alpine Recovery Centre, South Tyrol, Italy – designed by AllesWirdGut Architektur

Set in an alpine town in Italy's South Tyrol, this project for a civic rescue centre impressed the jury with its powerful topographic quality. Long and low slung, it almost becomes part of the landscape, a reassuringly rugged presence in the town. The building's copper cladding emphasises this connection with its environment. The hue and texture of the dark copper panels evoke the surrounding farmhouses and pine forests. The jury admired how an essentially functional building was transformed into a new local landmark through the careful sculpting of form and adept use of materials.

This project was covered in detail in the last issue of Copper Architecture Forum (30/2011)

Photo: Hertha Hurnaus

SHORTLISTED – Town Hall, Police and Cultural Centre, Berriozar, Spain – designed by Garcia Rodriguez Alcoba

This large civic complex, which combines a range of different functions, from town hall to police headquarters, caught the jury's eye as a dignified addition to its townscape. Jury members were particularly impressed by how it articulates a sense of civic life, through a skilful interplay of solid and void, and how it meshes with the wider urban realm, defining and enclosing new public spaces. In this, copper cladding plays a key part. The material is used in horizontal strips of varying widths to animate and articulate facades with great finesse.

This project is reviewed on page 24–25.

By Chris Hodson

Meet The Judges

Without doubt, the status of the European Copper in Architecture Awards is defined by the growing pool of influential architects keen to act as judges. This year's judging panel included four architects – all recipients of previous Copper in Architecture Awards – together with Architectural Review Editor Catherine Slessor who chaired the panel. By way of our thanks for their involvement, enthusiasm and experience, Copper Architecture Forum readers might like to learn more about the 2011 judges.


Keith Williams


Patrick Genard


Pia Salin


Einar Jarmund


Catherine Slessor

Keith Williams is founder and design director of London based Keith Williams Architects. He sits on the National Design Review Panel at Design Council CABE, is a post-graduate examiner to the School of Architecture at the University of Strathclyde and was made Honorary Professor of Architecture at Zhengzhou University, China. Keith is a Fellow of the Royal Society of Arts, has lectured extensively and judged numerous architectural competitions and awards schemes.

The Unicorn Theatre, London by Keith Williams Architects – UK Winner of Awards 13.

Pia Salin is a Danish architect, also registered in the UK and a member of the RIBA, currently working in Zurich. Her wide-ranging, pan-European experience includes working for Foster + Partners and Dissing+Weitling Architects a/s where she was Senior Architect. Pia has been involved with all aspects of architecture including masterplanning, landscaping and interiors, working on projects ranging from bridges to tower blocks, and even the Elephant House at Copenhagen Zoo.

Frederikskaj Housing, Copenhagen by Dissing+Weitling Architects – Commended in Awards 14.

Patrick Genard joined the "Taller de Arquitectura" of Ricardo Bofill, just after qualification as an architect, where he was Conceptual Director on projects in various continents becoming a Partner/Director in 1990. Patrick then established his own architecture, urban planning and design studio Patrick Genard y Asociados SLP in Barcelona, where he is Principal Architect and Director, with associated offices in Paris and Brussels. The practice's expansive project list covers leisure, residential, commercial and public buildings around Europe and North Africa.

Mediacomplex 22@, Barcelona by Patrick Genard y Asociados and Ferrater Asociados – Highly Commended in Awards 14.

Catherine Slessor is Editor of the Architectural Review. In a long career as an architectural journalist, critic and editor she was Technical Editor of the Architects Journal and has also contributed to a number of international architecture and design magazines, among them Architectural Record (USA), Arkitektur (Sweden) and Bauwelt (Germany). Catherine has written several books, lectured in the UK, USA, South Africa, Spain, Sri Lanka and Argentina, and is also a regular university guest critic.

Einar Jarmund is a founding partner of Jarmund / Vigsnæs AS Architects MNAL. The practice focuses on projects with potential for outstanding and meaningful architecture, most often closely related to nature and preferably in strong natural settings with a harsh climate (none more so than the Svalbard Science Centre). Einar has worked and taught both in Norway and the USA, holding various academic positions including Visiting Professor at Rhode Island School of Design, University of Arizona and Washington University.

Svalbard Science Center, Longyearbyen, Spitsbergen by Jarmund / Vigsnæs – Highly Commended in Awards 13.

This project was COMMENDED in the 2011 European Copper in Architecture Awards page 14–17.

LONDON BRASS

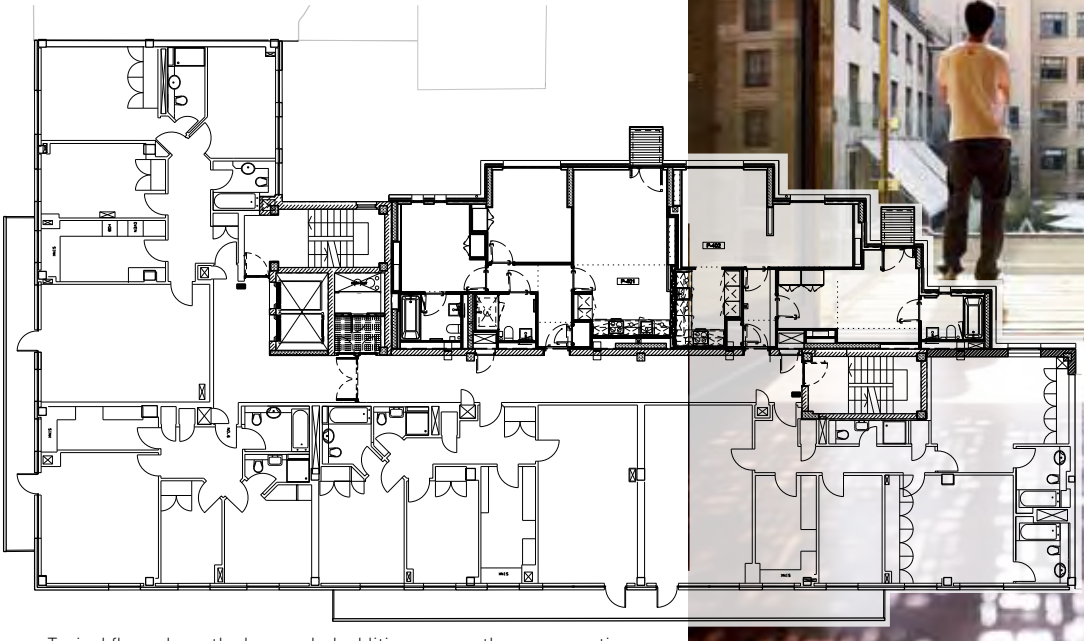
This project transforms a relatively undistinguished, six-storey 1960s block in a Conservation Area of London into a highly distinctive refurbishment scheme. It increases the residential accommodation and gives the building a striking new identity defined by extensive use of brass.

Architects: Make
Copper Products: TECU® Brass
Copper Installer: John Sisk & Son

Respecting its Conservation Area location, the original Weymouth Street facade has been retained and refurbished so that it blends virtually seamlessly with the surrounding vernacular; however, brass cladding dramatically caps the building, containing two new levels of penthouses. This brass cladding then fully envelops the rear elevation, where the building has been extended both horizontally and vertically to provide twelve new luxury apartments, exploding with punched balconies that cantilever out from internal living spaces.

Brass was chosen for its sustainability and complete recyclability, as well as its distinctive architectural qualities including natural oxidisation that will cause it to weather over time and provide added depth and character to the building. Each panel will patinate differently but this process has been enhanced by varying components in the copper alloy to achieve colours ranging from golden yellow at the rear of the building to a russet brown on the new upper levels glimpsed from Weymouth Street.

The colours complement the surrounding architectural palette and will gradually tone down to echo the shades of the neighbouring buildings. The new enclosed balconies are a play on the verticality of the neighbouring blocks and the pattern of this facade has been repeated within the balcony frames themselves, perforated into the screens to create a Mondrian-like design which casts intricate, artistic shadows.



Typical floor plan – the brass-clad additions are on the upper section.

This project was HIGHLY COMMENDED in the 2011 European Copper in Architecture Awards page 14–17.

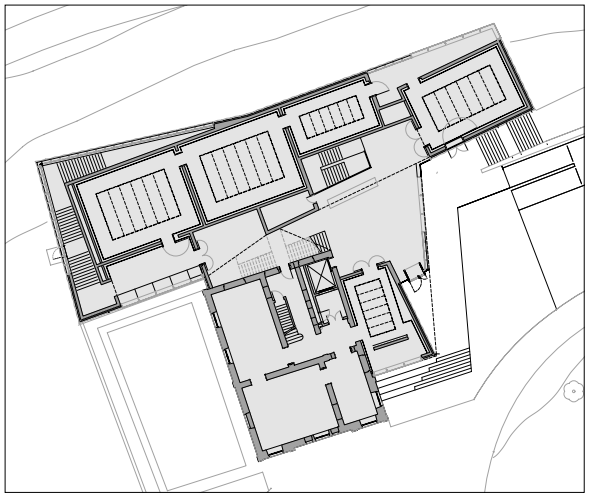
Architects: Philippe Schmit architects
Copper Products: TECU® Brass
Copper Installer: Arge Préfalux sa / Annen KG

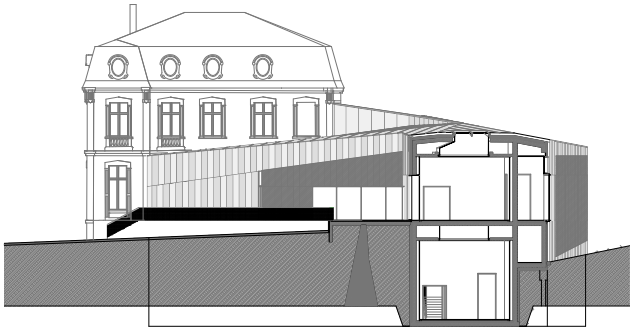
ART MUSEUM INTERVENTION

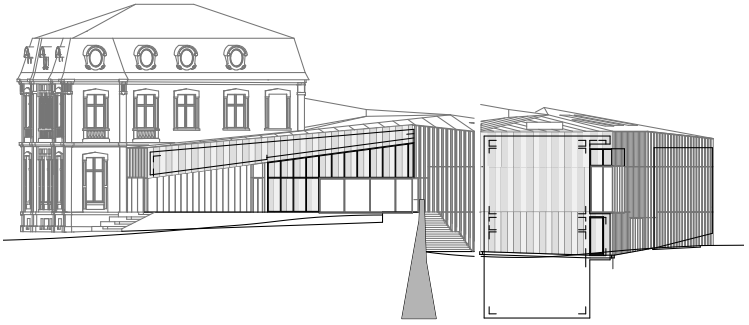
Located in the city's green belt, the historic Villa Vauban has hosted the Musée d'Art de la Ville de Luxembourg since 1959. In 2002 Philippe Schmit was commissioned to develop plans for a comprehensive renovation and extension project. This increases exhibition space from 350m^2 to 1200 m^2 while respecting the site's historic elements: a fortress wall, built by Vauban in 1739, and the villa dating from 1871–73 with its garden and public park from the same period.

Essentially, the design aims to create a new balance between buildings and landscape. Integration is achieved by burying half of the new building volume underground and giving it a dynamic facade of translucent, large sheets of perforated brass, which reflects rather than dominates the park. The new architectural ensemble is clearly identifiable as a public building in its municipal park setting. The new building gives two levels of exhibition spaces behind the villa, rising up from the foundation of the fortress wall below park level.

Openings in the frontage create viewing points to help visitors' spatial orientation and to reveal activities inside the museum to passers-by.







The folds of the metal facade and roof surfaces covering the new building give a strong haptical quality and an impression of lightness while integrating it into the landscape. Internally, exhibition spaces are characterised by hammered concrete surfaces, etched translucent glass facades and oak wooden floors. The bare walls reveal small quartz crystals in the concrete, making them both tactile and light.

Old and new exhibition rooms have been integrated into flexible continuous spaces, with a linking entrance hall forming a transition between the two buildings. Galleries in the new extension have been articulated as superimposed flights of rooms. They are slightly offset along their longitudinal axis, creating setbacks and recesses for various uses including a sculpture gallery, children's workshop, loggia with a view onto the park and a generous staircase leading down to the lower exhibition level. These elements define the choreography of the museum circulation – slowing down the pace and allowing visitors to savour the slowly disappearing park landscape and appreciate details of textures and space within the building.

URBAN UNIFICATION

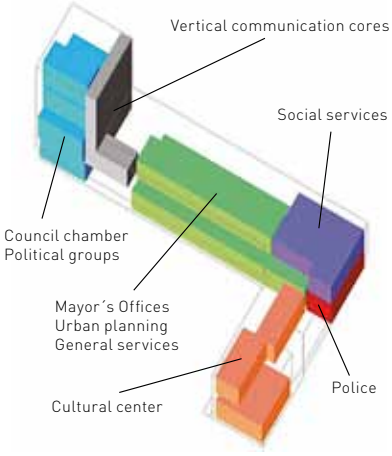
This project was SHORTLISTED in the 2011 European Copper in Architecture Awards page 14–17.

This project brings together essential municipal functions – Town Hall, Police Headquarters and Cultural Centre – defining the perimeter of a future square that will shape an important civic meeting place in the Spanish town of Berriozar. The building configures the public square and also ensures its own prominence. It is conceived as a single, forthright volume, a building that folds back onto itself, defining voids and volumes, both inside and outside.

This is an abstract, timeless sculptural form clad in pre-oxidised copper to appear powerful yet, at the same time, light. The copper bestows the building with a gravitas appropriate to its civic role. Inside, the white walls and floors capture the light and maintain its overall abstract nature, allowing some of the main rooms to be accentuated with timber panelling.

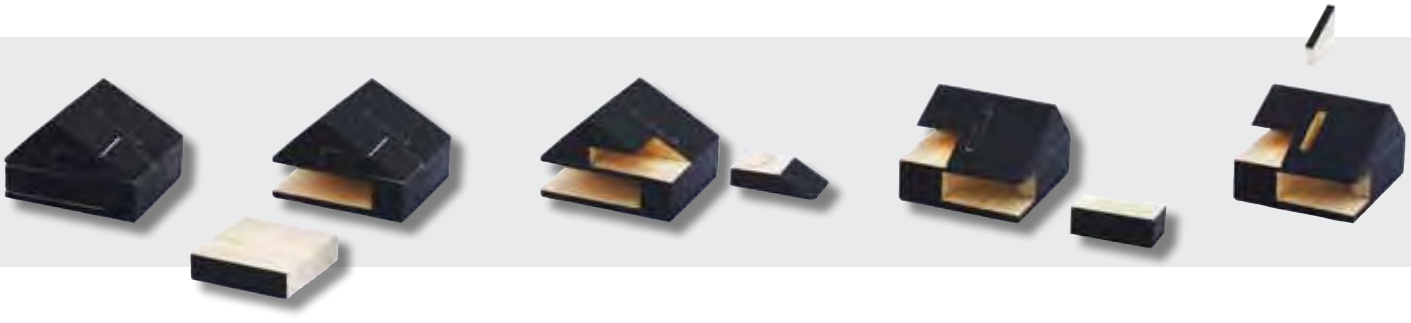
The formal structure consists of a continuous vertical and horizontal prism that configures the different areas. The vertical fold, formalized by the tower, and the horizontal fold, where the town hall services and the cultural centre are located, are articulated via several voids that interconnect the different areas, permitting their use as exhibition areas, waiting rooms and halls for public meetings. These voids are completed with a set of courtyards on the first floor, which feed light and ventilation into the rooms while at the same time serving as areas for rest and relaxation.

Visualisation of the interior demonstrating the use of multi-level spaces.



Architect: Garcia Rodriguez Alcoba **Copper Installer:** Tesico S.L.

This project was COMMENDED in the 2011 European Copper in Architecture Awards page 14–17.



REDEFINING THE GABLED HOUSE

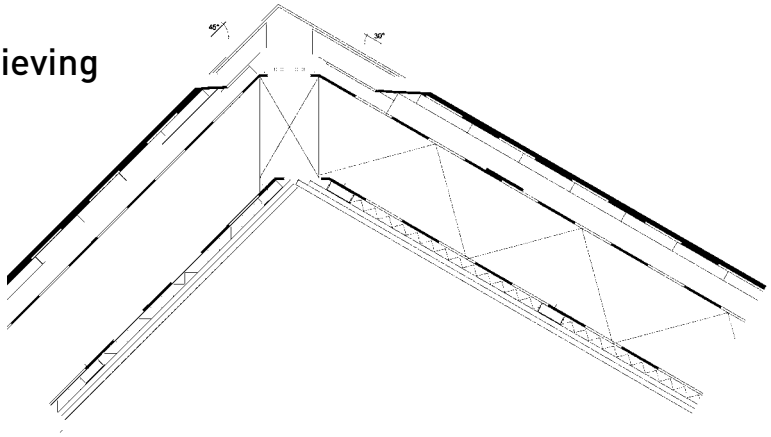
This House in Seeheim, Germany, is located in a lush, green, residential area developed around 1900 and its prominent hillside position commands impressive, distant views of the Rhine valley. The archetypal form of the gabled house, defined by the development plan, was taken up thematically as a monolithic form that advances beyond the edge of the slope, yet remains in equilibrium.

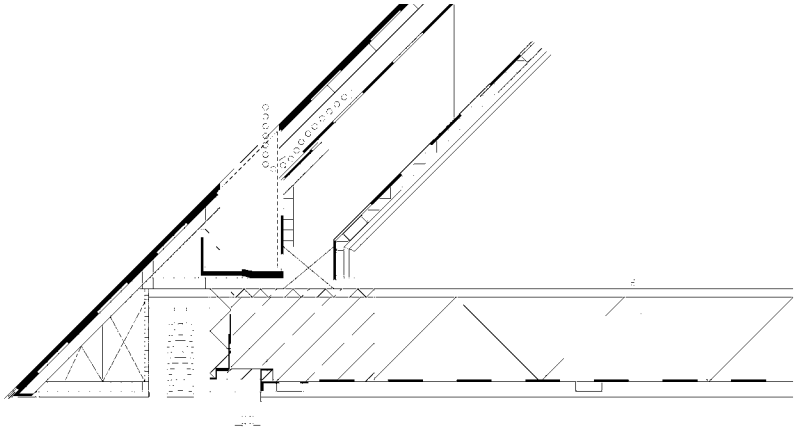
Contrasting views to the outside have been concentrated and staged with just four large openings across the corners biting into the monolithic form. Vertical 'cut-out' spaces, with full roof glazing over the dining area and stairs, connect the lower and upper floors. The panoramic openings were made as big as possible in order to do justice to the magnificent views - an essential quality of the property.

A central prerequisite of the design was creation of a homogenous appearance for both roof and external wall surfaces. Cladding all these surfaces in copper made it possible to realise this monolithic character in the form of an abstract, sharp-edged geometric body, while providing a weather-proof skin. The roof and outer wall surfaces are clad with large, pre-oxidised copper panels, contrasting with the white internal surfaces.

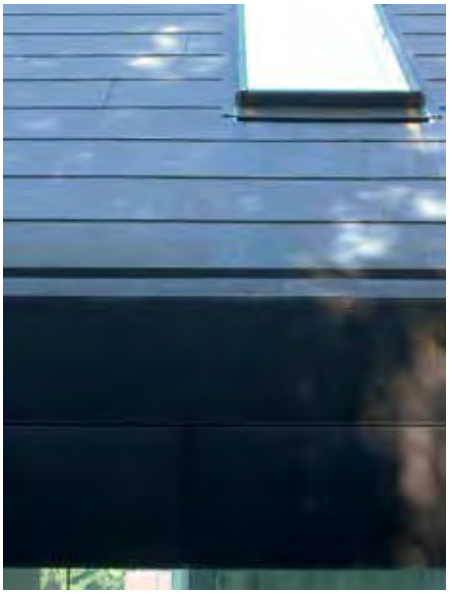
House in Seeheim, Germany – achieving a homogenous copper form

Detailing is handled with particular care to ensure that junctions and transitions are absolutely flush, while maintaining ventilation across the entire back surface area. The sharply defined white 'cuts' into the copper-clad mass form a fluid transition from outside to inside. Long-term performance was also an important driver of material choice and copper as a durable, natural material, contributes to the sustainability of the house.

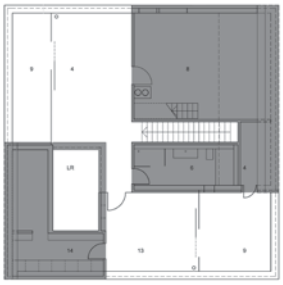




Typical cross-section

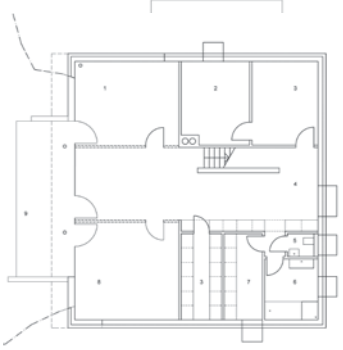


Architect: Fritsch und Schlüter Architekten **Copper Products:** Nordic Brown™ **Copper Installer:** Fa. Riegler **Photos:** C Kraneburg



Top floor plan

Upper ground floor plan



Lower ground floor plan

Vertical 'cut-outs' with rooflights flood the spaces with daylight.

Communicating Copper

This magazine is published by the European Copper in Architecture Campaign, which also organises the major architectural awards programme discussed in this issue. But the third pillar of the Campaign is the Copperconcept.org website – and this has been re-launched to provide the definitive resource for architectural inspiration with copper.

Copperconcept.org is organised into 17 separate language sections, each edited locally. The website features an extensive selection of regularly updated project references, demonstrating different uses of copper and highlighting some of the best examples of copper architecture from around Europe and beyond. Of course, the recently announced European Copper in Architecture Awards winning projects can be found there – with video clips – but there are also articles on topical issues, such as the antimicrobial capabilities of copper.

As well as design inspiration, Copperconcept.org gives access to a range of architectural and technical publications, and links to other organisations including copper fabricators. Journalists and editors can also access press releases, articles and images for publication. Finally – and most importantly – the website hosts Copper Architecture Forum and you can register for your free subscription there, as well as download the latest, and previous, issues of the magazine.

Explore the world of copper architecture now at – *http://www.copperconcept.org*

Lohja Main Library

End wall towards the town centre.

Architects Lahdelma & Mahlamäki won the open competition for the Lohja Main Library in 2002. The design was then continued based on this winning entry: "Johdanto" (the Prologue).

The new library building is harmoniously integrated into the cultural campus area, which contains the Church Saint Laurentius, the Hall of Laurentius, the Music Academy of Länsi-Uusimaa and the Academy of Hiisi. The building is located on the eastern side of the competition area allowing a walk through to the park.

The functions of the building are divided between two floors. Due to the proximity of the old church the library building was kept low, and this was the main concept of the design. The public spaces in the first floor are spaciously widened with the help of different sized skylights.

The long walls of the building are of red brick. The inner spaces open through the gables towards the church and the centre. Proverbs from the Lohja area are printed on the glasses of these openings.

Lahdelma & Mahlamäki Oy

Facade to the east, 2005. The patination of the copper material has begun.

Main library in Lohja

The town of Lohja is located in Southern Finland, some fifty kilometres from Helsinki.

The population of the town is ca. 40 000. Although not granted town rights until 1969, Lohja was already known as a trading port in the Middle Ages.

The main church in Lohja, the Church of St. Lawrence, is one of the notable Finnish Gothic churches from the 15th century.

The main library was built on the basis of an architectural competition. Its visual language with copper-clad conical rooflights and material choices represents international modernism. As a building mass the main library supports – through its spatial solution and external materials – the townscape in downtown Lohja. Cladding materials include red brick, copper and glass.

The chosen materials and colours make the interior of the main library freshly modernistic. Copper has been used prudently to draw attention to interior details.

Esko Miettinen, architect SAFA

The main entrance of the library, 2011. The copper is fully patinated.

A rooflight in the interior.

Site plan

Facade to the west

Architects: Lahdelma & Mahlamäki Ltd. Ilmari Lahdelma, M.Sc. (Archit.), Professor Juha Heino, M.Sc (Archit.)

Copper product: Nordic Standard

Copper installer: Mustion Teräs Oy

Photos: Jussi Tiainen and Eark

Year of completion: 2005

By Chris Hodson

Over the last 15 years, **Professor Inger Odnevall Wallinder** (IOW) has been involved with extensive interdisciplinary field and laboratory studies on corrosion and metal runoff from copper roofs and facades, conducted at the Division of Surface and Corrosion Science, KTH Royal Institute of Technology, Stockholm.

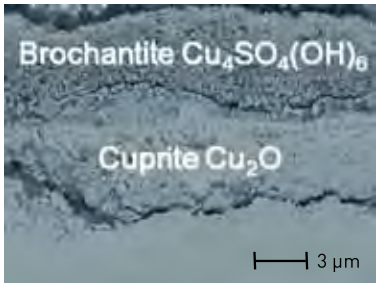
COPPER ARCHITECTURE **AND THE ENVIRONMENT**

What do architects need to know about the patination of copper on buildings and its effect on rainwater runoff and the environment? Architect Chris Hodson asks a leading expert for some straight answers.

Chris Hodson (CH): What is happening when copper changes colour to brown and then green in the atmosphere?

IOW: All metals – except the most 'noble' such as gold and platinum - are oxidised and corroded to varying degrees when exposed to outdoor conditions. We can see this with rust on steel and white staining on galvanized steel. However, oxidation of metals or alloys such as titanium and stainless steel can't generally be seen by the naked eye.

On exposed, external copper, copper oxide (cuprite) is formed initially which gives a progressively darker brown-black appearance. Then different basic copper sulphates and chlorides make the surface green. The make-up of patina depends on prevailing environmental conditions, in particular determining concentrations of sulphur dioxide and sodium chloride. In marine environments, the formation of basic copper chlorides turn the copper surface more blue. Despite these green/blue surfaces, the inner layer remains predominantly black-brownish cuprite. In the absence of air-borne pollution and away from the coast, the patina will stay brownish in colour.



CH: How does the patina affect corrosion of the copper surface?

IOW: The patina adheres strongly to the surface and acts as an efficient barrier significantly reducing the corrosion rate of the underlying copper metal. With copper surfaces that have patinated over 100 of years, the underlying metal has still not oxidised: this would not be the case if easily soluble corrosion products such as copper salts were present.

CH: Why doesn't the patina dissolve rapidly and run off the surface like water-soluble salts?

IOW: Firstly, basic copper compounds developed in copper patinas are chemically very different to soluble copper salts. Secondly, the basic copper compounds are integrated within the patina, predominantly composed of cuprite. Thirdly, the thin water film conditions, combined with repeated dry and wet periods that govern atmospheric exposure conditions, enable partially-dissolved copper released from patina constituents to re-precipitate during drying cycles. These conditions are very different from laboratory bulk immersion conditions where no dry period occurs and dissolved copper has limited possibility to re-precipitate.

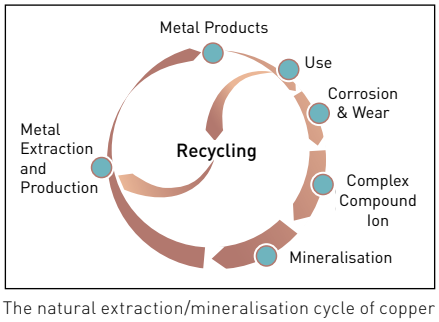
CH: So, is any material carried off the copper surface in rainwater?

IOW: All metals allow some material to be carried from their surfaces. It is only via the action of rainwater flushing the surfaces that any dissolved copper can be released. This essentially depends on rain characteristics (intensity, amount, duration, acidity) and prevailing wind directions, together with factors such as building geometry, orientation, inclination and sheltering. So the amount of material released into the water is a very small proportion of the patina and most copper products released have poor solubility anyway.

CH: What happens to any copper in water run-off from a building?

IOW: It has been shown that various material surfaces close to buildings - including soil, concrete and limestone - act as effective sinks for released copper. Interactions with these surfaces also reduce the bioavailability of the copper significantly as well. So, released copper will be retained by surfaces already in the drainage system: pipes of concrete and cast iron have proven to be very effective. Actually, more than 98% of the total amount of released copper in runoff water on concrete surfaces is retained within 20m of interaction.

Some countries have already adopted sustainable drainage techniques including permeable paving, wadis or swales, inverted wells or soakaways and wetlands – rather than piped drains into streams and rivers. Here, research has demonstrated high percentages of copper retention early on in these techniques. To summarise, through natural processes of binding to organic matter, adsorption to particles and precipitation, copper in runoff comes to rest in a mineral state as part of the earth's natural background of copper material, continuing the natural extraction/ mineralisation cycle..



The natural extraction/mineralisation cycle of copper

CH: Are there any situations where architects need to look carefully at runoff from a copper building?

IOW: Well, if you designed a large copper roof draining directly into a lake with sensitive water organisms, without any pre-interactions with organic matter or different surfaces, you should seek advice. And there is plenty of help and advice available through the European Copper Institute, including design assessment tools.

CH: Why are there still some concerns in a few countries about copper in water runoff?

IOW: Most ecotoxicological studies are conducted on easily water-soluble salts to assess adverse effects on aquatic organisms, induced by metals in their ionic form. They bear no resemblance to the actual situation on a copper-clad building exposed to the weather, as we discussed earlier. The real conditions of drainage systems, hard landscaping and building surroundings are also very different from the artificial ecotoxicological testing with copper salts where all copper is in a bio-available chemical form. Therefore, erroneous regulations and legislation should now be adjusted to real environmental situations, particularly consideration of the environmental fate of copper.

The brass-clad wing mirrors but, at the same time, contrasts with its glazed counterpart.

By Chris Hodson

Copper Chromosome

Brass cladding helps to define the strong architectural character of a major new research centre in Midlothian, Scotland, housing 500 scientists and research staff.

The design of the Roslin Institute building by architects HDR, develops from a plan form based on the shape of a pair of chromosomes, with coloured panels representing the DNA 'fins' which link the office and research laboratory blocks together.

Architect Marc Edmondson commented: *"The architectural treatment of the principal facades was the subject of serious focus. Brass was selected in dialogue with the client organisations. The choice was based upon how the patination would improve with age, adding to the statement of permanence that it would give this landmark building. The monolithic nature of the brass façade will contrast with glass curtain walling to the adjacent office accommodation.*

The curved, green pre-patinated copper wall under the glazed wing and brass cladding adjacent reveal two very different manifestations of copper.

"By providing varying textures of materials and cladding modules the volumes have taken on an expressive independence. This theme was further developed by using pre-patinated green copper to clad the curved walls of the auditorium. The boundary between internal and external spaces has been blurred by the continuation of the copper and brass cladding inside the building."

Funded by the Biotechnology and Biological Sciences Research Council, the £58m 'Chromosome' building will be a centre of excellence in areas including genetics, developmental biology, immunology and infectious disease, neuroscience and behaviour and animal sciences - bringing together experts in these fields under one roof.

The new building forms part of the University of Edinburgh's Easter Bush redevelopment project and is opposite a new vet school teaching building and the Hospital for Small Animals. As well as laboratories and office space, the building incorporates breakout areas and meeting areas to encourage collaboration on scientific research.

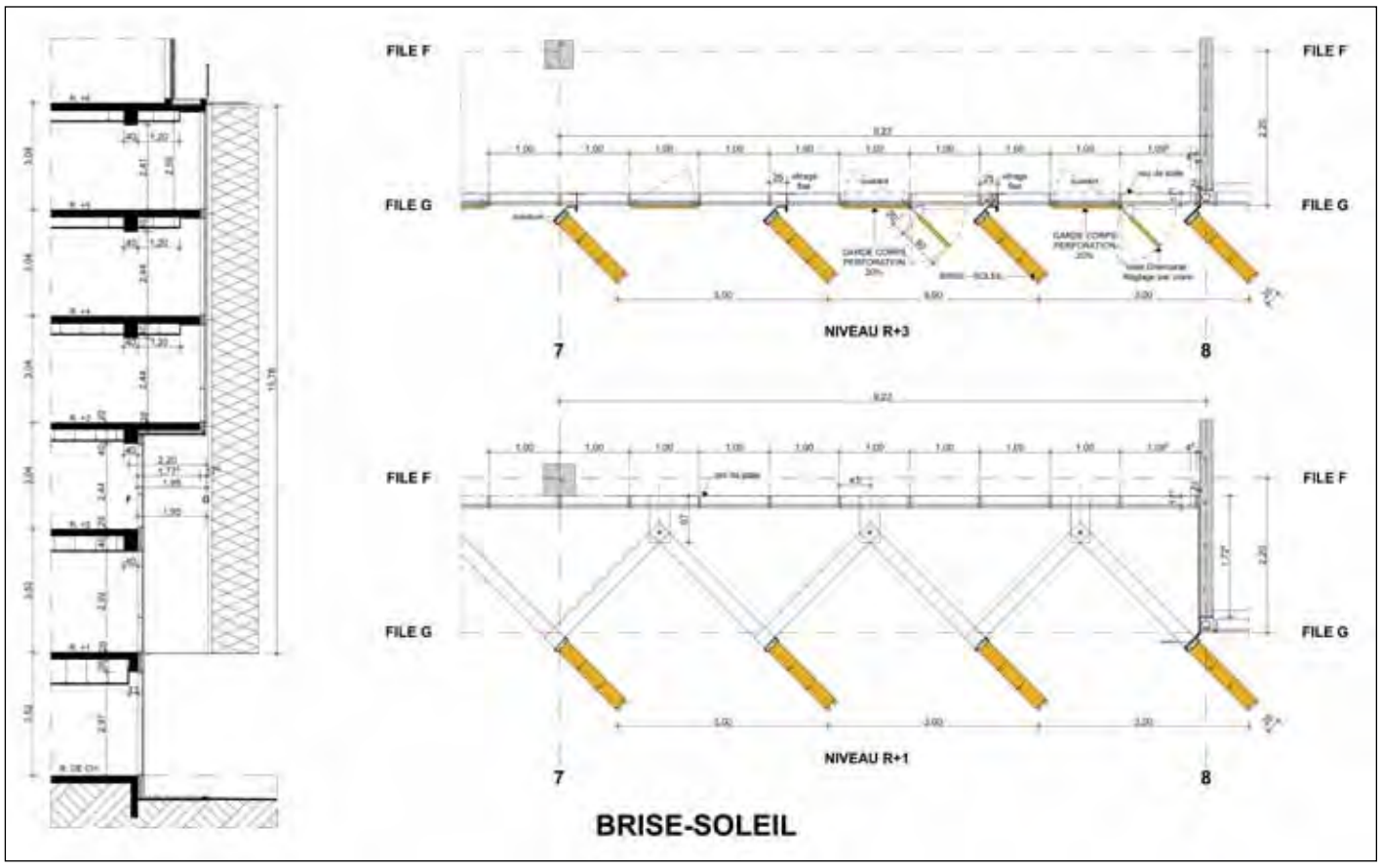
Architects: HDR
Brass and copper Installers: NJM Roofing
Copper Products: Nordic Brass and Nordic Green™
Photos: courtesy of NJM Roofing Ltd.

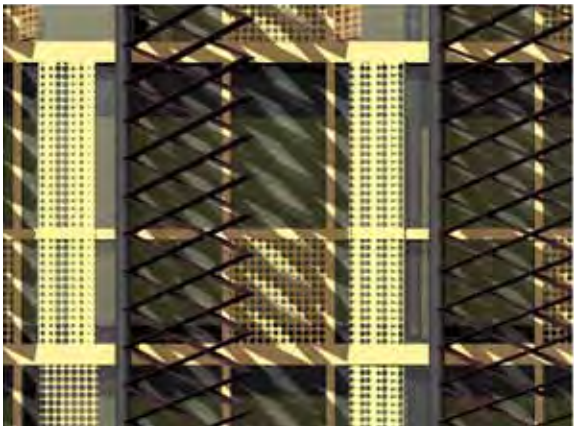
Animated Alloy Facades

The use of a single facade material – a golden alloy of copper – seeks to unify separate functions in this university building in St. Etienne, France. At the same time, contrasting manifestations of the material provide demonstrations of how it can be used to create transparency, animation and drama.

The architects wanted to give a new identity to the university and make a distinction between the two functions placed together: the University Building and the Student Building. The juxtaposition of the two compositions creates a harmonious whole, embellished with various copper alloy elements to signal different areas of the building. On the south face, an emergency stairwell, 22 metres in height, forms a corner landmark. This is clad entirely in diagonal squares of the copper alloy on a mirror stainless steel frame, sparkling and changing with different lighting conditions.

The adjacent block is arranged in a simple and systematic layout, defined by the posts of the curtain walling and accentuated by the vertical elements of brise-soleil placed every 3 metres. These brise-soleil, in the form of a diamond-patterned lattice and made of strips of copper, are placed at an angle of 45° to the façade to provide protection from the sun without blocking the view. At each floor, between these elements, there are small shutters and safety rails, all in perforated copper alloy panels, which help the facade to "vibrate" by interacting with the glazing. This arrangement is shown in detail opposite. The copper alloy is used again – this time in solid form, embossed with a regular pattern - to envelope the curved auditorium wall at street level. The combined effect of all these elements is a shimmering golden skin, constantly changing with the daylight.





Architect: Christian Schouvey **Copper Product:** TECU® Gold **Copper Installers:** Isobat / Antonangeli, Calgagni Métallerie, Fontbonne & Fils **Photos:** Christian Schouvey

TURKU TOWER

A sreamlined 12-storey tower provides a modern landmark for the historic town of Turku in Finland, characterised by an abstract pattern of pre-patinated cassettes with varying intensities of colour.

Resulting from an architectural competition, SIGGE Architects' distinctive Ikituuri student apartments building sits between a motorway and the Turku Student Foundation's complex. The building mass is divided into two parts: basement and tower. The rusty-red steel net covered triangular basement houses rooms for services and bicycles. Then in the copper tower, vertical circulation is in the centre with rooms radiating out.

The oval plan of the tower provides important aerodynamic qualities – as well as a distinctive form – acting as a 'sail'. Copper cassettes are mounted on a grid of stainless steel sections and arranged to give a horizontal abstract pattern. This is achieved with pre-patination techniques to give different shades of green patina as an integral part of the copper material. Architect Pekka Mäki has then arranged the lighter and darker copper cassettes to add dynamism to the oval's surface. Strong colour effects are also used for the interiors. The project aims to be as sustainable as possible and incorporates a bi-directional geothermal heating and cooling system.

Architects: Pekka Mäki, SIGGE Architects Ltd.
Copper product: Nordic Green™
Photos: Matti Kallio
Text: from an article by Matti Kallio

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