Residential Buildings on Frederikskaj in Copenhagen

New Copper for Roskilde Cathedral

A major sports building in Budapest, Hungary

Accordia – British housing project
As always, we have made an effort to find new and exciting projects around Europe, where copper has been used in creative ways. In this issue, we present both renovation projects and new construction, small and large. Architect Chris Hodson takes you to Cambridge, England where he visits the critically acclaimed Accordia project. This is in many respects a unique residential building project, where copper is part of the very limited palette of materials that formed the basic concept of the exterior design, and where environmental aspects were an important consideration.

We also make a stop in Copenhagen, to take a closer look at the new residential area Frederikskaaj, situated along one of the city’s many canals. In addition, you will acquaint yourself with a spectacular church renovation; Roskilde Cathedral in Denmark can again boast a new, beautiful copper roof.

The turbulent global economy this past year has strongly influenced the price of most metals. For example, the price of raw copper has fallen by approximately one third compared to last year. Read more about metal prices in Nordea’s article on page 34.

Next autumn, it is time again to choose a winner of The European Copper Award. You will find all information about the competition on page 13. Take the opportunity to present your own copper project in this big, international forum by participating in the European Copper Award 2009. Good luck!

Please feel free to contact us at the editorial staff with your comments on our articles, or if you would like to share new, exciting projects with us.

Enjoy reading this issue!

Lennart Engström, Editor
# TABLE OF CONTENTS

4   Copper used in renovations  
6   Copper inside and out  
8   Bathing in glass and copper  
10  Residential Buildings on Frederikskaj in Copenhagen  
13  Call for Awards Entries  
14  New Copper for Roskilde Cathedral  
18  5 Botanicheskaya Street, hotel, Moscow  
19  Seven-storey office block, Moscow  
20  Project ‘de Jonas’ – ROC Hengelo, The Netherlands  
22  A major sports building in Budapest, Hungary  
24  A new paradigm for urban housing  
32  Family House in Lelekovice  
34  Metal Market Update February – Copper  
36  Domus GaudiumThird Student Union Building
Cost-effective Copper

COPPER USED IN RENOVATIONS

Cold winds are blowing through the world economy. But bad news often has a positive side, too! There has been talk about recession and slump for so long that the news does not come as a shock to anybody any longer. Astronomically high revival and support packages are being granted here and there, and they seem to be swallowed up in a bottomless pit. There are few fortunetellers left to predict the duration of the downslide, but sooner or later rock bottom will have been reached and we can start looking forward to an upswing.

There is plenty to renovate everywhere in the world! The lack of money and the expensive-ness of materials have often been given as reasons for delaying renovations. Now that unemployment is rising more steeply than ever, we need effective means of rectifying the situation. Building construction is one of the worst affected fields suffering from a sharp drop after a building boom. The State of Finland has introduced measures to combat the problem and the government has directed financial resources to renovation work. Many building companies are considering taking advantage of this opportunity. Speedy decisions are needed, as there is a deadline for state support stipulating that work must get underway by the end of this year. Quick decision-making can save money in several ways now: interest rates are low, materials are inexpensive, skilled labour is readily available and there are grants and subsidies to be applied for.

Copper is inexpensive

The price of copper raw material has dropped to approximately a third of what it was as recently as a year ago. That high price level, tough competition and full stocks have reduced demand for copper. Many potential purchasers of copper have decided against buying due to the high price but now, at long last, copper is much more affordable again. So there are many good reasons for recommending the use and purchase of copper again!

The development of copper products intended for building construction has been very rapid. Previously, just panel and sheet was sold and the installation required qualified sheet metal workers. Today the highly developed products are easy to install and there are a number of alternative surfaces ranging from smooth copper to diversified profiles and cassettes. Copper is also available as netting and perforated material. Today copper is not necessarily recognizable by its colour as the shades range from gold to a beautiful blue depending on the product. Traditional workman¬ship is still needed when creating individual masterpieces from copper. Skilful handling of material is a great talent, and metal workers who truly know their craft have always been able to turn copper into works of art whose shapes and colours range with endless possibilities.
Copper facelift of the façade of an apartment building

As previously mentioned, the use of copper is now economical in renovations and therefore a sound long-term investment. A large seven-floor building in the city of Pori in Finland, with business premises on the ground floor had to be reinsulated, which meant the old façade had to be removed. As the building had originally been designed to have a copper façade, a decision was made to replace the old material with copper. Approximately 1000 kg of 0.6 mm smooth strip was used in the renovation.

The abundant use of copper on the façade of the seven-floor block makes the building look imposing. The copper profiles between the windows and on the windowills were designed and custom-made in a sheet metal works. The horizontal bands of copper sheets give the façade a neat finish. Small gaps were left next to opening ventilation windows to ensure good ventilation. A lot of copper was also used on the walls and in moulding and rainwater pipes. The material was fixed to wooden substrates with stainless steel screws. Copper panelling with a pattern resembling horizontal drop siding was installed on the front wall of the business wing. The profiles behind the advertising signs are also made of copper. In addition to all these, copper is used on balconies and in different mouldings.

The half-year project was carried out more or less entirely working on a manlift or a hydraulic platform and, since the building is located in the centre of town, special attention had to be paid to safety. Protective roofs for pedestrians were built. The work took about six months and is now completed. Combined with the light rock of the wall the dark brown copper creates a balanced and harmonious effect. The buildings next door also have copper, which gives the whole block a coordinated appearance.

Scrap copper sells at a high price

The timing of the renovation was not perfect considering the high price of copper but, on the other hand, the price of scrap copper was high, too, which compensated for the price of new copper. The removed sheets were recycled, which also reduced the environmental impact. Copper usually does not require renewal or maintenance, but if there is a need to replace copper due to insulation, which was the case here, old copper can always be resold.
Copper inside and out

The NHO building on Majorstua in Oslo, Norway was built in the mid-1960s. On November 1st, extensive rebuilding and expansion works were finalized, in which 50 tons of copper were used for the facades and interior walls. Erling Freitag AS in Tønsberg deliberately put a team of young sheet metal workers on the project, giving them considerable responsibility.
The copper facade of the newly renovated NHO building is marked by 50 cm-wide bands of copper panels, 1.2-mm Nordic Green Living 1 from Luvata. The copper plates are attached by hidden brackets and have profiled lists to highlight the copper bands. This is continued through the glass facades and the interior walls of the stairways and entry halls, where the copper panels are arranged in columns in the same width as the external profiled lists.

Several of the offices and meeting rooms have copper cladding. It is important that the sheet metal workers used the highest precision when measuring the size of the plates before they were cut to shape at the factory in Tønsberg.

"In the initial phase, when we worked mainly on the interior, the focus lay on tailoring the copper to fit. The young sheet metal workers travelled from Tønsberg at 5 am, began work at 7 am and arrived back in Tønsberg at 6 pm. There, they manufactured copper plates until 10 pm, returned home to get some sleep and then travelled back to Oslo the next morning at 5 am. This is not possible for married people," says Svein Freitag. "That’s why he deliberately put a young team on the NHO-building project, and he gave the team members extensive responsibility.

“They have learned a lot from taking more responsibility. I think this is advantageous and developing for young people," says Freitag, who has had on average 3-4 people on the site during the 34 weeks of the project.

At least 50 tons of copper were used for the project. There are also many copper details inside the new office space, particularly in hallways and common areas. Even the open gas-fireplace in the entry hall is clad with copper.

“There are a number of things that must be taken into consideration during an ongoing building project. The NHO complex has gained extended office space and additional levels. We are very glad to be able to show the high quality of sheet metal craftsmanship in this type of building”, says Svein Freitag.
Swimming in glass and copper

Soon, overalls will be replaced by bathing suits! In September, the new Marienlyst swimming pool hall in Drammen opens. Buskerud Blikk & Montasje AS has participated in the construction of the 11,000 square meter building, an exciting project in which 12 tons of copper were used.

Per Olav Berg

The sun shield on the southern wall resembles the foam of a wave when it breaks.

The northern wall with specially made windows has an original design.

Trond-Otto Oseberg (left) and supervisor Tor Erik Nordby stand in front of the new Drammensbadet.
The initial phase of the building project was complicated. BFS-architects AS in Oslo won first prize in a pre-qualification contest, but the detailed project was put on ice in 2003, to be resumed in 2006. The building proprietor, Drammen commune, originally estimated the cost of the swim hall construction to be 270 million Norwegian crowns. This estimate turned out to be too optimistic and was adjusted to 326 million crowns. Today, the construction work is coming to an end and the inauguration of the swimming pool hall is planned to take place on September 1, 2009. The main contractor, Strøm Gundersen A/S, can look back on a well-implemented project. The building contractors were not responsible for the exceeded budget.

Fasadeconsult in Mjøndalen installed the glass walls stretching 2,500 square meters around the entire hall. Buskerud Blikk & Montasje covered the box gutters and one of the walls with 12 tons of copper. In the main hall, a 50-meter pool with eight lanes was installed. In addition, the pool can be divided into two parts by a specially designed wall when desired. There are also a wave pool with an adjacent reverse-current canal, a children’s pool, a health pool with adjustable depth, two Jacuzzis and two waterslides.

Like a wave
The building is shaped like a wave; a large, arched roof rests on top of glass partition walls. On the northern side of the building, the gently curved roof drops all the way down to the ground. It is this northern wall with its specially designed windows that is characterized by copper strip covering from Luvata, supplied by Astrup; Nordic Green 0.7 mm.

"In addition to the arched wall and curved box gutters there are four ventilation ducts on the roof, also covered by double-seam copper strips", says Trond-Otto Oseberg at Buskerud Blikk & Montasje. Tor Erik Nordby supervised the sheet metal workers. The project occupied 3-4 people, who started in mid-November 2007 and completed the external work around Easter 2008. The box gutters below the northern wall windows and the downpipes were manufactured at the workshop according to architectural drawings. Copper strips and box gutters were produced in a newly purchased bender. The 70-80 pillars in the main hall received a "collar" of acid-resistant, shiny steel, also assembled by the sheet metal workers.

The new swimming hall is beautiful and exclusive. Steel and concrete structures are covered with veneer. "For us the work has advanced without problems, but the carpenters had a tough time in the beginning, as they started out with a veneer that was too thick. Also, at one point, the building proprietor considered using a less expensive material than copper, but fortunately he stuck with the original plan, which was to give the building an original touch. The hall is shaped like a huge wave with the sunshade over the southern wall resembling the foam on top of the wave when it breaks. I believe that people in Drammen will really enjoy this building", says Trond-Otto Oseberg.
Almost all the buildings are business premises. Here one will find most of the companies that frequently appear in sensational articles in the daily newspapers, for example TDC or DONG or companies with similar names. However, in the middle of the construction work the idea came up to add some flats to make the area livelier. Previously, this aspect was missing. You seldom saw people in the area, just silhouettes in cars—which is understandable as the wind always blows from all directions.

Most of the business premises are light grey, while the apartment buildings are clad with a dark reddish-brown copper, which with time will darken even more and finally turn green. At a distance the buildings surprise with their refreshing appearance and close up they are a pleasure to look at.

The buildings are beautifully designed and well proportioned with elegant details. The cladding includes copper cassettes and smooth strips, and large surfaces are clad with profiled copper with visible and precisely positioned screws. The entrance sides of the buildings are smooth with a combination of these elements, while the apartment sides are made of glass and have protruding balconies, also made of glass. The difference is pronounced; one side darker and calm, the other more vivid and incessantly changing when the light reflects in the different glass surfaces. It is very elegant and gives a solid impression compared to many other types of facade cladding.

The beautiful facade has been attained through the choice of material. If zinc, aluminium or some other light-coloured material had been used instead, the building would have revealed what it really is: a concrete construction wrapped in insulation material sealed with thin boards. A material with a "heavier" characteristic creates a more compact look. The result is so distinguished; one wishes that the homes had been built in a more "civilized" area of the city than this office desert. The balconies of glass are at their most beautiful when the apartments are still empty and not yet filled with bicycles, bed sheets and patio furniture.

Not only are the glass balconies transparent, the apartment windows run from floor to ceiling and to be comfortable living there you must trust that the glass surface is properly attached, and it helps not to suffer from vertigo. Still, if you happen to fall out of the window you may not get hurt, as you fall straight into the water; the harbour canal has been diverted to run along the facade, which looks nice but is hardly practical.

The buildings are interesting examples of a type of architecture that soon will be dominant, namely the facade-clad architecture. The latest building standards put such high demands on energy conservation that they can barely be met through traditional cast or brick constructions, but only by using sandwich-solutions where insulation materials consist of most of the filling. It is expected that there will be a high demand for this kind of architecture over the coming years. The buildings at Frederikskaj show that this will not necessarily be a bad thing.
Frederikskaj in Copenhagen
The advertising for the 152 flats of the building complex uses the following text, which hardly could be more poetic:

"Imagine the peacefulness of starting your day in the city sitting on the balcony with a view of the harbour and the water below. Or the unique feeling of taking a kayak trip through the canal around Frederikskaj after a long day at work. Imagine that you can choose among the many different things the city has to offer, such as culture, shopping or experience nature at Amager Fælled, only a short distance away. An apartment on Frederikskaj, just a few kilometres from central Copenhagen, will make this reality. The water is here, the light is here, the air, the atmosphere and the view are here – and the birds and the kayaks. All this together is a tangible part of the surroundings of Frederikskaj Residents. Even though situated in the centre of Copenhagen, they will give you the feeling of being far away from the city’s hustle and bustle. It is no longer necessary to commute for hours to get to a place were you could really relax.”
CALL FOR
AWARDS ENTRIES

Architects involved with copper buildings are encouraged to enter the 2009 'European Copper in Architecture Awards' and take advantage of this major opportunity to present their work to an international audience.

The design-led competition covers recently completed buildings in countries participating in the European Copper in Architecture Campaign. To be eligible, all entries must incorporate cladding, roofing or other architectural elements of copper or copper alloys, such as bronze and brass. But any building type can be entered - from major landmark projects to more modest buildings. There is also a discretionary award for innovation in specific areas of relevance today, such as sustainable building, economical construction, prefabrication, conservation or new uses of copper.

Winning and shortlisted projects will be featured in a special issue of the international magazine ‘Architectural Review’ and the best entries will also be covered in Copper Forum. Entries must be submitted by 31 May 2009 and the winners will be announced at a presentation in London, UK during September 2009. Entry forms and details of the 2009 Awards are available on www.copperinfo.co.uk/arch and www.copperconcept.org or via e-mail to: helpline@copperdev.co.uk
Roskilde Cathedral is one of Denmark’s cultural pearls. This is not just the opinion of the nation itself, as the Cathedral is on Unesco’s list of world heritage sites, which contains only two more Danish contributions: Kronborg and Jelling.

Heritage sites have to be well taken care of, and Roskilde Cathedral is no exception. However, it is both difficult and expensive. In the Danish climate buildings should be as simple as possible, a box with a sloping roof so that water and snow will run off quickly, and smooth facades where nothing can stick.

Roskilde Cathedral is quite the opposite. The building is as complicated as it possibly could be. It has all the ingenious features one will find in the art of building construction: pillars and box gutters, spires and domes, protrusions and recesses, vaults and towers, arches and curves and more – and all of this in great numbers. There is a lot to take care of.

What is most notable is the exterior: the slender spire, a Roskilde hallmark that can be seen from a distance, the tall copper roof and, close-to, the huge red brick building with its surprisingly successful additions made through several centuries, and the chapels with their royal graves that reflect the building techniques and architectural understanding of their time. Only in our times have we lacked the confidence to build a chapel for Frederik IX, but just a wall surrounding a garden. It is a shame, and goes against the healthy vitality that the building expresses.

The interior of the building confirms anticipated experiences: great beauty but also an equal amount of ugliness. The problem lies between the exterior and the interior – in other words in the construction.

The Cathedral was built between 1170 and mid-1200 in brick, which at the time was a new material. Absalon, who founded the Cathedral, had lofty plans; the building is 84 meters long and 24 meters tall! The style is both Roman and Gothic. The towers date from the 14th century. Christian I’s chapel is from 1459; Christian IV’s chapel – in renaissance style – was built 1615-20. Frederik V’s chapel, designed by C.F. Harsdorff, was erected 1774-78 in classicism. Christian IX’s chapel, designed by A.C. Clemmensen, was built 1917-23.

This is enough ancient construction to cause problems, but the problems did not arise without a reason. The Margrethe spire and the roof above the crossing in both directions burned in 1969. It was a violent fire as the woodwork had dried out completely through the centuries. At the following reconstruction, all efforts were put into making sure that such an accident would not happen again and all timber was pressure-impregnated against decay and fungus, and the planks also against fire.

It is due to that extensive chemical treatment that the work will have to be redone. Each age finds it both natural and necessary to use the latest knowledge as a supplement to life’s experience. But just as medicines can have side effects that will end up killing the patient, different chemicals in a church roof can get into violent conflict. The fire-prevention chemicals have caused the timber to absorb humidity, which has created ammoniac fumes that, in turn, have damaged the copper sheeting and washed away the impregnation against decay and fungus - chrome and arsenic. The roof started to leak and poisonous substances began to trickle down into the church room.
The copper covering of the spires was renewed in 1972-73. The 100-year-old roof covering had cracks and was leaking, and needed to be replaced together with parts of the timber construction. Already a couple of years later, cracks in the new copper sheeting were discovered, particularly in the swinging part of the spire. Since then, mechanical and thermal conditions have affected the copper sheeting and in several places destroyed attachments on the underside of the roof.

There are many theories about what went wrong with the covering of the two main spires. Could it be a faulty seaming technique? Or has poor ventilation caused the air to stay inside the roof, thus pressing the copper sheeting outwards? Today, all damaged wood in the spires have been replaced and a new roof covering, using approximately 10 tons of 0.75 mm soft, untreated copper, has been done using new methods that will ensure a long life.

The roof above the crossing is no longer impregnated. The enormous beams are made of Douglas fir. They are so big that they cannot be lifted by a crane when connected, but will have to be test-assembled on the ground, then separated and lifted up piece by piece, to be assembled finally on the roof. One of the “pieces”, the central beam, measures 320 x 320 mm, is 15.20 metres long and weighs approximately 1,100 kg.

Douglas fir, which resembles larch, contains a lot of resin and tannin substance, which make it resistant to decay and fungus. Oak is used for brick-wall support and base beams at the roof frame. Some of the wood is “Fleet oak”, from oak trees planted after the defeat of the Danish fleet in 1807. The carpentry contractor responsible for the woodwork has in addition engaged three Swiss and German carpenters with the greatest expertise – wearing in black costumes with shiny buttons and big hats and with special experience in renovating old timber constructions in European churches using sophisticated tools.

When all carpentry has been completed, the roof will be covered with about 20 tons of 0.75-mm soft copper sheeting. Once again people will be able to enjoy the tall silhouette of the Cathedral from a distance for the next 100 years to come as there is nothing now that eats the copper from the inside.

It took a few years, at a cost of 100 million crowns. But so what, when you think about what we otherwise spend millions on!
Architects Hvidt & Mølgaard A/S
Timber Jönsson A/S
Copper John A. Hansen [The two towers]
Bravidan Danmark A/S [The crossing]
5 Botanicheskaya Street, hotel, Moscow

The building was completed in 2007. The cladding material is Nordic Green, of which two different surface types have been intentionally used on the façade. The façade has been realised with the Aluwall façade system. The façade of the 12-storey hotel is mainly of copper and glass construction, with a vertical sun motif on part of the façade.

Architects Popov & Partners. Main designer architect Dmitriy Viktorovich.
4/7 Vozdvizhenka Street, seven-storey office block, Moscow

The administrative office of the President is located in this building designed by Architects Popov & Co, with architect Vershinsky Dmitriy Viktorovich as the main designer. The building was completed in 2008.

The façade material is Nordic Green copper with surface type Traditional. The façade has been realised with the Aluwall façade system. The metal façade of the building with copper surface sheets plays the role of a small-scale modernistic feature in the townscape.

Architects Popov & Partners. Main designer architect Dmitriy Viktorovich.
Project ‘de Jonas’
– ROC Hengelo, The Netherlands
An intriguing elliptical pod, clad with more than 3000 kilograms of copper, forms an organic central focus for the ‘ROC of Twente’ high school in Hengelo, the Netherlands.

The striking elevated pod is named ‘the Jonas’, after a tale from the Bible about Jona and the whale: “The prophet Jona gets the assignment of God to warn the people in Ninivé, because this city will be destroyed within 40 days. Jona refuses and escapes with a ship. A storm surprises this ship and Jona is thrown overboard. A big whale swallows Jona, and Jona survives three days and three nights in the stomach of the whale. When the whale spits Jona out, he still decides to go to Ninivé.” The Jonas pod can be seen as Jona, a small creature inside a huge space, the enormous hall of the school building.

The Jonas is used as a conference room where, for example, students can give a presentation. Moreover, this luxurious room can be used for meetings and also award ceremonies. The central eye of the ellipse is made of glass which, using a specific electric process, changes from transparent to opaque and can be used as a projection screen. The Jonas has a capacity for groups up to 50 persons.

Architect Harry Abels, director of IAA architects located in Enschede, The Netherlands, designed the Jonas. X kwadraat, a company that builds architectural art objects, also located in Enschede, planned and built it, starting in 2007. The base of the Jonas, a frame of steel, had already been built in June 2007. In total, 12 ton of steel has been used for this frame. On top of this frame is a concrete floor on which are so called ‘whale-bones’ - a complicated wooden structure which was prepared on the shop floor of X kwadraat and put together on location as a giant puzzle. This whalebones structure was then finished with copper plates, called ‘scales’. It took, in total, 6 months to build this project, and completion took place in September 2008.

The height of the Jonas is 12 metres, and the internal height of the floor is 8 metres. The length of the ellipse is 17 metres, with a width of 9 metres, giving a total surface area of 80 square metres. The view from inside the Jonas into the huge hall of the school building is wonderful. The initial design of the Jonas included brass scales but, as a result of the advise of X kwadraat, the architect chose to use copper scales because of the application of Nordic Green pre-patination. This colour, in combination with the shape of the Jonas and the pattern of the reptile-like skin, appealed the architect. The form of the Jonas is essentially organic, inside as well as outside.
COPPER DECONSTRUCTION
A major sports building in Budapest, Hungary mutates its straightforward rectangular plan into a complex faceted copper roofscape.

The building in Csörsz Street is a simple one as far as its floor plan is concerned. It is made up of two squares of identical area, one of them housing the gym hall with grandstand seating, the other containing a swimming-pool with auxiliary facilities wrapped around in an L-shape. The circulation system linking both functions is clearly presented: the two blocks are both separated and connected by open and enclosed public circulation spaces on two levels. This arrangement also separates barefoot pedestrians from those in footwear.

But it is at roof level that the designers T2.a Architects reveal the true form of this extraordinary building. Here a series of apparently random, faceted planes – all clad in copper – deconstruct the regular cube forms below. Viewed from Csörsz Street or from the longitudinal façade to the adjacent gardens, the building suggests fragmented pieces of a broken shell. Some of the copper planes interlink to form a continuous roof surface, while others generate areas of vertical glazing between them to provide generous natural lighting into the spaces below. These copper planes carry over to vertical surfaces dropping down from the roof area to meet the rendered walls below.
Client: Budapest-Hegyvidék, District 12, Local Authority
Architect: Gábor Turányi, Bence Turányi (T2 a Architects Ltd.)
Fellow-architects: Zsolt Frikker, András Göde, Orsolya Gánczi, László Földes, Barnabás Láris, Péter Márk, Eszter Mészáros, Levente Skultéti, Zoltán Stein, Miklós Vannay
Working drawing: Maczelka László (Materv Ltd.)
Fellow-architect: Barnabás Balai
Interior design: Szabolcs Nagy-Miticzky (TérAlkotó Ltd.)
Fellow-architects: Bence Sárkány, Ádám Vesztergom
Structure: Zoltán V. Nagy, Zsolt Inokai, Dr. József Almási
Plumbing & HVAC: Attila Braun, István Tóth
Electrical Planning: Gábor Bíró, Miklós Tornailay
Public utilities: Attila Bíró
Swimming-pool technology: Zoltán Sallai
Photo: Zsolt Batár

Further information
A critical article exploring the design philosophy of the building was written by Jen Kapy and published in 9–10/2008 issue of Alaprajz magazine in Hungary, for more info visit www.archiweb.hu
A NEW PARADIGM FOR URBAN HOUSING

In this 8-page feature, architect Chris Hodson looks at different aspects of a particularly influential British housing project. Following this project overview is a closer building study of one house design, then a discussion about the architectural role of copper and finally detailed design of a particular copper-clad building element.

The site, formerly occupied by low-rise government offices built in the 1940s, lies to one side of Brooklands Avenue, close to the Botanic Gardens and the railway station in south Cambridge. The locality is characterised by large terraced and individual 19th century villas. Accordia is a strategically important new residential quarter for Cambridge and the last major undeveloped ‘brownfield’ site close to the city centre, in a key position between the city and open fields. As a result, the municipal planning authority insisted that the developer – Countryside Properties – employed good designers to maximise the unique opportunities presented by the site.

Accordia is therefore the result of an unusual collaboration between three of the UK’s most highly regarded architects – led by master-planners Feilden Clegg Bradley Studios (FCBS) with associate architects Alison Brooks Architects and Maccreanor Lavington – working closely with landscape architects Grant Associates and other consultants. Building work started on site in September 2003 and still continues today. The development comprises 212 houses and 166 apartments on a 9.5 hectare site at a density of 40 dwellings per hectare overall including landscape spaces. In addition to master-planning, Feilden Clegg Bradley Studios designed 230 of the dwellings and subcontracted 30% to Maccreanor Lavington and 10% to Alison Brooks Architects to design the rest.
ACCORDIA CAMBRIDGE UK

Photo: Peter Cook, View Pictures

Photo: Tim Crocker

Photo: Countryside Properties

Photo: Chris Hodson
The master-planners FCBS have described the design as including a variety of innovative house and apartment types in the form of terraces, courtyard houses and ‘set-piece’ apartment buildings, composed within public landscaped gardens which extend to approximately 3 hectares – around one third of the site. The buildings are arranged in three dense groups of up to 65 dwellings per hectare, separated by mature landscape, with houses ranging in size from three to five bedrooms (90 to 350 square metres) and apartments of one, two and three bedrooms (45 to 145 square metres). Included is a proportion of 30% affordable dwellings in mixed tenure, integrated both in design and materials with the private housing.

The site presented a strong existing landscape framework with over 700 mature trees, so the principle design concept was “living in a large garden”, informed by local contextual references taken from the historic college garden courts and the public green squares – known as ‘pieces’ – of Cambridge. The scheme takes an innovative approach to providing gardens of many scales, from interior rooftop spaces and internal courtyards to large semi-public community gardens. In place of conventional house gardens, private open spaces in the form of courtyards, roof terraces and large balconies are designed as an integral part of the architecture. In combination with the generous communal gardens this aims to reflect the changing aspirations of our modern lifestyles and continues a strong tradition of domestic architecture in Cambridge.

“high density housing at its very best... a new model for outside-inside life... a paradigm shift in British housing”

Layouts for three typical FCBS house types illustrating the three-dimensional approach to introducing open areas.

Left: 3-Bed Courtyard House;
Centre: 4-Bed Courtyard House;
Right: 4-Bed Semi-detached House.
The master-plan was designed for pedestrian and cycle demands, with landscaped pedestrian 'streets', mews areas with shared surfaces, discreet car parking and integrated cycle parking for all dwellings. Each dwelling is accessed from an urban street side but opens out onto, and enjoys views of a shared landscape which includes amenities for passive and active recreation. The form of the buildings is not only determined by the relationship and scale of the open space and urban frontages but also by the solar orientation. The larger scale apartment buildings and terraces are associated with the bigger open spaces and are typically on an east/west orientation to minimise overshadowing of adjacent homes. The lower terraces and courts are arranged around the more intimate landscape spaces with south facing terraced gardens.

The project received strong support from the municipal planning authority, local residents of the area and CABE - the government’s advisor on architecture, urban design and public space. It has also won a range of important Awards, including the UK’s top architectural award – the Royal Institute of British Architects (RIBA) Stirling Prize – in 2008, the first housing project to do so.

Copper has an essential role in the limited palette of materials throughout Accordia including vertical facades, distinctive bay windows …[seen on the left and discussed on page 31] and dramatic curved roofs (seen on the right and discussed on page 28-29).

**COMMENTS FROM THE STIRLING PRIZE AWARD JURY ON ACCORDIA**

- high density housing at its very best, demonstrating that volume house-builders can deliver high quality architecture.
- a new model for outside-inside life with interior rooftop spaces, internal courtyards and large semi-public community gardens... there is common land where children safely play.
- the landscape architect deserves joint credit along with the three firms of architects. Together they have created a place that is both singular and cohesive – so much so in fact that it is hard to tell where one architect’s designs stop and those of another start; where landscaping ends and architecture begins.
- this is architecture that treats adults as grown-ups and children as people with different needs.
- an exhilarating project which adhered to the tenets of modernism, one that reinstates values that were lost from housing in the latter part of the 20th century...delivering light and fresh air at high density.
- a paradigm shift in British housing, sending a message to an industry that has for too long been anti-design and to politicians who have regarded houses as targets to be achieved.
- the values of Accordia are those British cities need more of: a subtly controlling master-plan, a collaborative approach and an eye for both the detail and the big picture in the landscape and the architecture.
Compared early on in the Accordia project, in March 2006, these four 400m² semi-detached houses form part of a row of substantial properties that front onto Brooklands Avenue and showcase Accordia. Inspired by the array of unusual old villas along Brooklands Avenue, the house design provides a flexible open plan layout with internal spaces varying in height and orientation within the envelope defined by FCBS' high density, sustainable masterplan.

Split down the middle to create a top-lit, triple height atrium and stair hall, the two halves are offset to create a split level so that the living room becomes a 4.5 metre high space. The ground floor was conceived as an open plan ‘landscape’ with a sunken living room, fireplace and dining areas having large glazed areas opening onto outdoor patios and terraces. A single curved pre-patinated copper roof sweeps over the top floor of each house creating a huge open plan family room, with a fireplace, rooflights and a wall of glass open to the sky.

The buildings are primarily clad in yellow stock brick in line with the masterplan with openings freely placed in the elevations. The front and back facades have projecting porticoes to provide shading for the large areas of south facing glazing and to create ‘blinders’ to reduce overlooking and increase privacy.

Alison Brooks, comments: “This house is about spatial drama, openness and natural light. The split level, open planning has allowed us to create a house with no corridors and double height living spaces. The central atrium fills the centre of the house with light and creates a visual connection between all levels of the house. The top floor family room is an ideal flexible space – an ideal party room, games room, or it could even be another bedroom suite. This house restores some of the glamour of living in a substantial urban villa, but has the flexibility needed by the modern family.”
“this house is about spatial drama, openness and natural light”
A limited palette of high quality external materials was developed by FCBS at the master-planning stage, which the other architects embraced and adapted to suit their particular architecture. FCBS Partner Mike Keys explains: “We defined the type of architecture with the local planners from the start – combining a modern approach to housing and design with high quality traditional materials with a local heritage. Walls for the houses are generally yellow brick, close to traditional ‘Cambridge stock’ bricks, and there is extensive use of timber and dark coloured windows. Copper roofs, distinct areas of cladding and elements such as the prominent bay windows harmonise well with the brick. Then, for the larger apartment buildings copper becomes the predominant facade material – again sitting comfortably alongside timber elements, the dark windows and stone gabion plinth. It was interesting to us that copper could deliver crisp detailing for features such as the bay windows and also a softer, ‘living’ surface in larger areas on apartment facades.”

FCBS are no strangers to designing with copper and regularly use the material on a wide range of building types. In fact, the practice has been commended on a number of occasions in the European Copper in Architecture Awards (reported in previous issues of Copper Forum). Mike Keys adds: “We are very comfortable with the central role of copper as one of the FCBS master-plan’s external materials. Copper roofing forms an important part of Cambridge’s historic skyline - probably more so than most other British cities – and that tradition continues with contemporary buildings. This aesthetic is typified by the distinctive green patina of the material after long exposure to the elements and we chose pre-patinated copper to give this vibrancy straightaway on the first four houses we designed. In contrast, our next design for Accordia – a 10 unit apartment building – takes a ‘cut and folded’ form with brass cladding.”

All those involved with Accordia have a longstanding commitment to sustainable design. The buildings and landscape have been designed with sustainability principles in mind, including the environmental performance of each dwelling type, water usage, the methods used for construction and the materials.
Copper-clad, square bay windows are used frequently at ground and upper levels throughout the FCBS buildings at Accordia, defining an important and recognizable theme. Generous glazing allows daylight deep into the buildings and frames the occupant’s views of the landscaped surroundings. But the bay windows also incorporate discreet side-opening copper-clad vents to allow air in. Careful detailing proved central to the success of these elements.

FCBS partner Mike Keys says: “Straightforward detailing with care – particularly where different materials meet – is a hallmark of Accordia’s architecture. The interaction of the window system we selected with the copper cladding and vents had to be carefully worked out. We were particularly concerned to detail neat copper flashings into the brickwork and avoid the large, untidy upstands and drips too often seen with housing details in the UK. The standard of copper craftsmanship was consistently high at Accordia so that our details were executed just as we intended.”

More Information
This building is a significant piece of architecture situated on the hilltop of Lelekovice near Brno in South Moravia, Czech Republic. At first sight you encounter the segmentation of material and colours, which mutually harmonise and create a pointed aesthetic contrast as well – a layering of materials and shades of colours.

The design determinants came from the regional planning of Lelekovice and from the investors’ priorities to create harmony of between nature, the house and living in the house.

The house was set on a sloping terrain with the aim of creating an architecturally interesting building for a man and nature living together, particularly with respect to the choice of materials. A simple palette of three materials – copper, stone and wood – determines the natural feel of the building.

The house was set in greenery and partly embedded into the ground in the north. A hall with a swimming pool on this north side is covered with earth and one can walk on the roof. Stairs leading from the hall to the rear of the plot run around an inclining copper strip-laid roof.

The architect extends the exterior into the interior with a continuous use of materials. The colour scheme of the whole interior is in subtle shades so that the wooden facing and stone walls can create a harmony with other elements.
The main part of the house is a big living room with a kitchen and a glassed-in wall, visually connected to the hall with a swimming pool. The countryside can be viewed through big areas of glazing. One can also watch a beautiful and colourful scenery and enjoy the sunshine inside the house. Spaces, shapes, colours and materials were carefully designed in detail by the architect, forming a unique concept for the house.

A triple combination of materials divides the house with different surfaces – copper, oak and various types of stones (flat stones and boulders) from a nearby stone pit. This way of laying stones is unique and has not been used yet. The colour of the chosen copper – dark brown, although in the beginning it is lighter and in the process of several months it grows darker, contrasts with the light shade of oak facing. Wooden areas unite the composition. Copper roofs and inclining strip-laid walls create the most appropriate choice of roofing for this type of a house. It gives visual and aesthetic value and meets all the functional demands.

Copper is an indispensable element for architecture linking people and nature.
Copper – Recent trading within clear price range, but still risk for new declines

By Ukko Massinen and Thina M. Saltvedt, Nordea Commodities

- We have experienced price jumps on index reweighing and strategic buying.
- Weak future outlook
- Financial actors in deep short positions
- Small production cuts compared to other metals

February 2009

Since the beginning of the year copper has traded in a broad range of USD 3,000/t and USD 3,600/t and is currently trading around mid-range levels of USD 3,300/t. Prices strengthened in January due to the commodity index rebalancing, and later in early February prices traded at range highs as rumours of strategic buying by Chinese SRB hit the market. However, the price outlook remains weak with the real economy in recession, credit issues prevailing and the US housing market in its worst state in decades. We believe that copper prices have held surprisingly well despite the weak demand picture, heavy selling from financials and the lower growth outlook for the economy and that any major rally in copper is unsustainable in the short term given the weakness in fundamentals.

There has been no improvement in the demand outlook. We would rather argue that the situation seems to be getting even worse. Key consuming sectors, automotive and construction, are in a bad state and the demand outlook for these areas is not likely to brighten in the medium term. For instance, US automakers are going to cut production in relation to the US government financing package, and US housing starts, reported this week, plummeted to record lows (-16.8%, 466k units, annual rate) and were down even more than expected. Meanwhile, stimulus packages and infrastructure spending will lend some support to copper wire and cable demand in the medium term as will potential buying by the SRB for the Chinese strategic reserves. Chinese import demand has been relatively strong with Q4 2008 net refined imports up 70% y/y.

Producers have continued to curtail output in the low price environment. A further 100ktpy of capacity has been announced to be taken off line. However, production cuts in copper have been marginal compared to other metals. This is because a large number of operations are cash positive even in the current price environment. Prices will need to correct below USD 3,000/t for the supply side to tighten significantly. That said, the longer-term supply pipeline looks thin and will result in a tighter copper market once the economy picks up.

Copper inventories have continued to build and currently total a mere 530k tonnes. Given the weak demand environment we expect the levels to increase also going forward. Inventories should be closely monitored as any change in the trend will act as a good sign of a pick-up in physical demand.

The Reuters semi-annual poll of metals analysts published in January shows that copper prices in 2009 and 2010 will average USD 3,471/t and USD 4,329/t, respectively. This implies that on average prices are not expected to drift significantly from current levels this year, but are likely to correct higher in the longer run. We agree with the consensus that prices are unlikely to move significantly higher from current levels in the medium term, but we believe that prices could fall below USD 3,000/t in the coming months given weak fundamentals.
HISTORY
The Leppäsuu estate is the only “City campus” estate in Helsinki with a history dating back to the 1940s, when the Student Union of the University of Helsinki initiated the building of student houses. At the turn of the millennium, the constant increase in the number of students at the University resulted in a lack of activity and assembly facilities, in particular. In addition to the Student Union, the Helsinki School of Economics, which is located near the campus and is part of the future Aalto University, was also looking for facilities in the area for the needs of HSE Executive Education.

The Student Union of the University of Helsinki and the Helsinki School of Economics joined forces in 1999 and started the design project of the Third Student Union Building in the only available plot in the area, in the corner of Mechelininkatu Street and Leppäsuonkatu Street.

The Old Student Union Building and the New Student Union Building on Mannerheimintie Road had been built in 1870 and 1910, respectively. The Third Student Union Building was completed in Leppäsuu in November 2008 and in the inauguration ceremony was christened Domus Gaudium, the House of Joy.

TOWNSCAPE, ARCHITECTURE
The 8-storey residential buildings in Domus Academica form an open block structure, which is rather atypical of a downtown area, but then they were originally located in the outskirts of the town. As a 2-storey corner building, Domus Gaudium will integrate the block structure and serve as a pedestal for the vertical rhythm of the point blocks. It has adopted its scale from the low-rise buildings on Mechelininkatu Street, such as the adjacent Domus library designed by Architects Arkkitehtitoimisto Einar Teräsvirta, which is now known as the Helecon Information Centre.
In addition to its complementary role in the block structure, the aim has been to render Domus Gaudium the expression of a symbolic building that it deserves on the basis of its functions. Despite the small size of the building, it boasts two impressive entrances; the more public entrance is on Mechelininkatu Street and the other on the Domus Square. Not only does this facilitate the activities carried out in the building, it also reflects the two end-user groups. The undersides and the wall surfaces of the lofty entrance shelters made of steel structures are covered with copper sheets, which are illuminated at night. The ground-level, cast-in-situ concrete surfaces have been adorned by sculptor Pertti Kukkonen with flakes of copper and he also pre-patinated the concrete giving it a greenish colour. The original idea was to create a copper recess pre-patinated in green, but this could not be realised due to the economic downturn, so we will have to wait for the copper to become naturally patinated.

The longest unbroken facade of the building on Leppäsuonkatu Street was realised as a double facade of steel and glass construction. It shines like a lantern at night in the main approach directions reflecting the swift pace of student activities and educational functions that often continue till late at night.

The office facilities of Executive Education are located in the Annex on the side of Mechelininkatu Street and open up to the Street through generous, large window surfaces. Solid wall surfaces are connected to adjacent buildings with discreet, warm plaster surfaces in light colours.

The third floor of the building is virtually invisible. A pavilion-type sauna department in the centre of the roof area is called Civilisation. An almost 100 m² roof terrace completes this civilised sauna floor.
INTERIOR
A partly 3-storey lobby extending from the entrance on Meche-lininkatu Street to the entrance on Domus square acts as the functional and spatial axis of the interior facilities. The most dominating element of the lobby in terms of space is a body with rounded edges floating on the level of the second floor, seemingly separated from everything else. The form of this body, which contains two lecture rooms, has been achieved with gypsum boards bent round the curved steel frame. The steel arches of the frame are fixed with 60 cm spacing to the concrete slabs of the roof and the intermediate floor. The auditorium wall which separates the body from the teamwork rooms is hollow and carries building services. Most of the load-bearing columns are spiral welded steel composite columns filled with concrete. Beams are Delta steel beams.

The typical character of the central lobby is also enhanced by two walkways of steel construction, which run along the full length of the lobby connecting the various floor levels in terms of both access and visual expression. The tall lobby brings light into the underground basement floor, which contains facilities also included in the floor area of the building. The lobby connects these facilities directly with the facilities located under the Domus Square courtyard and in the basement of the D building. These facilities were also renovated and converted simultaneously with the building project of Domus Gaudium.

The former Alibi Restaurant, for example, was completely renovated and refurbished in this connection. Natural lighting in the restaurant was essentially improved by a new glass pyramid of steel construction, which opens up to the Domus Square. The new gala room of the Student Union was built in the lower basement under the restaurant and for this reason the basement had to be lowered ca. 1.5 m. Many other acoustically challenging facilities were also realised in the basement, such as band rehearsal rooms and a small music hall. All the ceiling, floor and wall surfaces of these facilities were separated from the concrete frame of the building by multiple layers of gypsum boards mounted on steel structures.

The underground facilities of the buildings also provide parking space for ca. 100 cars.
DOMUS GAUDIUM, THIRD STUDENT HOUSE
ADDRESS: Leppäsuonkatu 11, 00100 Helsinki, Finland

SCOPE: Total area
New building 6 130 m² – renovated building part 5 950 m²
Volume, new building 26 780 m³ – renovated building part 23 680 m³

COSTS: New building 14.5 million €
Renovated building part ca. 11 million €

CLIENT: Kiinteistö OY Leppätalo/
Student Union of the University of Helsinki

Construction Project Manager Jukka Leinonen
Helsinki School of Economics, Facilities Administration

Architect Juhani Kurki

PROJECT MANAGEMENT CONSULTAT / PROJECT MANAGEMENT CONTRACTOR
SWECO CMU Oy
Aku Kallio, Jouni Pessala

ARCHITECTURAL DESIGN:
Architects Arkkitehtitoimisto Brunow & Maunula Oy
Architect Susan Niemelä, head designer of renovated building part
Architecture from

Austria • Belgium

Czech Republic • Denmark

Finland • France

Greece • Germany

Holland • Hungary

Italy • Luxemburg

Norway • Poland

Russia • Spain

Sweden • Switzerland

United Kingdom

www.copperconcept.org