

# trä!

A MAGAZINE OF INSPIRING ARCHITECTURE  
FROM SWEDISH WOOD » ISSUE 1 » 2020

**EXTREME PRECISION  
FOR WATCHMAKER  
SPACIOUS  
EXHIBITION HALL  
DISCREET HOUSE  
AMONG THE ROCKS**

**TRÄ MEETS**

**Architects Declare**

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**Wooden bridges for  
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## Extraordinary detail





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# trä!

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**Swedish Wood** represents the Swedish sawmill industry and is part of the **Swedish Forest Industries Federation**. The forest industry is one of Sweden's most important business sectors. It provides employment throughout the country. Thanks to its natural raw materials and products, the forest industry has a key role in the development towards a sustainable, biobased society.

**Trä magazine** is aimed at architects, structural engineers and everyone else interested in architecture and construction.

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**Responsible publisher** Mathias Fridholm

**Project manager** Alexander Nyberg

**Editorial team** Björn Nordin & Alexander Nyberg (Svenskt Trä), David Valldeby (Utopi)

**Editorial board** Tomas Alsmarker (T Alsmarker AB), Mikael Andersson (Wingårdhs), Jessica Becker (Trästad), Eric Borgström & Björn Johanson (Björking), Carmen Izquierdo (Esenial), Lars Ringbom (MSB)

**Editor & art director** David Valldeby, Utopi

**Text editing** Johanna Lundeberg, Ordglad

**Cover** cial park by Helen & Hard and SAHA in Stavanger, Norway. Photo Sindre Ellingsen.

**Advertising** Roger Nilsson, Annonskraft, tel +46 (0)651-169 81, [roger.nilsson@annonskraft.se](mailto:roger.nilsson@annonskraft.se)

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**Mathias Fridholm** Director, Swedish Wood

## »We have our health!«

**STOCKHOLM, SWEDEN** »We have our health. That's the main thing.« That's how my grandmother would always end our phone calls in her lilting southern Swedish accent. I used to speak to her at least once a week right up until she passed away around a year ago. And grandma was right! Health and well-being is and always will be the most important issue for generation after generation. Old sayings can sometimes feel a little outdated, but occasionally a quote such as »health is not valued till sickness comes« springs to mind.



However, what is considered healthy and beneficial varies over time. Grandma always thought cream was the best thing you could eat – maybe not surprising if you grew up in the harsh reality of rural Sweden in the early 1900s. And what happened to eating 6–8 slices of bread a day...? It's a while since I heard anyone recommend that. But although many health trends these days come and go in a flash, some endure.

Being out in the forest and countryside has a calming effect on us humans. It lowers the pulse and blood pressure, improves concentration and boosts our sense of well-being. The phrase »forest bathing« first entered the Swedish lexicon in 2017, but the concept of the forest's calming and invigorating effect is well documented. It originates from the Japanese word Shinyin-Roku, which is the notion that human contact with nature is good for our health.

But did you know about evidence suggesting that wood has the same calming effect as the forest? Research in this field is unfortunately still rather thin on the ground, but a number of studies support the theory. For example, a study in Austria reported an improvement in students' concentration when the classrooms were made of wood. Being able to reduce stress and ill-health by living in wooden homes and using more wood in interiors is an interesting and not unreasonable proposition. I personally love sharing my life with a material that is natural, beautiful, warm and versatile. Sometimes you don't need scientific results to know what makes you feel good.

Grandma, who thought health was the most important thing of all, lived most of her life in a wooden house. And she lived to the ripe old age of 99 years and 10 months! What more is there to say?

Mathias Fridholm





Oosp Architectuur Fotografie



Mark Hadden

## Artwork as bee hotel

**GLASTONBURY, UK** What role do bees play in our countryside and our lives? Greenpeace sought to address this question at the annual Glastonbury Festival with Wolfgang Buttress's timber pavilion, made from over

**OBJECT** Beam pavilion  
**ARCHITECT** Wolfgang Buttress  
7,000 locally grown Sitka spruce trees. The trees were cut to a suitable height but otherwise left completely untreated, leaving the branch marks and bark on the assembled stems, to give a sense of walking through a real forest glade.

The pavilion, measuring 30 metres in diameter, had several pathways that all led to an open space at its heart, surrounded by 3.5 metre-tall planks to form a kind of cocoon. Here, you could listen to recordings of buzzing bees and music created from the same sound.

Thanks to vibration sensors, it was also possible to experience the activity of the local bees in a light show that ran day and night. In addition, visitors were encouraged to take a small drill and create holes in the wood, so the pavilion could offer new homes for bees. «

**w|** wolfgangbuttress.com



Brigida Gonzalez

The concrete block has gained two new floors in CLT, while retaining the look of the exterior.

## Extending upwards in wood

**MUNICH, GERMANY** What do you do when you want to add a floor to a 1980s building, but the existing concrete structure isn't strong enough? In a German district, they simply demolished the top floor and then added two floors with a CLT frame that is light enough to avoid the need for reinforcement.

To harmonise with the rest of the building, and with other blocks in the area, the exterior is clad in metal, which also makes an appearance in parts of the interior, along with concrete, as a reminder of the building's origins. However, the dominant material inside is exposed CLT, particularly in the penthouse, whose sloping ceilings frame the whole apartment and join the rooms into a single unit. The generous ceiling height also leaves space for a mezzanine level with balcony, and the architects have worked to accentuate different angles in the interior – forming what they describe as a kind of sculpture. «

**OBJECT** R11 roof extension  
**ARCHITECT** Pool Leber  
**STRUCTURAL ENGINEER** Andreas Obermüller

**w|** poolleberarch.de

## Classic function in modern guise

**OBJECT** Villa Vught  
**ARCHITECT** Mecanoo  
**STRUCTURAL ENGINEER** Bartels Ingenieursbureau

**VUGHT, NETHERLANDS** A Dutch »hoeve« is a collection of farm buildings with a shared inner courtyard, sheltered yet open. The same typology, but with a modern twist, has been used in the little community of Vught to create a small cookery school next to the owners' private home.

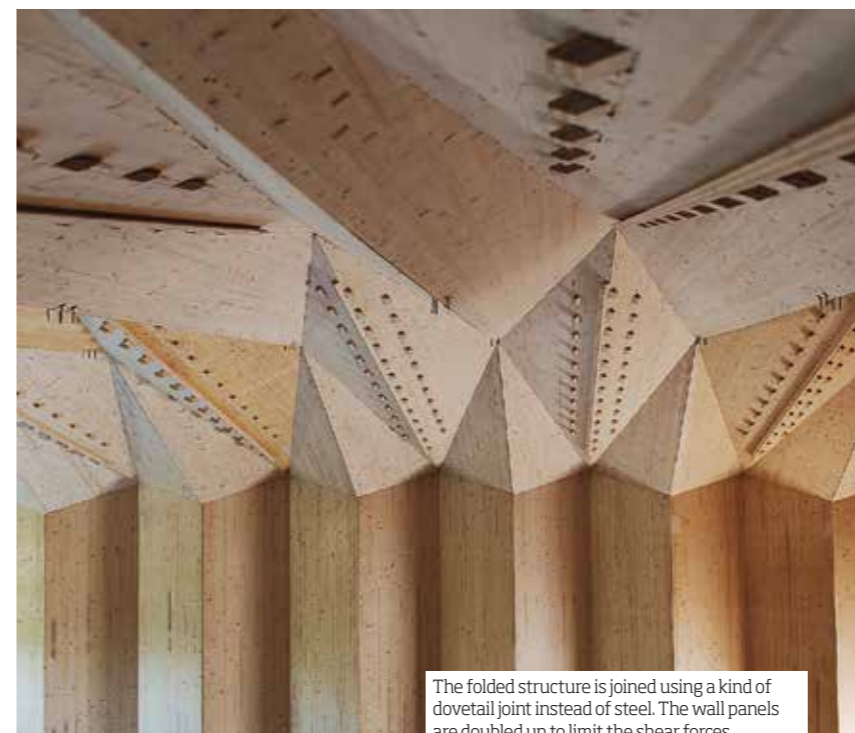
The buildings form three distinct volumes, the two lower of which are shaped like gabled barns. One of these contains a kitchen, dining room and workspace, and the other is designed to receive guests, providing a large studio for cookery classes and other activities.

The roof terrace offers panoramic views. The large sheltered courtyard connects the volumes.

Next to the barns, the taller building, which contains the family's private living quarters, forms a landmark with expansive views from the roof terrace.

The dominant material in the three volumes is cross-laminated timber. The wood has been left exposed as a distinctive part of the design, supplemented with silver fir internally. The façade is clad in dark, bronze-coloured aluminium, chosen to harmonise with the roof of corrugated metal, as commonly seen on local farms. «

**w|** mecanoo.nl



The folded structure is joined using a kind of dovetail joint instead of steel. The wall panels are doubled up to limit the shear forces.

Ilka Kraemer

## Origami put together with newly developed joints

**LAUSANNE, SWITZERLAND** A public building where the structure is connected in the traditional way, without the use of steel components. That's what the new arts stage in Lausanne looks like, made of wood with an attractive origami structure. Eleven CLT vaults in locally produced wood are formed by the pleated panels of the walls and the building's roof. Instead of screwing the elements together, the structural engineers have drawn inspiration from a traditional method, dovetails,

**OBJECT** Origami pavilion  
**ARCHITECT** Yves Weinand  
**STRUCTURAL ENGINEER** Blumer-Lehmann

but in a distinctly modernised guise. With the help of design software, they developed a precise and specific cutting plan for the various parts. The software also calculated how the forces will be distributed in the folded structure.

The walls are constructed in double layers, separated by a 210 millimetre gap that is filled with cellulose insulation made from recycled newspaper, which limits the shear forces and gives the building good acoustics. The roof height ranges from 16 to 20 metres without any intermediate supports, despite the wall panels only being 45 millimetres thick. «

**w|** weinand.be



## Arkitekten berättar

”Vi inspirerades av det röda 60-talsteglet och ville skapa en koppling till det genom pixleringen, färgskalan och det subtila mönstret i den nya Cembrit-fasaden. Med två röda nyanser och skilda texturer i skivorna blir fasaden mer levande genom ljusets skiftningar över året”

Fibercement är ett tåligt och robust material som kräver relativt lite underhåll, och det är enkelt att skapa olika uttryck med Cembrits breda sortiment.\*

Pilvi Vanamo, Lönnqvist & Vanamo Architects.

**CEMBRIT**  
Building Better Days

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Like a little log cabin, the shingled studio with sleeping loft merges into the Japanese forest.

## Minimal footprint with clay and wool

**OBJECT** Shell house  
**ARCHITECT** Tono Mirai  
**STRUCTURAL ENGINEER** Masuda Structural Architects & Associates  
[w| tonomirai.com](http://w|tonomirai.com)

**NAGANO, JAPAN** What the client wanted was an unusual and attractive design that doesn't feel old. The building also had to comply with detailed development plans, have a minimal climate footprint and be small enough to merge into the forest in Nagano Prefecture.

And all those conditions have been met. What awaits inside is a space packed with beautiful and clever solutions, all made using local materials. The supporting structure in FSC-certified local wood is anchored in the curved walls, made from clay and insulated with wool, before stretching out into the room. The tiny house has built-in storage and space for a loft bed. Up there, you get a good view of the ceiling, which comprises seven curved glulam beams, joined in a circle to symbolise the human lifecycle in symbiosis with the universe.

Small windows contribute to the cosy feel, but the main light source is very much the glazing across the front. «

[w| statenskonstrad.se](http://w|statenskonstrad.se)

## Supportive pavilion

**NORRKÖPING, SWEDEN** Portalen is an organisation that supports and helps people to get into work or education. When they needed larger premises, they turned to a group of newly arrived architects and engineers. A workshop was held in collaboration with Spanish architecture collective Map13 Barcelona. The initial idea was to build a brick structure, reflecting Norrköping's heritage as a city of brick, but it was soon

**OBJECT** Paviljong  
**ARCHITECT** Map13 Barcelona  
**STRUCTURAL ENGINEER** Dala Massivträ  
[w| statenskonstrad.se](http://w|statenskonstrad.se)

established that this would be too heavy for the assigned plot. Instead, a new proposal was put forward to build a wooden pavilion with a sculptural design where the curved roof is a "grid shell", a technique where a network of wooden laths is bent using moisture and then fixed in place once the desired shape is achieved.

The technology is based on wood's inherent flexibility. Within a frame of glulam bent in two directions, a grid of wooden laths in three layers has been created, with the knot-free pine laths measuring 34x90 millimetres. «



When the brick design proved too heavy for the ground, the solution was a pavilion with a bent wooden grid shell structure.

## New life for terraced house

**NESODDTANGEN, NORWAY** In the 19th century it was common in the American South to build a »shotgun house«, which is a simple rectangular building. Now Norwegian architecture firm Austigard has come up with its own updated version.

**OBJECT** Shotgun house  
**ARCHITECT** Austigard Architects  
**CARPENTER** Tømrerne Sæbø & Skånseng

On the upper floor of a terraced house, they have taken down all the internal walls to create an open-plan layout with voluminous windows on three sides. The room is divided by screens of pale glulam that create different zones in the space while still retaining the sense of a cohesive unit. Each zone is marked out by roof beams that are also made of glulam, as are the posts. The built-in storage is clad in birch veneer.

The old floor has been sanded and the holes and marks left by the missing walls have been filled in with new wood. The inviting room offers a warm contrast with the lower floor, which has kept its previous form. Certain Japanese influences can be seen, including the raised section where tatami mats invite visitors to sit on the floor. «

[w| austigard.eu](http://w|austigard.eu)



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## Systemet gör dig fri.

Visst är det en tanke som kittlar. Att Martinsons stommsystem i limträ och KL-trä är utvecklade för att skapa frihet. Utifrån önskemål kring funktion, design och hållbarhet tar vi fram en lösning som är optimerad för verksamheten. Ett bra exempel på det är att vi med synliga detaljer i limträ och KL-trä skapar naturligt behagliga lärmiljöer i skolor. Allt för att ge elever och personal en miljö att trivas och utvecklas i. Att det är riktigt klimatsmart är en självklarhet. Som sagt, det är systemet som gör dig fri. Det gillar vi.



martinsons



The dark wooden façade and black pitched roof are designed to sit comfortably between the brick neighbours.

## Openings create new typology

**LINJDEN, NETHERLANDS** Canals are a key element of the Netherlands' identity, but so are brick buildings. When a new family home was commissioned in Linjden, less than 10 kilometres outside Amsterdam, the architects had to take into account the local style, dominated by brick façades, and the canal behind. The solution was a building with a dark wooden façade that transitions into a black pitched roof in sheet metal, and although it uses different materials than its neighbours, the house has taken on a similar feel to the rest of the area. Coupled with one small rooflight, the two generous windows on the entrance side let in enough light for the two floors, particularly in concert with the glazed façade at the rear, which admits more daylight and provides close contact with the garden, making the 130 square metres of living space feel even roomier. The home sits on a slope that runs down to the canal, and is therefore designed as a split-level house with two floors and views of the Amsterdam skyline. « [w| arjenreas.nl](http://w|arjenreas.nl)

**OBJECT** House Akerdijk  
**ARCHITECT** Reas Architecten  
**STRUCTURAL ENGINEER** Schaap Bouwadvies

## Playing with materials

**MAHLSDORF, GERMANY A** school should have both a good learning environment and a certain amount of playfulness, in order to keep the students happy – creating well-being is important. This German middle school is a prime example of what that might look like. Externally, the students see a discreet building with a sheet-metal façade, but the large windows perhaps give a hint as to what lies beyond the entrance. CLT is the dominant material here, complemented by both birch cladding and osb panels. The three-storey staircase has exposed CLT and leads to light, wide corridors that create airy spaces and less crowding during breaks. Leading off the corridors are small



The school is built using a modular system. The colourful common rooms run off the wide corridors.

**OBJECT** Integrated school  
**ARCHITECT** NKBK  
**STRUCTURAL ENGINEER** Ecotec

common rooms where the students can work independently or simply socialise, all painted in cheerful, bold colours, but thinly enough that the

wood's knots still show through. The school's design is based on a modular system, with each CLT module measuring 2.86 metres. The modules were prefabricated up to 90% and then assembled on site, ensuring a very fast construction process. « [w|nkbak.de](http://w|nkbak.de)

Martin Röby, Architectural historian

## A new beginning

**SKOVED, SWEDEN** There is something special about the scent of the sea, forest and seasoned timber that hits me as I step onto the porch of the family's old coastal croft in Ångermanland. Increasingly battered by wind, rain and sun, the exterior of the house looks quite worn. But as the façades continue to take on the natural silver grey of ageing wood, the charm of the croft only increases. This says something about wood's capacity to grow in quality over time, like a vintage wine, and about the material's inherent poetic power.

For as long as we've been talking about responsible building, wood has been an obvious material to choose. But over time, the devastating threat of fire led other, more resistant, materials to find favour. Sweeping legislation that largely prohibited the use of wood in dense urban developments also threw up barriers to the development of new wood building techniques.

However, in the early 1900s, something happened to revive interest in wood even in more advanced structures – the introduction of glulam beams. The technology made it possible to produce arched components with large spans. The method of bonding the wood with adhesive that shut out oxygen also made the beams resistant to fire without any major loss of load-bearing capacity. In Sweden, the great ambassador for glulam was national rail company SJ's chief architect Folke Zettervall who, with countless platform roofs across the country and large station halls in Malmö, Gothenburg and Stockholm, excelled in showing what was possible.

Despite this, wood remained a marginalised building material in Sweden for much of the 20th century, with the exception of the individual houses and low-rise blocks that were built entirely or partially in wood. Many architects were attracted by the material's design versatility, but legislation and standards continued to rule out large-scale structures made purely of wood. This is why, for example, Jan Gezelius and Gunnar Mattsson's Museum of Ethnography on Djurgården from the late 1970s, and Ralph Erskine's Allhus in Frescati from around the same time had a concrete structural frame, despite them appearing to be wooden buildings.

It was only with the advent of a new planning and building act in 1994 that large buildings became permissible in wood. Coupled with the sustainability drive and digitalisation of recent years, we now have a radically different playing field. This represents a new beginning for wood construction which, through a younger generation of architects attracted by the material's previously unexplored potential, has already led to a host of technical innovations, bold projects and ingenious buildings. Sitting on the porch of the croft, I'm curious to see what the future brings!



## SOLID STAIRS FOR SPONTANEOUS MEETINGS

**PHOTO**  
Åke E:son Lindman

**OBJECT**  
ncc:s huvudkontor

**ARCHITECT**  
White Arkitekter

**STRUCTURAL ENGINEER, TIMBER**

Limträteknik

**SOLNA, SWEDEN** The atrium in ncc's new headquarters has been planned with an eye on creating a spontaneous meeting place where people are more likely to take the stairs than use the lift. It was therefore important that the staircase felt inviting, and the decision was made early on to clad it in wood, due to its tactile and warm properties and its capacity to move people. The solution was to create the whole structure in CLT, which actually proved to be the best option from a financial perspective too.

The staircase sides, known as strings, are made of CLT in fsc-certified Austrian spruce. The bridging

sections on alternate levels, which are subject to higher loads, are supported by LVL beams in beech. The elements were prefabricated and lightly pigmented to reduce the yellowing of the wood, and were lowered into place through the roof, with a tolerance of 1 millimetre. The finely crafted handrails were installed on site. The steps and the insides of the strings are clad in dark-blue carpet, both for acoustic reasons and to make the stairs feel welcoming and safe. «

- The whole staircase structure has a deflection of only 0.1–0.3 millimetres, giving an extra sense of stability.
- The property has a further atrium with a glulam structural frame. Here there is a calmer atmosphere that brings to mind climbing in trees.

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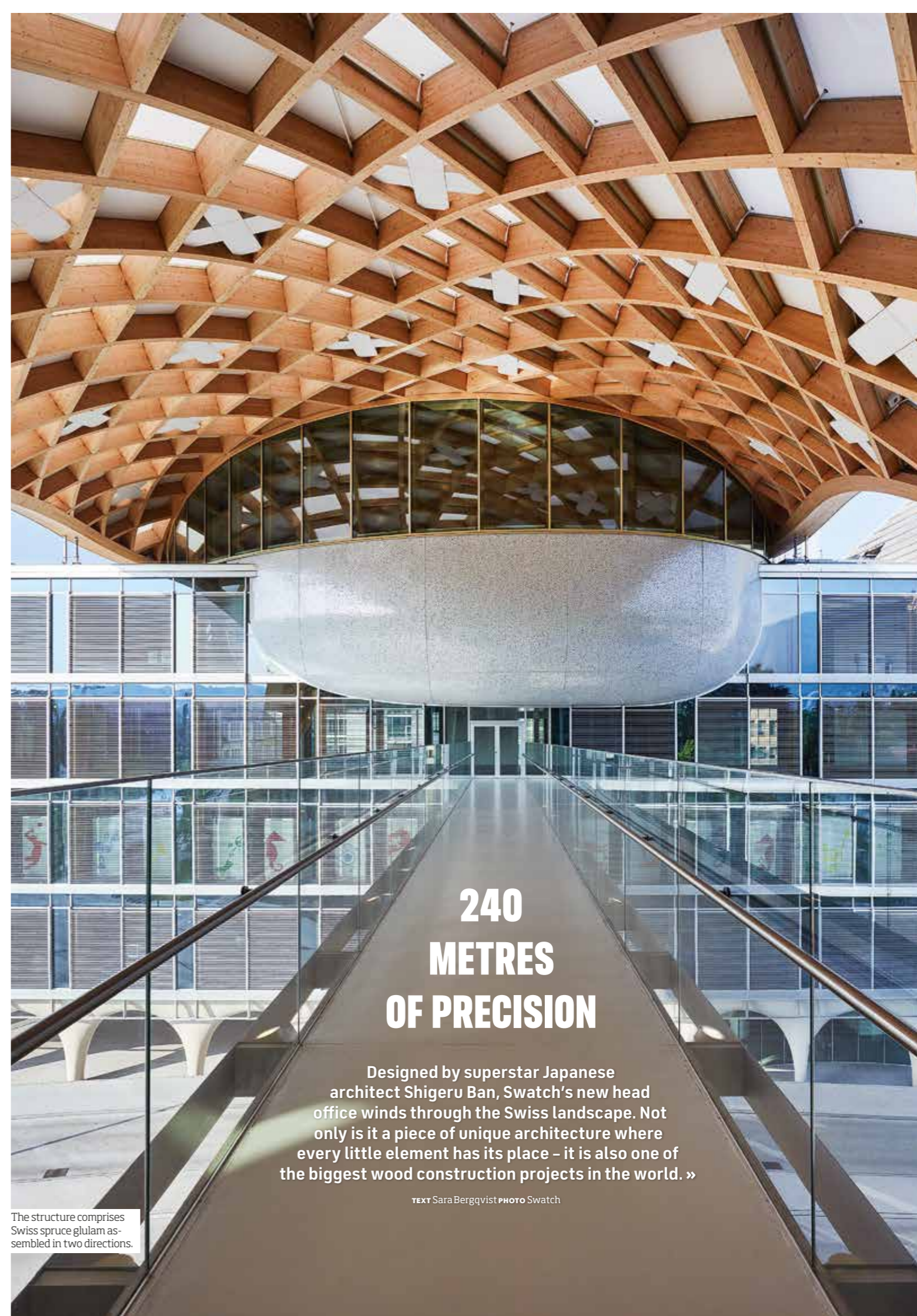
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**240  
METRES  
OF PRECISION**

Designed by superstar Japanese architect Shigeru Ban, Swatch's new head office winds through the Swiss landscape. Not only is it a piece of unique architecture where every little element has its place - it is also one of the biggest wood construction projects in the world. »

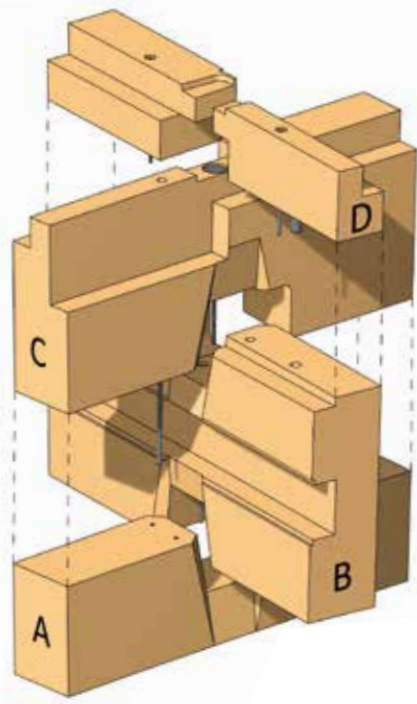
TEXT Sara Bergqvist PHOTO Swatch

The structure comprises Swiss spruce glulam assembled in two directions.



**MURMAN ARKITEKTER**

NYTT KONTORSHUS MED TRÄSTOMME, KUNGSHOLMEN, STOCKHOLM



Project manager **Jan Hempel, Blumer-Lehmann**

## » A TOLERANCE OF 0.1 MILLIMETRES IN THE NODES «

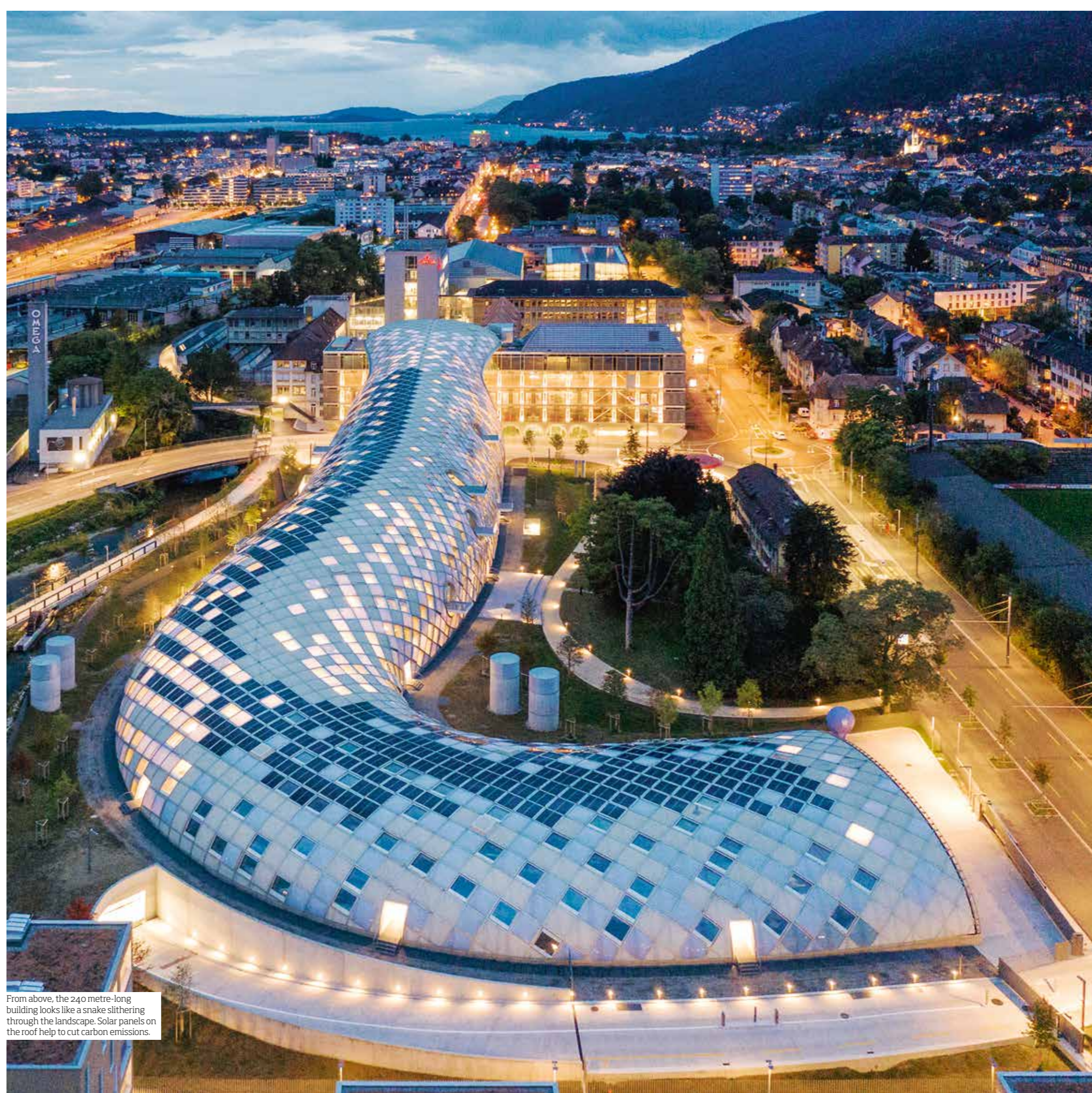
**T**here is much that is unique about Swatch's new headquarters in Biel, Switzerland. The main one, of course, is the architecture. The 240 metre-long building is like a glistening snake winding its way along the Schüss river. Architect Shigeru Ban, however, has a more pragmatic description.

»The form of the building is a natural consequence of the L-shaped site. The bottom of the L is the building's entrance, and the other side is used as a loading bay,« he explains.

The curved wooden structure, with its grid shell frame, provides the façade, roof and load-bearing carcass. It is made up of 4,600 wooden beams, of which no two are the same. The raw material is Swiss spruce that has been glued together into three different types of beam: straight, single-curved and double-curved, depending on how much load they need to take – with the double-curved beams used in the places under the greatest loads.

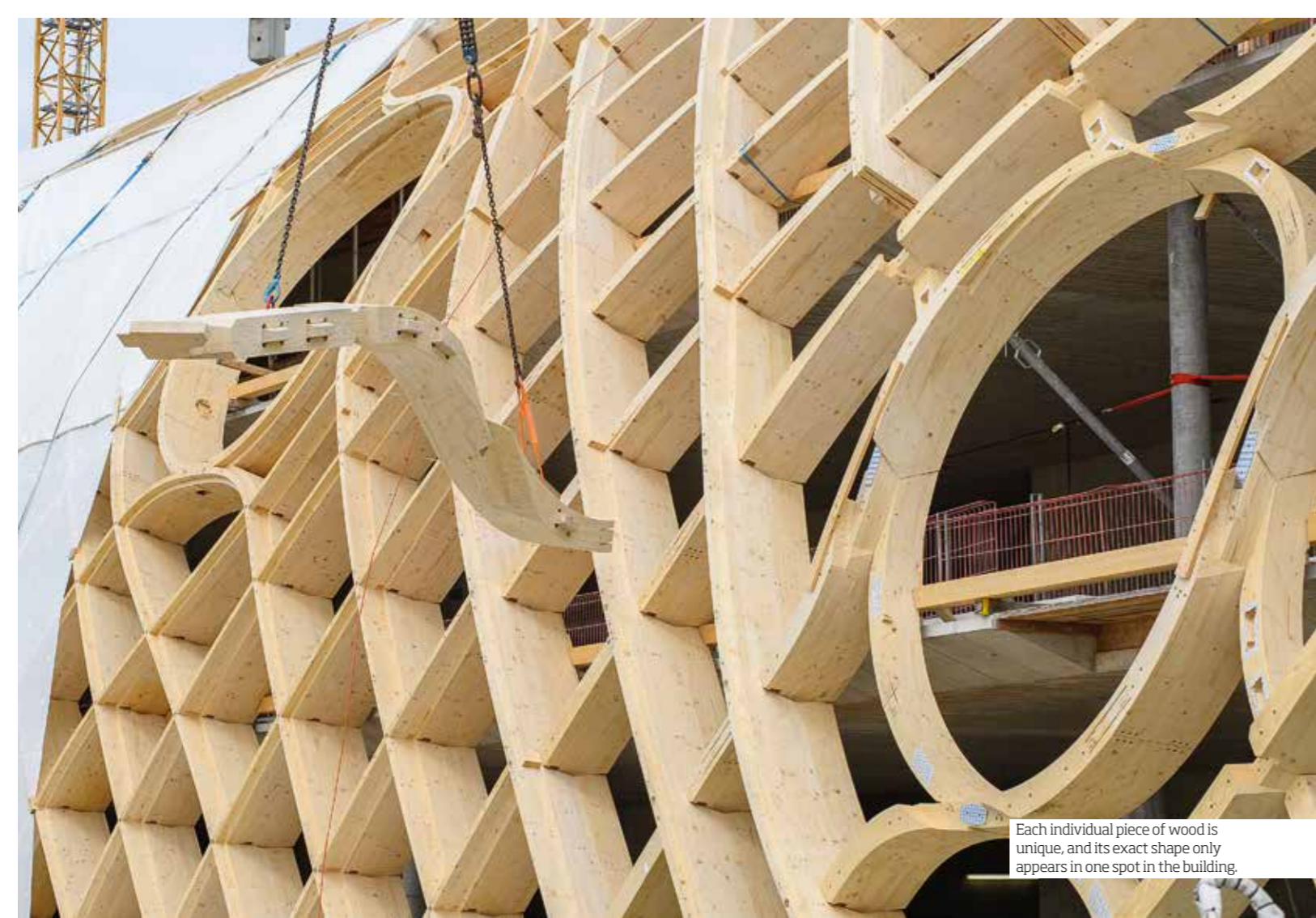
»If you stand on the top and look down, you'll see that the grid has a primary direction and a secondary direction. Each part of the grid comprises two layers that flow in separate directions. The grid line in the primary direction has to take the greatest loads, but the secondary line is also load-bearing,« says Jan Hempel, project manager and head of 3D modelling at Blumer-Lehmann, which has been responsible for the wooden structure on the project.

**The longest grid line**, comprising a row of connected elements, is 120 metres, and the longest individual element is 30 metres. The nodes that repeat every 2–3 metres contain no steel components, instead using ingeniously milled wooden components that lock each other into place. Complex 3D models and parametric design have been used to achieve the »



From above, the 240 metre-long building looks like a snake slithering through the landscape. Solar panels on the roof help to cut carbon emissions.





Each individual piece of wood is unique, and its exact shape only appears in one spot in the building.



All the parts of the timber grid shell frame, which seamlessly transitions from walls to roof, are load bearing.



The variation between windows and opaque sections lends a lively feel to the façade and roof.

» required level of precision. All the parts were then cut in advanced CNC machines with extremely high accuracy.

»We've worked to a tolerance of 0.5–1 millimetre for the individual pieces and 0.1 millimetres in the nodes,« says Jan Hempel.

The build was divided up into 13 sections and work began around the middle of the structure. This established an efficient building process that allowed for construction work to continue in two directions at the same time. As soon as the ground-level elements were anchored into place, it was also possible to work upwards from each side, eventually meeting at the top.

»It was a fantastic feeling on the day that we assembled the final parts of the grid shell and saw that everything fitted exactly as we had calculated,« adds Jan.

Since every part of the design was unique, one of the challenges was to ensure the right part was in the right place at the right time. It wasn't possible to do the milling in advance and store the large number of curved elements measuring up to 13 metres in length. The elements were therefore sawn and delivered to the construction site in the exact order they were going to be used.

»The other challenge was that all the technical installations, such as the ventilation ducts and power cables, had to be run within the grid shell, instead of the usual way of going

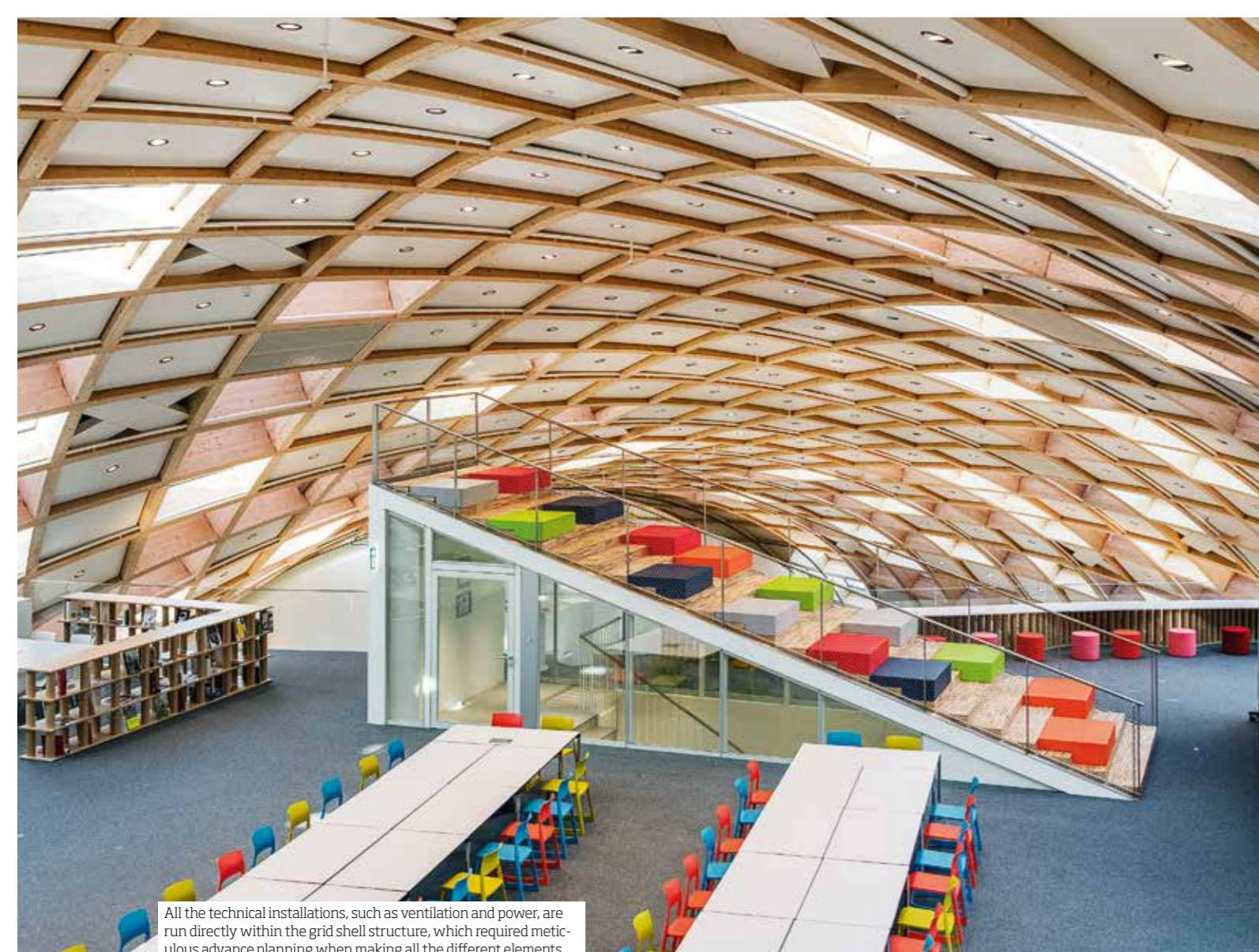
between the floors. This also meant that everything had to be meticulously planned in advance,« says Jan.

With its 18 brands, the Swatch Group is a world leader in watches. The new headquarters is one of three units in a larger newbuild project and gathers all the group's brands in one place. In addition to the Swatch headquarters, the project comprises Cité du Temps, which houses a museum for Omega and Swatch, plus the Omega factory, with its production and warehousing space.

»All the buildings are made of wood and designed by Shigeru Ban, with us taking care of the structural engineering,« relates Jan Hempel.

The Omega factory is a little further away, while Cité du Temps and the Swatch building are directly linked to each other. The Swatch building's grid shell continues over the road that separates the two buildings and rests on the roof of Cité du Temps – from above it looks like a snake taking a bite out of the other building. The two buildings are also connected via a glazed pedestrian bridge.

Inside, the Swatch headquarters contains 25,000 square metres of office space, spread over four floors. In addition to offices and storage, there are large conference rooms, a public cafeteria on the ground floor, five large olive trees stretching over two floors and a reading and brainstorming area on the second floor, shaped like a staircase to nowhere.



All the technical installations, such as ventilation and power, are run directly within the grid shell structure, which required meticulous advance planning when making all the different elements.

The building's grid shell design is repeated in the flat glazed façade at the entrance. It begins at a height of 5.5 metres and reaches up to 27 metres, before connecting with the roof elements. On the exterior, the roof is clad in several different materials that vary between the different squares of the grid – or scales on the snake's skin, if you will. Some form transparent windows, while others are opaque.

Like on the other two buildings in the project, large swathes of the roof are solar panels. On the Swatch building, they cover 1,770 of the full 11,000 square-metre roof area. The panels are expected to generate a little over 213 megawatt-hours of electricity each year, equivalent to the consumption of 61 Swiss households.

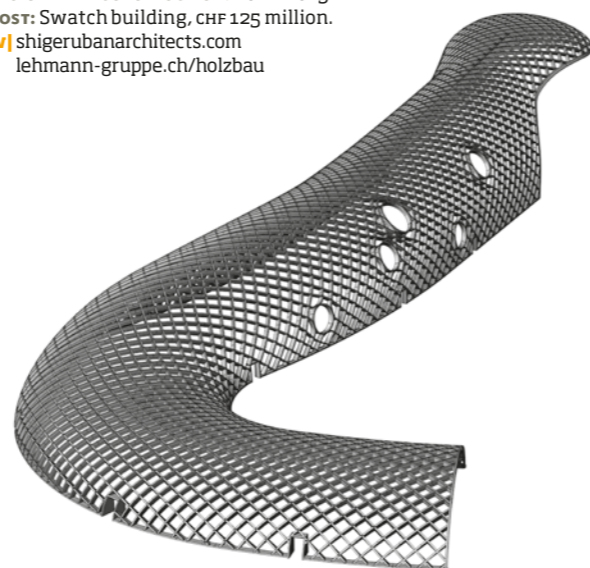
Clever use of groundwater to heat and cool the building, along with efficient systems for ventilation and lighting, contributes towards high energy efficiency and low carbon emissions. The basement also contains bike parking, bikes for loan and charging stations for electric bikes.

**But Shigeru Ban**, who has offices in Paris and Tokyo, prefers to talk about the sense in making good use of resources, rather than using the term sustainability.

»I have no interest in sustainability. I simply refuse to waste resources. Sustainability has become a buzzword. I think we overuse it, but have forgotten what it means. That's why I never use it,« he says. ©

### Swatch headquarters BIEL, SWITZERLAND

**ARCHITECT:** Shigeru Ban Architects.  
**CLIENT:** Swatch.  
**STRUCTURAL ENGINEERING:** Blumer-Lehmann.  
**DESIGN- AND CONSTRUCTION:** 2011-2019.  
**COST:** Swatch building, CHF 125 million.  
[shigerubanarchitects.com](http://shigerubanarchitects.com)  
[lehmann-gruppe.ch/holzbau](http://lehmann-gruppe.ch/holzbau)



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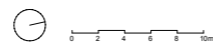




# Distinct form creates new values

In addition to oil riches, Stavanger is known for its well-preserved wooden buildings from the late 18th century. The new bank headquarters in the Norwegian coastal city build on that tradition, displaying an exciting interplay between innovative design and construction. But also that it is possible to build something large and solid in wood. »

TEXT Katarina Brandt PHOTO Sindre Ellingsen



CEO Arne Austreid

» **A GOOD ENVIRONMENTAL CHOICE THAT FEELS FORWARD-LOOKING** «

In recent years, much of Norwegian wood construction has been about coming first, being the biggest and soaring highest into the sky. This trend is represented by buildings such as Treet in Bergen, which for a short while was the world's tallest wooden building, and Mjøstårnet in Brumunddal, which at 85.4 metres is the current record holder. Now Finansparken in Stavanger, which opened in November 2019, has taken the crown as Europe's largest office building in wood.

The executives of Sparebank 1 SR-Bank had long been considering gathering their operations under one roof when they announced an architectural competition for their new headquarters in 2013. In the competition brief, the bank expressed a desire for a building with high architectural and functional qualities, extensive flexibility, good operating costs and innovative solutions concerning the spatial layout and work environment. In short, a signature building that the bank and its employees could be proud of. The entry that went on to beat the 17 other candidates came from local architectural practice Helen & Hard, in partnership with Oslo-based SAAHA.

However, there was no guarantee that the bank's new headquarters would be built in wood. To convince their client, the architects took the bank's management team on a tour of Germany, Austria and Switzerland to see some exemplary designs. Media group Tamedia's head office in Zürich, designed by Shigeru Ban, was one of many inspiring

eye-openers. It also served as a 1:1 scale model demonstrating the tactile benefits of wood and the inherent potential of designing and building in wood.

»Wood is a good environmental choice that feels modern and forward-looking, providing a good match with the bank's values. We also wanted our new headquarters to blend in with Stavanger's existing wooden buildings. What's more, wood helps to create a warm, functional and pleasant environment where our customers and employees can meet and spend time,« comments Arne Austreid, CEO of Sparebank 1 SR-Bank.

Finansparken is wedged into an almost triangular plot in the Bjergsted district, just north of central Stavanger. The plot formerly served as a car park and sits adjacent to the city's traditional timber-framed residences. The wedge shape, both horizontally and vertically, has created a building that changes character and scale in its interaction with the surrounding cityscape. Helen & Hard entered into partnership with SAAHA, and the main concept was developed in close collaboration during the competition and preliminary planning phase. The division between façade (SAAHA) and interior (Helen & Hard) was only decided in the detailed development phase.

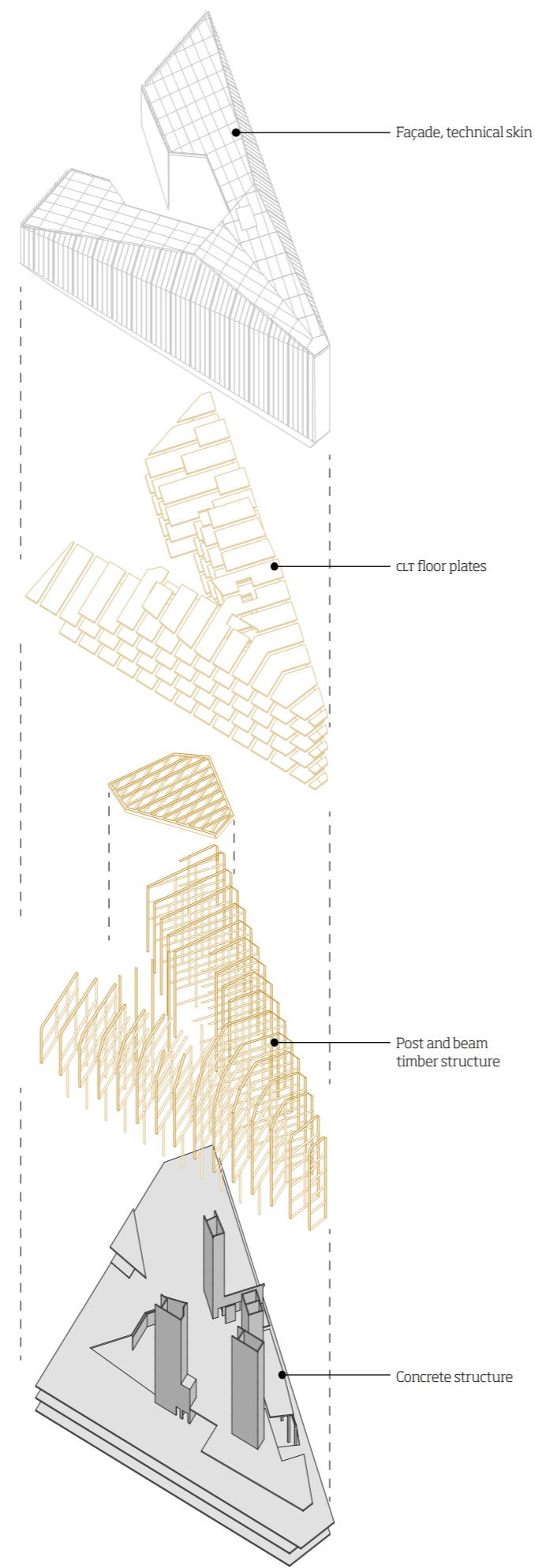
»The architecture is based around the contrasts between a sharply defined exterior and a softer, more organic interior. The result is far from discreet, yet it still merges in with the existing buildings,« says Njål Undheim, senior architect at Helen & Hard.



The staircase, which catches the eye at the entrance and then leads visitors through the building, is made from double-curved glulam beams.



The architects have used a post-and-beam structure to create an impressive building with large open spaces.



The building's streamlined exterior merges into the cityscape and forms a contrast with the soft, warm interior.

» The building sits on a load-bearing structure made of both site-cast and prefabricated concrete. The space below ground comprises three levels that house a parking garage for 200 cars and various utilities. Concrete has also been used in the three centrally located stairwells and in the lift shaft, which helps to stabilise the building.

**The complex wooden** structure is precision crafted by Creation Holz and Hermann Blumer. It comprises a framework of prefabricated beams and posts in glulam, reinforced with LVL beams in beech veneer that were pre-assembled and then erected on site in Stavanger. Instead of steel fixings, the choice went to a special connection system using 80 millimetre-thick wooden plugs in beech hardwood. The design involves 3,500 beech plugs in total. CLT has been used in the floor system to stabilise the building through diaphragm action. Assembly was completed in sections rising vertically, with each section quickly fitted onto the next.

»One of the biggest challenges was to keep moisture at bay without weather protection in one of Norway's rainiest cities. All the glulam was therefore delivered and assembled in plastic wrap,« relates Thor Olav Solbjør, architect and CEO of SAAHA.

The entrance level has a double roof height, with fewer posts in order to create a sense of space. The posts and beams used in the first three floors are made of laminated veneer lumber (LVL) in the form of »Baubuche« from German company Pollmeier. They mainly delivered 40 millimetre beech veneer panels to Moelven Limtre, which glued and finished »



Architect **Thor Olav Solbjør**

## » THE WOODEN STRUCTURE HELPS TO CREATE A WARM AND INCLUSIVE ENVIRONMENT «

» the material. Knot-free veneer has been used for the top layer on all exposed surfaces. The fact that beech is heavier and stronger gives the material high tensile, compression and bending strength, which enables more slender designs than would be possible with traditional spruce glulam. The ability to choose an extra high surface finish also makes Baubuche a good option for exposed structural elements.

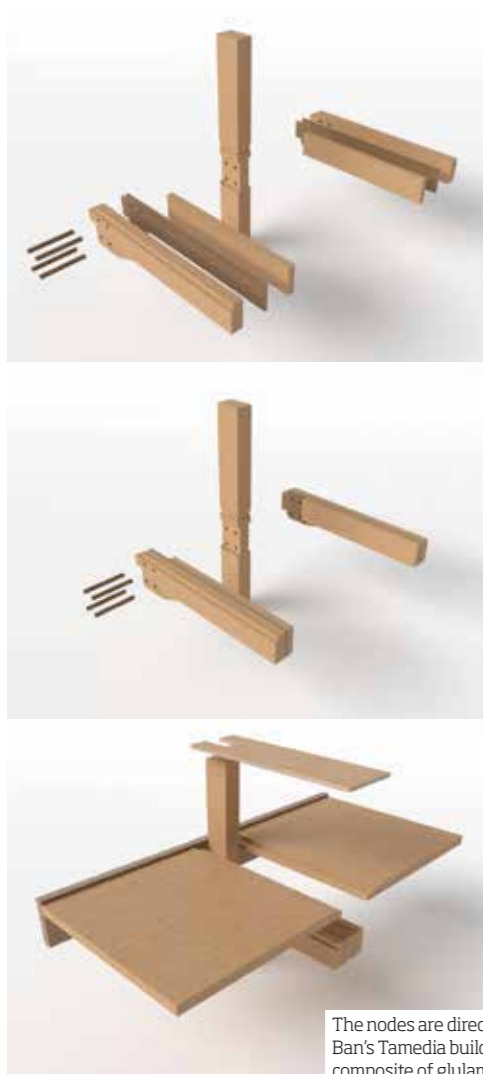
The other floors use locally produced glulam, finished by Moelven Limtre. The deliveries to Finansparken are by far the company's biggest since Gardermoen Airport was built in Oslo in 1998. CNC processing of the elements employed two full shifts over the course of a year. In all, the factory in Moelv delivered 1,900 cubic metres of CLT, 1,100 cubic metres of glulam and 600 cubic metres of beech LVL. The exposed wooden surfaces were polished by hand in the factory to achieve the best possible finish.

»The walls and ceilings are connected using 67,000 screws, based on 750 assembly drawings. The design required extremely high standards for the prefabricated glulam elements, and the holes were made with a precision of a tenth of a millimetre,« explains Moelven's project developer and senior consultant Åge Holmestad.

The southern and lowest part of the Finansparken development faces towards the city's old timber-framed residences, which are only a stone's throw away. From here, the building rises northwards up to a height of seven storeys. Crowning everything are the bank's reception rooms, with »



The upper floors are made from locally produced and prefabricated glulam.



The nodes are directly inspired by Shigeru Ban's Tamedia building. The beams are a composite of glulam and Baubuche.

» stunning views of the fjord and the surrounding mountains.

»Our watchwords have been transparency and openness. By giving Finansparken a fully glazed façade, we open the building up to the outside world,« says Thor Olav Solbjør.

This transparency is accentuated through passive solar screening in the form of 2 centimetre-thick vertical glass fins. These bring life to the façade and provide a look that changes with the weather. The fins are made from one clear and one bronze-coloured layer sandwiching a laminate coated with a solar film. In total, 5 kilometres of these glass fins have been used for the façades.

The atrium that greets employees and visitors to the left of the main entrance forms the heart of the building, with all the social zones facing towards it. What this creates is a warm, open space that draws in daylight via a fully glazed façade and a glass ceiling resting on a diagonal grid of glulam. The glass is made by OKALUX, and despite its high solar protection factor, it lets in a soft and attractive light that prevents sharp shadows in strong sunlight. The artwork Flocking lights over epic waters by Joachim Sauter also hangs in the atrium. It comprises a cylinder-shaped light fitting that communicates digitally with buoys out in Byfjorden and moves in time with the movement of the waves.

There is plenty to capture the eye in Finansparken, but perhaps the most striking feature is the sculptural staircase that punctuates the open atrium in the main entrance and winds on up

#### Financial park STAVANGER, NORWAY

ARCHITECT: Helen & Hard and  
SAAHA.

CLIENT: Sparebank 1  
SR-Bank.

STRUCTURAL ENGINEER: Degree of  
Freedom Engineer, assisted by  
Creation Holz/Hermann  
Blumer.

COST: NOK 650 million.  
SIZE: 22,000 square metres.  
www.hha.no, saaha.no

through the building. The double-curved glulam beams were made by Hess Timber in Frankfurt, one of only a few companies capable of mastering the complex geometry.

Despite the project's complexity, everyone involved bears witness to an excellent collaboration. Njål Undheim puts this down to a number of contributory factors: a client that has been clear about what they wanted to achieve, professional project management, skilled subcontractors and the fact that Finansparken is a reference project with which everyone has been proud to be involved.

Sparebank 1 SR-Bank moved into its new offices on 29 November last year, 180 years to the day after they were granted a banking licence with start-up capital of 224 Norwegian crowns, or 56 specialdalers as it would have been back then. Now the bank is looking to a future in which the new headquarters will serve as a value-creating centre of expertise for both customers and employees.

»Since the bank was founded in Egersund 180 years ago, we've never had a proper head office. Now we have a signature building that we expect to last for at least that number of years,« concludes Arne Austreid. ©

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Svenskt Trä startar nu kurser där du efter avslutad utbildning ska kunna medverka med hög kompetens vid projektering av träbyggnader som hallbyggnader, lokaler och flerbostadshus. Kursen hålls på fyra olika orter i Sverige och vänder sig i första hand till yrkesverksamma konstruktörer och byggingenjörer.

Senare under året kommer vi även att presentera kurser för yrkesverksamma arkitekter, beställare, projektledare och lärare inom arkitektur, byggt teknik och samhällsbyggnad.



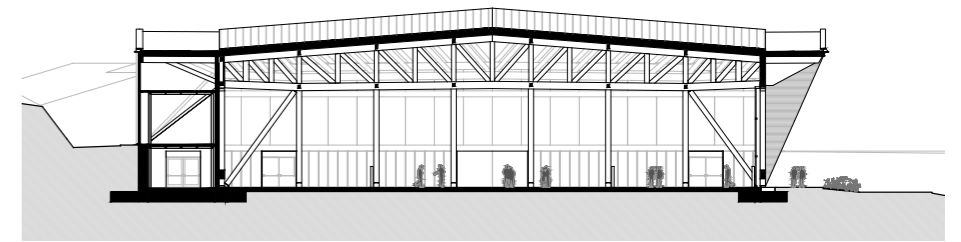
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SVENSKT  
TRÄ



Wood was chosen in part because of its acoustic properties, which are rather important in a large hall. The hall can, however, be split into smaller units.



Section.

## ROOF SHAPE ADDS CHARACTER AND SPACE TO VERSATILE EXHIBITION HALL, INSPIRED BY THE PEAKS OF THE DOLOMITES

TEXT Mats Wigardt PHOTO Simone Bossi

In the Italian town of Agordo, a new and versatile exhibition centre melts into the expansive alpine landscape. Built entirely in wood, with high ceilings and generous windows, it makes the limestone peaks of the Dolomites a constant and tangible presence. Playful, airy, considered and aesthetically attractive, the large exhibition hall really grabs the attention.

The client wanted a generously sized and multifunctional building that interacts with the surrounding landscape. And so it was.

**The project is** the work of two architectural practices, Studio Botter in Agordo and Studio Bressan from nearby Montebelluna. The owners, Andrea Botter and Emanuele Bressan, studied together at university in Venice and have been collaborating since 2010.

Their shared aim is to combine tradition with innovation, often with the inclusion of wood as a versatile material well suited to many of their construction projects, both for environmental reasons and for the building's design and structure.

»We share the same vision of a *modus operandi* that interacts with the setting, where we place an extra focus on material choices and approach the project based on economic and ecological sustainability.« explains Emanuele Bressan.

Here, the two architects took inspiration from the Alpine backdrop to the urban context of the plot. The most striking feature is a wavy roof that sets the tone for the project's design language, drawing on the area's topography and traditional style of building.

The architects chose wood as the main building material because it is both environmentally and aesthetically attractive, and sits comfortably with the older buildings that are common in the Alpine valleys. Added to that are the acoustic benefits and the option of recycling.

The acoustic properties of wood were an important argument in its favour, considering the kinds of activities the premises are intended to host – concerts, trade shows, theatre, lectures, sport, conferences and exhibitions.»





The roof trusses are also made of glulam. The airy structure helps make the generous ceiling height feel even higher.



A system of glazed wooden frames, coupled with posts and diagonal braces, makes up the exterior walls that support the roof.



The structure's roof and diagonal glulam beams are intended to reflect the jagged peaks of the surrounding Dolomites.

» «We presented an early proposal that the client accepted, and we then developed it in collaboration with specialists in large wooden structures,» explains Emanuele Bressan.

The foundation slab is cast in concrete, which has been polished and given an anti-slip treatment so it can serve as the interior floor of the large exhibition hall.

**The load-bearing structure** of posts, beams and roof trusses is made of glulam. The exception is the steel braces and tie-rods, partially clad in wood, that stabilise the building and are anchored in plinths and in the concrete support wall at the rear. The beams also use steel struts to connect to this wall, which is 3.6 metres high and 70 centimetres thick.

»The steel elements provide an extra guarantee in the event of fire, while the support wall helps to take up the force of strong side winds and any earthquakes,« says Emanuele Bressan.

The walls are designed as a system of

wooden frames coupled with posts and diagonal braces that carry the weight of the roof structure.

This in turn is made up of heavy-duty trusses that span over 50 metres, creating a completely open interior that is 100 metres long, with no posts to limit the building's flexibility.

The walls to the north and west are glazed from floor to ceiling, with unrestricted views of the surrounding Alpine landscape, while the projecting roof (reaching over 8 metres on the north face of the building) screens the large hall from direct sunlight in the summer. In the winter, the low sun shines in, so that overall the cost of both heating and cooling is lower through the year. The generous roof overhang also protects both guests and walls from the full force of the weather. To the south and east, the external walls are clad in sheet metal, and the interior is lined with panels of tobacco-coloured wood wool.

The ceiling height in this almost

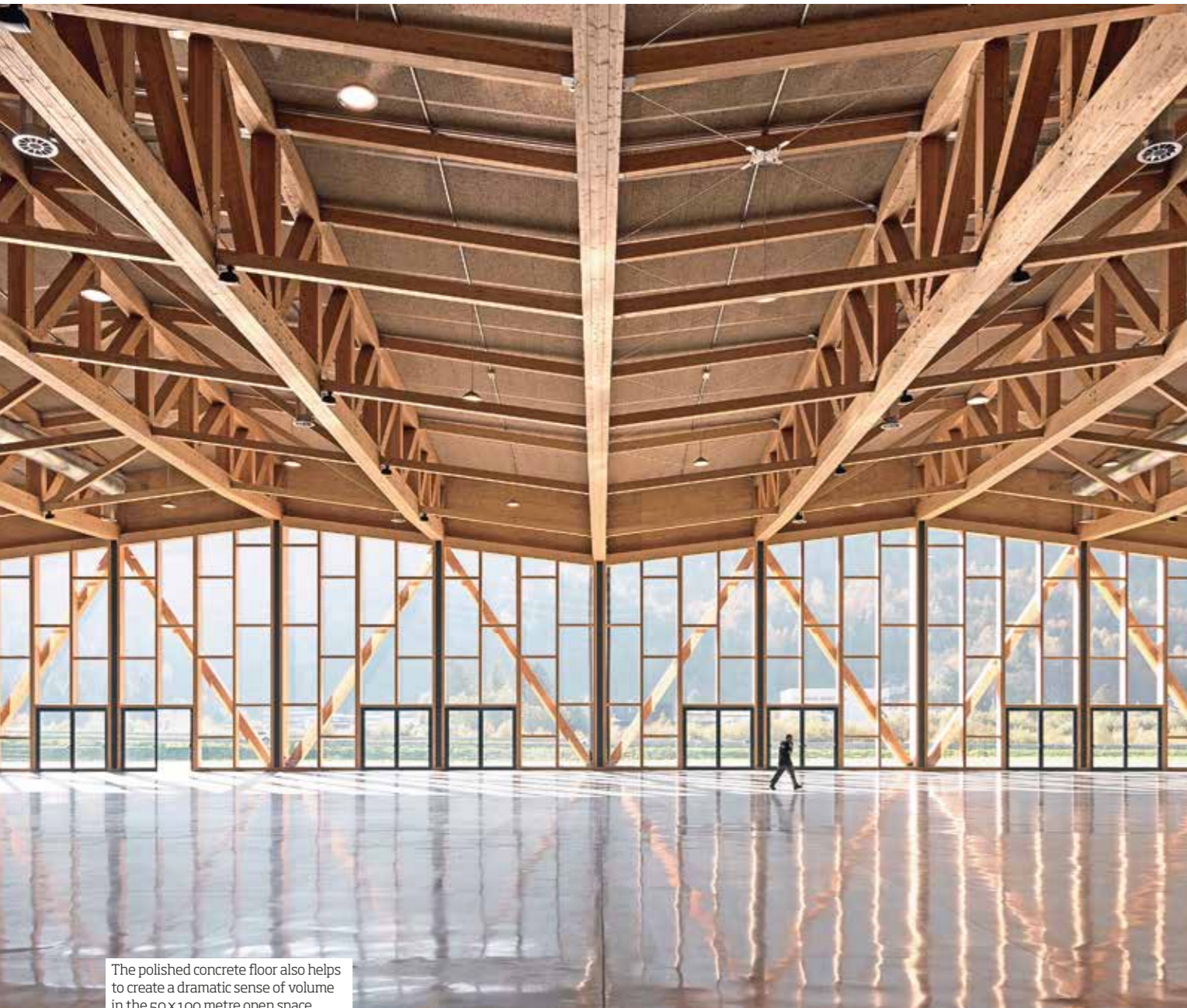
cathedral-like exhibition hall is said to be between 12.7 and 14.3 metres, although in reality the clear height is somewhat lower at 8 to 9.6 metres, depending on the dimensions of the trusses and beams in the roof.

**In addition to the main exhibition hall**, which runs from north to south, there are areas for toilets, offices, storage and deliveries collected along the east section of the building.

This creates huge flexibility, with thousands of square metres of available floor-space that can easily be divided up into several smaller rooms.

The mechanical and technical installations are hidden away one level up at the back of the building, in order not to encroach on the visual appearance of the exhibition centre.

The roof comprises prefabricated wooden panels, clad internally with wood fibre boards and externally with corrugated sheet aluminium.»



The polished concrete floor also helps to create a dramatic sense of volume in the 50x100 metre open space.

» Visually, the recurring diagonal elements of the structure and the rhythm of the roof echo the jagged silhouette of the Dolomites. It is effortlessly light and airy, despite the impressive dimensions of the ventilation ducts and the glulam elements that support the roof and walls.

»Getting the building to reflect the landscape it sits in has been one of the main focuses of the project, and I believe we've succeeded in that,« says Emanuele Bressan.

He also stresses that the whole of the distinctive and remarkably attractive building project has been possible thanks to the use of prefabricated elements, which has meant short construction times and high precision during assembly.

All the beams, braces and trusses were

#### Exhibition centre AGORDO, ITALY

ARCHITECTS: Studio Botter, Studio Bressan.  
STRUCTURAL ENGINEER: Fabio Valentini.

EXTERNAL DIMENSIONS: 112x57x14,8 metres.

AREA: 6,400 square metres.

www.studiobotter.it  
www.studiobressan.net

produced in a factory and then shipped to the construction site for installation. The posts and ties were also delivered prefabricated, assembled and lifted into place by crane.

There was no need for any additional decoration, beyond that the painted and weathered wooden structure offers. According to Emanuele Bressan, the structure's own aesthetic would not benefit from any additions to its appearance.

»The structural frame and the mountainous landscape of the Dolomites interact. Together they create a spatial continuity that draws the eye to the surrounding mountains, without lessening the building's own impact.«

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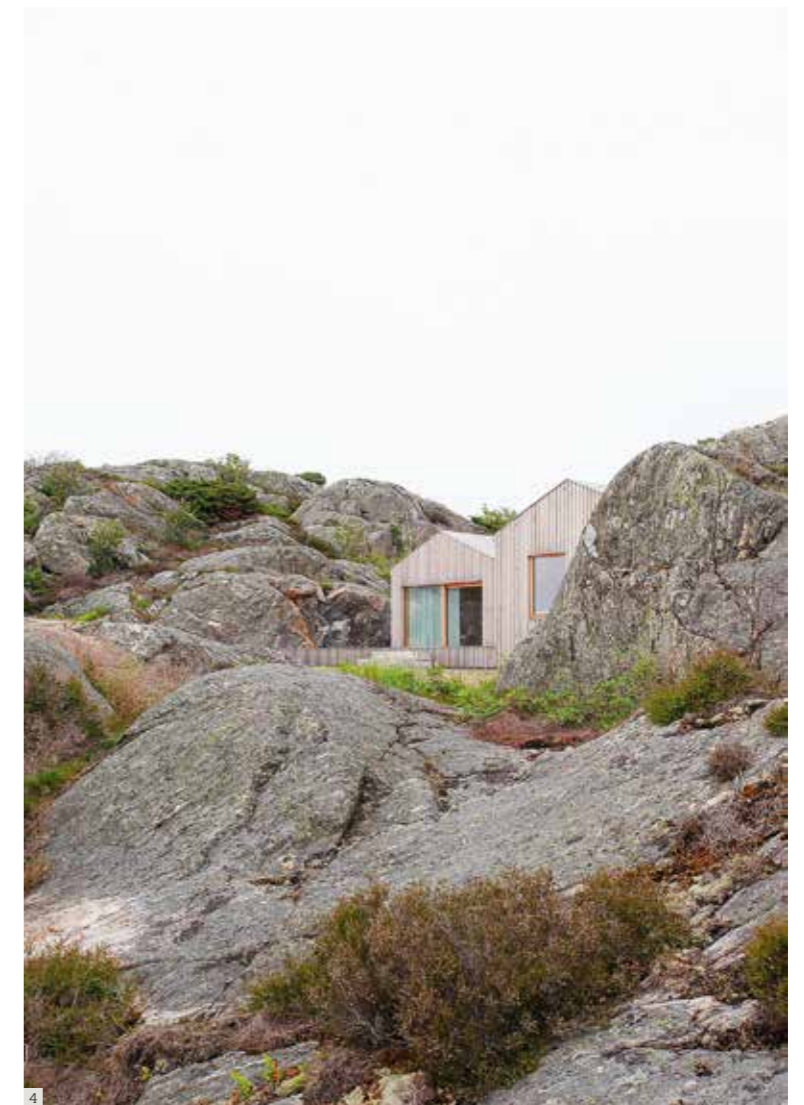
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**MOELVEN**



# Monolith discreetly positioned among Brännö's rocks

**Three volumes form a low-rise building that peeps out from among the rocks. The roof is a key factor in the overall look – externally and internally.**

TEXT Johanna Lundeberg PHOTO Markus Bülow

On the island of Brännö in Gothenburg's southern archipelago, a holiday home has sneaked into the rocky landscape. Three low volumes are bound into one unit by the shared board-on-board roof in heartwood pine.

»We wanted to root our choices firmly in this place, in terms of volume, material choices and tradition. The volumes are tailored to, and interact with, the surrounding rocks and use the features of the plot to create shelter and privacy. The shapes also hark back to a well-known traditional vernacular on the West Coast,« says Mathias Holmberg, architect and son of the clients.

The way the home discreetly melts into its surroundings is no doubt also due to the

roof, which is essentially an extension of the façade, creating a monolithic look overall.

»The roof is an important part of the building, because it can be seen from several directions. One of the first ideas was to create a building with a flat roof, clad in sedum. However, in the end it felt like too much of a compromise that restricted the interior options. Instead, we came up with a design that both preserves and frames the views, while at the same time creating exciting spaces inside,« explains Mathias.

**Board-on-board roofs have** historically been found on various types of building, mostly in northern Sweden, but also on Gotland, for example. In recent years, that interest in using wood on roofs has been rekindled.

»The ability to create a unified feel with the same material on the façade and roof, coupled with the connection to a historical building tradition, made a board-on-board roof the most interesting choice,« continues Mathias.

To avoid standing water in the roof's

1. The roof height alternates between 2.1 and 3.0 metres. The variation creates a sense of space and good acoustics, which delivers a good living environment.
2. Walls and ceilings in light birch plywood combine with the varying height for a light and tranquil feeling.
3. Plan.
4. The board-on-board roof joins the three volumes into a single monolith. The details around the windows, sliding doors and window openings are exposed oak instead of metal, for a more welcoming feel. Single boards are also easy to replace if necessary.

valleys, he has fitted V-shaped flashing that channels the water away to the rear. As an extra safety measure, the roofing felt has also been supplemented with a welded rubber sheet. The rebates around the windows and sliding doors are clad in the same heartwood pine as the façade. The window and door frames are made of oak that simultaneously interacts and contrasts with the pine.

**Brännö is a** car-free island, so the loose timber for the home was dispatched in handy packages, first by boat and then by digger and occasionally flatbed scooter. The environment on Brännö is quite exposed, but after studying several reference projects, Mathias Holmberg felt confident about leaving the façade untreated.

»There's something wonderful about having a natural material with no additives. The site also proved particularly suitable for wood, as it is regularly hit by strong winds that dry up any moisture. There are also no trees on the plot to cast shade or drop leaves onto the house.«

## Villa Vassdal BRÄNNÖ, SWEDEN

ARCHITECT: Studio Holmberg  
CLIENT: Private  
STRUCTURAL ENGINEER:  
Sture Byberg ingenjörbyrå  
SIZE: 120 square metres  
wj | studioholmberg.se

The untreated wood is now silvering at its own rate and will be left to its own devices. It was therefore an important part of the design not to have any eaves, in order to avoid extra movement in the wood.

And it is not just outside that the roof makes a bold statement. It also plays an important role in the interior, with rooms that are open to the roof ridge and clad in pale birch plywood. The height alternates between 2.1 and 3.0 metres, with the variation creating both space and good acoustics, despite the flat surfaces. At the same time, the shifting levels also help to mark out the different functions of the three volumes: private section with bedrooms and bathrooms, kitchen and dining area, and living room.

»We wanted to create a sense of openness between the living room and kitchen, so that it becomes a real social space, while at the same time creating defined zones. By varying the height, we also create a symbiosis between the exterior sight line and the experience inside the rooms,« says Mathias Holmberg. ☺

### Architects Declare Climate and Biodiversity Emergency

The twin crises of climate breakdown and biodiversity loss are the most serious issue of our time. Buildings and construction play a major part, accounting for nearly 40% of energy-related carbon dioxide (CO<sub>2</sub>) emissions whilst also having a significant impact on our natural habitats.

For everyone working in the construction industry, meeting the needs of our society without breaching the earth's ecological boundaries will demand a paradigm shift in our behaviour. Together with our clients, we will need to commission and design buildings, cities and infrastructures as indivisible components of a larger, constantly regenerating and self-sustaining system.

The research and technology exist for us to begin that transformation now, but what has been lacking is collective will. Recognising this, we are committing to strengthen our working practices to create architecture and urbanism that has a more positive impact on the world around us.

#### We will seek to:

— Raise awareness of the climate and biodiversity emergencies and the urgent need for action amongst our clients and supply chains.

— Advocate for faster change in our industry towards regenerative design practices and a higher Governmental funding priority to support this.

— Establish climate and biodiversity mitigation principles as the key measure of our industry's success: demonstrated through awards, prizes and listings.

— Share knowledge and research to that end on an open source basis.

— Evaluate all new projects against the aspiration to contribute positively to mitigating climate breakdown, and encourage our clients to adopt this approach.

— Upgrade existing buildings for extended use as a more carbon efficient alternative to demolition and new build whenever there is a viable choice.

— Include life cycle costing, whole life carbon modelling and post occupancy evaluation as part of our basic scope of work, to reduce both embodied and operational resource use.

— Adopt more regenerative design principles in our studios, with the

aim of designing architecture and urbanism that goes beyond the standard of net zero carbon in use.

— Collaborate with engineers, contractors and clients to further reduce construction waste.

— Accelerate the shift to low embodied carbon materials in all our work.

— Minimise wasteful use of resources in architecture and urban planning, both in quantum and in detail.

We hope that every architectural practice will join us in making this commitment.

[w|architectsdeclare.com/](http://w|architectsdeclare.com/)

## » THE WORLD REALLY HAS TO ACHIEVE SOMETHING MAJOR THIS YEAR. «

There is a global urgency to reduce carbon dioxide. The European Parliament has declared a climate emergency. So the question is relevant, what do architects' do about the climate? We spoke with Michael Palwyn in the UK who, together with Steve Tompkins, has been a driving force behind the spreading movement Architects Declare.

TEXT David Valdeby

#### What is Architect's Declare?

»I would describe it as a global petition urging the construction industry to really mobilize to address the true nature of the environmental crises that we face. It's intended to also draw together our efforts so that we can act to some extent collectively to bring about the kind of paradigm shifts that we need to. Which sometimes or in some cases are beyond what is possible within the constraints of an individual practice or an individual project.«

#### How did it start?

»The idea we came up with was to get together as many of the UK Stirling prize winners as possible and make some kind of joint declaration – it became clear that the thing to do was to call it a declaration of climate and biodiversity emergency. As it turned out that there were 200 UK firms signing up in the first two days. Worldwide, we've got 14 countries signed up and there are three that are just about to.«

#### Does it cross over into other sectors?

»It varies according to the countries. In the UK, we have structural engineers, civil engineers, environmental engineers. Separately to our initiative there was also a group of about 25 of the largest property developers who signed up to a declaration called Developers Declare.«

#### You had your first meeting in November, what was the outcome of that meeting?

»We started working on the declaration points and how we can raise our ambitions and share knowledge. We know that we still have more work to do, we are developing our theory of change. The meeting made sure that we bring the signatories with us together.«

»One of the keynote speakers we invited is Kate Raworth and she talked a lot about regenerative design and that was deliberate because that's been an important subject for us. We think it's essential that the industry moves on from a paradigm of sustainable design to one of regenerative design.«

»To design a regenerative city, what the consultancy group Biomimicry 3.8. argue is that you should start by looking at how a pristine ecosystem in that part of the world functions. And you should establish metrics for how much water it filters, how much oxygen it produces, how much carbon it sequesters, how much food it produces, how much biodiversity it accommodates, et cetera, et cetera. And then those metrics should become the target for your new bit of city.«

#### You have spoken about levers of change, could you elaborate?

»That tends to be the way that change often occurs. You see very small-scale changes over a long period of time, then all of a sudden it reaches a tipping point and shifts to a completely new way of doing things.«

#### What are the next steps?

»We're pushing ahead as much as we can. And we're also coordinating our efforts, not just with other groups within the construction industry but also with other emergency declaration groups. A major milestone for us that's coming up is the COP26 climate change talks in Glasgow. The world really has to achieve something major this year.«

#### How will you work with information sharing?

»It's likely that we will use the websites as one of the main ways of sharing knowledge, but also by continuing to expand the network.«

#### What about working with researchers at universities?

»We haven't focused much of our effort specifically on that yet. However, many of the larger companies have well-established links with academia.«

#### Talking with Architect Sweden's acting president Elisabet Elfström we asked: What is Architects Sweden's involvement in the declaration?

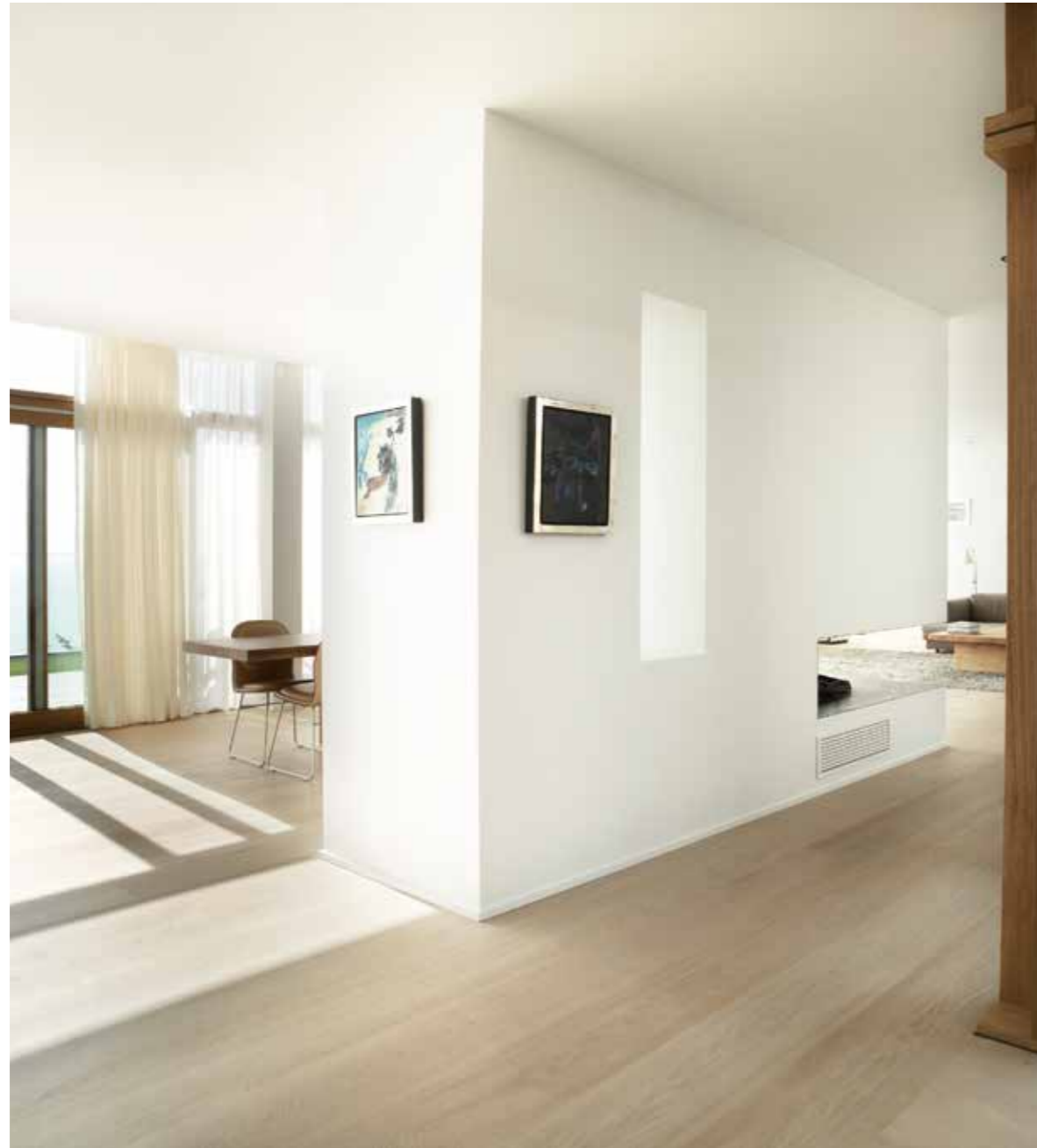
»We are responsible for administration and communication. We're also developing strategies to support the architects to act even smarter with regards to the climate.«

#### What is the plan ahead?

»We are working for new legislature around climate declarations and life cycle analysis (LCAs) for buildings. That will make it easier for our members, the architects, to drive the change to a more sustainable built environment. The competence working with LCAs must increase in the whole construction sector. Architects have a very important role in this. Current certifications and the new Swedish climate declarations that will be in effect in 2022 are necessary but not enough if we are to reach the national targets.«

»In the end the client decides what is actually built. We need political support. It's climate smart to build well-working environments that last – cities, buildings and the places around them. At the moment we focus on reducing the environmental impact under the construction phase – in processes, transportation and materials.«

Oak  
Width 300 mm  
Length 1.2-5 m



Dinesen Oak plank flooring — Henning Larsen Architects / Denmark

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The Muskrat Bridge over Bow River in Canada is designed as a cantilever bridge with a simply supported beam section in the middle, resting on two cantilevers that are anchored into land abutments at each end.

## Elegance and climate benefit with modern wooden bridges

**Few of Sweden's bridges are built in wood, partly due to concerns about service life and maintenance costs. Petter Werner, structural engineer at Swedish Wood, stresses the importance of showcasing successful wooden bridge projects in order to quell these concerns.**

TEXT Petter Werner

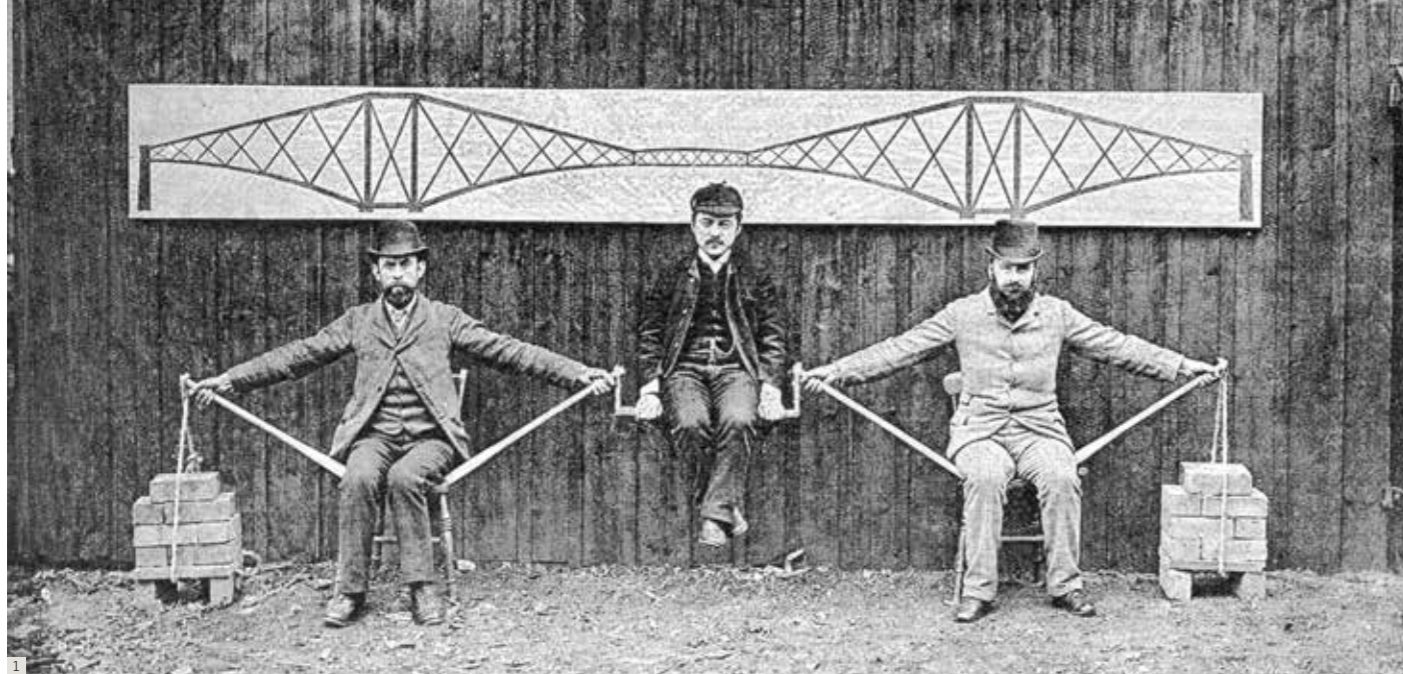
Throughout history, bridges have played an important role in developing the art of engineering. For centuries, bridges have provided proof not only of a material's load-bearing capacity but of engineers' creativity. Wooden bridges have perhaps the longest history, since the world's first bridge is highly likely

to have been a tree conveniently blown over to allow people to cross a stream or other obstacle. For a long period, wood was the go-to material for building a bridge. Many wooden bridges were built from the Middle Ages up until the 19th century, and various new building techniques using trusses and arches were developed during this period. The 20th century saw wooden bridges give way to steel and later concrete, particularly for large spans. The development of new wood products, including glulam, now once again makes wood a competitive material choice for bridge projects. Today, wooden bridges are being built for both light and heavy traffic, although they remain limited in number.

One advantage of wooden bridges is that they can often be erected quickly, and the low weight of wood makes transport easier and therefore favours prefabrication. The low self-weight also means that bridges with

low imposed load (pedestrian and cycle traffic) can often have slimmer designs in wood than in concrete, where the weight of the material accounts for much of the load. However, the breaking load is often not the determining factor for slender wooden bridges. In fact, it tends to be the permitted deflection. For bridges with long spans, the requirement concerning permitted oscillations will also usually inform the design.

A bridge that has both a slender design and a long span is the Muskrat Bridge over Bow River in Banff, Canada. Here, oscillations were a major challenge for the structural engineer. The oscillations were tackled with the help of two tuned mass dampers that were fitted underneath the bridge and calibrated to counter its resonance. Thick steel plates are suspended on cables to provide the counterweight for the damping. Adjusting the number of steel plates allows the »



Wikimedia



Patrick Odegerman

1. Sir John Fowler and Sir Benjamin Baker demonstrate the design principle behind the Forth Bridge in 1887. The two engineers represent cantilevers, and between them sits the Japanese engineer Kaichi Watanabe on a beam.
2. One of the two tuned mass dampers being assembled for the Muskrat Bridge. They help to counter oscillations from pedestrians.
3. Älvsbackabron in Skellefteå is a cable-stayed structure.
4. Tied-arch bridge for heavy traffic in Gislaved.



Sören Hökansson

» damping effect to be calibrated in order to best handle dynamic loads from the pedestrian and cycle traffic.

The 113 metre-long bridge is a cantilever design, made of tapering glulam beams in a form that is meant to follow the distribution of moment across the structure. The height of the glulam beams varies from 2.6 metres at the supports to 0.9 metres at the narrowest point. The bridge is divided into three main sections – two cantilevers, each resting on a concrete pier, and a 34 metre simply supported beam section resting on the end of each cantilever. In the land abutment, each cantilever is anchored with ties to resist the lifting forces that occur. This is a tried-and-tested method, ably illustrated above by Sir John Fowler and Sir Benjamin Baker, with the help of their assistant Kaichi Watanabe. The 4 metre-wide deck is made of cross-tensioned CLT elements. The bridge is designed for a service life of 75 years. The unsupported span

between the piers is 80 metres, making the bridge one of the longest of its kind.

**For even larger spans**, the cable-stayed bridge is a better option. One example of such a bridge is Älvsbackabron in Skellefteå, which was completed in 2011. Measuring 183 metres in total, the bridge has an unsupported span of 130 metres and, like the bridge in Banff, is designed for pedestrian and cycle traffic. For heavier loads, such as road traffic, tied-arch bridges are usually more suitable. Tied-arch bridges also have the potential to cover large spans, since the arch is subject to a compression load, with not much of a bending force. Wood is an eminently formable material, and is therefore well suited to this type of structure. A good example of a tied-arch bridge is Gislavedsbron, 47 metres long and designed for heavy traffic.

According to Swedish Transport Administration rules, wooden bridges must have an

estimated service life of either 40 or 80 years. Both Älvsbackabron and Gislavedsbron are expected to have a service life of 80 years. To achieve this, it is important to protect the wood from prolonged exposure to moisture. Cladding keeps the weather out and is often a key part of the structural wood protection. Another method is to give the bridge a roof. This is not particularly common in Sweden, but Switzerland has covered bridges that are several centuries old.

**All these examples** show that, as a result of amassed knowledge and major technical advances, wood once again has the potential to be a natural choice when designing bridges. Just like wooden buildings, wooden bridges bring major climate benefits, and if we are to meet the climate objectives set in Sweden, the choice of material for bridges should follow the same trend as for buildings, leading to more wooden bridges. ☺



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Vi startar vår KL-träfabrik i Långshyttan första halvåret 2020. Där kan vi producera de största KL-träelementen på marknaden och fräsa fram urtag för dörrar, fönster och installationer direkt i modulerna. Det gör både logistik och byggande smidigare och snabbare. Och all råvara kommer från ansvarsfullt brukade skogar i vårt närområde.

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