

trä!

A MAGAZINE ON INSPIRING ARCHITECTURE
FROM SWEDISH WOOD » ISSUE 3 » 2023

INNOVATIVE SPHERE
LANDS IN THE CITY
THREE TIMBER
ADDITIONS
MUTED TONES
HIGHLIGHT NATURE

TRÄ MEETS
Reza Hosseinpourpia

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15 » Spherical building forms new landmark

Gothenburg has a new silhouette with the addition of the Wisdome visualisation centre, a spherical dome built with great precision and materials that are as sustainable as possible. It has been placed on top of Universeum as part of its expansion.

34 » Material mix creates pleasing calm

In Hampshire, UK, ancient wisdom is combined with modern life, in the form of a temple open to all and without any religious symbols. Instead, the soft shapes and select materials of the architecture speak for themselves.

53 » Discreet volume in dark shades

The dark façade and equally dark interior make the holiday home a discreet presence on the rocky West Coast. The house serves up luxurious glamping where the eye is constantly drawn to the windows and the adjacent nature reserve.



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Old meets new in three different projects

Developing buildings instead of demolishing them can make the industry more sustainable. Three projects highlight three different ways to do this: by going upwards, inwards and outwards. The buildings in Malmö, Stockholm and Devon, UK, show how wood can combine old materials with new architecture.

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Swedish Wood disseminates knowledge about wood, wood products and wood in construction, contributing towards a sustainable society and a thriving sawmill industry. We achieve this by inspiring, educating and driving technical advances.

Swedish Wood represents the Swedish sawmill industry and is part of the Swedish Forest Industries Federation. Swedish Wood represents the Swedish glulam, CLT and packaging industries, and collaborates closely with Swedish builders' merchants and wholesalers of wood products.

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Anna Ryberg Ågren Director, Swedish Wood

Good quality is crucial for long life

ONSALA, SWEDEN Welcome to an inspiring new issue of Trä! I hope you have had a great summer and enjoyed your time off. I have filled my vacation with things that energise me, especially being out in nature.

My autumn began with a visit to Södra in Värö, Halland. I never cease to be amazed at how efficiently the forest raw material is used. In the sawmill, planks and boards are made from the thickest part of the trunk, with the incoming log scanned to ensure a maximum yield. The thinner part of the trunk goes to the pulp mill to be turned into paper, paper-board and textiles. The tops and branches of the tree, as well as by-products such as bark and chips, are turned into products such as bioenergy, biofuels and chemicals. Nothing goes to waste, everything is put to good use. Moreover, all these products that we get from the renewable forest raw material can replace things with a much higher carbon footprint. Isn't that amazing?

Another key aspect of resource efficiency is ensuring that the wood products we use have as long a life as possible. The longer we can keep the products in use, the longer we delay the release of carbon dioxide into the atmosphere. Swedish wood products are well known for their high quality – as confirmed by our market analysis – and can therefore be useful for a long time. In terms of deliveries from our members, we can see that, despite challenging conditions, Swedish sawmills are still doing surprisingly well. The weak Swedish currency helps, of course, but we already know that demand for high-quality Swedish wood products is strong. So far this year, despite a dip in construction activity, we have seen almost unprecedented demand. However, the trend is uncertain, and demand has fallen slightly over the summer months. It will therefore be exciting to follow developments this autumn.

Good quality is essential for wood products to last as long as possible. But of course, they also need to be used in the right way. Swedish Wood is keen to play its part in this, and does so through our technical handbooks and websites with tried and tested design solutions.

We also offer various training courses, such as the RIBA-accredited CPD courses for the UK at woodcampus.co.uk. Don't miss the »Diploma in Wood Construction« course, read more about it at swedishwood.com. Wishing you a pleasant read!

Anna Ryberg Ågren



The functions of the house are arranged around the central fireplace. From here, the staircase leads up to the sleeping loft.

Open plan for many guests

OBJECT The Hat house
ARCHITECT Tina Bergman
 architect
STRUCTURAL ENGINEER
 Limträteknik

TÄNNDALEN, SWEDEN The Hat house, a holiday home named after a Swedish children's tale about Hat cottage, sits gently nestled just below the tree line in one of Tännålen's birch forests, overlooking the lake and mountains. Here, a family wanted a holiday home that could also accommodate many guests. The asymmetrical gable roof slopes steeply on one side, freeing up interior space for a sleeping loft while maintaining its low-key look.

The 100 square metre cottage is centred around the fireplace and its chimney, which is

supposed to figuratively pull the hat down over the ears. Other functions are then placed around these. The structure is a combination of glulam and softwood timber. The exterior walls, roof and gutters are clad in locally produced, furfurylated heartwood pine, while inside, the walls and ceilings are finished in spruce that has been treated with a white pigmented oil to prevent it darkening. The downstairs floor is made of spruce end-grain blocks that will take on extra patina from boots and dog paws. «

w| tinabergman.com

Wood stands proudly among the brick

LONDON, UK The former high street of Walthamstow in north-east London is being increasingly reimagined, with former shops becoming homes. To retain the historical connection, this new house has an entrance designed to resemble a modern

OBJECT Spruce house
ARCHITECT Ao-ft
STRUCTURAL ENGINEER MES Building solutions

boutique, where the ground floor windows are carefully covered with an array of vertical timber ribs to maximise privacy while allowing light to filter into the dwelling. The ground floor is positioned half a meter below ground level, to connect the house and the garden while giving the entrance level more volume.

The new building replaces a previous infill that had fallen into disrepair, and since the aim was to build with as low a carbon footprint as possible, CLT was chosen as the main material. The wood cladding has been left exposed in the interior, reducing the need for other building materials such as plasterboard or paint. Instead, timber is mixed with steel and polished concrete. The house also includes a stand-alone larchwood design studio. ◀

www.ao-ft.com



The new infill building is designed like the street's former shops but with a modern façade.



Marcos Zeigens

The triangular shape of the park building is visually appealing and helps to drain away rainwater.

A-shaped house on stilts copes with both rainfall and water flow

PUERTO VARAS, CHILE In a nature park in southern Chile stands a long building, internally divided into two equal halves, one of which serves as the reception area for the park and the other as the home of the park ranger. On the outside, the monochrome façade has only a few discreet openings, referencing the old larch barns in the area that had a similar look.

Placing the building on posts almost a metre above ground leaves room for the flow of water from the streams that run

into a lake just below the building. The triangular geometry of the building marks the difference between the natural and the artificial, but the A-shaped structure also serves another important function, with the steep roof protecting against the heavy downpours that occur in the area.

The rooms run in sequence through the 30 metre long building, with no corridor, and transverse beams form an essential part of both the structure and the visual aesthetic, complemented in some rooms by exposed trusses reaching up to the roof ridge. ◀

OBJECT Aladino
ARCHITECT Iván Bravo

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The dark pavilion at the Venice Biennale invites visitors to step into a forest glade.

Pavilion brings the forest to Venice

OBJECT Kwaae

ARCHITECT Adjaye associates

STRUCTURAL ENGINEER

Format engineers

VENICE, ITALY Outside the central exhibition hall of the Venice Biennale stands a 13 metre tall triangular pavilion called »Kwaae«. It means forest in Twi (a dialect of the Ghanaian language Akan) and was designed by Ghanaian-British architect David Adjaye. Through its shape and uniform choice of materials, the wooden pavilion evokes a clear sense of the forest, thanks to its enveloping feel and the different-sized slats that give the walls their repetitive pattern.

Two round windows and an arched entrance provide the

greatest amount of light, like a forest glade or an opening in the tree canopy. The slats have been positioned to allow enough light to filter in to give the visitor the feeling of being in the middle of a dense forest where light is glimpsed through the branches, while the tactile properties of the wood are reminiscent of tree trunks.

The pavilion is used for lectures and gatherings, and once the Biennale is over in November, the parts can be dismantled and used in other locations around the world. « w|adjaye.com

Summit station with space for machinery and views

ALPBACHTAL, AUSTRIA Stop for a moment at the summit to admire the view before continuing your hike or skiing off down the slopes. In the Tyrolean Alps, there is now another reason to linger, because when the Ski Juwel Alpbachtal Wildschönau resort replaced an outdated ski lift, they took the opportunity to create a viewing tower on top of the machine room.

There is a proud tradition of wood construction in the region, and the 13 metre high tower was developed with both

local construction methods and consideration for the landscape. Narrowing at the top, the tower consists of two floors. The lower one is covered with wood cladding, inspired by Tyrolean farmhouses, while in the upper section the roof structure is open. The tower is not heated but provides good protection from the wind and is unlocked so that it can be accessed by those seeking shelter in both summer and winter.

The façade is clad with grey shingles that allow the summit building to blend into the landscape. The shingles were handmade by a local carpenter. « w|snohetta.com

OBJECT Timber tower

ARCHITECT Snohetta

STRUCTURAL ENGINEER Plan TEC



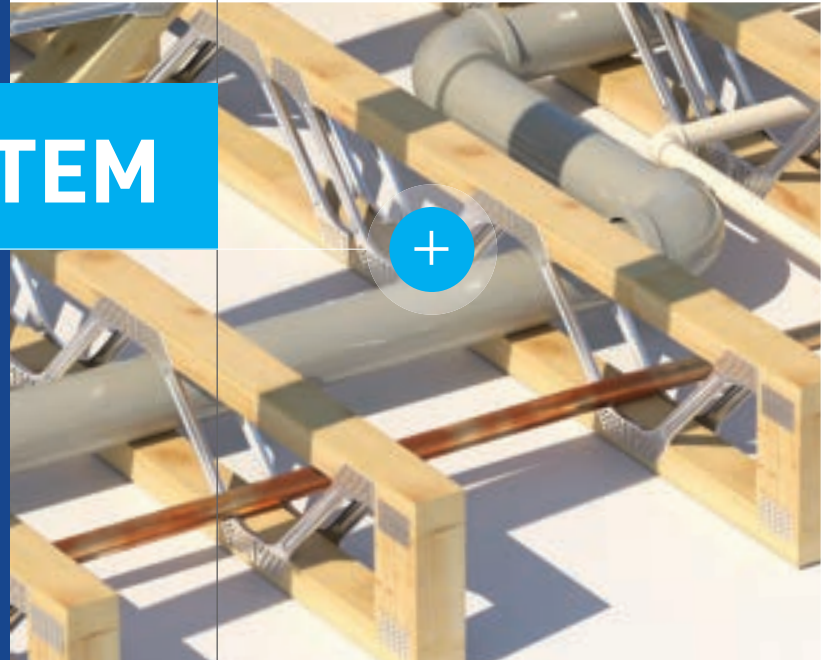
The two-storey tower offers a panoramic view of the Tyrolean Alps in a cosy environment.

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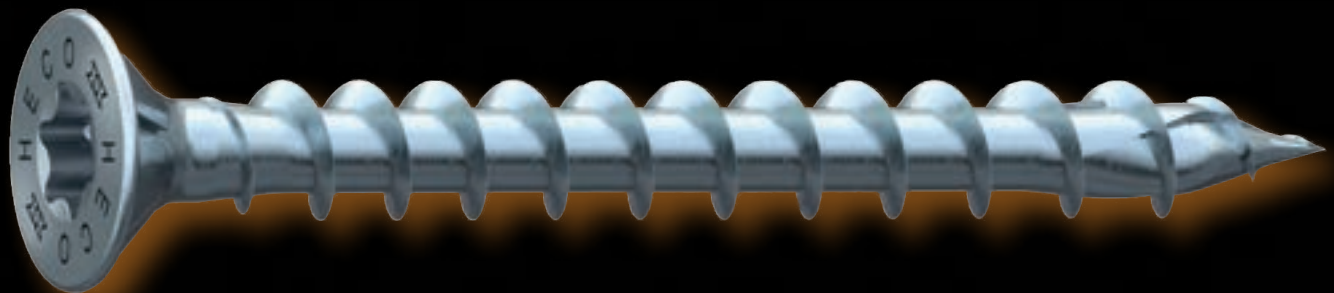
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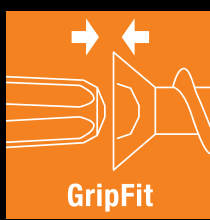


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Spaces that play with level differences

BRANDENBURG, GERMANY In the middle of the town centre, opposite the village church, an elongated residential building stands out with its façade of red-painted spruce planks. The entire structure is made of CLT of different thicknesses, which has been left exposed in the interior, accompanied by repeated red details around the doors and windows.

OBJECT House Parlow
ARCHITECT Annabau
STRUCTURAL ENGINEER Niehues Winkler engineers

As a result of the sloping site, the flat roof has been adapted to run parallel to the topography and the ground floor has four different levels, where the exposed concrete floors contrast with the light wood. The upper floor also consists of rooms at different heights, connected by stairs of varying gradients.

The moderate size of the building, at 5x15 metres, preserves much of the site's open and green spaces. The roof stores rainwater which is then gradually released to the plants, and from the south side of the building, miniature kiwi plants meander on the red garden twine, helping to frame and shade the terrace.«

[w| annabau.com](http://www.annabau.com)



Hanns Josten

The rooms are at different heights, connected by staircases with different gradients. Red details complement the exposed framework.



Adrià Goula

The Spanish research station for the study of biodiversity is constructed from locally grown invasive pine trees.

Research station built by architecture students using invasive pine trees

BARCELONA, SPAIN The Parc de Collserola is an 8,000 hectare green space rich in flora and fauna, where a group of Master's students have built a research facility 8.5 metres off the ground. The observation point and weather station will be used by researchers to study the park's biodiversity and how it is being affected by climate change.

In the park, 70 invasive pine trees have been felled and

machined by the students to create cross-laminated timber panels, glulam beams and other elements. The CLT frame rests on four glulam posts measuring 300x300 millimetres, and all the wood is protected by external cork cladding that provides both heat and sound insulation. The bridges are made of glulam produced by the students themselves.

The surrounding mesh was designed digitally and then woven by hand, with climbing plants trained up to help conceal the building. The students were inspired by biologist Margaret D. Lowman, «Canopy Meg», a pioneer in canopy ecology.«

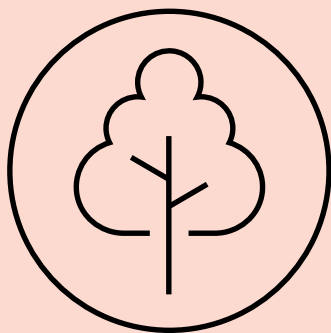
OBJECT Flora
ARCHITECTS Students from Valldaura labs, Institute of advanced architecture of Catalonia, led by Vicente Guallart and Daniel Ibañez

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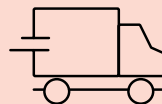
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The bridge separates pedestrians from road traffic and is designed with only two ground supports.

Wooden bridge brings more fun to Manhattan

OBJECT Glulam bridge
ARCHITECT SOM
STRUCTURAL ENGINEER
 Thornton Tomasetti

NEW YORK, USA In New York City, there is a current drive to create safer and more enjoyable routes for pedestrians to get from one place to another without being disturbed by road traffic. Now it is the turn of the Moynihan Train Hall, a commuter hub that forms part of Pennsylvania Station, from which people will be able to walk across Manhattan to the High Line – the former rail tracks that have now been transformed into a long green park – via two bridges.

With its distinctive glulam trusses, the 80 metre long wooden bridge is an inviting walkway completely separated from surrounding traffic. The bridge is supported by two Y-shaped steel columns, but thanks to the choice of material, it requires no additional ground supports, leaving the existing roads below unaffected. The deck of the bridge is made of corten steel and its handrail is bronze. These details also recur in the second bridge, which is lined with trees instead of trusses to give it a green feel. «

[wj|som.com](http://wj.som.com)

Safety in an open courtyard

VILNIUS, LITHUANIA Bordering a Baltic forest, new generations will develop their creativity and love of nature in this newly opened preschool, close to the area's schools and with an area of forest right next-door. The dark, metal-clad façade, with its dynamic shape, contrasts with the soft greenery of nature as well as the welcoming, hexagonal courtyard in exposed wood.

Enclosed on five sides by the building, the courtyard is designed to provide a safe and stimulating space for children, with glulam posts framing the tall, narrow floor-to-ceiling windows. These help to give the children a clear connection to the outdoors from inside and



Norbert Tulej

The courtyard welcomes children with a safe and fun play area that also connects the indoor and outdoor spaces.

OBJECT Preschool
ARCHITECT ngarchitects
STRUCTURAL ENGINEER
 Žilvinas Stasiulevičius

combine with the posts to create a varied play of shadows in the interior. The glulam posts

and beams facing the courtyard are also exposed in the otherwise white-painted rooms. The decked floor is made of locally grown wood, and the two-storey high walls provide shade from the sun. «

[wj|ngarchitects.eu](http://wj.ngarchitects.eu)

Leanne Johnstone, assistant professor, Örebro University

Sustainability starts in the break room

ÖREBRO, SWEDEN In a world where governments and organisations are often expected to lead on sustainable change, my recent study *The Limits of Control?* highlights that employees' actions are also needed for sustainable change to be implemented in practice.

My research indicates that informal conversations in the break room, about both sustainability more generally and how the organisation can work towards sustainability specifically, are crucial for engaging employees in sustainability work. The impact of peer pressure and the creation of a sustainability culture cannot be underestimated. With this in mind, alongside an organisation's formal policy documents on environmental management and so on, managers should use other strategic tools to engage employees in sustainability work.

For example, it is important that managers lead by example and also involve employees in good sustainability practices in the workplace. This can be as simple as putting waste in the right bin or highlighting employees' views and success stories on sustainability on notice boards, via email or on the intranet. Turning the spotlight on good employees inspires others to work in a similar way.

It is also important that employees can relate to the sustainability goals, for example by something as simple as telling them that savings made on material waste can be spent on staff activities or teambuilding days. Such incentives appear to be important in the construction industry to ensure that employees follow sustainable practices. The industry is trying to act as an «advisor», but the transition is not solely down to those working in construction companies; the commitment to sustainability is bigger than the company.

Moreover, the research highlights the potential of leading sustainable change from the bottom up through open dialogue between managers and employees on sustainability ideas and innovations.

In short, having all your formal management systems and procedures in place means nothing if the organisation has not engaged its employees in sustainability efforts in more informal ways. The importance of erasing hierarchical boundaries and talking about sustainability in the workplace, not only in formal meetings but also in the break room, cannot be underestimated for truly sustainable organisations and industries.



Nicola Falson

This is an opinion piece. The views expressed are the writer's own.



INNOVATION AND TECHNOLOGY TO INSPIRE NEW HOUSES

PHOTOGRAPHER

Boys play nice

OBJECT

Kloboucká lesní
högkvarter

ARCHITECT

Mjolk architekti

STRUCTURAL

ENGINEER Lostade cz

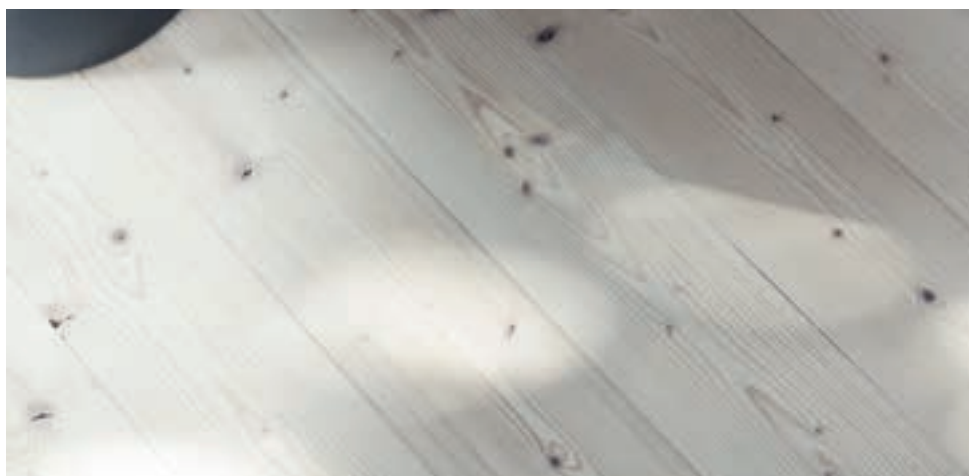
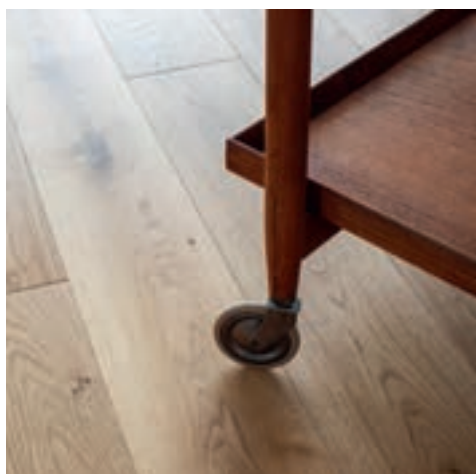
BRUMOV-BYLNICE, CZECH REPUBLIC Czech forestry company Kloboucká lesní wanted its new headquarters to be a place of innovation and technology. Surrounded by greenery and water, the building's laboratory focuses on developing faster and better ways to build with wood and encourage more people to use the material.

The structure is made of glulam, manufactured in the company's own production hall located a few hundred metres away. The repetitive structure forms a long and elegant volume that conceals the site's production facilities. The north side of the façade houses the main entrance and faces towards the city. Like the façade, the interior is lined with spruce

cladding and it offers considerable flexibility by design, so that in the future the building can be adapted to different types and scales of production. The structure combines glulam with expanses of glass and acoustic partitions in wood and glass to create an open feeling. Windows cover the northern part of the roof, illuminating the upper level.◀

- Rainwater from the roof is stored in open ponds and used for irrigation and cooling in the summer months. By reflecting daylight, the water surface helps to cast light deeper into the building.
- The project aims to inspire more people to opt for wooden buildings in the Czech Republic. According to Kloboucká lesní, only 2,000 are built annually at the moment, which is equivalent to 0.5% of the country's total timber production.

www.mjolk.cz



Tidlöst.

Råvaran till våra klassiska golv i furu och gran kommer från Norrlands djupaste skogar. I vårt breda sortiment finns massiva trägolv och parkettgolv – i ask, ek, furu och gran. Genuina och noga utvalda golv som håller över tid. Gör ett bra val på baseco.se.

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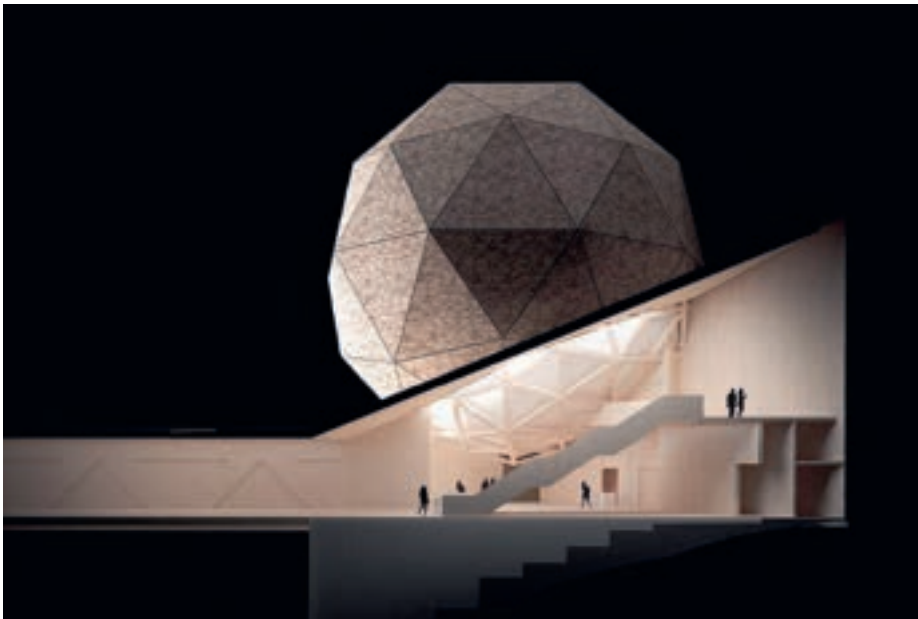


SPHERE SIGNPOSTS ROUTE TO KNOWLEDGE

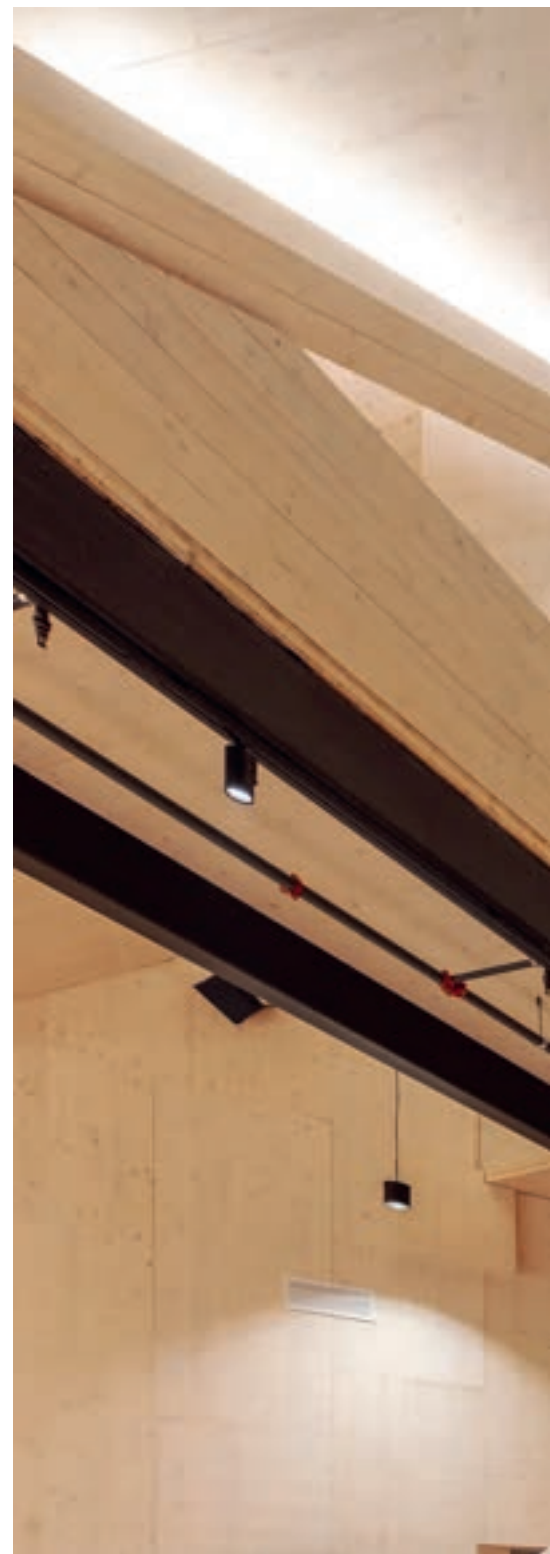
The newly built Wisdome in Gothenburg is one of the most advanced visualisation domes in the world. With its spectacular appearance and location on top of Universeum, it has become a new landmark in Gothenburg. »

TEXT Sara Bergqvist PHOTO Jonas Edblad & Daniel Frickeus

The Wisdome's shape is formed by equilateral triangles connected using steel components.



Rendering.



Given its playful appearance, it is not surprising that many motorists driving by on the E6 highway think the Wisdome is connected to neighbouring Liseberg amusement park. In fact, the visualisation dome has become an important new feature of the national science centre, Universeum, the aim of which is to disseminate scientific advances and explain complex events in a more accessible way. The Wisdome's activities are based on research conducted at Visualisation Centre C in Norrköping and Linköping University.

»Around 70 percent of our sensory cells are located on the retina, which means that we can absorb very complex information when we receive it in images. The ambition is to bridge the gap between various research fields and us ordinary citizens so that we can create our own image and understanding of different scientific contexts,« explains Carina Halvord, CEO of Universeum.

The Wisdome in Gothenburg is the largest of five new visualisation domes in Sweden, the others being in Stockholm (Trä issue 2/23), Malmö, Umeå and Norrköping. Enveloped by a 360 degree and 443 square meter projection screen, the dome's visitors can enjoy magnificent experiences of space, the sea and the human body in a way that makes it feel like you are immersed in the whole thing – which you very much are.

»In the data visualisation show 'Big', based on open software and data from organisations such as NASA and ESA, we can take interactive journeys into space in real time. Using data from observatories around the world, for example, we can 'land' on Mars and see the surface there down the centimetre,« says Carina Halvord.

When Universeum opened in 2001, its sustainability level was unique in several respects. The activity centre, which includes huge aquariums, a tropical rainforest and experimental attractions, was built entirely of wood, with a clearly exposed timber frame – something that was relatively

uncommon for such large buildings at the time. Other sustainable features included solar panels, a passive ventilation system and a urine separation system.

THE SUSTAINABILITY THINKING obviously continued with the design of the Wisdome, which incorporated wood from the outset. The job of creating the new dome went to Wingårdhs, who also designed the original Universeum building.

»The idea for the structure of the Wisdome is based on geodesic technology, which is a resource-efficient way of building domes,« says Gert Wingårdh, chief architect at Wingårdhs.

Seating up to 150 visitors, the dome has a diameter of 27.5 metres, and the total elevation from the street to the top is 57 metres. It is constructed as a glulam geodesic sphere made up of equilateral triangles, with steel connecting nodes and



The Wisdome's mission to promote knowledge of sustainability is also reflected in the choice of materials, such as the staircase leading up to the dome's entrance.

wooden façade elements. The internally visible parts of the dome are clad with CLT panels.

»The façade elements were made at a factory in Hällingsjö just outside Gothenburg, but because they were so large – the base and height of the triangles is eight metres – we had to divide them into two parts,« says Maria Normann, supervising architect at Wingårdhs.

However, the stairwell and most of the floor structure uses concrete.

»Since this is a place for visualisation technology, it's vital that there are no vibrations. Accordingly, we needed concrete in the foundation to ensure that the projectors would be sufficiently stable – not least because Liseberg's rides pass by right next door,« Maria continues.

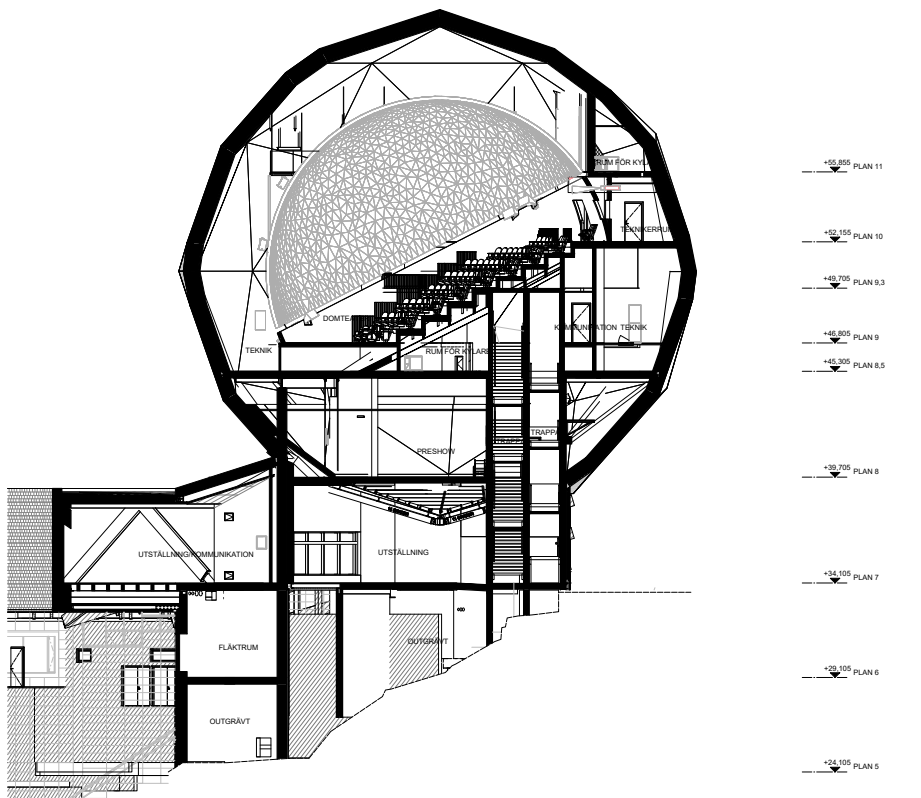
The site-built screen inside the dome is made of 249 aluminium sheets attached to a steel skeleton. This in turn

hangs from 16 chains that distribute the weight between the attachment points. All in all, the structure weighs 4,5 tonnes.

»The whole building has required extreme precision. We provided 3D models for the build, which the installers used on site to get the nodes correctly positioned in spatial terms. The dome structure deforms during construction and is only stable once the sphere is complete,« says Jonas Edblad, the project's lead architect at Wingårdhs.

UNIVERSEUM SAW THE construction of the Wisdome as an ideal opportunity to also resolve its pent-up demand for new and modified functions and areas. This included a new restaurant section, a new entrance and reception desk, as well as more exhibition areas and elevators.

»The Wisdome was the engine for doing everything else. Putting the dome in the right place allowed us to achieve »



Cross-section

Architect **Jonas Edblad**

» **THE DOME STRUCTURE DEFORMS DURING CONSTRUCTION AND IS ONLY STABLE ONCE THE SPHERE IS COMPLETE.**«

» many other benefits and a better flow throughout the building. We also replaced the poorly functioning angled elevator with new elevator and stair towers. Their location means that it is now possible to use the new section for conferences and other events outside regular opening hours without having to open up the rest of the building,« says Gert Wingårdh.

The new extension adds an additional 4,500 square metres to the existing 10,000 square metres.

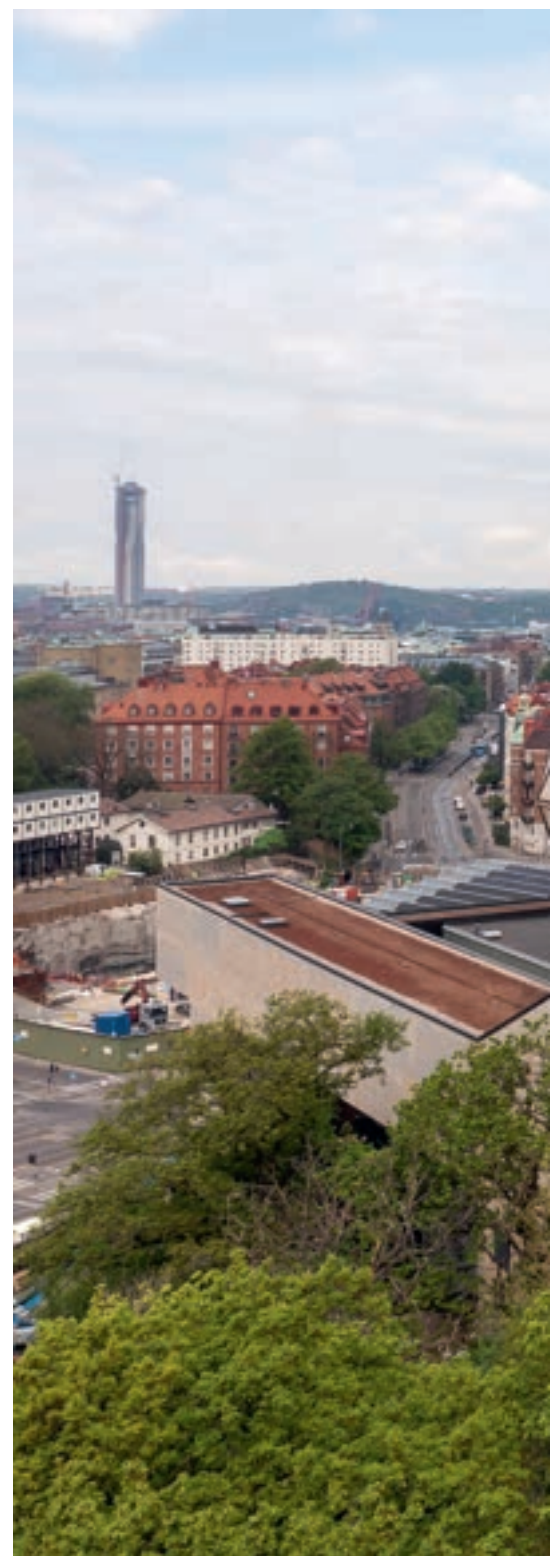
»The extension is divided into a lower section, an elevator tower and a bridge connecting the tower to the dome. The bridge has a span of 43 metres and a height of 6 metres, providing a large display area. At the other end, the bridge projects out nine metres and terminates in a conference room with a glazed façade and amazing views,« says Stefan Kastberg, designer at MW Byggtkniska, which was responsible for the wooden structures.

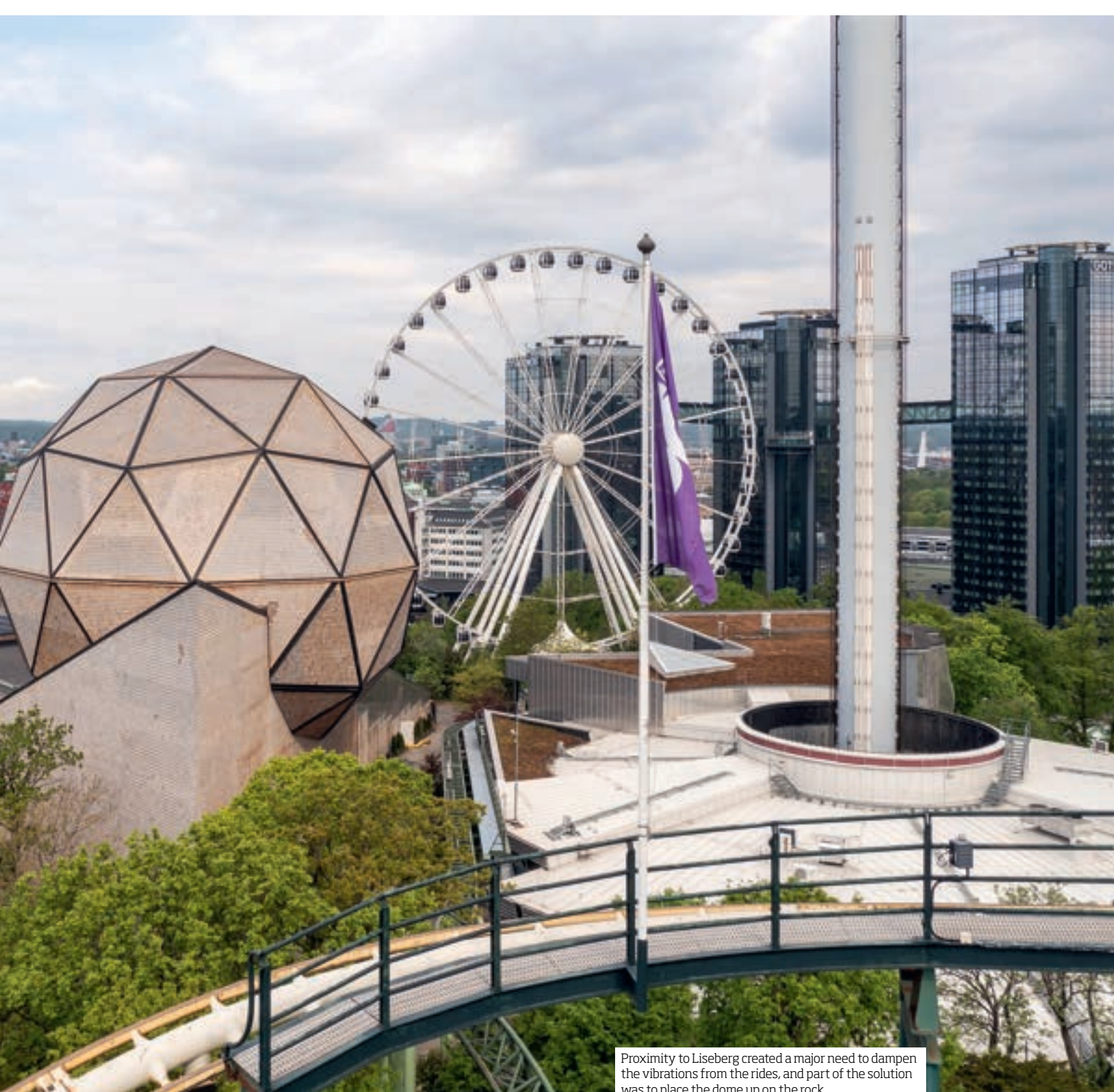
Apart from the concrete foundation, the evacuation staircase and the steel ties holding the wooden beams together, the extension, including the elevator tower, is constructed from spruce glulam and CLT. Most of the façade, including the dome, consists of small cedar shingles – the exception being the glazing in the stairwell.

»One of the biggest challenges of the build was the special shape of the dome, which has no two parts the same and required a number of custom solutions. Another was the mix of materials and the connections between wood and concrete, steel and wood, and steel and concrete, especially in the dome,« says Stefan Kastberg.

Christofer Barkebo, from construction company Skeppsviken, agrees.

»Another challenge was having to build up in the air, on top of an existing building. We set up scaffolding inside the





Proximity to Liseberg created a major need to dampen the vibrations from the rides, and part of the solution was to place the dome up on the rock.

dome that went all the way to the top. In addition, we had numerous climbers fixing the joints between the different elements. A lot of the elements were prefabricated. But when we were making the bridge, we had to do some assembly work on site because the elements were too big to be transported at full size. The longest glulam posts were 19 metres long,« he says.

IT SHOULD ALSO be added that the work was carried out in parallel with extensive excavation work in the surrounding area due to the West Link rail line being built in Gothenburg.

»Because of this, we also had some problems with ground-water issues and had to pump a lot of water,« recalls Jonas Edblad.

With everything that has been done, sustainability has always been an important starting point. For a start, the

operation itself is about researching and disseminating knowledge on the sustainable use of the planet's resources. The materials have consistently been chosen to be reusable, recyclable and have as little impact as possible on the environment.

»We've primarily tried to work with local suppliers and materials. The exception is the façade, where we preferred spruce shingles but couldn't source such large quantities. Instead, we chose cedar shingles from Canada because they have a natural protection against rot and are virtually maintenance-free. They also have a relatively low carbon footprint despite the long-haul transport,« says Maria Normann.

In the restaurant area, the chairs are made from recycled fishing nets, the tables from durable, recycled flooring material, and the menu is based on what is best from a sustainability perspective that week. »



Projection and audience from inside the dome. On the site-built screen, visitors can experience the whole world and even parts of space.

»In the reception area, we've made the glulam part of the interior design by forming the new reception desk out of glulam beams. We've designed it so that children can climb up and stand on it, while at the same time ensuring that it's easily accessible for wheelchair users and user-friendly for the staff,« says Sara Helder, lead interior designer at Wingårdhs.

AND WHEREVER YOU go in the new building, you are embraced by wood, not only visually but also through the inviting scent.

»Universeum has a warmer feel. I'm so pleased with what the new extension and dome have added to the city's skyline – and because it will make a big difference in spreading and democratising knowledge in a range of scientific fields,« concludes Carina Halvord. ©

Wisdom and Universeum extension

GOTHENBURG, SWEDEN

ARCHITECT Wingårdhs

CLIENT Universeum

STRUCTURAL ENGINEER MW Byggtkniska

AREA 4,500 sqm gross floor area, of which 3,800 sqm is usable space

TOTAL AREA Universeum after renovation 14,000 sqm

COST The five Wisdom centres are a national initiative made possible by an anniversary donation of SEK 150 million from the Knut and Alice Wallenberg Foundation.

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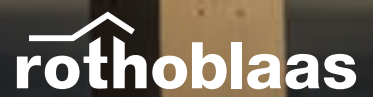
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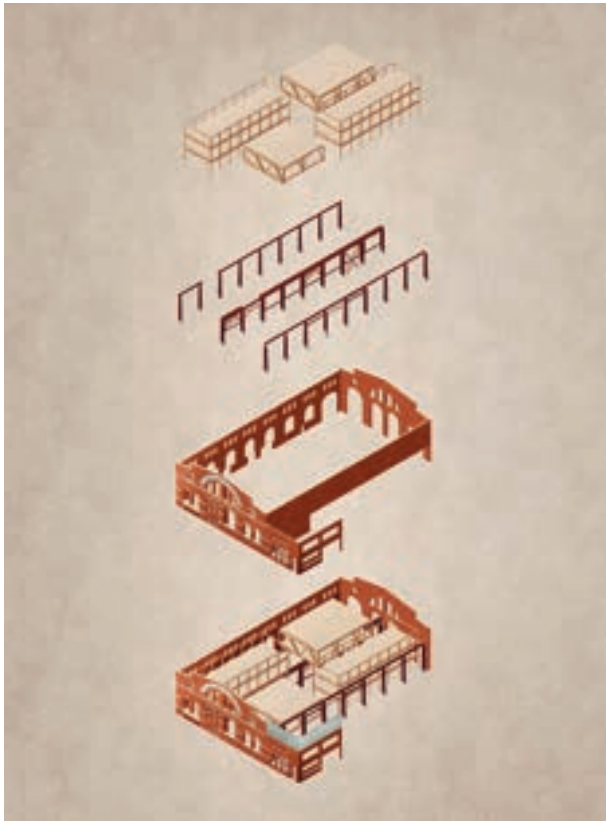
Old meets new. In Malmö, Stockholm and Devon in the UK, three buildings have been refreshed using wood.



Sustainable development in three different ways

Of the many ways to make the construction industry more sustainable, the best is to reuse and develop existing buildings. Come with us to a retrofit in Malmö, an upward extension in Stockholm and an outward extension in the county of Devon in south-west England. Their common denominator is that they renew and extend the function of what has already been built. »

TEXT Katarina Brandt PHOTO Rasmus Hjørthø, Coast (Kjellander Sjöberg)
William Gustavsson (Wingårdhs)
Jim Stephenson (Studio Weave)



Kjellander Sjöberg

Concept diagram.

Sustainable construction requires us to preserve existing assets, but that doesn't prevent us from creating new ones. An extension makes it possible to add new assets that neither the original building had nor a new building could achieve. Here, the wood has the opportunity to interact with the materials used previously, as new architecture meets what came before.

RETROFIT HIGHLIGHTS THE HERITAGE OF THE SHIPYARD: The better we preserve, the better we can renew. This is the motto for the formation of the new Varvsstaden district in Malmö. With a focus on the future, there are plenty of nods to the history of Kockums, showing how the shipbuilding industry has helped shape the city's identity for over 160 years.

Although Kockums is no longer in operation, the soul of the company still very much hovers over Malmö, where its legacy as a major industrial player has become part of the city's unique industrial landscape. Now new life is being breathed into the shipyard area, as the 182,000 square meter industrial site is transformed into the new and sustainable Varvsstaden district, where many of the old buildings are being carefully renovated and converted. The area, which was previously closed to the public, will now link central Malmö with Västra hamnen. The land is owned by Varvsstaden, a joint enterprise by construction firm Peab and real estate company Balder.

Perhaps the most iconic building in the area is Gjuteriet, the former foundry on the quayside promenade. Built in 1910 to manufacture components for the yard's ships and bridges, the building stands right next to the dry dock and shipyard basin. Over the years, Gjuteriet has been adapted to meet new needs. Now Kjellander Sjöberg, in close collaboration with Varvsstaden and the tenant Oatly, has created a custom work environment based on Oatly's culture, for the food company's growing number of employees.



»For this building, we've interpreted Oatly's values and what they want their headquarters to convey. They wanted a unique office with a focus on sustainability, designed to create a sense of community among their employees,« says Simon Estié, architect at Kjellander Sjöberg.

IN MANY WAYS, Gjuteriet reflects the ambitious sustainability goals of both Oatly and Varvsstaden, where reuse and circular construction have been a common thread throughout the project. Two of the building's brick façades have been preserved almost intact, but the others were in very poor condition. The western façade now boasts a new wall made of recycled bricks, where the new windows are larger than the original ones to reveal the old brick façade that remains on the inside, showcasing the reuse.

»Our strategy was to preserve as much of the building as possible, both original parts and later additions. Our focus in the second instance was on using recycled materials and



In the former industrial building, the new timber frame complements the older steel one both visually and technically.

thirdly, on adding new, circular materials,« explains Johan Pitura, architect at Kjellander Sjöberg in Malmö.

Varvsstaden realised early on that the amount of material on the site could be a valuable asset. Prior to the demolition and soil remediation work, therefore, work began on setting up the Material Bank database, in which all the material dismantled in the area is inventoried, catalogued and entered, with labels such as type of material, size, financial value and carbon content. Structuring the information in the Material Bank in a clear way, with search functions and shareability, has made the database both user-friendly and accessible. The physical material is stored in one of the large machine halls on the site. The hope is that a large part of Varvsstaden can be built using recycled materials from Varvsstaden.

For the Gjuteriet project, Kjellander Sjöberg has used the old architecture to add something new. With a glulam and CLT structure, they have created a 'building within a building' where part of the new construction hangs from the old steel

Architect **Simon Estié**

»THE WOODEN FRAME CAME MACHINE-CUT TO THE PERFECT DIMENSIONS.«

frame and the preserved cast iron girders that run through the former industrial hall. The other part sits directly on the foundation slab, which is made of climate-improved concrete.

The added elements have opened up a variety of spaces for the new content of the building – meetings, socialising, creativity, exhibitions, food and drink. The design also brings in natural light which, thanks to the high window openings and roof lanterns, reaches far down and into the wide and deep building.

»There is a similarity between wood and steel in the sense that the materials can be exposed and load-bearing at the same time. Wood, like steel, has both a strength and a »



The older parts of the former foundry help highlight the history of the building, while the new wood contributes to the calm atmosphere.

» lightness to its appearance, and we think the existing steel frame and the new timber one work very well together, technically and aesthetically,« Johan Pitura continues.

A key idea has been to clarify how the building works, so all the utilities such as electricity, heating, sanitation, ventilation and sprinkler systems are visible. The interior wooden walls help to reduce the contrasts and create a calm and harmonious atmosphere.

»It's nice to be able to see the layers of history in the building, some of it broken and some of it complete. However, we've been careful to ensure that all the new elements are pristine, while the old stuff can be a bit shabbier. The high-tech timber frame is a prime example. It was machine-cut to perfect dimensions by Martinsons and represents the new, while the brick envelope has more imperfections. It creates an exciting bridge between then and now,« says Simon Estié.

UPWARD EXTENSION ADDS A NEW GROWTH RING: The area around Slussen in Stockholm is changing rapidly, with new meeting places popping up everywhere. Part of the change is due to the real estate company Slussgården, whose timber-on-top extension of the Överkikaren 30 block has quickly become one of the capital's new landmarks. As of last spring, the elevator goes all the way up to the newly built 13th floor, where the Freyja restaurant and roof terrace offers both a great buzz and the city's most amazing panoramic view of the inlet to Lake Mälaren and the island of Södermalm.

The starting point for the extension project was the more than 30 year old glass lantern on the roof of the Swedish Association of Local Authorities and Regions' base at Hornsgatan 18, which needed to be replaced. It all took an exciting turn when Slussgården, in collaboration with Wingårdhs, saw the potential for something much bigger.

»When considering the planned replacement of the lantern, we looked at how the previously inaccessible roof area

Gjuteriet

MALMÖ, SWEDEN

ARCHITECT Kjellander Sjöberg

CLIENT Varvsstaden

CONTRACTORS Peab, Martinsons

STRUCTURAL ENGINEERS Reijlers, Tyréns

TENANT Oatly

COST SEK 200 million

AREA 4,900 sqm

www.kjellandersjoberg.se

could be put to better use. The extension is in line with our ambition to promote positive development of the area and it fits well with the City of Stockholm's vision of creating new meeting places,« says Lars Kinneholm, CEO of Slussgården.

The building was designed by Mats Edblom and completed in 1989. At the time, it was a welcome addition to the neighbourhood, as it was built on the void left after the Söderleden rail line was moved under Södermalm. The special foundation required for the construction meant, among other things, that any future foundation reinforcement would not be economically viable, as was explained when planning the upward extension.

»We simply had to use the existing structure and build in a way that didn't affect the frame. The choice of wood was therefore born out of necessity. Primarily for reasons of load-bearing capacity, but also for sustainability,« Lars Kinneholm continues.

From the time the idea of an upward extension was raised, it took only nine months to obtain a building permit, after which a smooth construction process followed. Lars Kinneholm and Niklas Carlén, head of Wingårdhs' Stockholm office, highlight the excellent collaboration between Slussgården, the City, the architects and the builders »



The extension has created a new social hub framed by the restaurant's high ceilings and burgundy sound absorbers.



The restaurant's bay windows offer inviting views of Stockholm. The CLT walls are stained grey to resemble driftwood.

» at MVB Öst as the main reason why the project was completed faster than anyone had dared to expect.

»The City wants to develop on a responsible basis, and I think they appreciated that the restaurant and roof terrace would give the property a public function and not make it an entirely private affair. We made sure that all their concerns were addressed and that we worked within the conditions of the detailed development plan without adversely affecting the city skyline,« says Niklas Carlén.

The frame of the restaurant is made of cross-laminated timber (CLT) from Martinsons and glulam from Moelven. Although the high degree of prefabrication of the wood contributed to rapid assembly, careful planning was required to tackle the logistical challenges of a project in the heart of Stockholm.

»In order to lift the large CLT elements, we needed to shut down traffic around the block. We couldn't do that during the day, so our contractor MVB Öst had to do the lifting at night,« says Lars Kinneholm.

The new glass lantern sits diagonally across the new storey like an upturned boat, abutting the extension on its newly raised side. One half is the covered restaurant area and the other half is the open-air terrace with seating for 400 guests. Visiting the restaurant feels like stepping into a penthouse, an impression enhanced by fine views in all directions thanks to the added bay windows. All the utilities are placed directly against the exposed timber structure, with the addition of burgundy acoustic louvres developed by Wingårdhs' Gothenburg office, which was responsible for the interior design.

»We wanted to satisfy Slussgården's desire to manifest the wood and make it a feature without it becoming too generic. We therefore chose a grey stain for the raw CLT walls that are visible on the inside, giving them a driftwood feel,« says Niklas Carlén.

The restaurant building's sedum roof helps clean the air

Överkikaren/Freyja

STOCKHOLM, SWEDEN

ARCHITECT Wingårdhs

CLIENT Slussgården

CONTRACTOR MVB Öst.

STRUCTURAL ENGINEER Byggnadstekniska byrån,

BTB

TENANT Stureplansgruppen

AREA 1,100 sqm

w| wingardhs.se

and reduce energy consumption thanks to its insulating effect, as well as promoting biodiversity. An efficient new ventilation system has replaced the 30 year old units, and the new glass lantern provides further energy savings.

»Wood goes hand in hand with the concept and philosophy we have for Freyja. We think Nordic in everything from what we put on the plate to the environment we occupy. The material gives the rooftop level a warm and cosy atmosphere. It also delivers really good acoustics, something much appreciated by our guests and by us working in the restaurant,« comments Malin Olander, CEO of Freyja.

Compared with the elegance of the restaurant, the terrace with its two rooftop bars is more raw and stripped back. The focus here is on the view of the city, which is more than enough to make this a magical place.

EXTENSION EMBRACES WITH CARE: Every building has a story, and when we choose to make a change, we add a new chapter to its history. This was the thinking of architectural firm Studio Weave when they took on the extension of a stone house in the south-west of England.

Spanning the counties of Devon and Somerset, the Blackdown Hills offer a rolling landscape of gentle hills, lush »



The extension's greying wooden façade with geometric details interacts with the older stone building.



In the thick walls, lined with Douglas fir, the architects have created both seating and storage space.

» meadows and dense woodland that is designated an Area of Outstanding Natural Beauty (AONB) to preserve its unique and special beauty for future generations.

A few years ago, London-based couple Tom Baker and Natalie Silk bought an old stone house in the area. As well as a summer home for their immediate family, they wanted to create a retreat where creative friends could pursue their art surrounded by nature. The couple therefore commissioned architects Studio Weave to add a self-sufficient extension that could both live its own life and be integrated into the existing structure.

The result is Made of Sand – an 85 square metre timber extension that gently embraces the stone house with its traditional post-and-beam frame and bold geometric façade of giant western red cedar and iroko (African hardwood). The name comes from the fact that there used to be a sandpit on the site.

»We wanted to establish the distinction between old and new, without making the extension to the stone house feel alien to its surroundings. The fact that wood is one of the most versatile materials available makes it a great choice for creating a contemporary aesthetic in rustic properties,« says Eddie Blake, architect and partner at Studio Weave.

The two-storey extension now functions as a self-contained residence and studio, with each room giving direct access to the outside and thoughtful window placements framing the landscape and taking advantage of the valley views. The walls are fully soundproofed so that Made of Sand can be used as a creative retreat by the couple's many

Made of Sand

DEVON, UK

ARCHITECT Studio Weave

CLIENTS Tom Baker and Natalie Silk

CONTRACTOR David Joyce Cob & Lime


STRUCTURAL ENGINEER JJO associates

AREA 85 sqm

www.studioweave.com

musician friends. With that in mind, Studio Weave has created spaces for seating and storage in the thick walls. The wall elements are made of Douglas fir which, together with hand-made terracotta tiles, clay-lined walls and brass details, create an atmosphere that is both inviting and robust.

For this project, Studio Weave has drawn on the knowledge and skills of local artisans working with traditional building materials and methods. At the same time, they have not been averse to new techniques and materials. With solar panels, energy-efficient windows, natural ventilation and plenty of insulation, Made of Sand is at the forefront of sustainable solutions.

»Extending an existing building is a balancing act between old and new, natural and constructed, heritage, comfort, vision and budget. It requires a thoughtful approach, and by prioritising quality, sustainability and longevity along with social and environmental responsibility, we continue to tell the story of not just the building, but the entire site,« says Eddie Blake. 



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Model.

TEMPLE COMPLEX OF NEWLY BUILT VOLUMES FOR BODY, SOUL AND THE LANDSCAPE, WITH DIFFERENT FUNCTIONS IN A HARMONIOUS WHOLE

TEXT Malin Zimm PHOTO Rory Gardiner

Shrouded in gentle mist, the temple complex looks like a mirage in the damp greenery of the South Downs National Park in Hampshire, UK.

The stillness is brokered by the understated presence of the architecture, bringing together landscape, buildings and materials to create a sensory space where all religions are welcomed to practice meditation and yoga and seek the spiritual connection between body and earth.

The building complex was designed by James Gorst architects, with Steve Wilkinson taking the lead, using a material palette that is both visually coherent and locally rooted. Wood, brick and lime plaster speak to Hampshire's building tradition and resources. The landscaping, designed by McWilliam Studio, comprises an east-west band of orchards and gardens that form as strong a part of the experience as the buildings. The client is a multi-faceted humanist organisation.

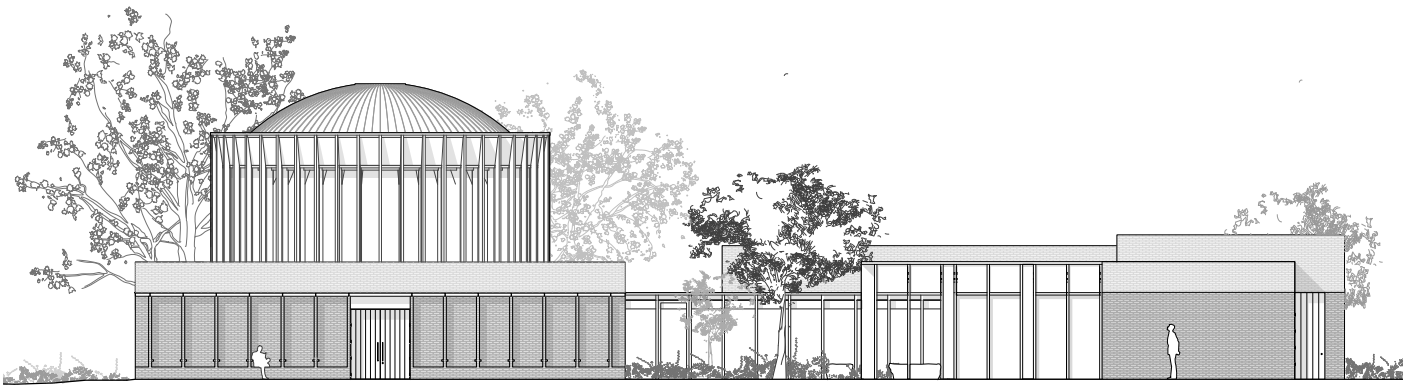
There are no religious symbols in the temple that can be attributed to any particular faith. Instead, the light, form and materials reflect beauty and reverence.

The project began with an architectural competition that encompassed the entire landscape, seeking a temple and gardens in holistic unity. The task of the architecture was to bring body and soul, land and buildings together in harmonious order. The client is The White Eagle Lodge, an international spiritual organisation founded in 1936 by Grace Cooke to combine ancient wisdom with modern life.

The movement had a 1970s building on the unique site in the middle of the national park, which over time became a patchwork of various additions and eventually suffered damp issues and was condemned. The new building was funded in part by donations and property holdings in central London.

James Gorst architects is not a large firm, »

The light, form and materials are conducive to worship by all faiths - no specific religions are foregrounded in the temple.



0 1 2 5m
Façade facing east.

» but with eight dedicated staff members, it was a strong contender in the two-stage competition held in 2017/18, being one of four shortlisted from the 14 architectural practices invited to bid. Their portfolio included a Greek Orthodox private chapel, built in 2014 on Mykonos, with sculptural pavilions and gardens and a dome of similar design to that used in the English temple complex.

James Gorst architects have worked on the principle of »fabric first«, meaning that the first thing required of the structure is

sustainability and energy efficiency, rather than trying to achieve these qualities afterwards by adding technical systems. The architects chose to work entirely in wood, as both a spiritual and a sustainable statement.

From their analysis of the site, all the material choices fell into place. The site was crossed by the old Tudor road, called The Shipwright's way, along which timber was transported from the ancient oak forest to the shipbuilding town of Portsmouth.

The vegetation is defined by the clay soils

of the landscape, criss-crossed by chalk streams – crystal clear watercourses filtered by the porous chalk stone that give rise to special biotopes. All the material choices come from this landscape: the clay bricks, the chalk and lime plaster, the timber. The clear water is reflected in the mirrored pools at the temple entrance.

Landscape architects McWilliam Studio approached the site as a sacred geometry characterised by the golden ratio, drawn with alternating wild and cultivated planting, walkways and building volumes. Along the central axis, circular gardens represent different chakras – the focal points of the ancient tantric meditation technique.

THE BUILDINGS ARE arranged in a sequence that leads the visitor from the more secular and open parts of the site, via spaces with a more ritual feel, to the spiritual heart of the building – the temple. The visitor arrives at the east-facing entrance and follows a glazed corridor overlooking the courtyard in a movement that echoes traditional monastic architecture. Along the other side of the corridor follows a sequence of rooms, from kitchen and plant growing room to lecture hall, meeting room, library and chapel. At the end of the corridor, the bright temple room awaits with a centrally placed podium marking the heart of the circular hall.

A pendentive structure on four load points supports the rotunda, with a vault in each direction. The squareness of the room can be glimpsed in the side aisles behind the arches. The vaulting technique is called pendentive after the French word for »hanging«. This type of vault is the most efficient way to support a cylinder from a square plane. The same type of vault can be found in everything from Norman churches to the Hagia Sophia mosque in Istanbul.

The temple hall itself has the same dimensions as the surrounding contemplation courtyard, to emphasise a symbolic balance »



At the top of the dome, the vaulting meets in a lantern with the symbol of the temple etched in the glass.



The scale and location go hand in hand with the landscaping.



The natural colour scheme is reflected in the wood, brick and plaster.



The New Temple Complex consists of several newly built volumes with different functions in a harmonious whole.

» between space and void. In the temple, steel has only been used to reinforce the wooden structure of the temple hall and in the beam hangers. The spiritual symbolism is embodied by the architectural encounter between the square – the earth and earthly life – and the circle as a symbol of heaven and holiness.

THE MATERIALS ARE close in tone, with the soft light absorbed similarly by the plaster, brick and wooden surfaces. For the walls, the wood used for the beams was subject to digital optical grading before lamination, to ensure that no knots are visible in the cut. The wooden surfaces are brushed with a pigmented wood oil that maintains the light tone of the wood.

Three types of wood have been used in the building: Siberian larch with its pink colour and exterior durability, the whiter pine used in the interior, and for joinery a British ash whose hardness makes it suitable for doors, details, and so on. The latter comes from diseased trees felled less than two miles from the site.

The building uses a minimum of input power for heating and ventilation. As far as possible, low-tech solutions have been used, bordering on the Passive House standard. The facility is heated by geothermal energy with a solar-powered heat pump, and solar panels are installed at the edge of the site. In the brick façade of the temple, air intakes are hidden under the benches in the alcoves between the transverse slats of the wall. From here, the air is drawn in by solar-powered pumps and warmed/cooled in an underground space beneath the temple floor, where the air is circulated in a maze of ventilation ducts. Actuators at the top of the rotunda regulate the release of hot air.

The construction of the temple coincided with both the COVID-19 pandemic and the aftermath of Brexit, which had cost implications for the build. It was difficult to keep tradesmen on site at the price procured before the pandemic struck, and costs escalated rapidly. To avoid the risk of having to buy much more expensive timber as a result of Brexit, the timber was ordered well before

New Temple complex

RAKE, UK

ARCHITECT James Gorst architects.
STRUCTURAL ENGINEER Eckersley O'Callaghan.
LANDSCAPE ARCHITECT McWilliam studio.
TIMBER FRAME Pacegrade.
www.jamesgorstarchitects.com

the start of construction, a gamble that paid off in the end despite the cost of storage. What is more, the slowdown of many construction projects had at least one upside: highly skilled people were available to erect the frame, with such professional knowledge reflected in the built result.

LIKE THE OLD cathedral buildings, the New Temple Complex has been quite the educational building site. A sense of humility pervades the entire site, from the scale to the materials, which will blend in with the colours of the surrounding landscape from which they have been taken. That is a journey of contemplation in itself. ①

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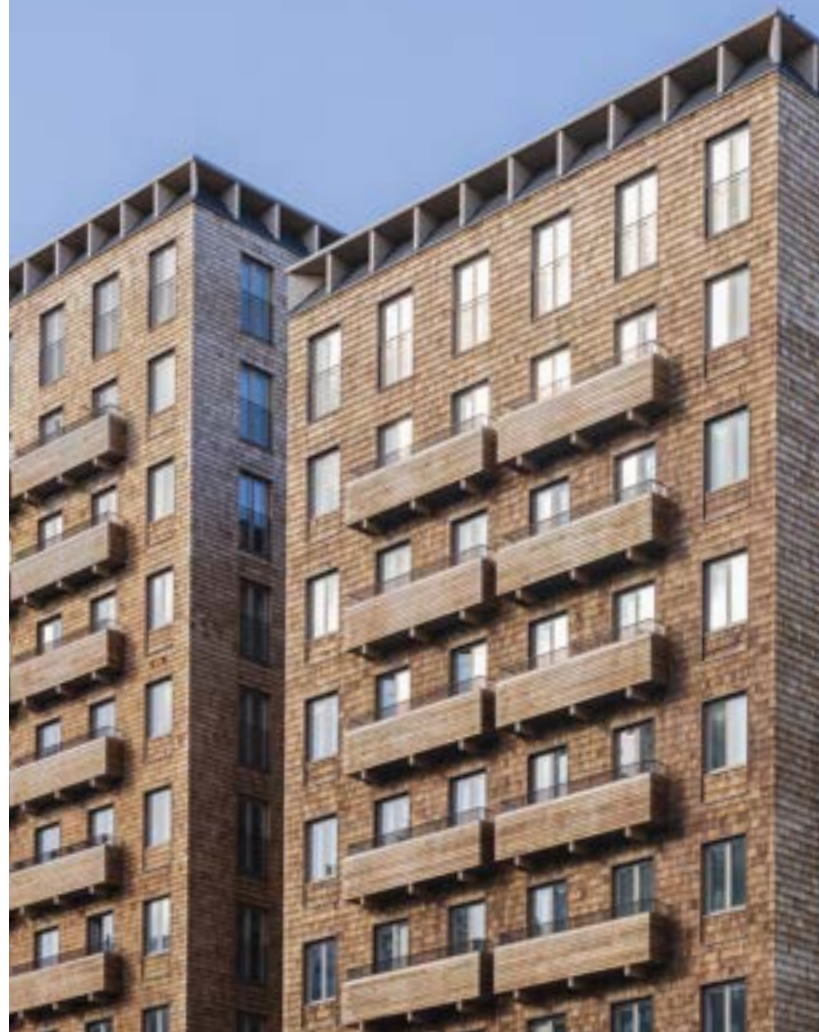


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SiOO:X
WOOD PROTECTION

Bild: Privat villa i Førresfjorden utanför Haugesund i Norge. Byggt i Kärnfuru och applicerad SiOO:X Träskyddande Panelfärger 02-Oyster Grey.



The interior of the museum is designed for children, with low walls, natural colours and gentle interfaces.

Undulating shapes encourage the imagination

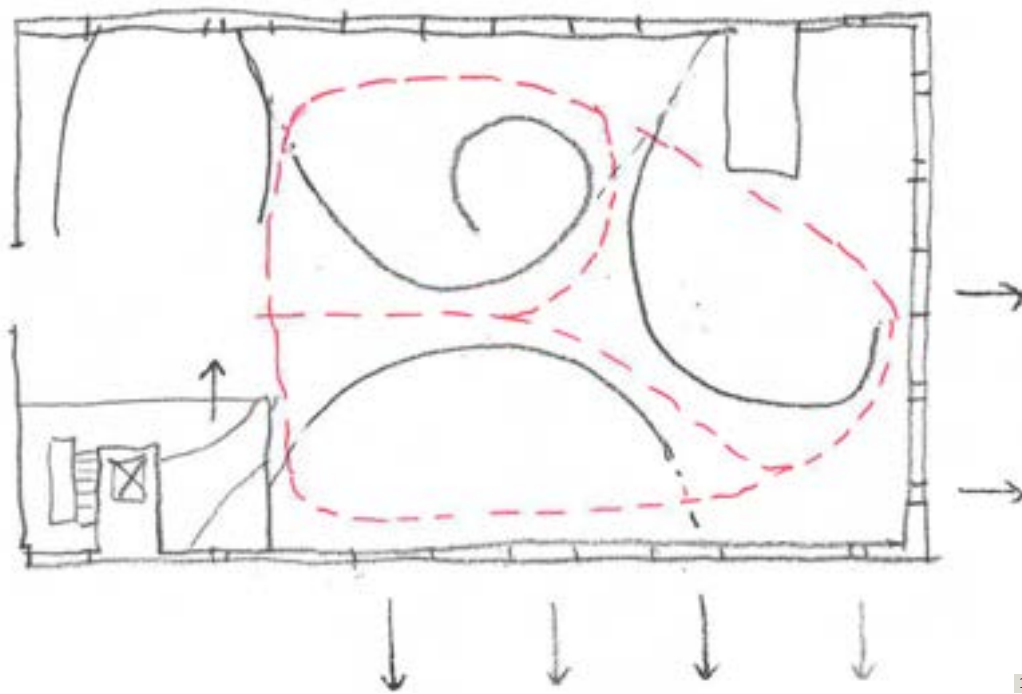
The brick-built former Bronx Terminal Market Powerhouse, constructed on the Harlem River in New York in 1925, now has a new function. The retrofitted interior of curved CLT elements houses the Bronx Children's Museum, which aims to teach children more about nature and spark their sense of discovery.

TEXT Marit Engstedt PHOTO Paul Warchol

The building's former activities were discontinued shortly after the turn of the millennium, and the exterior was restored in 2009, while the interior was left open to new ideas. The owner, the New York City Parks Department, decided to create a museum dedicated to children's discovery and imagination, allowing them to connect with nature. O'Neill McVoy architects, consisting of Beth O'Neill, Chris McVoy and their colleagues, were commissioned to design the museum's interior.

»In line with the museum's mission to connect children to the natural world and its theme 'Water unites us all', we proposed a natural landscape inspired by changing topography and the flow of water,« says architect Chris McVoy.

The 1,400 square metre museum thus welcomes its visitors with undulating shapes, elevated ramps, spiral spaces, transparent acrylic walls, soft pebble-shaped window openings and integrated benches of different heights. In addition, the museum's ceiling height has been maximised by placing an exhibition space on the mezzanine »



1 2



» that includes an interactive projection room. To support the museum's mission of allowing children to see their context in nature, the architects chose a natural colour palette.

ALMOST EVERYTHING – walls, floors and stairs – is made of cross-laminated timber (CLT), sustainably grown black spruce and other natural materials such as stone, cork, linoleum and glass. The ceiling is painted sky blue, and white fabric vents hang down like fluffy clouds. In the science section of the museum, a dark green floor with yellow

splashes resembles a landscape and recalls the view of the Harlem River.

»There were several factors that led to us choosing CLT as the predominant material,« says Chris McVoy.

»The organic and curved shapes in the design required a new approach to materials and manufacturing. We chose cross-laminated timber because it's durable, light yet strong, and made from an infinite grown resource. Its honey colour also has a natural variation and offers interesting details for children to discover, such as patterns from knotholes.«

1. Flow concept.
2. Visitors' curiosity is piqued right from the lobby and they want to see what is in the next room; the acrylic glass partition walls help bring in light.
3. The untreated wooden surface is attractive to the touch and can easily be sanded if it becomes worn and scratched.
4. The undulating, geometric shapes required advanced technology and precision.



The decision to keep the wooden surfaces bare also has its advantages. The warm wood with its patterned grain provides a natural finish that requires no additional surface treatment.

»The CLT is just asking to be touched, which encourages children to act and engage. And the durability of the material works well in a children's museum. If it's scratched, it can easily be sanded back to its clean finish,« says Chris McVoy.

Advanced digital technology was used to shape the curves and rounded window

openings, in collaboration with the CLT manufacturer in Austria.

»The challenge was how to create a geometry of curves, with varying radiuses, to form organic shapes out of CLT. We worked with KLH in Austria to find a way to make large panels of a custom shape, not unlike how Charles and Ray Eames made their pioneering laminated plywood leg frames in 1943,« says Chris McVoy.

»We then took full advantage of KLH's precision work using computer-controlled CNC milling to create precise organic shapes

in the factory, which then allowed for rapid on-site assembly. We provided KLH with 3D computer models that they used as the basis for their production drawings, resulting in finished modules that were shaped and milled to the exact size at the factory and then delivered and assembled on site. The modules comprised large batches of guardrails and walls plus pre-cut staircases with treads and stringers in one.«

Chris McVoy notes that this is the first use of moulded CLT in the US, and appreciated the fact that the complex design could be »



5

» manufactured with precision in the factory.

»Even with such a challenging process, the use of prefabricated CLT enabled us to achieve precise, high-quality construction.«

One advantage of CLT is that it is easy to shape and mill. Cutting grooves in the wood, for example, made it possible to securely fit the recycled acrylic guardrails that were needed to let in light.

»We were also able to mill special shapes into the CLT to create unique details: pebble-shaped openings, undulating benches of varying heights to accommodate visitors of all sizes, perforated guardrails and an intriguing rabbit hole.«

THE UNUSUAL DESIGN of the interior is strongly influenced by Swiss psychologist Jean Piaget's views on how children perceive spatiality. Piaget observed that children begin to understand their environment by building basic relationships, such as proximity and distance, enclosure and openness, light and darkness, continuity and separation – rather than through the abstract Euclidean (mathematical) geometries of the conventional city.

O'Neill McVoy wanted their architecture to reflect the museum's mission to develop children's abilities. They therefore designed curved, organic spaces in materials and shapes that would be unexpected and invit-

ing and spark children's imagination.

The curvature of the rounded walls leads the children through the museum, enticing them to want to see what is around the bend, while offering them the choice of several paths. Different parts of the interior are enclosed by low walls that are a perfectly fine height from a child's perspective, inviting new exploration of the space.

»We aimed to create an environment that was different from the ordinary rooms and streets they knew, a space that arouses their curiosity to explore and discover. In contrast to the typical 'black box' often used in children's museums, we designed a series of platforms for the exhibitions with the aim of integrating architecture and exhibits in a new way.«

Chris McVoy says they focused a great deal on developing a circulatory flow, which is now built into the architecture.

»Children seem to intuitively know how to navigate the museum. When they arrive, they light up and immediately know to follow the curve into the room. They don't get lost or bump into each other while running or turning a corner, even when the space is full. Our hope is that the children's visit will be part of their development in understanding the built world, the environment and their own place in it,« he says.®

Children's museum

BRONX, NEW YORK, USA

ARCHITECTS O'Neill McVoy architects

CLIENT NYC Parks Department, Bronx Children's Museum

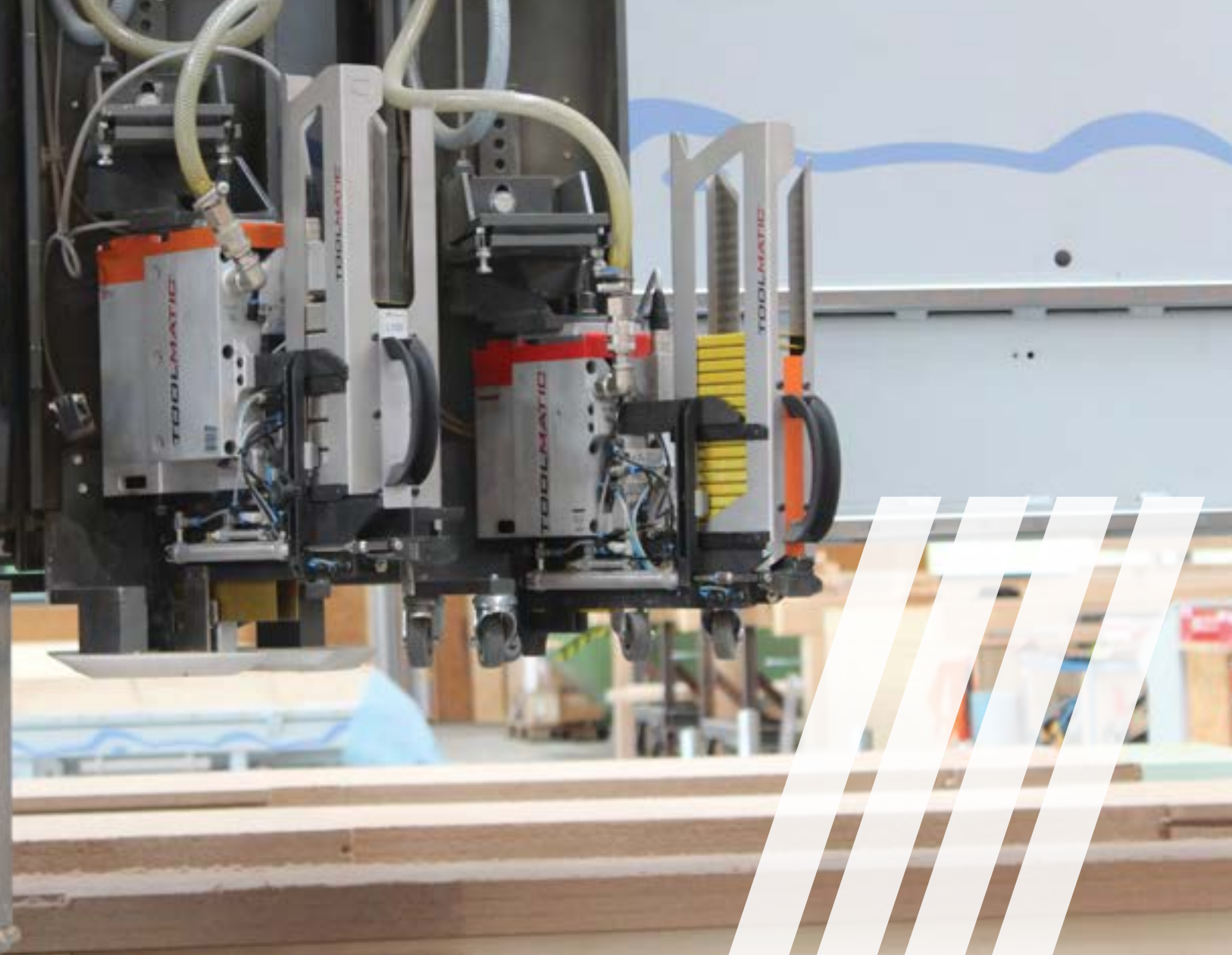
STRUCTURAL ENGINEER KLH, Austria

AREA 1,400 sqm

COST USD 14 million

www.oneillmcvoy.com

5. The shapes of the museum embrace children's experience of spatiality, and the architecture helps them navigate through the rooms.



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 **CONSTRUCTION PRODUCTS**



The »Naturlig Rækkerne« pavilion is part of the World Congress' From 4 to 1 Planet initiative.

Traditional materials meet in exploratory pavilion

In building preservation and ecological construction, materials and structures are said to »breathe«, as if buildings were biological phenomena. What they mean is that some materials and structures are open to diffusion and can buffer and release moisture. Other materials can do neither.

TEXT Stina Hagelqvist PHOTO Reværk

A DIVIDING LINE is often drawn between so-called traditional and modern materials and building systems. Mixing them in the same building is not sensible, but it is possible to combine traditional materials and systems with each other – as in Aarhus-based Reværk's pavilion for the 2023 UIA World Congress of Architects in Copenhagen. The aim of the pavilion and the choice of materials is to demonstrate a way of supporting the transition to a sustainable society.

The pavilion, which showcases the practice's terraced house concept »Naturlig Rækkerne«, combines the traditional materials of wood and clay and succeeds in both reusing older building systems and employing the materials in modern ways. In the pavilion, the thin roof is supported by walls made of a compacted clay/earth mix and a timber frame system of wooden posts and a top plate anchored using wooden dowels. Reværk's pavilion keeps both construction


methods fully exposed. The post system and the rammed clay earth are visible to the naked eye, and the negative space of the wooden frame forms a tactile surface patterned by the horizontals of the soil layers and the verticals and surface patterns of the formwork planks. The posts and the insulating wood fibre panelling in the walls are reminiscent of Japanese architecture.

Clay – in its pure form or mixed with earth, sand, straw, wood chips or other additives; worked, shaped, rammed, cast, reinforced; simply dried or fired into bricks – is probably the world's oldest and most widespread building material. It is found as a construction material, alone or in combination with other materials, as in Reværk's pavilion with its visible timber reinforcement in the walls; as a filler material together with reeds or branches in half-timbered structures; as a binding agent in walls; and as a surface layer in the form of bricks or render.

THE COMBINATION OF wood and clay is said to be particularly appropriate. Both materials can be reused and recycled and have properties that make them compatible. Clay and solid wood products such as timber and CLT have low thermal conductivity and therefore high thermal storage capacity. They are both hygroscopic and buffer moisture. Rammed clay earth like in Reværk's pavilion has a low

moisture content, coupled with surprising durability, and has been used as a building material for thousands of years. The Great Wall of China, Mesopotamian ziggurats and Aztec pyramids were all originally built using clay and earth-based techniques, and parts of the 11th century Alhambra in Granada were built partly from rammed clay. The Roman architect Vitruvius, in his Ten Books on Architecture from 14 BC, mentions the rammed clay technique, as does the historian Pliny the Elder in 79 AD in his *Historia Naturalis*. Since the 1970s, clay construction has moved on from the experimental stage and is now used in both private and industrial construction.

Like wood, unfired clay has a low climate impact, is available locally and is relatively cheap. Both materials also provide a comfortable indoor climate. From the perspective of a life cycle analysis, the combination should be a real winner. Research is currently under way on clay qualities and how clay can be given new properties and methods for large-scale production through various additives, while standards are being developed for clay renders.

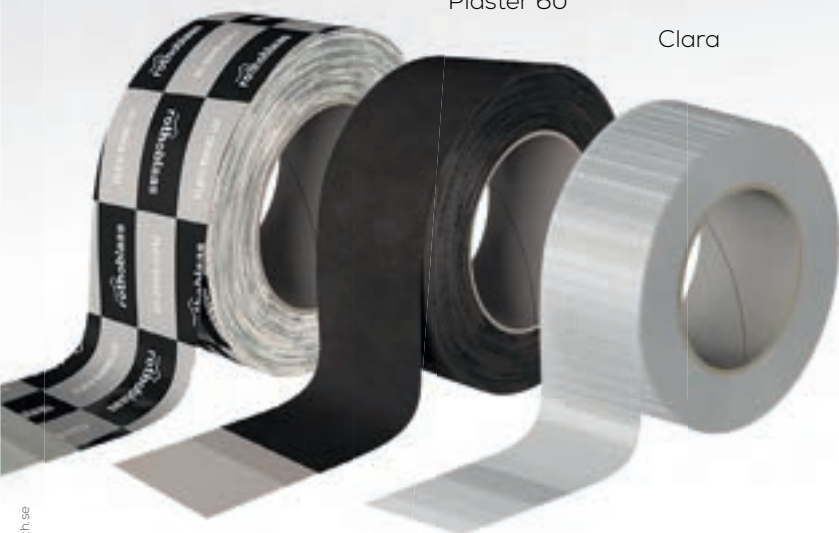
Reværk's pavilion demonstrates in practice that the world's oldest and most widespread building materials – wood and clay – can be not only the most sustainable material combination of the present, but also the most sustainable one for the future. 

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Wood – a fossil-free, renewable material that traps carbon dioxide – has a vital role to play in the green transition. But what is the situation with the forest? In a series of articles, trä! addresses the question of why Swedish forestry is the way it is, and what opportunities and challenges are on the horizon.

How to make forests do even more

There are many forests in Sweden. But of course they are not infinite. So all kinds of actions are being taken to use every part of the tree as many times as possible.

TEXT Malin Age & Göran Crafoord

ONLY THE IMAGINATION seems to set the limit on what wood can be used for. But as the green transition calls for the fossil-free material, and research discovers even more uses for the wood fibre, the question arises: will there be enough forest for everything we want to use it for?

Johan Bergh is a professor in the Department of Forestry and Wood Technology at Linnaeus University, and he has noticed growth in demand for wood.

»Wood fibre has huge potential to replace other fossil-based products that are not sustainable. In addition to the more traditional uses such as pulp, paper, sawn timber and bioenergy, it can, for example, replace many plastics, be used for textiles, be turned into a battery and replace concrete, and it's possible to make fuel from wood. I think interest in materials from the forest will only continue to grow.«

70% of Sweden is forest, making it one of the most densely forested countries in the world, beaten only by Finland. But forests are not an infinite resource. Sweden's forest owners therefore have to report all felling operations larger than half a hectare to the Swedish Forest Agency, and the trees must have reached a certain size and age. It is the productive capacity of the soil that determines when a forest is ready for harvesting, which means that forests in the southern parts of the country can be felled earlier than in the far north. For stands dominated by conifers, the minimum age varies between 45 and 100 years. Beech may be felled after 80 years and oak after 90 years.

THE SWEDISH FOREST Agency also calculates how much of Sweden's stock can be harvested while remaining sustainable. In October 2022, the Swedish Forest Agency, together with the Swedish University of Agricultural Sciences (SLU), presented a forestry impact assessment, in which they assessed that under the current conditions, the highest sustainable harvesting volume from now until 2035 will be in the range of 95–100 million cubic metres growing stock, solid over bark

(unit for a forest stand's wood volume) per year. The figure refers to the highest average harvesting level over a ten-year period, and in 2022, 95.8 million cubic metres, solid over bark, was harvested. This is about one percent of Sweden's forest holding.

»One way to make the forest go further is to increase its growth, and that means taking measures to encourage the trees to grow faster. Forest management then becomes essential, from ensuring that regeneration is encouraged to being careful to choose the right plant and tree species, and fertilising to create the most favourable conditions possible,« says Johan Bergh.

However, it is equally important to seek to process the harvested wood in a resource-efficient way. The fact that a paper fibre can be recycled up to 25 times creates many opportunities. A juice box can be reborn as a pizza box, the fibres from which can then be used to make a packing box which, when no longer usable, can become 3D printed wooden furniture or fibreboard.

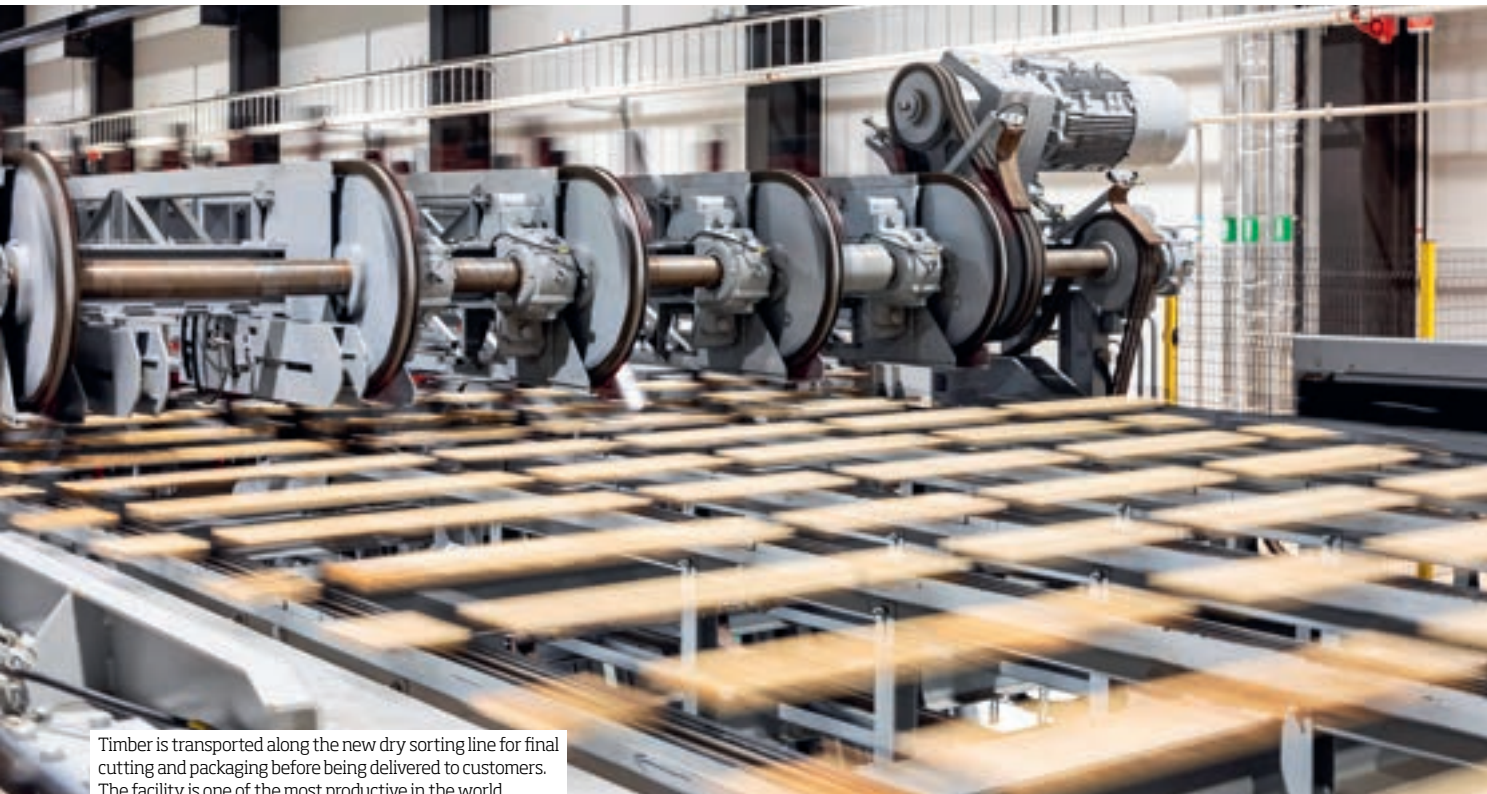
As a final step, the paper fibre can be burned to produce fossil-free energy.

»There are always side streams from the paper industry and sawmills, and a lot of research is going into taking these by-products and putting them to good use. Here at Linnaeus University, for example, we're researching how to develop a completely fossil-free adhesive from the constituent elements of wood (see next page). Today, we're able to take apart fibres and put them back together again to create extremely strong structures,« comments says Johan.

SAWMILLS HAVE ALWAYS tried to create as few side streams as possible. Since the raw material is the main cost, it is important to get the most out of each log. Bollsta Sawmill, located north of Kramfors, is an example of how research and technological development has led to efficiency improvements. The forestry company SCA recently invested SEK 750 million in a new state-of-the-art dry sorting line there, along with the world's most advanced X-ray equipment.

»The whole tree is used. However, not everything can be turned into sawn wood products. A tree is shaped like an elongated carrot, but planks and boards are rectangular products, so our challenge is to get as much wood as possible from each log. With the new dry sorting line and all the new technology in place, we'll now have complete

Read more about the wood products industry of the future in Swedish Wood's market analysis: *Med blicken mot 2030* (in Swedish).
svenskttra.se



ACC Media

Timber is transported along the new dry sorting line for final cutting and packaging before being delivered to customers. The facility is one of the most productive in the world.



SCA

Two of the many robots installed on the new line to automate and streamline the process. The plant can be run by just three operators.



A-Hus

Icell cellulose insulation is manufactured in Sweden. The raw material is old newspapers and magazines.

information about our entire flow. All the data gives us completely new opportunities to optimise our production and our working methods. We can determine exactly which log is best suited for which type of product,« says sawmill manager Magnus Wikström.

X-raying the timber creates an accurate picture of each log's unique properties, such as size, density, number of knots and where they are located. Using the digital information, each log is positioned, rotated and sawn to maximise the timber and its value.

»Simply put, the new technology enables us to get more value out of a smaller volume of raw material. When the wood, which continues to store the carbon that the tree once captured, is then used in construction, for example, even more climate benefit can be generated,« says Magnus Wikström.

THE WOOD INDUSTRY company Derome and the housing company A-hus are examples of businesses that strive to use building

materials as resource-efficiently as possible. Derome has developed a process for industrial wood construction in which windows, doors, insulation and exterior walls, as well as furnishings and façades, are pre-assembled in a factory. It is an energy-efficient method that creates minimal material waste.

But they are also happy to try out new materials. Last spring saw completion of the Klivet research and development building, for which A-hus and Derome have jointly experimented with construction panels made from recycled milk cartons and Swedish-made insulation that comes from newsprint.

»We wanted to challenge ourselves and see what's actually possible. We replaced mineral wool with bio-based insulation made from recycled newsprint, i.e. regular newspapers and magazines. During production at the insulation supplier's facility, a magnet is used to remove all the staples. The paper is then ground down, compressed and shaped

Every plank is traceable

Even in the construction process itself, ways can be found to use the wood raw material. Extensive work is currently under way to create a system that can ensure each plank is traceable. This will make it easier to safely reuse materials from one building in another, for example.

Read more about digitalisation and traceability on svenskttra.se via the following links:
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into boards that we can use for insulation. The production of construction panels is a similar process. The packages are ground down and compressed. A major advantage is that we avoid harmful dust during our work,« says Jimi Leo, technical product owner at A-hus.👤

Trä meets! Reza Hosseinpourpia (page 50–51) »



» CAN WE REPLACE TRADITIONAL FOSSIL-BASED GLUES WITH BIO-ADHESIVES? «

Bio-based products are fossil-free and renewable. But in order to manage the green transition, we must also make processes more efficient and make use of all the side streams that arise in the industry. Trä meets Reza Hosseinpourpia, an associate professor at Linnaeus University.

TEXT Göran Crafoord PHOTO Jonas Ljungdahl

What is your background?

I'm an environmental engineer with a focus on wood and wood products. After completing my Master's degree in Iran, I continued my research in Europe. First in Germany, at the University of Göttingen where I also completed my PhD, then in Spain. I came to Sweden in 2016 and am now an associate professor at Linnaeus University in Växjö.

How did you end up researching wood?

I come from northern Iran. I grew up in a town near the mountains and the Hyrcanian forests. My interest in wood and trees came early in life.

What kind of research do you do?

I used to do basic research, but in recent years my focus has increasingly turned to applied research in collaboration with companies such as IKEA, Södra and Stora Enso.

I get to solve real-world problems and receive direct feedback on what works in practice. In addition, companies can quickly access the latest research results and turn them into competitive advantages.

What are you currently researching?

My research focuses on the efficient use of forest materials and the possibility of scaling up the use of bio-based products in the wood and furniture industry. For example, we're trying to improve the water resistance of wood using pine oil instead of paraffin, which is made from crude oil. In another project, we're testing whether we can replace traditional fossil-based glues with bio-adhesives. I'm also researching how using bio-based preservatives can extend the life of indoor and outdoor wood products.

What is the future role of bio-based products?

Bioproducts are alternatives to fossil-based products. They're environmentally friendly, renewable and infinite if they come from managed forests. Extracting crude oil from the ground and producing fossil-based products releases tons of carbon into our atmosphere. Trees, on the other hand, take carbon from the atmosphere and release oxygen. The secret is to keep this carbon stored in wood products for as long as possible. I think the trend is heading in the right direction. But while the main product is planks and boards, for example, much of the by-product streams is used for combustion and energy purposes.

So many other things could be made from these by-products, including bio-based chemicals, building materials, packaging, bioethanol and biodiesel.

Why is it so important to harness the by-products?

The transition to a more sustainable society requires efficient use of forest products. In Sweden, we have plenty of forest raw material, but the supply is still finite and it's important to use the resources as efficiently as possible. We need to optimise the production processes and replace fossil products with innovative, bio-based alternatives. We also need to extend the lifetime of products and reuse and recycle as much as possible. For example, we're looking at how we can use wood dust from sawmills or lignin from the pulp industry to produce efficient adhesives for furniture manufacturing.

Besides the climate benefits, are there other reasons to switch to bio-based products?

At the moment, industry mainly uses fossil-based products that are harmful to people and the environment. Many of the adhesives used contain formaldehyde, which is a toxic gas released during production and afterwards in our homes. Polyurethane is another glue that is toxic during production and has a high climate footprint. Reusing and recycling wood products glued with these dangerous adhesives is also difficult, so we need to find bio-based alternatives.

What are the challenges of developing a new type of adhesive?

Although interest in bio-adhesives is growing, it's a fairly new field. Many people need to be convinced of the benefits, and this takes time. In addition, bio-adhesives need to become stronger, more water-resistant, more fluid and more resistant to fungal attack. We're aiming for a global market, so a bookshelf has to withstand the high humidity and heat of India, for example. Another challenge is that the fossil-based adhesives have been used for so long that all the processes and methods are optimised for them. In other words, a combination of product development, process adaptation and trust is needed to make headway.

If interest increases rapidly, can we produce enough bio-adhesive?

Technically, this is not a major issue. But in order to start producing bio-adhesives on a large scale, there needs to be market demand for the product. Perhaps new legislation banning non-bio-based adhesives in manufacturing is also needed?

What is your dream for the future?

I want to be part of the green transition and make this planet a slightly better place to live for future generations. ¹

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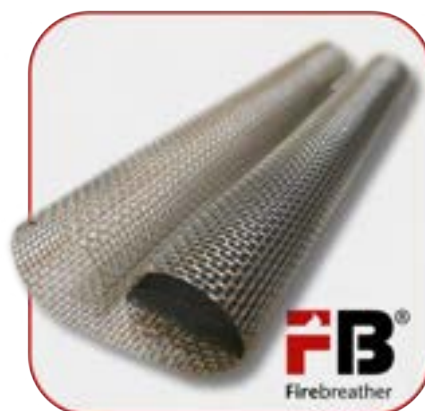
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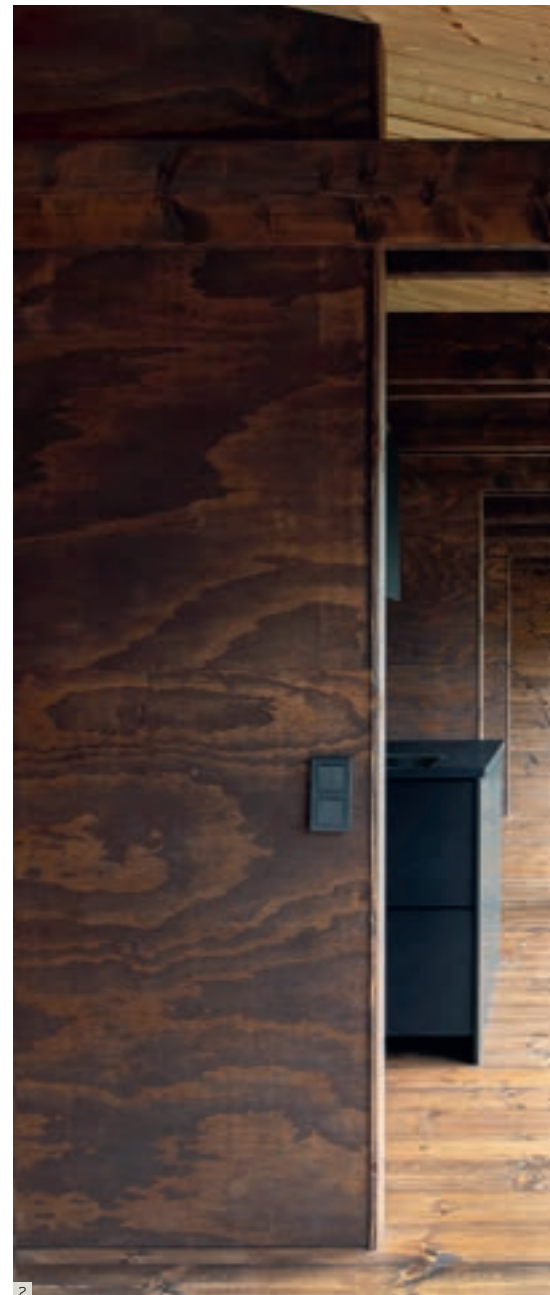
Transparent view of the nature reserve

Respect for the adjacent nature reserve and a sense of luxurious glamping were key to the brief for this holiday home in Tanum Municipality. The dark façade meets an equally dark interior that allows the eye to wander back out into the landscape.

TEXT Johanna Lundeberg PHOTO Mikael Olsson

TJURPANNAN NATURE RESERVE, north-west of Grebbestad, is strongly influenced by the windswept coastal environment. The lack of an outer archipelago allows the winds of Skagerrak to sweep in over the mainland and leave their mark on nature, and just on the edge of the reserve a holiday home blends gently into the open landscape.

»Although you can't see even a glimpse of the sea, you can sense its proximity, which is nice. The first time we saw the site, there were only two gate posts at the end of a gravel road, and we've built on that feeling, with the posts first forming an entrance and an »



» axis that leads through the house and on into the nature reserve. It's like a little story, with every chapter leading towards the water and the house as part of the experience,« says architect Isabell Gonzaga, who together with Andreas Helgesson Gonzaga makes up Helgesson Gonzaga Arkitekter, the firm that designed the house.

The east-west glazed lengths are positioned like a portal into the reserve, and a walkway helps to mark out the route from the house into nature. »Like a kind of luxury glamping,« explains Isabell Gonzaga:

»Not all the needs of a permanent home are required here – it can be more spontaneous depending on the weather or who is using the cottage. There are various places to sit, including outside under the overhanging canopies or inside with a view through the windows, allowing for more unplanned activities and spontaneous get-togethers.«

On one part of the plot stands an old oak tree and a stone wall that clients Daniel and

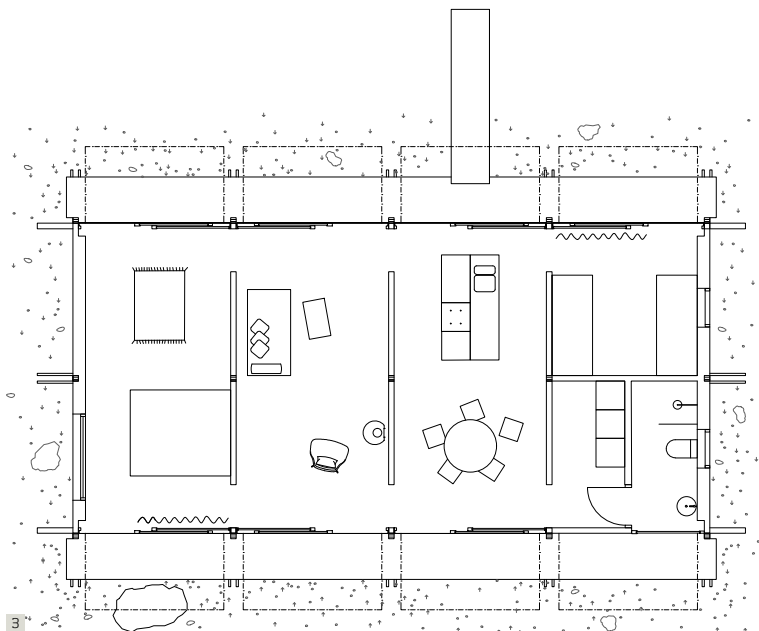
Marie Gonzaga – Isabell's brother and sister-in-law – did not want to touch. Instead, they decided to build a little higher up on the rocky outcrop.

»On one side you can see a farm with horses and cows and large fields, and on the other you look out over rocks and the nature reserve. This creates two different types of environment, and that's also how the plot feels, with the peaceful meadow, the oak tree and the wall on one side and the bare rock on the other,« says Marie.

THE HOUSE STANDS on slender posts attached to the drilled rock by means of post shoes.

»Thanks to the bedrock, we don't need a concrete slab, and the building only has a small footprint on the site, respecting the granite that is so characteristic of the whole Tjurpannan Nature Reserve. The posts work really well and the wind always keeps the underside of the house dry,« says Isabell Gonzaga.

1. The dark interior leads the eye out of the window and clearly accentuates the surrounding landscape.
2. The openings between rooms have no doors, which contributes to the sense of togetherness in the holiday home.
3. Plan.
4. The house stands on narrow posts seated in post shoes drilled into the granite. In this windy location, the underside of the house is always blown dry.



The house is located between two other plots, one of which has been developed so far. To provide a more private feel, the gables, which face the neighbours in a north-south direction, are windowless.

»Even with neighbours next-door, you should still get the feeling of being more on your own, in contrast to your main home, where you often live closer to others. There is also not a dense cluster of houses, as tends to be the case on the West Coast,« Isabell adds.

The long sides are the polar opposite of the gables, with sliding glazed doors along their entire length creating a real openness to nature, a feeling that is echoed in the interior as well. With the exception of the bathroom, there are no doors to close, but the openings to the kitchen and the three rooms are an important part of the experience.

»When you're on holiday, you live a little differently and socialise more, and this is also part of the glamping feeling. You're there together, and if you want to be by

Architect **Isabell Gonzaga**

»WHEN YOU'RE ON HOLIDAY, YOU LIVE A LITTLE DIFFERENTLY AND SOCIALISE MORE.«

yourself, you can find other places; maybe go and sit on a nearby rock so you feel that you're part of the outdoor environment,« says Isabell Gonzaga.

Much of the project has been about testing out details to achieve a coherent whole where all the dimensions slot into place and interact. The slender glulam posts – 115 x 115 millimetres – are combined with thicker glulam beams of 115 x 360 millimetres. Wood was the obvious material for several reasons: it is too far from the parking area to be able to crane materials up to the house, so everything had to be adapted to allow two people to carry all the elements. In addition, Daniel and Marie Gonzaga enjoy getting their teeth into a project together, and by

doing a lot themselves they were able to keep the budget down, so much of the construction is a collaborative project between the architects, the local builders and the client. The builders erected the frame and modified the different heights of the glulam posts on site, based on the incline of the plot. Then the clients, who are both engineers, did much of the construction and painting themselves, and the details are designed to be handled by them, without access to all the tools of the trade.

»We spent a lot of time on the theoretical calculations and thought through every detail before we started. Much of what we did was about the surface finishes and what's visible,« says Daniel Gonzaga. »



5

»The result is a simple and coherent look. The dark façade is treated with tar, which makes the house difficult to spot from a distance. The idea is to be as invisible as possible from the nature reserve and the hiking trails that run past.

»A house can stand out quite a lot – if you paint it white it pops out from the colours of nature. This is a way to show respect for the place,« explains Isabell Gonzaga.

But it is not only the exterior that is dark. The entire interior has been given a dark brown shade using hardwax oil. The architects were confident, but Marie Gonzaga notes that getting there was a bit of a journey. She describes the initial feeling as almost frightening:


»It was a difficult decision because it felt like it was going to be very dark everywhere. We painted sample boards in other colours but they didn't really work, so we thought we'd trust them to know what they were doing. Now we're really happy.«

Isabell Gonzaga explains that dark

interiors not only add a cosiness to the welcoming rooms, but also create a different relationship with the outside because the eye is always drawn to light, whether it's a wall, a lamp, a fireplace or a window.

»In this case, your gaze is drawn out through the window, extending the space and perspective. The experience is always towards the landscape. If we had chosen pale stained pine instead, which is often what you get in holiday homes, the experience would have been completely different, in terms of both the exterior and the internal space.«

A PERSON STANDING outside can also get the same feeling. The idea is that you might not look directly into the house, but instead straight through it and out into the countryside. Outside and inside merge into that tented feeling they are all so fond of.

»The large expanses of glass make it almost feel like you're sleeping outside. We like camping, but it's nice to have a roof over our heads too,« says Marie Gonzaga. 

House Tjurpannan GREBBESTAD, SWEDEN

ARCHITECT Helgesson Gonzaga
Arkitekter

STRUCTURAL ENGINEER
Byggkvalitetskonsulten (BKK)

CLIENTS Daniel and Marie
Gonzaga

AREA 86 sqm

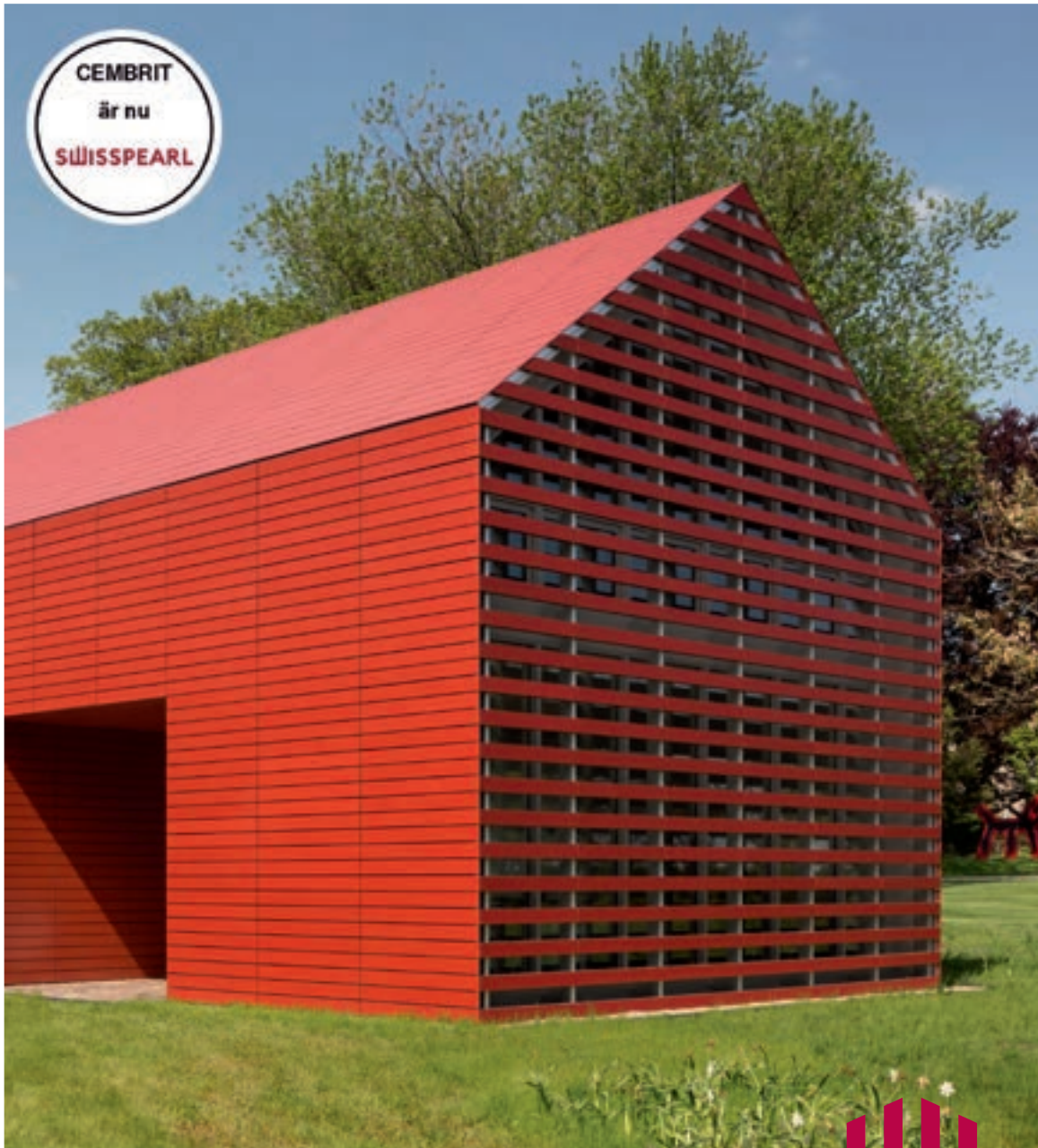
COST SEK 3 million

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

5. The house is built to blend in gently with the site, on top of a rocky slope that falls away below, and its dark colour scheme makes it difficult to spot from a distance.

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Housing on Lisbjerg Bakke, 2018.



The Modern Seaweed house, 2013.

Wood
Vandkunsten architects, editor
Anne-Mette Manelius

Arvinus + Orfeus (Eng, also published in Danish under the title Træ)
 978-91-89270-00-8

Wood is the third in a series of books from Denmark's Vandkunsten architects. The title piques our interest from the outset, and as a review of the studio's various wood projects, the book provides a detailed insight into projects, material choices and detailed solutions. Photos and informative drawing illustrate each project.

The book is divided into four parts – flexible, regional, solid and modular. Three different essays highlight the studio's approach to wood architecture, with co-owner Søren Nielsen's »Materials are power, power is responsibility« providing an exciting read that posits arguments outside the usual suspects (climate, fire, LCA, etc.) on why wood should have a more important role in the architect's world. He puts

forward the thesis that materials affect the user's consciousness through decoding and reflection – an awareness of the forest, the wood and how the material affects us humans, but also the architect's work, because wood requires adapting and detailing. But he also writes about how important it is to ensure that wood is seen as a positive material.

It can feel something of a luxury to read

about the thoughts Vandkunsten expresses, the thoughts they have about the future, from a Swedish perspective. But as the number of Swedish projects with the architect as the developer grows and engagement with the built environment continues to increase, their questions become highly relevant and may even provide some smart shortcuts.

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Möbelriksdagen 2023

Through Möbelriksdagen, Interior Cluster Sweden seeks to offer a unique meeting place for inspiration, knowledge exchange and networking, in a drive to strengthen and promote the Swedish furniture and interior design industry. This year's theme is »Collaboration, courage and responsibility – from raw material to finished interior«.

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Ingenjörsmässigt byggande i trä

A seminar on *engineering in wood construction* will take place at Slagthuset in Malmö. The theme of the seminar is »4 steps towards a climate-neutral built environment«. The day will be divided into four parts, all of which represent this important perspective on wood construction in society.

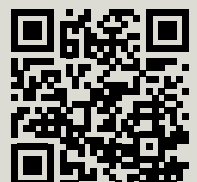
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5 December 2023 | Trä! issue 4

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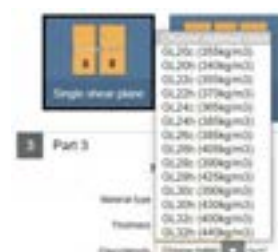
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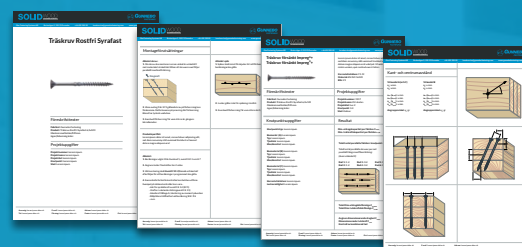
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