



# Free Form structures

Reshaping timber architecture



Shigeru Ban Architects

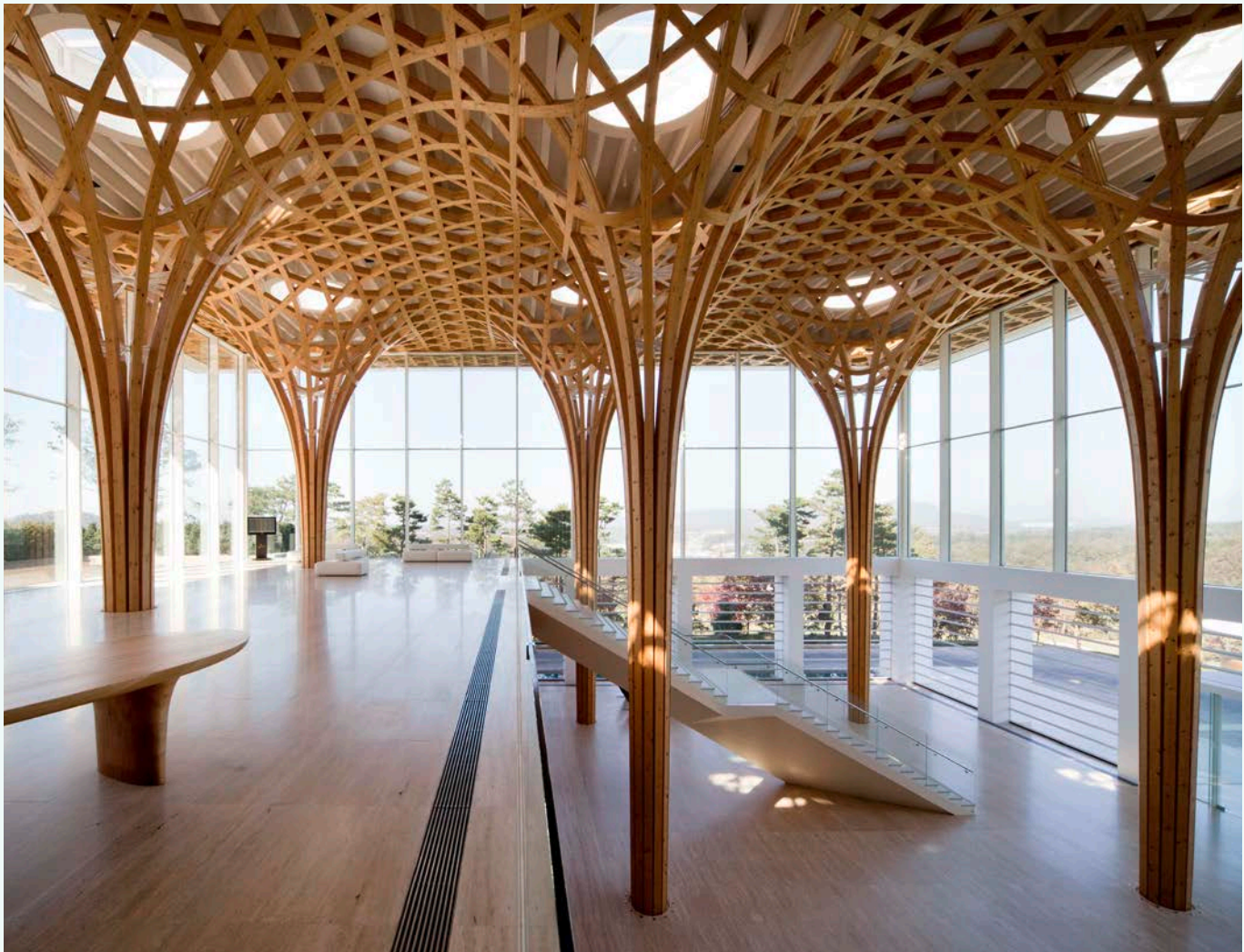
# Haesley Nine Bridges Golf Club

**The first Free Form project**

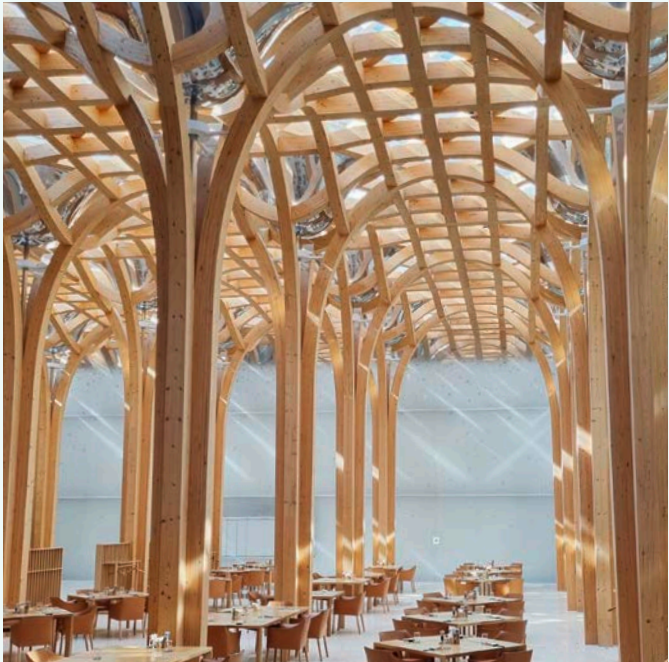
The spectacular clubhouse for the Haesley Nine Bridges golf resort in South Korea is the first Free Form project that we implemented in 2008. Both the idea and concept for the unique building housing a restaurant, bar and spa were developed by Tokyo-based Shigeru Ban Architects and South Korean architect Kyeong

Sik Yoon. The fundamental architectural concept for the construction of the clubhouse roof is based on the geometric pattern of traditional Korean basketwork and combines various influences from nature.

↳ [blumer-lehmann.com/haesley-nine-bridges-golf-resort-reference](https://blumer-lehmann.com/haesley-nine-bridges-golf-resort-reference)



We use our knowledge, our experience and our fascination with wood as a renewable raw material to create seemingly impossible Free Form structures. In all dimensions. All over the world.



Around 10 years after constructing the clubhouse, we had the opportunity to create six more exceptional Free Form buildings at the Haesley Nine Bridges Golf Resort – including the Grand Hall and the Learning Centre – based on designs by Shigeru Ban Architects.

↳ [blumer-lehmann.com/haesley-nine-bridges-additional-reference](https://blumer-lehmann.com/haesley-nine-bridges-additional-reference)







Swatch and Omega, Biel – Shigeru Ban Architects

# A milestone in modern timber construction

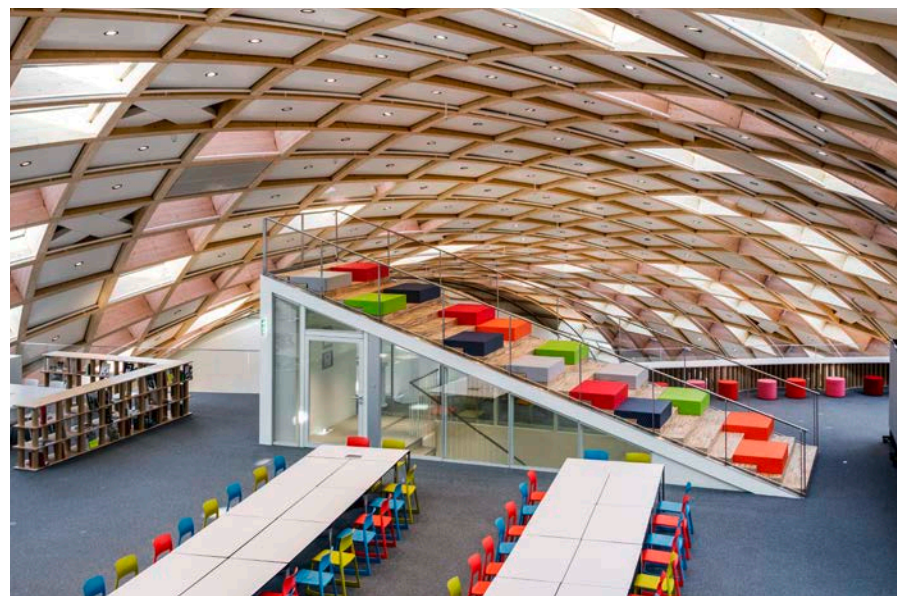
The spectacular building of the Swatch headquarters is characterised by its Free Form supporting structure, made of timber frame construction measuring 220m long and around 50m wide. The timber structure is clad with a facade or roof cladding composed of 11 different facade types. The building stretches across the factory premises like a snake and sweeps over the roof of the newly constructed Cité du Temps museum building. The Omega production and logistics building further to the west is another timber structure.

## Planned with parametric precision

The three buildings illustrate what is possible when innovative architecture, parametric planning processes and precision manufacturing production methods are combined.

## Hero material

As a logical consequence of the client's sustainability goals, architect Shigeru Ban designed all three of his buildings in timber, expressing the character of the brand in question through the timber construction technology used. A building material becomes a hero material when it not only fulfils its function, but also expresses individuality and identity. By using a specific building material, the builder consciously communicates, creates or consolidates a message or an image.



Anything but classic office block architecture. Beneath the Swatch building's Free Form support structure, spacious work, retreat and creative spaces are spread over 25,000 m<sup>2</sup>.

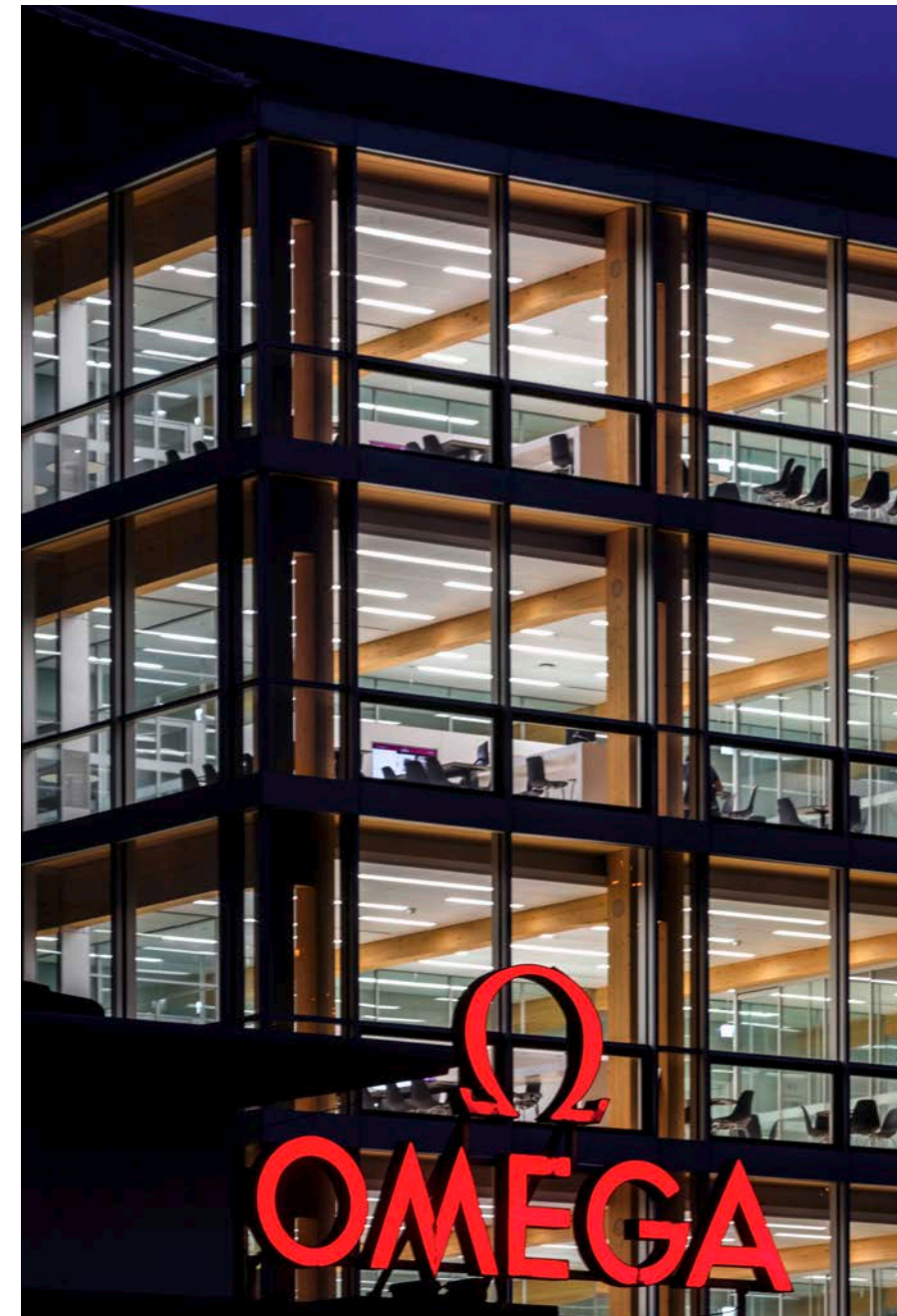
© Swatch





### Perfectly timed timber construction for Omega

The Omega production and logistics building is also an architectural and technical highlight of sizeable proportions. The five-storey building – which is located further west on the same site – meets the highest energy efficiency and environmental compatibility standards. But that's not all. The timber used comes exclusively from Swiss forests.



The five-storey Omega building for watch-making, training and quality control meets the highest energy efficiency and environmental compatibility requirements.

© Swatch

↳ [blumer-lehmann.com/  
swatch-project](https://blumer-lehmann.com/swatch-project)



↳ [blumer-lehmann.com/  
swatch-reference](https://blumer-lehmann.com/swatch-reference)



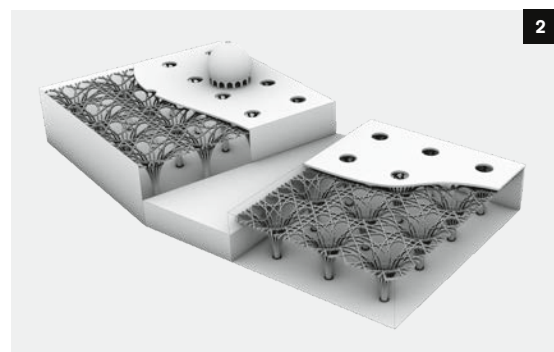
↳ [blumer-lehmann.com/  
omega-reference](https://blumer-lehmann.com/omega-reference)







1



2

- 1 The first of a total of 30 timber columns can be seen in the entrance area as they soar upwards like trees, merging with the lattice-like ceiling structure to form a vast tracery of timber.
- 2 The Free Form project team overcame the planning and production challenges by developing a kind of modular system comprising 2,746 components in 145 variants.

Cambridge Mosque – Marks Barfield Architects

# The load-bearing trees of the Cambridge Mosque

Covering an area of 4,000 m<sup>2</sup>, the Cambridge Mosque with its striking timber construction provides space for a prayer hall capable of accommodating 1,000 worshippers, as well as a café and two apartments. The mosque's architecture was designed by the London-based architecture firm Marks Barfield Architects.

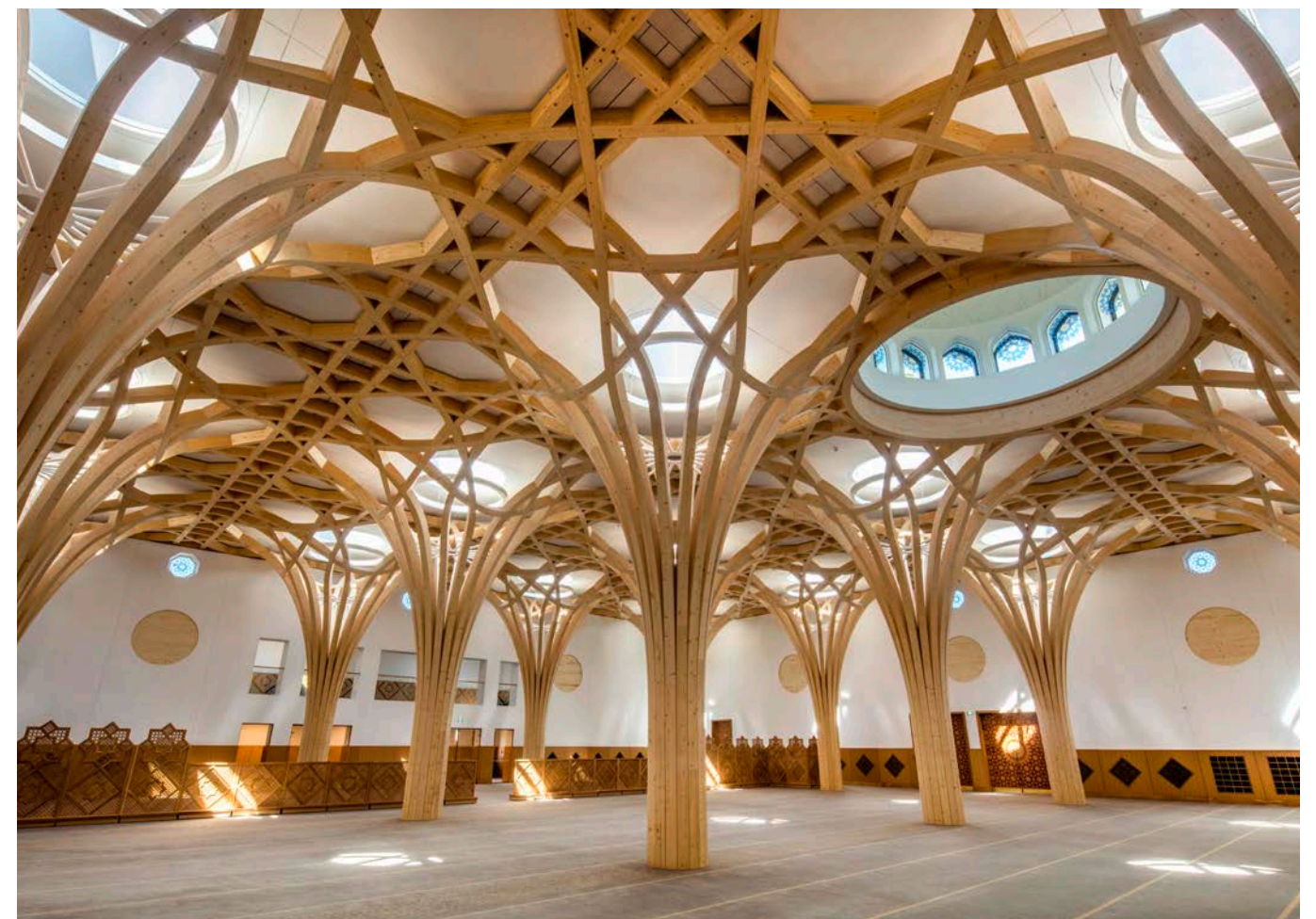
The atmosphere in the building's interior is generated by the 30 Free Form, tree-like timber pillars, which are connected to one another

through the ceiling structure. The branches of the trees form an octagonal structure. An octagon is a traditional shape from Islamic architecture that symbolises the rhythm of life.

↳ [blumer-lehmann.com/cambridge-mosque-reference](https://blumer-lehmann.com/cambridge-mosque-reference)



© Morley von Sternberg





Sunflower timber sculpture –  
Blumer Lehmann and Dimensional Spin

# A sunflower made of timber

The Free Form ‘Sunflower’ sculpture adorns the atrium of a private residence in India. The design was developed by our very own Advanced Geometry Group, working in collaboration with the client’s architect. It draws on the Indian motif of an elliptical sunflower and translates it into a Free Form supporting structure made of steam-bent laminated timber beams. The timber structure is clad with customised glass elements.

↳ [blumer-lehmann.com/sunflower-reference](https://blumer-lehmann.com/sunflower-reference)



- 1 The timber beams of the Sunflower sculpture are made out of ash timber, as this type of timber is easy to bend even in designs involving tight curves.
- 2 The Sunflower timber structure sits beneath customised glass elements, which also protect it from strong sunlight by providing shade.







The clear design and material language with lots of visible timber is also continued inside the Hillmaru Country Club.

Hillmaru Golf Clubhouse, Pocheon – YKH Architects

## An impressive Free Form geometry reception area

The Hillmaru Country Club in South Korea welcomes its guests with a Free Form entrance portal of impressive dimensions. Under the two tree-like structures made of spruce and fir that straddle the driveway, there is a multi-lane drop-off zone. Based on the designs by YKH Architects, the Blumer Lehmann project team planned, produced and assembled the building on site in Switzerland. The entirety of the

contoured roof surface spans the 160-metre-long clubhouse and is complemented by a projecting roof over the reception area.

↳ [blumer-lehmann.com/pocheon-reference](https://blumer-lehmann.com/pocheon-reference)



© Studio Time of Blue





# Free Form roof redefines the future of timber construction

Wisdome Stockholm is a scientific experience arena being built at Sweden's National Museum of Science and Technology. The Free Form roof was designed by the Swedish architecture firm Elding Oscarson in collaboration with the Norwegian construction engineer Florian Kosche. Based on their designs, we created the detail plans for the unique Free Form building together with their planning partner.

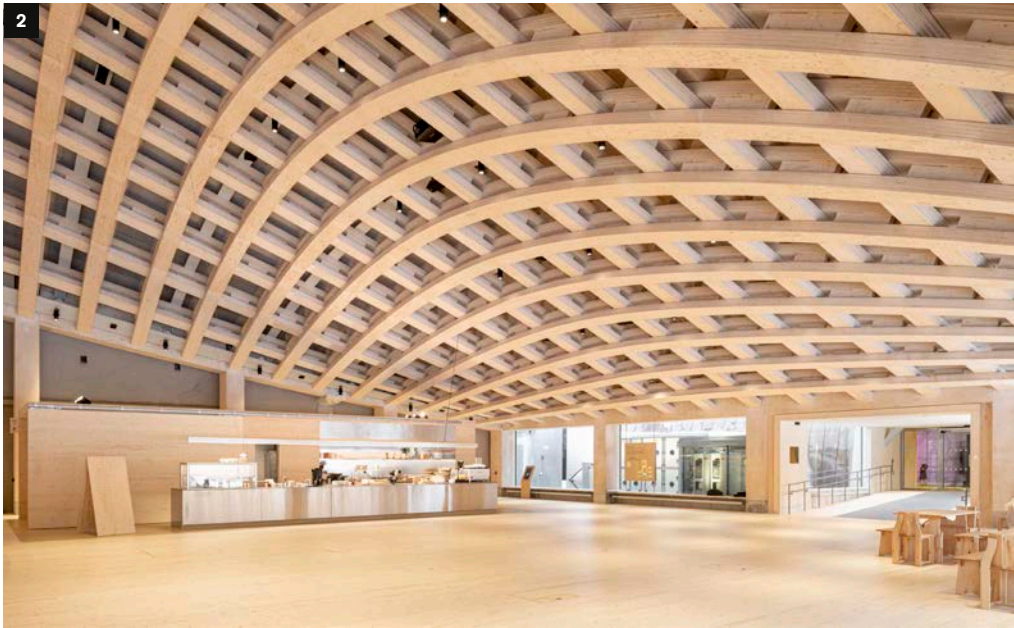
The heavily curved Free Form timber roof connects the inside and outside areas of the National Museum of Science and Technology and creates a spectacular interior for the dome structure of Wisdome Stockholm. The roof geometry spans a footprint of 25×48 metres, without columns. On three sides of the building, a projecting roof supplements the roof support structure and brings the curvature of

the roof surface level with the eaves line. The Free Form structure is based on a grid system of LVL beams. The dome below the vaulted roof is made from cross-laminated timber. A requirement of the architecture competition was that timber – in particular cross-laminated timber (CLT) and laminated veneer lumber (LVL) – be used in the construction. One of the main partners of the Wisdome Stockholm project is Stora Enso, one of the world's largest forestry firms.

↳ [blumer-lehmann.com/wisdome-stockholm-reference](https://blumer-lehmann.com/wisdome-stockholm-reference)



The unsupported Free Form roof made of laminated veneer lumber and arranged as a visible lattice shell spans an area of 25 x 48 m.



- 1 The actual 'Wisdome' dome structure – complete with a 3D cinema – is located inside the complex timber construction with its curved roof.
- 2 Blumer Lehmann joined forces with its engineering and geometry partners to develop the highly complex roof support structure and was responsible for planning and production of the components, as well as assembly.

© Anders Robert



The Red Sea Golf Clubhouse – Foster + Partners, London

# Luxury in timber on the Red Sea

The golf clubhouse on Shura Island and designed by Foster + Partners is one of the new buildings in the gigantic 90-island tourism project. The group of buildings with its unusual roof comprising five contoured leaf-shaped sections houses a restaurant, reception area, golf shop and changing rooms. The 664 double-curved laminated timber beams – each one unique in both shape and size – form the roof.

The Blumer Lehmann project team developed a complex parametric model that covered all the elements necessary for planning – from the axis model and static calculations all the way to detailed connection points.

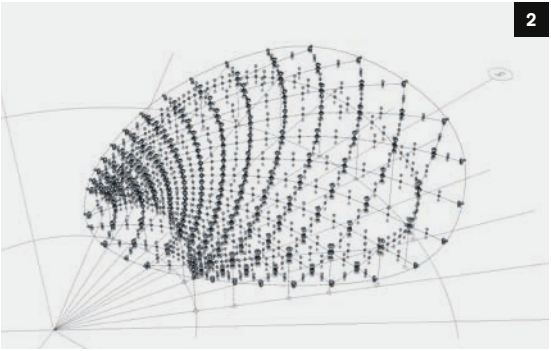
↳ [blumer-lehmann.com/golfclubhouse-shura-island-reference](https://blumer-lehmann.com/golfclubhouse-shura-island-reference)



© Foster + Partners



1



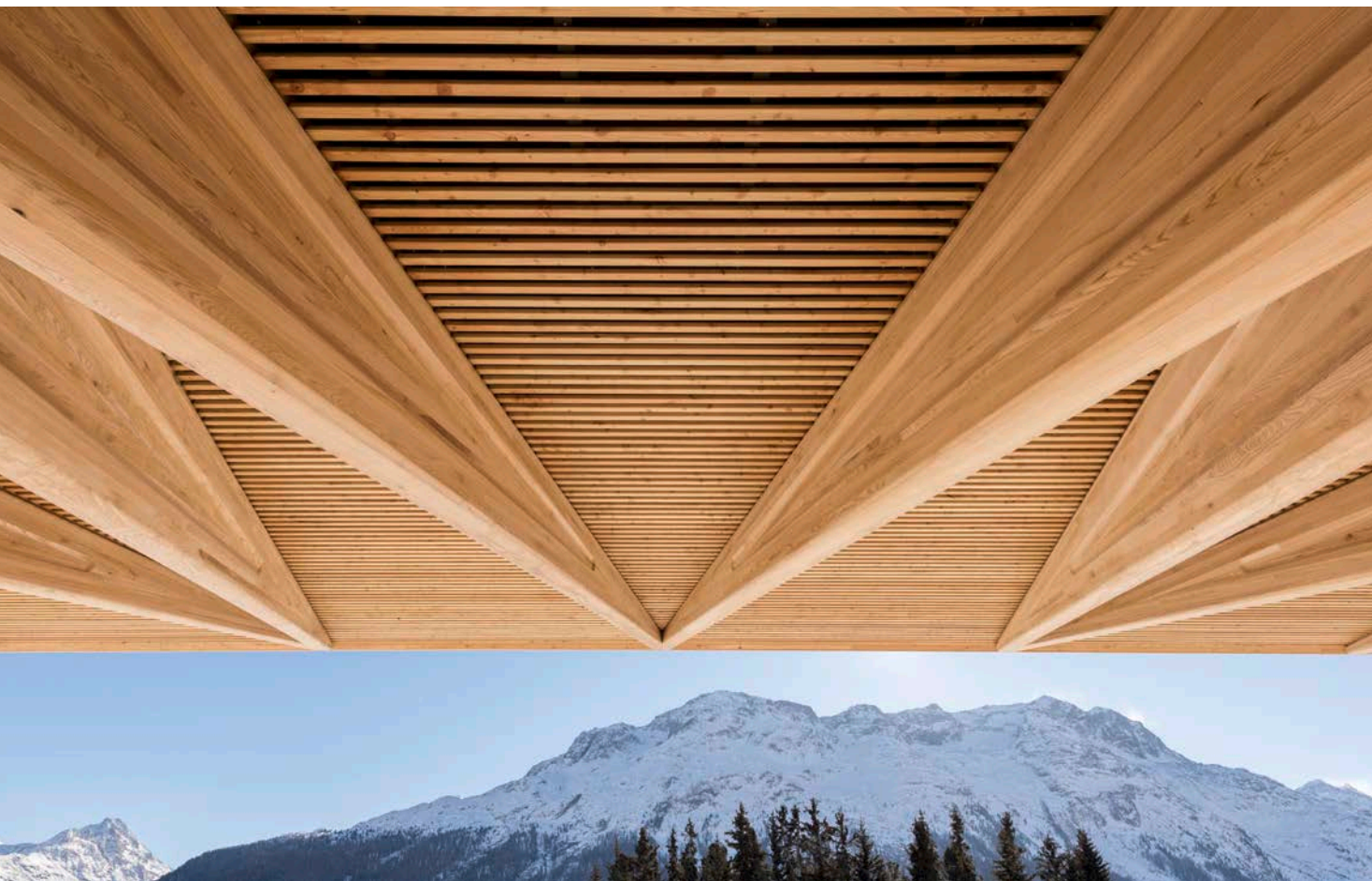
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- 1 Enormous shell-like components and double-curved designs – skilled craftsmanship and precision work were required to assemble the clubhouse roof.
- 2 The complex Free Form structure of the roof, consisting of double-curved laminated timber beams, placed great demands on statics and geometry.
- 3 Our project team created a complex parametric model based on the designs by Foster + Partners. This enabled efficient planning of the clubhouse roof – right down to the 20,000+ pre-defined connectors in the roof support structure.





The main grandstand is right next to the ice pavilion, while the secondary set of stands is slightly off to the side and at a roughly 45-degree angle to the main grandstand. Their supporting structures consist of ash timber main girders that are used as cantilever beams.

Grandstands at Hotel Kulm in St. Moritz –  
Foster + Partners, London

## Multifunctional grandstands

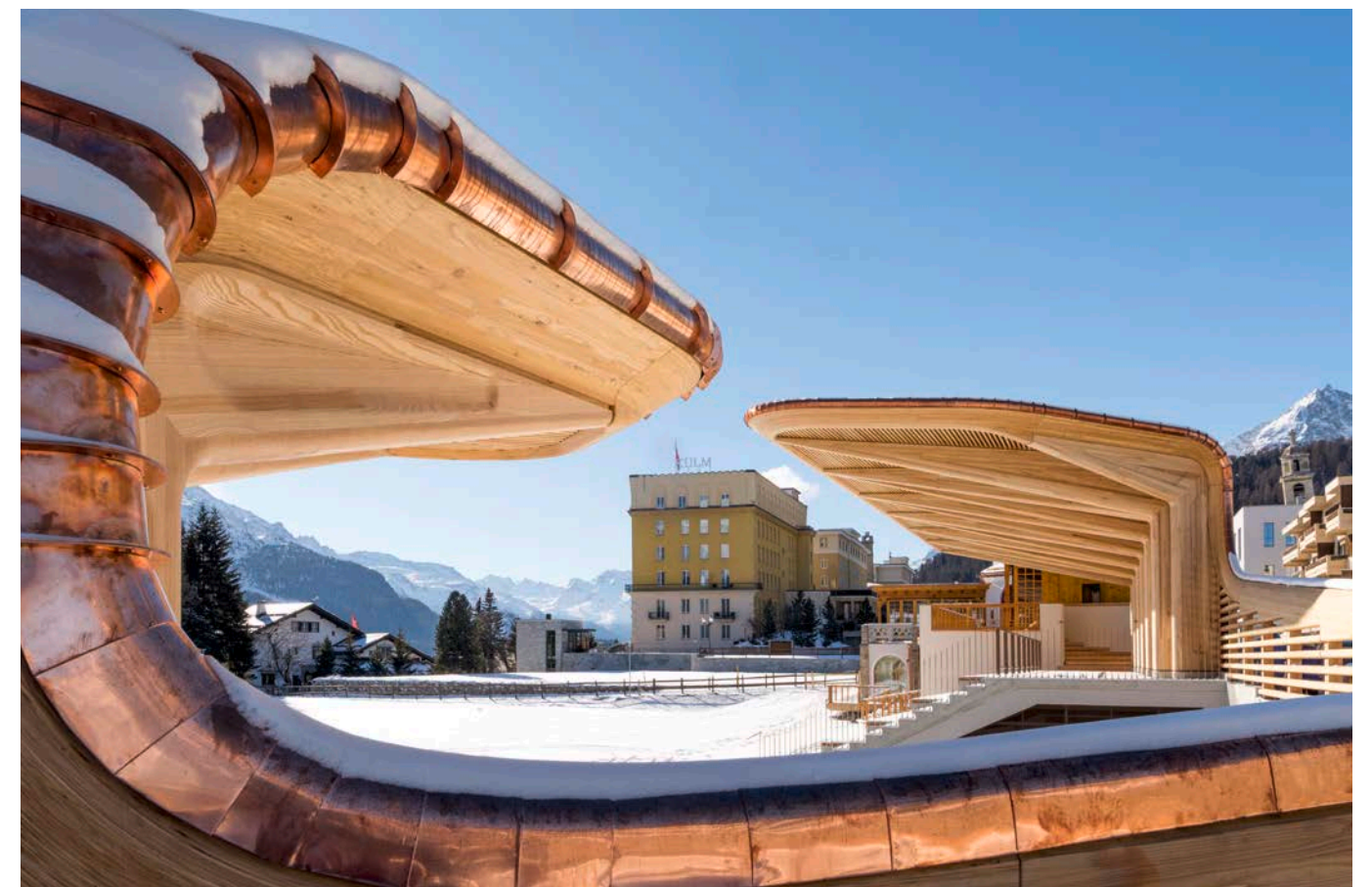
A grandstand and a smaller set of stands were built at the five-star Hotel Kulm in St. Moritz as part of the renovation of the historic ice pavilion that dates back to 1905. The architects Foster + Partners believe that the structures are suitable for a variety of uses, which is why they can be described as both a stand and a pavilion. The most significant eye-catching features of the two elaborately constructed timber grandstands, with their rib structure

and cantilever beams, are their architecturally ambitious Free Form roofs. Blumer Lehmann was responsible for the detailed development and technical planning of the timber construction work, as well as for coordinating production and installation.

↳ [blumer-lehmann.com/hotel-kulm-reference](https://blumer-lehmann.com/hotel-kulm-reference)



The covered grandstand and the smaller set of stands are suitable for a variety of uses during sports and cultural events and are located right next to the ice rink of the five-star Hotel Kulm in St. Moritz.



© Pfeffinger | Blumer-Lehmann AG



# Event location with playful architecture

A total of 230 m<sup>3</sup> of timber, 470 Free Form timber elements, a 20-tonne hat, eight months for production and construction – as well as plenty of hair-raising moments during planning, production and assembly. Knies Zauberhut – a multifunctional event location – offers a special atmosphere reminiscent of a circus. Carlos Martinez, a Swiss architect, designed the building based on a levitating magic cloth and opted for timber construction with a high degree of prefabrication for scheduling and envi-

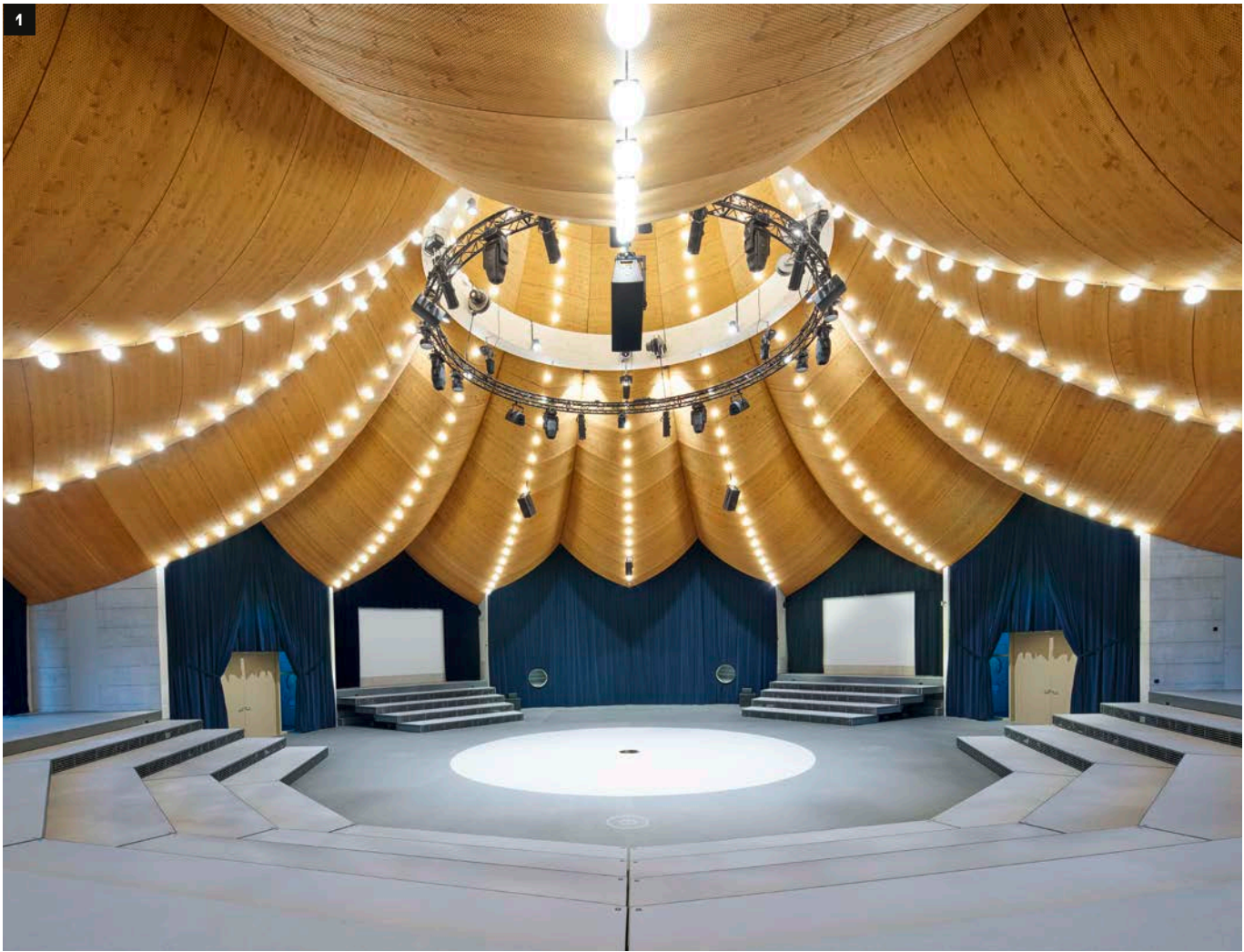
ronmental reasons. The components – which weigh up to 4 t with their curved designs – were planned and pre-programmed using a three-dimensional parametric model, completely prefabricated in our factory halls and assembled using a special crane.

↳ [blumer-lehmann.com/  
magicians-hat-knie-project](https://blumer-lehmann.com/magicians-hat-knie-project)

↳ [blumer-lehmann.com/  
magicians-hat-knie-reference](https://blumer-lehmann.com/magicians-hat-knie-reference)



The 26-metre-tall tower in a curved timber supporting structure is the building's eye-catcher and yet another exceptional Free Form construction from Blumer Lehmann.



- 1 The roof of the event space is reminiscent of circuses and magic. Free Form timber elements designed as a prismatic shell structure made it possible to create the curved roof shape.
- 2 Twelve identical, mirrored timber elements create the Free Form roof structure, which is topped off by the hat, a special feature in itself. Our Free Form specialists assisted the work of the planners from an early stage by creating a mock-up for implementing the geometric specifications from a technical standpoint.





Years of research went into the tower construction. The innovative timber structure was finally created in collaboration with the University of Stuttgart, the Swiss Federal Laboratories for Materials Testing and Research (Empa)/ETH Zurich and the Blumer Lehmann team.



Urbach Tower, Remstal – ICD and ITKE institutes at the University of Stuttgart

## Paradigm shift in the production of curved timber

The unique timber construction for the 2019 Remstal Garden Show was the first to use cross-laminated timber technology, which bends into the desired shape by means of a self-moulding process. The tower's cross-laminated timber elements were not moulded into their curved shape using machine power, but rather by their material properties. When damp timber dries, it contracts more across the grain than parallel to the grain.

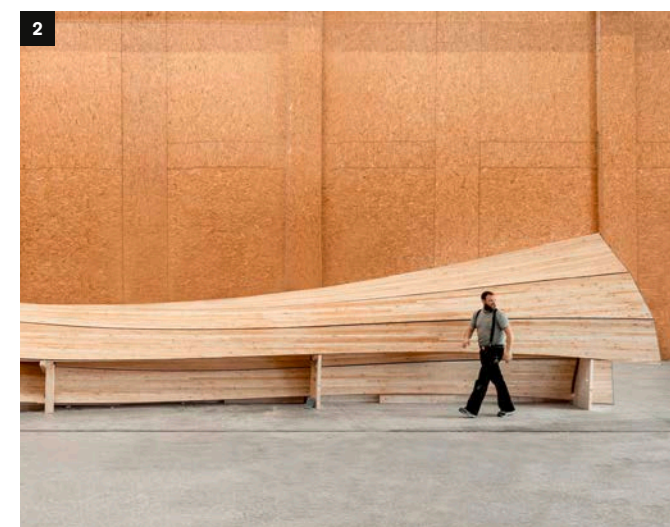
The research project was led by the ICD and IKTE institutes at the University of Stuttgart in collaboration with Switzerland's ETH

and Empa. Lehmann Holzwerk AG and Blumer-Lehmann AG were involved as industrial partners. This allowed the entire process chain to be implemented at our Gossau site, from cutting the logs in the sawmill and the drying process for the timber to final processing and pre-assembly of the structure.

↳ [blumer-lehmann.com/urbach-tower-reference](https://blumer-lehmann.com/urbach-tower-reference)



- 1 The Urbach Tower is the first building to use 'bilayer cross-laminated timber panels', which mould themselves into shape.
- 2 During 'timber programming', a computer model is used to calculate how the basic building element deforms during the drying process.



© ICD | IKTE University of Stuttgart





Holland Casino, Venlo – MSVA Architects

# Flowery architecture and impressive Free Form structures

The image of a flower provided the inspiration for the appearance and interior design of the Holland Casino in Venlo, making a striking allusion to the importance of flowers in the Netherlands. A Free Form laminated timber structure rises up through the casino's atrium like a flower on its stalk. The artfully curved supporting structure comprising some 300 Free Form parts measures 55 m by 45 m in the roof area, is almost 25 m tall and is supported by a stalk

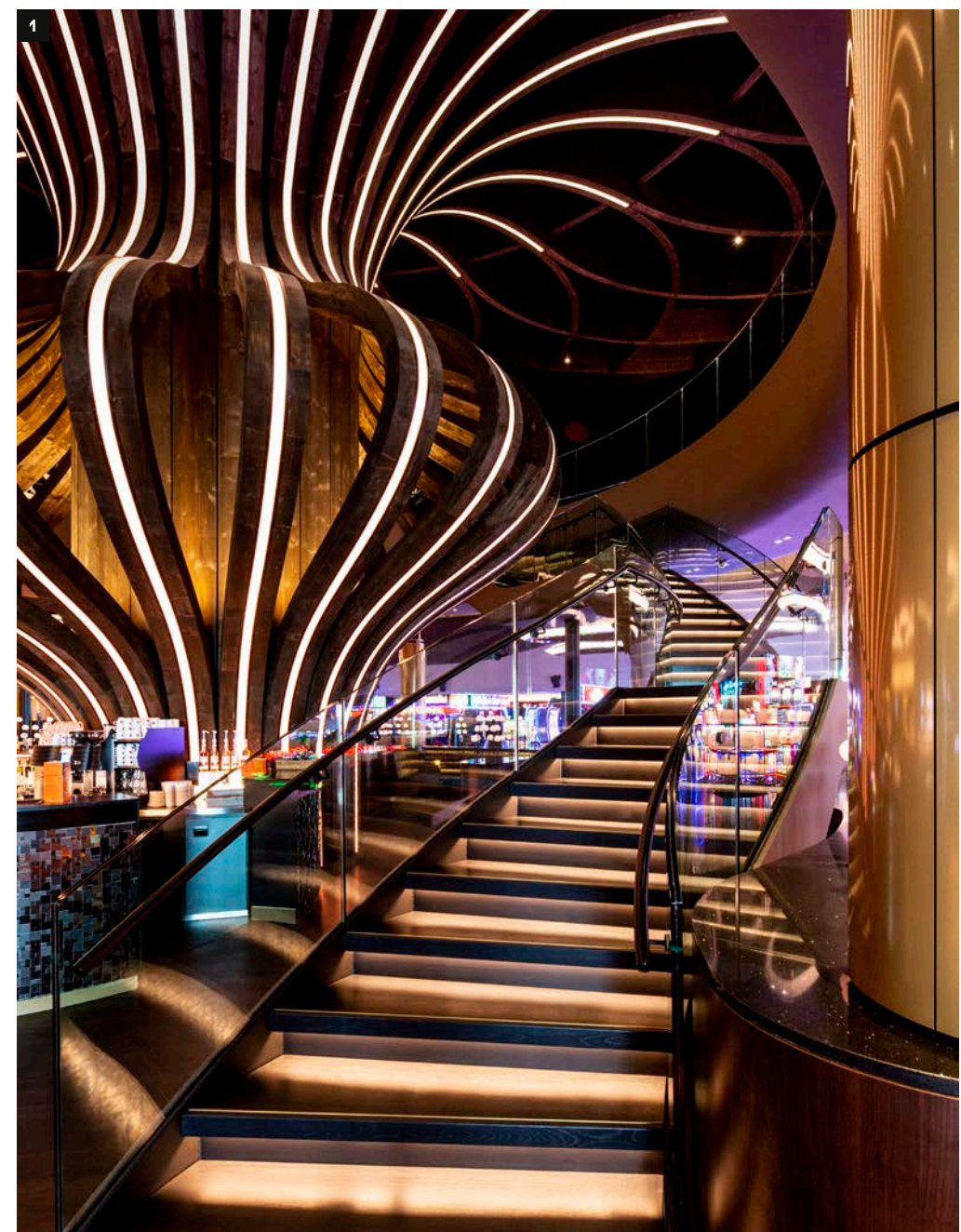
measuring 3.2 m in diameter. In the previous project development phase, the first task was to translate the architectural designs by Amsterdam-based MSVA Architects into viable geometric specifications.

↳ [blumer-lehmann.com/casino-venlo-reference](https://blumer-lehmann.com/casino-venlo-reference)



© MSVA | Laurens Eggen

© Barwerd van der Plas



- 1 Spruce arches form a flower stem emphasised with bands of light around the 3.20 m-thick, solid timber column in the casino's atrium.
- 2 The casino's seemingly delicate flower head gives no hint of just how complex the supporting structure needs to be to hold it in place.



# Therapeutic architecture for body and mind

Studies show that patients recover quicker and need less pain medication when they can see parks and trees from their hospital rooms rather than just staring at a concrete wall. Colours, lighting, acoustics, materials, sensory surfaces, smell, temperature and indoor air quality can also have a positive impact on

patient recovery. This is where timber as a natural construction material can fulfil some core functions within modern therapeutic health-care buildings. It ensures comfortable indoor conditions and has an appealing sensory quality, while also creating a connection to nature.

The timber frame construction of Maggie's in Leeds creates an unusually curved building and room shape, which helps to create a pleasant atmosphere.



© Nigel Young | Foster + Partners  
© Hufton & Crow

## Maggie's Cancer Caring Centres

The Maggie's Centres in the UK support people diagnosed with cancer in their daily lives. The founder Margaret 'Maggie' Keswick Jencks, herself a cancer patient, believed that architecture and timber as a construction material could have a healing effect.

### Maggie's Leeds, Heatherwick Studio, London

Maggie's in Leeds is an example of how an outstanding architectural fusion of nature and timber as a sensory material can look. Based on designs by the architects at Heatherwick Studio in London, we completed Maggie's Leeds as three pavilions. They all differ in height and contain an airy interior that houses spaces for both meeting and retreating. Lush plantings on the rooftops also offer accessible garden spaces and restorative outdoor areas.

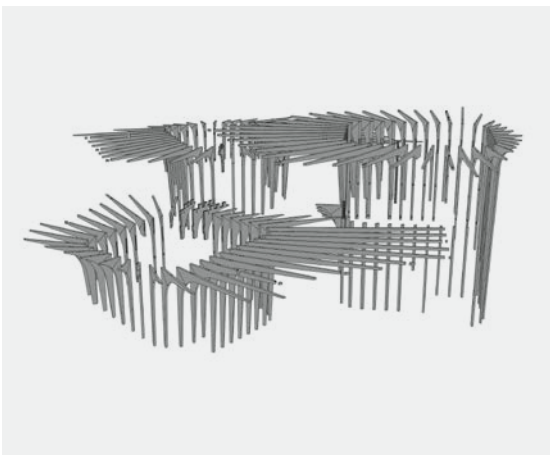
↳ [blumer-lehmann.com/  
maggies-centre-leeds-reference](https://blumer-lehmann.com/maggies-centre-leeds-reference)



### Maggie's Manchester Foster + Partners, London

Foster + Partners' architectural idea for Maggie's in Manchester is based on the skeleton of a bird. The architects chose timber as the main construction material. Throughout the centre, the focus is on natural light, green spaces and a view of the garden. The supporting structure is a filigree framework with 17 axes. The surfaces of the components are made of spruce and have a furniture quality.

↳ [blumer-lehmann.com/maggies-  
centre-manchester-reference](https://blumer-lehmann.com/maggies-centre-manchester-reference)



Laminated timber elements arranged radially around the pavilions support the roof elements. Prefabricated from spruce in the Blumer Lehmann factory, the elements were transported to Leeds and assembled on site.





# Practical construction with timber

Timber is the all-rounder capable of overcoming the challenges of our time. Its properties and practical advantages make it the construction material of the future.

## Climate friendly

Timber generates less grey energy and fewer greenhouse gases than other materials. Throughout its entire lifecycle – i.e. harvesting, processing and transporting – timber's energy footprint is unparalleled.

## Healthy

Timber creates a comfortable indoor climate by binding pollutants and regulating humidity.

## High-tech

Timber is lightweight, yet sturdy and capable of bearing heavy loads. The material is also pressure-resistant and moisture-regulating and has high thermal insulation properties.

## Carbon sequestration

Wood protects the climate. It sequesters CO<sub>2</sub> as it grows and stores it – even when it is in use. One cubic metre of wood sequesters around one tonne of CO<sub>2</sub>.

## Renewable

Timber is a renewable raw material. Thanks to sustainable forestry, the material is endlessly available.

## Efficient

Timber is easy to process at low energy consumption. Prefabricated components lessen the effort required on the construction site and shorten building times.

## Safe

The behaviour of timber in a fire is more predictable than other materials because it contains water, conducts heat poorly and burns slowly.

## Limitless

Thanks to new technologies and timber products, there are almost no limits to the architectural possibilities.

## Zero waste

We do not waste a single part of a log. In addition to sawn timber, we also produce pellets, animal litter and energy.

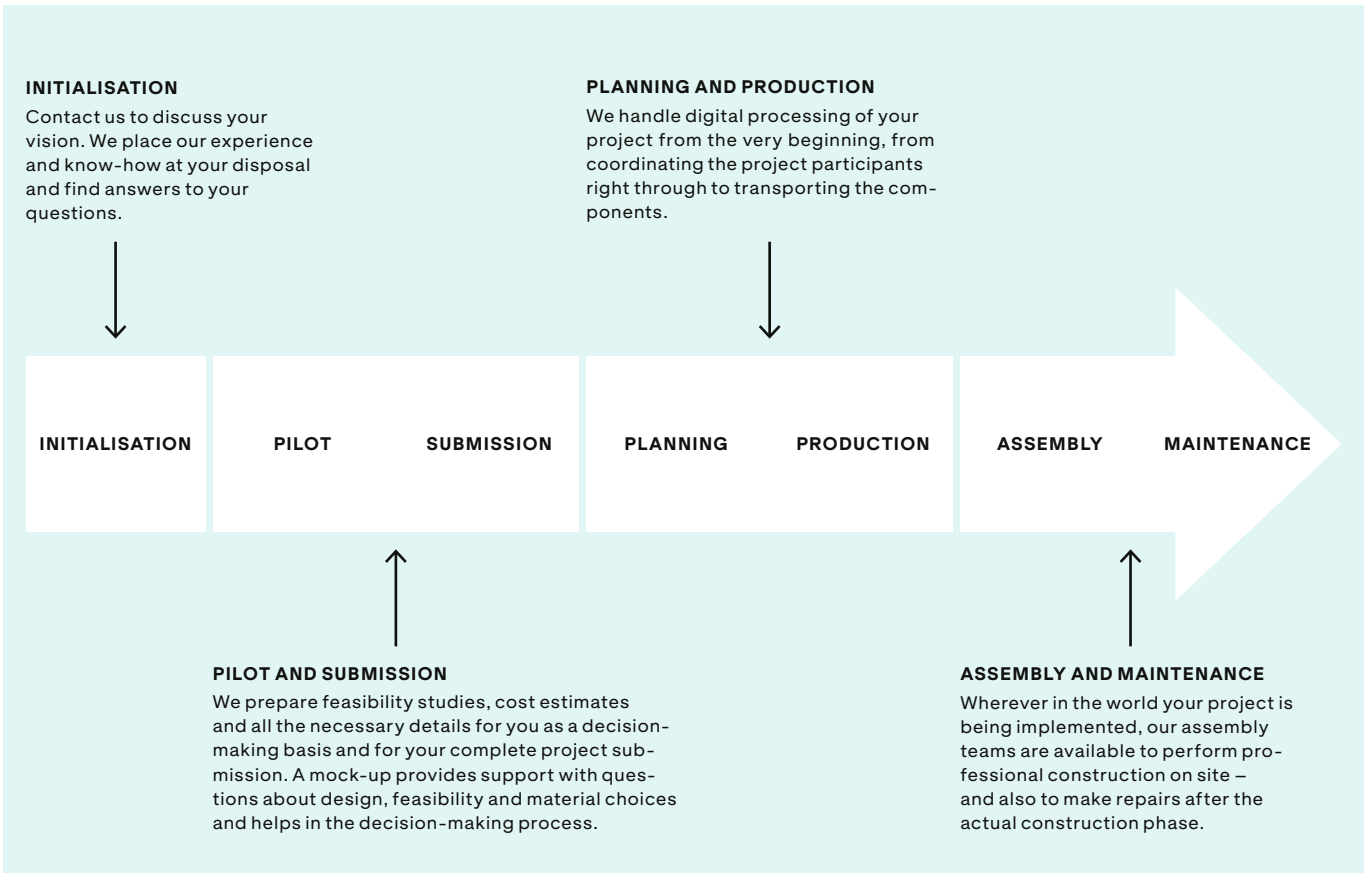
## Recyclable

Timber components can be dismantled in a non-destructive manner and reinstalled elsewhere.



# From the idea to the finished Free Form building

Whether it's spectacular in size or visionary in shape, we offer comprehensive services for extraordinary timber construction: on time, on budget and of the highest quality. We support you from the initial idea to the finished structure. Let us help you turn your architectural dream into a reality.



More information about our services for extraordinary timber construction projects

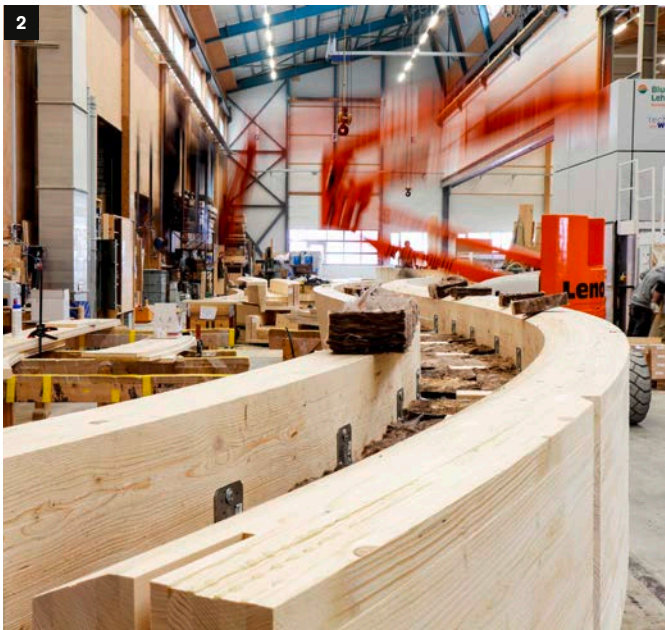
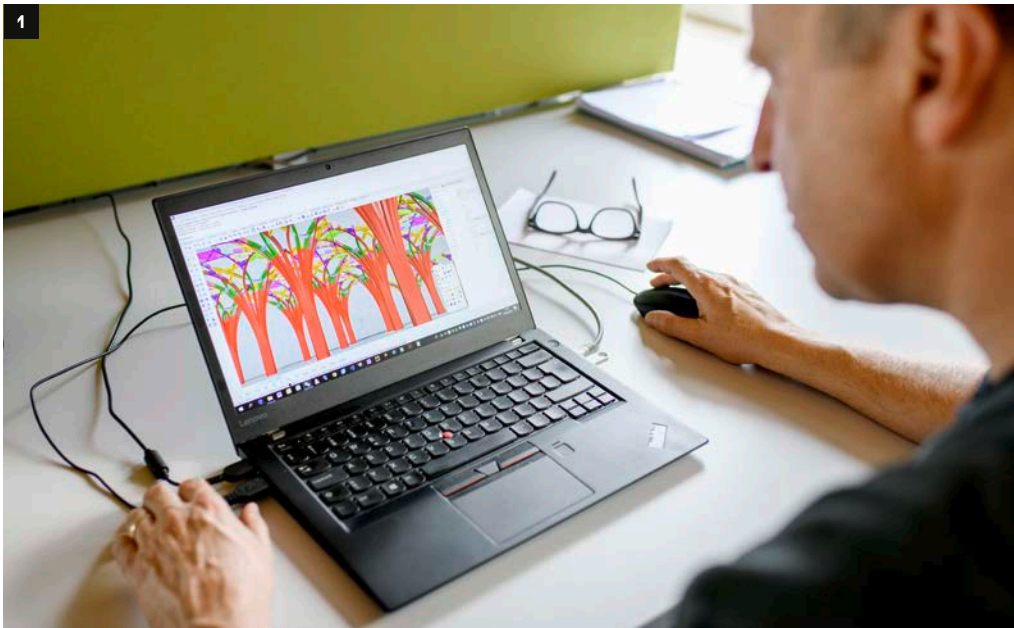
↳ [blumer-lehmann.com/advanced-geometry-services](https://blumer-lehmann.com/advanced-geometry-services)



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↳ [blumer-lehmann.com/sustainability](https://blumer-lehmann.com/sustainability)



- 1 Parametric planning on the digital 3D model enables us to perform highly complex construction, flexible planning and defect-free production.
- 2 From the 3D model to production: digital process chains create a direct connection between the CAD design of the building to computer-aided CAM production.
- 3 Our largest CNC system with three five-axe assembly units and eight transport vehicles enables the processing of a single-curved or double-curved component on all six sides.
- 4 With parametric planning tools, we can quickly make adjustments and incorporate information into the digital plans for transportation, segmentation, assembly sequences, etc.







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