

High Tech Timber

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Lignum is the umbrella organisation of the Swiss forestry and timber industry and coordinates the cooperation of the Swiss trade associations in this field. Its aim is to achieve sustainable competitiveness and to ensure that thinking and acting are based on common strategies and goals. Through interdisciplinary networking Lignum creates excellence in development and value creation. www.lignum.ch

With the support of



About ingenious switzerland

**Quality & quantity belong together:
it makes no sense to consider them
separately.**

Quotation attributed to Marx & Engels' dialectics

Seen from an undistorted outside perspective, Switzerland largely draws respect and serves as a role model internationally. The prestige of Swiss architects, engineers and designers and the expectations placed on them are high.

Why is Swiss architecture, engineering and design highly successful? It is the interplay of well-established framework conditions: Co-determination, financing mechanisms and public procurement procedures, the broad-ranging competitive culture, the modern and efficient normative and regulatory environment and the high degree of autonomy enable innovations and Swiss competitiveness.

Understanding of the context and consistency of solution approaches – both along the entire value chain and throughout the entire decision-making process and its dependencies – forms a wealth of experience that the Swiss planners from High Tech Timber are able to draw on abroad as a matter of course. This means specific, 'fit-for-purpose' services that are rarely explicitly requested, but which, in view of the increasing complexity of the tasks set, pose an essential requirement and generate genuine added value.

Planning in and for countries abroad gives rise to tasks, insights and relationships. For the members of ingenious switzerland, this entails new cultural horizons and professional spheres of experience that are also individually perceived as a form of personal enrichment. Swiss services provided abroad in this context achieve greater effectiveness and visibility thanks to their official nature, thereby diversifying and broadening the basis of our economy represents further values – quality and quantity from a single source!



Timber construction is beautiful, timeless and up-to-date as ever – it reconciles gracefully human homecoming in architecture with the ecological lifecycles.

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High Tech Timber

About High Tech Timber

Urban growth is creating new needs, with smart-density (modernising and social densification through building) now very much the buzzword.

Timber has many comprehensive benefits. A short construction time with highly prefabricated elements, the flexibility to react to changing urban challenges, strength and lightness of the material, and its solid image are just a few. They all make timber construction the solution for today's requirements in urban development.

High Tech Timber is a pool of five Swiss architects and engineers with unique expertise in the field of timber construction. Together, they are able to offer innovative solutions with comprehensive services to any challenge in timber construction. High Tech Timber has been formed by these Swiss professionals



Sustainable forest management is essential to the success of an economy, and society benefits in many ways from the use of timber: the processing of timber creates jobs, and the final products – comfortable, atmospheric wooden houses – contribute to their residents' feeling of well-being.

Hermann Blumer, Création Holz
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under the umbrella of ingenious Switzerland, in close cooperation with Lignum.

Switzerland has a well-established tradition in timber construction and conducts cutting-edge research on this topic. The members of High Tech Timber contribute significantly to the development of this industry at an international level. To achieve the best solutions, the members of High Tech Timber always work with carefully chosen local partners: their specialised knowledge is combined with the experience of the members of High Tech Timber and the mutual expertise is used in all joint construction projects.

The aim is to collaborate and collectively provide examples of excellence in innovative timber construction to cities such as Greater London, where **high-density housing** is a key issue.



Timber buildings are a reversible form of densification. They can be relatively easily converted, extended and dismantled. Modern town planning has to be able to respond quickly to changing demands. Timber construction offers the required flexibility.

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Engineered timber buildings created by Swiss professionals are convincing as they exhibit excellent craftsmanship and a high level of technical expertise. Many large timber construction projects have been realised internationally by Swiss experts to customer specifications and stand out due to the vast experience and expertise of those involved.

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Thanks to timber's excellent thermal insulation properties, the dry construction method and its low weight, this material is incredibly well suited to renovating, refurbishing or extending existing buildings. Prefabricated timber construction is very precise and can be assembled in any environment within a very short time.

Beat Lauber, Lauber Engineers
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Switzerland has a long tradition of timber construction. Swiss professionals combine this centuries-old knowledge with modern technologies and designs to create climate-neutral buildings. Timber is both a renewable natural product and a high-tech material. Rooms made of timber are welcoming, exude warmth and have a high aesthetic quality.

Beat Kämpfen, kämpfen für architektur
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Timber used for building reduces CO₂ by removing carbon from the atmosphere and storing it for a long time. In addition, CO₂ is also reduced through the replacement of energy-intensive construction materials such as concrete and steel. Moreover, our manufacturing facility, the forest, offers a free oasis for the senses. What more could you want?

Olin Bartlomé, Lignum
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About timber



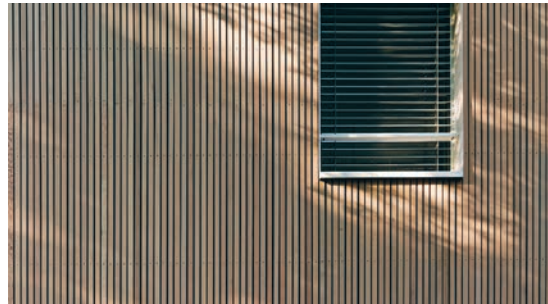
Light weight construction

Most existing conventional buildings are designed in such a way that no substantial extra weight can be added. However, the trend of densification is towards taller buildings. Engineered timber is the solution: additional floors can be constructed using lightweight timber structures without the need to reinforce the existing building.



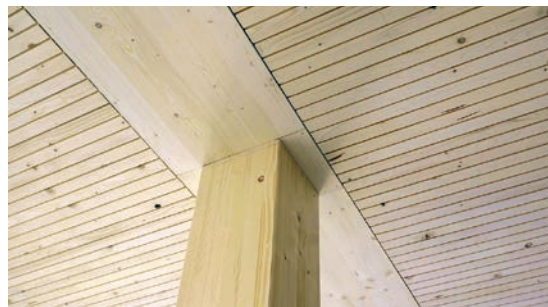
Short construction times

Timber construction is fast. The elements are fully prefabricated in the workshop in dry conditions and therefore comply with the highest quality standards. High tech timber buildings are assembled on site like 'Lego' and timber construction is more accurate than any other method of construction.



Less CO₂

Forests act as a carbon sink; the CO₂ concentration in the atmosphere is therefore reduced by using timber as a construction material. Furthermore, timber contains very little embodied energy. Timber can be used again and again for other purposes, or when a timber building is finally demolished, it can be used for CO₂-neutral heating, thus ensuring zero waste.



Comprehensive safety

Building with timber is safe due to its extremely high load-bearing capacity and outstanding performance during fire and earthquakes. For example, timber burns evenly in the event of fire and does not collapse. Incorporating this feature in the design process ensures that residents have more than enough time to leave the building in case of emergency.



Adaptable buildings

Our cities will change even more rapidly in the future. Timber buildings are very flexible and are also easy to convert and extend. They can be easily adapted to all kinds of new requirements.



Pleasant indoor climate

Timber structures have many qualities that people regard as pleasant. They regulate moisture, absorb sound and have excellent thermal performance. Both residents and office workers feel comfortable and at home in timber buildings.



Unmatched space efficiency

High Tech Timber's construction techniques allow for exterior walls with optimal insulation, yet minimal thickness: the insulation can be easily inserted into the load-bearing structure. For this reason timber buildings feature a larger rentable area and therefore offer significant economic benefits.



Swiss precision

High Tech Timber's buildings are developed, planned and constructed in an interconnected planning process involving architects, engineers and timber construction specialists. Timber is a traditional construction material which has been widely used in Switzerland for many years, and is now enhanced by state-of-the-art manufacturing technology.



Pile it up

'Giesshübel': A four-storey prefabricated timber structure has been added onto an existing two-storey building.



1

Structural systems and components

System components are defined and reduced to the minimum, and handbooks are available in the national language.

Timber is well known for its multi-functionality. High load-bearing capacity, good thermal insulation properties and the uniquely warm atmosphere it creates are only a few of the strengths of this natural building material. To ensure optimal structures that function perfectly as whole buildings, extensive knowledge of materials, comprehensively tested systems and the smallest possible number of creatively combinable base modules are required.



Different materials being used in contemporary timber construction: timber, concrete, steel



Timber-concrete composite floor system

The two projects 'Mühlebach' and 'Giesshübel', accomplished by High Tech Timber's experts, are examples of consistent system planning involving various components, including intermediate floor and wall elements. Networked planning with all the parties involved is a key factor in the success of such structures.

Timber is an extremely versatile material which can also be used in combination with other materials like steel or concrete. The resulting composite elements and hybrid structures utilise the individual materials in such a way that the unique features of each individual component are accentuated.

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Health & safety

Timber structures offer a high degree of safety in the event of fire and during earthquakes. Moreover, timber does not produce any harmful emissions.

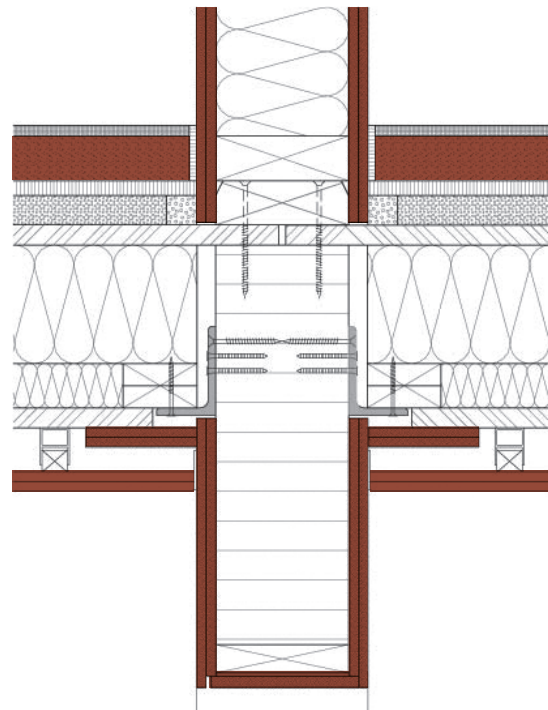
Under the direction of Lignum (the umbrella organisation of the Swiss forestry and timber industry), the Swiss timber industry and the state and cantonal building insurance organisations have carried out extensive research and development in the area of fire protection over the past 15 years. Lignum's comprehensive fire protection documentation was compiled with members of High Tech Timber.

Since 2005 new building regulations permit the construction of six-storey timber buildings in Switzerland; from 2015 high-rise construction will be approved. The 'Mühlebach' and 'Giesshübel' buildings specified in this document are contemporary show houses, demonstrating the range of designs possible under the current regulations.

Thanks to extensive fire tests at Empa (the Swiss Federal Laboratories for Materials Science and Technology), the fire performance of timber structures can be calculated very precisely. It has also been proven that timber burns evenly and gives occupants more than enough time to make their way to safety, especially when a building's particular specifications have been exactly calculated. Close cooperation with the ETH Zurich allows High Tech Timber immediate access to the expertise and research of one of the world's most renowned universities in the area of fire protection.

'With planning and dimensioning that take fire protection aspects into account, followed by detailed design and execution, fireproof multi-storey timber buildings can now be constructed.'

Prof. Dr. Andrea Frangi, Institute of Structural Engineering, ETH Zurich



Fire protection (red elements)

Intermediate floor: cement screed, impact noise insulation material and suspended plasterboard ceiling

Walls: studs with plasterboard panelling

Fill the gap

‘Mühlebach’: Two six-storey timber buildings as inner-city infill.





Strasse 8

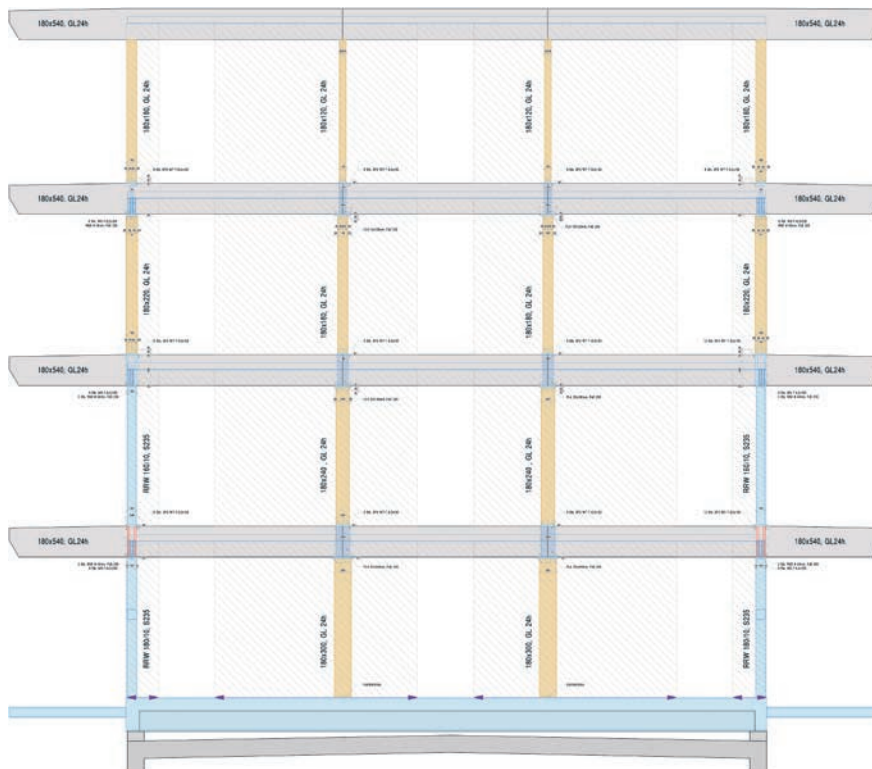
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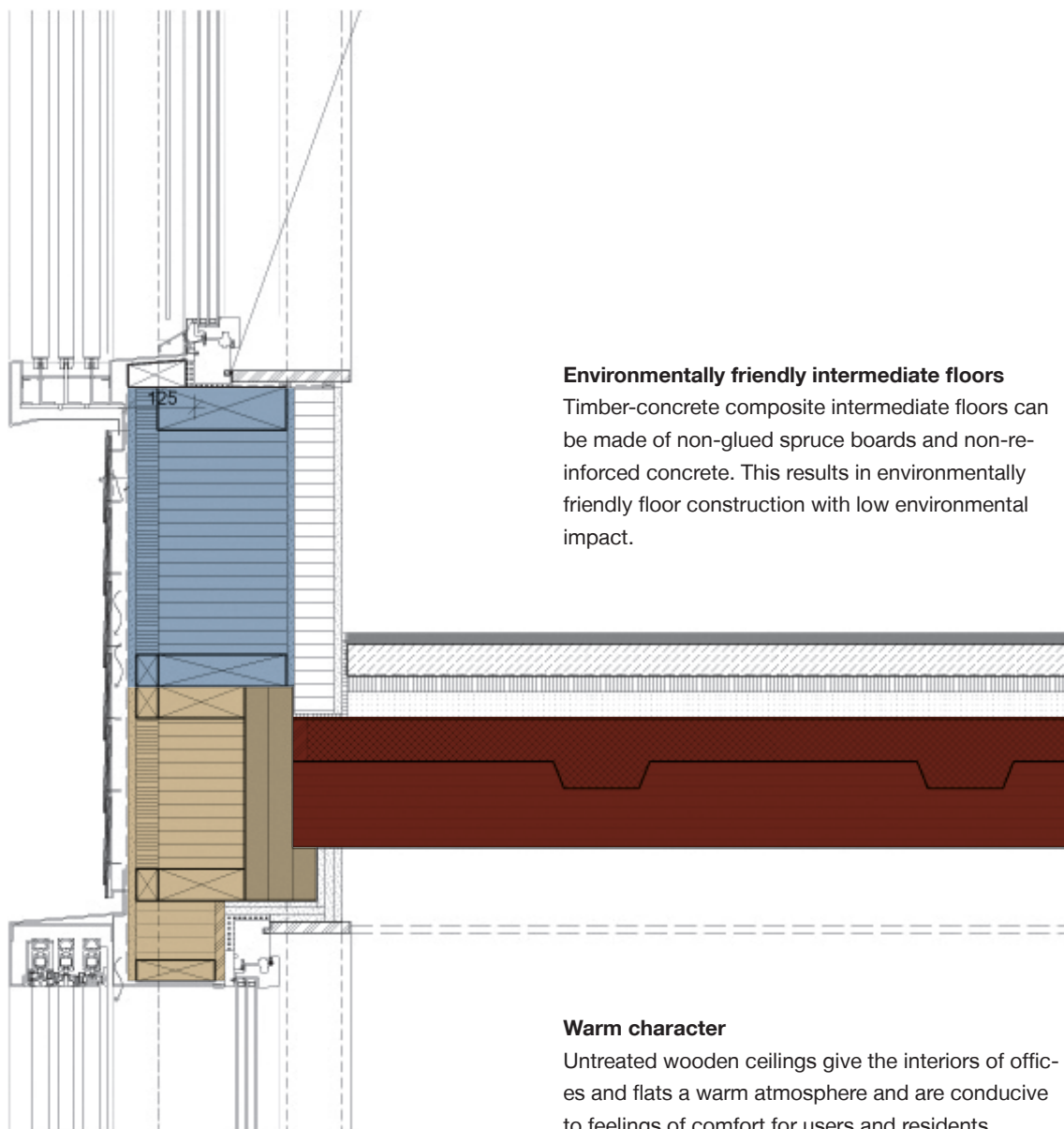
Show buildings Timber buildings in cities

Take a look into the future, show courage and reap the rewards! The incentives for timber construction are manifold, particularly when it comes to inner-city buildings. Large scale timber structures are still new and unusual in many countries. However, modern timber structures encourage innovative, economical solutions that – with the right level of creativity and expertise – are easy to implement. High Tech Timber can draw on its members' prolific pool of experience when contributing to the development of timber construction in cities and any other places.

Cantilevers without thermal bridges

In modern timber buildings continuous timber beams provide cantilevers without creating thermal bridges for balconies on both sides of the building. Without adding any extra cost onto the property, balconies are included and provide an outside space for residents to relax and enjoy moments of leisure.





Environmentally friendly intermediate floors

Timber-concrete composite intermediate floors can be made of non-glued spruce boards and non-reinforced concrete. This results in environmentally friendly floor construction with low environmental impact.

Warm character

Untreated wooden ceilings give the interiors of offices and flats a warm atmosphere and are conducive to feelings of comfort for users and residents.

Economic added value

Exterior walls made of timber are much thinner than solid wall structures that exhibit the same energy efficiency. This represents a massive benefit in high-priced inner-city locations, as it creates more rentable floor space.

Fill the gap

'Mühlebach': The courtyard facade
with integrated solar collectors.



4

Holistic planning

Integral, transdisciplinary and simultaneous planning is the key to the success of any construction project.

The team of architects and engineers from High Tech Timber make planning an enjoyable and motivating process. They help clients to master unknown and untried situations, and find innovative ways to overcome obstacles. They understand planning and construction in timber as a transdisciplinary and cross-cultural collaboration process.



'Corbett's Move' or 'Design by Committee' in:
Delirious New York, Rem Koolhaas, 1994



The experts from High Tech Timber have been working together for many years and can also draw on the experience of leading Swiss timber construction companies. They understand that the industry requires a planning culture that is characterised by creative, collegial teamwork and mutual respect – a culture that inspires and drives everyone involved to achieve outstanding results.

Using the systematic approach developed by a holistic and experienced planning team, projects can be implemented in an innovative, creative and target-oriented way. The key to success lies in the organisational and technical expertise this team provides.

Pile it up

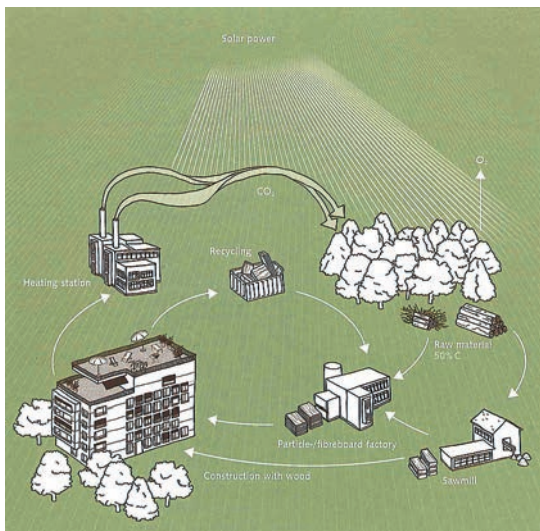
'Giesshübel': A four-storey prefabricated timber structure has been added onto an existing two-storey building.



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Complete sustainability

In a world that is becoming more densely populated, the various aspects of sustainability are taking on increasing importance.



Global warming is one of the most pressing global issues of our time. The current emissions of greenhouse gases, particularly CO₂, are incompatible with the objectives of sustainable development worldwide. As the construction and maintenance of buildings account for about half of the energy consumed and half of all greenhouse gas emissions in Switzerland and many other European countries, architecture has a central role to play in the endeavour of realigning the supplies of resources and energy.

The goal of the '2000-watt society' environmental vision is for the average First World citizen to reduce their overall average continuous energy usage to no more than 2000 watts by the year 2050. This would mean people living in Switzerland consuming two-thirds less energy than they do today by the year 2050, with emissions of greenhouse gases even being reduced to a quarter of the current amount

over this same period. The prestandard 'SIA path to energy efficiency' forms the basis for implementing this strategic milestone in the building sector. The 'SIA path to energy efficiency' is characterised by a total energy perspective: In addition to the energy required for building operation, embodied energy introduced through the building and demolishing process of a new building or refurbishment as well as location-dependent mobility are taken into account and targets for greenhouse gas emissions are also specified. Only by considering the whole life cycle of a building can we achieve architecture that is ecologically, economically and functionally sustainable in the long term.

Studies carried out by Lignum* show that timber structures have a better overall assessment according to the 'SIA path to energy efficiency' than comparable buildings made of other materials. In addition, it should be noted that forests and timber in construction simultaneously create multiple benefits for the climate: Timber not only stores carbon (sequestration of CO₂ from the atmosphere; storage effect) but also replaces other more energy-intensively manufactured materials (substitution effect).

* 'Climate-friendly and energy-efficient construction with wood'; Lignatec 25/26, 2012

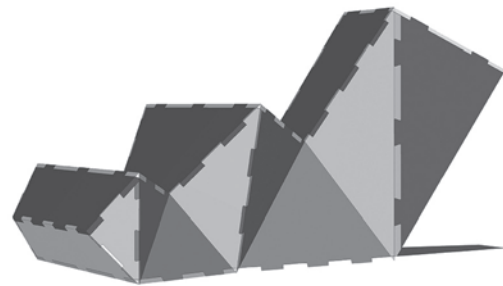
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Innovation

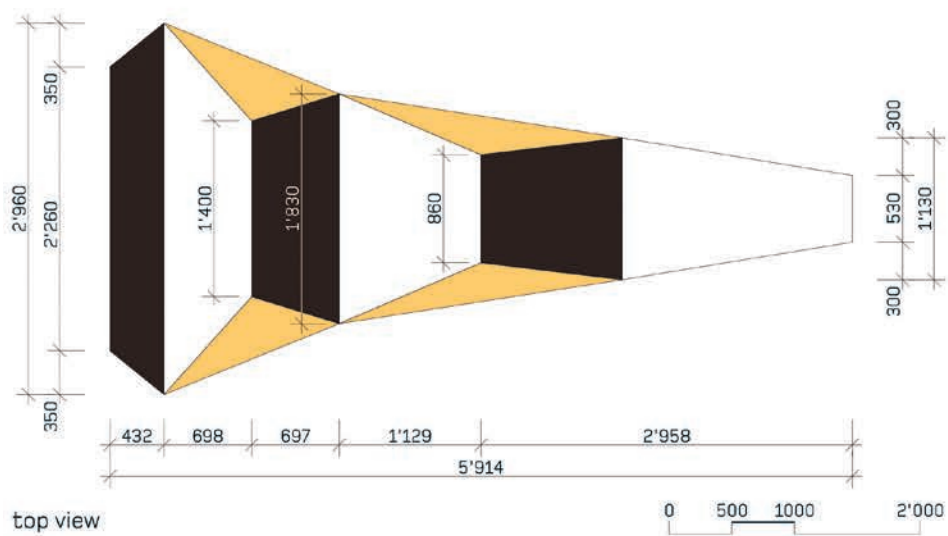
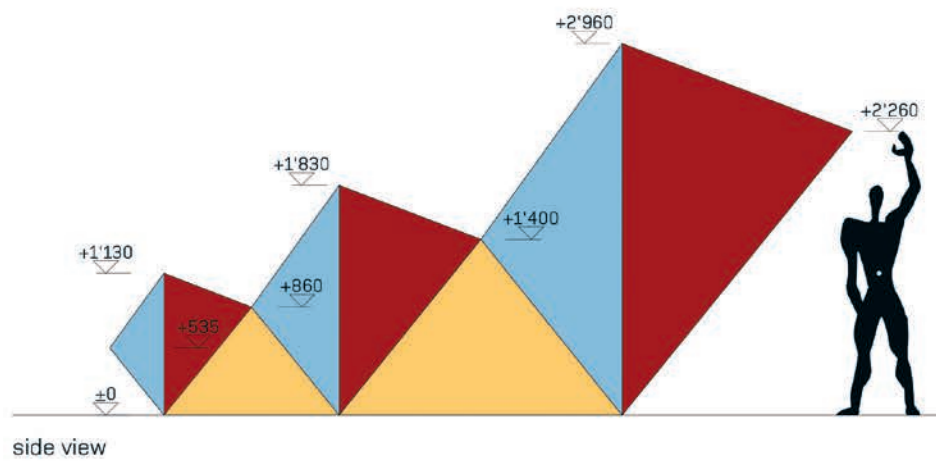
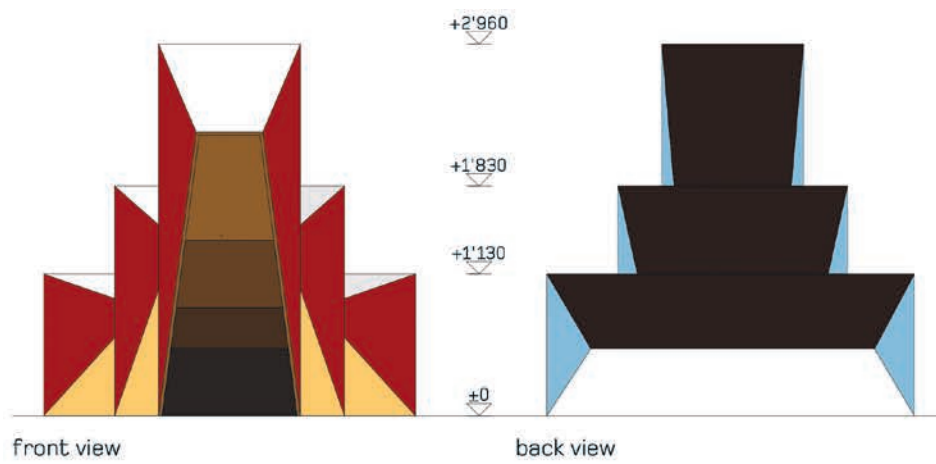
Timber joints without steel connectors



A specially developed prototype, in the form of a contemporary timber structure, provides a vision of the future of timber construction. Future buildings designed by High Tech Timber will be reversibly put together just like furniture, with steel connections being replaced by simple and clean timber joints (dovetails, rabbets, etc.).



Holistic, transdisciplinary planning and the use of CNC machines in today's production, allow complex spatial arrangements to be constructed from timber. The prefabrication process means that construction is both fast and precise. Thanks to its physical properties, timber can be used for the shell, the supporting structure and interior work. As the joints are exclusively made of timber, the elements can be dismantled and reused, thus minimising material waste.



The Swiss tradition of timber construction

Fällanden Youth Hostel

Emil Roth, 1937

The simplicity and functionality of modernism can be seen in Roth's uncompromising rejection of decorative elements. However, by using timber and the post-and-beam construction method, he was able to maintain a vital connection with Switzerland's age-old building tradition.



Wooden towers in Evolène, Val d'Hérens

Architect unknown, approx. 1600

The first high-rise buildings made of timber were constructed some centuries ago in Switzerland. Demonstrating outstanding craftsmanship, imagination and resourcefulness, they represent a creative use of the local building tradition and a close-knit community's will to survive..



Bern University of Applied Sciences, Department of Architecture, Wood and Civil Engineering, Biel Marcel Meili, Markus Peter Architects, 1999

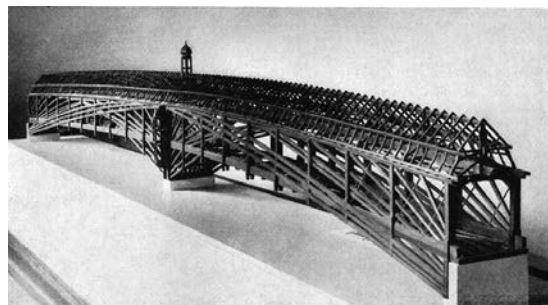
The educational institution in Biel/Bienne, which trains people to work in all sectors of the timber industry and whose premises are made entirely of timber, was one of the first modern large-volume timber buildings in Switzerland.



Grubenmann bridge, Schaffhausen

Hans Ulrich Grubenmann, 1756

In 1755, the Schaffhausen City Council commissioned master builder Hans Ulrich Grubenmann to construct a timber bridge. Clad with 400,000 shingles, it featured a clear width of 4.5 metres between the supporting pillars (laterally arranged trusses) and had a clear height of 5 metres.



High Tech Timber

Shigeru Ban on the new Tamedia building

The new Tamedia building in Zurich, which was designed by Japanese star architect Shigeru Ban, opened in 2013. The engineering for the impressive timber construction was carried out by Hermann Blumer, a member of High Tech Timber.*

What made you think of wood for this site?

‘It was easy, really. It fits in with the Swiss tradition and you simply feel comfortable inside this material. You can feel the breath of nature and experience the scent of the building. The light also hits the building in a very beautiful way.’

Workers' housing development in Gwad, Wädenswil Hans Fischli 1944

The housing development in Gwad comprises 28 units and is a good example of flexible housing. The upper storey of the houses in Wädenswil can be extended from a basic gallery with bathroom and bedroom to a fully developed upper level that contains a bathroom and up to four bedrooms.



Were you aware of this tradition of timber construction in Switzerland?

‘Yes, I was aware of it. When I built the Centre Pompidou-Metz, the Swiss timber construction engineer Hermann Blumer carried out the engineering. Since then, I have worked with him on many projects and benefited a great deal from his expertise. There also used to be a strong tradition of timber construction in Tokyo. It disappeared after the Second World War when wooden houses were hardly built any more due to the severe bomb damage suffered by Tokyo. That was one of the reasons, certainly. There have been significant advancements in the fire protection of wooden houses since then.’

* by Res Strehle. Updated 10.07.2013

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