

# Timber and Technology

Timber for the building revolution

**Timbatec**  
Timber and Technology

**Dear Partners, Customers and Timber Enthusiasts:**

Imagine standing on top of Uetliberg mountain looking down on the city of Zurich – or on top of the Gurten enjoying the view over Bern. You can reach buildings as far as your eyes can see. Now imagine that all these buildings being made from timber: the railway building, the university, the skyscrapers, the commercial buildings, the viaducts. Thanks to modern technology, it became real: timber cities are now possible. They are safe, clean and economical.

You may ask yourself: why should all those structures be built in timber? The answer is simple: Because it's better! A city made of timber is a huge stock of CO<sub>2</sub>. In contrary, common concrete buildings emit gigantic quantities of CO<sub>2</sub>. For this reason, the Climate Declaration of Paris explicitly mentioned timber construction being part of the solution.

At Timbatec, we see solutions, not problems. We launch and finance research projects and implement the insights gained immediately. For example, we are developing new technologies such as floor slabs without concrete, or the revolutionary TS3 technologies (see page 6 for details).

Just this year, we have already worked on more than 200 timber construction projects in Switzerland, Europe, and North America. Sue&Til, the largest timber building in Switzerland, was erected in Winterthur. We are proud of this accomplishment, but we strive for more. With our commitment to new technologies and our technical expertise at four locations, we are paving the way for you to build not just single flagship projects, but entire cities of timber.

In order to advance these new technologies, I handed over management of the company to Andreas Burgherr, our equally committed Co-Owner and Managing Director of the Zurich Branch, on January 1, 2019. I wish him the best of success in his new position (see page 7 for details).



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**Stefan Zöllig,**  
Founder and Co-Owner of Timbatec  
Holzbauingenieure  
Schweiz AG

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# Timbatec is offering an all-round package

A building is more efficient and economical if understood integrally. When planning timber structures, architects should preferably add a timber construction engineer to their team to gain expertise above and beyond standard structural engineering. Therefore, we offer a full range of services for planning and implementation support. In cases where viable solutions do not yet exist for specific applications, we are able and willing to develop them. Our core competencies are in the following four areas:



**Timber Engineering**



**Fire protection**



**Building physics**



**Product development**

# Timber construction is convincing in all aspects

Nowadays, the advantages of timber as a natural building material are winning over more and more building owners and planners. As a result timber is used for major projects like the “Sue&Til” residential complex – Switzerland’s largest timber building.



## 1 | Timber, the renewable resource

In Switzerland, there is no shortage of timber as a building material. Annually, 10 million cubic meters of wood grows in our country, 7,5 million cubic meters of which we can use. In other words: Every year, enough wood grows to build 600 single-family homes each day.

Or a school building every 15 minutes. Timber structures are not a threat to Swiss forests. On the contrary: A managed forest is more robust, protecting against natural hazards, and storing more CO<sub>2</sub> than an unmanaged forest thanks to the faster growth. So ask for Swiss Wood!

## 2 | Timber is burning in a controlled manner

In case of fire, timber is providing many advantages: It burns in a predictable manner and retains its load-bearing capacity for a long time, even if the outer layer is charred. Larger timber components are difficult to ignite and tend to extinguish themselves. During their operations, firefighters appreciate these properties. Thanks to fire protection concepts developed by Timbatec engineers, timber structures are

as safe as buildings made of concrete or steel – a necessity since fire safety legislation does not distinguish between different building materials. The regulations apply equally to all materials. Public authorities have responded accordingly: Due to the proven safety of timber structures, building high-rises, hospitals, and hotels with timber have been permitted since 2015.



The shingle façade made of larch wood, constructed for a six-story apartment building in Andermatt was only possible due to fire tests and plans carried out by Timbatec.



“Thanks to years of research and development efforts, it is now possible to build fireproof timber structures.”

**Prof. Dr. Andrea Frangi**

Professor for Timber Construction at the Institute of Structural Engineering, ETH Zurich, Switzerland

Thanks to the light weight of wood, whole elements can be lifted to lofty heights with the crane.



## 3 | Timber, the light-weight

Timber is a lightweight construction material. One cubic meter of spruce wood only weighs 500 kg, while one cubic meter of concrete weighs five times as much, i.e. 2'500 kg. Lighter weight has its advantages: Timber is easy to transport, even with prefabricated elements and it can be assembled in a short time. A crane is

needed for a few hours only, so the space on site is quickly freed up – a major advantage on urban construction sites. Timber is ideal for adding stories to existing buildings where concrete and steel would be too heavy. Multi-storey additions in timber provide a significant amount of living space in desirable locations.



“Timber is lively. It breathes. It touches people. Timber makes people happy! This gives me new inspiration every day.”

**Sylvia Flückiger**

Member of Parliament, President of Lignum, Holzwirtschaft Schweiz, Schöffland (Aargau), Switzerland

## 4 | Timber, the climate protector

Timber structures store CO<sub>2</sub> on a permanent basis, thus contributing to a dire demand for climate protection. One cubic meter of timber relieves the atmosphere of about one ton of CO<sub>2</sub>. In the process of photosynthesis, trees convert CO<sub>2</sub> into oxygen and carbon, as trees

need carbon to grow, they release the oxygen back into the environment. The story is completely different in the case of concrete and steel: Large quantities of CO<sub>2</sub> are emitted during production of these materials which further add to harming the climate.

### Carbon Sink City

While created, cities emit great quantities of CO<sub>2</sub>. Just producing a single cubic meter of reinforced concrete results in the emission of about 500 kg of CO<sub>2</sub>. Producers of steel, concrete and brick have not yet been able to find a solution to avoid carbon emissions. By emitting millions of tons of carbon, the construction industry is causing more environmental damage than ever before. However, this does not have to be.

A carbon sink city functions as a “carbon sink”, i.e. it sequesters carbon and permanently stores it in its structures. In terms of structural engineering, it forbids any use of steel, reinforced concrete, or brick, as these materials can no longer meet those environmental requirements. Construction projects in a carbon sink city are based on natural materials that collect and store carbon before their use, such as timber. This is already possible.



# TS3 for the building revolution

Columns, slabs, ready! The TS3 technology is a revolution in timber construction. It enables point-supported floor slabs without supporting beams.



**In Grossaffoltern, Stuberholz has constructed four apartment buildings with 2140 m<sup>2</sup> of TS3 floor slabs.**

Commercially available since 2018, the third generation of timber structures, known as TS3, is now available. As part of multiple research projects, Timbatec engineers cooperated with Bern University of Applied Sciences and ETH Zurich to develop the Timber Structures 3.0 (TS3) technologies. TS3 enables butt-joint-bonded connections of CLT panels and thus to create large panels. These panels have the same properties as reinforced concrete: They can transfer loads in multiple directions and cover spans of up to 8 m – without supporting beams. TS3 is opening up structural and creative worlds that were previously off limits for timber construction.

## Market launch accomplished

TS3 is now commercially available. Test structures with high continuous loads as well as the first residential buildings based on this technology are clear proof that TS3 can deliver what it promises. In the spring of 2018, we worked with all of our research partners to erect a TS3 endurance test bench in the courtyard of Bern University of Applied Sciences in Biel. There, we applied a load consisting of 12 tons of boulders.

## More from the Timbatec Lab

Since its founding in 1997, Timbatec has been involved in research and development of timber construction technologies. We are creating, testing and perfecting technologies and products to make them market-ready. Three further developments from our Timbatec lab:

*Available today:*

### Concrete core in a timber frame

In large construction projects, the contractors usually erect the concrete staircases first. Carpenters then add the prefabricated wooden components around it. Timbatec has reversed this sequence: The wooden structure is erected, then liquid concrete is filled in. This saves time and money.

### End of the timber/concrete composite era

While timber/concrete composite construction once paved the way for multi-floor timber structures, it clearly provides disadvantages.

Since 2013, Timbatec has worked with an elastically bonded gravel layer to build as many as 400 apartments with over 40000 m<sup>2</sup> of floor slabs. This layer meets the requirements for sound insulation and does not emit any CO<sub>2</sub>.

*in 2 year's time*

### Timber basements

We are developing technologies for timber basements that will allow rapid construction of comfortable and practical basement rooms. Here we need clever solutions for sealing, seepage and water discharge.

*In 5 year's time*

### Manufacturing building components from bushes and sawmill waste

The term "Scrimber" is used to describe a method for manufacturing panels and bars for use in load-bearing applications made from wood with smaller diameters as well as from short, crooked or otherwise irregular pieces.

# «Timber construction share to double over the next ten years»

Andreas Burgherr, Chairman of the Management Board of Timbatec Holzbauingenieure Schweiz AG, believes timber construction is still far from reaching its full potential.

**Andreas Burgherr, how did you become so enthusiastic about timber as a building material?**

It's part of my family's legacy. My great-great-grandfather ran a sawmill and carpentry business. The business stayed in the family. I therefore grew up surrounded by the smell of wood shavings. When the polytechnic (HTL) opened its doors in the year 1986, I immediately knew: That's where I want to go! After finishing my apprenticeship as a carpenter, that is exactly what I did. I became a timber construction engineer.

**Let's catch a glimpse into the future: How do you expect timber construction to evolve over the coming years?**

There is still a great deal of potential to be tapped in this area. I am convinced we can build 90% of modern above-ground structures based on timber construction techniques. Over the next 10 years, the share of timber construction will double in the area of new construction projects. Furthermore, topics such as urban densification and addition of stories will become increasingly important. Due to the low weight of the material, timber construction is unbeatable and will prevail.

**Are the prerequisites already in place?**

The necessary expertise is definitely available. We are capable of building entire cities, including skyscrapers, hospitals and schools with timber. To double the volume of timber construction, however, we need strong partners – for example, in forest management and in the timber industry. Swiss timber must remain competitive. Moreover, we need to do some outreach – there are still skeptics who refuse to let go of conventional construction techniques.

**You mentioned cities made from timber: Which construction methods will be especially relevant in the future?**

We need flexible structures. Timber construction already provides those. For certain parts of buildings, concrete is still justified – for



**Andreas Burgherr, Dipl. Ing. HTL Timber Construction, lives with his family in Buchs near Aarau.**

example, in cellars and stairwells. However, we try to keep the usage of concrete as little as possible. We are currently developing new techniques to avoid the enormous CO<sub>2</sub> emissions associated with concrete. In projects that use both building materials, concrete must adapt to timber construction nowadays rather than the other way around. In contrast to earlier times the timber construction now takes place on site before we add the concrete. This is a little revolution.

**TS3 is another revolution.**

Indeed! In fact, it's the much greater milestone. Thanks to the TS3 technology developed by Timbatec, skeleton construction is now feasible with load-bearing columns and slabs with timber. This is opening up entirely new possibilities, especially for major projects.

**At the start of 2019, you became Chairman of the Management Board of Timbatec Schweiz AG. What do you plan to change?**

We are pioneers in the timber sector and we will continue progressing timber construction. It is our aim to keep substantially contributing to a sustainable construction industry and be part of the future. This always was and will remain our aim. Stefan Zöllig remains loyal to Timbatec and will continue to drive innovation, while I will lead the company's operations – an ideal solution.

# The largest timber building of Switzerland

Nowadays, timber construction is spacious and modern: Switzerland's largest residential complex made from timber is six stories tall, 200 m long and concealed behind a modern aluminum façade. This trendsetting project known as "Sue&Til" is located in Winterthur Neuhegi.



**Timber construction in large format: The Sue&Til development impresses with 300 apartments on 6 floors.**

Winterthur is growing. With more than 114,000 inhabitants, it is now the sixth-largest city in Switzerland. In order to meet its demand for offices and living space, the town is developing its brownfield land. The former industrial area between the Grütze and Oberwinterthur railroad stations is currently undergoing transformation into a new urban district known as Neuhegi. Being the newest building block, Sue&Til is also the largest timber structure in Switzerland.

#### **Fast construction thanks to prefabricated elements**

In major projects, building owners are accustomed to delays in the progress of the project.

None of this for Sue&Til: The first tenants were able to move into their apartments half a year earlier than planned. 250,000 prefabricated wood parts facilitated the fast construction time. Exterior wall elements with lengths up to twelve meters, fully insulated including windows as well as ready-to-use bathroom modules accelerated the construction time. The dry construction method also saves time: Timber doesn't need drying.

#### **Good ratings from EMPA**

„The big sticking point was the sound insulation between the apartments“, explains Stefan Rüegg, project manager at Timbatec, „but the classic timber-concrete composite ceiling

Lateral vertical steel profiles and T-head plates transmit the forces and prevent settlement.



**Building owner**

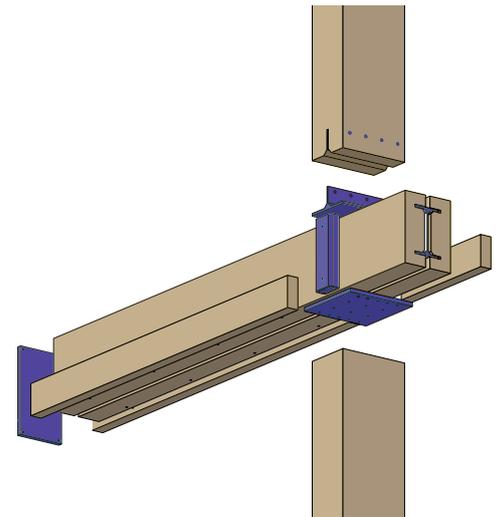
Allianz Suisse  
Implemia Schweiz AG

**Architect**

weberbrunner architekten AG  
und soppelsa architekten GmbH

**Timber subcontractor**

Implemia Schweiz AG



**Combined timber/ steel beam: The steel is stiffening the timber, the timber protects the steel in case of fire.**



“Thanks to the elastically bonded gravel layer, we were able to avoid concrete for the floor slabs.”

**Stefan Rüegg**

Dipl. Ing. BSc Timber Construction and  
Assistant Director of Timbatec Zurich Branch

was not an option for us“. Instead of a concrete layer, Timbatec proposed a gravel layer of eight centimetre. It consists of a crushed grit which is mixed with an elastic binder. Laboratory tests in the EMPA as well as construction measurements resulted in excellent values.

**Innovative load transfer**

Timber is about ten times stronger longitudinally to the fiber than crosswise. Heavy weights crosswise on timber can squeeze the fibres and lead to settlements. This must not happen with large timber structures such as Sue&Til. Timbatec wanted to transfer the force from one column to the one underneath

without squeezing the beam in between. „The solution was a lateral doubling with two vertical steel profiles on both sides of the girder, resting on slotted T-head plates. These profiles also simplified the positioning and assembling of the columns“, explains Stefan Rüegg.

**Steel beams protected with wood**

Timber slabs generally consist of three elements: a slab system, beams and columns. For the floor system, there is a range of options. For the beams, however, the choice is limited. Pure timber beams are generally too massive. Steel beams are lower, but they are heavy, costly and come along with a

bad carbon footprint. In addition, they have to be protected against fire. At Sue&Til, Timbatec has broken new ground: “We combined steel and timber in a single beam. The steel reinforces the timber during everyday use, while the timber protects the steel in case of fire“, explained Stefan Rüegg. The new beam only requires a small quantity of steel and it is, nevertheless, flat.

**Large timber buildings become popular**

Sue&Til is a trendsetting project. But Timbatec is already working on the next record holder: The „Krokodil“ building in the Sulzer Areal in Winterthur will already supersede Sue&Til as the largest wooden building in Switzerland.

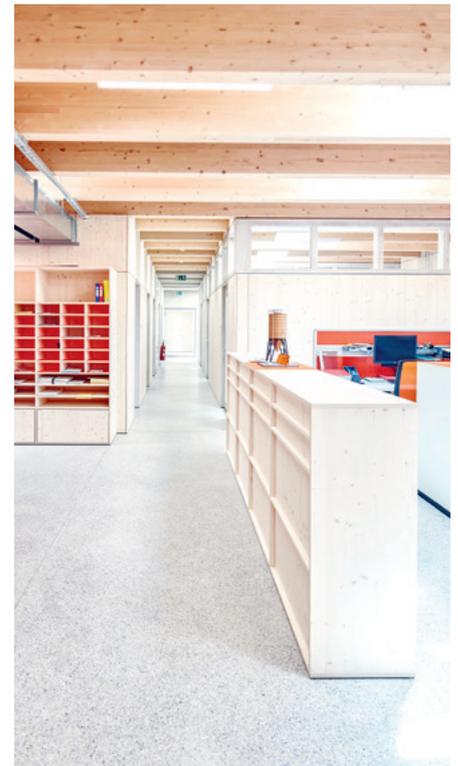
# Operation center with timber skeleton

At the operation center for the A16 highway in Loveresse (Bernese Jura), top precision was mandatory. The timber components made from Swiss wood had to be carefully planned for the 150 m long hall.



The 150 m long operation center fits perfectly into the landscape.

Offices in the operation center also feature the timber look.



Since 2016, the A16 highway ("Transjurane") is connecting the Swiss highway network with France. For use in maintaining the southern segment of this highway, the federal and cantonal governments decided to build a new operation center. The building owner aimed to implement a sustainable project that would replace several older operation centers. This provided the opportunity to source local materials from local partners. Lukas Rüeeggger, Managing Director of Timbatec Bern, emphasized: "This is a timber structure that uses a whole lot of Swiss wood."

## Maximum usage flexibility thanks to skeleton construction

"For operation centers like this one, skeleton construction is the right choice", explained Lukas Rüeeggger. In this technique, supports are erected at regular distances and

spanned with beams. Support/beam construction of this kind forms the backbone of the hall with its straight-line design. Walls, gates or windows can be installed in the spaces between the individual supports, as required. "Using this construction technique, customization is possible at a later time without impacting the static basic structure."

## Prix Lignum for the Loveresse operation center

The Prix Lignum is awarded every three years to trendsetting timber construction projects. The architecture of this simple longitudinal edifice, combined with the careful stacking of the narrow vertical and horizontal beams, won over the Prix Lignum jury: The operation center took 3rd place in 2018 for the west region.

## Building owner

Office for Land and Buildings (AGG) of the canton of Bern

## Architect

Claudia Meier & Markus Bachmann/MBAA

## Timber subcontractor

PM Mangold Holzbau AG

“Ökolandgut” residential facility, Gänserndorf, Austria

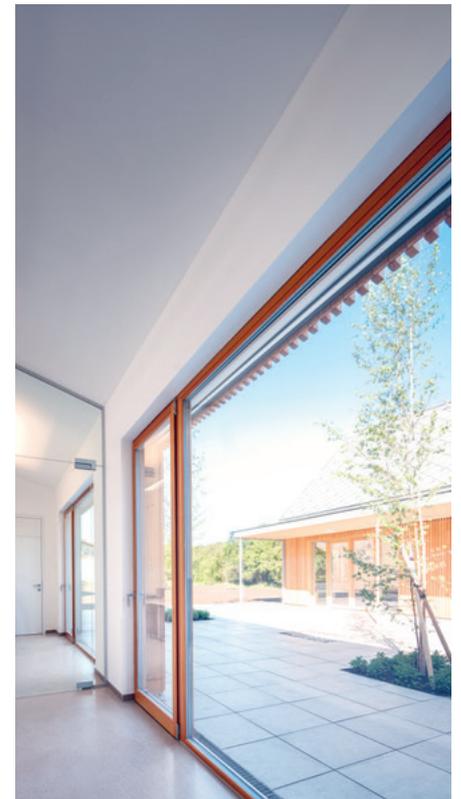
# Inclusive residential facility made from timber

The new residential facility for 12 young adults with disabilities fits perfectly into the landscape. Thanks to the selected building materials, this spacious timber structure meets all of the ecological requirements.



The residential facility is well integrated into the natural environment.

Special attention was paid to the fire protection and evacuation concept.



The Helga Keil-Bastendorff Foundation built the new residential facility on the Sonnenfeld biological manor near Vienna. Alongside the integrated animal shelter and certified organic farm, the residents learn to live with nature and other people.

## Special solutions for special people

The building concept was developed based on ecological principles and is intended to meet the diverse needs of the residents. “We paid special attention to the fire protection and evacuation concept”, explained Tamir Pixner, Managing Director of Timbatec Austria. Persons with limited mobility must also

be able to safely escape from the buildings if necessary.

## Suitable construction for every building component

For erecting the ground-level building, we selected reliable timber construction methods: The exterior walls were built using a timber frame technique with blown-in cellulose insulation. For the flat roofs, a ceiling made of cross-laminated timber was the ideal construction technique. Cross-laminated timber was used for the steep roofs of the residential group buildings as well. The residential facility has been occupied since the start of 2019.

## Building owner

Helga Keil-Bastendorff

## Architect

Sebastian Illichmann architecture

## Timber subcontractor

Liebbau Weiz

# A successful career with Timbatec

Timbatec offers its employees not just one, but three different career tracks: company manager, technical expert and project manager. In this manner, we can develop different types of talent.



We value the capabilities of all of our employees. Are you interested in a management role? If so, we can support your career in company management. Are you a technical specialist who wants to go deeper? Then, a career as a technical expert is the right choice. Do you like challenges and enjoy teamwork? If so, we can propose a career in project management. Timbatec has its fingers on the pulse of the latest developments. For us to succeed, we need committed and well-trained employees. This is why all of our employees have the right to 100 hours of personal continuing education per year. As a result, we as a team always stay at the state of the art – no matter whether the relevant topic is fire protection, building physics or earthquake safety.



“Are you interested in joining our team? Please contact us – we would like to get to know you.”

**Lukas Rügsegger**  
Managing Director Bern Office

### Our office locations

Timbatec has branches in Thun, Bern, Zurich and Vienna. After many successful years of business with continuous growth, our premises in Zurich became too small. Starting october 1st 2019, you can find us at our new location next to Zurich main station (Ausstellungsstrasse 36).

[www.timbatec.com](http://www.timbatec.com)

Switzerland:

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