



INTRODUCTION

SOLID TIMBER MANUAL 2.0

binderholz ■

 **Rigips**
SAINT-GOBAIN

INTRODUCTION

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3rd edition, February 2023

All information in this document reflects the latest state of development and has been prepared for you according to the best of knowledge and good faith. As we always strive to offer the best possible solutions for you, we reserve making changes due to improvements in terms of application or production technology. Assure yourself that you have the most recent edition of this document available. Printing errors cannot be ruled out.

This publication is targeted at trained specialists. The illustrations of executing activities contained in this document are not understood as processing instructions, unless expressly marked as such. Renderings and sectional views of the individual assemblies are not depicted on scale; they merely serve as illustration.

Our products and systems are matched to each other. Their interaction has been confirmed by internal and external testing. All information is generally based on the exclusive use of our products. Unless described otherwise, the information does not permit any conclusions as to the combinability with third-party systems or exchangeability of individual parts by external products; to this end, no warranty can be extended or liability accepted.

Please also note that our business relationships are exclusively subject to our general terms of sale, delivery and payment (GTC) in the current version. You can receive our GTC on request or find them online at www.binderholz.com and www.rigips.com.

We are looking forward to a pleasant cooperation and wish you great success with all of our system solutions.

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“It is time to rediscover what makes wood so substantial on a broad basis. Building with this healthy material opens new horizons in all respects. Involving our technology and a new aesthetic relevance are a great opportunity for the pioneering use of timber.”

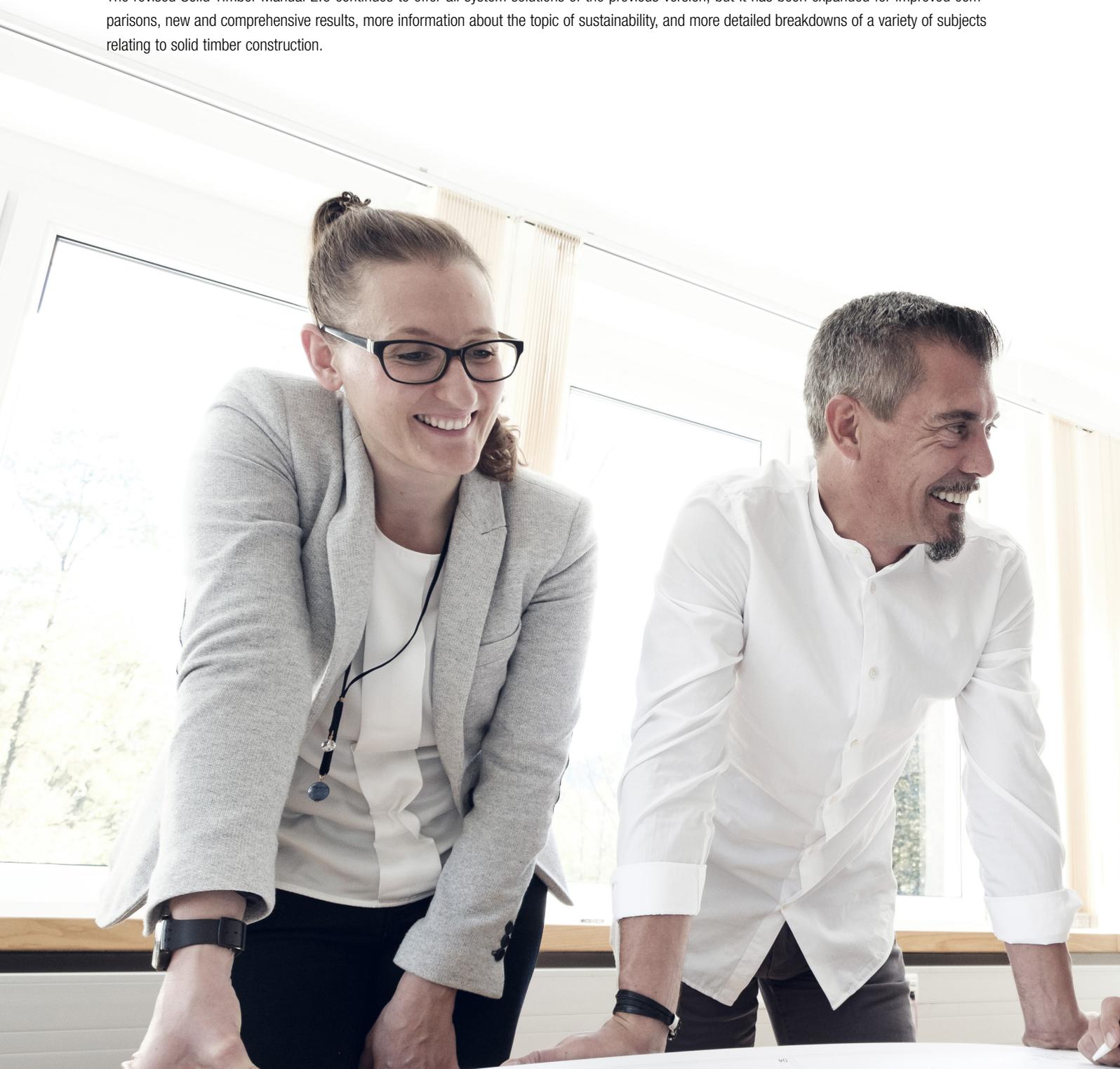
Architect Josef Lackner, 1979



THE SOLID TIMBER MANUAL 2.0

The Solid Timber Manual is a detailed reference work for architects, planners, builders and executing workers, and investors who are interested in solid timber construction solutions. The manual was created by two partners sharing one vision: Both want to develop and provide the right systems for living space worth living and for the construction of sustainable buildings. This motto brings together binderholz and Saint-Gobain Rigips Austria, and thereby unites them to form a perfect team because every building is a symbiosis of the most diverse materials. A special combination is the connection of binderholz cross laminated timber CLT BBS and dry construction systems. The benefits of one material support those of the other. The manual explains briefly the advantages of timber construction, offers valuable information on the topic of environmental protection and explains details of building physics. In specific, this concerns fireproofing, sound and heat insulation. The most important and comprehensive chapter describes tested structural assemblies.

The revised Solid Timber Manual 2.0 continues to offer all system solutions of the previous version, but it has been expanded for improved comparisons, new and comprehensive results, more information about the topic of sustainability, and more detailed breakdowns of a variety of subjects relating to solid timber construction.



Improvements and expansions

Additional assemblies for sound insulation of residential partition walls with double-layer installation level that comprise only one carrying CLT BBS wall layer have been tested. Compared to the double-layer assemblies (two separate CLT BBS elements per assembly), they have a significant economic advantage, such as gains in space by virtue of lower wall thickness, material savings and much more.

In the Solid Timber Manual 2.0, not only the components are evaluated in terms of sound insulation but the secondary sound paths leading through flanking components and component connections have been considered as well. For this purpose, the results of the calculation models and tests from the research project "Vibro-acoustics in the planning process for timber construction" have been processed.

The newly developed materials of Saint-Gobain have been tested elaborately. Exterior walls with different heat insulating compound systems of Weber and the latest insulating materials of Isover have been considered. By means of the examined optimisations, panelling thicknesses could be reduced, for example, in systems with one layer of 12.5 mm thick panelling of Rigips fire protection boards in wall, ceiling and roof structures.



Green centre, Holzkirchen | DE



Living in the Park, Mondsee | AT



Dalston Lane, London | GB

Testing institutes

Testing was performed at accredited testing institutes. They have many years of experience from research and monitoring activities at home and abroad. Exclusively by the institutions listed below assigned the building physical and ecological rating of the structures.



FIRE RESISTANCE TEST

The IBS and the MFPA Leipzig have subjected the CLT BBS for load-bearing and non-load bearing components, also in combination with Rigips systems, to a number of fire tests and they have classified its functionality and safety.



SOUND INSULATION

All sound insulation tests have been conducted by the ift Rosenheim and the timber research institute Holzforschung Austria. Their far-reaching experiences in timber construction make a significant contribution to the development of efficient solutions.



ECOLOGY

The Österreichische Institut für Bauen und Ökologie [Austrian Institute for Building and Ecology] (IBO) as well as the Institut für Baubiologie Rosenheim [Rosenheim Institute for Building Biology] (IBR) test and evaluate building products regularly and certify them according to their safety in use as a recommended construction material.



HEAT INSULATION

The characteristic values of the exterior components with high-quality insulation have been calculated by the Österreichische Institut für Bauen und Ökologie (IBO).

Approval and component database



APPROVED EUROPE-WIDE

binderholz CLT BBS and the Saint-Gobain building products are building materials with Europe-wide approval. The CLT BBS received the European technical approval ETA-06/0009 as early as in the year 2006. Besides the EN classification, Rigips Riduro timber boards and Rigidur H fibre reinforced plasterboards additionally have a European technical approval for particular characteristics.



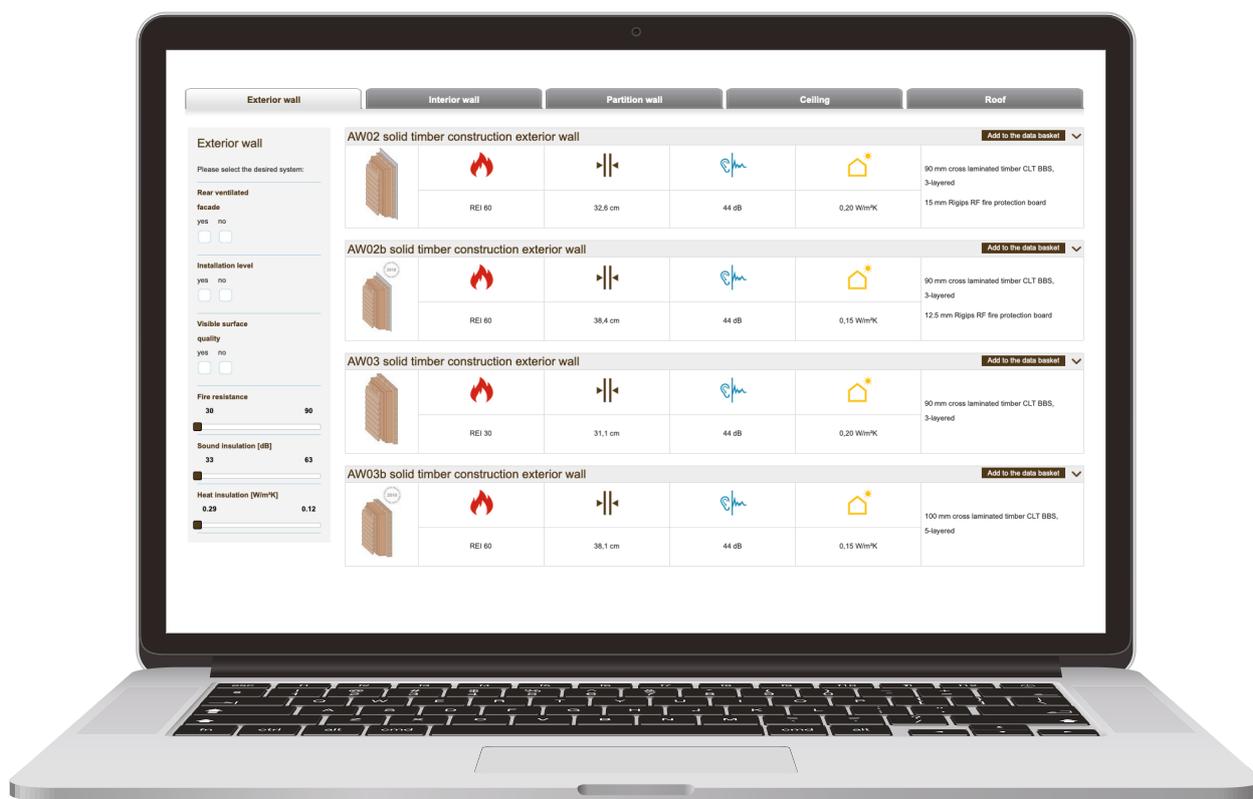
CONSTRUCTION BOOK

All assemblies in this manual have been evaluated and they can be found in the “baubook” construction product declaration book. The “baubook” is an online platform of ecological building products for guidance and information of manufacturers, dealers, builders, planners, experts and people interested. It not only serves to support the realisation of sustainable buildings but also as a reference work on topics such as subsidised housing development and climate control criteria.

Assemblies with additional details available online

You can find our Solid Timber Manual Online Tool at www.massivholzhandbuch.com/en.

All shown assemblies as well as supplementing details and component ratings are available in this database. Your benefit: You can download all drawing files and documents directly and use them in your CAD program.



TWO PARTNERS, ONE VISION

Developing systems for living space worth living and sustainable and functional buildings — this is the vision that connects binderholz and Saint-Gobain Rigips Austria.



binderholz – letting ideas roam freely

In the timber industry, the name of Binder stands for tradition and integrity, combined with high-tech and innovation. From humble beginnings as a small sawmill more than 70 years ago, the family-run binderholz has grown into a fully integrated group of companies that utilises state-of-the-art technology and manufacturing methods.

Besides its original headquarters in Fügen, Austria, binderholz operates 60 other sites. Some 6,300 employees at Austrian, German, British, Latvian, Finish and US sites share a passion for wood. Our solid wood products range from lumber, profiled timber, single and multi-ply laminated solid wood panels and glulam to binderholz CLT BBS. These are complemented by DIY products such as garden wood, construction wood and multi-purpose boards as well as wooden pallets and customised packaging solutions. Residual wood accruing during production is turned into densified biofuels, green electricity, press-board pallets and pressed pallet blocks.

Handling the wonderful raw material wood and of the environment responsibly guarantees high-quality solid timber products and biofuels. binderholz sees to the right raw material. All products are produced sustainably and efficiently according to the zero-waste principle and the resource wood is used to 100%. The energy-efficient processing that is sparing on resources assures an ecological, cost-aware and individual end product. By means of solutions based on energy and environmental awareness, wood can be used with a good conscience.

binderholz owes its reputation to providing elaborate customer care and its proximity to the customers, a product range and a price policy that are accordingly aligned to the market, as well as to binderholz's quality management.

As a competent partner, binderholz is at its customers' side with many years of experience, as well as tried and proven construction solutions using solid timber. Experts of the highly capable technical department offer comprehensive consulting and well-founded service. The qualified engineers, construction technicians and draftsmen provide competent support in all matters relating to statics and design, building physics and fire protection. In the development of building concepts, drafts of load-bearing structures and detail solutions, too, the experienced binderholz expert team is effectively at your side.

Each building is a symbiosis of the most diverse materials. A special combination is the connection of binderholz CLT BBS and dry construction systems of Saint-Gobain Rigips Austria. The benefits of one material support those of the other. Sustainability, the careful handling of resources and the energy-efficient operation of the buildings play a particularly important role in these considerations. To realise this aim, the companies bundle their know-how, development potential and consulting competency.

Rigips – sustainability in the DNA

Rigips drywall is one of the leading brands for modern interior finishing solutions in the German-speaking market and it is part of the Saint-Gobain Group, one of the world's 100 largest industrial corporations. Rigips offers diverse system solutions including all components needed for the purposes of the modern, dry and design-oriented interior finishing. The sparing use of natural resources is particularly important to the company. Therefore, the strict requirements that the company has imposed on itself go far beyond the legally mandated values.

Rigips Austria was founded in the year 1971 and has shaped dry construction in Austria over recent decades. By now, the company has three sites in Austria and multiple sales representations additionally in South East European countries. While capacity is being expanded con-

tinuously, the pollutant emissions have minimised to near zero and energy consumption has been reduced by more than 30%.

Rigips Germany has nine production sites and two logistics centres in Germany. Here, plasterboards, fibre reinforced plasterboard, dry screed and accessories are developed, produced and marketed under the Rigips trademark.

Sustainability is of central importance for Rigips. The innovative Rigips systems are therefore the ideal addition to timber construction. They round out the natural advantages of the building material wood with the ecological products of Rigips.

binderholz CLT BBS

The cross laminated timber CLT BBS (see Figure 1) has a multi-layered and completely solid timber design. By pasting lengthwise and transverse layers, the “working” of the wood, meaning swelling or shrinking, is reduced to a negligible measure. This way, it can safely fulfil the requirements for a modern construction material.

The material is monolithic, meaning in a certain sense made of “one piece of wood” with 0.6% ecologically harmless glue. The solid finished part can bear heavy loads, is fire resistant, can be installed quickly and dryly, and has sound and heat insulating effects. It regulates the room humidity and thereby creates a comfortable and well-balanced room climate – in the summer as well as in the winter.

It simplifies planning and construction. CLT BBS guarantees defined building physical and mechanical characteristics; this is why the planned building physics can be implemented and tested easily. Many planners quote this as being one of the greatest benefits of the CLT BBS construction design. No complexity in design, no films, no complicated details. Planning, construction and control – everything made simple.



Figure 1 – binderholz CLT BBS

Rigips dry construction systems

The dry interior finishing with systems made of plasterboard or fibre reinforced plasterboards (see Figure 2) has become well established for multiple reasons in architecture as well as in the private and public sphere: dry construction systems are standardised, easy to install and nonetheless permit the realisation of rooms with sophisticated design. Based on their composition, plasterboard products are ideally suited to master challenges of fire protection, acoustics and sound insulation, and they can be used permanently in wet rooms. Rigips boards are recommended in terms building biology and they contribute to a comfortable room climate.

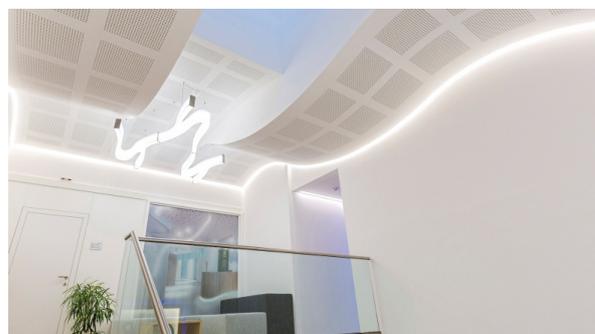


Figure 2 – Dry construction systems of Saint-Gobain Rigips Austria



ADVANTAGES OF TIMBER CONSTRUCTION

International studies attest to a great future of timber construction. While the ecological component has been decisive until recently, strong economic arguments are now increasingly coming into play.

Solid timber is natural, beautiful and cosy

Construction projects are created with solid timber products and building solutions of binderholz that meet all normative requirements for building physics and fire protection. The solid timber structures are stable in value, sturdy and meet the highest demands for quality, efficiency and ecological sustainability.

To assure this, all binderholz construction solutions are developed in close orientation on practice, and they are tested and certified. In addition, they permit a quick, dry, clean and low-noise construction design.

Thanks to the comprehensive research, development and certification work of binderholz, solid timber structures can be implemented nowadays in technical terms within the limits of the building code so that they reliably fulfil all generally applicable construction standards.

A large number of successfully realised reference objects and the constantly increasing demand prove that solid timber construction is equally popular as economically competitive. Technical and economic aspects meanwhile are only one side of it. There are further good reasons in addition that support solid timber construction.





For the question of suitable construction solutions and building materials, criteria such as ecology, sustainability, lifecycle costs, recycling and a sparing treatment of resources play an ever more prominent role. Solid timber construction is clearly superior to all conventional construction methods in these aspects. Besides, the binderholz construction solutions also offer great quality at a comparably low expense of construction time and cost.

Furthermore, binderholz manufactures according to the zero-waste principle. In this process, the raw material wood is utilised to 100% and largely with no effects on climate. This begins with the sparing wood harvest in exclusively sustainably managed forests and culminates in a wide range of solid timber construction projects. All by-products created in the manufacturing are completely utilised and converted into green energy in special biomass heat power plants or for the production of biofuels. Moreover, binderholz construction solutions stand out for their high degree of reusability and they can be completely ecologically recycled at the end of their lifecycle. This way, binderholz ensures a sparing and smart handling of the raw material wood.

Projects, such as Dalston Lane in Great Britain with nine storeys and lift shafts made of binderholz CLT BBS impressively prove the capacity of the solid timber construction design. Of all construction materials, wood has the best capacity: this is the relation of weight to load-bearing capacity. It is not only suitable for realising buildings of solid timber construction on particularly difficult parcels of land, for example, on mountain ridges in Zillertal of Tyrol, but also for constructing roof structures on pre-war houses in Vienna's city centre. Wood is the most frequently chosen building material when it comes to low-energy and passive houses – and notably for good reasons, as experts know because wood accomplishes meeting the building physical requirements to the full extent. Many people decide in favour of wood because of its room climate characteristics: the pleasant surface temperature and the ability to balance temperature and humidity peaks. Wood has an equally positive effect as plasterboard on the well-being of people and thus on their health. This, too, is not only an economic but also a macro-economic factor.

Eco-bonus wood

The natural resource wood also offers numerous advantages under environmental protection aspects in comparison to conventional building materials



Comfort and air quality

Solid timber stands for well-being and cosiness. This alone is ensured by the diverse possibilities for architectural design. For example, the visible surfaces in the interior of a building can be combined of different wood types such as spruce, stone pine, silver fir or CLT BBS antique and be further customised by means of paint varnishes and sanded or brushed surfaces. Together with the excellent properties of the wood mass as heat and moisture store, the warm wooden surfaces guaran-

tee a balanced living climate and a high measure of comfort. Construction products of Saint-Gobain have been provided with the seals of quality of the Blauer Engel or the Indoor Air certificates, and essentially contribute to a good room climate. Rigips Activ'Air plasterboards cannot only absorb pollutants from the air but also even convert them into inert substances. These positive characteristics have already been used in many buildings in the domestic and in foreign countries.



Lean, light-weight structures with high degree of pre-fabrication

binderholz construction solutions permit a maximum of pre-fabrication. This substantially reduces construction periods and assures high quality. Furthermore, solid timber structures convince for their economically attractive relation of gross to net residential floor space compared to conventional construction designs. In view of construction costs, this fact increasingly gains importance especially in the urban areas. Smart combinations of solid timber and conventional building materials such as concrete, steel and glass often lead to efficient

hybrid solutions. These conjoin the advantages of traditional materials with the benefits of the solid timber construction design. A big advantage, for example, is the comparably low weight of solid timber. This strength literally comes to bear when raising buildings by additional floors. Here, solid timber makes a compelling case by its structural possibilities and the fact that its comparably low weight does not significantly increase the load on the building.

Natural

As natural wood is used without building chemistry in solid timber construction, a building construction of solid timber has even positive effects on health. Cheap building materials and furniture can release problematic substances possibly causing allergies and other illnesses. To deliberately counteract the causation of such diseases, it should be relied upon materials that are harmless in terms of building biology. Solid timber is a completely unpolluted building material and moreover even strengthens the immune system and vitalises the nervous system. Wooden rooms have a calming effect and ensure a pleasant room climate. Plasterboards produced by Rigips Austria consist of natural plaster and they are tested regularly by the IBO for their non-objectionable properties.



Sustainability

Sustainability rests on three pillars: an economic, an ecological and a social pillar. All three of them must be in harmony before it can be spoken of sustainability. Building with wood fulfils all of them. Building with wood is economical. Building with wood is ecological because wood is a sustainable raw material. And building with wood is socially valuable because wooden structures are optimised energetically and therefore affordable over the long term.

Wood is a renewable raw material with a positive effect on the environmental climate. During their growth, trees convert CO₂ and water into hydrogen. When wood is used as building material, it serves for many years as a safe CO₂ store. Each cubic metre of wood that is used as substitute for other building materials, reduces the CO₂ emissions in the atmosphere by 1.1 tonnes on average. Gypsum is 100% infinitely recyclable. Through lean components that are sparing on resources, Rigips plasterboard contributes to sustainable construction throughout the entire lifecycle.

Pre-fabrication

Wooden building elements are nearly completely pre-fabricated (see Figure 3). This results in advantages of quality and scheduling. Even humidity and temperature is prevalent in the production halls. The assemblers work under steady framework conditions and the structures are protected from the effects of weather. The work in subsequent trades, such as electrical and sanitary installations, is prepared to the furthest extent so that the construction progress at the construction site proceeds in a coordinated and swift manner.



Figure 3 – Production supervision from the control room at the binderholz CLT BBS site in Unternberg

Efficiency

The low deadweight of timber and dry construction structures reduces the expense for the foundation and baseplates. The high degree of pre-fabrication simplifies the implementation at the construction site and secures a standardised and verifiable level of quality. The construction site equipment can be reduced and the logistics expense is

lower. The dry construction design shortens the construction periods significantly and thereby enables that the buildings can be used at an earlier point in time, which in turn drastically reduces the financing periods.

Savings of time

The savings of time through the use of binderholz CLT BBS in combination with Rigips dry construction systems can be substantial in the construction of large-volume buildings. The high degree of pre-fabrication drastically shortens the construction phase. Load-bearing wall elements simply need to be aligned and linked to each other. Drying periods for brickwork or screed are eliminated when using Rigips dry

construction systems. Based on their comparably low weight, these pre-fabricated timber elements can have very large dimensions. As the installation is made in the level between the plasterboard system and the timber element, the subsequent cutting and plastering work is omitted.

Long lifetime and value preservation

Long tradition in crafts and industry as well as targeted research and development have generated the experience to use the right product in the suitable manner for the various applications. Austrian institutions and businesses are internationally leading in the production and further development of wood and timber materials, and in state-of-the-art production and processing techniques. In modern timber construction, all businesses that manufacture self-contained wall and ceiling elements are subject to internal and external supervision. Moreover, many businesses are voluntary members of workmanship and quality associations. The quality of the used timber materials and products is ensured by means of defined standards and permits. If wood is used professionally (constructive wood protection), it has a long lifetime and its value is preserved.



Stability and light-weight

Wood stands out for its very high static quality. In reference to its dead-weight, wood carries 14 times as much as steel; its pressure resistance equals that of reinforced concrete. Multi-story wooden buildings and wide-area load-bearing structures are optimal areas of use. The reason for the high stability is the microstructure of wood, which

ensures high load-resistance with simultaneously low deadweight. Wood is therefore a light-weight building material with excellent technical characteristics. In spite of its low weight, wood offers high tensile and pressure resistance and it is resilient to weathering when it is used correctly.

More net useable area by virtue of narrower wall structures

Wood has excellent heat insulating characteristics, which is why substantially leaner walls than in conventional construction can be incorporated in solid timber buildings. For example, the portion of walls in timber construction adds up to merely 20% of the constructed overall floor space, while this portion is greater in conventional buildings (see Figures 4 and 5). This means that up to 10% more residential space can be had in a building made of wood with the same exterior dimen-

sions as a conventional building. In the case of a single-family home this means a gain of floor space of almost an entire room. For larger projects, this outstanding construction feature of wood also has positive effects on the construction density. Significantly less land is needed for high-quality residential buildings. Thus, also the cost share for land is reduced for all involved. Building with wood creates more living space.

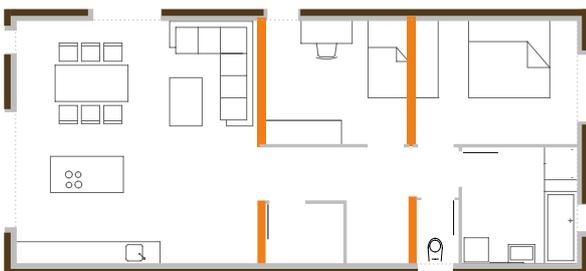


Figure 4 – Floor plan of a flat in the conventional construction style
Residential floor space of 100 m²

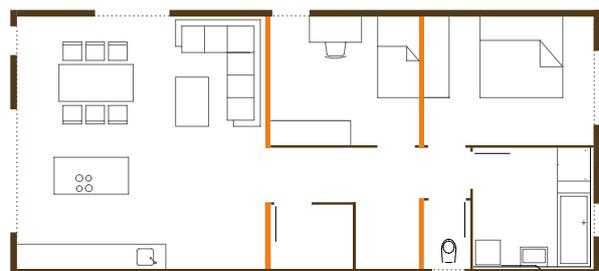


Figure 5 – Floor plan of a flat in the timber construction design
Residential floor space of 110 m²

Noise-free, dust-free, rainproof

Noise, waste and dust are three keywords that probably everyone associates with construction projects. Not so when building with CLT BBS. Based on the high degree of pre-fabrication and the installation method of solid timber, CLT BBS in particular, noise, waste and dust can be reduced drastically. The installation of CLT BBS does not require a noisy machine park, as individual elements are merely bolted together

er on site. A raised level of pre-fabrication of the CLT BBS elements reduces the processing steps on site and lowers the exposure to dust, waste and also noise. Since timber does not require any periods for drying and as the construction site is rainproof when the roof is set on top, also multi-storey floor additions can be realised quickly within a few days.



BUILDING WITH A SYSTEM

Massive safety

Timber construction systems using CLT BBS and Rigips dry construction systems fulfil all building physical requirements and standards for load-bearing walls, ceilings and roofs. They are tested according to European standards and meet requirements applicable Europe-wide. The products and production sites are remote monitored at regular intervals and the systems are optimised further. Therefore, the binderholz construction solutions of solid timber deliver safe and lasting building products for a wide range of applications.



Living with wood

The many years of experience of binderholz in the handling of wood and the knowledge about the texture, structure and composition of the wood form the basis for the modern and future-oriented handling of the raw material wood. All processing steps internal of binderholz,

covering everything from static planning and dimensioning of the structural timber products up to the production and final beam, take place at more than 60 sites by now in Austria, Germany, Great Britain, Latvia, Finland and the USA (see Figure 6).

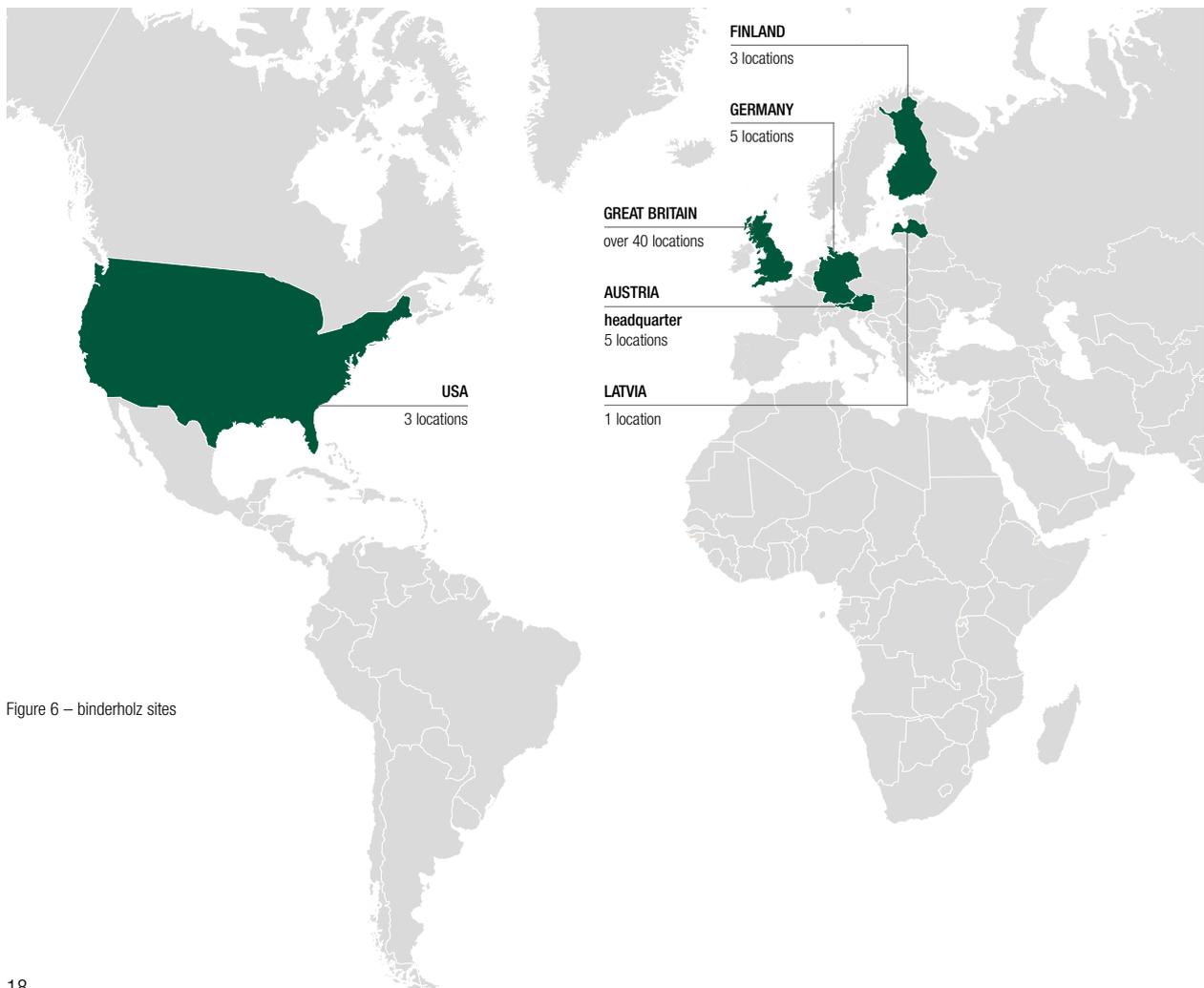


Figure 6 – binderholz sites

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