

MANUAL

LAM CONCRETE®

NEW

THE TIMBER-CONCRETE-COMPOSITE ELEMENT

Connecting **wood and concrete.**



A STRONG CONNECTION

When the leading manufacturer of wood and timber composite materials and the market and technology leader in industrial production of precast concrete components founded a joint venture in June of 2013 to research and develop a completely new timber-concrete-composite technique, the goal was nothing less than revolutionising the construction and installation of timber-concrete-composite slab components.

The complementary material properties of wood and concrete have been known and the materials combined for a long time – but no industrial prefabrication of these composite components had yet been attempted. Over a two-year period, a method was developed to produce an optimal material composite under controlled industrial manufacturing conditions, allowing a number of significant advantages for the construction site. Multiple industrial property rights (patents and utility models) are testimony to the uniqueness of the technology developed during this process.

Of course, a novel concept such as this is not adopted at every construction site right away. However, with many interesting and highly successful reference projects and the development of corresponding industrial standards, tender documents, and empirical values from practical applications, our XC® components have already reached a point where many planners and contractors value and recommend the benefits of this new construction method. With comprehensive consulting services from the very first planning phase through implementation on the build site, we also give our customers the certainty that they have optimally utilised the benefits of this innovative hybrid technology.

We are pleased that you are interested in our product. On the following pages, we present a compact product manual that makes the methods and benefits of the industrially prefabricated timber-concrete-composite (TCC) construction method understandable at a glance.

Sebastian Knoflach
MMK Managing Director

Alexander Barnaš
MMK Managing Director

Mayr-Melnhof Holz chain of custody certification for the cross-laminated timber in XC® living and glued laminated timber in XC® office

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PEFC/06-38-79
Promoting Sustainable Forest Management
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INDUSTRIAL PREFABRICATION MADE TO MEASURE: XC® SLAB ELEMENT REVOLUTIONISES TIMBER-CONCRETE-COMPOSITE CONSTRUCTION

Timber-concrete-composites combine the unique characteristics of two ingenious materials that have proven themselves for hundreds of years. But only industrial prefabrication of optimally produced composite components brings significant, scientifically proven savings of both time and money to the construction site. It is currently revolutionising all aspects of timber-concrete-composite construction.

The superior structural properties of wood and concrete and the composite's synergy are increasing the popularity of timber-concrete-composite construction. Modern living spaces require the highest-quality materials and a comfortable indoor climate, and their planners require flexibility in generating the floor plan. Wooden slabs are an environmentally friendly, sustainable alternative to classic mineral slabs, but at spans of more than five to six metres with single-span beams, they are costly. This makes them unrealistic for use in multi-storey residential buildings, both for economic reasons (the slab would be too thick at the required span) and structural reasons (vibration problems).

Timber-concrete-composite slabs are therefore being used more and more in multi-storey wooden buildings. In TCC slabs, the wood, which has a high tensile strength, is on the underside, and the concrete, which is highly resistant to pressure, is on top; these material properties, each favourable from a structural perspective, complement each other. The timber almost completely replaces the reinforcing steel that is otherwise required in the tensile area of mineral slabs. These slabs meet all of the structural requirements and are the standard for planners today.

However, the necessary collaboration of different trades and resulting coordination requirements increase construction site complexity. Until now, TCC slabs have been primarily produced in situ as cast-in-place components (assemble glued laminated and cross-laminated timber components including underpinning, seal joints, install connectors and reinforcements, and lay concrete). But this conventional design is not the typical assembly method used in timber construction. It leads to complex coordination between different trades (handovers between mineral builders and wood builders) and long wait times and work steps (concrete drying times, underpinning set-up times) before assembly can continue.

XC® The timber-concrete-composite: Two materials – one system

XC® slab components (X-lam/concrete), which are prefabricated at the factory to meet the customer's requirements, now offer timber construction companies the opportunity to assemble the entire load-bearing building structure in one go, autonomously and without working with or being dependent on another trade. XC® slab components are produced at the prefabrication plant according to specified component and product standards, protected from the elements and monitored for quality.

Prefabrication at the factory ensures high concrete quality and minimises deformations due to concrete shrinkage. The slabs do not need to be underpinned or reinforced on the construction site, eliminating the otherwise typical coordination between trades. All (prefabricated) components can be installed by timber installers (typically master carpenters), without having to worry about laying concrete.

Since underpinning and drying times are eliminated, subsequent finishing work (such as drywall installation) can be started much sooner, **reducing construction time by up to 40%, which is especially important in multi-storey buildings.** In the product version with the edge beam integrated into the slab, thermally insulated balconies can be connected at the production plant. In most cases, this means that no scaffolding is necessary for constructing the outer walls of a finished facade.

Innovative products with social and environmental responsibility

MMK's product portfolio consists of high-quality natural materials that are 100% recyclable and produced in our factories under controlled, worker-friendly production conditions. In addition to efficient, environmentally friendly production, we have also dedicated ourselves to increasing productivity on the build site using "lean construction" criteria. The favourable carbon footprint of the timber used, minimal transport distances, a material-saving design, significantly shortened construction time, and the substitution of strong wood for energy-intensive steel contribute greatly to achieving our climate goals and shaping a liveable future in our cities and communities.

Ready to go for planners and building contractors

The availability of comprehensive tender texts and documents removes all impediments to uncomplicated XC® component use: The new LG 36 standardised specification of services, part of LB HB 021 (standard specifications for building construction) and the update to the 2020 Austrian industrial standard includes tender items from MMK for the XC® slab elements and provides a solid, practical foundation for tendering, calculation, and cost planning in timber construction.

KEY PRODUCT BENEFITS:

- Predefined standards
- Large spans for simple floor plan layout
- Standardised tender documents
- Natural wood appearance maintained through tested sound insulation structures
- Excellent structural properties
- Effective sound insulation and very good vibration behaviour (slab class 1 according to Eurocode)
  Ready to install, no underpinning required
- Fire resistance certificate for design
- Benefits in construction process (see analysis by Graz University of Technology)
- No additional introduction of moisture during the construction process
- No connectors in the component in the standard version, therefore completely recyclable

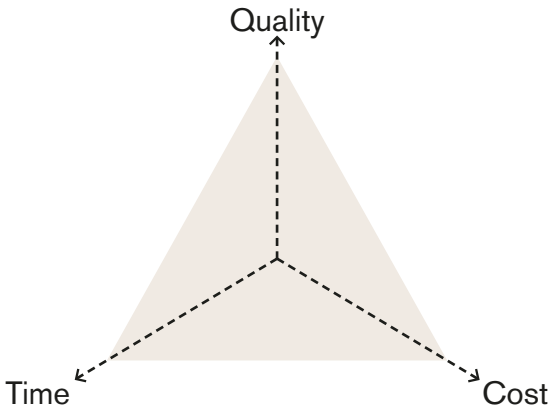
Winner of the Architecture+Building Innovation Award

MMK HYBRID SOLUTIONS

AN OVERVIEW OF OUR SERVICES

Hybrid Solutions – Build simply with planning and consulting services from a single source

With XC® composite components from MMK Holz-Beton-Fertigteile GmbH, you have chosen a new hybrid construction system that intelligently combines the strengths of each material, achieving characteristics and benefits that would be impossible with timber or conventional concrete alone. Industrial prefabrication also saves considerable amounts of time and money on the construction site. To ensure the best possible balance of quality, construction time, and overall costs for your building project, we provide you with a range of additional consulting services from a single source and accompany you step-by-step from the first preliminary design to completed building certification. You can thus be certain that you will profit from the experience and expertise of our renowned hybrid construction experts and complete your building project smoothly, cost-effectively, and free of stress.

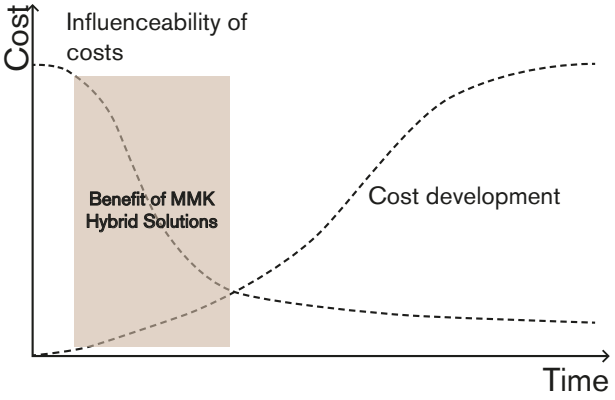


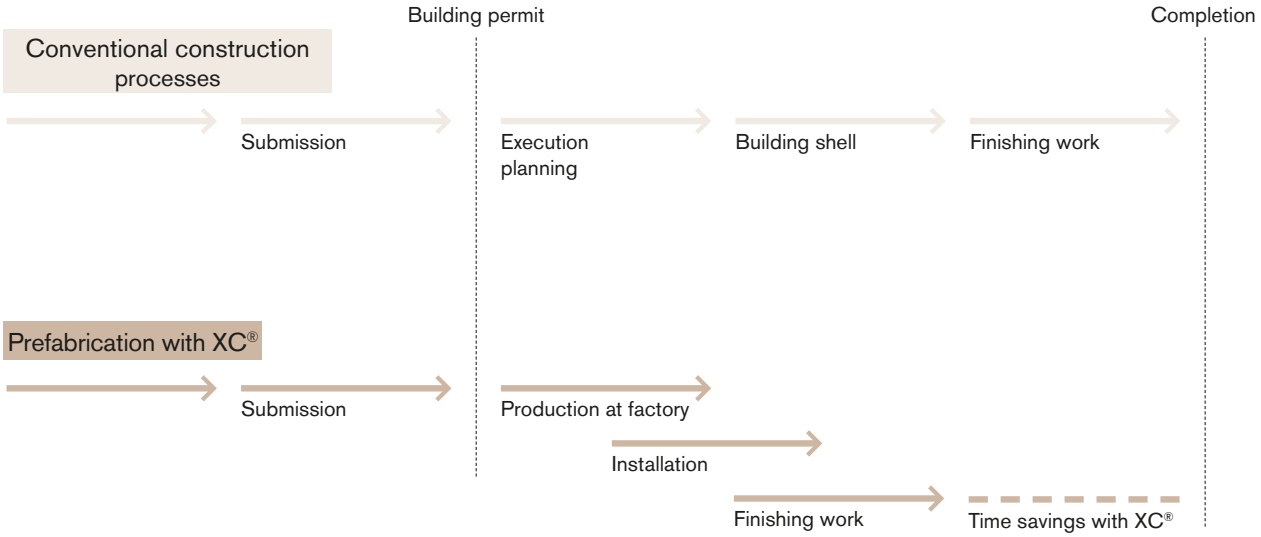
We are your first point of contact for building with the hybrid system

Whether you are just beginning to consider which building system to select or have already decided on the hybrid approach, it is a good idea to make us your first contact. As experts with practical experience from many successful projects, we can explain and calculate the advantages and disadvantages of all available options and versions for your specific building project, including a detailed comparison of the precast and in-situ methods. The earlier you get our experienced engineers involved, the more efficiently we can work together to plan the entire project. This will assure you that you can immediately take advantage of the full potential of this hybrid construction technique, which may be completely new to you. Our consulting services cover the entire project cycle, and you can choose the scope that best suits your wishes and requirements. We can serve as a single point of contact to coordinate all parts of the project, or you can select individual consulting services. As master builders, we are your first point of contact for competence in planning and building.

Consulting during the planning process saves time and money

You have probably heard the phrase “Good advice is valuable” – and especially for complex building projects, the earlier the advice, the more valuable it is! The most important decisions with the greatest influence on quality, construction time, and building costs are made in the planning phase. From a version study to the final draft, our experts optimise the use of the best component version for each individual requirement and situation: From fire safety and sound insulation criteria to environmental and economical considerations, the materials can exhibit their strengths in the project, individually or in tandem, only when they are used in the right place. Our planning services provide the optimal coordination between preproduction options and implementation on the construction site. As a result, you can plan complex details with a minimum of cost and effort and easily coordinate various workers. This gives you access to our wealth of experience in tried and tested detailed solutions in such applications as the connections between the walls, slab, and roof and for the relevant base points. As early as the planning phase, this ensures that the components will be easy to install properly on the construction site – a crucial advantage of the prefabricated hybrid system.





We keep the construction site and your budget on track

Upon request, we help you create a budget with transparent cost estimates, including cost control and optimised planning based on your budget requirements – including a detailed preliminary structural design that gives you a very concrete calculation of the required component dimensions during the planning phase and explains basic production feasibility. You can thus plan from the beginning with the correct dimensions and enjoy cost security. Our direct communication with the production plant and construction company gives you an optimally coordinated construction process and experience-based construction scheduling support. The combination of competent preplanning and industrial preproduction under constant conditions ensures that the process runs smoothly and flawlessly, not least on the construction site. And this means your building will be completed faster, more precisely, and in better quality.

*) The standard structural product assessment of the XC® slab includes the following:
- Proof of load-bearing capacity (concrete, cross-laminated timer, bird's mouth joints)
- Proof of load-bearing capacity in case of fire (REI)
- Proof of vibration
- Proof of deformation
- Consideration of camber
- Consideration of cut-outs

Services beyond this scope (proof of slab effect, introduction and transfer of global forces, connection details, etc.) must be agreed upon separately

AN OVERVIEW OF OUR SERVICES:

- Support during design planning (version study)
- Optimised use consulting during material selection (structural physics, environment, cost)
- Cost calculation, including cost optimisation
- Support during 3D planning and visualisation
- Preliminary structural design (including fire safety and vibration verification*)
- Costs and feasibility
- Support during submission, execution, and detailed planning
- Optimisation of build time and construction process
- At customer's request, coordination with the individual trades
- Support during building certification (life cycle)

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THE INTEGRATED CONSTRUCTION SYSTEM CONSISTING OF CONCRETE, TIMBER, AND PREFABRICATED TIMBER-CONCRETE-COMPOSITE COMPONENTS

The MMK hybrid system fits seamlessly into the proven, systematised construction system from Kirchdorfer Concrete Solutions (KCS) and brings the prefabricated crosslam timber components from Mayr-Melnhof Holz AG (MM) to your construction site. This gives you not only the best of both worlds, but also nearly limitless combinations! Each individual design element is used in a way that optimises the desired properties.

Beams

Strong beams open up a wide range of options for harmonizing spacious, open architecture with structural requirements.

- **KCS precast reinforced concrete beams**
- **MM masterline (glued laminated timber)**

Supports

In spun concrete or solid wood supports, high load-bearing capacity is combined with visually appealing design options.

- **KCS Rotop® spun concrete poles**
- **MM masterline (glued laminated timber)**

Access elements

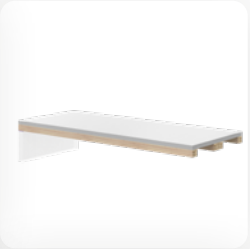
A comprehensive portfolio of customer-specific and project-specific prefabricated elements reduces complexity in modern residential construction.

- **KCS precast reinforced concrete stairs (straight, spiral)**
- **KCS porch systems**
- **KCS lift shafts**

Slab systems

Slab systems prefabricated according to customer needs with flexible design options and exceptional fire safety and sound insulation properties.

- **XC® living**
- **XC® office**
- **KCS hollow-core and full slabs**
- **MM crosslam (cross-laminated timber)**

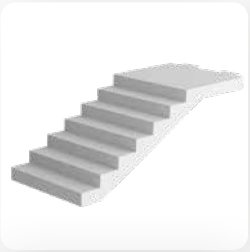



Wall systems

Designed as complete precast concrete parts or as solid wood elements, our wall systems fit together perfectly, greatly simplifying construction.

- **KCS Ziegelit® solid wall**
- **KCS solid concrete wall**
- **MM crosslam (cross-laminated timber)**





GLEIS 21

Multi-storey residential building, Austria

Challenge

The Gleis 21 project in Vienna's Sonnwendviertel is a group residential project in which future residents were heavily involved in the planning process. The construction costs were capped by Vienna residential building subsidies, but they still wanted to construct the five upper floors with wood if possible. Flat size flexibility and the layout of the (non-load-bearing) dividing walls between the flats required by the future residents meant that the slabs could be spanned only from the outer wall to the centre wall. The size and layout of the balconies for each flat could be freely chosen by the residents. All “Hybrid Solution” planning was possible only within the constraints of the existing building permit and subject to continuous communication with the contractors, planners, and residents.

Our solution

Prefabrication – the construction site becomes an assembly site

Version study in the tender phase with the goal of reducing on-site services. Replanning the load-bearing structure, including climate shell, for prefabrication and prefabricated part assembly. The wood construction company assumes the role of general contractor for the project.

XC® living plus and XC® living balcony

Prefabrication of the XC® living components at the factory with integrated reinforced concrete edge beams and balcony slabs enables assembly without underpinning and without coordination between different trades. No scaffolding is required, saving time and money.

PYRKERGASSE

Attic expansion, Austria

Challenge

Expanding attics in urban areas is one of the biggest challenges in the construction industry. During joint project planning, it was important to our client to keep the weight of the components as low as possible while taking advantage of the benefits of a prefabricated construction method.

Our solution

Prefabricated, cambered XC® living slab elements were mounted on the prefabricated edge beams. The balconies were then mounted on prepared rods in the XC® element by means Schöck's new, innovative IQlick system. This new system, which was used for the first time in Austria, can be assembled at nearly any time and without underpinning.

FIRE TEST

Wooden high-rise, Austria

Challenge

This wooden high-rise is classified according to EC1 as a building with “severe consequences in the event of failure” (CC3) and is designed so that the failure of a column can be compensated for.

We tested and verified the fire performance of the meeting point of the components (column, beam, and XC® slab component) in advance.

Our solution

Precast reinforced concrete beams spanned over two bearing axes are placed on laminated timber double supports with glued-in threaded rods and fixed with grout after the XC® elements were installed. The beams are connected with Gerber joints at certain intervals, This not only allows fast installation, but has also proven effective in fire testing.

MOOSBRUNN

Primary school expansion and renovation, Austria

Our solution

XC® slab elements prefabricated at the factory and placed onto load-bearing walls made of **MM crosslam®** allow assembly without underpinning or in-situ concrete work, so interior work can begin quickly. The XC® elements' high area density ensures that the demanding sound insulation requirements in school construction are met.

Challenge

In every school construction project, construction time and structural physics are among the challenges, as is environmental impact. The XC® slab elements, cross-laminated walls, and basement made of MABA precast concrete parts met this challenge perfectly.

- Building in an existing structure
- Lifting large parts over existing building, lower weight thanks to XC®
- Fast construction time (short school time interruption)
- Dry construction techniques (no drying times)
- Total construction time less than 11 months!

XC® COMPARED TO IN-SITU CONCRETE-COMPOSITE CONSTRUCTION: SCIENTIFICALLY PROVEN TIME AND COST SAVINGS

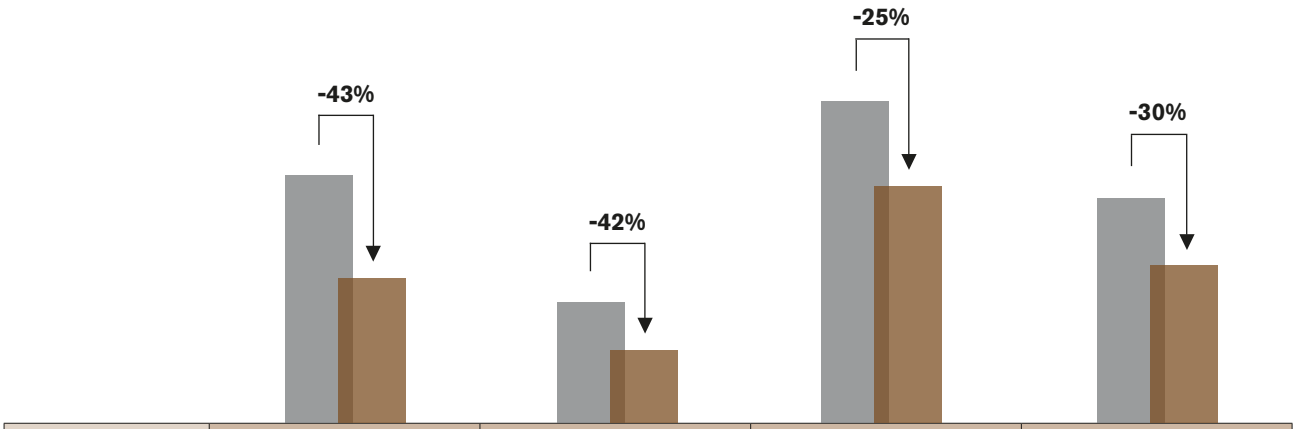
From the beginning, a key goal in developing the industrially prefabricated XC® product portfolio was using our composite components as efficiently as possible on the construction site. Elimination of many complex work steps, simplification of co-ordination between the woodworking and concrete trades, and, of course, efficient production under controlled conditions are therefore fundamental benefits of the overall system.

Significant, measurable reduction of construction site workload

In order to appropriately verify the ambitious aspirations of our product design in practice, a scientific study was performed in the summer of 2015 by the Institute for Building and Construction (*Institut für Baubetrieb und Bauwirtschaft*) at the Graz University of Technology. In a residential construction project run by Kaufmann Bausysteme on Paulasgasse in Vienna-Simmering, multiple buildings were constructed using different timber-concrete-composite methods. This allowed the researchers to determine the "effort values" on the construction site during the installation of comparable slab elements, each about 400 m², scored according to the REFA system, which is well established in the construction industry. These values allowed direct comparison of the slabs constructed using the in-situ concrete construction method and the XC® construction method.

Detailed on-site analysis of construction progress followed the activities necessary for installing cross-laminated timber, rework, installing reinforcements and laying concrete for the in-situ concrete version on the one hand and installing the prefabricated components and filling the joints for the XC® elements on the other. The result was clear: The overall costs of the XC® version calculated according to the ÖNORM B2061 standard were nearly one third lower. Construction time and labour were more than 40% below values for conventional construction with in-situ concrete. The planned and conceptualised savings effects have also been impressively demonstrated in practice on the first prototype construction sites – even with a relatively simple slab design. The more complex the building project, and the more demanding the required approaches for the building's equipment, the greater the savings effect. And, as the study also found, the quality is also higher!

Savings potential on the construction site:
Slab design in the Paulasgasse building project, Vienna



	Slab construction time	Workers	Truck transport	Effort values
TCC, in-situ concrete	39 h 12 min	19	Cross-laminated slab + in-situ concrete	0.35 h/m²
XC prefab	22 h 17 min	11	XC elements + crushed gravel	0.24 h/m²

Source: STUDIE HOLZ-BETON-VERBUNDDECKEN: XC® FERTIGTEILE IM MEHRGESCHOSSIGEN WOHNBAU.
Study by Graz University of Technology (*Institut für Baubetrieb und Bauwirtschaft*), 2015

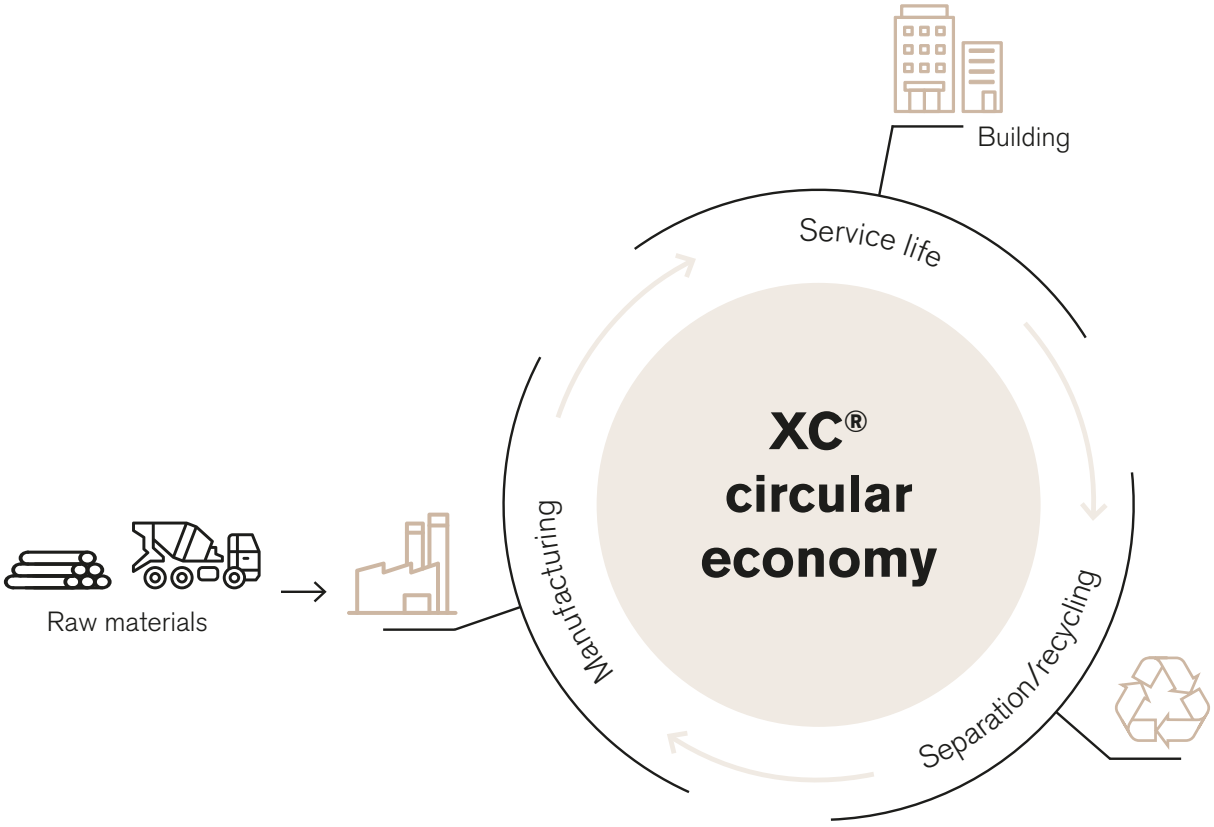
THE XC® SLAB IN THE CIRCULAR ECONOMY

Simple separation enables recycling of individual materials

The XC® slab was born from the idea of developing a sustainable construction technique. But sustainable construction is not limited to the composite materials used, the high degree of prefabrication, and the excellent structural properties – another important part of this sustainability concept is, wherever possible, complete recyclability at the end of the product life cycle.

Therefore, when the XC® slab was designed, special attention was paid to making the slab's composite materials as easy to separate as possible. Minimising the use of connectors in the design process allows the concrete slab to simply sit on the cross-laminated wood in a bird's mouth joint, forming a shear connection. Easy separation of wood and concrete is thus a part of the design – which in practice means that the XC® slab can be broken down into its constituent materials at the end of its life and does not have to be tossed into a landfill, which is expensive and damaging to the environment.

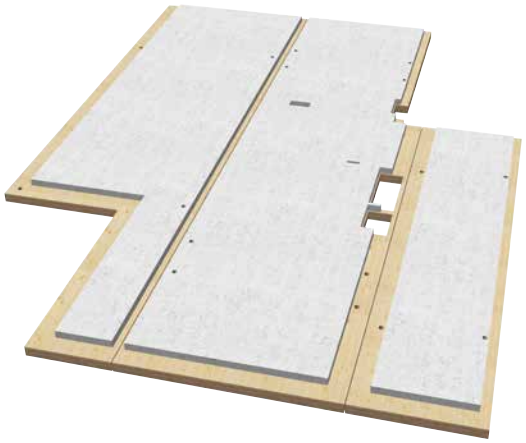
Incidentally, the Austrian mineral construction industry had a recycling rate of over 90% in 2019, making it a prime example of the circular economy in action. A considerable portion of the concrete is reused as concrete granulate to build roads, for instance. The cross-laminated timber is eminently suited to reuse and can be broken down into its original components with industrial methods after being used in the support structure. It then becomes a conventional wooden board, wood chips for the paper industry, or wood shavings for pellet production. Cross-laminated timber can be used to produce wooden fibre for use in a further life cycle as insulation in sustainable buildings or as furniture. Even with the stability provided in the XC® slab by combined wood and concrete, the materials can be separated easily and without complication at all times.



XC® LIVING

XC® living slab elements are industrially prefabricated, large-format, standardised timber-concrete-composite components for design applications in building construction in Use Classes 1 and 2 for such applications as the production of high-quality floors and partition slabs in:

- Single- and multi-family homes
- Multi-storey residential buildings
- Commercial buildings for offices, kindergartens, and tourism



XC® living slab elements
(example configuration,
manufactured to customer specifications)

PRODUCT DATA

XC® living slab elements are slabs that can be fully installed without underpinning and are produced at the factory under controlled conditions according to a predefined design using a structural type assessment. Upon request and after coordination, built-in parts such as empty electrical conduits or sockets can be preinstalled and delivered according to customer specifications and the structural situation. The XC® living element consists of a large-format solid wood slab which, when installed, absorbs the tensile forces, and a layer of concrete positively locked with bird's mouth joints to absorb compressive forces. The ratio of wood to concrete (in relation to the cross-section height) can be adjusted to the loads and demands of the specific use case within the specified structural design concept.

Since they are fully installed without underpinning, XC® living slab elements can be combined with other MABA residential building system components. They can also be laid on other linear supports (walls or balconies) in concrete, masonry, and wooden structures. Standardised design details are available for these purposes.

For placement on supports, an edge beam can be integrated into the structure (and can be flush with the slab). Depending on the requirement, this edge beam can be made from wood or reinforced concrete.

If the XC® living element with edge beams is used, cornice or balcony slabs (up to 2.0 m cantilever, concrete underside) can be set into the concrete in a thermally insulating manner at the factory using the Isokorb system.

Built-in parts

Standard XC® living slab elements are not reinforced. In special cases, reinforcement is also possible according to customer needs after the relevant project statics have been checked. For the minimum reinforcing steel coverage, the relevant national annexes of EN 1992-1-1:2015, 4.4.1.2. apply.

Examples of built-in parts:

- Transitions and recesses
- Reinforcement connectors
- Slab vents
- Welded embedments
- Mounting rails
- Empty conduits
- Empty electrical sockets

Material quality

Structure and production of cross-laminated wood

Cross-laminated wood is a large-format solid wooden slab with multiple layers oriented crosswise in cross-section. Finger-jointed, planed boards are laid next to each other and the planar surfaces of the layers are glued together at right angles. The structure consists of at least three layers and is typically symmetrical. The layers are brought together flush to obtain a gap-free surface before pressure is applied. To prevent uncontrolled cracks due to tension, the narrow sides are not glued.

Material characteristics of cross-laminated timber	
CE acc. to ETA approval	1359-CPR-0641
Material quality (acc. to EN 338)	Cross-laminated slab from C24
Bulk density	480 kg/m³
Thermal conductivity (λ)	0.10 W/mK
Heat storage capacity (c)	1.60 kJ/kgK
Diffusion resistance (μ)	60 (at 12% wood moisture content)
Burn rate	0.72 mm/min

Concrete strength, exposure classes, and steel quality:

Processing in the prefabrication plant allows the use of low-shrinkage concrete. XC® elements therefore bend much less than is common in conventional applications where the concrete is freshly poured on the construction site.

Material characteristics of concrete	
Standard designation (ÖNORM B 4710-1)	C30/37 or C35/45 XC3/RRS/GK16
Monitoring	ÖNORM B 3328
Bulk density	2,400 kg/m³
Thermal conductivity (λ)	2.00 W/mK
Heat storage capacity (c)	1.00 kJ/kgK
Diffusion resistance (μ)	130 (dry)

Marking and monitoring

XC® living slab elements are not covered by a harmonised European (hEN) standard and are therefore not subject to CE marking. They are used following project-based individual certification by a civil engineer authorised for this purpose.

The cross-laminated timber slabs used to produce the XC® living slab elements bear the CE marking, are subject to regular internal monitoring by the manufacturing plant, and are verified at regular intervals by accredited testing institutions (external monitoring).

EC Declaration of Conformity from Holzforschung Austria, No. 1359 – CPR – 0641

Precast concrete production plants in which XC® living slab elements are produced are certified, operate according to internal testing and control plans, and are subject to external monitoring by accredited testing institutions in accordance with ÖNORM B 3328:2012 (Precast concrete products – Requirements, tests and conformity assessment of products that are not covered by harmonized European product standards).

SUSTAINABILITY

Sustainable resource use

XC® living slab elements are typically planned in accordance with Class 4, Table 2.1 of ÖNORM EN 1990. Compliance is ensured for the environmental influences at the location of use (exposure classes) through compliance with the stipulations of ÖNORM B 1992-1-1 and ÖNORM B 4710-1.

The two material layers (cross-laminated timber and concrete) can be easily separated after reaching their typical duration of use (usually 50 years) if they are demolished properly. The bond between wood and concrete typically uses no mechanical connectors (screws, etc.) or chemical agents (adhesives, etc.). Crushers can crush the concrete into concrete gravel and crushed sand, which can be recycled as an aggregate for recycled concrete, for example. Demolition of reinforced concrete also includes separation of reinforcing steel. This scrap steel can be melted down and shaped into new steel products.

The wood used to produce XC® living elements is from sustainably managed forests (PEFC Certificate No. HCA-CoC-0120). Depending on its condition, it can be “downcycled” or used for thermal energy.

TECHNICAL PROPERTIES

Mechanical strength and stability
The static load-bearing capacity of the XC® living slab elements has been determined in accordance with EC for different use cases and loads as part of a structural type assessment and documented and listed in the load/span tables shown above.

Structural design
The XC® living slab elements' structural design is based on a design model for the single-span beam structural system and the impacts according to EN 1991-1-1 and ÖNORM B 1991-1-1. It is documented in a structural type assessment and has been assessed and confirmed by a civil engineer. It is provided by MMK at the request of the customer and must be checked by a qualified civil engineer (typically the structural engineer responsible for the project) and confirmed and approved as part of the project's structural assessment.

Geometric properties
Element thickness depends on structural requirements (span, bending, and applied load) and varies from 20.0 to 36.0 cm. The limits in the other dimensions are between 1.05 and 3.00 m in width and up to 10.20 m in length. The minimum billable width is 2.40 m; additional billable widths go up in increments of 10 cm to a maximum of 3.00 m. Minimum element length is 6.0 m. Elements can have structural camber to limit deformation with large spans or applied loads. Shim plates, multi-span beams, cantilever slabs, and special dimensions can be delivered upon request.

Dimension limits (standard elements):
- Element height: min. **20** cm – max. **34** cm
- Standard width: **240** cm
- Element length: max. **1**,**020** cm (XC® living)
- Element width: min. **105** cm – max. **300** cm
- Element weight: max. **7.68** t
  (XC® balcony up to about 12 t possible)

Billing
Billable widths: 2.4 m | 2.5 m | 2.6 m |
2.7 m | 2.8 m | 2.9 m | 3.0 m

Intermediate widths are billed at the next largest billable width.

Tolerances
Cross laminated timber is manufactured to the exact ordered dimension. Production tolerances and natural wood shrinkage and swelling can lead to cross-section deviations.

Element size
Recommendation for XC® living slab elements: 18 to 32 m²

At a measured reference moisture content of 12%, the manufacturer's dimensional tolerances for cross-laminated timber are:

Maximum tolerances for slab and roof elements		
XC® living	**Tolerance limits** [mm] depend on the nominal dimensions	
	< 100 cm	> 100 cm
Width, height (edge length) and openings	± 2 mm	± 0.2% of the nominal dimension or max. ± 5 mm
Element thickness	+10 mm/-5 mm	+10 mm/-5 mm

For the concrete layer, the simple tolerances for dimensions and the angle and evenness tolerances in accordance with ÖNORM EN 13369:2018-10 Section 4.3.1 Geometric properties and 4.3.2 Surface quality apply. Higher requirements can be applied, but require a separate agreement.

Performance in the event of fire
With regard to fire safety, XC® slab elements can be classified as European construction material Class D, s2, d0 in accordance with the ÖNORM EN 13501 standard.

Fire resistance class
When the maximum span is fully utilised, standard XC® living slab elements meet the requirements of fire resistance class R90 starting at a cross-laminated timber slab thickness of 140 mm. Versions that meet higher fire resistance classes are possible.

Notes regarding the load/span table
- Calculation of the span limits according to Eurocode; useful loads including partition wall allowance ≤ 1.0 kN/m²
- The listed slab types correspond to Slab Class 1 in accordance with Eurocode and can be used as partition slabs between two different housing units
- The indicated maximum spans (see excerpt from the structural type assessment) are for preliminary planning only and do not replace a structural certificate. In individual cases, a structural examination of the overall system must be performed by the structural engineer for the project.
- Additional versions of the product are available upon request.

Load/span table for single-span beam in accordance with EC and national annex for Austria

			Category A1: Residential 2.5 kN/m²		**Category B2:** Office 3.5 kN/m²	
			Light structure 1.0 kN/m²	Heavy structure 2.0 kN/m²	Light structure 1.0 kN/m²	Heavy structure 2.0 kN/m²
Designation h_{clt} | $h_{concrete}$	**Component height** [mm]	**Area densities** [kg/m²]	**Maximum span** in [cm] **Fire resistance** in [min]			
XC® living 120|80	200	250	579 30	544 30	597 30	550 30
XC® living 140|80	220	260	625 90	602 90	627 90	592 90
XC® living 160|80	240	270	680 120	658 120	680 120	647 120
XC® living 180|80	260	280	717 90	699 90	717 90	690 90
XC® living 120|100	220	300	611 30	578 30	600 30	569 30
XC® living 140|100	240	310	669 90	633 90	658 90	624 90
XC® living 160|100	260	320	726 120	688 120	714 120	678 120
XC® living 180|100	280	330	768 120	728 120	755 120	718 120
XC® living 200|100	300	340	810 120	767 120	796 120	757 120
XC® living 120|120	240	340	646 30	613 30	635 30	604 30
XC® living 140|120	260	360	701 90	666 90	690 90	657 90
XC® living 160|120	280	370	756 120	719 120	744 120	710 120
XC® living 180|120	300	375	795 120	757 120	783 120	746 120
XC® living 200|120	320	380	833 120	793 120	820 120	783 120
XC® living 180|140	320	420	823 120	786 120	811 120	776 120
XC® living 200|140	340	430	858 120	820 120	846 120	810 120

Load/span table for single-span beam in accordance with EC and national annex for Germany

			Category A2: Residential 2.3 kN/m²		**Category B1:** Office 2.8 kN/m²	
			Light structure 1.0 kN/m²	Heavy structure 2.0 kN/m²	Light structure 1.0 kN/m²	Heavy structure 2.0 kN/m²
Designation h_{clt} | $h_{concrete}$	**Component height** [mm]	**Area densities** [kg/m²]	**Maximum span** in [cm] **Fire resistance** in [min]			
XC® living 120|80	200	250	538 30	506 30	533 30	502 30
XC® living 140|80	220	260	595 90	560 90	589 90	555 90
XC® living 160|80	240	270	649 120	612 120	643 120	607 120
XC® living 180|80	260	280	692 120	653 120	686 120	648 120
XC® living 120|100	220	300	569 30	538 30	564 30	534 30
XC® living 140|100	240	310	623 90	589 90	617 90	585 90
XC® living 160|100	260	320	675 120	640 120	669 120	635 120
XC® living 180|100	280	330	715 120	678 120	709 120	673 120
XC® living 200|100	300	340	754 120	715 120	747 120	710 120
XC® living 120|120	240	340	631 30	600 30	626 30	596 30
XC® living 140|120	260	360	652 90	620 90	647 90	616 90
XC® living 160|120	280	370	703 120	669 120	697 120	665 120
XC® living 180|120	300	375	740 120	704 120	734 120	699 120
XC® living 200|120	320	380	776 120	739 120	770 120	734 120
XC® living 180|140	320	420	766 120	732 120	760 120	727 120
XC® living 200|140	340	430	799 120	764 120	794 120	759 120

SURFACES

Surface qualities
The standard concrete surface on the element's upper side is screeded and floated. Any additional surface treatment (broom finish, smoothing, etc.) requires a separate agreement. The concrete side surfaces against the form are smoothness S1, 2P, F1 in accordance with ÖNORM B 2204:2021-01, Annex A.2.4. Standard wood surfaces are delivered in spruce from domestic forests (PEFC certified).

Underside in residential quality (WSI)
Suitable for XC® living slab elements intended to remain visible, with special requirements regarding a homogeneous surface structure and timber slat quality. This surface is especially popular in residential buildings, schools, and office buildings where the owner desires a homogeneous appearance for the natural wood.

- Only raw material of the highest visual timber grades is used.
- The slats must have a maximum thickness of 20 mm and ensure a minimal gap in the joint.
- The surface is sanded. To prevent shrinkage cracks, standard joints are not additionally glued.
- Special surfaces, coatings, and other types of wood are available upon request.
- There may be a few isolated loose knots, and defects and small resin pockets (≤ 5 x 50 mm) are permissible. Correction with a different type of wood is also permissible.
- Sanded surface.

Non-visible quality (NSI), not pictured
Non-visible surfaces in XC® living slab elements perform only load-bearing and structural physics functions. The surfaces do not have to meet any visual standards, so it is recommended that they be covered with other panelling after installation.

- The slats are selected only according to the sorting criteria for load-bearing capacity for C24 in accordance with EN 338.
- There may be colour differences between individual slats (such as blue stain) and loose knots, ingrown bark, and signs of insects (burrows up to d = 2 mm).
- There may be isolated gaps in the outer layer, glue stains, isolated pressure points, and soiling.
- Planed surface, no further requirements.

WSI example image

WSI example image

WSI example image

Underside in industrial visible quality (ISI)

XC® living slab elements with industrial visible-quality surfaces are suitable for use in industrial areas where the surface structure is to remain visible and the owner wishes natural wood appearance. The surface structure is adapted to use in commercial and industrial construction.

- In addition to load-bearing capacity sorting criteria, increased aesthetic criteria are used in selecting the slab slats.
- Selected slab slats with healthy, firmly intergrown knots.
- There may be a few isolated loose knots, and defects and small resin pockets (⩽ 10 x 90 mm) are permissible. Correction with a different type of wood is also permissible.
- Sanded surface.

Criteria	NSI	ISI	WSI
Joint width	⩽ 4 mm	⩽ 4 mm	⩽ 2 mm
Mix of wood types	✓	○	x
Firmly intergrown knots	✓	✓	✓
Black knots, loose knots	✓	○	○
Resin pockets	✓	○	○
Ingrown bark	✓	○	x
Dry cracks	✓	✓	○
Wane	✓	x	x
Defects	—	○	○
Signs of insects	○	x	x
Discolouration (e.g., blue stain)	✓	○	x
Compression wood	✓	✓	○

✓ permissible; ○ permissible in isolation; x not permissible

ISI example image

ISI example image

ISI example image

Important information

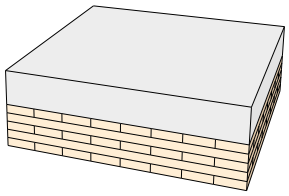
Please note that cross-laminated timber is
a natural product that can change in appearance (colour, surface, etc.). Even when
the raw material is chosen with care, there may be deviations in the structure of the wood. Surface appearance is determined by the outer layer's board structure. Over time, gaps may appear between the individual boards (due to fluctuations in humidity, for example). There may also be a few isolated surface cracks due to drying. The client may incur additional costs for repairs to visible surfaces due to improper installation, manipulation, or storage on the construction site. The surface qualities refer to the underside and can be combined in different ways for each element. Edge surfaces are generally provided in non-visible quality. Note that cross-laminated timber is a semi-finished product and that additional surface treatment on the construction site is recommended.

SOUND INSULATION

Due to their high area density of 250 to 430 kg/m², XC® living slab elements have very good sound insulation properties and can be used as partition slabs between different units in office buildings and multi-storey residential buildings with typical (sonically decoupled) flooring, even without false slabs. The following tables show a selection of our tested and expert-approved slab structures – with and without flooring. XC® elements thus provide the best in sound insulation in addition to certificates of structural fire safety and vibration performance.

XC® living slab elements without floor construction

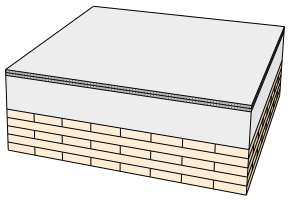
System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Measured values	
			Rated sound reduction index	Rated standardised impact sound level
XC® living 160|120	280	370	R_w (C; Ctr) = 55 (-2; -6) dB	$L_{n,w}$ (C1) = 86 (-14) dB
NEW XC® living 140|80	220	260	R'_w (C; Ctr) = 50 (-1; -6) dB	$L'_{n,w}$ (C1) = 87 (-14) dB
NEW XC® living 140|90	230	285	R'_w (C; Ctr) = 52 (-2; -7) dB	$L'_{n,w}$ (C1) = 86 (-14) dB



NEW XC® living hotel slab element

Slab element with carpeting

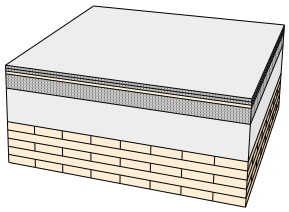
System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Measured values	
			Rated sound reduction index	Rated standardised impact sound level
DESSO SoundMaster	7	4.5	R'_w (C; Ctr) = 52 (-2; -7) dB	$L'_{n,w}$ (C1) = 48 (-1) dB
Levelling compound	17	24		
XC® living 140|80	220	260		



XC® living slab elements with dry screed

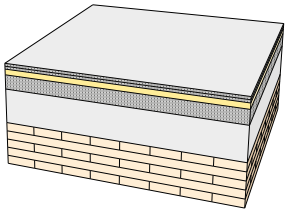
Flooring structure: FERMACELL type 2E31 with dry fill

System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Measured values	
			Rated sound reduction index	Rated standardised impact sound level
Plasterboard with 10 mm fibreboard	2 x 10	25	R_w (C; Ctr) ⩾ 61 (-2; -7) dB	$L_{n,w}$ (C1) = w 55 (0) dB
Levelling fill (dry fill)	60	24		
XC® living 160|120	280	370		



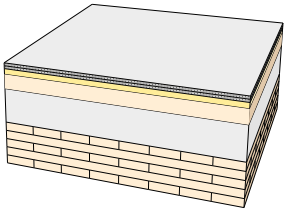
Flooring structure: FERMACELL type 2E35 with dry fill

System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Measured values**	
			Rated sound reduction index	**Rated standardised impact sound level**
Plasterboard with 20 mm mineral wool	2 x 13	32	R_w (C; Ctr) ⩾ 63 (-3; -9) dB	$L_{n,w}$ (C1) = 49 (2) dB
Levelling fill (dry fill)	60	24		
XC® living 160|120	280	370		



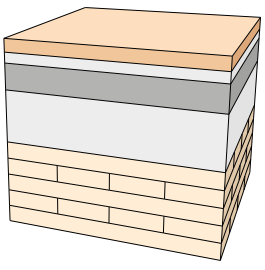
Flooring structure: FERMACELL type 2E35 with softwood fibreboards

System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Measured values**	
			Rated sound reduction index	**Rated standardised impact sound level**
Plasterboard with 20 mm mineral wool	2 x 13	32	R_w (C; Ctr) ⩾ 64 (-1; -7) dB	$L_{n,w}$ (C1) = 47 (1) dB
Soft wooden fibreboard	40	75		
XC® living 160|120	280	370		



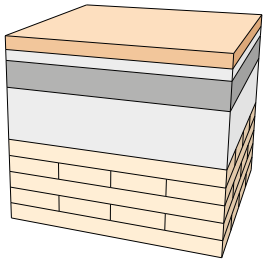
Flooring structure: Dry screed with light fill

System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Assessment values**	
			Rated sound reduction index	**Rated standardised impact sound level**
Powerpanel TE	25	25		
Floorrock GP sound insulation board	20	2.5		
Fill (light)	50	20		
XC® living 140|80	220	260	R_w ⩾ 56 dB	$L_{n,w}$ ⩽ 55 dB
XC® living 160|100	260	330	R_w ⩾ 58 dB	$L_{n,w}$ ⩽ 52 dB
XC® living 180|120	300	375	R_w ⩾ 59 dB	$L_{n,w}$ ⩽ 49 dB



Flooring structure: Dry screed with heavy fill

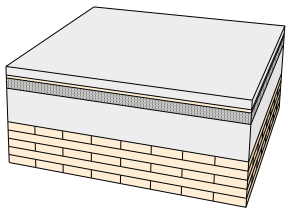
System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Assessment values	
			Rated sound reduction index	Rated standardised impact sound level
Powerpanel TE	25	25		
Floorrock GP sound insulation board	20	2.5		
Fill (heavy ⩾ 1,300 kg/m³)	50	65		
XC® living 140|80	220	260	$R_w \geqslant 58$ dB	$L_{n,w} \leqslant 53$ dB
XC® living 160|100	260	320	$R_w \geqslant 59$ dB	$L_{n,w} \leqslant 50$ dB
XC® living 180|120	300	375	$R_w \geqslant 60$ dB	$L_{n,w} \leqslant 48$ dB



XC® living slab elements with cement screed

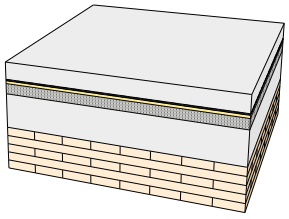
Flooring structure: Cement screed with bonded EPS fill and tacking sheet

System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Assessment values	
			Rated sound reduction index	Rated standardised impact sound level
Cement screed	70	140	$R_w \geqslant 61$ dB	$L_{n,w} \leqslant 52$ (+2) dB margin
EPS TS staple plate s' ⩽ 16 MN/m³	30	6		
EPS bonded fill	50	18		
XC® living 160|120	280	370		



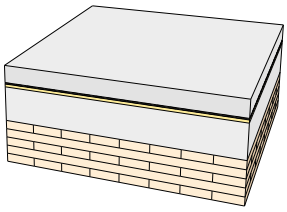
Flooring structure: Cement screed with bonded EPS fill and mineral fibreboard

System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Assessment values	
			Rated sound reduction index	Rated standardised impact sound level
Cement screed	70	140	$R_w \geqslant 63$ dB	$L_{n,w} \leqslant 45$ (+2) dB margin
Mineral fibre impact sound insulation s' ⩽ 10 MN/m³	30	3.3		
EPS bonded fill	50	18		
XC® living 160|120	280	370		



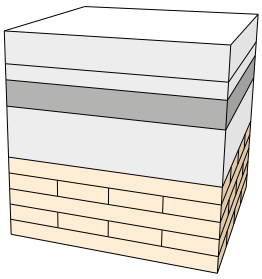
Flooring structure: Cement screed with mineral fibreboard

System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Assessment values**	
			Rated sound reduction index	**Rated standardised impact sound level**
Cement screed	70	140	$R_w \geqslant 63$ dB	$L_{n,w} \leqslant 45$ (+2) dB margin
Mineral fibre impact sound insulation s' ⩽ 10 MN/m³	30	3.3		
XC® living 160|120	280	370		



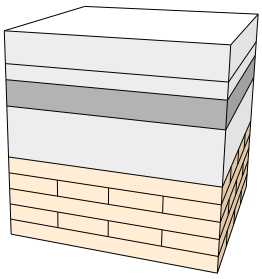
Flooring structure: Cement screed with light fill

System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Assessment values**	
			Rated sound reduction index	**Rated standardised impact sound level**
Cement screed	60	132		
Mineral fibreboard impact sound insulation s' ⩽ 9 MN/m³	30	5		
Fill (light)	50	20		
XC® living 140|80	220	260	$R_w \geqslant 57$ dB	$L_{n,w} \leqslant 46$ dB
XC® living 160|100	260	320	$R_w \geqslant 58$ dB	$L_{n,w} \leqslant 44$ dB
XC® living 180|120	300	375	$R_w \geqslant 59$ dB	$L_{n,w} \leqslant 42$ dB



Flooring structure: Cement screed with heavy fill

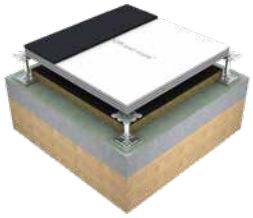
System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Assessment values**	
			Rated sound reduction index	**Rated standardised impact sound level**
Cement screed	60	132		
Mineral fibreboard impact sound insulation s' ⩽ 9 MN/m³	30	5		
Fill (heavy ⩾ 1,300 kg/m³)	50	65		
XC® living 140|80	220	260	$R_w \geqslant 59$ dB	$L_{n,w} \leqslant 44$ dB
XC® living 160|100	260	320	$R_w \geqslant 60$ dB	$L_{n,w} \leqslant 42$ dB
XC® living 180|120	300	375	$R_w \geqslant 61$ dB	$L_{n,w} \leqslant 40$ dB



XC® living slab elements with raised floor

Dry hollow floor structure, with and without integrated floor heating, with carpeting

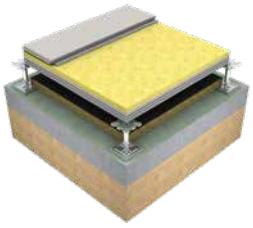
System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Assessment values**	
			Rated sound reduction index	**Rated standardised impact sound level**
Carpeting	10	61 62*	$R'_w \geq 62$ dB	$L'_{n,w} \leq 48$ dB
FLOOR and more® G 40	40			
Cavity damping (mineral wool)	50			
Hollow floor support on sound insulation plate (type DP PU 90, 6 mm)	Support height as needed			
XC® living 160|120	280	370		



* FLOOR and more® comfort G 40 AL/N 40 AL (integrated floor heating)

Flooring structure for free choice of covering

System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Assessment values**	
			Rated sound reduction index	**Rated standardised impact sound level**
NORIT-TE 30*	30	93	$R'_w \geq 62$ dB'	$L'_{n,w} \leq 48$ dB
Impact sound insulation	20			
FLOOR and more® G 40	40			
Cavity damping (mineral wool)	50			
Hollow floor support on sound insulation plate (type DP PU 90, 6 mm)	Support height as needed			
XC® living 160|120	280	370		

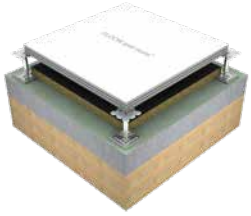


* Choice of covering depends on structural load capacity.

NEW

Dry hollow floor structure with free choice of covering

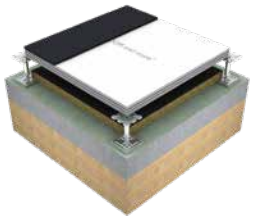
System structure from top to bottom	**Thickness** [mm]	**Area densities** [kg/m²]	**Assessment values**	
			Rated sound reduction index	**Rated standardised impact sound level**
FLOOR and more® G 40	40	51	R'_w (C; Ctr) = 57 (-2; -6) dB	$L'_{n,w}$ (Cl) = 61 (-2) dB
Cavity damping (mineral wool)	50			
Hollow floor support on sound insulation plate (type DP PU 90, 6 mm)	Support height as needed			
XC® living 140|80	220	260		



Dry hollow floor structure with carpeting

NEW

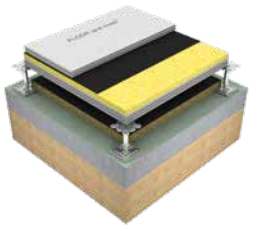
System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Assessment values	
			Rated sound reduction index	Rated standardised impact sound level
DESSO SoundMaster	7	56	-	$L'_{n,w}$ (C1) = 49 (2) dB
FLOOR and more® G 40	40			
Cavity damping (mineral wool)	50			
Hollow floor support on sound insulation plate (type DP PU 90, 6 mm)	Support height as needed			
XC® living 140|80	220	260		



Dry hollow raised floor structure with free choice of covering

NEW

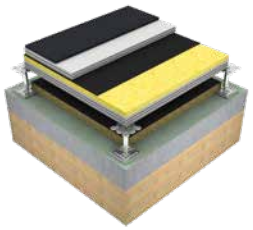
System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Assessment values	
			Rated sound reduction index	Rated standardised impact sound level
FLOOR and more® G 30	30	103	R'_w (C; Ctr) = 57 (-2; -7) dB	$L'_{n,w}$ (Cl) = 53 (1) dB
Heavy-duty film	4			
Impact sound insulation	20			
FLOOR and more® G 40	40			
Cavity damping (mineral wool)	50			
Hollow floor support on sound insulation plate (type DP PU 90, 6 mm)	Support height as needed			
XC® living 140|80	220	260		



Dry hollow raised floor structure with carpeting

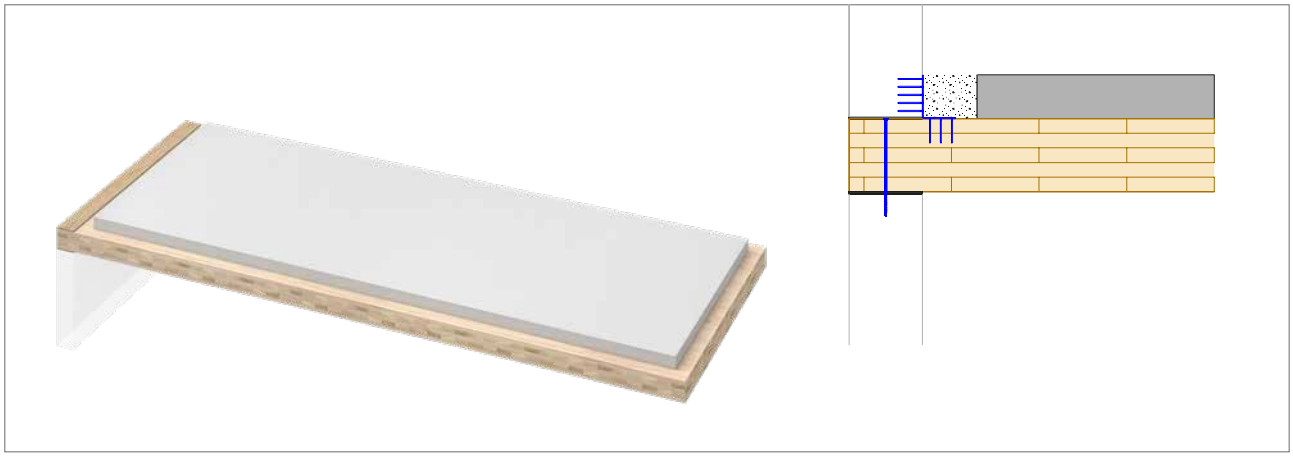
NEW

System structure from top to bottom	Thickness [mm]	Area densities [kg/m²]	Assessment values	
			Rated sound reduction index	Rated standardised impact sound level
DESSO SoundMaster	7	103	-	$L'_{n,w}$ (Cl) = 48 (3) dB
FLOOR and more® G 30	30			
Heavy-duty film	4			
Impact sound insulation	20			
FLOOR and more® G 40	40			
Cavity damping (mineral wool)	50			
Hollow floor support on sound insulation plate (type DP PU 90, 6 mm)	Support height as needed			
XC® living 140|80	220	260		



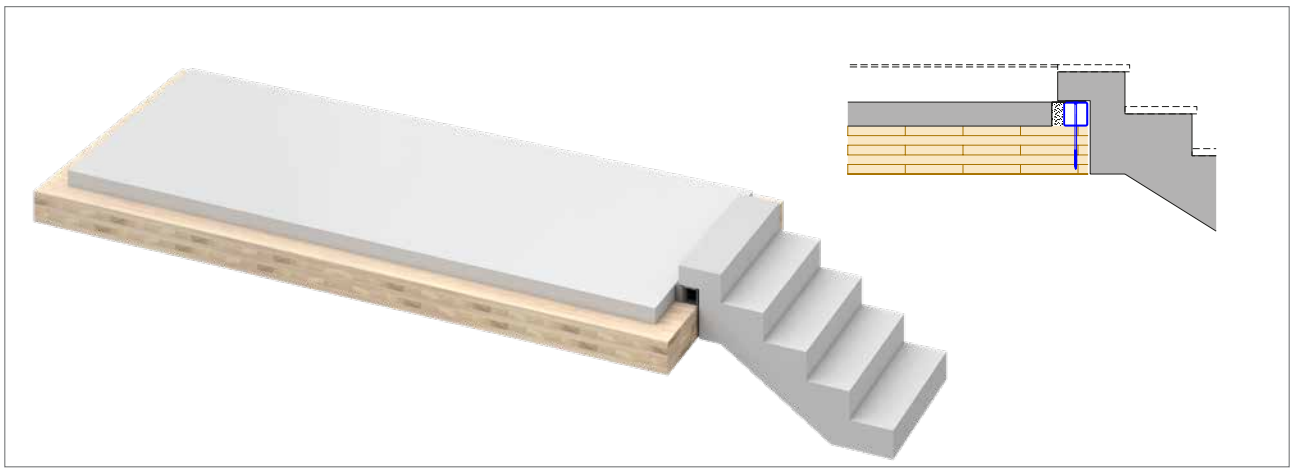
STANDARD DETAILS
XC® LIVING

XC® living for linear abutment



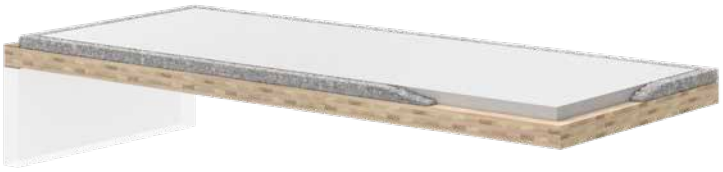
XC® living elements connected with joint cover plate

XC® living precast stairway abutment



STANDARD DETAILS
XC® LIVING

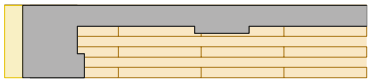
XC® living backfill with crushed gravel



The recess in the XC(R) living elements allows economical connection by means of a joint cover plate and can be used to lay cables. Standard recesses are backfilled with crushed gravel.

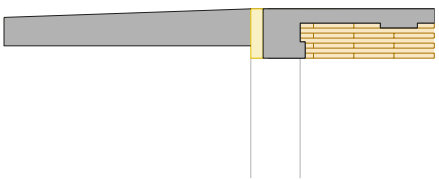
STANDARD DETAILS
XC® LIVING PLUS

XC® living plus with reinforced concrete edge beam, for linear and support abutments



STANDARD DETAILS
XC® LIVING BALCONY

XC® living plus with reinforced concrete balcony, for linear and support abutments



XC® OFFICE

XC® office beam slabs are industrially prefabricated timber-concrete-composite components for residential and industrial design applications. XC® office slab elements can be fully installed without underpinning and used to produce partition slabs between multiple storeys (Use Classes 1 and 2). XC® office beam slabs can be produced as both XC® office line with horizontally glued slats and XC® office deck with vertical boards. Both versions of the product offer wood surfaces in visible and industrial quality and, in combination with the smooth concrete surface, create high-quality slabs for multi-storey buildings.

PRODUCT DATA

XC® office slab elements are produced at the factory under controlled conditions according to a predefined design using a structural type assessment. Upon request and after coordination, built-in parts such as empty electrical conduits or sockets can be preinstalled and delivered according to customer specifications and the structural situation.

XC® office elements consist of two, three, or four beams made of glued laminated timber, which absorb the tensile forces that occur when they have been installed, and a concrete layer positively locked by bird's mouth joints to absorb compressive forces. The ratio of wood to concrete (in relation to the cross-section height) can be adjusted to the loads and demands of the specific use case within the specified structural design concept.

Since they are fully installed without underpinning, XC® living slab elements can be combined with other MABA residential building system components. They can also be laid on other linear supports (walls or balconies) in concrete, masonry, and wooden structures. Standardised design details are available for these purposes.

For placement on supports, an edge beam can be integrated into the structure (and can be flush with the slab). Depending on the requirement, this edge beam can be made from wood or reinforced concrete. If the XC® office element with edge beams is used, cornice or balcony slabs (up to 2.0 m cantilever, underside in exposed concrete) can be set into the concrete in a thermally insulating manner at the factory using the Isokorb system.

Built-in parts

The XC® office slab elements are reinforced in accordance with EC according to a structural type assessment. In special cases, reinforcement is also possible according to customer needs after the relevant project statics have been checked. For the minimum reinforcing steel coverage, EN 1992-1-1:2015, 4.4.1.2. applies in accordance with the applicable national documents.

Examples of built-in parts:

- Transitions and recesses
- Reinforcement connectors
- Slab vents
- Welded embedments
- Mounting rails
- Empty conduits
- Empty electrical sockets

Material quality

Structure and production of glued laminated timber

Glued laminated timber consists of at least two slats glued together with the fibres running in parallel. Glulam typically experiences bending stress, with the highest stresses occurring in the tension and compression zone. The layered structure of glulam allows slats of different qualities to be used in the beam's different elastic-mechanical zones (strength sorting). In a flexural member, the high-quality pieces of timber are placed in the tension and compression zone according to the stress curve over the height of the member. The middle layers can consist of lower-strength slats.

Material characteristics of glued laminated timber	
CE acc. to ETA approval	1359-CPR-0641
Material quality (acc. to EN 338)	GL 24h and 1359 – CPR – 0623
Bulk density	420 kg/m³
Thermal conductivity (λ)	0.13 W/mK
Heat storage capacity (c)	1.60 kJ/kgK
Diffusion resistance (μ)	50 (dry)/20 (moist)
Burn rate	0.72 mm/min

Concrete strength, exposure classes, and steel quality

Processing in the prefabrication plant allows the use of low-shrinkage concrete. XC® elements therefore bend much less than in conventional applications where wet concrete is poured on the construction site.

Material characteristics of concrete	
Standard designation (ÖNORM B 4710-1)	C30/37 or C35/45 XC3/RRS/GK16
Monitoring	ÖNORM B 3328
Bulk density	2,400 kg/m³
Thermal conductivity (λ)	2.00 W/mK
Heat storage capacity (c)	1.00 kJ/kgK
Diffusion resistance (μ)	130 (dry)

Marking and monitoring

XC® office slab elements are not covered by a harmonised European standard (hEN) and are therefore not subject to CE marking. They are used following project-based individual certification by a civil engineer authorised for this purpose.

The glulam beams used to produce the XC® office slab elements are produced in accordance with EN 14080:2013 and bear the CE marking. They are subject to regular internal monitoring at the production plant and are verified by accredited testing institutions at regular intervals (external monitoring).

EC Declaration of Conformity from Holzforschung Austria, Reuthe 1359 – CPR – 0623; Gaishorn 1359 – CPR – 0637

Precast concrete production plants in which XC® office slab elements are produced are QA certified, operate according to internal testing and control plans, and are subject to external monitoring by accredited testing institutions in accordance with ÖNORM B 3328:2012 (Precast concrete products – Requirements, tests and conformity assessment of products that are not covered by harmonized European product standards).

SUSTAINABILITY

Sustainable use of resources

XC® office slab elements are typically planned for a useful life of 50 years in accordance with class 4, table 2.1 of the ÖNORM EN 1990 standard. Compliance is ensured for the environmental influences at the location of use (exposure classes) by complying with the stipulations of the ÖNORM B 1992-1-1 and ÖNORM B 4710-1 standards.

Both layers of material (cross-laminated timber and concrete) can be easily separated after reaching their typical duration of use (usually 50 years) when demolition is carried out properly. The bond between the wood and the concrete is created without mechanical connectors (screws, etc.) or chemical means (adhesives, etc.). Crushers can crush the concrete down into concrete gravel and crushed sand, which can be recycled, for example, as an aggregate for recycled concrete. The demolition of reinforced concrete also includes the separation of reinforcing steel. This scrap steel can be melted down and shaped into new steel products.

The wood used to produce XC® office elements is from sustainably managed forests (PEFC certificate no. HCA-CoC-0120). Depending on its condition, it can be “downcycled” or used for thermal energy.

TECHNICAL PROPERTIES

Mechanical strength and stability
The static load-bearing capacity of the XC® office slab elements has been determined in accordance with EC for different use cases and loads as part of a structural type assessment, documented and listed in the load/span tables shown above.

Structural design
The structural design of the XC® office slab elements takes place on the basis of a design model for the single-span beam structural system and the impacts according to EN 1991-1-1 and ÖNORM B 1991-1-1, is documented in a structural type assessment and has been assessed and confirmed by a civil engineer. This design is provided by MMK at the request of the customer and must be checked by a qualified civil engineer (typically the structural engineer responsible for the project) and confirmed and approved as part of the project's structural assessment.

Geometric properties
The thickness of the part depends on the structural requirements (span, bending and applied load) and typically varies from 34.0 cm to 48.0 cm. The dimension limits for elements with two beams are 1.20 m to 1.50 m and for slabs with three or four beams are 2.40 m to 3.00 m in width. Shim plates, multi-span beams, cantilever slabs and special dimensions are possible upon request.

XC® office dimension limits (standard elements):
- Element height: min. **34** cm – max. **48** cm
- Standard width: **270** cm
- Element width: min. **90** cm – max. **300** cm
- Element length: max. **1,200** cm
- Element area: min. **10** m²

Element size and billing
Recommendation for XC® office slab elements:
approx. 25 m²

Billing
Billable widths: 2.4 m | 2.5 m | 2.6 m
2.7 m | 2.8 m | 2.9 m | 3.0 m

Intermediate widths are billed at the next largest billable width.

Tolerances
Glued laminated timber is manufactured to the exact ordered dimension. Production tolerances and the natural shrinkage and swelling of the wood can lead to deviations in the cross-section.

The dimensional tolerances for glued laminated timber are regulated in EN 14080:2013.

The measured reference moisture content is 12%:

Width	60 mm ⩽ w ⩽ 300 mm		
Width tolerance	± 2 mm		
Height	100 mm ⩽ h ⩽ 400 mm	400 mm < h ⩽ 2500 mm	
Height tolerance	+ 4 mm/- 2 mm	+ 1%/- 0.5%	
Length	< 2.0 m	2.0 m to < 20 m	> 20 m
Length tolerance	± 2 mm	± 0.1%	± 20 mm

For the concrete layer, the simple tolerances for dimensions and the angle and evenness tolerances in accordance with ÖNORM EN 13369:2018-10 section 4.3.1 Geometric properties and 4.3.2 Surface quality apply. Higher standards are possible but require a separate agreement.

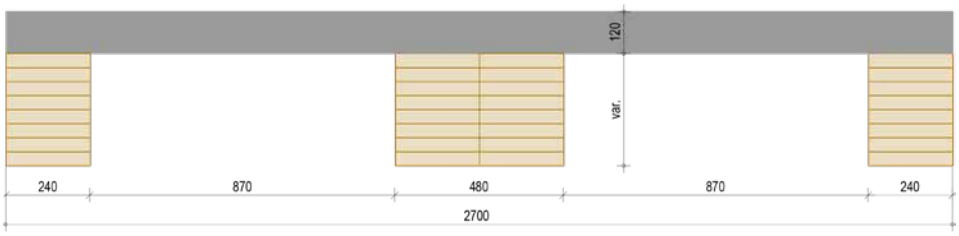
Performance in the event of fire
With regard to fire safety, XC® slab elements can be classified as European construction material class D, s2, d0 in accordance with the ÖNORM EN 13501 standard.

Fire resistance class
XC® office slab elements are typically designed in accordance with ÖNORM EN 1995-1-2 so that they can be classified as fire resistance class R90 by default when the full span limit is utilised. Versions that meet higher fire resistance classes are possible.

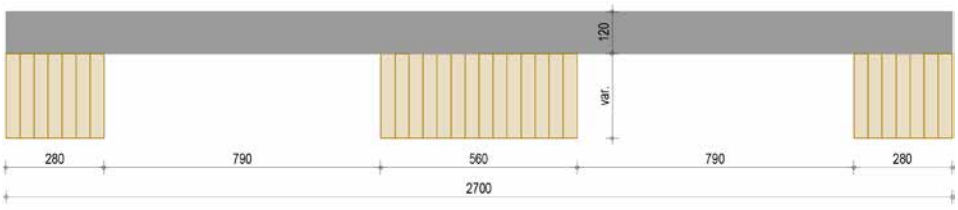
Notes regarding the load/span table
- Calculation of the span limits according to Eurocode; useful loads including partition wall allowance ⩽ 1.0 kN/m²
- The listed slab types correspond to Slab Class 1 in accordance with Eurocode and can be used as partition slabs between two different housing units.
- The indicated maximum spans – excerpt from the structural type assessment – serve only for preliminary planning and do not replace a structural certificate. In individual cases, a structural examination of the overall system must be performed by the structural engineer for the project.
- Additional versions of the product available upon request.

Load/span table for single-span beam in accordance with EC and national annex for Austria and Germany

			Austria		Germany	
			Category B2 Office 3.5 kN/m²		**Category B1** Office 2.8 kN/m²	
			Light 1.0 kN/m²	Heavy 2.0 kN/m²	Light 1.0 kN/m²	Heavy 2.0 kN/m²
Designation $b_{clt}/h_{clt}\,|\,h_{concrete}$	**Component height** [mm]	**Area densities** [kg/m²]	**Maximum span** in [cm] **fire resistance** in [min]			
XC® office deck 280/220|120	340	330	821 $_{90}$	781 $_{90}$	771 $_{90}$	732 $_{90}$
XC® office line 240/240|120	360	330	845 $_{90}$	803 $_{90}$	794 $_{90}$	753 $_{90}$
XC® office deck 280/260|120	380	340	917 $_{90}$	872 $_{90}$	860 $_{90}$	818 $_{90}$
XC® office line 240/280|120	400	335	935 $_{90}$	892 $_{90}$	882 $_{90}$	837 $_{90}$
XC® office line 240/320|120	440	340	1,026 $_{90}$	981 $_{90}$	966 $_{90}$	921 $_{90}$
XC® office line 240/360|120	480	350	1,115 $_{90}$	1,070 $_{90}$	1,056 $_{90}$	1,004 $_{90}$



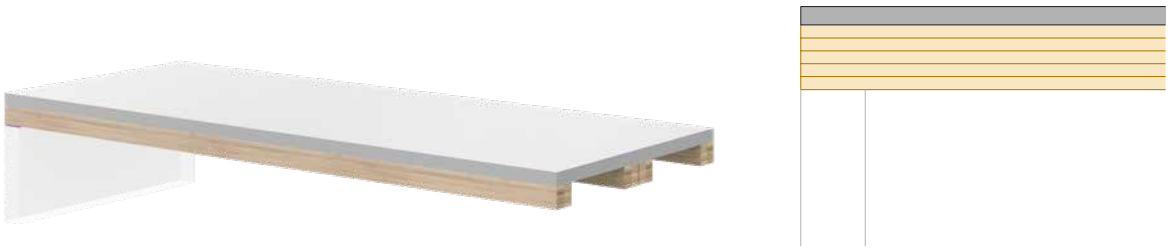
Cross-section of XC® office deck



XC® office slab elements (example configuration, manufactured to customer specifications)

STANDARD DETAILS
XC® OFFICE LINE AND XC® OFFICE DECK

XC® office, direct linear abutment on load-bearing wall



XC® office, direct linear abutment on precast reinforced concrete beam

XC® office, indirect linear abutment on precast reinforced concrete beam

SPACE FOR IDEAS

CREE BUILDINGS

MMK DELIVERS TIMBER-HYBRID SLAB ELEMENTS

CREE Buildings is an international construction collective for regenerative building solutions and helps project developers and construction companies to build sustainable, healthy buildings with prefabricated wood components. They also offer a collaborative model for manufacturers and planners.

Given the increasing demand for and implementation of environmentally friendly, resource-saving timber-hybrid buildings throughout Europe, the need for CREE components will rise in the coming years. As a CREE marketplace partner, MMK offers CREE timber-hybrid slab elements and additional products and services in line with CREE standards.

Collaboration on the CREE platform

MMK processes your query directly on the CREE platform. Here, manufacturers and project participants meet at an early stage and work together to efficiently implement the project. The
CREE marketplace is available to CREE licencing partners and all interested parties from the growing CREE network to use on the CREE platform.

Visit the CREE platform for more information:
portal.creebuildings.eco

The CREE system and the CREE timber-hybrid slab. Over 220,000 m² of the system have been installed (or are in construction).

Selected reference projects:

- LifeCycle Tower ONE
- Illwerke Zentrum Montafon
- Eunoia Junior College
- Handwerkerhaus Überseestadt
- Siemens Campus Erlangen
- EDGE Suedkreuz Berlin
- Allégra Luxembourg

Visit the CREE website for more information about the projects: creebuildings.com/projects

XC® COMPONENTS

TESTED PARTITIONING OPTIONS FOR XC® SLAB ELEMENTS

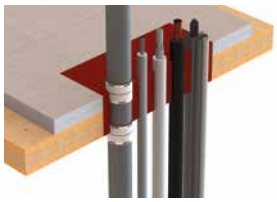
The fire safety requirements for multi-storey wood buildings are increasing. Regional regulations govern fire performance and component fire resistance requirements. Hilti and MMK offer tested partitioning solutions that meet the EN 1366-3 standard for applications in XC® slab elements for fire-retardant (30 minutes), highly fire-retardant (60 minutes), and fire-resistant (90 minutes) versions.

Hilti and MMK provide architects and technical planners with partitioning solutions for the entire field of building services. There are now tested partitioning solutions for electrical installations and sanitation and wastewater applications that meet the high fire safety requirements.

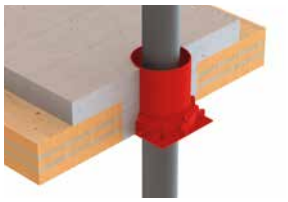
Unlike previously available technology, the tested solutions can be implemented without a reveal in a dry installation method that greatly increases productivity. This makes easy planning possible, from joining to partitioning. Openings for building services technology can be prefabricated at the factory. Partitions are tested either only in wood or throughout the entire timber-concrete-composite element.

The Hilti CFS-SL GA fire safety sleeve is convenient for situations where cables often have to be relaid. It is ideal for office buildings or hotels in which electrical installations are regularly updated.

The Hilti CFS-C EL endless fire safety sleeve is the partitioning solution for wastewater applications in PVC, PP, PE, and a wide variety of sound-optimised pipes.



Shafts housing all the building services technology can be partitioned with the CFS-BL P firestop block. Simple to install and nearly dust-free.



The Hilti CFS-CID cast-in element for sanitary and wastewater applications, which is cast into the XC® slab elements at the factory, is a distinctive feature.

DELTABEAM® IN WOODEN BUILDINGS AND TIMBER-CONCRETE-COMPOSITE CONSTRUCTION

Variable spans, high degree of fire safety and reduction in slab thickness with DELTABEAM® steel composite beam

DELTABEAM® is an excellent solution for slim floor structures in timber-concrete-composite construction. A timber-concrete-composite slab with DELTABEAM® reduces the overall thickness of the load-bearing slab structure and allows large spans with few supports. The flat underside of the slab offers greater room height and simple installation of building technology. Fire resistance is built into DELTABEAM®, so no fire prevention coatings or coverings are required. DELTABEAM® can be combined with any slab and support system – even with wooden supports.

DELTABEAM® Green

We reduce the building's CO_2 emissions and meet the requirements of green building certifications such as BREEAM and LEED simply and sustainably with wood as a building material in combination with DELTABEAM® Green.

Preliminary design tables for DELTABEAM® in combination with wood or timber-concrete-composite slabs, the DELTABEAM SELECT free software planning tool, BIM integration and CAD components, CE marking, and additional country approvals are available.
www.peikko.at/slim-floor-hbv-decken-mit-deltabeam/

ABOVE THE REST IN INTERIOR CONSTRUCTION – LINDNER GROUP IN HOHO VIENNA

Special system structures with XC® slab elements and Lindner raised floors ensure optimised sound insulation.

Lindner: Flexibility and sustainability in interior construction

The Lindner system's products and construction services connect these two areas perfectly. The Cradle to Cradle Certified® FLOOR and more® hollow flooring system was chosen for the entire building complex, including the "power" version with a special slab formulation and reinforced hollow floor supports in the fitness area. The nearly zero-emission floor panels made of calcium sulphate (gypsum), a non-flammable material, also have outstanding structural properties. Further sound insulation tests were also performed at HoHo with hollow floors on timber-concrete-composite slabs, and the acoustic properties were further optimised.

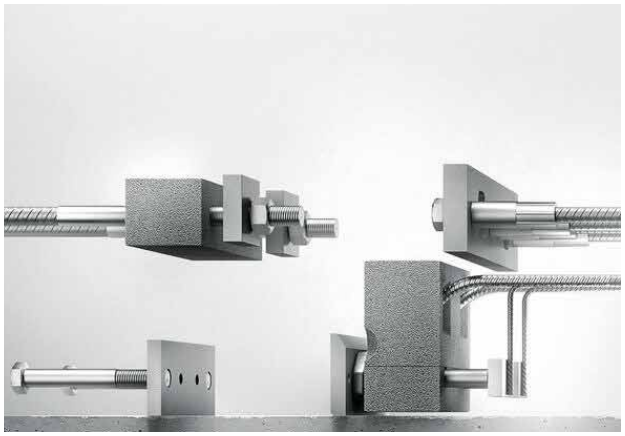
Special construction method, special sound testing

To verify that the sound-insulating requirements of OIB Regulation 5, 2015 can be met for the different use areas with the combination of the load-bearing XC® slab elements and the FLOOR and more® hollow floor, measurements were performed in various testing facilities and in-situ in collaboration with the Graz University of Technology.

Lindner systems improve not only the acoustics and sound insulation – at HoHo Vienna, impact noise values $L_{n,w}$ of 86 dB (without additional floor covering) to 48 dB (with floor coverings with FLOOR and more® with carpet tiles) were achieved. Lindner flooring systems' excellent, ecologically tested properties and very high environmental standards earn them a place in the strict sustainability plan.

FLEXIBLE INSTALLATION OF BALCONY SLABS WITH THE SCHÖCK IQLICK SYSTEM

The IQlick system is specially designed for prefabricated balconies to be installed with flexible construction times and consists of multiple components: the actual load-bearing thermal insulation element and connectors for a load-bearing screw connection. The balcony with the Isokorb® upper tension part embedded in the concrete at the factory is first placed on the lower Isokorb® part, which is mounted on the slab. Then the balcony is clicked into place and finally screwed into the bushings embedded in the concrete. The balcony element can be used and bear loads immediately. Another advantage is that the Isokorb® IQlick can be installed without scaffolding or supports. The individual installation processes can therefore be simplified and shortened with the IQlick system, reducing costs.

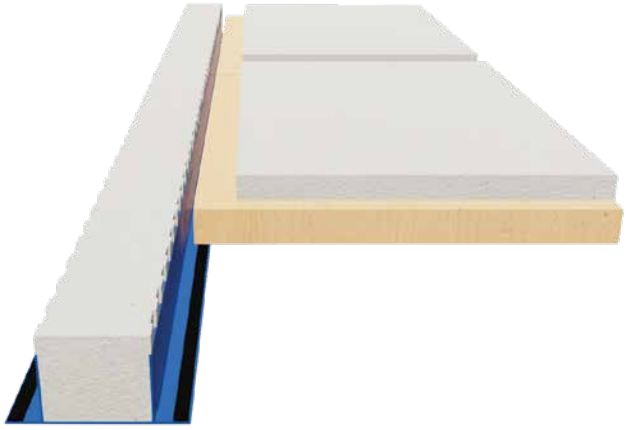


PFEIFER HYBRIDBEAM® IN WOOD AND TIMBER-CONCRETE-COMPOSITE SLABS

PFEIFER

The PFEIFER Hybridbeam® is a prefabricated load-bearing member that is used as a flat substrate for slim floors – integrated slabs with a low installation height. The basic structure of the PFEIFER Hybridbeam® can be adapted to the height of the slabs. Wooden slabs are experiencing a renaissance in the construction industry and can be combined with hybrid beams. Wood is light, natural, and environmentally friendly, a perfect complement to the innovative, robust, versatile PFEIFER Hybridbeam®. This combination meets the needs of planners and users. Depending on the project, the beam's high load-bearing capacity is used either with no connection to the slab (usually with wooden slabs) or with a connection to the slab (timber-concrete-composite slabs).

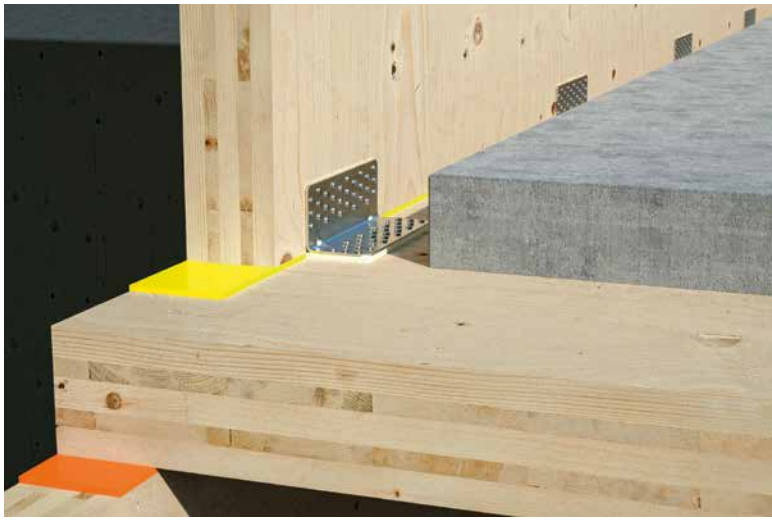
Wooden slabs that rest on the lower flange are produced as glued panels or as wooden beams covered with formwork. Timber-concrete-composite slabs are available in various shapes which, in combination with connectors, ensure that the two materials work together. A concrete slab (under pressure) is connected to a chipboard beam or a laminated board. The slab slabs can be produced in a factory as prefabricated elements or assembled on site after the concrete has been applied to the wooden structure. The examples described above are only a small part of the extensive, constantly evolving technology in wooden and combined timber-concrete slab structures.



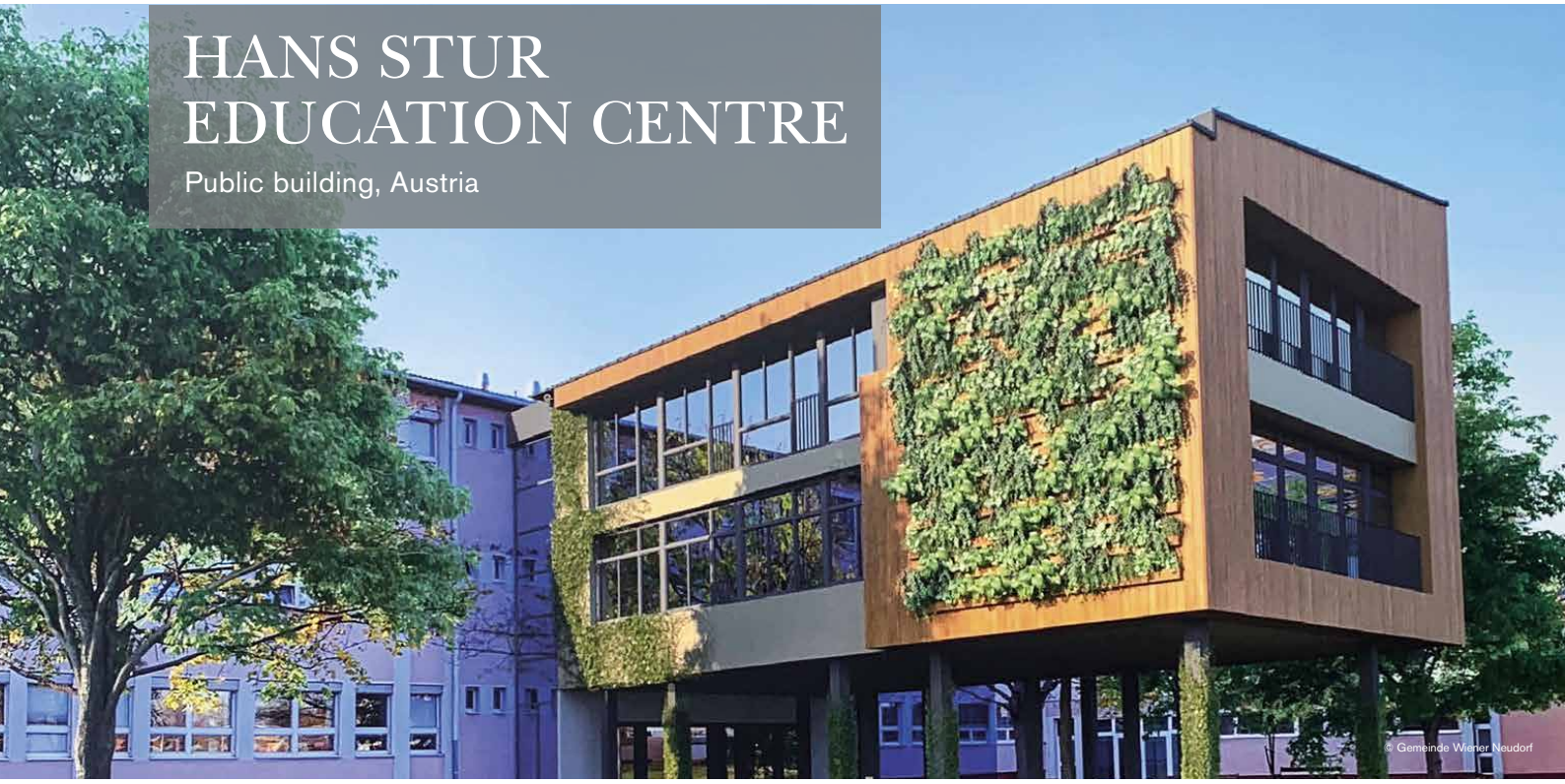
HIGH-EFFICIENCY SOUND-INSULATING STRIP FOR XC SLAB SOUND INSULATION

rothoblaas
Solutions for Building Technology

XYLOFON is a soundproofing strip made of polyurethane that dampens vibrations, ensuring a high level of sound insulation, especially in wooden buildings. XYLOFON can reduce airborne and structural noise by up to 15 dB. The monolithic structure of the polyurethane guarantees profile longevity and provides a waterproof seal. Another advantage is the low thickness of the profile. At only 6 mm, it does not significantly impact the design. The product is available in five hardness grades (from 35 to 90 Shore) depending on the load (up to 630 kN per running metre of wall). XYLOFON is delivered in easy-to-handle rolls (3.66 m) and can be cut to length and installed with simple tools.



REFERENCES



HANS STUR EDUCATION CENTRE

Public building, Austria

Project summary

Short construction time and high sound insulation were the requirements Chromy + Schneider civil engineers were to fulfil for the addition to the Hans Stur primary school in Wiener Neudorf. The design, developed in collaboration with Kuhlang ZT GmbH, included a purely prefab construction made of cross-laminated timber above the raised ground floor. In order to produce the slab above the ground floor without underpinning or cast-in-situ concrete, the construction company, Holzbau Hums, chose XC® 160|100 elements. Some of the XC® elements were produced with a camber due to the large load.

Facts	
Prefabricated parts used	**XC® living 160|100 slab elements**
Number of XC® elements	225 m²
Construction company	Johann Hums GesmbH
Special feature	Camber produced at factory for span > 6.5 – 6.9 m
Architecture/structural design	Chromy + Schneider ZT, Mödling, Austria/Kuhlang ZT GmbH, Brunn am Gebirge, Austria
Client	Town of Wiener Neudorf

PYRKERGASSE

Attic expansion, Austria

Project summary

At Pyrkergasse 25, 13 modern flats with large terraces and recessed balconies were added to a venerable building. Flat sizes are between 50 and 200 m². The property has an impressive, expansive park which was also redesigned as part of the construction project. This urban oasis also features a beautiful pool that will be available to all future flat owners.

Facts	
Prefabricated parts used	**XC® living 160|120** **MM crosslam®** roof elements MABA FTI precast elements (edge beams, balconies)
XC® elements	110 m²
Construction company	OBENAUF Generalunternehmung GmbH
Special feature	XC® living balcony including Schöck IQlick
Architecture/structural design	OBENAUF Generalunternehmung GmbH
Client	Private

MOOSBRUNN

Primary school expansion and renovation, Austria

Project summary

Weaving together an existing building with new construction results in a compact spaciousness in a vertical and horizontal orientation that provides a variety of open spaces for a vibrant school routine, serving as a place to live and explore. The promotion of pedagogical concepts is reflected in clusters in the the building's levels. Lots of natural light to bring the outdoors in, visual connections to landscapes for sitting, relaxing, and learning, and opportunities to work individually and in groups combine to present a lively space that adds pedagogical value to the school routine and makes the school ideal for all-day learning.

Facts	
Prefabricated parts used	**XC® living 180|140,** **XC® living 200|140** **MM crosslam®** slab elements MABA FTI precast elements (hollow-core slab slabs, stairs, porch frames and slabs)
XC® elements	670 m²
Construction company	Kreiseder Holzbau GmbH
Special feature	XC® living with patented lifting system for heavy elements
Architecture/structural design	a-plus architekten zt-gmbH
Client	Municipality of Moosbrunn

NURSING HOME & CARE CENTRE

Public building, Korneuburg, Austria

Project summary

To honour the simplicity of a sustainable concept, the building is built from brick. The brick used includes additional internal insulation, allowing a conventional, long-lasting plaster layer on the inside and outside. The slabs in the residential wings are made of timber-concrete-composite, so the rooms have a homey wooden slab that also follows the slant of the roof in the upper storey. In the residential areas on the ground floor, the exposed wood slab is visible in the rooms. Suspended slabs are used only in the utility and disposal areas. The roof of the residential wings is designed as a slightly slanted green rooftop which contributes to reducing the sealed surface, offers valuable ecological areas, and provides an additional structural buffer.

Facts	
Prefabricated parts used	**XC® living 140|80** **XC® living 140|90**
XC® elements	3,500 m²
Construction company	HAZET Bauunternehmung GmbH
Special feature	XC® living has been used in the false slab and roof to provide the best possible sound insulation and quality of life for the residents.
Architecture/structural design	Lindner Architektur ZT GmbH
Client	State of Lower Austria

GLEIS 21

Multi-storey residential building, Vienna, Austria

Kärnten Award for wooden buildings ´21 | Category: Export/multi-storey residential

Project summary

A housing complex with 34 residential units and four commercial units has been built in the immediate vicinity of the new Vienna Central Station. The lower floor and the ground floor were built with cast-in-situ concrete. The four upper floors and the top floor were built by WHSB as a purely prefab hybrid construction with elements prefabricated at the factory. In order to place the slabs onto the wooden supports integrated into the walls, the XC® elements were designed with an edge beam integrated into the slab, and the exposed concrete balcony slabs were also added at the factory using Isokorb®.

Facts	
Prefabricated parts used	**XC® living 140|100, XC® living 160|100, XC® living 180|100** **MM crosslam®** roof elements MABA FTI precast elements (supports, beams, hollow-core slab slabs, stairs, balcony slabs, porch frames and slabs)
XC® elements	2,250 m²
Construction company	Weissenseer Holz-System-Bau GmbH
Special feature	XC® living plus and XC® living balcony
Architecture/structural design	einszueins architektur, Vienna/KPZT Kurt Pock, Graz, Austria
Client	Schwarzatal, Vienna/Gleis 21 construction group

HOHO SEESTADT ASPERN

Wood high-rise, Austria

Project summary

HoHo Vienna, which makes a striking statement in Seestadt Aspern urban architecture, is currently the tallest wooden high-rise in Austria at 84 metres in total height. The timber-hybrid building, which houses a hotel, offices, and commercial spaces, is an example not only due to its height, but also because of the quality of its execution, its simple design, and the strategic approach to planning and administrative coordination. Working with the City of Vienna, the client, architects, and technical planners (structure, fire safety) explored the possibilities of wooden construction in this building class and found feasible solutions, especially regarding the complex fire safety requirements. The bearing structure consists of four components: the strong core, prefabricated wall elements made of cross-laminated timber with pre-installed wood and aluminium windows, a crown of reinforced concrete edge beams, and precast timber-concrete-composite slabs. The fire resistance required for the design is achieved in HoHo Vienna with small fire compartments and the corresponding wooden component sizes. What was accomplished in this building class should have long been a given for low-rise buildings: visible wood on the walls, slabs, and supports. The beautiful effect of the space is impressive.

Facts	
Prefabricated parts used	**XC® living 160|120, XC® living 180|120 slab elements** **MM crosslam®** slab elements MABA FTI precast elements (beams, stairs)
XC® elements	16,500 m²
Construction company	Handler Bau GmbH
Special feature	24 storeys | 84 m in height, sprinkler and fire alarm system installed in XC® elements; Failure Class CC2 according to EN 1990; fire and soundproofing tests
Architecture/structural design	RLP Rüdiger Lainer + Partner, Vienna/ RWT ZT Richard Woschitz, Vienna
Client	CETUS Baudevelopment GmbH

WIBEBA HOLZ

Administrative building, Austria

Project summary

Wibeba-Holz, a long-established company and one of the leading hardwood processing businesses on the market, invested in building a new headquarters in Wieselburg in Lower Austria in addition to renovating and expanding its production facility. The result was a modern wooden structure designed by Dietrich | Untertrifaller Architekten ZT GmbH, in which wide-span XC® slab elements are used. Construction was by the Pöchhacker Baukultur company.

Facts	
Prefabricated parts used	**XC® living 160|120, XC® living 160|100 slab elements** **MM crosslam®** slab elements
XC® elements	460 m²
Construction company	Ing. Pöchhacker GmbH
Special feature	Installation of underfloor cable ducts in the XC® elements
Architecture/structural design	Dietrich | Untertrifaller Architekten ZT GmbH, Bregenz, Austria/mkp merz kley partner, Dornbirn, Austria
Client	WIBEBA-Holz GmbH

ST. GEROLD PRIORY

Renovation + attic expansion, Austria

Project summary

The St. Gerold priory, a monastery with more than 1,000 years of history and historical building stock from the 12th, 15th, and 17th centuries, was comprehensively renovated and expanded in multiple stages. In the second stage, the slab of the top floor and the old roof were removed with great care taken to maintain the existing building, which is listed as a historical site, and a new attic storey was built. XC® slab elements enabled the construction company, Kaspar Greber Holz- u. Wohnbau GmbH to install the prefabricated slabs and the modularly prefabricated roof structure above the two wings in one working day each – no concrete pouring or underpinnings.

Facts	
Prefabricated parts used	**XC® living 140|120 slab elements**
XC® elements	320 m²
Construction company	Kaspar Greber Holz- u. Wohnbau GmbH
Special feature	XC® 140|120 single-span beam with a span of 7.5 m; renovation project under the conditions of a registered historical site
Architecture/structural design	Hermann Kaufmann + Partner, Bregenz, Austria/mkp merz kley partner, Dornbirn, Austria
Client	Einsiedeln Abbey

PAULASGASSE

Multi-storey residential building, Austria

Project summary

The housing complex on Paulasgasse makes an important statement for multi-storey wooden buildings in Vienna. The three-storey residential building with a set-back top floor is impressive not only for its architectural integrity and differentiated open space offering, but also for its timber-constructed design. The four rows connect directly to the neighbouring buildings, forming an open residential area. An open path running perpendicular to the rows serves as the primary access.

Aside from the concrete stairwells, the living areas are purely wooden buildings made from prefabricated, fully insulated timber-frame walls and cross-laminated timber slabs. Inside, the material remains visible in some areas of the slab, and on the outside the structure is completely sided with untreated larch. Although the building is already several years old, its low, uniform level of greying makes it look almost like new.

Facts	
Prefabricated parts used	**XC® living 140|80, XC® living 160|80 slab elements, MM crosslam® slab elements**
XC® elements	500 m²
Construction company	Kaufmann Bausysteme GmbH
Special feature	Custom XC® elements as double-span beams; some produced with camber; scientific comparative study of the construction process by Graz University of Technology: “Holz-Beton-Verbunddecken, XC® Fertigteile im Mehrgeschoßigen Wohnbau”
Architect/planner	Johannes Kaufmann Architektur & Riepl Kaufmann Bammer Architektur
Client	“Neues Leben” housing cooperative

BREITENAU FOREST PARK

Restaurant, Austria

Project summary

During the renovation and expansion of the forest park's new main building, construction time and material sustainability in harmony with the environment were the primary considerations. Another level was added to the restaurant area, and a children's play area was set up in the attic. XC® living was chosen to ensure that the slab provided the best possible sound insulation in combination with a wooden surface.

The desired sound insulation was achieved with a very thin slab, and the dry construction method meant that the elements could be used immediately after installation without curing or drying times.

Facts	
Prefabricated parts used	**XC® living 120|80**
XC® elements	50 m²
Construction company	Zimmerei Konrad, Frohnleiten, Austria
Special feature	XC® living with visible surface and high sound insulation
Architecture/structural design	Josef Göbel
Client	Waldpark Hochreiter

SPACE FOR IDEAS

XC® TENDER DOCUMENTS

General tender

The goal of a tender is a precise written presentation of the planned construction work and the expected circumstances in which the work is to be carried out. This is intended to prevent additional costs, building time overruns, and the resulting legal disputes, and to achieve the client's intended objective to the highest degree possible. In Austria, tenders in the construction industry are largely based on the *Standardleistungsbeschreibung Hochbau* (standard specifications for building construction, or "LB-HB"), both in the public sector – where, according to the legal foundation (BVergG 2018), the LB-HB is recommended as the basis for a tender – and also largely in the private sector. With the LB-HB 021, Service Group (LG, *Leistungsgruppe*) 36 for timber construction (previously: work by master carpenters) has been fully revised and brought in line with the state of the art in wooden buildings. A new version of the ÖNORM B 2215 work contract standard for timber construction was also published on 1 December 2017 with numerous additions referencing the new LG 36. Achieving a tender in the timber construction industry that is complete in scope and adequate to the building material requires consistent application of the current version of the LB-HB, since this ensures transparent comparability of the quotes and thus an overall reduction of contractual risk.

Austrian industrial standard

In order to both meet the legal requirements of a general, company-neutral tender required by BVergG and implement the prominent company technical developments in current tenders in Austria, there is the option of integrating company-specific tender texts within the Austrian industrial standard. This standard is updated annually and contains a variety of products and solutions from Austrian and international companies. The goal of this industrial standard is to prepare product-specific tender texts in a standardised form. This allows service schedules to be created quickly by adopting standardised items and using a data carrier for electronic implementation in classic tender/awarding/billing software to create and price service schedules, including data exchange in accordance with ÖNORM A 2063-1, which is valid in Austria.

XC® tender texts

Comprehensive tender texts for the **XC®** slab are available as part of the Austrian industrial standard to companies submitting tenders. The XC® product is integrated into LG 36 according to the specifications of the Austrian industrial standard and is composed of product-specific and company-specific preliminary remarks, basic items, and written elaborations at the item level. The basic XC® product is declared in detail in the preliminary remarks so that possible technical adaptations are also sufficiently and clearly defined in subsequent items and in the items incurring additional charges.

The following information about the XC® product is included in the industrial standard:

- Preliminary remarks
  - with details about services included and used in calculation with regard to delivering and moving XC® slab elements (planning, transport, packaging, lifting points, scaffolding, etc.),
  - clear definitions of the technical basics, approval and underlying standards of XC® slab elements, relating both to the cross-laminated timber and to the concrete part including the bond,
  - the connection of the elements to each other,
  - and the billing provisions of individual elements and surfaces.
- Invoice items
  - XC® prefabricated timber-concrete-composite parts with cross-laminated timber in different thicknesses and layer numbers
  - Installation at different heights and angles and under special conditions
  - Additional technical measures during installation, such as acoustic decoupling, increased screw connections, and the like
- Invoice items subject to additional costs:
  - Varying surfaces or material qualities of the cross-laminated slab and concrete
  - Joining, including butt joints
  - For slots, openings, apertures, and recesses that are to be integrated
  - Drilling holes, installing cables for electrical installations and sockets

In total, the industrial standard comprises 68 items and extra items (for additional charge) for the tender of XC® slab elements in addition to the supplementary preliminary remarks.
The current version of the tender documents for XC® slab elements can be downloaded at the link below. The data is available as a pdf, an onlv data carrier (for Austria) and a gaeb data carrier (for Germany).

INSTALLATION INSTRUCTIONS

These installation instructions were created by MMK Holz-Beton-Fertigteile GmbH and are a non-binding recommendation. MMK Holz-Beton-Fertigteile GmbH is not liable for the completeness or accuracy of these installation instructions, nor for consequences resulting from non-compliance with these instructions or due to negligent/intentional behaviour during installation.

The information in these installation instructions assumes that all generally applicable/specific safety regulations have been complied with. Furthermore, note that the "*VÖB Montageanweisung gemäß Bauarbeiterschutzverordnung – BauV*" (installation instructions in accordance with the regulation governing occupational safety of construction workers) must be complied with.

For legal reasons, we ask you to note that an assembly supervisor without a separate work order confirmed in writing assumes neither the role of a building coordinator in the sense of the BauKG legislation nor the role of a site supervisor.

Part 1: General installation instructions

Document: LV2001FTI, updated 14/10/2020

These installation instructions do not replace self-study of and compliance with all applicable regulations and guidelines, such as the Austrian Construction Work Coordination Act, the Workers Protection Act, occupational health and safety provisions, regulation relating to work equipment, construction worker safety regulation, the Directive on Personal Protective Equipment, the Directive on Explosive Atmospheres (VEXAT), and administrative requirements. If there are unclear passages or contradictions, statutory regulations always take precedence. When handling and installing prefabricated products, comply with the safety regulations for construction sites (SIGE-Plan) and the manufacturer's specifications, especially for the transport anchor system.

Some product groups have special product-specific instructions that take priority over these general transport and installation instructions if there are contradictions. Since prefabricated components present particular risks due to properties such as inertia and great weight, they must be transported and installed by qualified, authorised specialists.

1. Supervision and performance of work

Work with and on prefabricated components may be performed only under the supervision of an appropriately qualified supervisor who assumes responsibility for proper performance of the tasks assigned to him. Critical processes on the loading or construction site must be performed in the presence of the supervisor, who also assumes responsibility. Furthermore, work must not begin without written installation instructions, including the information required in accordance with §§85 and 86 BauV (construction worker safety regulation), being present and checked.

A sufficient safety distance from all lines, especially electrical, gas, and water lines, must be maintained to eliminate hazards.

2. Special properties of prefabricated components

Prefabricated components have special quality properties, especially smooth surfaces and edges, that should be retained for the customer through careful transport, storage, and installation. They can tip over or fall down. The great weight and inertia of prefabricated components place stress on transport and lifting equipment, support points, and structures. They are designed and produced to be handled (loading, storage, transport, and installation) only in the load states documented in these installation instructions. Prefabricated components therefore must not be handled when subjected to load states other than those documented in these instructions, since doing so could lead to loss of life and considerable damage.

3. Fastening and lifting prefabricated components

Before any handling occurs, prefabricated components and the installed lifting points/transport anchors must be checked carefully for damage, deformation, and cracks to ensure that they can bear the required loads. Before attaching the prefabricated components to the lifting equipment, the weight of the components must be checked to ensure that it corresponds to the embedded lifting points/transport anchors. Improperly handled prefabricated components may have lost their internal strength or the bond to the lifting points/transport anchors embedded at the factory. If there is uncertainty for any reason, consult the supervisor.

Only lifting equipment and tested or correspondingly marked lifting or load-carrying devices (such as chain slings) that are appropriate for the embedded lifting points/transport anchors may be used. Each time an element is lifted, all of the appropriate lifting points must be used and remain effective at all

times. Unless otherwise stated in the special product-specific instructions, the diagonal pull on the lifting anchors must be limited to a maximum of 30 degrees for diagonal loading and to a maximum of 15 degrees for transverse loading (use a suitable hanger, beam, or similar device!). The load-lifting factor (taking into account the effects of inertia) during lifting, pivoting, moving, and lowering must not exceed 1.3. When selecting lifting devices, ensure that there is sufficient reserve to control load increases resulting from inertia. The radius of the lifting devices must be used only if there is still a reserve sufficient to control the process safely at all times.

To ensure that all lifting points/transport anchors are uniformly stressed, a balancing sling or balancing device must generally be used (this is the case, for example, for a beam with more than two and for a slab with more than three lifting points). Prefabricated products with large surfaces and long lengths must be guided using guide ropes if they could collide or get stuck during lifting.

Crane hooks or individual slinging lines or load-carrying devices may be unhooked only when the load is resting on a stable surface.

4. Suspended loads

Do not begin loading, unloading, or moving loads until there are sufficient barriers and monitoring in place to ensure that no people are present in areas where there is a danger of falling loads. Before beginning any of these activities, attach all fall protection devices and put on personal protective equipment (gloves, helmets, safety harnesses, etc.). Any people not immediately required for the work being performed must leave the swivel range of the lifting equipment. Sufficient safety distances must always be maintained.

5. Loading and transport

When loading the components, ensure that edges and surfaces are protected from damage during transport, if necessary with suitable packaging (such as wood). The sequence in which the parts will be unloaded should be considered to ensure easy, safe installation. If necessary, create a loading plan.
Prefabricated components are not designed to withstand unusual transport loads. The components must be held securely in place in relation to each other and to the vehicle so that all loads, including loads due to movement, can be safely controlled. Prefabricated components must be stored and transported so that their position cannot change unintentionally. If possible, they should be transported in the intended installation position, taking into account the structural requirements and instructions.

The M 846 safety information for securing loads in street traffic, M 844 for truck-mounted cranes, crane-related regulations, M 210 summary of BauV legislation from AUVA, and our truck transport guidelines must be adhered to. Cranes must not be operated without the written operating manual being present and complied with in detail. The haulier must be informed of any rules for external companies before entering the factory premises.

6. Checking the delivery

Check the delivered prefabricated components to ensure that they are complete and match the order and that no parts are missing or damaged. The goods must be properly examined for defects upon receipt. Visible defects must be noted at the latest on the delivery slips; otherwise, the warranty will not apply.

7. Unloading and moving

Lifting equipment (trucks, cranes, Hiab, etc.) must be set up on a base that can sufficiently bear the load. During intermediate storage of prefabricated components, the base must also be sufficiently stable and the storage location identified.

When performing installation work, adhere to the generally recognised codes of practice (in particular Eurocode 2 for concrete and reinforced concrete, Eurocode 3 for steel construction, Eurocode 5 for timber construction, ÖNORM EN ISO 17660 for welding reinforcing steel, ÖNORM B 4710-1 and 4710-2 for working with concrete) and the installation-related information in the specific documents (calculations, drawings, etc.).

Prefabricated components must be installed in the planned position, when all preliminary work has been completed and any substructures and auxiliary structures (brackets, supports, etc.) are already stable, and in particular when the concrete has sufficiently hardened and is able to support the load. If an installation plan is available, the labels on the prefabricated components must be used to match them to their location. Prefabricated components must never be installed at locations other than their intended position, not even as a replacement for visually similar prefabricated components or ones that appear identical (because, for example, they may have different reinforcements) without being verifiably approved by the responsible structural engineer.
The prefabricated component connectors must be sufficiently durable, in particular resistant to corrosion, to handle the ambient conditions to which they are subjected.

No liability is assumed for surface damage, chipping on corners and edges, or cracks that occur due to improper handling.

Stability must be ensured through suitable on-site measures in all building states (underpinning, bracing, etc.) and must be continuously monitored; the information in the product-specific documents must be followed. The prefabricated components must be secured with the connections shown in the drawings (including any applicable standard drawings). The rules of the specialist companies for anchoring and fastening technology (such as wall plug anchor systems) must be followed. Welded connections may be produced only by those who have completed a welding examination. Any reinforcements that are required on site must be laid according to the reinforcement plans provided by the project's structural engineer or to any other reinforcement plans that may be provided (including any standard drawings!).

During installation, prefabricated components must be regularly checked for damage.. If unforeseen deformations or cracks appear, immediate measures must be taken. If necessary, stop work until suitable countermeasures have taken effect.

Exceptional weather conditions (low temperatures, wind, etc.) may make it impossible to continue work. The safeguards in place during construction (underpinning, bracing, etc.) may be removed only when it is certain that the entire building is sufficiently stable. Regarding the deadlines for stripping the formwork and subsequent concrete treatment, follow the specifications in ÖNORM B4710-1.

8. Securing the site after performing work
Immediately after performing installation work, the local site supervisor is responsible for ensuring that all remaining locations at the site where there is a falling risk are provided with appropriate fall protection devices. During breaks, equipment must be secured to prevent start-up and modifications by unauthorised parties, and the construction site must be monitored.

9. Exclusion of liability
The information in the general transport and installation instructions is correct to the best of our knowledge and belief. However, we cannot guarantee that it is binding, complete, or accurate. No liability is assumed, especially for consequences of non-compliance with these instructions or negligent/intentional behaviour during installation.

Construction site coordination in accordance with the current version of the Construction Work Coordination Act BGBl. I No. 37/1999 is a legal obligation of the client. The customer is responsible for safety on the construction site; we assume no responsibility for the tasks of the planning and construction site coordinator.

Part 2: Installation instructions for XC® slab elements

Comprises installation provisions for XC® slab elements.

Below, MMK Holz-Beton-Fertigteile GmbH is referred to as "manufacturer", unless expressly noted otherwise.

1. Element properties
XC® elements have special quality properties – in particular visible wooden surfaces – that should be retained for the customer through careful transport, storage, and installation. It is important that components be protected from possible mechanical damage to the wooden surface and from dirt and moisture.

The prefabricated components' great weight and inertia place stress on transport and lifting equipment, support points, and structures. They can tip over or fall down, causing considerable damage. They must therefore be loaded, transported, and moved only by authorised companies with experienced, qualified employees and equipment that can handle the load.

2. Transport, delivery
In general, all transport and delivery by truck must comply with applicable automotive and street traffic regulations.

The edges and especially the surfaces must be protected at all times, beginning with loading. The surfaces in particular must be protected with suitable layers between the components. The visual quality of the surfaces must not be impaired by possible discolouration or deposits on the protective layer.

Prefabricated components must be held securely in place in relation to each other and to the vehicle so that all loads, including loads due to movement, can be safely controlled. The elements must be stored, transported, and installed so that their position cannot change unintentionally. Whenever possible, they must be transported in the intended installation position, taking into account the structural requirements and the information in these instructions, to ensure that they can be assembled easily and safely without damage. If necessary, create a loading plan.

The client must ensure that the vehicles can drive into and out of the construction site without difficulty (curve radii, ramps, parked cars, overhead clearance, solid street substructure, weight restrictions) and that the transport vehicle and crane locations are sufficiently firm and at a sufficient distance from excavated trenches, embankments, ditches, etc. in all weather. The prefabricated components are delivered on articulated trailers or low-loaders. Upon delivery, the prefabricated com-

ponents must be checked for quantity, items, and any damage, in particular with regard to the load-bearing capacity (cracks, irregular deformations, visible damage, etc.). If there is damage in the area of the lifting equipment or to the elements that could affect load-bearing capacity, the components may be unloaded only after consultation with the site supervisor.

3. Storage

3.1 General

Materials and equipment must be stored so that workers are not endangered by falling, sliding, tipping, or rolling materials or equipment.

Stored goods must be protected from external influences so that no dangerous chemical or physical changes to the stored goods occur. Goods may be stacked only to a height at which they are still stable.

Stacks must be placed on a firm, even surface or on a sufficiently strong base and must be well secured to each other and properly stacked. Stacking items, removing items from a stack, and moving stacks must be performed from a stable surface.

3.2 Intermediate storage

Intermediate storage on the construction site must be avoided wherever possible. If such storage cannot be avoided, items must be stored carefully to avoid damage and dirt. Transport frames and/or pallets are recommended. Intermediate storage must also be on an even, firm, sufficiently strong base. Components must be supported on sufficiently dimensioned supporting timbers over the entire width of the slab, as they are during transport, or below the lifting points of the lifting anchors. The elements should be stored indoors whenever possible, or be protected by suitable means from moisture and dirt.

If the prefabricated components must be stored on existing parts of the building, their load-bearing capacity must be verified in advance by the site supervisor (if authorised) or by a designated structural engineer. Overloading must be avoided, if necessary with additional supports. Prefabricated components must never leaned against structures that are not yet sufficiently stable due to their installation state.

4. Handling

4.1 Lifting equipment

When selecting the location for lifting equipment (truck, crane, Hiab, etc.) on construction sites, ensure that the base, substructure, and bearing surfaces can handle the load and that existing supports are used. Surface load-bearing capacity may be reduced in the area of filled working spaces and where there are cavities, for example.
Lifting equipment used for handling on the construction site must also be designed for the weight of the elements being moved. The work procedure must be performed so as to retain sufficient reserves to control the process safely at all times.

4.2 Transport anchors

XC® elements must be handled with the installed anchors and appropriate lifting tackle. Depending on product version of the and element weight, different tested or approved transport anchor systems with a safety factor of $\gamma = 2.1$ (in accordance with VDI 6505) may be used. For elements weighing less than 4 t, the “blind hole/rod/sling” system is typically used. A" blind hole" is drilled in the wood in the plane of the slab and a DM16 or 20 mm rod is driven in symmetrically to the centre of the hole. A single-use lifting strap (load level 2,500 kg) is threaded around the rods. A correspondingly shaped recess in the concrete layer allows the diagonal pull that is also required. XC® lifting anchors are integrated into elements weighing more than 4 t. Even load application (using such measures as a balancing sling) allows lifting XC® living elements of up to 7.68 t with four anchors. The load-bearing capacity of the load-bearing and lifting tackle must be ≥ 22.3 kN in order to accommodate a diagonal pull of up to 30°. For higher element weights, separate agreements must be made in consultation with the manufacturer.

4.3 Selecting the lifting tackle

Only lifting equipment and tested and marked lifting or load-carrying devices appropriate for the transport anchors built into the XC® elements may be used. The number and position of the transport anchors is illustrated in the approval plans, allowing authorised users to check them before and during installation.

The appropriate lifting tackle for attaching to XC® lifting anchors can be purchased from MMK. After use, it can be returned in technically flawless condition, and the purchase price will be refunded.
Lifting tackle (single-use lifting strap) is already built into the “blind hole/rod/sling” system. For intended sling use, refer to the user information for textile lifting tackle from the applicable manufacturer.

4.4 Selecting the suspension gear

When lifting the elements, use all lifting points. To ensure that the load is placed equally on all anchors, use a balancing sling or other suitable balancing device when moving the XC® elements.

Diagonal pull is limited to a maximum of 30 degrees, and transverse pull is limited to a maximum of 15 degrees. The load-lifting factor (taking into account the effects of inertia) during lifting, pivoting, moving, and lowering must not exceed 1.3. The use of this dynamic factor requires favourable conditions: level ground, favourable crane stability, and a maximum lifting speed of $v_h \leq 35$ m/min.

So when attaching the slings, ensure that tension is even and lifting is performed slowly. Avoid sudden, jerky movements.

4.5 Slinging the prefabricated components

The client or another appropriate person authorised by the client is responsible for unloading, moving, and installing the elements. Slings must be attached to the loads by people who have been instructed in how to do so by the site supervisor or by the person responsible on the construction site.

The weights of the prefabricated components can be found in the bill of materials, the delivery slip, or the drawing/labelling on the component, the site supervisor/installation supervisor can also be consulted. Prefabricated components may be slung only if the components are labelled and the weight is known.

XC® elements may be moved only in the orientation, typically horizontally, in which they will be installed at the location of use.

Also note the following:

- Never hook two load hooks into one sling; use load hooks only with a load hook safety catch.
- Always follow the instructions for use from the manufacturer of the load-bearing equipment. For parts that cannot be safely attached to slings, seek alternative attachment methods.
- All load-bearing equipment must be free of damage and must not be bent.

Prefabricated components with large surfaces and long lengths must be guided with guide ropes during handling if they could collide or get stuck while being lifted.

To protect wooden surfaces, ensure that edges and surfaces that will remain visible after installation do not come into contact with other parts.

4.6 Unloading

When unloading components, pay special attention to securing the prefabricated components remaining on the vehicle and the vehicle itself (vehicles may need to be braced).

4.7 General

Any installation procedure must be planned and performed in such a way that risks due to weight and inertia can be safely controlled and surface quality remains high after installation is complete.

The installation supervisor must ensure that preliminary work on the construction site has been performed properly. During installation, the building's load-bearing capacity and stability must be ensured during each stage of the installation. This may require a designated structural engineer.

Adjoining components such as walls, frames, beams, girders, etc. must be suitable for connecting to the XC® slab elements and aligned accordingly with regard to position, evenness, and installation tolerance. In particular, load-bearing capacity, strength, and fire safety requirements in the region of the abutments must be met. Information for connections to adjacent components must be provided by the client in a timely manner; the client is liable for the correctness of this information. The user is responsible for all necessary documentation. Slab elements must be connected to each other and to adjacent components in a suitable manner approved by the project's structural engineer. The connectors required for this purpose are typically not included in the delivery from MMK.

4.8 Auxiliary structures required for installation

The client is responsible for installing the auxiliary structures required for assembling the prefabricated components.

The building and the individual elements must remain stable when auxiliary structures are used. If necessary, stability may need to be verified by a qualified specialist.

Supports placed on unpaved ground that can support the appropriate load must be set up on a suitable base such as square timbers or posts so that they do not shift. Stacks of bricks or similar solutions are not permitted.

4.9 Ensuring stability

To ensure the load-bearing capacity and the stability of the building and the prefabricated components during each step of the installation process, the client must provide proof of the necessary stability and load-bearing capacity (including during assembly). The client can do this himself (if authorised) or have it done by a designated structural engineer.

4.10 Installation procedure

The components must be laid in accordance with the installation plans and the installation instructions. The prefabricated components are identified by the labels attached to them.

Crane hooks may be unhooked only when the component is resting on a stable surface. The installation supervisor is responsible for ensuring stability by means of suitable on-site measures (underpinning, etc.). Prefabricated components must be secured with the connections shown in the drawings. During installation, prefabricated components must be regularly checked for damage. Stability of supports, underpinnings, and the like must also be regularly checked. If unforeseen deformations or cracks appear, the installation supervisor is responsible for initiating immediate measures.

XC® slabs may be installed only in the planned position and only after all preliminary work has been completed. The elements must be measured according to the installation plan. The prefabricated components are labelled to allow them to be identified and correctly placed.

A level abutment surface is required to create a proper slab surface. To prevent adjacent slab elements from bending to different degrees, it may be necessary to create underpinning with adjustable braces or similar means at suitable intervals. The underpinnings must be set up consistently on all storeys. To prevent damage, pressure-distributing elements must be mounted between the supports and the slab elements.

The XC® slab elements are placed next to each other (with edges placed together flat or forming a rabbet) and connected to each other as specified by structural rules or the instructions of the structural engineer.

The slab made of XC® elements must be protected from moisture and weather by suitable means during the installation phase, and the visible underside must be protected from dirt.

GENERAL TERMS AND CONDITIONS

I. General

1. These general terms and conditions (hereinafter referred to as “T&Cs”) form part of all quotes, deliveries and other contracts with MMK Holz Beton Fertigteile GmbH (hereinafter referred to as “MMK”). However, they apply only when the contractual partner is a businessperson, a corporate entity governed by public law, or a special fund under public law. Deliveries shall be made exclusively in accordance with these T&Cs, which are to be interpreted in the light of the respective industry and business practices, are known to the contractual partners, and can be transmitted in detail by MMK at any time upon written request or accessed at www.holzbetonverbund.at. Provisions to the contrary are binding for MMK only if they are expressly recognised by MMK in writing. This also applies if a contractual partner refers to his own terms and conditions of purchase (“battle of forms”) or these conditions are included on invoices, orders, or delivery notes. Individual agreements made with the contractual partner in individual cases (including ancillary agreements, supplements, and amendments) shall in all cases take precedence over these T&Cs. The content of such agreements is subject to a written contract or written confirmation by MMK.

2. These T&Cs shall also apply in the event that MMK accepts the contractual partner’s order without further conditions in the knowledge that some of the contractual partner's written or oral provisions contradict or deviate from these T&Cs.

3. Documents, in particular drawings and descriptions of the products and technical specifications or models from MMK, are exemplary and are neither authoritative with regard to type and quality nor binding unless these specifications have been expressly designated as binding in writing in advance. Information, technical consultation, and other details of any kind whatsoever provided by MMK are based on experience. However, these are also non-binding and, to the extent permitted by law, are made without liability or warranty. This also applies in the context of contract negotiations at the pre-contractual stage.

4. If no written contract is concluded (in the case of a verbal contract, for instance), these T&Cs shall apply in particular if the contractual partner is or could have been aware of them from a previous regular business relationship.

5. The goods are always dispatched only after receipt of the response letter duly countersigned by the contractual partner (returned and signed order confirmation, for instance). If the goods are delivered and accepted by the contractual partner without objection despite the reply letter not being countersigned, the T&Cs shall be deemed to have been accepted by the contractual partner.

6. The basis for the execution and production of the prefabricated elements is exclusively the execution planning provided free of charge by the contractual partner (serving as final execution plans) to be agreed upon in consultation with MMK. This planning must be submitted to MMK before the start of production for the entire scope of the order or, in the case of large orders, for entire sections of the construction project. If execution plans are received late, additional costs due to planning and production interruptions must be expected. MMK’s construction documentation shall be made available to the contractual partner in a simple version if required.

7. If installation, suspension, and fastening parts that do not comply with MMK’s standards are used, MMK cannot guarantee that the prefabricated structures will fit together properly.

8. The services provided by MMK do not include:

- Closing any openings for lifting parts
- Weather-proofing coatings
- Structural fastening components
- Sealing strips, elastomers and the like as abutment surfaces
- Surface improvements
- Any necessary grouting work
- Fasteners and other components, unless separately agreed upon in writing

II. Quote and order confirmation

1. Unless expressly agreed upon otherwise, all of our quotes or cost estimates are non-binding and based on the compensation and material prices valid on the date of the quote. Dimensions, weight, and other information is given with great care, but no guarantee is provided for accuracy. Totals are subject to possible calculation errors. Offers and plans, drawings, manufacturing documents, and the like provided by MMK may be made accessible to third parties only with the written consent of MMK.

2. Offers, orders, and changes or cancellations are binding for MMK only if they are confirmed in writing by MMK. The contractual partner consents for personal data to be processed electronically and shared with third parties in the course of business.

3. As long as they do not compromise the intended use specified in writing, MMK reserves the right to make minor modifications to the items ordered. Should MMK be forced for production-related reasons to make modifications beyond this scope, such changes shall be deemed to have been approved if they are not economically unreasonable for the contractual partner; the burden of proof for the economic unreasonableness is with the contractual partner.

III. Prices

1. The prices are net sales prices excluding VAT and apply ex works, loaded on a truck or vehicle. MMK reserves the right to decide at which plant the prefabricated components can be picked up.
2. Invoicing shall be carried out according to the quantity of units in the order confirmation, or the actual delivery according to the delivery note or proof of performance. We reserve the right to issue partial invoices. If the prices on which the quote was based (raw material, collective agreement wages, energy, other costs) increase between the offer, order, and delivery, we may adjust the price accordingly.
3. Shortages in quantities for individual items do not result in price changes if all the items of one type are omitted; however, if some of the items are omitted, the unit price changes due to higher formwork costs. Completely removing individual items from an offer requires our express consent.

IV. Shipping and transport

1. Incoterms apply in the version stated in MMK's order confirmation.
2. The delivery site must be level and have sufficient load-bearing capacity for a truck with 10 t axle pressure to drive in and out unhindered. Unloading be immediate and proper; crane use requires a separate prior written agreement. Idle periods and waiting times will be charged separately unless they were caused by gross negligence on the part of MMK. The same applies to any costs necessary to store the goods if they cannot be unloaded at the intended location.
3. If packaging is required, it will be at MMK's discretion and charged at the rate customary in the industry.

V. Delivery and storage

1. Partial deliveries are expressly declared permissible.
2. If the contractual partner is late in accepting the goods, the handover shall be deemed to have taken place. Storage costs arising from the delay in acceptance shall be borne by the contractual partner.
3. If, in the case of a "call-off agreement", MMK does not receive the call from the contractual partner in time, MMK may continue to insist on delivery and invoice the delivery at the end of the delivery period or withdraw from the contract in whole or in part. Storage costs arising from such circumstances shall be borne by the contractual partner.
4. If the goods cannot be delivered immediately after completion as a result of circumstances unforeseeable at the time of conclusion of the contract and for which MMK is not at fault, the contractual partner shall bear the risk from that point. Storage costs arising from such circumstances shall be borne by the contractual partner.
5. Upon delivery, an insignificant quantity deviation (up to 10 percent) upwards or downwards that is customary in trade is permitted at the express discretion of MMK.
6. If the delivery date cannot be met, MMK is entitled to deliver the goods at a reasonable alternative date. This new date is chosen in consultation with the contractual partner. If MMK is delayed in delivering on this new date, the contractual partner is entitled to demand fulfilment of the delivery by setting a reasonable grace period in writing, stipulating a withdrawal from the contract if this new date is not met. The contractual partner is not entitled to make any further claims in this context, unless permitted by law. MMK is bound by the delivery deadlines only if the contractual partner fulfils its contractual obligations (such as timely release of plans, advance payments, etc.).
7. In the event of force majeure, or if significant changes to contract components beyond MMK's control are or become necessary, or if circumstances occur that make deliveries significantly more difficult or partially or completely impossible not only on a temporary basis, MMK is entitled to withdraw from the contract without further claims by the contractual partner.

VI. Warranty and notice of defects

1. The contractual partner must properly inspect the delivered goods for defects without delay, but not later than seven calendar days after receiving the goods, and immediately notify MMK of any defects in writing. If defects that were already present at the time of handover of the goods and which could not have been detected during the proper inspection after receipt of the goods (see VI. Sentence 1) become apparent only in the course of the warranty period, these defects must be reported to MMK in writing immediately after they become known within the warranty period, but in any case before any processing, treatment, or resale. The warranty period is generally one year. The burden of proof for all prerequisites for a claim, in particular for the existence of a defect at the time of goods handover, for the time of discovery of the defect, and for the timeliness of reporting the defect, is always with the contractual partner. If there are defects, the contractual partner is obliged to accept the delivery in all cases and to treat it with the usual and reasonable care. The notice of defects must in all cases be made in writing with sufficient attached documentation that is customary in the industry (in particular photographic documentation, for example), and receipt must be confirmed in writing by MMK. The type and extent of the defect must be clearly marked so that MMK can clearly see the reason for the complaint. If these provisions are not complied with, no claims (warranty, damages, error, etc.) can be asserted.
2. Complaints due to transport damage must be made by the contractual partner immediately in writing and directly to the transport company, and in any case before any processing, treatment, or resale. Here, too, the burden of proof for all prerequisites for a claim, in particular for the defect or damage itself, for the time of discovery of the defect or damage, and for the timeliness of reporting the defect or damage, is with the contractual partner. In all other respects, point VI.1. shall apply mutatis mutandis.

3. Defects have no influence on the agreed payment dates.
4. Defects shall be remedied at MMK's discretion by rectification or redelivery with delivery to the place of performance provided free of charge for the contractual partner. MMK is entitled to another attempt to rectify the defect. If this attempt to remedy the defect or to add what is missing is also unsuccessful, the contractual partner can demand a reduction of the remuneration or rescission of the contract if statutory requirements are met.
5. Goods returned by the contractual partner become the property of MMK. Further claims, such as compensation for labour, material, lost profit, damages for non-performance, etc., are precluded where and to the extent permitted by law.
6. The warranty applies neither to natural wear and tear nor in the case of improper handling, excessive use, or negligence on the part of the contractual partner. The contractual partner shall be liable for damage resulting from on-site handling of the prefabricated components or from improper assembly or adverse weather conditions during the construction phase (water ingress, etc.).
7. MMK guarantees compliance with the information provided in its offer insofar as it was agreed upon in writing. Minor deviations of the delivery from a sample and from brochures enclosed with the offer (with regard to such characteristics as dimensions, weights, quality, and colour) which do not impair the intended use cannot be objected to. Furthermore, MMK expressly reserves the right to make modifications or improvements to the products resulting from new experience.

VII. Limitations of liability and indemnities

1. In any cases that may arise, MMK is obliged to pay compensation for damages only in the event of intent and gross negligence. In the event of slight negligence, MMK shall be liable only for personal injury. Liability lapses six months after knowledge of the damage and the damaging party. Liability is limited to the amount of the liability insurance taken out by MMK.

VIII. Default and withdrawal

1. If the contractual partner is in default of payment, MMK is entitled to withdraw from the contract after setting a grace period of at least one week. In the event of default in payment, MMK is entitled to demand from the contractual partner – without prejudice to further claims for damages – the statutory interest pursuant to §456 of the Austrian Commercial Code (UGB).
2. In the event of delay in acceptance by the contractual partner, MMK is otherwise entitled to either:
a. to insist on completion of the contract and to postpone the fulfilment of its own obligations until the contractual partner has made the payments in arrears or met its other performance obligations, or
b. to make a reasonable extension of the delivery period or to declare withdrawal from the contract after granting a reasonable grace period.
3. In any case of delay in acceptance, the contractual partner shall be obliged to pay a penalty of ten percent of the respective net purchase price, whereby claims for further damages shall remain unaffected.
4. Should the contractual partner terminate the contractual relationship before complete fulfilment for reasons for which the contractual partner is responsible, MMK reserves the right to demand compensation from the contractual partner for expenses already incurred and any damages.
5. If, after conclusion of the contract, a significant deterioration in the financial circumstances or adverse information on the creditworthiness of the contractual partner is established or if the insurance limit from the contractual partner's current orders is exhausted, MMK is entitled to demand immediate payment of all outstanding invoices, including those not yet due, to withdraw in whole or in part from any existing agreements and orders placed, and to retain outstanding deliveries.
6. Insofar as a right of a court to reduce or abate exists and can be excluded by law, it is hereby excluded. The assertion of further claims for damages, in particular for storage, shall remain unaffected.

IX. Payment and prohibition of set-off

1. Unless otherwise stated in the order confirmation, the purchase price is due without deduction within ten calendar days after the invoice date in accordance with Point III. of these T&Cs and, in the absence of any agreement to the contrary, must be paid by bank transfer.
2. In addition, MMK is entitled to charge the contractual partner for all expenses incurred by non-fulfilment of contractual obligations on the part of the contractual partner, in particular including the costs of appropriate legal action (collection agency or legal representation). Bank transfer costs and expenses (in particular internationally) are exclusively at the expense of the contractual partner. Incoming payments will first be used to cover expenses and interest on arrears, any claim under Point X. herein, and then to repay the purchase price.
3. The contractual partner may not set off his own claims against the purchase price unless a set-off of those claims has been agreed upon separately with MMK in writing or claims have been recognised by MMK in writing or established by a binding legal verdict. The contractual partner is not entitled to rights of retention.
4. Invoices that can be discounted may be treated as such only if they are settled within the period granted, the deductions made correspond to the agreement made, and there are no other due dates.

X. Retention of ownership

1. MMK retains ownership of the delivered goods until full receipt of all payments arising from the relevant contractual relationship existing between the contracting parties, including interest or costs such as reminder fees or interest on arrears and related claims. Until all claims have been paid in full, the contractual partner shall be liable, from the point of the transfer of risk, for all damage caused by breakage, theft, fire, or other natural hazards. The contractual partner agrees neither to pledge the goods nor to assign them by way of security. Resale in the ordinary course of business is permitted.
2. If MMK's property is endangered by a third party, MMK must be informed immediately.
3. MMK must be informed immediately in writing of any seizure of goods by a third party during the applicable retention of ownership; the contractual partner shall bear the (court and legal representation) costs of any lien indemnity that becomes necessary. If delivered goods are seized, MMK is entitled to withdraw from the contract. In such a case, MMK is entitled to sell the purchased item after it is returned. The realised proceeds shall be credited against the liabilities of the contractual partner less reasonable realisation costs.
4. If payment of the purchase price by cheque or bill of exchange has been agreed upon with the contractual partner, the retention of ownership shall extend until the time that the bill of exchange accepted by MMK is actually cashed by the contractual partner and shall not expire upon crediting of the cheque or bill of exchange by MMK.
5. The contractual partner is obliged to handle and store the goods with care until the entire purchase price has been received by MMK in accordance with Point X.1. In doing so, the contractual partner shall exercise due diligence.
6. Should the contractual partner resell the goods subject to retention of ownership, it hereby assigns to MMK, to the extent permitted by law, all claims arising therefrom in the amount of the final invoice amount (including VAT), irrespective of whether the delivered goods have been resold without processing or after processing. The contractual partner shall remain authorised to assert this claim even after assignment. MMK's authority to assert the claim itself remains unaffected. However, MMK is obliged not to assert the claim as long as the contractual partner meets his payment obligations from the proceeds taken in, does not default on payment and, in particular, has not filed an application to open insolvency or reorganisation proceedings or suspended payments. If he has done any of these things, however, MMK may, insofar as legally permissible, demand that the contractual partner inform MMK of the assigned claims and his debtors, provide all information necessary and expedient for collection, hand over all associated documents, and duly inform the debtor (third party) of the assignment.
7. If the goods are processed or mixed with other objects not belonging to MMK, MMK acquires co-ownership of the new item in the ratio of the value of the goods to that of the object processed or mixed at the time of processing or mixing. The contractual partner shall hold the sole or co-ownership thus created in safe custody for MMK with the appropriate due diligence.
8. MMK shall release the goods and the items or claims replacing them on request at its discretion, insofar as their value exceeds the amount of the secured claims by more than 50% and doing so is required by law.

XI. Deadlines

1. The stated delivery time shall apply only after order confirmation and upon receipt of all necessary commercial and technical information and upon compliance with the agreed terms of payment. The actual delivery date must be agreed upon separately by the contractual partner and MMK.
2. The delivery deadlines shall be deemed to have been met if the delivery has been completed at the factory by the delivery deadline and notification has been given that the goods are ready for shipping if collection by the contractual partner or shipping has been agreed upon.
3. MMK's delivery deadlines (including set dates, periods for rectification, replacement, etc.) shall be extended if events occur for which MMK is not responsible, in particular force majeure, unforeseeable operational disruptions, delivery disruptions on the part of suppliers, or circumstances beyond MMK's control, in particular in the area of freight forwarding or haulage. When the events mentioned and meant here cease, the delivery deadline will be extended by the length of the delay.
4. MMK is bound by delivery deadlines only when the contractual partner meets his contractual obligations. This presupposes in particular compliance with the terms of payment, timely receipt of all documents to be supplied by the contractual partner, necessary approvals, releases, timely clarification and approval of plans, and performance of all other required cooperation. If the contractual partner does not meet his obligations in a timely manner, legal consequences of delay in acceptance will be initiated.
5. The above provisions shall apply mutatis mutandis to any other deadlines accepted by MMK.

XII. Protection of intellectual property, confidentiality

1. MMK reserves the property rights, copyrights, or other industrial property rights to illustrations, drawings, calculations, models, and all other documents which MMK transmits in business transactions; they may not be made accessible to third parties without the written consent of MMK, nor may they be used or exploited outside the business relationship with MMK.
2. All documents relevant to the aforementioned rights must be returned to MMK immediately upon request and in the event of non-conclusion or termination of the contract, for whatever reason, along with any copies made.
3. The contractual partner agrees to treat all business or trade secrets that become known because of or in connection with the offer or the initiation or execution of the contract with absolute confidentiality and not to disclose them to third parties. The contractual partner shall impose this obligation on all his employees, agents, consultants, or other persons or vicarious agents engaged by the contractual partner.

XIII. Final provisions

1. The contractual partner is obliged to inform MMK immediately in writing of any change of address. Written declarations can be sent with binding effect to the address last provided by the contractual partner.
2. Modifications and additions to these T&Cs must be made in writing to be legally valid; this also applies to eliminating this in-writing clause.
3. Should one or more of the above provisions be or become invalid or unenforceable, this circumstance shall not affect the validity of the remaining provisions. The contracting parties hereby agree to replace the invalid or unenforceable provision with a valid and enforceable provision that comes as close as possible to the economic purpose of the invalid or unenforceable provision. This shall also apply mutatis mutandis in the event that the present terms and conditions prove to be incomplete.
4. For the purposes of these T&Cs, “in writing” shall be understood by the contracting parties to include not only a letter sent by post, but also an e-mail, unless otherwise agreed upon in these T&Cs.
5. All contractual relationships between MMK and the contractual partner shall be governed exclusively by Austrian law, to the exclusion of the respective conflict-of-law rules of applicable international private law. The United Nations Convention on Contracts for the International Sale of Goods (UN Sales Convention) shall not apply.
6. For the resolution of all disputes arising from deliveries and services which result directly or indirectly from a contractual relationship between the contracting parties concerned here, including those concerning their existence or non-existence, the court for A-2700 Wiener Neustadt is agreed to have exclusive jurisdiction.
7. If these T&Cs are also provided as a translation in a foreign language, only the German version shall be used for questions of interpretation.
8. Should MMK expand to include additional companies, MMK will inform the contractual partner in writing of the names of these companies. The T&Cs shall then also be deemed to be confirmed and agreed upon in the relationship between these companies and the contractual partner for future transactions.

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