

Only what grows
again can become
something **truly big.**



The Natural Change In Urban Architecture.
INVENTED BY RHOMBERG

2010

IF WE CONTINUE IN THE WAY WE HAVE DONE UP TO NOW, BY THE YEAR...

2030

...WE WILL NEED THE RESOURCES OF TWO PLANETS.



A brief look into the future.

IRREFUTABLE BASIC PRINCIPLES

We have learned to move forward without the use of our muscles and to fly, we have found a wireless way of communicating with each other and are able to send our species to the moon. Even though the progress humankind has achieved has continuously proved a positive surprise, there are, nevertheless, some irrefutable basic principles that cannot be denied. For example, you cannot make two out of one.

Our planet has a lot to offer - but not infinitely so. The global population is growing at a rate of 78 million people a year – about the same number as the inhabitants in Germany. The consequences of the climate crisis that we are experiencing today are quite obvious, we are not using natural sources of energy sufficiently and are causing the irretrievable loss of all resources through our global exploitation. And at the same time we are producing so much waste and CO₂ that you would think we had a second planet at our disposal – one which we would in fact need by 2030 where resources are concerned if we are to maintain the existence of the human race.

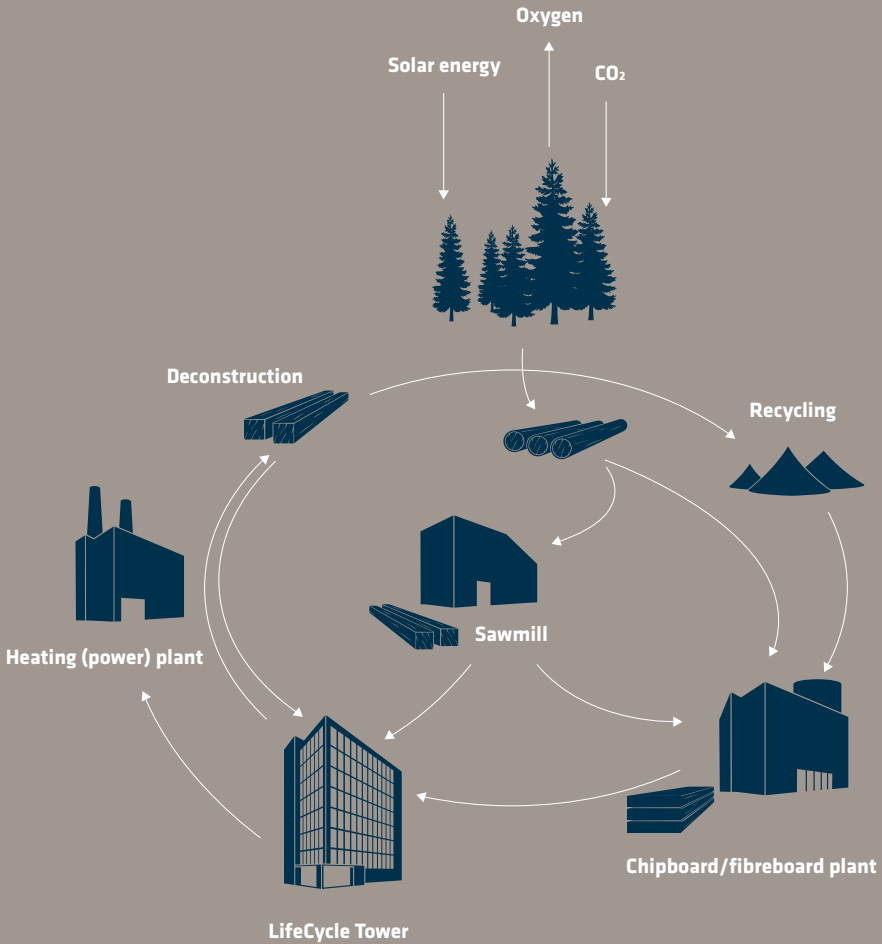
Why less will have to be more in future.

Building better naturally – with renewable raw materials. Every day sees many prestigious and architecturally sophisticated buildings being constructed all around the world. Urban development is based primarily on conventionally produced prototypes. However, the complex construction work this involves goes hand in hand with high building costs, long construction times and high planning risks. And this on top of the fact that the construction industry with its conventional construction methods today consumes **40 % of our energy and resources** as well as generating **40 % of our waste and CO₂ emissions**. The branch is also responsible for **60 % of the world's transport routes**.

Construction waste is valuable.

You do not have to go to great lengths to produce something that already exists: the term »urban mining« is becoming significantly more relevant in the field of sustainable building.

Recovering, recycling and reusing materials from construction waste – **urban mining** contributes significantly to lessening the impact on the environment and reducing dependency on rising raw material prices. You can build so much better with good ideas. For example, by using **natural, renewable raw materials**. Such as **wood**.



Wood is a natural raw material. It can be found in many parts of the world and has a positive impact on the world's carbon footprint. The wood used as building material in the LCT system can regrow in our world's forests. Normally even within a few hours, depending on the size of the project.

Cree. Creative Resource & Energy Efficiency.

If you want to take new paths, you have to rethink. As part of the renowned Rhomberg Group, Cree is the logical outcome of four generations of experience in construction. However, Cree is not simply a construction company but just as much a source of ideas and inspiration for new strategies involving the **sustainable handling of nature and its resources**. We bring wood as a building material into cities – and, with reduced life cycle costs, higher conservation of building value, best possible comfort and state-of-the-art safety requirements, we create a new basis for **modern, urban architecture**. Cree is certified in compliance with ISO 9001 (quality) und ISO 14001 (environment).

We also work a little differently. There are various options as to the extent that we become involved in a **LifeCycle Tower**: just in the planning phase, with consultation alone or for the complete project. A strong team of architects, engineers and planners then work hand in hand until a turnkey building is ready to be handed over – either by us as the general contractor or in cooperation with other project partners.

Like the Rhomberg Group, Cree is also based in Vorarlberg in Austria. Timber technology has a long tradition here – as does a large degree of inventiveness. This is reflected in a high concentration of timber construction. So it is really no surprise that the world's first LifeCycle Tower is being built here: **the LCT ONE**.



IF YOU WANT TO TAKE NEW PATHS, YOU HAVE TO RETHINK.

Nature as a role model.

An innovative system can grow better than individual projects. The LCT system is: individual industrialisation.

This is based on a **sustainable wood-hybrid system for multi-storey buildings** that has been thought-out down to the last detail, one that can be designed individually and constructed in the shortest possible time, thus guaranteeing minimised use of resources and energy over the whole life cycle. **The LifeCycle Tower.**

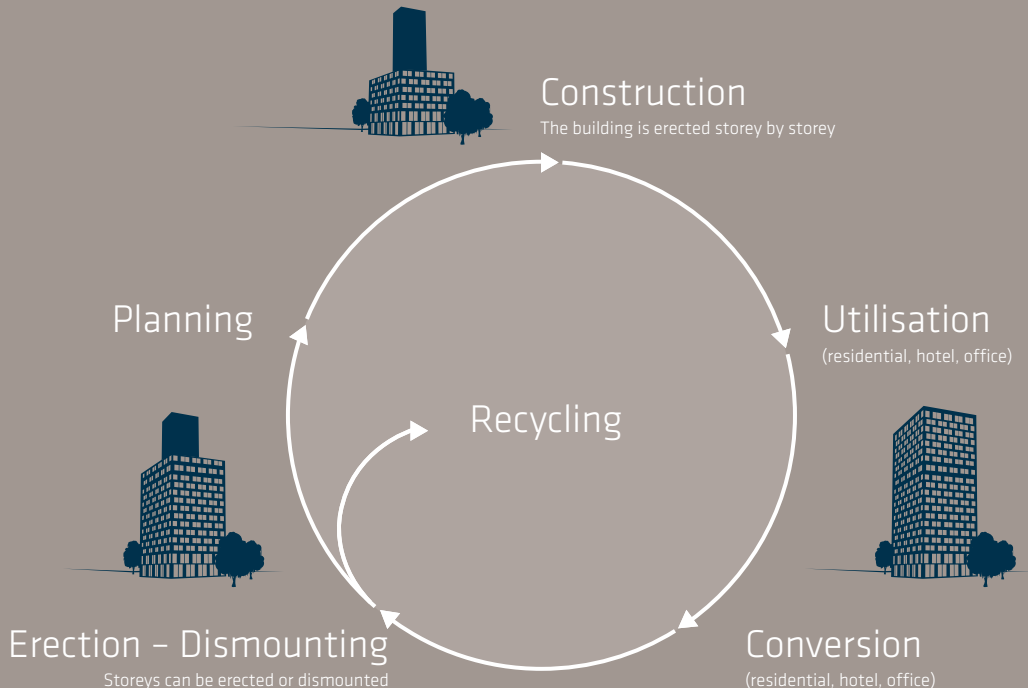
The wood-hybrid high-rise.

The vision: a hybrid timber high-rise building up to 100 m high and with up to 30 storeys. The reality: the LifeCycle Tower from Cree. Up to 90 % improved carbon footprint. Drastically reduced use of resources. And an exceptionally pleasant indoor climate thanks to plenty of visible, exposed wood.

If you want to achieve more, you should do things **systematically**. That is why a LifeCycle Tower is pre-fabricated to plan. This brings a lot of benefits, such as shorter construction times and cost certainty. Lower noise and dust pollution during the construction phase and minimized sources of error in the execution of the construction work. But that does not mean that **building systematically** has to be boring: the facades of every LifeCycle Tower are conceived in such a way that they can be designed individually to suit many different requirements and wishes.

A LifeCycle Tower can be converted at any time in its life cycle, and its modular design makes its renovation a far lot easier.

In this respect we rely on **urban mining** in the LCT system, because we know the materials, know how many different types have been used in the building, and how they can be reused again.





We build
our future
upon wood.

WITH WOOD, NATURE SUPPLIES US WITH THE BEST BUILDING MATERIAL, ONE THAT INCORPORATES ALL THE NECESSARY PROPERTIES DEMANDED BY INNOVATIVE URBAN ARCHITECTURE. AND THIS IS TRUE DESPITE SOME BIAS AGAINST WOOD AS A BUILDING MATERIAL.

From bias to benefit.

Wood burns – that is true. But wood also burns »safely«, because unlike a conventional house made of reinforced concrete where the steel collapses in a fire at some point and the concrete crumbles, with wood you can predict exactly how long it will withstand the flames. As you can imagine, fire protection is a major issue for obtaining a building permit for multi-storey buildings. Even more so if the building is built for the most part from wood.

A number of large-scale **fire tests** have therefore been carried out for the floor slab elements of the LCT system. Based on the results of these tests the components have been continuously optimised, which has led not only to a reduction in the amount of concrete used, but finally also to the success of receiving the required REI 120 Certificate.

Another bias: wood is not durable. But wood is indeed extremely durable if used properly, and what is more it needs **no chemical protection when used indoors.** Thanks to its natural resilience, wood lasts for a very long time. And even if a timber house is demolished after several decades, it still produces no unusable waste, but instead reclaimed wood that can be reused into the resource cycle.

Wood is ideal for use in a systematic approach to construction and the pre-fabrication of building components. Its excellent structural properties also make it very interesting for building construction. That is why this stable material can be used for a wide range of building types – **from long-span frameworks to multi-storey buildings.**

Wood. For a sense of well-being.

THE MORE TIME YOU SPEND IN NATURE, THE LONGER YOU WILL STAY HEALTHY.

But not everyone living in the large cities of this world is lucky enough to have a natural recreational area on his/her doorstep. All the more important it is to at least surround oneself with materials that are not harmful to our health – with wood for example.

Not only does wood provide an incomparable living and working environment, it can actually promote **health**. Studies have shown that solid Swiss stone pine and spruce wood, for example, can reduce the heart beat rate in physical and mental stress situations. The cardiovascular system is less burdened in a room with natural wood and the body's vegetative regeneration process is accelerated. You notice these benefits after a hard day's work and a healthy, refreshing night's sleep.

So wooden rooms promote a general feeling of **well-being** – and even help to lift the mood. Comparative tests have shown that people who spend a longer time in rooms made of wood are more open and communicative than others. Added to this are the pleasant aroma and classic appearance of wood. Could you surround yourself with anything better within your own four walls?

Wood is an excellent building material. Even better if used **systematically.**

Nature with structure.

THE LIFECYCLE TOWER IN DETAIL.

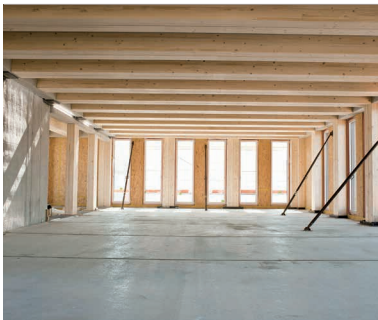
The LCT system is a standardized system consisting of components that has already integrated the mechanical and electrical systems and can be used globally. The system components (slab, columns, façade) are prefabricated industrially and can be used as components to suit individual requirements. The use of serial »off-site production« enables economies of scale, consistently high building quality and speedy erection on site.

The fact that there are no load-bearing partition walls makes the system extremely flexible, allowing floor plans to be designed individually. It is possible to convert the building at any time throughout its complete life cycle. What is more, the **LCT system components** (slab, columns, façade) can be produced by many different companies, so they offer great opportunities for local craftsmen and the **local timber industry**. In addition, it allows architects to concentrate fully on the design aspect of the building, because **all the technical details have already been taken care of in every LifeCycle Tower**. The LCT system can be implemented for any number of different uses including residential, office, industry, training, science, culture, health, catering, accommodation, etc. The local building requirements of different countries have also been taken into consideration: in contrast to other timber construction projects, Cree takes a **»top-down«** approach, whereby all components are planned in such a way that they can be adapted to the requirements and regulations in the respective country in the case of international projects.

Modular construction.

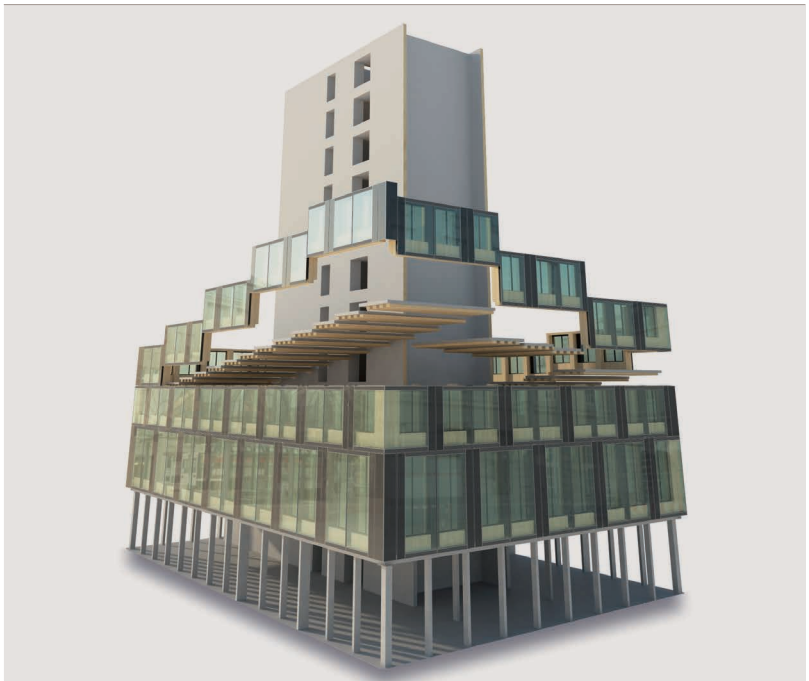
Building with prefabricated components (modular construction), with meticulously designed standard solutions, also reduces the need for single solutions.

All necessary detail solutions are structurally pre-defined, the individual components only have to be fitted together on site. Any subsequent work with non-prefabricated elements, such as separate fire protection cladding for example, are kept to a minimum. This prevents complex details having to be realised on site, details whose correct execution are very difficult to control during construction on a normal building site.



Access core.

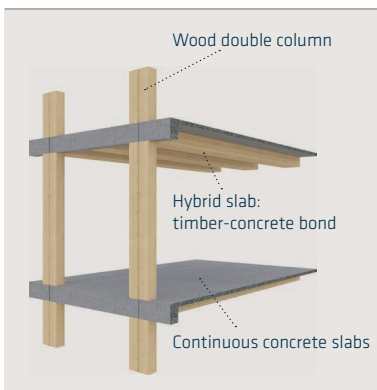
The different storeys and their technical services are accessed via one or several centralised or decentralised access cores. The cores serve as the stiffening elements of the building. Wood is also an option as a material for the access cores. However, the choice of wood or concrete depends on regional building regulations, as does the use of non-combustible building materials for high-rise buildings.



The load bearing system.

The gravity loads are transferred through double columns (hinged columns) directly into the hybrid slabs and out again into the double columns below. The pull out or lateral forces, between the hinged columns and the hybrid slabs, are prevented from separating through the use of simple mortise and tenon joints.

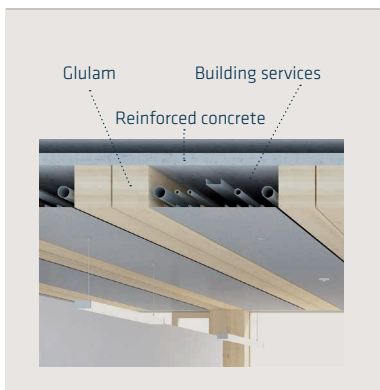
Wood frame walls are attached to the double columns to create one component that can be installed as a facade element. Building progresses much faster than is the case with conventional systems thanks to the **connection of the primary and secondary structures**, because this predominantly dry construction method means that drying out times are irrelevant during the whole construction time. Interior work can be started straight away because the façade is already weatherproof in the shell phase due to the assembly process. **Everything that starts quickly during shell work continues swiftly in the finishing phase.**



The hybrid slab system.

A wood-concrete composite rib construction was developed for the slab. This fulfils several functions:

Firstly it enables the **floor plan to be arranged freely** thanks to its long span (< 9.45 m) and secondly it guarantees the **separation of the storeys** in the building from each other that is required by fire protection regulations. The space between the beams is used for the **technical building services** that are installed flush with the slab. Frame acoustics are improved considerably by this rib structure. Because the **wood is to remain visible** and to be experienced tangibly, as it is in the façade supports, **no suspended ceilings** have been provided for. This reduces the floor-to-floor height to a minimum, which in turn has a positive impact on investment and maintenance costs. In addition, the extremely low dead load has an appreciably beneficial effect on the foundations of the building.



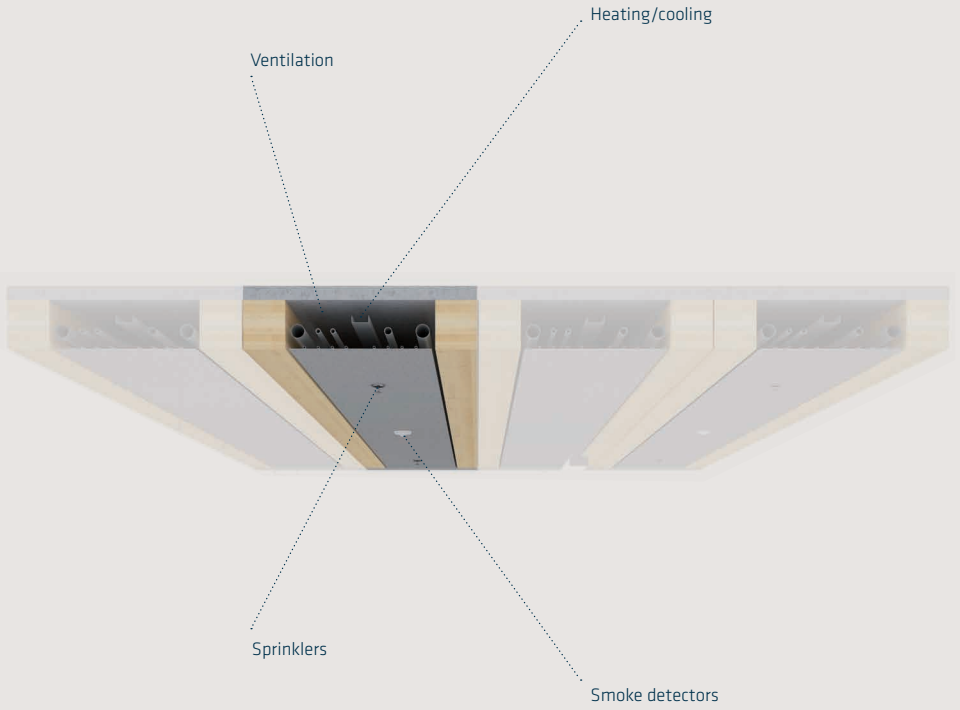
The building services.

A clever, highly energy-efficient building services concept has been developed for the LifeCycle Tower: the following options are available

low-energy, passive house or plus-energy standard.

The qualities of the respective location are utilised optimally for the building. Priority is given to the use of **renewable energy sources in the energy planning of the building**, sources such as geothermal energy, for example, that can be used for both heating and cooling the building. The distribution and delivery system is adjusted to the respective system temperatures. Combined heating-cooling ceiling elements have been developed for space heating and cooling.

The **lighting, a comfort ventilation system** as well as **smoke detectors and sprinklers** are all integrated between the ceiling elements. Other possible elements focusing on the use of **regenerative energy** include solar thermal systems for hot water, regenerative fuel plants where high water temperatures are required and photovoltaic systems integrated in the facade. Despite sun protection measures, the demands on room temperatures in summer (comfort criteria and workplace guidelines) make the use of passive cooling ceilings to cool the building inevitable. However, the higher energy expense that this involves can be reduced by an **intelligent control concept** (exterior shading controls, automatic night cooling, occupancy sensors) and correct user behaviour.





We
think
ahead.

The façade is configurable. Freely, however you wish.

Seen from the outside the LifeCycle Tower always looks differently – in many aspects its façade can be designed individually.

This is equally true for the interior: the LCT is designed in such a way that there are **no load-bearing walls** inside. Thus, there are no limits to the individual options for design and layout.

All proven materials can be used for the surface of the façade, whereby great importance is placed on the content of **recyclable material** when the selection is made. The possibility of disassembling the components into their individual constituent parts plays a major role in the production of the system façade, in order to ensure an **optimum cycle of materials.**

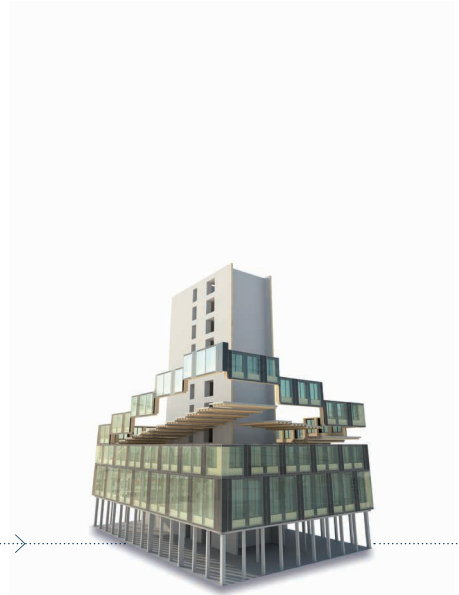
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The construction process.

IT IS NOT ONLY WOOD THAT GROWS QUICKLY

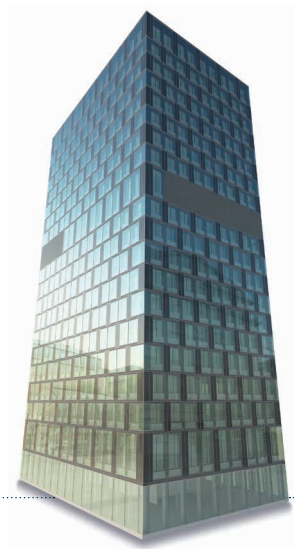
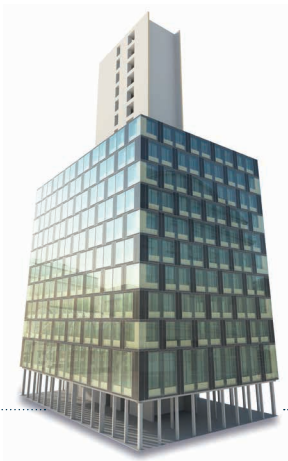
Centuries of experience in design and construction – plus experimenting with different approaches – have shown that building from the bottom upwards is advisable.

The layout of the ground floor and basement will be designed according to the specific properties of the site. In order to exclude any external impacts from humidity or fire on the timber framework of the **LCT system**, the lower stories are built out of conventional reinforced concrete. The **floor slab above the ground floor** is furnished with the **mounting points** of the LCT system for **vertical load-bearing**



elements (façade with timber columns). The **access component** that includes the staircase, lift and the utility shaft has the **mounting points** of the LCT system for **horizontal load-bearing elements** (hybrid slabs). Façade and hybrid slab elements are laid in direct sequence and can be delivered and mounted individually or in series. **The percentage of completion can therefore be up to 100 %** - including the integrated sun shading devices.

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At the end of each work phase, the facades made out of wood, a moisture-sensitive material, are weatherproof even while in the state of construction thanks to the hybrid slabs. **The building rises at amazing speed.** Due to the **dry construction method**, interior work can begin immediately after parts of the building have been erected. There is no need for drying out time usually required when concrete is poured on site.

This well-thought out building method developed for the structural and facade elements is replicated for the **building services: Ceiling panels are installed accurately onto the underside of the hybrid slabs.** These panels contain the heating, cooling, ventilation systems and improve room acoustics. Other building services such as fire alarms, motion detectors, occupancy sensors, power supply to the façade, fire extinguishing systems and lighting can all be added optionally. In other words, **virtually the complete building services can be integrated on the underside of the floor slabs.**

The modular principle of erection greatly reduces the construction time, **which in turn has a positive impact on emissions, costs and quality.**

Facts and figures of the LCT system.

Dimensions

- › Height: up to 100 m (3-30 storeys)
- › Grid options: 1.25 m, 1.35 m, 1.5 m
- › Floor span: < 9.45 m
- › 1 system for multiple uses such as residential, office, industry, training, science, culture, health, catering, accommodation, etc.

Materials

- › Basements and ground floor: reinforced concrete
- › Slabs from the first floor upwards: wood hybrid, exposed timber
- › Façade columns: wood, exposed
- › Sense of well-being thanks to natural surface materials

Building service

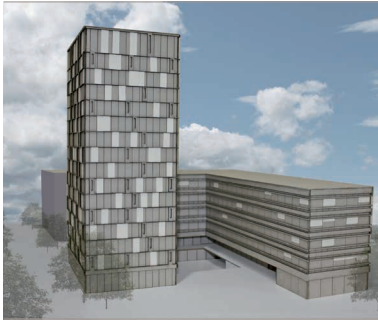
- › Individual energy design
(options: low-energy, passive house or plus-energy standard)
- › Power generation via photovoltaic system
- › Monitoring of operating costs
- › Daylight-dependent artificial lighting control
- › Comfort ventilation
- › High degree of user comfort thanks to control level of building services

Façade

- › Single or double façade
- › Integrated shading devices
- › Optional manual ventilation vents for natural ventilation
- › Individually configurable façade architecture

Inherently adaptable.

The LCT system has its roots in nature – that is probably why a LifeCycle Tower blends organically and harmoniously into its environment in virtually any location. This has been put to the test impressively by the future potential of urban, sustainable architecture that has been designed on the basis of the LCT system by both well-known design studios and several universities.







The city has been waiting for it: **the LCT ONE.**

A vision became reality: The LCT ONE in Dornbirn/Vorarlberg. With eight stories, this flagship project has mainly been fitted out as an office building. But the LCT ONE is also an inspiration to see the bigger picture: as a »LifeCycle Hub« which is open for visitors as a showroom and/or museum for sustainable solutions. The LCT ONE is also being sponsored by The **Austrian Research Promotion Agency (FFG)** and the **Ministry for Transport, Innovation and Technology (bmvit)** within the scope of the **Building of Tomorrow+ program**. It is not without reason that the first LifeCycle Tower is called the number one. Because never before has a building of this type been erected. The LCT ONE in Dornbirn will be an international sensation. And will set new standards: in every respect.

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The LCT ONE

Project:	LCT ONE
Location:	Dornbirn/Austria
Client:	Cree GmbH
Start of construction:	September 2011
Completion date:	September 2012

Dimensions:

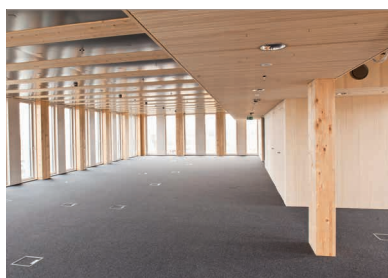
Length:	approx. 24 m
Width:	approx. 13 m
Height:	approx. 27 m
No. of storeys:	8
Floor area:	approx. 2,500 m ² (gross)
Cubic content:	approx. 7,500 m ³ (gross)

Financed by:



LCT ONE Facts.

- › **Dimensions:** 8 storeys, height 27 m, width 13 m, length 24 m
 - › **Floor space:** individually rentable areas 100 m² - 1,600 m²
 - › **Architecture:** designed by Hermann Kaufmann, facades constructed from recycled metal, visible wooden supporting structure, reception area
 - › **Energy standard:** passive house technology
 - › **Windows:** triple glazing
 - › **Operating costs:** optimised by automatic energy consumption monitoring
 - › **Room temperature:** heating/cooling panels integrated in the ceiling, window contacts to prevent loss of energy
 - › **Air quality:** comfort ventilation system with highly efficient heat recovery, automatic control via CO₂ measurement
 - › **Intelligent building service control:** shutters with automatically controlled motor drive, occupancy sensors and daylight-dependent lighting control
 - › **Equipment:** electronic access system, passenger lift, Cat.7 cabling, visualisation of individual energy consumption
 - › **Lighting:** basic lighting of common areas, individual office lighting
 - › **Floor construction:** noise-optimised access floor system
 - › **Floor plan:** individually configurable in dry construction or with system partition walls
 - › **High safety standards:** automatic fire extinguishing system and fire alarm system
 - › **Storage areas:** on every floor
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above: conference room view
below: Storey and office view

The new bandwidth of nature. **The IZM.**

Greatness need not be expressed in height. Cree is erecting a 120-meter long LifeCycle tower with almost 10,000 m² of floor space for Illwerke AG, in Montafon/Austria: the IZM (Illwerke Center Montafon).

A close development partner of Cree won the architectural competition for the new Illwerke center at the end of the year 2010: the architectural firm Hermann Kaufmann ZT GmbH.

The first client order received by Cree is also a showpiece – a hydropower competence center with a staff restaurant and visitors' center is being erected in Vandans, Montafon for Illwerke. The IZM will not only be the **first green building of its size in Vorarlberg**, it will in fact also be **one of the biggest office buildings made of wood in the whole of Europe.**

And thus a **milestone for resource-efficient and sustainable construction.** The features that convinced the client were primarily the **technological, ecological and economical advantages of the LCT system** – as well as its proven high fire safety standard. So good ideas are obviously growing.

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The IZM

Project: Illwerke Center Montafon

Location: Montafon/Austria

Client: Illwerke AG in Vorarlberg

Start of construction: March 2012

Completion date: August 2013

Dimensions:

Length: approx. 120 m

Width: approx. 16 m

Height: approx. 21 m

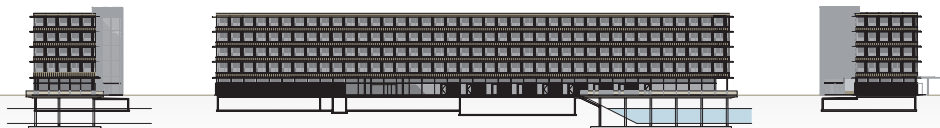
No. of storeys: basement, ground floor,
upper floors 1- 4

Floor area: approx. 11,500 m² (gross)

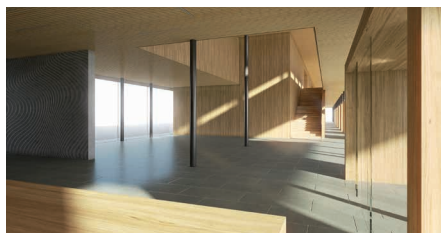
Cubic content: approx. 45,000 m³ (gross)

IZM Facts.

- › **Dimensions:** basement, ground floor, 4 upper floors, height 21 m, width 16 m, length 120 m
 - › **Location:** 1/3 in the pump reservoir Rodund
 - › **Architecture:** designed by Hermann Kaufmann, façades constructed mainly from wood, visible wooden supporting structure, reception area
 - › **Energy standard:** passive house technology
 - › **Windows:** triple glazing
 - › **Operating costs:** optimised by automatic energy consumption monitoring
 - › **Room temperature:** heating/cooling panels integrated in the ceiling, window contacts to prevent loss of energy
 - › **Air quality:** comfort ventilation system with highly efficient heat recovery, automatic control via CO₂ measurement
 - › **Intelligent building service control:** shutters with automatically controlled motor drive, occupancy sensors and daylight-dependent lighting control
 - › **Equipment:** electronic access system, passenger lift, fibre optic cabling, visualisation of individual energy consumption
 - › **Lighting:** basic lighting of common areas, individual office lighting in LED technology
 - › **Floor construction:** noise-optimised access floor system
 - › **Floor plan:** individually configurable in dry construction or with system partition walls
 - › **High safety standards:** sprinkler and fire alarm system
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1 view of north side · 2 view of the east side · 3 view of south side



above: entrance of the IZM · below: foyer in the IZM
left: sectional view of the IZM

