



Stora Enso CLT

Wood: the world's oldest and yet most modern building material



Stora Enso

Doing good for people and the planet

Stora Enso is a leading provider of renewable solutions in paper, packaging, biomaterials and wood products on global markets. Our aim is to replace fossil based materials by innovating and developing new products and services based on wood and other renewable materials. Stora Enso recorded sales of €10 billion in 2015 and it employs some 26,000 people in more than 35 countries around the world. Stora Enso shares are listed on the Helsinki and Stockholm stock exchanges.

The Wood Products division provides versatile wood-based solutions for building and housing. Our product range covers all areas of urban construction including solid-wood elements, housing modules, pellets and wood components. We also offer a variety of sawn timber products. Our customers are mainly construction and joinery companies, merchandisers and retailers. Wood Products operates globally and has more than 20 production units in Europe.

Rethink is our company philosophy. It encourages us to think differently about the way we live our lives and inspires us to find ways to improve our world with renewable solutions.

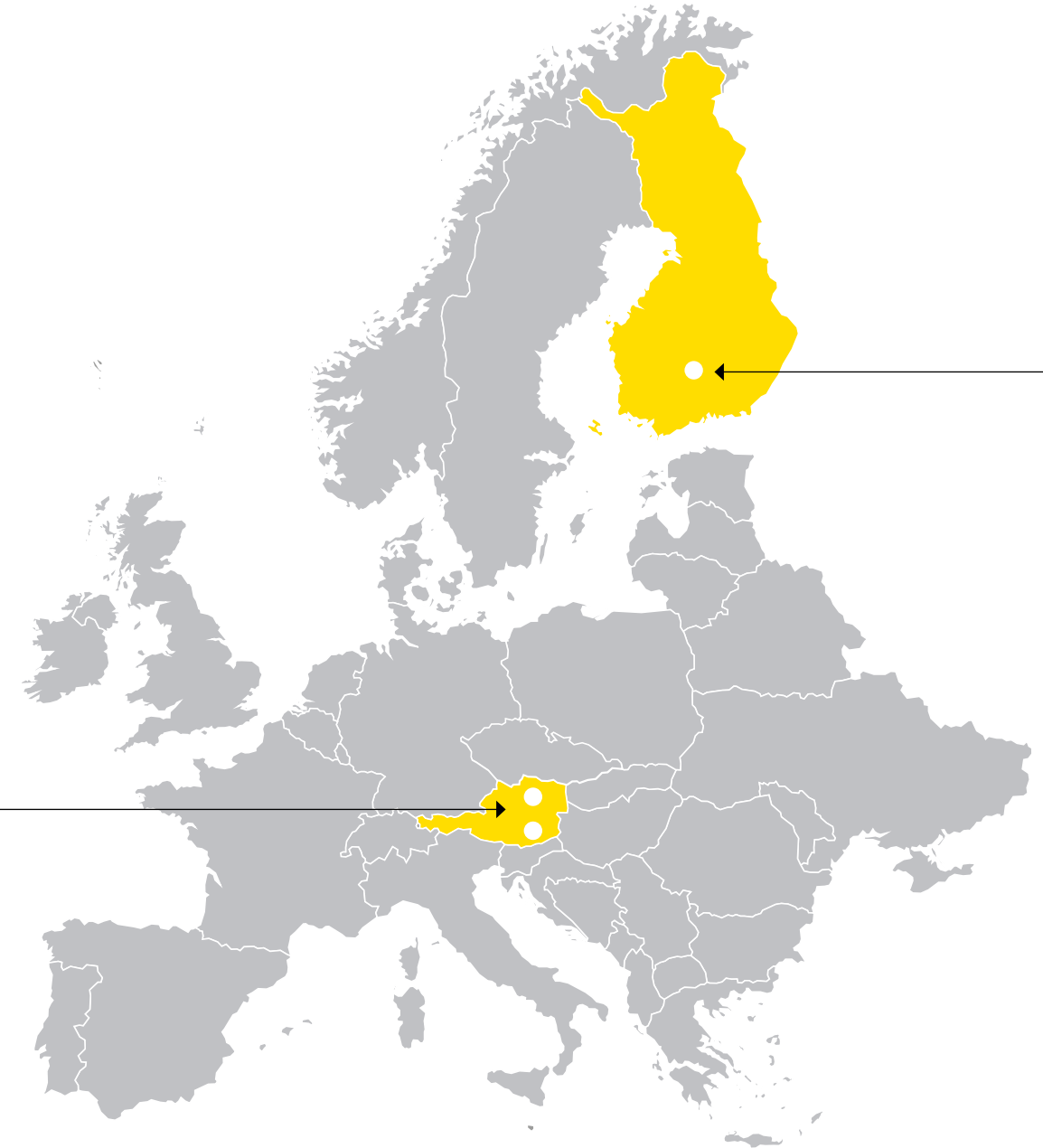
Our core values — remain at the forefront of innovation and conduct business ethically — underpin everything we do. These values must always comply with local laws and regulations and at the same time should help us have a positive impact on people and the communities they live in beyond the local level.

Our company vision — doing good for people and the planet — expresses our ultimate goal. All our endeavours are guided by a well thought-out and responsible strategy. We strive to improve this world, its communities and the lives of everyone that comes into contact with us through our products, activities and services.



Our factory in Hartola

Our Finnish factory in Hartola produces pre-fabricated CLT modules. The modular concept is exceptionally well-suited to buildings with identical accommodation units such as halls of residence or hotel rooms, and can reduce construction times by up to 70%. As the modules are produced in our factories, they are not exposed to the weather which also brings added benefits.



Our factories in Ybbs an der Donau and Bad St. Leonhard

CLT is produced in our Austrian factories in Ybbs an der Donau and Bad St. Leonhard before being distributed around the globe. The two factories have an annual production capacity of approx. 140,000 m³ which corresponds to roughly 2,500 detached houses, thus providing a continuous supply to meet current demand.



Durable, sustainable and flexible: CLT — the solid wood construction system

Recognition of the environmental and structural benefits that wood brings to construction is constantly increasing. Growing social awareness of resource conservation and new technical developments are bringing mankind's oldest building material back into the spotlight.

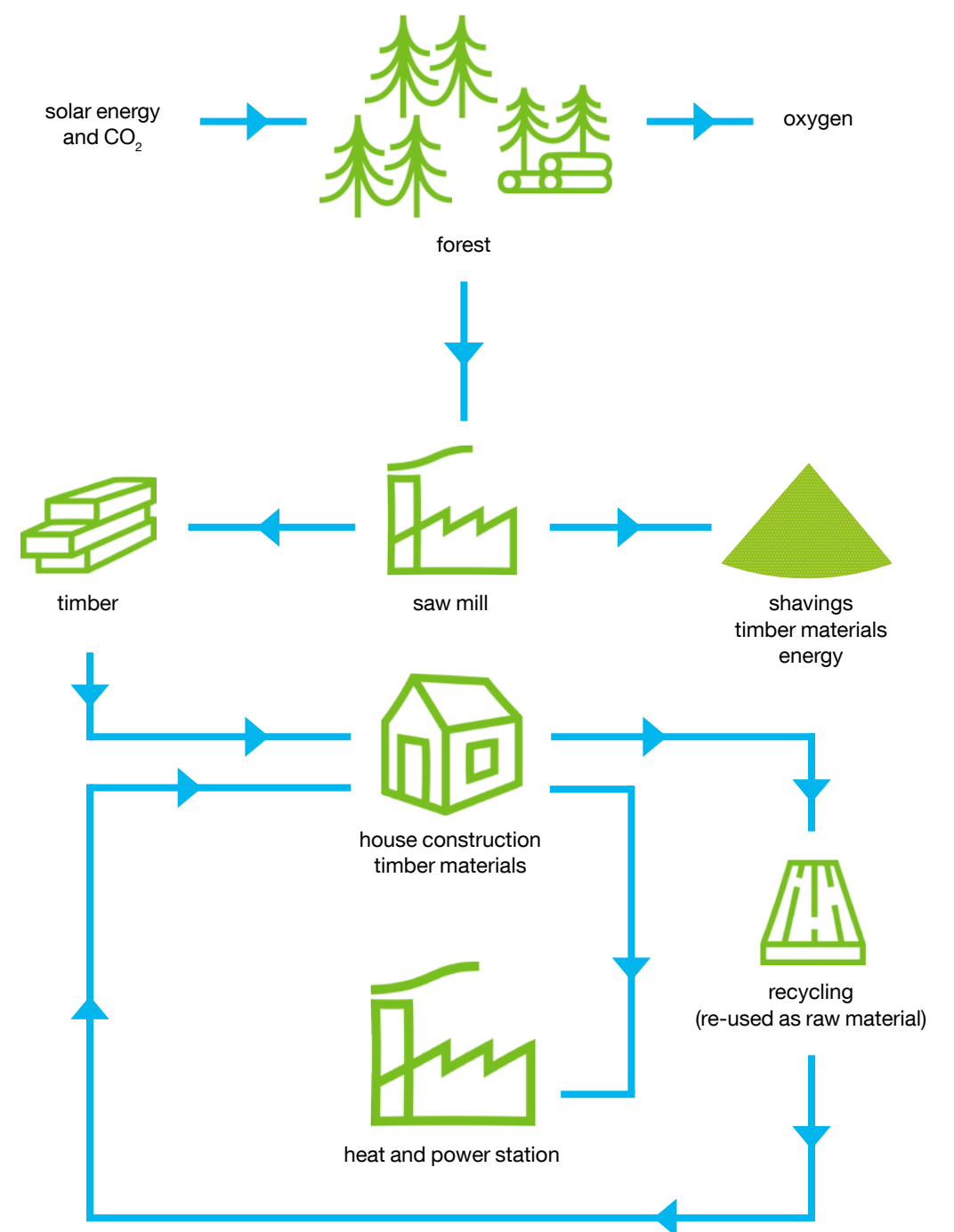
Certification for quality and environment

We believe in a sustainable and energy-efficient construction method for the public and private sectors. Wood, our most important raw material, has many advantages over the materials made from non-renewable resources. Wood is renewable, recyclable and it can be used as a bioenergy at the end of its life cycle. With carbon captured in the wood, the products offer a truly sustainable means of combating climate change. Stora Enso products are manufactured from responsibly sourced wood. The wood supply chains to Stora Enso Wood Products Division units are covered by a wood traceability system, which is third-party certified according to PEFC™ or FSC® Chain of Custody system, or according to both systems.

In the manufacturing process, we set constantly higher targets to minimize negative environmental and social impacts and to maximize the efficiency of all raw material use. To achieve operational excellence, we apply integrated management systems. Stora Enso Wood Products Division units have a good coverage of third-party certified management systems for Quality (ISO 9001) Environment (ISO 14001) and Occupational Health and Safety (OHSAS 18001).



Natural cycle: wood can be used again and again



Wood is an excellent reusable material. Timber products can be recycled again and again.



CLT

Cross Laminated Timber

CLT is a solid wood construction product consisting of at least three bonded single-layer panels arranged at right angles to each other. From five layers, CLT can also include middle layers (transverse layers) without narrow side bonding. It can currently be produced with dimensions of up to 2.95 x 16.00 m. CLT solid wood panels are made up of several layers and are available in different panel thicknesses. The layers are bonded using environmentally-friendly formaldehyde-free adhesives. CLT offers virtually boundless possibilities in terms of construction concept, style and architecture. It is suitable for internal and external walls and for ceilings and roofs.

Universal applications

CLT is extremely versatile and can be fully combined with other building materials. Thanks to its load distribution properties in two directions, CLT presents no limitations to archi-

tectural, residential or utility building projects. For this reason, it is becoming increasingly used for the construction of houses and apartment buildings, as well as for industrial and commercial buildings. As a high-quality structural material with an enormous load-bearing capacity, CLT is becoming increasingly popular for the construction of carports, small structures and wood composite ceilings, and is also being widely used in many other areas.

More room for living

Another advantage of CLT is its space-saving dimensions. External and internal walls are much thinner than brick walls, for example. On average, this means 6% to 10% more living space* in a house made from CLT.

* based on a house with a living space of 100 m²

Technical specifications

Use	wall, ceiling and roof panels
Maximum width	2.95 m (on request up to 4.00 m)
Maximum length	16.00 m
Maximum thickness	400 mm
Panel design	3, 5, 7 or 8 layers
Machining	any cut required
Wood species	spruce, pine
Wood moisture	12% ± 2%
Visual quality	non-visible, industrial visible and visible quality
Surface	sanded on both faces
Weight	approx. 470 kg/m³ CLT
Water vapour transmission resistance	20–50 µ
Thermal conductivity	0.11 W/(mK)
Specific heat capacity c _p	1,600 J/(kgK)
Usage class	1 and 2



Ready-to-fit wall panels

The pre-cut CLT panels are delivered by truck directly to your construction site, ready for fitting by a construction company. Even the openings for windows, doors and installations are already machined in the factory. Above all, this particularly high level of prefabrication saves time and money.

Visually appealing

Manufactured by means of sustainable processes, refined with care, worked with superior skill, this wood construction material meets exceptional quality standards. CLT is available in non-visible, industrial visible and visible quality, and each individual panel is supplied with a sanded surface. The individual lamellas are sorted according to criteria specified by Stora Enso.

Four new special surfaces

To offer a greater choice of wood species, Stora Enso CLT now also exists with the special surfaces: pine, larch, silver fir and Swiss stone pine. These surfaces are applied as a 20 mm additional layer in visible quality.



Entirely prefabricated

For projects with many identical units, such as halls of residence or hotels, we have developed a modular system whereby most of the work — tiles, paint, technical installations, etc. — is performed at the factory.

Building responsibly

Wood is an eco-friendly building product and a responsible choice in the fight against climate change. During its growth, a tree absorbs carbon dioxide from the atmosphere which it stores for centuries in buildings made with solid wood. At the same time, new trees grow back and absorb more carbon. One cubic metre of wood stores approximately one ton of CO₂ and thus plays an active role in reducing the greenhouse effect. The more wood that is used in buildings, the better. Therefore not only does it make sense to use CLT for walls, ceilings and roofs, it is also an extremely environmentally friendly way to build.

Wood, the material of the future

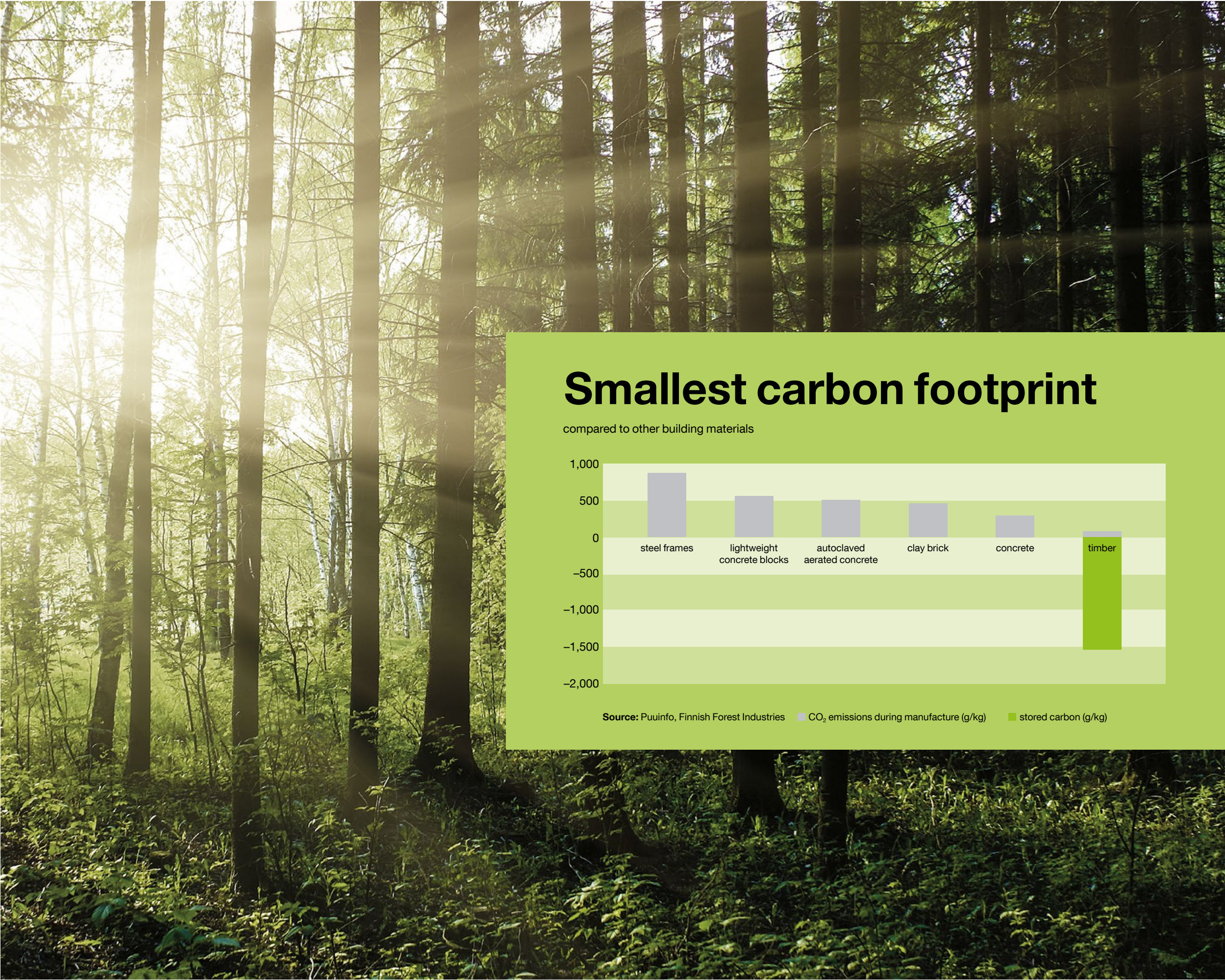
Wood is widely available everywhere and is a natural and sustainable raw material which grows back faster than it is used up. In Austria, trees produce enough wood every 40 seconds to build a timber house. A timber house which is disassembled after centuries of use does not leave behind worthless rubbish, but rather utilisable wood. Individual elements can be recycled, while scrap wood can be used as a source of energy.

For future generations

Careful production planning ensures that the raw materials for producing CLT are used in the most efficient way. With correct planning, construction and protection against adverse weather conditions and damp, CLT buildings can last for centuries.

Actively protecting the environment

In addition, thanks to its heat storage capacity and mass, CLT can efficiently store heat in the winter, and protect buildings from overheating in the summer. This means that passive house standards are easy to implement and less additional insulation material is required.





Top marks in all areas

CLT has outstanding characteristics in all areas including in those that you would least expect.

Advantages at a glance

We know that CLT is the construction material for a sustainable future. CLT offers many advantages over conventional construction materials:

- short set-up time, easy to assemble and high level of prefabrication
- up to 10% more living space gained by using CLT*
- CLT is lighter than concrete or brick
- eco-friendly and sustainable construction method
- positive CO₂ balance
- comfortable and healthy indoor climate
- excellent fire safety characteristics
- good insulating properties
- excellent structural properties
- dry construction method
- earthquake-resistant construction method
- sustainable, certified building material

* based on a house with a living space of 100 m²

Comfortable and healthy indoor climate

Solid wood is able to absorb moisture from the ambient air which it then releases again when the air becomes drier. That is why solid wood provides an excellent indoor climate and is the ideal choice for people who attach importance to a healthy and pleasant atmosphere.

Safe, even in earthquakes

Thanks to their high static strength and flexibility, buildings constructed with CLT solid wood panels perform superbly in areas of seismic activity. As solid wood is lighter than concrete, the weight of the building is better able to withstand tremors.

Excellent structural properties

Due to their enormous structural load-bearing capacity, CLT panels now also enable new architectural and design dimensions to be created in timber construction. As the board layers are bonded at right angles to each other, the load is transferred along two axes. Even projecting or point-supported structures can be realised in outstanding quality with CLT. The high inherent stiffness of CLT also has a positive impact on bracing a building.

Fire protection

Solid wood is more fire-resistant than is generally assumed. CLT has a moisture content of approximately 12%. Before wood can catch fire, the water it contains must first evaporate. In addition, the carbonised surface protects the internal CLT layers so that the solid wood construction does not collapse in a fire. To support this statement, we asked an accredited institute – the Holzforschung Austria – to test the fire resistance of CLT. The results speak for themselves, demonstrating CLT's high level of fire resistance. The corresponding classification reports can be found on our website.

Location: Sistrans (Austria)
Architect: maaars architecture ZT GmbH
Partner: DMH Handels GmbH
CLT installed: 175 m³

CLT offers almost unlimited possibilities from passive houses and nurseries to industrial buildings. For many years we have also been moving towards urban construction, i.e. multi-storey, urban timber structures such as apartments, offices and hotels.

Detached houses

Sistrans (Austria)

CLT was consistently used as a construction material for the interior work, stairs and furnishings of this duplex house. Thanks to its high insulation thickness and construction method,

the building consumes less than 15 kW hours of electricity per square meter per year, thus fulfilling passive house standards and playing an important role in protecting the climate and the environment.

A word from the customer:

“Dwindling sources of energy, high energy costs and, above all, the fragile environment are causing us to rethink how to build houses — for the sake of our children.”

Public buildings



Eggldham primary school (Germany)

The school comprises three u-shaped gable roof buildings, each with two storeys, which are connected together. Virtually all flat structural components are made from CLT and the building, which was constructed in 2010, features a large amount of visible quality CLT elements.

Studies have shown that compared to standard classrooms, timber classrooms give pupils a greater ability to concentrate and help to reduce stress and tension.

A word from the Kreamsreiter architects:

“Right from the start, the customer wanted a future-oriented building that would consume as little energy as possible. Consequently, the plan was to create a school which sets an example of how to respect the environment.”

Location: Eggldham (Germany)
Architect: Kreamsreiter Architekten
Partner: Grossmann Bau GmbH
CLT installed: 600 m³





Location: London (United Kingdom)
Architect: Karakusevic Carson Architects
Partner: Eurban Ltd.
CLT installed: 1,576 m³

Public buildings



Building constructions

Bridport House (London, United Kingdom)

Set in the London Borough of Hackney, Bridport House which is London's tallest CLT building with eight storeys, took just twelve weeks to build (starting from October 2010). The building comprises 41 apartments, each with its own garden or balcony.

The light weight of CLT was an important consideration for the project, as a sewer runs beneath the building. Bridport House and with it, the use of CLT to build a multi-storey building in an urban environment, marked a milestone for Stora Enso.

A word from the London Borough of Hackney:

"The use of eco-friendly materials was a fundamental choice in achieving our goals for a sustainable and cost-efficient construction."



Haltia Nature Centre (Finland)

Haltia is the first public building in Finland to be constructed using CLT solid timber. With the exception of the basement level, the supporting structures and cladding are made of wood. Stora Enso delivered 5,200 m² of elements for the exterior and partition walls, along with glue-laminated joists for the roof and balcony structures. Haltia was awarded the 2013 Finnish Wood Prize in recognition of its superb architecture and superior building quality.

A word from the customer:

"The construction method and choice of materials are important aspects of the nature centre's eco-friendliness. Thanks to the CLT, not only is the building air-tight and protected against the risk of fire and moisture, but it also boasts excellent thermal and acoustic properties."



Location: Espoo (Finland)
Architect: Lahdelma & Mahlamäki
Partner: YIT Rakennus Oy
CLT installed: 870 m³

Industrial and commercial buildings



Location: Bressanone (Italy)
Architect: Sandy Attia and Arch. Matteo Scagnol
Partner: Damiani Holz & Co S.p.a.
CLT installed: 90 m³

LignoAlp office building (Bressanone, Italy)

Even from the outside, LignoAlp's office building has an extremely innovative and impressive appearance, evocative of an over-sized wooden cube. The staircase, elevator shaft and entrance area were made with CLT, demonstrating the flexible functionality of this building material. The fascinating interior design invites visitors on a journey of discovery into the world of wood as a natural building material.

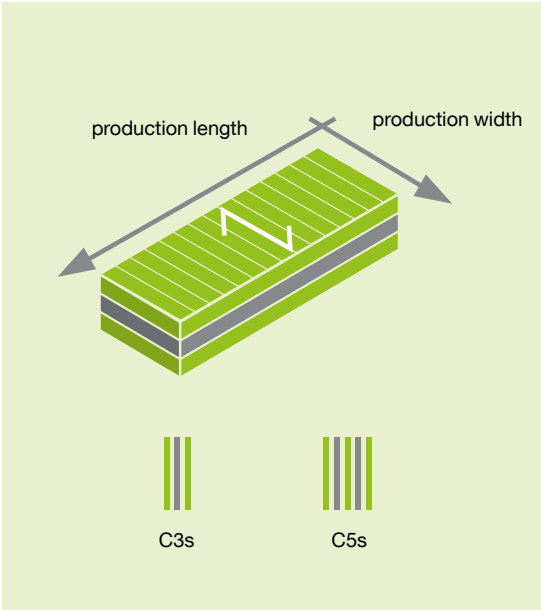
A word from LignoAlp:

"A love of wood and the understanding that healthy, energy-efficient living best serves the needs of people are part of our day-to-day business."

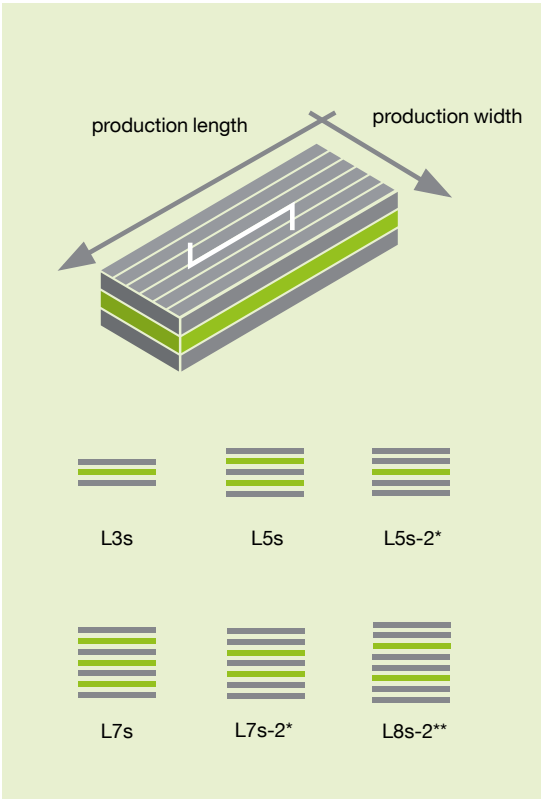


CLT standard designs

C panels									
The grain direction of the cover layers is always parallel to the production widths.									
Thickness [mm]	Panel type [—]	Layers [—]	Panel design [mm]						
			C***	L	C***	L	C***	L	C***
60	C3s	3	20	20	20				
80	C3s	3	20	40	20				
90	C3s	3	30	30	30				
100	C3s	3	30	40	30				
120	C3s	3	40	40	40				
100	C5s	5	20	20	20	20	20		
120	C5s	5	30	20	20	20	30		
140	C5s	5	40	20	20	20	40		
160	C5s	5	40	20	40	20	40		



L panels									
The grain direction of the cover layers is always at right angles to the production widths.									
Thickness [mm]	Panel type [—]	Layers [—]	Panel design [mm]						
			L	C	L	C	L	C	L
60	L3s	3	20	20	20				
80	L3s	3	20	40	20				
90	L3s	3	30	30	30				
100	L3s	3	30	40	30				
120	L3s	3	40	40	40				
100	L5s	5	20	20	20	20	20		
120	L5s	5	30	20	20	20	30		
140	L5s	5	40	20	20	20	40		
160	L5s	5	40	20	40	20	40		
180	L5s	5	40	30	40	30	40		
200	L5s	5	40	40	40	40	40		
160	L5s-2*	5	60	40	60				
180	L7s	7	30	20	30	20	30	20	30
200	L7s	7	20	40	20	40	20	40	20
240	L7s	7	30	40	30	40	30	40	30
220	L7s-2*	7	60	30	40	30	60		
240	L7s-2*	7	80	20	40	20	80		
260	L7s-2*	7	80	30	40	30	80		
280	L7s-2*	7	80	40	40	40	80		
300	L8s-2**	8	80	30	80	30	80		
320	L8s-2**	8	80	40	80	40	80		



* cover layers consisting of two lengthwise layers
** cover layers and inner layer consisting of two lengthwise layers
*** with C panels, the sanding direction is at right angles to the grain

Production widths:
245 cm, 275 cm, 295 cm
Production lengths: from minimum production length of 8.00 m per charged width up to max. 16.00 m (in 10 cm increments)



Publisher, responsible for the contents:
Stora Enso Wood Products GmbH,
Printed on Stora Enso MultArt Silk paper.
Subject to typographical or printing errors.
Printed and published: 04/2016.

Stora Enso Division Wood Products

Building Solutions

Email: buildingsolutions@storaenso.com

www.storaenso.com

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THE RENEWABLE MATERIALS COMPANY