

# InnovaWood GA 2017

## 30.3.2017

### Sami Typpö

# Stora Enso in brief



- A leading provider of renewable solutions
- Some 26 000 employees in 35 countries
- Sales in 2015: EUR 10 billion
- Shares listed on NASDAQ OMX in Helsinki and Stockholm





# "Everything that's made with fossil-based materials today can be made from a tree tomorrow"



From a traditional paper and board producer to a global renewable materials growth company



Packaging Solutions



Consumer board



Bio materials



Wood Products



Paper

# From a classic sawn producer to a leading provider of innovative wood-based solutions



**Classic sawn**



**CLT (Cross Laminated Timber)**



**LVL (Laminated Veneer Lumber)**



**Building Solutions**



**Industrial components**



**Construction beams**



**Pellets**

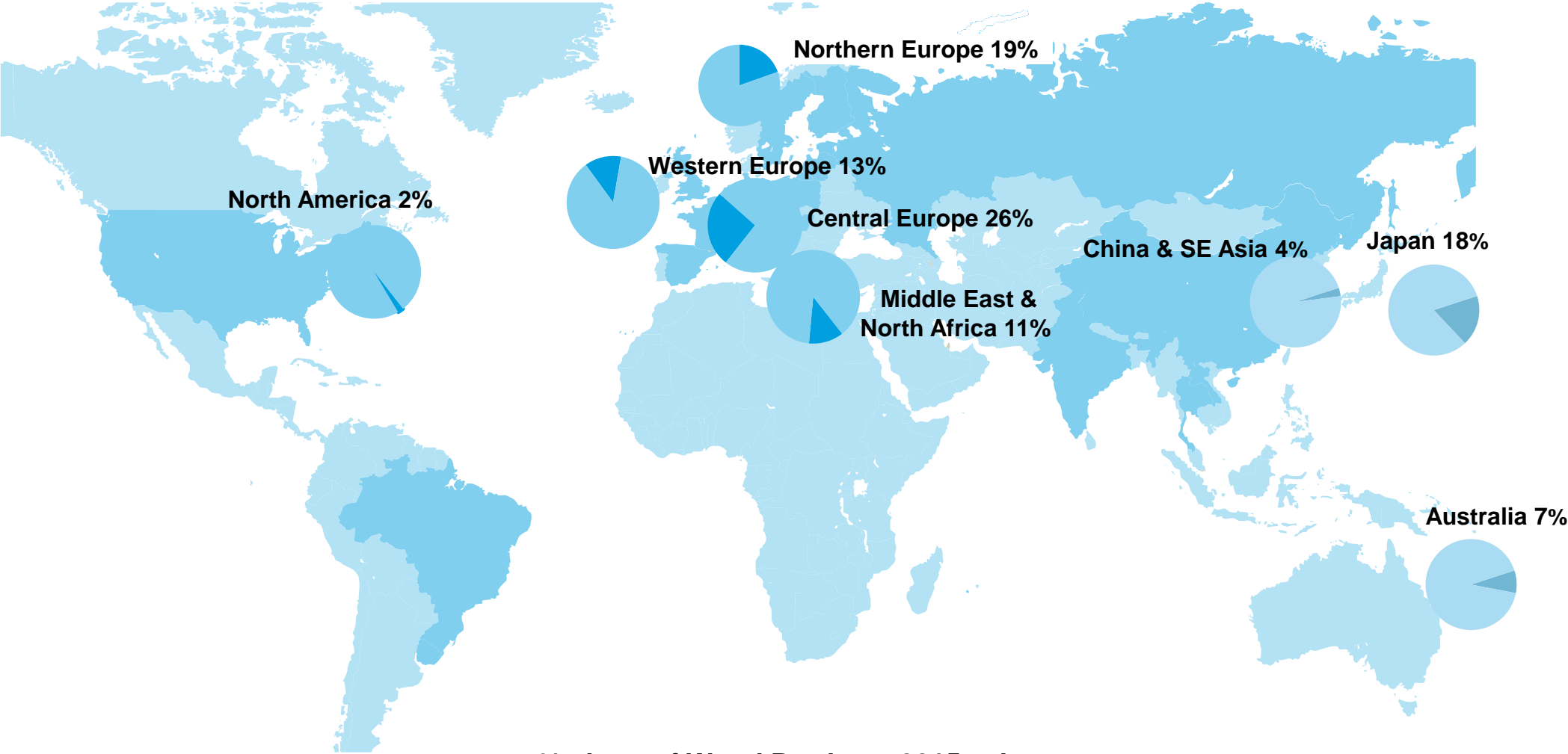


**Biocomposite granule**



**Online services and e-business**

# Distribution concepts open worldwide growth



% share of Wood Products 2015 sales



# Solid timber products changing the construction



## LVL (Laminated Veneer Lumber)

- The most advanced wood product known and used globally since 1960s, suitable for versatile structural applications
- Most modern production equipment enabling customized products and further processing
- Strength higher than steel when compared to weight



## CLT (Cross Laminated Timber)

- Value-adding wood product developed in 1990s
- High degree of prefabrication possibilities, accurate and economic construction material
- Earthquake and fire resistance











100-10000  
100-100000





# CLT by Stora Enso



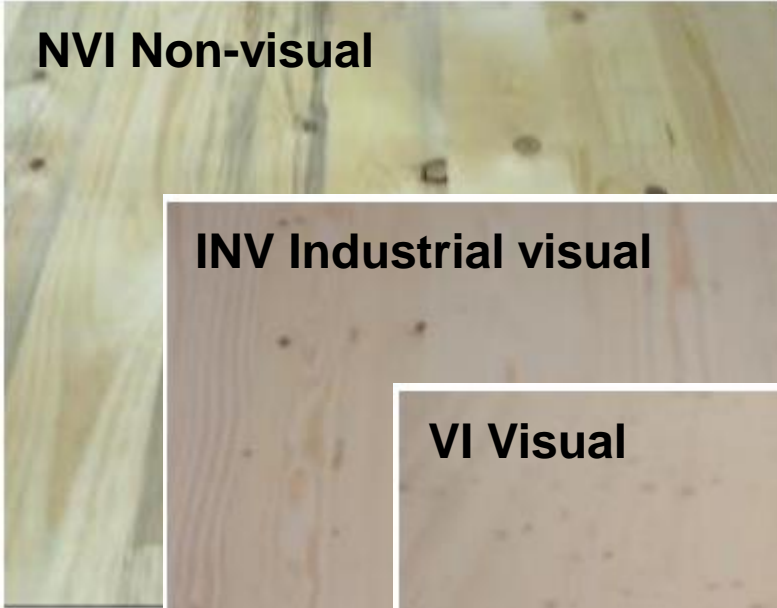
- CLT is the construction material of the future
- CLT is made up of at least three bonded, single-layer panels arranged at right angles to one another
- Measures up to 2.95 m in width and 16.00 m in length.
- Stora Enso is a global market leader with capacity of 140.000 m<sup>3</sup>



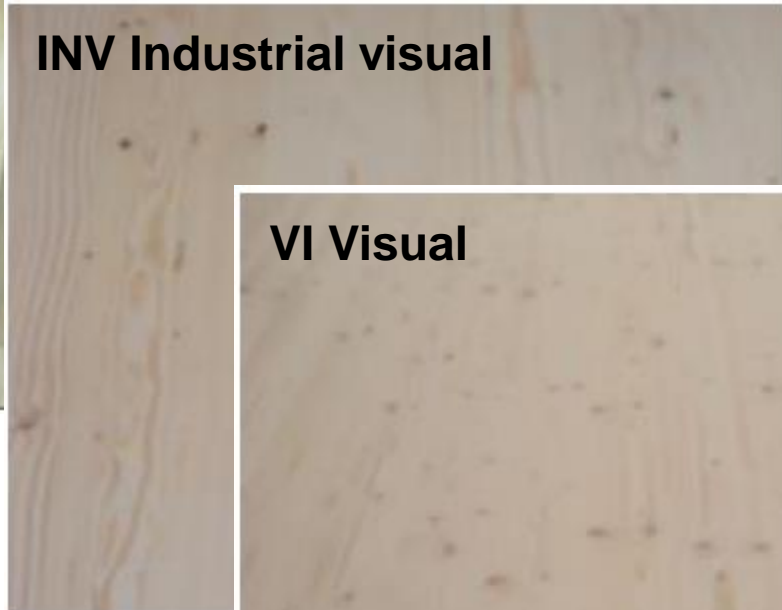


# CLT surface qualities

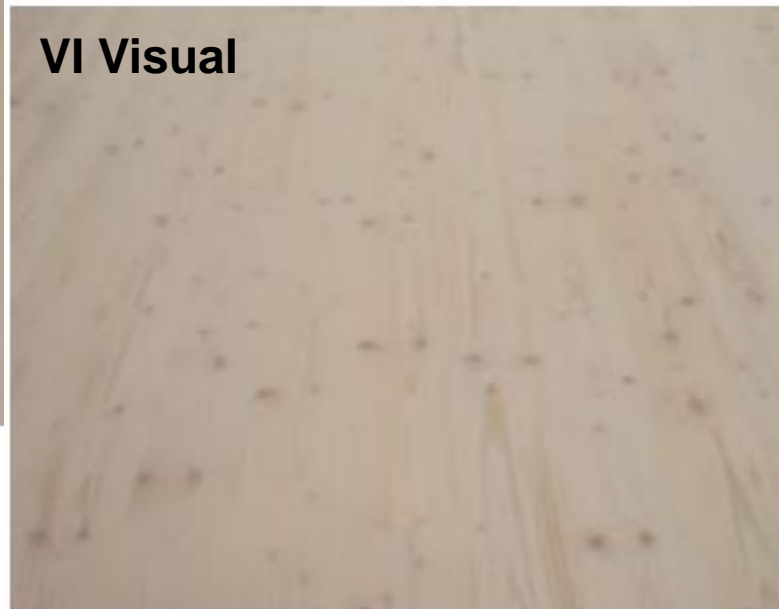
**NVI Non-visual**



**INV Industrial visual**



**VI Visual**



## Special qualities

**CLT**  
pine



**CLT**  
larch



**CLT**  
silver  
fir



**CLT**  
swiss  
pine















DANGER  
PENETRATION  
RELAX





# Calculatis: Free online tool for structural analyses



Projektin yksityiskohdat

Projekti			
Numero	Maa	Suomi	
Nimi	testipoista	Luontipäivämäärä	22.11.2016
Kuvaus	Projekti on valmis.	<input type="checkbox"/>	

Jatkuvan palkin suunnittelu

CLT-levy

Laskelma ei saatavilla  
Uusi laskelma

Puupalkki

Laskelma ei saatavilla  
Uusi laskelma

Teräspalkki

Laskelma ei saatavilla  
Uusi laskelma

Ruodepalkisto

Nimi

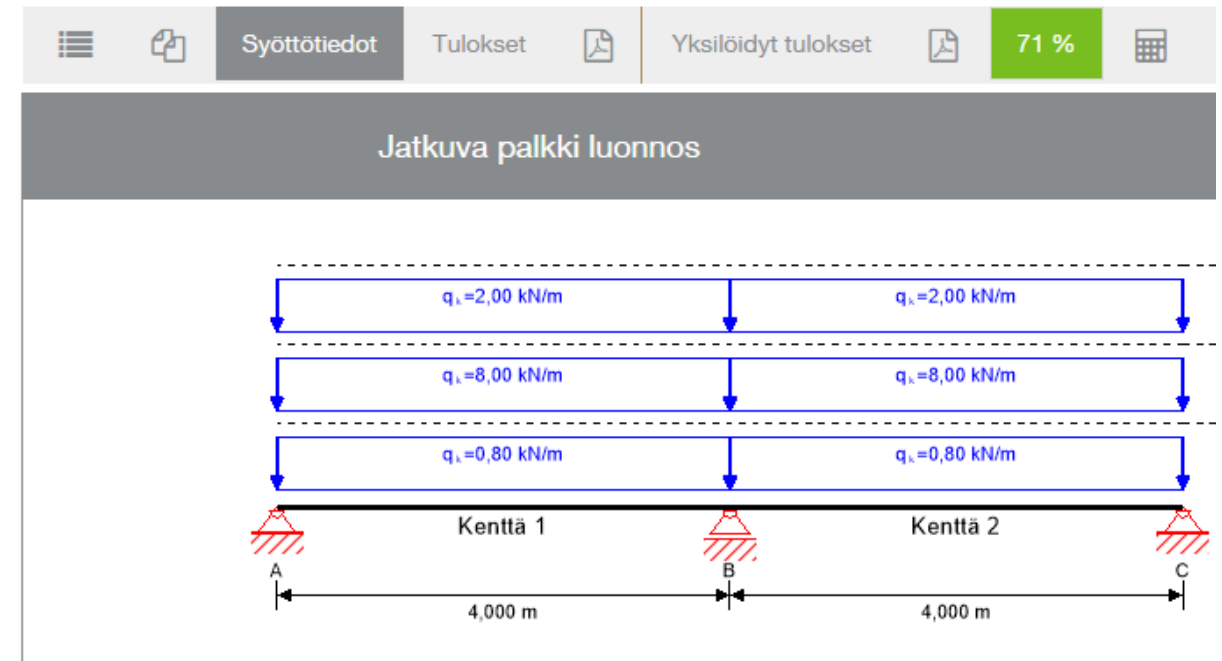
Puu-betonikomposiittilattia

Laskelma ei saatavilla

Levy

Laskelma ei saatavilla

calculatis.clt.info





# Benefits of CLT & LVL

## Modern wooden construction



### Flexible, fast and cost-competitive

- Lightweight
- Easy installation
- Reduced construction time 20-70%
- High dimensional accuracy
- Ease of alteration on site
- High flexibility in design and construction
- High prefabrication level
- No drying time
- Enormous static load capacity
- High elasticity



# Benefits of CLT & LVL

## Modern wooden construction



### Indoor climate and health impacts

- Indoor air quality and high thermal performance
- Acoustics
- Fire resistant
- Last for generations

### Sustainable and renewable

- Reduce fossil and non-renewable materials
- Reduce fossil carbon emission
- Sustainable managed forests (FSC® and/or PEFC™)
- Superior carbon footprint



# Stora Enso's role in wooden construction



- Create market demand in targeted markets
- Develop building systems for different building types
- Develop ecosystem of wood construction in targeted markets
- Share our technical know-how and expertise
- To be most wanted building component supplier



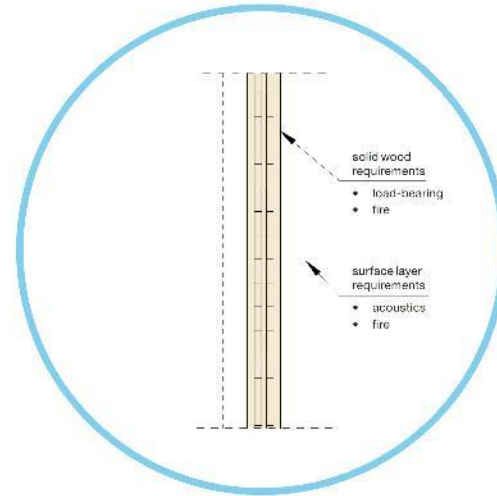
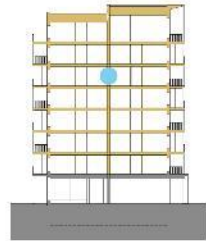
# Building Systems by Stora Enso



- Instructions to design and build massive wooden buildings
- Developed in collaboration with recognized 3rd parties
- Open for everyone to access and use

# Example structures

Load-bearing partition wall



Charring values used for CLT cross-section calculation are calculated according to zero strength layer theory presented in EN 1995-1-2.

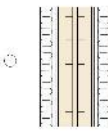
Variables of the construction materials, listed from the outside to the inside. Yellow colour indicates changed variable.

Type	Insulation	Materials	Thickness (CLT 140)	Minimum CLT cross-section (see 4.3)				Surface reaction to fire	R <sub>w</sub> (C; C <sub>tr</sub> ) [dB]
				R60		R90			
				4 stories	7 stories	4 stories	7 stories		
A.0	100 mm	steel studs, gypsum boards [13 mm]	318 mm	140 C5s	140 C5s	140 C5s	180 C5s	A2-s1,d0	57 (-3; -9)
A.1	100 mm	steel studs, gypsum boards [13 mm] (punctual fastening only at floor and ceiling level)	318 mm	140 C6s	140 C6s	140 C6s	160 C6s	A2-s1,d0	59 (-3; -6)
B.0	100 mm	steel studs, gypsum boards [15 + 13 mm]	348 mm	100 C3s	120 C3s	120 C5s	140 C5s	A2-s1,d0	55 (-3; -5)
B.1	100 mm	steel studs, gypsum boards [15 + 13 mm] (punctual fastening only at floor and ceiling level)	348 mm	100 C3s	120 C3s	120 C5s	140 C5s	A2-s1,d0	61 (-2; -6)
C.0	50 mm	timber frame, gypsum board [13 mm] / CLT	229 mm	140 C5s	140 C5s	140 C5s	140 C5s	A2-s1,d0/ D-s2, d0	43 (-2; -7)
C.1	50 mm	steel studs, gypsum boards [13 mm] (gypsum board weight > 920 kg/m <sup>2</sup> ) / CLT	229 mm	140 C5s	140 C5s	140 C5s	140 C5s	A2-s1,d0/ D-s2, d0	52 (-2; -6)
D.0	50 mm	visible CLT	300 mm	140 C5s	140 C5s	140 C5s	140 C5s	D-s2, d0	53 (-2; -7)
E.0	100 mm	timber frame, gypsum boards [13 + 15 mm] / 2 x 15 + 18 mm	311 mm	100 C3s	120 C3s	120 C5s	140 C5s	A2-s1,d0	56 (-3; -4)
E.1	100 mm	steel studs, gypsum boards [13 + 15 mm] / 2 x 15 + 18 mm (gypsum board weight > 920 kg/m <sup>2</sup> )	311 mm	100 C3s	120 C3s	120 C5s	140 C5s	A2-s1,d0	59 (-3; -4)
F.0	20 mm	gypsum boards [15 mm]	330 mm	120 C3s	140 C5s	140 C5s	140 C5s	A2-s1,d0	56 (-2; -7)

Note that all final solutions need to be reviewed and approved by responsible designer. See 1.3 (Disclaimer, page 5).

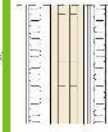
## Variables

### A. Lightweight inner partition, both sides



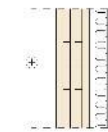
- Structure**
- gypsum board [12 kg/m<sup>2</sup>; 13 mm; 2 x 18 mm]
  - timber (or steel) frame wall [66 mm]
  - + insulation [50 mm]
  - air gap\*\*\* [10 mm] + punctual fastening
  - CLT\*\* [140 mm]
  - air gap\*\*\* [10 mm] + punctual fastening
  - timber (or steel) frame wall [66 mm]
  - + insulation [50 mm]
  - gypsum board [12 kg/m<sup>2</sup>; 13 mm; 2 x 18 mm]

### B. Lightweight inner partition, double gypsum boards



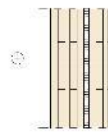
- Structure**
- gypsum board [12 kg/m<sup>2</sup>; 13 mm; 2 x 18 mm]
  - timber (or steel) frame wall [66 mm]
  - + insulation [50 mm]
  - air gap\*\*\* [10 mm] + punctual fastening
  - gypsum board [15 mm]
  - CLT\*\* [140 mm]
  - gypsum board [15 mm]
  - air gap\*\*\* [10 mm] + punctual fastening
  - timber (or steel) frame wall [66 mm]
  - + insulation [50 mm]
  - gypsum board [12 kg/m<sup>2</sup>; 13 mm; 2 x 18 mm]

### C. Lightweight inner partition, one side, double gypsum boards



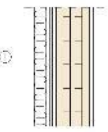
- Structure**
- CLT\*\* [140 mm]
  - (soft connection to the frame required)
  - air gap\*\*\* [10 mm] + punctual fastening
  - timber (or steel) frame wall [66 mm]
  - + insulation [50 mm]
  - gypsum board [12 kg/m<sup>2</sup>; 13 mm; 2 x 18 mm]

### D. Double CLT



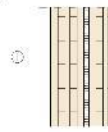
- Structure**
- CLT\*\* 140 mm
  - mineral wool [20-50 mm]
  - CLT\*\* 140 mm

### E. Lightweight inner partition, both sides, service shaft



- Structure**
- gypsum board [12 kg/m<sup>2</sup>; 13 mm; 2 x 18 mm]
  - timber (or steel) frame wall [66 mm]
  - + insulation [50 mm]
  - air gap\*\*\* [10 mm] + punctual fastening
  - gypsum board [15 mm]
  - CLT\*\*\* [140 mm]
  - gypsum board [16 mm]
  - plumbing cavity
  - steel frame + insulation [50 mm]
  - 2 gypsum boards [15 mm]

### F. Double CLT, gypsum boards



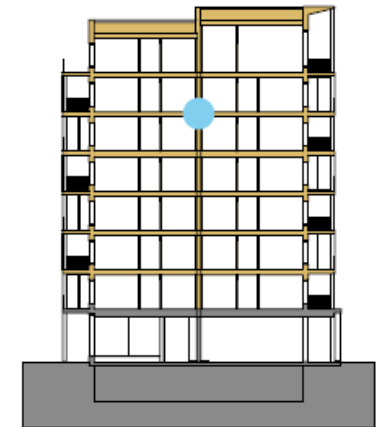
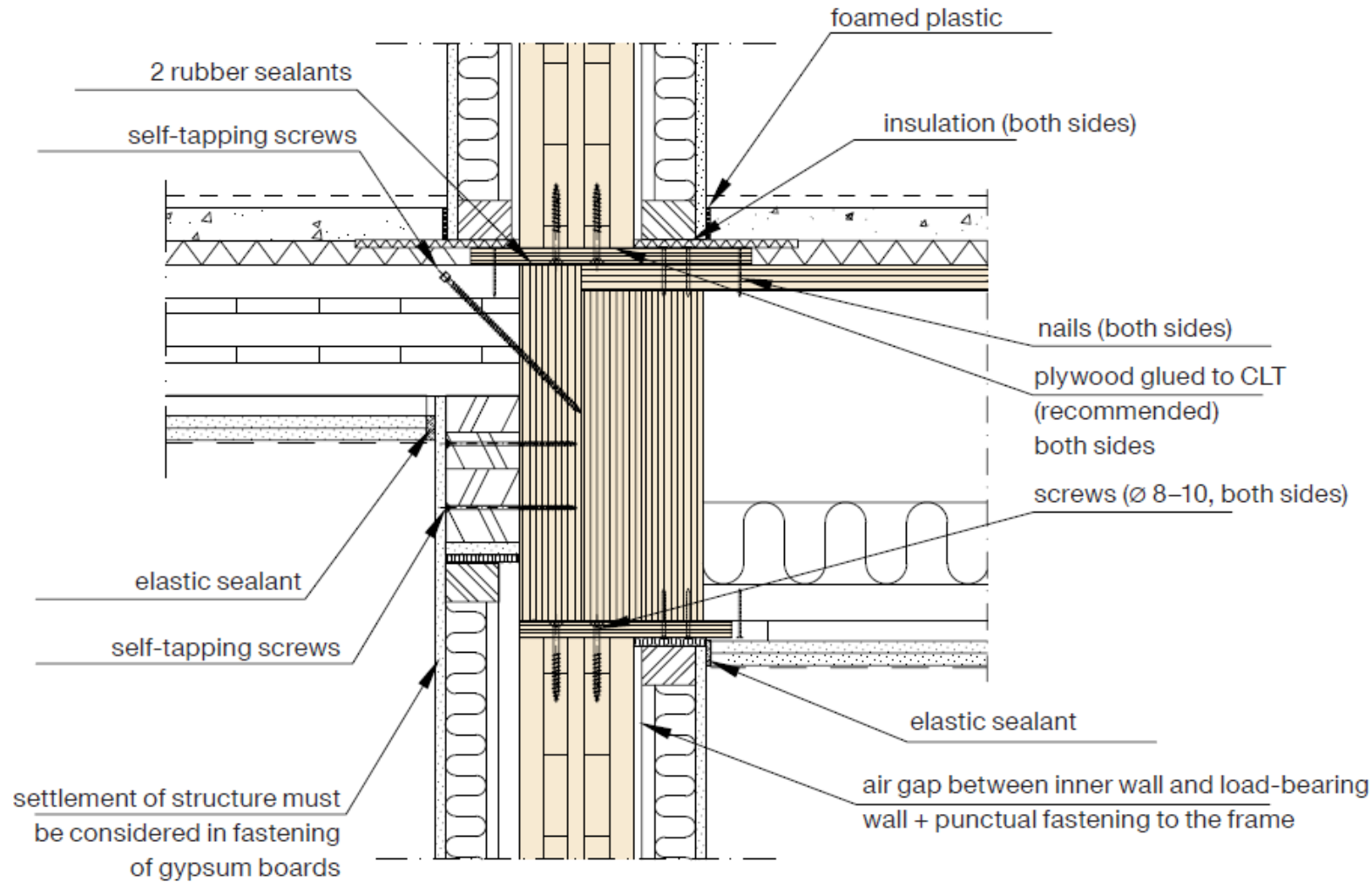
- Structure**
- gypsum board [15 mm; min. 12 kg/m<sup>2</sup>]
  - CLT\*\* [140 mm]
  - mineral wool [40-70 mm]
  - CLT\*\* [140 mm]
  - gypsum board [15 mm; min. 12 kg/m<sup>2</sup>]

- \* variable  
\*\* according to structural calculations  
\*\*\* air gap due to acoustics  
\*\*\*\* for render and included details, look at the manufacturer's guide

These minimum CLT cross sections are calculated for walls in cases where three or six stories are loading them. For exact loading considered, see 4.3 (walls 2 and 4, interior wall).



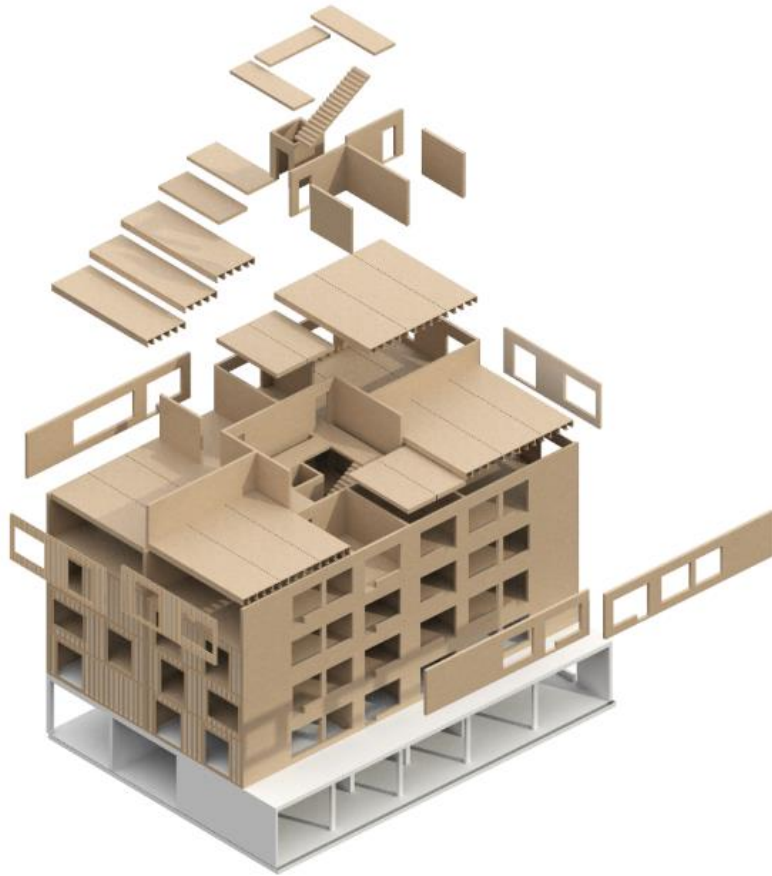
# Example details



# Multi-storey Residential Building Systems



**Panel system**



**Modular system**



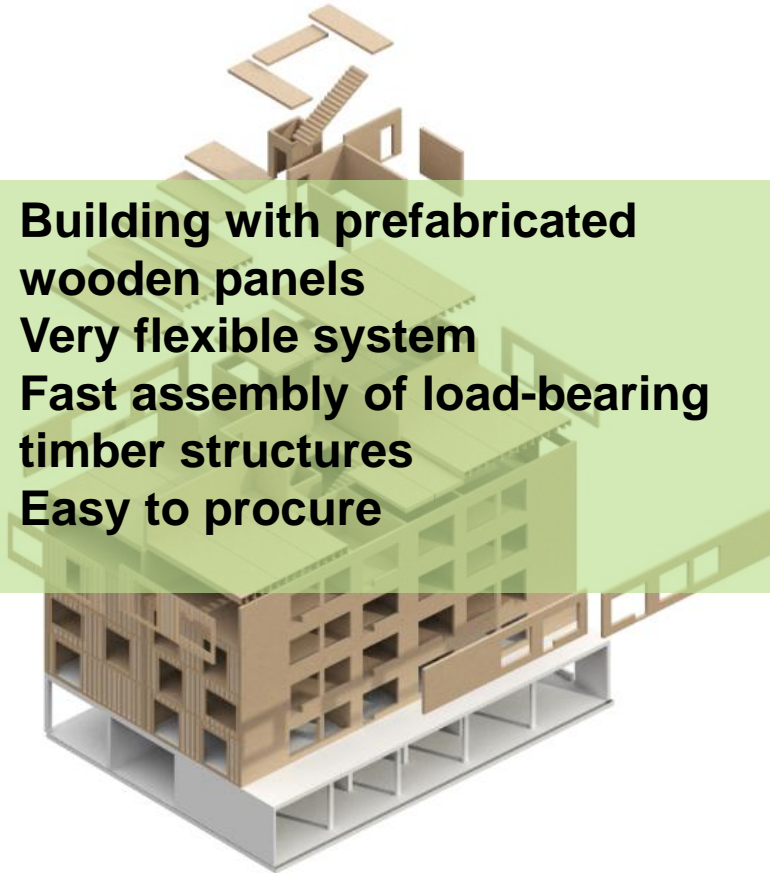


# Multi-storey Residential Building Systems



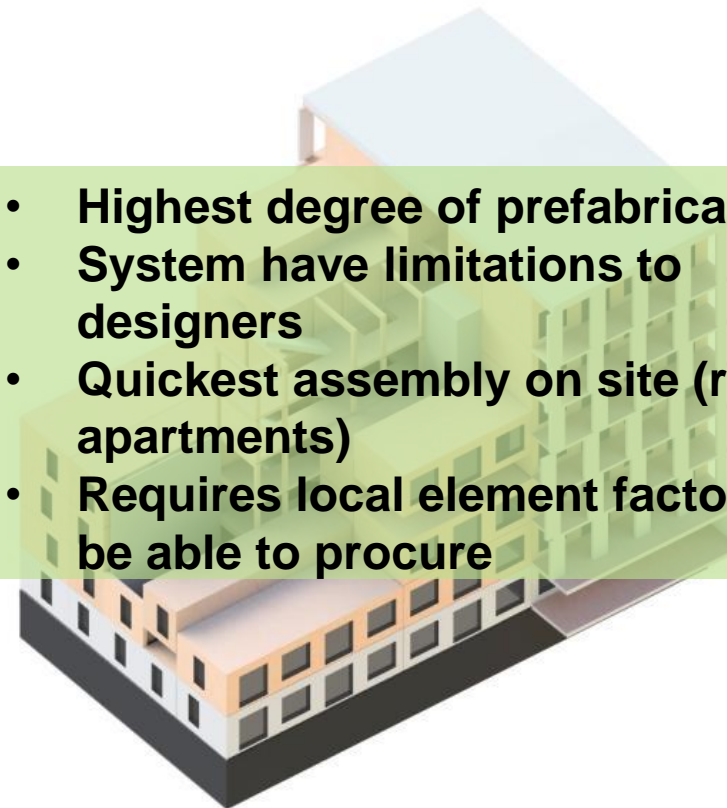
## Panel system

- Building with prefabricated wooden panels
- Very flexible system
- Fast assembly of load-bearing timber structures
- Easy to procure



## Modular system

- Highest degree of prefabrication
- System have limitations to designers
- Quickest assembly on site (ready apartments)
- Requires local element factories to be able to procure



# Multi-storey Residential Building Systems



## Panel system



## Modular system





# Project examples

# Wood City, Helsinki, Finland





# Wood City residential buildings, Helsinki, Finland



16/8/2016







# Moholt 50/50, Trondheim, Norway





# Moholt 50/50, Trondheim, Norway





# Moholt 50/50, Trondheim, Norway



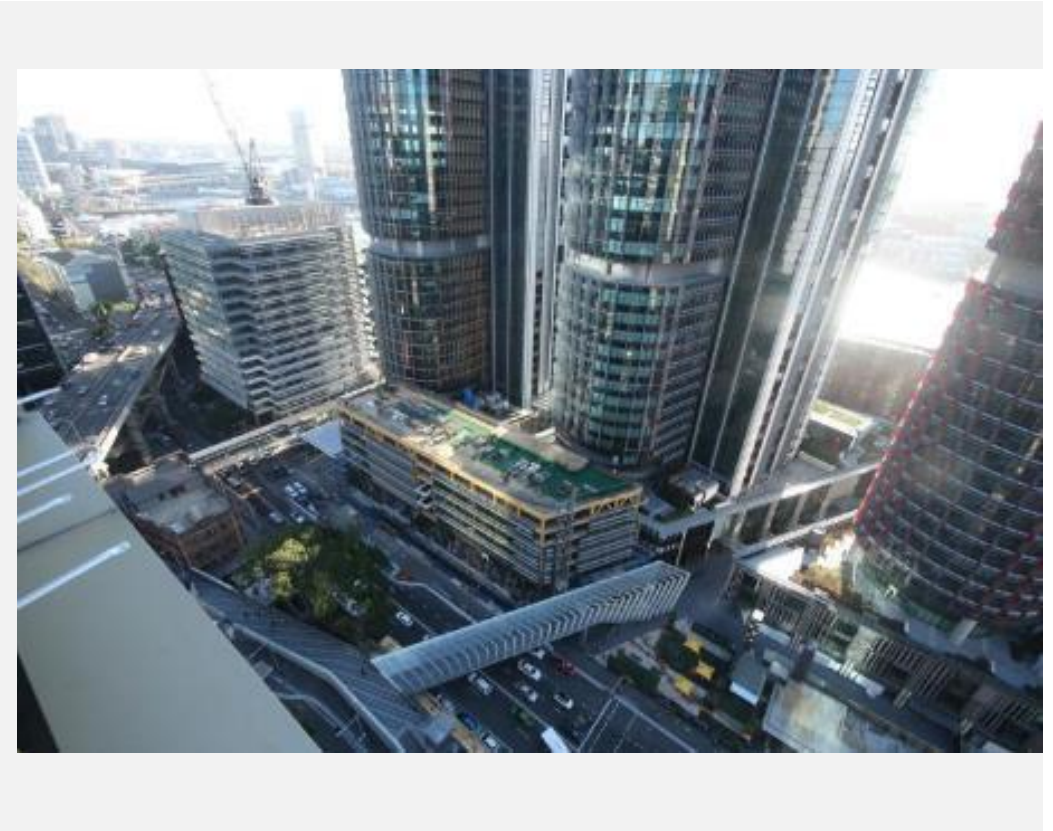


# International house, Sydney





# International house, Sydney





# Library at the Dock- Melbourne





# Quai de la Borde - France





# Quai de la Borde & Trafalgar Place - London





# Puukuokka, Jyväskylä, Finland, 2014





# Eskolantie, Helsinki, Finland, 2015



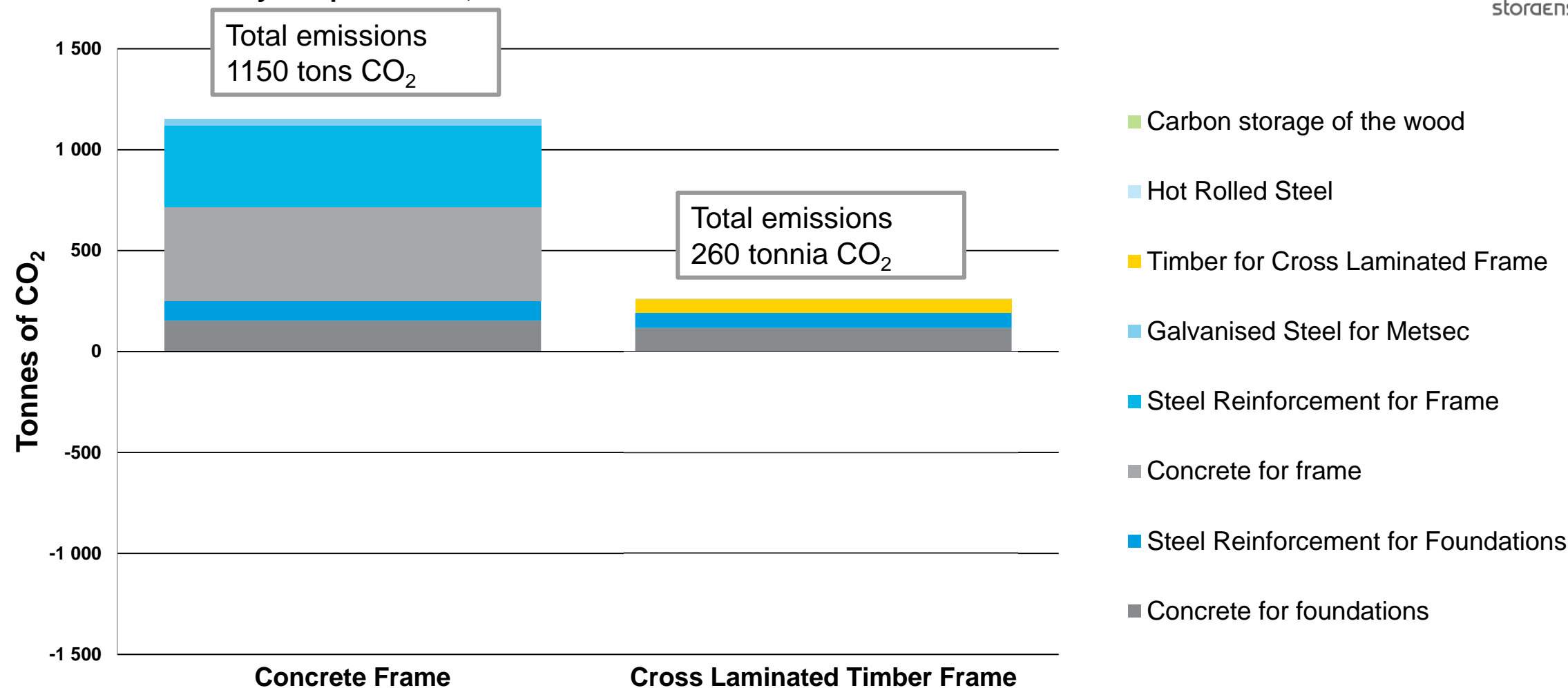


# Mäihä, Seinäjoki, Finland, 2016



# Sustainability aspects

Source: Case Study Bridport House, 2011







# Thank you!

[storaenso.com/buildingsystems](https://storaenso.com/buildingsystems)

[storaenso.com/lvl](https://storaenso.com/lvl)

[clt.info](https://clt.info)

[calculatis.clt.info](https://calculatis.clt.info)