SBE16 Excursion

Woodcity-project

Residential multi-storey building systems

THE RENEWABLE MATERIALS COMPANY

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

A changing world
Global trends drive for renewable materials

Growing population

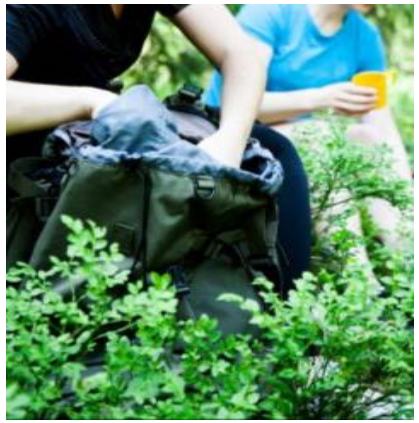
Urbanisation

Digitalisation

Income growth

Global warming

Changing lifestyles



Eco awareness

”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

Stora Enso Wood Products

THE RENEWABLE MATERIALS COMPANY

Broad portfolio of offering

CLT (Cross Laminated Timber)*

Construction beams*

LVL (Laminated Veneer Lumber)*

Building Solutions*

Industrial components*

Classic sawn

Pellets*

Online Services and e-business

Services

**) Value added products = Building Components and Systems products*

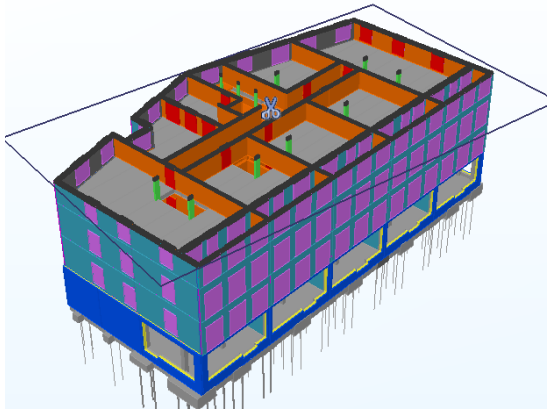
Our vision


”Our aim is to be the leading building solutions provider in wood construction and the forerunner in related technology development.”

Wood City - project

Wood City block

- Office building 12.000 sqm
- Hotel building 7000 sqm
- 2 residential buildings 8000 sqm



WOOD CITY / RESIDENTIAL BUILDINGS

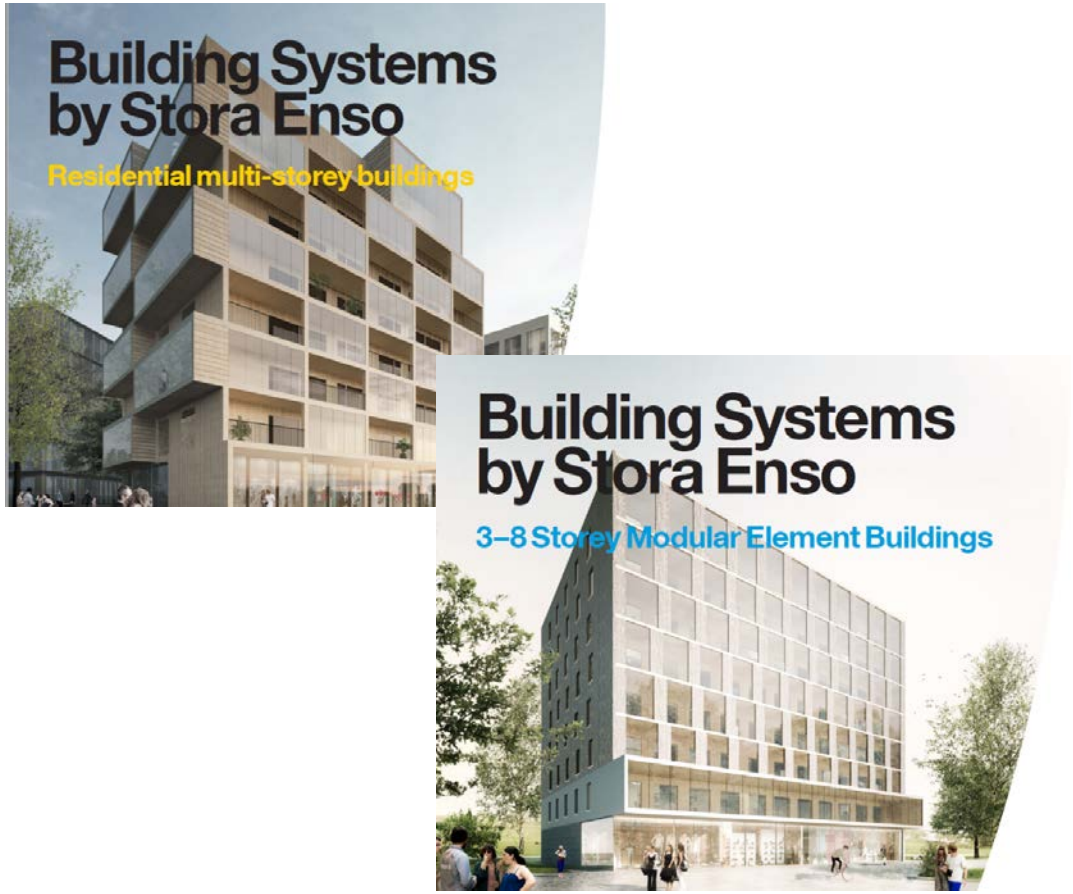
- 2 pcs 8 storey apartment buildings
- 8198 m^2 floor area
- ~2000 m^3 of Stora Enso Building Components
- Developer: Helsinki Housing Production Department ATT
- Design & Build contractor: SRV Rakennus Oy
- Anttinen Oiva Arkkitehdit Oy

Building Systems by Stora Enso

For residential multi-storey buildings

THE RENEWABLE MATERIALS COMPANY

What is a “Stora Enso Building system”?



- Different system for different building type
- System manuals => Instructions how to build wooden building
- “European level” manuals which interpretation to certain project requires professional designers
- Open for anyone to access and use
- Developed together with recognized 3rd parties (Customers & specifiers)

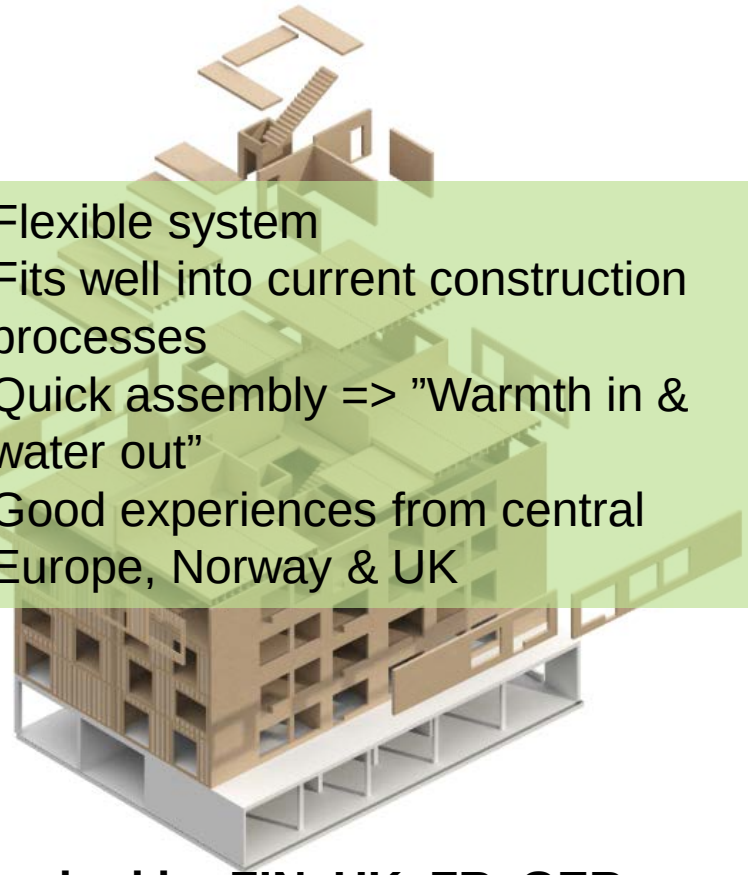
Building Systems for residential multi-storey buildings

Panel system

Modular element system

Differences in between the systems

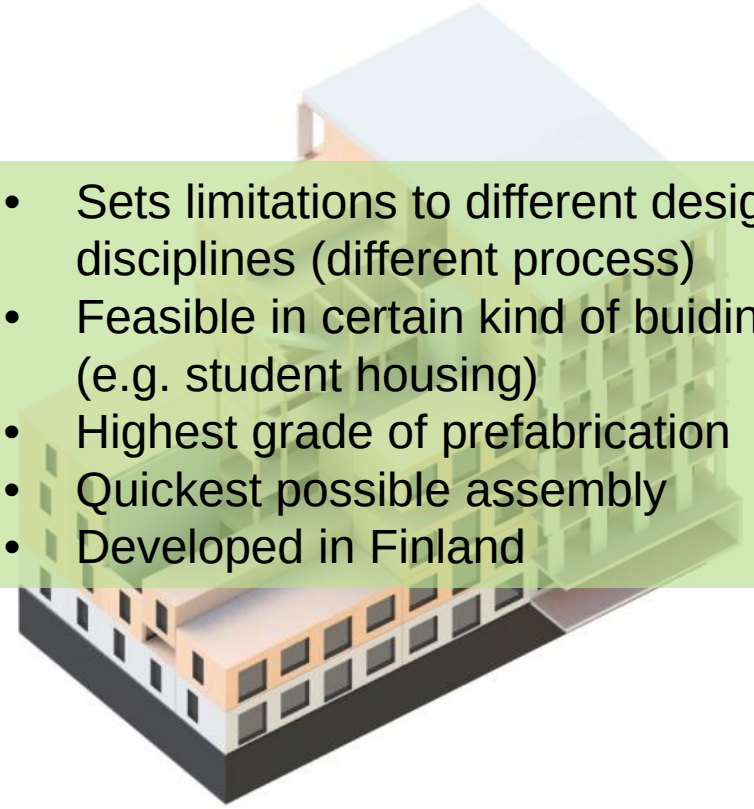
Panel system



- Flexible system
- Fits well into current construction processes
- Quick assembly => ”Warmth in & water out”
- Good experiences from central Europe, Norway & UK

Launched in: FIN, UK, FR, GER

Modular element system



- Sets limitations to different design disciplines (different process)
- Feasible in certain kind of buidings (e.g. student housing)
- Highest grade of prefabrication
- Quickest possible assembly
- Developed in Finland

Launched in: FIN

Stora Enso’s role

- Identify clear needs for targeted markets
- Create building systems per building type
- Promote best practices to get competiveness
- Share our technical know-how

⇒ Sustainability and collaboration are key factors to success

Create the best network

Stora Enso

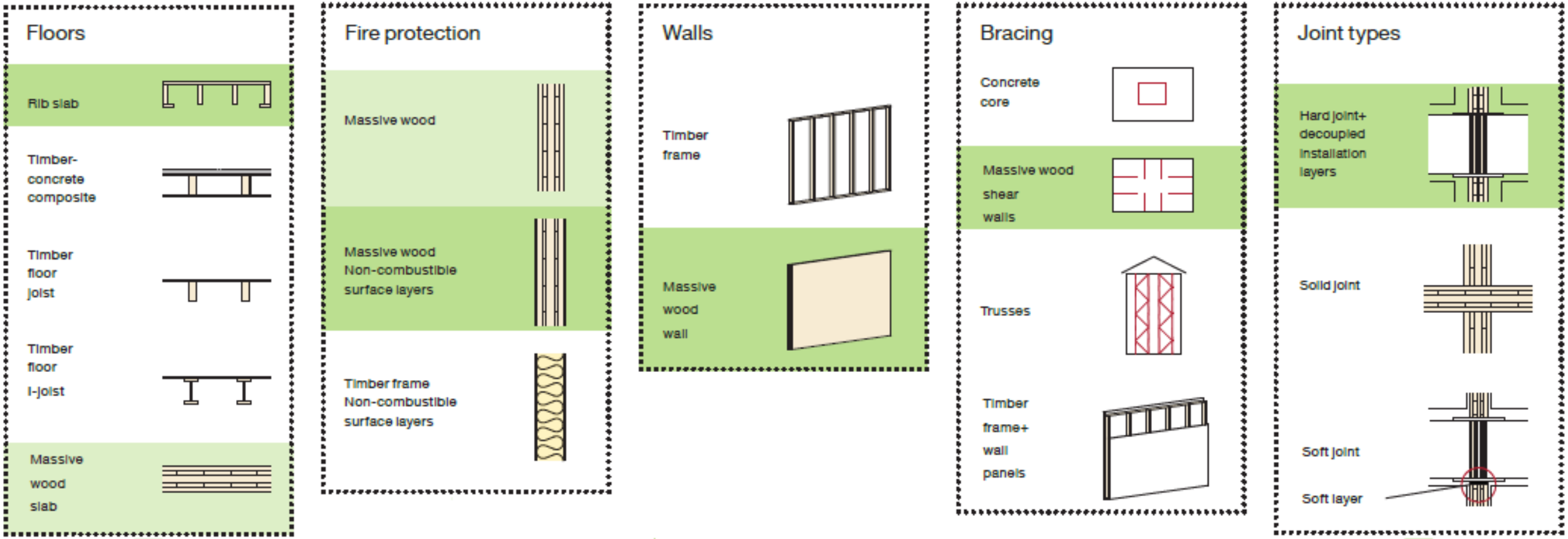
Developers

Architects

Engineers

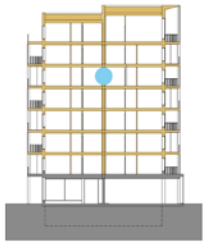
Contractors

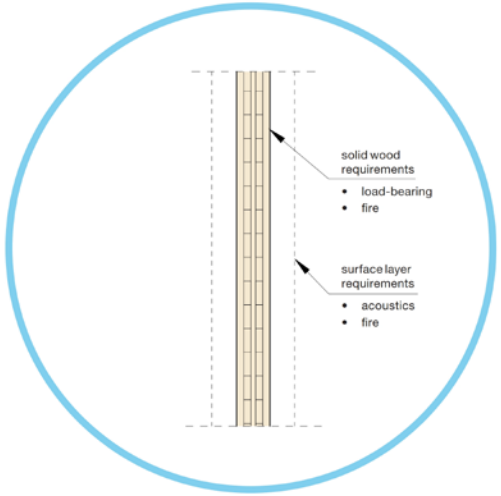
Manuals have selection of structural components ….



….structural types…

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.

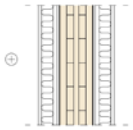
Variables of the construction materials, listed from the outside to the inside. Yellow colour indicates changed variable.

Type	Insulation	Materials	Thickness (CLT 140)	Minimum CLT cross-section (see 4.3)				Surface reaction to fire	Rw (C; Ctr) [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	160 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 C5s	140 C5s	140 C5s	160 C5s	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; –5)
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/m³) / 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 × 15 + 18 mm	511 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 × 15 + 18 mm (gypsum board weight > 920 kg/m³)	511 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).

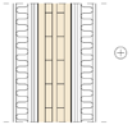
Variables

A. Lightweight inner partition, both sides



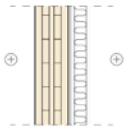
Structure
- gypsum board [12 kg/m³; 13 mm; 2 × 18 mm]
- timber (or steel) frame wall [66 mm] + insulation [50 mm]
- air gap*** [10 mm] + punctual fastening
- CLT** [140 mm]
- air gap*** [10 mm] + punctual fastening
- timber (or steel) frame wall [66 mm] + insulation [50 mm]
- gypsum board [12 kg/m³; 13 mm; 2 × 18 mm]

B. Lightweight inner partition, double gypsum boards



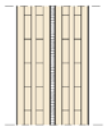
Structure
- gypsum board [12 kg/m³; 13 mm; 2 × 18 mm]
- timber (or steel) frame wall [66 mm] + insulation [50 mm]
- air gap*** [10 mm] + punctual fastening
- gypsum board [15 mm]
- CLT** [140 mm]
- gypsum board [15 mm]
- air gap*** [10 mm] + punctual fastening
- timber (or steel) frame wall [66 mm] + insulation [50 mm]
- gypsum board [12 kg/m³; 13 mm; 2 × 18 mm]

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



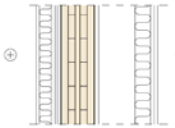
Structure
- CLT** [140 mm]
- (soft connection to the frame required)
- air gap*** [10 mm] + punctual fastening
- timber (or steel) frame wall [66 mm] + insulation [50 mm]
- gypsum board [12 kg/m³; 13 mm; 2 × 18 mm]

D. Double CLT



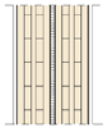
Structure
- CLT** 140 mm
- mineral wool [20–50 mm]
- CLT** 140 mm

E. Lightweight inner partition, both sides, service shaft



Structure
- gypsum board [12 kg/m³; 13 mm; 2 × 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 [18 mm]
- plumbing cavity
- steel frame + insulation [50 mm]
- 2 gypsum boards [15 mm]

F. Double CLT, gypsum boards

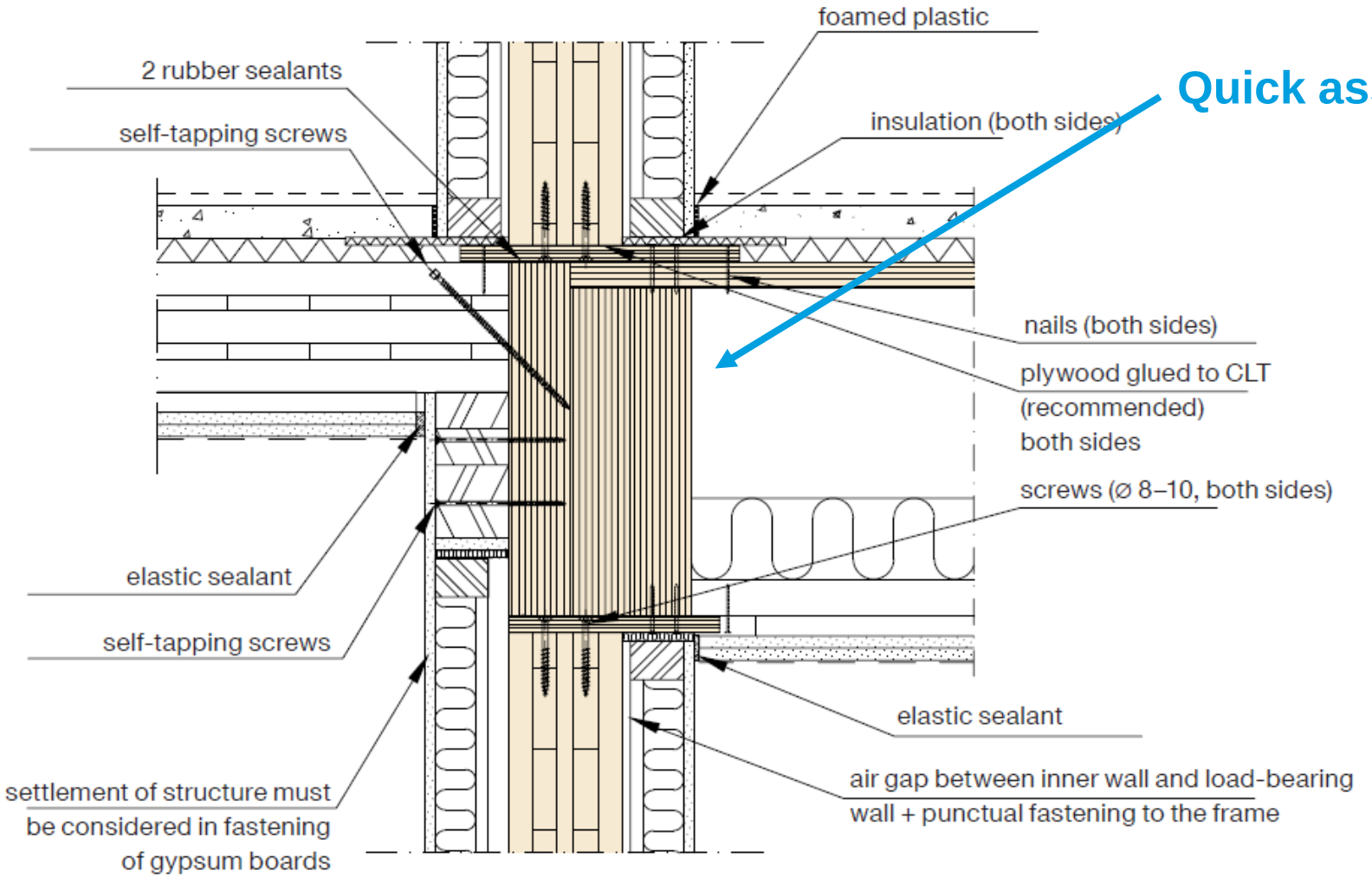


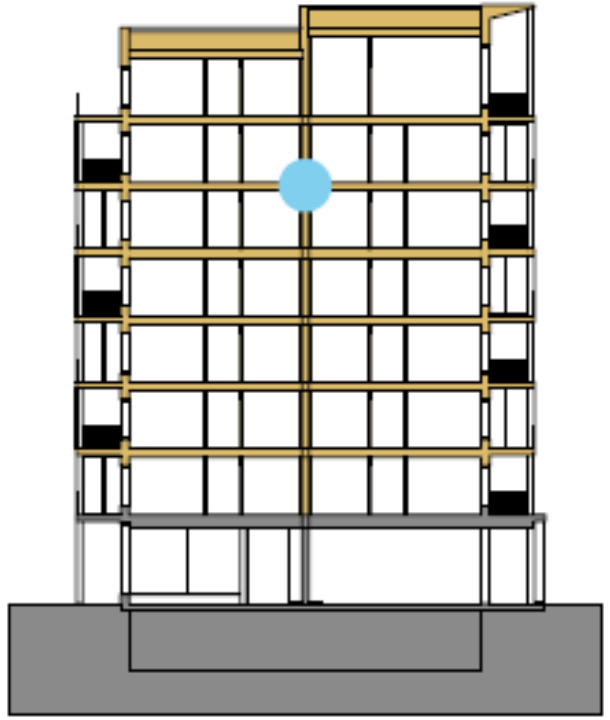
Structure
- gypsum board [15 mm; min. 12 kg/m²]
- CLT** [140 mm]
- mineral wool [40–70 mm]
- CLT** [140 mm]
- gypsum board [15 mm; min. 12 kg/m²]

* 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).

..and a lot of structural details





Assembly guidelines

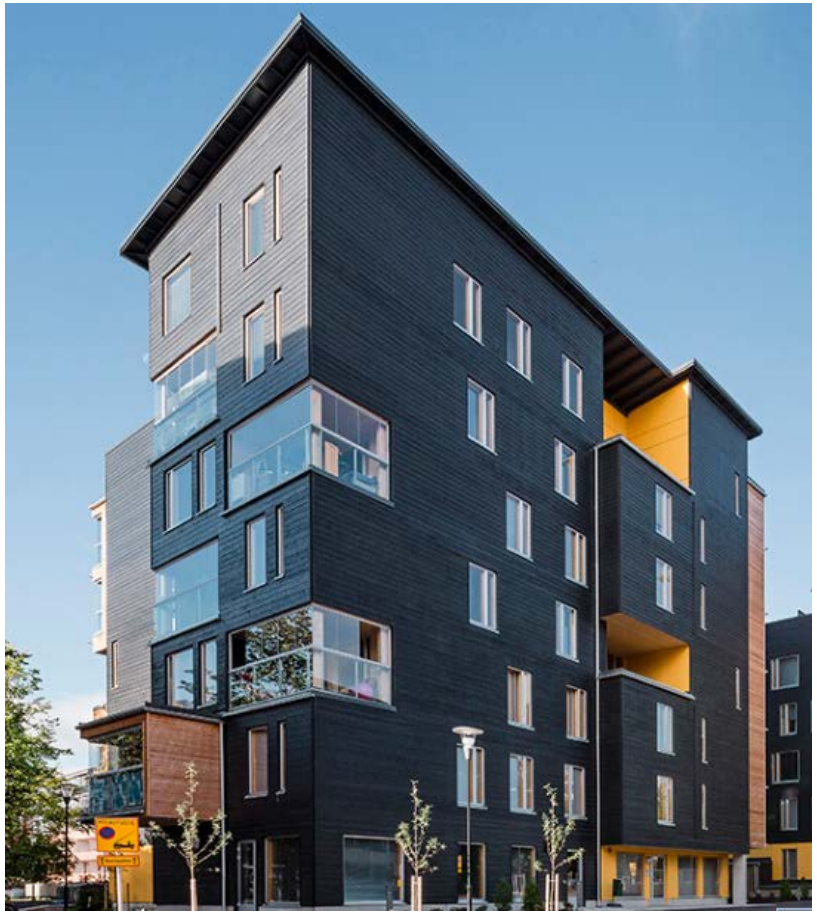
- Very quick erection
- Light cranes
- Panel system is typically installed without the tent/wheather protection
- Indoor climate important to control

Modular element system

THE RENEWABLE MATERIALS COMPANY

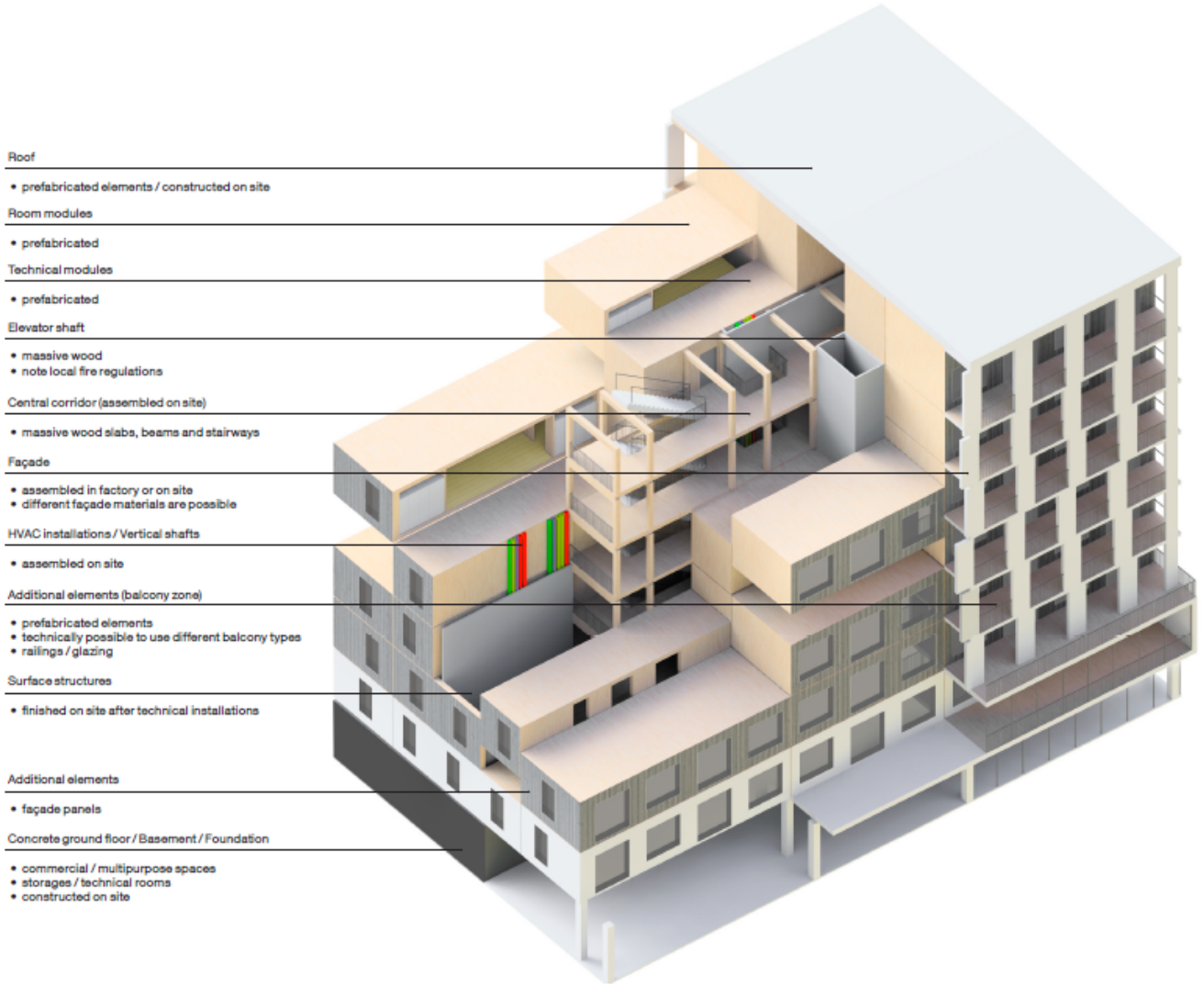
Case Puukuokka, Jyväskylä, 2015

Case Eskolantie, Helsinki, 2015



Case Mäihä, Seinäjoki, 2016

System anatomy



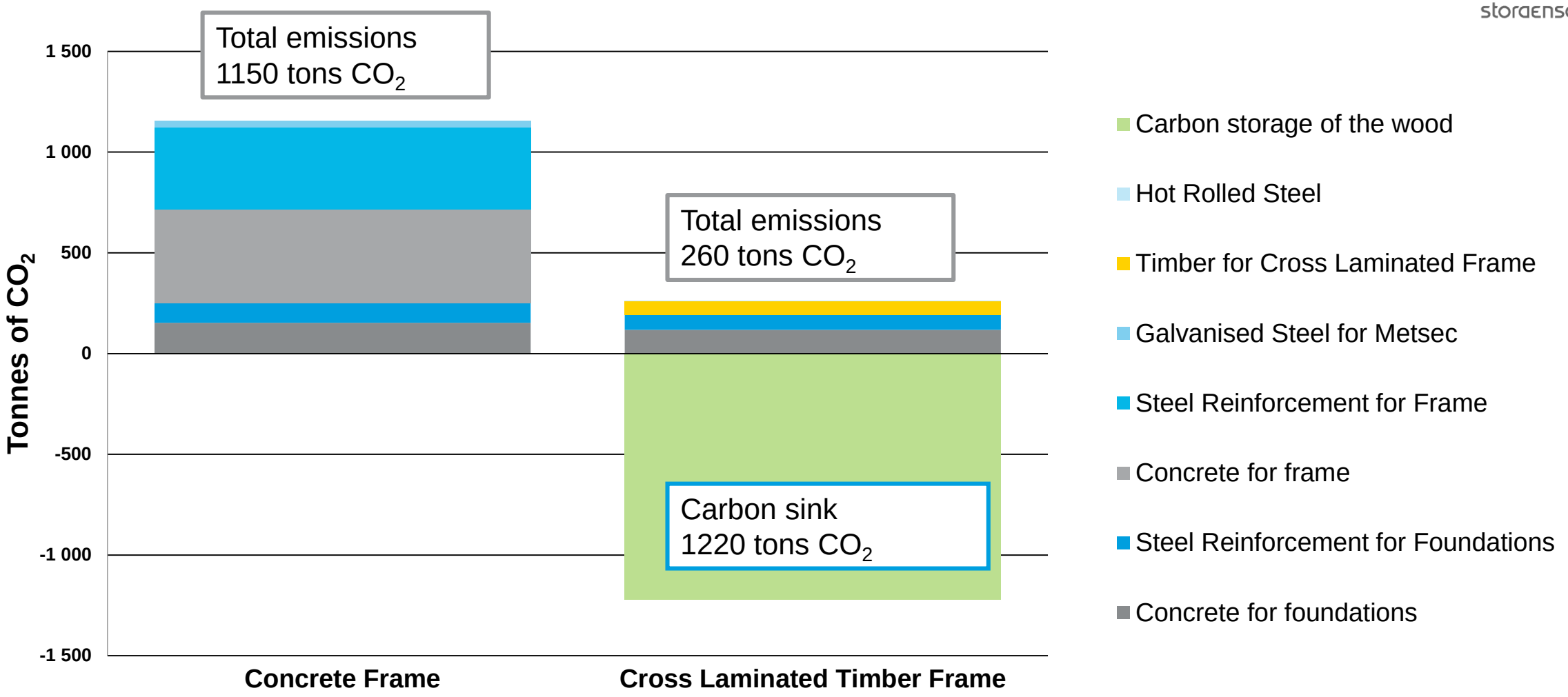
Why to build with wood?

- Light-weight material
- Speed and clealiness of construction
- Flexibility in conception
- Good loads transmission
- Noise pollution reduced

- Reduction of non-renewable energy consumption
- Reduction of CO2 emissions
- Forests sustainably managed
- Best carbon footprint

- Good air quality
- Esthetical performance
- Thermal performance
- Acoustic comfort
- Good fire resistance
- Sustainable heritage

Environmental aspect / Case: Bridport House



Source: Case Study Bridport House, 2011

Thank you!

Usefull links below:

- Panel system manusl: here
- Modular element system manual: here
- Building systems page: here
- CLT-information: http://www.clt.info/fi/
- LVL-information: here