Wood Solutions
design and build
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Timber –
a low energy & emissions construction material

Alastair Woodard

The Sustainable Engineering Society

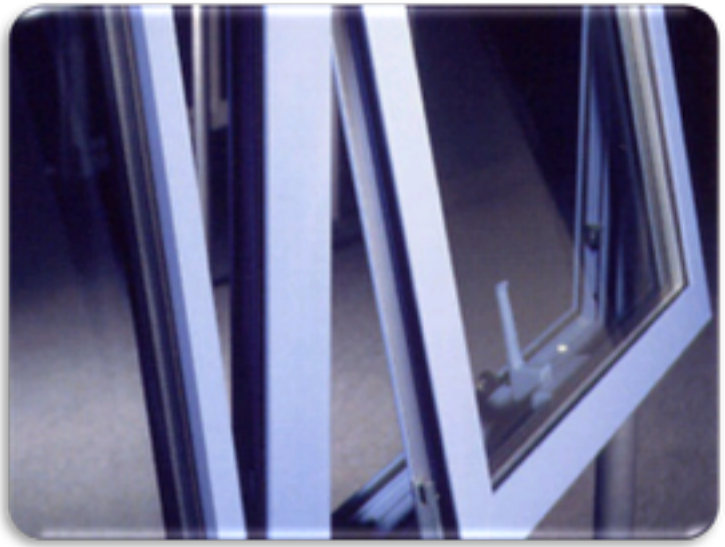
Seminar: Tuesday, March 24, 2015

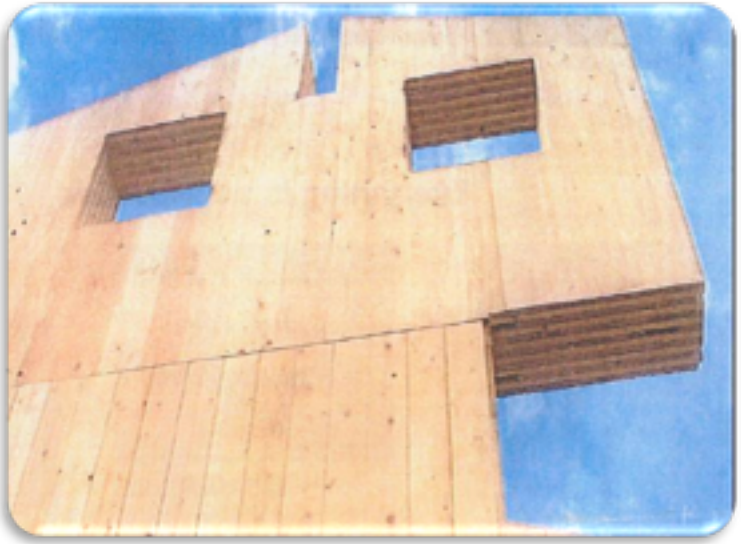
Residential

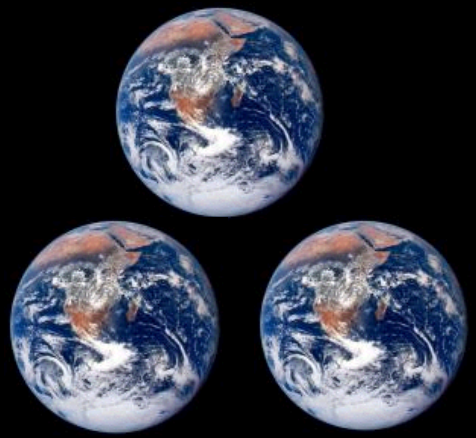
Commercial

Infrastructure

General Construction Materials







CO

2

Built Environment

Buildings have a significant impact on the environment, consuming

- 32% of the world's resources,
- 12% of its water and
- up to 40% of its energy.

Buildings also produce

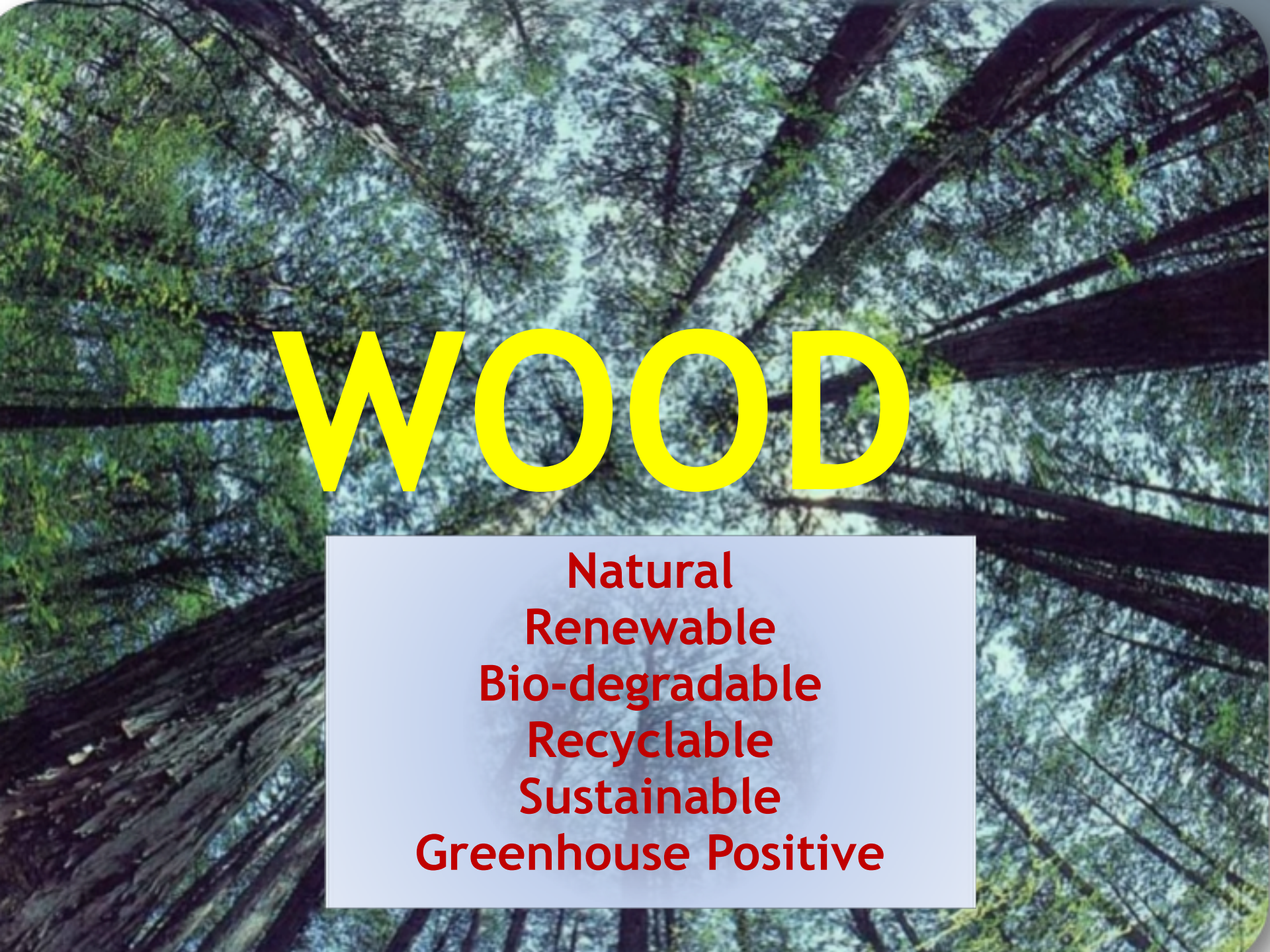
- 40% of waste going to landfill and
- 40% of air emissions.

Ecologically Sustainable Development (ESD) is today a key policy development area and a huge interest to the design community

Architects realisation – GHG Emissions

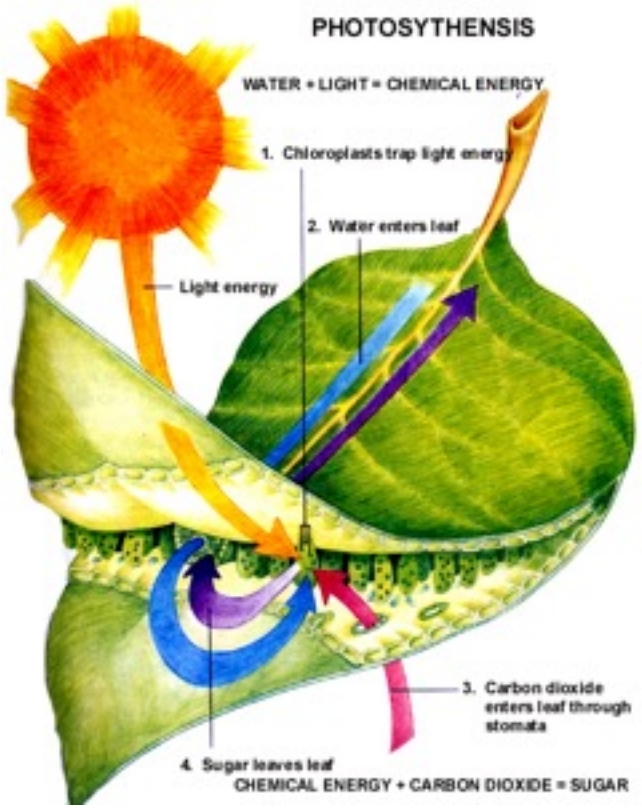
Michael’s Aim - to solve one of architecture’s biggest challenges -- *meeting worldwide housing demand without increasing carbon emissions -- by building with carbon-sequestering wood instead of concrete and steel*

Michael Green – Canadian Architect


WOOD
Natural
Renewable
Bio-degradable
Recyclable
Sustainable
Greenhouse Positive

Carbon storage in wood - sequestration

- During photosynthesis trees absorb CO_2 from the air, store carbon in woody tissue and give off oxygen.
- Approx 50% of the dry weight of wood is carbon
- The tree absorbs 3.66 tonnes of CO_2 for each tonne of carbon stored.



Source: BRS 2008 Australia's State of the Forests Report

Env Benefits: Carbon stored in forests

- In 2001, Australia's plantations and managed forests stored a net 22.7 million tonnes of carbon dioxide equivalent.

- So, they stored more than half of the greenhouse gases emitted by all the passenger cars in Australia that year.

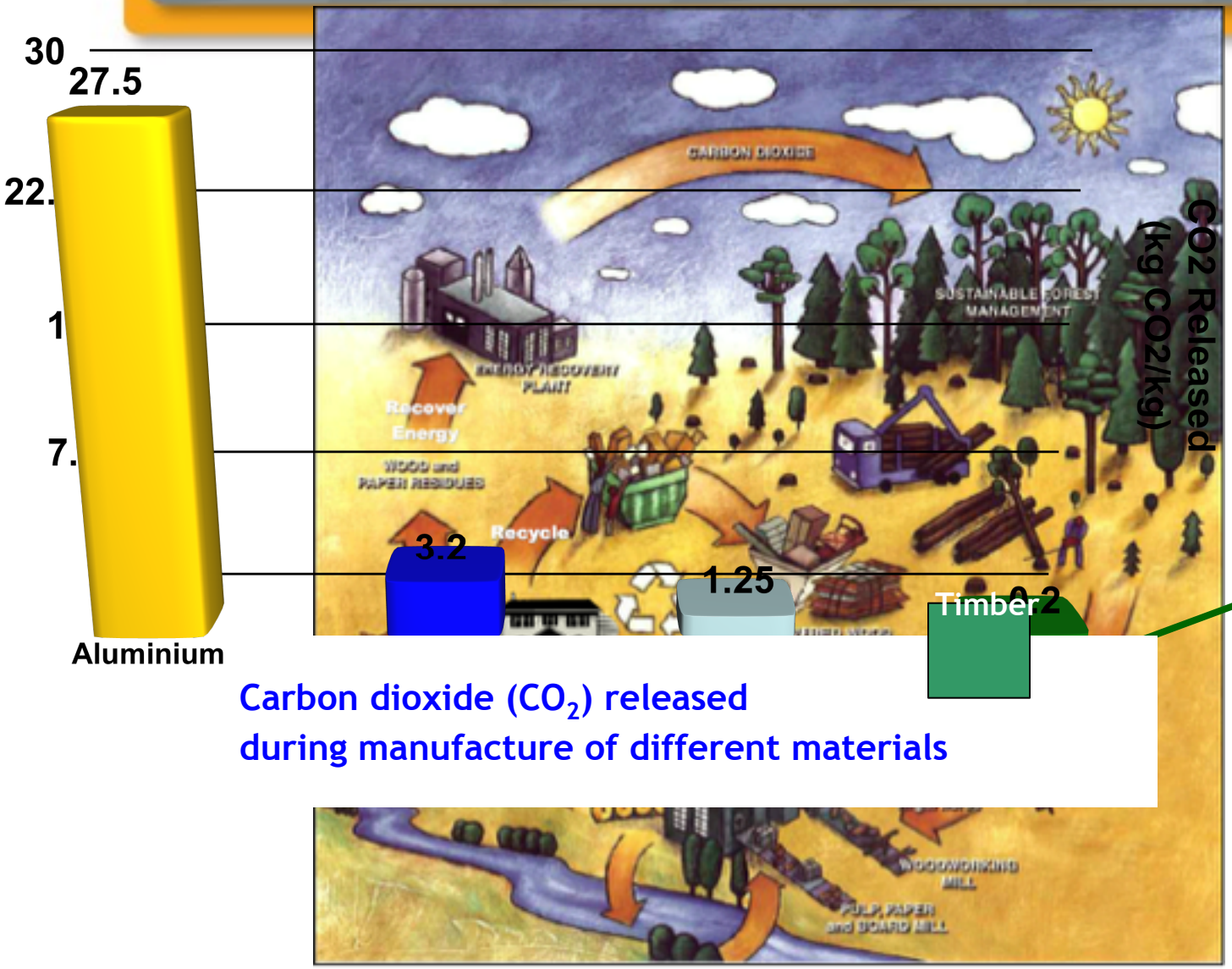
50% of CO^2

Env Benefits: Carbon stored in products

- When logs are converted to timber and other wood products, the carbon from the tree is stored in the products.

- Timber buildings and products are carbon stores (furniture, joinery, paper, framing etc)

The Timber Cycle



Carbon dioxide (CO_2) released during manufacture of different materials

- Manufacturing of timber is low in embodied energy
- minimal pollutants during processing

End of Life

Manufacture

The Timber Cycle

Recover Energy

- can be burnt at end of life to recover energy

Landfill Carbon Store

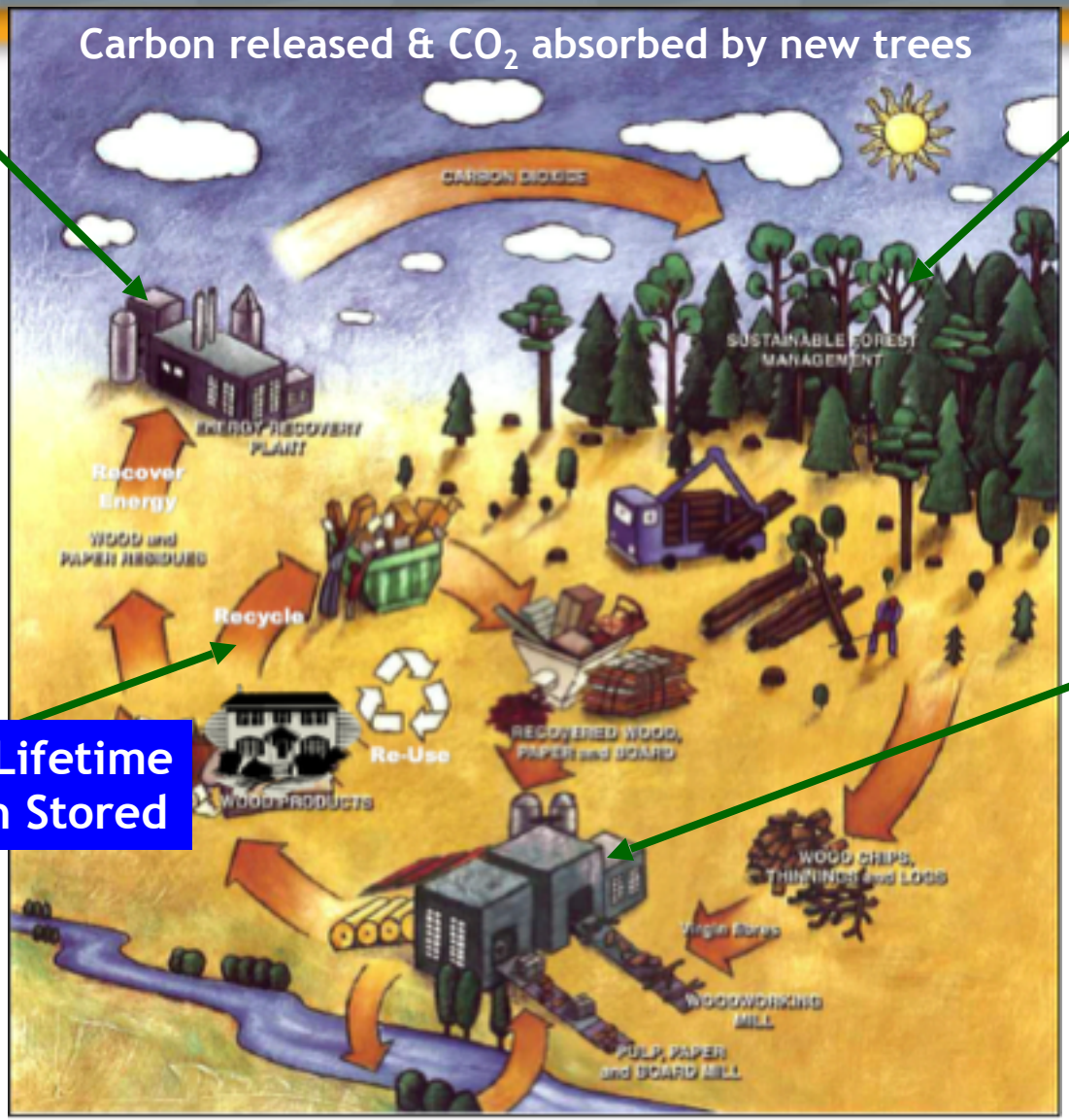
- wood/paper in landfill stores carbon

Recycle

Re-use

- high potential to recycle and re-use

End of Life



Re-grow

- natural, organic and non-toxic
- 'greenhouse' positive sequesters CO2 & produces oxygen

- manufacturing is low in embodied energy
- minimal pollutants during processing

Manufacture

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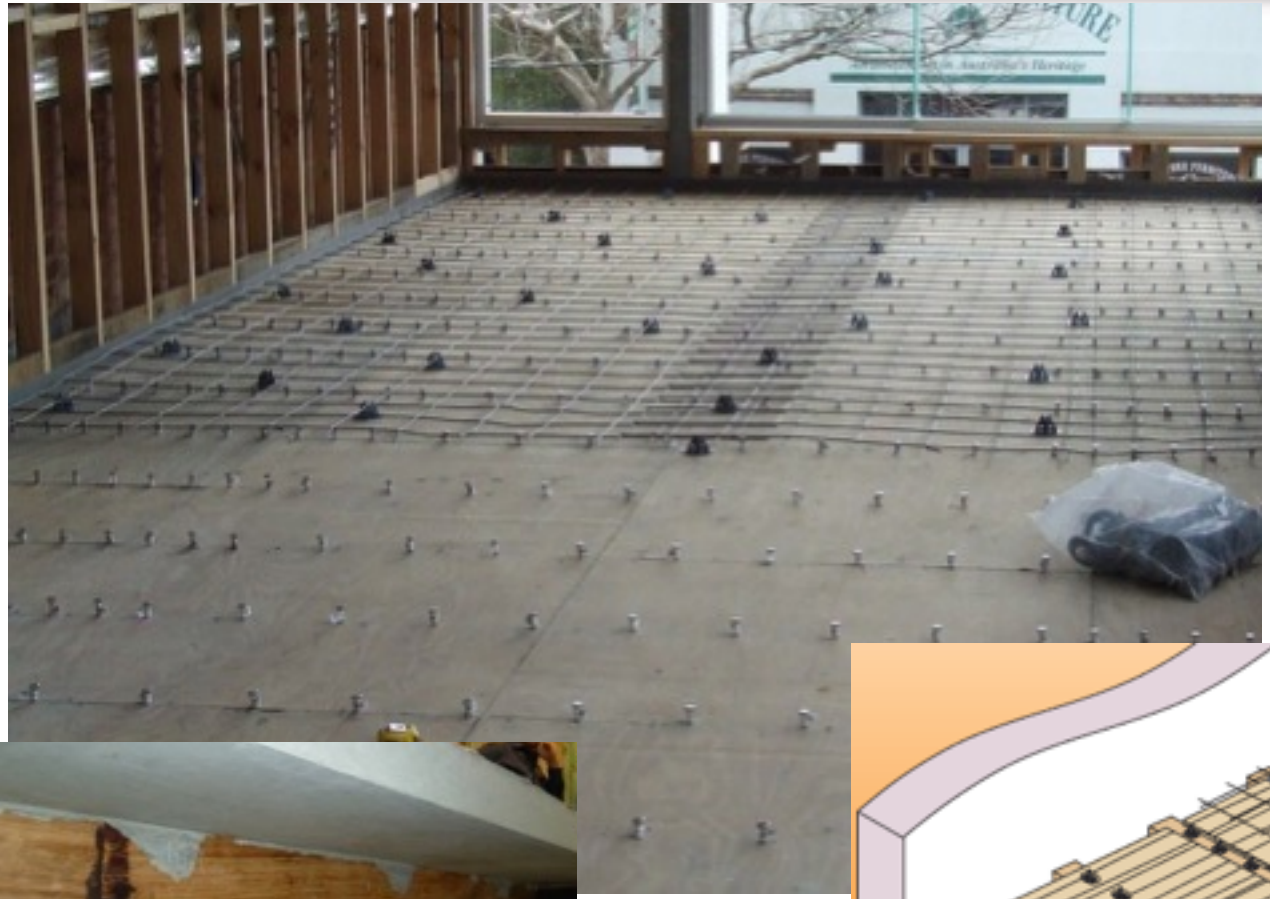
Innovative developments in timber and the future

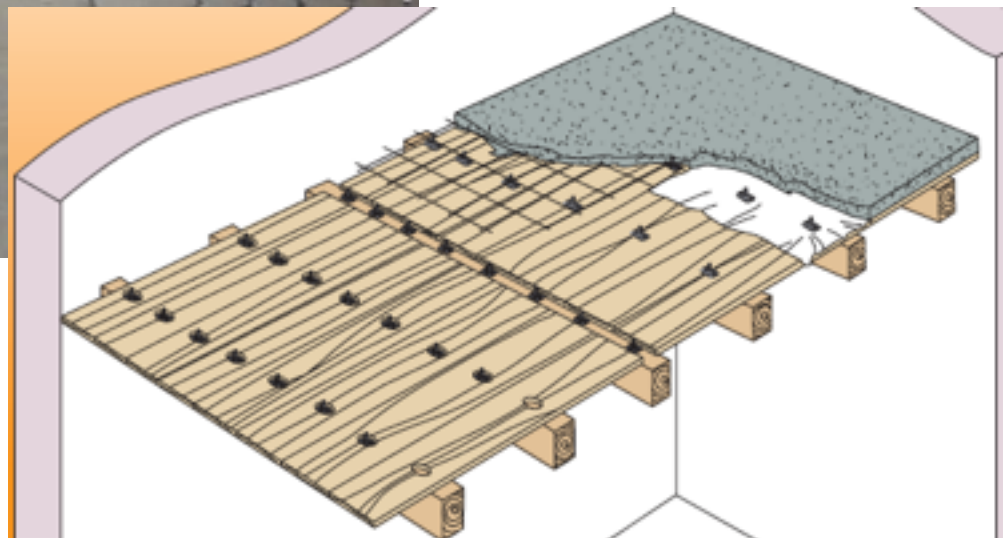
Long Span Timber Portal Frames

Product systems: MRTFC

Multi-residential timber framed

Timber – Concrete Composite Members



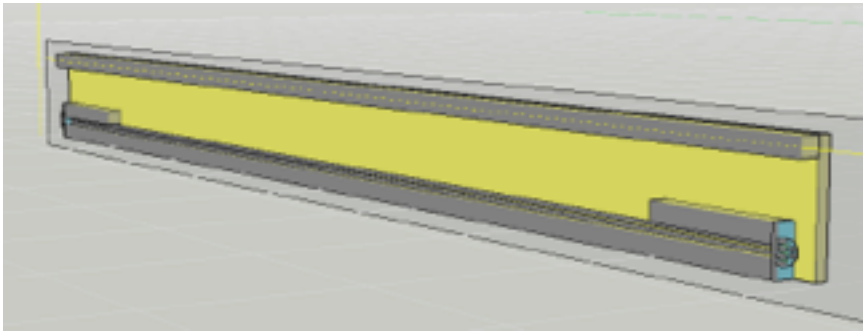


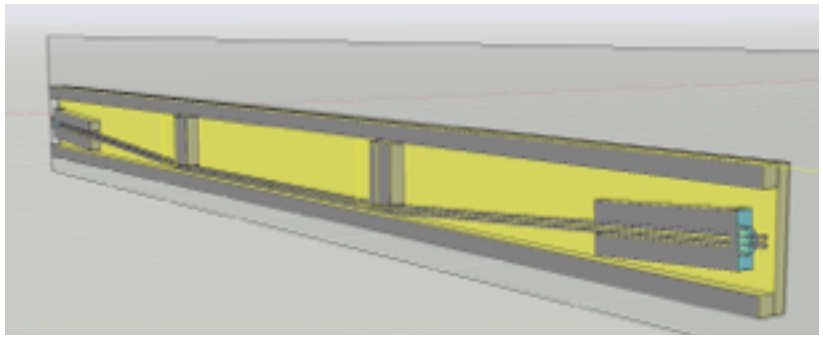
"If the 19th century was the century of steel, & the 20th the century of concrete, then the 21st century is about engineered timber"

Alex de Rijke, Director of dRMM

XCLT

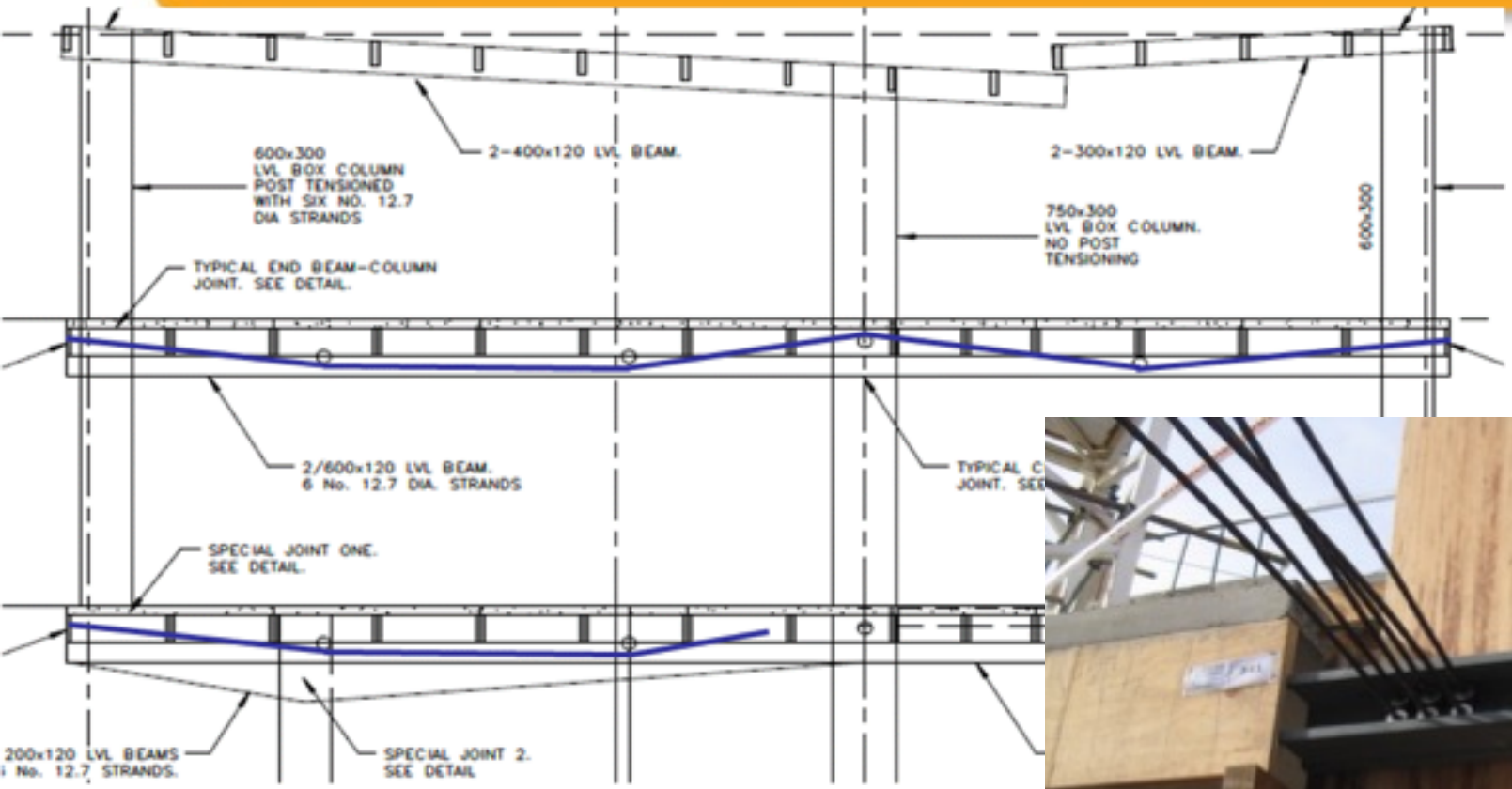
Pre or Post-Stressed LVL/Glulam Box Beams





EXPAN
STRUCTURAL TIMBER SOLUTIONS

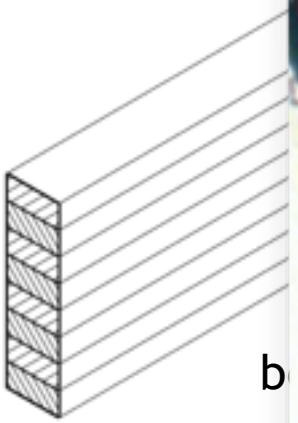
Post-Tensioned Timber Frames

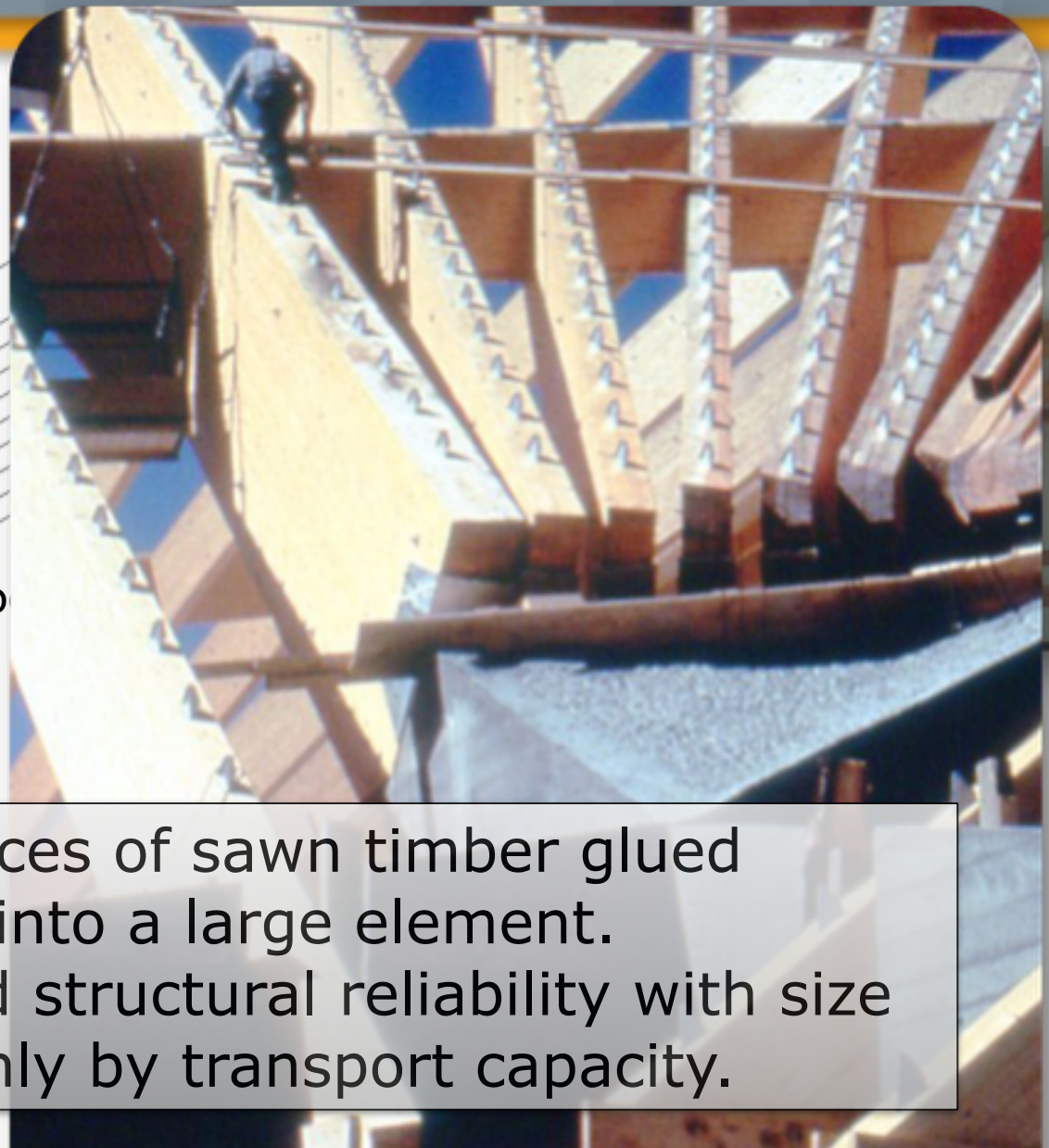


EXPAN
STRUCTURAL TIMBER SOLUTIONS

Project: North Marlborough Institute of Technology
Location : Nelson, New Zealand.

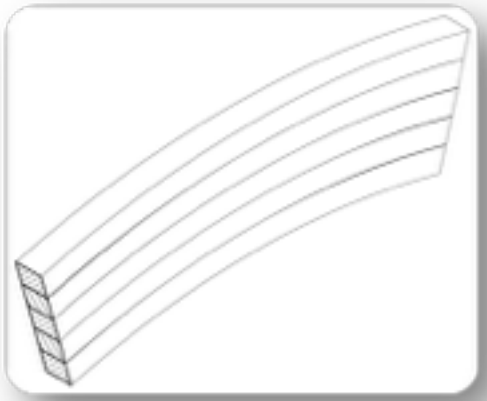
Glued Laminated Timber





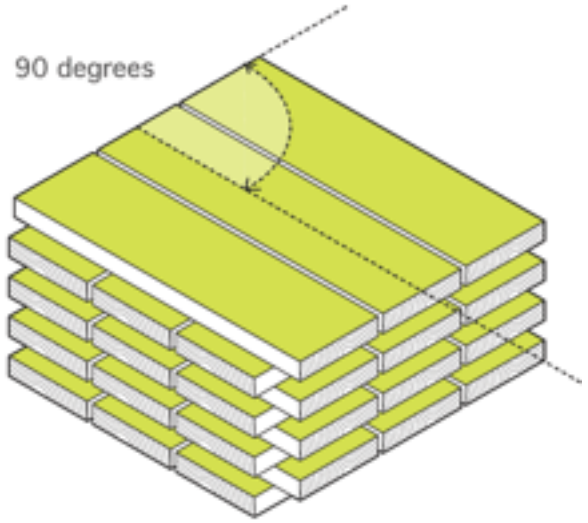
Small pieces of sawn timber glued together into a large element.
Increased structural reliability with size limited only by transport capacity.

Glued Laminated Timber



- Glue laminated can be curved to almost any shape; depending on the thickness of the laminates.

Cross Laminated Timber – CLT - UK



Stadthaus London

8 stories CLT – 1 Concrete, 32 Units


Nine storey's constructed in nine weeks
(27 days on site - 4 men 3 days per week)
Time saving of 22 weeks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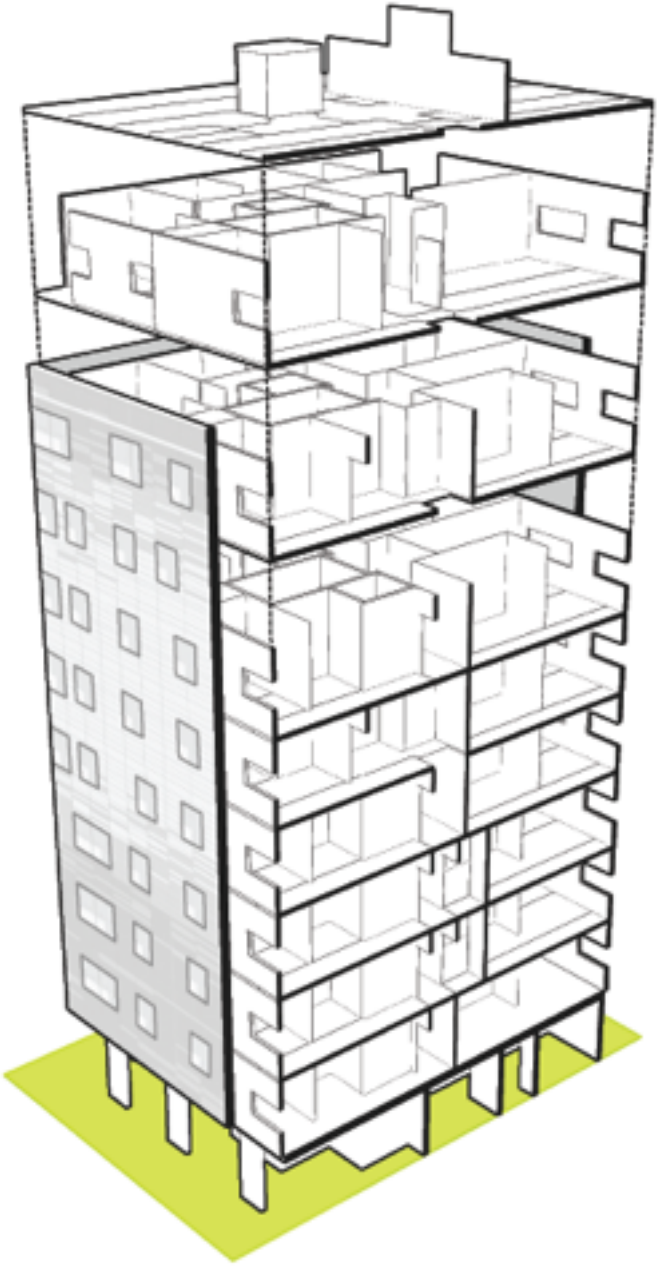
The exterior cladding is made up of over 5,000 individual 1200×230mm panels manufactured by Eternit and made up of 70% waste timber.

Electrical & plumbing fitting was fast & efficient



Honeycomb structure

Stores 185 tonnes of carbon

Further 125 tonnes of carbon is saved by not using concrete

Anticipated carbon emissions saved equivalent to 21 years of operational energy use

Project: Stadthaus

Secondary School

- Three storey, 10,500 m2

House, Austria

Cinema, France

Cross Laminated Timber - CLT - Australia

807 Bourke St
Victoria Harbour

10 storeys
23 apartments
4 townhouses

Project: Forte
Builders: Lend Lease
Location: Melbourne, Vic

32
HI

5
GR

STAR ACHIEVE THIS

485
TONNES OF
TIMBER

759
CLT PANELS

CKETS

25
CONTAINERS

2SHIPS

BUILT WITH 2
LL APPRENTICES

SAVING
1,451
TONNES OF CARBON

Cross Laminated Timber - CLT - Australia

FORTÉ

LIVE WEBCAM

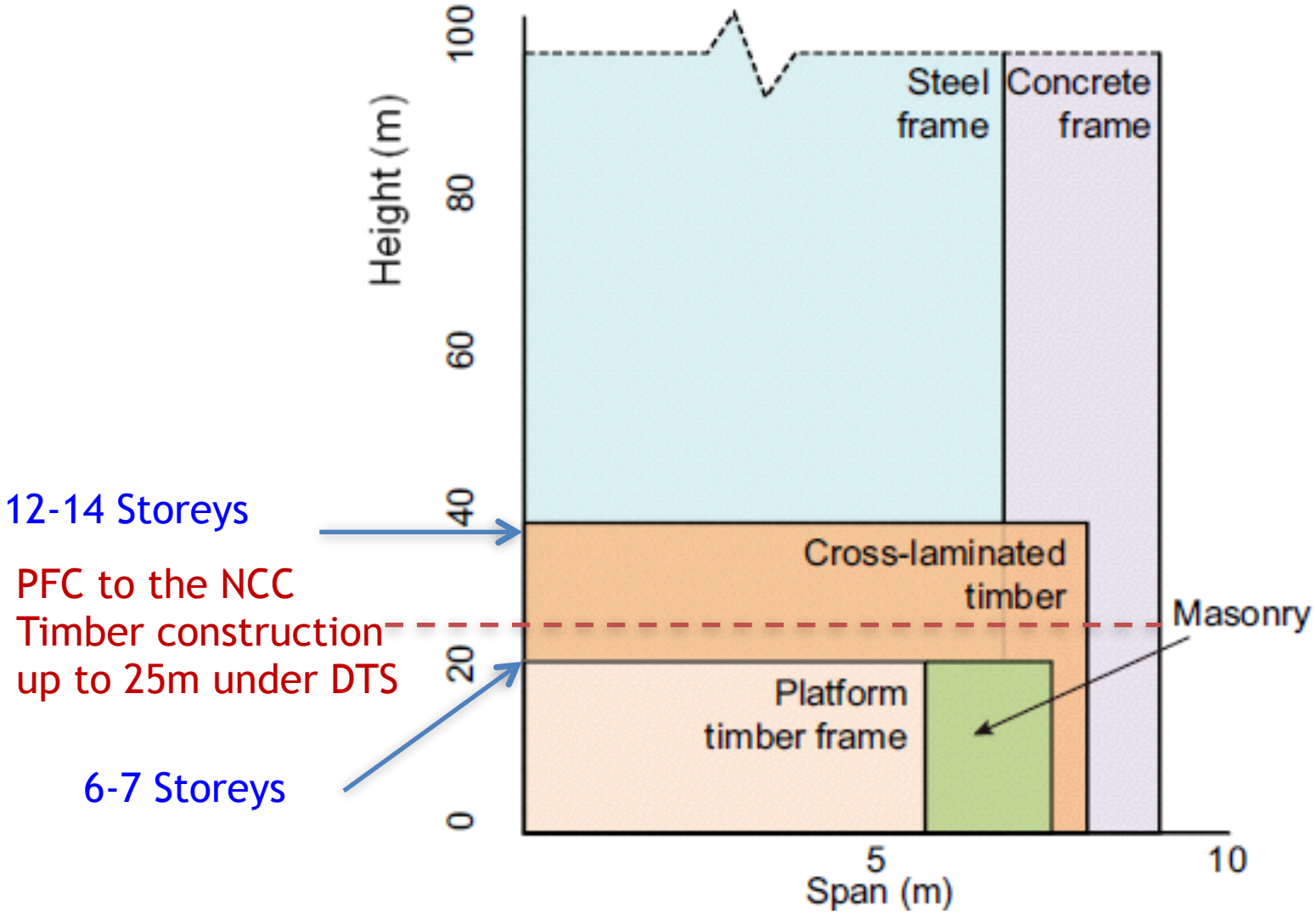
Cross Laminated Timber – CLT - Australia

Docklands Library
- Lend Lease

CLT – A Host of Advantages

- Dimensionally very stable and accurate
- Lightweight (~500 kg/m^3) 1/5^{th} the weight of concrete
- Smaller lightweight crane requirements
- Smaller foundations can be used – significant cost saving
- Quicker to build with (1/3 that of concrete - cost saving)
- Less on-site labour (4 not 40 – significant cost saving)
- Easy electrical & plumbing fit-out (cost saving)
- Low carbon footprint compared to steel / concrete

Where does CLT fit?



How High - 30 Storeys and Further?

TA
LL
THE CASE FOR
Tall Wood BUILDINGS
WO
OD

Vancouver, British Columbia's Timber Highrise Feasibility Study: Tall Wood

- Michael Green Architects have designed prototype for 12, 20 and 30-story massive wood buildings
- Demonstrates carbon neutral construction for highly urban areas

- www.cwc.ca

Benefits of Timber as a low energy & emissions construction material

- Wood is renewable and sustainable
- Forests absorb CO_2 and wood products store carbon
  ($1m^3$ softwood timber = 250kg C = 1 tonne CO_2)
- Low embodied impacts in timber manufacture
- Using timber in place of other can mean avoided CO_2 emissions
- At end of life – timber products benefit from the 3-R's
  - Reuse
  - Recycling into other products
  - Recovering the energy – avoiding fossil fuel emissions

More Information

- WoodSolutions Technical Manuals
- Available for free by registering at www.woodsolutions.com.au

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Questions

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