Design of Mid-rise Timber Apartment Buildings

1st December 2015

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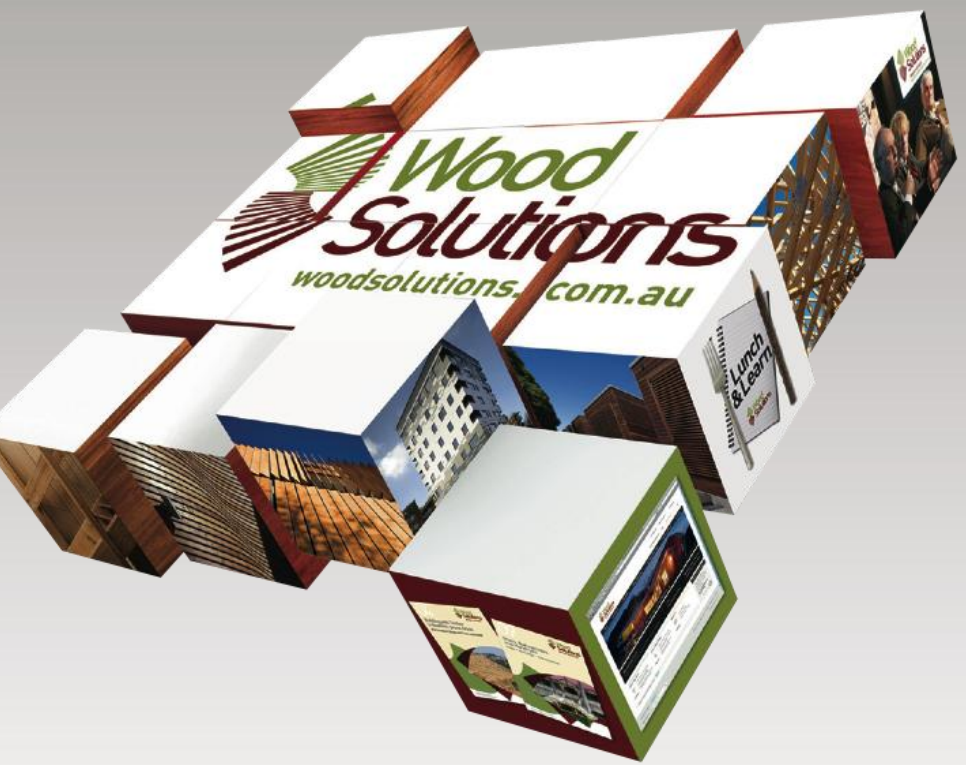
WoodSolutions™: Who we are



An Australian industry initiative, resourced by Forest and Wood Products Australia (FWPA) –

For architects, engineers, designers and other building professionals

- inspiration
- information & resources
- CPD.

Alastair Woodard

WoodSolutions Program Manager Vic

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What WoodSolutions provides

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Technical Design Guides (19)

Interactive Website

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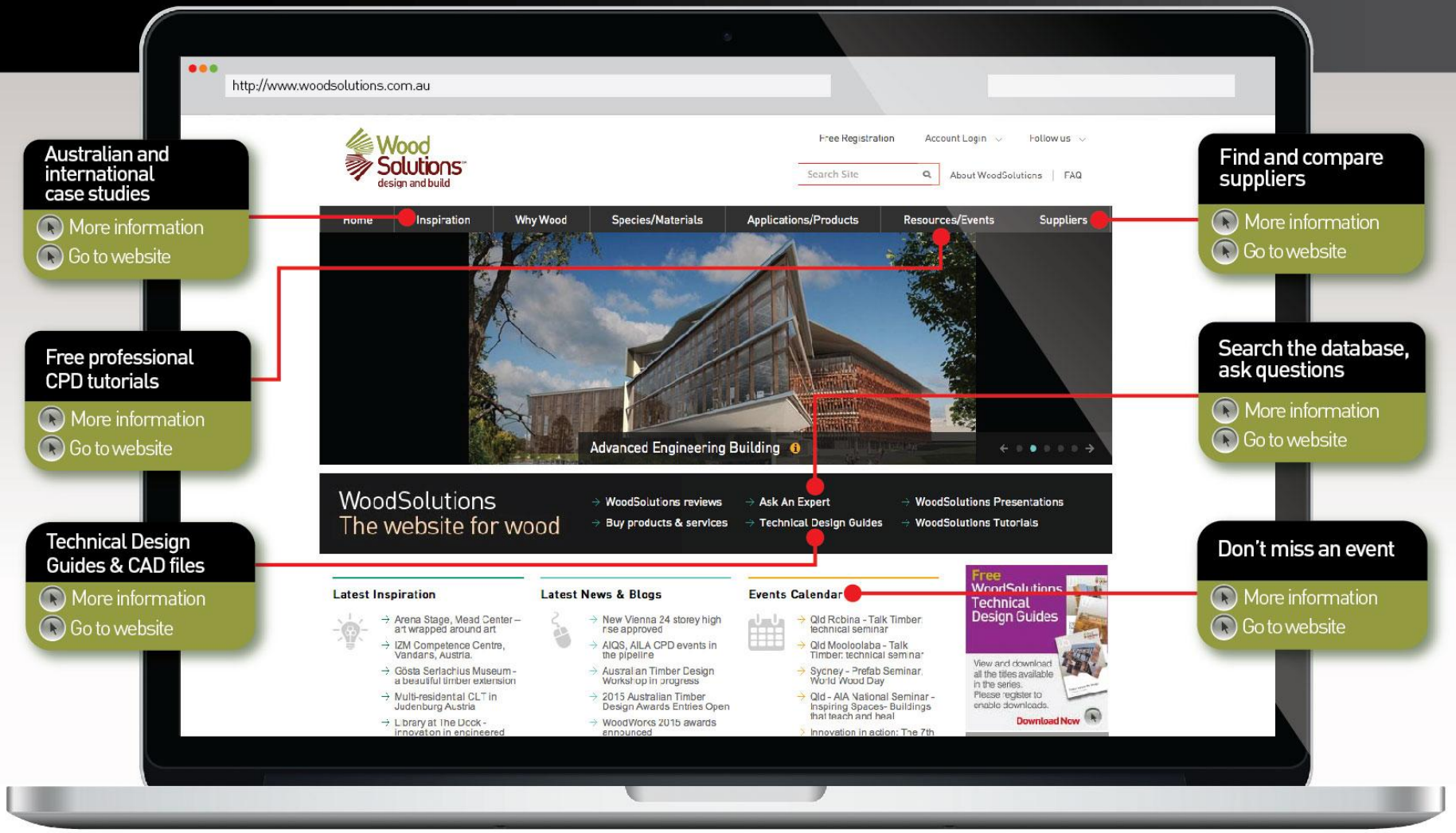

Australian and international case studies
More information
Go to website

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Home page

WoodSolutions Case Studies

From innovative timber building systems to historical restorations, artists' studios to education facilities, detached houses to office blocks – you'll find an inspiring and informative range of case studies at WoodSolutions

Search the case study list here

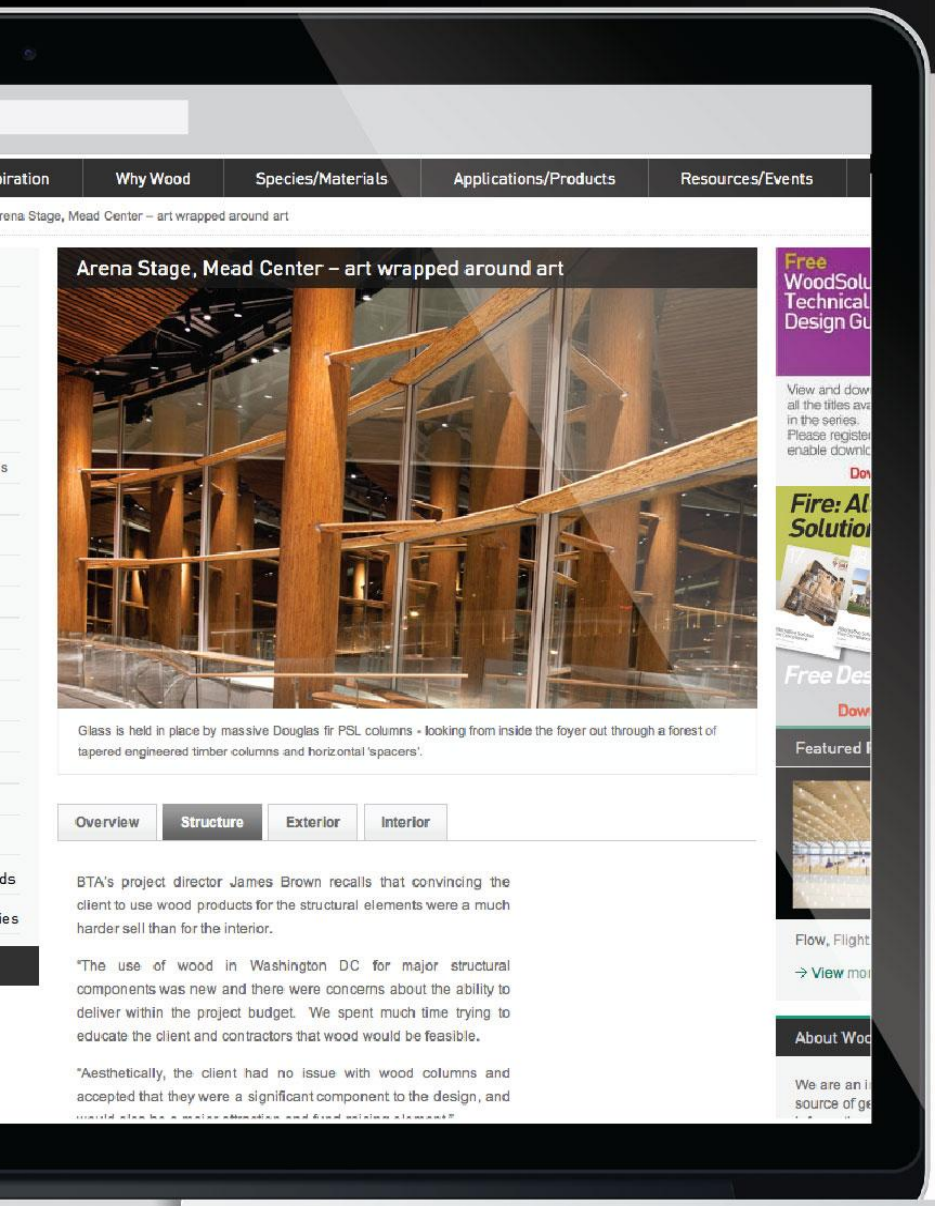
Or explore these examples. *Click on the button to link to the project.*

The Zurich Elephant House – a CLT engineering feat.
A compound of some 22,000 m² with a 6,800 m² shelter under a wooden free form cupola spanning 80 m.

Kooyong Road Residence – a meeting of two worlds.
Traditional Victorian segues to a striking modern renovation in this polished project.

Armada House – a striking statement in timber
A combination of timber products feature in this 492m² dwelling n the mountains of Victoria, British Columbia.

The Library at the Dock – Glulam and CLT combine
Australia's first community building to use massive timber construction system, the Library at the Dock has a 6 star green rating.



Home page

Technical Design Guides

Written by experts in their fi… …sign guides are designed to… …uthoritative, acc…

…able for

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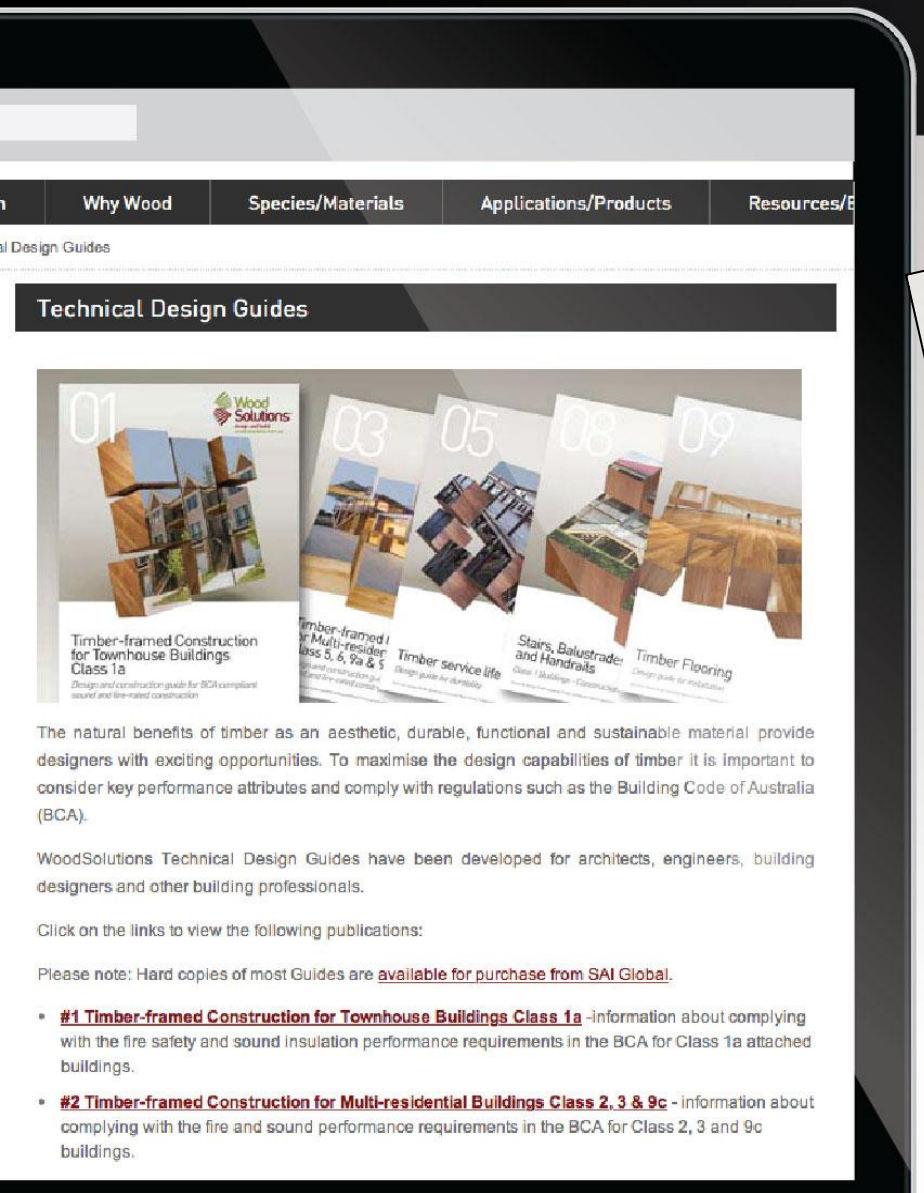

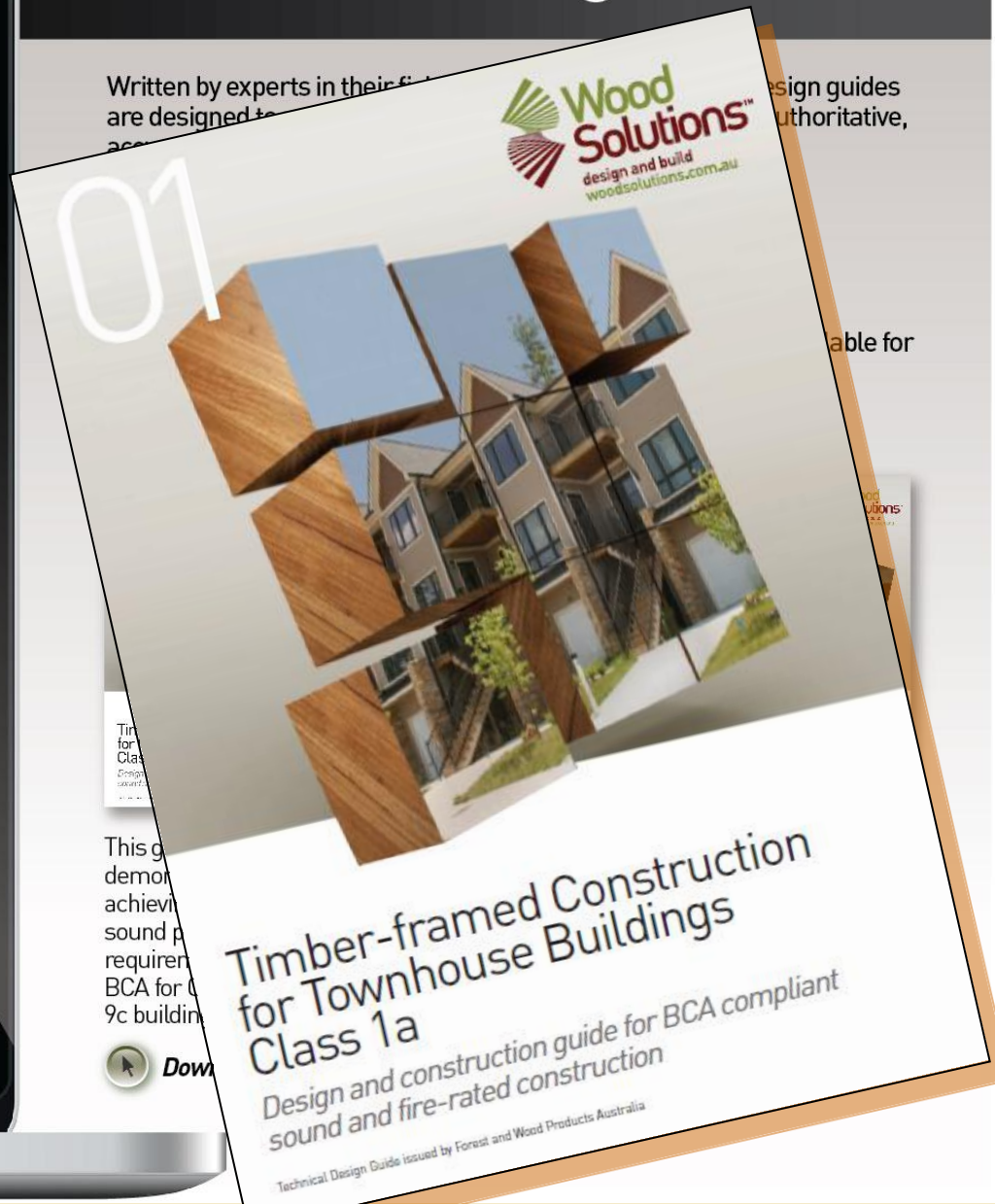

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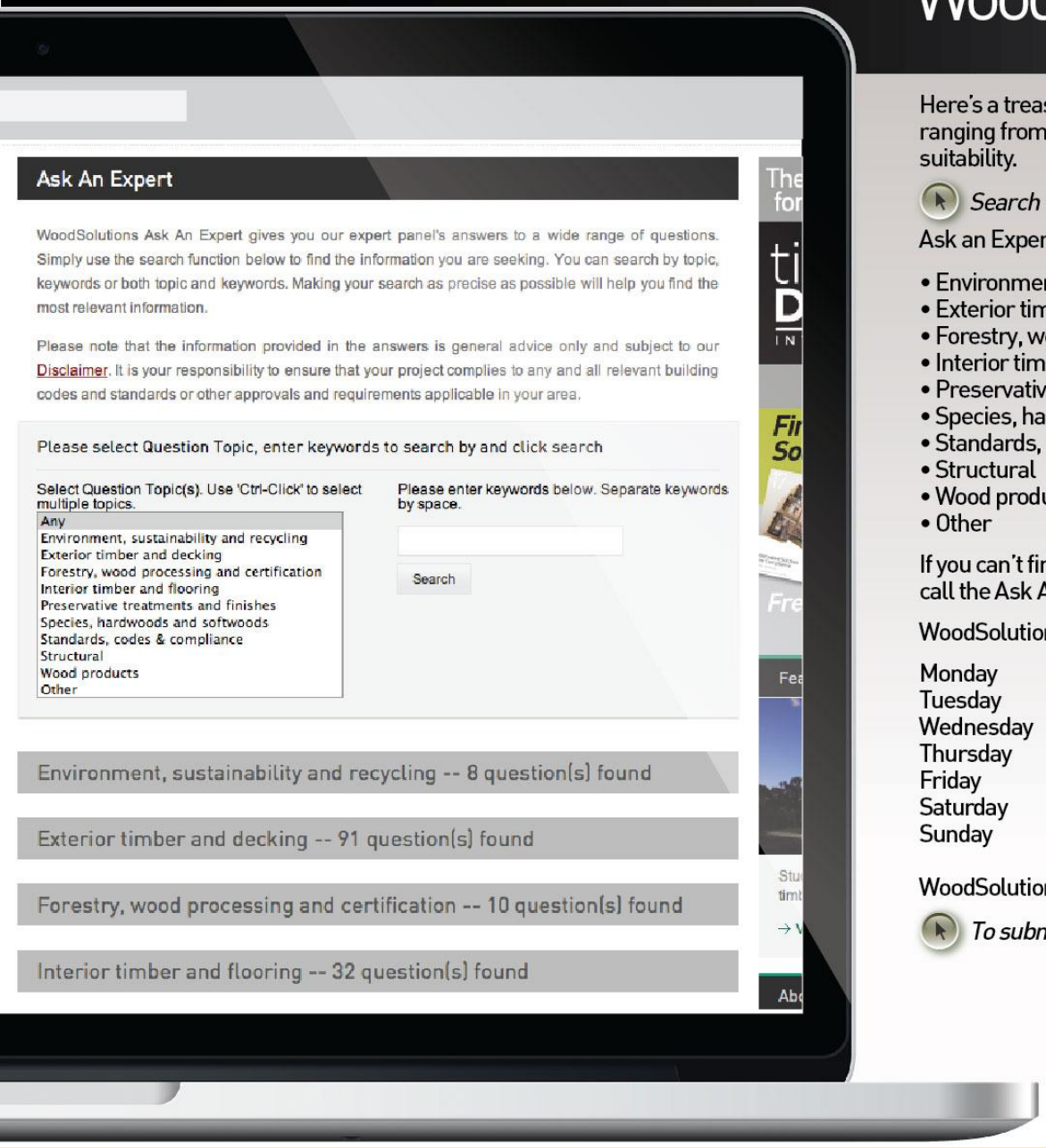
WoodSolutions Ask an Expert



Here's a treasure chest of information – questions and answers on topics ranging from fixings and finishes to building code compliance and species suitability.

Search the Q&A list here

Ask an Expert categories include:

- Environment, sustainability and recycling
- Exterior timber and decking
- Forestry, wood processing and certification
- Interior timber and flooring
- Preservative treatments and finishes
- Species, hardwoods and softwoods
- Standards, codes & compliance
- Structural
- Wood products
- Other

If you can't find the answer you're looking for in the Search results, you can call the Ask An Expert line or submit an email question.

WoodSolutions Ask An Expert line: 1300 414 044* operating hours

Monday	9:00am – 4.30pm
Tuesday	Closed
Wednesday	9:00am – 4.30pm
Thursday	Closed
Friday	9:00am – 4.30pm
Saturday	9:00am – 4.00pm
Sunday	Closed

WoodSolutions Ask An Expert email service

To submit a question by email here

**Please note call charges are:*
Landline callers in metro. Melbourne - 13.8¢ per minute
Other Australian landline callers- 15¢ per minute
Mobile callers - 15¢ per minute
This service is not available to international callers.

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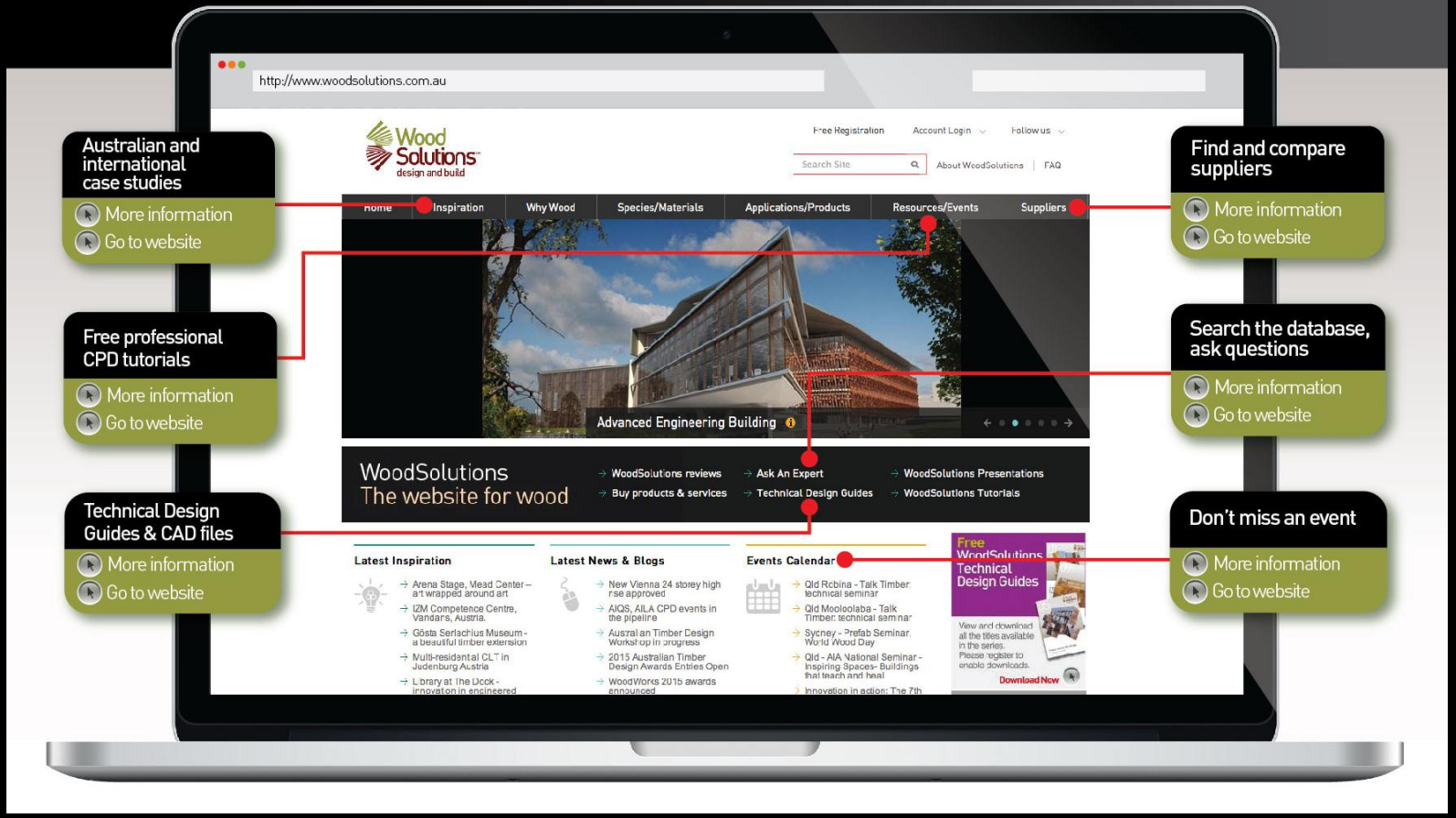

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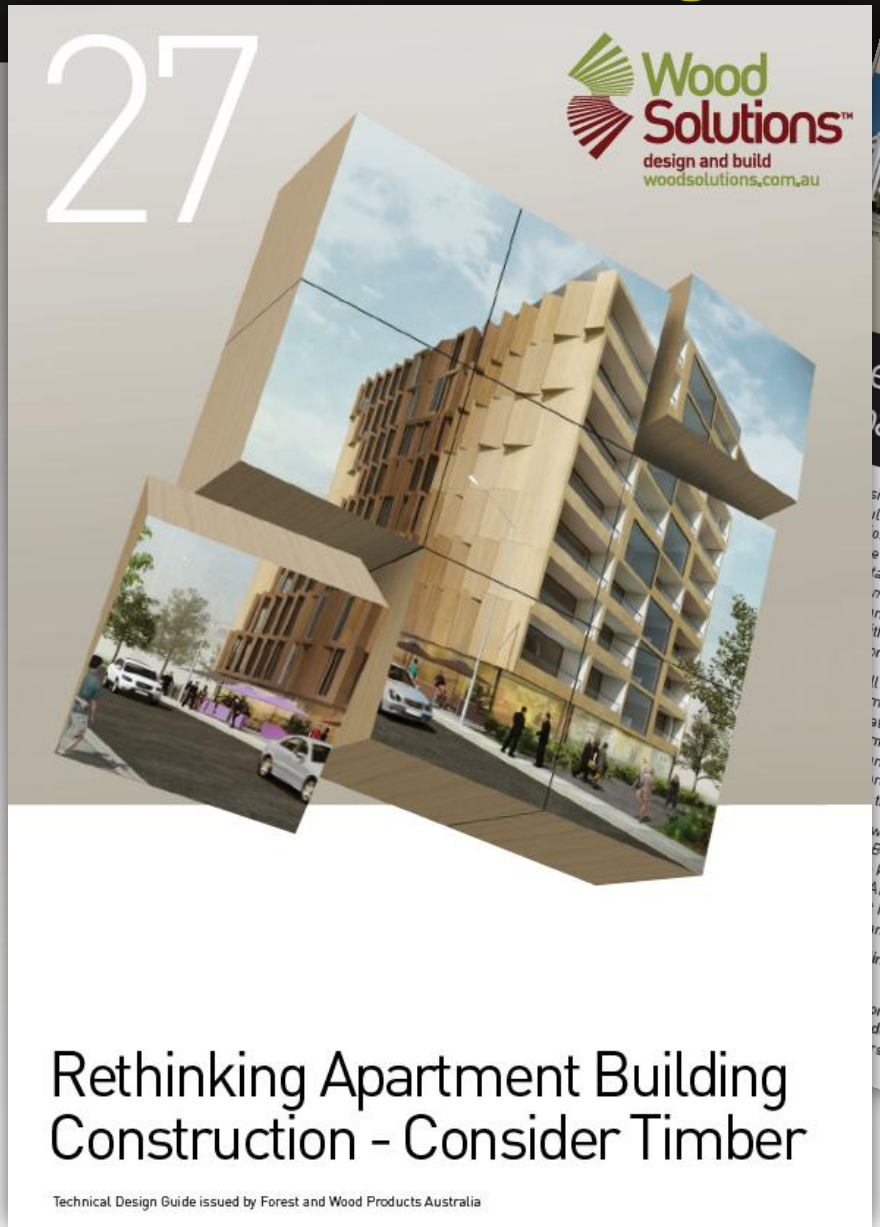
Events – Design of Mid-rise Timber Apartment Buildings



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Today's Seminar Program

Introduction & the Importance of the Design Team Interaction
Alastair Woodard, WoodSolutions

Architectural Design Considerations
Dirk Zimmermann & Dylan Brady, Studio 505

Engineering Design Considerations
Nick Hewson, AECOM

Afternoon Tea *- approx 2.45pm*

Timber Building Cost Comparison
Andrew Dunn, WoodSolutions, TDA NSW

Timber Prefabrication & Supply

Lightweight:	*John Bowen, Bowens Timbertruss*
Glulam:	*Robert Mansell, Hyne Timber*
Mass:	*Erkki Valikangas, Stora Enso*

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Presentations and CPD

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Rethinking Apartment Building Construction - Consider Timber

Design of Mid-rise Timber Apartment Buildings

Seminar Series 2015

Tuesday 1st December 2015: 12.30 – 5.00pm

Program

12.30 - 1.00	**Introduction - The Importance of Design Team Interaction**	Alastair Woodard - WoodSolutions
1.00 - 2.00	**Architectural Design Considerations** Apartment Case study Practical Example – Windsor Project	 Dirk Zimmermann - Studio 505 Dylan Brady -Studio 505
2.00 - 2.45	**Engineering Design Considerations**	Nick Hewson - AECOM
2.45 - 3.15	**Afternoon Tea**	
3.15 - 4.00	**Apartment Cost Comparison**	Andrew Dunn - WoodSolutions
4.00 - 5.00	**Timber Prefabrication & Supply:** Lightweight: Glulam: CLT:	 John Bowen - Timbertruss Robert Mansell - Hyne Erkki Valikangas - Stora Enso
5.00pm	**Close**	

This workshop is free to building professionals
Brought to you by WoodSolutions

Please note: WoodSolutions reserves the right to cancel this event and/or change the program and speakers without notice. Registrants may be contacted by WoodSolutions about future seminars and events.

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The Website for Wood.

FEEDBACK FORM

We would appreciate it if you could take a few moments to complete this form to let us know how we did, and what could be done better in the future.

1. **Overall, how did you feel about today's seminar?**

.....

.....

.....

2. **Of the topic discussed which did you find of most interest and value?**

☐ *Intro & Importance of the Design Team*	*Prefabrication & Supply*
☐ *Architectural Design Considerations*	☐ *Lightweight Timber Systems*
☐ *Engineering Design Considerations*	☐ *Heavy Timber Systems (Glulam)*
☐ *Timber Buildings Cost Comparison*	☐ *Mass Timber Systems (CLT)*

3. **Did you find what you learnt to be valuable for your professional development?**

Low value 0 1 2 3 4 5 6 7 8 9 10 *Highly valuable*

4. **How would you assess the skills and ability of today's speakers?**

Low 0 1 2 3 4 5 6 7 8 9 10 *High*

Comment: .....

5. **How do you think that the seminars might be improved to better serve your needs?**

.....

.....

.....

Would you prefer?
☐ More detail
☐ Less detail, or
☐ Detail level was OK

6. **In future seminars, what other major topics would you like to see covered?**

.....

.....

I would like to be emailed PDF copies of the following Seminar presentations

☐ *Intro & Importance of the Design Team*	*Prefabrication & Supply*
☐ *Architectural Design Considerations*	☐ *Lightweight Timber Systems*
☐ *Engineering Design Considerations*	☐ *Heavy Timber Systems (Glulam)*
☐ *Timber Buildings Cost Comparison*	☐ *Mass Timber Systems (CLT)*

☐ *I would like a CPD Certificate for Attendance at today's Seminar (Informal CPD points)*

Name: .....

Company: .....

Email address: .....

Timber Apartments

- a Brief Introduction & the Importance of the Design Team Interaction

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Framing

Flooring

Furniture

Joinery

Residential Buildings

Industrial Buildings

Institutional Buildings

Recreational Buildings

Commercial Buildings

Multi-Residential Apartments

New Changes to 2016 NCC

Renaissance in Timber Construction

Some of the Key Drivers & Issues

- Global population growth
- Changing housing needs & demand (densification)
- Environmental concerns – global warming
- New cost effective timber systems
- Regulatory change

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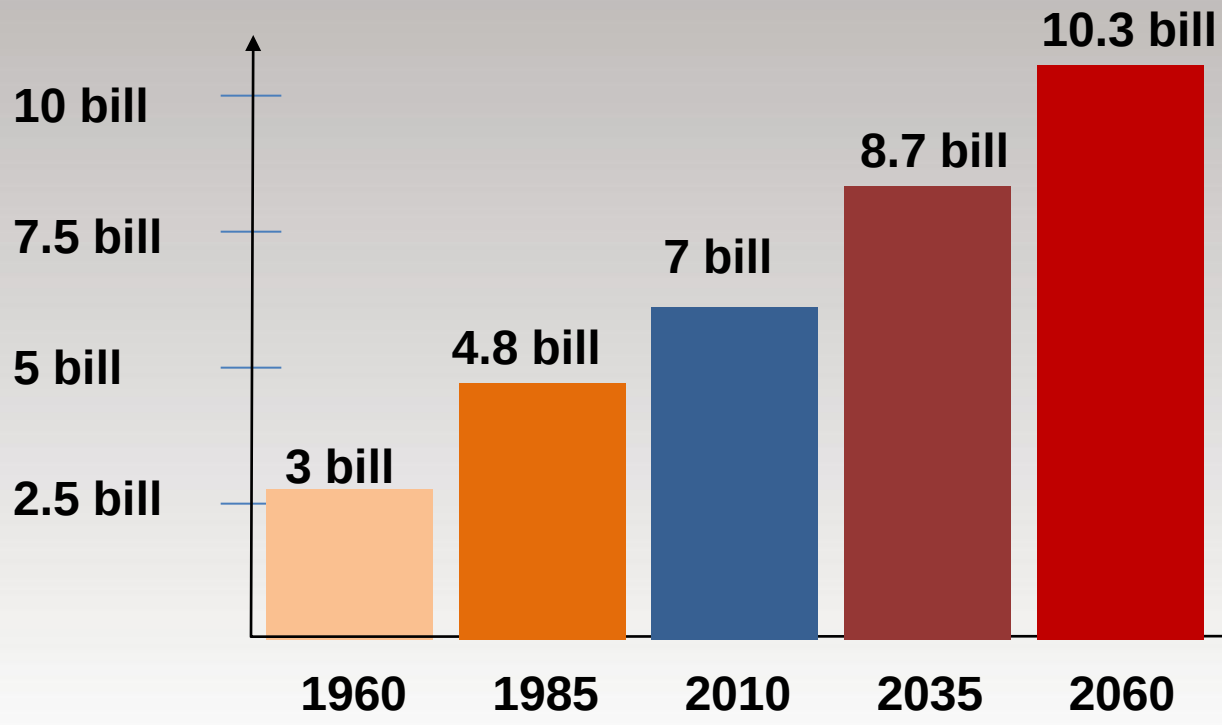
The Future Population Challenge

- World population growth



World population growth rate at 25 year intervals

The Future Housing Challenge

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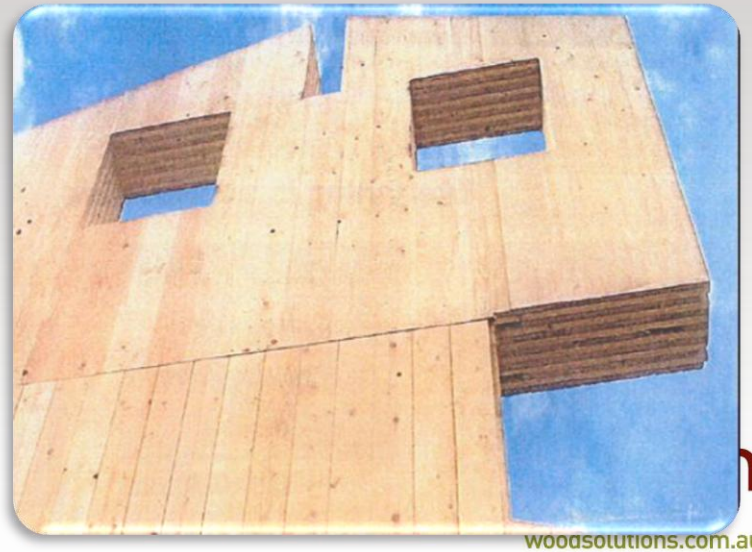
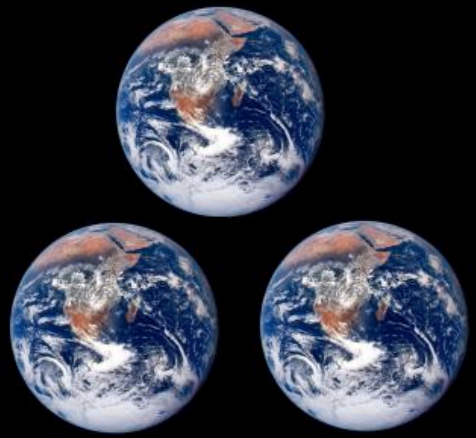
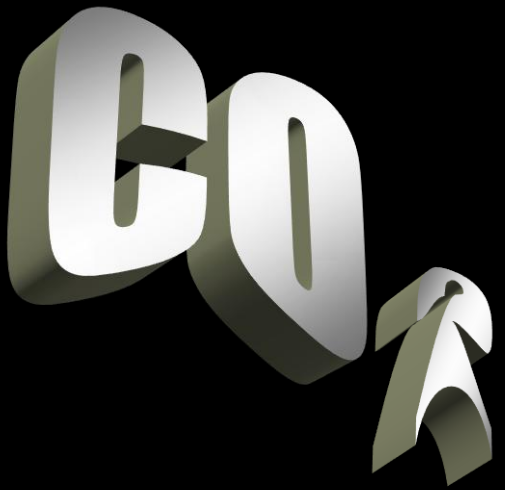
Why the Choice of Materials Matters



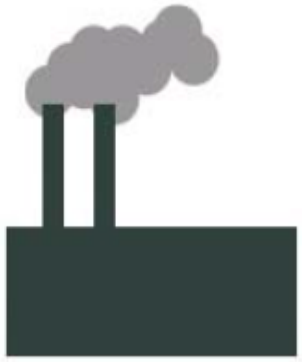



CO2

GLOBAL ENVIRONMENTAL IMPACT OF BUILDINGS

12-20%
OF WATER CONSUMPTION

25-40%
OF ENERGY USE (INCL.EMBODIED)



30-40%
OF GREENHOUSE GAS EMISSIONS

25-40%
OF SOLID WASTE GENERATION

Global Greenhouse Gas (GHG) Emissions

1% AIRLINES

3% SHIPPING

>10% CEMENT & STEEL

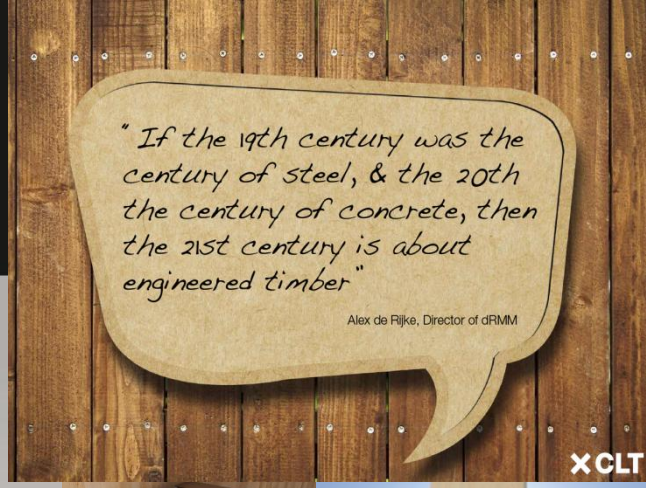
Architects realisation – GHG Emissions

Michael Green – Canadian Architect

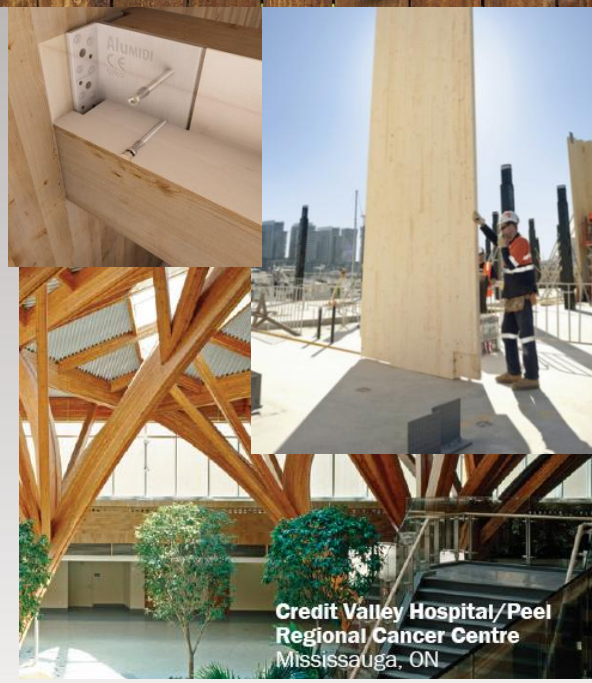
Michael's Aim - to solve one of architecture's biggest challenges -- *meeting worldwide housing demand without increasing carbon emissions -- by building with carbon-sequestering wood instead of concrete and steel*


WOOD
Natural
Renewable
Bio-degradable
Recyclable
Sustainable
Greenhouse Positive

Very Exciting Time for Timber



- ✓ New Products
  - Structural products (engineered)
  - Appearance Products
  - Connectors
- ✓ New Systems
  - Prefabricated houses (residential)
  - Prefabricated cassette floors
  - Timber-concrete composites
  - Post-tensioned beams & frames
  - Mass timber systems
  - Lightweight MRTFC timber systems
- ✓ New Regulations



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The Design Process & Design Team

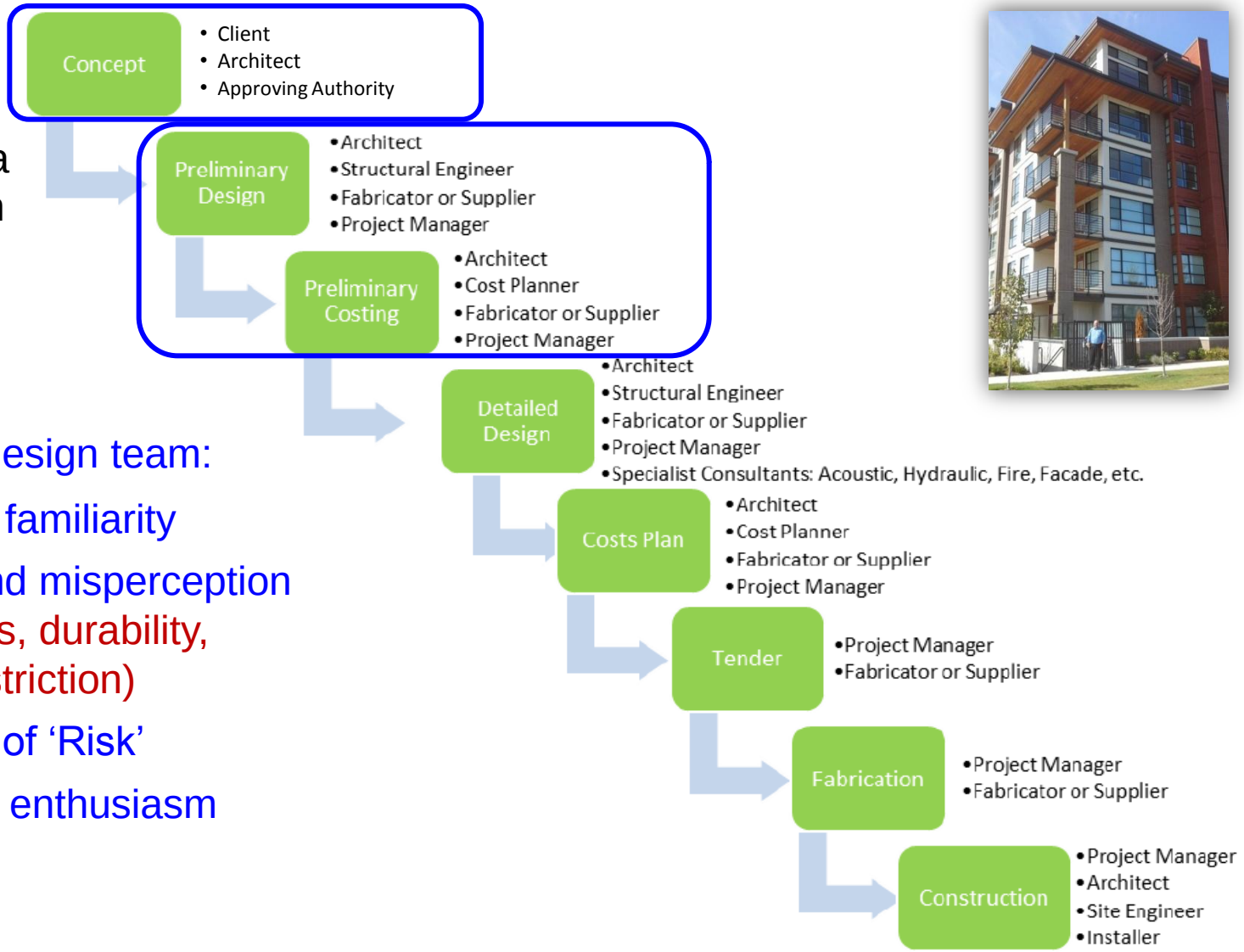
This is where a timber solution needs to be considered

- **Concept**
  - Client
  - Architect
  - Approving Authority
- **Preliminary Design**
  - Architect
  - Structural Engineer
  - Fabricator or Supplier
  - Project Manager
- **Preliminary Costing**
  - Architect
  - Cost Planner
  - Fabricator or Supplier
  - Project Manager
- **Detailed Design**
  - Architect
  - Structural Engineer
  - Fabricator or Supplier
  - Project Manager
  - Specialist Consultants: Acoustic, Hydraulic, Fire, Facade, etc.
- **Costs Plan**
  - Architect
  - Cost Planner
  - Fabricator or Supplier
  - Project Manager
- **Tender**
  - Project Manager
  - Fabricator or Supplier
- **Fabrication**
  - Project Manager
  - Fabricator or Supplier
- **Construction**
  - Project Manager
  - Architect
  - Site Engineer
  - Installer

Almost impossible to convert an existing design to timber

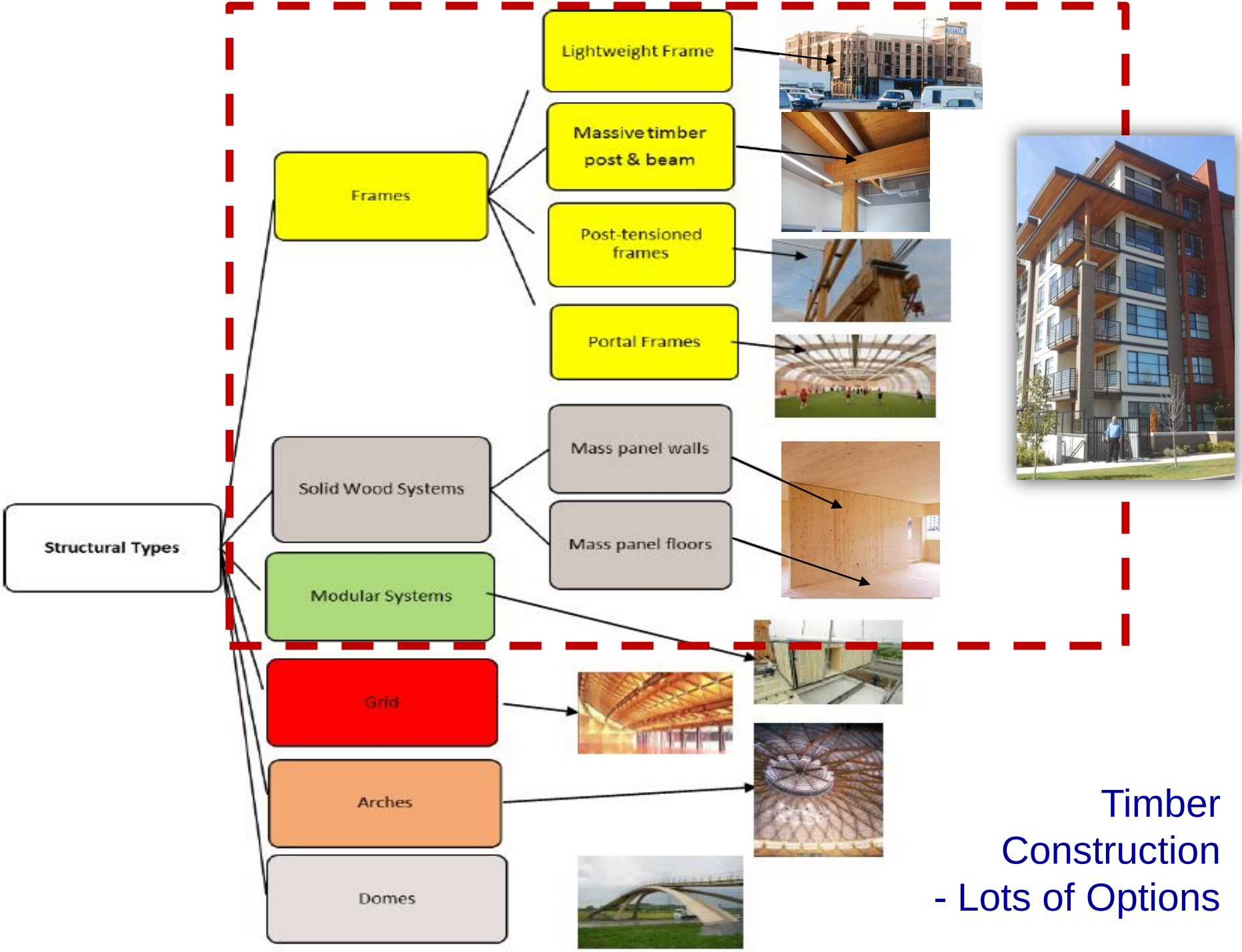
The Design Process & Design Team

This is where a timber solution needs to be considered



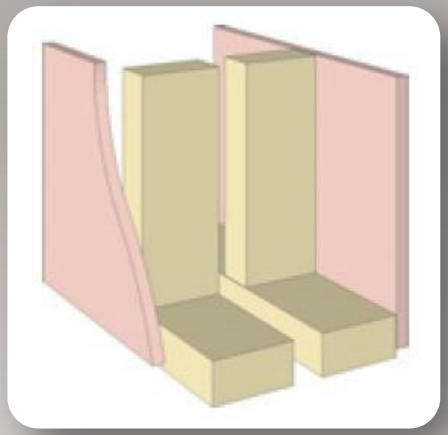
Key issues for design team:

- Knowledge & familiarity
- Perception and misperception (fire, acoustics, durability, regulatory restriction)
- Management of 'Risk'
- Confidence & enthusiasm



Timber Construction - Lots of Options

Lightweight Timber Systems



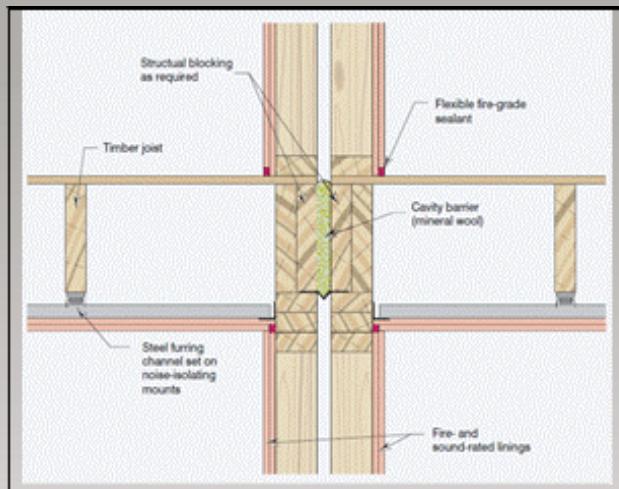


Figure 1 Floor / Wall Junction Cavity Barrier

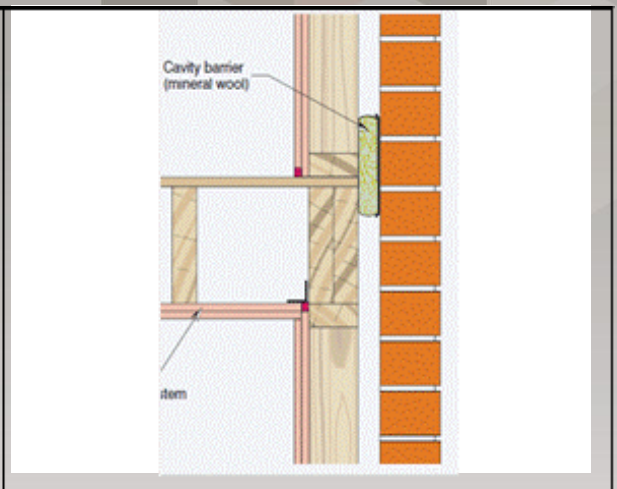


Figure 2 Floor / External Wall Cavity Barrier

Prefabricated Floor & Wall Systems

Heavy Timber Systems

Glulam
LVL
Box-beams

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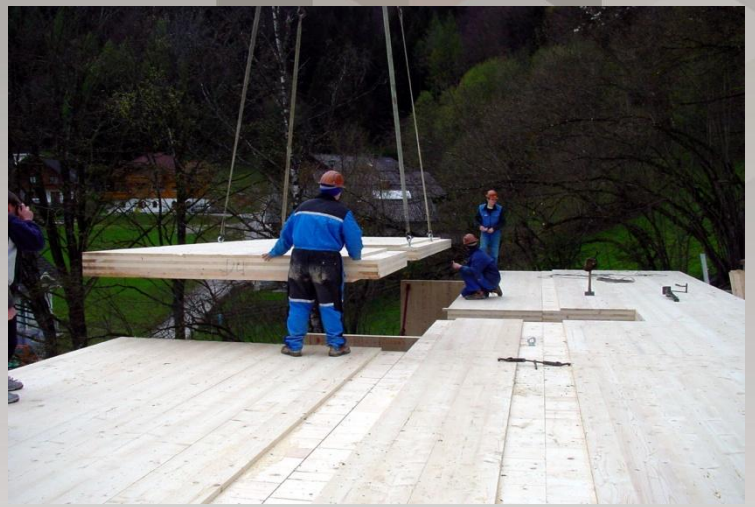
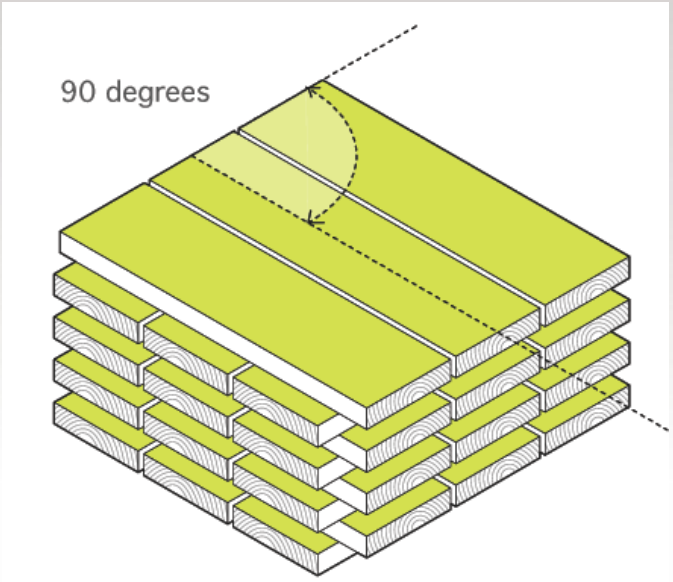
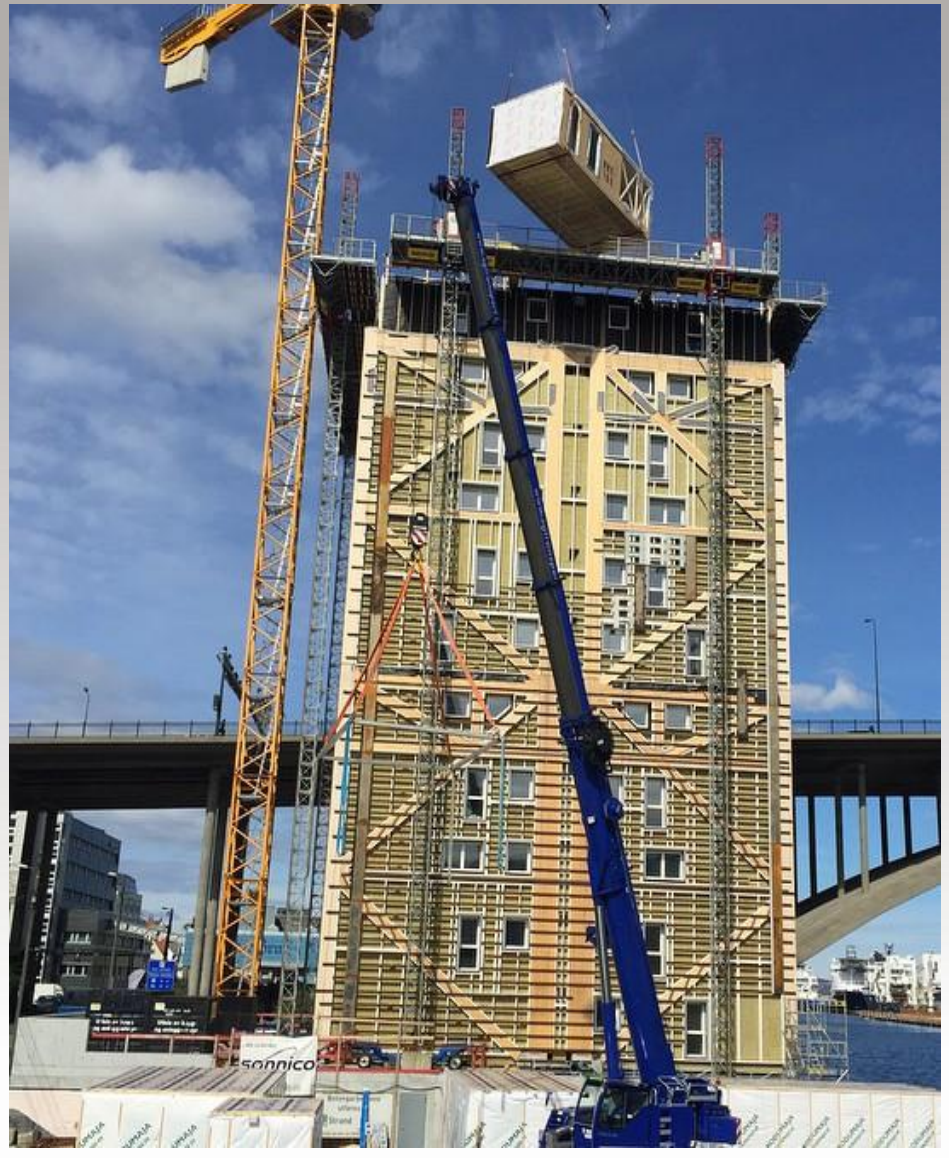
Prefaricated Mass Timber Systems

Cross Laminated Timber





Prefabricated Modular Timber Systems



Project: Treet Apartments
Builders: Kodumaja Constructions
Location: Norway

Project: Winter Olympic Village Torino

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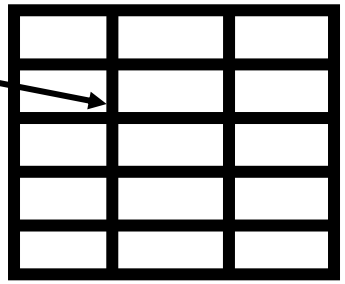
Building Form

Heavy Timber

Post & Beam

(Glulam)

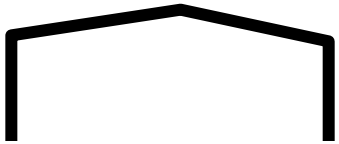


Industrial Portals

And

Specialty Buildings

(schools, etc)



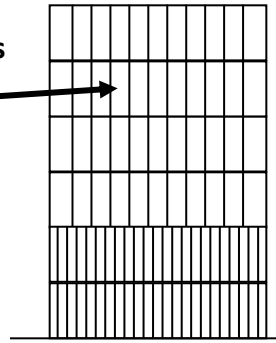
Building Form

Multi-Res Apartments

1-6 Storeys

Lightweight Timber

Conventional framing upper walls closer stud centres lower walls



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6 – 8

Ligh

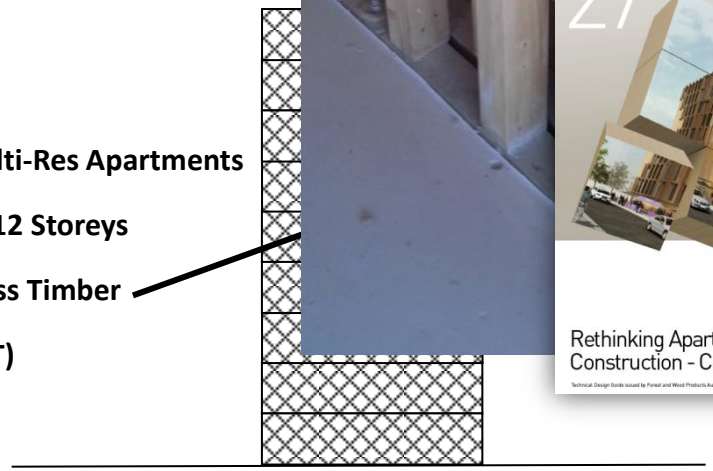
M

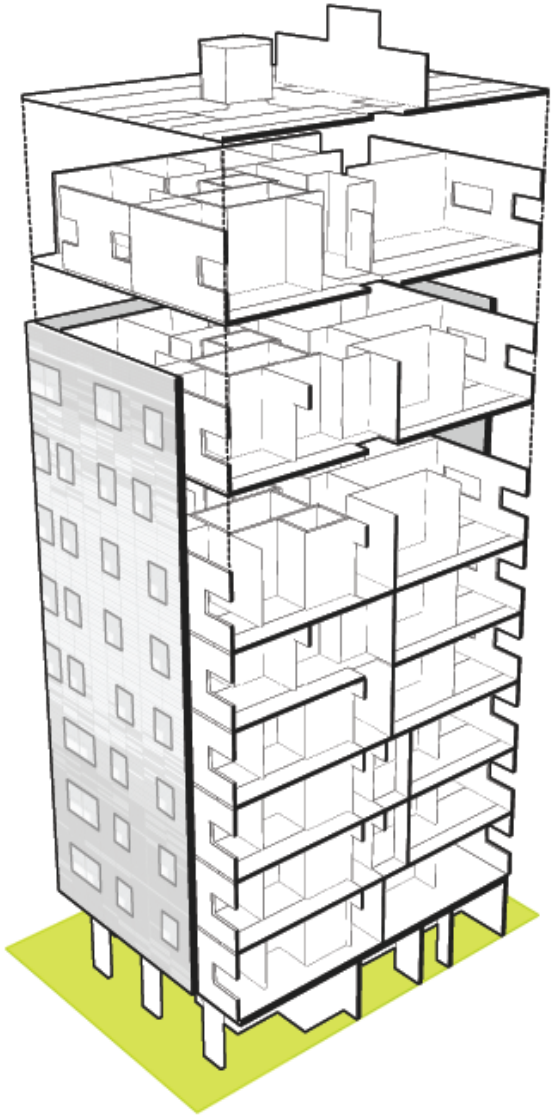
Multi-Res Apartments

6 - 12 Storeys

Mass Timber

(CLT)



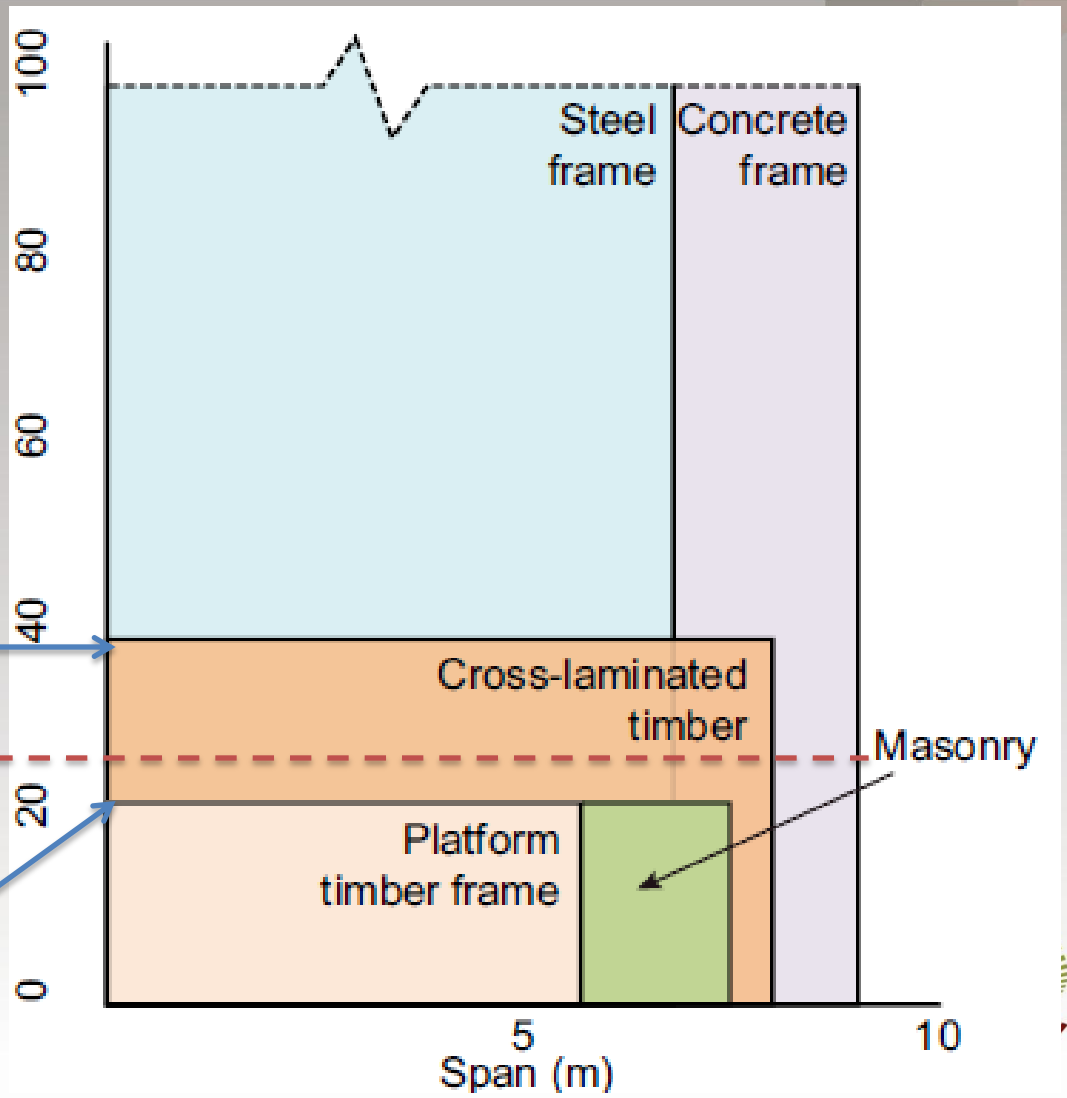


Timber Construction Options

12-14 Storeys

PFC to the NCC
Timber construction up to 25m under DTS

6-7 Storeys



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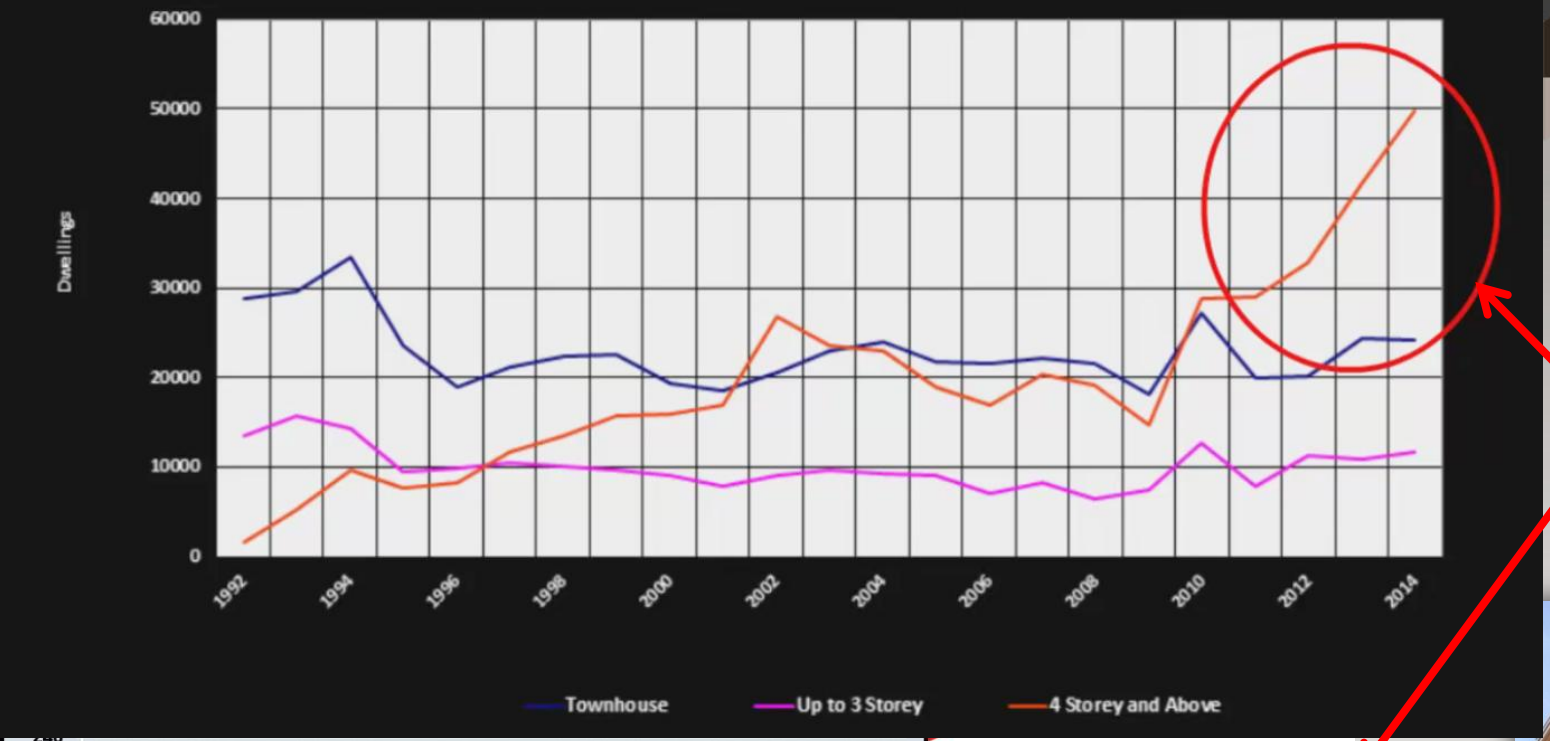
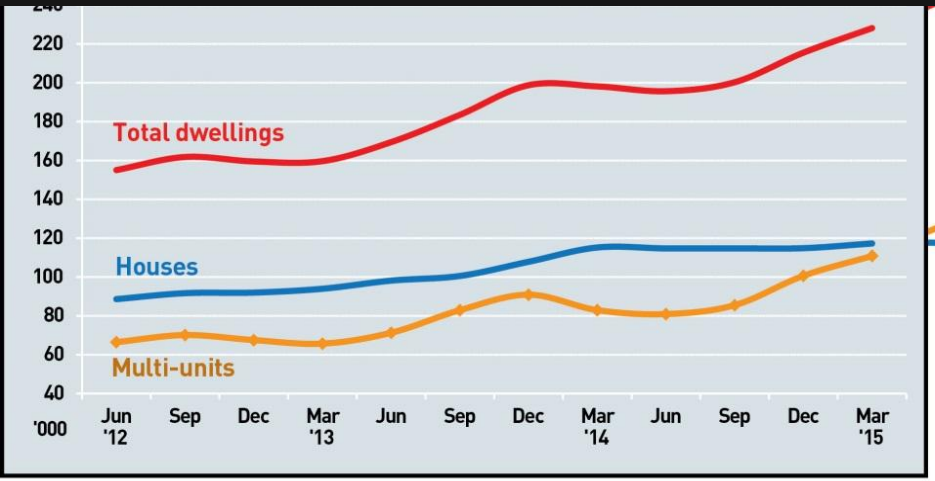
All Attached Approvals (ABS)



Future

4 Storey and Above



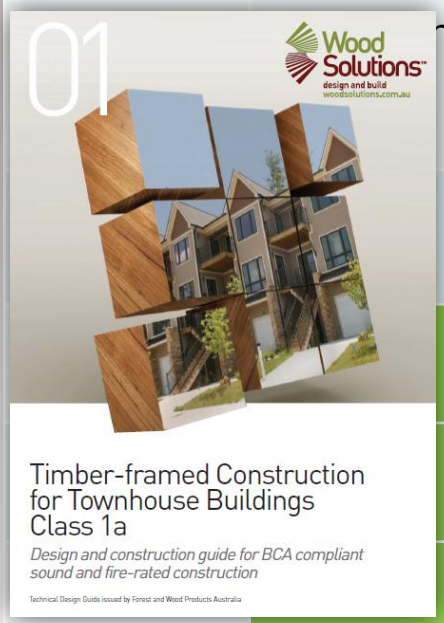
Source: ABS 8731.0

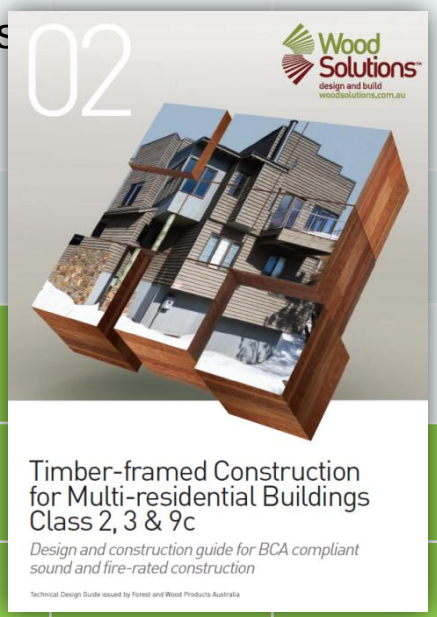
Growing demand for multi-residential

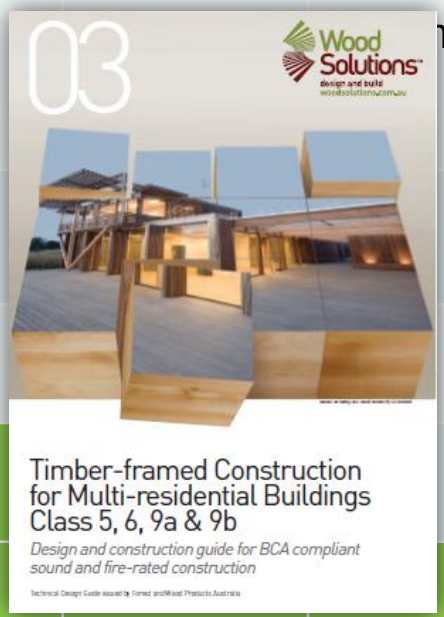
Level demand for houses

Maximum Timber Storey Height by Building Classification (BCA 2014)

Rise in storey	Type of Construction					
	Class 2	Class 3	Class 5	Class 6	Class 9a	Class 9b
					ncare	Schools & public buildings
						A
						A
						B
						C







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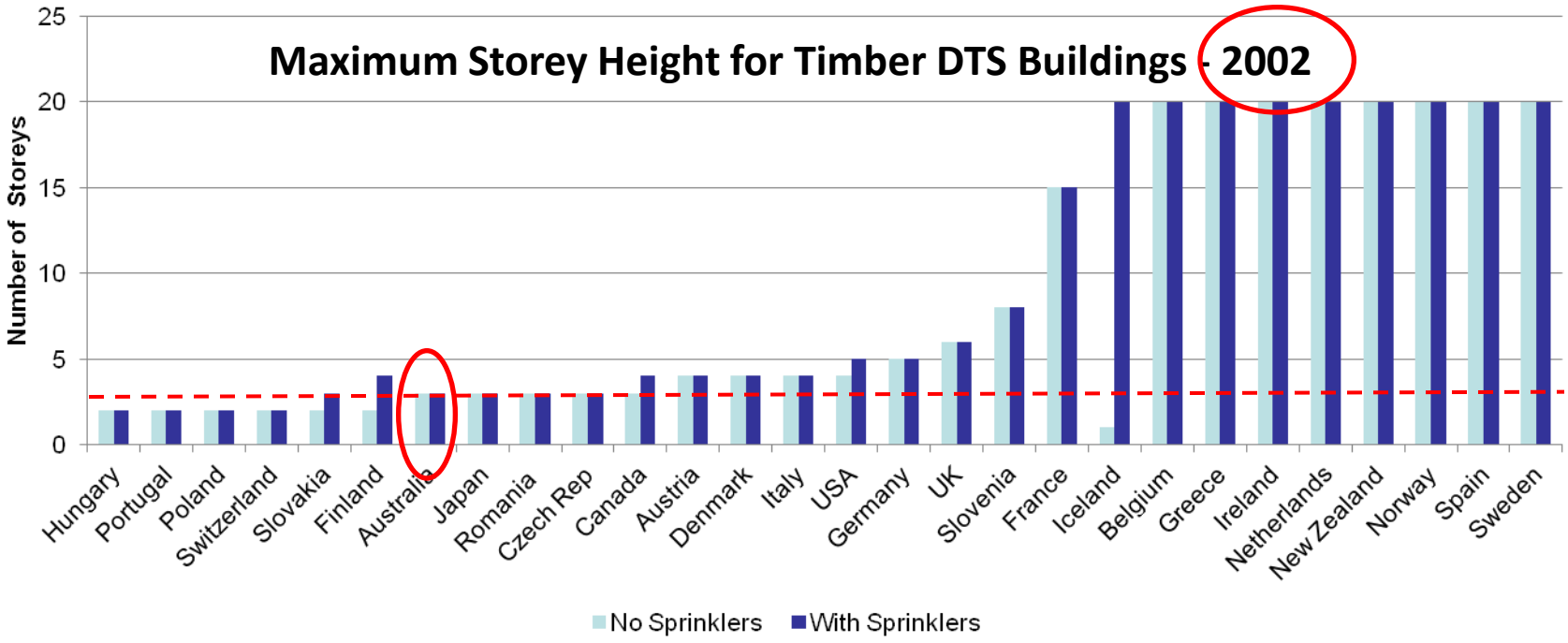
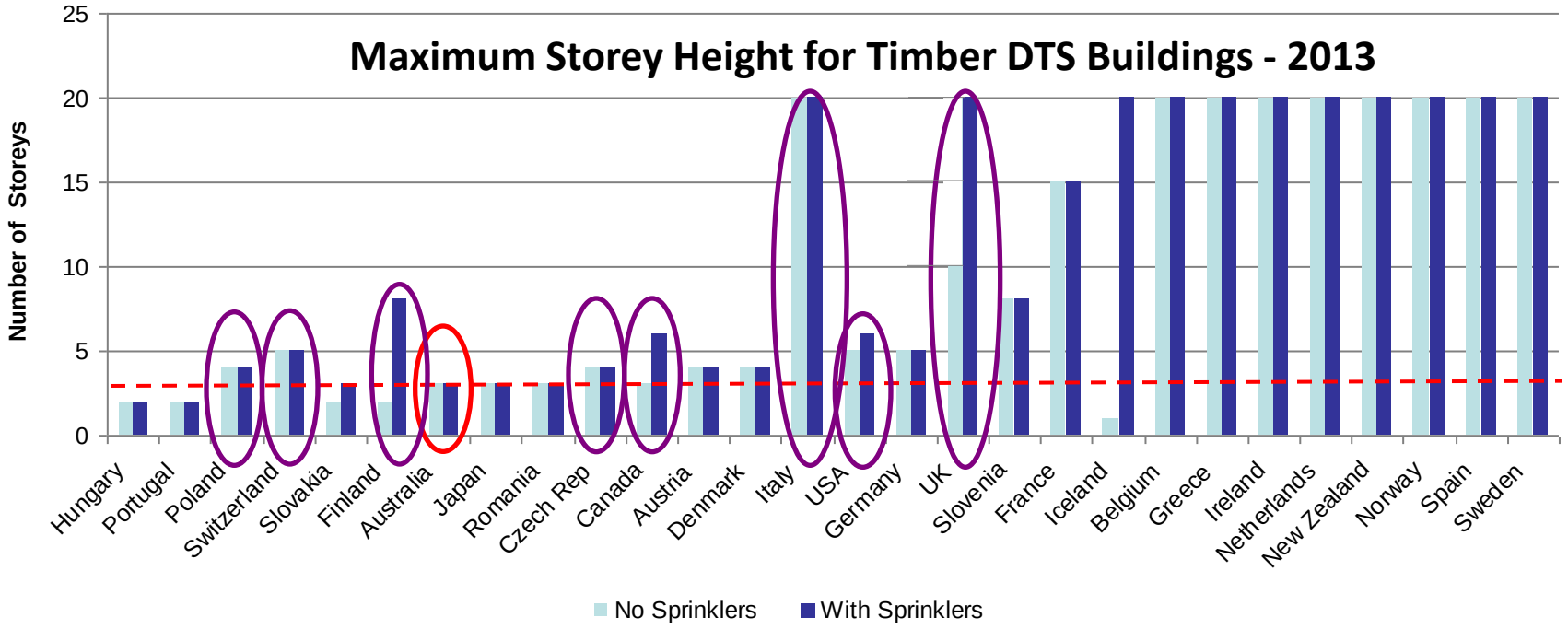
How does Australia Compare to the rest of World?



Source: Timber Development Association - NSW

How does Australia Compare to the rest of World?

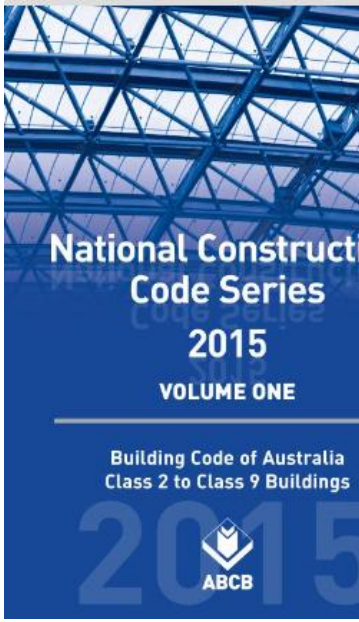


Source: Timber Development Association - NSW

2016 NCC - Proposal for Change

The proposal:

- Building effective height of not more than 25m (approx 8 storeys).
- Protected by automatic fire sprinklers complying with Specification E1.5 of the BCA.
- *Fire Protected Timber* used in applications where the BCA DtS requires the element to be of non-combustible construction or concrete or masonry.
- Cavity barriers specified for timber framed construction to address risk of fire spread via cavities.
- No reductions in FRLs proposed despite provision of automatic fire sprinklers.

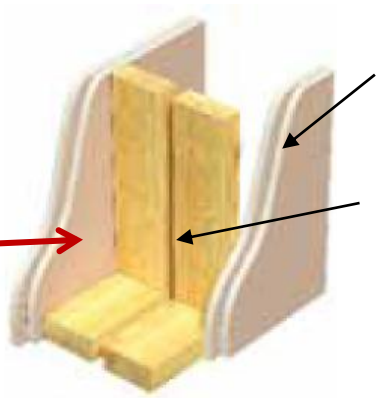


Fire-Protected Timber - Lightweight

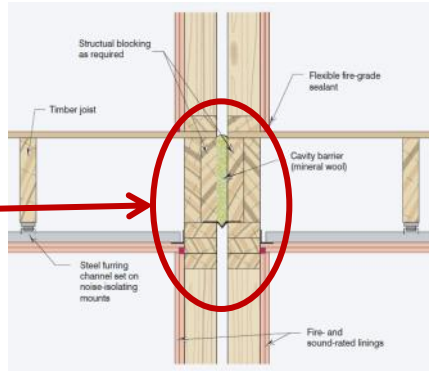
General Timber *(High level of protection to timber)*

- FRL lightweight timber-framed construction
  e.g. 90, 120, 140 x 45mm

- Additional precautions to reduce risk of fire spread to cavities
  e.g. Sprinkler systems
  plus 2 x 13mm fire-grade plasterboard for walls, 2 x 16mm fire-grade plasterboard for ceilings



- Additional precautions to reduce risk fire enters or starts in cavity
  e.g. cavity barriers



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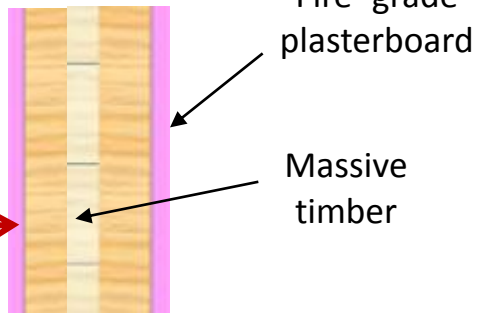
Fire-Protected Timber – Mass Timber

Mass Timber *(Lower level of protection to timber)*

- Minimum 75mm thickness of massive timber element, with required FRL, with no concealed spaces between plasterboard coverings and timber
  e.g. CLT, Glulam, LVL

- Precautions to reduce risk of timber ignition
  e.g. Sprinkler system
  plus 1 x 16mm fire-grade plasterboard for walls, 1 x 16mm fire-grade plasterboard for ceilings



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WS Design Guide: New DtS Requirements

- New Technical Guide detailing the NCC DtS requirements for lightweight and massive systems
- Guide to be published early 2016

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WS: Training Package – New DTS Requirements

Training Package

- New training package for use by registered training providers detailing the DTS requirements for lightweight and massive systems
- Training package to be completed by May 2016

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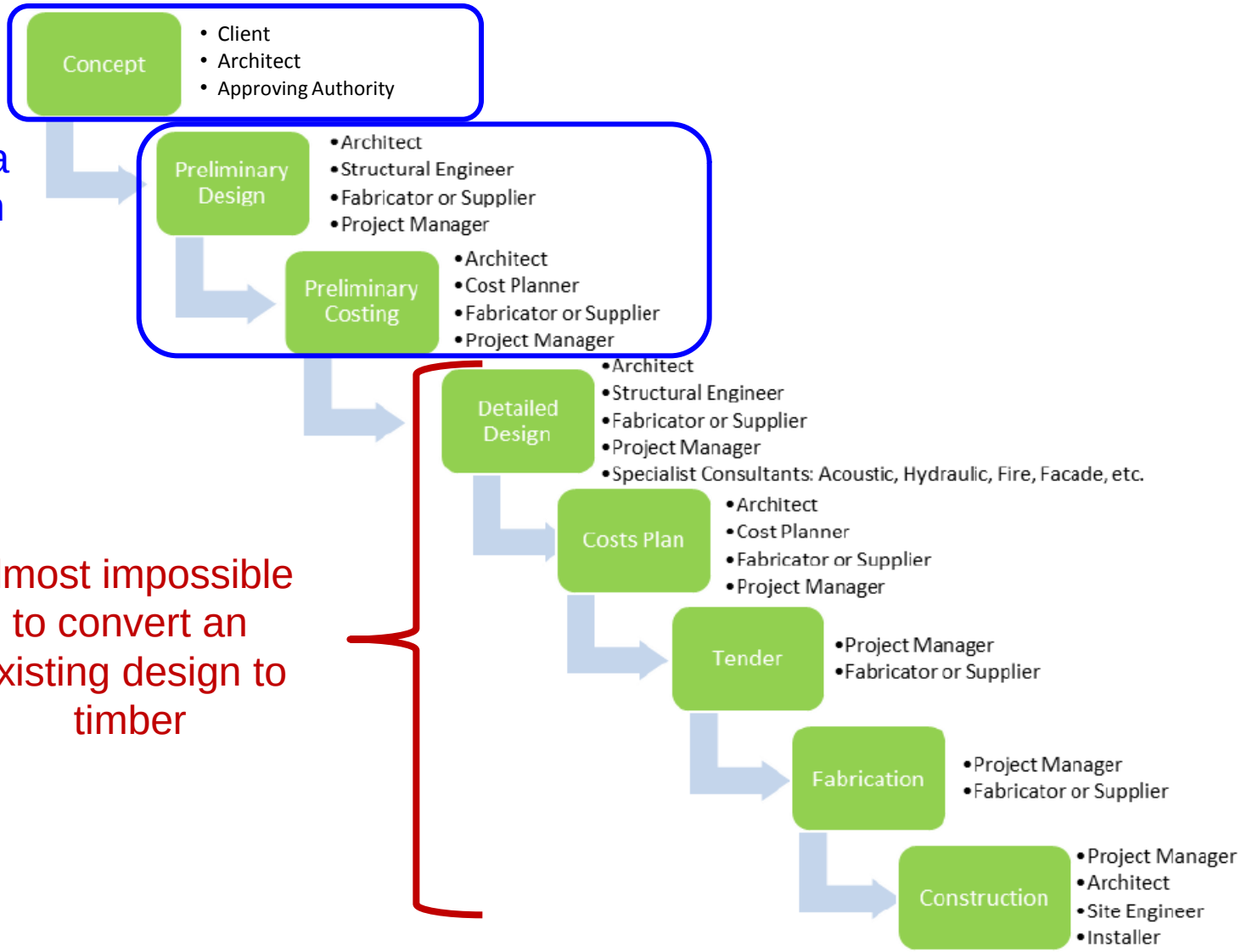
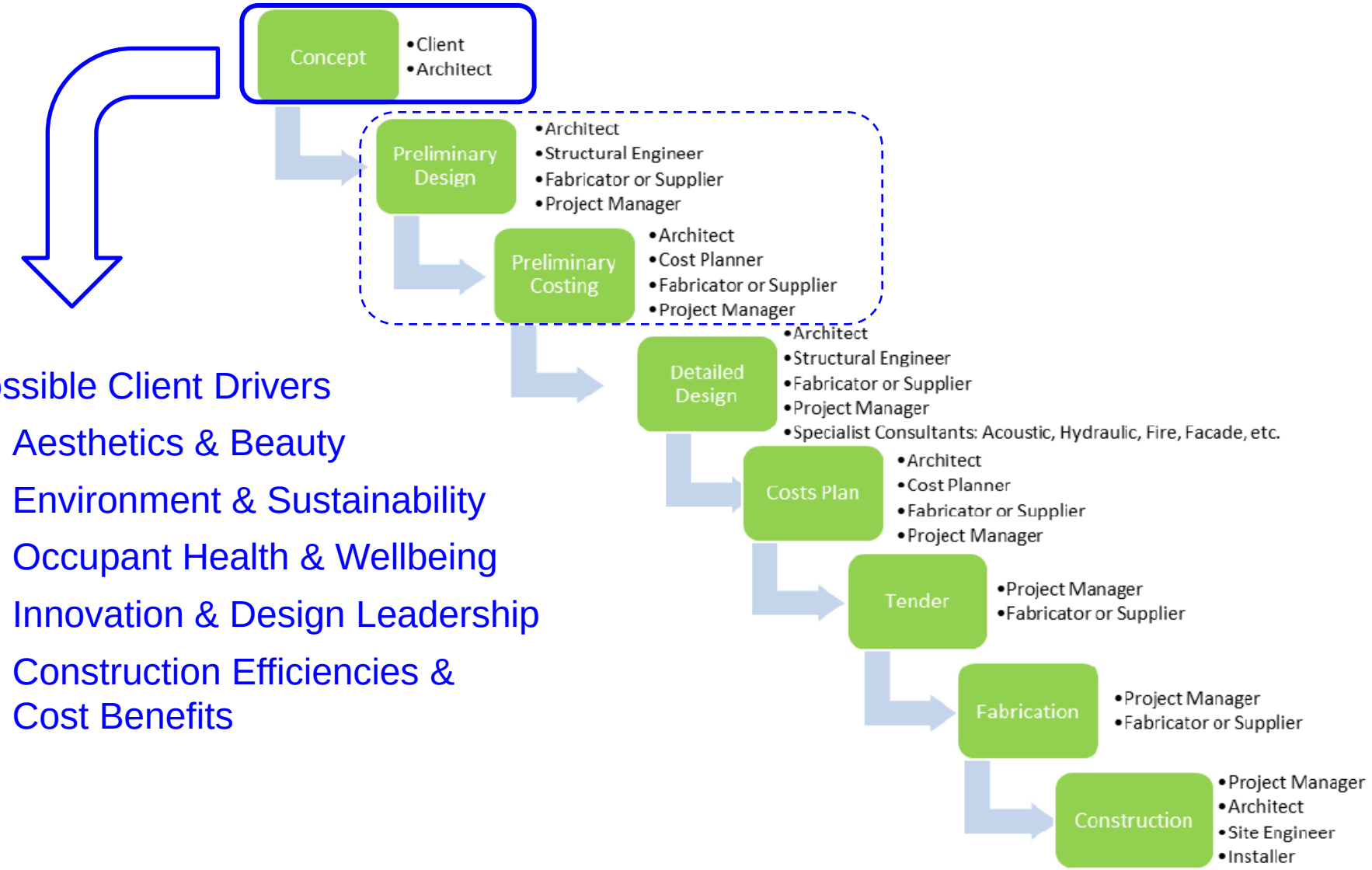
The Design Process & Design Team

This is where a timber solution needs to be considered



Almost impossible to convert an existing design to timber

The Design Process



Possible Client Drivers

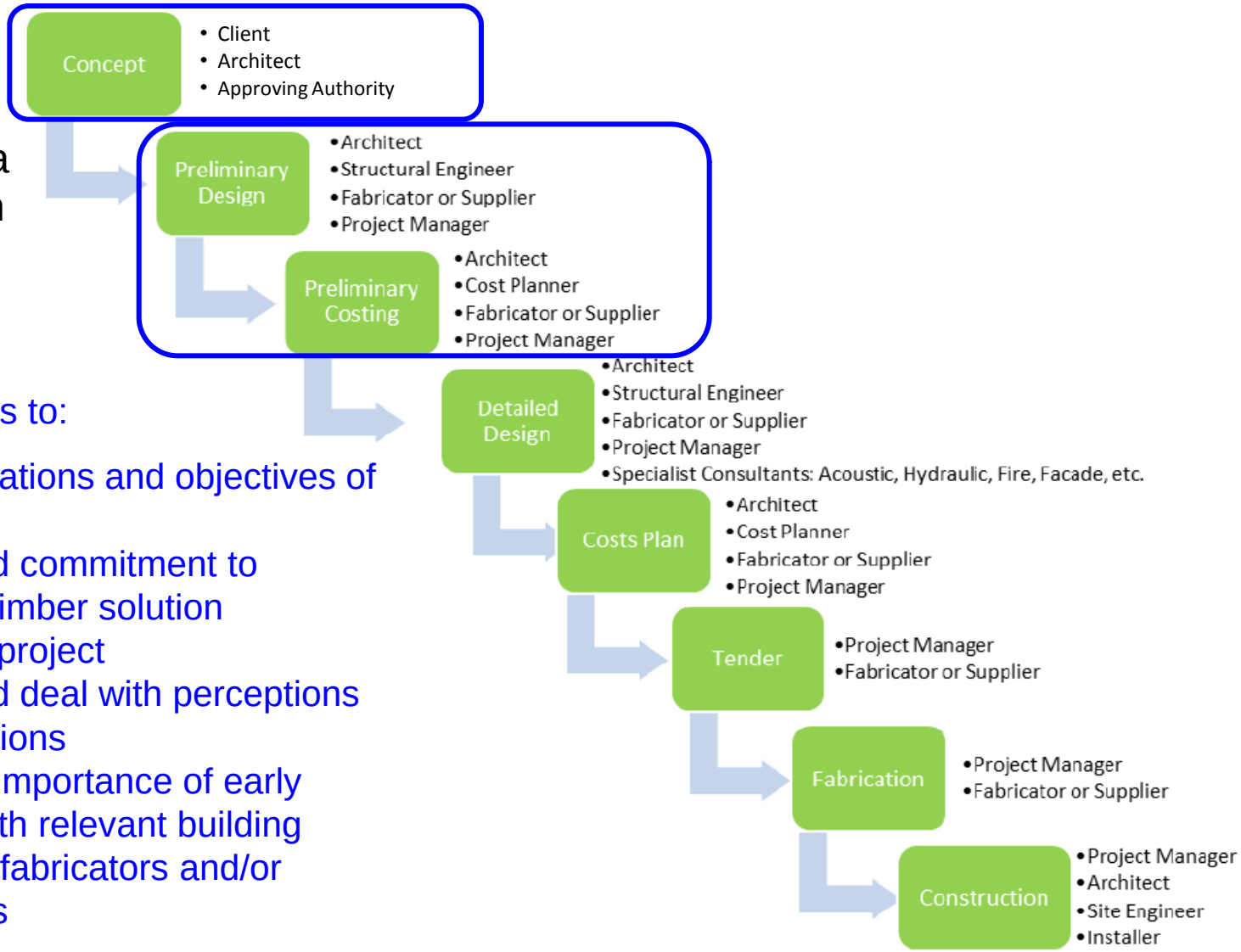
- Aesthetics & Beauty
- Environment & Sustainability
- Occupant Health & Wellbeing
- Innovation & Design Leadership
- Construction Efficiencies & Cost Benefits

Efficiencies & Cost Benefits

- Direct savings from faster methods of construction compared to traditional steel and concrete structures due to both:
  - increased scope for off-site prefabrication
  - lighter and more easily manipulated and installed materials
- Reduced foundation requirements due to lighter above-ground structure;
- Reduced numbers of on-site staff (costs & OH&S issues) , particularly with a shift to more prefabricated solutions;
- Increased ability to commence follow-on trades earlier in the construction process, reducing the overall construction program time to completion;
- Reduced on-site construction infrastructure *(preliminary costs)* such as fixed cranes, site accommodation, storage areas, scaffolding and edge protection, hoists and so on ; and
- Increased accessibility of the construction site and far lower impacts on noise and site impacts on neighbouring buildings (less truck movements & workers); a major benefit for suburban multi-residential developments.

The Design Process & Design Team

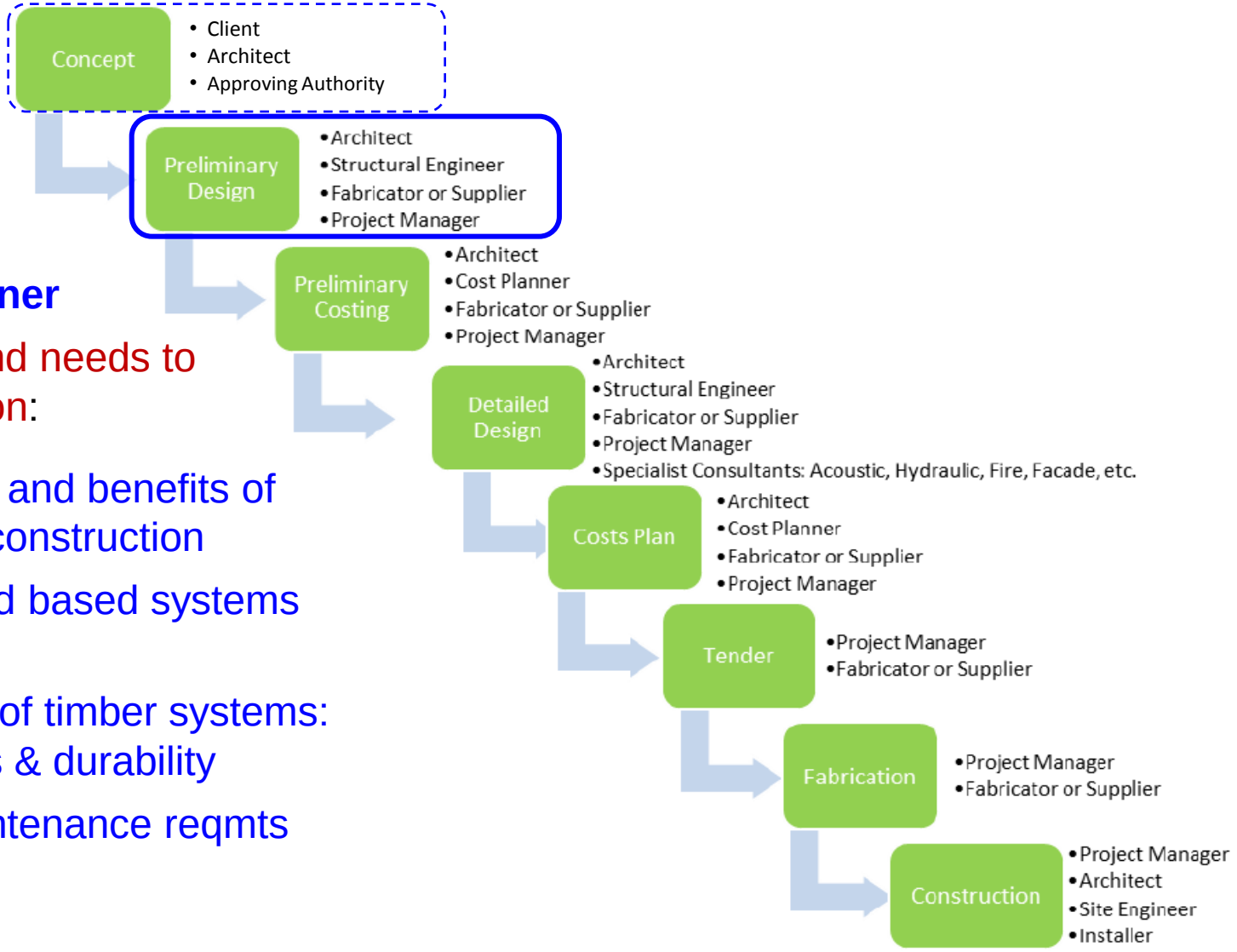
This is where a timber solution needs to be considered



Design Team needs to:

- Share the aspirations and objectives of the client
- Have an agreed commitment to sticking with a timber solution throughout the project
- Understand and deal with perceptions and misperceptions
- Recognise the importance of early engagement with relevant building authorities and fabricators and/or timber suppliers

The Importance of the Design Team

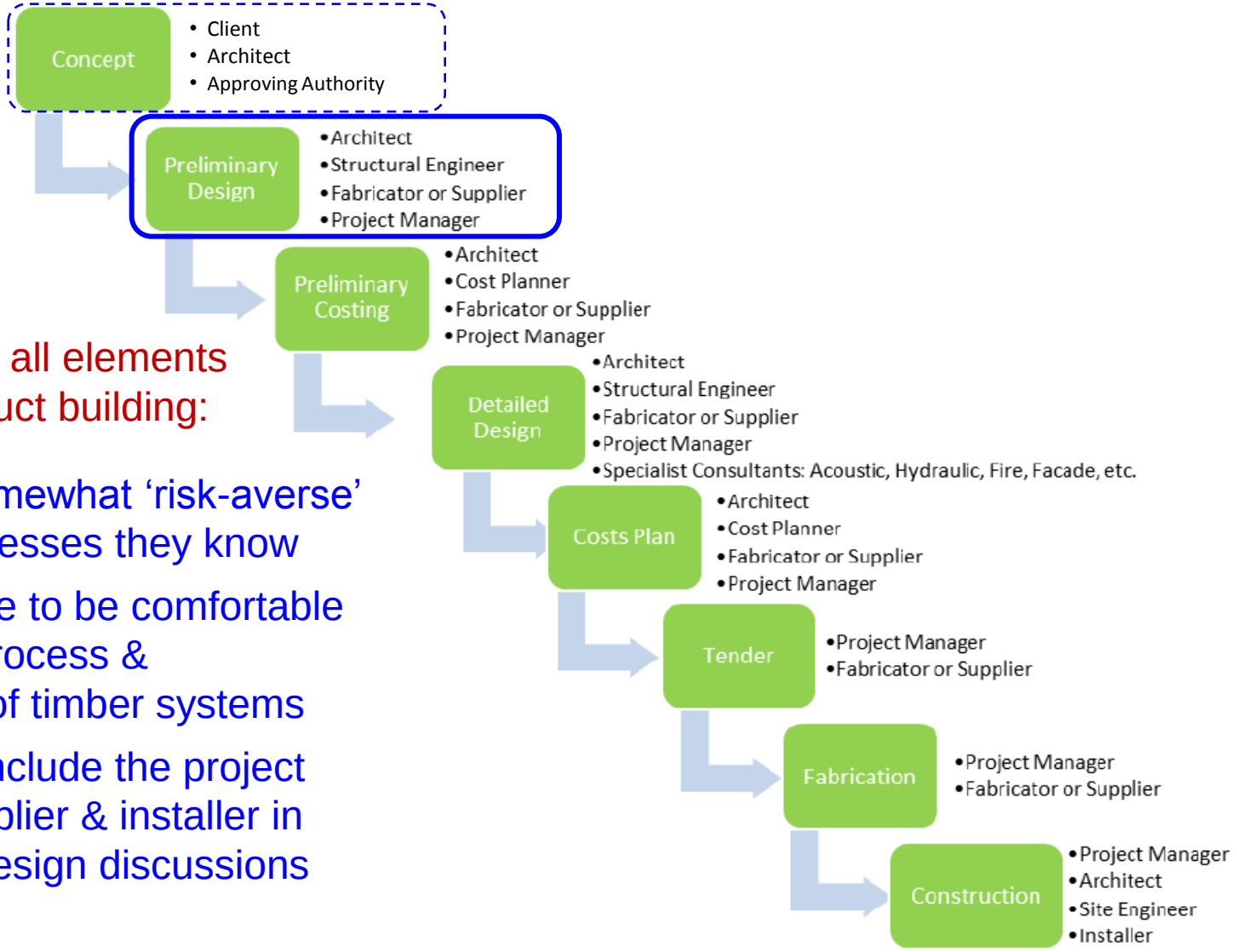


Architect / Designer

Key to success and needs to be well informed on:

- Opportunities and benefits of wood based construction
- Types of wood based systems available
- Performance of timber systems: fire, acoustics & durability
- Ongoing maintenance reqmts

The Importance of the Design Team

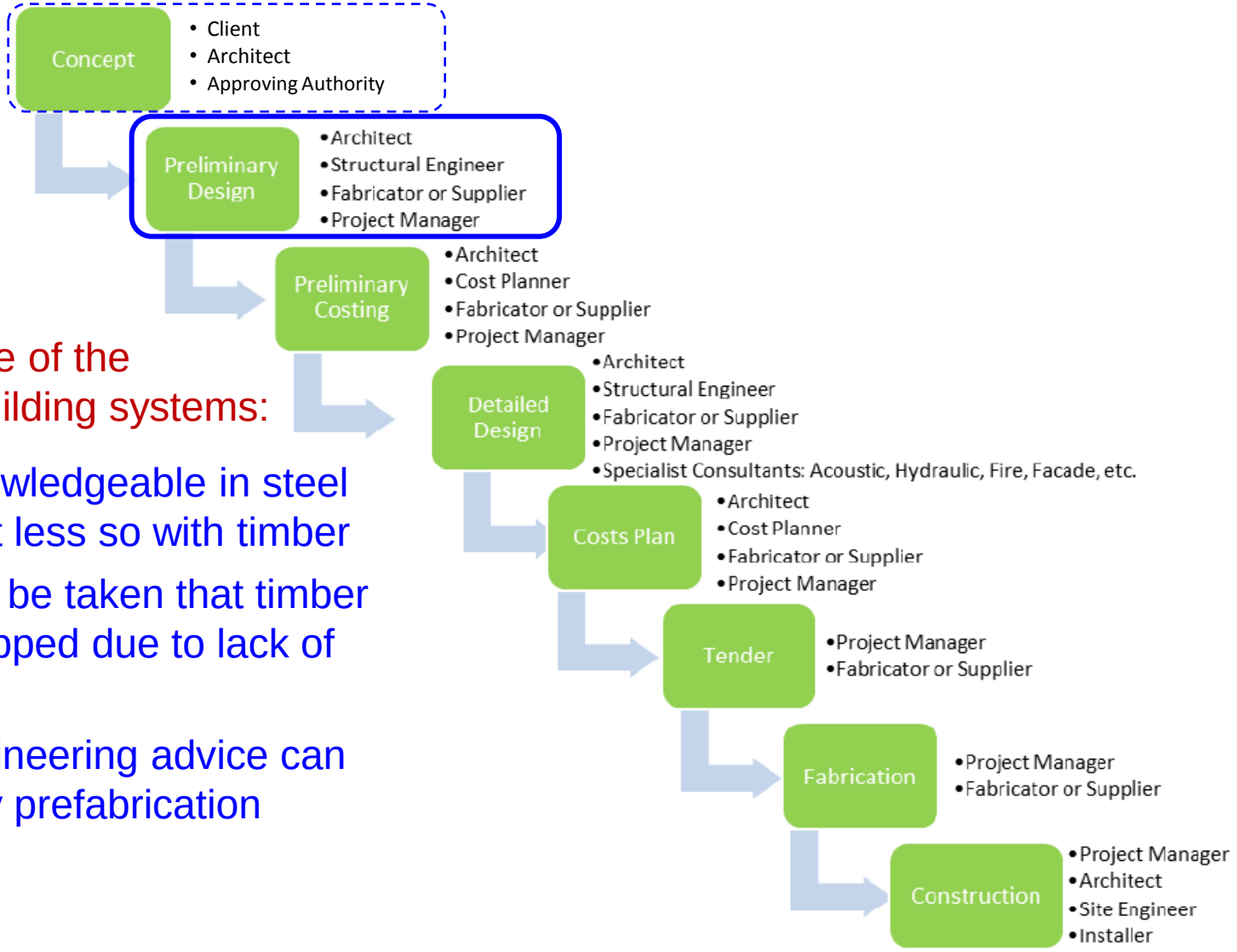


Project Manager

Critical in bringing all elements together to construct building:

- Tend to be somewhat 'risk-averse' so prefer processes they know
- Need therefore to be comfortable with supply, process & performance of timber systems
- Important to include the project manager, supplier & installer in early prelim design discussions

The Importance of the Design Team

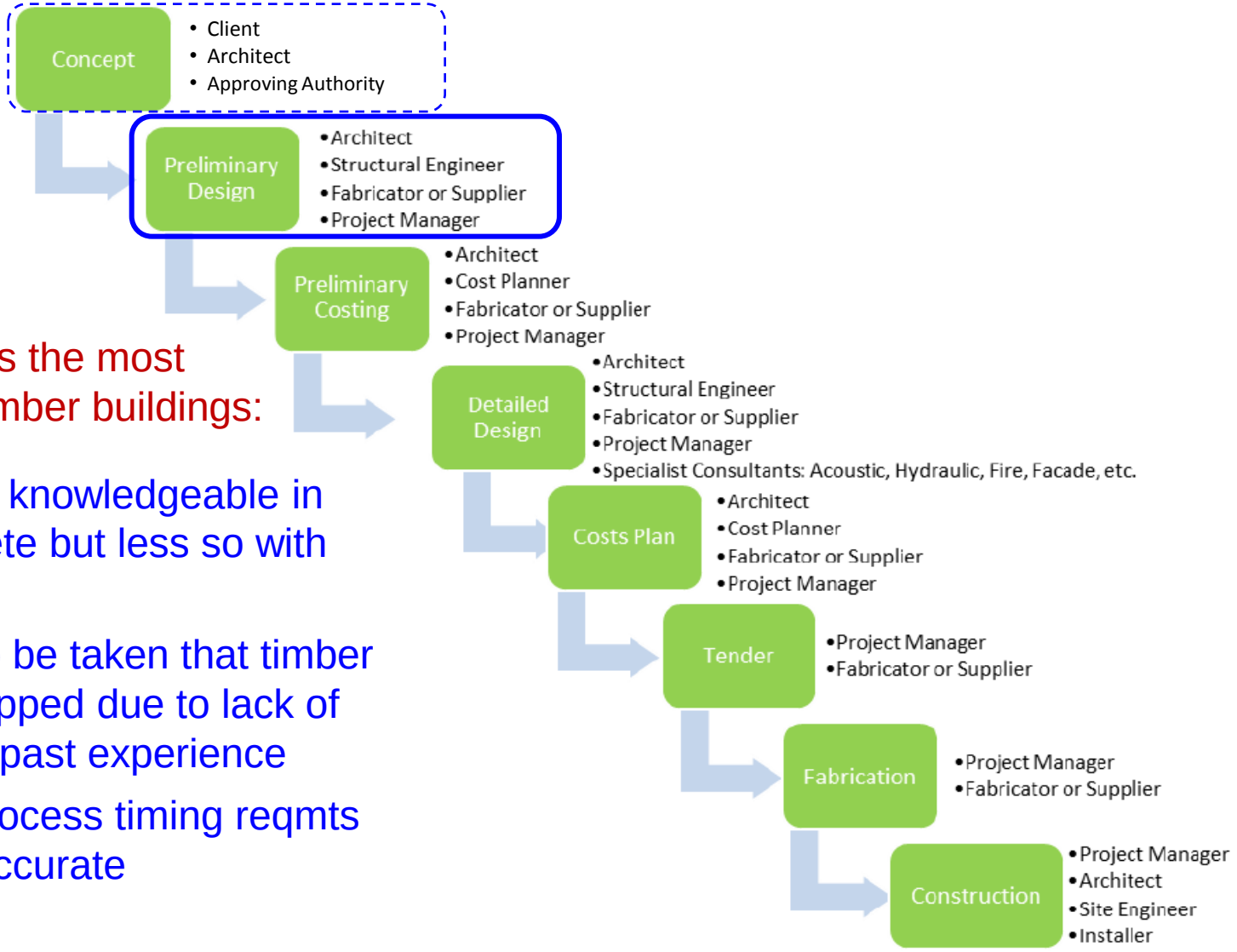


Engineer

Needs to be aware of the different timber building systems:

- Engineers knowledgeable in steel & concrete but less so with timber
- Care needs to be taken that timber option not dropped due to lack of knowledge
- Structural engineering advice can be supplied by prefabrication companies

The Importance of the Design Team

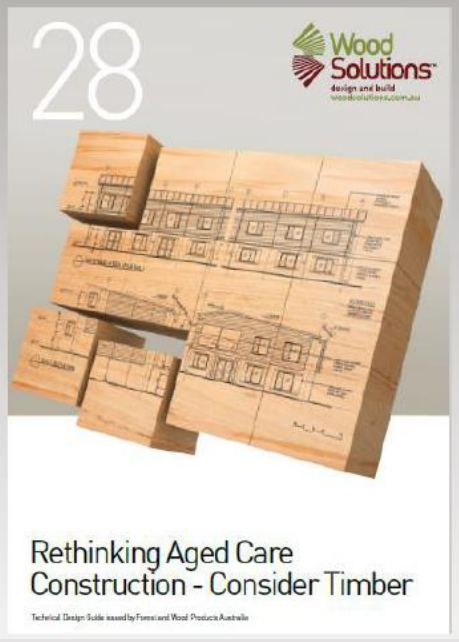


Cost Planner

Accurate costing is the most critical issue for timber buildings:

- Cost planners knowledgeable in steel & concrete but less so with timber
- Care needs to be taken that timber option not dropped due to lack of knowledge or past experience
- Pricing and process timing reqmts needs to be accurate

WS Design Guide: Costing Case Studies



- The following new costing case study guides have been formally launched today

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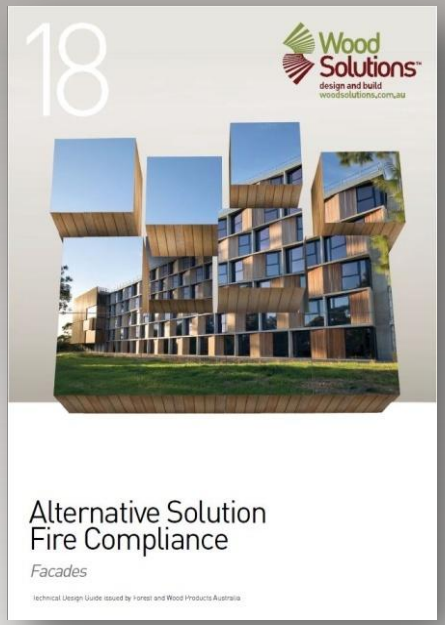
WS Design Guide: Alternative Solutions



- The following existing guides are related to fire engineering and developing Alternative Solutions.

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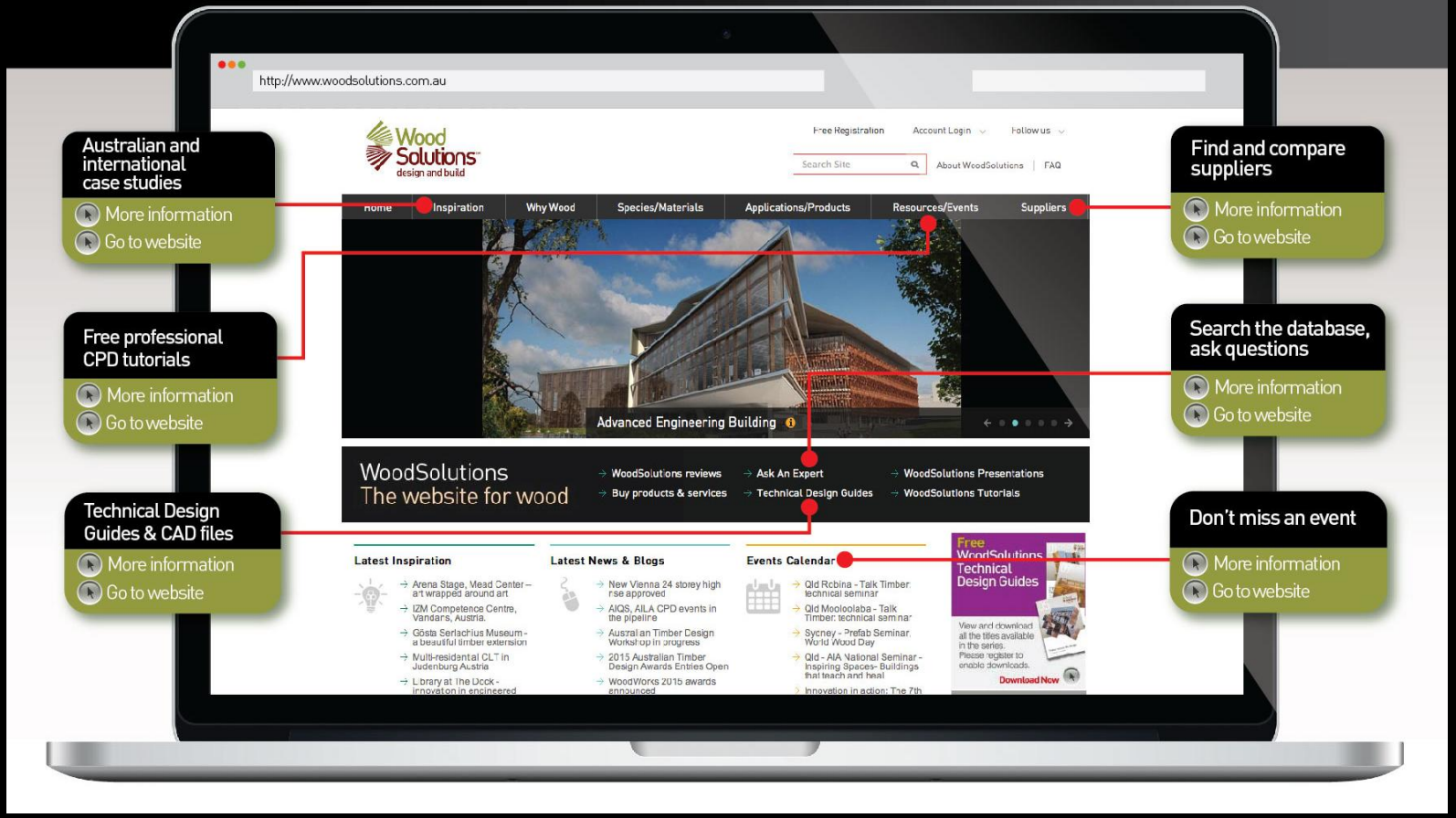

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Thank you for your attention

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Today's Seminar Program

Introduction & the Importance of the Design Team Interaction
Alastair Woodard, WoodSolutions

Architectural Design Considerations
Dirk Zimmermann & Dylan Brady, Studio 505

Engineering Design Considerations
Nick Hewson, AECOM

Afternoon Tea

Timber Building Cost Comparison
Andrew Dunn, WoodSolutions, TDA NSW

Timber Prefabrication & Supply

Lightweight:	*John Bowen, Bowens Timbertruss*
Glulam:	*Robert Mansell, Hyne Timber*
Mass:	*Erkki Valikangas, Stora Enso*

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