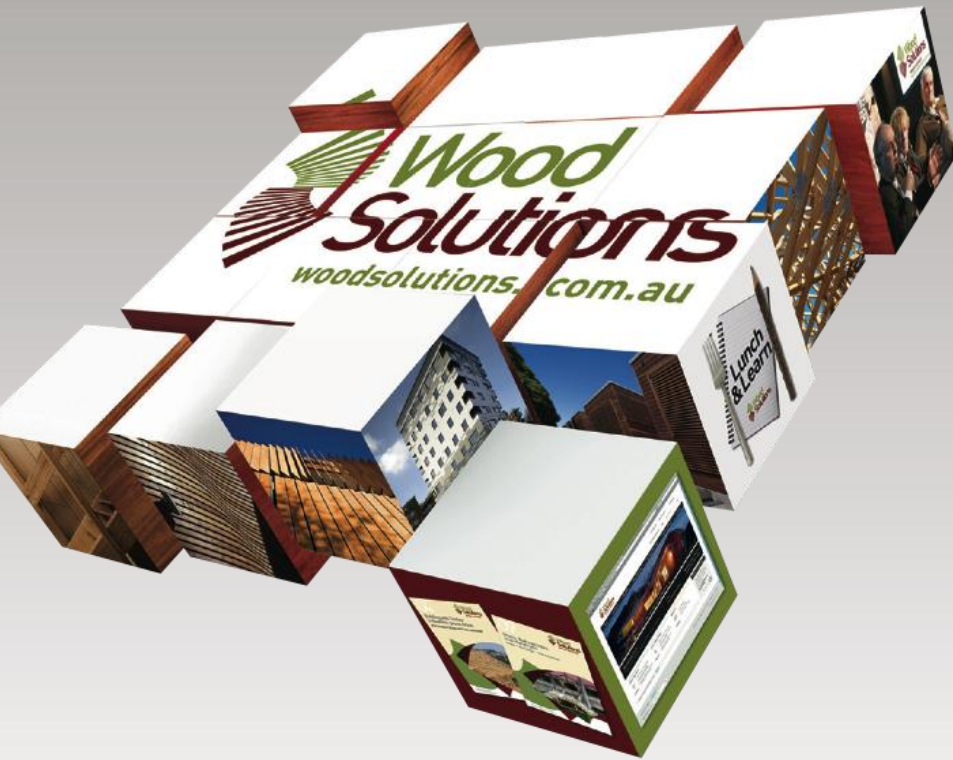


Design of Mid-rise Timber Apartment Buildings

1st December 2015



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



What WoodSolutions provides



Events



Technical Design Guides (19)



Interactive Website

www.woodsolutions.com.au



Sponsorships



Technical Tutorials



Discover WoodSolutions



The laptop screen shows the WoodSolutions website at <http://www.woodsolutions.com.au>. The website features a navigation bar with links: Home, Inspiration, Why Wood, Species/Materials, Applications/Products, Resources/Events, and Suppliers. A search bar is located in the top right. The main content area displays a large image of a modern building with the text "Advanced Engineering Building". Below this, there are sections for "Latest Inspiration", "Latest News & Blogs", and "Events Calendar". A sidebar on the right promotes "Free WoodSolutions Technical Design Guides".

Australian and international case studies

- More information
- Go to website

Free professional CPD tutorials

- More information
- Go to website

Technical Design Guides & CAD files

- More information
- Go to website

Find and compare suppliers

- More information
- Go to website

Search the database, ask questions

- More information
- Go to website

Don't miss an event

- More information
- Go to website

Arena Stage, Mead Center – art wrapped around art

Arena Stage, Mead Center – art wrapped around art



Glass is held in place by massive Douglas fir PSL columns - looking from inside the foyer out through a forest of tapered engineered timber columns and horizontal 'spacers'.

Overview Structure Exterior Interior

BTA's project director James Brown recalls that convincing the client to use wood products for the structural elements were a much harder sell than for the interior.

"The use of wood in Washington DC for major structural components was new and there were concerns about the ability to deliver within the project budget. We spent much time trying to educate the client and contractors that wood would be feasible.

"Aesthetically, the client had no issue with wood columns and accepted that they were a significant component to the design, and

Free WoodSolutions Technical Design Guide

View and download all the titles available in the series. Please register to enable download.

Fire: A Solution



Free Design Guide

Featured




Flow, Flight

About Wood

We are an industry source of information

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 in 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.

Technical Design Guides



The natural benefits of timber as an aesthetic, durable, functional and sustainable material provide designers with exciting opportunities. To maximise the design capabilities of timber it is important to consider key performance attributes and comply with regulations such as the Building Code of Australia (BCA).

WoodSolutions Technical Design Guides have been developed for architects, engineers, building designers and other building professionals.

Click on the links to view the following publications:

Please note: Hard copies of most Guides are available for purchase from SAI Global.

- **#1 Timber-framed Construction for Townhouse Buildings Class 1a** - information about complying with the fire safety and sound insulation performance requirements in the BCA for Class 1a attached buildings.
- **#2 Timber-framed Construction for Multi-residential Buildings Class 2, 3 & 9c** - information about complying with the fire and sound performance requirements in the BCA for Class 2, 3 and 9c buildings.

Technical Design Guides

Written by experts in their field
are designed to



design guides
authoritative,

01

Tim
for
Clas
Design

This guide
demonstrates
achieving
sound per
requirem
BCA for C
9c buildin



**Timber-framed Construction
for Townhouse Buildings
Class 1a**
Design and construction guide for BCA compliant
sound and fire-rated construction

Technical Design Guide issued by Forest and Wood Products Australia

able for

Wood
Solutions
SAI Global

Ask An Expert

WoodSolutions Ask An Expert gives you our expert panel's answers to a wide range of questions. Simply use the search function below to find the information you are seeking. You can search by topic, keywords or both topic and keywords. Making your search as precise as possible will help you find the most relevant information.

Please note that the information provided in the answers is general advice only and subject to our [Disclaimer](#). It is your responsibility to ensure that your project complies to any and all relevant building codes and standards or other approvals and requirements applicable in your area.

Please select Question Topic, enter keywords to search by and click search

Select Question Topic(s). Use 'Ctrl-Click' to select multiple topics.

Any
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

Please enter keywords below. Separate keywords by space.

Search

Environment, sustainability and recycling -- 8 question(s) found

Exterior timber and decking -- 91 question(s) found

Forestry, wood processing and certification -- 10 question(s) found

Interior timber and flooring -- 32 question(s) found

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.*

Discover WoodSolutions



The laptop screen shows the WoodSolutions website at <http://www.woodsolutions.com.au>. The website features a navigation bar with links: Home, Inspiration, Why Wood, Species/Materials, Applications/Products, Resources/Events, and Suppliers. A search bar is also present. The main content area includes a large image of the 'Advanced Engineering Building' and a section titled 'WoodSolutions The website for wood' with links to reviews, products, design guides, and tutorials. Below this are sections for 'Latest Inspiration', 'Latest News & Blogs', and 'Events Calendar'. A 'Free WoodSolutions Technical Design Guides' download button is also visible.

Australian and international case studies

- More information
- Go to website

Free professional CPD tutorials

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www.woodsolutions.com.au

Events – Design of Mid-rise Timber Apartment Buildings

27



Rethinking Apartment Building Construction - Consider Timber

Technical Design Guide issued by Forest and Wood Products Australia

27

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Rethinking Apartment Building Construction - Consider Timber

Design of Mid-rise Timber Apartment Buildings

Seminar Series 2015

Date
Tuesday 1st December 2015

Time
12.30pm sharp until 5.00pm
(Registration 12.15pm)

Venue
Library at the Dock,
Docklands (come early and
inspect this magnificent
building)

RSVP early - (see over)
Registrations close
Wednesday
25th November 2015
**BOOK EARLY as places
are limited**

Cost
This workshop is 'FREE'
to all building professionals.

CPD
Certificates of attendance
available.

Brought to you by
WoodSolutions

Concept → Prelim Design → Detailed Design → Tender → Fabrication → Construction

Multi-residential construction is today a major building form; in some cities now outnumbers single dwelling starts. New timber construction systems provide highly cost-effective and efficient solutions for apartments up to 8 or more storeys - Australand has stated that it was able to deliver its 5-storey timber 'The Green' more cost effectively than a traditional concrete solution. Changes to the 2016 NCC will also make design & construction with new deemed-to-satisfy provisions for lightweight and construction for buildings up to an effective height of 25m. It specifically examines the design and development of mid-rise timber apartment buildings: what are the systems, mass panels, prefabricated solutions, what are the construction considerations architectural & the key supply considerations and most the comparative costs? We produced a specific Design Guide on this topic Building Construction - Consider Timber and this key authors of this study - practising architects (AECOM), cost assessors, prefabricators and hand their state-of-the-art understanding and timely topic. Building professionals already actively for all building and design professionals designers, engineers, certifiers, ers, educators and students.



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*



Presentations and CPD



27

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Fortis Living Level Lease

Rethinking Apartment Building Construction - Consider Timber

Concept → Pre-Design → Detailed Design → Tender → Fabrication → Construction

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



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woodsolutions.com.au

The Website for Wood.

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.

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?

- | | |
|---|---|
| <input type="checkbox"/> Intro & Importance of the Design Team
<input type="checkbox"/> Architectural Design Considerations
<input type="checkbox"/> Engineering Design Considerations
<input type="checkbox"/> Timber Buildings Cost Comparison | Prefabrication & Supply
<input type="checkbox"/> Lightweight Timber Systems
<input type="checkbox"/> Heavy Timber Systems (Glulam)
<input type="checkbox"/> 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

- | | |
|---|---|
| <input type="checkbox"/> Intro & Importance of the Design Team
<input type="checkbox"/> Architectural Design Considerations
<input type="checkbox"/> Engineering Design Considerations
<input type="checkbox"/> Timber Buildings Cost Comparison | Prefabrication & Supply
<input type="checkbox"/> Lightweight Timber Systems
<input type="checkbox"/> Heavy Timber Systems (Glulam)
<input type="checkbox"/> 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



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

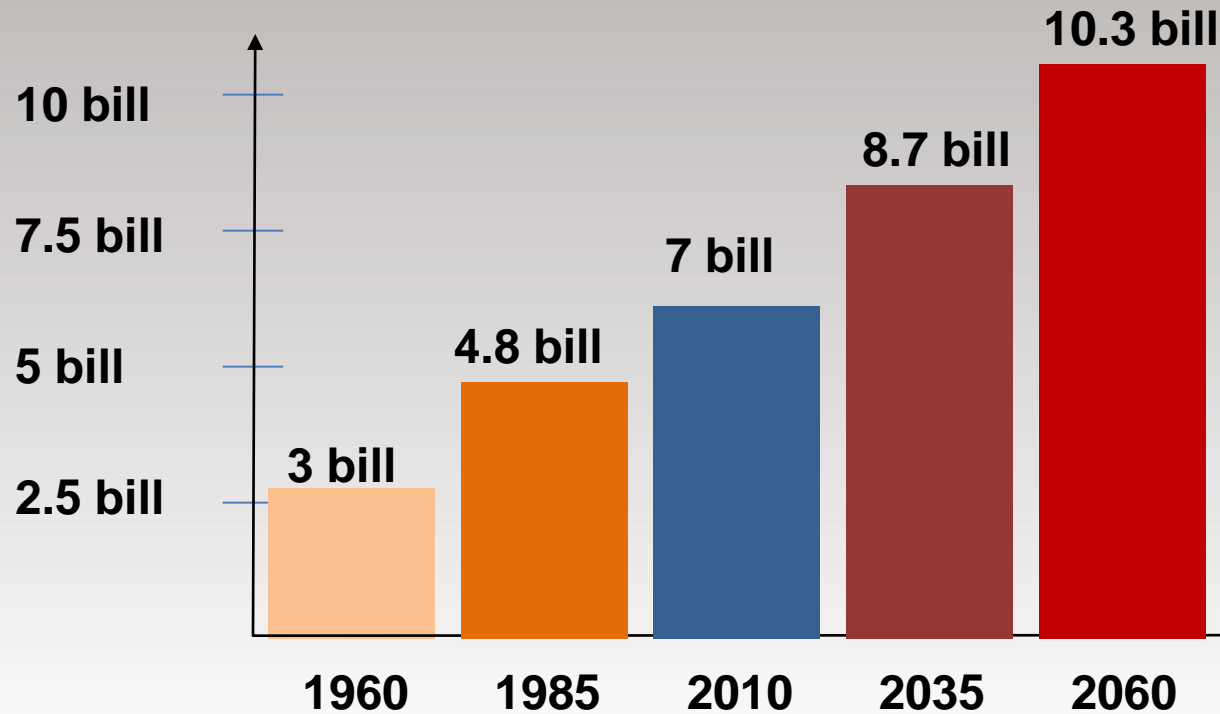
Some of the Key Drivers & Issues

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



The Future Population Challenge

- World population growth

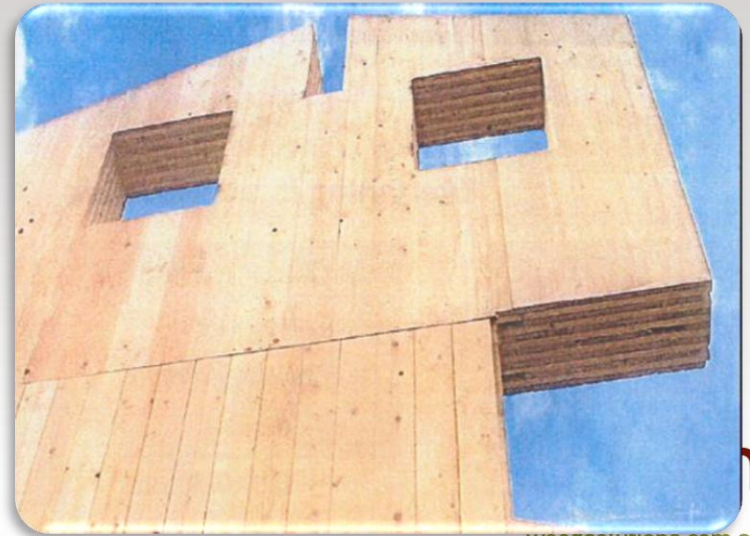


World population growth rate at 25 year intervals

The Future Housing Challenge



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'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**

Very Exciting Time for Timber

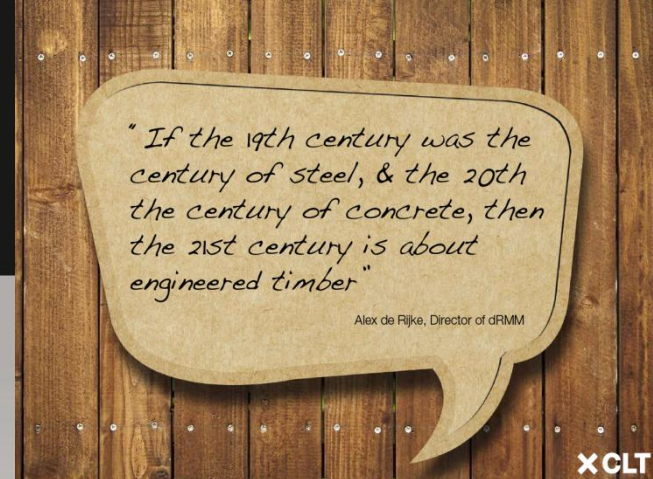
✓ New Products

- Structural products (engineered)
- Appearance Products
- Connectors

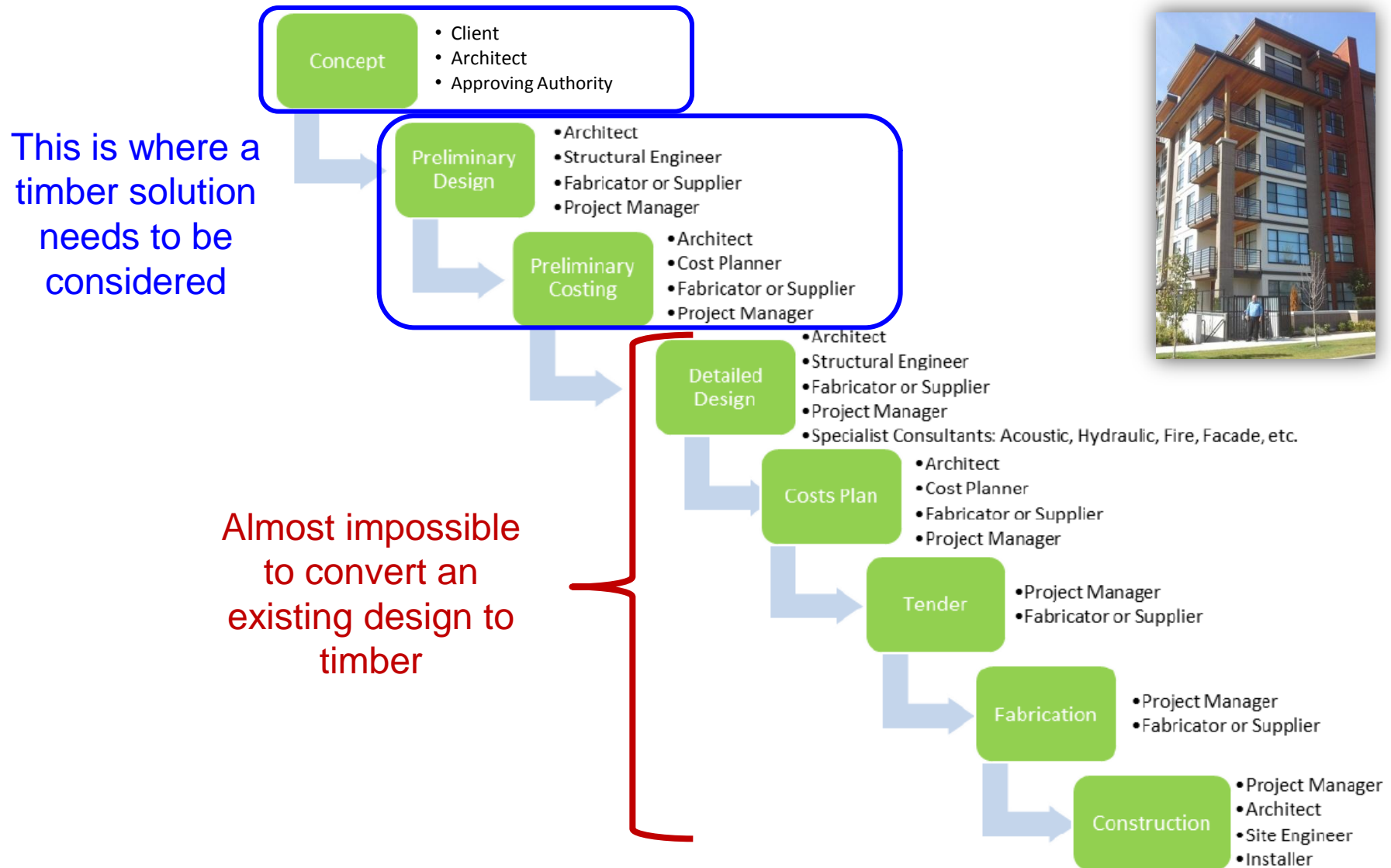
✓ New Systems

- Prefabricated houses (residential)
- Prefabricated cassette floors
- Timber-concrete composites
- Post-tensioned beams & frames
- Mass timber systems
- Lightweight MRTFC timber systems

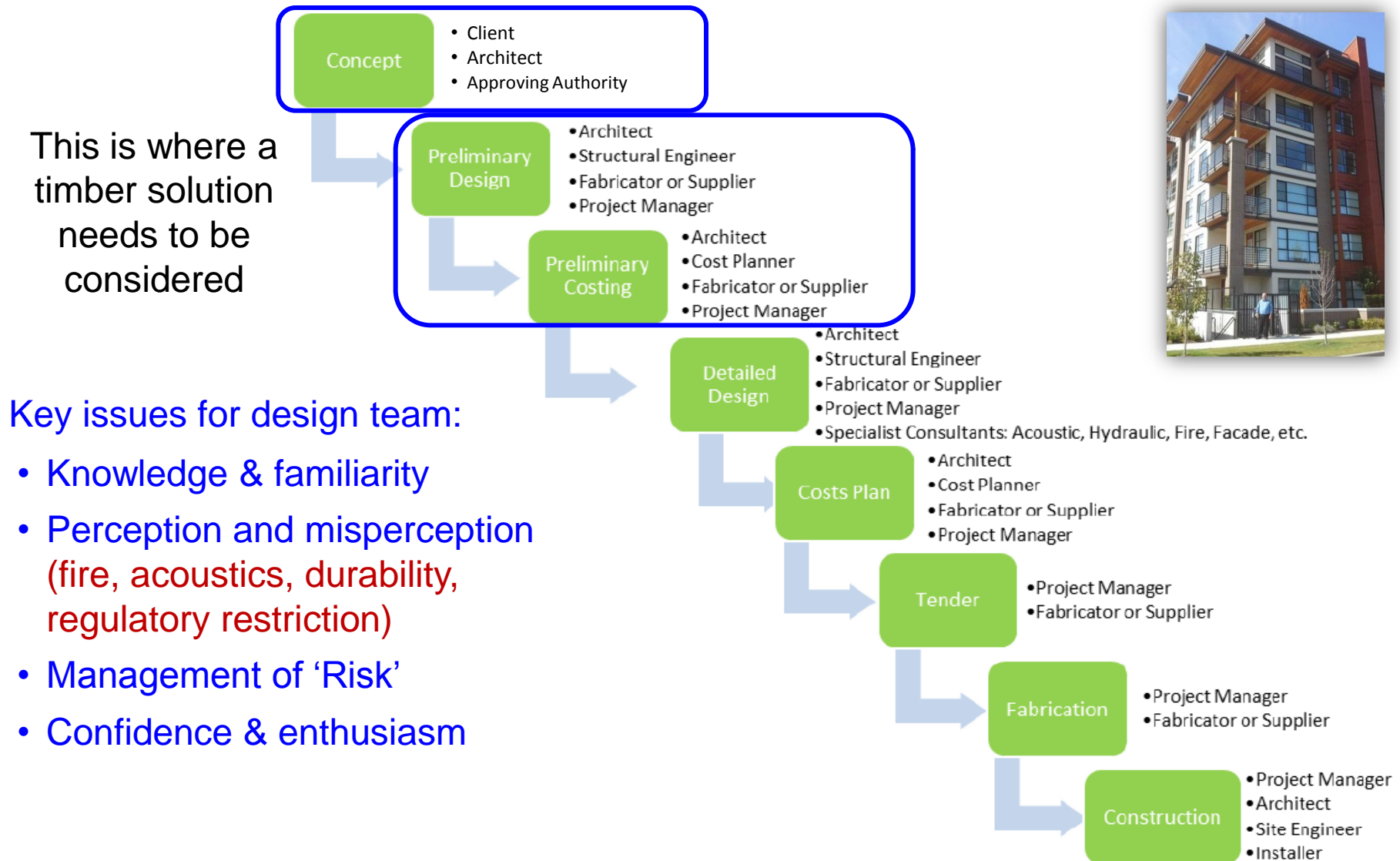
✓ New Regulations

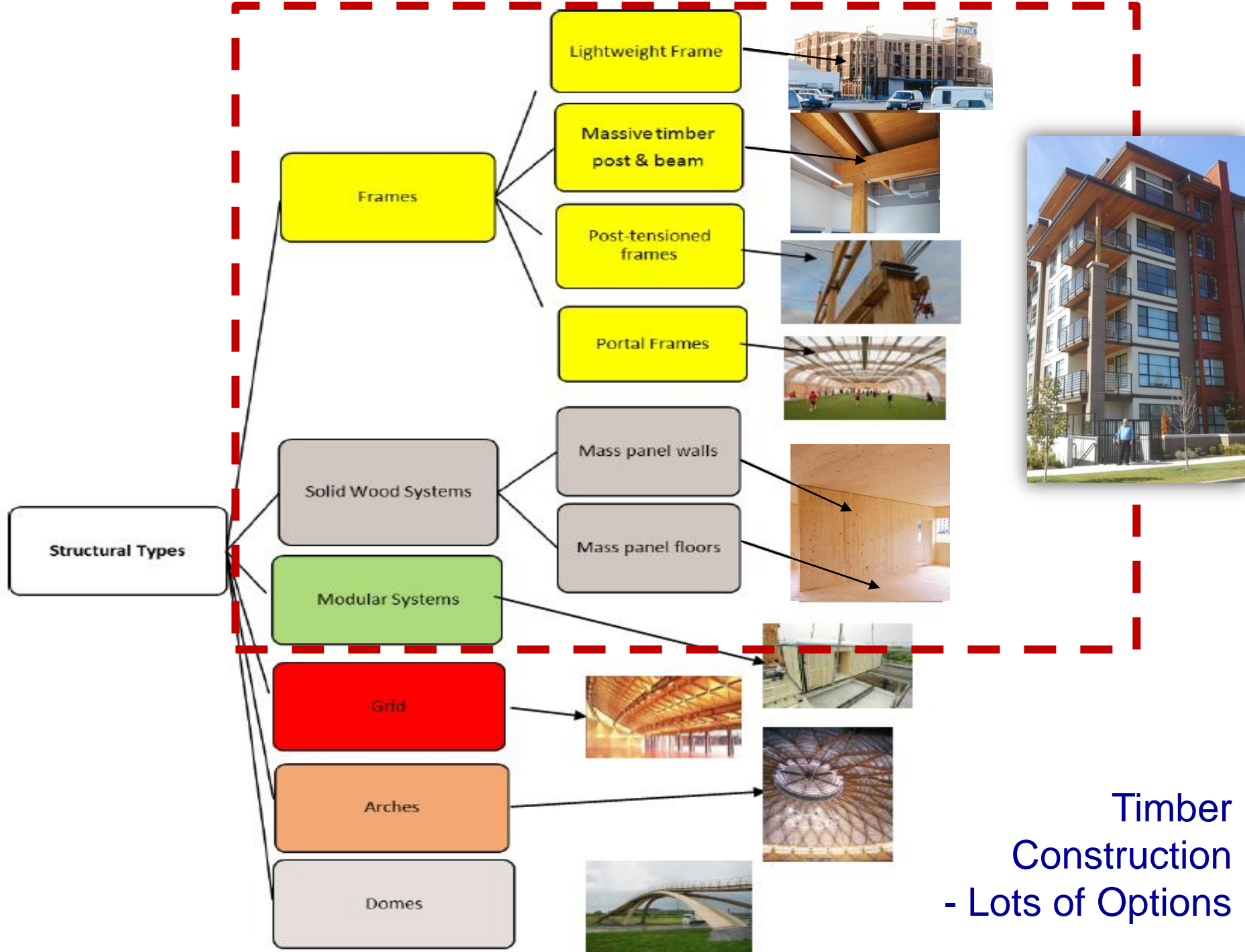


The Design Process & Design Team



The Design Process & Design Team





Lightweight Timber Systems

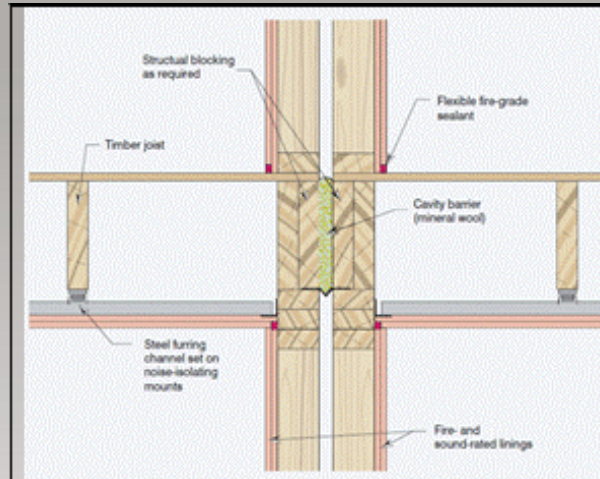
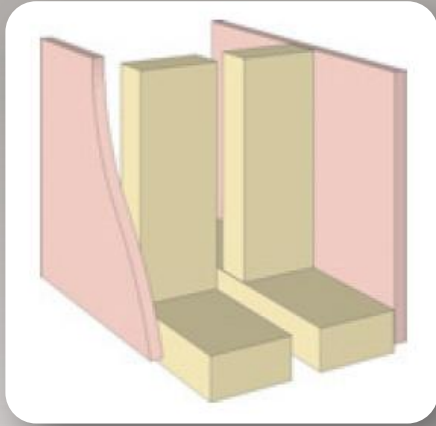


Figure 1 Floor / Wall Junction Cavity Barrier

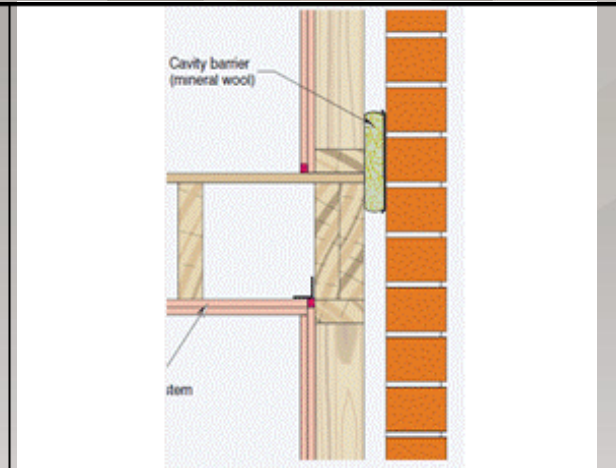


Figure 2 Floor / External Wall Cavity Barrier



Prefabricated Floor & Wall Systems

Heavy Timber Systems

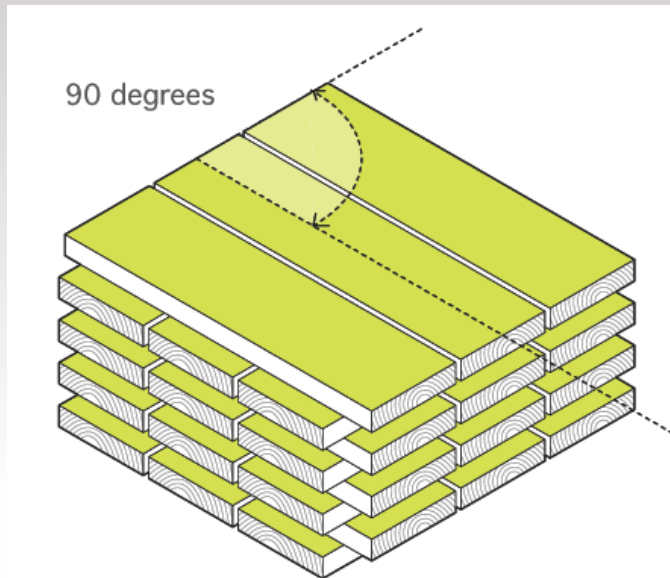


Glulam
LVL
Box-beams

Prefabricated Mass Timber Systems



Cross
Laminated
Timber



Prefabricated Modular Timber Systems



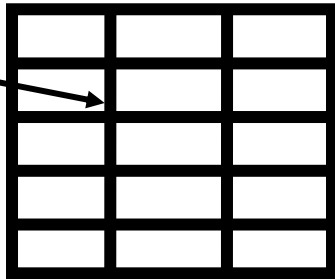
Project: Treet Apartments
Builders: Kodumaja Constructions
Location: Norway



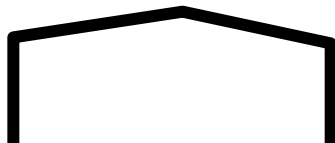
Project: Winter Olympic Village Torino

Building Form

Heavy Timber
Post & Beam
(Glulam)



Industrial Portals
And
Specialty Buildings
(schools, etc)



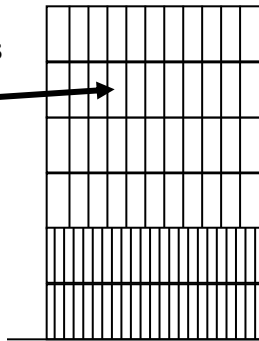
Building Form

Multi-Res Apartments

1-6 Storeys

Lightweight Timber

*Conventional framing
upper walls closer stud
centres lower walls*



Multi

6 - 8

Light

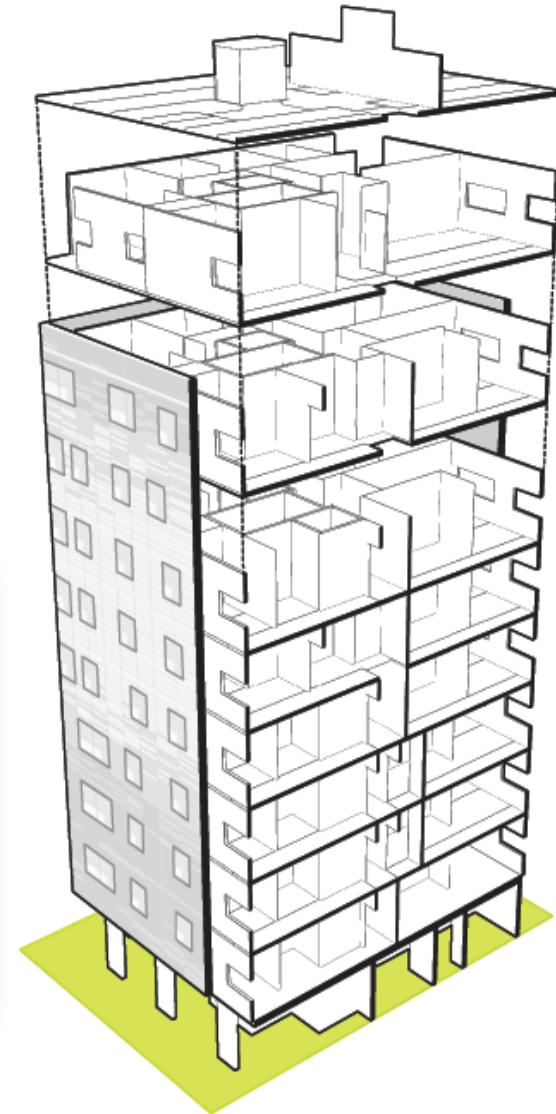
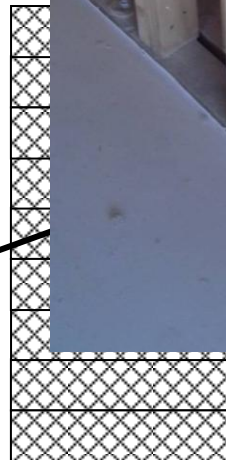


Multi-Res Apartments

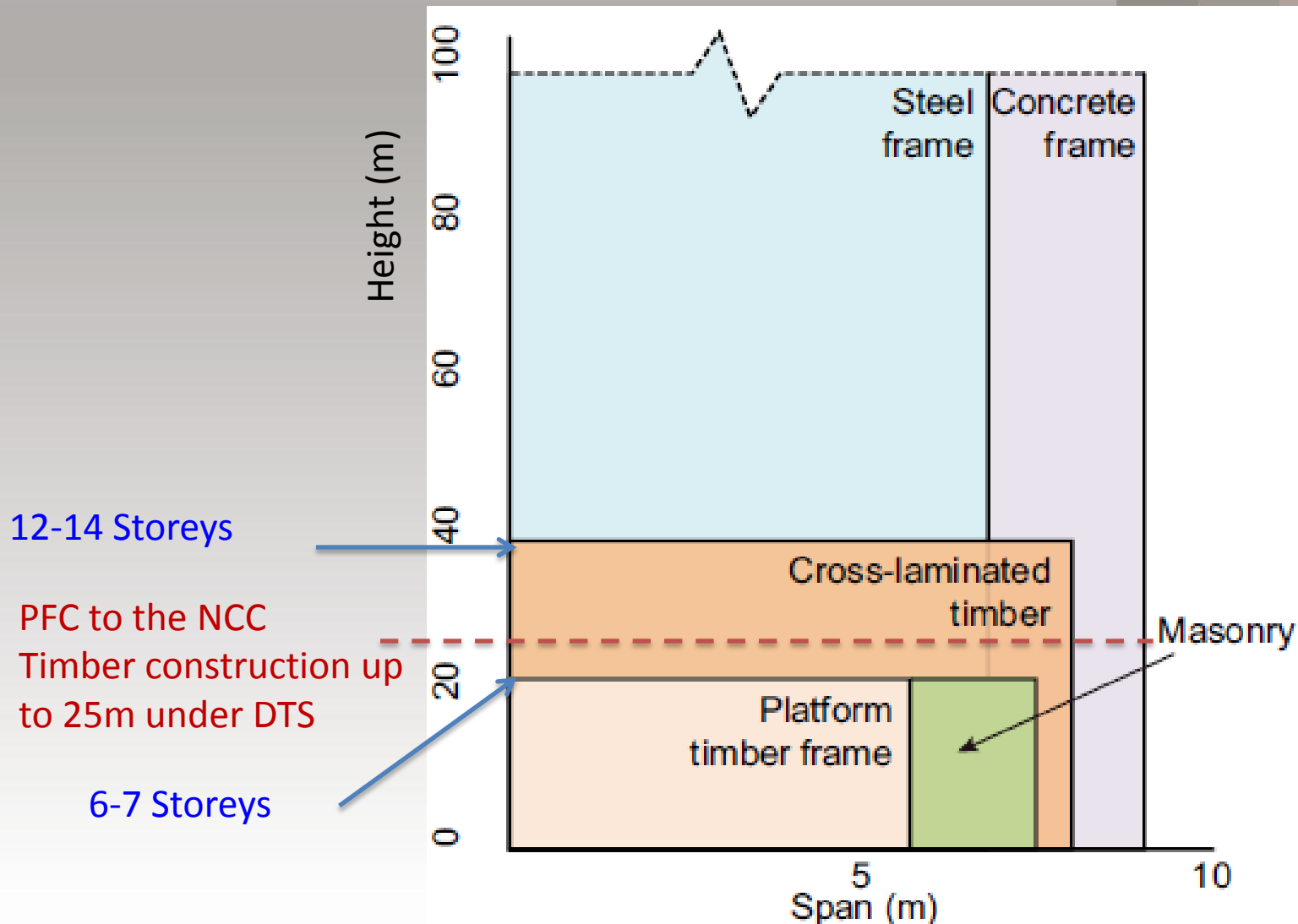
6 - 12 Storeys

Mass Timber

(CLT)

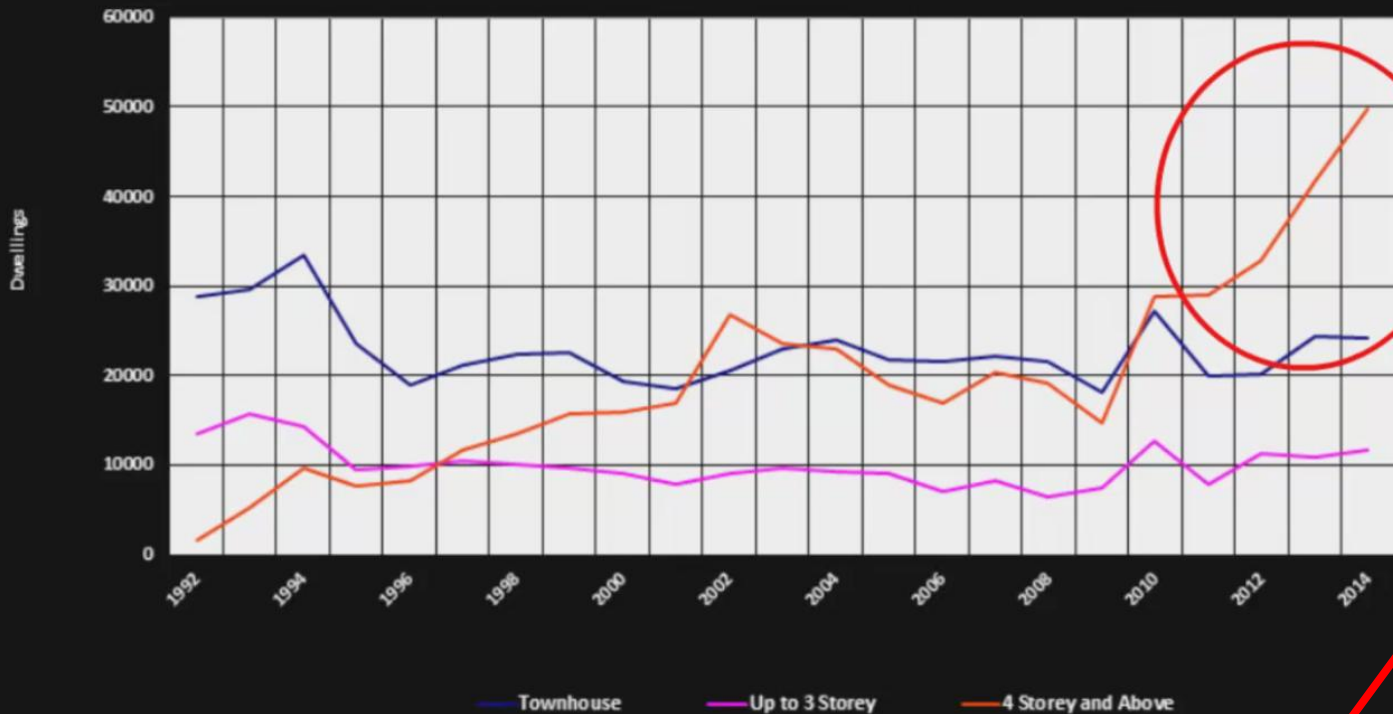


Timber Construction Options



All Attached Approvals (ABS)

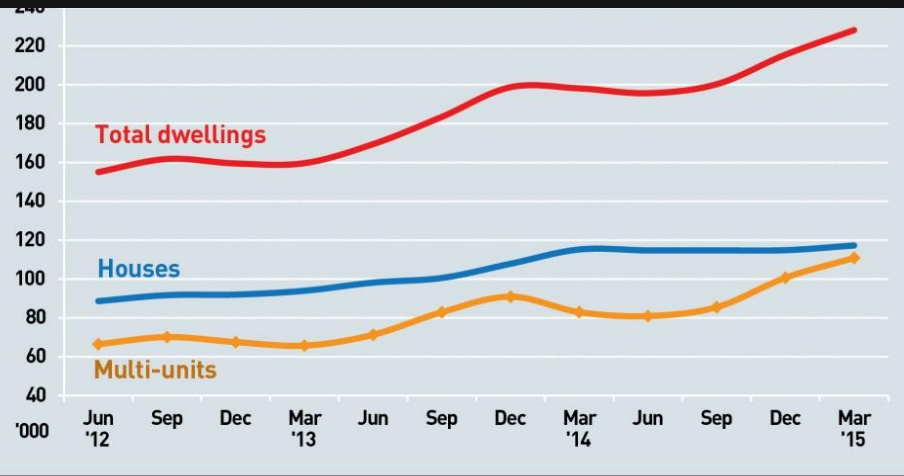
Future



4 Storey and Above

Growing demand for multi-residential

Level demand for houses



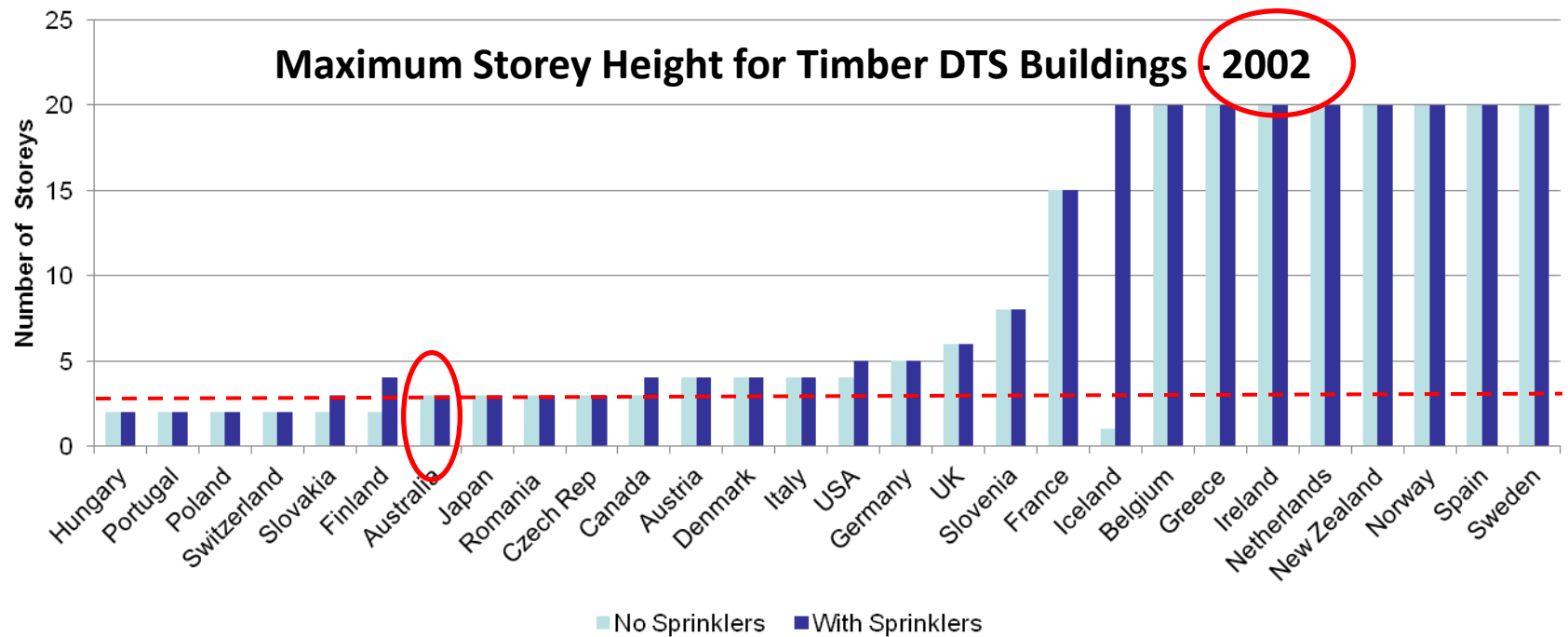
Source: ABS 8731.0



Maximum Timber Storey Height by Building Classification (BCA 2014)

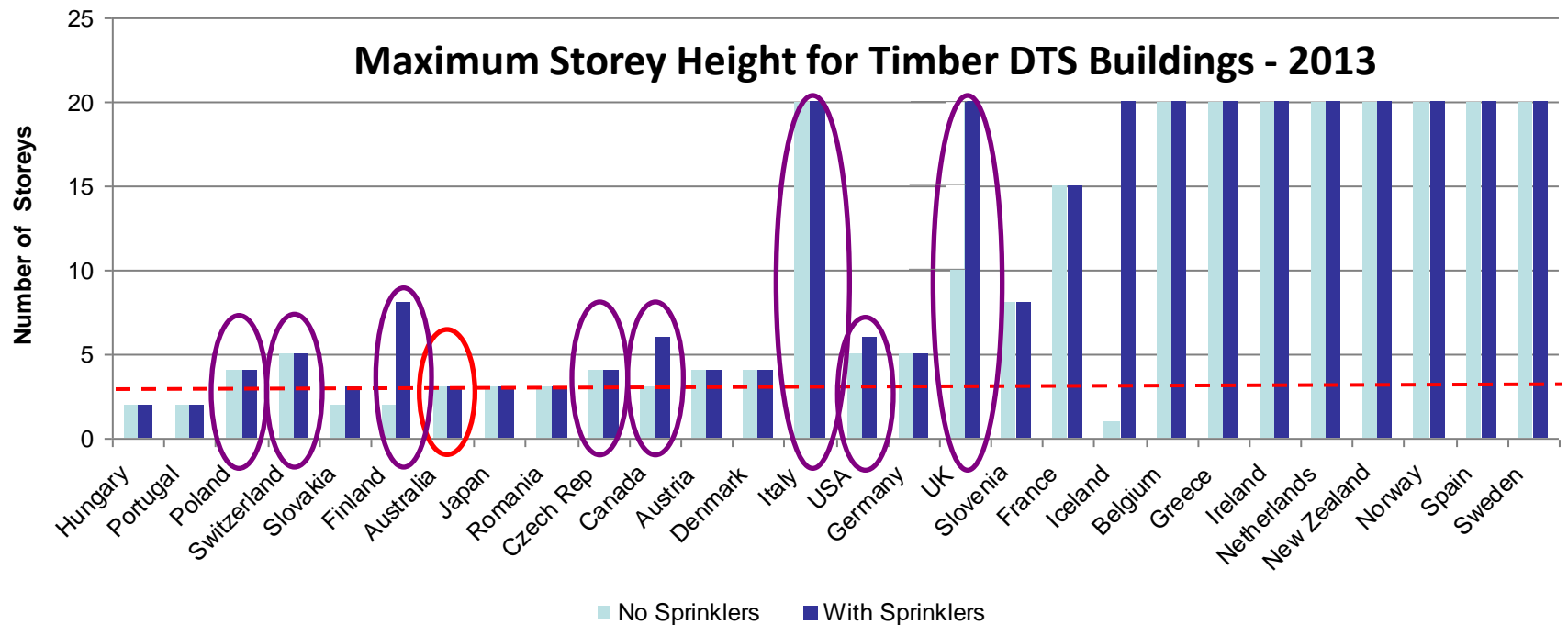
Rise in storey	Type of Construction					
	Class 2	Class 3	Class 5	Class 6	Class 9a	Class 9b
01	 <p>Timber-framed Construction for Townhouse Buildings Class 1a Design and construction guide for BCA compliant sound and fire-rated construction</p>		 <p>Timber-framed Construction for Multi-residential Buildings Class 2, 3 & 9c Design and construction guide for BCA compliant sound and fire-rated construction</p>		 <p>Timber-framed Construction for Multi-residential Buildings Class 5, 6, 9a & 9b Design and construction guide for BCA compliant sound and fire-rated construction</p>	
02						
03						
04					Nursing homes	
05					Schools & public buildings	
06					A	
07					A	
08					B	
09					C	

How does Australia Compare to the rest of World?



Source: Timber Development Association - NSW

How does Australia Compare to the rest of World?

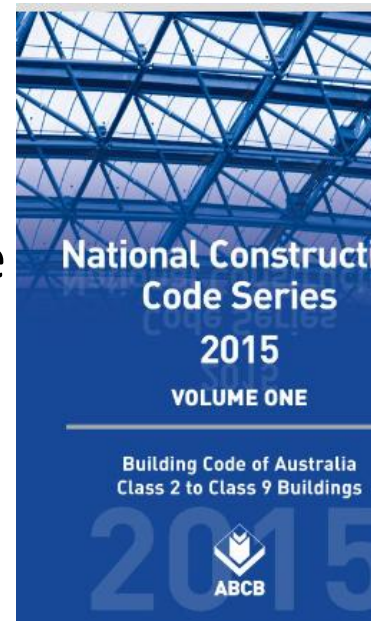


Source: Timber Development Association - NSW

2016 NCC - Proposal for Change

The proposal:

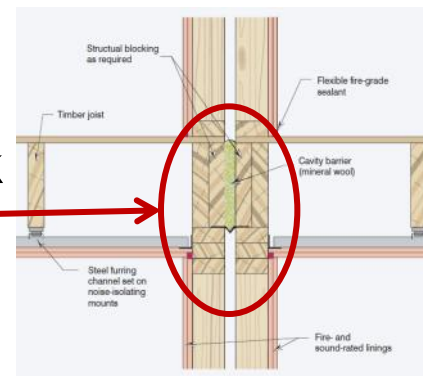
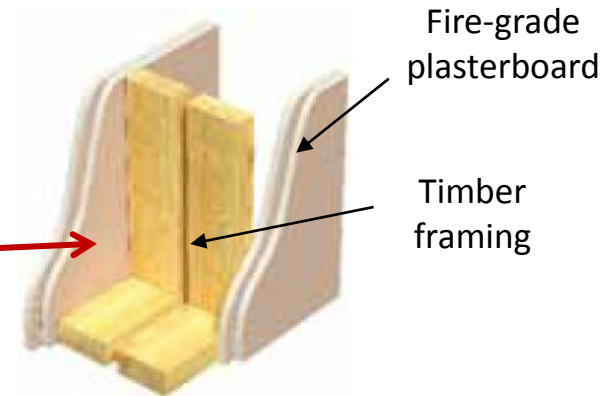
- Building **effective height of not more than 25m** (approx 8 storeys).
- Protected by **automatic fire sprinklers** complying with Specification E1.5 of the BCA.
- **Fire Protected Timber** used in applications where the BCA DtS requires the element to be of non-combustible construction or concrete 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)*

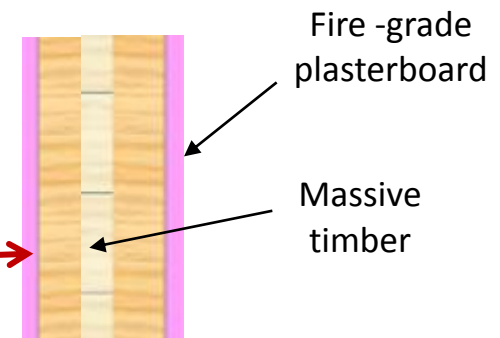
- FRL **lightweight** timber-framed construction
e.g. 90, 120, 140 x 45mm
- Additional precautions to reduce risk of fire spread to cavities
e.g. **Sprinkler systems**
plus 2 x 13mm fire-grade plasterboard for walls, 2 x 16mm fire-grade plasterboard for ceilings
- Additional precautions to reduce risk fire enters or starts in cavity
e.g. **cavity barriers**



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



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**

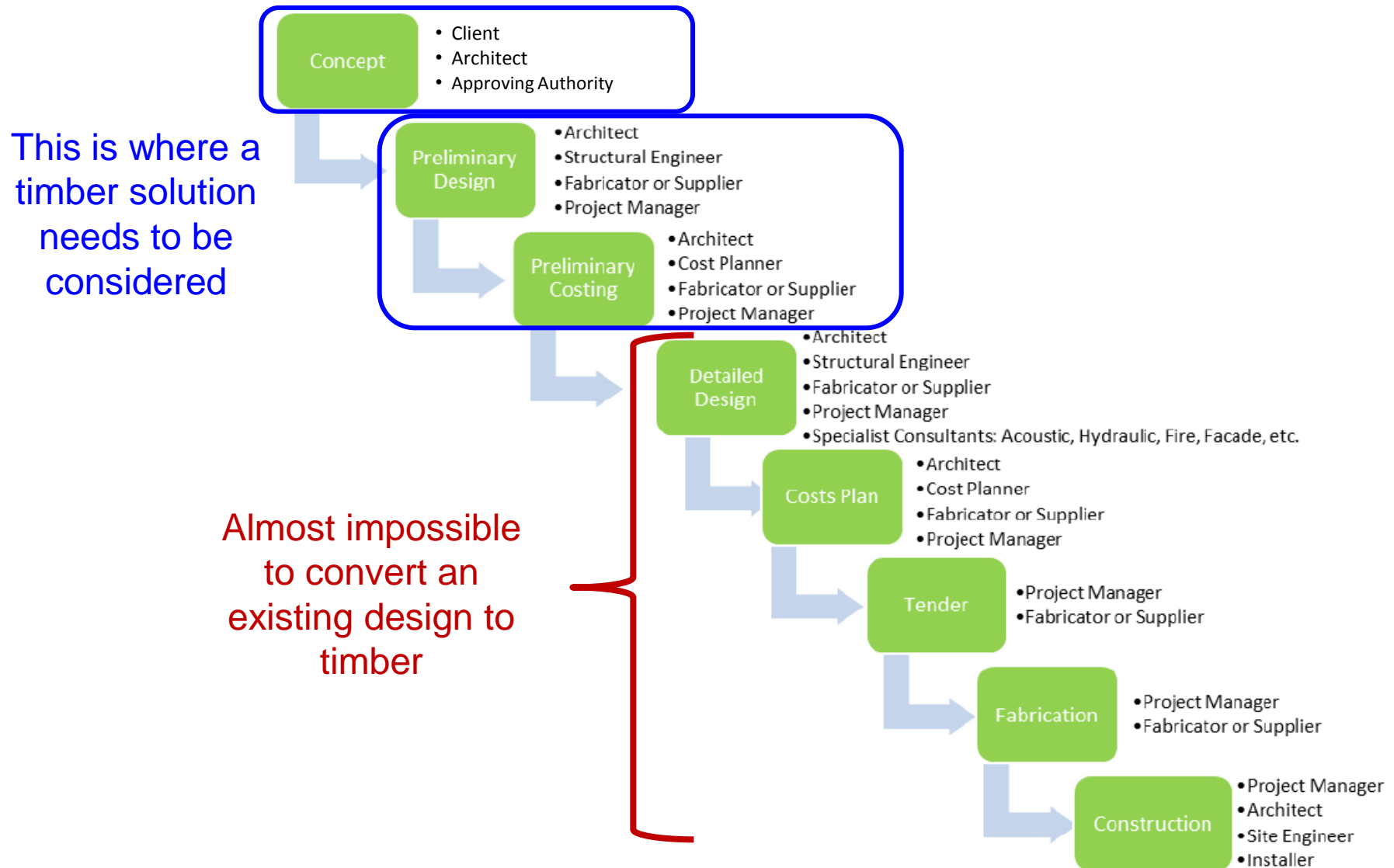
WS: Training Package – New DTS Requirements



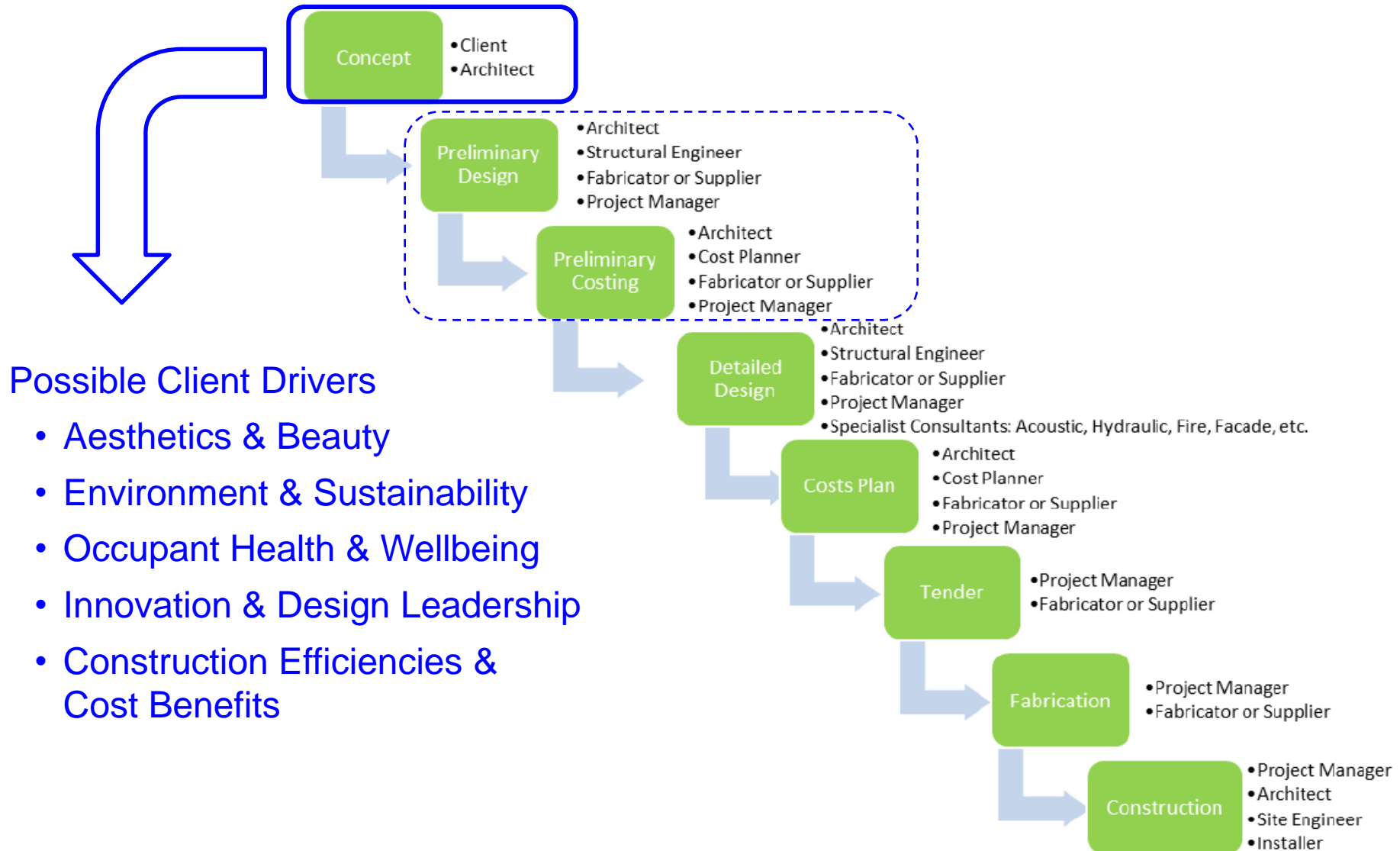
Training Package

- 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**

The Design Process & Design Team



The Design Process

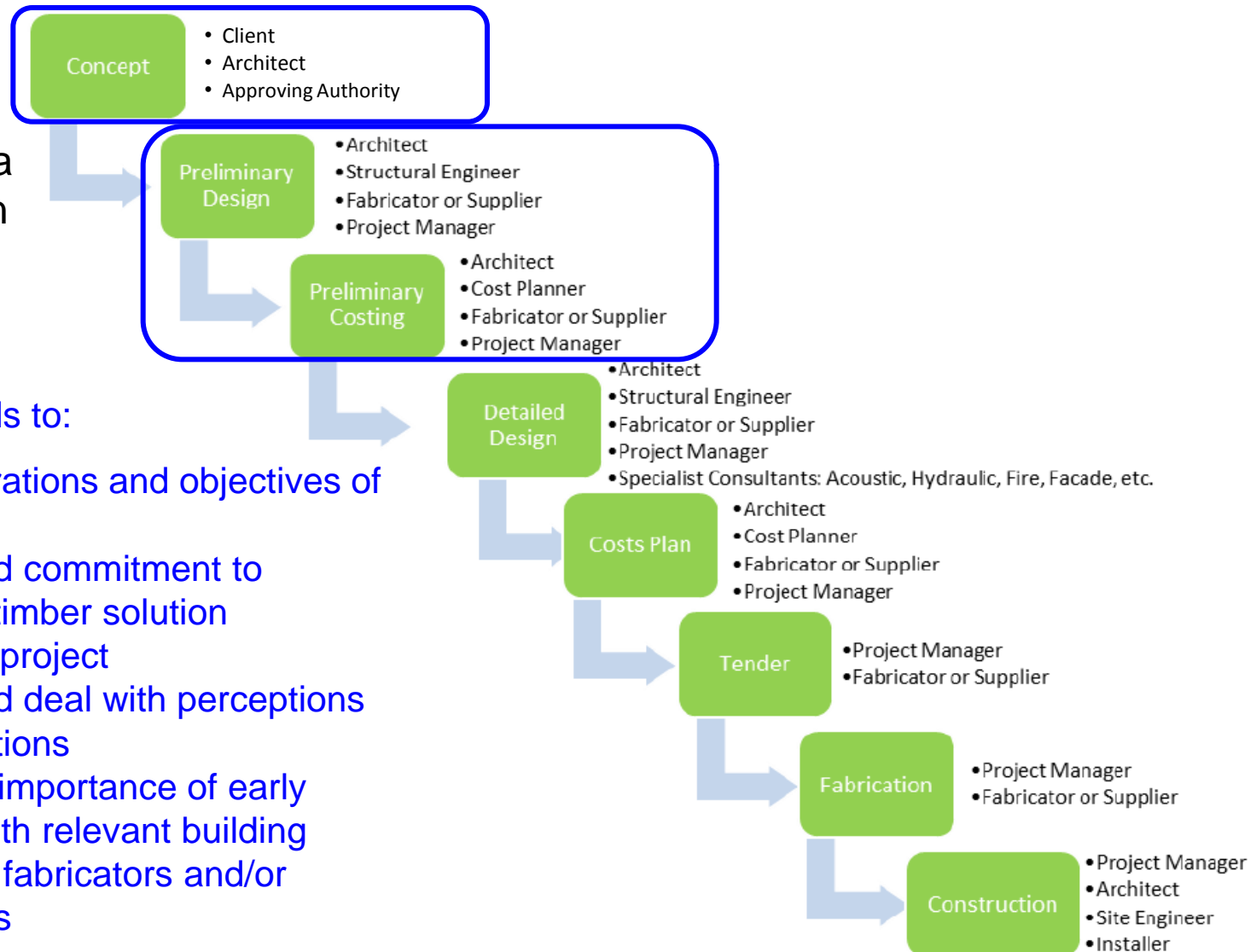


Efficiencies & Cost Benefits

- 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

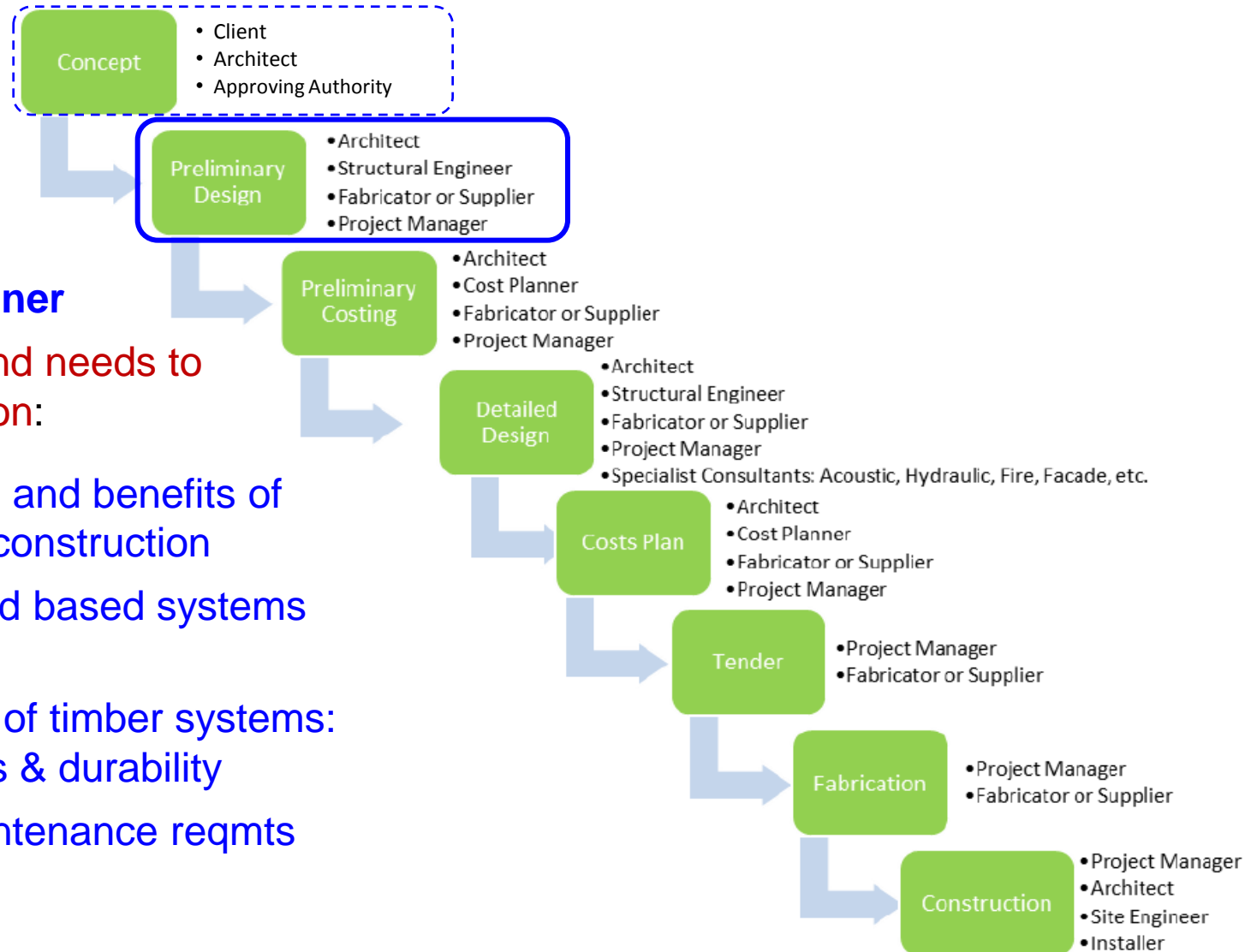


This is where a timber solution needs to be considered

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:

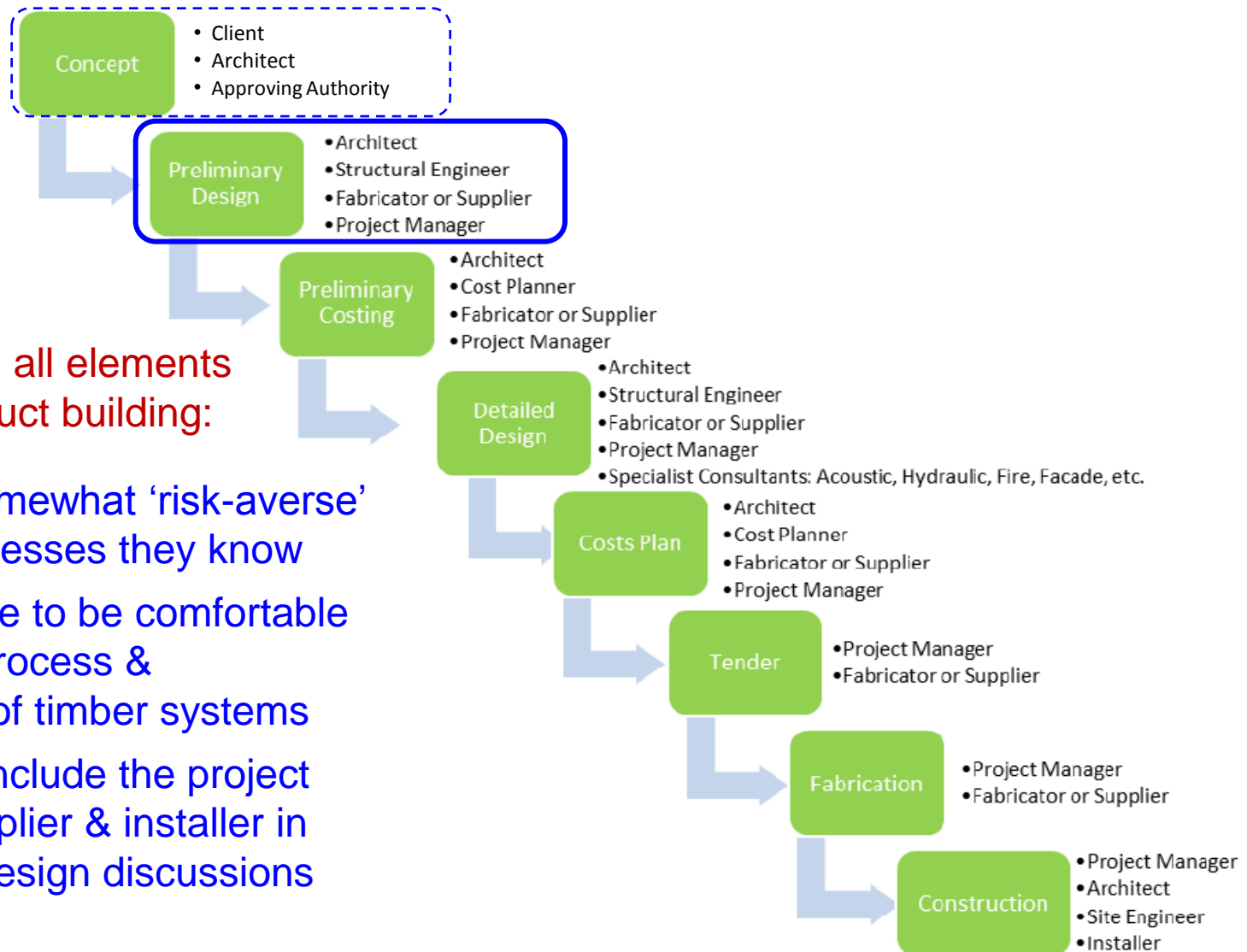
- Opportunities and benefits of wood based construction
- Types of wood based systems available
- Performance of timber systems: fire, acoustics & durability
- Ongoing maintenance reqmts

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

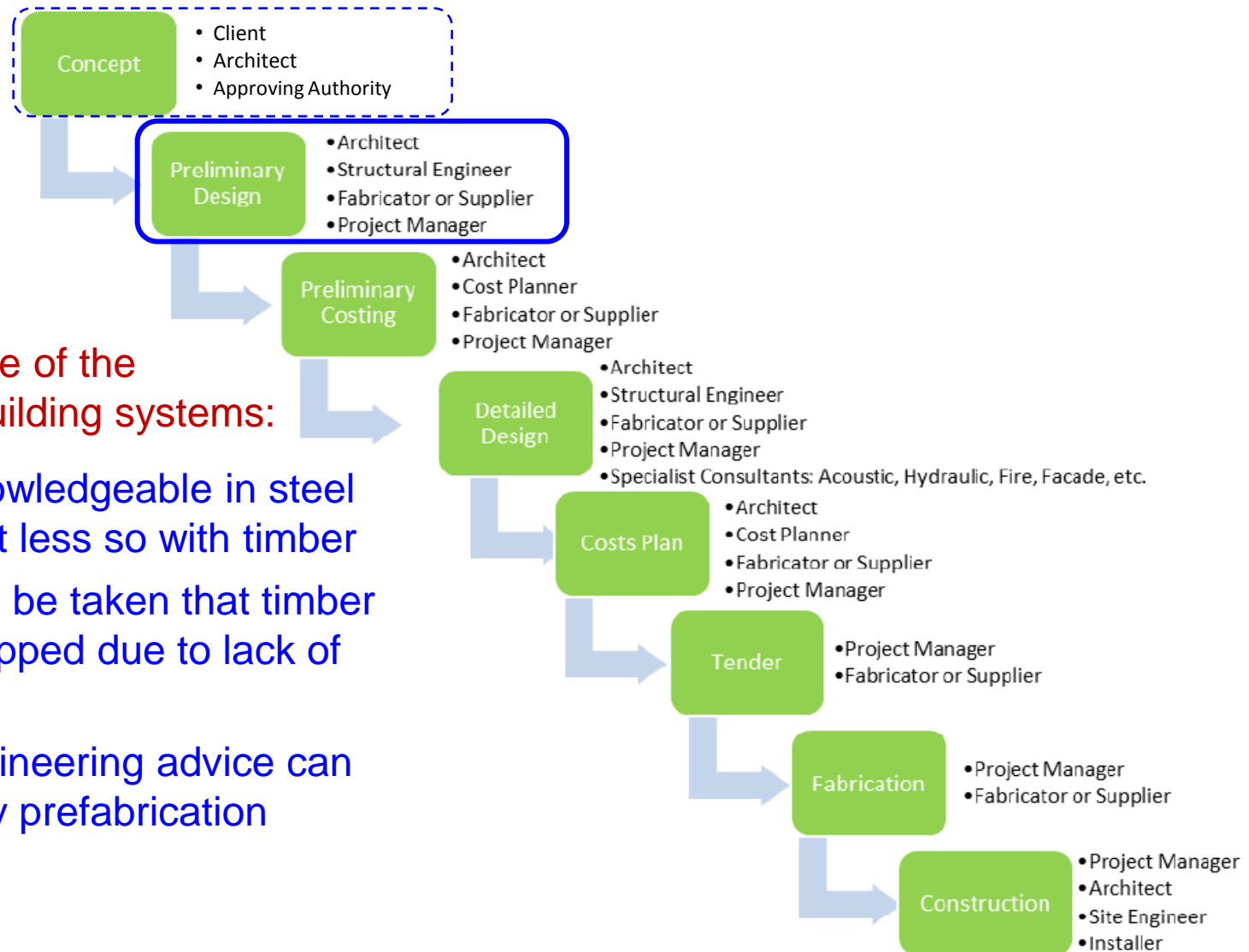


The Importance of the Design Team

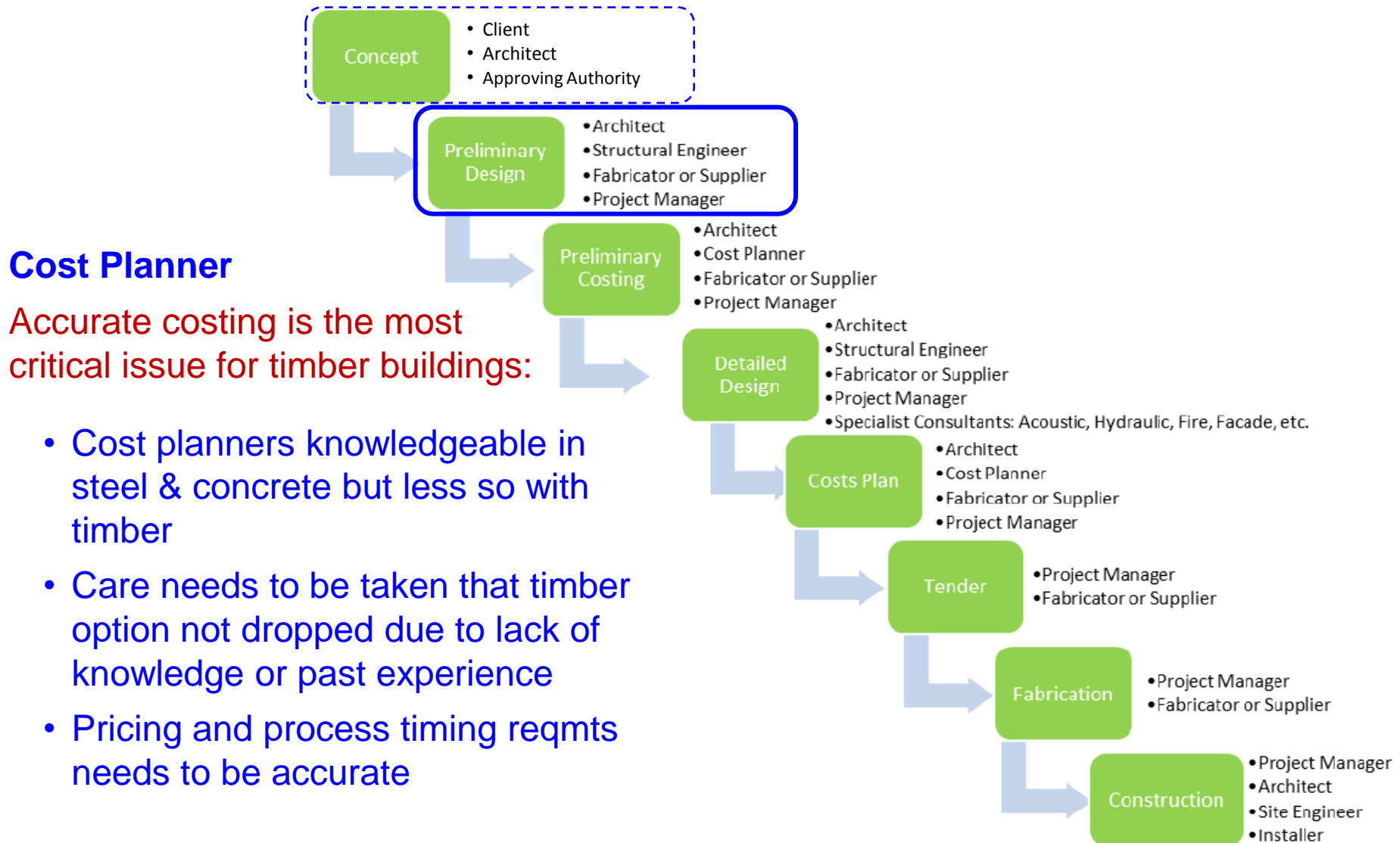
Engineer

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

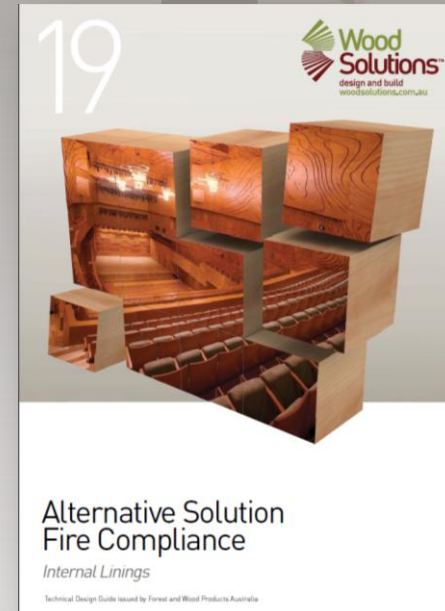


WS Design Guide: Costing Case Studies



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

WS Design Guide: Alternative Solutions



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

Discover WoodSolutions



The laptop screen shows the WoodSolutions website at <http://www.woodsolutions.com.au>. The website features a navigation bar with links: Home, Inspiration, Why Wood, Species/Materials, Applications/Products, Resources/Events, and Suppliers. A search bar is also present. The main content area includes a large image of the 'Advanced Engineering Building' and a section titled 'WoodSolutions The website for wood' with links to reviews, products, design guides, and tutorials. Below this are sections for 'Latest Inspiration', 'Latest News & Blogs', and 'Events Calendar'. A sidebar on the right offers 'Free WoodSolutions Technical Design Guides' for download.

Australian and international case studies

- More information
- Go to website

Free professional CPD tutorials

- More information
- Go to website

Technical Design Guides & CAD files

- More information
- Go to website

Find and compare suppliers

- More information
- Go to website

Search the database, ask questions

- More information
- Go to website

Don't miss an event

- More information
- Go to website

www.woodsolutions.com.au

Thank you for your attention



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*