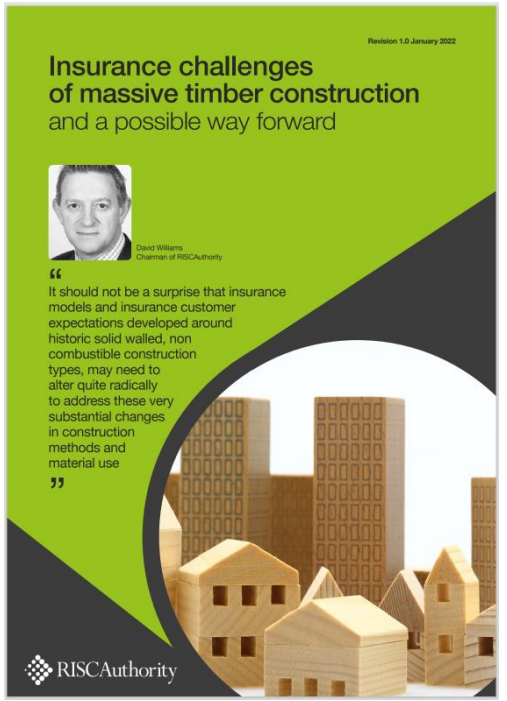
Green Fire Safety Issues Conference
17th May 2023

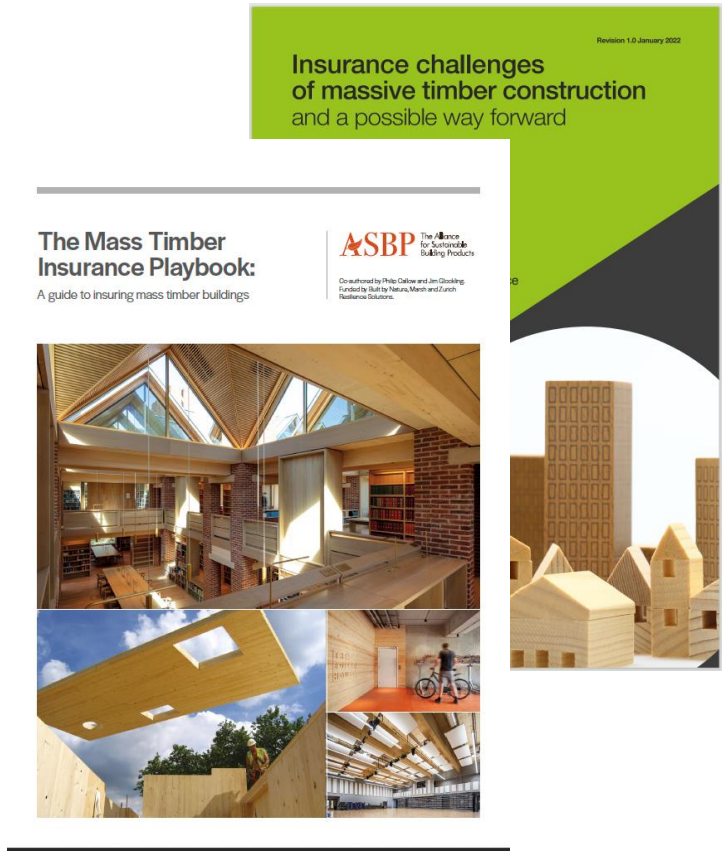
Professor Jim Glockling
Visiting Professor University of Central Lancashire

Insurance challenges of Mass Timber and an introduction to the Mass Timber Insurance Playbook (MTIP)



Contents

- A crude introduction to insurance
- ~~Drivers behind move to modern methods of construction~~
- Consequences of change for Material Damage and why Building Regulations exert great influence
- Potential design solutions
- Introducing the Mass Timber Insurance Playbook



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Takeaway(s) – In a nutshell

'Designers will need to build in features that enable the insurer to assign an Estimated Maximum Loss (EML) value that is something other than 100% (or even >100% where multiple building are considered) - this does not happen natively when 'compliance' is the only design goal (UK)'

Also: the construction debate is not just about wood, and it's not just about fire

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Estimated Maximum Loss

EML ~ 4 floors of 17

But what about if certain design features or materials stop this model from working?

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Insurance and insurability

Underwriting Relevant Building Features (compliant building assumed)

		Building scenario described	Residential Apartment Block	
			Drop Down List - Scroll down for more options	
Occupancy & use	1	Occupancy and use	Mixed commercial and residential	
Scale	2	Number of Storeys above ground	< 4 Storeys	
	3	Building footprint	900m2<1,600m2 (40mx40m)	
	4	Size of largest compartment by Area	20%	of building footprint
	5	Size of largest compartment by Volume	20%	of building volume
Structure & Fabric	6	Ground floor structure	Same as building structure	
	7	Structural material	Structural Timber Modular Stack	
	8	Construction method	Modular	
	9	Core structure	Same as Structure	
	10	Floor / Ceiling	Timber alternating with concrete	
	11	Cladding system	Rainscreen with NC insulation and NC Cladding	
	12	Interior Surfaces	Bare structure	
Other risk factors	13	Atria	Yes - open	
	14	Basement car parks	Yes	
	15	Balconies	No	
	16	Swimming pools / spa baths	Yes	
	17	Hazardous materials	No	
	18	Green surfaces	Green Roof	
	19	Green Energy	Wind & Solar	
Fire mitigations	20	Combustible void protection	Dry lined	
	21	Suppression system protection	No Suppression	
	22	Separation	5m<10m	
	23	Firefighter provisions	Wet Risers	
	24	Stairwells	2	
Water-peril mitigations	25	Designed for flood	Yes - Raised on water insensitive stilts	
	26	Designed for EoW	Detection, Control, and Fail-to-safe devices	

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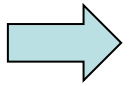
A lack of trust / technical concern
= a lack of available insurance capacity



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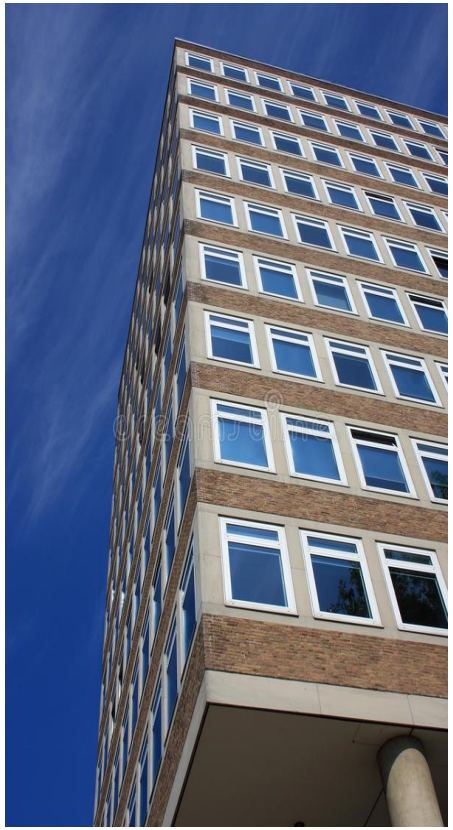
Trust and good technical understanding
= choice, excess capacity, and competition



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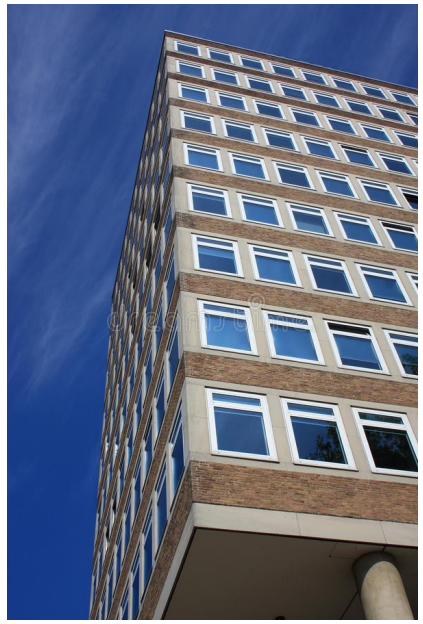

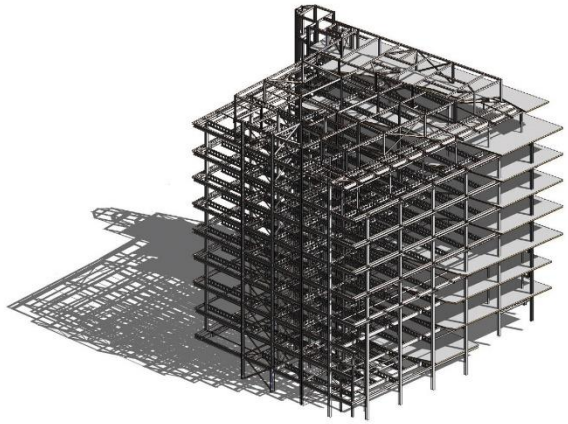

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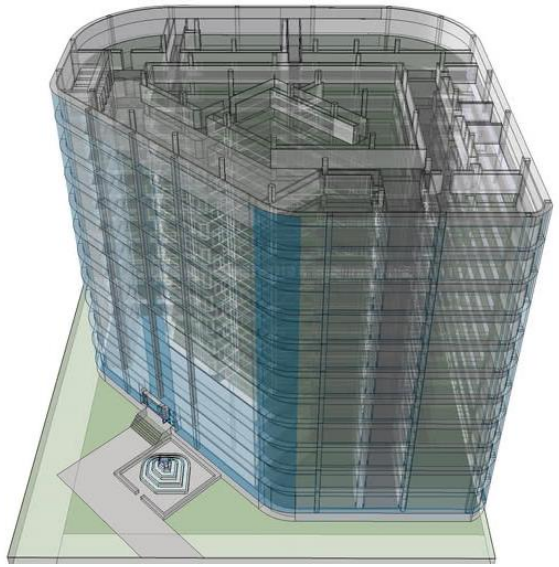
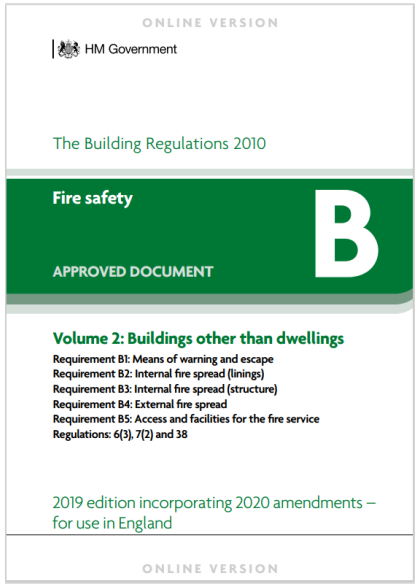
What has NOT changed (UK)?

- Our Building Regulations
- All of the other factors that contribute to a building's insurability
- How people expect buildings to perform in fire
- Expectation of availability, and cost of insurance / lending
- Any sign of climate change abatement





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	8	Construction method
	9	Core structure
	10	Floor / Ceiling
	11	Cladding system
	12	Interior Surfaces
Other risk factors	13	Atria
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	15	Balconies
	16	Swimming pools / spa baths
	17	Hazardous materials
	18	Green surfaces
	19	Green Energy
Fire mitigations	20	Combustible void protection
	21	Suppression system protection
	22	Separation
	23	Firefighter provisions
	24	Stairwells
Water-peril mitigations	25	Designed for flood
	26	Designed for EoW

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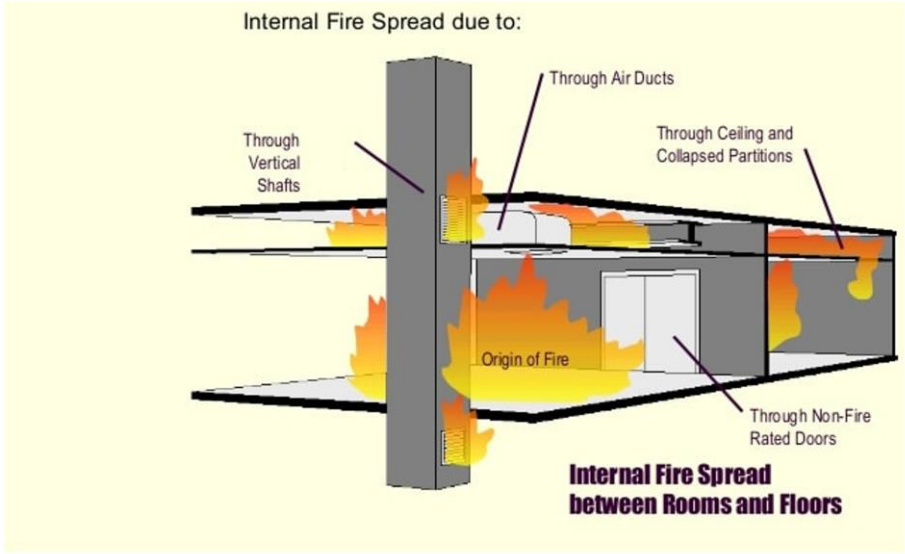
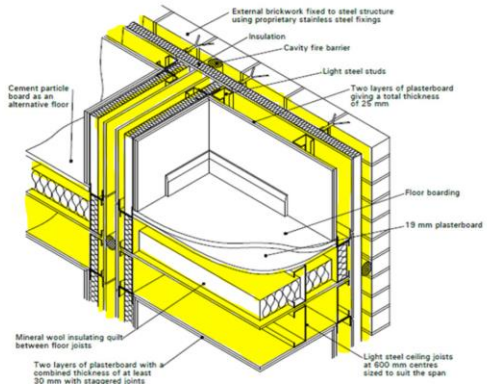
Fire Spread mechanism (1) - External

Fire Spread mechanism (2) - Internal



Fire Spread mechanism (3) - Voids

- A new, and particularly problematic dominant mechanism



Fire Spread mechanism (4) – Between Buildings

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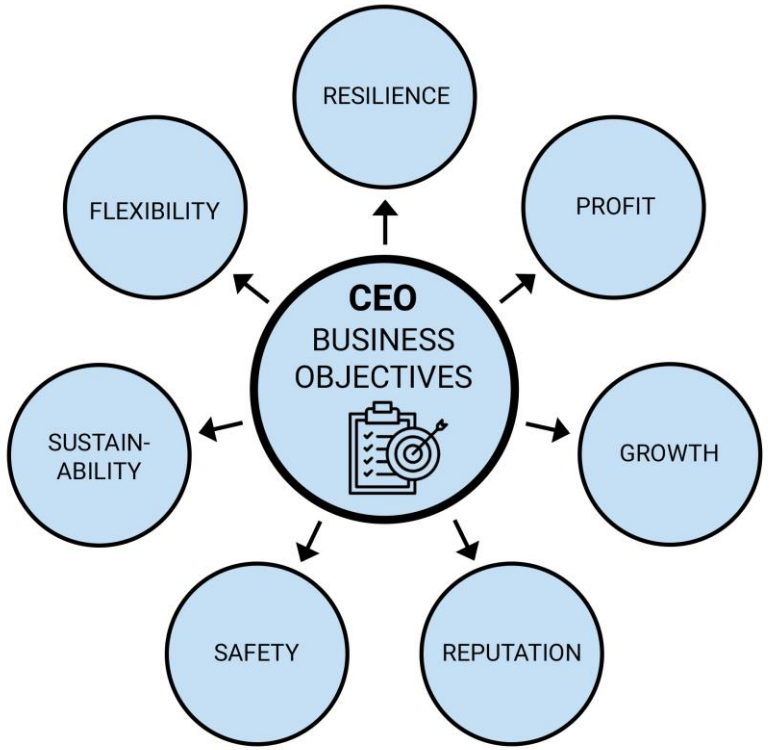
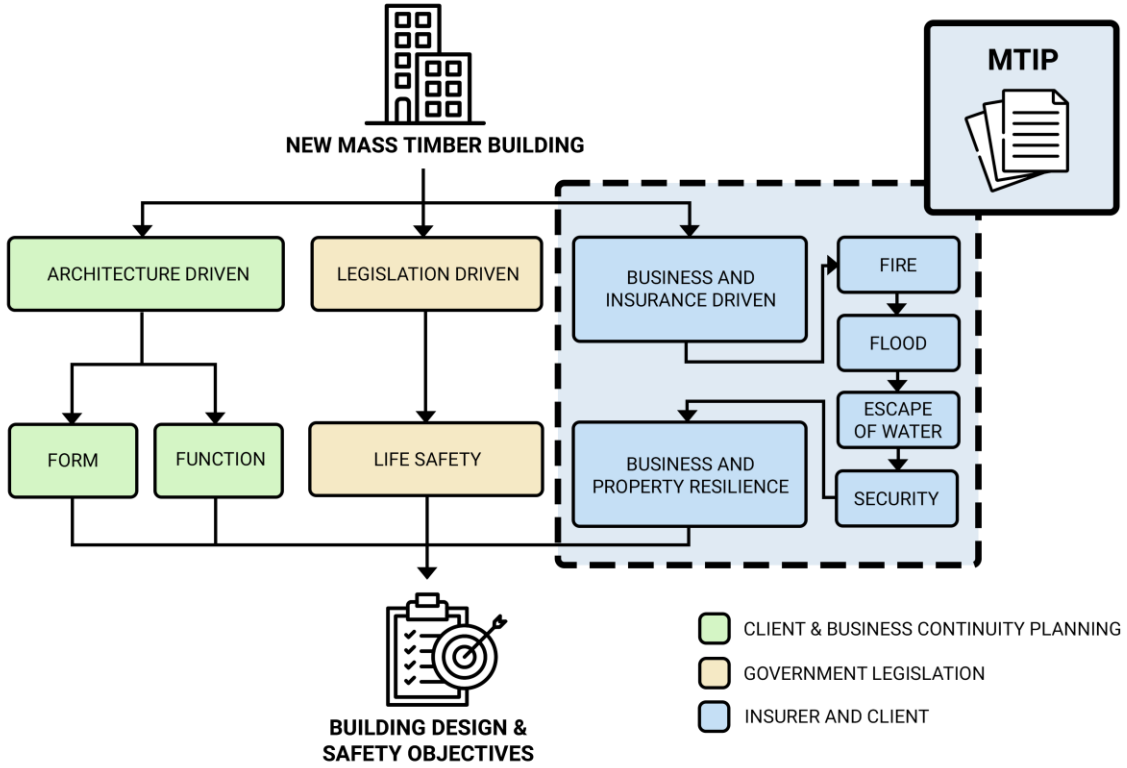
3 masters to satisfy?

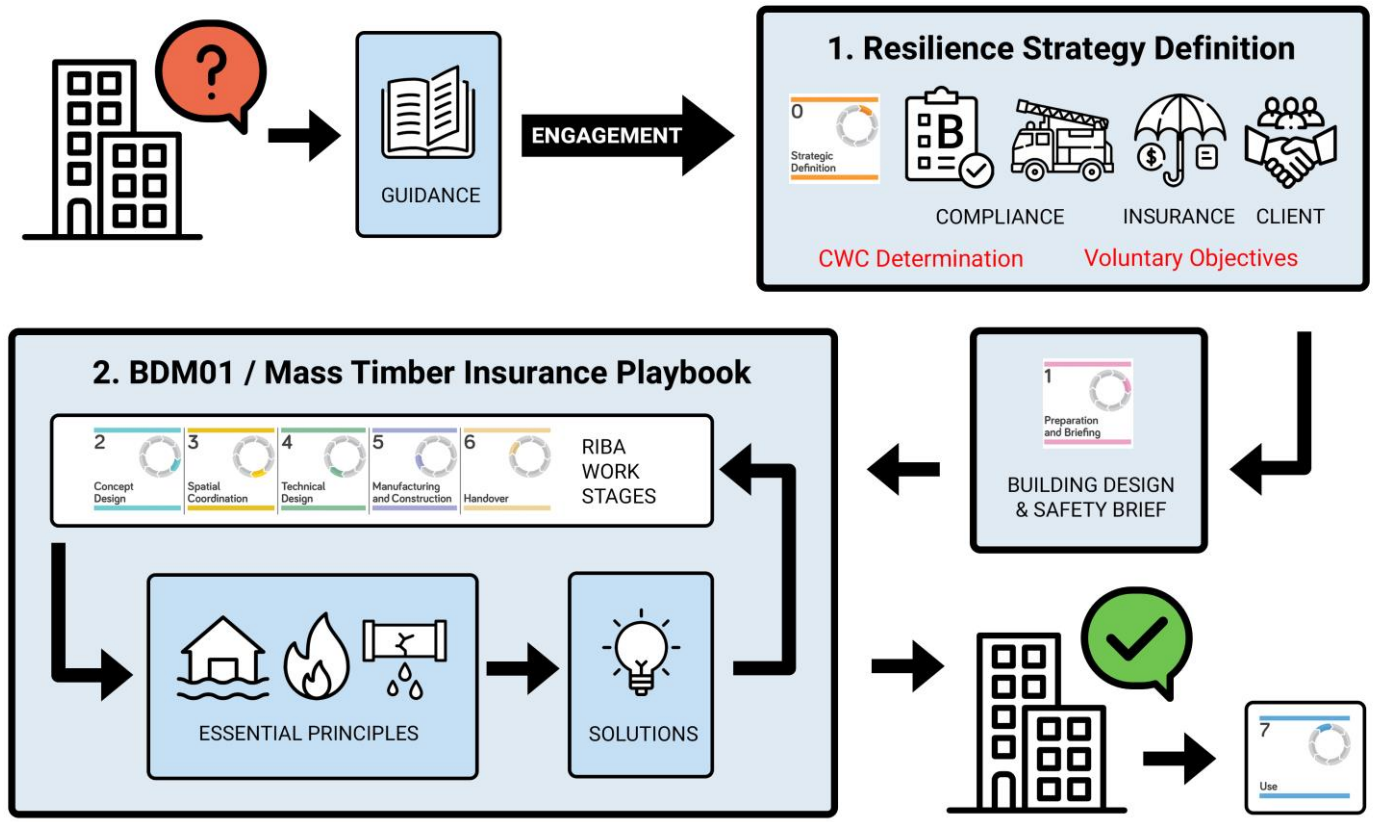
- The Government
- The Client
- The Insurer



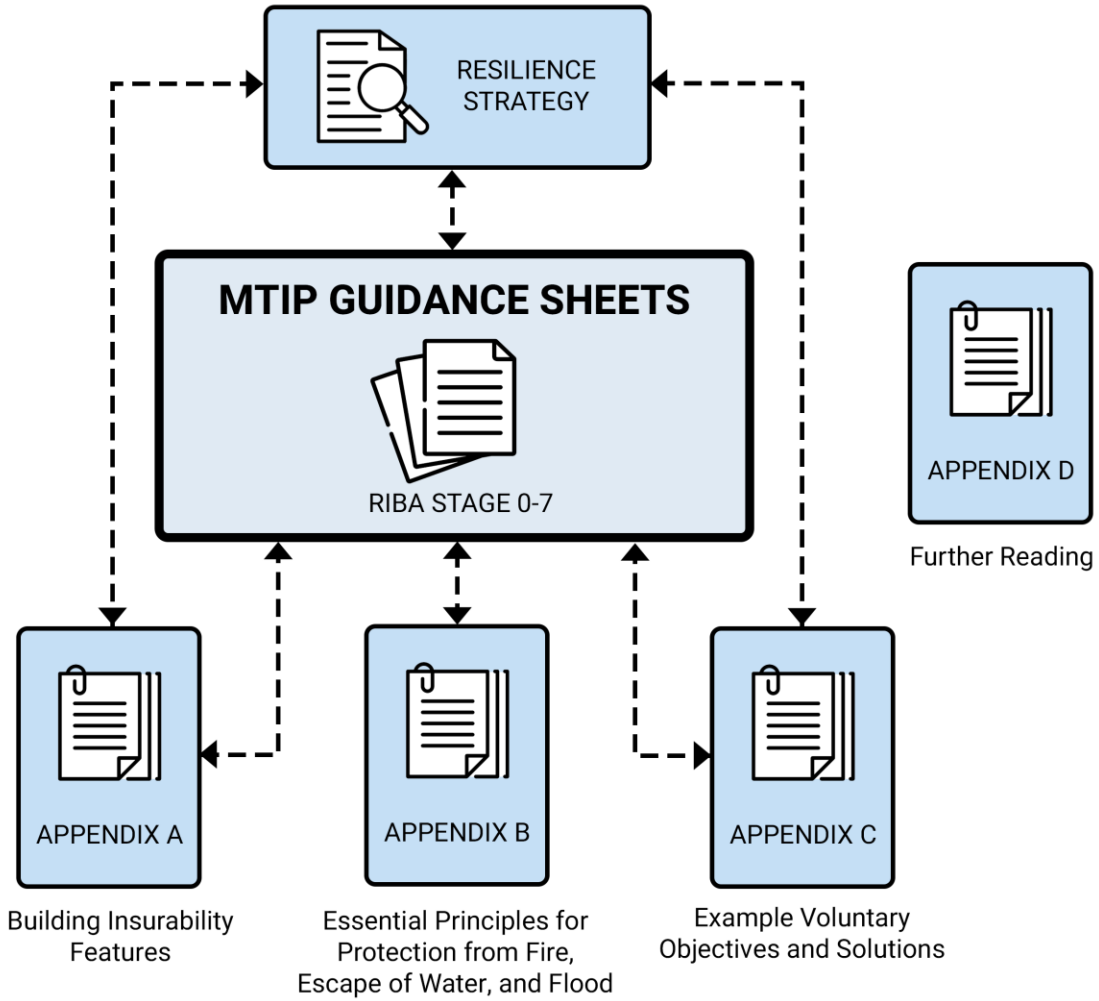


How to use the MTIP?

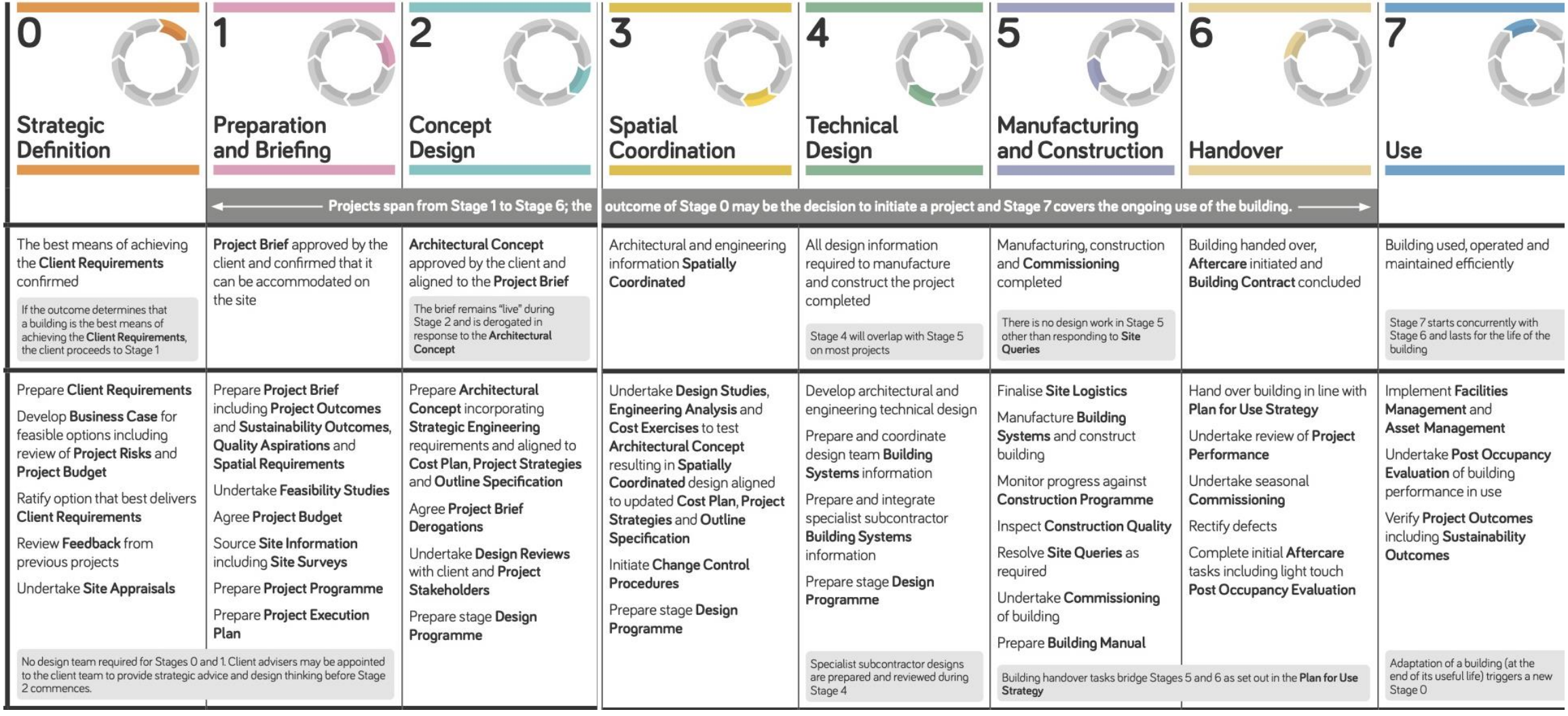
- Qualitative Design Review
- Solutions engineering (MTIP)
- Peer Review
- Compliance Objectives
- Voluntary Objectives



Structure of the MTIP?



Guidance Sheets – Follow RIBA Stages



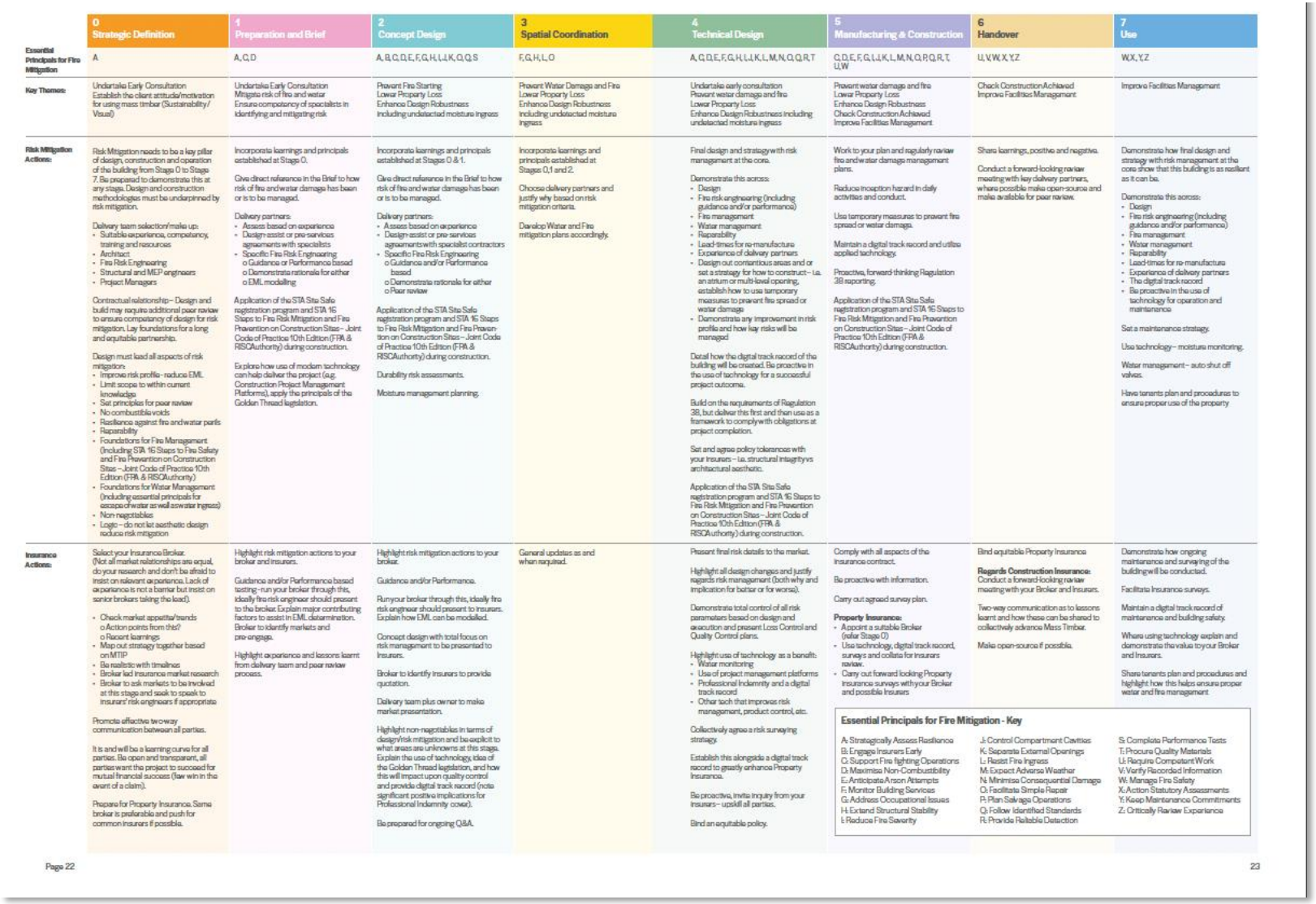
Guidance Sheets – Follow RIBA Stages

Essential Principals for Fire Mitigation

Key Themes

Risk Mitigation Actions

Insurance Actions



	0 Strategic Definition	1 Preparation and Brief	2 Concept Design	3 Spatial Coordination	4 Technical Design	5 Manufacturing & Construction	6 Handover	7 Use
Essential Principals for Fire Mitigation	A	A, C, D	A, B, C, D, E, F, G, H, I, J, K, O, Q, S	F, G, H, I, O	A, C, D, E, F, G, H, I, J, K, L, M, N, O, Q, R, T	C, D, E, F, G, I, J, K, L, M, N, O, P, Q, R, T, U, W	U, V, W, X, Y, Z	W, X, Y, Z
Key Themes:	Undertake Early Consultation Establish the client attitude/motivation for using mass timber (Sustainability / Visual)	Undertake Early Consultation Mitigate risk of fire and water Ensure competency of specialists in identifying and mitigating risk	Prevent Fire Starting Lower Property Loss Enhance Design Robustness Including undetected moisture ingress	Prevent Water Damage and Fire Lower Property Loss Enhance Design Robustness including undetected moisture ingress	Undertake early consultation Prevent water damage and fire Lower Property Loss Enhance Design Robustness including undetected moisture ingress	Prevent water damage and fire Lower Property Loss Enhance Design Robustness Check Construction Achieved Improve Facilities Management	Check Construction Achieved Improve Facilities Management	Improve Facilities Management
Risk Mitigation Actions:	Risk Mitigation needs to be a key pillar of design, construction and operation of the building from Stage 0 to Stage 7. Be prepared to demonstrate this at any stage. Design and construction methodologies must be underpinned by risk mitigation. Delivery team selection/make up: • Suitable experience, competency, training and resources • Architect • Fire Risk Engineering • Structural and MEP engineers • Project Managers Contractual relationship – Design and build may require additional peer review to ensure competency of design for risk mitigation. Lay foundations for a long and equitable partnership. Design must load all aspects of risk mitigation: • Improve risk profile - reduce EML • Limit scope to within current knowledge • Set principles for peer review • No combustible voids • Resilience against fire and water perils • Reparability • Foundations for Fire Management (including STA 16 Steps to Fire Safety and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) • Foundations for Water Management (including essential principals for escape of water as well as water ingress) • Non-negotiables • Logic – do not let aesthetic design reduce risk mitigation	Incorporate learnings and principals established at Stage 0. Give direct reference in the Brief to how risk of fire and water damage has been or is to be managed. Delivery partners: • Assess based on experience • Design-assist or pre-services agreements with specialists • Specific Fire Risk Engineering o Guidance or Performance based o Demonstrate rationale for either o EML modelling Application of the STA Site Safe registration program and STA 16 Steps to Fire Risk Mitigation and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) during construction. Explore how use of modern technology can help deliver the project (e.g. Construction Project Management Platforms), apply the principals of the Golden Thread legislation.	Incorporate learnings and principals established at Stages 0 & 1. Give direct reference in the Brief to how risk of fire and water damage has been or is to be managed. Delivery partners: • Assess based on experience • Design-assist or pre-services agreements with specialist contractors • Specific Fire Risk Engineering o Guidance and/or Performance based o Demonstrate rationale for either o Peer review Application of the STA Site Safe registration program and STA 16 Steps to Fire Risk Mitigation and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) during construction. Durability risk assessments. Moisture management planning.	Incorporate learnings and principals established at Stages 0,1 and 2. Choose delivery partners and justify why based on risk mitigation criteria. Develop Water and Fire mitigation plans accordingly.	Final design and strategy with risk management at the core. Demonstrate this across: • Design • Fire risk engineering (including guidance and/or performance) • Fire management • Water management • Reparability • Lead-times for re-manufacture • Experience of delivery partners • Design out contentious areas and or set a strategy for how to construct – i.e. an atrium or multi-level opening, establish how to use temporary measures to prevent fire spread or water damage • Demonstrate any improvement in risk profile and how key risks will be managed Detail how the digital track record of the building will be created. Be proactive in the use of technology for a successful project outcome. Build on the requirements of Regulation 38, but deliver this first and then use as a framework to comply with obligations at project completion. Set and agree policy tolerances with your insurers – i.e. structural integrity vs architectural aesthetic. Application of the STA Site Safe registration program and STA 16 Steps to Fire Risk Mitigation and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) during construction.	Work to your plan and regularly review fire and water damage management plans. Reduce inception hazard in daily activities and conduct. Use temporary measures to prevent fire spread or water damage. Maintain a digital track record and utilise applied technology. Proactive, forward-thinking Regulation 38 reporting. Application of the STA Site Safe registration program and STA 16 Steps to Fire Risk Mitigation and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) during construction.	Share learnings, positive and negative. Conduct a forward-looking review meeting with key delivery partners, where possible make open-source and make available for peer review.	Demonstrate how final design and strategy with risk management at the core show that this building is as resilient as it can be. Demonstrate this across: • Design • Fire risk engineering (including guidance and/or performance) • Fire management • Water management • Reparability • Lead-times for re-manufacture • Experience of delivery partners • The digital track record • Be proactive in the use of technology for operation and maintenance Set a maintenance strategy. Use technology – moisture monitoring. Water management – auto shut off valves. Have tenants plan and procedures to ensure proper use of the property
Insurance Actions:	Select your Insurance Broker. (Not all market relationships are equal, do your research and don't be afraid to insist on relevant experience. Lack of experience is not a barrier but insist on senior brokers taking the lead). • Check market appetite/brands o Action points from this? o Recent learnings • Map out strategy together based on MITIP • Be realistic with timelines • Broker led insurance market research • Broker to ask markets to be involved at this stage and seek to speak to insurers' risk engineers if appropriate Promote effective two-way communication between all parties. It is and will be a learning curve for all parties. Be open and transparent, all parties want the project to succeed for mutual financial success (law win in the event of a claim). Prepare for Property Insurance. Same broker is preferable and push for common insurers if possible.	Highlight risk mitigation actions to your broker and insurers. Guidance and/or Performance based testing - run your broker through this, ideally fire risk engineer should present to the broker. Explain major contributing factors to assist in EML determination. Broker to identify markets and pre-engage. Highlight experience and lessons learnt from delivery team and peer review process.	Highlight risk mitigation actions to your broker. Guidance and/or Performance. Run your broker through this, ideally fire risk engineer should present to insurers. Explain how EML can be modelled. Concept design with total focus on risk management to be presented to Insurers. Broker to identify insurers to provide quotation. Delivery team plus owner to make market presentation. Highlight non-negotiables in terms of design/risk mitigation and be explicit to what areas are unknowns at this stage. Explain the use of technology, idea of the Golden Thread legislation, and how this will impact upon quality control and provide digital track record (note significant positive implications for Professional Indemnity cover). Be prepared for ongoing Q&A.	General updates as and when required.	Present final risk details to the market. Highlight all design changes and justify regards risk management (both why and implication for better or for worse). Demonstrate total control of all risk parameters based on design and execution and present Loss Control and Quality Control plans. Highlight use of technology as a benefit: • Water monitoring • Use of project management platforms • Professional Indemnity and a digital track record • Other tech that improves risk management, product control, etc. Collectively agree a risk surveying strategy. Establish this alongside a digital track record to greatly enhance Property Insurance. Be proactive, invite inquiry from your insurers – upskill all parties. Bind an equitable policy.	Comply with all aspects of the insurance contract. Be proactive with information. Carry out agreed survey plan. **Property Insurance:** • Appoint a suitable Broker (refer Stage 0) • Use technology, digital track record, surveys and collate for insurers review. • Carry out forward looking Property Insurance surveys with your Broker and possible insurers	Bind equitable Property Insurance **Regards Construction Insurance:** Conduct a forward-looking review meeting with your Broker and Insurers. Two-way communication as to lessons learnt and how these can be shared to collectively advance Mass Timber. Make open-source if possible.	Demonstrate how ongoing maintenance and surveying of the building will be conducted. Facilitate Insurance surveys. Maintain a digital track record of maintenance and building safety. Where using technology explain and demonstrate the value to your Broker and Insurers. Share tenants plan and procedures and highlight how this helps ensure proper water and fire management

Essential Principals for Fire Mitigation - Key

A: Strategically Assess Resilience
B: Engage Insurers Early
C: Support Fire fighting Operations
D: Maximise Non-Combustibility
E: Anticipate Arson Attempts
F: Monitor Building Services
G: Address Occupational Issues
H: Extend Structural Stability
I: Reduce Fire Severity
J: Control Compartment Cavities
K: Separate External Openings
L: Resist Fire Ingress
M: Expect Adverse Weather
N: Minimise Consequential Damage
O: Facilitate Simple Repair
P: Plan Salvage Operations
Q: Follow Identified Standards
R: Provide Reliable Detection
S: Complete Performance Tests
T: Procure Quality Materials
U: Require Competent Work
V: Verify Recorded Information
W: Manage Fire Safety
X: Action Statutory Assessments
Y: Keep Maintenance Commitments
Z: Critically Review Experience

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Guidance Sheets – Working Examples

4

Technical Design

4.6 Technical Design

Key Themes:
Undertake early consultation.
Prevent water damage and fire.
Lower Property Loss.
Enhance Design Robustness including undetected moisture ingress.

Risk Mitigation Actions:
Final design and strategy with risk management at the core.

Demonstrate this across:
- Design
- Fire risk engineering (including guidance and/or performance)
- Fire management
- Water management
- Reparability
- Lead-times for re-manufacture
- Experience of delivery partners
- Design out contentious areas and or set a strategy for how to construct – i.e. an atrium or multi-level opening, establish how to use temporary measures to prevent fire spread or water damage
- Demonstrate any improvement in risk profile and how key risks will be managed

Detail how the digital track record of the building will be created. Be proactive in the use of technology for a successful project outcome.

Build on the requirements of Regulation 38, but deliver this first and then use as a framework to comply with obligations at project completion.

Set and agree policy tolerances with your insurers – i.e. structural integrity vs architectural aesthetic.

Application of the STA Site Safe registration program and STA 16 Steps to Fire Risk Mitigation and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) during construction.

Essential Principals for Fire Mitigation

A: Strategically Assess Resilience
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N: Minimise Consequential Damage
O: Facilitate Simple Repair
Q: Follow Identified Standards
R: Provide Reliable Detection
T: Procure Quality Materials

Insurance Actions:

Present final risk details to the market.

Highlight all design changes and justify regards risk management (both why and implication for better or for worse).

Demonstrate total control of all risk parameters based on design and execution and present Loss Control and Quality Control plans.

Highlight use of technology as a benefit:
- Water monitoring
- Use of project management platforms
- Professional Indemnity and a digital track record
- Other tech that improves risk management, product control, etc.

Collectively agree a risk surveying strategy.

Establish this alongside a digital track record to greatly enhance Property Insurance.

Be proactive, invite inquiry from your insurers – upskill all parties. Bind an equitable policy.

5

Manufacturing and Construction

4.7 Manufacturing and Construction

Key Themes:
Prevent water damage and fire.
Lower Property Loss.
Enhance Design Robustness.
Check Construction Achieved.
Improve Facilities Management.

Risk Mitigation Actions:
Work to your plan and regularly review fire and water damage management plans.

Reduce inception hazard in daily activities and conduct.

Use temporary measures to prevent fire spread or water damage
Maintain a digital track record and utilize applied technology.

Proactive, forward-thinking Regulation 38 reporting.

Application of the STA Site Safe registration program and STA 16 Steps to Fire Risk Mitigation and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) during construction.

Essential Principals for Fire Mitigation

C: Support Fire fighting Operations
D: Maximise Non-Combustibility
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O: Facilitate Simple Repair
P: Plan Salvage Operations
Q: Follow Identified Standards
R: Provide Reliable Detection
T: Procure Quality Materials
U: Require Competent Work
W: Manage Fire Safety

Insurance Actions:

Comply with all aspects of the insurance contract.
Be proactive with information.
Carry out agreed risk survey plan.

Property Insurance:
- Appoint a suitable Broker (refer Stage 0)
- Use technology, digital track record, surveys and collate for Insurers review
- Carry out forward looking property insurance surveys with your broker and possible Insurers

Guidance Sheets – Key Takeaways

- Voluntary objectives/BCP – Owner/Developer to take the lead
- Broader and early engagement
- Fire Risk Engineering and EML modelling
- Reparability – commentary as well as level of cover, i.e. aesthetic vs structural
- Tech/Digitisation & Golden Thread – new opportunities to share information and manage risk – two way
- Other Tech – IoT – Water management, moisture monitoring, weather tracking, etc..

Potential for hybrid designs

Location of all plant and electrical intakes in concrete core, and vertical routing of services – this:

- Replaces significant concrete usage with timber
- Reduces combustible void challenges
- Improves building stability
- Supports firefighting activities

Locating all bathrooms and kitchens within a concrete core of a massive timber building – this:

- Replaces significant concrete usage with timber
- Reduces the potential for escape of water damage
- Supports built in drain-to-safe features

CLT panel waterproofing membrane – this:

- Reduces the potential for water damage during delivery and construction before weather proofed.

Alternating CLT floors in concrete or steel framed buildings – this:

- Reduces concrete usage
- Preserves a higher level of (insurance relevant) compartmentation
- Improves building stability under fire
- Supports firefighting activities

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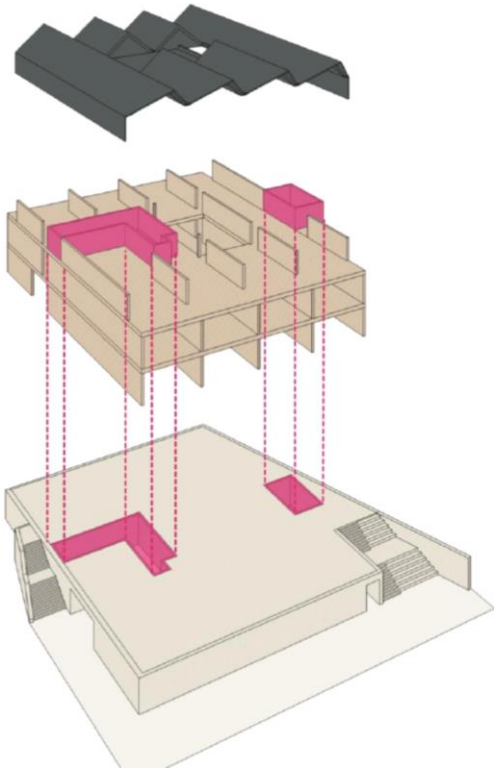
Successfully deployed

SCHOOL SCIENCE BLOCK

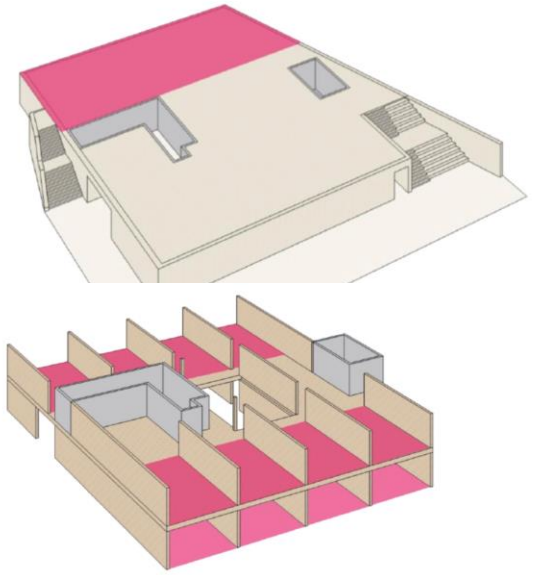
whitby wood



Catering Kitchen

Located at ground floor in concrete plinth

All kitchen ventilation service routes contained within ground floor



Science Labs

Compartmented design

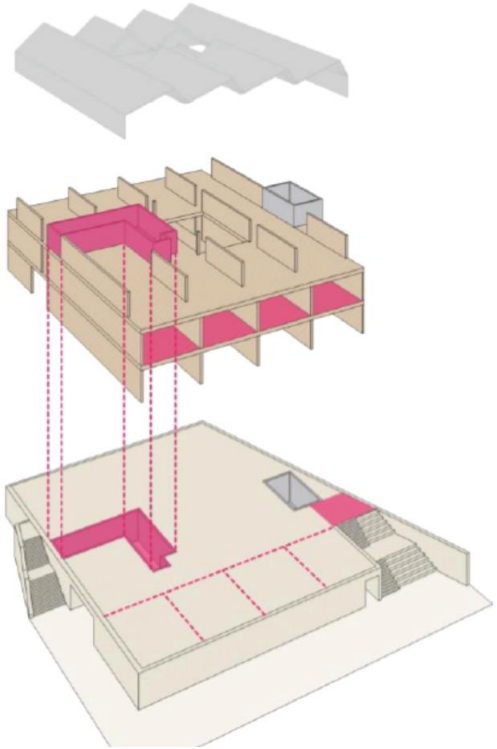
Automated suppression system – sprinklers

De-centralised ventilation & heating reduces ducts & voids running between rooms

Auto-extinction tested structure

Non-combustible linings to floors

Non-combustible linings to walls where required; design preference to have 1-2 walls of exposed CLT if possible



Escape of Water

Bathrooms

Located within concrete plinth and concrete cores to reduced potentia for escape of water damage

Science Lab Sinks

Drain-to-safe place

Labs on first floor are on concrete slabs – only on CLT at second floor

NC waterproofing membrane over CLT slab at second floor – Siga

NC cement board over CLT slap at second and third floors

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Thank you

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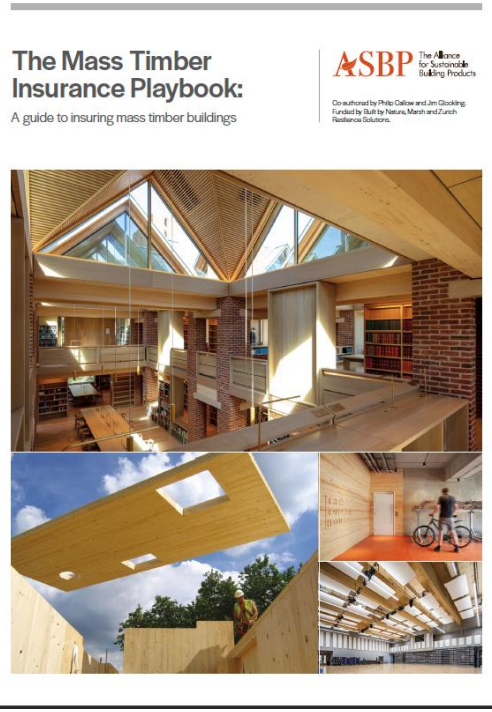

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