

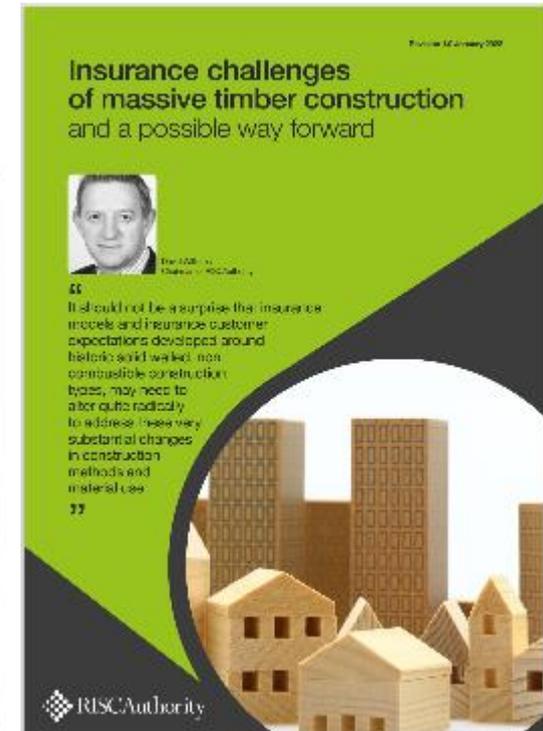
Insurance Challenges of Massive Timber Construction

And a possible way forward

7th International Tall Building Fire
Safety Conference

17th May 2022

Dr Jim Glockling
Technical Director FPA
Director RISCAuthority



About RISC Authority

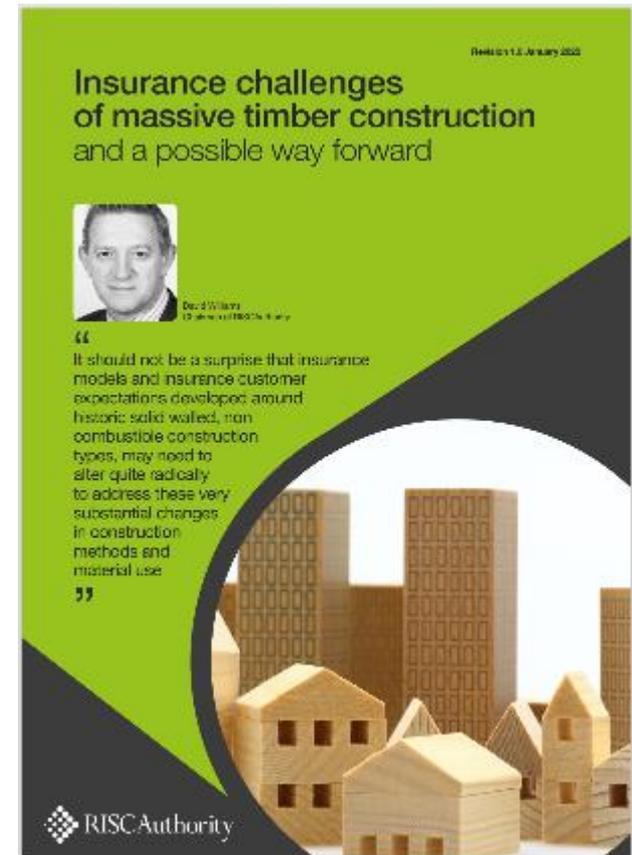
RISCAuthority is a research scheme administered by the Fire Protection Association and supported by many UK insurers which, through the operation of its technical working groups, seeks to support measures that improve and promote property and business resilience measures.

The Massive Timber Working group was formed to analyse, address, and communicate the insurance challenges that these newer proposed building methods give rise to with a view to assisting future dialogue in creating buildings that meet all needs of safety, carbon reduction, and resilience to the insured perils of fire, escape of water and flood.



Contents

- A crude introduction to insurance
- ~~Drivers behind move to modern methods of construction~~
- ~~New construction methods and materials~~
- Consequences of change for Material Damage and why Building Regulations offer little protection
- Potential design solutions



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% - this does not happen natively when ‘compliance’ is the only design goal’



Also: it's not just about wood, and it's not just about fire

Insurance Perils

- Fire
- Escape of Water
- Flood



Loss types

- Material Damage
- Business Interruption
- Loss of Stock
- Loss of Rent
- Displacement costs

Estimated Maximum Loss



EML ~ 4 floors of 17

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



Insurance and insurability

Underwriting Relevant Building Features

(compliant building assumed)

Building scenario described

Residential Apartment Block

Drop Down List - Scroll down for more options

Mixed commercial and residential

< 4 Storeys

900m²<1,600m² (40mx40m)

20%

of building footprint

20%

of building volume

Same as building structure

Structural Timber Modular Stack

Modular

Same as Structure

Timber alternating with concrete

Rainscreen with NC insulation and NC Cladding

Bare structure

Yes - open

Yes

No

Yes

No

Green Roof

Wind & Solar

Dry lined

No Suppression

5m<10m

Wet Risers

2

Yes - Raised on water insensitive stilts

Detection, Control, and Fail-to-safe devices

Occupancy & use
Scale
Structure & Fabric
Other risk factors
Fire mitigations
Water-peril mitigations

- 1 Occupancy and use
- 2 Number of Storeys above ground
- 3 Building footprint
- 4 Size of largest compartment by Area
- 5 Size of largest compartment by Volume
- 6 Ground floor structure
- 7 Structural material
- 8 Construction method
- 9 Core structure
- 10 Floor / Ceiling
- 11 Cladding system
- 12 Interior Surfaces
- 13 Atria
- 14 Basement car parks
- 15 Balconies
- 16 Swimming pools / spa baths
- 17 Hazardous materials
- 18 Green surfaces
- 19 Green Energy
- 20 Combustible void protection
- 21 Suppression system protection
- 22 Separation
- 23 Firefighter provisions
- 24 Stairwells
- 25 Designed for flood
- 26 Designed for EoW

Relevant types and periods of insurance

- Construction
- Latent Defects
- Material Damage & Business Interruption



Cost modifiers

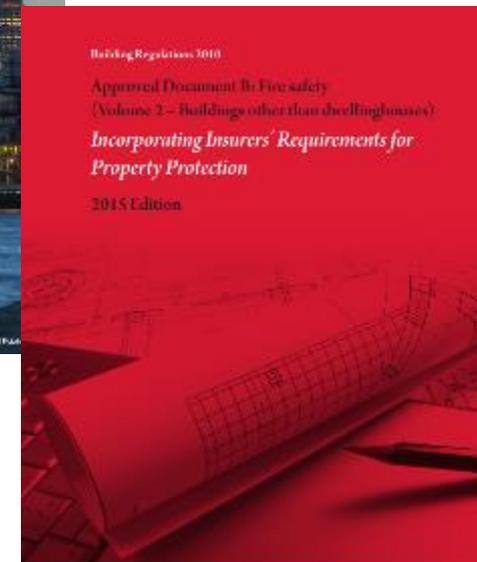
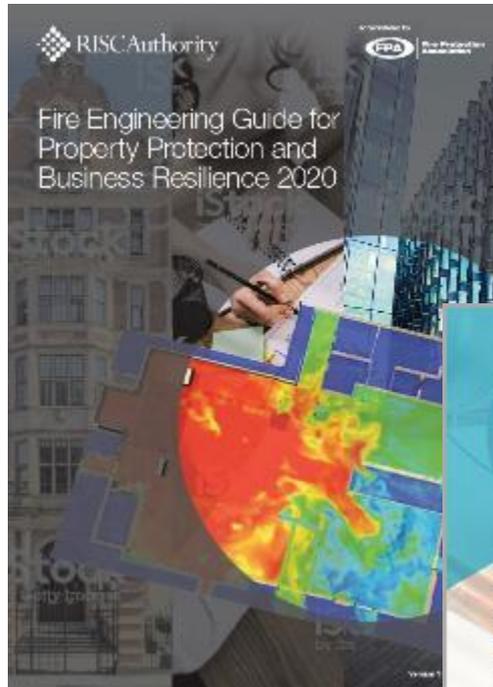
- Susceptibility
- Maintainability
- Repairability
- Assessability
- Availability
- Approvability
- Pedigree

=>

INSURABILITY



Essential Principles



RISK INSIGHT, STRATEGY AND CONTROL AUTHORITY
Reducing insurable risk through research, advice and best practice






 Department for
 Business, Energy
 & Industrial Strategy

THE NON-DOMESTIC PRIVATE RENTED SECTOR MINIMUM ENERGY EFFICIENCY STANDARDS

The Future Trajectory to 2030

Any caveats?

- Without reducing safety?
- Without reducing Property Resilience?
- Without reducing Business Resilience?
- Without reducing Service Delivery Resilience?
- Without reducing FRS support?
- Maintaining insurability?

JLL commits to making net zero carbon mainstream and to operating at net zero carbon by 2030 in the UK

Property repositions to enter zero carbon future

10 Feb 2020, 11:01

As developers respond to the climate emergency, engineers and architects are being pushed to devise solutions to the challenge of carbon reduction. Paul Unger talks with Steve Merridew, low energy design expert at BDP in Manchester.

Avison Young has committed to a carbon-neutral future by signing up to the World Green Building Council's Net Zero Carbon Buildings Commitment.



Fore Partnership announces ambitious net zero carbon 2025 target

12 Jun 2020, 11:54, 10 Jun 2020 by Wipro/Asana



24 Jun 2020, 10:05 AM The Glasser

Major UK housebuilder commits to net zero emissions by 2040

Barratt Developments has also set a target to ensure its new house types will be net zero carbon by 2030



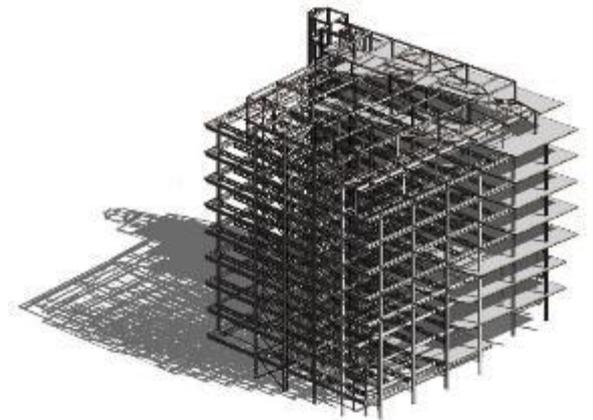


Centre
 Newcastle
 10 Jun 2020



Grosvenor Britain & Ireland makes Zero Carbon Commitment

Grosvenor Britain & Ireland (GBI) has committed to achieving net zero carbon operational emissions* from all its directly managed buildings, including historic listed buildings** by 2030.



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Reducing insurable risk through research, advice and best practice





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Types of Timber Construction

- Light Timber Framing
- Heavy Timber Framing
 - Glue Laminated Wood (Glulam) (Post and Beam)
 - Laminated Veneer Lumber (LVL) (Post and Beam)
 - Cross Laminated Timber (CLT) (Load bearing walls)



Glue Laminated Wood

- Horizontal stacking of thick wood
- Beams



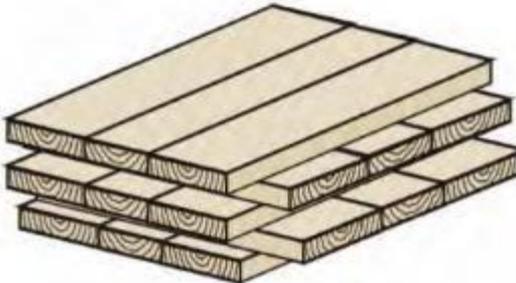
Laminated Veneer Lumber

- Vertical stacking of thin veneers
- Beams



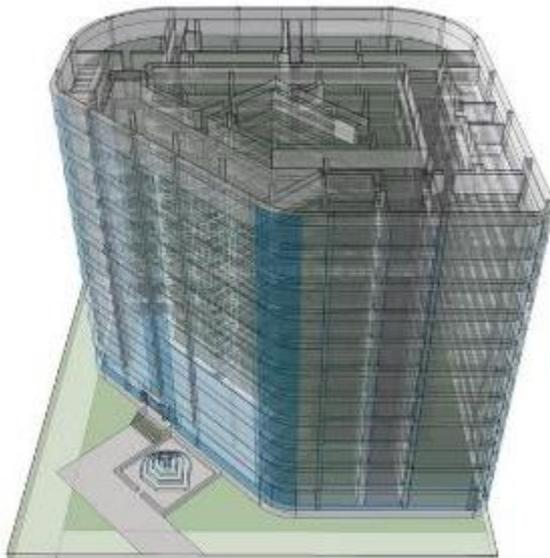
Cross Laminated Timber

- 90 degree offset stacks
- Panels



What has NOT changed?

- 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



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Building Regulations

Some country's codes better equip them for adoption because they have a property protection element to them

UK

- Evacuation before collapse

In the UK there is total divorce of 'Life-Safety' and 'Property Protection' – only life-safety is mandated in law.

Acceptability by one country cannot infer it will be acceptable in any other. A good lesson to learn from light timber frame buildings – where the UK asks for none of the protections demanded in the US which were created in response to their own loss history.

US

NFPA 5000 primary goals are:

- Safety from fire goal
- Safety from structural failure goal
- Safety during building goal

NFPA 5000 also requires that the building design shall meet the following performance requirements:

- Safety from fire
- Safety from structure failure
- Serviceability performance
- Immediate occupancy performance
- Collapse and structural failure prevent performance
- Safety during building use
- Function
- Cultural heritage
- Mission continuity
- Environment
- Uncontrolled moisture



‘Compliance’ with UK building regulations has never been more meaningless to the insurability of a building – who will be the de-facto regulator going forward?

- Lenders?
- Insurers?

Green Building News

Timber High Rise in New York Is Canceled

The developer blames a softer market and a loss of interest among potential lenders



By Scott Gibson | April 7, 2017



No one died, and the buildings might even have been compliant – but are these design successes?

Crewe retirement complex partially collapses in fire

© 9 August 2019

f t e Share



Bristol Premier Inn: Fire at hotel near Cribbs Causeway

© 10 July 2019

f t e Share



The Premier Inn near Bristol caught fire overnight severely damaging it

Barking fire: Blaze destroys 20 flats in east London

© 9 June 2019

f t e Share



Local resident: "The whole thing was an inferno"

The new normal?

INSIDE HOUSING



Low Rise

Moorfield Hotel, Brae Shetland

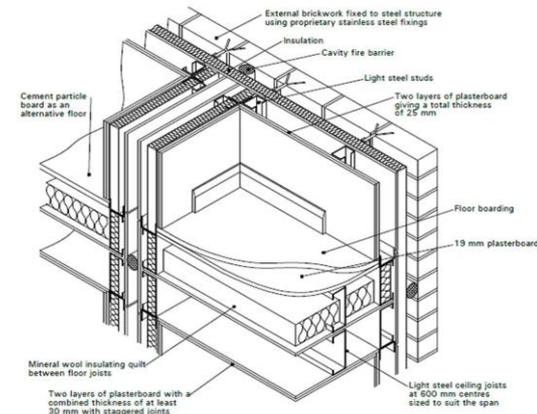
27 July 2020

ICA Architects
SIP Building Systems
McAlister and Rushe

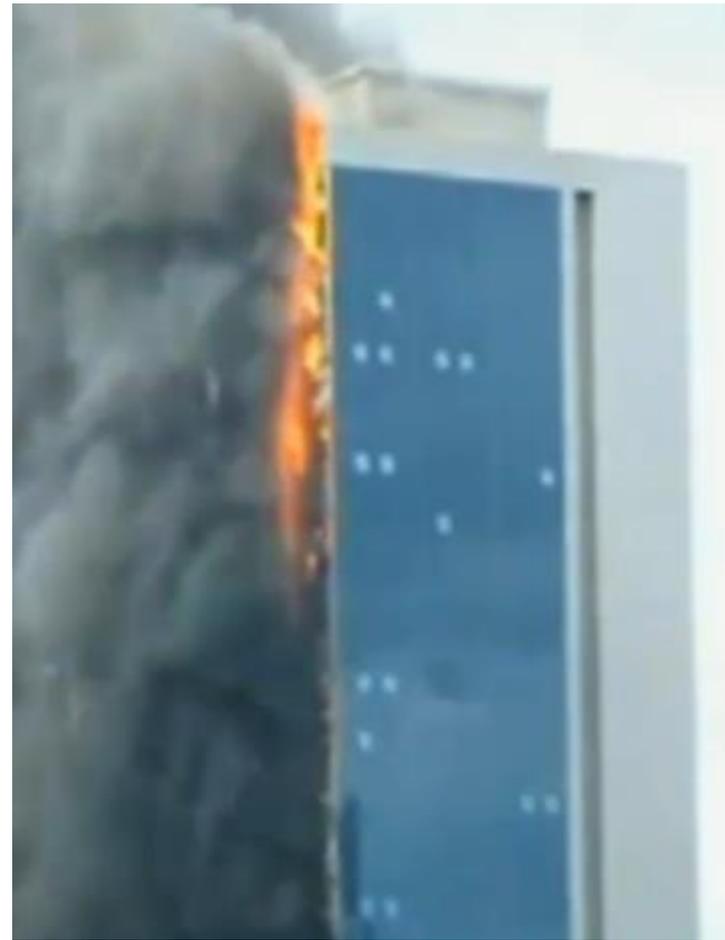
Materials and design

- Building out of wood breaks the first Essential Principle of Fire protection – ‘**Don't build out of combustible materials**’
- If wood is to form the structure – there may be increased potential for **disproportionate collapse** (during fire and from wet perils)
- Many MMC design methods (in particular Modular) have many **voids** which present a 3rd, and particularly problematic route for fire spread.

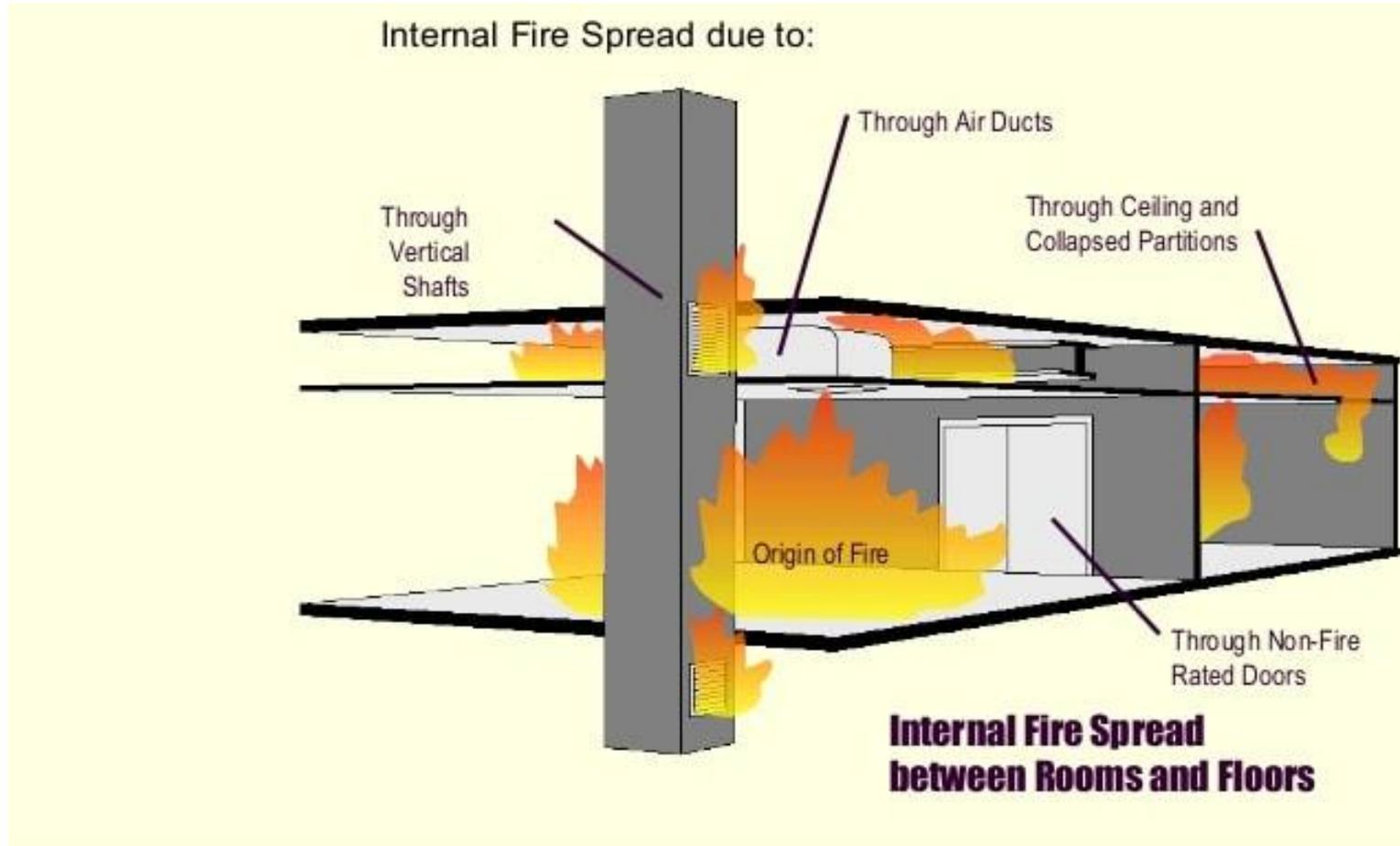
Insurance focus on the means and potential for large-scale fire spread



Fire Spread mechanism (1) - External

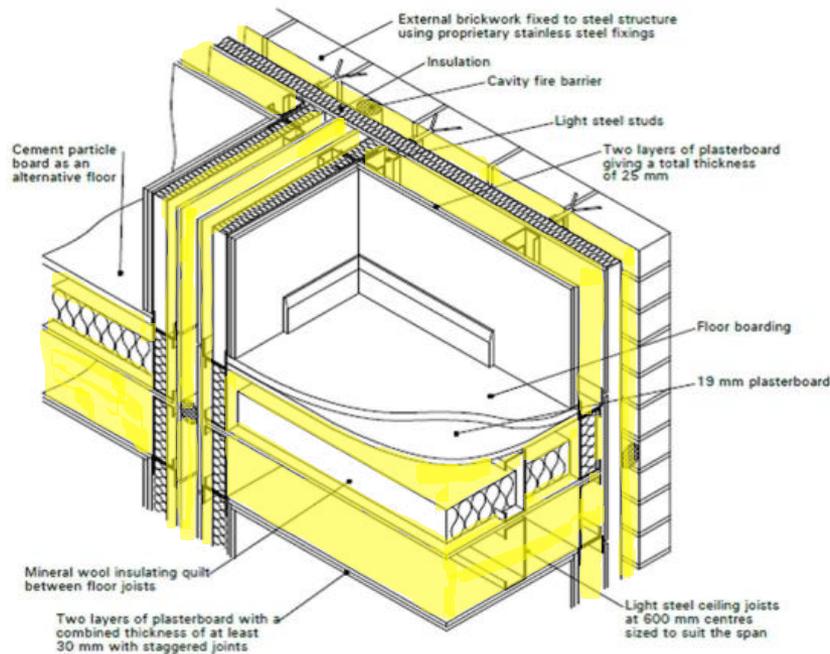


Fire Spread mechanism (2) - Internal



Fire Spread mechanism (3) - Voids

- A new, and particularly problematic dominant mechanism

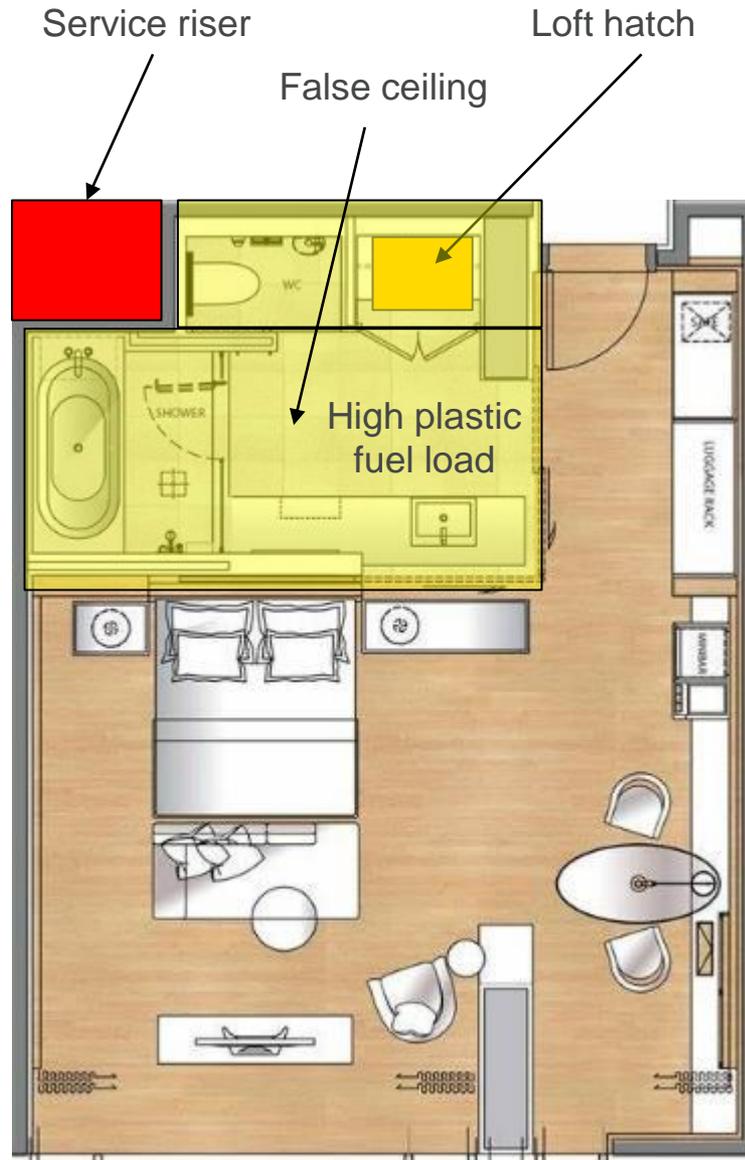


Impact – Micro example

Hotel / Apartment bathrooms

- Stacked – what happens to one can happen to all
- Location of key service risers – communication route for fire
- Lots of big plastic penetrations – fire stopping will be critical
- False ceilings housing aircon units and services
- Loft hatches
- Lots of combustible plastic bathroom furniture
- No requirement for suppression





Impact – Micro example

Now consider this in the context of:

- A fire gets in to a combustible void
- Smouldering combustion relishes the low oxygen environment
- It may eat away for hours or even days before emerging
- **The hardest question to answer is 'What will ultimately put the fire out?'**
 - Suppression system?
 - Fire Service?
- Are our BRs good enough?

Does the whole protection concept rely on ensuring fire cannot enter a void, because if it does the building is lost? – that's always going to be difficult.



UK insurer 'building of the year' 😊

- Non-combustible materials of construction (properly 'non combustible')
- Excellent resilience to water
- Excellent compartmentation
- Little or no reliance on 'systems' (human or mechanical) to deal with fire



Building Regulations must respond

The greatest enabler of MMC in the UK will be the development of ADB in the same way that the US has done in the 'International Building Codes'

602.4.4.3 Concealed spaces. CDP

Concealed spaces shall not contain combustible materials other than *building elements* and electrical, mechanical, fire protection, or plumbing materials and equipment permitted in plenums in accordance with Section 602 of the *International Mechanical Code*. Concealed spaces shall comply with applicable provisions of Section 718. Concealed spaces shall be protected in accordance with one or more of the following:

1. The building shall be sprinklered throughout in accordance with Section 903.3.1.1 and automatic sprinklers shall also be provided in the concealed space.
2. The concealed space shall be completely filled with noncombustible insulation.
3. Surfaces within the concealed space shall be fully sheathed with not less than $\frac{5}{8}$ -inch Type X *gypsum board*.

Exception: Concealed spaces within interior walls and partitions with a 1-hour or greater *fire-resistance rating* complying with Section 2304.11.2.2 shall not require additional protection.

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



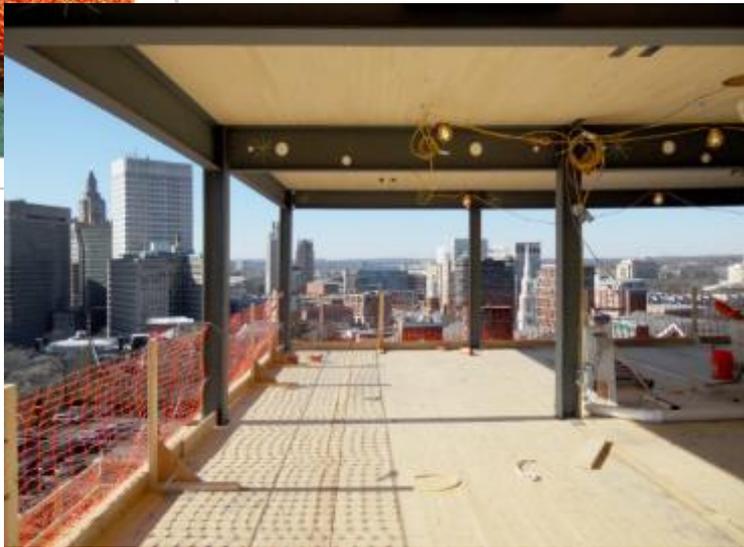
A balanced design?

What about a hybrid of:

- CLT Massive timber
- NetZero / Low carbon concrete

ARUP

Mass timber fire safety
Experiment one updraught experiment two initial findings



SUMMARY



- A time of great change
- The future is wood
- Desire to build is running ahead of research
- UK Building Regulations have not responded to the challenge – ‘compliance’ alone assures little of relevance to the insurer
- Whilst ply-scrapers seem too difficult to consider currently, hybridisation, in association with other control measures should be able to satisfy many current requirements
- The design industry is working hard to address insurance issues
- The RISC Authority white paper succinctly specifies the challenge for the 1st time
- Designers must understand the importance of EML and what they can bring to the table to reduce it

Thank you

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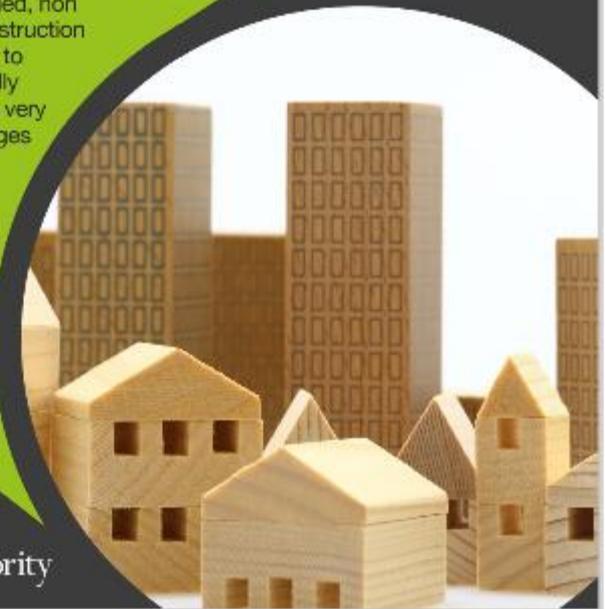
Revision 1.0 January 2022

Insurance challenges of massive timber construction and a possible way forward



David Williams
Chairman of RISC Authority

“
It should not be a surprise that insurance models and insurance customer expectations developed around historic solid walled, non combustible construction types, may need to alter quite radically to address these very substantial changes in construction methods and material use
”



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