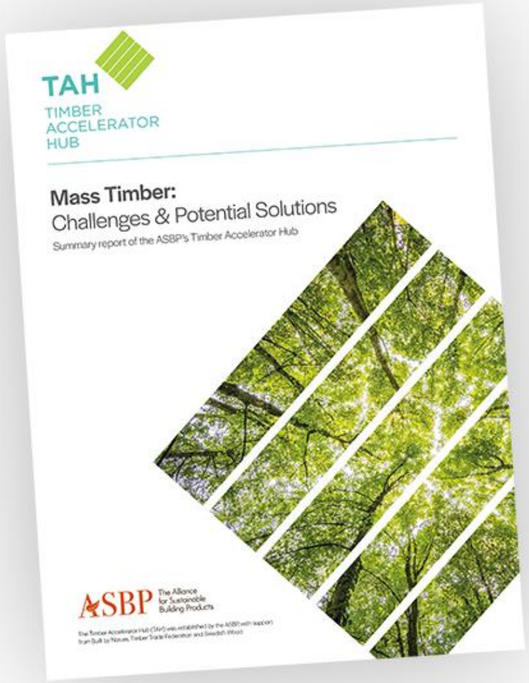
TIMBER ACCELERATOR HUB

Presentation of Summary Findings
ASBP
05/05/22



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Free to download now!

asbp.org.uk/project/asbp-tah

01: The Project

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Project Lead:

ASBP The Alliance for Sustainable Building Products

Funders:

Laudes Foundation

BUILT BY NATURE

SWEDISH WOOD

Timber Trade Federation
growing the use of wood

Further Support / Advisory Group:

STRUCTURAL TIMBER ASSOCIATION
Building offsite solutions in timber

woodknowledge WALES

lendlease

Gallagher
Insurance | Risk Management | Consulting

bwf BRITISH WOODWORKING FEDERATION

GT

CENTRE FOR NATURAL MATERIAL INNOVATION

OFR

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Aims of the Timber Accelerator Hub

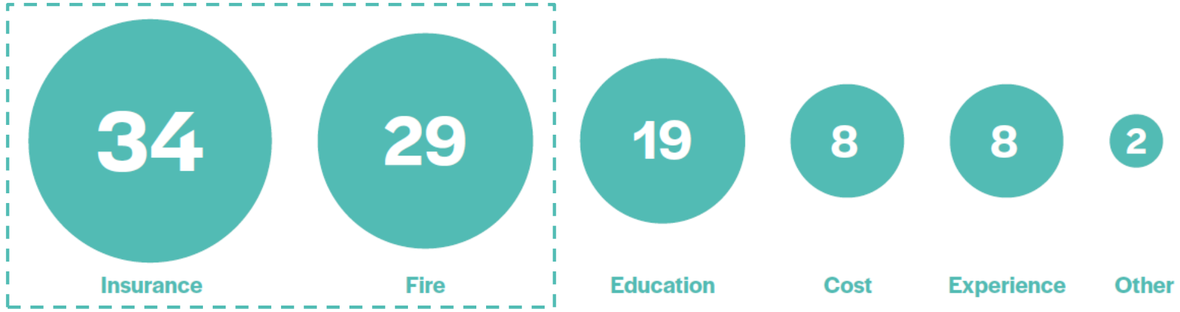
To **investigate the primary challenges and barriers** that are preventing the wider adoption of mass timber across the UK

To **establish a coordinated network** of key stakeholders seeking to address these challenges, to enable a more collaborative approach

To **identify, initiate or support further work** needed to overcome the major barriers, and make recommendations towards their resolution

What do you think is the greatest barrier to the uptake of mass timber offices?

% of survey respondents



Graphic taken from "Mass Timber Office Forum Summary Whitepaper" Gardiner & Theobald 2021

Orsman Road, Waugh Thistleton Architects. Photo credit: Ed Reeve

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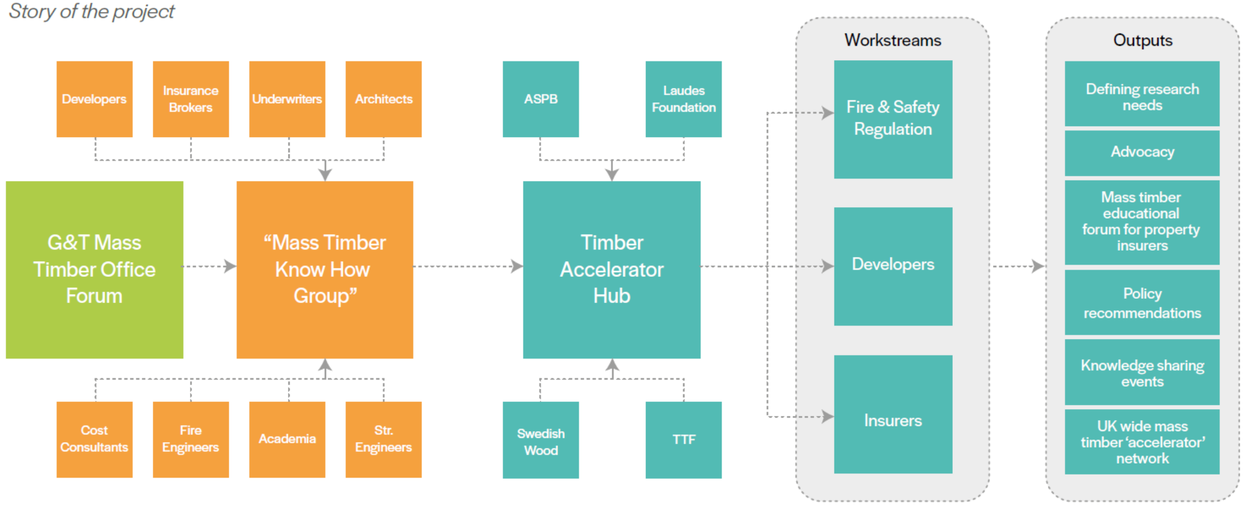
The Story of The Project

- Initiated in Autumn 2020 by ASBP in response to a significant shift in UK construction industry attitudes towards timber construction
- Regulatory focus on the combustibility of materials: shockwaves ran through to the insurance industry
- Picking up on this trend Gardiner & Theobald (G&T) organised a game-changing series of discussions, the ‘Mass Timber Office Forum’.
- Emerging from this forum, several key stakeholders coalesced around an aim to translate these discussions into meaningful action towards solutions, and formed an informal group called the ‘Mass Timber Know How Group’ (MTKH).

Story of the project



Timber Accelerator Hub

Orsman Road, Waugh Thistleton Architects. Photo credit: Ed Reeve

ASBP The Alliance for Sustainable Building Products

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TAH Network

With funding in place to be led by the ASBP, the TAH has convened & joined several working groups comprised of key stakeholders:

- **Developer's Working Group**
- **TAH Steering Group**
- **Mass Timber Know How Group**
- **Mass Timber Property Insurance Forum**
- **Government Timber in Construction Policy Group**

Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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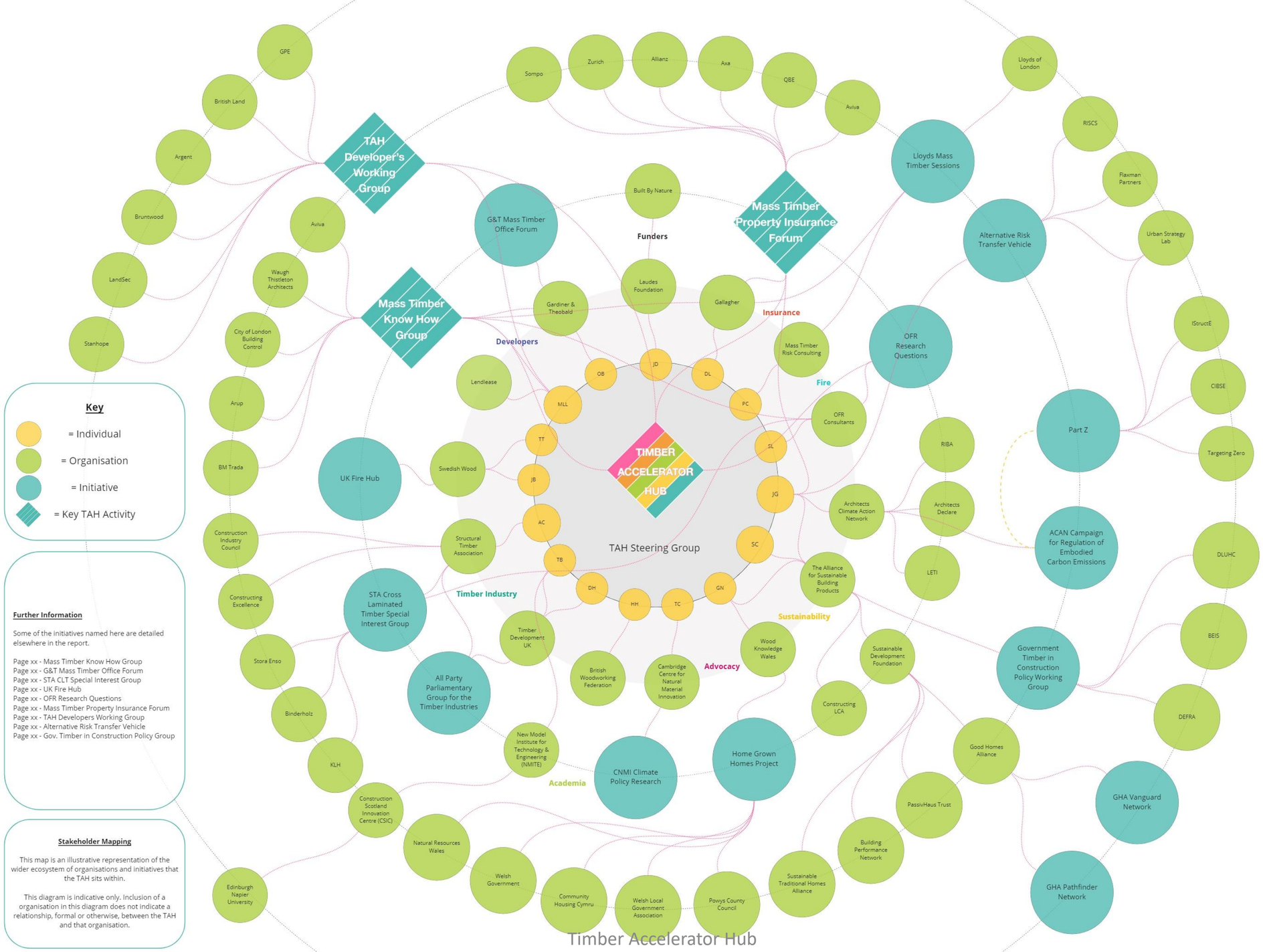

Key

= Individual

= Organisation

= Initiative

= Key TAH Activity

Further Information

Some of the initiatives named here are detailed elsewhere in the report.

Stakeholder Mapping

This map is an illustrative representation of the wider ecosystem of organisations and initiatives that the TAH sits within.

This diagram is indicative only. Inclusion of a organisation in this diagram does not indicate a relationship, formal or otherwise, between the TAH and that organisation.

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Dalston Lane, Waugh Thistleton Architects. Photo credit: Daniel Shearing

Mass Timber

The work focused on mass timber, a group of products facing particularly acute challenges, although it is believed that the learning is applicable to other nature-based products and systems.

‘Mass timber’ is the name given to the family of engineered wood products that comprise multiple pieces of timber that are layered, or laminated, into solid wood elements for structural application. Mass timber includes cross laminated timber (CLT), glue laminated timber (glulam), laminated veneer lumber (LVL) and dowel laminated timber (Brettstapl or DLT).

LVL and CLT are two of the most commonly used mass timber products.
Images from Stora Enso

02:
Fire Safety & Regulation

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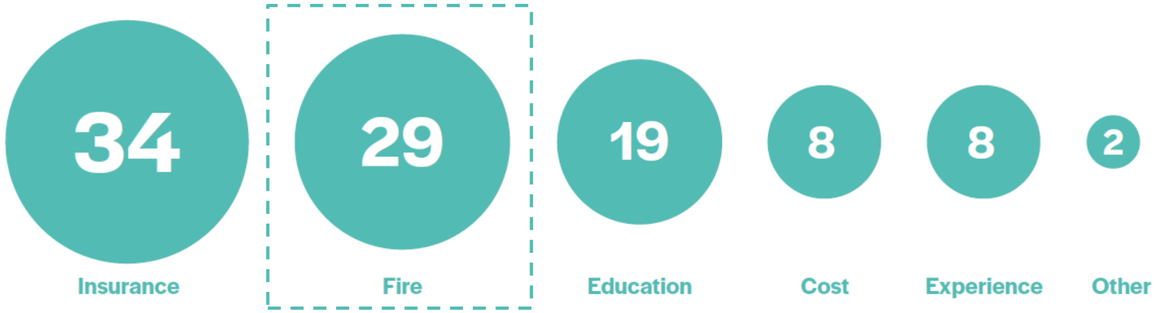
Mass Timber, Fire Safety & Regulation

1. Prohibitive regulations and standards
2. Wider industry impacts of negative perceptions
3. Current understanding & ongoing research
4. Further research requirements

What do you think is the greatest barrier to the uptake of mass timber offices?

% of survey respondents



Graphic taken from "Mass Timber Office Forum Summary Whitepaper" Gardiner & Theobald 2021

CLT production on the factory floor, Stora Enso

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Prohibitive regulations and standards

1. **2018 The Building Regulations amendment**
   - In November 2018 amendments to The Building Regulations were made by the Government in order to ban the use of combustible materials (Class A1, A2-s1 or d0) in any part of the external wall of buildings with a floor at least 18m above ground level that contain residential accommodation.
   - A 2020 consultation on further changes proposed lowering this threshold.

2. **2020 Greater London Authority Affordable Homes Programme Funding Guidance 2021-26**
   - In November 2020, the GLA released the Affordable Homes Programme Funding Guidance for the period of 2021 to 2026. The guidance states that for residential schemes receiving funding from the scheme, “no combustible materials may be used in the external walls of all homes and buildings, regardless of their height.”

3. **2021 British Standard 9991 (DRAFT)**
   - In September 2021 the British Standards Institution published a consultation on the draft of a new BS 9991. This is the standard that covers “fire safety in the design, management and use of residential buildings”. The draft new standard introduced a clause that ‘precludes the use of timber’ for any loadbearing element, within internal or external walls, in ‘single stair’ residential buildings with a floor above 18m.

Problems with fire testing regimes

- Some critique, although not unanimous, aimed at BS 8414, “Fire performance of external cladding systems - Test method for non-loadbearing external cladding systems.”
- Appears that work is required on updated standards for the testing of systems fixed back to mass timber substrates.

Most buildings are not affected by any restrictions...

Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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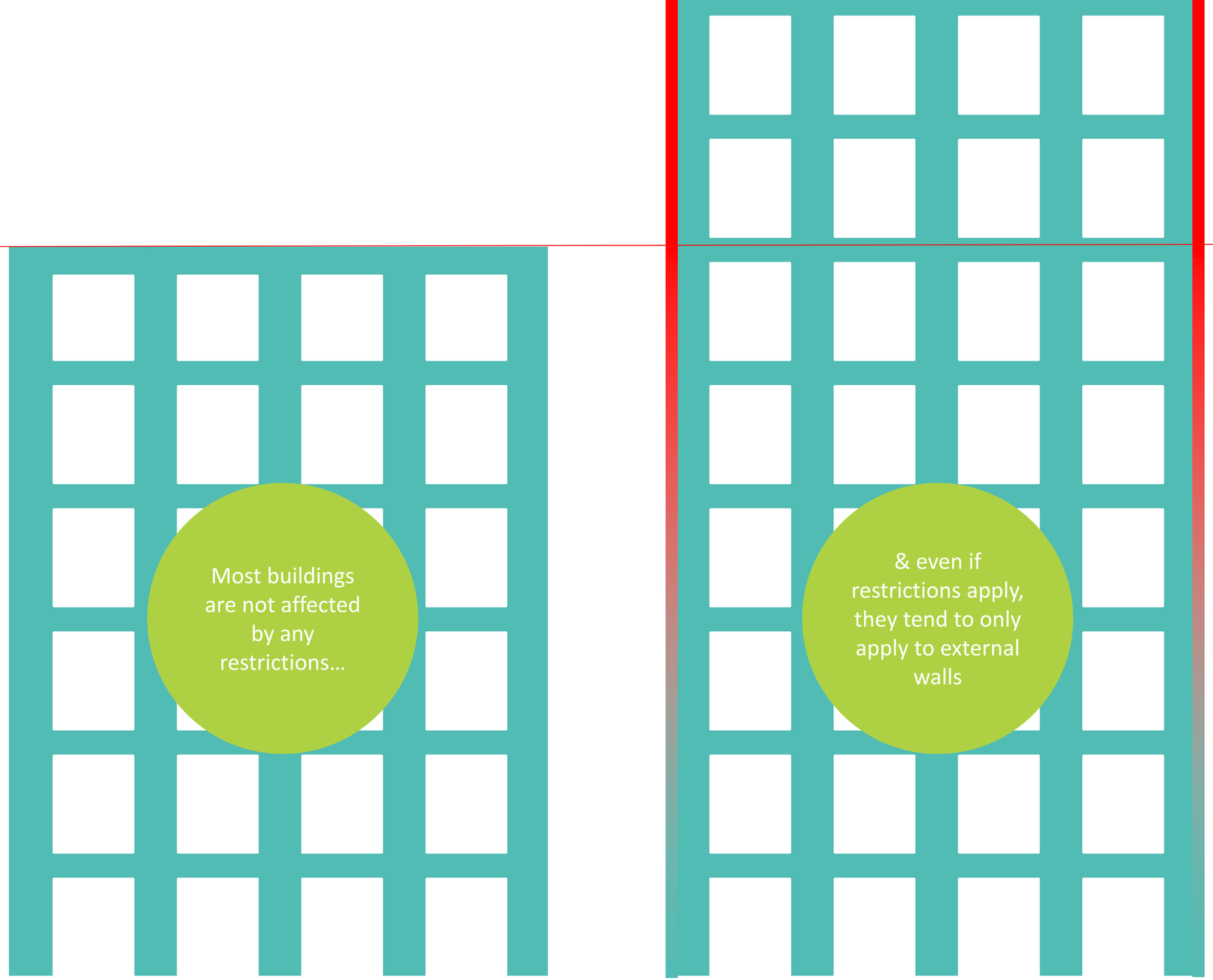
External walls of residential buildings over 18m

18m



In London only, if funded by GLA Affordable Homes Programme: External walls of residential buildings

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Wider industry impacts

1. Heightened awareness of the risks, both real and perceived
2. High cost of large-scale fire tests which are often requested on a project-by-project basis
3. Testing capacity in the UK appears to be lacking, some delays
4. Insurer: “is the CLT combustible? We are not interested”.

mass timber’s combustibility is having a prohibitive effect outside the scope of the combustible materials ban itself

Key recommendation

Government

- To provide clarity and consistency with regards to diverging standards & reiterate safe applications for mass timber.
- Long term: create dedicated standards that ensure safe use of mass timber in all building types.

Further potential solutions

Developers

- Consider open sourcing project-specific large scale fire testing data. Explore the potential for data sharing to reduce need for project-by-project testing.

BSI

- Consider developing a new British Standard, suitable for testing external wall systems fixed back to a mass timber structure

Government

- Further investigate the wider impacts that the combustible materials ban (above 18m) is having outside the scope of the ban itself, i.e., the impacts on the low-rise residential sector (below 18m).
- Provide grant funding for developers to cover incremental project costs such as large-scale fire testing

Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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Current Understanding

1. There is a good level of understanding of effects such as charring, so-called ‘self-extinguishment’ or ‘burn out’, delamination and pyrolysis.

2. There are many measures that are known to reduce the risks associated with fires in timber buildings, such as compartmentation, ventilation, encapsulation of timber elements, limiting exposed CLT surfaces, using concrete for ground floor structure, installing sprinklers, and using a non-combustible external wall build up.

3. A competent fire engineer should always be appointed, and on large and complex buildings, it is sometimes suggested to appoint a second fire engineer to peer review.

4. OFR Fire Consultants, through the Structural Timber Association Special Interest Group (STA SIG) on CLT, undertook a literature review of current testing.

“We know an enormous amount about timber behaviour, we understand quite well how delamination works, we understand quite well how self-extinguishment can be managed.” – Prof. Jose L. Torero

Murray Grove, Waugh Thistleton Architects.
Photo credit: WTA

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Ongoing Research & Emerging Solutions

1. **New Model Building** – Waugh Thistleton Architects w/ UCL
   The New Model Building, to be published early 2022, is a standard building typology, providing a pre-warrantied solution for residential buildings up to 18m. The design features a non-combustible external wall build up and will create a suite of standard details that can be adopted by others.

2. **Structural Timber Association CLT Special Interest Group.** Mentioned above, the group is undertaking a series of large-scale fire tests, underway currently in Poland, looking at a range of compartment sizes in residential and commercial typologies, with several treatments applied. Results will be reviewed and published later this year

3. **RISE Glue Line Integrity in Fire testing** - Large scale fire testing by RISE, examining the behaviour of various glues in CLT when exposed to fire.

4. **UK Fire Hub Website** – developed by Swedish Wood, this will be a repository of peer-reviewed fire performance information relating to timber, both mass timber and timber frame. Intended to be a comprehensive resource that contains all known scientific results.

Outlined in the report...

- **OFR's Research questions on the path to mainstream adoption of mass timber in *commercial* construction: outline research proposal**

Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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Emerging Solutions

- **New Model Building**

The New Model Building is a set of design principles created by Waugh Thistleton Architects in collaboration with expert fire engineers at UCL and structural engineers at Buro Happold.

The methodology explains how engineered timber can be used to construct multistorey residential buildings, in full compliance with UK building regulations.

The design will be published, open source, and available for design teams to replicate, potentially unlocking mass timber residential development in the UK once again.

Orsman Road, Waugh Thistleton Architects.
Photo credit: Ed Reeve

03: Construction & Property Insurance

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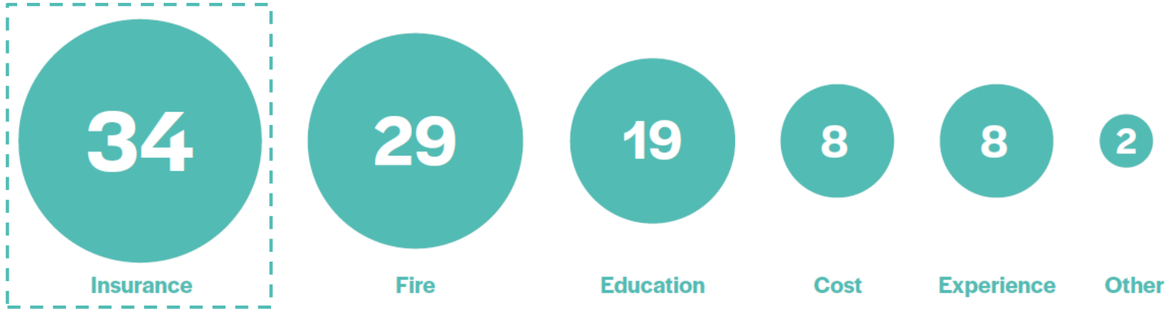
Mass Timber, Construction & Property Insurance

1. Background
2. Insurance industry perspective of Mass Timber
3. Mitigating risk in Mass Timber Buildings
4. Emerging Solutions

What do you think is the greatest barrier to the uptake of mass timber offices?

% of survey respondents



Graphic taken from "Mass Timber Office Forum Summary Whitepaper" Gardiner & Theobald 2021

CLT on site at Black & White, Waugh Thistleton Architects.
Photo credit: The Office Group

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Background

1. Post 2008 the cost of insurance fell dramatically, and policy coverage widened from 2010 leading to the soft market commentators refer to.

2. Premium income fell as coverage naturally widened due to positive competitive market dynamics. However, these softening dynamics meant that incurred losses were more acutely felt.

3. Capacity withdrawal and the need to return underwriting books to profit has meant that since 2018 the market has seen significant rate increases, a dramatic restriction in policy coverage and a strong reluctance to provide cover for more volatile or challenging risks. This is known as a hardening, or hard, market.

4. Insurance market remains in the middle of hard market cycle and may do so for some time to come.

Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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Insurance industry perspective of mass timber

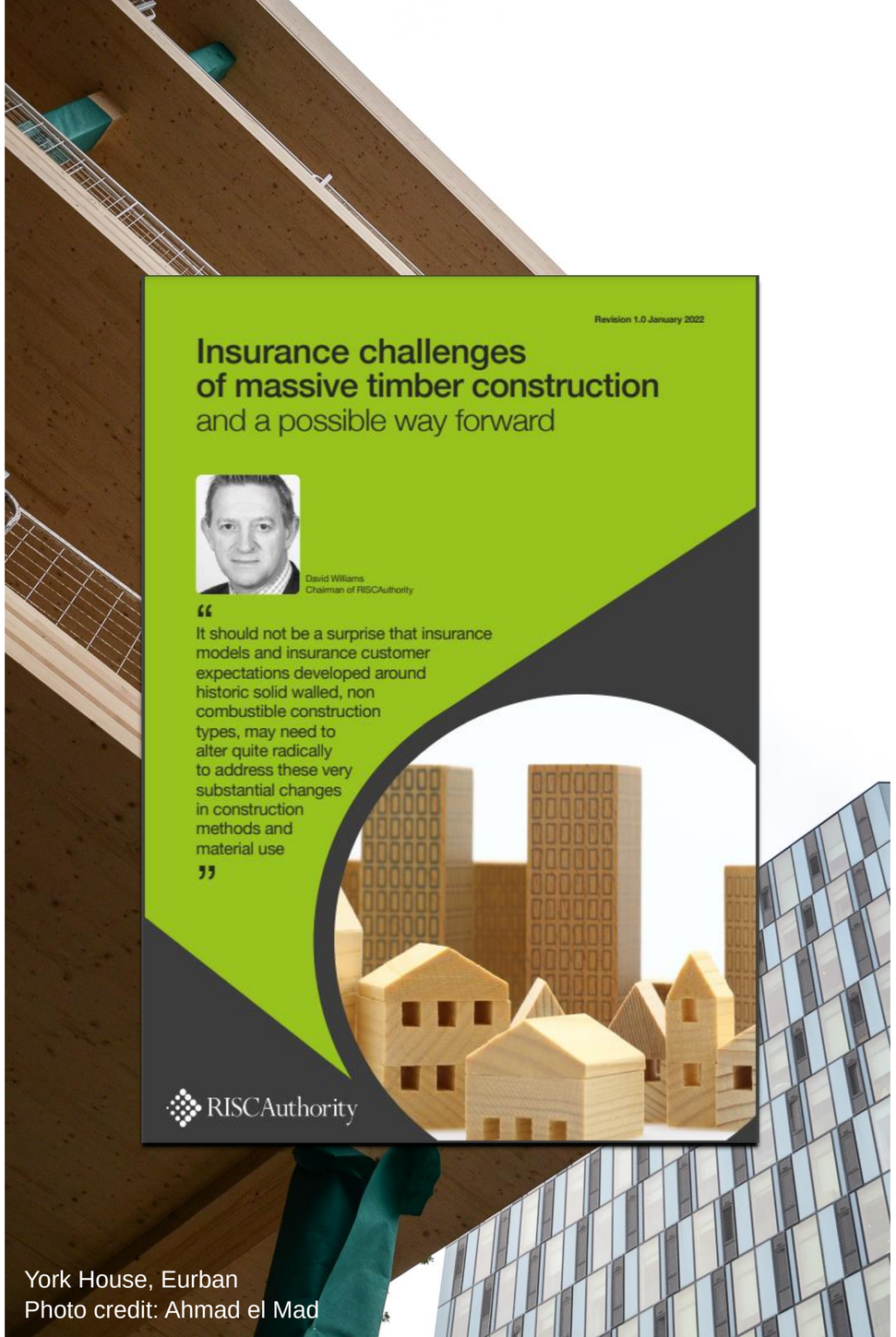
1. Apart from broader market dynamics, why is it difficult to gain insurance for mass timber? Earlier this year, an insurance industry white paper, published this year by RISCAuthority and the Fire Protection Association, sets out why. Worth a read.

2. Lack of performance data specific to mass timber buildings (how buildings fare in a loss event and how they have been repaired) by which insurers can price risk and dictate premium levels.

3. In the absence of the ability to accurately assess the Probable Maximum Loss, insurers must therefore assume (and price) for a total property loss in the event of a fire.

4. Similarly, insurers estimated maximum losses for escape-of-water claims are higher for mass timber.

5. Perception of risk exposure is poor (i.e., “timber burns & rots”) and the data to counter this perception hasn’t been sufficient to date, from the insurer’s standpoint.



York House, Eurban
Photo credit: Ahmad el Mad

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Mitigating Risk

1. Appoint a competent and demonstrably experienced design team

2. Engage early on with the insurance broker and providers – ideally at RIBA Stage 2

3. Adopt a ‘belts-and-braces’ approach to Fire Safety
   - - Early appointment of an experienced Fire Consultant
   - - Consider appointing a second fire consultant – to peer review the design
   - - Consider that large scale fire tests may be required
   - - Pay particular attention to combustible voids, particularly risers; consider full encapsulation or complete fill with non-combustible insulation
   - - Avoid green walls
   - - Consider hybrid structures
   - - Include fire suppression (sprinklers)

4. Adopt enhanced risk management protocols - apply the Golden Thread principle to information management

Insurance is available, capacity and cost depends on how well the proposal mitigates the risks

Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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Mitigating Risk cont.

5. Design a durable structure
   - Introduce a pitch to the roof if using solid CLT
   - Include details such as drainage cavities which prevent water ingress in high-risk areas.
   - - Consider avoiding CLT for balcony or walkway construction.
   - - Consider a ‘mixed’ structure – using concrete for the structuralmaterial of the ground floor and core
6. Adopt early warning systems in the completed building
   - Install moisture sensors within the mass timber in high-risk locations
   - - Install leak detection systems in wet zones as a bare minimum
7. Appoint a competent and experienced contractor
8. Protect the structure on site
   - - Develop a rigorous water management plan with the contractor – follow timber industry guidance around keeping wood dry.
   - - Protect the structure from moisture ingress using factory-applied coatings and on-site coverings.

Don’t rely on tick box lists in reports!

Appoint a competent design & construction team

*Engage **early** with your insurers*

Insurance is available, capacity and cost depends on how well the proposal mitigates the risks

Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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Insurance is available, capacity and cost depends on how well the proposal mitigates the risks.

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Emerging Solutions

- **Mass Timber Property Insurance Forum w/ Gallagher**
  - **April 2021.** “How to safely design a high rise mass timber building – A Case Study on Dalston Lane”. Presentations from Andrew Waugh & David Lomax, Waugh Thistleton Architects, and Alan Dowdall & Gavin White, Ramboll.
  - **July 2021.** “Fire safety in mass timber buildings; risk, spread & extinguishment”. Presentation from Sam Liptrott, OFR Consultants.
  - **October 2021.** “Repairability of mass timber structures”. Presentation from Phillip Zumbrunnen & Jonathan Fovargue, Eurban
  - **January 2022.** “Durability of mass timber structures”. Presentations from Andrew Lawrence, ARUP & Sarah Wakley, Leaksafe
  - **May 2022.** “Structural design of mass timber”. Presentations from James Walker & Martin Milner from Milner Associates.

Orsman Road, Waugh Thistleton Architects.
Photo credit: Ed Reeve

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Emerging Solutions

- **Timber Construction Insurance Association**

- An ongoing attempt to set up an ‘Alternative Risk Transfer’ insurance vehicle in response to the reticence of the traditional insurance market. for mass timber buildings, developed by three experts in design, risk and insurance, and joined so far by 7 large private developers.

- One such ART vehicle is what’s known as a ‘captive’. A captive is an insurance entity created and owned by one or several industrial / commercial entities, established to provide insurance cover for risks of the owners. This could bypass the traditional insurance market and provide a solution for members.

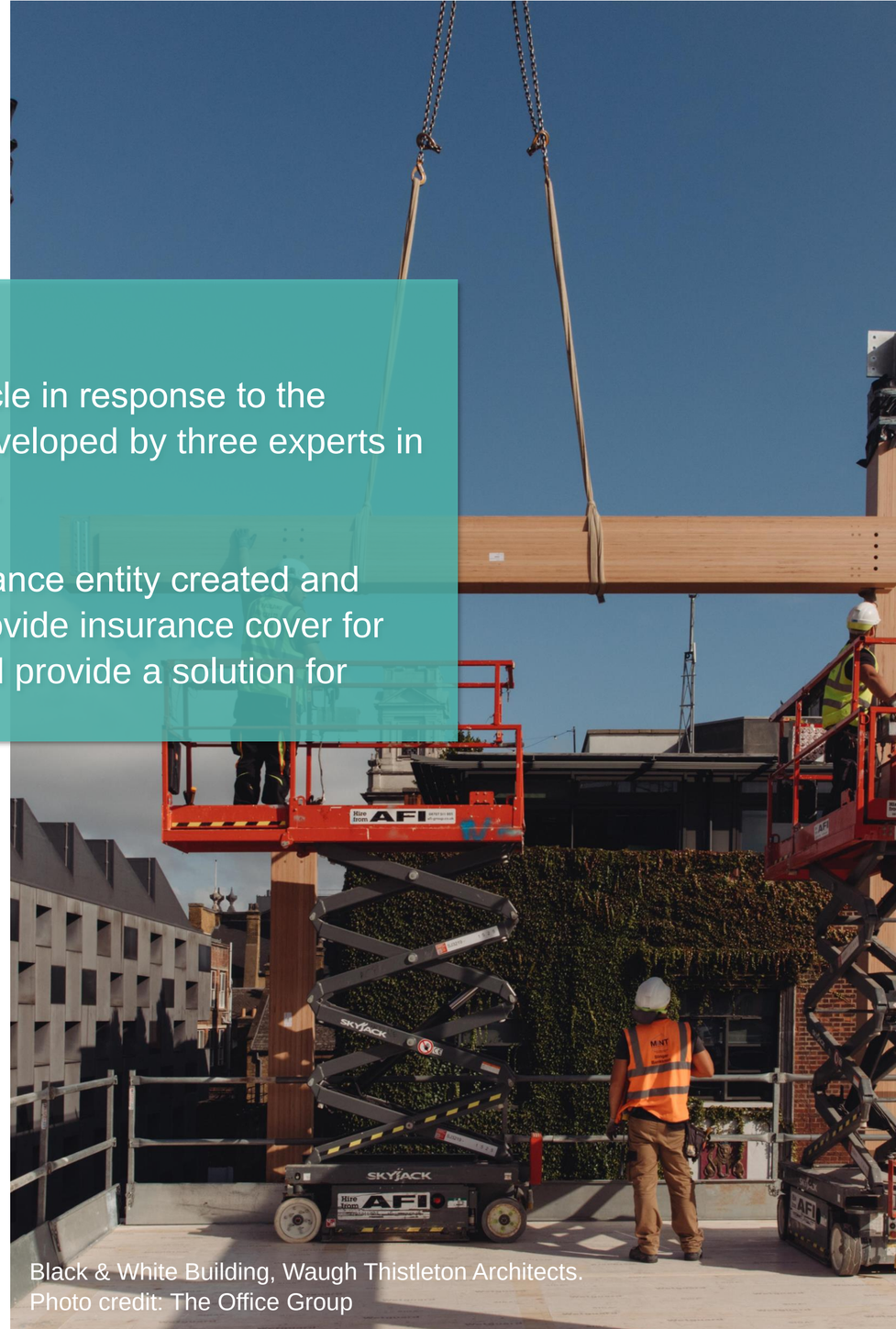

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Photo credit: The Office Group

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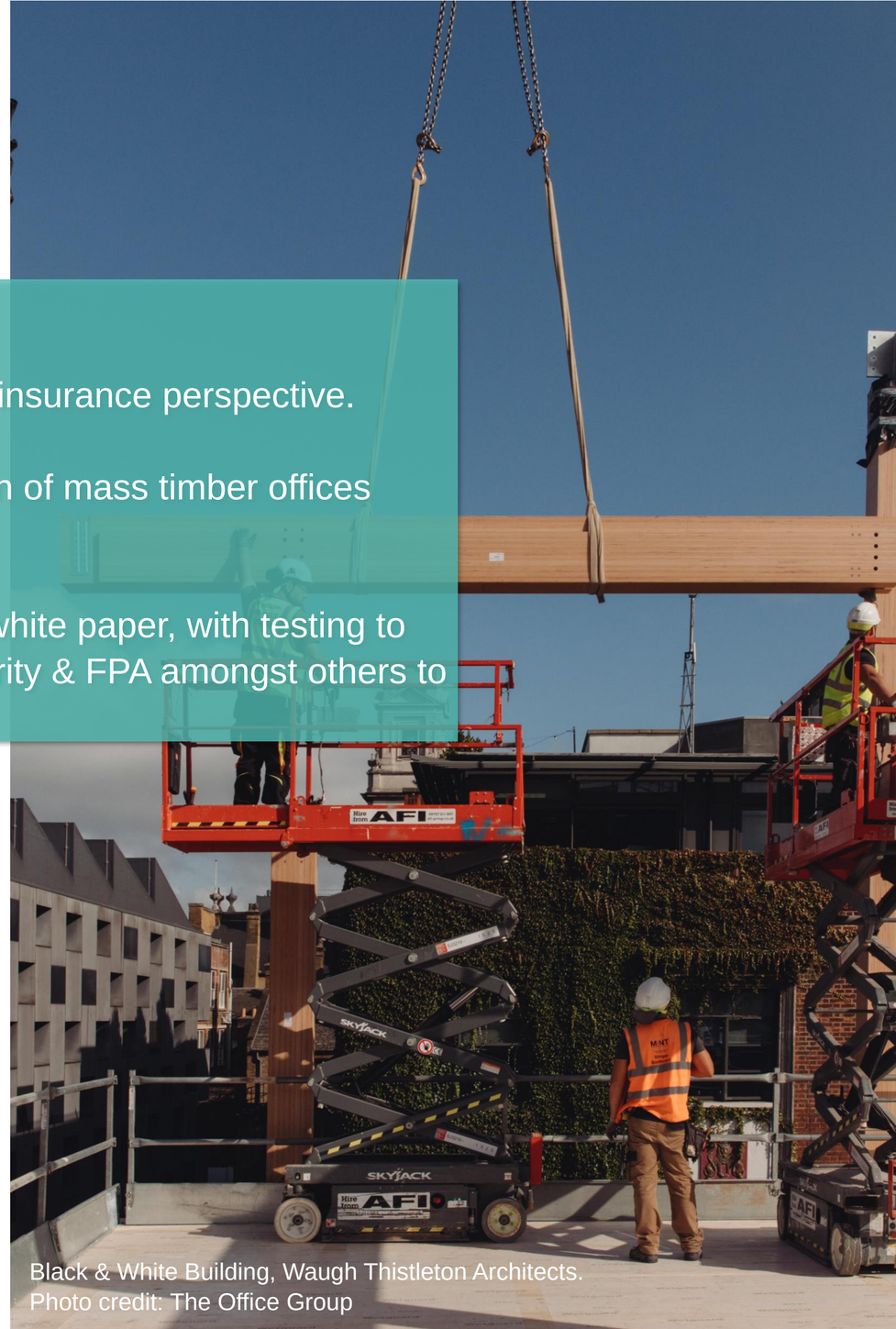
Emerging Solutions

- **Mass Timber Commercial Building Rulebook**
- Aim: To inform the design of Glulam/CLT/Hybrid offices - primarily from an insurance perspective.
- In the experience of designers & developers we have spoken to, the design of mass timber offices converges on a set of principles which are fairly standard.
- In a similar manner to the New Model Building, this will be presented in a white paper, with testing to back it up, following which engagement will be sought with the RISCAuthority & FPA amongst others to agree such an approach for insurable mass timber commercial buildings.



Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

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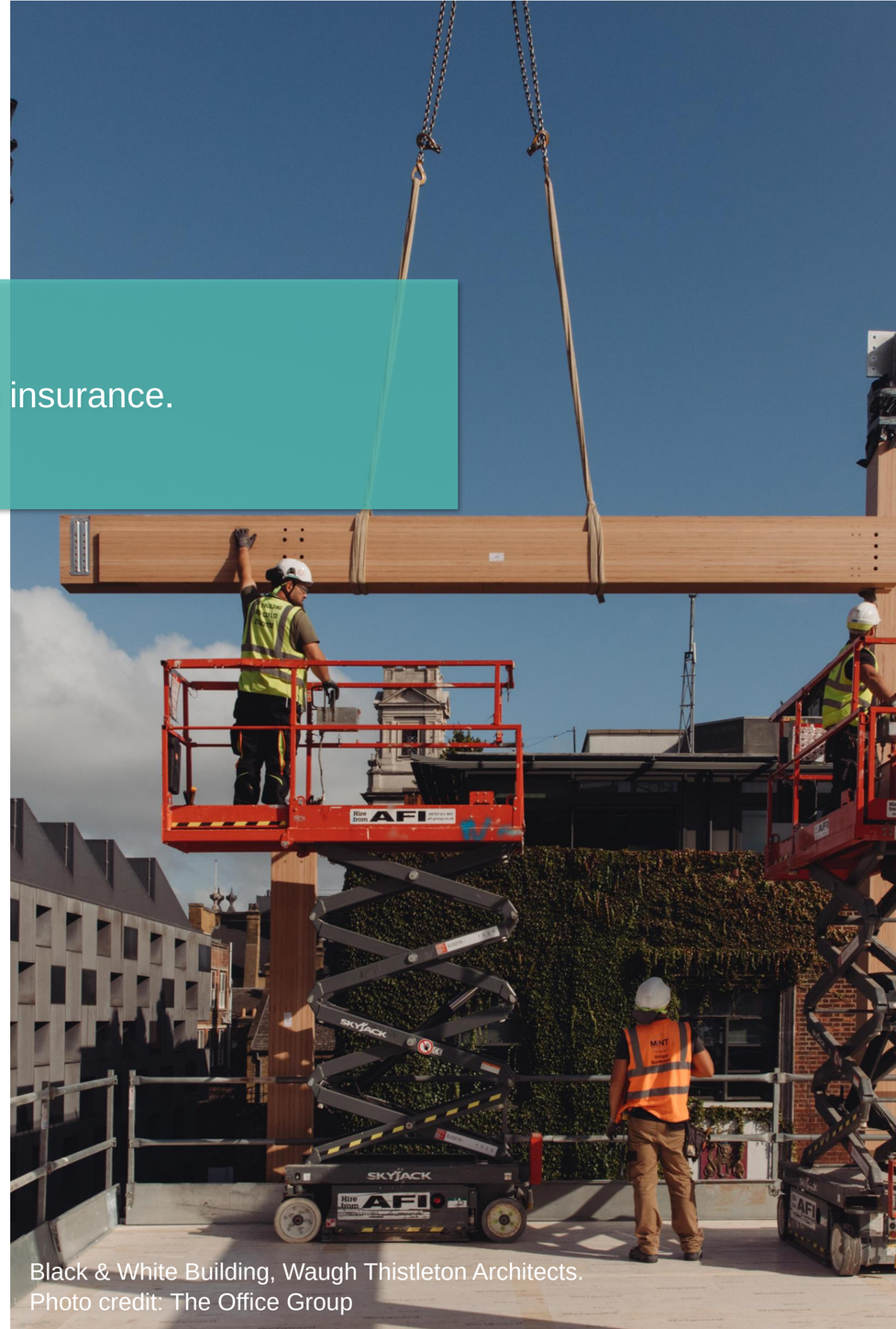
Emerging Solutions

- **Mass Timber Insurance Playbook : Engagement Guide**
- Aim: to provide guidance to developers and designers on how to approach insurance.
- Set out in-line with RIBA group stages.



Black & White Building, Waugh Thistleton Architects.
Photo credit: The Office Group

04:
Next Steps

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Government

- **Government Timber in Construction Policy Working Group**
- Aim: to draft a series of policies for ministers to consider for implementation, to see an increased use of timber
- Led by DEFRA w/ BEIS & DLUHC
- Looking specifically at policies for low-rise construction

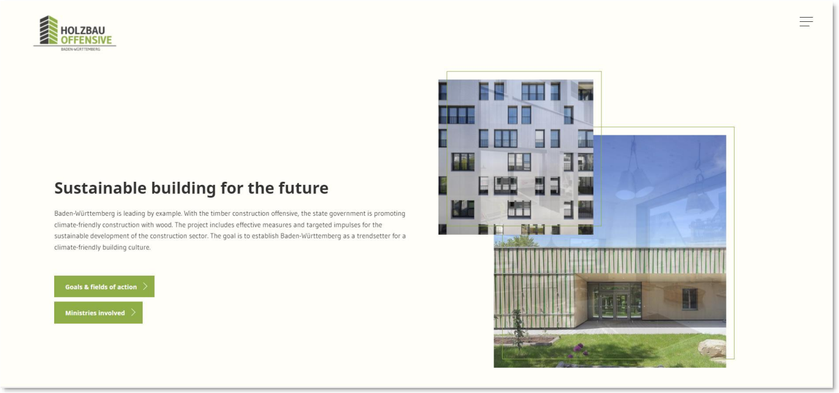

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Photo credit: The Office Group

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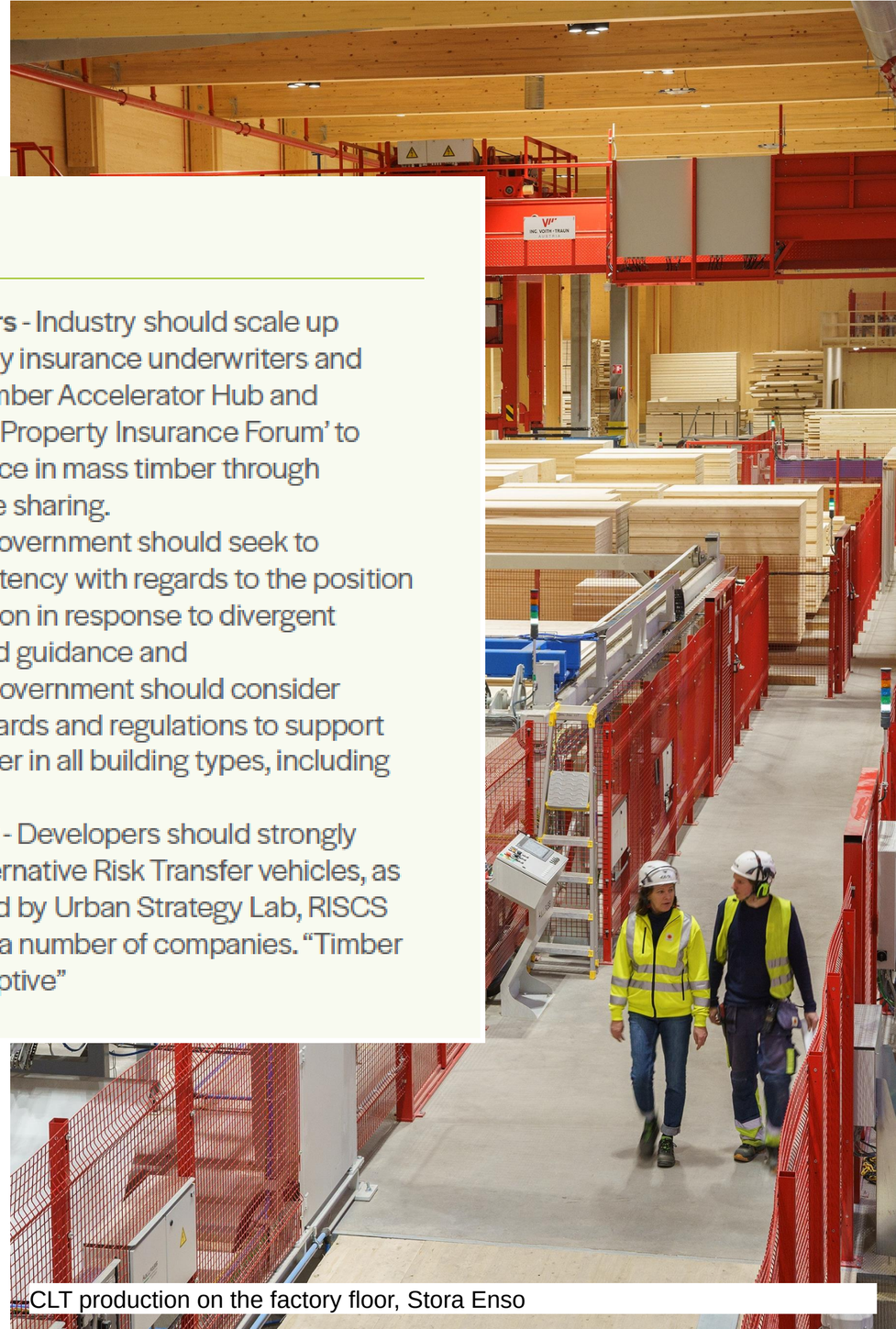
Key Recommendations

- **Large scale testing** - Industry, Government and funding bodies should provide resource towards developing a more robust evidence base to address prevailing fire safety concerns, such as OFR's fully costed proposal, "Research questions on the path to mainstream adoption of mass timber in commercial construction."
- **Establish a common approach to risk mitigation** - Industry should establish engagement with the FPA & RISCAuthority, ideally through a 'neutral' organisation (i.e., not a timber body), towards the creation of a common approach to risk mitigation for mass timber buildings. (i.e., a 'mass timber playbook'). This guidance should be simple, visually based and suitable for clients, design teams and insurers. "How to mitigate risk and gain insurance for mass timber buildings"
- **Engagement with insurers** - Industry should scale up engagement with property insurance underwriters and risk assessors through Timber Accelerator Hub and Gallagher's 'Mass Timber Property Insurance Forum' to increase insurer confidence in mass timber through education and knowledge sharing.
- **Consistent standards** - Government should seek to provide clarity and consistency with regards to the position of mass timber construction in response to divergent standards, regulations and guidance and
- **Dedicated standards** – Government should consider creating dedicated standards and regulations to support the safe use of mass timber in all building types, including those taller than 18m.
- **Alternative Risk Transfer** - Developers should strongly consider establishing Alternative Risk Transfer vehicles, as is currently being explored by Urban Strategy Lab, RISCS and Flaxman Partners w/ a number of companies. "Timber Construction Industry Captive"



CLT production on the factory floor, Stora Enso

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Steps towards an increase in mass timber buildings

This diagram outlines a number of actions that could be taken to support an increase in mass timber buildings, in response to the primary challenges of **insurance, fire safety & the regulations.**

Other actions should be considered to address other challenges; carbon accounting inconsistency, cost & supply, knowledge & skills

Can the project be built with mass timber within the current regulatory regime?

Current

YES

Most building types are **not** subject to any of the following:

- Regulation 7(2) of The Building (Amendment) Regulations 2018
- Draft new British Standard 9991
- Greater London Authority Affordable Homes Programme Funding Guidance 2021-2026

Yes

Actions to be taken to support an increase in projects

Actions

In most cases, mass timber represent a lower carbon option. If upfront embodied carbon emissions were regulated, mass timber provides a clear solution for the construction industry. Demand would increase rapidly following such a measure, which in turn would bring issues around insurance and fire safety into sharp focus, accelerating their resolution.

For further info on embodied carbon visit the websites of campaigning organisations Part Z or ACAN

Government regulation of embodied carbon emissions

Government must lead by example and procure timber buildings that are not covered by the combustibles ban: Residential below 18m, educational, cultural, industrial & commercial buildings.

Government procurement of timber buildings

OFR Consultants have defined a series of research questions on the path to mainstream adoption of mass timber in commercial projects - i.e. offices. This research is fully costed and should be a priority.

OFR fire testing &

Some restrictions apply

Certain residential buildings face restrictions, if they are subject to any of the following:

- **The combustible materials "ban" in Regulation 7(2) of The Building (Amendment) Regulations 2018**: *Residential buildings over 18m proposing timber in any part of the external wall.*
- Draft new **British Standard 9991**: *Residential buildings over 18m with only a single stair, proposing timber for any loadbearing element.*
- **Greater London Authority Affordable Homes Programme Funding Guidance 2021-2026:** *Residential buildings of any height proposing timber in any part of the external wall, if seeking funding from the programme.*

No

Actions to be taken to permit such projects

Recognition that *regulation* was changed and not the *guidance*

The Building Regulations 2010 is primary legislation, therefore an Act of Parliament is required if seeking an amendment or an exemption. Abridged wording:

"building work shall be carried out so that materials which become part of an external wall, or specified attachment, of a relevant building are of European Classification A2-s1, d0 or A1, classified in accordance with BS EN 13501-1:2007+A1:2009"

EITHER — OR

Amendment from "materials" to "systems" or "products"

Certain mass timber systems added to list of exemptions

Both suggested routes would require amendment to The Building Regulations 2010

Before either option can even be considered, a more robust evidence base demonstrating the safe use of structural timber in the external wall of high rise residential buildings must be established through further, and continual, research and testing.

Significant further

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OFR Consultants have defined a series of research questions on the path to mainstream adoption of mass timber in commercial projects - i.e. offices. This research is fully costed and should be a priority.

Alongisde this, and backed up by the results, a common approach to the design of commercial buildings should be established and agreed by develoeprs with insurance sector 'approval'.

OFR fire testing & "Mass Timber Commercial Playbook"

The New Model Building, to be published early 2022, provides an approved solution for residential buildings up to 18m. The design features a non-combustible wall build up, and creates standard details that can be adopted by others. The next step should be insurance sector 'approval'.

The practice intends to seek approval for a New Model Building up to 30m following this.

Waugh Thistleton Architects' New Model Building

Listen to insurers concerns. Increase knowledge on best practice for mass timber and demonstrate how the risks associated with timber, namely; use of a combustible structural material & moisture induced structural damage, can be mitigated and managed through the adoption of a number of design measures and risk management protocols.

See Section 2.8 , Page xx

Increase confidence amongst insurers

An UK based initiative led by Urban Strategy Lab, RISCS & Flaxman Partners is seeking to establish an alternative risk transfer vehicle, such as a 'captive', to provide insurance for mass timber buildings by 'bypassing' the traditional insurance market.

Signpost > Section 2.8 , Page xx

Formation of an Alternative Risk Transfer Vehicle (e.g Insurance captive)

Such a statement of clarity from the Government would help to reassure a wide range of stakeholders; investors, insurers & client bodies.

Statement of clarity that mass timber is safe for use in buildings not covered by the ban

Increased use of timber in low-rise residential, commercial, educational, industrial & cultural sectors.

Future

Before either option can even be considered, a more robust evidence base demonstrating the safe use of structural timber in the external wall of high rise residential buildings must be established through further, and continual, research and testing.

Only when evidence is sufficiently robust and outstanding safety concerns have been addressed, should the regulations be amended. Given the urgency of the climate emergency and the timescales involved - this should be an upmost priority.

Significant further testing to increase evidence base

May require new British Standard alongside BS 8414

BS 8414, a key plank of the UK's testing regime for facade systems, has been discredited by multiple industry figures, and is unsuitable for testing systems fixed back to a timber substrate.

New 'route to compliace' based on updated testing and regulatory regime

Alongside amendments to regulations, statutory guidance should be produced, perhaps as an amendment to Approved Document F, that sets out an approved route to compliance.

Able to build

Renewed use of timber in medium & high-rise residential.

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