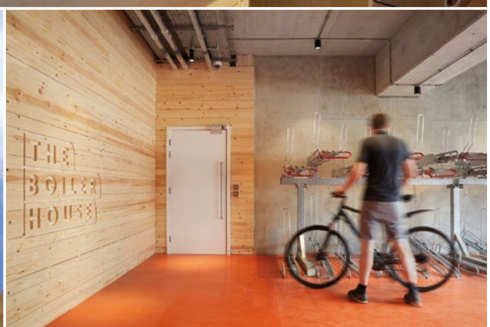
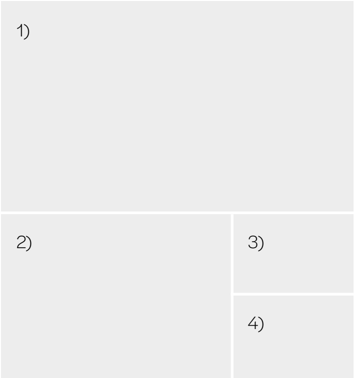
The Mass Timber Insurance Playbook:

A guide to insuring mass timber buildings

ASBP The Alliance for Sustainable Building Products

Co-authored by Philip Callow and Jim Glockling.
Funded by Built by Nature, Marsh and Zurich Resilience Solutions.





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Contents

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Built by Nature

As a network and grant-making fund accelerating the timber building transformation, Built by Nature is proud of our role in supporting the development and dissemination of the Mass Timber Insurance Playbook.

We recognised that this Playbook would articulate clear solutions and practical steps to tackle one of the most challenging barriers to the adoption of mass timber in construction – the ability to secure cost-competitive insurance for large-scale projects in the UK marketplace.

Reflecting our commitment to connecting key actors across the built environment to explore solutions, we are encouraged that this Playbook is the product of deep collaboration between experts in the field with extensive knowledge of the fundamental risk factors involved and the commercial interests underpinning the demand for mass timber. As a result, this Playbook will carry considerable credibility, with buy-in from a broad range of influential players and organisations in the industry.

We see this as a relevant and timely instrument in our mission to reshape the built environment system, and Built by Nature wishes to thank and congratulate all those who have contributed their time, expertise and commitment to the Mass Timber Insurance Playbook.

Amanda Sturgeon, CEO Built by Nature
https://builtbn.org

Foreword

The built environment is a key contributor towards global carbon emissions and for the UK to achieve net zero carbon emissions by 2050, the carbon footprint of a building must be reduced. To do this, new initiatives on how buildings are designed, constructed, maintained, operated and decommissioned must be embraced.

One of the key initiatives being adopted by building developers, owners and designers is to replace materials such as steel and concrete, with more carbon friendly materials such as mass timber. However, there is significant difficulty in obtaining both construction and property insurance as these buildings have an increased risk profile given the very different native resilience of timber to fire, water and pest exposure when compared to the materials it seeks to replace. When an insured loss occurs, the extent of damage can be far greater, especially if specific efforts have not be made to address the lost resilience.

The insurance industry wants to support sustainable construction but for this to happen there must be a better understanding of the needs and requirements of all parties involved. By engaging with the insurance industry earlier in the building's lifecycle and through close collaboration by all parties, then we can overcome the insurance challenges.

The Mass Timber Insurance Playbook (MTIP) was created specifically to help create a platform to facilitate this collaboration and early engagement. The Playbook aims to do this by giving the reader insight into the key insurer considerations, providing engagement guidance linked to the Royal Institute of British Architects (RIBA) stages and outlining some of the essential principles of risk mitigation. The Mass Timber Insurance Playbook provides us with a real opportunity to address all parties' needs and deliver sustainable buildings that are considered best in class for building safety and property protection both, during construction and operation.

We would like to thank the dedicated organisations who participated in the production of this Playbook.

Robert Innes, Senior Risk Engineer and Construction & Power Team Leader, Zurich Resilience Solutions

About
The MTIP has been co-authored by Philip Callow and James Glockling, managed and organised by the ASBP (Simon Corbey and Asselia Katenbayeva). Infographics and comms contributions from Richard Broad.

To be representative and reflective of the current landscape for the insurability of mass timber, extensive research, interviews, review and feedback was sought from key individuals and companies from all the relevant industries and professional services that are required to design, build, operate, own and insure buildings where mass timber is used. As such, we hope that the MTIP reflects not only the author's own views but more accurately the current state of play and what is possible to achieve.

→ The Mass Timber Insurance Playbook provides us with a real opportunity to address all parties' needs and deliver sustainable buildings that are considered best in class for building safety and property protection both, during construction and operation.

Orsman Road, Waugh Thistleton Architects.
Photo by Ed Reeve.

2 How to use the Mass Timber Insurance Playbook (MTIP)

This Mass Timber Insurance Playbook provides a framework for eliciting, understanding and resolving the risk challenges that are currently hindering insurance provision for mass timber buildings.

The process follows the accepted methodology as outlined in RISCAuthority[a] Building Design and Management Guidance BDM01 '*A to Z of Essential Principles for the protection of buildings'* – simplified to specifically address mass timber buildings.

The MTIP is aimed at all buildings where mass timber is used aside from single dwellings. Whilst example solutions to key issues are mentioned for guidance, the Playbook is non-prescriptive, affording the designer all of the normal freedoms to resolve the identified issues by the most appropriate means that satisfies the needs of all stakeholders. It is also hoped that by providing a simplistic guide to what insurability features are important to underwriters, users of this guide can adequately prepare for that procurement process.

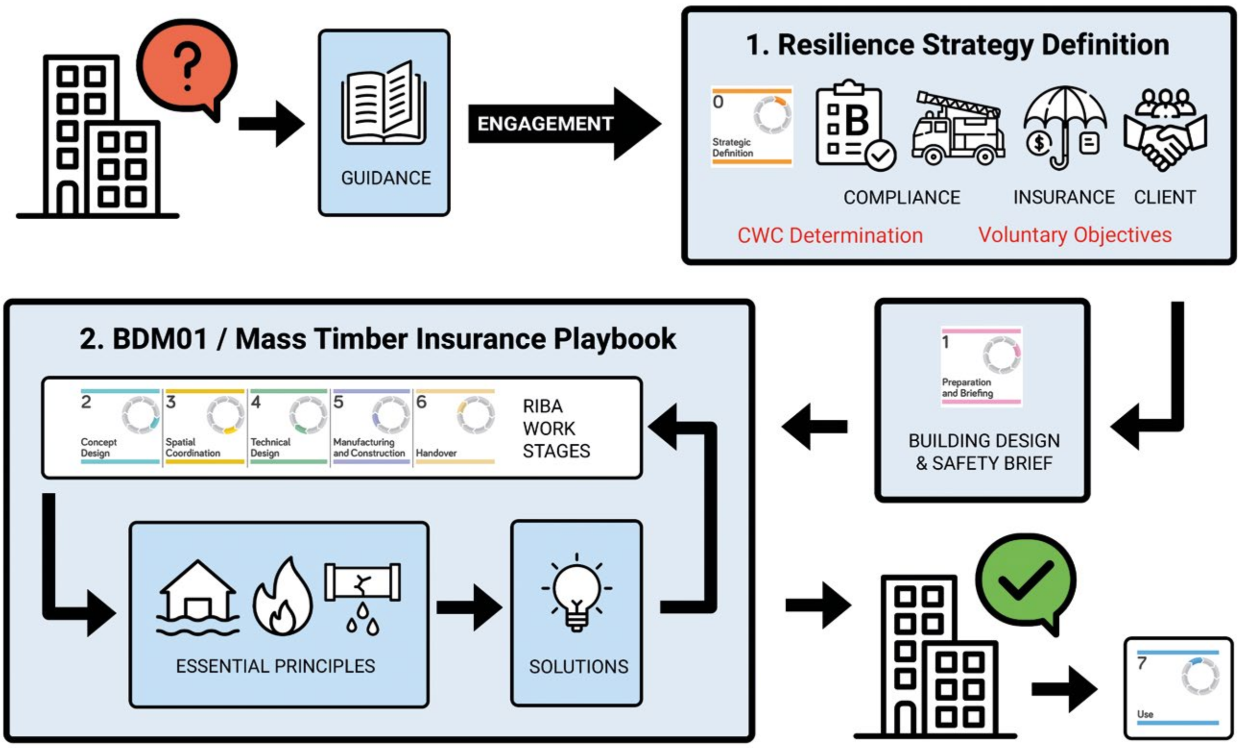
Use of the MTIP cannot guarantee insurability but through improving the risk profile and early engagement with insurers, every opportunity for a satisfactory outcome will be explored.

The components of the MTIP are:

1. Qualitative Design Review
2. Solutions Engineering (MTIP)
3. Peer Review

as outlined in the graphic below.

Figure 1: Process



[a] RISCAuthority is the UK insurance annual research scheme that works to analyse and disseminate loss control guidance in all areas of property risk control. Its membership accounts for more than 95% of UK commercial insurance.

CWC - Credible Worst Case scenarios.

A Qualitative Design Review or QDR is defined in PD 7974: 2001 as *the initial stage of any engineering design in which the basic design parameters for a project are established and the scope and objectives of the fire strategy can be defined.* Government guidance does not consider mass timber building a ‘common situation’ and to this end, the application of Approved Document B (ADB) is not permitted, requiring an ‘engineered approach’. Whilst this is often conducted only from the perspective of life-safety (satisfying legislation), insurance of large mass timber buildings demands additional consideration of property and business protection and overall resilience to fire and other insured perils such as escape of water (EoW), flood, infestation and weather. How to conduct the QDR effectively is not specifically described here however, but should result in the determination of a Building Design and Safety Brief that presents:

- Compliance objectives (Government, Building Control and Fire Service)
- Voluntary objectives (Client, lenders, tenants and insurers)

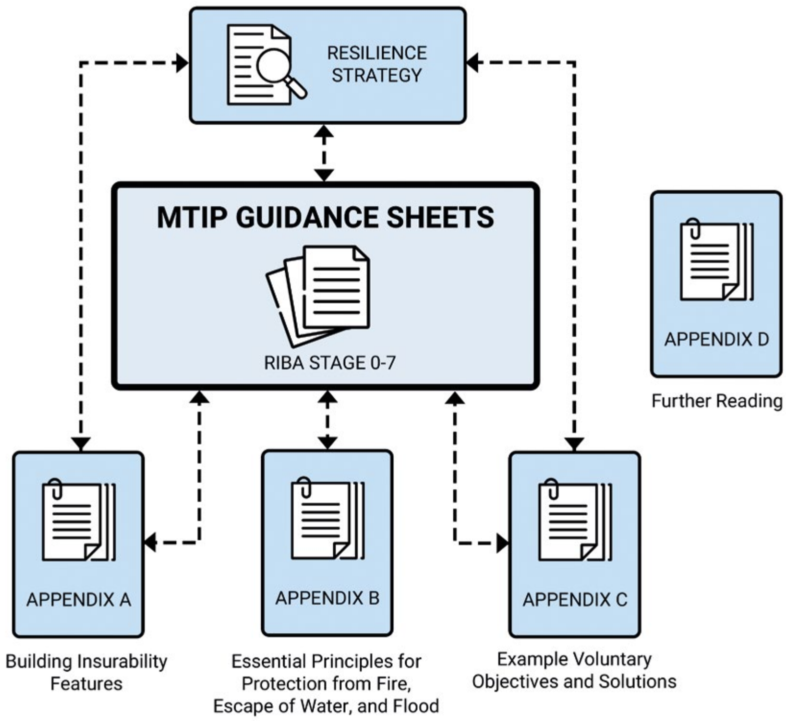
against revised Credible Worst Case (CWC) scenarios (CWC scenarios are challenges that need to be addressed within the design and might include arson in areas of high crime; specific ignition sources and fuels pertinent to the machinery housed and materials stored; and challenges of occupation of the building such as hoarding).

Having established the Building Design and Safety Brief, the Playbook introduces the insurers’ Essential Principles for fire, flood and escape of water mitigation as key points of reference to within each phase of the RIBA Stages which are presented as a series of Guidance Sheets. Some will be more relevant to each design stage than others and many are not addressable through building design alone. By considering each Essential Principle at the appropriate time, opportunity exists to address these and sample methods are proposed for ameliorating risk.

The principles of the MTIP can be used for any construction or property insurance purchase and are not limited to mass timber buildings. Using these principles can improve resilience with obvious beneficial impact upon insurability, relationships between key parties and the overall risk management of the built environment.

The MTIP is structured as shown below:

Figure 2: MTIP Structure



The framework provided gives a logical means for addressing all stakeholder risk mitigation interests over the entire life-span of the building. The survival of the building for its working life-span is an essential component of fulfilling a sustainable lifecycle that includes deconstruction and recovery and reuse of materials with minimal carbon impact.

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Our explicit aim is to support the increased use of mass timber in construction and the carbon reduction it can enable, in a manner that maintains a level of building resilience that protects the client's business.

Photo: ©Richard Fraser, Oundle School

3 Introduction

The Mass Timber Insurance Playbook (MTIP) provides guidance for all parties on how to secure an equitable insurance policy for both the construction and operation of mass timber buildings

The perspectives of the client, designer, architect, insurers, broker, lender, fire service, fire engineer and building control can be different, requiring language, definitions and actions that might be alien to some but must be understood if progress is to be made.

Buildings with combustible structural elements and a sensitivity to water, can have radically different risk profiles and challenge the fundamental principles and methods of insurance loss estimation both during construction and whilst in operation.

Reliance on and compliance with building regulations and design codes (historically the explicit goal of many designers), is not always meaningful to insurers and clients, such is the difference between life-safety and the pursuit of an acceptable level of property / business protection.

The provision of both construction and property insurance is a commercial choice as is lending. Simplistically, there is no requirement to purchase or to offer insurance cover and there is no requirement for lenders to offer mortgages against them. As such, the successful provision of cover requires an agreement between insurers and the insured. As with any such commercial agreement, all parties are free to offer and accept terms and conditions of their choosing.

Given this, the MTIP explains the needs and requirements of insurers for the benefit of anyone seeking to purchase insurance for either the construction or operation of a mass timber building. Its explicit aim is to support the increased use of mass timber in construction and the carbon reduction it can enable, in a manner that maintains a level of building resilience that protects the client's business, will act to obtain the best response from the attending fire service in the event of a fire, appreciates all perils and associated contributing factors and will be insurable. Compliance with building regulations and design codes is assumed.

3 Introduction (continued)

A starting point for the MTIP is to understand:

- Who are the key design stakeholders?
- What are the challenges that need to be addressed?
- What are the key differences between life safety and property protection objectives – Setting Voluntary Objectives?
- What is Estimated Maximum Loss?

Each of these are discussed in turn below.

3.1 Who are the key design stakeholders?

The principal stakeholders in setting and defining the design and performance requirements of the building for designers and architects to work towards are:

- The Government
- The client
- The insurers (a subset of the client's requirements)

3.1.1 The Government
The Government's role in building specification for fire safety is the protection of life. This remit extends to occupants, those around the building and the attending fire service.

All fire safety measures and the methods and products on which they depend, are based around curtailing fire spread and ensuring the structural stability of the building for a period of time that is coherent with the effective evacuation of persons from the building. After this time has elapsed, there is nothing in regulation (for any construction method), that requires the extinguishment of the fire or an assurance that anything is recoverable following the event.

→ Anything that the client, occupier or insurers expect, or may wish to achieve by way of asset or capability protection, is an entirely voluntary pursuit which reinforces the need for early consultation with key stakeholders and setting of design objectives.

Anything therefore that the client, occupier or insurers expect, or may wish to achieve by way of asset or capability protection, is an entirely voluntary pursuit which reinforces the need for early consultation with key stakeholders and setting of design objectives. Reference is made to this in Section 0.7 of the Building Regulations 2010 Part B Fire Safety Vol1 & Vol2 as follows:

Property Protection
0.7 - The Building regulations are intended to ensure a reasonable standard of life safety in a fire. The protection of property, including the building itself, often requires additional measures. Insurers usually set higher standards before accepting the insurance risk.

Many insurers use the *RISCAuthority Design Guide for the Fire Protection of Buildings* by the Fire Protections Association (FPA) as a basis for providing guidance to the building designer on what they require.

Further information on the protection of property can be obtained from the FPA website **www.thefpa.co.uk**

Another vital aspect to appreciate in respect of legislative fire safety provision, is that the protection provided is based upon a number of assumptions in respect of the Credible Worst Case (CWC) fire scenarios that may occur and where they might happen in the building. Regulations cater only for common circumstances during the operational phase, such as failure of electrical devices within a room or an inappropriately discarded cigarette. They are not designed to deal with more onerous situations such as deliberate fire raising, abnormally high fuel loads from hoarding or storage of hazardous materials or fire ingress from external sources – all, some or others, of which might be important to a client, occupant or their insurers.

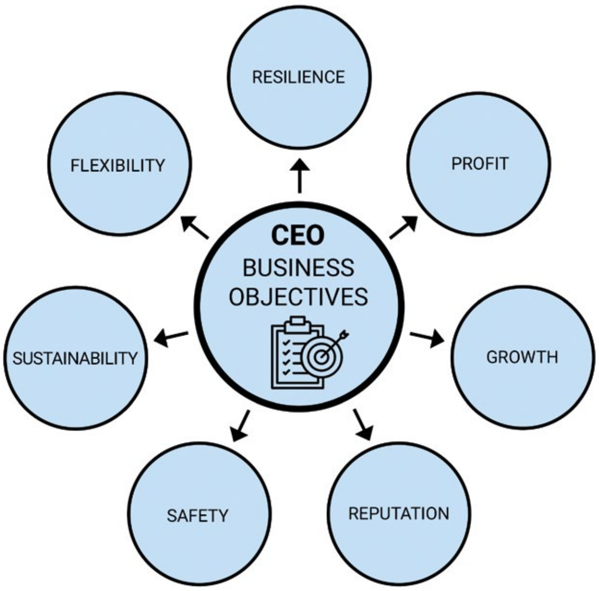
The weakness of building regulations to supporting business and property protection has always been the case but in many respects, this shortfall has been compensated for by a prevalence for large building construction out of non-combustible materials, principally steel and concrete. With the necessary move to mass timber methods and the carbon saving benefit it brings, the relevance of an exclusively compliance-only goal is increasingly meaningless to the building's insurers and the importance of embedding protection measures both during construction and once in operation, has never been greater.

In satisfying legislation, key stakeholders include Local Authority Building Control (LABC) and the Fire Service.

3.1.2 The Building Owner

Every business and service provider will be cognisant of their legal obligations for safety and their business objectives. It is in the remit of every CEO to ensure their business is profitable, that their workforce is not harmed and to act in the long-term interest of the shareholders. Inherent in the latter, is being resilient against adverse conditions. Other customer facing factors might also be considered as indicated in the diagram below:

Figure 3: Business objectives



Clearly, mass timber designs can support higher level Environment, Social and Governance ambitions including:

- Sustainability
- Reputation (green credentials)

But if done without due consideration of introduced risks can erode:

- Resilience
- Flexibility
- Safety

And a disproportionate scale of loss can lead to:

- Reduced profit
- Impaired growth
- Lost / missed opportunities
- Fines
- Reputational damage

All businesses and service providers should be knowledgeable in the process of Business Continuity Planning (BCP), a strategy for determining which processes and resources must be available if critical damage to the business is to be avoided. Resources in the form of buildings, their sub-compartments, the equipment they contain and the function the equipment performs, can feature very heavily in a Business Continuity Plan and as such there presents a great opportunity for architects and designers to embed these requirements within the design as a suite of 'Voluntary Objectives' – giving the client the building they need to support their aims and objectives and making their business better and stronger, rather than giving them the cheapest building that legislation (in respect of property protection) allows.

3 Introduction (continued)

3.1.3 The Insurers
The insurers and business owner resilience objectives will generally be aligned and often as not, the insurers perform the role of being a key consultation resource in assisting their clients establish the balance of risk transfer to reach acceptable terms of insurance. Damage to a building from fire, flood, moisture, escape of water and other perils can result in insured loss by:

- Material Damage (MD)
  - Building
  - Contents
  - Machinery & Plant
  - Stock
- Business Interruption (BI)
  - Loss of Gross Profit
  - Loss of Rent

Provision of insurance requires the insurers to have an understanding of the building's risk profile to make an estimation of the potential for loss. In respect of fire, design features that may allow the spread of fire within or over a building and impact structural integrity, will contribute greatly to this estimation. The generic term for this assessment is 'Estimated Maximum Loss' (EML), a vitally important facet which is discussed in more detail in Section 3.4.

It is also important to note that whilst the subject of this Playbook is 'Mass Timber' and that there might be an assumption that the focus is exclusively on fire, many other building design features and perils come in to play when considering insurability. Twenty-six insurance relevant features, assigned to six overarching categories, are presented and discussed in greater detail in Section 3.2 and are listed in Appendix A.

→ It may surprise many that, in respect of mass timber construction, some insurers view the wet peril challenges (sudden and unforeseen escape of water, flood, moisture and water ingress), as more concerning than those related to fire.

Large fires are rare but immensely costly events. Water damage events are both costly and frequent and result in enormous cumulative costs (in the residential sector, escape of water costs alone were greater than fire and security related losses combined and in the multi-storey environment this will be amplified further). It may surprise many that, in respect of mass timber construction, some insurers view the wet peril challenges (sudden and unforeseen escape of water, flood, moisture and water ingress), as more concerning than those related to fire. Long term exposure to moisture and water can be a contentious area and may or may not be covered under a construction or property insurance policy but may be a matter for a warranty or Professional Indemnity claim[b]. The opportunity for local repair may be higher for moisture damage but it is not uncommon for issues of this type to be systemic.

It is rare for the provision of insurance to be a barrier to the roll out of a new building method but the potential impact of the increased susceptibility of timber to fire and water exposures over other more traditional building materials, cannot be underestimated. Factors that contribute extensively to the reinstatement of a property and its associated capability following loss include:

- extent of structural damage
- ease of assessment of extent of damage
- supply chain
- ease and cost of system repair and availability of experience labour
- displacement of occupants and delays to rebuild programme
- and many more factors besides.

[b] Designers need to ensure their PI insurance extends to mass timber in particular

Whilst the assessment of structural damage to steel and concrete buildings is well-trodden territory, the same might not be true yet for mass timber systems. For example, exposed timber components, albeit structurally sound, may have greater associated recovery costs to reinstate architectural finish.

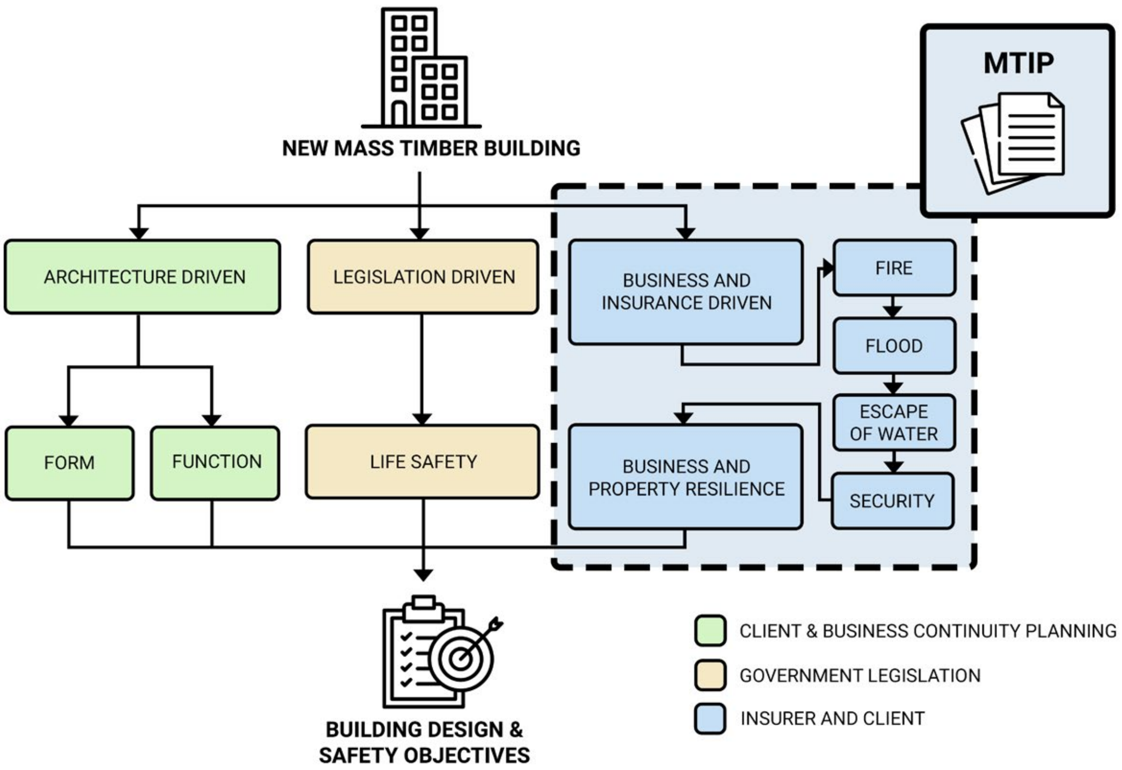
Insurers hold a register of 'Essential Principles' for loss mitigation from fire, flood and escape of water. These are referenced extensively within the MTIP and called up for consideration within the framework of the RIBA Stages (Royal Institute of British Architects). The Essential Principles (based on RISCAuthority Building Design and Management Guidance BDM01 *'A to Z of Essential Principles for the protection of buildings')* and potential methods for meeting them, are given in Appendix B.

3.1.4 Summary

Whilst the above may seem to be complex and challenging, at its core the risk transfer mechanism contractually bound by a construction or property insurance policy, is dependent on the effective management of risk. In the absence of prescriptive regulation with regards the use of mass timber, it is beholden upon the insured to mitigate the core risks of fire and water damage where possible.

The MTIP seeks to drive positive change across the design, construction and operation of our built environment through the early engagement of all relevant stakeholders and the application of principles aimed at delivering best-in-class mass timber buildings.

Figure 4: Stakeholder engagement in setting the Building Design & Safety Objectives



3 Introduction (continued)

3.2 What are the challenges that need to be addressed?

The use of timber as the main structural building component is just one of many features that will contribute to the overall insurability of a building and it is important that users of the MTIP have an awareness of these to ensure that the overall design is insurable. These features describe factors that may contribute to large-scale fire spread either internally, through voids and occupied spaces or externally over the envelope of the building. The sensitivity of mass timber systems to water exposure is also addressed together with options for mitigation against both fire and water exposure.

By way of example, carbon reduction initiatives, such as the increased use of timber in buildings to replace concrete and steel, are often accompanied by other measures such as green walling, solar energy generation and electrical storage systems, to name but a few; all of which will act to collectively alter the risk profile of the project. Just as timber requires additional consideration by insurers, so too will the potential for fire spread over green walls, the fire safety of solar generation systems, the impairment to fire fighting activities these may cause and the challenges of high-current / low voltage DC energy storage systems. The insurability of any building, even of concrete or steel frame, might be compromised if clad in combustible materials or greened over without compelling mechanisms in place to control the risk of external fire spread.

The aforementioned twenty six insurance relevant features can be split into the following six, high-level categories:

- Occupancy
- Scale
- Structure and Fabric
- Other Risk Factors
- Fire Mitigations
- Water Exposure Mitigations

→ Residential and commercial buildings are subjected to different regulatory requirements and shared usage can result in great complexity for risk profiling given the shared responsibilities and influences present.

The relevance of each feature in establishing overall building insurability may be heavily influenced positively and negatively by other features included in the design. Insurers will have their own view of the importance of each feature and the trust they place in the correct function of all active, passive and management controls when required. Each of the categories is described briefly in turn below and it is recognised that only certain risks may be addressed through building design.

It is also important to note that supply-side challenges can have a negative effect on the insurability of a building given long or unknown replacement times. However, as supply chain issues are variable/cyclical, it does not form part of these features but can be an important consideration for insurers when reviewing the structure and fabric of the building.

3.2.1 Occupancy

The functional purpose to which the building is put, is a key factor in determining whether the materials, systems and management controls put in place to assure overall safety and resilience, are appropriate to the people that occupy them, their daily activities and the business conducted within. Industrial processes may warrant the use of more intrinsically robust materials, to separate areas of particularly high risk or value. Similarly, commercial, residential and mixed-use buildings may require different features to account for the varying levels of familiarity, states of consciousness and abilities of the occupants. The use of the building and its ability to survive fire and water exposure events can have an enormous impact on the costs associated both with material damage (to building, contents and plant) and business interruption.

Residential and commercial buildings are subjected to different regulatory requirements and shared usage can result in great complexity for risk profiling given the shared responsibilities and influences present. These are discussed in more detail in Appendix A.1

3.2.2 Scale

The scale of the building and its sub-compartment in association with its proximity to other buildings, essentially sets the maximum worst case limits on what can be lost to any single event. The key parameters are:

- Building height and number of storeys
- Building footprint area
- Size of largest compartment by area and volume
- Separation from other buildings and interconnectivity through bridges, podiums and basements

As buildings increase in scale, so too will the value of EML (See Section 3.4). The % EML of overall insured value may also increase as larger buildings might have larger compartments and in the multi-storey situation, more floors may be expected to be involved in any given loss event to fire and water and the effectiveness of the fire and rescue service may be impaired.

Photo: ©Archetype/Jack Hobhouse, Harris Academy

3.2.3 Structure and Fabric

The structure and the fabric of the building can exert great influence in respect of the susceptibility and response of the building to fire, water, rot and infestation exposure threats throughout all periods of its life: during construction; from occupation; and through change and wear and tear over time and as such, is a key focus of insurers consideration.

The key features are:

- Building structure material
- Ground floor structure
- Construction method
- Core structure and overall structural stability
- Floor / ceiling structure
- Cladding system
- Interior surfaces

Newer building methods, the drive for sustainability, the need to use recycled materials and improving thermal performance demands, can act to introduce more combustible materials into the structure, insulation and cladding of all new buildings which can promote fire spread and reduce overall building resilience. The above are discussed in greater detail in Appendix A.2.

3.2.4 Other Risk Factors

In addition to the materials of construction, building size and occupancy, many other features are known to play a part in the potential for negatively impacting on physical loss/damage from fire and water exposures. These include:

- Atria
- Internal car parks
- Balconies
- Swimming pools & spa baths
- Hazardous materials
- Green / planted surfaces
- Green energy systems

The above are discussed in greater detail in Appendix A.3.

3 Introduction (continued)

3.2.5 Fire Mitigations
Systems put in place to address insurance concerns are considered in the context of the role they may play in reducing likelihood of loss and/or scale of loss. The impact may be included in some but not all loss calculations because, as with any system, they too can fail or are only relevant for a specific period of the building's life. It is important to note that life-safety systems such as water mist systems, detection and alarm systems and some forms of sprinkler protection (domestic and residential systems), might be ignored as being irrelevant to the curtailment of loss for insurance purposes. Fire mitigations considered, include but are not limited to:

- Combustible Void Protection
- Detection and Suppression Systems (Fire Sprinklers)
- Separation between buildings and compartmentation
- Fire fighter Provisions
- Stairwells

The above are discussed in greater detail in Appendix A.4.

3.2.6 Water Damage Mitigations
For certain building geometries and material make up, water damage may pose as great a financial risk as fire if not more and can include the following sources:

- Construction entrapment
- Failure of envelope
- Escape of water
- Flood
- Condensation

The key mitigations for protecting against flood, escape of water and water ingress events, are given in Appendix A.5.

3.3 What are the key differences between life safety and property protection objectives – setting Voluntary Objectives?

As previously stated, life-safety objectives mandated in law, essentially stop at ensuring the structural integrity of the building for a period of time that is coherent with evacuation. That is to say, structural protection is assured only for a period of time which, once passed, has no further role to play. That said, there is an expectation that buildings will perform better and that not every fire will result in a total loss of the building. This expectation is entirely coincidental with the traditional use of non-combustible materials as the key means of assuring life-safety and going forward, it is possible that the increased use of combustible building materials will create a 'new-normal' of greater loss expectation if additional property/business protection objectives are not included in the design brief.

The performance based engineering approach to fire safety is a toolkit of parts that can be used to meet any specified objective. Without asking for anything else, a fire engineer may design for compliance but should also ensure that the proposed design aligns with the BCP goals of their client and for securing insurance on acceptable terms.

These business and property protection Voluntary Objectives may be specified in a number of ways and at very different levels of granularity. For example:

- As a reinforcement to building regulations requirement – i.e. the fire shall be contained to the compartment of origin (the modification being that the fire resistance period which in law might be 60 minutes, is extended to become infinite).
- As a business continuity objective – i.e. a fire shall never cause an amount of damage that exceeds the critical damage threshold. Other examples might include a requirement to recover the space and the capability within a timeframe of x weeks etc.
- As a business operations objective – i.e. the building will reduce the businesses carbon impact by y% without reducing overall resilience to business process (the modification being an over arching look at introduced challenges and necessary mitigations for resilience equivalency).
- As an insurers requirement – i.e. to ensure damage never exceeds an EML (see later) of z%.

Agreement of these voluntary Building Design & Safety Objectives will be fundamental to satisfying all stakeholders and the process outlined in this Playbook will assist the designer to understand a process for their consideration, adoption and implementation. Examples of some Voluntary Objectives and solution options are given in Appendix C.

3.4 What is Estimated Maximum Loss?

Insurers use a range of methodologies to estimate potential loss to combined property and business interruption damage. Their meanings and interpretations may vary between insurers and differ through the inclusion or exclusion of mitigations, such as fire sprinklers and the ability of passive features to perform. Regardless of these variations, the key requirement for all insurers is to establish the Estimated Maximum Loss (EML).

Scale is a vital feature of insurability and can exert great influence during the consideration of provision of building insurance, especially where novel methods and materials are used where little claims experience may exist. EML is the most commonly used number for the analysis of insurability and where insurance provision is troublesome, all measures taken to improve the situation must demonstrably act to reduce EML.

Two key areas of interest for the insurers in respect of mass timber construction include:

- Fire spread within a building (EML)
- Fire spread between buildings (EML/Accumulation)

3.4.1 Fire Spread within a Building
Only in certain established commercial and heritage risks is insurance provided on the basis that the whole building or business would be lost in the event of a fire – an EML of 100%. If the insurers can be convinced that the protection measures in place will curtail damage to a lesser amount, then provision of insurance can be made more readily and at a better price.

Using a crude analogy for a high-rise building of 20 storeys, an assumption might be made that during a significant fire event, the fire floor would be lost, two floors above might be lost to smoke damage and a floor below to water damage from fire fighting activities. The assumption is therefore, the loss of 4 floors of 20 or, an EML of 20%. It is important to understand however what features give the insurers confidence that such a model is appropriate:

- There is an assumption in this case that the compartmentation is good enough to ensure the fire cannot spread internally from the floor of origin to other floors above or below. Historically this is associated closely with being a property of concrete floor slabs and non-combustible voids for the routing of services.

- There is an assumption that fire cannot spread within internal cavities to other floors or the roof.
- There is an assumption that fire cannot spread externally to other floors via the cladding and insulation materials.
- There is an assumption that the building remains suitably stable during fire to support effective Fire Service intervention and the structure does not add to the fire load.
- There is an assumption that fire will not spread to other buildings.

Now think of this in the context of mass timber construction methods where:

- Floor slabs may now be of timber construction
- Where combustible voids may provide a third dominant route for fire spread, out of reach of suppression systems and fire service intervention
- Where the inclusion of green walls may promote external fire spread and you quickly appreciate how these traditional insurance assumptions can break down.

The importance of EML cannot be overstated - if the insurers cannot be convinced of the limits of a fire event, (i.e. if there is insufficient control of combustible voids), then there may be no other option but to assign an EML of 100%.

3.4.2 Fire Spread between Buildings
Just as the insurers will make an assessment of the likelihood and extent of internal fire spread, they will also assess the likelihood for fire spread between buildings. Materials of construction used both internally and externally, play a key role for both the emitter and receiver buildings as does separation distance. The use of combustible materials on the external envelope of a building, can create a large radiation source that, even without direct flame impingement or wind-borne burning brands, may ignite façades of adjacent buildings. Where the insurers assess other buildings they insure may become involved in fire due to their close proximity, then the assumed loss will be an accumulation of all of those buildings – the EML will be an aggregate of all buildings with insufficient separation.

→ A fire engineer may design for compliance but should also ensure that the proposed design aligns with the BCP goals of their client and for securing insurance on acceptable terms.

04

Every person and commercial entity has a role to play with regards the successful use of mass timber in our built environment.

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4 Guidance Sheets

4.1 Roles and Responsibilities

As should have already been made clear, every person and commercial entity has a role to play with regards the successful use of mass timber in our built environment.

Noting the key design stakeholders and the fact that the provision of construction or property insurance is a commercial decision, the ultimate responsibility rests with the client to ensure that appropriate risk mitigation is employed at all stages of the design, construction, and operation of the building.

Both client and insurers should be open for early engagement, ongoing review and feedback, facilitated by the appointed broker.

In order to assist with both risk management and communication between parties, the following Guidance Sheets (following the RIBA stages) have been created to ensure that all parties can have their expectations and needs aligned at any stage during the design, construction and operation of a mass timber building.

0 **Strategic Definition**

1 **Preparation and Brief**

2 **Concept Design**

3 **Spatial Coordination**

4 **Technical Design**

5 **Manufacturing & Construction**

6 **Handover**

7 **Use**

	0 **Strategic Definition**	1 **Preparation and Brief**	2 **Concept Design**	3 **Spatial Coordination**
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, L, O
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
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 lead 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 ▪ Guidance or Performance based ▪ Demonstrate rationale for either ▪ 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 ▪ Guidance and/or Performance based ▪ Demonstrate rationale for either ▪ 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.
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/trends o Action points from this? o Recent learnings ▪ Map out strategy together based on MTIP ▪ 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 (few 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.

4 **Technical Design**	5 **Manufacturing & Construction**	6 **Handover**	7 **Use**
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
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
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 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.	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
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

0

Strategic Definition

4.2 Strategic Definition

Key Themes:
Undertake Early Consultation.
Establish the client attitude/motivation for using mass timber (Sustainability / Visual).

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.

Lay foundations for a long and equitable partnership.

Design must lead 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

Essential Principals for Fire Mitigation
A: Strategically Assess Resilience

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/trends
  - Action points from this?
  - Recent learnings
- Map out strategy together based on MTIP
- 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 both parties. Be open and transparent, all parties want the project to succeed for mutual financial success (few win in the event of a claim).

Prepare for Property Insurance. Same broker is preferable and push for common insurers if possible.

Build for resilience
not just life safety

1

Preparation and Brief

4.3 Preparation and Brief

Key Themes:
Undertake Early Consultation.
Mitigate risk of fire and water.
Ensure competency of specialists in identifying and mitigating risk.

Risk Mitigation Actions:
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
  - Guidance or Performance based
  - Demonstrate rationale for either
  - 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.

Essential Principals for Fire Mitigation
A: Strategically Assess Resilience
C: Support Fire Fighting Operations
D: Maximise Non-Combustibility

Insurance Actions:

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.

2

Concept Design

4.4 Concept Design

Key Themes:
Prevent Fire Starting.
Lower Property Loss.
Enhance Design Robustness including undetected moisture ingress.

Risk Mitigation Actions:
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
  - Guidance and/or Performance based
  - Demonstrate rationale for either
  - 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.

Essential Principals for Fire Mitigation
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
O: Facilitate Simple Repair
Q: Follow Identified Standards
S: Complete Performance Tests

Insurance Actions:

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.

3

Spatial Coordination

4.5 Spatial Coordination

Key Themes:
Prevent Water Damage and Fire
Lower Property Loss
Enhance Design Robustness including undetected moisture ingress

Risk Mitigation Actions:
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.

Essential Principals for Fire Mitigation
F: Monitor Building Services
G: Address Occupational Issues
H: Extend Structural Stability
L: Resist Fire Ingress
O: Facilitate Simple Repair

Insurance Actions:

General updates as and when required.

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
C: Support Fire fighting Operations
D: Maximise Non-Combustibility
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K: Separate External Openings
L: Resist Fire Ingress
M: Expect Adverse Weather
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
E: Anticipate Arson Attempt
F: Monitor Building Services
G: Address Occupational Issues
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
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

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Handover

4.8 Handover

Key Themes:
Check Construction Achieved.
Improve Facilities Management.

Risk Mitigation Actions:
Share learnings, positive and negative.

Conduct a forward-looking review meeting with key delivery partners, where possible make open-source and available for peer review.

Essential Principals for Fire Mitigation
U: Require Competent Work
V: Verify Recorded Information
W: Manage Fire Safety
X: Action Statutory Assessments
Y: Keep Maintenance Commitments
Z: Critically Review Experience

Insurance Actions:

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.

7

Use

4.9 Use

Key Themes:
Improve Facilities Management.

Risk Mitigation Actions:
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.

Essential Principals for Fire Mitigation
W: Manage Fire Safety
X: Action Statutory Assessments
Y: Keep Maintenance Commitments
Z: Critically Review Experience
T: Procure Quality Materials
U: Require Competent Work
W: Manage Fire Safety

Insurance Actions:

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.

Photo: ©Dug Wilders, Northstowe Academy, Frank Shaw Architects

Appendix A - Building Insurability Features: all building construction methods

A.1 Occupation

Residential and commercial buildings are subjected to different regulatory requirements and shared usage can result in great complexity for risk profiling given the shared responsibilities and influences present.

- **Residential Buildings** - there is great variability in scale in this occupancy category ranging from single dwellings to large multi-storey apartment blocks. The principle distinguishing insurance considerations are the lack of regulation around risk control (in comparison to the commercial environment), sleeping risks, multi-storey buildings, use of modern construction methods, cladding, emerging hazards from lithium-ion batteries, frequency of water damage events, type of residential tenure and specific occupant challenges that might include hoarding and illegal manufacturing use. Costs associated with re-homing during repair can be considerable.

- **Commercial Buildings –** there is great variability in scale in this occupancy category ranging from small offices to large multi-storey buildings and large production warehouses, with great diversity in hazards of the operations undertaken. Insurers may specialise in specific commercial areas. A distinguishing insurance consideration can be the high value of equipment and the Business Interruption component following an insured loss.

- **Residential over Commercial Buildings (mixed use residential) –** this occupancy type that will include multi-storey residential apartments over shops, offices, takeaways, cafés, bars, restaurants and many other types of business besides, presents specific property and safety challenges related to differing regulatory requirements and the diversity of hazards. Fire services note that poor practices within commercial premises, including external waste storage, can impact the safety of residents and their ability to escape. It is also recognised that the risk-share is bi-directional and commercial activities can be impacted from fire and water escape events from the residential apartments above. Costs associated with re-homing of residents during repair can be considerable and the commercial insurance considerations can include the high value of equipment, and the Business Interruption loss component following an insured loss.

- **Hotels and Halls of Residence (including build to rent) –** this occupancy type presents specific property and safety challenges that can include risks associated with sleeping occupants, unfamiliar occupants, commercial kitchens, bars & restaurants, underground and incorporated car parks, EV storage and charging, tall-buildings and heritage/building conversion. Having many bathrooms, escape of water challenges can be significant especially in the multi-storey situation. Fire and escape of water events can result in significant material damage and business interruption losses that includes business reputational damage.

- **Storage Warehousing (low, medium & high hazard) –** this occupancy type is characterised by warehouse construction methods (very large compartments), with the potential loss determined by the scale of the building, the hazard presented by the stored goods, the value of the stored goods, the sensitivity of the stored goods to fire, smoke and water and the business interruption potential associated with the loss. These environments are typically sparsely populated by people with hazards also stemming from site equipment, such as the use of fork-lift trucks.

- **Manufacturing Warehousing (low, medium & high hazard) –** this occupancy type is characterised by great diversity of manufacturing component processes, some of which can be highly hazardous, using dangerous component chemicals, involving specialist high cost equipment, with great Business Interruption and plant and equipment loss potential, following an insured event.

Appendix A - Building Insurability Features: all building construction methods (continued)

A.2 Structure and fabric

A.2.1 Building structure material
An understanding of the materials that form the structural load-bearing elements of the building are critical to the insurance assessment of the building. In fire law, materials are specified for life safety and therefore their period of structural integrity need extend no longer than the time required to be assured that all occupants have vacated the building in the event of fire. Obviously business owners and insurers would like the building to outlast the fire event and so there follows a preference for the structure to be made of non-combustible materials, which are also generally more resilient to water exposure. Some building methods use materials that introduce additional routes for fire spread in combustible voids which can greatly increase the extent of damage and raise the EML assessment. Repairs to structural damage can be costly and the associated increased repair times can significantly impact Business Interruption and the costs associated with providing alternative accommodation. An EML of 100% would be allocated to any building deemed vulnerable to collapse in the event of fire or water exposure.

A.2.2 Ground floor structure
The ground floor structure of a building may be different from that of the floors above and be selected as a means of mitigating risks both during construction and occupation. It is not uncommon for timber buildings to have the first floor built in concrete which can benefit the overall building in terms of:

- Reduced likelihood of fire loss during construction by incidental and deliberate fire raising
- Increased resilience to flood, escape and ingress of water damage during construction and through life

A.2.3 Construction method
The construction method selected, normally describes the materials that give the building its load bearing capability. Damage to these elements can greatly increase the cost of insured loss as repair can be challenging, requiring special techniques and equipment. Structural elements that are less sensitive to fire and water damage are more likely to only require cosmetic repair following exposure. For modern products, such as composite timber materials, there may also be a lack of engineering understanding of the consequence of exposure and how assessment of residual capability can be made.

A.2.4 Core structure
It is not uncommon for the core of a building to be constructed of materials that are different to the rest of the structure. The core may accommodate lift-shafts, stairwells, and routes for services distribution. If constructed out of materials that can be assured of retaining their structural integrity during fire and water exposure events, this can greatly add to a building's overall resilience, and to the level of confidence and assistance that might be provided by the attending fire service.

A.2.5 Floor/ceiling structure
In EML determination, floor construction plays a major role as the key passive element that prevents vertical internal fire spread. Traditional materials like concrete are resilient to both fire and water. Some newer construction methods use timber floors and others such as modular, have no continuous floorplate. The floor panelling may be a structural element of the building (i.e. panelised systems) or may only need to support what is on them as is the case for post and beam build systems. Materials are often used in composite forms to address strength, fire resilience, water resilience and acoustic issues.

The building's floor composition can also impact structural stability during fire which can influence fire service effectiveness. There are also implications for escape of water where long term issues, such as rot and delamination, might contribute to loss of structural integrity and short-term escapes might result in unacceptable staining and the loss of aesthetic finish which can exacerbate costs.

A.2.6 Cladding system
Knowledge of any building's cladding system is a key component of EML determination since external fire spread has the potential to involve the whole building in a short period of time. Cladding systems may be the same as the building's main construction components (i.e. brick, block or timber), or may be a specifically applied building component that may be complex in form and involve many individual materials, some of which may be combustible. Cladding system selection can impact the vulnerability of the building to fire spread from fires starting both inside and outside the building and feature in considering the risk associated with the building's proximity to others nearby.

A.2.7 Interior surfaces
The fire properties of the interior surfaces of the building (walls and ceilings), can impact greatly the rate of fire development within a compartment and the likelihood of spread to other areas. Combustible surfaces not only contribute to fire loading but can also accelerate the rate of spread through re-radiation of heat to other surfaces. In building designs of combustible structure, the internal wall finishes are the principal form of structural protection and prevention of spread to wall voids and adjacent compartments. The ability of lining systems to protect timber structures may require specific testing in order to be fully certified. Plasterboard is only effective for a certain period of time; once the embodied water has been driven off, its insulating capabilities are critically reduced.

A.3 Other risk factors

A.3.1 Atria
An Atrium is a large open skylighted covered space within a building that might traverse all floors from ground to the roof. Providing internal light, it often also serves as the location for lifts, stairways and escalators. In terms of risk, it presents challenges pertinent to fire and smoke spread between floors and can pose a difficult scenario for methods of smoke venting, fire suppression and detection in these 'compartments' with very high ceiling heights.

A.3.2 Internal car parks (including connecting basements)
Carparks within buildings present a range of insurance challenges including their high value, the high fuel loading associated with the cars themselves and from the fuel they contain and their close proximity to each other. Electric vehicles and electric vehicle charging stations can result in fires that are very persistent and difficult to extinguish. Factors that feature in determining the level of risk also include whether they are below ground (unable to vent hot smoke and gas freely) and whether they are sprinkler protected.

A.3.3 Balconies and terraces
Balconies can allow human access to the exterior features and materials of the building can be combustible in their own right and as such, can increase the overall risk profile of the building.

A.3.4 Swimming pools & spa baths
As a major source of water, failure of containment and poor maintenance of systems can result in significant escape of water loss.

A.3.5 Hazardous materials
Storage, using or producing hazardous materials (flammable materials, gases, dusts etc.), will have an obviously raised risk profile in terms of fire and explosion risks.

A.3.6 Green surfaces
Green surfaces can introduce significant quantities of combustible materials onto the external surfaces of the building in the form of plastic membranes, irrigation systems, plastic planting modules and plant material. The fire risk may be influenced by weather changes such as drought and maintenance standards. Failure of membranes may lead to water damage risk for some construction material types. Certification methods for the approval of these cladding systems are considered inappropriate. Blue roofs seek to capture and hold up the dispersal of rainwater. As an additional wet system, they may raise challenges for water damage potential of some construction materials if they fail or are poorly maintained.

A.3.7 Green energy systems
Green energy systems, including solar panels, wind turbines and their associated electrical storage and distribution systems, can present challenges when they fail. Fires can be persistent, high energy, in remote locations and impair fire service response (the application of water to high energy systems that cannot be isolated presents risks those fighting fires and solar panels can shield water application to burning roofs).

Appendix A - Building Insurability Features: all building construction methods (continued)

A.4 Fire mitigations

A.4.1 Combustible void protection
The threat of internal fire spread posed by combustible voids can be protected against by lining with NC board, provision of sprinklers or filling with NC fibre insulation (a requirement under US International Building Codes but not currently in the UK).

A.4.2 Automatic suppression systems
Suppression systems can greatly increase the resilience of buildings to fire and prevent internal fire spread. Their provisioning is made against specific rulesets which can be problematic for some construction forms. Only property protection focussed sprinkler installation rulesets are considered appropriate for the mass timber environment (such as BS EN 12845 / LPC Rules for Automatic Sprinkler Installations). Domestic and residential type sprinkler and watermist installations for occupant life-safety (i.e. BS 9251), are not appropriate. The water sensitivity of local materials must also be considered along with the potential for leakage.

A.4.3 Building separation
The proximity of the building to others is important in understanding all initiating risks and the potential scale of loss.

A.4.4 Fire fighter provisions
Whilst fire fighters are under no obligation to take risk in the preservation of property or business, inbuilt features that assure the structural integrity of the building such as non-combustible material choices, good access (external and stairwells) and the provisioning of reliable resources (water supplies, dry and wet rises etc.), can increase their effectiveness if the situation permits.

A.4.5 Stairwells
Improved access in and out of the building supports improved safety and fire service response.

A.5 Water damage mitigations

A.5.1 Designing for flood
In flood zones, the building should ideally be positioned above the highest predicted flood level (HPFL). Where this is not possible, the floors up to the HPFL can be built out of water resistant materials and all critical services and infrastructure will be located on upper floors. It is not uncommon for car parks to be located in the potential flood areas. Where no such measures are possible, property level protection systems (PLPS) and flood management schemes can be used to keep water out of the building. All measures to reduce the risks to people and property should act to reduce flood damage, speed up recovery and facilitate reoccupation of flooded buildings. Temporary protection measures should also be considered during the construction phase.

A.5.2 Designing for escape of water (EoW) – both during construction and operation
Escape of water losses are particularly damaging in the multi-storey situation with potentially high associated individual incident costs. As immensely prevalent events, on aggregate they result in great financial loss. Building designs should consider the consequence of long term and short term EoW events on the building and design in fluid systems that fail-to-safe discharge and room designs that can drain-to-safe place. Rapid means of system isolation and the use of water-stop type detection devices can also greatly reduce the loss. Where buildings might have a core built of water resisting materials such as concrete, this can present a resilient location to position water bearing rooms such as in kitchens, toilets and bathrooms. Maintenance of systems following good design is key to the prevention of escape of water issues over the life of the building.

Materials management regards exposure to water is also of key importance. Temporary protection, just in time delivery systems and effective scheduling are all of key importance.

A.5.3 Designing to minimise impact of water ingress
Ingress of water through failed roofing and cladding systems is most destructive when it goes unnoticed. Systems deliberately design to reveal issues are preferential or where not possible, water detection devices, akin to those used for the detection of escape of water events, can be deployed.

Stora Enso, factory floor

Appendix B - Essential Principles

These Essential Principles apply to all building types and are not exclusive to mass timber buildings.

B.1 Fire

*Some of these are not in the gift of building design to alter – operational mitigations.

Principle A
Strategically Assess Resilience
Assess susceptibility, vulnerability and recoverability in the structure, construction and services systems against risks in fire, escape of water, water ingress and flooding, to define a strategy for the development project, to be critically reviewed over time.

- Access or determine client's business continuity plan and assess how building design can contribute to mitigating shortcomings identified in the Business Impact Analysis
- Undertake risk assessments for fire, flood, water ingress, infestation, rot and escape of water to be available and updated throughout the design process
- Assemble suitable subject matter experts to contribute to the determination of and delivery of, the building design and safety brief
- Understand the meaning of the building design and safety brief to each stakeholder, including client, insurers, fire service, LABC, etc.
- Understand the balance of risk transfer between client and insurers
- Ensure dependant systems and methods are resilient enough in themselves to meet the overall required resilience ambition

Principle B
Engage Insurers Early
Engage with professional indemnity, construction, latent defects, new home warranty, building and contents insurers from the earliest RIBA Work Stage in project planning, to interrogate the value of the Essential Principles and optimise the insurability of the building in use.

- Engage with construction, latent defects, new home warranty, property and business insurers at the earliest opportunity and ensure continuous engagement throughout the project
- Provide information in a format that the insurers will understand (relevance to EML)
- Use insurers approved standards and support 3rd party quality work schemes
- Comply with RISCAuthority, FPA and Contractors Legal Group (CLG) publication "Fire Prevention on Construction Sites: The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation – 10th Edition: August 2022"
- Invite insurers to witness supporting research and provide input in to proof of concept testing

Principle C
Support Fire fighting Operations
Consult with the Fire and Rescue Services to facilitate operations in pursuit of life safety with an emphasis on timely self-evacuation, understanding that rescue is a statutory obligation but protection of the asset requires additional measures.

- Engage early and seek input from the Fire Service
- Understand building features that support fire fighter effectiveness including:
  - High integrity detection systems (believable call-out request)
  - Access
  - Water provision
  - Structural stability
  - Suppression systems
  - Smoke control systems
  - Fire fighting shafts, dry risers, wet risers, etc.
  - Familiarisation visits
- Understand building features that can impair effective fire fighting:
  - Poor false and unwanted alarm record
  - Fire spread in voids
  - External fire spread
  - Limited stairwell access
  - Smoke generation (visibility) and toxic gases
  - Impairment of progress by cables and pipes detaching from roof mountings
- Put an effective salvage plan in place with the Fire Service
- Rehearse evacuation plans and consider disabled egress

Principle D
Maximise Non-Combustibility
Use non-combustible construction materials and products within systems, elements and spaces, so far as is reasonably practicable, as methods of construction that make minimal contribution to fire development and the generation of smoke.

- Consideration of the use of mass timber in structural elements of the building needs to be given and maintain the use of timber if the associated property risks are adequately managed through the design elsewhere and not in breach of regulation (e.g. insulation/cladding in some residential developments)
- In areas where a greater level of protection against fire is required than wood can achieve (i.e. main access and egress routes, high risk areas), use other non-combustible materials
- Encapsulate the timber behind higher performing materials
- Make an audit of accessible versus encapsulated combustible surfaces
- Do not allow combustible voids (design out or adopt IBC approach of filling, lining or suppressing)

Principle E
Anticipate Arson Attempts
Introduce measures to prevent, so far as is reasonably practicable, an anticipated arson attack from an external fire source either thrown or positioned to cause damage anywhere within and around the building, particularly at lower storeys.

- (Construction) build basement, ground / 1st storey in non-combustible materials to raise timber elements above level of many deliberate and incidental ignition sources
- (Construction) follow the STA 16 Steps to Construction Site Fire Safety and Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority)
- Risk assess routes for uncontrolled access and the ease with which fire may be started with available materials
- Consider Credible Worse Case (CWC) arson fire scenarios and the ability of the design to defend against them (location, internal, external), fuels (accelerants like petrol), time of day (security, local FRS response to Automatic Fire Alarms (AFA's), etc.
- Consider security and vulnerability of business critical infrastructure
- Control external waste storage and proximity to building (bin stores etc.)
- Consider use of security alarm and CCTV systems including manned security guarding and patrols

Principle F
Monitor Building Services
Ensure services for ventilation, heating, lighting and power, including local sources of renewable energy or mains utilities are designed, installed and maintained to prevent them being a source of ignition, so far as is reasonably practicable.

- Use 3rd party approved installers and certificated equipment
- Penetration of compartment walls by services must be made good by suitably qualified personnel using appropriately tested and approved products
- Services to be incorporated early in the design stage to avoid on-site amendment
- Drainage and water supply systems that may leak, should be distributed in waterproof services risers separate from those containing electrical building services
- Continuously monitor the health of all services and maintain regularly
- Combustion appliances must conform to Building Regulations and gas systems must not be located within protected stairs or escape corridors
- Hazards associated with renewable energy generation and storage are specifically addressed by way of their own risk assessment
- Protection against lightning strike is provided to approved standards
- The use of mobile heating and ventilation units is minimised and where essential, have their hazards specifically assessed

Principle G
Address Occupational Issues
Address the design, construction, management and rearrangement of the building to specific hazards and risks facing occupants as "Relevant Persons", occupying either a building in an identified purpose group or a mixed-use facility.

- Development and maintenance of an appropriate evacuation plan
- Maintain all building systems and structures
- Change of use and occupancy must invoke an update of all pertinent safety documentation, including the evacuation plan
- Combustible content is described, monitored and controlled for excursions that may invalidate the plan (i.e. hoarding)

Principle H
Extend Structural Stability
Engineer against structural collapse and excessive deflection within compartment walls and floors above the statutory life safety requirement to prevent accidental disproportionate collapse and accommodate imposed loads in fire situations.

- Consider importance of structural stability to meeting the business resilience objectives of the client
- Recognise how building stability can facilitate an improved response from attending fire and rescue services
- Design to worst case loadings under worst case fire conditions
- Design for reduced voids and cavities that may facilitate unseen fire development
- Design to prevent collapse (not a requirement after successful evacuation)

Principle I
Reduce Fire Severity
Compartmentalise and fully protect the building with a sprinkler system so that if a fire starts the extent of fire, heat and smoke damage should be minimised and confined in the compartment of origin, so far as is reasonably practicable.

- Consider compartment fire resistance times appropriate to meeting the requires of the Fire Safety Management plan and Business Continuity plan
- Use only insurers recognised commercial sprinkler systems (not domestic, not watermist)
- Design to reduce water damage potential from deliberately and accidentally discharged suppression systems
- Select non-combustible materials at every opportunity possible in the structure, insulation and cladding of the building (see Principle D)
- Design out or protect hidden voids and cavities (fill or line with non-combustible materials or sprinkler protect)
- Fire stop all compartment boundary penetration with approved products
- Use fire doors with the same ratings as the walls they sit within

Appendix B - Essential Principles (continued)

Principle J
Control Compartment Cavities
Design out cavities within the internal compartment walls and floors, so far as is reasonably practicable, and where cavities are necessary reduce combustibility of structure/linings and contents and provide cavity barriers or fire stopping to prevent extensive routes for flame, heat and hot or cold smoke.

- Design out combustible cavities by the adoption of solid-wall construction techniques
- Where combustible cavities exist, they should be managed in accordance with the requirements of the International Building Code and be either filled or lined with non-combustible materials or protected with a suppression system
- The service life of all installed fire stopping systems must be no less than the life of the compartment element containing it and require no maintenance after installation
- Photographic records shall be made of the installation of every item of fire stopping and cavity barrier material

Principle K
Separate External Openings
Slow the speed of external fire growth beyond the compartment of origin within external walls and soffits, separating openings with fire resisting construction including attachments such as balconies, so far as is reasonably practicable.

- External walls should be of fire resisting construction
- Follow the ‘protected zone’ concept of protection
- Do not locate doors, windows and vents within the protected zone unless having the same rating as the protected zone
- Use product and services that appropriately third party approved for the application

Principle L
Resist Fire Ingress
Resist external fire ingress into the premises by party wall separation from any adjoining building, sterilisation of roofs, and control of external fire resistance with distance between neighbouring buildings, so far as is reasonably practicable.

- Design party walls as compartment walls appropriate to the Purpose Group (See ADB) from each side
- Roof should resist fire from both radiation and burning brands
- Consider carefully the additional risk posed by green walls and roofs (from the ignitability of both the foliage and planting/cladding system)
- Locate all waste storage in purpose designed lockers with at least 10m separation from the building
- Control temporary storage of potentially combustible materials (skips) in relation to the threat they pose to the building

Principle M
Expect Adverse Weather
Protect the building envelope against degradation from incident solar radiation, wind and water, interrelated to thermal cycles, anticipating prospects of flooding, high rainfall, drought and high wind, which may also complicate the event of fire.

- Materials used to assure fire and water protection must not degrade with exposure to weather and light over time
- Drainage and water management must be designed to cover future worst case scenarios
- The likelihood of climate change altering weather extremes (temperatures, wind, sunlight, snow mass, rainfall rates, etc.), must be considered for all product selection
- Protection must be provided against lightning strike
- Back up systems must be in place where irrigation systems of green wall and roof systems fail in times of drought to never increase the presented fire risk

Principle N
Minimise Consequential Damage
Invest in measures to limit the extent of damage caused by heat, smoke and water in the event of fire and by escape of water incidents, ensuring assets and the environment are minimally affected, so far as is reasonably practicable.

- Opt for non-combustible materials wherever possible (See Principle D)
- Opt for materials that are resistant to water where advisable
- Design building to shed water safely from floor or compartment of origin
- Compartment (fire) the building volume to the smallest units workable
- Split identical operations into separate fire compartments or buildings
- Allow for rapid isolation of power and water systems at times of malfunction
- De-energise and depressurise systems when not in use
- Separate water and electrical systems so failure of one cannot impact the other
- Have pre-agreed salvage plans in place with the fire service

Principle O
Facilitate Simple Repair
Develop the design to technically resolve how a partially damaged building can be cost effectively repaired and be vigilant against proposed changes in construction Work Stages that diminish repairability, which should be declined under contract.

- Design with repair in mind
- Select materials and methods of installation with repair in mind
- Design to limit the need for repair of structural components from both fire and water exposure
- Seek clarity on the process for estimation of extent of damage to structural materials and evidence of repairability

Principle P
Plan Salvage Operations
Plan enhanced protection and subsequent salvage of valuable building contents, so far as is reasonably practicable, including any important or irreplaceable furniture, fixtures, and equipment, in ways compatible with fire fighting operations.

- Consult early with fire services
- Rehearse and document salvage procedures
- Protect what is important but immoveable from a salvage perspective
- Maintain the salvage plan

Principle Q
Follow Identified Standards
Identify and closely follow standards for life safety and asset protection, avoiding selective "cherry picking" between standards, fully disclosing test reports and fire engineering assessments signed and dated by competent Fire Engineers.

- Analyse the standard for appropriateness to application
- Seek out additional test reports upon which certification was gained paying special attention to non-conformities
- Where shortfalls in controls appropriate to the validity of the standard are identified, these must be addressed by other means
- Standards must be used and applied in full
- Recognise that standards requested by regulation, are to meet life-safety requirements only and higher levels of protection may be required to meet the business continuity ambition
- Understand the pedigree and resilience of the systems used
- Use reputable providers of products and installers with a proven track record

Principle R
Provide Reliable Detection
Install a comprehensive automatic fire alarm system based on high-integrity detectors to prevent false alarms, so far as is reasonably practicable, installed and commissioned by specialist operatives who should also provide user training.

- Use high-integrity alarm and detection systems
- Understand the local fire service response to automatically generated alarms
- Use only certificated product installed by approved companies
- Ensure the system is designed with false and unwanted alarm reduction in mind
- Ensure all suppression and detection systems are unified and externally reported
- Maintain all systems

Principle S
Complete Performance Tests
Programme and complete specified and contracted performance testing, inspection and certification to show compliance and achieve client acceptance of results in a timely manner, to prevent possible performance deficiencies under contract.

- Review the project specification against the Evacuation, Fire and Resilience Strategy documents and use to define a programme structured to address the discipline of Strategy, Testing, Inspection, Certification, and Compliance (STICC)
- Confirm all approvals and certifications appropriate to product and installation
- Use only United Kingdom Accreditation Service (UKAS) accredited services
- Test all critical systems with invites extended to insurers and fire and rescue service

Photo: ©Archetype/Jack Hobhouse, The Rye, Tikari Works

Appendix B - Essential Principles (continued)

Principle T
Procure Quality Materials
Insist upon the procurement of materials, products and systems with third party certification schemes accredited by the United Kingdom Accreditation Service, with proof of service life in application and full disclosure of fire safety information.

- All materials in products and systems shall satisfy Regulation 7(1)(a) of the Building Regulations 2020 as amended 2018 and 2022
- All documentation and test reports supporting material and system quality shall be checked
- Ensure supplier has a thorough quality assurance and control regime

Principle U
Require Competent Work
Confirm protection measures are installed by identified specialists, trained and supervised under third party quality of work schemes accredited by the United Kingdom Accreditation Service, with full disclosure of fire safety information.

- Quality of work to construct the building to satisfy Regulation 7(1)(b) of the Building Regulations 2010, as amended 2018 and 2022
- Identified operatives working for all specialist contractors including fire protection installers, are third party certified under a quality of work and management scheme to install specific products and systems
- Quality of work and management third party certification schemes are accredited by the United Kingdom Accreditation Service (UKAS) to satisfy Regulation 7(1)(b)
- Fire Safety Information at Work Stage 6 required by Regulation 38 in the Building Regulations 2010 satisfied the “Responsible Person” and the statutory duty holder remains satisfied through Work Stage 7

Principle V
Verify Recorded Information
Accept only pertinent and accurate information at handover, insisting contractors satisfy statutory and contractual duties, checking record information provides full disclosure of the premises as built and commissioned for facilities management.

- The design and construction is reviewed by the client appointed natural persons for consistency with the Evacuation and Fire Strategies, who shall check the discipline of Strategy, Testing, Inspection, Certification, and Compliance (STICC)
- Also systems are demonstrated to function in accordance with the design requirement
- Photographic record made during construction, is available for all critical inaccessible systems (such as cavity barrier and fire stopping placement)
- Submission is made that meets the requirements of Regulation 38

Principle W
Manage Fire Safety
Provide fire safety management services to the satisfaction of the statutory duty holders appointed by the building owner and if different, the building operator, including induction and training in fire safety for building users on the premises.

- Formal training in the duties imposed by the Regulatory Reform (Fire Safety) Order 2005, has been completed as early as possible by the building owner and if different, the building operator to enable them to appoint their “Responsible Person” to relieve the client’s natural person
- All residual matters in the CDM 2015 Health and Safety File have been resolved by the “Principal Contractor” before the expiry of the Defects Liability Period after Work Stage 6 handover
- Copy of the Building Manual providing operational and maintenance information is made available in an accessible and printable format on the premises and kept current by a dedicated individual information controller who will provide information on request
- Documentation is maintained to address:
  - Consequential damage limitation
  - Water damage limitation
  - Fire damage limitation
  - Control of hazards
  - Evacuation plans
  - Maintenance of systems
  - Compartment fuel loadings
  - All forms of risk assessment

Principle X
Action Statutory Assessments
Instruct, review and promptly act upon Fire Risk Assessments that consider the scale or complexity of the building and the activities undertaken by building users on the premises, keeping a written record of assessments and actions over time.

- The “Responsible Person” has carried out and regularly reviewed Fire Risk Assessments (FRAs) and Fire Risk Appraisals of the External Wall (FRAEWs)
- Matters arising from the FRAs and FRAEWs are promptly actioned by facilities managers who maintain a written record and advise the “Responsible Person”, as required works are completed
- Moveable heating and ventilation appliance use is recorded and assessed as a wider problem of discomfort, with consequences for fire safety addressed in the FRA period when the appliances are identified; and moveable equipment with Lithium-ion batteries that require storage and charging is recorded and assessed as a wider problem of security, with consequences for fire safety addressed in the FRA period when the equipment is identified

Stora Enso, factory floor

Principle Y
Keep Maintenance Commitments
Inspect regularly, test and when required, promptly maintain or replace structure, construction or services systems over the life of the building, employing specialist operatives trained and supervised under third party certified schemes.

- Sprinkler systems shall be maintained in accordance with RISCAuthority Sprinkler System Service and Maintenance: Guidance, Records and Checklists June 2021
- Specialist fire protection installers are third party certified under a scheme to install specific products and systems
- Quality of work and management third party certification schemes are accredited by the United Kingdom Accreditation Service (UKAS)
- Fire resisting and smoke tight compartment wall and floor construction with fire doors and fire stopped building services is inspected and maintained to ensure ability to function is not impaired over time by degradations to and breaches in the compartmentation, with repairs promptly carried out
- Water drainage systems are kept clear of obstruction
- Scrupulous records of inspections and maintenance carried out are kept and made available to insurers on request, including photographic records, with updates to the Building Manual as a comprehensive and dynamic record risk management

Principle Z
Critically Review Experience
Review whether the aspects of resilience originally required of the asset were realised in practice over time and share lessons learned to strengthen a culture of disclosure which can inform insurable strategies for future development projects.

- A long term relationship is built up between the building owner or operator and the insurers, to be able to undertake a Post Occupancy Evaluation (POE), in which the changing occupancy of the building, the variability of contents particularly in stocks or storage representing the fuel load or the dynamic in processes that are undertaken within it, are better appreciated
- Conscious effort is made to encourage a culture of full disclosure so that lessons can be learned in public and not only within the project
- Success from one Resilience Strategy is repeated by strategists that follow

Appendix B - Essential Principles (continued)

B.2 Escape of Water

Principle 1
Follow identified standards
The systems shall be designed, installed and commissioned in accordance with the prevailing Regulations and Standards.

Principle 2
Require competent work
The designer, installer and commissioner shall be suitably qualified and experienced, belonging to a relevant professional body.

Principle 3
Procure quality materials
Only certified products shall be used to build the system.

Principle 4
Risk assess for EoW loss
The design, installation and commissioning of the system shall be risk assessed.

Principle 5
Employ detection and minimise consequential damage
The system shall be designed to reduce the likelihood and consequence of an escape of water incident (automatically where possible).

Principle 6
Facilitate simple repair & maintenance
The system shall be designed for ease of maintenance.

Principle 7
Isolate when not in use (construction)
During installation, the system shall be isolated when unoccupied.

Principle 8
Isolate when not in use (occupation)
When in-service, it shall be possible to readily isolate the system by means that are readily identifiable.

Principle 9
Limit system pressures
The system pressure shall be limited to 3.0-bar.

Principle 10
Pressure test systems
The system shall be pressure tested in accordance with the prevailing regulations and standards and a permanent record of those tests made.

Principle 11
Limit system temperatures
The system outlet temperatures shall be limited to 48°C.

Principle 12
Record all information
All documents pertaining to the design, installation and commissioning of the system shall be made permanent and retained.

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

B.3 Flood

The basic essential principles for flood protection include:

Principle 1
Do not build on flood plains
Consideration shall be given to all forms of flooding, including risk from rivers and seas and surface water runoff.

Principle 2
Determine the characteristics of a possible flood event and plan for worst case e.g. the type and source of flooding, frequency, depth, velocity and speed of onset
Arrange all building contents to minimise the extent of disruption, and cost and time of recovery. Mitigating the potential impacts of flooding through design and flood resilient and resistant construction materials

Principle 3
Raise building and plant above maximum likely immersion depth
Where possible inbuild resilient features such as office-over-car parks designed.

Principle 4
Invest in property level protection
Provide means for preventing water ingress and isolation of sewage sources. Provide adequate flood risk management infrastructure which will be maintained for the lifetime of the building. Reference CIRIA Guide Code of practice for property flood resilience (C790) .

Principle 5
Have a comprehensive flood plan/business continuity plan and any community resilience groups
Have a comprehensive response that is executable on a timescale coherent with Met Office warnings, that is both tested and regularly rehearsed. Include vehicle relocation to higher ground.

Principle 6
Build back more resilient
Floods are repeating events, and every opportunity must be taken to replace what is lost with a more resilient alternative.

Principle 7
Plan for loss of utilities
In the event of flood power and clean water supplies may be lost. The provision of generation and stored water may be prudent.

Principle 8
Plan for denial of access
Plan alternative accommodation for when property may not be accessible for a considerable period of time.

Principle 9
Have a salvage plan/engage with fire service
In cooperation with the local fire service, identify critical infrastructure and have a rehearsed salvage plan for its protection or removal.

Appendix C: Example Voluntary Objectives and Solutions

The table below describes example voluntary objectives and means of meeting them in a format that might be meaningful to insurers. These are high-level statements to assist with initial intent of meaningful engagement and will need more specific definition. A wealth of detailed risk-control guidance is available from many engaged sectors including insurers, fire service, RISCAuthority and the key timber trade bodies such as STA.

Objective	Mechanisms for achieving the objective through the Playbook (in no order)

To deliver significant carbon savings (without compromising overall building resilience)	▪ Maximising the use of timber without compromising overall building resilience
	▪ Could be achieved through:
	  ▪ Hybridisation of wood, concrete and steel methods, with most appropriate materials used for the balance of resilience and sustainability where they need to be
	  ▪ Use of lower-carbon versions of concrete and steel where required
	  ▪ Protection of timber structural elements to better match that of concrete / steel fire performance
	  ▪ To reduce or remove altogether adverse features that the extended use of timber introduces – such as combustible voids (line, protect, fill)
	  ▪ To reduce building material combustibility in all other areas – such as the insulation materials and cladding
	  ▪ Provision of water and fire mitigation systems / features
	  ▪ Controlling all potential ignition sources (management)

To deliver buildings that are insurable	▪ Early engagement ▪ Addressing the Insurers' Essential Principles for fire, flood, escape of water, and resilience (accepting, and designing to the increased use of timber) within the RIBA framework with appropriate cross-party communication. ▪ Limiting scale (stay within scope of current knowledge and research) ▪ Use mass timber to provide alternative and improved solutions for currently buildings that might struggle with insurance currently (such a Light Timber Frame (LTF)) ▪ Use of the Playbook to invoke resilient insurance meaningful features

To allow Fire and Rescue Service to be effective with established methods and materials without applying prejudicial risk appetite	▪ Assurance of stability and predictable behaviour under fire and provision of assisting resources
	▪ Could be achieved through:
	  ▪ Access and attack via fire hardened cores
	  ▪ Designing out combustible voids
	  ▪ Fire protected floor plates (hybrid timber / concrete)
	  ▪ Appropriate water supplies and access
	  ▪ Provision of risers
	  ▪ Stable and protected stairwells
	  ▪ No features that would allow the upward spread of fire (such as combustible cladding and insulation)
	  ▪ Inclusion of fire suppression

Investors feel their assets are protected	▪ Adherence to Regulation 38 – evidence the building has been assembled as designed ▪ Regulation 38 handover template ▪ Resilience measures over and above compliance – a building on-the-ground is not an acceptable outcome for them, their insurers, building owner, or business owner (only the government it seems)

Delivery of the building that the customer needs (Business owner / residential owner)	▪ Design to the customers' requirement (not assuming that lowest cost equals success)
	▪ Educate everyone on the difference between life-safety and property protection and how this might impact fire event outcome.
	▪ Could be achieved through:
	  ▪ Interrogation of the company's Business Impact Analysis (BIA – Part of the business continuity planning), and considering what building design features, in terms of layout, compartmentation, and material selection can contribute to meeting their business continuity objectives
	  ▪ Development of voluntary principles (objectives) over and above Approved Document B for the industry
	  ▪ adopt – i.e. design to prevent total building loss (an EML lower than 100%)

Building design responds to usage and local geographical and social challenges	▪ That assessment is made of the usage and local potential for adverse weather events, flooding, escape of water, and criminal activity (including arson / social unrest / intrusion etc.), and the design incorporates these from inception:
	▪ Could be managed by:
	  ▪ Lower level construction material choices to minimise risks from arson and flood
	  ▪ Following secure-by-design
	  ▪ Designing out 'soft features' for arsonists
	  ▪ Access control systems
	  ▪ Use of sensors, pumps, sumps, and Property Level Flood Protection Systems (PLFP)

Objective	Mechanisms for achieving the objective through the Playbook (in no order)
Sensitivities of wood to fire is appreciated	▪ In so far as it is practical to do so the involvement of the timber components are protected from participation in fire ▪ Could be achieved through: ▪ Lining with non-combustible materials (encapsulation) in a manner that will not hide water exposure ▪ Use of alternative (fire resistant) materials in key locations ▪ Protection by active systems (but disallow the use of plastic pipe) ▪ Early (high-integrity) detection systems ▪ Void reduction / protection ▪ Reinforcement of Fire Stopping requirements over ADB in key areas ▪ Fire door equality with walls ▪ Address stacked bathroom challenges
Sensitivities of wood to water is appreciated	▪ In so far as it is practical to do so the involvement of the timber components are protected from water exposure ▪ Could be achieved through: ▪ Coatings and end treatments (delivery, storage, in use) ▪ Use of alternative (water resistant) materials in key locations or moving of water associated rooms to water hardened location (core) ▪ Specification of fail-to-safe water systems ▪ Use of water-stop devices and detection ▪ Consideration of roof designs that prevent pooling ▪ Specification of fail-and-show construction (roof detailing to prevent hidden pooling) ▪ Water and flood detection systems ▪ Design for safe water shedding ▪ Lower floors constructed of water resistant materials ▪ Specification of property level flood protection systems ▪ If sprinklered – do not allow the use of CPVC or other plastic pipe systems
Potential for consequential damage is appreciated	▪ Minimise what might need replacing following a fire, flood or escape of water event (will repeat a lot of what has gone before) ▪ Flood – achieve by: ▪ Flood level and basements made of water insensitive materials ▪ Provision of PLFP ▪ Design for successive floods and make good with minimal disruption ▪ Escape of water – achieve by: ▪ Specification of water-stop devices ▪ Specification of leak/moisture detection ▪ Simple isolation systems / or automatic ▪ Design for safe water shedding from each floor (capture on floor or origin) or direct to central safe drainage point ▪ Disallow the use of CPVC pipe in sprinkler systems ▪ Mains pressure limitation and protection against water hammer ▪ Use of certificated products and installers ▪ Use of replaceable coatings ▪ Reduce use of 'raw wood' surfaces (water staining) ▪ And many other things described in Insurers ADG Guide ▪ Fire – achieve by: ▪ Compartmentation ▪ Smoke control – vent to safe and reduce material exposure ▪ Use of replaceable coatings ▪ Reduce use of 'raw wood' surfaces (smoke staining, burning, fire chemical attack) ▪ Provision of suppression ▪ Provision of rapid and reliable detection
Repairability is appreciated in the design	▪ Guidance on assessment and meaning of fire damage to structural timber elements (do we know what needs to be replaced, or sanded and revarnished?) ▪ Guidance on assessment and meaning of water damage to structural timber elements (do we know what needs to be replaced, or sanded and revarnished?) ▪ Reduce in the design structural dependency on timber (vast timber infill on skinny concrete / steel frame?) ▪ Methods and timescale of repair are known
Potential for Fire spread between buildings is prevented	▪ Consider construction order of many buildings to optimise distance between buildings unprotected whilst under construction ▪ Use of non-combustible façades to reduce maximum radiation emission

Appendix D: Further Reading

The following are a list of UK documents and resources that we encourage all interested parties to familiarise themselves with.

Structural Timber Association 16 Steps to Fire Safety

Structural Timber Association Moisture Management Strategy

Structural Timber Association Structural Timber Buildings Fire Safety in Use Guidance
Volume 6 - Mass Timber Structures; Building Regulation Compliance B3(1)

RISCAuthority White Paper Insurance Challenges of Massive Timber Construction (and a possible way forward)

Fire Prevention on Construction Sites – Joint Code of Practice 10th Edition (FPA & RISCAuthority) during construction

BDM01 A to Z of Essential Principles for the Protection of Buildings Revision 3 – 2022 (published February 2023)

@Hufton + Crow, Waingels College, Sheppard Robson

Future Work

It is intended that this document shall be revised periodically to reflect feedback from user experience and incorporate technological developments in this rapidly developing field.

Further Work
Several initiatives are underway which aim to increase knowledge and build consensus around appropriate strategies for design, construction and risk management for mass timber buildings. The following are funded by Built by Nature.

Commercial Timber Buildings Guidebook
Technical design guidance and risk mitigation principles to set an agreed best practice standard for large and complex timber office buildings, led by engineering firm Elliot Wood with design input from Waugh Thistleton Architects, fire engineering from OFR Consultants and insurance input from Lignum Risk Partners.

The guidance will be suitable for large (£25m+) office buildings and fills fills a knowledge and competence gap across the industry. This consensus will help unlock insurance for such projects by setting an agreement around high standards of design. A group of 10 developers including Landsec, British Land & Related Argent have backed the project with co-funding.

The New Model Building
A set of design principles for a 6-storey residential building (below 18m) created by Waugh Thistleton Architects in collaboration with UCL, Buro Happold and Gardiner & Theobald. To be published in summer 2023, providing a design standard pre-reviewed by the NHBC, that fulfils requirements in The Building Regulations and additional requirement set out in GLA funding guidance for affordable housing. The standard will be suitable for multi-storey residential construction and aims to unlock timber residential construction in the UK by de-risking a critical approval in the design process.

Moisture Management in Timber Construction
Research on moisture management for timber buildings through a 2-storey office and living lab demonstrator project, with a focus on connecting the insights directly with local insurers and developers. Moisture management has been identified as one of the main barriers to timber construction in Denmark and across Europe, even sometimes surpassing fire as a primary concern. Results will be disseminated in publications, workshops and communities of practice through Build in Wood and Built by Nature networks. They will also be integrated into local policy changes through the Byggeskadefonden (Danish Building Damages Fund).

Contributors

Joe Giddings, Built By Nature
Adam Smith, Stanhope
Scot Peachey, Marsh
Gaurav Kapoor, Marsh
David Lyle, Howden
Alex Tait, RIBA
Oliver Schofield, Lignum Risk Partners
Benjamin Ralph, Foster & Partners
Robert Innes, Zurich
Ricky McLain, WoodWorks
Andrew Goodwin, B&K Structures
Alex Brock, B&K Structures
Kate Fairhead, Marsh
Mario Leaderman, LendLease
Gabe Pelak, Gallagher
Andrew Waugh, Waugh Thistleton
Roger Moore, Griffiths & Armour
Brian Burg, Gallagher
Jonathan Fovargue, Eurban
Kelly Harrison, Whitby Wood
Tim den Dekker, Lignum Risk Partners
Roger Flaxman, Lignum Risk Partners
Kirsten Haggart, Waugh Thistleton
Sam Liptrot, OFR Consultants
Sam Hiller, Gallagher
Dominic Lion, Gallagher
Andrew Orriss, STA
Alan Bunting, British Land
Jonathan Lovejoy, British Land
Matthew Linegar, Stora Enso
Andrew Lawrence, Arup
Oliver Booth, Gardiner & Theobald
Greg Cooper, Hybrid Structures
Andrew Hunting, LendLease
David Smith, LendLease
Sam Williams, Argent
Cleo Curl, Land Securities
Brad Green, 538 Underwriting
Peter Pulford, BEAM
Caroline Hairsine, BMS
James Souter, Elliott Wood
Alan Patrick, Chubb
Brian Lewis, CV Starr
Kyrie Allen, Castel
Glen Dutnall, Munich Re
Daniel Amiss, Aviva
Charlotte Dancey, Zurich
Alex Ryan, RIBA
Dr Mila Duncheva, Stora Enso
Jess Hrivnak, RIBA
RISCAuthority Passive Working Group

If we have missed your name from this list then profuse apologies and please email simon@asbp.org.uk to add.

Graphic design by Paula Howkins Design Ltd.
design@paulahowkins.co.uk

The Mass Timber Insurance Playbook was co-authored by Philip Callow and Jim Glockling.
Funded by Built by Nature, Marsh and Zurich Resilience Solutions.