The proposed use of Massive Timber systems in high-rise construction is understood to offer significant advantages in terms of cost and sustainability but, as a novel building method, presents challenges for those asked to insure them.

This questionnaire seeks to elicit information that could be useful in engaging with insurers and focusses on the known sensitivities of wood as a structural building material to the insurance perils of fire, and water exposure.

The questionnaire has been developed by insurers through the RISCAuthority scheme. It is important to understand that 'compliance' with building codes is the assumed starting point (covering life-safety); the questions herein ask for details of the consideration given to the protection of the building and the business(es) conducted within it, and the mitigations proposed together with supporting evidence that will increase resilience. The matrix that insurers will use to consider the responses is also given to assist with interpretation.

Form: IQ 6

Version 1.0 September 2020

IQ 6

RISCAuthority

Building system questionnaire: Massive Timber System use in high-rise applications

To be completed at the design and proposal stage of building planning

Issued by: Ins.Co./Trade Ass/AHJ name here

DOCUMENT SCOPE: Building System Questionnaire – Massive Timber System use in high-rise applications

This document seeks to elicit information pertaining to quality assurance in pursuit of business and property protection objectives where massive timber (Glulam, CLT, LVL, etc.) has been for the structural construction of buildings of significant height and complexity. The key challenges addressed are the insurance perils of fire, and water exposure.

NOTE: COMPLETION GUIDANCE NOTES

Completion of this form neither guarantees building performance or acceptance by the issuer. It is strongly recommended that each completed form and the supporting data be reviewed by an independent expert.

IMPORTANT NOTICE

This document has been developed through the RISCAuthority and published by the Fire Protection Association (FPA). RISCAuthority membership comprises a group of UK insurers that actively support a number of expert working groups developing and promulgating best practice for the protection of people, property, business and the environment from loss due to fire and other risks. The technical expertise for this document has been provided by the Technical Directorate of the FPA, external consultants, and experts from the insurance industry who together form the various RISCAuthority Working Groups. Although produced with insurer input it does not (and is not intended to) represent a pan-insurer perspective. Individual insurance companies will have their own requirements which may be different from or not reflected in the content of this document.

The FPA has made extensive efforts to check the accuracy of the information and advice contained in this document and it is believed to be accurate at the time of printing. However, the FPA makes no guarantee, representation or warranty (express or implied) as to the accuracy or completeness of any information or advice contained in this document. All advice and recommendations are presented in good faith on the basis of information, knowledge and technology as at the date of publication of this document.

Without prejudice to the generality of the foregoing, the FPA makes no guarantee, representation or warranty (express or implied) that this document considers all systems, equipment and procedures or state-of-the-art technologies current at the date of this document.

Use of, or reliance upon, this document, or any part of its content, is voluntary and is at the user's own risk. Anyone considering using or implementing any recommendation or advice within this document should rely on his or her own personal judgement or, as appropriate, seek the advice of a competent professional and rely on that professional's advice. Nothing in this document replaces or excludes (nor is intended to replace or exclude), entirely or in part, mandatory and/or legal requirements howsoever arising (including without prejudice to the generality of the foregoing any such requirements for maintaining health and safety in the workplace).

Except to the extent that it is unlawful to exclude any liability, the FPA accepts no liability whatsoever for any direct, indirect or consequential loss or damage arising in any way from the publication of this document or any part of it, or any use of, or reliance placed on, the content of this document or any part of it.

This document, if used, shall be used in its entirety and without alteration. The latest version of this document may be obtained free of charge from the RISCAuthority website www.RISCAuthority.co.uk.

COMPLETION GUIDANCE NOTES:

This questionnaire is designed to elicit technical information required to assist insurers understand the building design, the construction system used, and the measures proposed for ameliorating risks from fire, and water exposure. To avoid confusion as to what information is required at each question, it is suggested that the questionnaire is read in its entirety prior to commencing completion.

In all cases, if insufficient space is provided to answer the questions in the questionnaire, continue on separate sheets. If separate sheets are used, indicate this is the case and record the document number, title, issue number and date at the location of the question.

IMPORTANT NOTE

Failure to be able to provide answers to any of the questions may demonstrate there to be a shortfall in the knowledge and evidence the FPA / RISCAuthority considers to be appropriate to the implementation of a resilient design.

Scoring matrix for completion ONLY by Insurer / Trade Association or AHJ

The Table below is for completion by the Insurer / Trade Association or AHJ and NOT by those proposing or designing the building. The matrix is made visible to ensure those completing the form understand in advance the key elements that are considered fundamental to the delivery of a resilient building.

Questions – For the risks described: -	Answer
1. Is the population of the questionnaire complete and are the answers provided of sufficient quality?	
2. Has the overall design taken adequate specific measures to address protection of the timber structure in respect of:	
a. Fire risks?	
b. Flood risks?	
c. Escape of water risks?	
3. Have sufficient representative Standards and test information been supplied to confirm the timber system's:	
a. Structural performance over time?	
b. Resilience against fire?	
c. Resilience against water and moisture?	
4. Have construction fire risks been understood and appropriately mitigated?	
5. Will the timber system be adequately protected from water and moisture for all periods of exposure prior to the building being weatherproof?	
6. Have the primary sources of fire risk been identified and mitigated?	
7. Have the primary sources of water and moisture risk been identified and mitigated?	

8. When fire propagates to a hidden / potentially combustible void (i.e. system shaft, wall cavity, or ceiling shaft) is there an understanding of how fire spread will be mitigated and ultimately extinguished?	
9. Is the plan for ultimate fire extinguishment appropriate and robust?	
10. Is the repairability of the timber system from fire events understood?	
11. Is the extent of potential loss from fire understood?	
12. Is the repairability of the timber system from water and moisture events understood?	
13. Is the extent of potential loss from water and moisture events understood?	
14. Fire and Rescue Service (FRS) Engagement	
a. Has there been sufficient engagement with the FRS to understand the role that they may have to play in any fire scenario?	
b. Have they committed to supplying the effort and resources to fulfil this?	
15. Has the lifecycle of the building been considered including:	
a. Maintenance requirements?	
b. Penetration of fire resisting encapsulation of the timber?	
c. Future modification?	

Table of Contents

Scoring matrix for completion ONLY by Insurer / Trade Association or AHJ 4
1 Basic Information 8
2 Design Principles 12
3 General Request for Evidence on Structural Timber Systems 13
4 Construction protection 15
5 Fire protection 19
6 Water and Moisture Protection 27
7 Declaration 32

Terminology

Mass / Massive Timber building:

A building whose primary load-bearing structure is made of engineered wood

Engineered wood / composite wood:

Beams and panels constructed of glued layers of smaller planks / veneers whose overall strength is greater than for raw lumber of the same dimensions

Cross Laminated Timber (CLT or crosslam):

A panelised construction system comprising planks (or lamellas) of sawn, glued, and layered wood, where each layer is oriented perpendicular to the previous. By joining layers of wood at perpendicular angles, structural rigidity for the panel is obtained in both directions, similar to plywood but with thicker components. In this way, the panel has great tensile and compressive strength.

Glued Laminated Timber (Glulam):

A beam and post construction system comprising beams made of thick parallel timber laminations (planks) glued together. The beam is used with the laminations in the horizontal plane and can support weights and spans greater than a raw lumber beam of the same dimensions.

Laminated Veneered Lumber (LVL):

A beam and post construction system comprising beams made of many thin parallel timber laminations glued together. The beam is used with the laminations in the vertical plane and can support weights and spans greater than a raw lumber beam of the same dimensions.

Timber Composite Floors:

A composite structural flooring system of timber and concrete that affords greater load bearing capability and increased fire performance.

Post tensioned structural system:

The inclusion of unbonded tensioning steel cables within timber beam and post construction systems (glulam and LVL) is used as a method of increasing the beam's load-bearing and spanning capability.

1 Basic Information	
1.1 Respondent Information	
a. Name:	
b. Job Title:	
c. Company Name:	
d. Company Address:	
e. E-mail Address:	
f. Telephone Number:	

1.2 Proposed Building name and location	
a. Building Name:	
b. Address:	

1.3 Key Stakeholder Details	
1.3.1 Client Details	
Company Name:	
1.3.2 Main Contractor Details	
Company Name:	

1.3.3 Architect Details	
Company Name:	
1.3.4 Timber System Manufacturer Details	
Company Name:	
1.3.5 Fire Engineer Details	
Company Name:	
1.3.6 Local Fire Authority Details	
LAFB Name:	
1.3.7 Local Authority Building Control Details	
LABC Name:	

1.4 Building Details							
1.4.1 Build							
New Build ☐		Refurbishment ☐		Extension ☐		Other ☐	
If Other, please specify:							
1.4.2 Form of Construction							
Post / Beam ☐		Panelised ☐		Timber Composite Floors ☐		Hybrid / Other ☐	
If Hybrid or Other, please specify:							

1.4.3 Massive Timber System Used									
GLULAM ☐	LVL ☐	CLT ☐	Post Tensioned ☐	Other ☐					
If Other, please specify:									

1.4.4 What standards for this system(s) will confirm product structural properties and manufacturing quality?

1.4.5 Timber exposed, encapsulated or hybrid?					
Exposed ☐	Encapsulated ☐	Hybrid ☐			
If Hybrid, please specify:					

1.4.6 Cladding System Type (including details of panels / slip and insulation type)

1.4.7 Roof Construction Details

1.4.8 Scale	
No. of floors:	
Floor Area:	m^2
Overall Height:	m
Overall Width:	m
Overall Length:	m

1.4.9 Building Core			
Masonry ☐	Steel ☐	Timber ☐	Other ☐
If Other, please specify:			
1.4.10 Occupancy			
Residential ☐	Commercial ☐	Mixed ☐	
1.4.11 Number of Stairwells			
1.4.12 What will be the evacuation policy for this building?			
1.4.13 Special Features			
Swimming Pool ☐	Rooftop Ponds ☐	Water Capture ☐	Helipad ☐
Green Roofs ☐	Green Walls ☐	Solar panels ☐	Wind turbine ☐
	Heritage ☐	Other ☐	
If Other, please specify:			

1.4.14 Provide examples of other complete buildings similar to this in construction methods, building products and size

2 Design Principles
2.1 What Building design codes for fire have been used?
2.2 Has fire ingress from external sources been considered within the fire safety design?
2.3 Property and Business Resilience Design Objectives
2.3.1 Have the client's / future occupant's business continuity objectives been considered in the setting of design performance parameters?
2.3.2 If yes, how have these influenced the design of the building over the standard (life-safety) measures required in law?
Loss to fire:
Loss to flood:

Loss to escape of water:
Loss to security events:

3 General Request for Evidence on Structural Timber Systems
3.1 Delamination
3.1.1 Supply test evidence to confirm the structural performance of the laminating glues / timber system combination used over time (please refence Standards or additionally supplied documentation)
What glue was used:
Expected Lifespan:
Any other information:
3.1.2 Supply test evidence to confirm the performance of the laminating glues / timber system combination used under fire conditions (please refence Standards or additionally supplied documentation)

3.1.3	Supply test evidence to confirm the performance of the laminating glues / timber system combination used when subjected to prolonged exposure to water (please refence Standards or additionally supplied documentation)

3.1.4	What period of submersion in water ban be tolerated by the timber structural components before they become non-viable for use, or need replacing?

3.2	Structural models
3.2.1	Supply evidence that the structural design models used are appropriate for the specific massive timber system used (structural component modelling)
(please refence Standards or additionally supplied documentation)	

3.2.2 Supply evidence that the fire engineering models used are appropriate for the specific massive timber system used (fire engineering structural modelling)
(please refence Standards or additionally supplied documentation)
3.2.3 What consideration has been given to the potential for timber delamination, or failure of encapsulation, that may act as additional fuel loading when predicting fire performance?

4 Construction protection
4.1 Protection against fire during construction
4.1.1 What are the primary sources of fire during construction considered to be?

4.1.2 What design measures seek to limit the likelihood of the timber structure (delivered / stored / erected) being involved in a fire during construction?
4.1.3 What management / system measures will be put in place during the construction phase to limit the likelihood of fire?
From accidental sources: From malicious sources:
4.1.4 What temporary protection systems will be deployed during the construction phase – detection, alarm, suppression, security, other?

4.2 Fire Service Engagement
4.2.1 Has there been consultation with the Fire Service specific to construction site fire challenges?

4.2.2 Have the water supplies been confirmed as appropriate for effective fire management by FRS?
4.2.3 What are the firefighting water supply details?

4.3 Protection against water and moisture during construction
4.3.1 What are the primary sources of water and moisture exposure during construction considered to be?

4.3.2 What measures will protect the timber from water and moisture pre-delivery to the site?
4.3.3 What measures will protect the timber from water and moisture during delivery and whilst on site before use?
4.3.4 What measures will protect the timber from water and moisture once installed and before the building is made watertight?

5

5 Fire protection					
5.1 What are the fire design objectives for:					
Life-safety	☐	Property protection	☐	Business protection	☐
5.2 What are the major sources of fire considered to be?					
5.3 Codes, standards, and test evidence					
5.3.1 What standards have the timber components been tested to that ensures their structural performance under fire?					
5.3.2 How long will the major structural components last in a fire event?					
Posts					
Beams					
Connecting brackets					
Ceiling / floor panels					
Wall panels					

5.3.3 Please supply test evidence that is relevant to this design, the construction methods used, and specific products used in this building to support the above claims.
5.4 How are the major timber components to be protected from fire?
5.5 Will metal fixings, plates, brackets, and post-tensioners be specifically protected from fire?
5.6 How will the potential for fire spread in timber voids be managed?

5.7 Suppression			
5.7.1 What type of fire suppression system(s) is installed?			
5.7.2 For each suppression system, please specify			
Type		Design Standard	
Type		Design Standard	
Type		Design Standard	
5.7.3 How has the fire protection system design accounted for the additional fuel load the timber structure may add (in addition to the compartments' contents)?			
5.7.4 What consideration has been given to reduce consequential damage to the timber structure from water-based fire suppression systems if used?			

5.7.5 Does suppression extend to the protection of all hidden timber voids?
5.7.6 Does the suppression system extent to all electrical rooms and car parks?
5.7.7 How will the fire safety of the building be managed during periods of impairment (when the suppression system is not operational due to fault or maintenance)?

5.8 Passive fire protection
5.8.1 What methods will be used to fire stop penetrations running through timber compartment walls?
5.8.2 Please supply performance test evidence of fire stopping devices to be used in timber compartment walls
5.8.3 What specific passive protection will be in place to prevent fire spread in timber voids?

5.9 Extinguishment
5.9.1 How will a fire ultimately be extinguished?
5.9.2 If there as a dependency on the Fire Service, are they confident that they have the equipment, resources, training, familiarity, and risk appetite to assure this? (please supply a letter to evidence that they are)
5.9.3 What measures have been taken to ensure future changes to Fire Service response policy do not impact upon the safety and survivability of the building?

5.9.4 In what time must the fire be extinguished to meet the fire design objective?
5.9.5 What are the consequences of not achieving extinguishment within this timeframe?

5.10 Recovery Plan	
5.10.1 Following a fire event, what components of the massive timber structure will need replacing? (please comment on each scenario)	
Structurally damaged	
Visually altered from fire but structurally undamaged	

Visually altered from water damage (from suppression system / FRS activities) but structurally undamaged	
Visually and structurally undamaged but residual odour	

5.10.2 What is the anticipated scale of damage from a single fire event within the building (i.e. number of compartments and floors affected)?	
Lost to fire damage	
Lost to smoke damage	
Loss to heat damage	
Lost to fire-water damage (FRS and installed Fire suppression system)	

5.10.3 Will unaffected building components require replacement whilst undertaking repair? – please identify % likely uplift on loss in question 5.10.2?

5.10.4 For a single anticipated event, how much of the building will need to be vacated during the repair phase?
5.10.5 Please provide evidence that the methods for repairing the type(s) of massive timber structure used from fire damage are known, and mature.

6 Water and Moisture Protection
6.1 What are the major sources of moisture and water considered to be that might expose the massive timber elements to harm?

6.2 What in-built design elements seek to limit the extent of possible damage to the timber structure from these sources?	
Fail to safe design (e.g. provision of drains / safe routing of services)	
Fail to safe plumbing fittings	
Waterproof coverings and encapsulations	
Other	
6.3 What systems and management controls will be in place to limit damage from each of these sources?	
Flood (i.e. first floor concrete)	
EoW (i.e. water leak detection, alarm, isolation devices)	

EoW (i.e. isolation valves and labelling)	
6.4 Recovery Plan	
6.4.1 Following a flood, EoW or moisture exposure event, what components of the massive timber structure will need replacing?	
Structural damaged	
Visually altered from water (staining / mould / growth / rusting of metal components) but structurally undamaged	
Structurally and visually undamaged but with residual odour	
6.4.2 What is the anticipated scale of damage from a flood, EoW or moisture exposure event within the buildings?	
Number of floors / compartments affected	

6.4.3	Please provide evidence that the methods for repairing type(s) of massive timber structure used from water / moisture damage are known, and mature
6.4.4	What are the long-term consequences of water saturation and elevated moisture levels (i.e. adhesive performance, accelerated mould growth, etc.)

7. Any other information deemed important to a potential insurer of massive timber buildings. If it is related to a previous question, please use the question's number for reference.

Commentary and Recommendations on test evidence:

- *Evidence submitted to support the understanding of massive timber system's reaction to fire and water, and of structural code capabilities to model performance accurately, should be supplied from independent and credible 3rd party sources*
- *References to supporting standards should be accompanied by test reports that are specific to the system used (wood / glue combinations)*
- *The test body shall be accredited by a national accreditation body for undertaking such work.*
- *Test reports shall be presented in full.*
- *Test evidence should be made at a scale that is relevant to end-use.*
- *There shall be full traceability between fire testing and subsequent application*
- *The limitations of testing shall not be exceeded in application*

7 Declaration	
I am authorised to represent the company identified below (21d) making this submission. I have supplied full and accurate information as required by this form.	
Name (please print)	
Signature	
Date	
Representing (Please print company name)	