



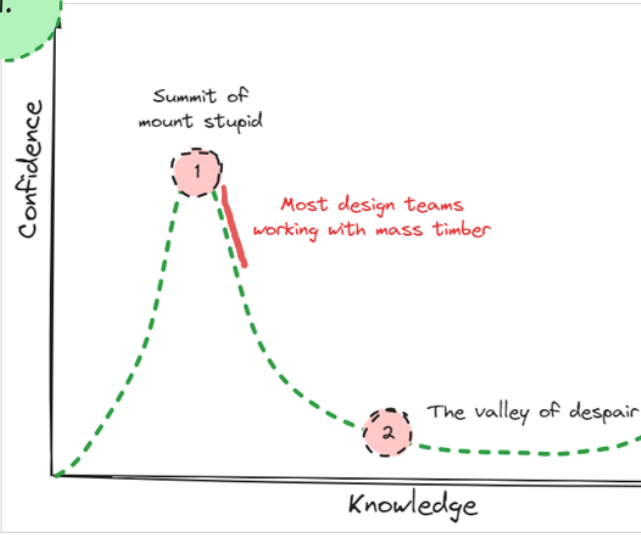
OFR

***Burnout: Objectives and expectations for mass
timber buildings***

Danny Hopkin
Director

Burnout: Objectives and expectations for mass timber buildings

1.



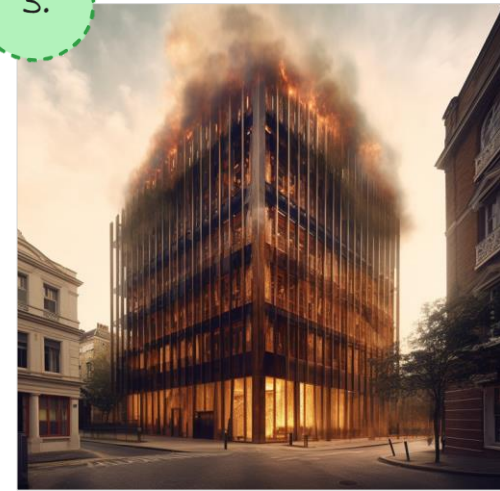
Confidence, despair, enlightenment & penance

2.



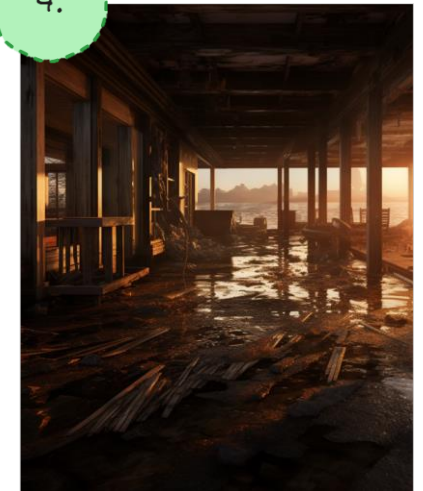
Law & objectives

3.



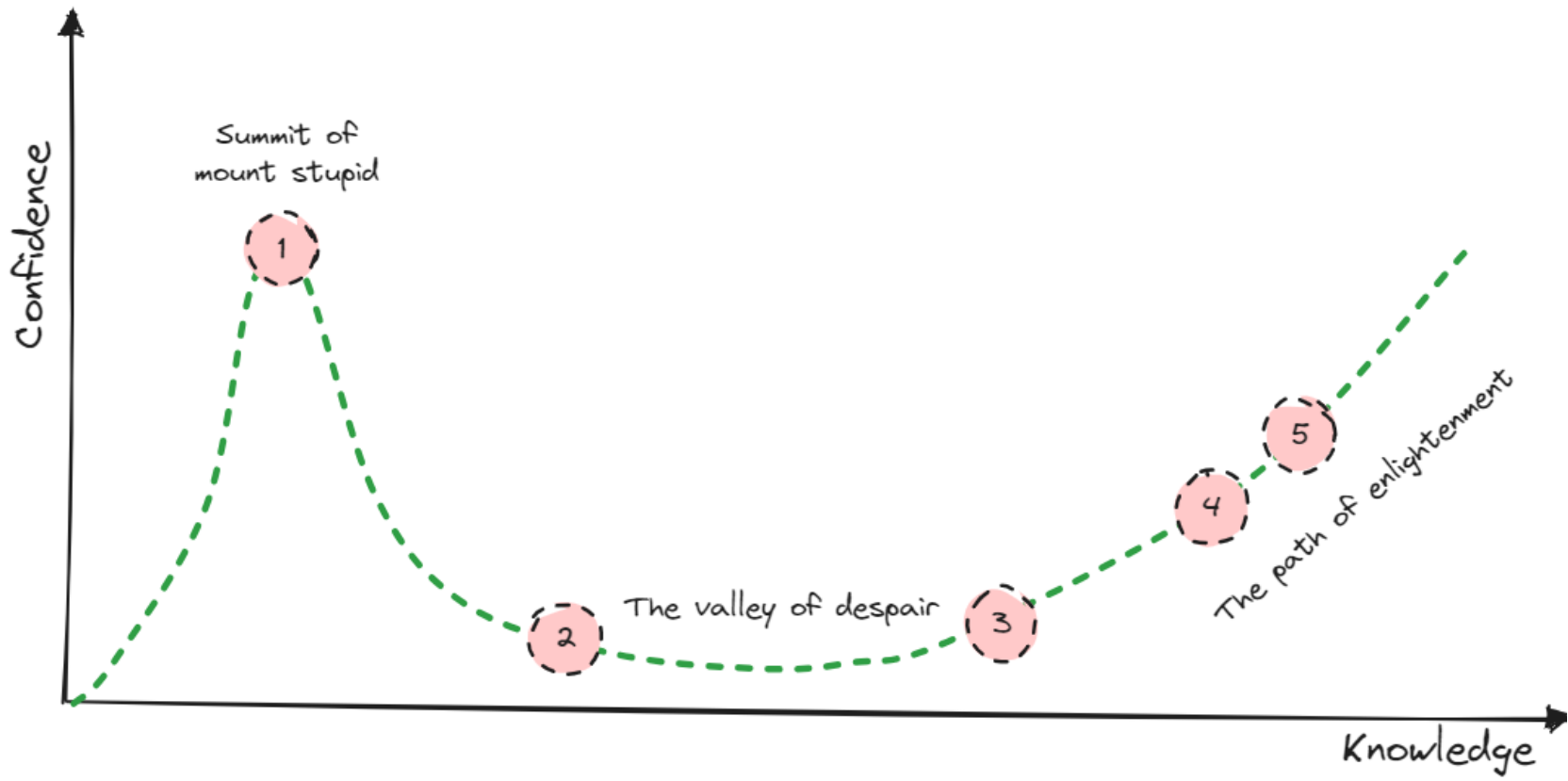
What if your structure is fuel?

4.



Expectations for mass timber buildings

Confidence, despair, enlightenment & penance





A perfect storm



A climate crisis that needs an urgent solution



Technological advancements that facilitate complex buildings



A housing shortage & ageing building stock



Inexperienced practitioners playing one crisis off against another

Mass timber has a communication problem



<https://www.thenakedscientists.com/podcasts/naked-scientists-podcast/would-wood-be-good>

Fear of fire in the wake of the Grenfell tragedy is holding back a switch to more sustainable building materials, a leading architect has told Sky News.

Andrew Waugh of Waugh Thistleton Architects, which is at the forefront of eco-building design, said the construction industry and regulators are too cautious about using engineered timber in tall structures - even though the catastrophe was in a concrete tower.

"We are being held back," he said.

<https://news.sky.com/story/fears-of-fire-after-grenfell-tragedy-are-holding-back-switch-to-sustainable-building-materials-like-engineered-timber-architect-says-12802760>

Carts and horses

sustainable

/sə'steɪnəbl/

adjective

1. able to be maintained at a certain rate or level.
"sustainable economic growth"
2. able to be upheld or defended.
"sustainable definitions of good educational practice"

knowingly

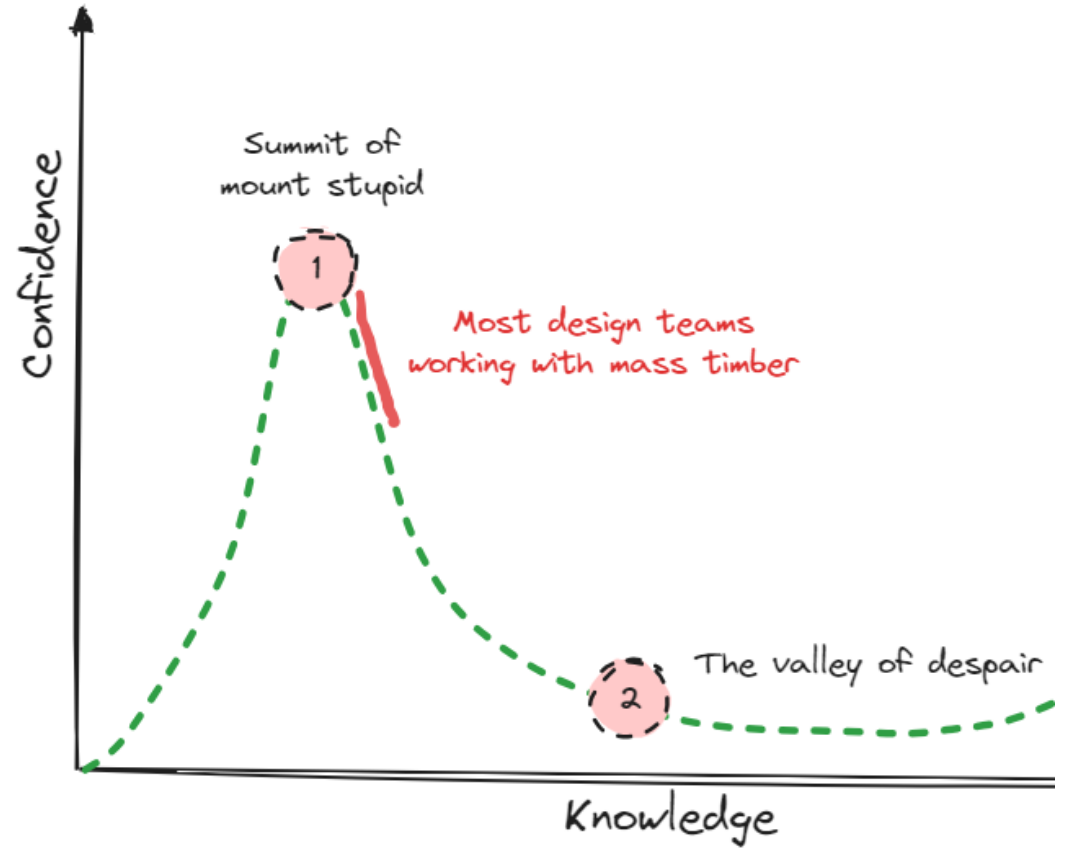
/'nəʊɪŋli/

adverb

1. in a way that suggests one has secret knowledge or awareness.
"Amy looked at me knowingly"

Similar: deliberately intentionally consciously wittingly with full knowledge ▼

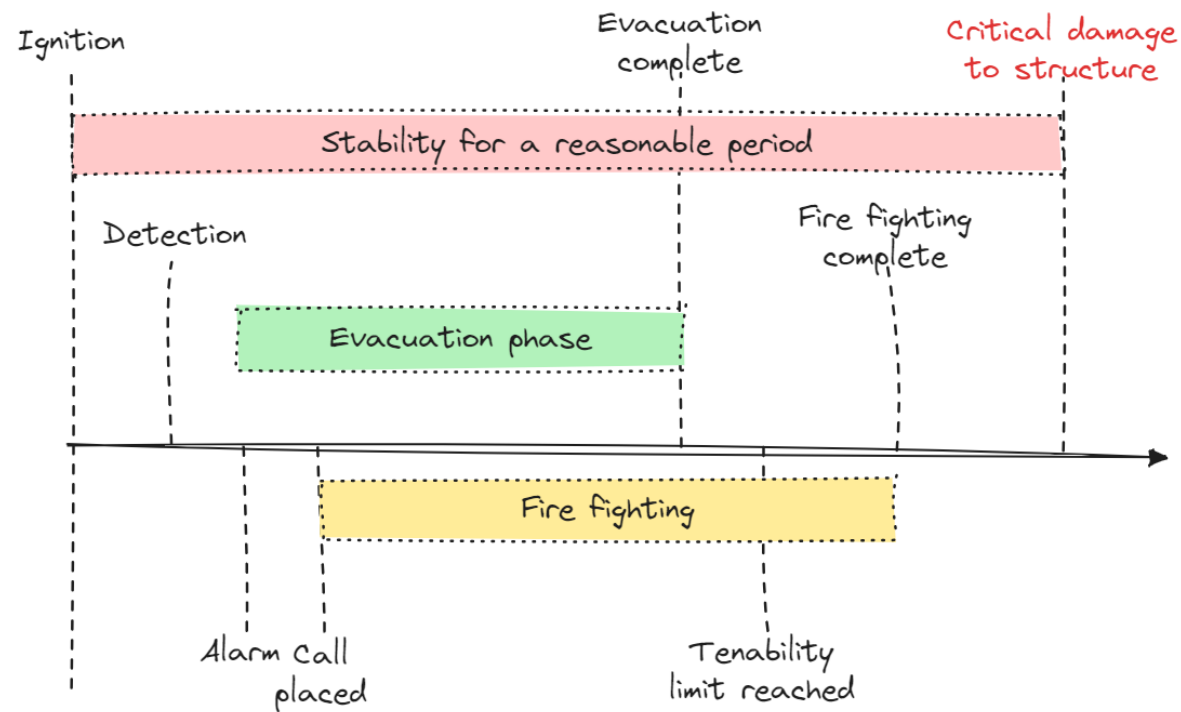
2. in full awareness or consciousness; deliberately.
"I can honestly say I've never knowingly misled anyone"





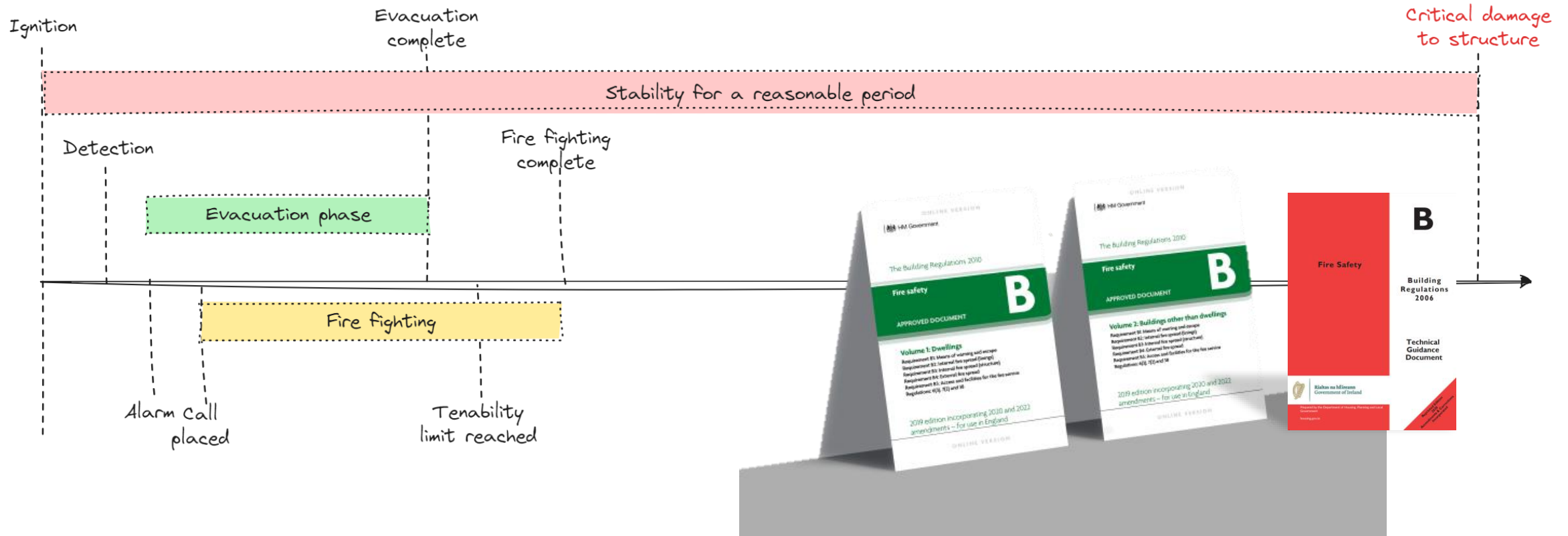
The Building Regulations

Regulation B3(1): *A building shall be so designed and constructed that, in the event of fire, its stability will be maintained for a reasonable period.*

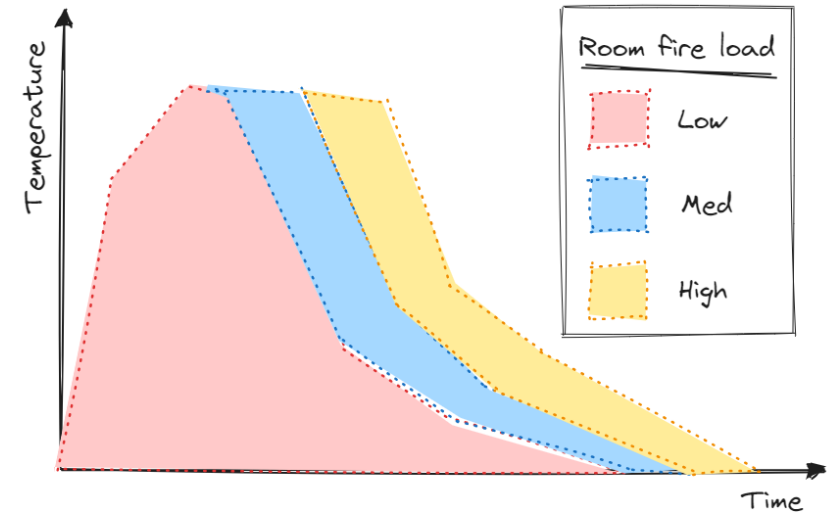


Language of the surrogate – reasonable period

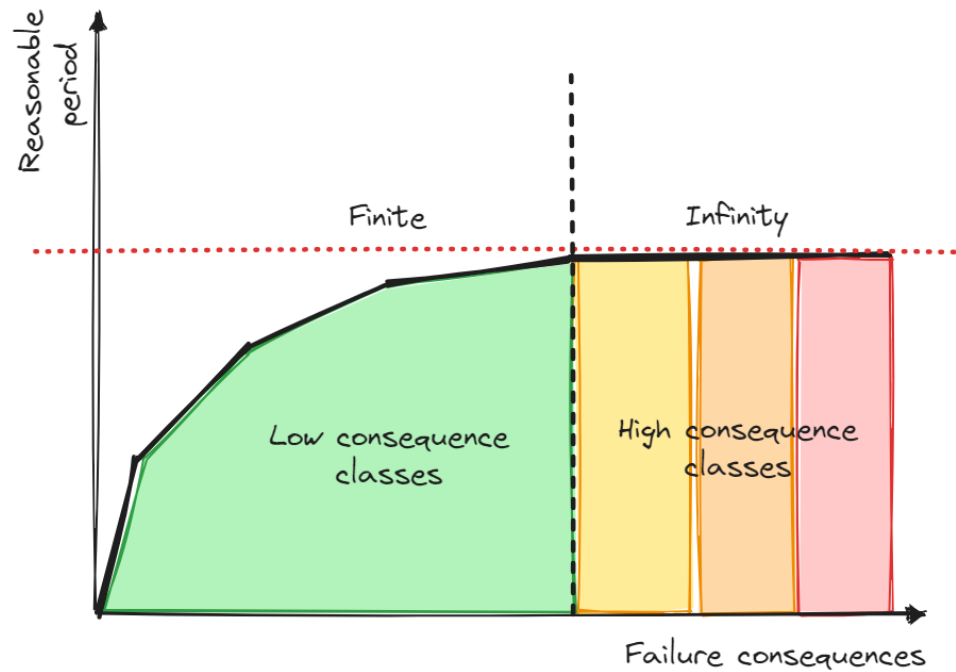
Regulation B3(1): *The building shall be designed and constructed so that, in the event of fire, its stability will be maintained for a reasonable period.*



Language of the surrogate – the fire resistance period

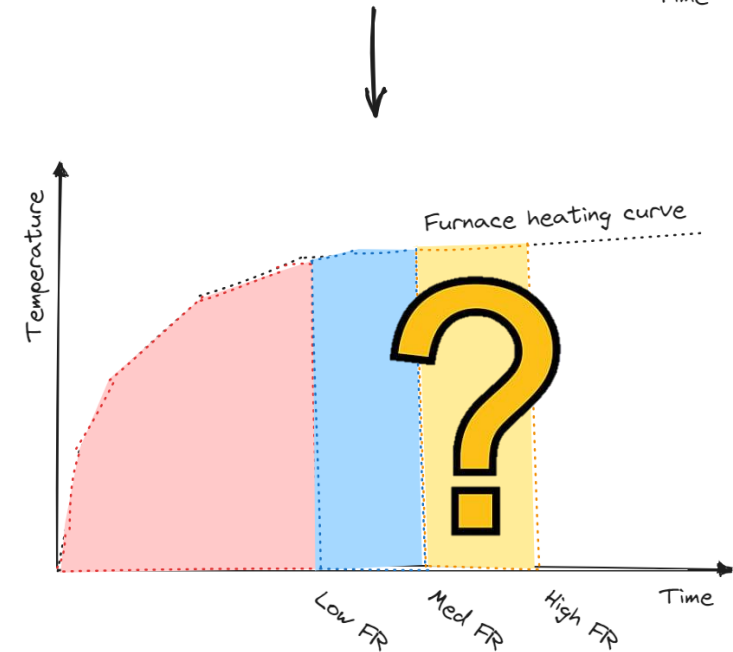
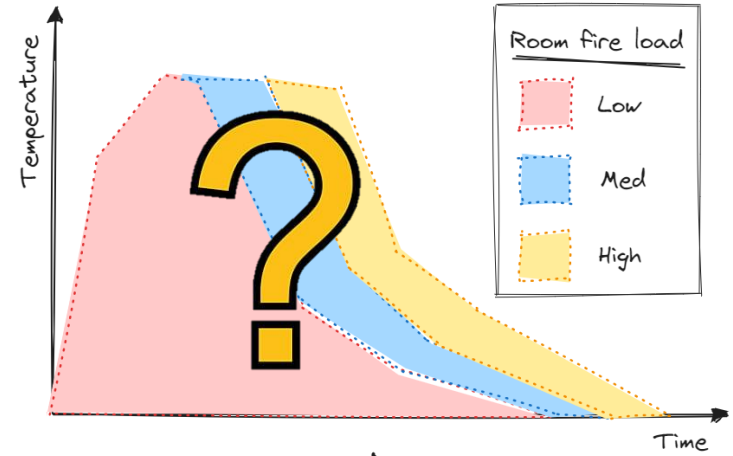


Structural fire performance – a collection of surrogates

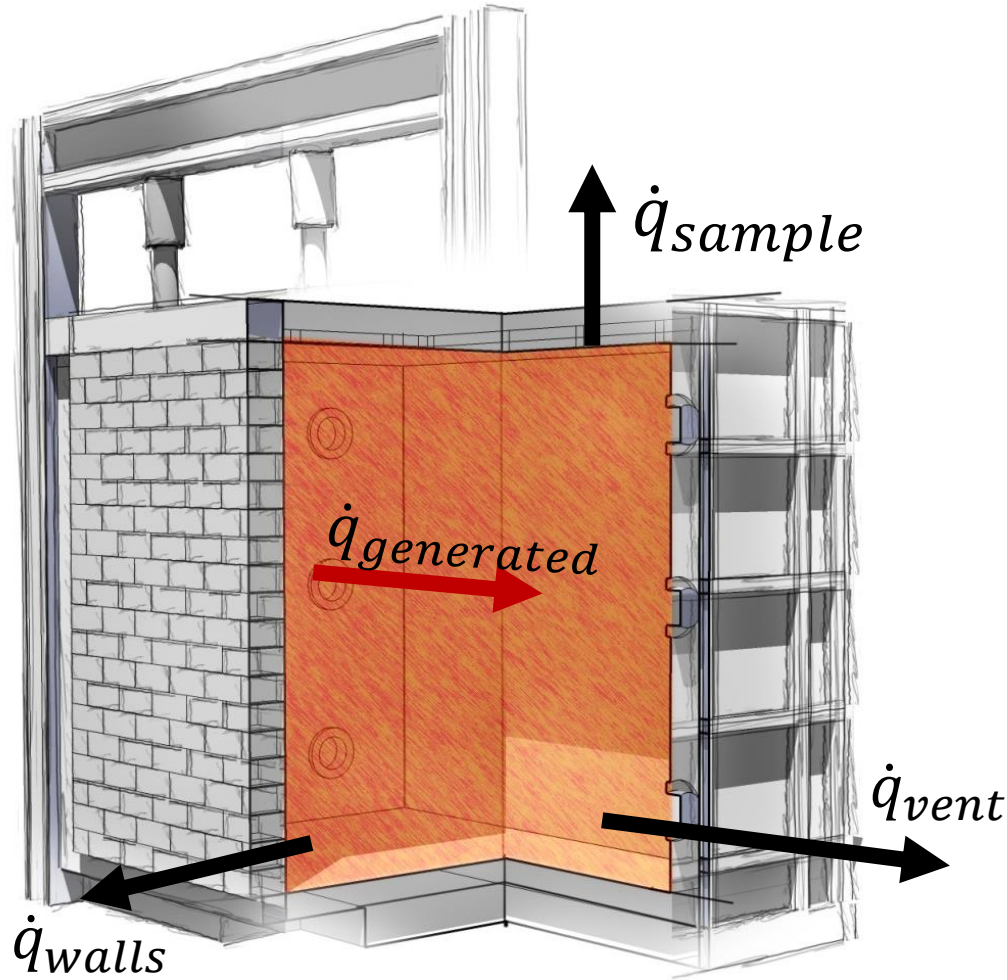


What if
your
structure is
fuel?

Implications for the fire resistance period

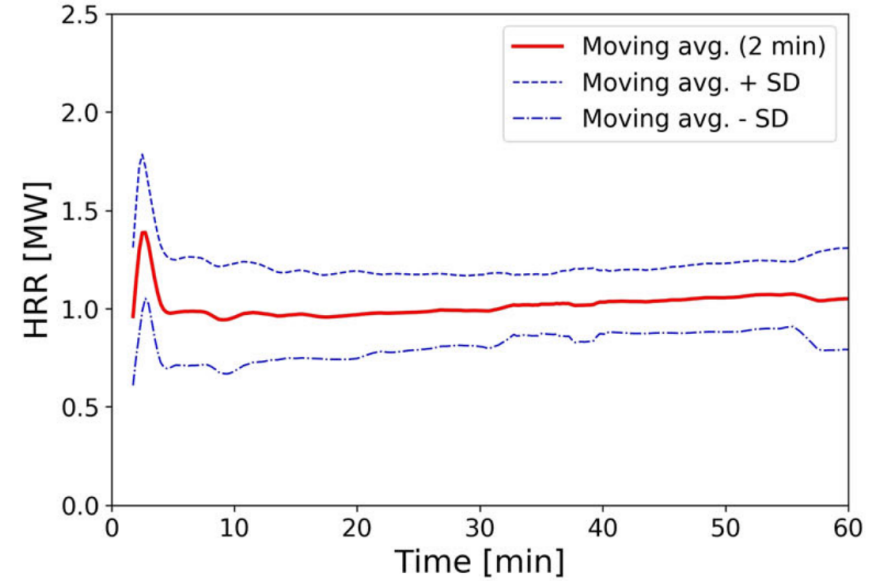


Implications for the fire resistance test

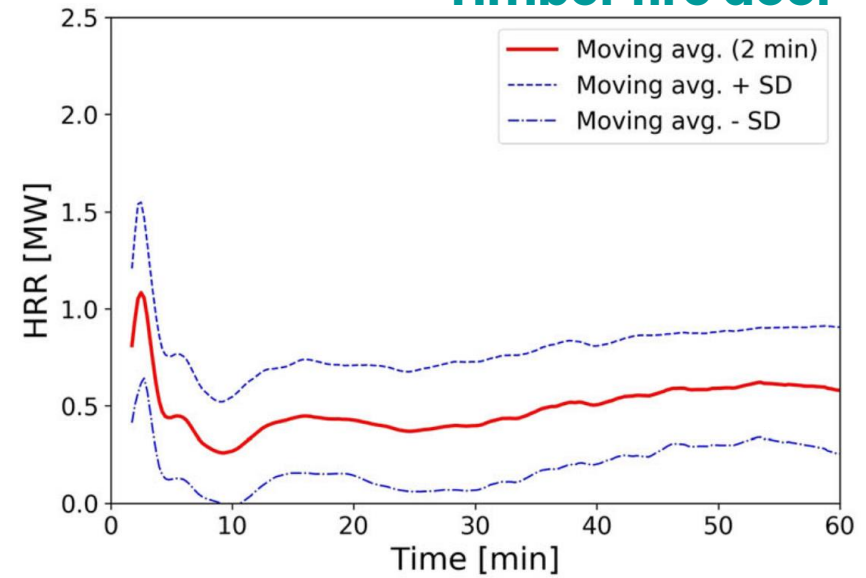


$$\dot{q}_{generated} = \dot{q}_{walls} + \dot{q}_{vent} + \dot{q}_{sample}$$

Steel fire door



Timber fire door



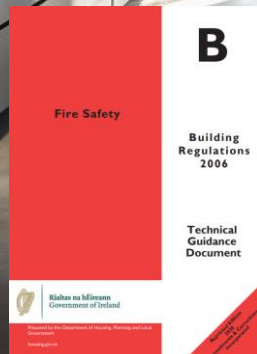
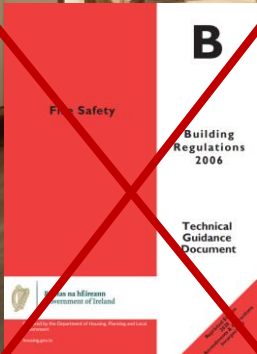
Structural fire loading (unknown)

Structural elements of the same fire resistance rating but difference levels of performance / robustness in a real fire

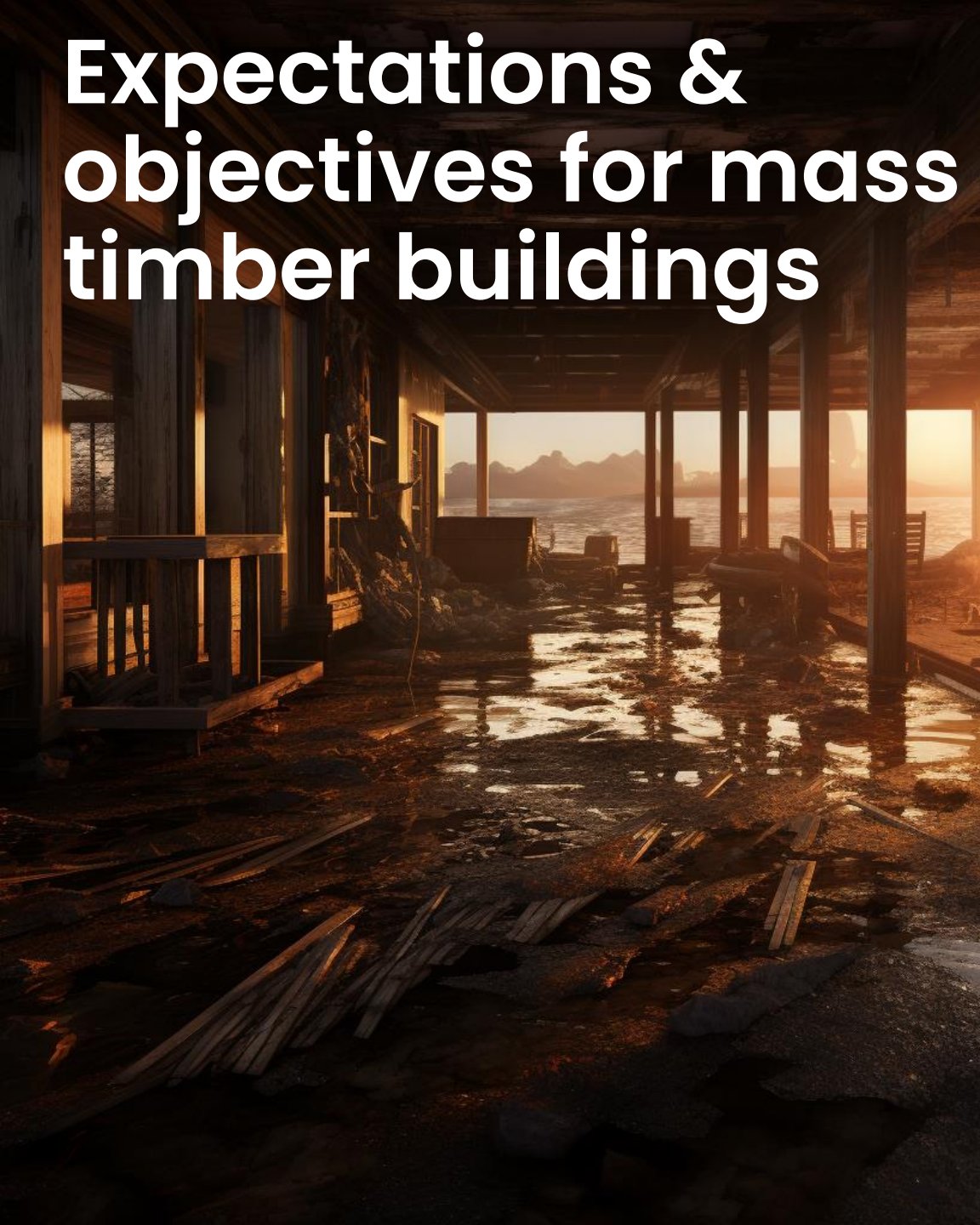
No structural fire load

Moveable fire loading (known)

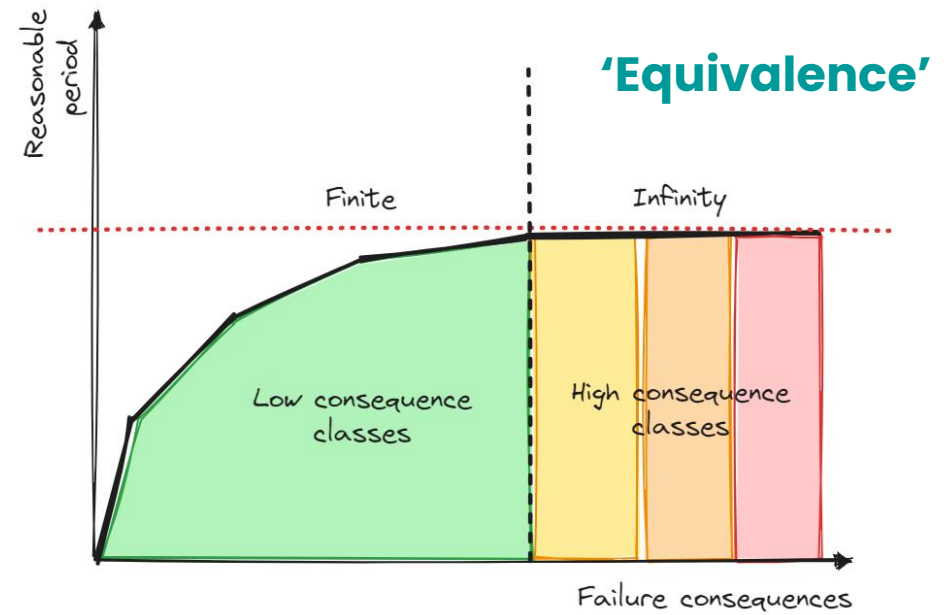
Moveable fire loading (known)



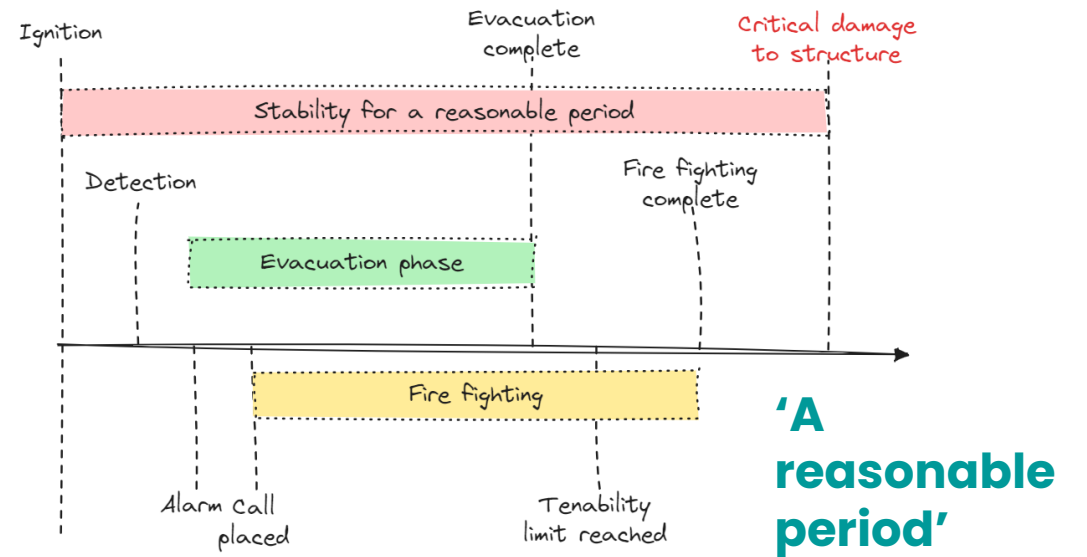
Expectations & objectives for mass timber buildings



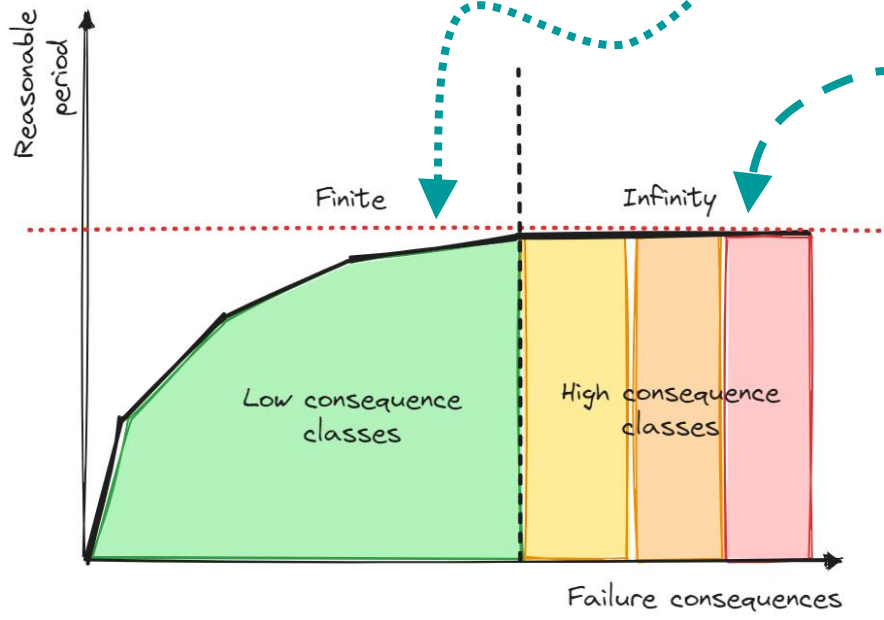
1.



2.



Equivalence



1.



Lesser consequence of failure buildings

A reasonable period is finite and fire resistance can deliver an adequate outcome

2.

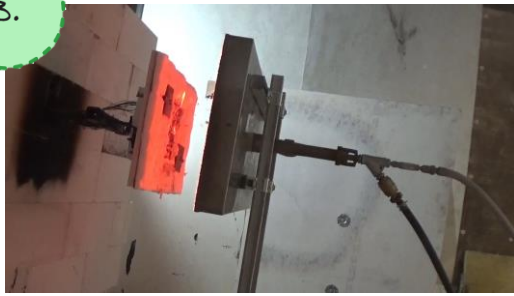


Higher consequence of failure buildings

The reasonable period is infinite

The structure should not become involved as a fuel

3.



Or

Burning should stop without intervention

Regulation B3(1): A building shall be so designed and constructed that, in the event of fire, its stability will be maintained for a reasonable period.

Burn-out: objective achieved?



Flaming combustion



Smouldering combustion

Mass timber

Regulation B3(1): A building shall be so designed and constructed that, in the event of fire, its stability will be maintained for a reasonable period.

For buildings with low consequences of failure and low fire resistance, the duration of stability in a fire is finite without intervention.

For buildings with higher consequences of failure, indefinite stability in the event of fire without reliance on intervention means the structure cannot burn.

If the structure is allowed to contribute as a source of fuel, the duration of stability is very likely finite, unless there is intervention.

But we can design a structure that limits the intervention to addressing residual smouldering.

Steel & concrete

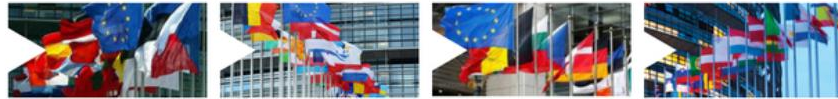
For buildings with higher consequences of failure and high fire resistance, the duration of stability in a fire is intended to be indefinite without intervention.

Burnout Means *Burnout



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SFPE EUROPE



Q1 2017 ISSUE 5

AN OFFICIAL PUBLICATION OF SFPE

Burnout Means Burnout

By Dr. Angus Law, and Dr. Rory M. Hadden
BRE Centre for Fire Safety Engineering
School of Engineering
The University of Edinburgh

**where some fire and rescue services activities will likely be necessary to extinguish smouldering combustion.*



Higher consequence requires stakeholder compromise



Thank you