WG3 - Robustness of systems

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Introduction - Robustness

Reasons to failures:

- Extreme high load / extreme low strength: very unlikely (probability of failure per year ~ 10^{-5}-10^{-6})

- Other reasons:
  - Unexpected hazards
  - Design errors
  - Execution errors
  - Deterioration of critical structural elements

→ Robustness requirements

Siemens Arena
Copenhagen 2003

WG3 – MoU: Scope

An important aspect for the assessment of the life cycle performance of timber structures is the **interaction of structural components in structural systems**.

System effects in timber structures are pronounced because of **multiscale spatial variability of environmental exposures** and **material properties**.

Existing numerical methods used to **assess the reliability of timber structures** need to be evaluated for their possible application to timber systems, and **simplified approaches** suitable for day-to-day engineering purposes must be identified.

Furthermore, consensus on the **general characteristics of timber systems regarding redundancy and robustness** has not yet been established.

WG3 – MoU: planned activities

Activities planned in WG3:

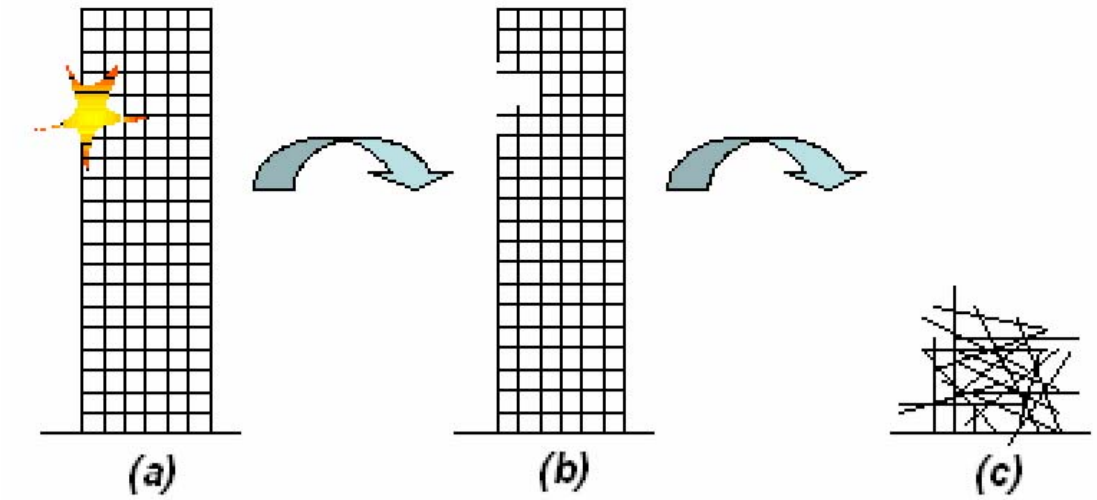
- Characterisation of multi-scale variability in timber structures.
- Analysis of system effects for several types of timber structures.
- Qualification of robustness as a characteristic of timber structures.

- Establishing a framework for reliability based design and assessment of timber structural systems based on these considerations.

Robustness - Eurocodes

A structure shall be designed and executed in such a way that it will not be damaged by events such as :

- explosion,
- impact, and
- the consequences of human errors, to an extent disproportionate to the original cause.



WG3 – focus points

Reliability of timber systems:

- Roof trusses / Roof elements / Glued laminated beams / solid timber structures / …
- Spatial dependence for material strength parameters / loads
- Reliability of systems / risk assessment

WG3 – focus points

Robustness of timber structures:

- Characterisation of timber structures with respect to robustness
- Reliability / risk based requirements related to consequences of direct failure consequences and follow-up consequences
- Consensus on the characteristics of timber systems regarding redundancy and robustness
- Development of simplified approaches for assessment of robustness, suitable for day-to-day engineering purposes – how to increase robustness of timber structures?