UQ Fire Project #2019.18

INVERSE CAUSE-CONSEQUENCE ANALYSIS FOR THE FIRE SAFE ENGINEERING DESIGN OF LOAD-BEARING STRUCTURES

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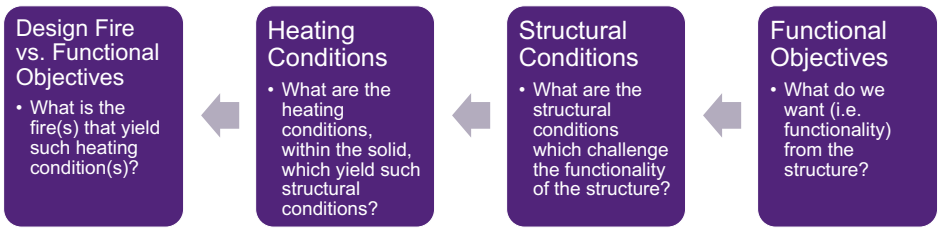
Background and motivation

Cause-consequence analysis is a technique which combines the ability of fault trees to show the way various factors may cause failure or any other consequence and outcome. The technique has considerable potential for illustrating the relationships from initiating events (e.g. ignition of a fire) through to end outcomes (e.g. failure of a load-bearing structure). It can be used fairly directly for quantification, but the diagrams can become extremely complex and highly dependent on probabilistic data. Moreover, in conventional structural fire engineering, the quantification of the type of fire becomes a critical starting point of the engineering design.

This work will explore the use of an inverse cause-consequence analysis for the fire safe design of load-bearing timber structures. Focus is placed on failure of the structure and analysing the types (not a single fire) that that yields the degree of structural failure which results in loss of structural stability.



Research objectives

1) This project is to use 3 or 4 case studies where the inverse cause-consequence analysis methodology will be used and evaluated.
2) Evaluate the influence of adding different degrees of simplification or complexity at every step of the analysis.

Methodology

This project will be based on desktop studies. Simple heat transfer and structural analysis will be used.

Recommended literature

[1] Bisby L, Gales J, and Maluk C. 2013. Fire Science Review 2:1
https://link.springer.com/article/10.1186/2193-0414-2-1