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Presentation Title:
The Pre-Flashover Compartment Fire and Fire Safety Engineering – a Review of Hand-Calculation Methods

Presentation Abstract:
Computer-modelling software for fire safety engineering has evolved rapidly during the last decades. Such software is generally good for fire engineering purposes, but there is still a need for simple engineering methods. The motivation is that hand-calculation methods are inexpensive and the result from such calculations can help an engineer to determine if it is necessary to perform more detailed calculations e.g. with a computer model. Simple methods can also be used to increase the knowledge and understanding of different fire phenomena and relationships between different parameters. This is important because it is necessary to have a general understanding of the fire phenomenon of interest when using more advanced and less transparent computer models.

The so-called MQH correlation [1] is an example of a hand-calculation method that can be used to predict hot gas layer temperatures. The MQH method was develop in the early 1980s but is still described in handbooks [2,3] used by practitioner’s worldwide. The MQH correlation can be used to estimate the pre-flashover temperature increase in a single cubical room. However, during the last years there has been an increase of available calculation methods [4,5], which means that there are more methods available for the practitioner. There has also been an increased amount of other hand-calculation methods e.g. for calculating hot gas layer heights [6] and ceiling jet temperatures [7]. The different methods all have their advantages and challenges, and might also be applicable for different situations.

The scope of the paper is to present a state of the art review and evaluation of different calculations that can be used to calculate hot gas layer temperatures, hot gas layer heights. The accuracy of the different methods will also be discussed and quantified.

The evaluation will be performed by comparing predictions with the different methods with data from a small-scale experiment. Most of the available hand-calculation methods, like e.g. the MQH correlation are based on stationary conditions. However, the methods could possibly also be used for transient problems with a so-called quasi-steady state approach. The suitability of applying such an approach with the studied methods will also be evaluated in the paper.

Preliminary results indicates that there are slight differences in the accuracy of the different methods and that the average errors, compared to the experimental data, in the methods to calculate hot gas layer temperatures are 5---15%.
References:


