SPEAKER

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[Ref: A Fire Risk Assessment Model for Tall Residential Buildings in Denmark]

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THE HONG KONG POLYTECHNIC UNIVERSITY
DEPARTMENT OF BUILDING SERVICES ENGINEERING

C P D L E C T U R E

A Fire Risk Assessment Model for Tall Residential Buildings in Denmark

- Free Admission -

SCHEDULE

6:30 pm	Registration
6:45 pm	Welcome and Introduction
6:50 pm	Talk by Dr. Grunde Jomaas

D a t e	29 August 2013 (Thu)
T i m e	6:30 – 8:00 pm
V e n u e	Room Y301 The Hong Kong Polytechnic University

Organized by

Professor W.K. Chow FHKEng JP
Director, Research Centre for Fire Engineering
Head of Department, Department of Building Services Engineering
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Abstract

The current legislation and the standard practice for fire safety in multi-story residential buildings in Denmark were scrutinized to establish the implicitly assumed fire safety level. Following the assumption that the inherent empiricism of the prescriptive solutions and the standard practice provide the societal fire risk acceptance, this code calibration method was assumed to supply the target fire safety level.

Once the target fire safety level was established with regards to occupant and property loss for a standard code-compliant multi-story residential building, the relative importance of different fire safety attributes was ranked. These attributes, covering different aspects of fire safety measures, including passive and active installations as well as firefighting operations, were analyzed based on a combination of statistical data and conventional fire modeling, leading to a quantification of the fire safety level with regards to the total building height. More specifically, different fire developments were analyzed through the use of fault trees, event trees and sensitivity analysis. In addition, probabilistic graphical models were used to capture the conditional dependencies embedded in the fire, evacuation, extinguishment and structural sub-models with the aim of optimizing the fire safety strategy. As far as possible, the analysis applied established failure reliabilities from literature.

Given that occupant safety is the main fire safety objective of the Danish Building Regulations, special attention was placed on an in-depth analysis of the different stairwell layouts to establish the effectiveness of over-pressurization, airlocks and the addition of a lobby. Further, the inclusion of fire fighter elevators has become standard practice in Denmark for buildings with a height that exceeds the reach of the fire service ladders. Therefore, the relative importance of this attribute was studied for different building heights. Also, a risk assessment was performed for different fire spread scenarios and the effectiveness of the suppression systems for various building heights.

The method provided a valid suggestion as to how fire safety levels as a function of attributes and building height compare with the target fire safety level established by the codes, despite being partially impaired by the limited availability of valid statistical data. However, throughout the process it became evident that a systematic effort to harvest the input data for the probabilistic models is required for an efficient and robust reliability framework.