

Developing Key Fire Safety Indicators (KFSIs) for Retail Buildings - A Tool for Fire Safety Monitoring

Indicators have a natural place in many industries, from finance to health care to processing and manufacturing. The aspects which are measured and monitored within these areas highlight a similar potential utility within the area of fire safety. The development of Key Fire Safety Indicators would enable continuous monitoring of a building's fire safety components, and in turn provide an indication on the building's overall fire safety. Despite this, indicators within the field of fire safety have not yet been developed for these purposes.

Indicators in various forms have been utilised throughout history and are found practically everywhere in society today. They are commonly utilised to measure performance in terms of profit, safety, or quality. Examples of common indicators include stock price to earnings ratio (company evaluation), number of tank leakages (process industry), and number of attendants per patient (health care).

In order to develop indicators measuring the most important aspects of fire safety, the initial approach undertaken was to identify the fire safety components – such as sprinklers, personnel and smoke evacuation – that have the largest importance to the overall fire safety of a building, and to let these components form the basis for the development of indicators.

Established methodologies within the area of fire safety that are used to undertake such a task fall under the Multi Attribute Decision Making (MADM) category. These methods are used to decide between alternatives that are characterised by multiple attributes (here synonymous with objectives, strategies, or components). As part of the MADM methodology approach to identifying the most important components in relation to the overall fire safety of a building, a hierarchical approach was taken.

A fire safety hierarchy was generated which set out the policy, objectives, strategies, and components of fire safety. The policy, in other words the overall objective of fire safety, was “a satisfying level of fire safety”; the objectives were “provide life safety”,

“provide property protection” and “provide business continuance”. The strategies encompassed fire extinguishment, emergency egress, limiting fire and smoke spread, and ignition prevention. Twenty fire safety components were included at the lowest level of the hierarchy.

An expert panel was consulted to weight the attributes in relation to their importance to the policy. Initially, the components were weighted in relation to the strategies, then the strategies were weighted in relation to the objectives and finally the objectives were weighted in relation to the policy. Through matrix multiplication, the component weights in relation to the policy were produced, allowing the components with the highest weight in relation to the policy (the most important components) to be identified. The components identified to form the basis for indicator development were sprinkler system, detection system, personnel, and inspection, testing and maintenance (ITM).

The indicators were developed using a reasoning approach due to the lack of established documented strategies for indicator development. The most important features of each component were identified through a literature review. These features were identified to be the most suitable to form the structure for meaningful indicators within the area of fire safety.

Based on the components of sprinkler system, detection system and personnel, a total of seven indicators were developed. The four fire systems indicators developed were: number of sprinkler activations and number of fire detection activations per building area unit; and a summarised grade indicator aiming to describe each system's design. The three personnel indicators developed were: number of personnel per building area unit; number of personnel per customer, and number of fire safety training sessions, weighted in accordance to the training session content and multiplied with the personnel participation.