



## An Introduction to Holistic Fire Engineering

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### **A need for a new fire engineering approach?**

Those who have worked in the fire industry for more than two decades will have seen a shift in the application of fire engineering from highly prescriptive fire codes to what is described as a novel approach – the use of performance based fire engineering. This is as a response to new and exciting advances in the creation of higher, larger and more dynamic buildings. Whereas prescriptive fire codes restricted architectural design, the performance based approach allowed greater levels of flexibility. However, and even after three decades, there are still some fundamental flaws. These include:

1. Enforcement Agencies around the world are entrusted to approve fire safety designs for new or modified building projects. However, still to this day, many do not have absolute confidence in submitted designs, especially those using a performance based approach. They either have a choice of employing their own team of fire professionals to, as far as possible, check the submitted fire strategies. This obviously has both time, resource and cost implications, especially when there are increasingly tight budgets imposed on them.
2. The problem of approving fire strategies is further exacerbated by the fact that fire engineering organizations, big and small, all have their own styles and methodologies. There is little in the way of consistency of approach.
3. The world is changing fast, and fire can be an outcome of an increasing array of threats. Despite this, many fire strategies still tend not to include a proper analysis of threats at the early project stages. Terms such as “Extreme events are not considered...” are still included in many current fire strategies.
4. Compliance with National Regulations and standards are still seen as the key objective for most fire safety engineered solutions. Most of these often derive from the US Codes (NFPA) and UK Codes (British Standards) but all include their own ideas and issues – resulting in subtle variations. Consequently, when viewed from a global perspective, the range of requirements is mind boggling. Furthermore, national fire codes have traditionally concentrated on life safety. They rarely

adequately address issues such as property and asset protection, business continuity and the protection of the environment against fire and the impact of fighting fires. With a changing world where these issues are becoming much more important, limited objectives setting is often an opportunity wasted.

Holistic Fire Engineering (HFE) is an idea developed by myself in conjunction with an international team of fire experts from far afield as Poland, USA, China, UAE and Iran. It has been designed to cater for all the above concerns under a single concept. HFE does not aim to change fire science, or the application of fire engineering principles. What it does seek to do is:

- Provide a highly auditable framework. The key beneficiaries of this will be those enforcement agencies around the world, as this will increase their confidence in HFE based fire strategies and save them time and money.
- Provide a consistent approach and format, whether the building design is based in London, Stockholm, Chicago, Dubai, Sydney, etc.
- Widen the scope of fire strategies to include threat assessment and objectives setting.

### **What is the HFE Process?**

Holistic Fire Engineering will follow some guiding principles:

- A. To ensure that a fire engineered solution properly accounts for the real and perceived threats affecting the building, its occupancy and processes. Extreme events may or may not be included based upon a risk evaluation.
- B. That we consider, fully, all objectives, and not just those applicable to national regulations. Note that comparison with national regulations will need to be included within the process.
- C. We utilise all existing recognised means to develop holistic fire strategies.
- D. Critical to holistic fire engineering is that the analysis and design process is controlled by a measurement system to allow full audibility and comparison at any stage of the process. Consequently, third parties can be provided with greater assurance that the solution is compliant with “holistic fire engineering” metrics.
- E. The process and metrics must be transferable globally such that they will be the same wherever they are applied.

The holistic fire engineering framework and process from feasibility through to delivery of the holistic fire strategy and is shown in Figure 1.

Each of the items are described as follows:

**Feasibility Design Review:** This is a special review prior to the commencement of the design, to enable all stakeholders to gain an understanding of the building, its processes and occupancy profile. Any special issues can be raised at this point.

**Threat assessment:** Any and every perceivable threat can lead to several fire scenarios. Each building, each occupant and each process will introduce specific threats. Kingfell Guide KF912 has identified six threat types:

- Intentional
- Accidental

- Environmental
- Economic
- Operational
- People

Objectives Setting: There are four key objectives related to fire engineering. These are:

- Life safety
- Property protection
- Business protection and continuity
- Environmental protection

Each of these objectives can be sub-divided for specific consideration. British Standard PAS 911 contains details of this. Note that, at this stage I deliberately would like to remove the need to comply with national regulations as an objective. This allows for more open thinking and makes more sense as we work more within a global environment. National Regulations will be considered as part of the Gap Analysis.

Holistic Design Review: Those who have used British Standard BS 7974 will know of the qualitative design review (QDR). This is also included within holistic fire engineering although it is now a two-part process with the feasibility design review initiating the fire engineering process. This review will assess the scenarios and key objectives that derive from the two previous exercises.

Holistic parameter determination and agreement on methodology: Directly resulting from the design review, agreement is made both on the parameters used for the fire engineered study but also what methods are used for analysis purposes. This will include consideration of the use of evaluation tools such as fire and evacuation modelling. The RSET and ASET criteria will be maintained. In addition, new criteria will be introduced for non-life safety objectives.

Holistic fire strategy preparation: The fire engineering will be tasked with the preparation of the strategy, controlled by the metrics (see later).

Peer Review and Gap Analysis: This is the point where an independent review will be undertaken, again controlled by the metrics. It is also this point where national requirements will be evaluated against the proposals and a gap analysis established. The gap analysis should be clear and concise and enable non-fire professionals to judge if the gaps are acceptable.

Holistic Fire strategy: The final holistic fire strategy will be established and will be of a state that approval can be given based upon both the earlier analysis and peer review and that the metrics have been suitable followed.

Metric Templates: This is the complete control process for holistic fire engineering. It is there to guide the fire engineers and to improve consistency. The metrics are a combination of checklists and recommended methodologies at every stage of the process. In some ways, the metric templates could be regarded as a replacement of the national codes and regulations. These will provide the same context for whatever building type, or for wherever it is – Dubai, Sydney, Amsterdam or New York.

**How will HFE work in practice?**

The concept is, and must be, very simple and straightforward:

1. All management of HFE will be undertaken via a dedicated global website.
2. Enforcement Agencies will be invited to register for HFE. They will be briefed as to what expect and how the business will work. Registration will mean that they will formally accept projects using the HFE process as an alternative to traditional arrangements. There will be no charge for registration.
3. Projects covered by the jurisdiction of a registered enforcement agency will apply for registration via the HFE Website. For their registration fee of what will be around \$25, they will receive access to one metric template. This may be a general template or one that has been specifically prepared and validated for a special purpose (e.g. railway stations, oil and gas processing plant, etc.). This metric template will then guide them through the HFE fire strategy process. Note that it will not be designed to complete the fire strategy itself. This will still be the responsibility of the Fire Engineers responsible for the strategy.
4. When the project is near complete and ready for approvals submission, the fire strategy, together with the completed HFE Metric Template will be submitted to the enforcement agency. If required, the proper completion of the Metric Template can be checked for a nominal additional fee. This is a form of peer review and will provide greater confidence for those tasked with the approvals.
5. The HFE Team can also assist with technical enquiries with regard to the fire strategy itself.

As the concept develops, further articles will be prepared.

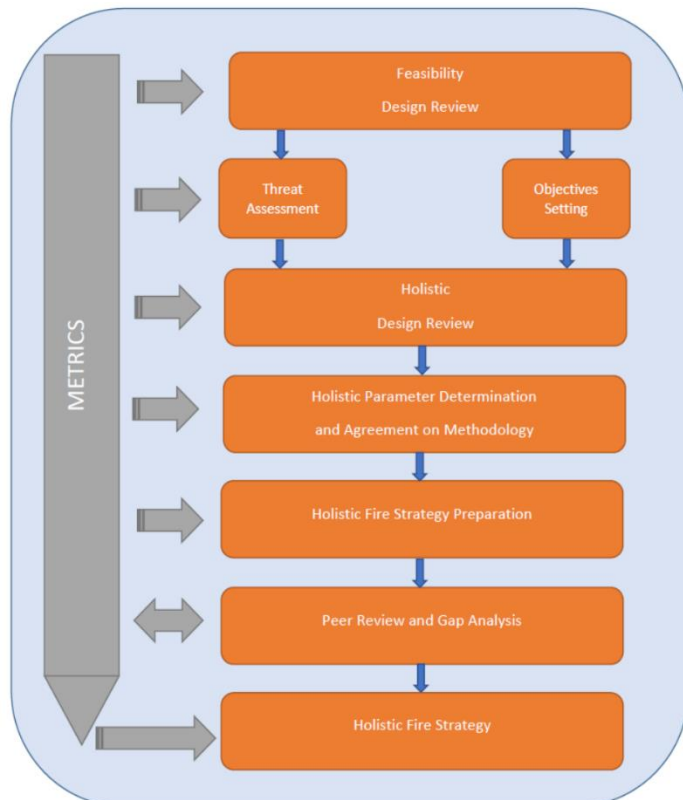


Figure 1: HFE Flow Chart