

KINGFELL WHITE PAPER



HERITAGE BUILDINGS – DESIGNING FOR LIFE SAFETY & PROPERTY PROTECTION

The design of fire detection systems for the heritage sector is both complicated and challenging, as Peter Stephenson, Principal Fire Safety Engineer at Kingfell Consulting, explains.

Each heritage building is unique. And each one demands careful consideration, as the client may have a somewhat confused or contradictory understanding about the risk of fire, or what needs to be put into place to provide maximum life safety and property protection. However, for any fire engineer working to BS 5839 - Fire Detection and Fire Alarm Systems for Buildings, the constraints on heritage buildings can be liberating. These problems present the fire engineer with the opportunity to go beyond conventional thinking, providing scope for the designer to be imaginative.

However, there are some fundamental issues that need to be addressed before embarking on the design work.

CLIENT, WHICH CLIENT?

The first task may well be to determine who, precisely, is the client! Is it the owner, possibly the National Trust or the Church Commissioners; is it the occupier, whose family may have lived in the building for centuries; or is it a conservation group such as English Heritage, Cadw – the official guardian of the built heritage of Wales – or Historic Scotland? The question is: what is each party's agenda, and what are each party's priorities?

Inevitably, a solution will have to be found that satisfies the fire safety objectives for both life safety and property protection to the satisfaction of everyone with an interest in the building. This may be a sometimes frustrating and seemingly impossible task. For example, the requirement for maximum fire safety by one group may only be

achieved by restricting access to another. Some historic buildings are so challenging that enforcement authorities may even decide that the only way to ensure safety is to restrict entirely the public, including the occupants, from the building. Is this acceptable? Unlikely.

So, the starting point must be to obtain a detailed understanding of the risks as perceived by each "client" or stakeholder group, to ensure that the designer's solution meets everyone's expectation and reflects what they perceive as the key requirements. This can be a lengthy and arduous process. Reliable answers need to be obtained to questions relating to any number of site-related issues, such, for example, as the presence and nature of any asbestos in the structure that needs to be avoided.

THE DEVIL IS IN THE DETAIL.

Accurate drawings are often difficult to obtain, even in relatively modern buildings; drawings for heritage buildings are frequently missing altogether or are grossly inaccurate, lacking in any real detail. So, it is imperative that all available information is found, verified and understood to gain an accurate picture of the building, including its components and structure, its voids and cavities. Only in this way will a solution develop that addresses the real risks, and meets the needs of all the interested parties, while remaining sympathetic to the age and style of the building; a solution that also addresses the possible need for fire compartmentation to limit the potential spread of fire and smoke. This may take the form of fire doors or separation introduced into voids or ducts as recommended in the 1993 Bailey Report entitled Fire Protection Measures for Royal Palaces.

So, it is essential that the fire system designer becomes intimately familiar with the structure and walks through the entire building to identify any possible fire safety challenges. These can include high or ornate ceilings, intricate architectural details, wall hangings or objects that are barriers to the line of sight for detection systems; information that is impossible to determine from even a thorough study of the available architectural drawings. This walk-through also gives the fire engineer the opportunity to update the existing fire risk assessment to provide an essential and practical foundation for the documentation and audit trail.

This information should be clearly documented and, once completed, will assist both the system designer and the building's "responsible person" to demonstrate compliance with the Regulatory Reform (Fire Safety) Order. The entire project should be recorded, including concept, design, installation, commission, handover, in-service

maintenance, life expectancy and, ultimately, de-commission. This record, along with the fire risk assessment, can be utilised in support of any design recommendations.

REALISTIC TIMESCALES FOR DESIGN & APPROVAL.

These pre-design exercises will invariably unearth fire safety problems that can only be overcome using fire engineering principles and some creative thinking. Often this will involve looking at new solutions, so an appreciation of the emerging technologies may well help in the delivery of sympathetic, yet effective solutions.

Aesthetics is inevitably a major consideration and issues such as the visual acceptability of detectors, sounders, agent discharge heads and surface-mounted cables, along with the prospect of damaging or detracting from the fabric of the building will undoubtedly be the subject of often heated debate. Understandably, any provision that can be introduced that limits any potential damage or visual intrusion is sure to be universally welcomed.

The approval process is dependant on a number of factors, such as the building itself, its size, age, conservation listing, architectural merit and rarity value, although in some cases fire safety system design decisions may be ultimately in the hands of the client. However, the majority of heritage buildings have sufficient historic, artistic or architectural importance to ensure that fire safety installations are monitored. Many heritage-building solutions include the use of fire engineering techniques rather than prescriptive measures and there is clearly scope for disagreement that can result in protracted negotiations, these need be factored into the project timescale.

During such negotiations it is often helpful to show how the designer's strategy has been deployed in another comparable building. This enables those not familiar with the elements of a proposed solution to gain a better understanding.

The documented strategy should include as much information as is possible to support the choice of fire detection equipment, including details of the fire risk assessment and other risk assessments, along with comprehensive design drawings. The inclusion of any relevant expert opinions in support of the proposed solution should also be incorporated. Of course, the content will be questioned and the designer called upon to explain the various design decisions, so the length of time that an approval may take should not be underestimated. The timescale varies from project to project and from one approvals body to another, and agreement may not be reached until all the modifications have been adopted, and often re-submitted.

The introduction of newer technology or new fire engineering solutions may well be challenged if they are unfamiliar to the client and the regulatory authorities and approvals bodies. However, when approvals have been accepted, the designer will be required to provide a design certificate to enable the next phase of works to proceed.

SYMPATHETIC INSTALLATION.

During installation, the installer must be aware of the designer's sympathetic approach to the heritage issues and the specific instructions of the designer, the client and the system's manufacturer. Also, during installation and commissioning, the designer may be called upon to advise on any modifications required to overcome unforeseen difficulties that were not identified during the detailed design phase.

Naturally, any alterations need to be agreed with the client, the regulatory authorities and approvals bodies and should be incorporated into the final design drawings and be transferred to the operation and maintenance manuals, along with all relevant documentation. This includes all of the initial assessments, approvals and certificates, as this will provide an immediate audit path for any future developments. The manuals should also include any product support information, and the client should be made aware of the importance of the safekeeping of the documentation as a project file that ensures compliance to BS 5839.

COMMISSIONING & MAINTENANCE.

At the commissioning and handover stages, the designer should verify that the installation is operating in accordance with the design. The commissioning engineer must supply a commissioning certificate upon successful completion and, if the designer or any third parties are providing verification, a verification certificate must also be supplied. It is wise to agree a time for a soak test, to allow the systems to settle and the client to become familiar with the technology. Particular care should be taken to ensure that the installed equipment is fully understood by the client and the end user, as this will help to build confidence in the technology. It is equally important for the end user and appropriate staff to be adequately trained.

As with the need for the installer to be sympathetic to the design, so there is a need to ensure that the maintainer of the installation shares this understanding. Equally vital though is to be sure that the maintainer understands any new technology, particularly at the early stages, as the client's confidence will be quickly eroded if confusion or misunderstandings arise.

Indeed, lifetime in-service maintenance and supervision of the installation is key to ensuring the long-term effectiveness of the system and to justify the investment. Under-investment in this area risks undermining the design decisions. A very effective control mechanism to ensure that the system remains effective is the ongoing fire risk assessment and the record of false alarms or systems failures. These, along with changes in the structure or material change of use of the building must be analysed against the original scope and objective of the fire system design.

Continual maintenance is more effective than simply waiting for the bi-annual service review required by BS 5839. Therefore, it is essential that a qualified maintainer completes and updates a detailed logbook, providing the paperwork to enable an audit trail should the designer be asked to revisit and update the system in the future.

Teamwork is the key to success, with the fire engineer, client, regulatory authorities and approvals bodies, the system provider, installer and maintainer working together to a shared agenda. In this way the solution can be supported long after commissioning to ensure the long-term protection and survival of this country's unique heritage, of which we can all be justly proud.

Author:

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