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historic buildings**

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AN INVESTIGATION INTO THE FIRE SAFETY MANAGEMENT OF HISTORIC BUILDINGS

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This paper presents the findings of a research project which considered the issues surrounding fire safety management in historic buildings. The main aim was to establish to what extent having a robust fire safety management regime might stand as an alternative to physical measures in achieving a satisfactory level of fire safety. In order to do this, a research method focusing on qualitative methods and aiming to gain an in-depth understanding of the issues was adopted. Secondary data was gathered from a wide range of literature. This was supplemented by interviews with a number of experts in the field of fire safety management and officers of the local fire and rescue service, to gain both a strategic and an operational view of fire service response. The theme was developed with a look at fire safety management in practice: taking three country houses in the local area as case studies. The conclusion arrived at was that, subject to a number of important limitations, such as human fallibility, the findings supported the hypothesis that adopting a robust fire safety management strategy in country houses would allow a reduced level of physical measures to achieve a satisfactory level of fire safety. It was noted, however, that this conclusion was reached with the use of wholly subjective data. It would however, given the subject under consideration, be difficult for this to be otherwise.

Keywords: fire safety, fire safety management, historic buildings

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INTRODUCTION

The primary aim of fire safety is the safeguarding of human life and, in the case of most buildings, the protection of property is a secondary consideration. However, in the context of a historic building (“a building of architectural or historic interest or significance”; Urquhart 2007, p6), protection of the building and its contents has a much higher priority. This is because original historic fabric is often unique and “the loss of any authentic fabric in a fire is irretrievable” (BSI 1998, p9). Thus, fire safety concerns in historic buildings have a dual focus – to protect life and to protect historic fabric.

Fire safety measures are often divided into passive (built into the building structure and fabric) and active (for example a sprinkler system). When considering improving fire safety in an historic building, both are problematic since they often involve physical alterations (also termed physical measures), which could affect the historic character of the building, and it has been suggested that “it is fundamental that we need to find solutions that do not unnecessarily intrude on the historic fabric and value of what we need to protect” (Maxwell and Westerlund Bjurstrom 2007, p1).

Fire safety management has been defined as the application of a disciplined plan to ensure that the risks of and from fire are minimised (Kidd 2010). To what extent fire safety management might be capable of providing the required level of fire safety with a reduced level of alterations, and thus with less effect on the historic character of the building, is a question that would benefit from investigation. Such an investigation was the broad aim of this research project.

According to Mills (2007), the historic building sector is a very large one, there being for example over 370,000 listed buildings in England alone. For the purposes of this study the focus was limited to privately owned country houses with public access. The Oxford Reference Online defines a country house as “a large house in the country, typically the seat of a wealthy or aristocratic family” (Soanes and Stevenson 2008) and this definition was adopted to avoid a potential understanding of the term as meaning simply ‘a house in the country’.

LITERATURE REVIEW

Fire in historic buildings

It has been asserted that “fire is still the greatest single threat to our heritage” (Kidd 2003, p1) and that the number, authenticity and quality of European historic buildings is being steadily reduced as a result of fire (Maxwell and Westerlund Bjurstrom 2007).

The gathering of accurate fire statistics for historic buildings, however, is a problematic area, and the exact scale of loss to the built heritage as a result of fire is not fully quantified, though it is known to be significant. As an example, collated data from a variety of sources indicate that in the UK, between January 2002 and June 2006, almost four hundred separate incidents involving fires to historic buildings were

recorded (Mills 2007). This level of loss is considered to be unacceptable (Maxwell and Westerlund Bjurstrom 2007).

There have been a number of significant fires in historic buildings and these have been well documented. The importance of these is in the lessons that have been learnt from them and the ideas, particularly those relating to fire safety management, that have been developed as a result. Following the Windsor Palace fire a report was commissioned and published as Fire Protection Measures for the Royal Palaces (Bailey et al. 1993). This contained a series of recommendations for fire safety in Royal Palaces. The conclusions were summarised by Kidd (1995) and subsequently developed as a comprehensive list of requirements for the management of fire safety in all historic buildings (see Figure 1).

LEGISLATION AND GUIDANCE

The primary article of legislation relating to fire safety is the Regulatory Reform (Fire Safety) Order 2005 (HM Government 2005), hereinafter referred to as the Fire Safety Order, which from October 2006 became the overriding fire safety legislation for existing non-domestic buildings in England and Wales. This was introduced “to simplify the regulations and their enforcement with a single risk-based piece of legislation” (Emery 2010, p33) and places the responsibility for fire safety with a ‘responsible person’ who is required to take certain specified general fire precautions. The ‘responsible person’ might be in differing circumstances an employer; a person who has control of the premises or the owner.

The responsible person is also required to “make a suitable and sufficient assessment of the risks to which relevant persons are exposed for the purpose of identifying the general fire precautions he needs to take to comply” (HM Government 2005, p9) For this purpose a Fire Safety Risk Assessment (FRA) must be carried out. If five or more people are employed on the premises, or if the premises are licensed, any significant findings of the FRA must be recorded (DCLG 2006).

Barker (2010) has suggested that for historic buildings it is crucially important that a well structured and properly implemented fire safety management plan accompanies the FRA.

Guidance and advice is offered by the Department for Communities and Local Government (DCLG) for various uses of premises, via a series of guides in the ‘Fire Safety Risk Assessment’ series, which contain an appendix about Historic Buildings. A key issue raised is the need to “endeavour to strike a balance between ensuring sufficient fire safety measures are in place for the safety of people, yet avoid extensive alterations and helping to maintain the character of the building” (DCLG 2006, p125). This dichotomy, between fire safety (for both people; and the building and contents) on the one hand and maintaining character on the other, is at the heart of fire safety issues in heritage buildings.

- Each building or institution must have a fire safety policy.
- The institution should appoint a fire safety manager.
- In larger premises, the FSM should be assisted by a full or part-time Fire Safety Officer.
- A fire risk assessment should be undertaken and updated regularly.
- A fire safety manual and a record book should be set up and maintained.
- Automatic fire detection systems of modern design and capability should be introduced.
- Following a full survey, the fire resisting elements of the building should be upgraded.
- Where particular legal requirements exist these must be complied with.
- All staff, including part-timers and volunteers must be trained in all aspects of their role in fire safety.
- Where individual residences or apartments form part of a heritage building, these must form part of the general survey and risk assessment.
- Special, detailed arrangements must be imposed to control and supervise all contractors.
- Special care must be taken when arranging or hosting special events, especially if these involve filming, fireworks or fashion. The Risk Assessment will have to be repeated, taking into account the new risks and hazards.
- In larger premises a trained damage limitation team should be set up.
- Regular liaison meetings and exercises with the local fire brigade should take place.
- Consideration should be given to the benefits of sprinkler systems, particularly if compartmentation and segregation of the building proves difficult or costly.
- A full set of records, drawings, photographs and other information should be stored off-site for use in rebuilding in the event of a fire.

Figure 1 Managing Fire Safety in Historic Buildings (Kidd 2008b)

CONSERVATION GUIDANCE AND PRACTICAL CONSIDERATIONS

The rationale for conserving historic buildings is set out succinctly in BS7913:1998, (Guide to the principles of the conservation of historic buildings): “An understanding of contemporary society as a basis for contemplating the future depends to a significant extent on knowledge of the past” (BSI 1998, p4). In addition to this, historic buildings may be of economic value (particularly to the tourist industry) and

have an impact on the attractiveness and identity of a community (Maxwell and Westerlund Bjurstrom 2007).

BS7913:1998 presents useful criteria for alteration work, which might be kept in mind whilst contemplating potentially ‘extensive alterations’ for fire protection. Perhaps the key parts of the advice are the following:

- “Disturbance of significant existing fabric should be avoided”.
- “The level of intervention should be the lowest appropriate level, and this should be capable of being substantiated”.
- “Some buildings or parts of buildings are of such quality, importance or completeness that they should not be altered at all except in the most exceptional circumstances”.
- “Consideration should always be given to the desirability of carrying out alterations in such a way that they could be reversed quite easily; that is, that new work could be removed and the building reinstated to its previous state without further significant damage to the pre-existing fabric”.

(BSI 1998, p12)

Forrest (1996) has suggested that developing a strategic approach to fire safety measures can lead to the adoption of more sympathetic solutions. Perhaps then, careful consideration of a suitable management strategy might allow an acceptable level of fire safety without, or with a reduced level of, intrusive alterations. Such a strategy would rely “on a strong management plan to minimise the risk of a fire occurring” (Betts 2009, p37) and ensure that if it did occur it might be discovered quickly and contained effectively.

However, such a strategy will only go so far and, juxtaposed to it in the context of this study, is the fact that many country houses are in locations where, should a fire occur, the fire and rescue service response might be slow and inadequate at first (for example where retained fire personnel are used; the house is some distance from the nearest fire station, where only a small tender is available). Limited water supply might present another problem. It has been estimated that in around 30% of historic building fires in rural areas a shortage of water is a major factor (Kidd 2008).

Given the above, in addition to other factors relevant in historic buildings (such as combustibility of materials; hidden voids and so on), Stewart Kidd has noted that “In virtually all historic buildings unless a fire is extinguished in the first two or three minutes by staff, it will burn until all combustible materials are destroyed” (Kidd 2008, p123). Thus, an important point to be considered is the possible provision of an automatic fire suppression system. Should a fire occur, such a system is likely to both limit fire damage and, importantly, water damage. Research has been carried out as to how automatic fire suppression might be sympathetically integrated into historic buildings.

THE EXPERT OPINION

Management as an alternative to physical fire protection

One of the aims of this project was to attempt to assess the extent to which having a robust fire safety management strategy in a historic building might reduce the need for physical fire protection measures in the building. Since there has been little written on this point, the opinions of experts in the field of fire safety in general, and with the historic building sector in particular, was considered important and a series of interviews were conducted to canvas this opinion.

There was broad agreement that good fire safety management is a crucial part of overall fire safety and that it might, to a large extent, reduce the need for physical fire protection measures by reducing the fire risk. However, a number of important points were brought up and some limitations were expressed.

Human fallibility emerged as a recurrent theme during the interviews and was considered to be a stumbling block where an approach is adopted that relies on management measures rather than physical measures. It was pointed out that people demonstrate every day that they can't be trusted with managing fire safety (Baker 2012a, pers. comm.).

The suggestion was made that a high level of management might obviate the need to do anything (Emery 2012, pers. comm.), and the example was given of some National Trust properties where there is a steward present in every room while the house is open. This might mean that there is no need to have, for example, exit signs or automatic door closers (the steward doing the work of both), and ultimately all the physical measures that would normally be incorporated into a country house (*ibid*).

However, there are two important points:

- Firstly the means of escape would still need to be considered: travel distances; other rooms that would need to be navigated on the exit route and exit capacities from rooms, would all need to be checked and might dictate that other measures are required (Emery 2012, pers. comm.).
- Secondly, and importantly, automatic fire detection would be required, in the majority of cases, in any historic building. In terms of a hierarchy of importance, automatic fire detection is considered to be most the important (Emery 2012, pers. comm.; Kidd 2012, pers. comm.), followed by management of the whole fire safety regime.

Additionally, there is a major limitation placed on this approach due to there being a high turnover of staff within the National Trust and, in reality, this could lead to a reduction in the level of staff experience with buildings and with fire safety matters (Kidd 2012, pers. comm.). Compounding this problem is the fact that, in the case of the National Trust there may be as few as two fire safety specialists dealing with around 300 buildings and, as a result, inspections and reviews can be relatively

infrequent (Kidd 2012, pers. comm.). This is a potentially dangerous scenario, one where remote senior management may believe that risks have been reduced to a low level and a parallel policy of reduction in physical measures has been adopted; whereas, in reality, the risk might be higher than thought. This brings us back to the second point: that automatic fire detection is a vital first tier.

In a broader context, and of particular relevance for the case studies considered in this study, for a privately owned and operated country house, the implementation of a robust management strategy might depend on the owner being on site at all times (Parker 2012, pers. comm.). In reality this is very difficult to achieve and, as with the National Trust example, the emphasis is likely to be placed on (theoretically) well trained and committed staff.

In terms of physical measures required, an important point is that the threshold between the need for no intervention to the fabric of the building and the need for intervention, needs to be building-specific and cannot be generic (Emery 2012, pers. comm.). In other words, each building needs to be risk-assessed with regard to fire and an individual decision made for each building. The risk assessment will disclose what the hazards are (if any), how the hazards have been managed and reduced, and what residual risks remain (Kidd 2012, pers. comm.). Overall, it is vital that the risk is both understood and managed (Parker 2012, pers. comm.).

If, beyond the installation of fire detection and alarm, there is a residual risk which requires physical intervention, then there is the choice between passive measures, for example by introducing compartmentation, and active measures, for example a sprinkler or water mist system (Kidd 2012, pers. comm.). In some cases both active and passive measures have been introduced, for example at Chatsworth House in Derbyshire (Grade I listed), where a partial sprinkler system has been installed and physical compartmentation has been created by the introduction of new doors and panels to divide long corridors (Sewell 2012, pers. comm.).

Another aspect of the management question considered was the extent to which fire risk could be managed down to as low a level as possible. It was felt by all that although risk could in theory be reduced to zero, in practice any building in use would retain some, albeit potentially low, residual risk.

THE CONSERVATION ASPECT

As has been noted already, the need to strike a balance between fire safety and historic character is at the heart of any matters relating to potential fire safety improvements which might require the adoption of physical measures.

In terms of physical measures introduced to improve fire safety, it was stressed that general conservation principles apply (Emery 2012, Kidd 2012, Sewell 2012: pers. comm.), and in particular minimal intervention and reversibility. The point was also made that the reason for the importance of a building, or of a feature, needs to be identified to put into context the effect of any potential alterations (Emery 2012, Sewell 2012: pers. comm.). Thus, for example, the introduction of sprinkler heads in

ceilings might be acceptable in a building that is important because of its overall character or historic importance, but not in a building whose ceilings are an important part of the historic fabric (Emery 2012 pers. comm.). It was also pointed out that concealed sprinkler heads are almost invisible in a ceiling and can be finished to match the surface finish of the ceiling (Kidd 2012, pers. comm.).

It should be noted that the need to make alterations to satisfy fire safety requirements are unlikely to be required unless some change is taking place to the building, either in terms of physical alterations or of use. In a situation where some form of consent is required, and if the building is listed all alterations require at least listed building consent, there is potentially a reasonable degree of flexibility where physical measures are required for fire safety. However, this reduces with the importance of a building and a Grade I listing could potentially preclude any physical alterations (Sewell 2012 pers. comm.).

FIRE SUPPRESSION SYSTEMS

Although automatic fire suppression systems have been identified as being of benefit in the context of historic buildings, the reality is that they are unlikely to be practical solution for the private owner of the average country house because of cost (Coull 2012, Emery 2012, Kidd 2012: pers. comm.). It was also pointed out that a sufficiently good system of managing the risk would be far cheaper (Baker 2012b, pers. comm.).

Should a system be able to be considered, installation would be best achieved whilst other work is being carried out (Coull 2012, Kidd 2012: pers. comm.), otherwise the installation costs would be disproportionately high. However, potential damage to historic fabric whilst installing pipework remains an issue (Emery 2012, pers. comm.). There is also the concern of leaks in the system causing damage to historic fabric (*ibid*).

It was also suggested that if there is the need to comply with legislation, then a fire suppression system might be more cost effective than the alternative ways of providing, for example, protected or alternative means of escape (Kidd 2012, pers. comm.).

FIRE AND RESCUE SERVICE ISSUES

The local fire and rescue service whose area covers all three properties considered as case studies is Derbyshire Fire and Rescue Service (hereafter referred to as DFRS), and interviews were carried out, both at strategic and operational levels, to gain their perspective on fire fighting in historic buildings.

Geographically, all the case studies are in areas that are classified as ‘remote rural’ by DFRS. These areas overall are considered low risk, especially in comparison to a city area, where both high population density and demographic indicators suggest a greater risk of fire and for potential spread of fire (Wells 2012a, pers. comm.).

Consequently, fire stations are smaller, with fewer pumps available and a lower level of crewing (often with a retained duty crew).

DFRS aims to be on scene at 95% of fires with one appliance within 10 minutes of the fire call; with a second appliance within 13 minutes in 85% of cases (Wells 2012 pers. comm.). However, the reality for a rural location, such as for the three case study properties, is that response times might potentially be longer. Factors such as crew availability at the nearest fire station; other current demands on resources; and even such diverse factors as summer tourist traffic on the roads may increase response times considerably (Doherty 2012, pers. comm.).

The implication of a potentially long response time is that a country house in a rural location cannot afford to rely on an early fire and rescue service presence at a fire incident. This can be seen to be the case in Derbyshire, but given that each regional fire and rescue service has similarly finite and limited resources, it is almost certainly the case nationwide. In fact, in some sparsely populated counties, response times might be even longer. To some extent therefore, country houses should perhaps seek to be self-sufficient and not simply rely on the fire and rescue service.

CASE STUDIES

Three case studies were carried out, all within the boundaries of the Peak District National Park in Derbyshire. These were at Haddon Hall, Hassop Hall and Tissington Hall. They were chosen because of their relative equivalence in size, but proved to be very different when investigated in detail.

Hassop Hall stands out because it contains hotel sleeping accommodation, and a higher level of fire safety vigilance on the part of the authorities (to ensure compliance with legislation) would be expected as a result. This is in fact the case, and, as a result, the level of fire safety appears to be in a process of continual improvement. In terms of fire safety management, to some extent Hassop's approach is reactive – acting on advice from the fire safety officer.

There is a greater reliance on physical measures at Hassop than in the other properties. Notwithstanding the Grade II* listing, the introduction of these appears to be perhaps more accepted in the context of a hotel and the increased risk associated with sleeping accommodation. This may also be related in part to the relative lack of valuable fabric internally.

Haddon Hall and Tissington Hall, although physically very different buildings, are very similar in some aspects. In both properties there are sections of the building covered by the Fire Safety Order, conjoined with sections that are outside of any legislative requirements. In both cases there is limited fire separation between the two sections.

In both buildings there is the possibility that a fire starting in the private apartments could spread into the section where the main heritage value is located (this being the section to which the public has access). Fire could also spread in the other direction of course. In both buildings, despite lack of legislative requirements, within the private

section there is at least fire detection and alarm, and alternative exits are available, both of which protect life safety in the private sleeping accommodation.

Improvements to fire separation (as allowed within conservation constraints), particularly through the upgrading of doorsets, would be worthwhile in both buildings.

There is, however, a fundamental difference between the two properties and this relates to fire safety management. That at Haddon is extensive and well organised; that at Tissington is partial and has not been fully considered. Thus, in the event of a fire, it would appear that Haddon is much better organised and equipped to react.

It was noted for Haddon, for example, that, in a fire situation, fire and rescue service response would be likely to be effective, since all the aspects have been planned for and rehearsed. The situation at Tissington leaves far more to chance, and there is a strong possibility that there might be a delay in getting water onto a fire.

The question has to be asked as to why this fundamental difference in fire safety management exists. Three reasons suggest themselves:

1. Resources: Haddon is a bigger commercial operation and employs full-time staff, who are tasked with fire safety management; Sir Richard FitzHerbert operates with little outside help and has less time and resources to put into fire safety;
2. Chance: A previous land agent who looked after Haddon was an ex-fire safety officer and introduced such things as regular staff training, a fire plan and a salvage plan;
3. Fire and rescue service operational risk classification: Haddon is classed as high risk; Tissington is classed as low risk. In theory this means that the fire and rescue service is more engaged with Haddon; in reality it probably has just as much to do with Haddon's pro-active approach. It does mean however, that the level of information (in the form of an Operational Incident Plan) held about Haddon is higher.

Both establishments have to satisfy similar legislative requirements, however the differences in the apparent effectiveness of the fire safety regime between the two would perhaps suggests that, where no changes are being carried out, legislation does not in practice determine the overall level of fire safety, particularly where fire safety management plays a significant part in this. From another angle, it might be suggested that the legislation is not actually effective. However, since life safety is the main thrust of the legislation, it could be argued that the legislation is effective where it is intended to be (for example protecting sleeping accommodation at Hassop Hall).

DISCUSSION

The idea that fire safety management in historic buildings might allow a reduced level of physical alterations (to accommodate physical fire safety measures) was identified during a review of the literature. This idea was pursued, and was confirmed, with limitations, by a number of experts in fire safety management in historic buildings.

A brief inquiry into the situation regarding fire and rescue service response revealed that, although reasonable response times to a fire call are theoretically possible, in reality retained duty crews in the closest stations might not be available (either not up to strength or busy elsewhere) and the response times considerably increased. A pragmatic conclusion from this is that historic buildings, particularly in rural areas such as the country houses which are the focus of this dissertation, should not necessarily rely on assistance from outside arriving in time to gain early control of a fire.

The onus then is on self-reliance for dealing with the initial stages of a fire. The first and most fundamental requirement is for effective automatic detection and alarm. Without this early warning, there is a good chance that any fire will have a chance to develop beyond the point of control before it is discovered. Automatic detection and alarm forms part of any fire safety management regime since it needs to be planned (if not already installed) and requires regular maintenance.

It can be argued that historic buildings should, within the constraints of affordability and sympathetic and reversible interventions, have the highest level of physical protection measures available in order to ensure maximum protection to irreplaceable heritage.

In terms of passive measures, it may be possible to achieve limited improvements in fire separation by improving the fire resistance of existing fabric. Recent improvements in intumescent finishes may offer a more widely applicable option in this respect. More intrusive interventions, such as the wholesale replacement of doorsets may simply not be possible.

Considering active measures, automatic fire suppression systems, the most appropriate of which for use in a historic building being water mist systems, have obvious and substantial benefits. They have the potential to either extinguish a fire or, at least, prevent it from developing. However, there are two big drawbacks of relevance. The first is that they may be prohibitively expensive in the context of most privately owned country houses. The question of automatic fire suppression was fully discussed during the case studies, and in all cases such a system would be a financial impossibility. The likelihood is that automatic suppression systems will only be considered for the very best historic buildings (in terms of rarity and cultural value) and most of these are likely to be in public ownership, where affordability may be less of an issue.

Secondly, the installation of a system in a historic building is problematic. The ideal is to have the system hidden from view and this is perfectly possible with narrow diameter pipework and concealed heads. However, installation could involve considerable disturbance to historic fabric and might be prohibitive.

So, the reality for most country houses is likely to be that fire safety management is actually very important in delivering an acceptable level of fire safety, by reducing the risk of a fire occurring and by limiting its development and spread. A fundamental starting point for this is a building-specific fire safety risk assessment, followed by the

development of a comprehensive fire safety management plan. Human fallibility is a factor that must be taken into account in the development of this plan.

In terms of the quality of practical, day-to-day management of fire safety, a privately owned country house might perhaps be in a better position than a publicly owned country house. Fundamentally, a fire safety strategy that puts emphasis on managed solutions depends on the staff and managers for effective implementation. As was noted with the National Trust example, high staff turnover may be a problem, and members of staff that don't remain in post for long are less likely to be experienced and committed. In contrast, for a building such as Haddon Hall, which has very low staff turnover and committed and loyal staff members, in combination with regular training and review, the implementation of the management strategy appears to be very effective. This is particularly of concern where the listing status of a building, and the consequent limitations imposed on physical alterations, is likely to put a higher emphasis on managed solutions.

For some privately owned country houses the issue of limited resources may limit the level of fire safety management that can be achieved.

CONCLUSION

The hypothesis questioned whether adopting a robust fire safety management strategy in country houses will allow a reduced level of physical measures to achieve a satisfactory level of fire safety. Based upon the opinions expressed by experts in the field, and on the case study of Haddon Hall in particular, it can be tentatively concluded that is indeed the case. If we consider the case of Tissington Hall, it might be suggested that the current situation is not ideal and argued that there is room for improvement. If a more proactive fire safety management strategy were adopted, and, for example, a comprehensive fire plan drawn up and efforts made to engage with the fire and rescue service, then a more satisfactory level of fire safety might be achieved.

It should be stressed that this conclusion has been reached with the use of wholly subjective data. It would be extremely difficult, however, for this not to be the case. All historic buildings are different in their physical make-up and contents; physical fire protection measures vary widely and fires are also very varied. To be able to compare therefore a similar fire, in a similar building, with similar existing protection measures; with and without a robust fire safety management strategy is impossible.

It is ironic that buildings which perhaps have the greatest need of fire protection measures, in order to protect valuable heritage, are least able to support them from a conservation viewpoint. However, if we accept that the adoption of a robust fire safety management strategy will indeed allow a reduced level of physical measures then this dichotomy is to some extent resolved. Further study into management measures in historic buildings, to prevent fires occurring and dealing with a fire should one occur, would enable the tentative conclusion reached here to be confirmed (or otherwise).

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