DEVON & SOMERSET FIRE & RESCUE SERVICE

Heritage and Buildings of Special Interest

A Guidance Note providing information on fire safety precautions and management for historic buildings and the damage control / salvage of artefacts and collections.

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1 HISTORIC AND LISTED BUILDINGS

1.1 Introduction

"Heritage is all that has been passed to us by previous generations. The term has become synonymous with the places, objects, knowledge and skills we inherit that are valued for reasons beyond their mere utility" Historic England.

Any historic structure or fabric lost to the effects of fire is irreplaceable. There are a finite number of buildings and any loss will have a significant and cumulative adverse impact on the country's heritage assets. Fire loss can adversely affect the significance, authenticity and continuing use of these buildings.

Historic buildings are of considerable economic value, especially to the tourist industry and for their positive impact to their surrounding area and community. There has been a significant level of loss to our built heritage through the effects of fire and it is incumbent upon us to ensure all practical steps are taken to protect these buildings.

This note looks at the protection afforded to our built heritage and provides guidance and advice on how we can better protect these important buildings from fire through improved fire safety measures and better management. It's aim is to help gain a better understanding of the:

- Vulnerability of historic buildings to fire
- Risk assessment process
- Protection of historic fabric
- Prevention of fire spread
- Detection and suppression systems
- Training and management of staff

1.2 Heritage assets and their protection

There are elements (building, monument, site, place area or landscape) within our historic environment that are of intrinsic value and these 'heritage assets' merit some level of protection in the form of legislation. The value placed on a heritage asset is based on its heritage interest which may be archaeological, architectural, artistic or historic. The significance of the heritage asset encompasses all of the different interests that makes the asset worthy of designation. Heritage assets may also be non-designated and are included in local lists.

The aim is for the historic environment and its heritage assets to be conserved for the quality of life they bring to this and future generations.

The main legislative framework for the historic environment is the Planning (Listed Buildings and Conservation Areas) Act 1990 which provides specific protection for buildings and areas of special architectural or historic interest. This primary legislation is supported by the historic environment policy contained in the National Planning Policy Framework (NPPF) and the related guidance given in the National Planning Practice Guide (PPG). Historic England has prepared a number of Good Practice Guides to help in the implementation of the policy in the NPPF and guidance in the PPG. In addition, BS 7913:2013 *Guide to the conservation of historic buildings* describes best practice in the management and treatment of historic buildings and applies to historic buildings with and without statutory protection.

1.3 Listed buildings and other structures are listed if they are of special architectural or historic interest.

- local or national
- a consequence of the building's age, build form or location.
- may result from its connection with a person or persons, or with local or national events or industry

Listed buildings are graded to show their relative importance:

- Grade I - Buildings of exceptional interest (around 2.5% of all listed premises)
- Grade II* - Particularly important of more than special interest (around 5.5%)
- Grade II Buildings of special interest warranting every effort to preserve them (over 90%).

1.4 Listed buildings are placed on statutory lists of buildings of “special architectural or historic interest” compiled by the Secretary of State for Culture, Media and Sport under the Planning (Listed Buildings and Conservation Areas) Act 1990, on advice from Historic England. Listed building consent is required for demolition or alteration or extension works that affect the character of the building. Consent is sought from the local planning authority.Managing those parts of the historic environment valued by local communities is an important element of the heritage protection system. Local designation allows for the management of local heritage through the planning system. It encompasses both individual assets identified by local listing right through to areas of local character represented by conservation areas.

1.5 Conservation Areas are spaces that planning authorities have a duty to identify and designate as areas of historic or architectural interest and to ensure that development preserves or enhances the character of those areas. A building does not have to be listed or lie within a conservation area to be of special or significant interest.

2 ENFORCING AUTHORITIES AND ADVISORY GROUPS

2.1 Works to alter, extend or demolish a listed building in a way that affects its character as a building of special interest will require listed building consent from the local planning authority (whether planning permission is also needed or not). The decision to grant consent is determined on the significance of the heritage asset and the impact the proposals have on the asset. Discussions should be held with the local conservation officers in the local planning departments before any changes are made to a listed building.

2.2 If the premises is being constructed or altered, it will be subject to Building Regulation approval administered by the Local Authority (LA) Building Control office, or an approved inspector under the Building and Approved Inspectors (Amendment) Regulations 2010.

2.3 In relation to Crown premises there is a direction from the Secretary of State which means all government departments shall follow the building regulations procedure as though they are bound by it.

2.4 Fire and Rescue Services enforce the Regulatory Reform (Fire Safety) Order 2005 (FSO). The FSO applies to all non-domestic premises including the common parts of blocks of flats and houses in multiple occupation.

2.5 Local planning authorities are obliged to consult with Historic England on certain planning and listed building consultations – DCLG Circular 01/01. Historic England offer advice on the historic environment, advises government departments; provides conservation advice and guidance and provides funding through grant schemes.

2.6 There are also other enforcing authorities who have legislative control over certain premises and, depending on the use of the premises, they may need to be consulted before any works are undertaken. These include:

- Health and Safety Executive (responsible for the management of the Construction, Design and Management Regulations on construction sites)
- Crown Premises Inspection Group (CPIG)
- MOD fire service (e.g. army base)

2.7 There are a number of heritage groups and amenity societies which offer advice and assistance to managers and owners of listed buildings as well as other heritage assets. These include:

- Historic Houses Association (HHA)
- The Society for the Protection of Ancient Buildings (SPAB)
- The Georgian Group

- The Victorian Society
- The Twentieth Century Society
- The Ancient Monuments Society

3 FIRE SAFETY HANDBOOK

All larger premises should develop and maintain a fire safety handbook. This should set out the fire prevention strategy, detail action plans in case of fire and be used as a basis for staff training. Information on all fire safety systems and components should be detailed to include floor plans showing locations of fire extinguishers; hose reels; hydrant points; gas; water and electric shut off points; wiring diagrams; equipment specification sheets and replacement part lists. The operational, service and maintenance instructions for fire protection systems and equipment should be identified together with details of any modifications or upgrades. Any improvements, adjustments or the introduction of new equipment to structural fire safety should be recorded and the handbook should be revised and kept up to date. The fire safety policy and fire risk assessments should be included. Procedures for working with the Fire and Rescue Service and a business continuity plan should be prepared and form part of the handbook.

4 FIRE RISK ASSESSMENT

4.1 The Regulatory Reform (Fire Safety) Order 2005 (the Fire Safety Order) came into effect in 2006. The Order is enforced by the local fire and rescue authority and is the primary legislation under which general fire precautions are imposed on virtually all non-domestic premises.

4.2 There is a requirement within the FSO to carry out a fire risk assessment. The Fire Risk Assessment (FRA) is required for all premises falling within the scope of the Order. The Order imposes a duty on the Responsible Person (RP) to have a FRA carried out by a competent person. The criteria set out by the Competency Council is a good starting point for choosing a competent Risk Assessor and a copy of “A Guide to Choosing a Competent Fire Risk Assessor” can be found by following this link to the Chief Fire Officers Association’s website - http://www.cfoa.org.uk/19532

4.3 The RP will be the employer in places of work and either the occupier or owner in other cases. For further information of how to carry out a FRA please see DSFRS website www.dsfire.gov.uk – Your Safety.

4.4 The obligation to ensure the safety of the occupants and the moral duty to protect the building from fire often gives rise to conflict. The FRA can be the key to striking a balance between the requirements for life safety and the need for property protection through the use of the Order. One of the challenges is that of melding the regulatory requirements with a sympathetic intervention philosophy. Protecting the environment should also be a consideration

especially regarding fire-fighting water run-off, smoke and fire debris and hazardous contamination. Any significant change to the building or deviation from current guidance or British Standard needs to be fully developed and justified within the FRA, to see whether it is possible to achieve safely.
At no time should a deviation take place without a full and detailed review of the FRA and/or fire strategy.

The RP should ensure that the risk assessor has relevant knowledge of how to apply conservation philosophy when carrying out risk assessments.

4.5 For large, complex premises an investigative survey may also be required to ensure that the building is well understood. In order to assess the fire safety requirements of a building it is important to carry out an appraisal of the existing compartmentation within the building and to gain an understanding of its construction including the presence of hidden timbers, the extent of masonry walls, the presence of voids, flues and other openings. The preparation of plans and dimensional surveys to accurately locate walls, floors, staircases, openings etc may help identify weaknesses and the potential for fire paths.

4.6 The key to reducing loss in buildings is gaining an understanding of the most common causes of fire. This can include accidental or deliberate causes and individual sources of ignition.

4.7 Historic buildings can be particularly vulnerable to fire in numerous ways, however the following represent some of the more common causes of fires and common risks in the building makeup.

4.8 Building or maintenance work have been the cause of several major fires due to careless application of heat. Lead work to roofs, plumbing and paint stripping present particular risks. Hot work should be avoided or strictly controlled and monitored. It is recommended that hot works are carried out away from the building where possible. Where building works are taking place the additional hazards presented by the works should be addressed. These could include:

- Loss of fire separation caused by the removal of doors or repair of partitions or ceilings;
- Temporary isolation of fire detectors to avoid false alarms caused by dust; Additional fire loading caused by the temporary storage of building materials and packaging;
- Additional sources of ignition caused by temporary lighting, plumbing works, sparks from cutting gear, burning paint and lead burning. Poor water supplies because hydrants have been covered or have not yet been fitted;

- Poor access because of temporary hoarding or site huts;
- Burning of rubbish in or near the building;
- Fire precautions not yet in place.

4.9 Electrical faults are considered to be a major fire hazard. In many buildings the wiring itself may be of considerable age and may deteriorate over time. Alterations over a period of years, or circuits becoming overloaded by the connection of too many appliances, can lead to installations becoming unsafe. Faulty appliances can be a source of fire and consequently electrical appliances require regular checking and maintenance.

4.10 Open fires, stoves, grates and hearths are a serious risk. Many fires have started with a spark from a fire or because of a cracked hearth.

4.11 Defective flues, chimney fires are common and fire can spread to other parts of the building due to cracked or faulty flues or where timber joists project into the flue way. Birds' nests in flues have also resulted in fires.

4.12 In addition to flues (often a concern due to their frequent poor condition and the presence of hot gases and sparks) other long forgotten ducts or shafts may be part of the original construction - waste shafts, natural ventilation stacks, bell pulley routes and dumb waiters. Such voids, often interconnecting, are extremely hazardous to a traditional building, providing fire, smoke and the products of combustion with an easy route by which to spread.

4.13 Lightning strikes to the structure of a building can cause fires as well as mechanical damage due to the explosive expansion of air heated to around 30,000ºC, by the ignition of dust and by flying debris. Electrical circuits may also be damaged by the electromagnetic field generated. The provision of a lightning conductor system is to direct the current discharged from the strike to earth safely, thereby protecting the structure and its occupants.

4.14 Other causes of fires have included the use of candles, or spotlights close to flammable material, and rodents gnawing through cables.

4.15 Fire-stopping / dampers - historic buildings rely on relatively high air change rates to ensure that damp and rot are kept at bay, and upsetting this balance may have far-reaching consequences. One way to avoid such unwanted side effects is to use mechanically or electrically operated fire dampers that operate to close off ducts when a fire is detected. Where it is not possible to remove services, attention is required to build-up openings, “fire stop” holes, restore pugging and other finishes and where necessary fit fire dampers to ducts or fire collars to pipework.

4.16 When hiring out rooms/areas etc. within a premises full consideration needs to be given to what risks and hazards may be introduced into the premises. There should be clear co-operation and coordination between the RP and the function organiser to make sure that everyone is aware of the findings of the relevant fire risk assessments and evacuation procedures for the premises. If there is an increase in numbers of people during an event the fire exits and escape routes will need to be reassessed.

5 FIRE STRATEGY

5.1 It is recommended, particularly in complex buildings, that an overriding strategy document is created. Fire strategies can be prepared in a variety of formats and level of detail, but ultimately they aim to formalise the base fire safety requirements for a premises or site. This can then be used to help inform more detailed fire protection specifications, fire risk assessments and emergency plans, and other relevant building strategies (for example, a building's security strategy).

5.2 Fire strategies primarily focus on life safety requirements, but may consider property protection, environmental and business continuity factors. They can be based upon prescriptive or performance based design criteria, or a hybrid of both. In the context of heritage and buildings of special interest, fire strategies can be a useful tool for ensuring that the required level of fire safety prevention and protection is effectively implemented and managed in a consistent manner.

5.3 It is important to note that the fire strategy for one premises may not be applicable/ transferable to another, thus it is imperative that a fire strategy considers and develops the overall fire strategy package for an individual premises or site on a case specific basis.

5.4 The creation or review of a fire strategy should only be completed by a competent person.

- The type of occupancy is a key factor in the fire strategy. There may be various occupants of the building such as visitors, staff, the donor family still on site and contractors
- Some heritage buildings have key representatives living on site, such as the curator or house and collections manager. They are the first line of defence from a fire and security perspective.
- Some heritage properties may have a holiday apartment incorporated into it.

6 FIRE SAFETY ENGINEERING

6.1 In some cases the only practical way for a historic building to achieve a satisfactory standard of fire safety and fulfil the requirements of the FSO and/ or Building Regulations is to adopt a fire safety engineered solution.

6.2 Fire safety engineering/ performance based design solutions often adopt a more holistic and systematic approach to a fire safety problem than typical prescriptive methods. For example, BS 7974 provides a framework and guidance on the design and assessment of fire safety measures needed to support a fire engineered design solution.

6.3 By using fire safety engineering, a building specific fire strategy can be developed based upon quantitative and qualitative scientific and engineering principles, which consider:

- The likelihood of a fire occurring.
- The anticipated fire development and severity.
- The performance of a building's structure and fire safety systems during a fire.
- The potential response and behaviour of occupants within a building during a fire, and fire service intervention.

6.4 A wide variety of fire protection measures could be applied as part of a fire engineered solution, with the appropriate combination/ level of measures being determined through the development of the building specific fire strategy and associated fire risk assessment(s).

6.5 Where a fire engineered approach is to be adopted a detailed survey should be available which will allow the fire engineer to provide relevant and practical data on a variety of issues such as:

- Fire and smoke spread analysis
- Proving existing means of escape or fire service access arrangements are adequate
- Minimising additional provisions
- Proving large spaces or compartments do not require splitting to meet compartmentation or external fire spread requirements
- Means of escape analysis
- Structural fire protection analysis
- Fire safety detection and suppression systems

6.6 Through the use of survey information and applying pragmatic fire safety design advice supported by performance based engineering it is possible to start to plan the foundations to achieving an appropriately robust level of fire safety whilst preserving the buildings integrity.

6.7 If it is thought that a fire safety engineering solution is desirable or required in a historic building, then the responsible person should seek further guidance from a suitably competent and qualified fire engineer.

7 PASSIVE FIRE SAFETY

7.1 Care needs to be taken when assessing the requirement to enhance or improve the fire resistance of elements of structure. Very often the implementation of regulations on historic buildings has adversely affected the historic integrity of the building. Consideration should be given to BS9999 where a different approach is adopted. This standard generates fire safety measures that relate to alpha-numeric risk profile which is the product of the buildings' use and contents. A major component in this risk profile is the severity / rate of fire growth which is categorised into slow, medium, fast and ultra-fast. The main factor that controls fire growth is the fire load. Other factors to consider are the amount of air available for combustion and the fabric of the construction. A slow growing fire will take much longer to damage the fabric or generate untenable conditions than a fire that is growing ultra-fast.

Once the rate of fire growth has been assessed and the fire safety objectives have been identified (i.e. life safety; life safety and protection of the fabric or life safety, protection of the fabric and contents) it becomes possible to assess the adequacy of the existing construction. In some instances, little physical intervention may be required such as making good the existing fabric. If the fabric is considered to be inadequate, the upgrading measures can be minimised by focussing solely on making up any shortfall in performance.

7.2 Compartmentation is the division of a building into separate fire compartments, using fire resisting walls, partitions and ceilings. This is to limit the size of fire and to stop it spreading from one part of the building to another, or into staircases and other exit routes. Examination of most buildings will show that each has its own natural lines of compartmentation, which can be utilised to provide separation elements that, with a little attention, are capable of providing a level of fire protection, and may, in some cases, provide an hour or more. It follows that, when deciding on a compartment strategy for the building, a full understanding of the location of all the hidden voids should be available to those responsible for the decisions.

7.3 Where services pass through a compartment floor, wall or cavity barrier then fire stopping should be provided to maintain (60min) fire-resistance. All pipes should be fitted with a proprietary sealing system capable of maintaining the fire-resistance of the floor, wall or cavity barrier. Any door in compartment walls should be fire resisting and self-closing and should not be propped or wedged open. They should self-close effectively to sit squarely within the frames. Any excessive gaps caused by warping or dropping of the hinges should be reported for remedial action. Holes in compartment walls or ceilings, formed for the passage of cables or pipes should be fire stopped to the appropriate standard.

7.4 Roof and roof voids are also an important feature of the fire resistance characteristics of any building, making their investigation an important aspect of the fire risk assessment. Compartmentation of the roof void is an essential element of upgrading the fire performance of the building. Installing fire insulating barriers that do not line up with the existing compartment lines in the accommodation below will undermine the fire integrity of the structure.

7.5 The existence of hidden voids is sometimes very difficult to ascertain, but original plans of the building may reveal where they can be found. The problem with these voids is that they form hidden paths for fire, smoke and the products of combustion to spread unnoticed to parts of the building quite remote from the place of origin. The fact that the fire is hidden also makes it almost impossible to tackle without a major dismantling of the building fabric.

7.6 Floor construction in traditional buildings presents a special area of vulnerability. Apart from a small number of buildings that have stone or brick vaulted floors with excellent fire resistance, the most common floor constructions in traditional buildings is timber. Early forms of construction lacked an applied ceiling, with the floor boarding itself laid over the joists providing little fire resistance. The protection offered by a floor to a fire from below depends on the plaster ceiling.

7.7 The age and condition of the plaster and the strength of its key to the lath will greatly affect its ability to perform in fire. Upgrading the fire resistance of a floor can be a difficult task, which may result in some loss of historic fabric, but there are a number of recognised upgrading methods:

- Consolidate any deficiencies in the original construction;
- Introduce mineral fibre quilt supported between or below the joists;
- Insert intumescent sheet material over or under existing surfaces;
- Insert intumescent material at the perimeter of the floor to close the link with the wall cavities in the event of a fire;
- Apply intumescent coatings to ceilings;
- Apply additional layers of fire resistant boards to ceilings.

7.8 In some instances, consideration could be given to reinstating the integrity of walls by increasing the number of fire divisions to compensate for the weaknesses in floors together with enhancing other fire precaution measures such as detection or suppression systems.

7.9 Thick stone walls have a great resistance to the passage of smoke, heat and flame. However, in many buildings numerous flues and other voids weaken their integrity in fire. The common construction of walls lined with lath and plaster or timber panelling creates narrow continuous cavities, and these present one of the most vulnerable elements in terms of fire resistance. The

cavities often link with those present in floors and can run throughout a building, giving an easy fire path with both fuel (timber) and air present. A fire can smoulder unnoticed for many hours before breaking out some distance from the actual point of origin.

7.10 Many compartment walls do not continue up into the roof void, or are compromised by openings, thus permitting the unhindered and rapid spread of fire along the roof space.

7.11 The height of the ceiling has a dramatic effect on the spread of smoke and flames and if sufficiently high will delay the moment when hot smoke starts to descend from ceiling level and mushroom out. The heat in the smoke plume could affect doors and break down the fire resistance. If the windows are higher than the tops of the doors, the heat from the fire could break the glass and allow the hot smoke and gases to vent.

7.12 Surface spread of flame rating of walls and ceilings has an impact on the speed of growth of fire within compartments. Full height timber panels and other wall coverings e.g. wallpaper, layers of paint, artefacts and tapestries can give flames a path from low level to ceiling height, so encouraging rapid fire spread.

7.13 If a door should be a fire door but does not meet that standard, then advice should be sought from a competent person to explore whether the existing door can be upgraded in order to achieve the appropriate fire resisting performance. Despite frequently being of intrinsic historic value, doors are often the fundamental weakness in a separating wall. Doors and frames that have gaps in their construction, or contain glazing that is not fire resistant, may readily allow fire to spread beyond the compartment of origin.

7.14 There are a number of techniques that can be employed to improve the fire resistance of a door (remedial joinery work is also often required). It is advised that advice is received from a specialist in relation to this.

7.15 There may be some situations where it is not practical to improve the fire resistance of a door, either because of its method of construction or because its intrinsic value makes an alteration unacceptable. In the latter situation and as a last resort, the doors might be recorded, removed and placed in storage keeping the doors safely in a controlled environment to prevent damage or distortion, preferably in the building itself. Alternatively where doors are to be retained other solutions will need to be considered such as improved evacuation procedures or the provision of a suppression system.

7.16 Large door sets often have brick arch openings covered with decorative panelling. Sometimes voids exist behind the frame assembly. When asked to upgrade a door it is important to consider the whole door set, including the voids behind the frame.

7.17 Every effort should be made to retain historic glass and replacement should be seen as an option of last resort. Any glass removed should be handled carefully and stored for repairs or reuse. During a fire, glass can melt in intense temperatures, or shatter due to gaseous explosions. Glazed openings are a potential weakness in the passive control of fire in otherwise sealed compartment walls. The range of options that could be considered includes improvements to the way glass is held into its frame, provision of secondary glass and frames and replacement of existing glass with thicker or fire resistant glass. Fire resistant glass is available in several forms, including 'wired' glass, modified toughened or laminated glass and insulated glass, to comply with BS 476: Part 22: 1987.

7.18 Historic buildings often have a substantial amount of timber. Timber has a degree of fire resistance that increases with the thickness of the component under attack. Therefore, whilst thin timbers such as window shutters, door panels, decorative wall lining boards and other trims will readily burn, large timber stud frames and structural elements such as beams, columns and roof members will burn at a slower rate and may perform their function for longer and even beyond the duration of the fire.

7.19 Traditionally, plaster was applied directly onto solid masonry, but later the primary technique employed was lath and plaster. This involved applying plaster to a timber frame, comprising thin strips (laths) that were nailed to upright studs attached to the wall. A cavity was left between the wall and plaster. Whilst theoretically giving a good level of fire resistance, the performance of traditional plaster is usually reliant on the condition of the mechanical bond ('key') between the plaster and laths, and if lost, plaster will start to detach. Performance in a fire may be unpredictable and at a certain stage in a fire complete failure may occur.

7.20 Steel wrought and cast iron were introduced into buildings as a structural element to compensate for the performance of timber in fires. Although non-combustible, the inherent characteristics of metals could create potential risks in a fire as the metals will expand when subject to high temperatures which could adversely affect the materials surrounding the metal components. Complete failure of the metal structural element can also be expected once it exceeds its natural period of fire resistance. There are a number of methods of protecting metal structures include encasing them in mortar, fireproof board and concrete sprayed material. Alternatively, applying a coating of intumescent material can provide the required fire resistance

7.21 The use of thatch on roofs is very vulnerable to the effects of fire particularly from defective chimneys and flues and windblown sparks. Therefore the primary aim must be to prevent fires from occurring in the first instance and consideration should be given to upgrading chimney liners to, for example, pumice liners, and regularly maintaining flues and the appliances. Spark arrestors can be fitted, but these can be blocked unless regularly maintained and in themselves become a fire risk. Fire retardant barriers fixed between the thatch and roof timbers may also be considered; however, attention must be given to the possible detrimental effects that this solution may have on the thatch and timbers. Other possible solutions to reduce the risk of fire may be to remove all electrical wiring and fixings within the roof space or place cabling in fire proof and rodent proof conduit. The use of clay or mortar (pargetting) may provide a level of protection to the underside of the thatch.

7.22 Surface treatments such as paints, wax, polish and wall papers can act as a fuel source and give off toxic fumes. If paint is to be removed, such work might require listed building consent as well as an analysis of the paint. The use of hot air guns or blow lamps are a fire risk and other solutions may be more appropriate where treatment is required to surface finishes.

8 ACTIVE FIRE SAFETY

8.1 Once consideration has been given to the passive fire safety measures within the building, the next step is to look at the active fire safety measures which might be present or may be required.

The introduction of fire protection systems, to improve the fire performance of the building, should only be done after the following points have been considered:

- Essential: The fire systems should be central to meeting the objectives of the protection of life, buildings and contents.
- Appropriate to risk: Any system that is installed should be appropriate to the risks being considered.
- Compliant with legislation: Systems should be installed according to demonstrable performance based and other legislatively prescribed standards of safety.
- Minimally invasive: The retrospective fitting of fire systems should involve minimal degrees of physical intervention on the historic structure.
- Sensitively integrated: Installed systems should be designed to be integrated sympathetically with the historic fabric and its detail.
- Reversible: Fire systems should be installed according to a reversible, 'plug-in, plug-out' installation philosophy so that if a feature is removed then the listed aspect of the building remains intact as it was before.

8.2 Fire detection and warning systems are an effective fire safety measures for heritage buildings and museums. They can be installed to provide property protection or for life safety, both of which should be installed to comply with latest edition of British Standard 5839 part 1 or part 6.

When installing an alarm system in a historic building the aim should be to install minimum invasive detection. There are several types of systems available on the market such as:

- Aspirating smoke detectors which offer potential for minimum invasion and reversible installation in sensitive environments. Aspirating smoke detectors have a low probability of false alarms. This is due to an integrating effect: small samples of low density smoke in several sampling points will raise an alarm, while quite dense smoke in one sampling point only will not.
- Wireless point detectors can offer high reliability and are unobtrusive.
- Visual and thermal image fire detectors (camera software fire detection) may be used in large indoor spaces from well-hidden locations. The visual category is prone to deception by moving objects and shadows. Thermal ones discriminate any movements or shade and detect fire by temperatures exceeding set limits.
- Beam smoke detectors can be used in large rooms with ornate ceilings.

8.3 The ideal position for detectors is as detailed in the British Standard, as central as possible. To satisfy aesthetics they are often placed close to the wall above the door, so that they cannot be seen when entering the room. Smoke testing in a variety of premises has shown that natural air currents influence the movement of smoke, in the early stages of a fire, as much as the convection currents set up by the fire. Doorways and windows often provide these air currents which very effectively keep the smoke away from the detectors, rendering them useless. Detectors that are recessed, or placed above holes in the ceilings, or hidden behind beams and lights are also ineffective.

8.4 The recommended position for manual call points is as detailed in the British Standard, but some degree of flexibility may be agreed as to where the call point(s) is to be located. For example, it may not be feasible to fix the call point directly to the wall adjacent to the exit door but an alternative solution would be to fix a call point into a free standing structure sited adjacent to the exit. A flush mounted call point could also be considered and subject to robust procedures and staff training, it may be feasible to locate a call point inside a cupboard or in recesses.

8.5 Measures should be undertaken to decrease the probability of false alarms while retaining response sensitivity to real fires. There should also be some consideration with regard to the transferring of the call from an automatic signal to a call centre.

False actuations from automatic fire detection systems result in increased Fire Service 'blue light' journeys that waste public money, and increase risk to staff and the public. Businesses are required by law to identify, maintain and manage their own fire safety procedures. Fire detection systems are designed to provide early warning of fire to those present in the building so that they can exit the building safely. The Service consulted on plans to not attend false actuations from automatic fire alarms in non-residential properties. From 01 November 2013 the Service will no longer attend automatic fire alarms actuations for non-residential properties between the hours of 8am-6pm, Monday to Friday, unless there is a confirmed fire.
DSFRS is advising businesses to ensure their premises fire risk assessment and management plans are in place to suitably address and deal with any false alarm actuations.

8.6 DSFRS will attend all calls to fires but consideration must be given to the frequency of false alarm instances and whether it is appropriate to introduce filtering practices to prevent false alarms from being transmitted to the emergency services.

8.7 Emergency lighting and emergency escape lighting conforming to BS5266 parts 1, 7 and 8 should be provided in those buildings where there is no natural light or where they are used in the hours of darkness. These lights are normally powered by battery packs and only illuminate upon mains or local lighting sub-circuit failure. There may be alternative solutions which could be adopted to minimise the impact within the historic setting. It may be possible to refurbish existing fittings to incorporate emergency facilities. However, care should be taken to ensure that where units produce heat steps are taken to provide adequate ventilation of batteries, chargers or transformers.

8.8 Fire exit signage should be provided with pictograms. They should be large enough to be clearly seen from the furthest viewing distances. The signs should be in the colours detailed in the 'The Health and Safety (Safety Signs and Signals) Regulations'. They are best sited above the exit doors, but could be hung by chains from the ceiling or brackets where they would spoil ornate architraves. Signs that meet the criteria in BS 5499 and BS EN 7010 also meet the standard of the Regulations and can be used. However, it is accepted that in some instances, a more flexible approach may be adopted which will have to be agreed in advance.

8.9 Notices detailing the actions to be taken in case of fire should be provided adjacent to the fire alarm break-glass call points.

8.10 Blue disc signs stating ‘Fire door keep shut’ should be affixed to self-closing doors. Where there are particularly ornate doors, these notices may be fitted to the leading edge and in the frame of the door, where they will only be seen when the door is open. Notices stating “Fire door keep locked shut” are affixed to doors such as cupboards or boiler rooms, which are fitted with locks rather than self-closing devices. Doors fitted with automatic closing devices will have the notice “Automatic fire door keep clear”. It may be feasible to adopt a ‘house’ style for signs and notices which will have less of an impact on the historic setting.

8.11 The type of extinguisher provided should reflect the potential fire risk for each area. Training in the use of fire-fighting equipment should be given to all staff who are expected to use it. With prior approval fire extinguishers may be placed on purpose built bases or be allowed to be free standing, rather than fixed onto wall brackets. Equally, subject to the outcome of the fire risk assessment, fire extinguishers could be placed in cupboards or inside panelling provided that appropriate signage are provided and maintained and staff are made aware of their location.

8.12 Adequate and appropriate maintenance of all fire protection systems and facilities is of the utmost importance as all of these requirements should be available and in good condition at all times. Failure to do so will not only endanger a building and its occupants and place fire-fighters lives at risk, but could also render the RP liable to prosecution.

8.13 In summary, whilst the aim of the fire risk assessment is principally to identify people at risk; to eliminate and/or mitigate hazards where possible; and to effect control by identifying appropriate measures; by including the need to be aware of conservation principles and good practice, it will greatly enhance its relevance in heritage matters.

8.14 Depending on the risks and hazards identified within the fire risk assessment, the findings may determine that a sprinkler/water mist system is required within the premises in order to remove/reduce the risk/hazard to an acceptable level. When installing automatic suppression systems, consideration should be given to the consequences of remote locations; poor access; sensitive and quality interiors; restricted fire and rescue service response; poor site utilities and services; and their legislative status. Where a bespoke suppression system has been installed, this should be fully accounted for within the fire risk assessment. BS5306 Part 0: 2011 provides guidance on the various suppression systems.

8.15 Where appropriate, DSFRS fully supports the use of sprinklers to protect property and to reduce fire deaths and injuries. The Sprinkler Position Statement is available on the Authority website.

9 SALVAGE/DAMAGE CONTROL PLAN

9.1 When considering salvage/damage control, the potential physical and chemical impact of firefighting activities should be taken into account as well as the impact of fire, heat, smoke and water discharge onto the historic fabric and contents during an incident. Any collections or artefacts should be subject to a suitable salvage/damage control plan to ensure that they survive any fire or other incident.

9.2 The procedures for salvage will vary according to the scale of the incident, but it is a worthwhile exercise to plan for the worst case scenario i.e. the removal of all the objects. Damage control is also a key factor which should be fully considered. For example, there may be a ceiling artwork or section of the building that, wherever possible, cannot be damaged by fire, smoke or water.

9.3 Each organisation is individually responsible for making adequate provisions for the salvage, recovery and protection of the artefacts and collections under their care.

9.4 Individual organisations may want to consider developing a Memorandum of Understanding (MOU) with other organisations with regards to cooperation on issues relating to emergency salvage, recovery and the protection of assets.

9.5 A Salvage Plan should identify the following points:

- The Salvage Incident Co-ordinator and any deputies;
- Contacts list;
- Training of the salvage teams;
- Site and building plans;
- Salvage priorities (snatch list);
- Salvage procedures;
- Emergency first aid conservation.
- Safe storage of items after they have been moved;
- Post incident survey arrangements.

9.6 If the risk to life due to the severity of the emergency is considered too great then DSFRS will take the decision that the building is unsafe to enter. Until the emergency is under control, that decision will stand and no one will be allowed to enter the building.

9.7 The local salvage incident co-ordinator will take the lead for their organisation and advise both the DSFRS Sector Commander responsible for salvage and their own salvage team members. He/she should be easily identifiable ideally by wearing a tabard or similar, and should be able to interpret the salvage plan to hand as well as give advice regarding any resources required to move priority objects to safety.

9.8 Once on site it is imperative that they make themselves known to the Incident Commander in charge and do not independently commence a salvage plan.

9.9 When a disaster occurs it may be necessary for the first member of staff on site to contact other members of staff in order to help with the many tasks that need to be performed. The initial stages of an incident are of great importance when attempting to organise a salvage operation, therefore the knowledge of the member of staff first on site could be invaluable. Consequently, if they are attempting to contacting members of staff whilst liaising with the fire service they will soon be overloaded. With this in mind full consideration should be given by the responsible person as to how members of staff are going to be contacted quickly without delaying the salvage of items. An alternative solution is to contract the task out to a third party, such as a call receiving centre.

9.10 One of the most difficult items in the plan to keep up to date is the contact lists, both for management teams, members of salvage teams and equipment suppliers. With staff movement and turnover it can be difficult to make sure the list is current at all times. If it was decided to employ a contacts centre then part of the contract would involve the third party periodically checking the lists and making test calls.

9.11 Training of the salvage teams should include practical aspects such as reading plans, identifying objects on the salvage list, removing paintings from their fixings, object handling and first aid treatment of damaged objects. All these should be practiced in simulated conditions and the practices should periodically include joint exercises with DSFRS.

9.12 Salvage lists ideally include photographs of the items to be rescued, their position in the room and building and any special measures needed to remove them. This can include manual handling requirements and removal techniques. If a room is completely filled with items of similar value, it is still worth sorting them into an order of removal. This could be by order of rarity, importance, ownership, or ease of removal rather than simply giving them all a priority 1 rating. The procedures for salvage will vary according to the scale of the incident, but it makes sense to plan for the worst case scenario and for removal of all the objects.

9.13 It is recommended that copies of the building plans are made available to fire service personnel. All plans should clearly identify the layout of the premises and the location of the items needing salvaging.

9.14 Ideally there should be a picture(s) of the item(s) that needs to be salvaged, as a minimum there should be a description of the item, including the height, weight, fixing method, number of people required to move it, or what measures are required to protect it in situ.

9.15 There should be a clear indication of exactly how these items should be removed from their location. For example:

- Where items are stored in cases, there should be clear instructions how the case can be opened.
- Can painting be removed off site in their frames? Does the picture need to be cut from the frame? How should the picture be rolled to minimise the damage to it?

9.16 Once the item has been identified and is ready to be removed from the building the next aspect is to consider how the item will be transported from the building to a safe area to store objects. This is particularly key for smaller objects which could be difficult to identify and remove safely. Consideration should be given as to whether a bag or carry case etc. would be appropriate. Ideally if a bag or carry case etc. is considered acceptable, then thought should be given to ways to reduce any potential water and smoke damage once the items are in the bag. In order to avoid any damage whilst the item is being transported it may be appropriate to consider a padded bag or other solution.

9.17 Once out of the building with a salvaged item, the local firefighters will report to the Entry Control Officer/ Salvage Commander. If the firefighters are in Breathing Apparatus (BA) they will be unable to go past this point to deliver the salvaged item to the safe area. At this point the Salvage officer from the premises will need to have a system ready to transport the salvaged items to the interim safe areas to store objects.

9.18 It may initially not be possible to get the salvaged items to a permanent store where they will stay in the longer term. It is advisable to consider where an appropriate interim safe area would be in relation to your premises. The incident commander may give the final agreement as to where the location will be but ideas will be welcomed. It would be prudent to consider the weather conditions when considering the location of this interim safe area.

9.19 The first few hours after a disaster are critical to the long term survival of fragile historic artefacts. If the condition of the objects can be stabilised as soon as possible the long term damage by mildew or rot can be avoided. The salvage plan should include the provision of first aid equipment and a suitable place, either permanent or temporary for treatment.

9.20 It is recommended that salvage teams are provided with personal protective equipment, which includes identification, hard hats, fluorescent vests, steel toed boots/shoes and torches.

9.21 Learning from experience is a very useful tool. All incidents should be reported to management so that a record can be made of their nature, size and potential threat. These reports can then be used to take action before the incident is repeated.

9.22 The probability of arson attacks can be reduced with good security measures, but the difficulties of removing secure objects during salvage operations need consideration. In addition the movement and storage of valuables after removal requires a degree of pre-planning. The security of the salvage priority list and the information it contains should also be readily available at all times.

10 WORKING WITH FIRE AND RESCUE SERVICES

10.1 Wherever possible DSFRS will attempt to facilitate salvage/damage control as a high priority providing crews of firefighters, who will endeavour to remove artefacts /collections from areas unsafe for salvage teams to access. Similarly DSFRS can work in support of the salvage team when they have been authorised by the Incident Commander to operate inside the premises.

10.2 To facilitate this, consideration needs to be given to providing simple Aide-memoires for the FRS, to include; The Salvage Sector Commander and the Incident Commander. These should give an overview of your operational procedures and key objectives in terms of salvage.

10.3 In complex buildings, there may be a requirement for layout plans to be made available for firefighters or information on the presence of particular hazards.

10.4 In the event of a fire, the DSFRS Incident Commander will have to decide on the operational tactics to be employed and quickly develop a plan for dealing with the incident. It is recommended that the responsible person for the historic building establishes a relationship with their local FRS to ensure that planning and potential exercises can be carried out to ensure more effective response in case of an incident. The following sections identify some of the likely operational considerations that should be considered as part of a plan.

10.5 The extent and value of the damage limitation team's training will influence the confidence which the incident commander will have in it. This will directly affect the extent to which he will allow use to be made of the team. Teams which have been properly trained and are accustomed to working alongside firefighters and complying with their instructions will be much more effective than those which have not been trained.

10.6 Although the hazards implicit in fighting fires in traditional buildings are little different from the hazards found in 'normal' firefighting, there may be additional risks to fire crews and others resulting from the types of materials stored or used in these premises. For example, it would be likely to encounter a wide range of hazardous chemicals in buildings used for the storage, display or preparation of natural history collections.

10.7 DSFRS try to cause as little water damage as possible when fighting fires, but at serious high level incidents the water from their hoses may leak into the rooms below. The weight of water may well cause structural damage and will certainly cause debris to cascade onto lower floors. It may be possible to cover objects to minimise water damage, but the best course of action would be to divert as much as possible to the outside, using waterproof sheets and hoppers if available. Removal of objects before the water reaches them is another option, but relies on there being enough people and time to remove them safely.

Collections of books are a particular problem because of the number and weight of them. If the collection is on upper floors a book chute may be required to get them to ground level quickly.

10.8 All activity aimed at minimising the impact of a fire on people or property is recommended to include regular and effective contact with the local FRS. In the case of larger properties or sites, an invitation should be extended to the local fire station to visit the premises and gain valuable knowledge of the building, its uses and any special factors which might affect the safety of the occupants or the way in which the fire might have to be fought. Tabletop exercises can also take place.

10.9 The following factors should be taken into account:

- Location of the building and signpost information- for example, is the building called one thing by the occupants but known as something different locally;
- Access to the building- special problems with bridges, roadways and gates any of which might prevent the speedy arrival of fire appliances e.g. weight and width restrictions;
- Entry to the building- may not always be at the front, possibly a rear service courtyard;
- Water supplies- apart from hydrants where are there additional sources of firefighting water;
- Are open water sources such as rivers or ponds/lakes accessible?
- The activities undertaken- what is the building used for?
- Are the occupants likely to have problems evacuating themselves?
- The presence of flammable liquids, explosives, compressed gases or radioactive substances;
- Locations of water stopcocks, meter bypasses, electrical substations, transformers and switchgear, gas shut-offs and the like;
- Particular hazards in the construction features of the building (including asbestos);

- The use of combustible under floor insulation;
- Underground vaults ducts and voids where fire may spread unchecked;
- Worn stone slabs in stairway construction; and
- The presence of cast iron columns and wrought iron beams.

10.10 Regular contact can be developed and other activities organised. For example, arranging for the attendance of fire appliances at a drill or exercise will benefit all parties and will ensure that crews from the local fire station are able to familiarise themselves with the site. Meetings should be held to ensure that the fire personnel are aware of forthcoming special activities such as major exhibitions and special functions, or of temporary changes in building layouts.

10.11 This is particularly important where buildings may only have a narrow frontage and no side or rear access. Pedestrianisation and narrow streets may also restrict or slow down fire service activities.

Access for fire appliances is often provided to pedestrianised areas, but may become more difficult with the provision of street furniture, siting of street traders and the growth of trees. Remote rural locations with no road access will also make access difficult or impossible.

10.12 Where there are significant changes, for example if an access drive is temporarily closed or if there is a long term presence of contractors on a site, the fire and rescue service should be informed immediately. The fire and rescue service should also be informed if the fire detection system or any firefighting equipment such as a fire suppression system is taken out of action for more than an hour or so.

11 BUSINESS CONTINUITY

11.1 Business Continuity Management is planning for and managing the unexpected including a fire or flood. A Business Continuity Plan is a management tool specific to your business and designed to help your business survive in the event of any severe disruption that prevents or restricts your business operating from your premises in both the short and long term.

11.2 You need to consider not only loss of stock, equipment and premises but also loss of income. It is surprising how long it can take to fully recover, in some cases up to 2 years or more. An insurance company could be reluctant to pay out on a claim if appropriate fire safety measures have not been implemented and/or managed correctly.

11.3 Make a list of everything in your plan that is critical to the running of your business and without which your business would be disrupted. The next step is to think of ways of how you could overcome the problem and write them into your plan.

11.4 All IT based records should be backed up regularly and recorded to another location or onto a disc and taken home. If your business operates using books then the books should be taken home at night and kept in a secure metal box or similar to protect them from fire.

11.5 Informing your customers is also important especially where they have left goods for service or repair with you. When you take in goods from customers make sure you take a telephone number to enable you to contact them.

11.6 Having developed your plan keep it alive by ensuring your managers are aware of the arrangements contained in your plan and by ensuring the procedures you have developed are carried out by appropriate staff. Keep the plans under regular review, place a note in your diary every 3 months to remind yourself to check them. It is recommended to test your plan annually.

11.7 The Local Authority Civil Contingency Planning Team can provide advice and guidance to help you develop your plan but they cannot write your plan for you.

11.8 Guidance to assist with writing your business continuity plan can be found via numerous Government sources. Searches on the following links should enable you to gather enough information to understand what you need to do;

http://www.cpni.gov.uk/Security-Planning/Business-continuity-plan/

https://www.gov.uk/government/publications/business-continuity-planning

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/137994/Business_Continuity_Managment_Toolkit.pdf

BIBLIOGRAPHY

Detailed guidance on the various standards listed in the guidance note may be obtained from the following publications:

Available from	Title
British Standards Institution (Sales), 389 Chiswick High Road, London W4 4AL Telephone: 020 7996 9000, Fax: 020 7996 7001, E-mail: cservices@bsi-global.com Web : www.bsi-global.com	**BS 5839 Part 1:** Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance **BS 5839 Part 6:** Fire detection and fire alarm systems for buildings **BS 5266-1:** Emergency lighting **BS EN 1838:, BS 5266 Part 7:** Lighting applications. Emergency lighting **BS 5266 Part 8:** Emergency escape lighting systems **BS 5306 Part 3:** Fire extinguishing installations and equipment on premises **BS 1869: or BS 7974:**Fire Blankets **BS 476 part 22** Fire Tests **BS 476 part 31** Fire Tests **BS EN 1634** Fire Tests **BS 5306 2011** Fire protection installations and equipment on premises. Guide for selection of installed systems and other fire equipment. **BS 7974 2001** Application of fire safety engineering principles to the design of buildings. **BS 9999 2017** Fire safety in the design, management and use buildings. **BS 7913:2013** Guide to the conservation of historic buildings
The Stationery Office (Counter Service),	Building Regulation Approved Document B Furniture and Furnishings (Fire) (Safety) Regulations

123 Kingsway, London, WC2B 6PQ Telephone: 020 7242 6393, Fax: 020 7242 6394 Web: www.tso.co.uk ALSO: The Stationery Office, (Mail, Telephone & Fax Orders) PO Box 29, Norwich, NR3 1GN Telephone: 0870 600 5522, Fax orders: 0870 600 5533	Regulatory Reform (Fire Safety) Order 2005 S.I.1541 TR/19 HVCA Guide to Good Practice Internal Cleanliness of Ventilation Systems