LONDON FIRE BRIGADE

Fire Safety Guidance Note: Historic Buildings and Buildings of Special Interest

GN80

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Contents

The London Fire Commissioner (the Commissioner) is the fire and rescue authority for London. The Commissioner is responsible for enforcing the Regulatory Reform (Fire Safety) Order 2005 (as amended), hereafter referred to as 'The Order'.

This Guidance Note provides fire safety information for historic buildings and buildings of special interest, including those containing heritage collections such as museums, art galleries and heritage archive premises. It also highlights the emergency salvage and damage control processes and record keeping requirements.

This Guidance Note is one of a series produced by the Commissioner to provide advice on various aspects of fire safety. If you require further guidance, please telephone our switchboard on 020 8555 1200 or visit the London Fire Brigade web site at http://www.london-fire.gov.uk

1 Historic and Listed Buildings

1.1 Historic England is the UK government's statutory advisor on the historic environment and is the national authority that designates listed buildings. 'Listed' is a term used to describe buildings and sites that have features that need to be protected. When buildings are listed, they are placed on a register of buildings of "special architectural or historic interest" under the Planning (Listed Buildings and Conservation Areas) Act 1990. The National Heritage List for England (NHLE) is the only official, up-to-date register of all nationally protected historic buildings and sites in England.

1.2 Listed buildings are graded to show their importance:

(a) Grade I - Buildings of exceptional interest (around 2% of all listed premises)

(b) Grade II* - Particularly important of more than special interest (around 6%)

(c) Grade II - Buildings of special interest warranting every effort to preserve them (around 92%).

1.3 To carry out works affecting the special character of a listed building without consent from the relevant Local Authority (LA) is a criminal offence, even if the responsible person was not aware the premises was listed.

2 Common Causes of Fire

2.1 Historic buildings, and those containing heritage collections, can be at significant risk if a fire breaks out. The risk of fire increases significantly during refurbishment or alteration works. Hazards must therefore be continuously monitored and assessed to reduce or eliminate the possibility of a fire occurring.

2.2 In addition to individual sources of ignition, such as a spark or embers from an open fire or hazards posed by electrical equipment, the risk of fire can also arise from accidental or deliberate causes.

2.3 Understanding and mitigating the causes of fire is crucial in protecting buildings and their contents from loss or damage. Addressing these fire risks through proactive monitoring, robust maintenance practices and appropriate safety measures, are essential components in the management of fire safety in any building.

Building Works and Maintenance

- Hot work activities like soldering, roof repairs, paint-stripping, sparks from cutting and plumbing works can ignite nearby combustible materials.

- Loss of fire separation (compartmentation), including removal or repair of doors, partitions or ceilings, can compromise fire containment allowing fire and smoke to spread.
- Isolation of fire detectors, by temporarily covering detectors or disabling alarm zones to prevent false alarms caused by dust, increases risk.
- Fire loading is the amount of combustible material stored in a building or space. Buildings under construction or renovation often have high fire loads due to construction materials, packaging, solvents and fuel for generators.
- Temporary lighting and contractor's power tools are potential sources of ignition.
- Water supply issues, such as hidden hydrants, can adversely affect fire-fighting activities.
- Restricted access from erected hoarding and site huts can lead to blocked entries and exits.
- Lack of fire precautions or safety measures not yet implemented.

Electrical Faults

- Aging wiring, where the insulation and protective layers of wiring deteriorates over time, can cause short circuits, overheating and electrical fires.
- Using too many appliances can overload circuits causing equipment and wiring to overheat.
- Electrical appliances not regularly maintained or cleaned can lead to malfunctions and fire.
- Electrical system upgrades may be needed to ensure systems remain safe and effective, such as replacing outdated fuses with modern systems featuring Residual Current Devices (RCDs) as per BS7671 Wiring Regulations.
- Open Fires, Stoves, Grates, Hearths and Flues
- Chimneys pose significant potential for fire spread if not swept regularly.
- Cracks and faults in hearths and defective flues allow fire to reach timber joists and brickwork.
- Obstructions such as bird nests in flues or on chimneys are a frequent cause of fires.

Vandalism and Malicious Damage

- Arson is a leading cause of fire, particularly in remote or vacant properties. Adequate security measures are vital, especially for buildings that are unoccupied or empty.

Accidental Causes

- Smoking materials carelessly disposed of can cause fires.
- Portable heaters and candles placed near flammable materials creates a risk.
- Sunlight hitting mirrors or glass can focus sunlight onto combustible materials, such as curtains and furnishings, causing ignition.

3 Fire Safety Legislation

3.1 The Regulatory Reform (Fire Safety) Order 2005 (the Fire Safety Order) is the main piece of legislation governing fire safety in buildings in England and Wales. It is enforced by several organisations, the primary enforcer being the local Fire and Rescue Service (FRS).

3.2 The Fire Safety Order requires that the Responsible Person (the person having control of the building, or a degree of control) takes reasonable steps to reduce the risk from fire and to ensure people can escape safely in the event of a fire.

3.3 In the context of the Fire Safety Order, anyone who is lawfully on the premises (employees, customers, visitors, contractors, people who live in the building etc.) are "Relevant Persons". This includes anyone in the immediate vicinity of your premises who is at risk from a fire on the premises.

3.4 Whilst life safety is paramount, to ensure that both life safety and historic building requirements are satisfied, a balance must be struck between the protection of relevant persons from fire and the implementation of sensitive fire safety mitigation measures.

3.5 All LAs in London should have dedicated Conservation/Planning teams who manage listed buildings on behalf of Historic England. Discussions should be held with the local conservation officers before any changes are made to a listed building.

3.6 Regardless of whether a building is listed by Historic England or by a local authority (locally listed), any alteration will be subject to Building Regulation approval. This will be administered by the Local Authority (LA) Building Control office, or an approved inspector under the Building and Approved Inspectors (Amendment) Regulations 2010.

4 Fire Safety Documentation

4.1 Fire Safety documents for non-domestic premises, including historic buildings, should include the Fire Risk Assessment (FRA), Evacuation Strategy (ES), Emergency Evacuation Plan (EEP) and where appropriate, Personal Emergency Evacuation Plan (PEEP). Together, these documents form part of the fire safety arrangements for the premises. Depending on the size and complexity of the premises, the amount of information these records contain will vary.

4.2 In premises such as museums, art galleries and buildings containing collections or archives, a comprehensive fire safety manual must be compiled. Where appropriate, the following elements should be considered:

- Fire Strategy
- Fire Safety Engineering details
- Emergency Evacuation Procedures
- Emergency Response and Salvage/Damage Control plan
- Fire and Rescue Service liaison including details of any joint exercises
- Business Continuity plan
- Emergency Contact List

4.3 All fire safety documents for the premises should be easy to understand, regularly reviewed and kept up to date. They should also be accessible and made available to any authorised person who needs to use them.

5 Fire Risk Assessment

5.1 The FRA is the foundation on which fire safety measures in your premises are built and involves a careful look at your premises and the people who use them from a fire prevention perspective. It's about understanding the potential risks, and then improving your fire safety precautions to keep people safe.

5.2 A Fire Risk Assessment (FRA) is mandatory for all premises falling within the scope of the Fire Safety Order. Further information about fire risk assessments can be found here: LFB Website content on: Fire risk assessments – your responsibilities

5.3 The obligation to ensure the safety of occupants, and the moral duty to protect the building from fire often leads to conflict. The FRA can be a valuable tool in striking a balance between life safety requirements and the need for property protection. It may be appropriate to apply a more flexible risk assessment process that ensures property protection and business continuity is achieved. This approach may require the expertise of specialists from various disciplines and early engagement with a Conservation Officer and /or Historic England.

5.4 At no point should any variation to a premises take place without a full and detailed review of the FRA and/or the fire strategy. Any significant change to the building or deviation from current guidance or British Standard must be fully documented within the FRA.

5.5 When a historic listed building is used for events or functions, there should be clear co-operation and co-ordination between the RP and the event organiser to ensure everyone is informed about the findings of the relevant FRAs and evacuation procedures for the premises.

5.6 When sub-letting part of a building or hiring out rooms or areas within a premises, it is crucial to consider any potential hazards present and the risks they may introduce into the premises.

6 Fire Strategy

6.1 A fire strategy is a complex document specifically tailored to a building, reviewing all aspects of the building's fire safety features including construction, compartmentation strategy, means of escape and other fire safety features/measures - including management arrangements.

6.2 The fire strategy document serves as the basis for more detailed fire protection provisions such as the FRA, ES, EEP and PEEP and other relevant building strategies (such as a building's security strategy).

6.3 Fire strategies primarily focus on ensuring the safety of occupants, but they may also consider property protection, environmental and business continuity. In the context of historic buildings and buildings of special interest, fire strategies can be instrumental in implementing and managing the necessary fire safety prevention and protection measures in an effective and consistent way.

6.4 The type of occupancy plays a crucial role in developing the fire strategy. Occupancy can include various categories such as the following: -

- Members of the public including children, volunteers and staff.
- Key representatives of historic buildings and buildings if special interest, such as curators and house and collections managers, who may live on site. They are the first line of defence against fires and security threats.
- Some historic properties may include holiday apartments or are used in their entirety as a rental property for guests.
- In certain cases, the donor family and their staff may continue to reside in the property, often living in private apartments or other areas of the building. These private living areas are not covered by The Fire Safety Order and do not generally form part of the FRA. However, as Relevant Persons, these occupants and their escape routes must be considered within the FRA for the historic building.

7 Fire Safety Engineering

7.1 In certain instances, the only practical way for a historic building to achieve a satisfactory standard of fire safety to comply with The Order, while also meeting Building Regulations, is to adopt an engineered fire safety solution.

7.2 Fire safety engineering solutions often adopt a comprehensive and systematic 'performance-based' design approach to address a fire safety issue. British Standard BS 7974 or CIBSE Guide E provides a framework and guidance on the design and assessment of fire safety measures necessary to support a fire engineered solution.

7.3 Fire safety engineering allows a building-specific fire strategy to be developed. These solutions consider various factors based on scientific and engineering principles, including:

- The likelihood of a fire occurring.
- The anticipated fire's 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 the building during a fire, as well as the fire service's intervention.

7.4 If it's believed that an engineered fire safety solution is desirable or necessary for a historic building, the RP should seek further guidance from a qualified and competent fire engineer.

8 Passive and Active Fire Protection

8.1 Passive and active fire protection systems work independently, but together they provide comprehensive fire protection to a building.

8.2 Passive fire protection (PFP) slows or prevents the spread of fire within a building using fire resistant doors, walls, and floors. Fire dampers are another passive fire protection measure that can prevent the spread of fire and smoke through a building's ventilation system.

8.3 Passive fire protection systems work to contain fire, heat, and smoke, with the aim of limiting any fire spread to a single compartment within the building. By containing a fire to its area of origin, occupants can evacuate the building safely. Limiting the spread of the fire to the compartment also results in a smaller, contained fire which will be easier for the FRS to deal with and protects the building's overall structure.

8.4 Active fire protection systems have features that operate when a fire is detected. These systems include fire alarms, emergency escape lighting, suppression systems (water, gas or chemical) and fire-fighting equipment (extinguishers).

Passive Fire Protection Systems

Compartmentation and Fire Stopping

8.5 Compartmentation is the division of a building into separate fire compartments and is achieved using fire-resistant walls, partitions and ceilings. The objective of compartmentation is to restrict the size of the fire and prevent its spread from one area to another, or onto staircases and other exit routes. Most buildings have natural lines of compartmentation that can be utilised to create separation elements that, with some attention, can provide adequate fire protection, potentially lasting an hour or more.

8.6 When designing a compartment strategy for a building, it is crucial to have a comprehensive understanding of all the concealed voids within the structure. It may therefore be appropriate to undertake a full compartmentation survey.

8.7 Holes in compartment walls, floors and ceilings should be fire stopped to the appropriate level of fire resistance. Where service cables or pipes pass through a compartment floor, wall or cavity barrier, fire-stopping material should be used that provides the required level of 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.

8.8 Doors should be fire resistant or capable of resisting the passage of fire for a designated period and should not be propped or wedged open. They should self-close effectively to sit squarely

within the frames. Any excessive gaps between the door and the door frame caused by warping or dropping of the hinges should be identified and remedial action taken.

Roof voids, attics and lofts

8.9 The areas between the ceiling of the top floor and the roof structure can significantly affect the fire resisting capabilities of a building. Investigation of roof spaces is therefore an important aspect of the Fire Risk Assessment (FRA).

8.10 In many historic buildings, compartment walls weren't constructed to extend up into the roof space. Compartmentation of the roof void is therefore a vital element in enhancing a building's fire performance. However, installing fire-insulating barriers that do not align with the existing compartment lines below will undermine the structure's fire integrity.

8.11 Numerous flues and other voids can also compromise fire resistance by allowing smoke, heat and flames to move between areas, allowing fire to rapidly spread unhindered along the roof space.

8.12 Other long-forgotten ducts or shafts may also be part of the original construction, such as waste shafts, natural ventilation stacks, bell pulley routes and dumbwaiters. These voids, often interconnected, pose a significant hazard to buildings, providing an easy route for fire, smoke and combustion products to spread.

8.13 Sometimes, it can be challenging to detect hidden voids. However, original building plans can reveal their locations. The issue with these voids is that they create concealed pathways for fire, smoke and other combustion products to spread undetected to distant parts of the building. The fact that the fire is hidden makes it almost impossible to extinguish without significant structural dismantling.

Floor construction

8.14 Historic buildings present a unique vulnerability in their floor construction. While some buildings feature stone or brick vaulted floors with excellent fire resistance, others may use timber construction. The risk of a fire compromising the floor above a room is significantly reduced by a plaster ceiling. However, early floors provided minimal resistance to fire as they generally consisted of floorboards laid over the joists with no applied ceiling below. Where a ceiling is present between floors, the age, condition of the plaster and the strength of its attachment to the underside of the joists, will significantly affect its ability to withstand fire.

8.15 Upgrading the fire resistance of a floor can be a challenging task, potentially resulting in some loss of historic fabric. However, several recognised methods can help to strengthen any weaknesses in the original construction:

- Introducing mineral fibre quilt between or below the joists.
- Inserting intumescent sheet material over or under existing surfaces.
- Inserting intumescent material at the perimeter of the floor to seal the connection with wall cavities in the event of a fire,
- Applying intumescent coatings to ceilings,
- Applying additional layers of fire-resistant boards to ceilings or floors.

Walls and Ceilings

8.16 Thick stone walls have excellent resistance to fire and traditionally, plaster was applied directly onto solid masonry. However, later the primary technique was "lath and plaster". This involved applying plaster to thin strips of wood (laths) that were nailed to upright studs attached to the wall. Whilst theoretically providing fire resistance, the performance of plaster relies on the condition of the mechanical bond (key) between the plaster and laths. If this bond is lost, the

plaster will start to detach. The performance of traditional plaster in a fire may be unpredictable, and at a certain stage in a fire, complete failure may occur.

8.17 Walls and ceilings lined with lath and plaster, or timber panelling creates narrow, continuous cavities. These cavities are one of the most vulnerable elements in terms of fire resistance. They often connect with floor cavities and can extend throughout a building, providing an easy fire path with both fuel (timber) and air present. A fire can smoulder unnoticed for many hours before breaking out far away from its origin.

8.18 Anything attached to a wall or ceiling can significantly influence the rapid growth of fire within compartments. Full-height timber panels and other wall coverings, such as wallpaper, layers of paint, display items and tapestries, can create a path for flames to easily travel from low level to ceiling height, thereby encouraging rapid fire spread.

8.19 A high ceiling can impact the spread of smoke and flames by delaying the descent of hot smoke from ceiling level and preventing it from entering other areas. If the windows are higher than the tops of the doors, the heat from the fire can also break the glass, allowing hot smoke and gases to vent safely out of the building. The heat from smoke can also damage doors and compromise their fire resistance.

Doors

8.20 Doors are often the primary weakness in a separating wall. Doors and frames with gaps in their construction, or those containing non-fire-resistant glazing can make the spread of fire beyond the original compartment much easier.

8.21 If a door is intended to be a fire door but fails to meet the required standards, it is advisable to seek guidance from a qualified professional to assess whether the existing door is of sufficient solid construction to resist a fire for the required duration. Doors should also be assessed to establish if self-closing mechanisms, intumescent strips and cold smoke seals can be installed on the door or its frame.

8.22 There might be instances where improving the fire resisting properties of a door, to improve its performance during a fire, is not practical. A door's construction method or its inherent value, can make alterations unacceptable. In these circumstances, an alternative option would be to replace the door with a replica that meets the necessary fire safety standards and to place the original door into suitable storage. However, before undertaking any works, a Conservation Officer or Historic England should be consulted first.

8.23 The structural stability of a door in a fire resistance test is directly related to the size of the door (height, width and thickness) and the size of the stiles and rails. Therefore, when asked to alter or upgrade a door, it is important to consider the whole door set, including the voids behind the frame. Where doors can be altered or upgraded to improve their reaction to fire, any works should be performed in collaboration with a suitably qualified expert.

Glass and Glazing

8.24 Glazed openings can pose a potential weakness in the passive control of fire within otherwise sealed compartment walls. During a fire, glass can melt at high temperatures or shatter due to gaseous explosions or thermal shock. To address this issue, several options can be considered. These include improvements in the way glass is held within its frame or the provision of secondary fire-resistant glazing fitted over the existing glass. These options allow for the retention of ornate glazing, as removal is usually considered a last resort. However, any glass that is removed should be handled with care and stored for repairs or reuse. Fire resistant glass that

complies with the relevant British or European standard is available in several forms, including 'wired' glass (Georgian glass) or fire resisting glass, often referred to as "pyro" glass.

Timber

8.25 Traditional buildings often contain a significant amount of timber. Different timbers exhibit varying levels of fire resistance that increases with the thickness of the wood. As a result, thin timbers like window shutters, door panels, decorative wall lining boards and other trims will burn easily. Large timber stud frames, and structural elements such as beams, columns and rafters will burn at a slower pace and may continue to function for an extended period, even when the fire has been extinguished. However, the fire performance of timber can be negatively impacted by factors such as rot or woodworm.

Active Fire Protection Systems

8.26 Once consideration has been given to the passive fire protection measures within the building, the next step is to look at the active fire protection measures which might be present or may be needed. When introducing fire protection systems to enhance a building's fire performance, it is essential that they meet the primary objectives of protecting life, buildings and contents.

Several other factors should also be considered:

- Any system that is installed should be tailored to the specific risks being considered.
- Systems must comply with relevant fire safety legislation and performance-based standards.
- To protect the historic fabric and structure of a building, installation of fire protection systems should involve minimally invasive procedures and be designed to discretely and sensitively integrate with the historic fabric and intricate detail of the building.
- Any changes made to the fabric of a building when installing fire protection systems should be easily reversible. This ensures that if a protective feature is removed, any significant element of the building that led to it being listed remains undamaged.

Fire Detection and alarm systems

8.27 Fire detection and alarm systems are highly effective safety measures for buildings. They can be installed to provide life safety or property protection and should comply with the latest edition of British Standard BS 5839 parts 1 and part 6, depending on building type and use.

8.28 When installing a detection and alarm system in a historic building, minimally invasive and discrete components and devices should be used to ensure the historic fabric of the building is not damaged and does not affect any historic features. Examples of systems that have been installed in historic buildings include:

(a) **Aspirating smoke detectors** offer potential for minimum invasion and reversible installation in sensitive environments. They operate by drawing air through a network of pipes to a sampling chamber capable of detecting the slightest trace of smoke. The likelihood of this type of system producing false alarms is low.

(b) **Wireless detectors** provide high reliability and are unobtrusive. However, thick walls of brick and stone are much more difficult for Wi-Fi signals to penetrate thereby potentially reducing the effectiveness of a wireless system. It is therefore crucial to conduct a signal strength investigation before any installation work is undertaken.

(c) **Visual and thermal image fire detectors** (camera software fire detection) can be used in large indoor spaces from well-hidden locations. The sensitivity of visual detectors can lead to false alarms as they are susceptible to moving objects and shadows. Thermal detectors

register heat sources and will raise an alarm based on pre-set temperature limits thereby reducing the possibility of a false alarm.

(d) **Beam smoke detectors** can be used in large rooms with ornate ceilings.

8.29 The ideal location for detectors is as central as possible within a room, as detailed in the British Standard BS 5839. However, detectors are often incorrectly placed near the wall above the entrance door to a room to make them less obtrusive when entering. However, when detectors are placed in this location the natural airflow around doors may slow down detection time and delay smoke from reaching the sensor. Detectors that are recessed, placed above holes in the ceilings, or hidden behind beams and lights can also be ineffective.

8.30 Some Fire and Rescue Services may not always respond to an automatic fire alarm (AFA) unless it has been confirmed via a 999 call. It is therefore crucial to evaluate the frequency of false alarms to assess whether filtering measures are needed to prevent false alarms from reaching the emergency services. To maintain a robust early-warning alarm capability, during periods when the premises is unoccupied, consider employing the monitoring services of an Alarm Receiving Centre (ARC). Frequent false alarms are an indication of failures in fire safety management, which may lead to enforcement action by the relevant FRS or result in charges from the FRS who are entitled to recover some attendance costs.

Dampers

8.31 Traditional buildings rely on relatively high air change rates to prevent dampness and mould. Disrupting this balance can have significant consequences. One way to avoid these unwanted effects is to use mechanically or electrically operated fire dampers that automatically close off ducts when a fire is detected.

Emergency lighting and emergency escape lighting

8.32 Buildings with no natural light, or those that are used during the hours of darkness, should be provided with an Emergency Lighting (EL) system conforming to British Standard BS 5266-1. These lights are typically powered by battery packs and only illuminate when the mains or local lighting sub-circuit fails. If this type of lighting is not feasible, an alternative method must be identified and assessed as part of the FRA.

Fire exit signage

8.33 These types of signs 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 1996'. Signs that meet the criteria in British Standards BS 5499 and BS EN 7010 also meet the standard of the 1996 Regulations and can be used. Where the character of a building needs to be preserved, it may be unsuitable to physically install signs. An alternative solution should be explored, such as using free-standing signs or employing room wardens to guide people. Any alternative solutions must undergo a comprehensive risk assessment and testing process and be fully documented in the FRA.

Other signage

8.34 Where possible, Fire Action Notices detailing the actions to be taken in the event of a fire or other emergency should be located next to fire alarm call points. In certain situations, emergency instructions can be provided through alternative means such as a public address system or verbally by staff. Any alternative methods adopted should be fully documented in the FRA.

8.35 Blue discs stating either 'Fire door keep shut', "Fire door keep locked shut" or "Automatic fire door keep clear" should be attached to fire doors. In areas with particularly ornate doors, these notices can be installed to the leading edge or in the frame of the door, where they will only be seen when the door is open.

Fire-fighting equipment

8.36 All staff members expected to use firefighting equipment should receive appropriate training.

8.37 The types of fire extinguisher on a premises should reflect the potential fire risks in each area. It is recommended that an appointed competent person should liaise with the fire extinguisher technicians during installation to ensure the extinguishers are placed in the appropriate areas.

8.38 It is sometimes not advisable to install fire extinguisher brackets on certain walls, especially those with historic value or protection. Instead, consider using fire extinguisher stands to prevent any compromise or damage to the walls.

8.39 Maintaining all fire protection systems and facilities is crucial. They must always be available and in good condition. Neglecting this aspect endangers, the building, its occupants and firefighter's lives. It could also lead to legal consequences rendering the RP liable to prosecution.

8.40 Depending on the risks and hazards identified within the fire risk assessment, sprinkler/water mist or oxygen reduction systems may be required within the premises to lower the risk or hazard to a tolerable level. If a bespoke suppression system has been installed, it should be fully accounted for in the fire risk assessment.

8.41 Sprinklers have been proven to reduce the impact of fire and are potentially a lifesaving tool that brings many benefits. London Fire Brigade fully supports the use of Automatic Fire Suppression Systems (AFSS) to protect property and to reduce fire deaths and injuries. Comprehensive information on AFSS and useful links are available on the LFB website sprinkler page.

Oxygen reduction systems (ORS)

8.42 Oxygen reduction systems (ORS), also known as "OxyReduct®", are a fire prevention technology used in locations such as IT server rooms, small warehouses and archive stores. These systems are designed to protect equipment, or the materials being stored by reducing the oxygen content of the air to levels that prevent fires from starting. ORS work by introducing controlled levels of nitrogen into closed rooms to continuously reduce oxygen concentrations creating an atmosphere where fires are practically impossible to start, develop or spread. Sensors continually monitor oxygen levels within the protected area, ensuring they remain at a predefined value.

8.43 The main risk associated with the use of ORS is the potential for people working in areas with low oxygen levels to suffer from oxygen deprivation (hypoxia). Oxygen-reduced air can cause symptoms such as headaches, tiredness, nausea, a lack of concentration, confusion, loss of appetite, dizziness, and in extreme cases, unconsciousness. Oxygen deprivation can be particularly hazardous to people with pre-existing medical conditions including heart and circulatory conditions, respiratory and lung disorders, or blood disorders.

8.44 It is recommended that ORS systems should only be installed in areas where strict access and monitoring measures can be effectively managed and controlled. A thorough risk assessment should be performed for staff requiring access to areas where ORS is installed. Additionally, they should undergo regular health checks (health surveillance) to identify any changes in their health.

8.45 To determine the suitability and effectiveness of ORS, it is advisable to seek professional advice from an accredited company specializing in this field.

9 Emergency Response and Salvage / Damage Control Plans

9.1 Pre-planning is crucial to the success of salvage operations. The Fire Safety Manual should therefore include well designed Emergency Response and Salvage/Damage Control plans. Any specific parts of a building, items or collections that need protecting should be subject to a well-designed Salvage/Damage Control Plan to ensure their survival in the event of a fire or any other incident.

9.2 RP's or appointed persons are responsible for making adequate plans and provisions for the salvage, recovery and protection of a building, items and collections under their care. They should formulate a salvage plan based on a worst-case scenario. It's also important to consider out-of-hours incidents, where a responsible/competent person may not be available on site.

9.3 Templates and examples of documents that should be included in a salvage plan can be found on the LFB website: https://www.london-fire.gov.uk/safety/property-management/fire-safety-in-heritage-and-historical-buildings/emergency-response-and-salvage-plans-for-heritage-buildings/how-to-write-a-salvage-plan/

9.4 Salvage Plans should cover the following points:

- Details of the Incident Coordinator and their deputy.
- Details of the Salvage Team Coordinator
- Details of Recovery Team Coordinator
- Contacts list.
- The creation of a Salvage Team that includes suitable numbers of staff.
- Site plans and building floor plans.
- Salvage priorities (Grab sheets).
- Salvage procedures.
- Emergency first-aid conservation, including suitable containers and covers for priority items which allow responders to minimise the risk of damage during salvage operations.
- Consideration should be given to the availability of trained site staff who can meet, assist and support fire crews.

9.5 One of the most challenging aspects of maintaining the plan is updating the contact lists for management teams, salvage team members and equipment suppliers. With staff turnover and movement, it becomes difficult to ensure sure that the lists are always current. If it was decided to use the services of a contacts centre, a part of the contract should require them to periodically review the lists and conduct test calls.

9.6 Training of the salvage teams should include practical elements such as reading plans, identifying objects on the salvage list, removing paintings from their secure fixings, object handling and first-aid treatment of damaged objects. These skills should be practiced in a simulated environment and include regular joint exercises with the FRS.

9.7 In the event of an emergency, the FRS Incident Commander (IC) must swiftly decide on the operational tactics to be employed and develop a comprehensive plan to manage the incident. It is therefore crucial that relevant information is accurate, readily available and can be effectively communicated to FRS personnel.

9.8 Laminated, easy to read floor plans should be provided along with the location of any hazards. This can be achieved through an on-site staff member or security team, or by using a Secure Information Box, ensuring that the information does not compromise the premises' security measures. By supplying this information, firefighters will be better prepared to take appropriate action and respond swiftly to minimize any potential impact, while prioritizing their safety and the

safety of others. For more information on secure information boxes see the Government Secure Information Box Factsheet. The following sections outline some of the key operational considerations that should be incorporated into the plan.

9.9 Hazards to firefighters: There may be additional risks to fire crews and others resulting from the types of materials stored or used in certain premises. For instance, there is a high likelihood that crews will come across a diverse array of hazardous chemicals in buildings used for storing, displaying or preparing natural history collections.

9.10 Pedestrianisation and narrow streets can restrict or slow down FRS operations. While access for appliances is often provided in pedestrianised areas, it can become more challenging when street furniture is present. The siting of street traders and growth of trees can also affect access.

9.11 The size and weight of FRS vehicles should also be considered. Aerial appliances, specialised fire trucks with large extendable ladders, will need sufficient space to deploy their stabilisers. Space will also be needed so that equipment can be removed from an appliance's sliding trays. Many modern fire appliances are also very heavy, potentially making access to rural locations with poor or limited road access more difficult.

9.12 Other things to consider:

- Building name and location signage: Is the building called one thing by the occupants but known as something different locally?
- Access: Is there anything on site that could prevent the rapid arrival of fire appliances such as roadways, bridges, gates, security bollards or traffic control measures. Are there any weight, height or width restrictions?
- Building entrances: These may not always be at the front. Is there a rear service courtyard?
- Water supplies: In addition to public hydrants, are there any private hydrants on site or other sources of water that could be used for firefighting? Are open water sources such as rivers, ponds or lakes accessible and useable?
- Are there any automatic fire suppression systems installed to parts of the building?
- What is the building used for?
- Are the occupants likely to face difficulties in evacuating the premises?
- Are there any hazardous materials on site such as flammable liquids, explosives, compressed gases or radioactive substances?
- If utility services (water, gas, electricity) need to be isolated, are the locations of stopcocks, electrical switchgear and gas shut-off valves recorded in the emergency plan?
- Are there any hazards in the construction features of the building such as asbestos or combustible under-floor insulation?
- Are there any underground vaults, ducts and voids where fire can spread unnoticed?
- Are there any worn stone slabs in stairway construction?
- Are there cast iron columns and wrought iron beams in the building?

9.13 Salvage procedures will vary based on the size of the incident. If the risk is considered too great, due to the severity of the emergency, the FRS will take the decision that the building is unsafe to enter. Until the emergency is under control, that decision will stand, and nobody will be allowed to enter the building.

9.14 Damage control in respect of specific areas of the building, or for items that cannot be removed from site, should be fully considered in a salvage plan. For example, there may be ceiling artwork or sections of the building that must be protected from damage by fire, smoke or water.

10 Salvage Grab Sheets

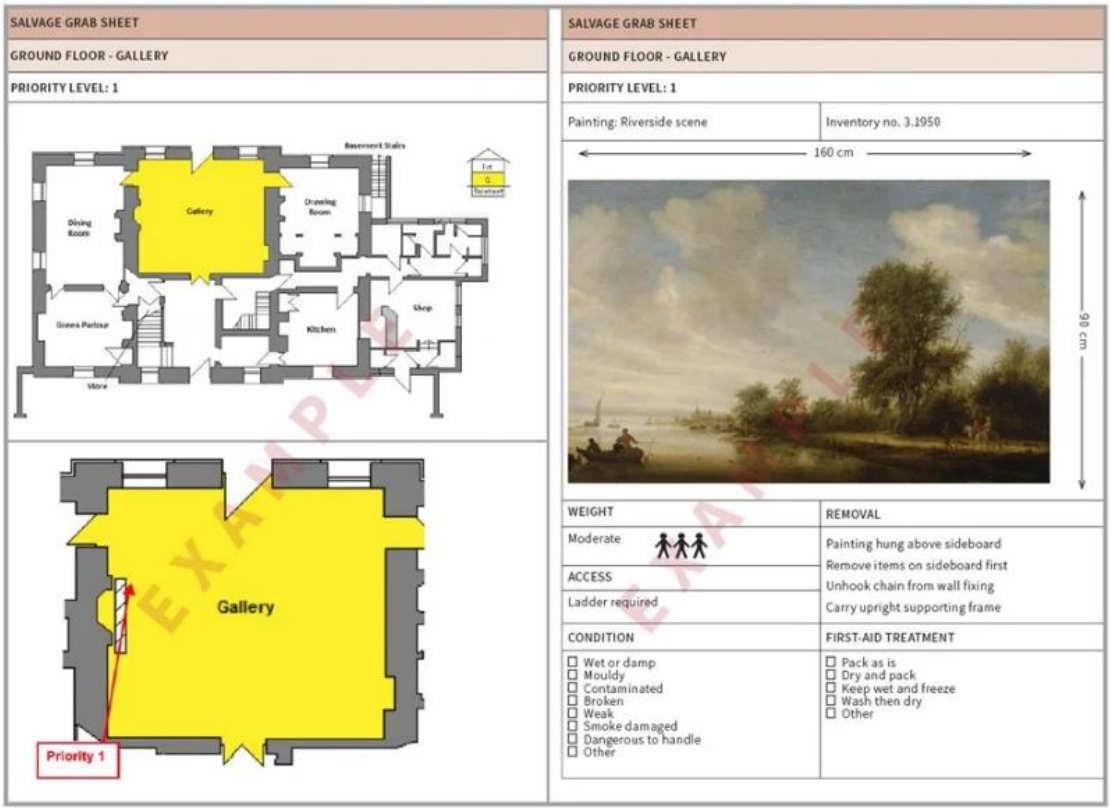
10.1 If items are to be salvaged, fire crews will need access to simple floor plans and salvage plans that are easy to understand. The salvage plans provide useful information, including 'salvage grab sheets', which will assist the fire crews to undertake salvage procedures.

10.2 Salvage grab sheets display important information about priority items that need to be salvaged in an emergency. Both the salvage plan and any salvage grab sheets should be developed and readily available before the FRS arrive on-site. This allows action to commence promptly upon arrival, subject to the FRS Incident Commander's approval.

10.3 Salvage grab sheets should ideally include the following information: -

- Location of the item alongside a clear floor plan.
- Priority rating, 1, 2, 3 (with 1 being the highest importance).
- A picture of the item that needs to be salvaged.
- A description of the item.
- The dimensions & weight of the item.
- How the item is fixed and whether tools or security keys are required to remove it.
- The number of people required to safely move the item.
- Is the item at height and are ladders required?
- If any items cannot be moved, what measures are required to protect them in situ?

10.4 It's best practice to place salvage grab sheets in a designated folder and group them by location or area instead of in order of priority.



11 Liaison with Fire and Rescue Services

11.1 Pre-planning activities aimed at minimising the impact of a potential emergency on people or property should include regular and effective discussions with the local FRS. To enhance the

effectiveness of responding to an emergency, it's therefore crucial for the RP for an historic building or building containing historic items and collections, to establish a collaborative relationship with their local FRS.

11.2 Joint activities between the heritage sector and FRS can also be organised, such as arranging for the attendance of fire crews at a drill or exercise. This will benefit everyone involved and ensure that crews from the local fire station are familiar with the site and its surroundings.

11.3 For complex properties or sites, the local fire station's crews should also be invited to visit. This will help them gain valuable knowledge about the building, its uses, any special factors which could affect the safety of the occupants, and the way in which the fire might have to be fought.

11.4 Consideration should also be given to running Tabletop Exercises (TTX). A TTX is a discussion-based activity where participants work together to respond to simulated emergency situations to identify any weaknesses in policies, procedures and the overall emergency response plan.

11.5 Meetings should be held to inform FRS personnel about upcoming special activities, such as major exhibitions and special functions, or any temporary changes in building layouts. This is particularly important in buildings with narrow frontages and limited access from the sides or rear.

11.6 Where there are significant changes, such as temporary closure of an access drive or prolonged presence of contractors on a site, the local FRS should be promptly informed. Additionally, they should be notified if the fire-fighting equipment, including any fire suppression system, is rendered inoperable or taken out of action for more than 24 hours.

12 Roles and Responsibilities

12.1 Incident Coordinators, Salvage Team Coordinators and Recovery Team Coordinators are all crucial roles in managing and executing salvage operations during an incident. The coordinators are responsible for advising on or requesting additional resources or adjusting priorities as the situation changes. They collaborate with the FRS and other emergency services to ensure that the most critical objects are salvaged first.

Their key responsibilities and considerations are as follows:

Incident Coordinator role

- If FRS are in attendance, collaborates with the FRS Incident Commander, assisting with strategy and resource allocation.
- Actively manages the involvement of heritage sector staff during an incident to ensure that salvage operations do not interfere with firefighting, rescue or other objectives set by the Fire and Rescue Service (FRS) Incident Commander.
- Conducts all operations in accordance with health, safety, and operational protocols, prioritising the safety of individuals.

Salvage Team Coordinator role

- If FRS are in attendance, supports and collaborates with the FRS Salvage Sector Commander.
- Serves as technical advisor for implementing the salvage plan and supports team members.
- Maintains a thorough understanding of the salvage plan's details.
- Prioritises the protection or movement of high-value or sensitive objects utilising priority salvage lists and grab sheets to facilitate decisions.

Note: When the fire service is present at an incident, the Salvage Team Coordinator must not initiate salvage activities independently. Instead, they should coordinate with the FRS Incident Commander and Sector Commander, ensuring that their actions align with the broader incident response plan and does not interfere with other priorities.

Recovery Team Coordinator role

- Organises resources for the triage of objects in the designated salvage recovery areas.
- Establishes workstations, equipment and teams for both wet and dry recovery.
- Ensures all salvaged objects are treated, packed and labelled.
- Considers and implements appropriate security measures for the salvage recovery areas.
- Ensures location of objects are documented or liaises with the Documentation team.

Note: The roles of Salvage Team Coordinator and Recovery Team Coordinator both involve working under pressure in potentially rapidly evolving situations. Due to the complexities and pressures of each role, it is strongly advised that these roles are performed by separate individuals. However, during the early stages of an incident, if staff availability is limited, it may be necessary for one person to initially assume both roles until a second appropriately trained person becomes available.

12.2 By maintaining a clear structure, effective communication, and visible coordination, these roles ensure that salvage operations are conducted effectively and safely, without hindering the primary incident response efforts.

13 During an Incident

13.1 Clear communication is essential during an incident. To prevent salvage operations from interfering with firefighting or rescue activities, each coordinator should have a suitable means of keeping in touch with their teams and the FRS Incident Commander

13.2 Each coordinator should wear Hi Viz vests or tabards to ensure their visibility to all responders and aid quick identification in the incident area. Consideration should be given to the colours used to help differentiate from emergency workers and contractors. This is especially crucial during incidents involving multiple agencies or teams.

13.3 Hi viz vest/tabards should be clearly marked with the individual's role (e.g., "Incident Coordinator", "Salvage Team Coordinator", "Recovery Team Coordinator") and their organisation's name.

13.4 It is recommended that salvage teams are provided with personal protective equipment (PPE). As a minimum, this should include hard hats, suitable protective footwear, gloves and face masks and Hi Viz vests.

13.5 Staff appointed to take part in salvage procedures may be required to travel from home or another location to the site, potentially passing through a police cordon control area. It is essential that staff carry appropriate identification and follow agreed procedures to avoid any delays in reaching the site.

13.6 The first staff member on-site often has a critical role in both assessing the situation and setting up the salvage operation. However, their attention could easily be divided between managing the incident and attempting to contact other team members, potentially leading to delays in both communication and response efforts.

13.7 It's crucial to ensure that the first responder is not overwhelmed with administrative tasks, as their primary responsibility is managing the incident. Streamlining communication through a designated person or system can significantly enhance the response time and effectiveness of your team. Whether using social media tools, contracting with a call centre, or implementing an automated notification system, the key is having clear and effective communication protocols in place before an incident occurs.

13.8 To improve the efficiency and effectiveness of contacting staff without burdening the first responder with too many tasks, several strategies could be implemented:

- Appoint a dedicate person for communication
- Outsource to a third-party Alarm Receiving Centre (ARC)
- Use an Emergency Notification System (ENS)
- Create a contact list to aid communication.
- Integrate with Incident Management Software

13.9 During any emergency involving the Fire and Rescue Service (FRS), the protection of persons from injury is paramount. When the FRS is present during an incident, in-house salvage staff are **not** permitted to operate independently but **must always** be accompanied by a member of the FRS when working within the building. When firefighters and in-house salvage team members work together in recovery operations, this collaboration is usually referred to as a "Mixed Team".

13.10 The Fire and Rescue Service (FRS) will only instigate salvage and damage control operations when it's safe to do so. In areas deemed unsafe for in-house salvage teams to access, firefighters will assist in the removal or protection of items and collections. The in-house salvage team will only be authorised to enter the premises by the Incident Commander, once the area is confirmed as safe, or is remote from the fire location and active firefighting operations.

13.11 FRS will strive to minimize water damage during firefighting operations. However, the water used for firefighting may seep into other areas and adjacent rooms. The weight of water may well cause structural damage and potentially leak onto lower floors. While covering objects can help reduce water damage, the most effective course of action is to divert as much water as possible to the outside, using waterproof sheets and hoppers if available. Removing objects before the water reaches them is another option. However, this will depend on having enough personnel and time to do this safely. Book collections pose a particular challenge due to their abundance and weight. If the collection is located on upper floors, a book chute may be necessary to quickly transport them to ground level.

13.12 Upon arrival at the incident site, the Incident Coordinator and Salvage Team Coordinator **must** introduce themselves to the FRS Incident Commander or FRS Sector Commander. This ensures activities are coordinated and that all parties are aware of their respective roles.

13.13 It is recommended that copies of the building floor plans are made available to FRS personnel. All plans should clearly identify the layout of the premises and the location of items for salvage.

13.14 There should be a clear and specific indication of how these items should be removed from their current location. Considerations include:

- For items stored in cases, there should be clear instructions on how the case can be opened.
- How each item should be handled to minimise damage.
- How many people are needed to lift and remove an item? Is specialist equipment required?
- Do any items require bespoke containers for safe removal, and can the containers be found easily in an emergency?

13.15 Once an item is identified and ready to be removed from the building, the next step is to consider how it will be transported to the designated recovery area. To prevent any damage to smaller items during transit, it may be advisable to use a padded bag or something similar.

13.16 Where it is only safe for firefighters to conduct salvage operations, once they have extracted a salvaged item, they will report to the FRS Entry Control Officer / FRS Salvage Sector Commander. If firefighters are wearing breathing apparatus (BA), they won't be able to proceed beyond this point to deliver the salvaged item to the recovery area or other safe area. At this stage, the Salvage or Recovery coordinator from the premises must have a system in place to ensure salvaged items can be taken to the designated object assessment area for triage.

13.17 It might initially be challenging to find a permanent, safe storage area for salvaged items. If this happens, you should consider using the best interim safe location that is near your premises. Also, consider the weather conditions. The FRS Incident Commander will make the final decision on the proposed location and will welcome your ideas and suggestions, as this will help them to assess the location's suitability.

13.18 The first few hours following an incident are critical to the treatment and long-term survival of fragile historic items. If their condition 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.

13.19 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

13.20 Useful resources for related information on emergency responses are:

- The Historic England website
- The Historic England Emergency response plans page
- London Fire Brigade (LFB) website
- LFB Five Steps to Emergency Response Plans and Salvage Plans (see Appendix 1).

13.21 You can contact the LFB Fire Safety Heritage team by emailing the Heritage mailbox: heritage@london-fire.gov.uk

14 Business Continuity

14.1 Business continuity planning involves preparing for and managing unexpected events, such as fires, floods or other emergencies. A business continuity plan is a tailored management tool designed to help your business survive severe disruptions that prevent or operations from your premises in the short and long term.

14.2 Consider not only the loss of stock, equipment and premises but also income. It is surprising how long it can take to fully recover, sometimes up to 2 years or more. Insurance companies may be reluctant to pay out on a claim if appropriate fire safety measures have not been implemented and managed correctly.

14.3 Make a list of critical elements in your plan that are essential for business operations and without which your business would be severely disrupted. Next, brainstorm solutions to overcome these challenges and document them in your plan.

14.4 Once you've developed your plan, ensure that your managers are aware of its contents and that the procedures outlined are carried out by appropriate staff.

14.5 Regularly review your plan and set aside time in your diary every 3 months to remind yourself to check it. It's also recommended to test your plan annually.

14.6 A Business Continuity Management Toolkit, to assist with writing your business continuity plan can be found on the UK Government website.

Making London the Safest Global City

LONDON FIRE BRIGADE

Five Steps to Emergency Response Plans and Salvage Plans

Below is a list of the information you may need to consider as part of your emergency response plans and salvage plans. Tick off the items once you've included them.	
Remember to laminate your finished plan to prevent water damage and consider storing it at strategic locations around your building.	
Step 1: Roles and responsibilities	
☐	Internal contacts (e.g. conservator, curator, general manager, facilities manager, front of house manager, incident coordinator, salvage coordinator, security).
☐	External contacts (e.g. local authority emergency planning officer, local hospital, local police station specific utilities companies.
Step 2: Emergency plan/strategy	
☐	Full address including postcode of the premises, and description of building (e.g. number of floors, approximate size).
☐	Full plans of building – these can be basic but must be clear and indicate all significant features such as fixed firefighting facilities, service shut-off valves and potential hazards on site.
☐	Full list of significant items/artifacts that require salvaging or protecting in situ (see step 4 for more information).
☐	Risks to firefighters (e.g. radiation, cylinders, gas suppression, chemical storage, hazardous objects).
☐	Fire Service Rendezvous Point (RVP) and fire crew access points.
☐	Water supplies (e.g. hydrants, open water sources).
☐	Salvage handling areas, temporary storage areas, first aid treatment areas (consider gazebo's and out-of-hours).
☐	Location of salvage equipment and personal protective equipment (PPE), including hi-vis vests.
☐	Full list of salvage equipment required to be kept within storage.
☐	Details of welfare areas where salvage staff and fire crews may be able to rest and recuperate if necessary, during down-time/handover periods.
☐	Arrange any necessary contacts with external emergency services, particularly with regard to firefighting, rescue work, first aid and emergency medical care.

Step 3: Develop an incident management/teamwork structure for salvage	
☐	Roles and responsibilities chart for staff and volunteers that are part of the salvage team (take a look at the Incident Management Structure for Salvage chart on our website).
☐	An explanation of how the salvage team will work/liaise with emergency services.
☐	Details on how cordons and security arrangements will be implemented for the fire/flooding incidents and ALL salvage areas (consider if staff need identification to pass through any cordon).
☐	How will staff be contacted? (e.g. group text messaging).
Step 4: Develop and produce a salvage plan	
☐	A log of ALL items that need to be salvaged in a priority order (e.g. Priority 1, 2 and 3) with 1 being the highest priority.
☐	Salvage item inventory log sheets to identify what items have been recovered and what location they have been taken to.
☐	Identification sheets for each item to be salvaged (known as grab sheets). These must include:
☐	A simple description of the item
☐	A photograph of the item
☐	A basic plan indicating where it's located within the building and its location within a room.
☐	Number of persons required to remove and carry the object.
☐	Details of items provided with security fixings and the correct tools required for removal.
☐	Any PPE or other important information required for fire crews
☐	If an item cannot be removed, how can it be protected? Consider 'Protect in Situ'. This may involve utilising compartmentation, fire resisting/retardant blankets, etc.
Step 5: Handling, treatment and storage of salvaged items	
☐	A list of suitable temporary and long-term locations for the handling, treatment and storage of all salvaged items. Consider:
☐	Are locations secure? (e.g. is temporary fencing or additional security staff required).
☐	Are locations suitable in all weather conditions and during times of darkness? (e.g. underfoot conditions, trip hazards, temporary lighting required).
☐	Can areas be clearly split between 'wet', 'dry' and 'contaminated' salvaged items?
☐	How will items be moved to a more permanent storage location (e.g. secure vehicles).

Further Information

For more detailed guidance and templates on the topics listed here, see Historic England's Writing an Emergency Response Pan page.

For more information about creating a salvage plan, visit London Fire Brigade's (LFB) How to Write a Salvage Plan page. You can contact LFB's Heritage Team via our website or email heritage@london-fire.gov.uk