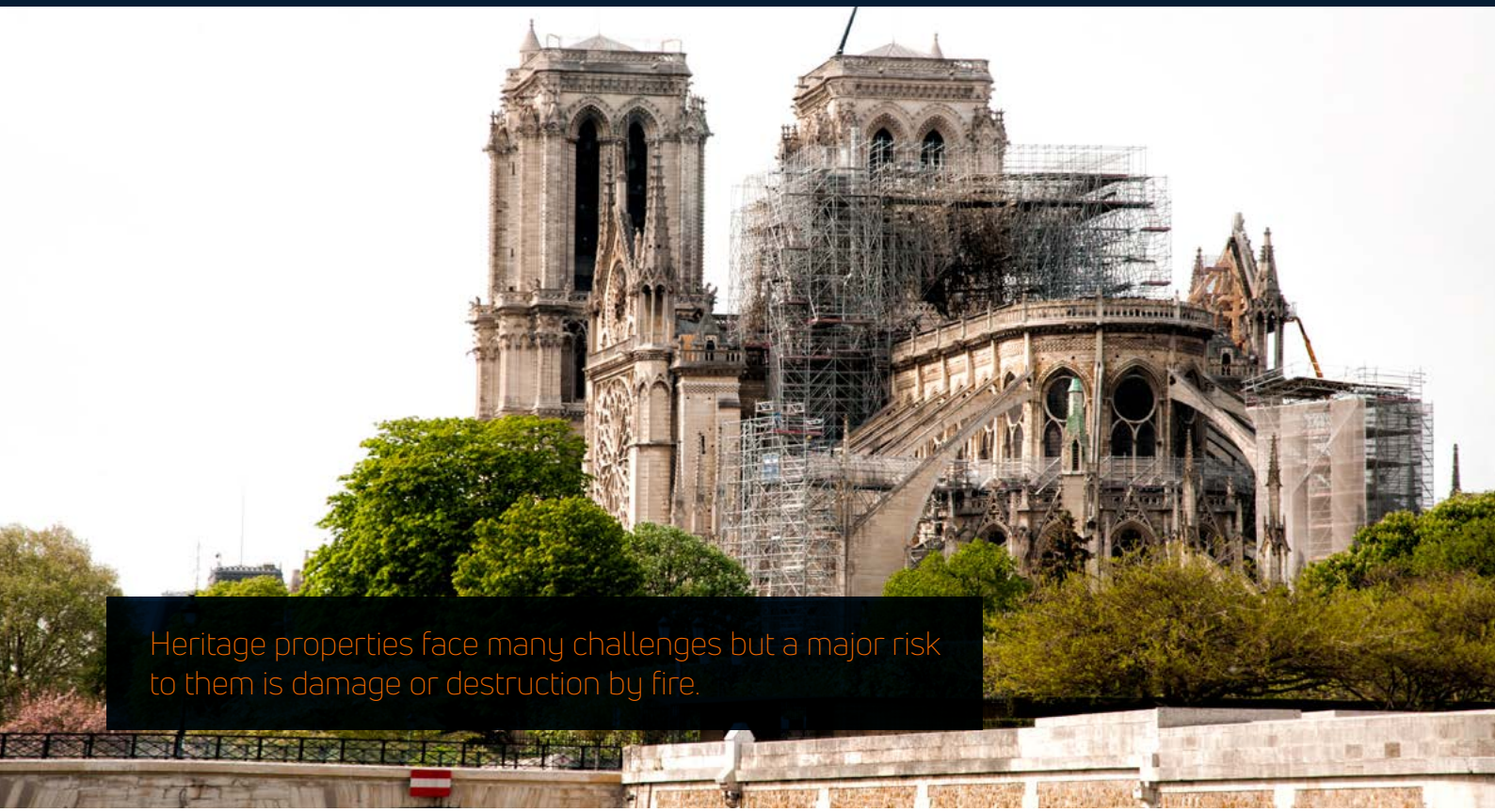
1.0 Fire risk in heritage properties

This information highlights the key risk factors from fire in heritage settings. It also identifies precautions that can be taken to prevent them.

RISK ADVICE LINE

Having read this guidance should you have any additional questions on this topic or other risk related matters, as a valued Ecclesiastical customer you can contact us through our 'Risk Advice Line' on 0345 600 7531 (Monday to Friday 9am - 5pm, excluding bank holidays) and one of our in-house risk professionals will be able to assist. Alternatively you can email us at **risk.advice@ecclesiastical.com** and one of our experts will call you back within 24 hours.

For queries about your policy cover or claims please contact your insurance broker.



Heritage properties face many challenges but a major risk to them is damage or destruction by fire.

It is capable of destroying buildings and their contents and bringing businesses operating in them to a standstill in a very short period of time.

There have been a number of recent fires that highlight the devastation that can be caused and reminds us of the loss of cultural heritage that can never be regained.

When many heritage buildings were constructed there was little appreciation of fire safety. These buildings can be extremely vulnerable to fire due to a number of factors including the use of traditional, often combustible, materials, undivided roof spaces, hidden voids and a history of alterations and changes.

Compared to modern buildings the manner of construction of historic buildings can make them extremely difficult to protect from fire. Retro fitting of fire protection systems can be can be expensive and challenging to install. Many heritage properties are listed and there will be requirements to ensure that any measures suit the environment in which they are installed and do not detract from historic features of the building.

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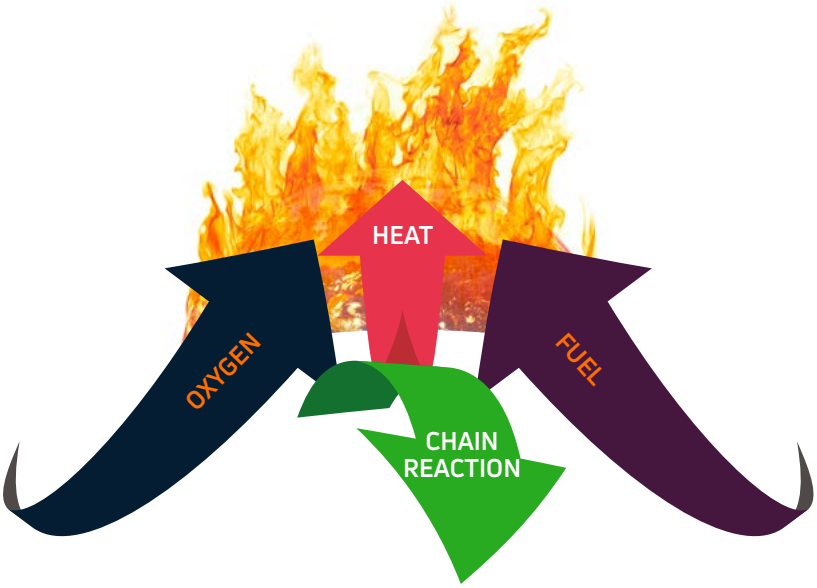
A significant challenge is found when attempts are made to introduce fire safety measures into heritage buildings to meet fire safety regulations or building regulations. It is important to achieve a balance between retention of the historic value of the fabric and the fire safety measures introduced to protect the buildings.

As a specialist heritage insurer we appreciate each heritage building is unique. We have created a series of guidance notes that accompany this document on how to protect a heritage property from fire and outline ways in which risks can be mitigated. Sensitive fire prevention solutions have been achieved in this sector by adopting fire engineering principles and taking a holistic approach to fire management.

The fire tetrahedron



Traditionally, the concept of fire was highlighted by the fire triangle of combustion representing fuel, heat, and oxygen. Research determined that a fourth element, a chemical chain reaction, was a necessary component of fire. The fire triangle has changed to a fire tetrahedron to reflect this fourth element.

All four essential elements must be present for fire to occur, fuel, heat, oxygen, and a chemical chain reaction. Removal of any one of these essential elements will result in the fire being extinguished. This is how extinguishers work – by removing/disrupting one element.

The four elements are oxygen to sustain combustion, sufficient heat to raise the material to its ignition temperature, fuel or combustible material and an uninterrupted chemical chain reaction.

When fuel or flammable materials are heated, the energy stored inside starts to react with oxygen in the air, giving off heat. This creates a cycle, which causes the fire to spread. Removal of one of the four elements means that combustion is not supported and the fire cannot spread. This is the basis on which fire extinguishers work.

Oxygen

Oxygen makes up about 20% of the air we breathe. There is a ready supply to fuel a potential fire if flammable materials come into contact with enough heat to start a fire. Once a fire has started, depriving it of oxygen will extinguish it.

This is a principle used by some fire extinguishers e.g. foam and dry powder extinguishers which can be used to smother flames and deprive the fire of oxygen, whereas the CO2 in carbon dioxide fire extinguishers will replace the Oxygen to deprive the fuel source of it. Special attention is required in the use of dry powder fire extinguishers with advice being provided in the fire extinguisher guidance note.

Without a sufficient supply of Oxygen a fire will stop burning, so it's always handy to keep appropriate fire extinguishers near areas with a high risk of fire. Always use fire extinguishers with care and check that you are using the correct type of fire extinguisher for the type of fire you are dealing with.

Fire blankets form a seal around the fire and prevent more oxygen from reaching the fire. Another example of removing oxygen is closing doors when evacuating a building. This prevents fresh supplies of oxygen from entering the building as well as limiting any fire spreading.

Heat

Blowing out the flame on a candle is a good example of this. The fast moving air removes the heat from the candle, stopping it from burning any more. A useful method of removing heat from a fire is to use water, which absorbs the heat from a fire very effectively. However, water should never be used on electrical fires – due to the risk of electrical shock, or oil fires – since oil and water do not mix, meaning the water only makes the oil form smaller droplets which makes the fire worse.

All flammable materials have a flash point, this is the lowest temperature at which they will ignite when exposed to an ignition source. If you are storing flammables on site then you will need to be aware of their flashpoints and make sure that all materials are stored away from sources of heat and below their flash point temperature.

If a fire does break out having an extinguisher, appropriate to the type of material, on standby is a very positive action.

Fuel

A fire will continue as long as there is fuel to burn. Fuel comes under three categories, solid, liquid and gas. Each type should be considered separately to ensure that their presence does not result in a fire.

The most common types of fuel are solid materials. Just look around you, everyday materials that surround you such as paper, card, clothing, fabrics and furniture could all be potential fuel for a fire. To reduce the chance of a fire starting, keep these materials away from potential ignition sources such as open flames, electrical equipment and heat sources.

Liquid fuel and flammable gases require special attention. Ideally you should keep liquids and gases in a sealed non-combustible container away from other flammables and possible sources of ignition or heat. You should regularly check for signs of damage to the containers and keep as small an amount as necessary for the task in hand on site. Of course following these tips can only help reduce the chance of a fire breaking out, so it is strongly advised to only keep flammable liquids and gases if they are absolutely essential and if no non-flammable alternative is available.

Once a fire has started it is very difficult to remove the fuel, but wet chemical fire extinguishers which are specially designed for cooking oil and grease fires will help tackle these types of fire. The chemicals released react with oil to form a non-combustible soapy layer, which stops the spread of fire in its tracks.

Each year there are many fires that could have easily been prevented. By understanding the basic fire principles and developing a fire strategy that reflects them you will reduce the risk of a potential disaster caused by fire in your premises.

Classes of fire

Class	Fueled by:
A	Solid materials e.g. plastic, wood, paper, textiles and furniture.
B	Flammable liquids e.g. oil, paraffin or petrol.
C	Flammable gases e.g. methane, propane or butane.
D	Ignited metals e.g. titanium, aluminum or magnesium.
F	Cooking fats or oils e.g. kitchen setting

Electrical fires do not have a category of their own but require significant consideration.

The causes

To help reduce fire loss in heritage buildings an understanding of the most common causes of fire, be they accidental or deliberate, is essential. Some common causes are listed below:

- Electrical faults are considered to a major cause of accidental fires. Risk factors include the following:-
  - Electrical installations can be of considerable age with outdated materials such as cloth, rubber and lead.
  - Over time the installation may have been extended.
  - Electrical circuits can be overloaded by connecting too many appliances. As we introduce more electrical equipment into our homes and businesses the demands on the electrical installation can exceed the electrical load capacity of older wiring systems.
  - Poorly installed electrical installations.
  - Change in use of the premises meaning the electrical installation is no longer fit for purpose.
  - Damaged or inadequate insulation on cables or wiring.
  - Defective electrical appliances.

  It is important that electrical equipment is installed and maintained in a safe manner. If portable electrical equipment is used, the potential for defects can be reduced if it undergoes portable appliance testing at suitable intervals.

  A programme of Periodic Inspection, at intervals appropriate to the nature of the occupation, and planned preventative maintenance for all fixed installations and portable appliances should therefore be implemented for the premises.
- Building or maintenance work. Fires have been caused by the uncontrolled application of heat e.g. leadwork to roofs, plumbing and paint stripping present particular risks.
  - Prior to any building work or decoration starting, any fire risk assessment for the property should be reviewed and any additional risks likely to be introduced considered and evaluated. Additional safety controls should be introduced to manage such risks.
  - A Hot Work Permit system should be introduced where hot works are considered necessary.
  - Any impact of building works on general fire safety measures should be considered.
  - Limit the amount of new building materials being introduced into the building to minimize potential fuel for any fire that may start as a consequence of the works.

  Additional hazards associated with building work can include:
  - Use of temporary electrical equipment.
  - Blocking or obstruction of escape routes including external escape routes.
  - Loss of normal storage facilities.
  - Fire safety equipment, such as automatic fire detectors becoming affected by excessive dust or otherwise being obscured/obstructed.
  - Fire-resisting partitions being breached or fire-resisting doors being wedged open.
  - Increased risk from quantities of combustible materials and accumulated waste.
  - Fire stopping measures not being introduced or replaced upon completion of works.

- Vandalism and malicious damage from willful fire raising has damaged many buildings both in urban and remote locations. Appropriate security measures may include the following:
    - Protecting stored materials.
    - Regular removal of waste.
    - Security against unauthorised entry or access.
- 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. A fire guard is strongly recommended.
- Defective flues. Chimney fires occur and fire can spread to other parts of the building due to cracked or faulty flues or where timber joists project into the flueway. Birds' nests in flues have also caused fires. Chimneys should be swept on an annual basis and inspected at least once every three years by a HETAS registered chimney engineer to ensure the liner and brickwork remain in good condition.
- Lightning strikes have started fires in some properties.
- A number of known fires have been cause by careless use of portable heaters, rodents gnawing through cables and mirrors or glass focusing sunlight onto flammable materials.
- Smoking. Careless use of cigarettes and other smoking materials. Careful disposal of smoking materials is essential. A cigarette may smolder for some time, especially when surrounded by combustible material. Many fires are started several hours after smoking materials have been emptied into waste bags and left for future disposal. A smoking policy for residents, staff, guests and visitors should be in place. Where smoking takes place in external areas, consideration should be given to minimising the risk of combustible materials being ignited.
- Cooking can be a cause of accidental fires in heritage properties. The hazards can be reduced by ensuring that the following rules are applied:
    - Consider using an electric fryer rather than traditional deep fat frying.
    - Cookers must be wired into a special fused switch, installed by a qualified electrician.
    - A switched-on grill should be never left unattended.
    - Keep your grill pan clean of fat.
    - Never dry tea towels over your cooker or in the oven.
    - Store papers, fats, oils and other flammable items well away from cookers/ovens.
    - For commercial kitchens consider installing a fire suppression system. Please refer to module 5.0 Fixed fire extinguishing systems for further information.

Key messages

- Fire can cause significant damage to heritage buildings.
- For a fire to begin and survive four elements need to be present i.e. heat, ignition, fuel and a chemical chain reaction. If any one of these elements is not present then a fire will not be able to sustain itself.
- The main causes of fire are electrical defects, hot works, arson and cooking. Proactive housekeeping can greatly reduce the risk of fire occurring.

Important Note – For any interventions to your building you will require Listed Building Consent (if a listed building). You should also consider any advice given by Historic England, the Amenity Societies and other conservation bodies.

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