DEVON & SOMERSET
FIRE & RESCUE SERVICE

Cathedral Yard Exeter Fire

Devon & Somerset Fire & Rescue Service

Contents

1. Introduction

This review has been produced by Devon & Somerset Fire & Rescue Service (DSFRS) on behalf of the Devon & Somerset Fire & Rescue Authority. The review is aimed to provide the communities of Devon & Somerset with the facts around the incident in response to several requests made to the service.

2. Acknowledgement

DSFRS are extremely grateful for the generosity and support of the people of Exeter. As such we would like to thank all members of the public, local business owners and partner agencies who assisted in bringing the incident to a safe conclusion.

3. Executive Summary

The incident in Cathedral Yard has been described as the largest fire in Exeter since the Second World War. The first call was received at 05:11 on the 28th October 2016 and first appliance in attendance at 05:18. The Service remained in attendance throughout, up to the last appliance and officer leaving the incident ground at 14:30 on the 7th November 2016 the incident spanned over 10 days.

Crews were immediately mobilised following the first phone calls received from the public and management of the Royal Clarence Hotel (RCH), after discovering a fire had started in number 18 Cathedral Yard which is next to the hotel. The hotel occupies the upper floors above the Well House Tavern. The number 18 building consisted of a 5 storey building that was under renovation from the first to top floor. The ground floor was an established art gallery, the building also had a basement level.

Within a few minutes the first crew arrived and were faced with the number 18 building fully involved in fire. The incident commander undertook a risk assessment and concluded that all firefighting operations would be conducted externally as it was too dangerous and of no benefit to send anybody inside due to the building being fully involved in fire.

More resources were requested to fight the fire and to try and reduce further escalation.

One of the first messages sent from the incident commander to fire control stated that the fire had spread into the RCH. Very early discussions between crews and the hotel management team identified that there may still be guests within the hotel.

While crews were still externally fighting the fire in number 18, additional fire crews were sent into the hotel building to search bedrooms for residents. During the search, crews reported that fire was breaking through from number 18 into the hotel.

One of the crews searching the rooms in the hotel placed their hand against the adjoining wall of the bedroom which collapsed into number 18; the crews were faced with a wall of raging fire. Shortly after this the hotel management confirmed that all residents had made themselves known outside, which meant that there was no further risk to life within the hotel. Due to the fire spread and early collapse within the hotel, fire crews were removed and external firefighting continued to take place.

Within an hour and a half of the initial crews attending, there was total internal collapse of number 18 which reduced the severity of the fire. At this time however, crews external to the hotel were still fighting the fire which had spread into the roof space.

Access to the roof of the RCH was limited to the outside only with no access internally.

Aerial appliances were used to fight the fire and to remove roof tiles from the pitched roof externally, but were not able to identify any visual internal fire spread.

Throughout the incident, officers reviewed the risks, which based on their assessment led to a change of operational dynamics on a number of occasions. A key mantra that the fire service operates within is 'the greater the benefit, the greater the risk'. Fire service officers will not commit operational crews into buildings where the building is already lost, but will take risks to ensure that the fire does not spread into other unaffected properties.

The fire spread undetected through voids and other channels throughout the hotel leading to the sudden development of the fire. Crews continued to fight the fire in the hotel, while working extremely hard to stop the fire spreading into the adjoining buildings on the High Street and across St. Martins Lane to a large number of significant historic buildings; if it had spread catastrophic damage would have been caused to the centre of Exeter.

A significant challenge faced by the crews was that the hotel had grown in size over many years prior to the building and fire safety regulations that we know today. The hotel had acquired a number of surrounding buildings within its history and had grown through adding walkways, coverings and essentially joining the buildings together. This led to many hidden voids being created and covered up by the internal walls and decoration.

For the next few days, fire crews were involved in fighting the fire in the hotel which had suffered internal and external collapse. Crews worked tirelessly to ensure the fire was contained within the hotel, this was difficult arduous work carried out over a number of days ensuring that the surrounding linked buildings did not become further involved.

Fire crews and staff remained on scene throughout the incident working with local residents and businesses. Although the RCH suffered a total loss of the building, it was down to the hard work of the crews that prevented the fire from spreading past the footprint of the RCH and into other significant buildings.

Following the conclusion of the incident and a review of all aspects it was confirmed that there were only 2 minor injuries to firefighters.

A DSFRS fire investigation officer attended early into the incident, but due to the collapse within number 18 a full internal fire investigation by DSFRS was not able to be completed. DSFRS do however believe the fire spread through voids and spaces created by the age and proximity of the buildings, the materials and age of the construction complexity and the timber-built buildings involved. DSFRS believes these factors enabled the fire to spread through the adjacent inter-connected buildings of The Well House Inn public house and RCH.

This was an exceptional and unfortunate incident and there is no evidence to show that the management and staff of the RCH could have done anything more, and due to their actions there were no injuries to the guests. This was formally recognised and the staff members received the Chief Fire Officer's Certificate of Commendation for their actions on the night of the 28th October 2016.

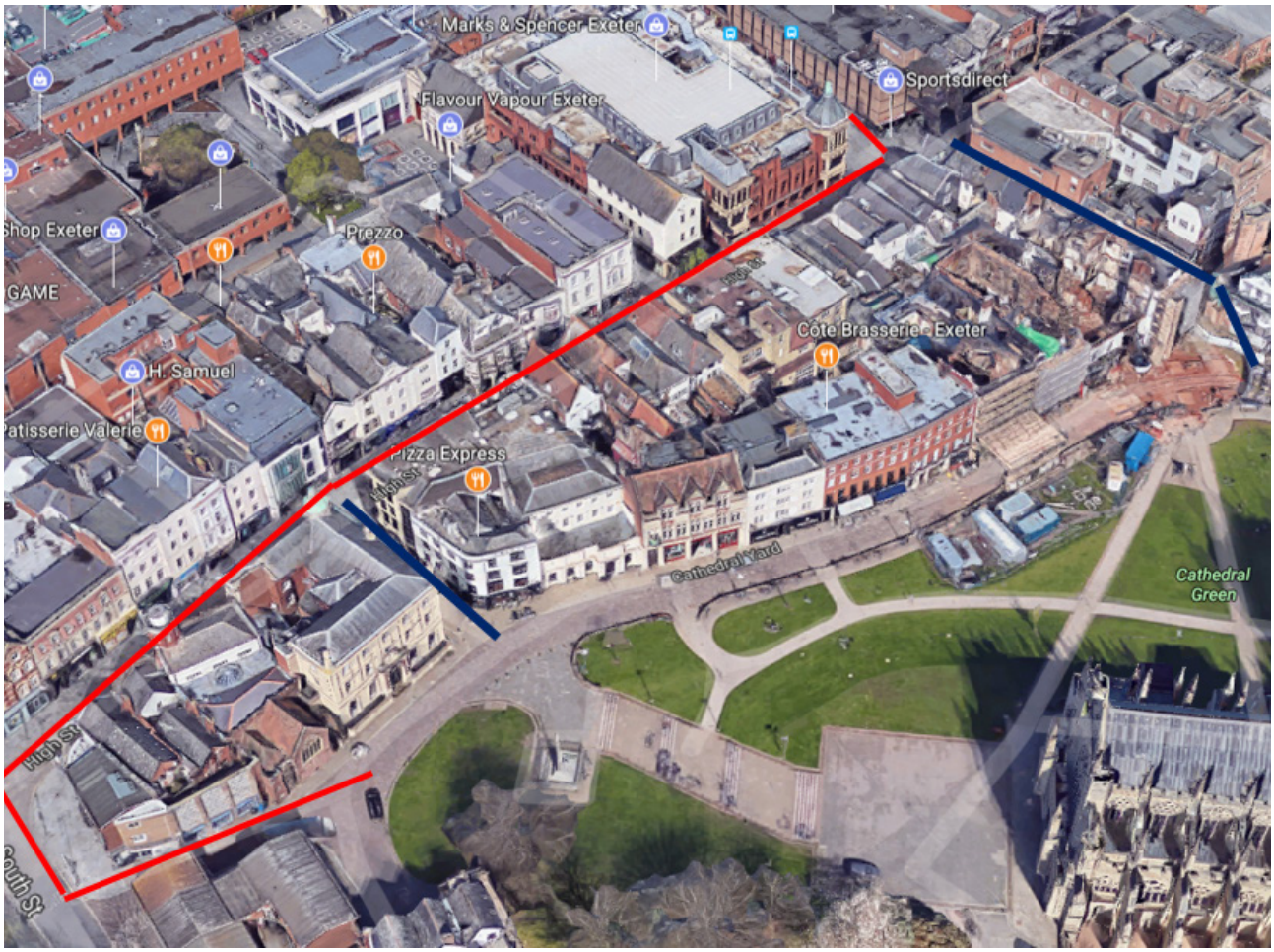
4. Context

Cathedral Yard Exeter and the surrounding area is of significant historical importance, and as such houses a number of historic buildings. On the 28th October 2016 a fire devastated a number of the buildings including numbers 18, 17, 16 the RCH, as well as causing damage to buildings on the High Street Exeter including, Costa Coffee, Laura Ashley, Sketchers and Waterstones. This report focuses on the RCH and the generic risks and hazards associated with heritage buildings.

No. 18 including the gallery and building above, No. 17 and 16 (Well House Tavern) and the RCH are located within the ancient parish of St Martin's, adjacent to Cathedral Green.

Fig 1 - view of number 20, 18 Well House Tavern and start of Royal Clarence Hotel above the Well House Tavern

Vehicular access to Cathedral Yard is via South Street Exeter. Pedestrian access is via the High Street, South Street, Southernhay, St. Martin's Lane, Broadgate and Cathedral Close.



The red line indicates the vehicle access via the High Street and South Street. The dark blue line indicates the pedestrian access via the High Street and St Martin's Lane.

DSFRS has two fire stations situated within Exeter.

- Danes Castle Fire Station is situated on Howell Road in the City Centre. The station has a 24 hour crew and On-Call crew, housing 2 x fire appliances, 1 x aerial ladder platform and 1 x water bowser.
- Middlemoor Fire Station is located on Sidmouth Road Exeter close to the M5 J30. The station has a 24 hour crew and houses 1 x fire appliance, 1 x heavy rescue tender and a support vehicle.

5. The Review

DSFRS is a learning organisation that has the desire to continually improve in line with its three key organisational priorities of Public Safety, Firefighter Safety and Efficiency and Effectiveness; as such the organisation reviews all operational incidents to identify best practise as well as areas for improvement including future training requirements; and making use of modern technology in operational equipment and techniques.

As part of this review a team of two, spoke with over seventy operational staff, representative bodies, members of the public, guests and staff at the RCH, the Building Research Establishment (BRE) and Historic England.

In order to gain a full understanding of the tactics, firefighting methods deployed and risks faced at this incident, it was imperative that staff who attended the incident and the Firefighters' representative bodies were able to engage with the review team to allow thorough fact finding.

All those contacted engaged openly with the review team and are commended for their honest appraisals and evidence provided to support the findings of this report.

6. History of the Royal Clarence Hotel and neighbouring buildings

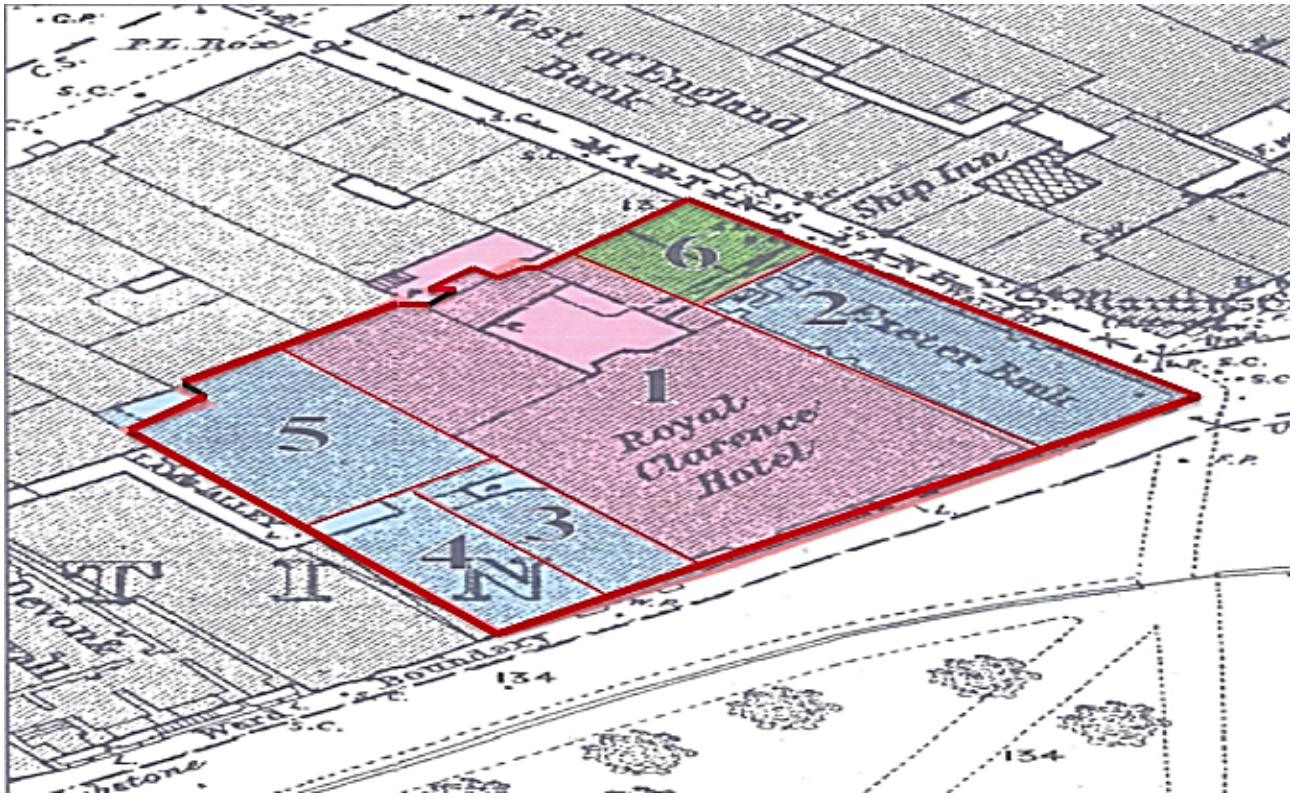


Fig 2. The picture above shows the original outline of the RCH in pink and its surrounding buildings. The thicker outline shows the footprint of the RCH now which has incorporated all of the surrounding buildings.

(Archaeology, An Archaeo-Historical Assessment of the Royal Clarence Hotel Exeter, 1998)

The RCH, along with its later additions, is a Grade II Listed Building. The entire site is within the Exeter Area of Archaeological Importance, designated under the 1979 Ancient Monuments and Archaeological Areas Act, and also the Central Conservation Area.

The original building of the RCH (No. 1 in Fig 2) occupies the site of a medieval canon's residence, and was formerly the property of the Dean and Chapter of Exeter Cathedral.

The property was rebuilt as a hotel and assembly rooms in 1769. Although the building externally was remodelled beyond recognition, much of the early internal structure remained.

Medieval fabric remained within the party walls of number 16 & 17 (No's 3 and 4 above) (the Well House Tavern) and within the RCH kitchen wall.

Between 1772 and 1774, 2 storeys to the front of the building were added creating a façade of six bays divided into two parts. The elevation of the building was altered within the 19th century, including the relocation of the main entrance, the addition of balconies and bay windows and the loss of the glazing bars.

Throughout the period of the RCH, the interior had been greatly altered, and only a few original features remained.

The second and third floors were approachable by an elegant staircase, while the roof was not accessible internally.

In 1815 the building was enlarged upwards and altered in the late 19th century.

16 and 17 (Nos. 3 & 4 on the plan fig.2) (now the Well House Tavern) consist of five-storey gabled structures under steeply-pitched roofs presenting their gables to Cathedral Close. The tenement adjoins Lamb Alley, a narrow court or lane formerly linking Cathedral Yard to the High street, and may have contained several medieval houses.

Both 17th century houses likely had similar plans, consisting of two rooms on each floor. The rooms were separated by large chimney stacks and also by the staircases, which rose alongside the chimney stacks. The lower storeys of No. 16 preserves a side passage, and stairs to the cellar from the close. Alterations occurred in the 1980's involving the extension of the ground-floor areas of both houses to the rear, across the site of a small rear courtyard.

The Exeter Bank (No. 2) adjoining St. Martin's Lane, was the property of the Custos of the College of the Vicars Choral. The Exeter Bank was founded in 1769. After the amalgamation of the Exeter Bank in 1905, the building was converted into a restaurant. The restaurant has a staircase to the basement in the area of the existing lift within the RCH footprint. The existing ground floor interiors largely date from after 1919 following the acquisition of the building by the hotel. The upper floors of the building have been used by the hotel since the 18th century.

Property in Lamb Alley (No.5) stands on the same tenement as Nos 16 & 17, and was also the property of the Vicars Choral. The building was leased separately from the front buildings as far back as 1622. The property was redeveloped in the 16th century at the same time as the front buildings.

No. 10 St Martin's Lane (No. 6) was annexed by the hotel in the late 18th century, and since that time has been greatly altered to convert it into hotel bedrooms and staff accommodation. The building is of three storeys, under a pitched slate roof, with a flat façade to St. Martin's Lane. The internal staircase and tie-beams suggest an 18th century construction.

The ground floor formerly had a through passage connecting to a yard at the rear, but this was blocked in the early 20th century by the creation of toilet blocks at the rear of the building, within the hotel courtyard. A passage from the staircase to St. Martin's Lane was made across the rooms at the north-western end of the building to provide a fire escape. At the rear of the property a low two-storey range links the building to the kitchens in the rear part of the hotel.

(Archaeology, An Archaeo-Historical Assessment of the Royal Clarence Hotel Exeter, 1998)

No 18 is a very large five-storey Grade II Listed property, which stands on the north-western side of Cathedral Yard. The existing building was a rebuild of c.1870 of an earlier property from between the 15th & 16th century. The property occupies a long, narrow plot extending towards the rear of a group of three properties within the High Street. The building has deep cellars which occupy its entire footprint. The premises was formerly used as a mix of domestic dwellings, offices, retail and a record store. The building was vacated in 2005 and most of the interior was empty pending conversion to residential apartments.

In many of the ceilings of the peer floors pairs of beams have been inserted either side of cross walls to provide support for floor joists. The earlier floor frames and walls were then dismantled and the new floors extended afterwards to fill the gaps where the walls formerly stood, creating narrow bays in the floor structures.

The third floor was rebuilt in the early 20th century. A doorway overlooking Lamb Alley at third-floor level related to a fire escape, but was sealed up in the 20th century after this was removed.

As part of the rebuild most of the internal partitions on the lower floors were removed to provide large public rooms and smaller rooms on the upper floors for offices.

As well as internal restructuring, the front of the building remains at full height; however, at the rear of the property, the roof had been removed and structural brickwork on the outer building was removed to take the building down by 2 storeys, leaving the building height at the rear lower than that at the front face. See Fig. 3

At the front of the property there is access into the ground floor property via a wide opening of double doors. To the right hand side is the entrance to Lamb Alley. To the left the access provides open stair access down to the basement, which also led all the way up to the top floor.

(Archaeology, Report No. 10.10 Project Nos 5520 and 6501, 2010)

Fig.3 This picture is of number 18 where the fire originated and spread to the RCH. The arrow shows the scaffold around the rear of number 18 where the building is wide open and indicates the reduction in height by two floors and how the fire may have spread. Photo taken 1/11/16.

Fig. 4 This picture shows the hotel to the left and number 18 to the right. The reduced building height of number 18 allowed the dramatic fire to impinge on the hotel at the very early stages. Photo taken 1/11/16

7. History of relevant Regulations

7.1 Building regulations

The London Buildings Act of 1667 was the first for surveyors to enforce its regulations. It laid down that all houses were to be built of brick or stone. The number of storeys and width of walls were carefully specified. Streets should be wide enough to act as a fire break. In 1774 a comprehensive Act covered the whole built up area, including doors. This Act soon became relevant outside of London.

More commonly towns sought to tackle a variety of problems through local improvement Acts. Between 1800 and 1845 nearly 400 improvement Acts were passed for 208 towns in England and Wales. They might be concerned with street cleaning and lighting. Acts for creating new streets and widening old ones gave the local authority at least a limited degree of building control. Building regulation was a patchwork of different provisions in different places.

In the early Victorian period central government became concerned about the conditions of the urban poor. Outbreaks of cholera created alarm. A series of government inquiries identified problems of overcrowding, lack of water and sanitation. Home Secretary Lord Normanby proposed a national building Act in 1841, to apply to all borough councils in the British Isles. The bill failed. However some of its proposals were incorporated into the Metropolitan Building Act of 1844, which once again extended the area covered by London's building control.

It was a series of Public Health Acts that established a more consistent apparatus for controlling the urban fabric. The first such Act in 1848 had limited impact on buildings, but laid out the framework of local authority in England and Wales, known initially as boards of health. The Local Government Act of 1858 extended the powers of these local authorities to regulate the structure of buildings through Bye-laws. The government issued a set of guidelines called the Form of Bye-laws, which were followed quite closely by most English and Welsh urban authorities in the 1860s. The Public Health Act of 1875 and associated Model Bye-laws consolidated building control.

The Public Health Act of 1961 was the statutory instrument and the first regulations were published in 1965. They came into operation in February 1966 throughout England and Wales, apart from the Inner London Boroughs.

Currently buildings are covered under the following Acts:-

- The Buildings Act 1984
- The Building Regulations 2010
- The Building (Approved Inspectors Etc.) Regulations 2010

(Manco, http://www.buildinghistory.org/regulations.shtml, 2009)

7.2 The Construction Design and Management (CDM) Regulations 2015

The CDM Regulations are for buildings that are under construction, any responsibility or powers for Fire and Rescue Services to inspect for fire safety regulations adherence in respect of a construction site which is contained within or forms part of premises occupied by persons other than those carrying out construction work, or any activity related to this work is removed. The Regulations inspecting body is the Health & Safety Executive.

(Regulations CDM, 2015)

Due to this DSFRS did not have any enforcement or inspection responsibilities of the building works being undertaken in number 18 (origin of fire) prior to the fire occurring.

7.3 Fire Building Safety Regulations 2010

Fire safety information Regulation 38 Building Regulations 2010 state that:

38.—

(1) this regulation applies where building work —

(a) consists of or includes the erection or extension of a relevant building; or

(b) is carried out in connection with a relevant change of use of a building,

And, Part B of Schedule 1 imposes a requirement in relation to the work.

(2) The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier.

(3) In this regulation—

(a) "fire safety information" means information relating to the design and construction of the building or extension, and the services, fittings and equipment provided in or in connection with the building or extension which will assist the responsible person to operate and maintain the building or extension with reasonable safety;

(b) a "relevant building" is a building to which the Regulatory Reform (Fire Safety) Order 2005 applies, or will apply after the completion of building work;

(c) a "relevant change of use" is a material change of use where, after the change of use takes place, the Regulatory Reform (Fire Safety) Order 2005 will apply, or continue to apply, to the building; and

(d) "Responsible person" has the meaning given by article 3 of the Regulatory Reform (Fire Safety) Order 2005.

(Legislation.co.uk)

7.4 History of Fire Safety Regulations

Current statutory provision within the UK have evolved from measures introduced slowly over many centuries.

It was not until the 19th Century that structural provisions were made for the safety of people within premises on fire as shown in appendix 3.

Due to the history of fire safety regulations, when they came about, and when they became relevant for fire brigade and fire and rescue services as inspecting and enforcement bodies, it allowed all changes such as extensions, internal changes and development within properties such as the RCH to be undertaken without any required standard. Over years heritage buildings have been subject to internal re-design as well as increasing the size of the properties by adding additional buildings to the footprint. This has enabled the increased risk of hidden voids, old shafts, old materials to be covered with more modern building materials over the years. This certainly will have played a significant part in the hidden development of the fire within the RCH.

8. Prevention & Protection visits

Prior to the fire, DSFRS had undertaken site visits to the RCH with the last being on the 7th December 2015.

Site Specific Risk Information visits identified numerous firefighting risks within the RCH, such as hidden fire travel due to voids, dumb waiters and porters staircases, as well as risks associated with numerous older buildings being merged together to form the larger hotel. There were also however a number of voids that the crews and hotel management knew would be within the property, but they were unable to identify the specific location without causing significant damage during familiarisation visits.

As the timelines on building and fire safety regulations show, there was very little in the way of statutory regulations when the RCH expanded in size by adopting the surrounding buildings into the hotel grounds. This meant that unregulated building adaptation took place which would not meet modern building and fire safety regulations. It must also be noted that as building regulations change over time, they are not implemented retrospectively, meaning that any existing buildings do not necessarily need to be adapted or, changed in line with the implementation of new regulations as new builds would.

9. Legislation

Firefighters and fire service managers are often sent to manage and deal with complex dangerous situations and as far as reasonably practicable, ensure the safety of all personnel and members of the public at the scene.

Fire & Rescue Services are bound and governed by a number of Acts including:

- Fire & Rescue Services Act 2004
- Civil Contingencies Act 2004
- Health & Safety at Work etc. Act 1974

Fire and Rescue Services manage the risks posed to firefighters at operational incidents through the use of safety maxims to balance risk and benefits; they are:

- At every incident firefighters and managers conduct dynamic risk assessments against a safety maxim to control health and safety risks. The Firefighter Safety Maxim is: – "At every incident the greater the potential benefit of fire and rescue actions, the greater the risk that is accepted by commanders and firefighters. Activities that present a high risk to safety are limited to those that have the potential to save life or to prevent rapid and significant escalation of the incident".

(National Operational Guidance Programme, 2015)

To support Fire & Rescue Authorities, the Health and Safety Executive (HSE) has created a document titled 'Striking the balance between operational and health & safety duties in the Fire & Rescue Service'. The document outlines what reasonable risk management processes are expected of managers to maintain the safety of personnel at dangerous incidents. The HSE has developed the following principles for fire service personnel.

(Health and Safety Executive, 2010)

9.1 Health and Safety Principles

Particular challenges for Fire and Rescue Authorities as employers

The application of health and safety law is challenging for Fire and Rescue employers in relation to some of their operational activities because:

- They have to send firefighters into dangerous situations in order to save lives when anyone else would be seeking to get away from the danger;
- There is often public expectation that firefighters will put themselves at risk even when such risks outweigh any potential benefits to be gained which is balanced by the incident commander;
- Some incidents firefighters face can develop at speed, some can develop in unexpected ways – and firefighters may, from time to time, be confronted with situations outside their experience;
- They have to prepare individual employees to be able to make decisions in dangerous, fast-moving, emotionally charged and pressurised situations, even when there may sometimes be incomplete or inaccurate information about the incident;
- They have to respond to dangerous situations which are not of their own making, this is different to most other sectors where it is the employer's own business that creates the hazards; and
- They may not be able to control or mitigate some aspects of the working environment.

(HSE, 2010)

10. Fire related issues with Heritage Buildings

Causes of fire spread in heritage buildings

The challenges of fighting a fire in a terrace of 'heritage' or buildings of substantial age are significant.

Heritage buildings are very often more vulnerable to the effects of fire than new builds. The building's performance against fire cannot easily be compared with any other building due to its individual and unique qualities.

As buildings grow and are adapted over time, their vulnerability changes; particularly where their adaptation is uncontrolled, unregulated and there has been a failure to introduce basic fire safety measures. The introduction of new services such as pipes or wiring can lead to separating walls being breached to allow them to be passed through.

Interconnecting voids create one of the greatest hazards to a traditional building in a fire.

Fire performance of traditional materials

Picture taken 10:27 on 28th October 2016 shows internal collapse of number 18 due to the significant fire. The fire spreading and developing within the RCH, compared to the modern building construction in No. 20 which did not sustain any fire spread or damage.

A large proportion of old buildings are constructed from timber which has had centuries to season and become tinder dry. This means that any flame or heat contact will lead to flaming ignition very quickly. There is a degree of fire resistance to timber that increases with the thickness of the component under attack; thin timbers such as door panels, wall

linings will readily burn, whereas structural elements such as beams, columns and roof members will burn at a slower rate. However, in addition to their thickness, fire resistance will also be affected by the species, moisture content and growth characteristics of the timber as well as treatments and applied finishes (polishes, wax, spirit based insecticides and anti-fungal treatment), insect and fungal attack and the presence of shakes, splits or shrinkage cracks.

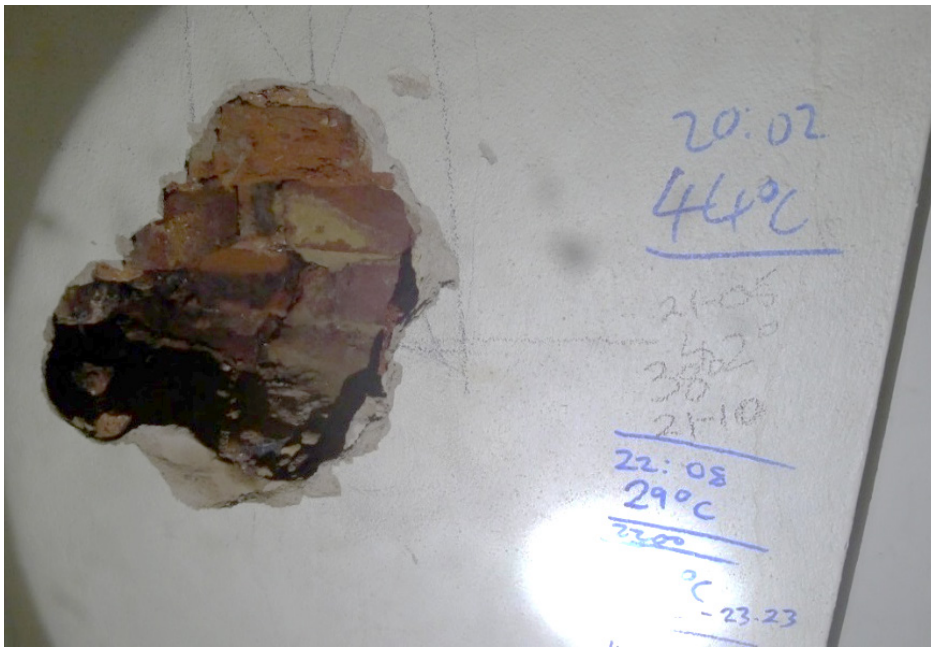
Where services such as new wiring and pipework for heating systems have been introduced, timbers may also be notched which will also adversely affect their performance. Stone and brick are non-combustible and masonry elements will have the greatest resistance to the passage of heat, smoke and fire. However, the presence of flues and other voids will compromise their integrity. In addition, masonry elements may also be vulnerable to thermal shock experienced during a fire, the condition of the stonework and pointing prior to a fire are critical to its overall performance. Metals such as cast iron, wrought iron and steel used in traditional buildings are considered to be non-combustible and offer a degree of fire resistance, however their performance in a fire can have an adverse impact. When subject to heat, they will expand and disrupt other structural elements.

Compartmentation

This photo shows No 18 prior to the fire during the construction phase. Note that the floors are open and not compartmentalised, allowing fire to travel easily.

Compartmentation is the division of a building into separate fire protected 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. Most buildings will have their own natural lines of compartmentation or cells; their removal or alteration could have a serious impact on fire safety.

Walls



Crews using a thermal imaging camera identified a heat source behind a plaster wall and this led to the removal of the plaster and location of a burning timber beam behind. The writing on the wall shows where the fire crews were recording the temperatures.

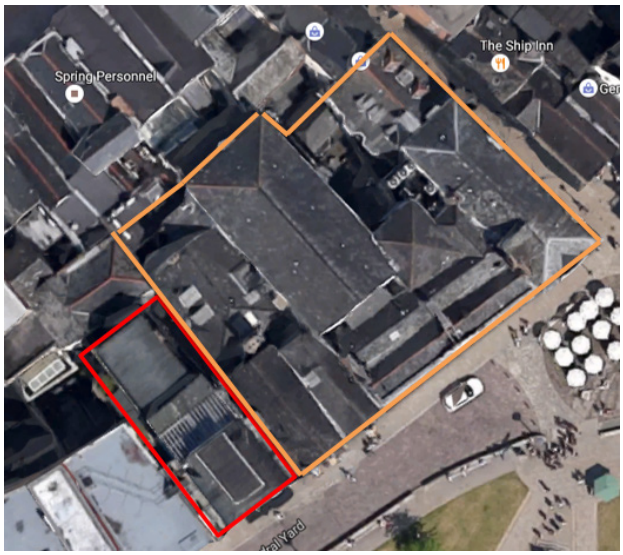
Generally, masonry walls have a greater resistance to fire provided their integrity has not been compromised. Where these have been lined with lath and plaster or timber panelling, the fire resistance of the walls is greatly reduced as narrow cavities are formed which often link with those present in 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 – a really good example of unseen fire spread can be referenced from Laura Ashley, where a crew using a thermal imaging camera identified a heat source behind plaster lined walls and this led to the removal of the plaster and location of a burning timber beam behind.

Floors

This picture shows the floor from above. Made completely of timber, but unprotected with a ceiling material.

Floor construction in traditional buildings presents a special area of vulnerability. The most common floor constructions in traditional buildings are of 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. 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.

Roof construction



Heritage buildings and terraced properties can have a 'common' roof void. This is where the roof extends from one end of the property to the other or large sections of roof space without any separation from the individual properties.

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, and it was not until 1850 when the requirement for compartment walls to continue into the roof space came into effect.

Voids

This picture shows where firefighters have removed part of a wall to reveal a void which had undetected fire and smoke spread.

The existence of hidden voids is sometimes very difficult to ascertain.

The problem with the voids are 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 makes it almost impossible to tackle internally and externally, without a major dismantling of the building fabric.

Long forgotten ducts or shafts may be part of the original construction

This example picture shows a dumb waiter in a void which would reach from the kitchen to various floors in the building. (Library pic not from Royal Clarence)

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.

Defective flues

This example picture shows that the flue is not correctly fitted, allowing smoke and fire to travel through the void. (Library pic not from Royal Clarence)

Chimney fires can spread to other parts of the building due to cracked or faulty flues or where timber joists project into the flue way.

Summary

Construction in buildings of such substantial age is complex with potential for unseen fire spread through long hidden voids and supported by tinder dry timber construction.

Even with the most attentive fire prevention and protection measures (such as fire alarms and fire separation), it cannot always be guaranteed that a fire will be contained and prevented from causing destruction. It could be significantly reduced through the development of a comprehensive pre-survey of the impact on surrounding buildings during the construction phase.

11. The Incident

11.1 Timeline 05:11 – 08:40

At 05:11 on Friday 28th October 2016, DSFRS received several 999 calls reporting a large fire located within Cathedral Green. On arrival crews immediately identified a fully developed fire within number 18 Cathedral Green (Fig 8).

At 05:21 the incident commander (IC) contacts fire control and declares a 'major incident'.

05:23 assistance message "make up from IC, make pumps 10 and aerial ladder platform" this is acknowledged by Fire Control who mobilise the appliances.

05:31 further assistance message from IC "Priority make up, make pumps 15, Aerials 2"

05:31 The first aerial arrives quickly on scene and is established at the front of the hotel; the aerial was pitched to be used as a viewing tower while other crews set into the hydrant and twinned the supply from a fire appliance which was now located in Cathedral Green.

05:32 further informative stating "from IC, fire now involving Royal Clarence Hotel and Waterstones buildings"

The message at 05:32 informs Fire Control that the hotel is involved in fire; which was confirmed as within the eaves, which can be seen in fig.9 where the fire is impinging on the pitched roofs of the RCH, above room 402.

Crews were initially involved with establishing water supplies to begin fighting the fire. Crews were located within Cathedral Green as well as on High Street for firefighting purposes and protecting adjoining properties.

At approximately 05:50 the crews were informed that there were 'persons reported' missing within the hotel. This led to more offensive tactics with crews being committed into the hotel to search for and rescue the missing persons. Fortunately all guests had already made their way out of the hotel and presented themselves to the police. Once again this led to a dynamic change within the risk assessment and due to internal collapse within the hotel, crews were instructed to exit the hotel so that external firefighting could take place.

Number 18 and the Royal Clarence Hotel experienced varying levels of structural collapse within the buildings (Fig 17).

To ensure the safety of crews they were withdrawn from fighting the fire from within the hotel, only using the aerial ladder platforms outside of the hotel (Fig 18).

Following the complete structural collapse of number 18, the severity of the fire reduced and although from the outside the fire may have looked as though it was extinguished, there were still firefighting actions taking place at number 18 and on the High Street. (Fig 19).

Crews continued to damp down the fire while at the same time remove roof tiles from the pitched roofs of the hotel looking for fire spread.

Throughout this period of time the dynamic risk assessments undertaken by the incident commanders changed as further information was gathered. Initially crews were involved in external firefighting as it was too dangerous to enter. The property could not be saved and there was no known life risk.

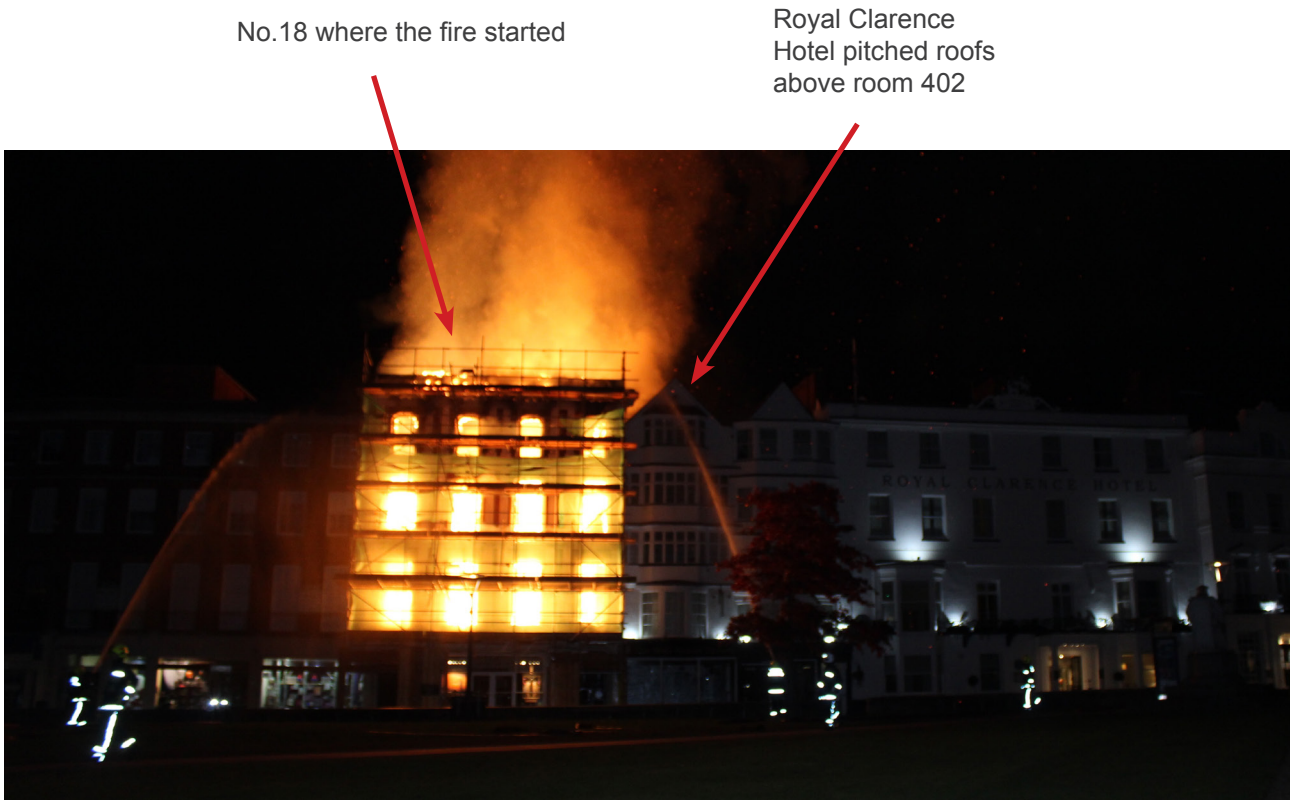


Fig 8.

Fig 9.

Fig 8 & 9 show that the first attending crews were faced with a significantly developed fire which appears to be showing fire and heat not only within number 18, but at the rear of the hotel.. (Pictures taken prior to the arrival of DSFRS) picture courtesy of guest N. Groom taken at 05:13

11.1.1 Sectorisation

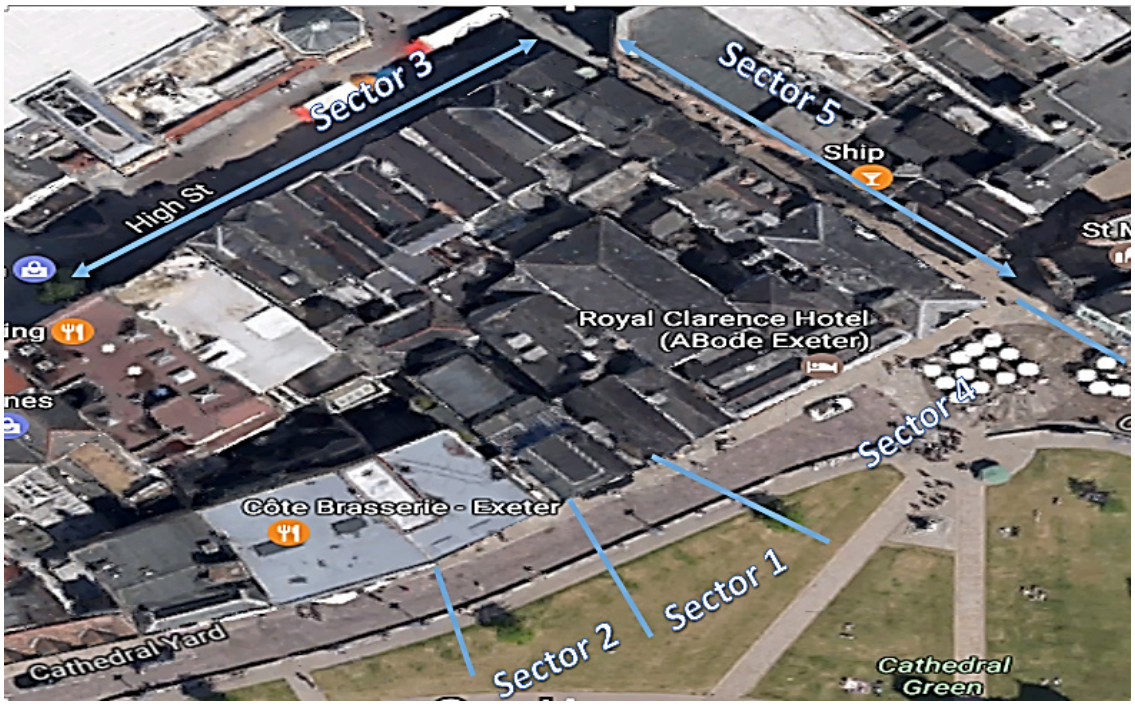


Fig 10. Google overview of the sectorisation (Google, 2017)

Fig 11. Google overview of the sectorisation (Google, 2017)

Early sectorisation took place at the incident and remained mostly the same throughout the incident until its conclusion; however once the RCH was fully involved sectors 1, 3, 4 and 5 became the main sectors for Operations (Fig 10 & 11).

As annotated above there were 5 operational sectors as well as a number of support sectors such as water, welfare, Command Support etc.

The above shows a birds eye view taken from internet maps to show how the sectorisation took place.

Sector 1 was the original scene of operations of number 18 Cathedral Yard.

Fig 12. Sector 1 showing number 18 fully involved in fire courtesy of guest N. Groom

Sector 2 was established in front of Waterstones, number 20 Cathedral Yard, immediately to the left of the main seat of fire.

Fig 13. Sector 2 No 20 during the fire. Photo taken at 07:49

Sector 3 was established on the High Street, incorporating Costa, Laura Ashley and Sketchers.

Fig 14. Photo shows the view of sector 3. Photo taken at 11:45

Sector 4 was established in front of the Royal Clarence Hotel.

Fig 15. Sector 4 in front of the hotel. Photo taken at 06:53

Fig 16. Sector 5 St. Martin's Lane

Sector 5 was established and disbanded a number of times throughout the incident within St. Martin's Lane, this was due to the risk assessment of the commanders changing, based on the changing dynamics of the incident and risks that were posed to fire crews. Sector 5 contained access to a number of shops including a bakery, a jewellers and also provided access to The Ship Public House, and expanded into Cathedral Close which included a number of shops, restaurants and domestic premises.

Fig 17. Photo taken post incident from the Waterstones building showing where the BA crews entered room 402. The arrow indicates where the wall had fallen away as the BA crews made their way along the hallway. The collapse of the wall revealed the raging fire within number 18 (in the forefront of the pic) which led to the decision to remove internal firefighting crews.

Fig 18. Aerial crews removing roof tiles looking for internal fire spread

Fig 19. Picture showing the internal collapse within No. 18 and still shows the glow of the fire at the top rear of the building. Photo taken at 06:53

Fig 20. Photo taken at 06:52

Fig 21. Photo showing sector 5 and the use of compressed air foam. Photo taken at 13:01

11.2 Timeline 08:41 – 11:55

During the next phase of the incident, the command structure was altered with an Area Manager in charge and officers in support and operational roles.

The crews that were in attendance had worked extremely hard in dealing with the significant fire within number 18. A number of other crews were involved in using thermal imaging cameras, ensuring hot embers from the fire had not landed on surrounding properties which would have allowed the fire to spread via roof tops of buildings that were not adjoined to the footprint of the hotel and number 18.

At approximately 08:45 a multi-agency meeting was convened led by the fire & rescue service to identify the joint priorities of all agencies including the police, ambulance, city council and services providers. During this period, aerial crews were involved in stripping the pitched roofs above the Well House Inn pub and rooms number 401 and 402 (Fig 18).

Aerial appliances were also established within sector 3 on the High Street, but were no longer in use. Due to the depth of the hotel, crews operating the aerials at the front and rear of the building found it very difficult to closely inspect the centre of the hotel for external signs of fire spread. It is believed that during this time, and due to the generic hazards associated with heritage buildings, the fire and smoke continued to travel and grow within the hotel undetected through voids supported by tinder dry materials. This led to crews continuing to strip the roof unaware that the fire was moving through the hotel, which would eventually break through the rest of the roof voids.

At approximately 10:18 crews witness the sudden significant development of the fire which breaks through the roof of the RCH (Fig 22). Experienced fire officers, who also instruct on fire development courses, stated that they had not seen a significant escalating fire develop like it in their 28 years in the fire & rescue service. This sudden development led to an additional 4 fire appliances and specialist equipment, such as the High Volume Pump to deliver large quantities of water being requested to support the ongoing incident.

Aerial appliances were immediately re-established for firefighting as well as roof stripping, to protect the surrounding buildings and heritage of the hotel and the High Street (Fig 23). Due to the sudden development of the fire, crews were firefighting using hand held jets and the aerial appliances. Due to the number of hose lines being used from all sectors, the water supply was over-run leading to tactical decisions being made that the water should be diverted into the sectors that would allow the most effective firefighting. The greatest priority now changed from stripping the roof, to stopping the fire jumping across into Cathedral Close and spreading past the footprint of the hotel into the High Street.

During this period the dynamic and analytical risk assessment identified that it was now safe to place breathing apparatus wearers in the RCH above the Bistro, at the opposite end to where the aerial appliances were working to stop the fire spreading; as well as using the aerial appliances from the front and rear of the hotel for water towers and firefighting.

Fig 22. Picture showing smoke and fire development from the middle of the RCH roof

Fig 23. Photo showing the use of aerial appliances during the escalation of the incident. Photo taken at 11:14

11.3 Timeline 11:56 – 00:46 (29/10/16)

Due to the length of time on the incident ground crews and officers were being rotated to ensure effectiveness in continuing to fight the fire.

At approximately 14:00 the tactical plan was outlined by the incident commander who instructed crews to ensure the fire did not spread past the footprint of the RCH, reducing the impact on the buildings within the High Street and Cathedral Close. Breathing Apparatus crews were committed into the RCH above the bistro to find the fire and stop it from spreading across St. Martin's Lane.

Crews reported that they could hear the fire roaring in voids, but could not see it to be able to actually find and fight it. BA crews on the ground floor reported to the incident commander, that water being applied to the roof was coming down through internal voids and dripping through to the ground floor and was red hot. This was due to the water passing through voids that were on fire.

Outside of the hotel crews reported that there was unusual fire spread through voids as the fire was in the roof and on the ground floor, without any sign of the fire on the 1st or 2nd floors (fig 24). One officer stated 'we wanted the fire to show itself, so that we could actually attack it'. 'We could hear the fire, we could feel the fire, but we could not see it; it was travelling around through walls and voids'.

Shortly after this, the BA crews were withdrawn from the front of the building but continued internal firefighting within St. Martin's Lane and the High Street properties.

At approximately 22:30 there was concern over the structural integrity of a section of the hotel that overlooked St. Martin's Lane. This led to the lane being closed down, with access restricted until specialist officers monitored the movement of the building for potential collapse (Fig 25). This impacted on gas engineers being unable to access the gas isolation valve for the gas main within St. Martin's Lane.

The fire developed and grew with the hotel becoming fully involved in fire. BA crews were then withdrawn as the incident commander could not justify committing crews for a building that was lost. Efforts of the crews were directed to stopping the fire spreading past the footprint of the hotel. As the gas main had not been isolated externally the fire damaged the internal gas pipes leading to a dramatic gas fire (Fig 26). This did not have any impact on the development of the fire. Crews allowed the gas to continue burning under control until external isolation took place. The reason that the gas was not extinguished prior to this was that it would have created a greater danger to the crews and community as the gas would continue to escape uncontrolled and create an unmanaged explosive risk. Crews continued to fight the fire internally from the High Street and with aerial appliances.

During this period the risk assessment of the incident commander was to commit BA wearers to fight the fire and save some areas of the hotel. Due to the severity and unpredictable movement of the fire development the hotel became fully involved. The incident commander changed their risk assessment to remove all personnel from inside the hotel and use external aerial appliances while maintaining BA and aerials within the High Street.

Fig 24. This photo was taken at approx. 13:30 when the roof of the RCH was involved in fire, and shows the issues that crews had with unusual fire travel, which was suspected to be travelling within hidden voids. The arrow shows the presence of fire on the ground floor with the floors above being fire free.

Fig 25. This picture shows Sector 5 St. Martins Lane. The arrow indicates the section of the building that required monitoring.

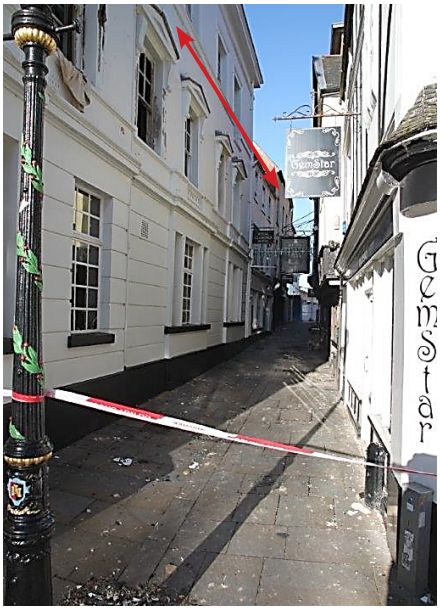


Fig 26. Picture showing the gas main fire within the RCH

11.4 Timeline 29/10/16 – incident conclusion

29/10 00:46 throughout the incident DSFRS maintained a constant presence at the Cathedral Yard fireground, providing support to Exeter City Council, local businesses and members of the public. Fire crews remained damping down hotspots and areas of fire that flared up under collapsed structures to ensure the fire was fully extinguished. The incident was completed and handed over to Exeter City Council and the demolition company at 14:30 on Monday 7th November 2016.

Fig 27. This picture shows the devastation caused to the RCH, it also shows the entrance to St. Martins Lane which was saved from fire and smoke damage.

Fig 28. Photo shows that the crews stopped the fire spreading through this shop on the High Street

Fig 29. Photo showing the buildings on the High Street which are of significant historic importance saved by the fire crews

11.5 Business Continuity

A key priority for DSFRS is to support the local and national economy, working closely with businesses on a daily basis, ensuring that their risk of having a fire or flood is reduced through pre-planning and the implementation of prevention measures. The DSFRS also ensure that during large incidents, including this fire, officers are dedicated to support businesses within the affected areas allowing a return to normal state as soon as is safely possible.

To achieve this and whilst crews continued to monitor and damp down the fire, the DSFRS Business Safety Team for Exeter were involved in assessing businesses which remained open/trying to re-open to ensure their businesses remained safe through amendments to risk assessments and engagement with the businesses. This led to a significant number of independent and High Street businesses being allowed to open and continue to trade during the period that the fire was still affecting the area.

See appendix 2 for their experience of this event.

11.6 Believed fire spread

Fig 30. The picture above shows number 18 and the total collapse and the fire spread into the Royal Clarence Hotel

There are signs from the floorplans within Appendix 4, of wide open spaces, such as the Clarence room and ducting, as well as voids, staircases etc. that may provide an understanding of the fire spread and sudden rapid escalation that led to the travel and spread of fire and unburnt combustibles and smoke.

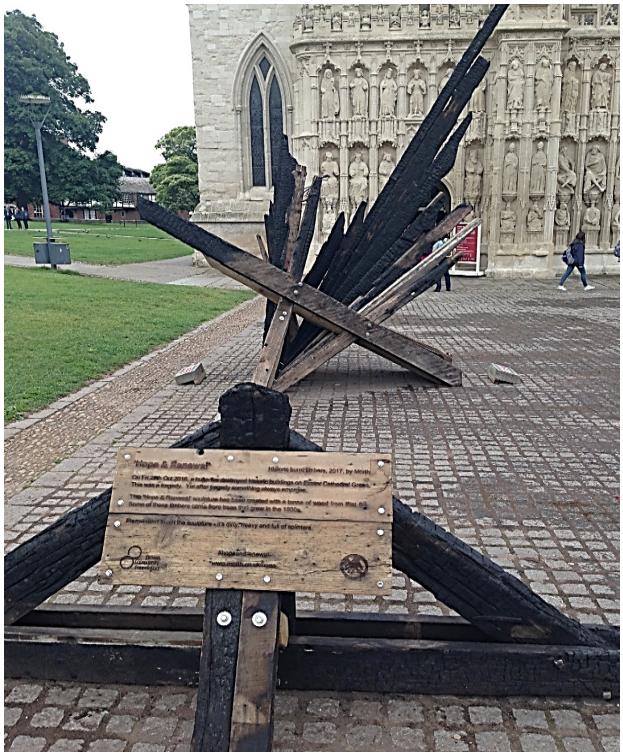


Fig 31 & 32. Shows a memorial taken from the Royal Clarence Hotel and displayed at the front of Exeter Cathedral named 'Hope & Renewal'

(Ellis, Hope & Renewal 1, 2017)

12. Key Statistics

Total pumping appliances used (includes repeat visits by the same appliance)	231
Total number of firefighters that attended	1,186
Different fire engines that attended (does not include repeat visits by the same appliance)	95
Different fire service vehicles that attended	135
Different aerial ladder platforms that attended	5
Maximum number of firefighters on scene at the same time	207
Maximum number of fire engines on scene at the same time	38
Maximum number of fire service vehicles on scene at the same time	57
Total firefighter hours at the incident	12,094.61
Including total hours committed by on-call firefighters	9,931.97
Different officers who attended (does not include repeat visits by the same officer)	65
Officer hours at the incident	549.59
Maximum number of officers on scene at the same time	20

Timeline	Time	Time Elapsed
Time of call	05:11	N/A
First three appliances mobilised	05:12:33	00:01:20
First attendance (Exeter Danes Castle)	05:18:49	00:07:36
10 fire engines mobilised	05:24:21	00:13:08
15 fire engines mobilised	05:33:38	00:22:25
Fifth fire engine arrives	05:40:06	00:28:53
Tenth fire engine arrives	05:50:33	00:39:20
20 fire engines mobilised	05:59:17	00:48:04
15th fire engine arrives	06:04:16	00:53:03
20th fire engine arrives	06:35:07	01:23:54

12.1 Associated costs

The associated costs from this incident to the service including; replacement/damaged equipment, running costs such as diesel etc. was in excess of £250,000, which was covered within existing budgets.

13. Recommendations

There have been a number of devastating fires in historic heritage buildings including Windsor Castle, Clandon Park (Appendix 1) and the RCH. It has been identified within this report that due to the complexity and build of the RCH that there was unusual fire spread due to unseen voids that allowed fire to travel undetected.

To ensure safety of life, the environment and protection of the properties the level of fire safety provision should be high without destroying the historical value of the property.

- It is recommended that automatic fire suppression is fitted where needed, including within hidden voids to provide early detection of heat and fire spread and therefore able to provide immediate suppression. (CFPA, 2013)
- Suppression systems should also be considered where there are significant artefacts. Use of an oxygen reduction system will avoid damage to valuable artefacts and archived objects/materials. If appropriate to the risk, a water-mist suppression system will apply considerably less water than a sprinkler system. (Exova)
- Visual and thermal smoke detectors with linked cameras for surveillance
- Aspirating smoke detectors for the identification of small amounts of low density smoke in several areas (such as voids) Aspirating detectors may be located in adjacent buildings or suitable rooms, so that sampling pipes only run in protected areas. Tiny capillary tubes may be inserted from voids into the room. Aspirating smoke detectors are very reliable in harsh environments. (Jensen, 2006)
- Temporary suppression systems to be used during renovation/re-design work in heritage buildings similar to those used for the construction phase of timber framed buildings. Water damage is negligible compared to fire loss.

One key impact on the Fire & Rescue Service as identified within the paper is the limited knowledge of buildings under construction. Buildings under construction restricts responsibility or powers for Fire and Rescue Services to inspect for fire safety regulations adherence in respect of a construction site which is contained within or forms part of premises occupied by persons other than those carrying out construction work, or any activity related to this work. The Regulations inspecting body is the Health & Safety Executive. Therefore DSFRS recommends that:

- A review takes place at Government Level to identify if an amendment is required under the CDM regulations to notify the local Fire & Rescue Service of buildings under construction which can pose significant risk to firefighters when responding to reports of fires within the premises.
- A review of the CDM regulations to place a duty on the property owner to inform surrounding properties of the construction; allowing the responsible persons for the surrounding domestic and commercial buildings to review their own fire risk assessments in light of the construction activity, particularly any of those that involve heritage properties.

Fire and Rescue Services cannot be expected to be aware of every historic building undergoing renovation, unless lines of communication are created. Development of dialogue between Historic England and the HSE (where the CDM Regulations apply) is essential to prevent re-occurrences of similar events; therefore:

- A further recommendation based on communication and cooperation between the building owners, Historic England, neighbours, planners, builders, HSE and Fire and Rescue Services cannot be over emphasised.
- Fire and Rescue Services for their part must be prepared to support and respond to all requests for comment and plan to visit premises when notified of works, to understand the implications of the works from a fire safety and operational response aspect.

14.Statement of thanks

DSFRS would again like to thank the communities, partners and staff that assisted with bringing this incident to a successful conclusion and their assistance in gathering the facts to produce this review.

Appendix 1 Case study example

The case study below has been lifted directly from an electronic news source not related to DSFRS, and provides a further example of the hazards and fire safety concerns that are common throughout many historic heritage buildings within the UK.

Thousands of historic buildings across the country are vulnerable to fire, say experts

Owners are blocking attempts to install “unsightly” fire prevention methods for fear of ruining the character of the building.

Firefighters battling the blaze at Clandon Park an 18th century National Trust property near Guildford in Surrey Photo: PA

Heritage buildings across England are at risk of burning down because their owners are blocking attempts to install “unsightly” fire prevention methods, experts have warned.

A “misplaced” fear among conservationists and architects that such measures will ruin the character of the building has left hundreds of thousands of historic buildings across the country vulnerable.

Steve Emery, chair the Institute of Fire Engineers and fire adviser for Historic England, said that building owners will “very often” use the building’s listed status as a reason for not installing proper fire protection measures.

He said people are reluctant to install sprinklers because they are concerned it will increase the likelihood of the building flooding if it goes wrong.

“There aren’t many instances of sprinklers going wrong and spraying water everywhere, but people are reluctant to add another level of water,” he said.

“There is also the actual cost of installation – if there is a choice between fixing the roof and installing sprinklers, the first thing will be to fix the roof.”

Mr. Emery said that there are tens of thousands of fires every year in heritage buildings but since the vast majority are privately owned, it is hard to keep track of all the damage.

Jim Glockling, technical director of the Fire Protection Association, said the lack of legislation to protect heritage buildings from fires is “staggering”.

“We have rafts of legislation to protect heritage buildings, if you want to do any building works you have to go through a big planning process, there are huge restrictions,” he said.

“But when it comes to fire, there are no measures to stop fires in heritage buildings above and beyond normal homes - the heritage listing means nothing at all.”

He said that people think it is “unsightly” to fire proof doors or to install sprinklers, and worry that it would ruin the “character” of the building.

“We need to think of the greater good and the greater mission – this would improve the building’s likelihood of existing forever,” he said.

Given that many heritage buildings are in remote locations and may be far away from the nearest fire station, Mr. Glockling said that the only real option is for buildings to be self-sufficient and install its own fire protection methods.

An aerial photograph shows the extensive damage following the fire at Clandon Park Photo: Rex

Earlier this year, an investigation was launched after Clandon Park, an 18th century stately home in Surrey, was devastated by a fire which destroyed irreplaceable artefacts.

The inferno is believed to have started in the basement before ripping through the building and spreading through voids in the roof.

Clandon Park is one of 375,588 listed buildings in England, according to English Heritage's most recent count.

Of these, 2.5 per cent are Grade I listed, meaning they are of exceptional interest, and a further 5.5 per cent are Grade II* listed, meaning they are particularly important buildings.

The remaining 92 per cent are Grade II, meaning they are of special interest and warrant every effort to preserve them.

Stewart Kidd, secretary general of the British Automatic Fire Sprinkler Association, said it is a "total misconception" that sprinklers are "dangerous" and put buildings at risk of flooding.

He said it "tends to be the architects, the planners, the conservationist and the archivists" who are the most reluctant to install sprinklers in heritage buildings.

Mr. Kidd added that the National Trust and English Heritage should have clearer guidelines on the use of sprinklers in historic buildings.

A spokesman for National Trust said: "We take fire safety and the protection of its historic places extremely seriously.

"We have a robust and rigorous fire safety strategy in place at all our places, which are tailored to each property's individual requirements."

(Turner, 2015)

Appendix 2 Business Safety Team experience

The work of the Business Safety Team for Exeter during this incident has been identified nationally as best practice. Below is an article written by Julia Aylott, Business Safety Officer for Exeter.

Julia Aylott
Business Safety Officer, Devon East.

On Friday 28 October 2016 I woke up to a text saying the Royal Clarence hotel in Exeter was on fire. As a business safety officer, not only was I saddened to read this but knew that the fire would have implications on our business safety team. We had already experienced a number of major incidents in Exeter before October. We only realise now the positive influence we could have on the businesses affected by the fire as the impact of the Cathedral Yard incident developed.

Three days after the fire had started me and a colleague, WM Martin Sleigh attended the Cathedral Yard site. A help desk had been set up inside the incident cordon and it was our intention to be able to give support to businesses that were affected by the fire to get them trading again where possible. There was mounting pressure from these businesses to reopen and to be more informed about what was happening with the incident.

The fire incident was still ongoing and many authorities and third parties were involved. Both 'Marks and Spencer' and 'House of Fraser' had been closed since the fire started and were reporting a loss in revenue of a million pounds over the preceding three days.

Both stores were affected as access and egress from parts of their premises were inside the safety cordon that had been erected due to the risk of collapse of the Royal Clarence gable end wall adjoining Martins Lane. Whilst we knew that this would have a big impact on means of escape from the premises we also had to do what we could to get these businesses back open.

We worked with Marks and Spencer first and they reopened the next morning Monday 31st October with a lot of support from their head office. The main entrance from the High Street was within the cordoned area so couldn't be used. This is the biggest exit from the store. We knew the exit would have to be secured to stop customers using this exit but for the store to trade effectively we knew the exit was needed if there was a fire emergency within Marks and Spencer. We were constantly thinking through scenarios of fire within the premises but also the risk of the Royal Clarence collapsing, affecting the High Street. It was agreed that the store could reopen if protective hoarding was placed around the escape route from the main entrance to protect customers from debris if collapse happened at the same time as a fire within the store itself. This may seem highly improbable but as business safety officers we should always consider the worst case scenarios. M&S were able to use the entrance in Goldsmith and Queen Street for customer ingress and we agreed other control measures with the company to allow them to safely trade, which they implemented successfully.

House of Fraser was a little more challenging due to their fire escape staircase that runs the full height of the building discharging into Catherine Street, adjacent to the Royal Clarence. We then had to come up with a fire safety strategy that meant the store could

reopen without this fire exit route. We looked at travel distances on the upper floors and agreed on restricting parts of floors due to excessive travel distance. The Manager of the store worked quickly to get the temporary arrangements in place and the store reopened a few days later. The Manager of the store acknowledged the extensive assistance we gave him. We took the opportunity to engage with him to learn about the business and it became very apparent to us just how much the fire had affected business.

We visited the Cathedral Yard site along with colleagues Michelle Purchase and WM Andy Aggett for the whole week following the fire and called into the surrounding businesses to give advice where changes had happened to their escape routes and to provide support where we could. This in turn highlighted deficiencies which were also challenging, as we needed to balance the need for safety whilst being supportive after a major fire incident. We worked closely with Exeter City Council business commerce team that were very active on social media posting updates on the situation of the incident and providing our details so that businesses could contact us directly.

Some businesses on the High Street took many weeks to reopen. It was an opportunity for us to see the wider effects of the fire and see what damage had been done to the very historic part of the High Street which still remains unseen from the main road.

Right up until the New Year we were carrying out fire safety checks and audits on local premises as a result of what was seen during the week preceding the fire.

Not only was this a major operational incident for this service but an incident which called on the expertise of the Exeter business safety team and showed how fire safety is a very important part of incidents, not only to collect evidence in the view of subsequent legal action but to support businesses in trading safely after an incident.

During our intervention at the incident we received a lot of positive comments and praise of Devon & Somerset Fire & Rescue Service which made us immensely proud.

Business safety officers and Marks & Spencer store manager

Appendix 3 History of Fire Safety Legislation

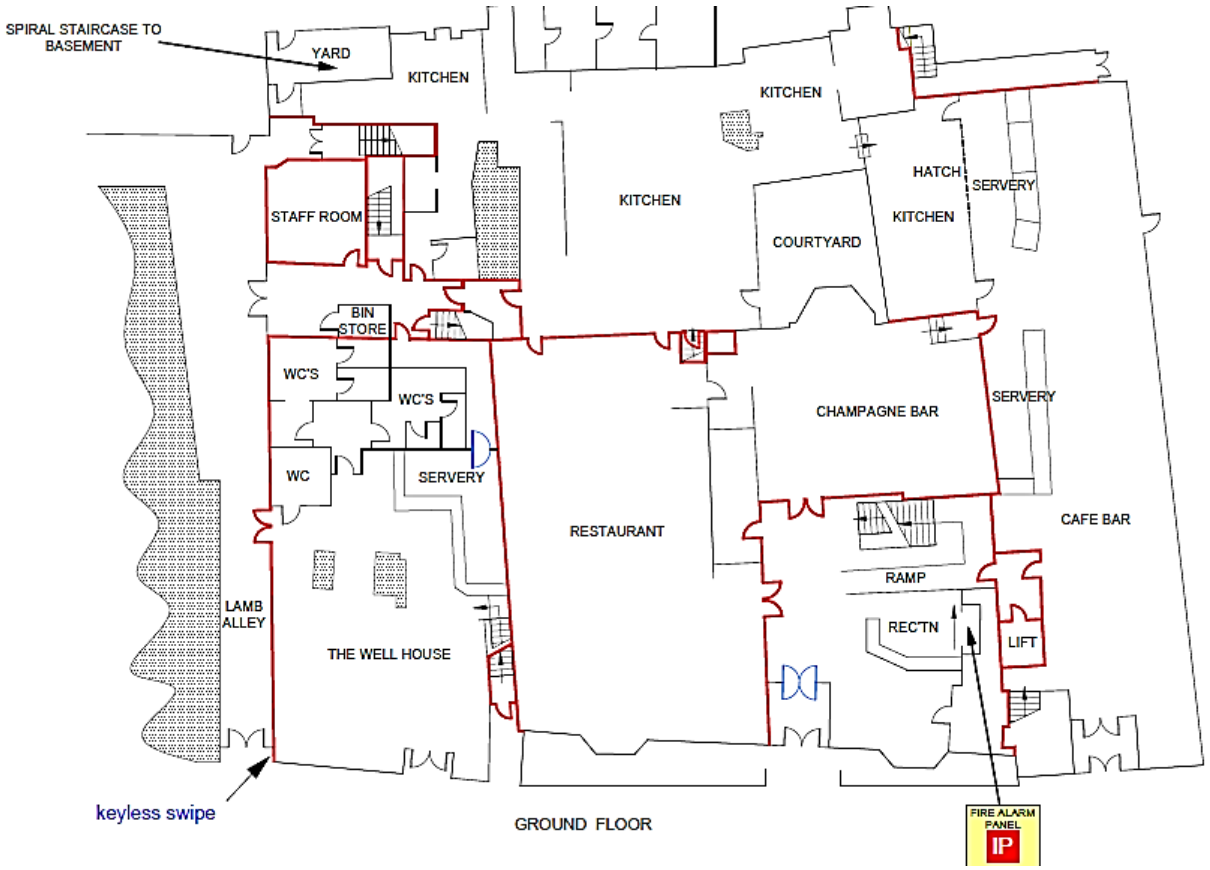
12th Century	The first recorded attempt to legislate for fire safety. The Mayor of London laid down that houses in the city were to be built of stone, thatched roofs were not permitted, and party walls were to be of minimum height and thickness.
13th Century	A disastrous fire in London where an estimated 3000 people died led to all alehouses being governed on their construction. Other requirements were made in connection with bakeries and brew houses. During the summer months a tub of water was to be made available in case of fire.
15th Century	The 15th century saw timber chimneys outlawed and the first Act of Parliament relating to fire which made provision for fire prevention, firefighting and penalties against persons causing fire in Scotland.
17th Century	The Great Fire of London started in the early hours of 2nd September 1666 at the end of a long dry summer and after burning for 4 days had destroyed five-sixths of the city. Although only 6 people died it was a national disaster and London acquired its first complete code of building regulations and means for its implementation. On September 13th 1666 King Charles II issued a proclamation in which the walls of all new buildings were to be of brick or stone. The main streets were to be widened to prevent fire spread. Existing narrow alleyways were to be considerably reduced. A survey of every ruin and ownership shown of every plot.
18th Century	The Fires Prevention (Metropolis) Act came into being in 1774. This Act listed buildings into 7 classes with thickness of external walls and party walls laid down for each class. The Act also included provisions with the maximum area of warehouses. London boroughs were to appoint Surveyors and “every parish should provide three or more proper ladders of one, two and three storeys high, for assisting persons in houses on fire to escape therefrom”
19th Century	**1844** The 1844 Metropolitan Building Act, which was based on the Fires Prevention (Metropolis) Act 1774, made few changes in constructional requirements for fire. However the 7 classes were reduced to 3 namely Dwelling Houses, Warehouses and Public Buildings. Warehouses limited to 200,000 cubic feet (undivided) **1847** The 1847 Towns Improvement Clauses Act and the 1847 Town Police Clauses Act set out various standard clauses usually contained in local improvement Acts e.g., construction of roofs and walls, and the purchase of fire engines. **1850** In 1850 the Burgh Police Act required that party walls be carried through the roof and that all party walls, external walls and roofs be constructed in “Incombustible” materials. **1858** In 1858 the Local Government Act gave urban authorities the power to make building bylaws subject to confirmation by the Home Office. However in 1871 this responsibility was transferred to the Local Government Board who drew up model bylaws (first issued in 1877). The original scope of the bylaws was extended under the Public Health Act of 1890.

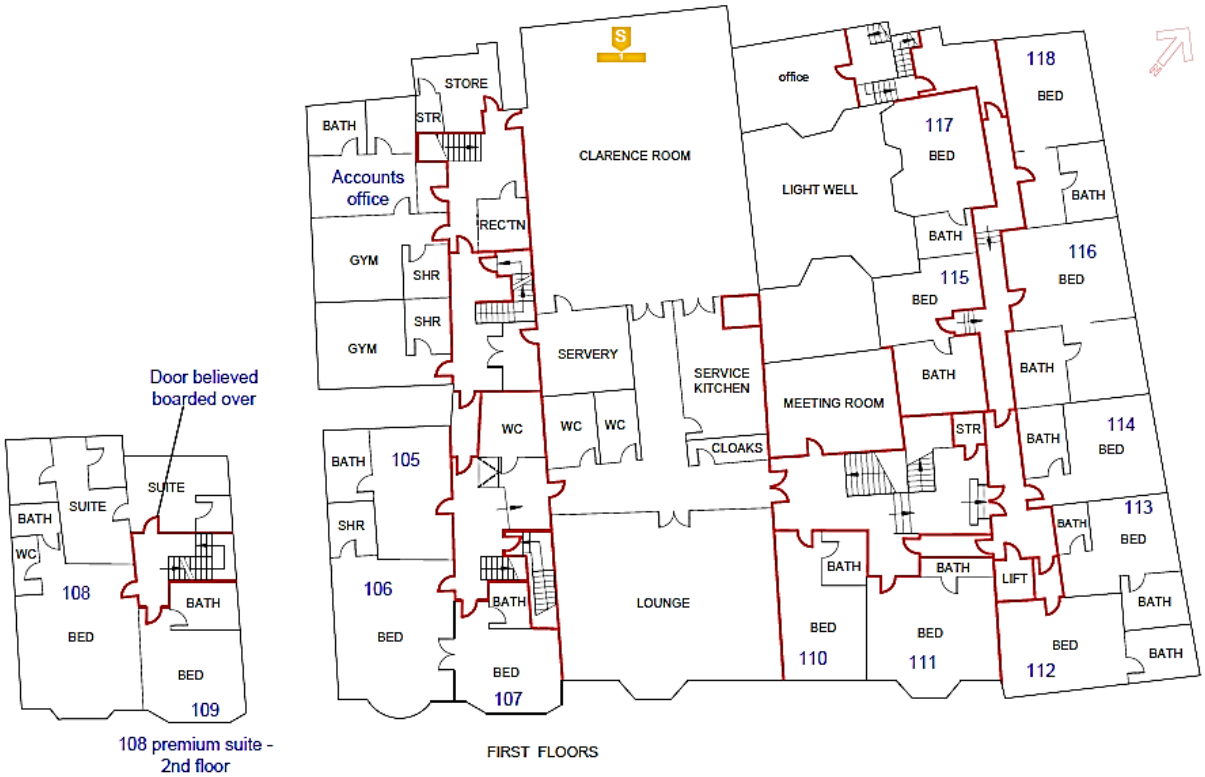
19th Century (cont'd)	**1867** A Select Committee was set up in 1867 "to inquire into the existing legislative provisions for the protection of life and property against fires in the United Kingdom, and as to the best means to be adopted for ascertaining the causes, and preventing the frequency of fires". They recommended that a general Building Act for all towns in the United Kingdom should be placed on the Statute Book (with similar provisions and powers to the Metropolitan and Liverpool Building Acts). This should embrace thicknesses and heights of party walls; the placing of fireplaces, stoves and flues and the proximity of timber to them; the limiting of size and isolation of warehouses; and the use of proper materials in building. Other recommendations concerned living accommodation above shops; large lodging houses; water supplies; the classification and storage of goods; the sale and storage of flammable substances; and the setting up of procedures for investigating the cause of every fire. **1891** The Act made rules concerning new public buildings which included regulations (based on the earlier 1879 theatre regulations) on the width of staircases and exits, and required that every new building exceeding sixty feet in height be provided on the storeys over 60 feet above the street level "with such means of escape in the case of fire for the persons dwelling or employed therein as can be reasonably required under the circumstances of the case" and that no such storeys be occupied until the Council had issued a certificate that the provisions of this section had been complied with. It also provided a schedule of "fire-resisting materials".
20th Century	**1930** Under the London Building Acts 1930 - 39 powers were granted to make bylaws and the first set issued in 1938 covered many of the constructional matters previously contained in the earlier Acts. Powers were also granted in respect of means of escape from certain new and existing buildings based on their height and use. However, these bylaws were not entirely satisfactory in that local authorities were not obliged to adopt them, and many did not. The 1936 Act was therefore amended by the 1961 Public Health Act to permit the making of one set of building regulations to replace the 1400 sets of local bylaws. The first building regulations for England and Wales were made in 1965, the scope of which extended through the Fire Precautions Act 1971 to include means of escape in case of fire. **1941** Until the formation of the National Fire Service in 1941 the United Kingdom Fire cover consisted of 1400 local Fire Brigades and within a couple of months these local Fire Brigades were transferred into a central command. **1945 (BSCP)** It is perhaps worth noting that apart from guidance prepared by the LCC, specific guidance in respect of means of escape and fire precautions had generally not been available before the last war; a fact which prompted the Building Industries National Council (BINC) to publish in 1945 a model code of requirements for application throughout the country and applicable to all types of buildings. (A report ten years earlier was concerned only with London). The first British Standard Code of Practice on "Precautions against Fire" was published in 1948 (Houses and flats of not more than two storeys), with other parts following in 1962 (Flats and maisonettes over 80 feet in height) and 1968 (Shops and Department Stores) and (Office Buildings). **1947** The Fire Services Act 1947 transferred the National Fire Service to Fire Brigades maintained by County Councils and County Boroughs. This Act had amendments in Fire Services Act 1951 & Fire Services Act 1959.

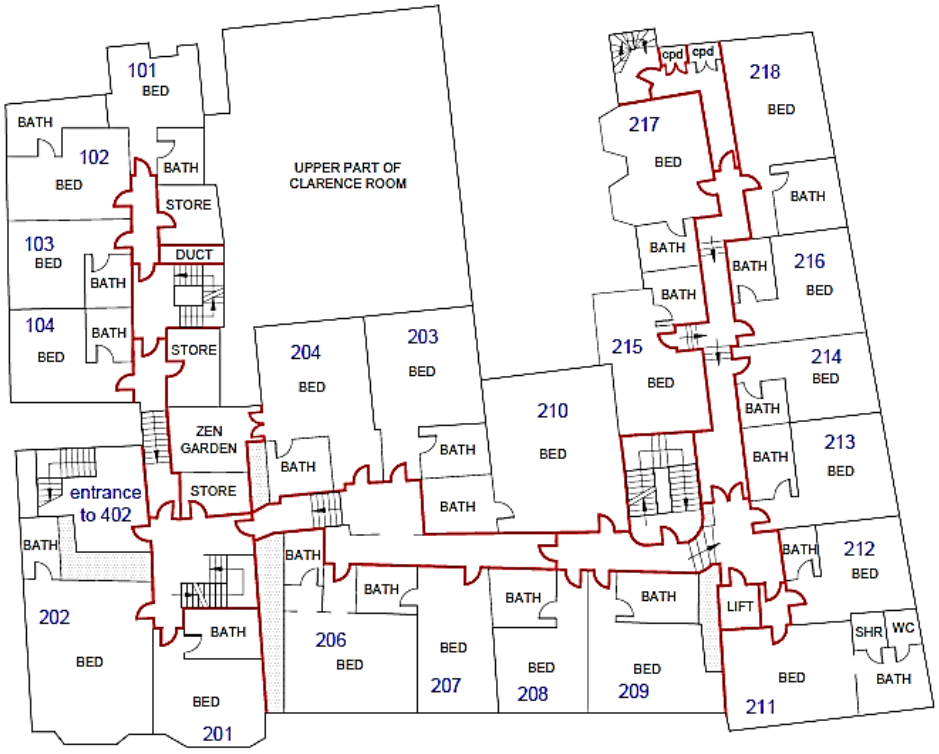
20th Century (cont'd)	**1971** The Fire Precautions Act 1971 (an enabling Act) came into effect. "This Act shall come into operation on such day as the Secretary of State may by order made by statutory instrument appoint, and different dates may be appointed under this subsection for different purposes." **1977** The Fire Precautions (Factories, Offices, Shops and Railway Premises) Order 1976 (SI 1976 : No 2009) came into effect on the 1st January 1977 which required that certain premises falling into this category required a Fire Certificate. **1997** The Fire Precautions (Workplace) Regulations 1997 came into force on 1st December 1997. These Regulations were amended which came into force on the 1st December. **1999** The Fire Precautions (Workplace) (Amendment) Regulations 1999 (S.I. 1999 No. 1877), were laid before Parliament on 7 July 1999 and come into force on 1 December 1999. They amend the Fire Precautions (Workplace) Regulations 1997 (S.I. 1997 No. 1840), which came into force on 1 December 1997. The Regulations, in their amended form, apply to the majority of workplaces where people are employed, including workplaces where a fire certificate is in force or for which an application for a fire certificate is pending under the Fire Precautions Act 1971.
21st Century	**2004** The Fire and Rescue Services Bill was published on 13th January 2004. The Fire and Rescue Services Act came into force on the 1st October 2004. An Act to make provision about fire and rescue authorities and their functions; to make provision about employment by, and powers of employees of, fire and rescue authorities; to make provision about education and training and pension schemes; to make provision about the supply of water; to make provision about false alarms of fire; to provide for the funding of advisory bodies; and for connected purposes. **2005** The Regulatory Reform (Fire Safety) Order 2005 (FSO) came into effect in October 2006 and replaced over 70 pieces of fire safety law. This Order reforms the law relating to fire safety in non-domestic premises. It replaces fire certification under the Fire Precautions Act 1971 with a general duty to ensure, so far as is reasonably practicable, the safety of employees, a general duty, in relation to non-employees to take such fire precautions as may reasonably be required in the circumstances to ensure that premises are safe and a duty to carry out a risk assessment. The Order imposes a number of specific duties in relation to the fire precautions to be taken. The Order provides for the enforcement of the Order, appeals, offences and connected matters. It amends or repeals other primary legislation concerning fire safety to take account of the new system and provides for minor and other consequential amendments, repeals and revocations.

(Fire Net, 2009)

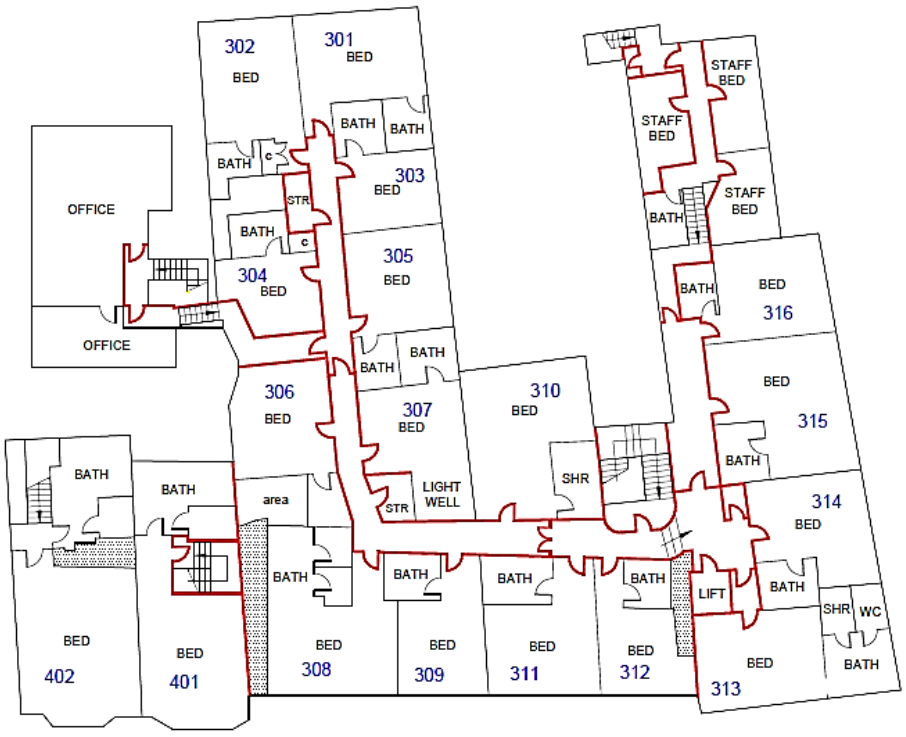
Appendix 4 Floorplans







SECOND FLOOR



THIRD FLOOR

(DSFRS, 2017)

Appliance attendance

First 20 appliances in attendance (some appliances were sent on standby duties in or around Exeter city prior to the request to increase appliances).

Call Sign/Station	Mobile	In attendance
32P2 Danes Castle Exeter	05:17	05:18
45P1 Topsham	05:18	05:26
45P2 Topsham	05:19	05:25
38P2 Crediton	05:24	05:35
33P1 Exmouth	05:26	05:45
39P1 Cullompton	05:28	05:48
41P1 Ottery St. Mary	05:29	05:45
33P2 Exmouth	05:31	06:04
44P2 Tiverton	05:31	05:50
25P1 Dawlish	05:33	05:55
59P1 Middlemoor Exeter	05:34	05:44
32P1 Danes Castle Exeter	05:34	05:40
44P1 Tiverton	05:37	06:00
43P2 Sidmouth	05:37	05:56
30P2 Teignmouth	05:38	05:57
30P1 Teignmouth	06:00	06:05
36P1 Budleigh Salterton	06:00	06:35
27P1 Moretonhampstead	06:00	06:19
38P1 Crediton	06:02	06:05
28P2 Newton Abbot	06:05	06:23

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