

Ministry of Housing, Communities and Local Government Release Copy of Fire of Special Interest Report

Grade II listed property under renovation, Exeter, Devon, 28th October 2016

Prepared for:	Brian Martin
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MHCLG Fire Report Release Copy

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Approved on behalf of BRE Global

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Date 08 November 2018

Signature

A handwritten signature in blue ink, appearing to read "David Crowder", is written over a light blue horizontal line.

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Introduction

This report was produced by BRE under contract to the Building Regulation and Energy Performance Division of the Ministry of Housing, Communities and Local Government (MHCLG) and has been released to the British Broadcasting Corporation (BBC) with the approval of MHCLG.

The information contained within this report is based upon on-site investigation work conducted by BRE staff on 20th January 2017, information gathered by BRE concerning the premises and information provided to BRE by Devon and Somerset Fire and Rescue Service. This report may contain inferences, conjecture, deductions and conclusions made by BRE staff for the purpose of informing decisions made by the Ministry of Housing, Communities and Local Government. This report has not been prepared with the expectation that it will be used in any legal proceedings or litigation. It has been released on the understanding that its contents will not be divulged or disseminated verbally or in writing to any third parties. Any views expressed in this report are not necessarily those of MHCLG.



Grade II listed property under renovation, Exeter, Devon, 28th October 2018

FSIS Ref. No: 04 – 16/17

Period/Date Covered: October 2016 to December 2016

FRS Incident No: VV016294-28102016

Public Incident No: Not known

Date of Fire: 28th October 2016

Report drafted: 31st July 2017

Address of fire: 18 Cathedral Yard, Exeter, Devon, EX1 1HB

BRE Fire and Security Investigators: David Crowder and Kaloyan Markov

How BRE Fire and Security found out about the fire: Media report on BBC website

Fire Service (or other) Contact: Andrew Justice, Station Manager – Fire Investigation, Devon & Somerset Fire and Rescue Service (DSFRS).

Work Undertaken: Site visit on 20th January 2017.

Summary:

Several buildings of various purpose groups, one under renovation, October 2016. Fire and Rescue Services were called to a fire in a Grade II listed building at 05:11. The five-storey building was of brick and block construction, comprising an art gallery on the ground floor and construction of living accommodation in the basement and on the first and upper floors. At the time of the fire, the parts to be used as flats were undergoing significant construction/refurbishment work and most of the fire protection inside the building had been removed. A major fire developed in the undivided volume which breached lines of compartmentation as a result of the severity of the fire. Later fire development appears to have resulted from the fire reaching a stage where it was neither accessible nor visible to Fire and Rescue Service personnel. The fire reached the roof over the main portion of the adjacent hotel and spread to cause total destruction of the hotel complex of buildings and full collapse of their roof structures. There was no one inside the building of fire origin and the adjacent hotel was evacuated before the arrival of the Fire and Rescue Service. There were no reported injuries and the cause of the fire is unknown.

Type of Building:

There were several buildings involved in the fire during its development: the first building where the fire started and developed to become a severe uncontrolled fire; and the second group of buildings which are various parts of an adjacent hotel, consisting of multiple buildings attached to one another.

The building where the fire started

The building where the fire started (18 Cathedral Yard) is a five-storey Grade II listed property. The front façade comprises four storeys beneath a steep-sided, square dome terminating in a lantern, see Figure 1. The building occupies a long, narrow plot extending towards the rear of a group of three properties. The subdivision of the large early tenements into the present smaller and narrower plots fronting onto different streets is reported in fifteenth and sixteenth century archaeological surveys, see Figure 2. Archaeological surveys indicate that the building of fire origin underwent a change of use from residential to commercial in around 1870.

The building is understood to comprise an art gallery on the ground floor and construction of living accommodation in the basement and on the first and upper floors. At the time of the fire, all of the parts to be used as flats were undergoing significant construction/refurbishment work. It is understood that because of this, most of the internal partitions and floors in the flats had been removed, see Figure 3 and Figure 4.



As a result, the majority of the property was a single uncomparted space, with the predominant fuel load comprising the structural elements of the building and construction materials in the building. The windows on the façade of the building were all boarded (except for one in the 'dome room'). The majority of the plaster ceilings had been removed, exposing wooden ceiling joists throughout all floors (except for the 'dome room'). At the rear section of the building, the third floor roof and walls had been removed. The rear was surrounded by scaffolding and weatherproof plastic sheeting to third floor level. Doors had been removed throughout the building and some of the door openings were boarded. Part of the first floor construction passed over an alley. It is unclear how the rear end of this first floor construction above the alley was constructed. However, the party walls between this part of the building of fire origin and the hotel remained.

The second group of buildings comprising the hotel

The hotel is four- to five-storeys which appears to comprise a number of premises (described in archaeological records as tenements) which have been joined to form a single building, see Figure 1. The hotel is Grade II listed and the main hotel building is understood to have been a hotel since 1769. The hotel is understood to have extended into adjoining properties over later years, although it is not known when these expansions occurred. The compartmentation layout of the hotel is shown in Figure 5.

One part of the hotel was a pair of houses with medieval origins, see Figure 2 and Figure 6. These houses were extensively rebuilt in the late seventeenth century. Prior to the fire, it appears likely that medieval or late seventeenth century materials survived in the party wall between these houses and the building of fire origin. The fire exposed the different types of construction materials in this party wall; there were visible layers of bricks, timber frame with brick infills and timber frame with wattle and daub, see Figure 7. From inside the building of fire origin it can be seen that the party wall between this building and the next one was initially a facade of the neighbouring building. The bricked up window frame in this area would have originally provided a view from the neighbouring building towards the plot of the building of fire origin, above the location of the alley.

There is a public house on the ground floor of this section of the hotel (the ground floor of the medieval houses). The public house is understood to be completely separated from the hotel with fire resisting construction, as though a separate property, but under the ownership of the hotel.

The roofs of the building of fire origin and the different buildings forming the hotel were all made from timber frame structure and in close proximity to one another. To the rear of the roofs of the medieval houses, there were pipes covered in lagging which appeared to be of a combustible material (polymeric foam), see Figure 8.

Location and cause of fire:

The exact location inside the building of fire origin and the cause of the fire are unknown.

Injuries:

It is understood that there was no one inside the building of fire origin at the time the fire started. The hotel is understood to have contained several guests as well as night staff; everyone evacuated prior to the arrival of the Fire and Rescue Service. There were no reported injuries.

The fire:

The time at which the fire started could not be estimated with any degree of certainty due to the window openings on the building façade being boarded up as part of the refurbishment. It is therefore likely that there was a substantial delay in detection of the fire by passers-by seeing flames and/or the light from flames. Fire and Rescue Services were called to the fire in the building at 05:11. The fire is believed by to have started within the structure of the building of fire origin.



The fire development can be divided into three stages:

The first stage covers the start of the fire to full involvement of the building of fire origin. This is considered to have taken place between approximately 05:00 and 06:00. Photographs taken between 05:13 and 05:30 indicate that some sort of flashover occurred throughout the internal volume of the building of fire origin. This intense fire generated considerable radiant heat to cause further fire development onto the roof of the part of the hotel in the medieval houses above the public house, see Figure 9.

The second stage covers the spread of the fire from the building of fire origin to the part of the hotel above the public house. This is considered to have taken place between approximately 05:30 and 06:25; at this time the fire incident log indicates that the fire had spread to the adjacent hotel "...building of 5 floors approx. 30 x 30m fire spread to adjacent hotel inc now sectorised". During this stage, the fire appears to have crossed the party wall between the building where the fire started and the hotel. This fire development coincided with the arrival of the first fire crew. First responders inside the hotel indicated that walls had become friable and very hot, with localised collapse of these walls occurring when touched by the fire-fighters; revealing a severe fire burning behind the wall. Fire also spread through the roof structures above the hotel; it has been difficult to make any detailed assessment of this fire spread due to the complex layout of roofs and limited aerial photography and video taken during this stage.

The third stage covers the fire spread from the portion of the hotel above the public house to the roof of the main hotel. This occurred several hours later, after the fire had appeared to have been brought under control by the Fire and Rescue Service. In particular, it is understood that there were no significant observations relating to fire development between approximately 09:00 and 10:30. After this, there was a sudden increase in production of smoke and flames, indicating rapid fire development within the main portion of the hotel. This resulted in destruction of the hotel complex of buildings and full collapse of their roof structures.

The first and second stages of fire development are relatively straightforward; a very large fire developed in the undivided volume of the building of fire origin. The intensity of this fire led to fire spread both at roof level and through the party wall between the building where the fire started and the hotel.

The third stage of fire development is less straightforward. Information and photographs from the Fire and Rescue Service indicate that the fire was under control for well over an hour, with low energy, light smoke rising from the roof of the hotel, see Figure 10. At around 10:30, the fire suddenly escalated, with a high energy, dark smoke plume, indicating a rapid increase in the burning rate and the quantity of materials involved in the fire, see Figure 10 and Figure 11. Given the lack of significant smoke over such an extended period of time, it is BRE's opinion that the fire became confined to a smouldering material or materials, and/or a material capable of sustaining a small flame over an extended period of time, then encountering a more flammable material and escalating from this.

The construction of roofs over the hotel appears to have been complex, built over a number of years, and comprising a number of unknown concealed spaces. It is possible that the fire may have been smouldering in the timber construction of the roof before escalating again. However, given the age of the construction (old dry timbers), it is considered unlikely that such smouldering would have continued over such a period of time in a confined manner and gone unnoticed by Fire and Rescue Service personnel working from aerial ladder platforms.

To the rear of the section of the hotel, formerly two houses, there were two sets of pipes which were lagged in what appears to be some form of combustible insulation. These pipes would not have been visible to Fire and Rescue Service personnel working from aerial ladder platforms. It is possible that fire may have involved the lagging on these pipes and spread from the rear of the former houses to the eaves of the roof over the main section of the hotel, see Figure 12. This is considered to be more plausible as it provides a route which circumvents the former party wall between the houses and hotel, and provides a mechanism which would involve low level burning for some time which eventually reached the much larger fuel load in the roof over the main section of the hotel.



Implications/risks, emerging issues and conclusions:

Means of warning and escape - The building where the fire started is understood to have been unoccupied at the time of the fire. The adjacent hotel, which was understood to have had 51 occupied rooms at the time of the fire, was successfully evacuated.

Compartmentation – Given the timescales of the incident and the age of the premises, there do not appear to be any concerns regarding compartmentation. Various compartment lines were breached but these appear to have been the result of the severity of the fire and the time over which it was able to burn.

Cavity barriers and concealed spaces – The buildings clearly contained a number of concealed spaces and it is possible that the fire was confined within one of these for a period of time before breaking out and the fire escalating.

External fire spread – The fire may have spread externally via insulation materials which pass across a line of compartmentation.

Fire service considerations – The Fire and Rescue Services were forced to withdraw from the building early on, as there were signs that compartmentation in the building was beginning to fail due to the severity of the fire. Fire-fighting continued from outside the buildings until the fire was extinguished. Also, access from outside was limited due to the restricted areas surrounded by multiple buildings situated between the two streets.

Conclusions:

The building layout was complex; this appears to have included numerous refurbishments, extensions and changes of use of the buildings over hundreds of years. A major fire was able to develop within a space which was under construction which contained no substantive fire protection. The fire breached lines of compartmentation as a result of the severity of the fire and would have done so whether or not compartmentation complied with modern standards. Later fire development appears to have resulted from the fire reaching a stage which was neither accessible nor visible to Fire and Rescue Service personnel. Eventually, the fire reached the roof over the main portion of the adjacent hotel and caused total destruction of the hotel complex of buildings. However, life safety fire precautions appear to have been successful as there were no fatalities and no known injuries resulting from the fire.

Potential future work and or small scale experimental fire testing (as appropriate):

None, as it was not possible to obtain samples of the lagging material covering the pipes to the rear of the hotel to examine their fire performance; the pipework and lagging had been removed prior to the site visit.

Known related Incidents:

Historic mansion, Surrey, April 2015. Fire and Rescue Services were called to a house fire at about 16:00. All staff and volunteers of the Grade I listed mansion were safely evacuated. The intensity of the flames burned away floorboards and ceilings. The fire was originally thought to have started in the basement and quickly spread through uncontained voids to the roof. Although a significant amount of highly valuable items was retrieved from the property, the building was a blackened shell.

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Figure 1 – Façade of 18 Cathedral Yard
Image courtesy of Devon & Somerset Fire and Rescue Service

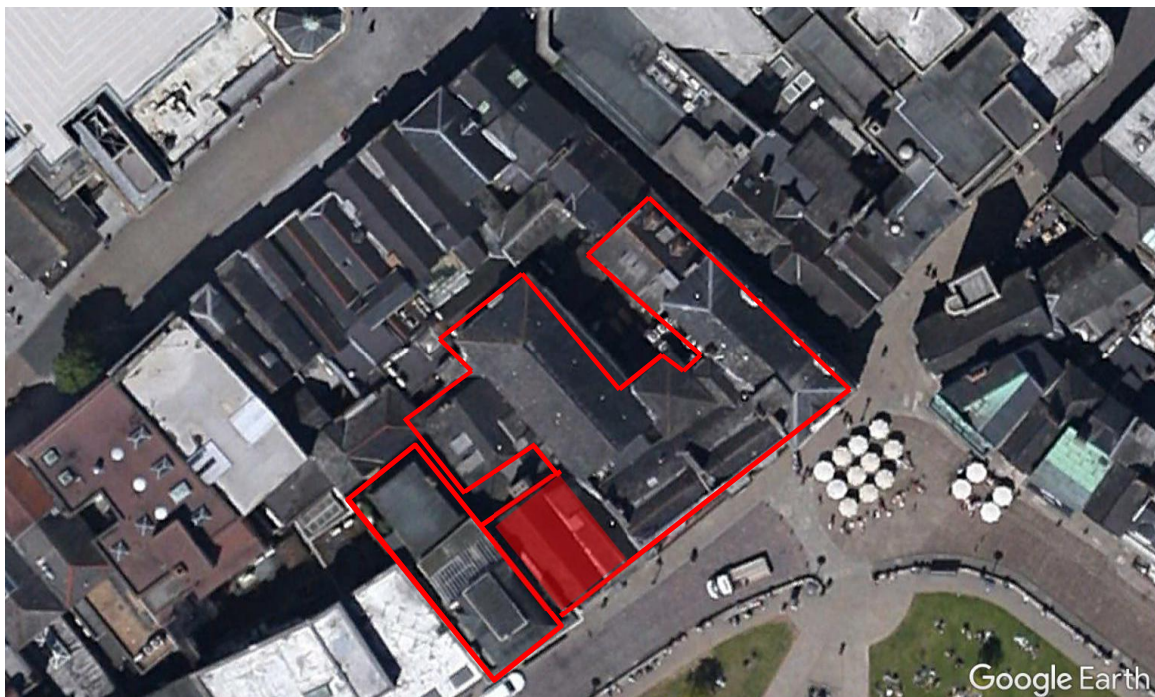


Figure 2 – Satellite image showing 18 Cathedral Yard to the south west and Royal Clarence Hotel to the north east (both outlined in red). The shaded red box indicated the location of two medieval houses which were subsumed into the hotel (© Google 2013)



**Figure 3 – Exposed floor joists with floorboards removed as part of refurbishment
Image courtesy of Devon & Somerset Fire and Rescue Service**



**Figure 4 – Exposed timber structure with plaster linings removed as part of refurbishment
Image courtesy of Devon & Somerset Fire and Rescue Service**

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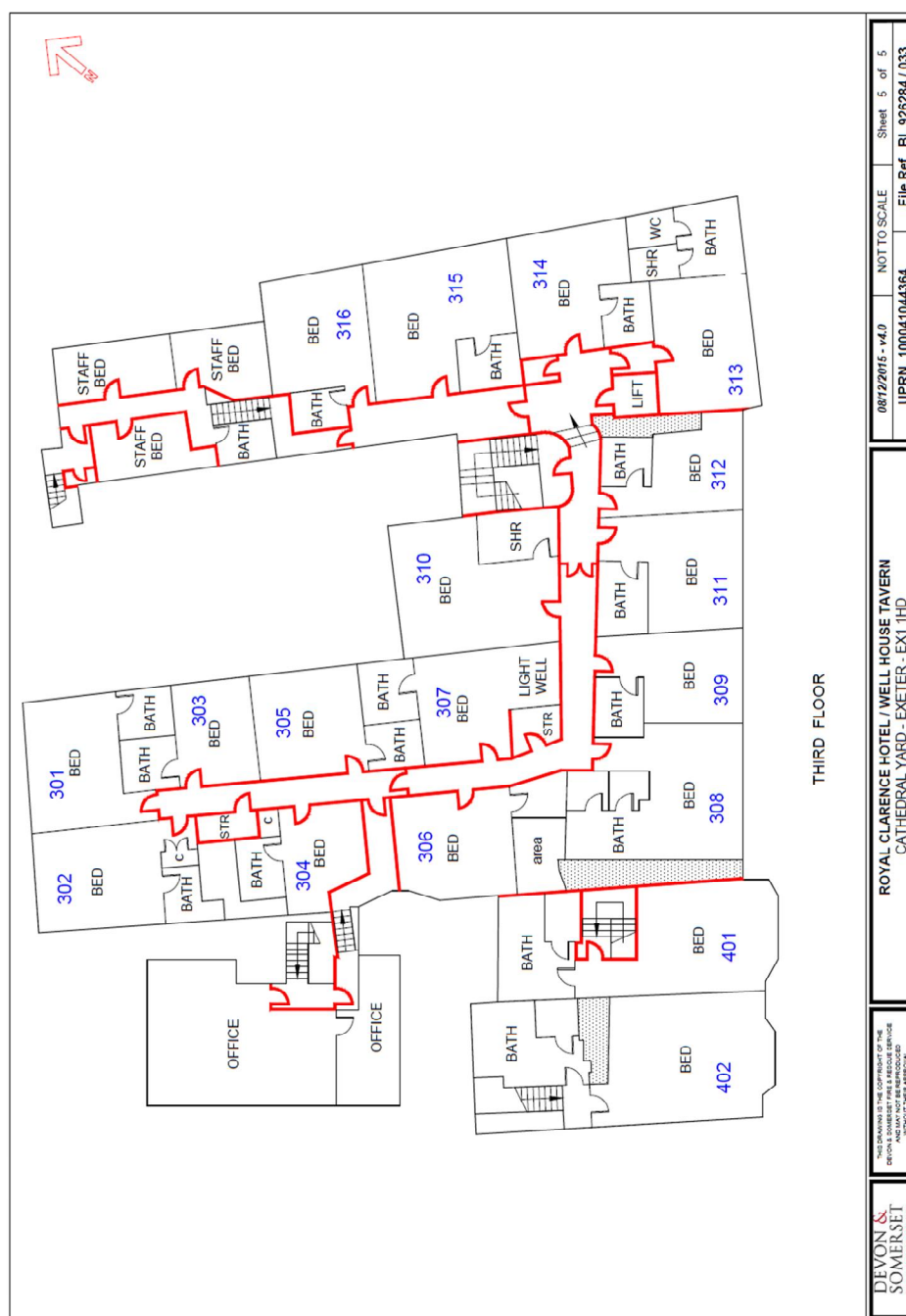


Figure 5 – Plan of third floor of hotel. Note continuous compartment wall where there was a party wall between the medieval houses (separating rooms 401 and 402 from remainder of the hotel)
Plans courtesy of Devon & Somerset Fire and Rescue Service

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Figure 6 – Facade of 18 Cathedral Yard and the hotel, with the two former medieval houses which were subsumed into the hotel in between
Image courtesy of Devon & Somerset Fire and Rescue Service



Figure 7 – Construction of party wall between 18 Cathedral Yard and the hotel, showing mixture of traditional wattle and daub construction (bottom right) and timber stud and plasterboard construction

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Figure 8 – Insulated pipes in lightwell to the rear of the hotel
Image taken from drone video footage courtesy of Devon & Somerset Fire and Rescue Service taken on 28th October, prior to fire escalation at around 10:30



Figure 9 – One of first photographs of fire taken by a hotel guest shortly after evacuating

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Figure 10 – Light smoke rising from the roof of the hotel
Image courtesy of Devon & Somerset Fire and Rescue Service taken at 10:27 on 28th October 2016



Figure 11 – Darker smoke rising from the roof of the hotel
Image courtesy of Devon & Somerset Fire and Rescue Service taken at 10:37 on 28th October 2016



Figure 12 – Remains of set of pipes (Set 2) shown in Figure 8; Set 1 is no longer visible but appears to have been destroyed by the fire
Image from drone video footage courtesy of Devon & Somerset Fire and Rescue Service taken on 31st October, after the fire had been extinguished