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Lessons from two fires at Glasgow School of Art

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Author Statement

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Simon Kincaid is a Senior Lecturer at Sheffield Hallam University teaching undergraduate and postgraduate architecture and building surveying students; with his main areas of teaching expertise including fire safety, building conservation and building pathology. He has written widely on the subject of fire in heritage and has presented on this theme at several conferences.

Abstract

Fires have occurred in many high-profile historic buildings, including several in recent years. The Mackintosh Building at Glasgow School of Art however is unique in having suffered two fires in recent years, the second of which was highly destructive and impacted the whole building. The comprehensive level of documentation about the building, ironically far more complete in the aftermath of the first fire, as a consequence of the fine detail needed to facilitate a reconstruction project (at an advanced stage at the time of the second fire), means that there remains the potential for reconstruction. This in fact is the preferred option for the future of the building.

There are a number of important lessons to come out of the fires, which have wide applicability for other historic buildings. The first, alluded to above, is that strenuous efforts should be made to ensure that documentation of the building is as complete as possible, this likely a combination of safe storage of archival material and new digital recording. Secondly, the fires have emphasised the importance of early warning of fire, and consequently detection and alarm systems must be of high quality and failsafe; they must also remain at this standard when construction work is occurring, at which time care must also be taken not to compromise passive fire protection. Thirdly, since fast and effective intervention is critical, the fire and rescue service should be well acquainted with the building, with planning and cooperation to this end being prioritised. Conversely, where location means that early response is unlikely, independent action by the building staff and other fixed measures may be required. Finally, the possibility of there being a future for a historic building following a destructive fire may often depend on suitable and adequate insurance cover being in place.

Key words: Glasgow School of Art, fire, historic buildings, detection and alarm, documentation

Introduction

Fire remains the single greatest threat to heritage, its action being swift and highly destructive. Despite efforts that have been made to reduce the incidence of fires in historic buildings, these

continue to occur with dispiriting frequency. Therefore, the lessons from any such fires are important to take note of.

The Mackintosh Building, which forms part of Glasgow School of Art, has had the exceptional misfortune to suffer two very serious fires in recent years, these having occurred in 2014 and in 2018. These were very different fires in terms of extent and outcome, and both offer valuable insight into heritage fire for those charged with the care of important historic buildings and offer useful understanding of possible post-fire concerns. The long-awaited fire investigation report into the second fire, by the Scottish Fire and Rescue Service, was published in January 2022.



The interior of the Mackintosh Building after the 2018 fire (photo 2019).

The Mackintosh Building

The importance of the Mackintosh Building as a heritage asset should not be underestimated. It was designed by Charles Rennie Mackintosh, primarily an architect and designer (though also an artist) who was a pioneer of modernism, and blended Scottish and Japanese influences with art nouveau to create his own unique aesthetic¹, which it has been suggested represented the birth of an important new style in 20th century European architecture.²

The building, which was built in two phases of construction and finished in 1909, is regarded as Mackintosh's masterpiece and is given Category A under the Scottish listing system³. It is considered to be of international significance.⁴ The building featured intricate interiors and varied and innovative exterior design, with equal design emphasis being placed on both.⁵ In 2009 the building was judged to be the best building of the past 175 years, in a UK-wide poll run by the Royal Institute of British Architects.⁶ It was perhaps unique in that although it was of such importance it was also, at the time of the first fire, a place of education and in daily use by the students of Glasgow School of Art, as it had been for over a hundred years. The building is also an important part of the local community and forms part of the historic and urban identity of Glasgow.

The 2014 Fire

The first fire occurred on the 23rd of May 2014. It was caused by flammable gases being in contact with hot components in a projector and occurred when a student was working on an art project in a basement room. It is worth noting that it had been previously identified that the methodology of the art installation should not contravene school protocols and the student who was involved apparently did not follow instructions and was doing something that they had been told several times not to do.⁷

Fire spread was rapid, and the fire investigation report noted that a major contributory factor was the number of voids and ventilation ducts, which ran vertically and horizontally throughout the building.⁸ It refers specifically to a vertical service void almost directly above the location of the projector, which had several panels removed to allow easy access for the installation of 'sprinkler pipes' (a water mist system in fact). This void extended the entire height of the building and acted like a chimney, allowing flames, hot gases and smoke to travel vertically.⁹

The fire resulted in the almost complete loss of the Charles Rennie Mackintosh building's library, which was regarded as one of the most important interiors of the 20th century¹⁰ and one of world's finest examples of art nouveau design. It also housed rare and archival materials, together with original furniture and fittings¹¹. There was additional damage to the 'Hen-Run' (a glazed gallery connecting the east and west sections of the building at high level) and to some studios and archival stores. Total losses resulting from the fire were estimated to be about 17%.¹² However, the majority of the building survived the fire due to a fast fire service response which was possible because of the city-centre location (the first appliance was on scene within 4 minutes of the alarm call and resources were able to be increased very rapidly) and an aggressive and determined attack on the fire by the Scottish Fire and Rescue Service, aided by good knowledge of the building. The chair of Glasgow School of Art confirmed the relatively light damage to the building, suggesting the day after the fire that it had been "slightly bruised" and that the lost library would be "recreated".¹³

The post-fire project was initially limited to reconstruction of the elements damaged in the fire, but the decision was subsequently taken to expand the project and carry out a comprehensive refurbishment of the whole building¹⁴. This included complete re-servicing; extensive external repairs and conservation work on the internal finishes. The library was considered the most important space and was in the process of being carefully and authentically reconstructed, to the as-built original from 1909, with the idea of re-establishing the original design intent¹⁵ (bookshelves and a staircase up to the second floor which had been added later were not going to be reinstated). There was time-pressure to have an important part of the teaching space of Glasgow School of Art back in operation as quickly as possible, and the work on the building was started in 2015. Despite the time-consuming level of detail required by the reconstruction process this proved to be a fast-paced project¹⁶ and was on schedule for completion within 5 years of the fire.

The fire, and specifically its ignition, raises an important point related to fire safety management: there should be no deviation in practice from rules which have been established for safety reasons. Such rules must be enforced via a robust and aware management regime – a situation in which an end user has been told 'several times' should never arise.

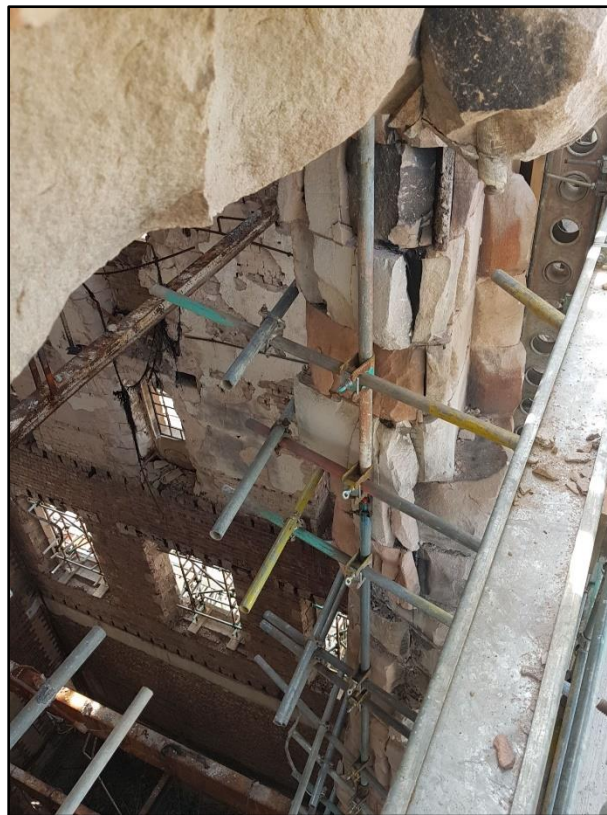
Another point, concerned with post-fire choices, is the importance of having an expert and invested team able to go into the high level of detail that may be required in order to arrive at the most

suitable approach to mitigation. Considerable research may be necessary before decisions can be made. This in conjunction with the cost of carrying out any reconstruction work underlines the importance of having suitable insurance in place to cover the high costs likely to be involved.

The 2018 Fire

Work to the building was nearing completion when a second fire occurred on the 15th of June 2018. This was a fire on a much larger scale than the previous one and caused extensive damage throughout the building. Immediately after the fire the viability of the building structure itself was left in doubt and there was initially a large exclusion zone around the building because of potential structural collapse¹⁷; consequently this time no announcement was made about the intention to reconstruct until 3 months after the fire.¹⁸

Post-fire, the building consists of external masonry walls; internal masonry cross-walls; main connecting steel beams (some badly distorted) and a partial concrete slab at second floor level, this offering some weather protection to the floors below (work has now started to remove some of the most badly damaged elements, prior to their replacement).¹⁹ There was extensive heat damage to the stonework and some exterior walls were found to have moved from position by as much as 100mm in places.²⁰ Most of the superstructure above second floor level was removed due to concerns about stability and the structure was made safe with the use of an extensive support and restraint system, consisting of scaffolding, and lattice and box trusses. All the intricately designed and detailed interiors were lost in the fire, and in most places the interior surfaces are now bare masonry.



Heat damaged stonework on the Mackintosh Building after the 2018 fire; note also the support/restraint system (photo 2019).

The fire investigation proved to be a very long process, hampered by the intensity of the fire which had consumed most of the interior materials (including plasterwork); the volume of fire debris that needed to be sifted through; the difficulty of access into what was initially a dangerous structure and by the Covid 19 pandemic. The investigation proved to be the most complex that the Scottish Fire and Rescue Service had ever carried out and their report was finally published in January 2022, three and a half years after the fire.

The report details that, in common with many construction sites, a temporary fire detection and alarm system had been installed and it was thought that this system was operational at the time of the fire; however the night watchman was first alerted to the fire by noises caused by the fire burning and not by an alarm activation.²¹ Thus the fire had likely been burning for some time before the alarm was raised, this delay meaning that the fire was already well-developed before firefighting commenced and was rapidly out of control.²² The serious consequences of the apparent failure of the system in this case (which was reportedly subject to ongoing faults²³) suggest that such systems, as far as possible, need to be failsafe. The importance of rapid detection and alarm is highlighted by contrasting the 2014 and 2018 fires. In 2014, as mentioned above, the alarm was raised quickly and firefighters from the nearby Cowcaddens fire station were on the scene very quickly; the response was rapidly increased; the fire was fought aggressively and with good knowledge of the building. Due to these factors, it was possible to contain the fire and limit the damage caused by it. This was sadly not the case in 2018.

Fire spread was augmented by the impact of ongoing construction work on passive fire safety measures in the building; the fire report notes that separation and compartmentation had been compromised by openings in walls, floors, open duct work, open voids, partially completed stud/partition work and the fitting of temporary door sets.²⁴

The Future

The evidence submitted as part of the Scottish Parliament's (Culture, Tourism, Europe and External Affairs Committee) 2019 investigation²⁵ following the second fire revealed very divided stakeholder opinion as to the future for the building, with suggestions ranging from a completely new building to full and accurate reconstruction of the existing. Although the Glasgow School of Art has clearly stated from outset its desire to authentically reconstruct the Mackintosh Building, the Committee recommended that a comprehensive consultation exercise should be undertaken to "fully acknowledge and understand differing viewpoints, before making a formal decision on whether or not to rebuild"²⁶ This parallels the commonly referenced guidance on reconstruction of cultural heritage, the Riga Charter, which calls for full and open consultations to establish the need for reconstruction.²⁷

This full consultation has now taken place and external consultants have analysed all the possible options for the building using a strategic outline business case.²⁸ These options ranged from demolition and a new build on the site, through a hybrid approach, to a full reconstruction. The strategic, economic, commercial, financial and management aspects of each option were reviewed; together with sustainability, social, cultural and educational impacts. The process also involved consultation with various stakeholders, including the local community, heritage sector, local and national government and GSA alumni, students and staff. The universal conclusion, with a now

unified stakeholder viewpoint, was that an authentic reconstruction (termed a 'faithful reinstatement' in this case) of the building is in fact the preferred way forward.²⁹

Although the reconstruction project will be a very big challenge, and major structural stabilisation and repair work will be required before the interior can be addressed³⁰, there is certainly a strong case for reconstruction. The level of documentation existing before the 2014 fire was already quite comprehensive, based on an extensive archive which includes Mackintosh's original drawings and some design development drawings; as-built drawings; detailed survey-based architectural drawings from the early 1990s and glass plate photographic negatives showing a very high level of detail for the key spaces³¹. After the first fire this material was augmented by very careful archaeological salvage and recording work, and by a Building Information Model (BIM) that was created for the whole building, based on a point cloud survey using 3D laser scanning and supplemented by detailed site surveys.³² This meant that by the time of the 2018 fire, there was an exceptionally comprehensive record of the Mackintosh Building and, despite the extensive damage to the building, this now allows for the possibility of a full and accurate reconstruction.³³ There are also the funds available to do so because the building was fully insured for reinstatement at the time of the 2018 fire.

The widely acknowledged importance of the Mackintosh Building rests to some degree in the fact of the building being symbolic to the city of Glasgow and being the central element of a working school of art, still in use for the purpose for which it was designed at the time of the first fire; both of these factors support reconstruction. It is also considered one of the best examples of Charles Rennie Mackintosh's unique work, underlining his importance as an architect and designer, thus it could perhaps be argued (particularly for the interior) that another element of the historic significance is in the artistic design intent, rather than in the original fabric itself, and that full reconstruction could re-establish this: the finished building can potentially look exactly as Mackintosh intended, albeit in a new materials, missing only the 'patina of age' (which will eventually develop as the building weathers and is used).

Conclusion – widely-applicable key lessons from the Mackintosh fires

A high level of documentation is critically important for historic buildings

Despite the best efforts to prevent fires from starting, or at least to reduce the incidence of fires, they will inevitably continue to occur. It is possible through various means to reduce the impact of such fires, but many high-profile fires, not least the 2018 fire in the Mackintosh Building, show that fires still retain the propensity to cause significant loss of heritage. Accepting that this is the case, it is suggested that important historic buildings are recorded to a high level of detail; capturing exact dimensions, details; and understanding construction methods and materials used as far as possible (it is recognised that there may be constraints imposed by limitations in the use of destructive sampling on historic fabric). This recording process allows for the possibility that, should the worst occur, there is the potential for accurate reconstruction. It is proposed that accurate reconstruction, though a poor second to retaining original, historic fabric, is far better than accepting the cumulative loss of heritage due to fire. This idea is well supported by buildings that have successfully and literally 'risen from the ashes' and continue to be enjoyed as worthwhile heritage assets. A prime example is Uppark in West Sussex, a Grade I National Trust property, which was badly damaged by a

fire in 1989³⁴; was subsequently authentically reconstructed and is now enjoyed by many visitors every year.

Concerning documentation, it should also be stressed that all the information should be securely stored. An original paper version of, for example an architect's plan, should ideally be stored offsite in a climate controlled and fireproof location (such as in a fire safe), though could potentially remain onsite if these conditions were met, but must also be scanned to a digital format and stored both on a secure computer and remotely via cloud storage. Some data will in any case be in a native digital format, such as a point-cloud survey or BIM model, but these must also be backed-up with remote storage.

Detection and alarm are of key importance

The contrasting alerts of the two fires at the Mackintosh – immediate alarm because there was someone present at the ignition point in 2014 and delayed alarm because there was no apparent automatic activation of the alarm in 2018, highlight the key importance of early detection and alarm. In order for any action to be taken to fight or limit the fire, it is first necessary to know that there is a fire. We clearly cannot rely on human detection, unless there is a person in every room 24 hours a day – a solution that is impractical. Therefore, effective and completely reliable (possibly with a system back-up) automatic fire detection and alarm is a necessity, and this is particularly important in the context of a building where construction work is ongoing.

Passive fire protection should not be compromised during construction work

Both fires evidence issues with passive fire protection and a consequent increase in the vulnerability of the building to fire spread. Thus, care should be taken to avoid compromising passive fire protection during construction operations, and it may be additionally necessary to provide temporary compartmentation and fire stopping of voids and ducts, even though this might be time-consuming and incur additional expense.

The fire and rescue service must know about the building in detail

Owners and operators of historic buildings should engage with the local fire and rescue service, as part of wider consideration of emergency planning requirements for the property, and this is likely to involve a degree of cooperative planning and practice. It may also include orientation visits for the fire and rescue service – such that in the event of a fire they are able to operate quickly and effectively, with any unknowns which would reduce initial speed of intervention removed; knowing for example where it may be possible to establish fire lines to hold back the fire.

Location must be carefully assessed and independent action prioritised as required

The Mackintosh building, at least in the context of the 2014 fire, had a considerable advantage in terms of fire and rescue service intervention because of its city-centre location and clearly shows the advantages of a fast response. In some cases, due to location, it will be obvious that a response may take considerable time; for example, many important historic buildings are in rural locations. If this is the case, careful internal planning must be undertaken and action independent of the fire service may need to be prioritised. This may involve such as having staff on site 24/7 and staff training in first aid firefighting, and where this is not practical or sufficient, potential adoption of physical solutions, such as fire suppression, may need to be considered.

Insurance must be suitable and sufficient

If the worst happens, and to allow the possibility of a positive future, such as by reconstruction, all important buildings must carry the correct insurance. This must be suitable for the building and cover all potential future interventions, including reconstruction. There must be a sufficient level of cover to allow for this, since all rectification works to historic buildings are likely to be very costly.

Afterword

The individual points detailed in this article represent an exploration of the learning that can be derived from the fires at the Mackintosh Building. However, it should be stressed that these are by no means comprehensive in scope and must only be taken as part of what must be a holistic and committed approach to fire safety for historic buildings. This approach should seek to prevent the outbreak of fire as far as possible and should this prove to be unavoidable, as experience sadly suggest that it may be in some cases, aim to reduce the spread and impact of fire and thus minimise the consequent loss of heritage.

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³ Grade A listing in Scotland is equivalent to Grade I listing in England and Wales (Northern Ireland has a separate system). Both represent the highest category of listing in their respective systems.

⁴ The selection of tense when talking about the building's attributes is problematic here since little more remains than the structural shell post-2018, and hence perhaps a past tense might be more appropriate. However, the firm intention to reconstruct suggests the present tense can also serve. Here the most appropriate tense for each statement has been used.

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