PRESERVING SCOTLAND’S OBSCURE ROMANTIC RUINS

Analysis of (Semi)Ruinous, Roofless Castles in order to Determine which Conservation Technologies can be used to Preserve them as Ruins
PRESERVING SCOTLAND’S OBSCURE ROMANTIC RUINS
ANALYSIS OF (SEMI)RUINOUS, ROOFLESS CASTLES IN ORDER TO DETERMINE WHICH CONSERVATION TECHNOLOGIES CAN BE USED TO PRESERVE THEM AS RUINS

A Dissertation submitted for
MSc in Architectural Conservation,
University of Edinburgh
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First Reader: Dimitris Theodossopoulos
Scotland is an internationally renowned land of castellated architecture. Numerous publications about Scottish castles and tower-houses, as well as most tourists’ pictures highlight the appeal of a national heritage. Dilapidated ruinous castles constitute a particularly romantic vision, constantly depicted up until today.

One may wonder why and how such ruins, which naturally are submitted to the ongoing process of weathering and decay, have come down to us through the ages. Leading architectural theorists have put the focus on the field of heritage preservation through their centuries-old debate over conservation versus restoration. Conflicting ideologies led to various technological consolidation-works that have slowed down or even halted the weathering of ruins in the last two centuries.

Through the analysis of previous interventions and observing ongoing decay mechanisms, the present research will propose possible and adequate conservation technologies for ruinous castles, which have remained roofless and exposed to natural external factors for some time. The scope of this research is thus to offer an analysis and leads on which conservation technologies can be (and have been) used to preserve (semi)ruinous castles as ruins.
ACKNOWLEDGEMENTS

Firstly, I would like to express my sincere gratitude to my tutor Dimitris Theodossopoulos for his continuous support and guidance in this research, for his motivation and immense knowledge about Scottish castles which he passed on to me. I’d also like to thank him specifically for the huge help he gave me for the on-site surveying of a deflected vault in the West Tower of Duntarvie Castle – to which its owner, Geoffrey Nicholsby, gave us access; for which I am grateful.

Besides my tutor, I’d like to thank Ruxandra-Iulia Stoica for her guidance during the initial stages of the dissertation and the redaction of my Research Proposal.

I would furthermore like to thank several people who helped me get access to the documentation needed for the proper development of my research, as well as for their patience in answering my numerous questions:

- Historic Scotland and more specifically Peter Ranson, Robbie Nuttall, and Ian Lambie, for both the access to documents in Longmore House and Condition Surveys & Conservation Statements and their willingness and rapidity in providing answers to my technical questions;
- Ed Kelly from EK:JN architects for his enlightening insight to previous stabilisation works carried out in Duntarvie Castle;
- John Addison from Addison Conservation and Design;
- All of the people who helped and provided information to me during my site visits, such as the Kirkdale Archaeology members in Bothwell.

Last but not least, I would like to thank Richard Collins for his help with the 3D mesh rendering of the surveyed vault in Duntarvie and the technical department for providing me with the necessary surveying material.

Finally, I would like to thank every person who directly or indirectly contributed to the fulfilment of this dissertation.

Wordcount of the main body: 14476 words
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INTRODUCTION
I have no greater, no dearer aim than to have it in my power ... to make leisurely pilgrimages through Caledonia, to sit on the fields of the battles, to wander on the romantic banks of her rivers, and to muse by the stately tower or venerable ruins, once the honoured abodes of her heroes.

Robert Burns. Letter to Mrs Dunlop. 1787.
Late 18th century’s Romanticism meets Scottish landscapes, architecture and national pride in the figures of iconic authors such as Sir Walter Scott and Robert Burns. While the picturesque feeling conveyed by the sight of a ruin is often described in their verses, M.W. Thompson states—in a slightly more rational point of view—that “even the most down-to-earth person can feel his imagination stirred by a ruin, and that is of course his main source of pleasure and satisfaction.”

Truth be told, the author of the present work is no exception to this sentimental, subjective point of view that overcomes tourists visiting Scotland; a trip through this country will leave most visitors amazed by its castles, especially if they are set in dramatic sceneries such as by a loch or on a cliff near the sea. Even official bodies, such as Historic Scotland, could not go without noticing that “whatever their scale, Scotland’s ruined buildings have become an important part of our national ethos, as anyone who has ever sent a postcard or bought a presentation tin of shortbread must be acutely aware!”

This leads one to wonder why in a country where the Romantic Movement was, and to a certain extent still is, blossoming, are castles being fully restored back from a ruinous shell into a habitable building? Two iconic and frequently photographed castles located on lochs illustrate the difference between the two approaches: while Kilchurn Castle is presenting itself as a majestic ruin (fig.1), Eileen Donan Castle has been fully restored to a “previous glory” during the 1910s, after almost 200 years of lying in ruins (fig.2).

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Those examples and a rich collection of publication show that conservation is often in opposition to restoration. A centuries-old debate (having its roots in the 19th century with Ruskin opposing a non-interventionist view to Viollet-le-Duc’s restoration philosophies) is revived in the “Scottish Castle Restoration Debate”. The rather recent example of a Public Inquiry (2001) being launched to assess whether Castle Tioram should be restored confirms that this debate is still ongoing in the 21st century (fig.3).

While Romanticism and the never-ending, evolving debate of conservation versus restoration certainly both have a part to play in the preservation concerns of ruinous Scottish castles, the present work will propose a more rationalistic and technically-based point of view. The author having received an Architectural Conservation education wonders HOW such ruins, which naturally are submitted to the ongoing process of weathering and decay through various factors, are still standing. Research and on-site surveys show that derelict castles have been excavated, consolidated, and put on display through previous maintenance-works and restorations. The use of technology, evolving over time, has thus enabled dilapidated castles to come through the ages in various states of preservation. An analysis of said techniques, deformations, decay mechanisms, and the currently visible weathering, will offer leads on what defects occur in ruinous castles exposed to the highly changeable Scottish weather; further analysis on which conservation-works have previously been used to slow down and/or freeze the weathering of said ruins, as well as the effects of the technology used in said conservations. These factors all affect our understanding and appreciation of a ruin’s character.

To sum up, this research offers an analysis of the preservation of (semi)ruinous castles as ruins.
GENERAL STRUCTURE AND METHODOLOGY

This work is composed of two theoretical sections that provide the background information for a third analytical section, which makes use of original data as the primary source.

Part I: Ruins, a story of Romanticism and Restoration

The rich history of how ruins have been viewed over the centuries constitutes a necessary background to the understanding of the Restoration-Conservation debate that started in the 19th century and continues today. During that era, leading architectural theorists brought heritage preservation into peoples’ consciousness, and thus enabled historic structures to be cared for. Moreover, their ideologies greatly influenced our modern approach to conservation/restoration.

Part II: Scotland’s castles

Since the Restoration-Conservation debate is deeply linked to the Scottish castle culture of recent centuries, Part II will focus on how Scotland’s castles have been viewed and cared for over time. An analysis of the current castle situation concludes this section, both through the evolution of conservation policies and through a tangible census of the ruinous castles in Scotland. Relevant case studies were chosen on the basis of the acquired, Scotland-specific background-knowledge.

Part III: Technical conservation

This third part constitutes the main body of the present work and aims to find a possible answer to the scope of this research: which conservation technologies can be used to preserve (semi)ruinous castles as ruins?

First, some thoughts are given to the general process of ruination. Since no reasonable solution can be offered without an understanding of the original cause of the decay, it is vital to detect the main reasons contributing to the demise of most castles exposed to external weather conditions.

Then, both technical papers and original data gathered through several on-site visits and surveys give an insight into the vast domain of Scottish castle conservation. Multiple case studies showcase the recurring issues encountered in freestanding and exposed dilapidated structures. The resultant analysis can be subdivided into two general themes:

- Analysis of material decay: comparison of relevant case studies of (semi)ruinous, roofless castles in order to determine typical pathologies observed on freestanding structures;
- Analysis of structural deformations: on-site surveys in order to understand the typical deflections and eventual failures that occur in exposed structures.

The analysis concludes with commentary on to what extent the current state of decay and previous interventions determine how we appreciate the current space and character of the ruin. The chapters of this study will analyse possible conservation technologies and repair solutions based on the observed faults, intermittent alterations, and cultural
associations attached to the buildings. The author acknowledges the limitation of this research and that it cannot, and does not, have the ambition to offer an unrealistic, non-existent, universal solution.
LITERATURE REVIEW

A countless number of publications exist on the history of Scottish castles and tower-houses. The most renowned systematic description of this type of architecture is from MacGibbon and Ross’s “The Castellated and Domestic Architecture of Scotland from the Twelfth to the Eighteenth Century”, 1887. Many more authors, such as Nigel Tranter (1970), Mike Salter (1994), and Martin Coventry (1997), have followed their example. Those descriptions cover the major castles of Scotland in an analytical way, comparable to the descriptions included in the Listed Building and Scheduled Monument lists.³

Audrey Dakin, Miles Glendinning, Aonghus Mackechnie, et al., provide a complete overview of “Scotland’s Castle Culture” through coverage of the evolution of Scottish castles from an architectural and sociological point of view, as well as how those buildings have been viewed and treated over the centuries. The recalling of a rather heavy tower-house restoration phase that occurred under the Historic Building Council from the 1950s to the 1980s furthermore shows how viewpoints diverge and change over time.

As long as the interest is purely theoretical, a certain number of publications can also be found that pertain to the romantic appeal of ruins. Furthermore, international charters and a specific Historic Scotland publication about the preservation of ruins (The Conservation of Architectural Ancient Monuments in Scotland, Guidance on Principles) give guidance on the general conservation philosophies without, however, constituting a legal policy or technical advice.

As for the ideas behind the conservation versus restoration debate, Michael C. Davis provides a counter-argument to the conservative guidance laid out by Historic Scotland in his paper, “The Scottish castle restoration debate 1990-2012: a paper to stimulate discussion and understanding.” Without particularly advocating a pro-restoration attitude (at least up until the conclusion), Davis makes some valid points by putting concepts such as History, Authenticity, Significance, and Reversibility in the perspective of the 21st century and the specific case of ruinous castles. Davis also points out that Scotland lacks the bold, modern interventions seen in ruinous castle restoration done abroad; no architecturally meaningful debate exists in the historically-driven Scottish castle conservations—a lack which the present research will touch upon (without, however, focusing on the wider debate of conservation versus restoration per se).

One cannot go without noticing that when it comes to technical publications about the conservation of ruins, the amount of available publications decreases considerably. Despite this lack, some publications exist that appear to be a source of valuable information; Michael Thompson, who has over 30 years’ experience working on the preservation of ruins for the British Government, gives a broad overview of the subject in his book “Ruins: Their Preservation and Display” (1981). Specialised bodies, such as the British Geological Survey and the Conservation Group of Historic Scotland, provide relevant information on specific issues and corresponding ruin conservation techniques through their technical publications.

³ The history and evolution of Scotland’s castles is not included in this work since it isn’t directly relevant to the question of “How to preserve ruinous, roofless castles”. However, the aforementioned publications provided background-knowledge.
Eventually, this work positions itself amongst a long series of publications both about the Romanticism conveyed by ruins and the never ceasing debate in castle restoration by trying to cover a certain lack in practical and technical publication—rather than taking a stand on the castle restoration debate per se. In a contrast to most of the historicist and theoretical debates of the aforementioned publications, roofless castles are being analysed in this work, with the intention to offer insight and guidance on their conservation/preservation as ruins. One has to be conscious, nevertheless, that what may seem an insignificant consolidation choice could have an impact both on the fabric and on peoples’ perception of the structure, thus making an absolute separation of theory and technique impossible.
PART I
RUINS, A STORY OF ROMANTICISM AND RESTORATION
This work focuses on technical consolidation possibilities for ruinous castles in their dilapidated, weathered state. Before one can move to a technical survey, however, one must be aware of the affects fluctuating sentiment has had on ruins over time. In this section, influential ideas held by leading architectural theorists will be briefly outlined.

**RENAISSANCE – REDISCOVERY OF THE ANTIQUITY**

During the Italian Quattrocento, values of the classical beauty and proportions were rediscovered. Because of this new-gained love of antiquity, the concept of “ruin” emerged into human consciousness during the Renaissance: ruins became witness and models of a grand, ancient way of building.

Yet, while humanists went on-site in order to measure and draw the architectural remains, a majority of people were sourcing their building materials from the same ruins. No general concern for the preservation of historic structures existed during the Renaissance.

**THE ENLIGHTENMENT, ROMANTICISM, AND THE PICTURESQUE MOVEMENT**

The Enlightenment of the late 17th century brought great scientific advances while foreshadowing a certain Romanticism and Sublime in artistic movements. Forces of unleashed nature eroding and flattening what humans had erected were being depicted (fig.4). The excavation of Pompeii in the 18th century, where a natural catastrophe had instantly frozen in time an entire civilisation, confirmed the ruin as an allegory of times gone by.

With the Gothic Revival beginning at the end of the 17th century in Great Britain, ruins attained their place in the landscape; for instance through the erection of fictitious, purpose-made ruins, Follies in the so-called “English” garden.

However, despite all the artists, architects, and writers raising the interest for ruins, Thompson reminds us that “it is important to remember that there was no question of preservation in the Romantic or Picturesque attitude towards a ruin. The ruin was there
to stimulate and excite the onlooker; whatever increased the theatrical effect—ivy or moonlight—was desirable to heighten the sensation.”

**FRENCH REVOLUTION AND HERITAGE**

Quite ironically, the destruction of the French Revolution was necessary to pre-empt the notion of historic building and national heritage. Starting off as a purely aesthetic enjoyment, heritage gained an active form of protection in 1830, when François Gizot created the post of *Inspecteur général des monuments historiques de France*.

**19TH CENTURY RESTORATION-CONSERVATION DEBATE**

The (in)famous restoration versus conservation debate between French architect and art historian Eugène Viollet-le-Duc and English architect William Morris, and his fellow countryman John Ruskin, started in the second half of the 19th century. For the first time, ruins were actively cared for and consolidated. During this time, a general European sensibility was aroused around the question of heritage and its preservation.

**Viollet-le-Duc: Restoration**

>To restore a building is not just to maintain, repair or re-erect it: it is to restore it in a complete state that could never have existed at any given time.\(^5\)

According to this famous quote, restoration aims at an ideal that goes beyond the simple historical reconstruction. The physical remains are subject to a restoration guided by a documentary knowledge of a unitary style. Iconic restorations such as the battlements in Carcassonne or the Château de Pierrefonds are excellent examples of this extensive restoration approach (*fig.5*).

>Château de Pierrefonds before and after Viollet-le-Duc's restoration in 1858

**Fig.5**

However, Viollet-le-Duc’s philosophy should not systematically be reduced to this sole quote since his willingness to use modern materials and techniques in gothic structural modes displays a pragmatic view of the physical realities of construction and restoration.

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\(^4\) Thompson, p.17.

**Ruskin, Morris, and SPAB: Conservation**

As a reaction against this “fatal practice of ‘restoration’”\(^6\), John Ruskin and William Morris led a movement which encouraged preservation over radical interventionism, thus promoting a technologically rather rudimentary conservation approach. Authenticity, honesty and truth of the historical building as witness of the past quickly became key concepts. With the creation of the *Society for the Protection of Ancient Buildings* by William Morris in 1877, these ideas became widespread amongst leading architects. Modern conservation philosophies are still largely based on SPAB ideologies.

The following quotes illustrate the virulent opposition of Morris to Viollet-le-Duc’s ideology of ‘restoration’:

> Restoration is a lie from beginning to end. We think that those last fifty years of knowledge and attention have done more for their destruction than all the foregoing centuries of revolution, violence, and contempt.

> It is for all these buildings, of all times and styles, that we plead, and call upon those who have to deal with them to put Protection in the place of Restoration ... and show no pretence of other art, and otherwise to resist all tampering with either the fabric or ornament of the building as it stands.\(^7\)

**OTHER RESTORATION/CONSERVATION THEORIES**

Viollet-le-Duc and Morris certainly are the most iconic “restorers/conservationists”; however, several other theories exist on this subject.

**Camillo Boito**

Italian architect, engineer, and art critic, Camillo Boito offered a compromise between Viollet-le-Duc and Morris by not entirely rejecting the idea of a conservation-restoration. His views were at the origin of most heritage-related charters of the 20\(^{th}\) century. One innovative idea was, for instance, that any new work (based on evidences) should be identified as such (either clearly or upon closer inspection) (*fig.6*). This rule is still common practice in our modern approach to conservation/restoration.

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7. Ibid.
Aloïs Riegl

Austrian art historian, Aloïs Riegl defined an analytical method of classification for historical structures through a definition of values. The two main values are the historical value (scientific) and the age-value (subjective). The contentious character of these two values perfectly illustrates the modern choice every architect faces when dealing with heritage, especially ruins: favour and enhance the scientific historical value by restoring the structure to a previous glory or respect the age-value and let the patina show in a “leave-as-found” approach.

20th and 21st century

20th and 21st century technological progresses have shifted the focus of the conservation-restoration debate. Structural archaeology facilitates the understanding of changes that happened during the active life of a building, thus supporting the view of ruins to be enjoyed as historical documents, as a fragmented evidence of the past. The elevation of photography as a dominant art form during the 20th century, on the other hand, highlights the purely aesthetic enjoyment conveyed by ruins, which supersedes any nationalist sentiment. Furthermore, since photography offers the possibility of mechanically recording buildings, it is sometimes used as an excuse and/or prerequisite to the demolition of historic structures. Technological advances in general have had a great impact on the practice of conservation over the last century. The advent of concrete as the innovative material of the 20th century was, for instance, responsible for numerous modern restorations being executed with a blind faith in the material’s properties (fig. 7). The extent of damages reached by the use of inappropriate mixes became visible several decades later.

Furthermore, the two world wars of the 21st century were responsible for widespread destruction that caused the creation of a new, modern, type of ruin. Destroyed structures were now linked to human pain and tragic events, rather than to a culturally rich past which has gradually been lost.

CURRENT CONSERVATION PRINCIPLES

Current leading views showcase the dominance of the pro-conservation in the field of ruin conservation. To them, preservation is the act of arresting the decay and freezing the
masonry in the condition in which it was found. The goal of this approach is not only to secure the remains but also to make the ruinous structure understandable for the visitor.  

**International Charters**


The main ideas presented in both documents are: importance of regular maintenance (which is facilitated by the building having a current use), conservation over restoration, and respect of every construction phase. Necessary restoration works must “stop where conjecture begins and must be distinct from the architectural composition” in order to avoid falsification—while still being in harmony with the existing fabric.

These key concepts, however, need to be analysed in perspective of the specific requirements for the preservation of ruins. Article 15 of the Venice Charter states:

**Article 15.** *Ruins must be maintained and measures necessary for the permanent conservation and protection of architectural features and of objects discovered must be taken. Furthermore, every means must be taken to facilitate the understanding of the monument and to reveal it without ever distorting its meaning. ... All reconstruction work should however be ruled out "a priori". Only anastylosis, that is to say, the reassembling of existing but dismembered parts can be permitted. The material used for integration should always be recognizable and its use should be the least that will ensure the conservation of a monument and the reinstatement of its form.*

The single article of the Venice charter related to ruins thus fails to specifically apply the aforementioned theoretical concepts to derelict structures; only “anastylosis”, first used in 1906 for the restoration of the Treasury of the Athenians in Delphi, and later in the 1920s restoration of the Acropolis in Athens (*fig.8*), is mentioned as a possible and acceptable rebuilding technique.

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8 The charters and guidance are included in the Appendix 1, p.93.

9 ICOMOS. *The Venice Charter*, 1964.

A document offering specific guidance to the conservation of ruinous structures was published by Historic Scotland in 2001. Although the booklet is once again intended as guidance and by no means meant to offer technical advice or to function as official policy, it considers an extensive variety of scenarios.

The Historic Scotland guidance document is very much in keeping with the aforementioned ideologies as shown through various key concepts, such as the necessity of regular small-scale maintenance work, the respect of the ruined ancient structure as a historical document through the limitation of interventions to those structurally necessary, the conservation of every construction phase, the complete reversibility of works, and the identifiable conservation works on close inspection (although they “should always be carried out in a self-effacing and sympathetic manner”).

Furthermore, the debate between the conservation and restoration of ruins is anticipated in a couple of articles:

2.5. Works of conservation aim to prolong that life, but there is a balance to be struck between achieving the continued life of a monument and of carrying out works that are so invasive that they modify the monument’s character and detract from its value as evidence for the age that produced it. Conservation should always be aimed at the lowest level of intervention that is consistent with achieving a monument’s stability.

2.14. While the aim for most scheduled monuments is to preserve them in the state in which they have come down to us, it is accepted that for certain monuments restoration for active use may be the most viable way of ensuring their continued existence. These might include some tower-houses that are sufficiently complete to be considered as candidates for renewed occupation … It is also important that any additions that have to be made are firmly based on the structural and archaeological evidence, and that those additions are designed to be technically and aesthetically compatible with the historic fabric.

A sensible statement, not often written in official documents, is also worth mentioning:

2.4. All monuments differ from each other and require individual conservation solutions to ensure their stability and preservation.10

In summary, while the restoration versus conservation debate is as strong as ever, official documents tend to recommend restoration only where structurally necessary, with a reluctance on the removal of later alterations and additions, an absolute restriction on conjectural restoration, and all with a major stress on the reversibility of every work.

10 Fawcett, articles 2.4, 2.5 and 2.14.
PART II
SCOTLAND’S CASTLES
**SCOTTISHNESS – WHY IS SCOTLAND A COUNTRY OF CASTLES?**

Scottish castles are part of the national pride and the country is often considered to be a land of castellated architecture. In terms of numbers however, Scotland does not have a disproportionately number more castles than its neighbouring countries in the British Isles. Terminology adds a layer to the research: which building types are to be counted as “castles”? Tower-houses (which became the prevalent Scottish model by the turn of the 14th century and lasted until well into the 17th century with slight adaptations), hall-houses, courtyard castles, fortified architectures, strongholds, castle-revival houses, castellated non-domestic architectures, palaces, and the Scottish château are most often included in the definition. There must therefore be a certain “Scottishness” prevailing in all of the above that conveys the castellated reputation of this country.

**SCOTLAND’S CASTLE CULTURE**

*Ever since the Middle-Ages, people have passionately valued, and also at times passionately criticised, Scotland’s castles for a wide range of reasons – cultural, visual, practical and emotional – sometimes all at the same time, and with the balance never remaining static for long. That stimulating but sometimes jarring diversity has continued into recent decades.*

From the beginning of their existence, castles were subjected to historical events such as the Independence War, starting in 1296. They were continuously besieged, damaged, and passed from one hand to the other. Finally, the Scots themselves demolished most of the castles still standing in order to deny the English the possibility of using them as bases. Such deliberate destruction was to occur repeatedly throughout history. Furthermore, castles have been periodically re-used for military purposes after previously having been derelict and abandoned.

Although it is difficult to pin-point an exact timeframe for the general demise of medieval castles, the innovative scholarly classicism, which blossomed after the Union of the Crown in 1603, shifted the focus towards a classicist ideal. While the ongoing castellated traditionalism never fully vanished, living in a new-built tenement in the city became fashionable; castles were being used as a secondary residence or fully abandoned, which caused them to then decay and eventually collapse.

During the late 17th century, an interesting trend emerged in a Proto-Romanticism Movement: historic, ruinous castles were being enjoyed as sentimental relics that enlivened the landscape. Sir William Bruce started this trend when he erected a new house with a view to the obsolete castle ruins on Lochleven in 1675 (fig.9). The enjoyment of castle ruins continued throughout the 18th century Romanticism. In Scotland particularly, because of the parliamentary union with England in 1707, Romanticism gained importance as a philosophy that lent a nationalistic feeling to historic Scottish structures that thus acquired a cultural importance without necessarily being in use anymore.

*11 Audrey Dakin, et al. Scotland’s Castle Culture. 2011,p.XXV*
Romanticism and Enlightenment however constituted “the great Scottish paradox of the eighteenth century: how it was that, in the age of Enlightenment, writers, artists, musicians, philosophers, architects and intellectuals ... all combined to make Scotland simultaneously a leading land of Enlightenment and Improvement, yet also an archetypal land of Romanticism.”

This paradox is a mirror for the technological advances being made in the field of construction, and thus restoration, with the lack of any castle conservation conducted in Scotland during that era.

**20th Century Restorations**

The 20th century brought major changes in the castle culture in Scotland. Starting from the late 19th century and continuing until World War I, private architectural restorers devoted themselves to imaginative castle restorations driven by imperialist pride; aristocrats reroofed and reoccupied Scottish castles with interventions often guided by pragmatic approaches aiming to provide modern comfort (e.g. restorations by leading architects such as J.J. Burnet, Sydney Mitchell and Lorimer, fig.10). Most interventions were far from compliant with SPAB ideologies. The late 19th century also saw the rise of the Arts & Crafts Movement, which placed the historic castle in the centre of a national perception of tradition, thus reviving the peoples’ interest in building techniques, such as Scottish rubble and harl. All in all, the castle projects were diverse and inconsistent.

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12 Dakin, p.66.
World War I brought the aristocratic rebuilding movement to an end. The economic unviability and unsuitability for modern living of the tower-houses led to inactivity in castle restoration. Despite the general inactivity of building work, a new generation of architectural restorers rose during the interwar era (e.g. Ian Lindsay who was a leading figure in the 1930s). On the intellectual scene, the interwar era was marked by the flourishing of scholarly antiquarian interest. MacGibbon and Ross’ descriptions as well as the Inventories conducted by the Royal Commission on the Ancient and Historical Monuments of Scotland had a major influence on preservation-dominated approaches.

Post-World War II, a massive boom in Scottish tower-house restorations began in the late 1950s and continued up to the 1980s, spurred by state grants made available to private restorers through the Historic Buildings and Ancient Monument Act of 1953. The Historic Buildings Council for Scotland (HBC) funded over 70 tower-house restorations in 40 years, with a peak of activity in the late 1970s (fig. 11).

The aim of these state-funded restorations was to secure the best possible long-term future for derelict yet important Scottish heritage assets. Strict criteria had therefore to be met: the original layout was to be respected, original structure and surviving internal finishes had to be preserved, and archaeological and documentary evidences had to be shown for the proposed reinstating interventions. The HBC’s restoration approach, however, shifted over time:

First, the decision had to be made whether the tower was complete enough for restoration to be a viable option. ... Second, archaeological and documentary evidence was the ideal basis for proposed restoration, and MacGibbon and Ross' work was the key historical source. From the 1970s onwards conjectural restoration was kept to a bare minimum if documentary evidence could not be found (e.g. Fawside Tower-house). ... Third, the removal of later additions to historic towers was common in the 1960s and 1970s, primarily to reduce the scale and cost of the restoration work (e.g. Kinkell and Carnousie Castle). ... The fourth fabric approach concerned the use of preferred rubble, against harled brickwork or blockwork with stone dressing. Although recognised as not ideal, up until the early 1980s the latter was ultimately used as the usual method for reasons of cost. ¹³

¹³ Dakin, p.167.
The program was revised in 1981 with the chief concern being the over-commitment by HBC and increased costs of restoration. Moreover, the 1980s saw the beginning of criticism over the ongoing pragmatic restoration practices in Scotland with the anti-tower-house-restoration lobby pointing out the contradictions between the shifting legislative context (e.g. successive publications of international conservation charters) and the actual state-funded restorations.

As Historic Scotland was formed in 1991 and gradually took over the funding from HBC, a “repair-only” approach and focus on the consolidation of ruins became dominant. Increasingly high standards—carried out by leading specialists—came to prevail in conservation practice. Meticulous documentary research and the recording of the existing fabric were now to be executed prior to the works beginning. Today, ambitious castle restorations are to be avoided if possible and monuments are to be preserved “in the state in which they have come down to us.” And yet, the rather recent restoration of Stirling Castle by Historic Scotland is a perfect counter-example to these current heritage management philosophies (fig.12).

THE SCOTTISH CASTLE RESTORATION DEBATE

Despite these fluctuating restoration approaches towards ruinous structures, no architecturally meaningful debate exists in the current Scottish castle conservation. Contemporary interventions showcase a rather poor architecture, “overwhelmingly traditional and contextual in style.” Scotland lacks the bold, modern interventions in glass and metal seen abroad, and Revivalism (re-use of a past architectural style adapted to modern requirements) is only marginally used. Michael Davis deplores this fact and tries to stimulate the discussion through his publication “The Scottish Castle Restoration Debate 1990-2012”. He puts the argument into the perspective of the 21st century and the specific case of ruin-preservation. In an attempt to propose a more creative, liberal approach to Historic Scotland’s relatively non-interventionist philosophy, Davis analyses certain key concepts.

A major concept used to guide restoration is authenticity, which is defined as the “conservation of cultural heritage in all its forms and historical periods, rooted in the

values attributed to the heritage” in the *Nara Document on Authenticity*.\(^{15}\) When applied to ruins, this notion becomes even more complex. Buildings were never designed to subsist as an empty shell and therefore one wonders whether a ruin might be the least authentic state a structure can achieve?

Furthermore, Historic Scotland’s guidance states that “proposals for restoration will only be viewed favourably when the monument can be restored authentically on the basis of surviving architectural evidence and authoritative pictorial evidence.”\(^{16}\) Davis asserts that no matter how “self-effacing” the consolidation is it leaves an additional layer in the history of a structure. The interventions of today quickly become the history of the future; the thought of a restoration/consolidation bringing a building to a previous state is therefore erroneous.

The drive for authenticity and honesty also urges charters to make statements such as: “All new work should be discreetly distinguished from the original work, with new areas of stonework being incised with the date of their construction.”\(^{17}\) We would, however, never consider incising the date of interventions on previous century’s additions.

The same fear of falsifying history induced the practice of reversibility in any new work. While the concept is not to be rejected per se, one must be aware that the idea of reversibility has been employed as an excuse for some unsympathetic interventions. Furthermore, Charles McKean states in the *Castle Tioram Public Inquiry Precognition* that:

> In paragraph 7.5 of Historic Scotland’s Statement of case, it states: “All phases of construction and modification are accepted as equally valid expressions of the archaeological and structural development” ... Each alteration, no matter how ill-considered, is considered of equal value—which allows those responsible to avoid having to make judgements. That was certainly not the intention of the pioneering European conservationists. True conservation, however, is not about words on paper: it is about making judgements that will support a building’s future.\(^{18}\)

Common sense and a case-by-case analysis are indeed essential for any conservation or restoration work. It is advisable not to blindly follow guidance documents without giving it further thought, especially since the views expressed in publications do not necessarily reflect the views of every division of the responsible body. A recent publication of *Focus* by Historic Scotland suggests, for instance, that “the way we treat monuments today will determine their future – and in considering this ‘future-proofing’ we should be aware of, and willing to learn from, some of the bolder interventions in the past.”\(^{19}\) This statement thus softens the general anti-restoration approach promoted in Historic Scotland’s guidance.

Debates about the concepts of cultural significance, stirred by varying fashions and a contemporary narrative, make the discussion around the rich history of ruinous castles intricate. Why are some structures considered to have iconic value as ruins (e.g. Tioram Castle—fig.3,p.14), while others acquire more national significance in their original design (e.g. Eilean Donan Castle—fig.2,p.13, or Stirling Castle—fig.12,p.32)?

\(^{16}\) Fawcett, article 16.6.
\(^{17}\) Fawcett, article 16.14.
Furthermore, not every ruin can be treated as a purely archaeological site. The question of which ones should be brought back into use thus becomes important. The issue of public safety may be one lead on the subject, since it can justify either the demolition of a derelict structure or its full restoration.

All of these valid and highly interesting points of views are worth keeping in mind while doing on-field analysis of ruinous castles in Scotland and their preservation/conservation.

**EVOLUTION OF CONSERVATION POLICIES IN THE 20TH CENTURY**

Along these theoretical debates, pragmatic developments happened during the 19th and 20th century in the field of Architectural Conservation in Scotland. Official conservation policies were established—even though protective legislation in Great Britain was relatively weak and late to develop.

The Scottish Office of Works was established in 1827 and charged with the maintenance of state-owned buildings. They primarily dealt with the after-math of the Reformation that caused the demise of innumerable abbeys and cathedrals. This constitutes a milestone in the development of a Scotland-specific set of policies regarding the conservation of ruinous structures.

The Ancient Monuments Protection Act of 1882 constitutes the first legislation aimed at preserving monuments in Great Britain. Based on the pioneering French monument model, the concept of *guardianship* was instituted; ancient monuments could be transferred into state care—the freehold and rights of private property remaining intact—and the Commissioners of Works would maintain and care for them at the expense of the state. *Scheduling* was another system that was introduced by the Act of 1882.

In the early 20th century, a cluster of new protective legislations further strengthened the state control of privately owned historic buildings. The Ancient Monuments Protection Act in 1900 was followed by a third Act in 1913, which instituted a required preapproval for proposed works and/or demolitions to scheduled ancient monuments. Furthermore, the concept of scheduling was extended to include a wider range of monuments, yet only unoccupied buildings were eligible. A further Ancient Monuments Protection Act was issued in 1931 that strengthened the preceding Act from 1913 by requiring three months’ notice before any work is done on a scheduled monument.

Between 1911 and 1913, 20 monuments—of which eight were historic castles—were brought into state guardianship. The 1920s and 30s saw around 100 buildings and sites being taken into state care. A quarter of those were historic castles. The mid 1930s were peak years for the guardianship system and 115 castles were declared as scheduled ancient monuments (but this does not necessarily mean that they were taken into guardianship as well).

Eventually, the Town and Country Planning Act of 1947 offered a means of protecting buildings in use. The Act furthermore made the owners of listed buildings financially responsible for the conservation/restoration instead of the state. It might be worth noting that a building can be both scheduled and listed since the creation of this act, and that the corresponding policies do not necessarily match.
As previously mentioned, the Historic Buildings and Ancient Monuments Act of 1953 made generous state grants available to private restorers thus hugely influencing the castle restoration field. The most current form of this Act is the Ancient Monuments and Archaeological Areas Act of 1979, although the procedures have been slightly changed since the establishment of the Scottish Parliament in 1999.

All in all, continuously strengthened policies, expressed in Ancient Monuments Acts, created a shifting context for castle restoration/conservation in Scotland during the last century.

CENSUS OF RUINOUS CASTLES IN SCOTLAND

It is estimated that 800 to 1000 castles and fortified houses were under legislative protection by the end of the 20th century in Scotland.\(^20\) However, these legal protections do not prevent decay and the eventual collapse of the structures; protective measures solely apply once the owner decides to alter or repair his property.

A census of currently ruinous castles in Scotland has thus been carried out for the purpose of this research; the author acknowledges, however, the limitation of this likely incomplete census. A map and a list indexing key information are included in Appendix 2. The following conclusions were drawn from the survey:

- Around 60 ruinous castles over the country are Historic Scotland properties. Most of these are open to the public. The question of tourism’s impact can therefore not be ignored in the context of consolidation for these ruins.
- The National Trust for Scotland does not own a single ruinous castle; all of their properties have been restored and brought back into use.
- Another 230 ruinous castles, mostly privately owned are included in the list produced from this study. As Thompson wrote, “the vast majority of privately owned ruins are left untouched. Ruins are deteriorating all the time, and it is on practical and economic grounds only possible to halt this deterioration in a minority of cases by direct intervention which cannot in any case stop the erosion of the stone.”\(^21\) A map crossing the information of ownership with the type of construction shows that most major castles are property of Historic Scotland, while smaller-scaled tower-houses are in private ownership. (fig.13,p.36-37)
- The state of ruination is highly variable within the list, ranging from few masonry rows barely standing over ground-level, to walls being almost fully intact. The common feature is the lack of roof and the structures’ intense exposure to external elements.
- Only some of these castles are included on the list issued by the Scottish Castle Initiative who aims to “highlight ruined castles and tower-houses that could be successfully restored and reused.”\(^22\)


\(^{21}\) Thompson,p.22-24.

Finally, out of this list, eight castles belonging to Historic Scotland and one privately owned tower-house were selected as case studies in order to provide an insight into the general conservation technologies used to consolidate variously weathered and dilapidated ruins in Scotland.
PART III
TECHNICAL CONSERVATION
However much solicitude may be lavished on a ruin, it has no indefinite life; we can take steps to prevent it falling down, but we cannot prevent erosion of the stone by the weather.

GENERAL PROCESS OF RUINATION

Causes of Degradation

The agents of destruction can be classified in broad categories:

- Natural erosion and effects of the climate and vegetation: wind carrying abrasive particles, especially in maritime environments, ceaseless rain, wide seasonal variations in temperature, action of frost and thaw cycles, activity of roots, etc.
- Catastrophes: storms, flooding, fires, etc.
- Human interference: fire, pillage, levelling and quarrying for reuse of materials, etc.

Although not an agent of destruction per se, the material in which the structure is built of is an important factor in the decaying process. Wood, of course, will deteriorate much faster than most stones; equally, some stones will suffer greater decay than others according to their geological composition.

Some inappropriate restorations from the 20th century show the extent damage can reach if the wrong material is chosen. Cement mortar has often been used in conservation works to repoint ancient masonries when the traditional lime mortar was badly decayed and washed out. A few decades later, we see the error of this action: cement, a “non-breathable” material, traps water inside the masonry, which will then have no choice but to find a way out through the softer stones instead of through a sacrificial mortar; the end result being that the stone erodes faster.

Excluding the scenario of a natural catastrophe or historical event causing the sudden and immediate loss of structures, severe damage will occur gradually over time, once the natural elements gain access to the interior of the building. The general process of ruination may start with the partial loss of roof coverings, thus letting the rainwater into the building. Over time, the remaining roof materials will become moist, until they eventually collapse. The loss of the roof often constitutes the fatal blow. Water is indeed a major enemy and it is the origin of almost every other type of damage a structure can encounter.

Collapse will continue through the consecutive loss of floors within the height of the building. Timber floors will go missing first, whereas stone vaultings resist longer. In many observed cases of castle ruins, ground-floor barrel vaults have suffered a structural deformation induced by the remaining freestanding walls on higher levels opening up and becoming off-plumb, thus creating a new load-path through the masonry. Stones falling from the exposed masonry onto the extrados of the vaults constitute another hazard. In general, instability of the foundation is rarely observed as long as there has not been an excessive erosion of the ground, which might happen for castles located close to the coastal line.

To sum up, a series of consecutive events is most often at the origin of the collapse of an unmaintained structure. Multiple factors and related issues exist; the following chapters therefore provide a more in-depth analysis on observed decaying and weathering mechanisms as well as on structural deformations.
Scottish weather in the UK, climate changes and trends - fig.14

June rainfall year-to-year variations from 2011-2014

UK rainfall annual average (1981-2010) max.>3000mm, min.<600mm

UK temperature annual average (1981-2010) max.>11°C, min.<4°C

UK wind speed average (1981-2010) max.>25 knots, min.<6 knots

WEST SCOTLAND
- Mean Temperature Increase: 2.0°C (1.0°C - 3.0°C)
- Mean Precipitation Increase: 15% (5% - 35%)
- Mean Temperature Increase: 2.4°C (1.1°C - 3.8°C)
- Mean Precipitation Increase: -13% (27% - 1%)

EAST SCOTLAND
- Mean Temperature Increase: 1.7°C (0.7°C - 2.9°C)
- Mean Precipitation Increase: 10% (1% - 30%)
- Mean Temperature Increase: 2.3°C (1.1°C - 3.5°C)
- Mean Precipitation Increase: -13% (27% - 1%)

NORTH SCOTLAND
- Mean Temperature Increase: 1.6°C (0.4°C - 2.9°C)
- Mean Precipitation Increase: 13% (7% - 30%)
- Mean Temperature Increase: 2.0°C (0.3°C - 3.4°C)
- Mean Precipitation Increase: -11% (24% - 2%)

Climate changes Trends for Scotland

Threave Castle after flooding in January 2014 - fig.15
**Threats**

Lately, the Technical Conservation Division in Historic Scotland has been concerned with sustainable building conservation. Several publications show a growing concern regarding the ongoing climatic changes and its effects on ruinous structures. Since the 1960s, Scottish weather has generally become wetter and warmer, sea levels have risen, and extreme weather events such as storms and floods are more common *(fig. 14)*. Historic Scotland uses the example of Threave Castle, which was flooded and completely inaccessible in January 2014, to show the effects of climate change *(fig. 15)*.

On the long run, if they remain unprotected and uncared for, some structures might well be lost. Historic Scotland, for instance, decided to accept and manage the loss of heritage at Lochmaben Castle.

**HOW TO PRESERVE A RUIN: CONSOLIDATION AND DISPLAY**

Since the continued decay of any derelict structure exposed to external conditions is inevitable, much thought has to be given to the preservation, consolidation, and conservation of these ruins. Financial issues aside, (thus deliberately ignoring the gap that exists between privately owned ruins that rarely have access to the level of state-funding that properties in Historic Scotland possession receive), the conservation of a ruin will happen along two major axes: preservation and display.\(^{23}\)

Preservation will aim to consolidate the ruin through actions such as excavation, removal of debris and vegetation, consolidation and finishing off the wall-heads once they are reset to a height that makes them capable of withstanding the weather, repointing, local stitching and/or consolidation of fractured elements, repair, substitution or replacement of certain features. All of these interventions have an impact on the fabric itself and on the peoples’ perception of the structure:

> Even a punctilious consolidation scheme, however, will have a greater interaction with the original fabric than the unsuspecting may realise.\(^{24}\)

The desire to make the preserved ruins accessible and understandable for the public is a second branch of activity to be considered. The display of historic sites comprises both physical and intellectual aspects. Access is the chief concern of the former – access to the site (public transport, car parking available, etc.), and access to the various elements of the ruins themselves (wheelchair and limited mobility accessibility). The installation of facilities such as a ticketing area and lavatories is another matter to be considered.

Most visitors will lack the background-knowledge to fully understand the ruin if they are not guided through with explanatory texts and graphic representations; plans showing the construction phase, as well as sketches, will enable the mental reconstruction that leads to the satisfaction of understanding a derelict structure. Some additional and occasional exhibitions, floodlighting or “sound and light” shows can add to the educational purpose and enjoyment of historic sites.

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\(^{23}\) Information for this sub-chapter extracted from Thompson’s book.

\(^{24}\) Davis, p.20.
CASE STUDIES

On-site visits to eight castles belonging to Historic Scotland (Bothwell, Cadzow, Crichton, Crookston, Dirleton, Hailes, Ravenscraig, and Tantallon) and one privately owned castle (Duntarvie) gave a good overview to various issues and conservation approaches. These castles, located in the central belt, constitute an accessible and fairly representative sample, displaying all the failures expected to affect important ruinous structures.25

This research focuses predominantly on on-site observations, analysis and experience, using condition surveys carried out by Historic Scotland to shed some light on certain remarkable facts.26 The observed pathologies—which are the reason why technical interventions are required—can be classified in two families: material decay and structural deformations.27

MATERIAL DECAY

Stone decay

Every exposed stone is bound to erode over time; the scale of weathering is much bigger for non-habited ruinous structures which then become a perfect case-study. A considerable variation in the degree of stone deterioration has been noted throughout the analysis—even within the same ruin. A particularly interesting case is Bothwell Castle, which shows various advanced mechanisms of decay within seemingly identical stones (fig.16). The degree and type of erosion a stone will suffer is primarily linked to its geological composition; softer sandstone (the primary construction material of most Scottish castles) will suffer from disintegration through crumbling, powdering or sanding and tend to present softened rounded edges (fig.17), whereas harder laminated stone will exhibit a delamination pattern (fig.18). Delamination constitutes a physical separation into layers of the laminated stone; on cant laid laminated stones are excessively vulnerable to this type of erosion. It is not to be confused with scaling, which is independent of any geological structure and thus can affect any stone.

Furthermore, it was striking to find stones showing almost no signs of decay next to heavily eroded ones (fig.19). It seems reasonable to make the assumption that geologically different stones were used for repairs or for later additions/transformations. The availability of local stones varied in the era before organised and professional quarrying, thus forcing builders and owners to resort to using diverse stone types—which may have even come from recently destroyed castles nearby. Fig.19 shows the effects of using materials with contrasting densities: when next to much harder stones, softer stones will suffer from intense erosion, called coving.

Water searching a way out of the masonry will always favour the way through softer materials. This highlights once again the importance of the mortar not only being “breathable” but also softer than the stone in order to be sacrificial. Repointing is thus part of regular maintenance work; the complete repointing of weathered out joints is

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25 Description and pictures for each of these castles in Appendix 3, p.105.
26 Historic Scotland Condition Surveys in the Appendix 4, p.124.
27 The Illustrated Glossary on Stone Deterioration Patterns by ICOMOS is used as reference. Definitions in Appendix 5, p.125.
Advanced coving and alveolisation due to cement repointing - fig.20

Alveolisation - fig.21

Weathering accelerated by wind erosion - fig.23

Casehardening - fig.22

Subflorescence - fig.25

Deposits and crusts - fig.24
generally required every 50-60 years, although an exact number can’t be determined especially in the case of rapidly and continuously decaying ruins. Excessively hard mortar causes surrounding stones to erode much quicker than natural weathering would. Several instances of this type of weathering seen on-site (especially in Tantallon) show how extensive this damage can be; advanced coving and some striking examples of alveolisation occur \( \text{(fig.20)} \).

*Alveolisation* is also found in soft stones which have not been repointed with hard cement mortar \( \text{(fig.21)} \). This decaying process is due to the geological properties of the stone: inhomogeneity in physical or chemical properties will result in a differential weathering when the stone is submitted to natural elements.

A last decaying process, once again linked to water migration, is *casehardening or contour scaling*, and constitutes a threat to the stone’s integrity \( \text{(fig.22)} \). The mineral cement particles contained in the geological composition of sandstone are carried to the surface through consecutive wetting and drying-out cycles. The outer face then becomes denser, while the rest of the stone is demineralised. Crusts that can or scale then form.

**Stone decay in marine environment**

The location of the structure, which influences the external elements it is submitted to, is another important factor in the varying degree of stone deterioration.

The heavily eroded castle of Tantallon, located on a coastal rock promontory overlooking the open sea, is the finest case-study of marine environmental decay. Ravenscraig Castle is also located on the sea, but on the narrow Firth of Forth, thus leaving it far less exposed to extreme wind conditions. Ravenscraig is also built out of harder stones. Strong winds around Tantallon, carrying abrasive salt particles from the seawater, constantly twirl around the high-standing ruin and thus further erode its stones \( \text{(fig.23)} \).

**Discoloration and deposit**

At first glance, it is difficult to make the distinction between stone deterioration with geological aspects such as blistering, delamination, or scaling from *deposits* forming a crust on the surface of the stone that can then peel away \( \text{(fig.24)} \). *Crusts* are characterised by an accumulation of materials in areas protected from waterfall washing off the particles. According to its composition, the crust adopts various colours; a black crust can for example be composed of particles from the atmosphere trapped in a gypsum matrix. A chemical process causes intrinsic particles to react to polluted water and form gypsum. Since gypsum takes up a bigger volume, it will create a pressure on the external layers of a soft stone and cause them to burst, thus exposing the white gypsum powder. The initial *subflorescence* soon fixes atmospheric particles and forms a crust \( \text{(fig.25)} \). If the water ingress is not stopped, the process will keep repeating through the layers, thus causing the loss of substance. Casehardening also often takes on a black crust since atmospheric particles stick to the stones’ surface \( \text{(fig.22)} \).

White crust can be a simple layer or film of particles that are deposited on the stones’ surface without any internal chemical reaction; this process is called *efflorescence*. The most frequent type of efflorescence is caused by salt concretion due to the evaporation of water carrying salt particles. This type of efflorescences are therefore often seen on the contours of soiled areas \( \text{(fig.26,p.48)} \). Crichton shows another case of white
efflorescence linked to water running from a new capping intervention and leaving mortar stains (fig.27).

Encrustations and efflorescence constitute a threat to the stones’ integrity since particles migrating with water through the masonry can crystallise during freeze and thaw cycles, thus expanding their volume. The stone might then endure compressions and/or tensions beyond their breaking point and burst.

Furthermore, some ruinous castles, such as Hailes, Ravenscraig or Bothwell, show a rather striking amount of soiling along their wall-heads (fig.28). The staining pattern clearly shows that it takes its origin from water run-off. Any protruding horizontal surface such as cornices or wall-heads can become an area on which water stagnates. The humid areas will then fix staining particles carried in said water.

Some black veils are due to an intensive algal growth. Fig.29 shows a striking example of soiling linked to water run-off that caused the fixation of (green) algae. Further testing and probing is often required in order to know the exact composition of the stain.

Exogenous (metallic) elements such as hand-railings or copper flashing cause another type of staining (fig.30). The high amount of metal sulphates contained in rainwater run-off become fixated on the stones’ surface (e.g. copper flashing within rough racking in Ravenscraig, fig.27-right). Fig.31 shows another example of this pathology, along with a rather high amount of differential stone weathering, black crust formation, humidity patches, and some efflorescence. Fig.32 displays a different kind of soiling linked to water run-off with high ferruginous and/or clay content. Birds are a further factor to consider in the presence of soiling and organic waste (fig.33).

A last pathology in this category is the non-natural, man-made graffiti. Scratching, engraving or the application of paint on the stones’ surface is an ongoing current problem, especially if ruins are accessible to the public. Very rarely, graffiti with historical, aesthetical or cultural values becomes the object of conservation.

**Humidity and biological colonisation**

Dilapidated ruins exposed to the highly variable Scottish weather will most often suffer from a certain amount of humidity. And yet, the fact that those structures are exposed to natural elements is also what keeps some of their elements from being constantly moist. Without natural ventilation, sunlight or heat to enable water to evaporate, unoccupied, enclosed, and covered spaces tend to show a high degree of dampness; shady areas will be moist (fig.34,p.50).

Some traditional thick masonry will most likely never have the time to dry out before the next rainfall, especially if their rubble core has become moist. Hailes Castle shows extensive humidity patches on both sides of its Great Hall. The soft red sandstone used for this building is capable of absorbing great amounts of water. Dirleton Castle also presents some major damp patches, which have already been noticed during a condition survey in 2002 (fig.35,p.50).

Bothwell Castle showcases the most impressive case of dampness. Although the degree of visible humidity is partially related to the weather conditions of the days or weeks prior to the visit, it can be asserted that the ruins of Bothwell chronically suffer from major dampness issues (fig.35). The pattern of the humidity patches demonstrates that, against
common belief, dampness is not necessarily linked to rising dampness problems or solely a result of run-off water from the wall-heads.

The humidity level of ruinous structures in Scotland is thus dependant on seasonably variable weather conditions, the morphology and the location of the ruin, and the geological composition of the stone.

Thermal imagery can be used to indicate the level of dampness in the structure. Unfortunately the thermal pictures taken during on-site visits seem rather inconclusive–especially regarding the massive humidity patches in Bothwell and Hailes. Some assessments can, however, be gathered from the data: wall-heads and any kind of protruding horizontal surfaces are several degrees warmer (3°C in average) since sunlight directly reaches them; and in the same logic, corners tend to be colder. This is merely linked to surface temperature and weather conditions, rather than core temperature of the material. Different materials–even different geological stone compositions–also exhibit varying temperatures (fig.36).

It remains certain that water ingress is the main origin to many problems. Excessively moist areas are, for instance, often host to a great variety of vegetation growth such as algae, lichens or moss colonisations. Therefore, covered, enclosed spaces showing a high degree of humidity often present impressive biological colonisation (fig.37,p.52). Localised patches indicate a source-specific water infiltration rather than a general dampness of the enclosed space. Vegetal organisms attack the outer masonry as well; open joints are particularly vulnerable locations, as well as protruding elements such as cornices, ledges and wall-heads (fig.38,p.53). Specific soiling traces combined with vegetation growth are furthermore to be traced back to the presence of waterspouts above (fig.38,bottom-right). Biological colonisation is, however, not considered directly harmful to the stone–as long as no plants are taking root in the masonry.

**Recommendations**

There is no unanimous solution to be offered to the above mentioned decay-mechanisms, even on a purely technical level. First of all, solutions should always be offered on a case-by-case analysis, based on a sound understanding of the origin of the problem. Moreover, the case of ruins is particularly tricky. Once the choice is made to preserve a ruin as a piece of fragmented archaeological evidence of the past (cf. 1990s Historic Scotland repair-only approach focusing on the consolidation of ruins) and thus not fully restore it to a new use, the structure will remain exposed to windy and rainy weather conditions. Without a function to facilitate regular maintenance, the origin of the problem will thus persist and the pathology will therefore be recurrent, even if the symptoms are treated. However, some leads can be given.\(^\text{28}\) Regular maintenance is always a good starting point in conservation. It is, for instance, necessary to regularly repoint defective mortar and fill hungry joints, in order to maintain a reasonable adherence of the stones. We have also seen that excessively hard mortar is causing excessive harm to surrounding softer stones; it is therefore vital to cut or rake incongruous mortar out and repoint the masonry with an adequate softer lime mortar.

\(^{28}\) Cleaning techniques extracted from observations and readings done for my previous dissertation about *Luxemburgish Sandstone–Stone deterioration and repairs*. They were also discussed in a previous work: “Study of a Barrel Vault” for Conservation Technologies at the University of Edinburgh,2015.
Biological colonisation in damp areas - fig. 37
Vegetation growing in hungry joints and on protruding surfaces - fig. 38
The treatment of decayed stones in ruinous structures calls for some philosophical choices. Whilst it is common to repair deteriorated carved pieces, it is less common to resort to plastic repairs (epoxy resin) or indents for common masonry in dilapidated ruins, as long as they are structurally sound. In Riegl’s words, carved pieces have a strong historical value which leads conservationist to restore the feature to its previous glory, whereas common dilapidated masonry presents an increased age-value. The patina of weathered masonry is often left visible in a charter-compliant “leave-as-found” approach. Raking out, tamping and pointing, along with rough racking, are common practices that have widely been used in 20th century conservations. In specific, rare cases, one might consolidate certain stones through injections (e.g. ethyl methacrylate, fig.39).

As far as vegetation growth is concerned, a simple brushing might do the trick if the masonry is dry enough not to support further growth of vegetation. Let it be noted that carefully brushing the masonry will also remove loose (crumbling, peeling, scaling, spalling) material. If the brushing is not sufficient against biological colonisation, one could proceed with a soft gommage, which is a technique derived from the much more aggressive (and now heavily criticised) technique called sand blasting. Loose abrasives are projected onto the structure under low pressure to clean the surface, either with a water addition (hydro-jet cleaning) or without. There is, however, a risk of losing a thin top-layer of material during this process, regardless of how gentle the parameters for the gommage are (fig.40).

Chemical treatments should also generally be avoided. Porous materials can absorb the chemicals and this may lead to new and unintended soiling. If the decision was, however, made to use biocide products for localised troublesome areas, on-site test samples should be carried out in order to observe the ruin’s response. Water-repellent coatings are to be avoided since traditional masonries are breathable constructions, which need to remain so in order to allow the masonry to naturally dry out. This is especially true for highly exposed ruinous structures.

The application of clay compresses to draw salt out of the masonry is an efficient treatment against efflorescences (fig.41).

It is worth noting that several modern, more sophisticated cleaning methods exist for the treatment of delicate elements or for resilient stains. Nebulisation is for instance used on sculptures. Once a nebulisation chamber has been set up in a workshop, the statue is temporarily removed from its original position and treated inside the chamber (fig.42). The process of nebulisation softens vegetal colonisations without soaking the sculpture. Biological growth can then be brushed off. Cryogenic treatment is another up-and-coming, expensive field of research in the fight against vegetal colonisation. Dry ice is projected onto the respective areas under the moderate pressure. Tenacious biological organisms are then left to die out, and finally brushed off. On one occasion the author has even witnessed the use of a pneumatic hammer to get rid of tenacious encrustations (fig.43).

Finally, condition surveys and conservation history & strategies carried out by Historic Scotland show that attention has been and is still given to their ruinous properties through regular maintenance, inspections29, and monitoring (of cracks, deformations,

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29 Inspection teams go on-site up to once a week, along with annual (complete) check-ups.
joints, weathering, erosion, vegetation growth, staining, and dampness). Previous interventions are indeed responsible for the fact that some ruinous structures have remained in a reasonable state of preservation and current, ongoing maintenance, possibly through the above-mentioned techniques, keeps the dilapidated ruins sound and safe to visit.

**STRUCTURAL DEFORMATIONS**

**Loss of fabric – rebuilding?**

A certain loss of fabric is inevitable with weather-exposed ruins. Without interventions, towers and walls submitted to wind and storms will eventually collapse. Ruins have come down to us in highly variable states of conservation, which is why choices have to be made in the process of preserving the remains. These choices will strongly influence how the ruin is experienced by visitors, and even professionals.

An exposed rubble core is a common feature of ruins (*fig.44*). The majority of the case studies had at least one section of wall-core exposed, which is in keeping with preservation-focused theories stating that “where facing masonry has been robbed or lost, and only a rubble core remains, every effort should be made to preserve this core in its existing state.”

The ruins of Hailes Castle show a considerable amount of exposed rubble core, consolidated through rough racking and consistent repointing (*fig.45*). Tantallon’s West wall constitutes another impressive example of exposed rubble core, mixed with massively decayed facing stones. Tantallon’s advanced state of decay is probably linked to its highly militaristic background as a frequently besieged castle (*fig.46* & *fig.48*).

On a larger scale, Ravenscraig Castle combines several conservation decisions into one single structure. The towers were consolidated and rebuilt, while some parts of the rubble core were left exposed on the northeast elevation, and the subsidiary domestic buildings are barely visible as foundations above ground. Various levels of readings are thus laid out in one glance (*fig.47*).

The most recent example of partial reconstruction is the restoration of the mid-tower in Tantallon Castle during the early 2000 (*fig.48*). The original green breccia stone was heavily eroded (up to 75-150mm back from the red sandstone bands.)

Freshly cut green sandstone has been used to reface the majority of the fore-tower. It remains to be seen whether the density of the chosen minerals is too dissimilar from the soft red sandstone, which would cause the adjacent fabric to suffer advanced coving. The author of the present work suspects that the stones geologically match (probable suggestion by the British Geological Survey).

Another feature of note at Tantallon is that the sea-facing side of the mid-tower presents an interesting pattern of ruination. The southeast corner has progressively disintegrated whereas the rest of the tower remains more or less intact. The late 14th century tower in Crichton Castle presents a similar ruination process: one corner of the massive tower has collapsed, leaving the interior in ruins but the rest of the envelope standing (*fig.49*).

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30 Fawcett, article 3.20.
31 *Tantallon Castle – Condition Survey 2000*, p.35.
Missing lintel - fig.50

Bracing of freestanding wall - fig.52

Missing lintel consolidation - fig.51

Stitched slabbed ceiling - fig.54

Bracing of rubble underneath chimney lintel - fig.55

Cracks and fractures in Bothwell Castle - fig.53

(a) Bothwell  (b) Bothwell  (c) Bothwell
As a result, the tower that remains allows the visitor to understand the historic building techniques and layouts through a sort of (de)constructivist conservation technique. Some visitors might also see a certain appeal in this particular loss of material as a demonstration of nature’s force.

Overtime, certain architectural features go missing, like the window lintels of the 1585 renaissance wall in Crichton (fig.50), or parts of sculpted ornaments. Repair-wise, architectural choices have to be made. Future conservations might, for instance, decide that the ornamented chimney in Crichton has an outstanding artistic value that is worth preserving; repair through indents then becomes an option. Also at Crichton, a partially collapsed lintel is being supported by metal rods that have been sealed into the original fabric. The shape of these bronze bars perfectly follows the irregular soffit and keeps an elliptic-arch form for the other missing half, thus giving the visitor an impression of the original doorway (fig.51).

Despite all, technology can only offer possibilities; people dealing with modern ruin-conservation will have to make choices. Is a certain loss of fabric and heritage acceptable, or is the restoration of specific elements needed in order to enhance the scientific historical value of the castle? The various examples used in this sub-chapter show that a consensus about how to handle said loss of fabric is hard to reach, since a case-by-case approach is favoured according to the values represented by each castle.

**Cracks, fractures, and unstable parts – propping?**

The fact that there are relatively few cracks and that seemingly unstable parts are still standing is proof that ruinous structures are actively being cared for. On such example is metal bars that have been installed in Crookston tower-house in order to prop and brace a free-standing wall (fig.52).

Bothwell Castle exhibits a diagonal fracture springing from a window in the east staircase-turret. Modern consolidation methods have been used around the opening and the fracture has been filled in (fig.53(a)). Furthermore, the doorway towards the great hall has had to be propped with provisory means (fig.53(b)). Instabilities in that area might result from the poor junction between this early 15th century volume and the original 13th century curtain wall. Historic Scotland monitors any ongoing movements on the northwest tower of Bothwell; a superficial fissure found on this tower might be a translation of the movements Historic Scotland detected (fig.53(c)). Monitoring the movements of active fissures and fractures is advisable in any case. Understanding the origin of the crack is important, especially before deciding on an appropriate mixture to fill it in with.

A different repair approach has been chosen in Dirleton Castle where a slabbbed ceiling has been stitched together with visually intrusive phosphor bronze clamps (fig.54). Furthermore, Dirleton Castle’s kitchen chimney lintel has been braced. The metal strap holds together masonry that has been added underneath the actual voussoir lintel rather than consolidating a structural instability of the lintel itself (fig.55).

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Consolidation of wall-heads

Unstable wall-heads are a prominent problem in the field of ruin-preservation. Often, dilapidated and loose masonry needs to be secured. Various techniques, which are detailed below, have been employed over time.

Rough racking

One of the most used wall-head consolidation techniques for ruins is rough racking. Using this technique, the wall is covered in a thick layer of mortar (either lime or cement) with a certain amount of stones being left visible. This method thus leaves the impression of a ruinous fabric exposed to nature’s forces that suggests a natural, authentic, left-as-found character (as opposed to modern, clean-cut interventions) (fig.56).

Nearly all castles studied had portions of wall-head sealed off through rough racking. Nevertheless, some issues can appear with this type of intervention, such as soiling of the wall-heads through rainwater run-off and vegetation growth in the mortar (fig.57). Irregular “authentic” geometries, as opposed to effective slightly sloping surfaces, allow water to stagnate, or at least channel run-off water in specific paths, resulting in deeply moist stains on the facing masonry.

Slabs and Flagstones

Tantallon Castle presents a smoother version of rough racking through the application of slabs or flagstones (fig.58). It is, however, a peculiar example in that the whole ruin is constituted of this impressive long 14th century wall; visitors explore the stairs and rooms comprised within the thickness of the curtain wall. Flat walking surfaces, edged by equally flat wall-heads and protective handrails or fencing are therefore required.

Another particularly emblematic case (which has not been analysed further in this research) is the palace in Linlithgow, where flagstones have been laid on the wall-heads and the surfaces generally finished off perfectly horizontally (fig.59).

Hard capping

Crookston Castle offers another consolidation technique for the wall-heads. A protective hard capping was applied using cementitious granolithic mortar screed before the castle came into state care (fig.60). Some negative effects of capping a traditional masonry wall with water-repellent cement can be soiling on the walls linked to particles carried by the water being shed off the wall-heads. The major problem noted during the 2012 Historic Scotland condition survey is the cracking and slight lifting of the capping at the edges. Other sections of Crookston Castle have been capped with asphalt, which effectively sheds 100% of the rainwater. This causes severe saturation of the upper masonry with all the aforementioned consequences. The recent installation of waterspouts helps cast rainwater clear off the masonry. The 2012 condition survey states that asphalt recapping of the wall-head is being considered as a long-term solution, along with selective hydraulic lime mortar repointing of hungry joints and the consolidation of lose sections.

33 Crookston Castle – Condition Survey. 2012.
Wall-heads capped off with ashlar in Crookston Castle - fig. 61

Soft-capping on a section of Bothwell Castle's curtain-wall - fig. 62
Crookston Castle furthermore uses newly-cut ashlar-dressed stones to cap off the parapets of its lost tower. This technique does however take away from the traditional ruinous expression, through its horizontally cut-off appearance (*fig.61*).

**Soft-capping**

The excessive dampness at Bothwell Castle was the incentive to try out a different up-and-coming technique to shed rainwater from wall-heads. A couple of years ago, soft-capping has been applied to a section of the curtain wall in order to observe the effects the technique would have on this particular ruin (*fig.62*). *Fig.62* proves that the technique is effective: the upper part of the masonry is considerably dryer underneath the soft-capped portion of the wall.

According to a research report conducted by Historic Scotland on *Soft-capping in Scotland*, living plants and soil can be used to form “a thermal and moisture-buffering layer.” This layer works to diminish a number of decay mechanisms such as erosion, soiling due to rainwater run-off through soluble mortar binders, and effects related to freeze-thaw cycles. Soft-capping is considered to be a long-term, low maintenance solution with wide environmental benefits, and thus presents both economic and ecological advantages compared to hard-capping. A further charter-compliant benefit is that the technique is fully reversible.

This technique, which has its roots in vernacular architecture and has been used in recent centuries to preserve ruins, has increasingly become a preferred conservation method in Scotland since the mid-1990s. A SPAB note from 1903 suggested that wall-heads may be “covered with earth and turf” in order to protect ruinous walls. The technique proves particularly adaptable to irregular surface geometries thanks to its malleable and cohesive nature. However, not every substrate material has the same efficiency as host structure.

Scotland’s climate (*mild winters, cool summers, damp air and high levels of precipitation*) is generally favourable to a successful use of soft capping. One has, however, to give the selection of appropriate plant and soil materials the necessary thought. Eventually, the plants should be able to regulate the amount of rainwater seeping into the masonry by absorbing or retaining the water on the surface and allowing it time to evaporate. Furthermore, the use of clay-rich soils proves to be effective in excessively wet weather; previous 18th and 19th century restorations in Cadzow Castle, for instance, used a thick clay capping as waterproofing measures. For excessively damp climates or fragile structures, a full water-repellent barrier can be achieved through the incorporation of a damp proof membrane.

The occasional removal of invasive plants from the turf is often the only required maintenance. On rare occasions, the plants’ roots grow through the soft-capping and grip the masonry, which can then be damaged or loosened from its bedding. The technique is

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34 Historic Scotland, Research Report: *Soft capping in Scotland: the context and potential of using plants to protect masonry* – Vol 1, p.XV.
35 Ibid.
Effects of free-standing walls - fig.63

Theoretical behaviour of an arch under linear loads - fig.64

Location of the previously analysed vault - fig.65

Overlaying and comparison of section 1 to 4 with half circle - fig.66
not infallible: constant strong winds or solar radiation are performance reducing factors that can cause the edges to lift or dieback and the soil to progressively erode. Salt sprays in marine environments constitute another potential threat.

Lastly, a debate about the aesthetic benefits of soft-capping has arisen in the past decade. While some consider it to be visually fitting for ruinous structures since it mimics the natural process of biological colonisation (which links back to Romanticist and Picturesque views where ivy growth enhanced the theatrical effect and appreciation of the ruin), objectors argue that clean-cut, unnaturally green, poor-biodiverse examples may be seen as an eyesore on weathered structures.

As no technique is foolproof, most ruins consolidation projects combine several of the above-mentioned techniques. The non-unitary approach is a result of evolving conservation approaches and techniques over time.

**Deformation of vaults**

Tall, free-standing walls that are no longer braced with floors or a roof significantly impact the stability of subsisting vaults underneath. The opening up of these walls puts them off-plumb and induces a bending or twisting moment in the abutments (*fig.63*).

Free-standing walls are not the sole responsible for typical vault deformations like the flattening of the crown arch as the supports spread and the sagging/hogging along the longitudinal section (*fig.64*). Settlement, walls’ lack of thickness in order to contain the thrusts, poor quality of bonding material, local excessive thrust applied to the vault, are other possible explanations to structural deformations. According to Ochsendorf:

> These movements result from a wide range of causes, including foundation subsidence, construction defects, creep in the mortar, vibrations, etc., and they will continue to increase over the life of the structure. ... For masonry arches in historical buildings, small movements of the supports can destabilise the arch and can lead to collapse over time. As the supports move apart, the geometry of the arch adapts, causing the crown of the arch to descend, which increases the value of horizontal thrust.\(^{39}\)

The vaults in Duntarvie Castle, which are analysed in this sub-chapter, showcase extreme deformations linked to the type of movements mentioned by Ochsendorf. This analysis, however, was able to exclude a number of the sub-mentioned causes: excessive point loads on vaults is highly unlikely, the walls are at least one meter thick on the ground-floor and around 75 centimetres in the upper floors of the west tower, and the openings are not squinted, which excludes settlement. A previous analysis of a stone rubble barrel vault on the ground-floor of Duntarvie Castle (*fig.65*) revealed that this true barrel vault spanning around five meters showcases the aforementioned flattening of the crown arch (*fig.66*).\(^{40}\) Some accentuated bulging (both inwards and outwards) was attributed either to the presence of a large corbelled fireplace accentuating the off-plumb character of the free-standing walls, or to the preceding collapse of next-door vaults and part of the analysed vault itself. These observations become particularly visible when compared to a half-circle, which is considered to be the ideal shape for this barrel vault.

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West tower vault, with important web of cracks - fig.67

Diagram of the profiles (Total Station survey) and comparison with half circle - fig.68

West Edge, Eastings and Northing - fig.69
Moreover, an on-site total station survey was carried out on a second rubble barrel vault in the west tower. The intricate over-all geometry of this tower made a complete survey rather difficult (fig.67); several observations can however be made.

A web of cracks and fractures on the intrados is irrefutable proof of movements creating instabilities in the analysed vault (fig.67). These cracks tend to happen along the mortar rather than through the stones, thus breaking up the bond between the stones. The vault has been stabilised prior to this survey: pinning stones were installed where possible in order to secure loose stones and a new wet lime mortar and concrete fill was poured over the vault stones. The mix was allowed to seep through the fractures. A mass fill and temporary concrete paving slabs were then installed over the stabilised extrados.

The 2015 survey done for this research depicts a flattening of the crown-arch of this barrel vault due to the spreading of the bases—if the assumption is that the original shape was perfectly half-circular upon construction (fig.68). This might not be the case, since vaults usually were rendered, thus reducing the need for a perfectly smooth regular stone face.

Section AA and BB are contained and reveal no other problem than the aforementioned spreading of the support. On the other hand, section CC, located in a particularly bumpy area near the fractures, exhibits some severe bulging. The irregular surface of the intrados made the survey hazardous; the first point of section CC is, for instance, probably taken inside the crack and not just along it as initially intended. The west edge features some bulging as well. A cross checking of the data by rendering the eastings and northings gives a diagram which shows that the measured points are not perfectly located in the same plan and thus confirms the bulging on the vault’s intrados (fig.69).

Finally, the survey of some ridges shows a hogging of the measured barrel vault (fig.70,p.68). Ridge DD, approximately located on the crown of the arch, shows a greater degree of sagging in its middle than ridge EE located a bit lower to the north. The deflections all largely remain in the acceptable boundaries.

Last but not least, a 3D rendering of all the measured points presents a somewhat fragmented view of the hard-to-reach overall geometry (fig.71,p.68).

Recommendations – Structural stabilisation and/or repair

An in-depth survey should be carried out on a case-by-case analysis before any kind of structural intervention is carried out. Since most structural issues are somehow related, it is important to understand every single deformation in the analysed ruin. It is generally advisable to set up some sort of monitoring in order to keep track of structural changes in the long term.

Eventually, some vaults might need a more specific attention. Sloping, deflecting, sagging or hogging can be cared for through proper bracing (e.g. timber shuttering) and/or permanent consolidation. In theory, multiple techniques can be used. Collapsed portions can be rebuilt, new pinning stones help securing loose stones, and high strength grout offers the possibility to consolidate unstable parts. As shown by the consolidation of the vault in Duntarvie’s west tower, lime mortar and concrete mix is sometimes used to fill the gaps between loose vault masonry. The installation of lightweight mesh further helps binding said mortar, which is poured (where possible) on the extrados of the vault and allowed to seep through the fractures.
A promising new technique used for the local repair of vaults is fibre reinforcement (FRP). Much research has been conducted on failure patterns and hinge formations in order to decipher where to apply the fibre bands in order to obtain best possible results. An application on the extrados, at the springing of the vault, is often favoured to the placing of fibre strips at the crown on the intrados— which also guarantees the invisibility of the intervention. Plain fibres might, however, reach their limits for traditional medieval thick masonry, thus necessitating the use of stronger fibres.

Another technically (but not visually) invasive method laid out by Paolo Rocchi in his book “Atlante del Consolidamento degli Edifici Storici” is the insertion of metal profiles in the existing structure (fig. 72). According to Rocchi, this reinforcement only takes up its role if the vault starts moving; otherwise, the containment of the thrusts will happen along the same load path as before.

CONSERVATION AND PERCEPTION OF SPACE

No matter how technical the author’s approach to the case studies was, a more subjective perspective also guides the appreciation and the grasping of the character of the ruins.

Enclosed spaces – how they influence our experience of the ruin

Accessibility and exploration

A visitor’s experience of a place is genuinely affected by the amount of structural remains that can be explored. Ravenscraig is, for instance, only visible from the exterior, and no public access is given to its towers. The ruin is then merely seen as a decaying shell, which of course, still shares a fair amount of information with the visitor.

Another inaccessible castle is Cadzow. There is a great discrepancy between the picture featured on Historic Scotland’s website and the current reality; the former led the author to believe that Cadzow was intended to feature as an exemplar of soft capping and the conservation of semi-buried structures (fig. 73-left). The reality is a non-accessible ruin absolutely overgrown with vegetation and stabilised through the use of scaffold shoring and timber propping (fig. 73-right). At first glance, Cadzow Castle seems to be an example of Historic Scotland accepting a certain loss of heritage. However, previous extensive clearance and consolidation works and the 2004 conservation statement are evidence that “it is considered a long term goal to fully consolidate the castle to prevent further loss and to remove the fence to allow public access.”

Vaults

Stone vaults are the only original castle roofs that have come down to us through the ages; wooden structures require constant maintenance and therefore do not qualify as ruins. Vaults are therefore important elements which create a certain aesthetic and character. It is interesting to view how they’ve been left to decay or been preserved.

Various preservation techniques have been used to freeze the vault’s collapse, and each technique influences the current character and the visitors’ appreciation of space.

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The 13\textsuperscript{th} century De Vaux part of Dirleton Castle with its complete round tower showcases a grand expression of space character. The ground-floor hexagonal Lesser Hall is covered with a ribbed vault (\textit{fig.74(a)}), while the Lord’s Hall on the first floor displays a high hexagonal dome, though the ribs have gone missing (\textit{fig.74(b)}). The extrados is visible from an exterior position along the battlements (\textit{fig.74(c)}). Unlike many visitor experiences of ruins, this tower retains its majestic feature, which mentally thrust the visitor back into the 13\textsuperscript{th} century.

The cellar barrel vault beneath the early 13\textsuperscript{th} century Great Hall in Hailes Castle has been consolidated in what seems to be an exemplary charter-compliant, education-driven method of restoration. The external elevation reveals the construction method of the vaults by exposing the rubble core above the voussoirs, which were carefully selected to form a relatively smooth intrados. The dressed stones of the external elevation would normally have hidden the rubble core, however, this particular area above the vault has been left exposed (\textit{fig.75}).

A second cellar in Hailes Castle has been left to decay. As a result, only the springing is visible, and thus offers an absolutely different experience of the space (\textit{fig.76}). Whilst the mind might be able to reconstruct the former volume, the body experiences an outdoor space. The east tower in Tantallon presents a similar example of partially surviving stone vaults (\textit{fig.76(b)}). Fig.76(b) shows metal restraining straps used to hold the remains of the collapsed vault upright.

Vaults in the late 14\textsuperscript{th} century tower at Crichton show another typology of partial collapse. In this instance, part of the barrel vault is still standing, displaying the original half-circular curvature. The collapsed section once again reveals the thickness of the masonry. The fact that two storeys of this tower present the exact same pattern of ruination makes this case even more interesting; in-depth measured surveys might provide answers regarding the particular ruination process. The springing of the vault, capped off for stability and safety, is also visible along the length of the room (\textit{fig.77}).

The ground-floor cellar in Crookston Castle offers another variation in restoration techniques by leaving one edge of the room open to the sky while the majority of the cellar is roofed by an elaborate ribbed barrel-vault (\textit{fig.78-bottom}). Dirleton Castle has a similar example, where the vaulted servery leading up to the kitchen is partially open to the sky. However, the edging of the roof system takes a more natural form and the space is experienced as a “corridor” rather than a room (\textit{fig.78-top}).

Lastly, shorter span vaults naturally tend to be preserved. Private chambers within the thickness of the medieval masonry usually retained their stone-vaulted ceiling (\textit{fig.79}).

\textbf{Other types of enclosure}

The modern interventions in the northeast tower of Crookston Castle are a radical example of how previous works can modify our current experience of the ruins. During World War 2, this tower was used as an aircraft observation post during the Clydeside blitz. Concrete slabs and metallic ladders, still in place today, were inserted in the empty shell (\textit{fig.80,p.72}). While these alterations are an important part of the castle’s history, the space still somehow does not feel “authentic”.
20th century interventions in Crookston Castle: concrete slabs and metallic ladders - fig.80

Collapsed turnpike staircase - fig.81

Heavy ivy growth, around 1900 - fig.82

Stone bursting - fig.83

1982 restoration of the entrance gate to Hailes Castle - fig.84
Many ruins offer the opposite example in some of their towers where only fragments of a turnpike staircase remain, hanging in the void, and thus not granting access to upper floors. Yet, the visitor experiences history through time taking its toll (fig.81).

**Previous works**

Quinquennial surveys and conservation strategies, kindly made available by Historic Scotland, provide a deeper understanding of previous interventions and conservation plans. These documents reveal that much more conservation work has been done in recent decades than meets the eye, and each intervention has been thoroughly documented.

The works recorded in these documents show that the ruinous castles have been and continue to be actively cared for. A certain typology of interventions appears to be recurrent and common to most of the analysed cases:

- Raking, tampering and re-bedding loose masonry as well as (lime) repointing hungry joints;
- Cutting out and replacing stones where needed; consolidation through rough racking; rebuilding works;
- Repairing and strengthening of foundations where needed (e.g. through excavation and laying additional concrete foundations);
- Cleaning and removing of vegetation/weeds/tree roots, especially from the wall-heads; sometimes including the spraying of biocide products (fig.82);
- Clearance (clearing out debris, removal of ivy and other vegetation) and excavations, especially in the beginning of restoration/consolidation;
- Ground maintenance including surrounding vegetation/trees and regulating dampness in existing ditches through the introduction of drainage pipes;
- Erecting safety fencing and handrails if the ruin is to be opened to visitors.

It is worth noting that some previous works are currently causing damage. Eroded metal fixings can cause the stone to expand and eventually burst, thus creating yet another loss of material (fig.83).

The 1982 restoration of the entrance gate to Hailes Castle constitutes a most interesting intervention (fig.84). Freshly cut stones (with engraved date) recreate the inner surface of the gateway. These new stones stop in a random pattern in order to let the repointed rubble core show. This whole intervention seems to be used as an educational introduction to conservation according to charters and Historic Scotland guidance documents: fabric is retained and consolidated as found (exposed rubble core), new interventions blend in without creating a falsification of history, and new work is identified as such through the engraving of the date.
Choice of Flooring

Accessibility concerns require that new, level flooring be laid in ruinous castles open to the public. Several options exist, each one with its particular influence on the visitors' experience of the ruin. Concrete flooring (or lime concrete) (fig.85), cobbles (fig.86), stone paving/slabs (fig.87), gravel (fig.88), and lawn (fig.88) are common choices that can be combined in various ways to highlight certain elements or suggest a particular walking path. In order to determine whether the vaults can take the added load without deflecting, an engineer’s analysis might be required prior to the pouring of a new concrete floor where enclosed spaces are situated underneath. Hailes Castle once again constitutes an interesting example of modern flooring inserted into its early 13th century bakehouse. A layer of lime concrete was poured over a portion of the original fabric in 1969. A half-hidden, half-visible, educational approach has once again been favoured in this restoration (fig.89).

Castles surrounded by a moat also present the issue of the necessity to erect a new bridge over the ditch. Timber is quite often used in these modern interventions in order to give an “authentic” experience to visitors (fig.90). The new bridges are, however, rarely drawbridges.

Wear and Tear from Visitors

A last conservation concern needs to be mentioned: staircases are naturally subjected to ceaseless wear from a high number of visitors. The preferred walking path in the middle of the steps is typically worn down and characterised by a glossy sheen (fig.91,p.76). Staircases therefore need more frequent attention than other architectural elements. Restoration of worn steps is often done through localised stone indents (fig.92,p.76). The Earl’s Palace in Kirkwall implemented a unique intervention: one of the turnpike staircases combines the worn off old stone, new stone indents, and a modern wooden intervention (fig.93,p.76). Another approach has been favoured in Dirleton Castle where modern wooden steps have been installed overtop the heavily eroded original stairs (fig.94,p.76).

One staircase at Dirleton Castle has also been brought up to modern safety standards through the painting of the step nosing in bright colours, which is visible in a dark room (fig.95,p.76).

Added Volumes

The entrance at Bothwell Castle is characterised by a “new-built central section of wall including shop: ... Timber framed shop, with slated roof, completed in 1993.” The shop and ticketing area protrude into the court from the exterior wall and thus disrupt the 360° view of the castle (fig.96,p.76). The architecture of the hut is unmistakably new against the original fabric, and above all reversible (which is once again in keeping with key concepts laid out in international charters). Whilst the architectural and aesthetical appreciation of the new-built addition is subjective, this intervention constitutes a rare
Worn down steps - fig.91
Nosing painted - fig.95
Repair through localised stone indents - fig.92

Various repair/restoration techniques - fig.93

Modern, wooden steps on top of the worn-out historic ones - fig.94

Modern, added volume for shop and ticketing area - fig.96
Photovoltaic - fig.97
counter-example to the overall traditional, largely contextual in style, interventions in Scottish ruinous castles.

The ticketing area at Crichton offers another approach: the timber-structured shop has been installed in a cellar next to the entrance, thus being completely hidden from view when one stands in the courtyard to look at the successive architectural phases of the castle. Photovoltaic panels placed on a discrete area of the roof provide the required electricity (*fig.97*).

Overall, the type of intervention deemed suitable for additions mainly depends on the architect in charge; the approaches may therefore vary. Conservation-works carried out abroad or even on non-castellated domestic architecture in Scotland could inspire leading conservationists to carry out more creative, bolder expressions for small-scale interventions in Scottish castles—as long as they remain reversible and respectful to the original fabric (*fig.100-101*, p.83-84). Modern materials and tested technology could be used to differentiate new work from historic fabric (cf. Camillo Boito and international charters). Without advocating a complete restoration in a unitarian style, this approach would pick up on Viollet-le-Duc’s pragmatic view of the physicality of construction and restoration.
Conclusion
The previous chapter has shown that exposed ruins are susceptible to an impressive variation of decay and structural problems, often linked to water ingress. The repair or intervention possibilities are even more abundant. There is thus much to be considered when facing the preservation of ruins.

Firstly, it is essential to acknowledge that ruinous castles have come down to us in various states of preservation. Many a ruin is still standing today solely due to multiple conservation and restoration-works. Evolving technology has been employed overtime in interventions such as clearance and excavation, or stabilisation through the raking, repointing and re-bedding of loose masonry.

Despite the fact that Scottish ruinous castles have been cared for in the past, no intervention constitutes a permanent solution. Since ruins are constantly exposed to windy and rainy weather conditions, decay is an ongoing process, which can be slowed down at best. Whilst the origin of problems can rarely be removed in the particular case of exposed ruins, various symptoms can be treated. Current, continuous maintenance is necessitated in order to keep the ruins sound and safe to visit. Various inspection teams are responsible for the monitoring and regular maintenance of ruinous castles.

Several conclusions on the current state of decay can be drawn from the analysis of on-site visits; material decay, which ranges from stone weathering, soiling and crust formation, to biological colonisation, is witnessed on the nine case studies used for this research. Enclosed, covered spaces showcase a high degree of dampness that is often accompanied by an impressive level of vegetation growth (e.g. Crichton and Direleton Castle). Some ruins also exhibit impressive humidity patches on their external walls due to their deeply moist core (e.g. Botwhell and Hailes Castle). A certain amount of stone weathering is inevitable, especially when linked to hard mortar repointing or salt-loaded wind erosion in maritime environments. Due to various factors such as geological composition of the stone, location of the castle and historical events, some ruins display a strikingly advanced state of stone decay (e.g. Bothwell and Tantallon Castle), whereas the masonry at similar castles is in a relatively good state of preservation (e.g. Crichton Castle). All in all, ruins showcase the typical weathering mechanisms found in any historic structure, but in a more advanced state.

Whilst soiling and vegetation can be looked upon through regular maintenance work, the treatment of decayed stones in ruinous structures calls for some philosophical choices. Deteriorated carved stone elements are ordinarily repaired, whereas common masonry in dilapidated ruins tends not to be mended through plastic repairs or indents, as long as it is structurally sound. Loose masonry on wall-heads needs to be secured. Various techniques have been employed over time to do so: rough racking (either with lime or concrete, as witnessed at least partially in every case study), cementitious hard capping (e.g. Crookston Tower-house), use of slabs or flagstones in order to confer the wall-heads a smooth surface (e.g. Tantallon Castle or Linlithgow Palace), or soft capping (e.g. Bothwell). The latter is a promising long-term, low maintenance solution which helps diminishing a number of decay mechanisms, such as erosion, effects related to freeze-thaw cycles, and soiling due to rainwater run-off through soluble mortar. Despite the fact that no technique is foolproof, ongoing research may bring the application of living plants and soil on wall-heads to the front of modern conservation approaches.
Notwithstanding the technical possibilities, human interference and nature eventually provoke at least partial collapse of ruinous castles. It is then left to the conservationist to decide whether to intervene and restore specific elements in order to enhance the scientific historical value or to leave the structure virtually untouched “as found”. A consensus in the management of fabric loss is hard to reach since both leading conservation theories evolved over time and a case-by-case approach based on the values represented by each castle is favoured.

At this stage, the difficulty of finding a unanimous answer to the question of “which conservation technologies can be used to preserve (semi)ruinous castles as ruins?” already appears. All of the technical intervention methods, no matter how localised and precise they appear to be, will have an effect not only on the fabric itself, but also on visitors’ experience and understanding of the ruin. The appreciation of character and space strongly varies. We have seen, for instance, that a varying degree in accessibility strongly influences the way we experience the ruin; a fully accessible structure with entwining corridors and hidden staircases, an intricate and complex layout revealing massively built cells, possibly still roofed by sturdy stone barrel vaults, and levels to discover will be viewed as a gem worth exploring. Important castles such as Tantallon, Crichton or Dirleton become an educational joy of discovery for everyone, from the archaeologist, architect or architectural conservation professional to the everyday man playing hide and seek amongst the historic stones with his family (fig.98). The scenic character of a castles’ location equally influences our experience with, for instance, breath-taking views from the top of the walls or battlements (fig.99).
These last criteria and the “leave-as-found” approach take their roots in an ongoing romanticism. The idea of preserving and consolidating a ruin is, however, a relatively new one and has yet to confirm its place within conservation/restoration theories. Fast developing modern technologies contribute to the shifting character of conservation approaches. The concept of authenticity, for instance, used in almost every conservation statement, and even referred to in this research in order to qualify the authenticity of an experience, is to be put in perspective both of the 21st century and the specific case of ruins; what makes a ruin authentic and true to its history is not as clearly distinguishable as one might presume.

21st century architectural culture, that is flourishing in countries which lead modern conservation approaches such as France or Italy (e.g. Carlo Scarpa’s restoration of Castelvecchio, fig.100), should furthermore inspire Scottish conservationists to re-open the underdeveloped restoration debate. As highlighted by Michael Davis, current interventions on Scottish castles tend to showcase a rather poor, overwhelmingly traditional and contextual in style architecture. The appetite for major interventions is restrained to a few single architects, conservationists, and restorers while the general trend remains relatively non-interventionist. A slightly more interventionist attitude characterises most restorations/conservations of tower-houses in private ownership; if this mentality changes, Scheduled Monument Consent could be granted for the various interventions and the Scottish landscape might thus change. Without necessarily advocating complete restoration and reuse of ruins, modern criticism to architecture could stir the purely historically argument and make it architecturally meaningful to Scottish castle conservation.

![Carlo Scarpa’s innovative restoration of Castelvecchio (Verona) in 1957](Fig.100)

In a architecturally and historically critical approach, Scarpa employed modern technology and new materials (e.g. concrete and metal) in order to recompose the fragmented historical (medieval) parts, and thus create a new structural scheme and narrative adapted to the new museal use.
This issue becomes pressing in the light of increased tourism, which emphasises the need for new flooring in exposed ruins, the necessity of adding new volumes used as ticketing areas, shops and lavatories, and causing an accelerated wear and tear of architectural elements such as staircases. One may wonder whether, following the example of castle conservation projects abroad, small-scale interventions could adopt a more creative, liberal, bolder, and openly modern expression (fig.101). Why not combine tourism management and accessibility issues with a reversible, non-intrusive modern architecture, mark of our time?

To sum up, an important amount of parameters has to be considered when preserving ruinous castles in Scotland. The author hopes to have touched upon most of them in this research. The conservation of ruinous castle fabric is a complex matter which cannot be met with general assumption or consensus. Every technology used to conserve, consolidate, secure, and strengthen historical fabric has an effect both on the fabric itself and on our understanding of space and our appreciation of a ruin’s character. There is thus not one single, unified answer to the question of How to preserve ruinous castles. Whilst having an awareness of all the prevailing theories and debates, as well as the technical possibilities and their effects, is a necessity, a case-by-case study, based on a sound understanding of the problems’ origin, is strongly recommended. The present research corroborates this fact.

Finally, tested and proven technology should be used as an opportunity to shift the practice slightly away from the pure preservation and simple maintenance of historical fabric towards updating the values we attribute to these obscure romantic Scottish treasures. Why not dare to (re)open an architecturally meaningful debate, stirred by technological concerns, in order to preserve Scotland’s obscure romantic treasures?
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Part I and II


**Part III**

**In-depth information about the studied cases**


**Lectures and technical papers**


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Scran: http://www.scran.ac.uk/
Appendices
ICOMOS. International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter, 1964)

Conservation

Article 4. It is essential to the conservation of monuments that they be maintained on a permanent basis.

Article 5. The conservation of monuments is always facilitated by making use of them for some socially useful purpose. Such use is therefore desirable but it must not change the lay-out or decoration of the building.

Article 6. The conservation of a monument implies preserving a setting which is not out of scale. Wherever the traditional setting exists, it must be kept. No new construction, demolition or modification which would alter the relations of mass and colour must be allowed.

Article 7. A monument is inseparable from the history to which it bears witness and from the setting in which it occurs. The moving of all or part of a monument cannot be allowed except where the safeguarding of that monument demands it or where it is justified by national or international interest of paramount importance.

Restoration

Article 9. The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents. It must stop at the point where conjecture begins, and in this case moreover any extra work which is indispensable must be distinct from the architectural composition and must bear a contemporary stamp. The restoration in any case must be preceded and followed by an archaeological and historical study of the monument.

Article 10. Where traditional techniques prove inadequate, the consolidation of a monument can be achieved by the use of any modern technique for conservation and construction, the efficacy of which has been shown by scientific data and proved by experience.

Article 11. The valid contributions of all periods to the building of a monument must be respected, since unity of style is not the aim of a restoration. When a building includes the superimposed work of different periods, the revealing of the underlying state can only be justified in exceptional circumstances and when what is removed is of little interest and the material which is brought to light is of great historical, archaeological or aesthetic value, and its state of preservation good enough to justify the action.

Article 12. Replacements of missing parts must integrate harmoniously with the whole, but at the same time must be distinguishable from the original so that restoration does not falsify the artistic or historic evidence.
Article 13. Additions cannot be allowed except in so far as they do not detract from the interesting parts of the building, its traditional setting, the balance of its composition and its relation with its surroundings.

Historic Sites
Article 14. The sites of monuments must be the object of special care in order to safeguard their integrity and ensure that they are cleared and presented in a seemly manner. The work of conservation and restoration carried out in such places should be inspired by the principles set forth in the foregoing articles.

Excavations
Article 15. Ruins must be maintained and measures necessary for the permanent conservation and protection of architectural features and of objects discovered must be taken. Furthermore, every means must be taken to facilitate the understanding of the monument and to reveal it without ever distorting its meaning.

All reconstruction work should however be ruled out "a priori". Only anastylosis, that is to say, the reassembling of existing but dismembered parts can be permitted. The material used for integration should always be recognizable and its use should be the least that will ensure the conservation of a monument and the reinstatement of its form.


Article 3. Cautious approach
3.1 Conservation is based on a respect for the existing fabric, use, associations and meanings. It requires a cautious approach of changing as much as necessary but as little as possible.

Article 4. Knowledge, skills and techniques
4.2 Traditional techniques and materials are preferred for the conservation of significant fabric. In some circumstances modern techniques and materials which offer substantial conservation benefits may be appropriate.

Conservation Processes
Article 14. Conservation processes Conservation may, according to circumstance, include the processes of: retention or reintroduction of a use; retention of associations and meanings; maintenance, preservation, restoration, reconstruction, adaptation and interpretation; and will commonly include a combination of more than one of these.

Article 20. Reconstruction
20.1 Reconstruction is appropriate only where a place is incomplete through damage or alteration, and only where there is sufficient evidence to reproduce an earlier state of the fabric. In rare cases, reconstruction may also be appropriate as part of a use or practice that retains the cultural significance of the place. 20.2 Reconstruction should be identifiable on close inspection or through additional interpretation.

Article 22. New work
22.1 New work such as additions to the place may be acceptable where it does not distort or obscure the cultural significance of the place, or detract from its interpretation and appreciation. 22.2 New work should be readily identifiable as such.
Foreword by David J. Breeze (Chief Inspector of Ancient Monuments)
“Dealing with ruined ancient structures calls for a somewhat different approach from that required by buildings that have remained in use and have retained their first lines of defence against Scotland’s rain, snow and wind. [...] In the same way as with written documents, their conservation calls for the greatest care in ensuring that nothing is done that might detract from their value as primary evidence for the past.”

Introduction
1.13. The approach to the conservation of monuments that is generally applied in Britain was summed up as early as 1912 by Earl Beauchamp in his introduction to the Inspector’s Report for that year, which stated that the aim of those working on monuments should be:
‘... to avoid, as far as possible, anything which can be considered in the nature of restoration, to do nothing which could impair the archaeological interest of the Monuments and to confine themselves rigorously to such works as may be necessary to ensure their stability, to accentuate their interest and to perpetuate their existence in the form in which they have come down to us.’

General Principles of Conservation
2.2. Since the built heritage is one of the main channels through which we can understand the lives, aspirations and achievements of our ancestors, it is essential that as wide a range of types and ages of monuments as possible is preserved. So far as architectural monuments are concerned, it is true that higher status monuments were usually more permanently constructed and are therefore now generally better preserved than their more humble counterparts. Because of this, the picture they present of the past is an inevitably distorted one in some respects. [...] This makes it particularly important that works of conservation involve minimal disturbance to both the monuments themselves and to their wider contexts.

2.3. Monuments are more than just the sum of their constituent parts.

2.4. All monuments differ from each other and require individual conservation solutions to ensure their stability and preservation.

2.5. Since all monuments are unique they are all irreplaceable. However, it must also be accepted that, because they are generally open to the impact of the elements, and are subject to the natural processes of decay of their materials, without continuing interventions they would have a finite life. Works of conservation aim to prolong that life, but there is a balance to be struck between achieving the continued life of a monument and of carrying out works that are so invasive that they modify the monument’s character and detract from its value as evidence for the age that produced it. Conservation should always be aimed at the lowest level of intervention that is consistent with achieving a monument’s stability. Attempting to anticipate and forestall future structural problems can rarely be justified.
2.6. All works of conservation should aim to have an impact on the monument that is as completely reversible as is consistent with ensuring the monument’s continued stability.

2.7. For conservation of a monument to be as effective and as appropriate as possible it is essential that, before work starts, an assessment is made of its historical and cultural significance and of its structural composition.

2.8. Most monuments are the result of more than one phase of construction. Unless there are very strong reasons for doing otherwise, it should be assumed that all phases of a monument’s structural history deserve respect and conservation.

2.11. Works of conservation cannot be once-for-all operations, although carefully considered campaigns can usually secure the future of a monument for a number of decades. In general, it is both less damaging and less expensive to carry out regular works of small-scale maintenance than to postpone conservation until a major intervention is the only way of securing a monument’s continued preservation.

2.12. Conservation works themselves become an integral part of a monument’s history. While they should always be carried out in a self-effacing and sympathetic manner, any physical impact they have on the monument should nevertheless be identifiable on close inspection by those who are trying to understand the monument. Works of conservation should also be properly recorded.

2.13. Although at the great majority of scheduled monuments all forms of restoration as opposed to conservation should be avoided, part of the process of achieving an understanding of a monument may involve a mental process of reconstructing the parts that have been lost.

2.14. While the aim for most scheduled monuments is to preserve them in the state in which they have come down to us, it is accepted that for certain monuments restoration for active use may be the most viable way of ensuring their continued existence. These might include some tower-houses that are sufficiently complete to be considered as candidates for renewed occupation, [...] It is also important that any additions that have to be made are firmly based on the structural and archaeological evidence, and that those additions are designed to be technically and aesthetically compatible with the historic fabric. All of this can be achieved only if the full cultural significance of the monument has first been properly assessed.

Treatment of Masonry Walls

3.1. Masonry is the main surviving structural element of most architectural monuments, and the aim must be to preserve all that has survived. Replacement of stone should be considered only where it has been firmly established that the stability of the structure is otherwise at significant risk. It should be remembered that built masonry is often more inherently stable than might appear on first sight. The extent of any replacement should be as minimal as is consistent with the immediately foreseeable structural needs of the monument, and the implications of any replacement on both the documentary value and the aesthetic qualities of the monument should be carefully assessed in advance.

3.2. Where there is no alternative to the replacement of stonework, the new stone should match the stone to be replaced as far as possible in its geological origins, its texture, its colour, its weathering characteristics and its porosity.
3.3. Second-hand stone from demolished buildings in the vicinity may be one source of geologically suitable materials for some monuments.

3.4. It is most unlikely that it will ever be considered acceptable to replace stone with artificial materials such as 'reconstituted' or 'plastic' stone, since their long-term weathering qualities are so different from those of stone.

3.5. New stones should be cut and finished in a similar way to the stones to be replaced, if that is known. [...] Nevertheless, the new stonework should be distinguishable on close scrutiny.

3.7. [...] It is also generally preferable that a new stone should not replace only a part of a stone, unless the stone to be replaced is particularly significant for the evidence that part of it still embodies.

3.8. It should be remembered that, as a result of weathering and previous re-pointing, the width of the joints between the stones as now seen may not perpetuate the original dimensions. [...] Stone replaced within such contexts should always aim to respect the intentions of the original masons if these can be established.

3.9. Dismantling of adjacent areas of masonry to permit the insertion of replacement stones should be avoided.

3.10. Stone surfaces can often be badly decayed or friable through long periods of exposure to weathering. However, as the part of the stone which received the closest attention of the mason who cut it, the surface often retains much valuable information. [...] Stone surfaces should therefore never be re-dressed since this might obliterate important evidence

3.11. It may be appropriate to clean loose surfaces gently with a bristle (but not a wire) brush. In some instances it may be possible to fill cracks or laminations in stones with lime mortar, which can be coloured to match by the addition of crushed stone.

3.12. Consolidating rubble masonry presents a different range of problems from treating ashlar. When the rubble consists of a combination of larger stones with small and shallowly-set stones known as pinnings between them, removal of decayed mortar can often dislodge some of those pinnings. In such cases, the character and pattern of the masonry is not to be irreversibly modified.

3.14. Where dry-stone masonry has fallen it is generally best to leave it in its collapsed state. Where there is a clear case for reconstructing it, if for example the collapse is threatening to extend, care must be taken to match the style of construction of the rebuilt sections with those immediately adjacent areas that belong to the same original building campaign. [...] to hold the re-set stones in place with small pads of lime mortar, kept well back from the wall face so that they do not impinge on the appearance of the masonry, but are still visible on close scrutiny by those who need to understand the building.

3.15. Where walls are found to have been bonded with clay rather than lime mortar, every effort should be made to stabilise the wall with clay of a similar character to that originally employed

3.16. It is generally inadvisable to use stone preservatives except under certain very specific circumstances [...] Most preservatives, while being ineffective, may introduce harmful chemicals into the stone [...] With some substances there is insufficient knowledge
of their long-term effects to be able to use them with confidence, particularly since most treatments of this kind are irreversible.

3.17. [...] it is advisable to incise the date of replacement on each new area of stone, although this should be done discreetly and without disfiguring the monument as a whole.

3.19. In replacing masonry it is generally advisable that new stones should be set to the line of the original wall face where this can be determined, and this is particularly important where the stones are moulded or worked in some other way. [...] may be necessary to set the new stones further back. This is especially the case where the new stones would otherwise project excessively, or where stones set proud of the surrounding face might exacerbate the decay of adjacent stones.

3.20. Where facing masonry has been robbed or lost, and only a rubble core remains, every effort should be made to preserve this core in its existing state. Where it has to be augmented in order to achieve stability, this is usually done by the process known as rough racking, using rubble of appropriate dimensions and character in combination with larger quantities of lime mortar than would be normal in a finished wall face.

3.21. With rough racking it is important to ensure that water cannot collect and pond and that overhanging masonry is properly supported. But, in achieving this, every effort should be made to avoid changes which might be misleading, such as bringing the wall core too far towards the original wall face, or giving the core an excessively regular or domed profile to assist the rapid shedding of water.

3.22. In certain extreme cases it may be essential to dismantle and reconstruct areas of upstanding walling, particularly at wall-heads that have been open to the intake of water over long periods. Where this is unavoidable, rebuilt sections should replicate the appearance of the original as far as possible.

3.23. Most architectural monuments are now roofless, with the result that wall heads are exposed to the elements in a way that their builders never intended, and they are having to meet an onslaught of the elements for which they were not designed. In many cases rough racking is likely to be the simplest treatment of the exposed wall head, with care being taken to prevent the ponding of water. This approach also has the advantage of being largely reversible.

3.24. Where rough racking is not an appropriate treatment for a wall head, an alternative may be turf strips, applied in a way that reflects the natural growth that usually develops on wall heads. Where this is done, it is important to ensure that the wall head has been fully consolidated, and it may be necessary to provide additional water-proofing by placing clay under the turf.

3.25. Another possible treatment for wall heads that are more smoothly finished is an asphalt strip, though great care must be exercised to avoid fouling the wall faces in applying it. In general such finishes should probably not be used where the wall head is readily visible.

3.26. [...] where there is an identifiable risk of collapse it may be appropriate to provide discreet support without imitating the historic masonry and thus confusing the evidence. In some cases it may be acceptable to achieve this through the insertion of modern piers or buttresses of masonry.
3.27. In some cases, masonry walling left at risk by broken or missing masonry may be supported by strategically placed non-ferrous or stainless steel metal bars. This can be particularly effective in the case of broken lintels or missing mullions and form pieces in window tracery; it can also be a useful way of taking the weight of masonry that has been left unsupported by the loss of lower facing stones. Where this approach is adopted, the bars must be set into joints rather than into stones, and every effort must be made to insert the bars without having to widen the joints.

3.28. When the inherent instability of a monument leaves no alternative to rebuilding areas of masonry in order to support what survives, it should be ensured that the new masonry sits sympathetically with what is there, while still making it distinguishable on close scrutiny. Amongst techniques that have been found effective are the setting back of the new masonry face by a few centimetres, and defining the limits of the new masonry by inserting bands of tile, slate or other suitable materials in to the mortar joints around the new masonry.

3.31. Where walls or other features survive only as foundations or as fragmentary lower courses, it is sometimes less damaging to preserve them by covering them with earth rather than by leaving them exposed and consolidating them.

3.32. Stone cleaning at monuments should never be carried out unless there are sound conservation reasons for doing so, since most techniques currently available carry some risk for the stone, and particularly for sandstones and granites.

Treatment of Carved and Moulded Stonework

4.1. If a moulded or carved stone has to be replaced for inescapable structural reasons, as far as possible its profile and detailing should be carefully established from the stone that is itself to be replaced [...] Only in the most exceptional circumstances can it be justifiable to base the details on stones in other parts of the monument or on ex-situ stones preserved at the monument.

4.2. Where it is not possible to establish the original profile and detailing of a moulded or carved stone that has to be replaced, under no circumstances should detailing be provided that simply approximates to the original. Conjectural reconstruction should never be considered since this would confuse the authenticity and documentary value of the monument. In such cases it is probably best simply to block out either the whole of the replacement, or the unknown part. This should be done so that, if at some future stage it proved possible to establish the profile and detail of the replaced stone, it could be recut in-situ. The blocking out should be handled in a way that will not create an excessively jarring element in the total appearance of the building, and it should follow the tangential outline of the original as closely as can be established. Care should be taken to ensure that a replacement stone does not provide a ledge on which rainwater can lie.

4.3. Original carved and moulded stones should never be re-worked, since this would entail loss of authenticity.

4.5. Where important sculpture is at risk of decay due to its exposed situation, consideration may be given to providing in-situ protection, by the least intrusive means that can be adopted.
4.9. Where worked stones have had to be replaced for structural reasons, especially in the case of those that are carved or moulded, it is essential that the original stones are preserved at the monument, with a record of their original location.

4.11. Inscriptions on stones should never be re-cut. If an inscription is decaying it should be carefully recorded and consideration given to providing in-situ protection of some form.

Treatment of Mortar

5.1. Lime mortar was the most commonly used bonding agent of architectural monuments, and it is as much a part of the historic fabric as the stone which usually forms its main material. In some cases the mortar may in fact be ultimately more informative on the date of the monument than the stone, and perhaps also on the techniques employed in its construction. It is therefore important to preserve in place as much as possible of the mortar used in the successive phases of a monument’s history. As with stone, mortar should only be replaced where this is strictly essential. However, as a more perishable material, it is almost inevitable that the structural stability of a monument will call for the renewal of some areas of mortar, particularly in areas close to exposed wall heads.

5.3. Where Portland cement has been used in the earlier re-pointing of a monument, it is possible that it is now causing damage to the masonry, and consideration should be given to removing it and repointing with lime mortar. However, in some cases the difficulties of removing such hard mortar may result in greater damage to the adjacent stones than leaving the mortar in place, and any decision will require an evaluation of the particular circumstances.

5.5. Where either decayed original mortar or modern cement mortar have to be replaced, every effort should be made to ensure that the new mix is compatible with the original mortar of that part of the monument in its composition, texture and appearance, whilst accepting that the new work should nevertheless be distinguishable to expert scrutiny.

5.7. A particular difficulty with the replacement of mortar is that it may be necessary to reinstate it differently from the way in which the original mortar was applied. A high proportion of Scottish architectural monuments was originally rendered, and in rubble-built structures the mortar was often spread across parts of the surface of the stones in order to bridge irregularities in the masonry and to give a relatively flat surface for rendering. Little evidence of this now tends to survive, because both the render and the bonding mortar has usually weathered off the stone surfaces. Since the aim in dealing with monuments is usually to preserve them as they have come down to us, however, they are rarely rerendered, and there is therefore little reason to spread the mortar across masonry irregularities in replacing the mortar.

5.8. In cases where re-pointing narrowly jointed ashlar is necessary, every effort should be made not to widen the joints in raking out the old mortar.

5.9. Where joints that were originally narrow have been widened through weathering and earlier repointing, it is generally preferable to keep the new mortar back within the joint in order to avoid giving the impression that the jointing was initially wider.

Treatment of Harling and Wall Renders

6.1. At most Scottish medieval and early modern buildings the masonry was originally covered over with a protective lime coating. This coating is generally referred to as
In the case of rubble-built structures this may have been a relatively thick coating aimed at both regularising the surface and protecting the stone, and was intended to improve the finished appearance of a roughly-built wall. In ashlar-built structures, however, the coating may have been little more than a series of lime washes. Either or both techniques were often used in the same building when rubble walls had ashlar dressing to the openings and angles, extending across both rubble and ashlar. Harling and lime washes might often mask differences in colour in the masonry itself. At the majority of monuments the harling has fallen away, leaving little more than residual fragments in the more protected areas, while further fragments may be found when walls are re-exposed through excavation or as a result of the loss of adjacent structures.

6.2. The reinstatement of lime wall finishes is generally not considered appropriate at scheduled monuments for a number of reasons. To do so would be essentially a process of restoration, which would also entail obscuring the invaluable evidence for the history and development of the building that is embodied within the masonry. Reinstatement of harling also almost certainly leads to the loss of the evidence for any original finishes that may have survived. Beyond all of those considerations, however, is the fact that we simply do not fully understand the various ways in which harling and lime wash might have been applied and finished at the full range of building types, or over the long period of time during which they were so widely employed.

Treatment of Floors and Paving

9.1. The finishes of ground and floor levels that were provided at the time of a monument’s use and occupation are an important integral part of the historic fabric. They were, however, particularly susceptible to wear, and are likely to have been replaced at intervals in monuments that had a long active life; where they do survive, they may be in a very fragile state.

9.2. In some cases it may be best to protect historic ground surfaces from further damage by covering them over, though if they are to be obscured they must be properly recorded before this is done. Floor surfaces revealed through excavation tend to be particularly vulnerable.

9.3. Where sensitive internal floor finishes within a protected environment are subject to foot traffic and therefore require protection, it may be advisable to place a false floor or walkway over them, though this has to be done in ways which place no pressure on the historic surfaces themselves.

9.4. As with the preservation of historic walling, it is generally unacceptable to replace missing parts of paving or floor finishes with modern replicas of what has been lost. The effects of continuing wear and weathering will eventually make it difficult to distinguish between what is historic and what is modern.

9.5. Where it is necessary that voids in historic paved finishes have to be infilled in order to consolidate surrounding surfaces, this is usually best achieved by the use of different but sympathetic modern materials such as quarry dust or fine gravel.

9.6. A more stable and long-term alternative to dust or gravel for the filling of voids is a weak lime-concrete mixture. Where this is to be used it is essential that a separating membrane should first be laid so that there is no contamination of the historic fabric.
9.9. If sub-surface drains are essential, they should not be run through those areas where there are historic floor finishes.

Treatment of Earthworks associated with Architectural Monuments

12.2. Indeed, there is such a wide range of types of earthwork that may survive in association with a monument. [...] Amongst those that may be mentioned are: defensive ramparts; mounds left by collapsed structures; vestiges of pools and waterworks; terraces, beds and enclosures associated with agricultural and horticultural activities.

12.3. With earthworks the prime aim must be to preserve the existing ground profiles under vegetation which is not damaging subsurface archaeological evidence.

12.4. Grass growth may be beneficial as a way of inhibiting erosion of ground surfaces.

12.6. On some sites a balance may have to be struck between encouraging the growth of grass as a surfacebinding medium and preventing that grass from becoming so rampant that archaeological features are lost to sight. However, excessive cutting is rarely to be encouraged because of the risk of damaging ground surfaces, because of the aesthetic implications of creating an over-manicured appearance, and because of the risk of damage to the natural heritage interest of the site. The use of fertilisers is generally also to be avoided for the long-term risks they pose to both the monument and the natural heritage interest.

12.11. In cases where tree growth is creating an identifiable threat to earthworks, either through root penetration or the risk of wind-throw, there may be no alternative to removing the tree.

12.13. There may be cases where the re-establishment of eroded ground profiles has to be considered. Since this is by its nature essentially a form of restoration, it should probably not be considered where the gains would be purely aesthetic or cosmetic. The main arguments in favour of the re-establishment of profiles are usually the prevention of further erosion and the destruction of habitats for species that have caused damage to the site.

Treatment of Vegetation at Monuments

13.1. There are many aspects to vegetation at architectural monuments, with both positive and negative implications. Trees and plants around a monument can be an aesthetic enhancement of its setting, and few people would wish to see them removed without good reason. They can also provide a valuable habitat for wildlife. Nevertheless, in some cases their roots may be causing archaeological and structural damage, while their branches may be scraping walls. As in so many other areas, a balance has to be struck between the conservation needs of the monument on the one hand, and its aesthetic qualities and ecological value on the other. Similarly, plants growing on or around a monument can add to its picturesque appeal, and the well-established literary image of the ‘ivy-mantled tow’r’ is both well embedded in our Romantic consciousness and is enjoying a revival of popularity in reaction to the perceived ‘sanitisation’ of monuments in the recent past. Nevertheless, it is possible that the roots of such plants are causing damage to the masonry, while the weight of the plants themselves may be dislodging loosened masonry.
13.3. Although some types of ivy are believed to be less damaging than others, it is likely that most established ivy will eventually cause damage to fragile masonry. It should therefore generally be cut back at all growth points and steps taken to prevent further growth of the remaining root systems. The ivy should not be pulled away from the walls while still green, but should be allowed to die back before being removed or allowed to fall away.

13.4. No attempt should be made to remove woody root systems from within the masonry of the monument until the plants have died and a decision can be taken on the best way of dealing with them. In some cases it may be less damaging to leave the dead root systems within the walls than to dig them out.

13.7. Where trees are growing within an archaeologically sensitive area and there is a risk that their roots are causing damage to that archaeology, it should be determined if significant further damage will be caused by allowing the tree to continue to grow.

13.12. Although the planting of new trees within the vicinity of a scheduled monument is generally discouraged, where it has been agreed that they may be planted, they should be located at least 20 metres away from both the upstanding parts of the monument and the archaeologically sensitive areas around it.

13.13. Some monuments are located within sites designated for their natural heritage interest. In all cases it.

13.15. Because of the risks to masonry, underlying archaeological and environmental deposits, full account must always be given to the implications of the use of any chemicals as part of the process of dealing with vegetation. If there is any possibility of damage being caused by chemicals, they should not be used, and legal restrictions on the use of such chemicals must always be observed.

Restoration of Monuments for Re-Use

16.1. Although it is usually expected that monuments will be conserved in the state in which they have come down to us, there are some cases where the best way of preserving a monument may be its restoration for re-use.

Recording Works at Monuments

17.1. Works of conservation form a part of the history of a monument and, although the aim must always be that those works have as little irreversible impact as possible on the fabric, it is important for the future understanding of the monument that they should be recorded and that those records are made accessible.
A census of currently ruinous castles in Scotland has been carried out for the purpose of this research; the author acknowledges, however, the limitation of this likely incomplete census. A list indexing key information—such as age, location, architectural type, laird or architect, inscription on the Buildings at Risk Register, listing and scheduling, and internet links—is included on the annexed DVD (next page).
APPENDIX 3: DESCRIPTION, HISTORICAL OVERVIEW, AND PICTURES OF THE NINE ANALYSED CASTLES

The following texts are taken from the listing and scheduling descriptions. The annexed DVD comprises personal pictures from my on-site visits to the surveyed castles (© Aurélie Mangon).

Note: this DVD also includes the census of ruinous castles in Scotland mentioned on the previous page.
Bothwell Castle

Conceived on a grand scale in the late 1200s, Bothwell Castle was never completed to its original plan, largely thanks to a very active role in the Wars of Independence (1296–1356). It fell into English hands time and again, but was finally recaptured – and partly dismantled – by its rightful owner Sir Andrew Moray. The next owners were the powerful earls of Douglas, who added many of the features visible today. It now stands as one of Scotland’s most impressive medieval strongholds.

One of Scotland’s greatest castles

Bothwell Castle is one of the outstanding monuments of medieval Scotland. It owes its origins to Walter of Moray, from a northern aristocratic family, which acquired Bothwell in 1242. He (or his son William, known as ‘the Rich’) began the mighty castle in a spectacular display of feudal pride. Their dream was never completed, probably because of the outbreak of the Wars of Independence in 1296. What they did achieve is the great donjon – the circular keep tower. Not surprisingly, the Morays’ great castle figured prominently in the Wars of Independence with England. Siege followed on siege. The most momentous was Edward I’s great siege of 1301. After the wars, Bothwell Castle passed to another powerful noble family, the Black Douglases. They remodelled it in a form not envisaged by their predecessors. This is also impressive, with an array of fine-quality later-medieval secular architecture. After the Black Douglases were overthrown in 1455, the castle reverted to the Crown, and its later history was relatively uneventful.

The 13th-century Moray stronghold

The Morays envisaged a vast stone castle of enclosure covering 1.5 acres (0.75 hectares). This was to have had a mighty twin-towered entrance gatehouse and other circular towers projecting from its formidable curtain wall. Only the donjon, the main residential tower, was ever fully built. It measured 20m in diameter, and stood over 30m high. Although it was partially destroyed in 1337, it is still remarkably impressive – one of the greatest military works of medieval Scotland.

The great siege of 1301

In August 1301, when the Wars of Independence with England were at their height, Bothwell endured a major siege. Edward I of England, ‘Hammer of the Scots’, brought 6,800 soldiers to the castle. A huge siege engine called le berefrey (‘the belfry’) was hauled from Glasgow. It was a tall siege tower, with ladders inside to enable the attackers to fight their way onto the castle battlements. The garrison surrendered within the month.

The 14th-century Black Douglas stronghold

After the last recorded siege in 1337, the mighty donjon was partially dismantled. The castle lay derelict until 1362, when Joanna Moray, heiress of Bothwell, married Archibald ‘the Grim’, 3rd Earl of Douglas. Archibald and Joanna completely rebuilt Bothwell to a different design. This included a new tower house (now gone), with a great hall and chapel beside it. The hall and chapel still stand, and are impressive examples of later medieval castle architecture.

http://www.historic-scotland.gov.uk/index/places/propertyresults/propertyabout.htm?PropID=PL_037&PropName=Bothwell Castle
Cadzow Castle

The monument comprises the remains of a late medieval castle, which survives as substantial stone structures, earthworks and buried archaeology, together with an area enclosing the outer defences. The castle is located on a promontory above the deeply wooded gorge of the Avon Water, bounded by steep cliffs to N and E. The main elements of the castle are set below the brow of the hill, below the direct sight-line of any besieging artillery.

Cadzow is rarely mentioned in historic sources, although the architectural evidence suggests that it was built sometime between 1500 and 1550. It is possible that Sir James Hamilton of Finnart began its construction when he was made guardian of the 2nd Earl of Hamilton in 1529, and the earl may have continued work on it himself in the 1540s. The Hamiltons were very much to the fore in the politics of state surrounding Mary Queen of Scots, focussed on Hamilton castle which is located only 2.3km to the N. Cadzow is likely to have been involved in the considerable military activity in the area at this time. The Queen took Hamilton and Craignethan in 1565. Hamilton was taken again in 1568, then in 1570, and finally in 1579 when cannon were employed from Edinburgh Castle. Hamilton castle was demolished at this time and Cadzow is likely to have met a similar fate.

The castle consists of three concentric parts:

1. Outer ward: this is a large ditched enclosure to the W and S of the core, roughly triangular in plan and over 300m wide along the line of the ditch. The S part has been heavily disturbed by the construction 19th-century roads. The entire enclosure is currently overgrown with trees and vegetation, almost impenetrable in parts.

2. Middle ward: the middle ward is now chiefly visible to the W, while the S part is cut through by the roads mentioned above. The N range of the middle ward is the best-preserved structure, 32m long with a 9m wide basement, originally with a timber first floor.

3. Inner ward: the inner ward is comprised mainly of an overgrown mound, masking ranges and/or a tower on the cliff-edge. The N façade, above the gorge has been the subject of current repair works following collapse in 1999. The two S corners have projecting cylindrical towers. There is evidence of a timber bridge entry on the W side over the rock-cut ditch. The principle domestic apartments are likely to have been within the inner ward.

Cadzow may not have been re-occupied following the siege of 1579. The 5th Duke of Hamilton built the hunting lodge of Chatelherault close by in 1732. From then on the rugged picturesque ruins of Cadzow were incorporated into the formal landscaping of the High Parks of Hamilton Palace, providing a gothic counterpoint to the classical symmetry of Chatelherault. Recent archaeological recordings as part of current consolidation works has revealed that the wall heads on the N side of the inner ward had been artificially raised, and that a thick clay capping was spread over the structures here to act as waterproofing. Elsewhere the castle exhibits strong evidence of masonry works to 'romanticise' the ruins in the 18th and 19th century. This part of the Hamilton High Park was purchased by the Secretary of State for Scotland in 1978. Cadzow Castle remains in the ownership of the Scottish Ministers and is cared for by Historic Scotland.

**Crichton Castle**

Lordly residence of the Crichtons and later home to the Earls of Bothwell.
Crichton Castle

A hidden gem
Crichton Castle stands tucked away out of sight, on a terrace overlooking the River Tyne in Midlothian. It was a noble residence for some 200 years, from the late 14th century through to the close of the 16th century. It was seldom the stage for significant events. However, its connections with two influential families – the Crichtons and the Hepburn Earls of Bothwell – associate the place with some of the most colourful chapters in Scottish history.

The castle was built as a home of the Crichtons. With their fall from grace in 1484, the castle passed into the hands of the Hepburns of Hailes, Earls of Bothwell. The political intrigues of James, the 4th Earl, Mary Queen of Scots’ third husband, played themselves out far away from this sleepy corner of Midlothian. Following Bothwell’s downfall in 1567, the castle was briefly held by another complex individual, Francis Stewart. His tenure was brief, but his building legacy has endured to this day.

Castle of the Crichtons
The Crichtons appear on record around 1400. John de Crichton built the oldest part of the present castle complex – the lofty tower house that dominates the east range of the present quadrangular castle courtyard. We know very little about him. However, his son, William, became one of the most influential statesmen of his age. His undoubted astuteness and political influence combined to bring him to the very threshold of greatness. In 1437 he became Chancellor of Scotland. This position brought wealth as well as influence.

Sir William greatly extended his father’s castle, building an innovative great hall and kitchen around a new courtyard. He also built a collegiate church a short distance away (not in Historic Scotland’s care), where he paid priests to pray for his salvation and that of his family.

Castle of the Earls of Bothwell
On the accession of James IV in 1488, Crichton passed to the Hepburns, newly created Earls of Bothwell. It remained with them for the rest of its days. As such, it was linked with some of the most remarkable events in 16th-century Scotland, particularly during the time of James, 4th Earl who married Mary Queen of Scots in 1567. Prior to that union, Mary visited Crichton in 1562 for the wedding celebrations of Bothwell’s sister, Janet.

Mary’s third husband built nothing new at Crichton, but his successor, Francis Stewart, the 5th Earl, expanded it dramatically. The north lodging, built around 1580, is a most extraordinary structure. Its highly attractive, diamond-faceted façade, overlooking the courtyard, would be more at home in the Mediterranean, in Spain, Italy or southern France. Francis also had a most unusual complex of stables built beside the castle, with a huge overlight in the shape of a horseshoe.

http://www.historic-scotland.gov.uk/index/places/propertyresults/propertyabout.htm?PropID=PL_076&PropName=Crichton Castle

Crookston Castle

The altered ruin of an unusual 15th-century castle. The property consists of a central tower with four square corner towers, set within 12th-century earthworks. Affords excellent views of south-west Glasgow.


The monument comprises Crookston Castle of medieval date, visible as an upstanding tower, enclosed by the earthworks of the first castle, along with an area surrounding the earthworks. The monument is in the care of the Scottish Ministers and was first scheduled in 1920. It is being rescheduled to extend protection to cover the whole of the archaeologically sensitive area.

The castle occupies the western part of a hilltop, dominating the confluence of the Levern Water and the White Cart, at between 20-30m OD.

Crookston exhibits at least two distinctive and major phases of medieval castle building, part of which may encompass the outworks of an earlier fort.

The primary work comprises the massive encircling bank and ditch of Robert Croc’s earth-and-timber castle, built in around 1180. The ditch is up to 3.5m deep and forms an irregular hexagon shape in plan, with an entrance gap on its western side. Recent geophysical survey has revealed the remains of a circular structure and possible ditches some 40m E of the moat. These features may indicate the presence of a pre-existing ancient fort on this site, the western half of which may have been re-utilised by Robert Croc when he constructed his ringwork castle.

The secondary work comprises the impressive stone castle probably built by Sir John Stewart of Darnley at the beginning of the 15th century. The arrangement of this castle is unique in Scotland and comprises a high central oblong block (measuring c.19m E-W by 12m N-S) with four square corner towers. The two western towers and much of the western part of the main block have now gone, and the NE tower alone survives intact. This tower exhibits careful unitary planning. The public rooms were located within the central block, while the projecting corner towers contained the other accommodation expected in a conventional towerhouse: stores, kitchen, prison, bed chambers, and servants quarters. This castle was besieged by James IV’s forces during a rebellion in 1489, although the defenders surrendered without a shot being fired. Labourers were brought from Paisley to partially demolish the castle, and although some of this damage was subsequently repaired, the western towers were never rebuilt. Crookston continued to be used as a residence until the end of the 16th century.

http://data.historic-scotland.gov.uk/pls/htmldb/?p=2300:35:3907204724995806::NO::P35_SELECTED_MONUMENT:90085
**Dirleton Castle**

For 400 years, Dirleton Castle stood as a magnificent fortress–residence for three successive noble families. It was badly damaged during Cromwell’s siege of 1650, but its fortunes revived in the 1660s when the Nisbet family built a new mansion close to the picturesque ruins. They also resuscitated the splendid gardens, which now include the world’s longest herbaceous border.

**A residence of three noble families**

Dirleton Castle has graced the heart of Dirleton since the 13th century. For the first 400 years, it served as the residence of three noble families – the de Vauxes, Haliburtons and Ruthvens. The subsequent downfall of the Ruthvens saw the castle abandoned as a noble residence. The siege by Oliver Cromwell’s soldiers in 1650 rendered it militarily unserviceable. When the Nisbets purchased the estate in the 1660s, they built a new mansion house, Archerfield, nearby. But they didn’t forget the ancient castle. The graceful ruins became an eye-catching feature in their new designed landscape. Today, both castle and gardens are attractions in their own right.

**The de Vaux castle**

The oldest part of the castle dates from the de Vauxes’ time in the 13th century. The impressive cluster of towers – including the imposing keep at the SW corner – is among the oldest castle architecture surviving in Scotland. The builder, John de Vaux, was steward in the household of Alexander II’s queen, Marie, daughter of the Duke of Coucy, near Amiens in northern France, where a remarkably similar castle can still be seen.

**The Haliburton castle**

The de Vaux castle suffered badly during the Wars of Independence with England that erupted in 1296. Dirleton was captured in 1298, on the specific orders of King Edward I of England, ‘Hammer of the Scots’, and changed hands several times thereafter. By 1356 Dirleton had a new lord, John Haliburton. He rebuilt the battered castle, adding a new residential tower and great hall along the east side of the courtyard. Although largely ruined, the surviving cavernous storage vaults, family chapel and grim pit-prison convey a wonderful impression of lordly life in the later Middle Ages.

**The Ruthven castle**

The Ruthvens acquired Dirleton around 1510. It was not their main residence, which lay at Huntingtower, near Perth. Nevertheless, they carried out substantial improvements. They built a new residence, the Ruthven Lodging, and laid out gardens to the west. The present bowling green may once have been a parterre, or formal garden. The fine circular dovecot (pigeon house) was theirs also.

**The gardens**

The gardens that grace the castle grounds today date from the late 19th and early 20th centuries. The formal Victorian west garden – with its foliage plants and pelargoniums – was faithfully reconstructed in 1993. The beautiful north garden dates from the Arts and Crafts movement of the 1920s, and its fragrant herbaceous borders are the first thing the visitor sees on entering the property.

**Duntarvie Castle**

Duntarvie Castle is the only case study that is not a Historic Scotland property.

*Not much information can be found on both the Listed Monuments and Scheduled Monuments Lists are. The following description is taken from my previous work “Study of a Barrel Vault – Duntarvie Castle.” MSc in Architectural Conservation, Conservation Technologies, University of Edinburgh, 2015; which took most of the historic information from the CFA Archaeology Ltd report: Duntarvie Castle, Winchburgh, West Lothian – Level 4 Historic Building Survey – Report No.1710. November 2011.*

**Brief history and description**

Duntarvie Castle, located 1.5 km N of Winchburgh and 9 km E of Linlithgow (West Lothian), is a tower house built in the late 16th century. It is an oblong three storey block with square four or five storey tower at the North angles of a very typical late 16th and early 17th-century fortified country house style. An addition to the South-West corner (17th century) and the collapse of the North-East tower in 1995 interrupt the original symmetry.

The castle is an A-listed building since early 1971 and is further registered on the list of Scheduled Monuments since 1953. The latter status is partly responsible for the slow progress in the conservation works because of issues with the required Scheduled Monument Consent.

**Current state**

The castle was last inhabited in the 19th century. It quickly fell into decline and has remained roofless ever since. Several architectural details have since then been lost, such as the balustrades located on top of the towers (gone by the 20th century) and the central chimney stack (removed between 1990-94). During a storm in 1995, the North-East tower collapsed.

Surveys and consolidation works are being carried out since the early 1990’s. The present owner wants to make the castle habitable again. Roof trusses are currently being assembled next to the semi ruinous castle.

The lack of roof for centuries might be partly responsible for some of the observed deformation and decay on the analysed vault. Floors have also gone missing, leaving the walls freestanding over circa seven meters (if one does not consider the recent temporary wooden beams and planks introcuded between the second and third floor), which also will have some implications both on the observed deformations and possible solutions.

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Hailes Castle

Hidden away in the pretty valley of the River Tyne stands the remarkable castle of Hailes. It is one of Scotland’s oldest stone castles, dating from the first half of the 1200s. Hailes Castle served as a fortified noble residence for over 300 years. The puzzle is its location, for the castle is overlooked at close quarters by high ground, making it very difficult to defend. The reason may be that, when it was built, this part of Scotland was peaceful. Hailes is associated with two noble families – the de Gourlays and the Hepburns.

The castle of the de Gourlays

Very few stone castles in Scotland date from the 1200s. Hailes is among them. It was built around 1220 by one of the de Gourlays, a family that appeared in East Lothian in the reign of William I (the Lion) (1165–1214). They were knights of the powerful Balliol family, who settled in County Durham after 1066. The de Gourlay castle is remarkably well preserved. It is readily distinguishable from the later work by its cubed blocks (known as ashlar) of red sandstone. This first castle looks more like a lightly fortified manor house than a formidable fortress. The central hall block is flanked on either side by the chamber tower and kitchen tower; the latter has a fine rock-cut well.

The castle of the Hepburns

The de Gourlays forfeited Hailes during the Wars of Independence with England. Into their shoes stepped the Hepburns, tenants of the earls of Dunbar. They rebuilt the castle, partly to repair damage done during the wars (Hailes may have been one of the three East Lothian castles captured by Edward I in 1298, the others being Dirleton and Yester). They also wanted to upgrade the accommodation. The present stone curtain wall, tower house and hall/chapel are their handiwork. Following James Hepburn, 4th Earl of Bothwell and Mary Queen of Scots’ 3rd husband (1567), flight into exile after Mary’s capture, Hailes Castle quickly declined. A subsequent owner, Sir David Dalrymple, purchased Whitehill House, near Edinburgh, in 1709. He renamed it Newhailes in memory of the ancient castle.


Hailes Castle, which dates originally from the 13th century, was remodelled in the 14th-15th centuries, and remained in use until Cromwell’s invasion of SE Scotland in 1650. […] but re-occupied by tenants of the Dalrymple Estate in the 18th century. At a late period, the interior of the tower was converted into a dovecot. The earliest part of the castle, dating to the 13th century, occupies the eastern half of the site and is represented by red sandstone ashlar work. This forms the lower storeys and pit prison of the keep and the basement of a well tower a little to the E. The upper part of the keep is of grey rubble construction and represents a later rebuilding or addition. […] The tower, constructed of rubble masonry, dates to the 14th-15th centuries and comprises a storage basement, including a pit prison at ground level, a hall on the first floor and private chambers above. It overlooks a courtyard and various ancillary buildings, the footings of which are still visible. The curtain wall also belongs to this building phase. Between the tower and keep is a sizeable three-storey structure with attic, probably of 15th-century date, that has been substantially altered over the years.

Ravenscraig Castle

Stewart sovereigns and Sinclair earls

In March 1460 James II acquired the estate of Ravenscraig for his queen, Mary of Gueldres. Work immediately got underway on her new castle. Five months later the king lay dead, killed by one of his own guns at the siege of Roxburgh. Undaunted, his widow asked her master mason, Henry Merlioun, to continue with the construction.

The building work was sufficiently advanced by 1461 to allow the queen’s steward and other servants to stay there for 25 days. But it is not certain whether Mary ever lived here before her own death in December 1463.

In 1470 her son, James III, granted the castle to William Sinclair, Earl of Caithness. This grant was to help compensate him for resigning the earldom of Orkney and lordship of Shetland to the Crown. The Sinclairs completed the building and held it thereafter. But occasionally royal Stewarts came to stay, including James V in 1540 and James VI in 1598.

A strong residence

Ravenscraig was built as a noble residence, but one with defence well to the fore. The central entrance passage was approached across a deep, rock-cut ditch by a bridge, probably with a withdrawable section nearest the gate. Immediately inside was a guardroom. The rest of the central block was taken up by stone-vaulted cellars. The high west tower housed the four-floor apartment of the owner (first the queen, then the Sinclair earls). Access was at first floor level, via a forestair rising up from a small, secure courtyard behind. The east tower housed the well, and individual apartments for the owner’s senior officials in the upper rooms. In the courtyard behind were the kitchen, bakehouse and other domestic offices. Protection was offered by a wall skirting the edge of the steep-sided promontory.

No artillery fort

Thanks to its massive, 3.5m-thick frontal wall and proliferation of gun holes, Ravenscraig has generally been regarded more as an artillery fort than a castle. This view holds that it was built to help defend the Firth of Forth from an English invasion.

But a study of the many masons’ marks on the stonework shows that the only parts completed by Queen Mary’s death were the east tower and the foundations of the central range. And the only gun hole there, an inverted keyhole type, is clearly a later insertion.

It fell to the Sinclairs to complete the construction. It was only at some date in the mid-1500s that they built a gun platform over the central vaults – where Queen Mary would have built her great hall, had she lived a little longer.


Tantallon Castle

Tantallon Castle is a formidable stronghold that stands on a cliff overlooking the Firth of Forth. It was the seat of the Douglas Earls of Angus, one of the most powerful baronial families in Scotland. Tantallon served as a fortification for more than three centuries and endured three major sieges.

Stronghold of the Douglases

Mighty Tantallon Castle was built in the mid-1300s by a nobleman at the height of his power. In 1354, William Douglas came into possession of all his father’s lands, as well as those of his uncle, ‘the Good Sir James of Douglas’, a close friend of King Robert the Bruce. The estates included the barony of North Berwick. In 1358 William was created Earl of Douglas, by which date the masons may already have begun to build his new stronghold. In the 1380s the dynastic house of Douglas split into two branches, known as the ‘Black’ and the ‘Red’. Tantallon passed to the junior line, the ‘Red Douglases’, earls of Angus. For the next 300 years, the earls of Angus held sway at the castle. They were one of the most powerful baronial families in Scotland. During this period the castle endured three great sieges, in 1491, 1528 and 1651. The last, by Oliver Cromwell’s army, resulted in such devastating destruction that the mighty medieval fortress was abandoned to the birds.

Scotland’s last great medieval castle

Tantallon was the last truly great castle built in Scotland. Its architecture harked back to the mighty defensive stone castles of the 1200s, such as Bothwell Castle. These were characterised by enormously thick and high stone walls enclosing large closes, or courtyards. Tall stone towers projected from great curtain walls, providing living quarters for the nobles. Tantallon’s plan differs from most comparable castles only because of its situation, at the edge of a promontory. Although the curtain wall enclosed the entire site, the castle only needed formidable defences along its landward side. Its great curtain wall of red sandstone still stands remarkably complete, as do the three towers in which the mighty earls of Angus lived.

The architecture of warfare

The castle was constructed in the age before gunpowder artillery. Its high, thick walls had simply to withstand assault from stone-throwing machines, battering rams and arrows. This explains the almost complete absence of openings in the curtain wall, the concentration of defence on the battlements at the wall top, and the wide, deep ditch in front. The proliferation of artillery changed all this – subsequent owners had to improve Tantallon’s defensive capability. They filled in the wall chambers to help withstand incoming cannon shot, inserted gun holes and built additional gun defences outside. These included a gun tower beside the outer gate, and a ravelin (an earthen gun emplacement) beyond. In the end it was not enough. In 1651 Cromwell’s heavy guns, mounted on adjacent promontories, ripped the guts out of the end towers.

http://www.historic-scotland.gov.uk/index/places/propertyresults/propertyoverview.htm?PropID=PL_284

APPENDIX 4: HISTORIC SCOTLAND CONDITION SURVEYS OF THE EIGHT ANALYSED CASTLES

Historic Scotland kindly made quinquennial surveys, condition surveys, and conservation strategies available for the purpose of the present research. Most part of these documents is reproduced on the annexed CD.

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APPENDIX 5: GLOSSARY

Definitions extracted from Illustrated Glossary on Stone Deterioration Patterns; ICOMOS

**ALGA:** Algae are microscopic vegetal organisms without stem or leaves which can be seen outdoors and indoors, as powdery or viscous deposits (thickness: tenth of mm to several mm). Algae form green, red, brown, or black veil like zones and can be found mainly in situations where the substrate remains moistened for long periods of time. Depending on the environmental conditions and substrate type, algae may form solid layers or smooth films. On monuments, algae are constituted of unicellular to pluricellular clusters, and they never form macroorganisms. [Illustrated Glossary on Stone Deterioration Patterns, p.66]

**ALTERATION:** Modification of the material that does not necessarily imply a worsening of its characteristics from the point of view of conservation. For instance, a reversible coating applied on a stone may be considered as an alteration. [Illustrated Glossary on Stone Deterioration Patterns, p.8]

**ALVEOLISATION:** Formation, on the stone surface, of cavities (alveoles) which may be interconnected and may have variable shapes and sizes (generally centimetric, sometimes metric). Remark: Alveolisation is a kind of differential weathering possibly due to inhomogeneities in physical or chemical properties of the stone. [Illustrated Glossary on Stone Deterioration Patterns, p.28]

**BIOLOGICAL COLONISATION:** Colonisation of the stone by plants and micro-organisms such as bacteria, cyanobacteria, algae, fungi and lichen (symbioses of the latter three). Biological colonization also includes influences by other organisms such as animals nesting on and in stone. [Illustrated Glossary on Stone Deterioration Patterns, p.64]

**BLISTERING:** Separated, air-filled, raised hemispherical elevations on the face of stone resulting from the detachment of an outer stone layer. This detachment is not related to the stone structure. Remark: Blistering, in some circumstances, is caused by soluble salts. [Illustrated Glossary on Stone Deterioration Patterns, p.14]

**BURSTING:** Local loss of the stone surface from internal pressure usually manifesting in the form on an irregularly-sided crater. [Illustrated Glossary on Stone Deterioration Patterns, p.16]

**CRACK:** Individual fissure, clearly visible by the naked eye, resulting from separation of one part from another.

Sub-type(s):
- **Fracture:** Crack that crosses completely the stone piece
- **Star crack:** Crack having the form of a star. Rusting iron or mechanical impact are possible causes of this type of damage.
- **Hair crack:** Minor crack with width dimension < 0.1 mm
- **Craquele:** Network of minor cracks also called crack network. The term crazing is not appropriate for stone, as this term should be used for describing the development of a crack network on glazed terracotta.
- **Splitting:** Fracturing of a stone along planes of weakness such as microcracks or clay/silt layers, in case where the structural elements are orientated vertically. For
instance, a column may split into several parts along bedding planes if the load above it is too high.

*Illustrated Glossary on Stone Deterioration Patterns, p.10*

**CRUST:** Generally coherent accumulation of materials on the surface. A crust may include exogenic deposits in combination with materials derived from the stone. A crust is frequently dark coloured (black crust) but light colours can also be found. Crusts may have a homogeneous thickness, and thus replicate the stone surface, or have irregular thickness and disturb the reading of the stone surface details.

Sub-type(s):
- **Black crust:** Kind of crust developing generally on areas protected against direct rainfall or water runoff in urban environment. Black crusts usually adhere firmly to the substrate. They are composed mainly of particles from the atmosphere, trapped into a gypsum (CaSO4.2H2O) matrix.
- **Salt crust:** Crust composed of soluble salts, which develop in the presence of high salt levels, and form from wetting and drying cycles.

*Illustrated Glossary on Stone Deterioration Patterns, p.42*

**DECAY:** Any chemical or physical modification of the intrinsic stone properties leading to a loss of value or to the impairment of use. *Illustrated Glossary on Stone Deterioration Patterns, p.8*

**DELAMINATION:** Detachment process affecting laminated stones (most of sedimentary rocks, some metamorphic rocks...). It corresponds to a physical separation into one or several layers following the stone laminae. The thickness and the shape of the layers are variable. The layers may be oriented in any direction with regards to the stone surface.

*Illustrated Glossary on Stone Deterioration Patterns, p.18*

**DEPOSIT:** Accumulation of exogenic material of variable thickness. Some examples of deposits: splashes of paint or mortar, sea salt aerosols, atmospheric particles such as soot or dust, remains of conservation materials such as cellulose poultices, blast materials etc.

*Illustrated Glossary on Stone Deterioration Patterns, p.44*

**DISINTEGRATION:** Detachment of single grains or aggregates of grains.

Sub-type(s):
- **Crumbling:** Detachment of aggregates of grains from the substrate. These aggregates are generally limited in size (less than 2 cm). This size depends of the nature of the stone and its environment.
- **Granular disintegration:** Occurs in granular sedimentary (e.g. sandstone) and granular crystalline (e.g. granite) stones. Granular disintegration produces debris referred to as a rock meal and can often be seen accumulating at the foot of wall actively deteriorating. If the stone surface forms a cavity (coving), the detached material may accumulate through gravity on the lower part of the cavity. The grain size of the stone determines the size of the resulting detached material. The following specific terms, all related to granular disintegration, refer either to the size, or to the aspect of corresponding grains:
  - **Powdering, Chalking:** terms sometimes employed for describing granular disintegration of finely grained stones.
- **Sugaring**: employed mainly for white cristallyne marble.
- **Sanding**: used to describe granular disintegration of sandstones and granites.

[Illustrated Glossary on Stone Deterioration Patterns, p.20]

**EFFLORESCENCE**: Generally whitish, powdery or whisker-like crystals on the surface. Efflorescences are generally poorly cohesive and commonly made of soluble salt crystals. [Illustrated Glossary on Stone Deterioration Patterns, p.48]

**ENCRUSTATION**: Compact, hard, mineral outer layer adhering to the stone. Surface morphology and colour are usually different from those of the stone.

- **Concretion**: Kind of encrustation having a specific shape: nodular, botryoïdal (grape-like) or framboïdal (raspberry like). Concretions may even have conic shapes of form drapery-like vertical sheets. Stalagmites and stalactites are kinds of concretions. In general, concretions do not outline, contour the surface of the stone, and are of limited extent. [Illustrated Glossary on Stone Deterioration Patterns, p.50]

**EROSION**: Loss of original surface, leading to smoothed shapes. [Illustrated Glossary on Stone Deterioration Patterns, p.30]

**GRAFFITI**: Engraving, scratching, cutting or application of paint, ink or similar matter on the stone surface. Note: Graffitis are generally the result of an act of vandalism. However, some graffitis may have historical, aesthetical or cultural values and should be conserved. [Illustrated Glossary on Stone Deterioration Patterns, p.56]

**LICHEN**: Vegetal organism forming rounded millimetric to centimetric crusty or bushy patches, often having a leathery appearance, growing generally on outside parts of a building. Lichens are most commonly grey, yellow, orange, green or black and show no differentiation into stem, root and leaf. [Illustrated Glossary on Stone Deterioration Patterns, p.68]

**MOSS**: Vegetal organism forming small, soft and green cushions of centimetric size. Mosses look generally like dense micro-leaves (sub- to millimetric size) tightly packed together. Mosses often grow on stone surface open cavities, cracks, and in any place permanently or frequently wet (masonry joints), and usually shady. [Illustrated Glossary on Stone Deterioration Patterns, p.70]

**MOULD**: Microscopic fungus which colonies, to the naked eye, look like a downy film or a network or star-like millimetric patches of filaments of diverse colours (white, grey, black). [Illustrated Glossary on Stone Deterioration Patterns, p.72]

**PATINA**: Chromatic modification of the material, generally resulting from natural or artificial ageing and not involving in most cases visible surface deterioration. [Illustrated Glossary on Stone Deterioration Patterns, p.58]

**PEELING**: Shedding, coming off, or partial detachment of a superficial layer (thickness: submillimetric to millimetric) having the aspect of a film or coating which has been applied on the stone surface. Not to be confused with: Scaling, which is related to the detachment of stone layers. [Illustrated Glossary on Stone Deterioration Patterns, p.24]

**SCALING**: Detachment of stone as a scale or a stack of scales, not following any stone structure and detaching like fish scales or parallel to the stone surface. The thickness of a scale is generally of millimetric to centimetric scale, and is negligible compared to its surface dimension.
Sub-type(s):
- **Flaking**: scaling in thin flat or curved scale of submillimetric thickness, organised as fish scales.
- **Contour scaling**: scaling in which the interface with the sound part of the stone is parallel to the stone surface. In the case of flat surfaces, contour scaling may be called **spalling**. **Casehardening** is a synonym of **contour scaling**. [Illustrated Glossary on Stone Deterioration Patterns, p.26]

**SOILING**: Deposit of a very thin layer of exogenous particles (e.g. soot) giving a dirty appearance to the stone surface. [Illustrated Glossary on Stone Deterioration Patterns, p.60]

**SUBFLORESCENCE**: Poorly adhesive soluble salts, commonly white, located under the stone surface. *Remark: Subflorescence is commonly the result of evaporation of saline water present in the porous structure of the stone. As subflorescences develop inside the porous structure, they often result in scaling of the surface.* [Illustrated Glossary on Stone Deterioration Patterns, p.62]

**WEATHERING**: Any chemical or mechanical process by which stones exposed to the weather undergo changes in character and deteriorate. [Illustrated Glossary on Stone Deterioration Patterns, p.8]
Scotland is an internationally renowned land of castellated architecture. Numerous publications about Scottish castles and tower-houses, as well as most tourists’ pictures highlight the appeal of a national heritage. Dilapidated ruinous castles constitute a particularly romantic vision, constantly depicted up until today.

One may wonder why and how such ruins, which naturally are submitted to the ongoing process of weathering and decay, have come down to us through the ages. Leading architectural theorists have put the focus on the field of heritage preservation through their centuries-old debate over conservation versus restoration. Conflicting ideologies led to various technological consolidation-works that have slowed down or even halted the weathering of ruins in the last two centuries.

Through the analysis of previous interventions and observing ongoing decay mechanisms, the present research will propose possible and adequate conservation technologies for ruinous castles, which have remained roofless and exposed to natural external factors for some time. The scope of this research is thus to offer an analysis and leads on which conservation technologies can be (and have been) used to preserve (semi)ruinous castles as ruins.