What is building conservation? It might seem a silly question to pose here, but I do so because conservation keeps changing as a discipline and is often misunderstood. Some see conservation purely as a technical process of building repair and maintenance. But it is also about understanding the range of historic structures and traditional building materials, and how they are repaired. Old buildings need to breathe, for instance, and the mortar, plaster and paint used can affect this.

Wider view
We speak now of conserving the historic environment, a phrase that embraces more than buildings alone. Historic England defines it as “all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora”. Another phrase is “cultural heritage”, used to distinguish the work of humans from natural heritage. Cultural heritage not only includes buildings but also other assets such as works of art and intangible heritage.

As part of this broader culture, buildings must have secure and viable futures, and conservation professionals should help to ensure this. This may entail changes to a building to accommodate new uses or technology, and such changes must balance the building’s significance with the need for adaptation. It is not enough simply to preserve historic buildings: all of them have already been subject to change throughout their lives, and most can accommodate further changes. The legal protection regime does not rule out alterations to listed buildings, but ensures that any such changes are appropriate.

Conservation decisions need a clear understanding of a building or site, although proposals are all too often made without such insight. Making decisions usually involves consideration of different options that are not explicitly articulated, but it does help the process of obtaining consent if the owner has prepared an options appraisal.

Legal lag
The Planning (Listed Buildings and Conservation Areas) Act 1990 defines listed buildings as having “special architectural and historic interest”, but policy and guidance in the past few years have developed with an assessment of a wider range of values, not conceived when the act was drafted. Our concepts of what “heritage” is have changed: for instance, local heritage may not figure in listing designations, even though much greater value is now being put on it by the people who live and work there.

The key to making decisions about the future of historic buildings is to see them as a part of continuing development, and be informed by these wider considerations of value.
The Engine Shed in Stirling aims to promote Scotland’s built heritage by offering a resource for conservation professionals and the public alike, writes David Mitchell

Heritage hub

Run by Historic Environment Scotland, the Engine Shed at Forthside Way in Stirling opened on 4 July 2017. The £11m learning and visitor resource boasts state-of-the-art technology, with the interactive map of Scotland using an augmented reality app to explore buildings and including a 4K 3D theatre. This promotes innovation by educating and training built heritage and conservation professionals in the protection and preservation of Scotland’s traditional buildings, as well as enhancing public understanding of the historic environment.

Need for knowledge

Scotland’s historic built heritage is a unique resource, yet its maintenance demands conservation skills that are in short supply. An estimated 5,000 skilled workers are needed throughout the construction industry in Scotland to look after more than 450,000 traditionally constructed buildings. Many such properties are still in use as homes or workplaces, so the need for continued conservation and the development of techniques, technologies, skills and understanding of materials increases. The Engine Shed therefore seeks to raise standards in caring for the nation’s built heritage by demonstrating the continuing cultural and economic relevance of traditional buildings, construction materials and skills.

Indeed, the opening of the Engine Shed represents a significant milestone for Scotland’s heritage sector. It highlights the crucial work taking place, and also provides a platform for upskilling and engaging those interested or already working in the industry, ensuring Scotland’s built heritage is protected now and in the future.

Open to all, the Engine Shed provides hands-on workshops, lectures, training and educational resources for those working in the sector, as well as giving members of the public an opportunity to explore their built heritage through interactive exhibits and augmented-reality experiences. It aims to spark a passion for Scotland’s historic environment and inspire a new generation to take an interest in traditional buildings.

As part of its professional offering, the Engine Shed has begun running an advanced diploma in technical building conservation, aimed at those with experience in the built heritage field who are interested in furthering their career.

Taught on site, the 10-month programme is unique, and includes hands-on craft demonstrations, laboratory work, studio exercises in 3D digital documentation and regular field trips to active projects around Historic Environment Scotland’s estate. Individual modules and day-long seminars can also be taken as CPD to enhance knowledge of the technical aspects of traditional materials, combined with learning in conservation science and the latest digital documentation techniques.

In addition to the diploma, an outreach programme of events and activities runs throughout the year, including a week-long course introducing building conservation and traditional building materials and skills through a combination of talks, workshops and field trips.

Climate of concern

Over the past few decades, we have seen significant changes in weather patterns, with a shift towards more extreme weather events still predicted. Scotland has always been subject to severe weather and our traditional buildings were built with enormous resilience to environmental hazards, but recent climate change is having new and unanticipated impacts on them.

The Engine Shed has been designed in part to meet the need for a living classroom in conservation science and technology, which is vital in developing understanding of such physical effects on Scotland’s heritage. Providing a range of workshops and educational resources for architects, surveyors, construction workers and stonemasons among others, the Engine Shed will promote the skills and knowledge to protect Scotland’s built environment against the continuing impacts of climate change.

Historic Environment Scotland’s digital documentation and conservation science teams are now also based at the Engine Shed, and constantly seek new technologies – primarily to aid conservation but also to help with building or site management that better supports public understanding of heritage. The two teams help to
and remained in use by the Ministry of Defence until 1990.

Two modern extensions have also been built, using glue-laminated timber frames clad in lightweight zinc on either side of the original structure to provide extra space for Scotland’s first building conservation centre. The design and scale of these have been carefully planned to complement rather than compete with the original building.

In a purposefully contemporary setting, traditional skills and materials are blended with new technology, including a 95-seat 3D auditorium and a large-scale map of Scotland – compiled from high-resolution satellite images – in the main space, where visitors can access additional information by using iPads as augmented-reality devices.

The project team made the most of local and natural materials to retain as much of the fabric and character of the original munitions store as possible, while demonstrating a sustainable approach to construction with the new wings. The interior walls of the Engine Shed have been restored and the floor reduced to its original level, with side platforms removed to provide level access throughout the building. Existing openings were restored to their original proportions, with others created to provide access to the new extensions.

Three-quarters of the original slates from the roof of the building were salvaged, and the refurbishment of the existing steel windows is a further impressive design feature. A large amount of sheep’s wool has been used to insulate the building, as well as triple glazing and three ground-source heat pumps. Clay board has also been used instead of plaster board, as the former takes less energy to manufacture than the latter and thus has a lower carbon footprint.

Constructive continuity
Engine Shed Project Manager Peter Buchanan said: “We have sought to retain and disturb as little as possible of the original fabric and character and upgraded it with minimal impact. The form of the new shed is a simple, clear-span structure with a pitched roof, reflecting the traditional approach to railway architecture where a simple design for a shed is repeated until the required accommodation is achieved.”

The Engine Shed is not just about maintaining traditional buildings and materials, it’s about marrying these with new and advanced technologies to continue to conserve Scotland’s built heritage and environment. Long may it do so.

Sheds and sustainability
The Engine Shed itself is a sustainable build, using traditional and natural materials in unique new ways to refurbish a traditional Ministry of Defence munitions shed that dates back to the 1890s. The building formed part of the extensive Forthside military compound in central Stirling between 1890 and 1900. Although the exact construction details are unknown, Forthside was a core military depot storing and transporting supplies, equipment and munitions across the country via the rail and river network,
Looking into the past could inform future building use, explains Robyn Pender

Holistic histories

Demands on buildings continue to increase: energy reduction, maintenance simplification, climate change adaptation, new ideas about comfort and modern patterns of use. It’s often thought that these must be in fundamental conflict – but if you get things right, then it’s usually fine all round.

The key is to think holistically, concentrating not just on the building’s fabric and context or its services, but on the occupants as well. At Historic England, we call this the “building performance triangle”: you can’t address the fabric in isolation from the heating, cooling and plumbing. It makes no sense to talk about temperature control without thinking about the building and the climate, or the occupants’ expectations of the services.

Low-cost comfort

Looked at in this way, many apparently intractable problems can resolve themselves. Take the example of a church that the parochial council would like to heat. What it wants in fact are comfortable conditions that allow effective use of the building. If the council brings in an engineer who sees it as a box in which air needs to be heated to a particular temperature, fabric problems making the space feel damp and cold will go unresolved, and the building will have a conventional system fitted that heats the ceiling at some expense while causing terrible draughts. It will also pull moisture out of the walls, which may condense on the windows and under the roof, making the fabric’s condition even worse.

Housing and offices face similar issues: there is a huge gap between the energy performance promised by computer modelling and what is actually provided, and we also know that highly conditioned spaces are often too hot and poorly ventilated. Nevertheless, we persist in seeking innovative materials or smarter services that still burn fossil fuels.

Before the Industrial Revolution, energy was extremely expensive, so buildings incorporated many simple means of adjusting the interior environment: partitioning with curtains to cut draughts, cloth hangings or wooden panelling to reduce the loss of body heat through walls in winter, louvred shutters and chimneys to ventilate on summer nights, and so on. Characteristically, most were adjustable to suit conditions and taste, as people feel much more comfortable if they know they can open a window or set a heater going. Seasonal changes were well understood, with different responses for heat and cold.

We no longer include these options in our toolboxes, but – dusted off and given a modish touch – many could contribute again to making the built environment operate efficiently.

Trust your instincts

The problem is, as one US colleague of mine observed, that we have forgotten how to “sail” our buildings. How little we now understand them has been brought home to me by Sarah Khan’s recent research at the Architecture Association on Bedford Square. The occupants of the offices used for her experiments, whose ideas about buildings might have been expected to be better than average, had significant difficulty in trusting their own instincts. They all assumed that what was needed to make their too-sunny rooms comfortable in summer was air conditioning, even though the one association building that did have it was considered to be uncomfortable.

To combat solar gain and glare, Khan reintroduced some of the original elements that had been lost, including awnings and gauze curtains. Although the improvement in conditions was immediate, assumptions about the superiority of modern ways of doing things were so engrained that, until the occupants were shown the environmental monitoring results, they were convinced it must be due to better weather rather than Khan’s changes. As they gained knowledge and experience, they quickly became enthusiastic participants.

Clearly, if we are to save energy to the degree demanded to mitigate climate change, active engagement of occupants is a prerequisite. But where are the specialists able to assess buildings holistically, and help people understand and optimise use? At present, most of the few building performance experts have backgrounds in conservation – perhaps no surprise, given that a knowledge of building history and behaviour under practical conditions is so helpful. But we need many more experts if we are to ensure effective energy use across the built environment.

Could training in building performance be offered to surveyors and architects? Or to service engineers? What form would it take, and who would provide it? Since so much knowledge must be gained at work, how would we formally recognise the level of experience and understanding gained over time? These are questions to which we urgently need to find answers.

Dr Robyn Pender is Senior Architectural Conservator at Historic England robyn.pender@historicengland.org.uk
Summary

Natural hydraulic lime (NHL) is a binder that was commonly used for many construction purposes until the early 20th century. Today, it has had a significant resurgence, partly due to its favourable performance for traditional applications compared to Portland cement.

Composition and performance

NHLs are produced by burning impure limestone; they principally include calcium carbonate and can also contain silica and aluminium. The higher the level of impurities such as silica, the higher the amounts of hydraulic compounds formed during burning, and it is these that are mainly responsible for the strength of the material. NHLs are available in three classifications: NHL2, NHL3.5 and NHL5, with the higher numbers indicating greater strength.

Products known as hydraulic limes (HLs) and also formulated limes are available, but these are quite different to NHLs, inasmuch as they are artificially derived blends of various binder components and often contain cement as well (see BS 459 definitions). No indigenously sourced NHLs are currently available in the UK, although the import of French, German and Portuguese NHLs provides some choice in specification and procurement.

NHLs have relatively favourable performance characteristics, such as high permeability and flexibility. They must be set in context with cement mortars that are inherently less permeable and flexible. Generally, the higher the strength of the NHL binder, the lower the permeability and flexibility of the material. Compressive strength is in the range of 2–5MPa after 28 days, but continues to develop for considerably longer, and the upper limit for long-term strength in an NHL5 can be 10MPa or more.

Identification and application

NHL is used for mortars, renders and harls, limewashes, and specialised products. The major use of NHL is in wall construction, with bedding and core mortars, external pointing, renders and harls for external surface finishes being common applications.

NHL sets and hardens by two simultaneous chemical reactions, hydration – a reaction of hydraulic compounds on contact with water – and carbonation of the calcium hydroxide – that is, the reintroduction of carbon dioxide into the binder.

These setting mechanisms yield stable mineral forms known as calcium silicate hydrates and calcite respectively. NHLs can set partially in damp conditions, but the lower strength NHL2 sets largely as a result of carbonation and is therefore unsuitable for prolonged damp situations.

Decay and degradation

Durability is related in part to the suitable formation of the products of hydration. The materials must therefore be cured effectively, which is why after-care is fundamental to good lime works.

Defects in NHL materials can be subdivided into two main categories: during construction, early placement and curing; and in longer-term deterioration processes. The former are a result of frost damage, lime leaching, poorly graded aggregates leading to shrinkage cracking, and poor curing regimes causing rapid dehydration.

Longer-term defects are meanwhile caused by frost and salts associated with surface erosion and spalling. Life expectancy is a function of the climatic exposure level, the driving rain index and the conditions to which the element being constructed or repaired – e.g. a chimney or exposed or sheltered wall – will be subjected.

Additional data sources

Accreditation where it’s due

Ensuring conservation skills are retained and shared is just as important as protecting historic buildings, maintains Bryan Dickson

We are so fortunate to work in conservation – not only do we get to spend each day in buildings that radiate history and drama, continuing to fascinate, but we share our passion with many others in the sector, in common cause regardless of financial imperatives.

Skill supply

The challenges of looking after historic buildings are endless, however: diagnosing complex problems, removing previous, failing remedies and addressing the effects of changing weather patterns, all under an ever-increasing and complex legislative framework. The skills of an accredited professional, or certified professional to use RICS terminology, have never been in such demand, and the best individuals are those who can see beyond the here and now to fulfil the full potential of traditional building works.

Although it has been said in this journal before, it’s worth repeating that there is little point in looking after our heritage if we don’t also look after the skills required to protect it. So I encourage all specifiers, project managers and other professionals involved in making decisions about built heritage to find ways to support the future of these skills.

For instance, the National Trust for Scotland undertook a recent project in the ruins of a Cistercian Abbey in Fife, with a limited budget and a straightforward brief to waterproof wall heads. However, by creative thinking at the concept stage, the project was also able to train 20-plus volunteers and local enthusiasts in traditional skills and materials, while local schools were invited to take part so they could learn about conservation careers options, and the community was enthused about the attention that a well-loved local asset received, expressing willingness to help in future.

Granted, this is not done so easily on every project; but of all the built environment sectors, we should celebrate conservation professionals’ ability to collaborate around our common causes.

Articulating demand

One of the major stumbling blocks in construction-related professions is matching supply and demand. We all play a part in enabling this, and equally we all experience the frustrations when a timescale for a project’s completion does not marry up with the availability of relevant skills. Therefore, studies that investigate skills availability, growth and associated pressure points should be more widely used.

At the National Trust for Scotland, we have long wanted to develop a skills action plan – matching our own demand with the availability of skills on the local contractor market, thereby encouraging the supply chain to invest in training and apprenticeships. Ambitious programmes of conservation are subject
Environment Scotland and the Society for the Protection of Ancient Buildings in Scotland recently highlighted by Historic Environment Scotland and the Society for the Protection of Ancient Buildings in Scotland have collaborated on a comprehensive survey of all thatched buildings, which gives a snapshot of condition and latent demand. Through the promotion of planned preventative maintenance and a collaborative approach between owners, funders and the labour market at local and national level, some joined-up thinking will surely be possible. This could result in a more predictable work programme, enabling materials suppliers to be supported by land management programmes that provide confidence for the specialist contractors to invest in skills development for a new generation.

Over here and overlooked
On a recent trip to the USA, I visited a number of “preservation societies”, as they are commonly known. It is complex to draw parallels between our two countries when it comes to architectural heritage; however, I did get a sense that all those involved in rescuing, maintaining and sustaining historic buildings are part of a common cause.

One of the organisations I visited was Colonial Williamsburg, Virginia, a living-history museum recreating an 18th-century township that attracts more than 1m visitors a year. It interprets this fascinating period of change with authenticity, supported by historic and scientific research. When I was there, a fragment of a plate emblazoned with the crest of John Murray, the fourth Earl of Dunmore and a colonial governor of Virginia, had been uncovered, and was being studied by many specialists and researchers to inform the interpretation of the site.

I was struck by the contrast with the earl’s family seat of Dunmore House, just outside Stirling, with its renowned pineapple garden folly. This building lies unused and unloved and the family crest – beautifully carved in medallions on the masonry – gradually decays, even while its distant relation is being restored with much excitement in a lab thousands of miles away.

So do we take much of our built heritage for granted in the UK compared to others? Do we regularly pass buildings that are gradually disappearing before our eyes? Would this be tolerated if they were perceived as an important part of our history and the fabric of our society? This situation requires professionals and traditional skills practitioners to do more to explain the significance of these places and help tell their stories. It is only once we attach value to them that people begin to realise the importance of traditional skills and are more willing to offer support. It may be that we need to change our language, impart a sense of urgency to what we see happening around us, and encourage our colleagues and peers to do the same.

Our networks and collaborations give us an opportunity to do so, enabling us to speak coherently as a group. RICS’ conservation certification recognises our common interests, but too often it feels that we are preaching to the converted, with many familiar faces attending conferences, seminars and meetings.

To become more effective in promoting and protecting our built heritage, we must raise our collective voice, increase the number of accredited professionals and help spread best practice. There are many good surveyors out there who might need persuading of the benefits of certification; but undoubtedly, there are many traditional building projects whose full potential and associated benefits fail to be realised.

As the RICS project awards deadline approaches and we begin thinking about the benefits that this recognition can bring to clients and practitioners alike, let’s enable historic buildings to fulfil their full potential and turn good projects into great ones.

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Conservation areas celebrate 50 years

Historic England celebrates the 50th anniversary of conservation areas this year, which were introduced by the Civic Amenities Act 1967. A number of events have been held to honour the 10,000 or more areas that are now designated. Research by YouGov has revealed that 74% of adults in England support local authority powers to restrict changes to buildings in conservation areas, while people who live in such an area are almost twice as likely to have objected to a planning proposal than those who do not. As a result, 65% of residents who are aware they live in a conservation area would relocate to another if they had to move.

Around 2.2% of all land in England lies a conservation area, a total of 2,938 sq. km in total, with at least one area in each local authority. Wiltshire Council, a unitary authority, has the most at 246.

Economic impact of heritage reported

Heritage Counts has published *Heritage and the Economy*, which summarises findings from a range of relevant studies, and has also issued new research in the form of the *Heritage Economic Impact Indicator Workbook 2017*. The key findings of the latter are that:

- heritage tourism generated £16.4bn in spending by domestic and international visitors in England
- repair and maintenance of historic buildings directly generated £9.6bn in construction sector output
- 278,000 people are currently employed in the heritage sector
- heritage indirectly generates £11.9bn gross value added (GVA), which comprises 2% of English national GVA.

BIM guidance published

Historic England has published guidance on the application of building information modelling (BIM) in heritage projects, *BIM for Heritage* (http://bit.ly/2ufaA9A). This details how BIM can be used as a heritage management tool and how data can be acquired, and includes case studies of Waverley Station, Edinburgh, and Woodseat Hall in Staffordshire.

*BIM for Heritage* shows that, although the technology is less widely used in heritage than it is in other construction projects, it can offer advantages in the ongoing management of historic buildings. The Council on Training in Architectural Conservation prepared a report on BIM for heritage in 2014, which also provides useful background information (http://bit.ly/2hRXomV).

Trust revises energy efficiency measures

The National Trust’s environmental advisor Paul Southall has reported on the organisation’s new approach to specifying and implementing energy efficiency measures on its estates, providing practical advice on overall strategy as well as easily implemented savings.

Welsh study voices church upkeep concern

The National Churches Trust invited Welsh churches and chapels to participate in a survey, the result of which have just been published. Findings show that many churches and chapels are still vital for community life; however, the job of looking after religious buildings is becoming harder as congregations decline and the availability of volunteers inevitably decreases.

The *Supporting Places of Worship in Wales Survey 2017*, organised by the trust on behalf of the Welsh Places of Worship Forum, highlights some of the problems. Other principal concerns involve a lack of skills needed to raise funds for repairs, allied with a demand for external financing for repair projects.

PPG updated to help councils

Changes to planning practice guidance (PPG) were made this summer to support local authorities in preparing and publishing brownfield land registers. The PPG also offers information about the new consent route for planning permission in principle.

The PPG is only available online, but is worth monitoring for regular updates.

Framework due for review

The National Planning Policy Framework was published in 2012 and it is due for review, but no firm timetable is currently available.
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“HSE welcomes the introduction of this into the CISRS scheme... it will have a positive effect, particularly for those who may not have received any formal training for years.”
Ray Cooke, Head of Construction Sector Safety Unit, HSE

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