Catching the bug

If you want to be influential you could do worse than look around to see who influences you, and how. I caught myself quoting William Morris, ‘beautiful, useful, blah, blah, blah...’ in a discussion about branding, and realised that the Society for the Protection of Ancient Buildings is in the conservation surveyor’s DNA whether you are a member or not. Indeed, biological metaphors are quite catchy if you are planning on ‘going viral’, because ideas are something you ‘get’ rather than are ‘given’. If you want to catch the conservation bug, your best bet is to hang out with a few people who have it already. And like the world of pathogens, you want to be near the heritage good-guys who build our resilience.

But is an aspiration to be influential just self-aggrandisement? I hope not because I cannot think of anything worse than the kind of vanity that makes certain people (and organisations) play Professor ‘iggins to my Eliza. “Why can’t you be more like ME, ME, ME?” Thought leadership is the latest management speak for being influential, and amounts to building intellectual muscle for the heavy lifting the real world throws at us.

In truth, the people who have influenced me most are not the big names, but just practitioners and surveyors like you and me. People who make a little time to reflect on the ‘what’ and the ‘why’. Small is beautiful, so I don’t spend too long mulling. But the odd cuppa and a biscuit is usually enough to galvanise me to action. After all, what are words without action?

Finally, who is philosophy really for? Received wisdom holds that we would wish to influence policy makers, to shape a world in which good decisions are favoured and bad ones founded. In practice, I think the people who we most want to influence are our clients. We want to make the historic environment a place of opportunity not burden and coercion, by offering them more and better choices.

So, as you can see, you don’t need to be Plato to have a good idea, but you might need to be a good influencer if you want to get things done.

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Windsor Castle's College of St George was founded in 1348 as the spiritual home of the Order of the Garter, and its chapel – St George's Chapel at Windsor Castle – is familiar to millions in the complex of Grade I-listed and Scheduled Ancient Buildings. One of the earliest surviving parts of castle is the Canons’ Cloister, built around 1350 as lodgings for the canons and priests serving the order. The buildings still house the canons and lay clerks of the Order, making the Cloister the earliest surviving collegiate range in Britain.

Refurbishment work found important evidence of the floor plan and structure of the 1352 and later buildings and this, together with the urgent need for repair of the historic fabric, made the project one of national significance.

The quadrangle of timber-framed buildings is tightly positioned between the chapel and the castle wall. Its construction is unusual, having two storeys with a sloping lead covered roof. Each bay contained a small room and covered walkway at ground floor level, a large first-floor room with gently sloping ceiling and large windows and in some cases a later mezzanine floor inserted at the back of the room. A ground floor covered walkway opened onto the cloister garth, with trefoiled tracery spandrels between the principal posts.

Incremental changes throughout the centuries have allowed the original timber frame substantially to survive behind a 19th-century restoration, while much of the internal medieval structure and original floorboards also survive beneath Georgian and Victorian panels and floors. Conservators were therefore faced with the challenge of conserving both the original fabric, and later additions in order to preserve the buildings’ authenticity.

The project was the first major refurbishment of the cloister since the 1960s, when copper sheeting was used to replace the original lead roofs. This had begun to leak and the statutory authorities approved our proposal to reinstate a traditional sand-cast lead roof, and repair a wind-damaged series of clay tiled and slated roofs elsewhere. We also used the opportunity to improve insulation, ventilation and fire protection, as well as to ensure safer access for maintenance. Roof lights were overhauled or replaced, and a new lightning protection system was installed.

Opening up the roofs revealed fascinating new knowledge about the buildings and the wider architectural history of Windsor Castle. For instance, we noticed an unusual yet regular pattern of gaps at the end of 15 rafters, which gave them a tuning fork-like appearance. Project archaeologist John Crook, recalled a medieval reference to “the 15 images”, leading us to conclude that the gaps were in fact sockets for a series of lost statues. Once any archaeology had been recorded we connected damaged rafters using trimmer joints, allowing them to withstand the load of the new lead roof. Other damaged elements of the roof structure were strengthened using traditional carpentry techniques, and carefully detailed stainless-steel members. Despite numerous interventions, we took nothing away from the original medieval frame.

In other places a careful study of the building and its archives gave clues about its original appearance, and allowed us to address earlier interventions. At some point in the building’s history, for example, the rafters had been cut back from the edge of the roof. This had damaged its original profile, which led our 1960s predecessors to conclude that a box gutter was the most appropriate method of water management. This in turn was causing harmful water ingress to the walls of the cloister. We were reluctant to retain the gutter, not only because it had proved ineffective, but also because reinstating a lead roof would have added to the gutter’s height. However, finding stubs of projecting tenons on some rafters supported our alternative theory that the Cloister once had a cornice, which we reinstated in oak together with a more effective fascia-fixed cast iron gutter.
Cantilevered timber supports were installed to support the new gutter, and to recreate the appearance of the original projecting rafters.

Around the cloister a cementitious 1960s render had cracked, giving us concern about water damage to the 14th-century timber frame beneath. The render was removed and replaced with a more appropriate lime render once the frame had been surveyed and repaired where necessary. Perimeter repointing of the brick noggin panels in a soft lime mortar was undertaken, and three or four 20th-century panels were replaced following the basket weave of adjacent counterparts. The remarkable range and chronology of doors, leaded and plain-glazed oriel windows, casements and sash windows were thoroughly overhauled, repaired and decorated. Within the cloister garths, the lower arcade walls were cleaned and conserved where necessary, and modern cement pavoirs were replaced using Purbeck Downsvine. Other paving was cleaned and repointed, and gratings were overhauled and redecorated.

The project also included extensive conservation and refurbishment work to the interiors of the Canons’ Cloister. Decayed ceiling joists were repaired, and modern ceilings were replaced using riven chestnut laths and lime plaster. A series of medieval wall paintings was carefully monitored to protect them from the load and vibrations of lead ‘bossing’ works above. Work also included the internal refurbishment of three lodgings within the cloister. New modern kitchens, bathrooms and utility rooms were installed, and all mechanical and electrical services systems were completely renewed.

The conservation programme was supported financially by the Bray Fellowship, a philanthropic body established to support the College of St George’s. At the end of the works a wall-mounted bronze sundial was mounted on a newly rendered chimney in the cloister garth. It features the hours of service picked out in gilded highlights, and a hemp bray gnomon.

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Further info

www.stgeorges-windsor.org/canonscloister

Related competencies include T012
Seeing is believing

A pilot project in Edinburgh could clear the way for wider use of double-glazed window units in listed buildings, says Nicholas Heath

One of the fundamental problems with double glazing in historic buildings is its association with outdated, cumbersome plastic-framed eyesores. In reality, however, this is no longer the case. Double glazing has been installed successfully in numerous high-profile historic buildings across the UK, in many cases leaving the casual or even informed observer unable to tell the difference between it and its single-glazed predecessor as one such project in Scotland illustrates.

The pilot project was developed and led by Changeworks, a leading Scottish sustainable development organisation, in partnership with Lister Housing Co-operative, City of Edinburgh Council, Historic Scotland and Edinburgh World Heritage. Following extensive research and negotiations, bespoke double glazing was installed in both category ‘A’ and ‘B’ listed Georgian buildings in Edinburgh’s Old and New Towns, both Conservation Areas and a UNESCO World Heritage Site. As well as a permanent example of pioneering best practice this project led to a comprehensive research report and two technical papers published by Historic Scotland, and a change in local planning policy to permit double glazing in listed buildings across Scotland’s capital city.

Striking a balance

Around 75% of buildings in Edinburgh’s World Heritage Site are listed, and the majority are of traditional pre-1919 construction: solid masonry walls and timber-framed sash windows with single glazing predominate. From an energy efficiency perspective these buildings are ‘hard to treat’. This applies not only to the technical challenges of upgrading older buildings, but also the added challenges in meeting conservation principles and identifying affordable upgrade options. Consequently, many of these buildings are largely unimproved, often leading to relatively high energy consumption, fuel costs and CO2 emissions, and correspondingly poor energy ratings.

Heat loss through windows occurs in two ways: ventilation and fabric heat loss. The former may be addressed by good maintenance and suitable draught-proofing; however, be wary of those who insist that draught-proofing is all you need to do to make a single-glazed window thermally efficient. The U-value – a measure of the rate of heat transfer through a material (the higher number, the worse the insulation properties) – of single glazing is around 5.5, in comparison with new double glazing (which may commonly achieve 1.6) or a Scottish sandstone wall (likely to have a U-value somewhere around 1.4). Single glazing is undeniably inefficient.

Thick curtains, insulated blinds and internal timber shutters, are all non-invasive measures favoured by conservationists. But while these certainly contribute to keeping in heat (see trials carried out by Historic Scotland for relative performances), all are temporary measures, best suited to night-time and requiring daily occupant interaction. The more permanent – and more thermally effective options – are secondary or double glazing. Secondary glazing is traditionally viewed as being more discreet and enabling the retention of original fabric. However, it can be highly visible and interfere with original building elements such as window surrounds and timber shutters. It also requires double the effort every time the occupant wishes to open or close a window. All of these options have their place but equally have their drawbacks, and there are situations in which double glazing may be considered.

New systems

Apart from the loss of fabric, the main issue with double glazing is one of appearance: modern glass is flatter and has different reflective qualities from older hand-blown glass, and the thicker double-glazed units require heavier, less elegant dividing bars than single glazing.

However, in recent years, new systems have been developed specifically for the requirements of historic buildings. The key to these systems is their profile; they are much slimmer than conventional double-glazed units, having a spacer bar of 3mm-4mm rather than 12mm-18mm. Using more thermally resistant inert gases such as krypton or xenon, rather than the more conventional argon, allows them to achieve similar levels of thermal performance in a slimmer unit.

This slim profile allows them to be retrofitted into existing sashes (retaining original fabric), or made into new sashes but using the original slender astragal dimensions. Such specifications effectively remove the aesthetic issues associated with the heavier sash dimensions. In terms of glazing, however, modern glass undeniably looks different from old glass, which may either be accepted or mitigated to some degree by using crown-effect outer panes in the new units. Different schools of
thought prefer different approaches in this respect. In many cases it is not an issue, because original glass is now relatively rare, and replacing modern single glazing with modern double glazing should present no obstacle. Where historic glass survives, making the case for its replacement can be challenging.

City of Edinburgh Council had long been under pressure to relax its blanket prohibition of double glazing in listed buildings. In 2009 it commissioned Changeworks to develop and deliver a research and demonstration project, enabling all aspects of slim-profile double glazing systems to be scrutinised through pilot installations in historic buildings.

Following detailed research and negotiations, various listed properties were retrofitted with bespoke double glazing systems, each a different variant to enable comparison. A category ‘B’ listed Georgian (1820s) corner tenement building comprising nine flats was entirely retrofitted, with the full support and involvement of its owner Lister Housing Co-operative and tenants. In addition, the sashes in one window in Edinburgh World Heritage’s category ‘A’ listed offices were replaced.

Detailed technical analysis and specifications are provided in the project report. However, the trials covered a number of variables including:

- pane-only versus whole sash replacement
- standard versus crown-effect outer panes
- spacer bar colour and thickness
- contents of cavities
- product and manufacturer
- locality of supply

The impact of the installations was assessed on thermal performance, aesthetics, cost, ease of installation, embodied energy, longevity and occupant feedback.

Thermal performance was tested by Glasgow Caledonian University with support from Historic Scotland. A range of U-values was found from an exceptional 1.0 (for the vacuum unit) to a more modest 2.8 (for an air-filled unit), with most achieving somewhere near 2.0; in all cases a significant improvement on the single glazing.

In terms of aesthetics, perhaps the most telling aspect of the project is that a combined inspection team of expert staff from the council, Historic Scotland and Edinburgh World Heritage was unable to identify the building in question. Once identified, the nuances of each system were assessed, in many cases with individuals preferring different systems. Overall, however, all parties were sufficiently satisfied to enable a citywide policy change which received substantial support during its consultation stage.

Costs varied considerably, affected by variables such as technical specifications and window detailing. In several cases, costs were comparable to or cheaper than some types of secondary glazing available for historic buildings, although this was not always the case.

A detailed embodied energy analysis was carried out by Heriot-Watt University, again supported by Historic Scotland. This found that, broadly, with sufficient care in the specification process the embodied energy in most such units could repay itself may times during their life.

Conclusions

Double glazing is not universally applicable. But it is one of a suite of options available to upgrade the very poor thermal performance of single-glazed windows, and in the right circumstances it can prove the best solution. Indeed, some conservation officers now prefer it to certain types of secondary glazing.

There is only one question remaining: how long will double-glazed units last? The only meaningful way of finding out is to monitor such systems, and that is what is being done in Edinburgh. In 2012, two years after installation, Changeworks arranged for the units to be re-tested, again with support from Historic Scotland and carried out by Glasgow Caledonian University. The results were recently published in Historic Scotland’s Technical Paper 20° and found that the majority of systems were performing to a similar level as initially. With further testing in coming years, the realistic lifespan of such systems will be identified.

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Environmental sustainability is becoming an important element in evaluating repair strategies, explain Alan Forster, Kate Carter and Brit Kayan

Greening maintenance

Retention of traditional masonry buildings is important not only from a cultural perspective, but also from an economic standpoint, with 50% of national wealth across Europe being contained within the existing built environment. A lack of regular maintenance significantly devalues these assets due to premature deterioration. But despite its importance, maintenance appears to be poorly regarded by the public and construction industry alike.

Evaluating masonry repairs is almost always set within the parameters of budgetary constraints. But maintenance of historic buildings must also be implemented within a framework based on ethics and principles, including least intervention; like-for-like material replacement; distinguishability; integrity and reversibility. Success is evaluated against these principles. However, a third emerging factor in the maintenance process is environmental sustainability.

To evaluate the long-term maintenance requirements of historic buildings in relation to the tripartite approach proposed for ‘green’ maintenance (see Figure 1), it is necessary to understand the cumulative effect of routine operations in cost, philosophy, and environmental impact. The proposed evaluation framework has the potential to allow selection of the most sustainable solution.

Figure 1

Maintenance parameters

Carbon and energy use
Existing buildings have an important role in reducing carbon emissions and energy consumption, to meet global targets for 2050. Maintenance interventions clearly expend energy, with some leading to higher CO₂ expenditure than others, e.g. the significance of transport. Sandstone from China had more than six times the embodied carbon than the equivalent locally sourced material. This reinforces the influence of regional materials procurement on the total carbon associated with the construction process.

The three most common types of repairs for natural stone masonry are replacement stone, plastic repair, and pinning and consolidation. Replacement stone is considered very durable, with a life expectancy of 100 years. Its defensibility is generally good, enabling the continuity of aesthetic integrity. The energy used in this process is potentially considerable as a result of quarry extraction, processing and transportation. Plastic repairs (denoting plasticity not the addition of polymers) are a surface repair to deteriorated masonry faces, with a life expectancy of about 30 years. These repairs are highly defensible, because they enable the retention of the maximum amount of existing natural stone. Equally defensible is consolidation and pinning, a stabilisation technique in which nylon or stainless-steel dowels are inserted into holes drilled into delaminating layers or detached sections of masonry, and fixed with modified lime grouts. These repairs do not use a great deal of energy compared to the former interventions, but their life expectancy may be low.

Concept and methodology
There is clearly a relationship between the number, type and longevity of maintenance, and the embodied energy and CO₂ expended in repairs. A durable repair requiring fewer repeat interventions may incur less energy over the lifespan of the building than a less durable alternative. Although replacing natural stone is a significantly more durable than plastic repair, the energy associated is a great deal higher.

The time between interventions is influenced by many variables, including material durability; degree of exposure; building detailing; quality of repair and specification. Figure 2 illustrates the implications of undertaking maintenance interventions on the service condition of masonry over time. The downward sloping lines signify the steady decline in condition over the life of the repairs. Each maintenance intervention brings the area of masonry back to optimal service condition. It then deteriorates at a rate that depends on the repair type. Intervention is assumed to occur when the minimum acceptable condition is reached. A steep gradient denotes a repair with short life expectancy – such as pinning and consolidation, which can extend the service condition by 20 years. A shallow gradient equates to a durable long-lasting intervention, such as masonry replacement.

If interventions are considered in terms of carbon emissions, it becomes possible to model the whole life cycle of a building in terms of the carbon expended. Figure 2 overlays the carbon emissions for each maintenance intervention on the service condition graph. The model distinguishes between ‘brown’ and ‘green’ maintenance, i.e. interventions of high and low carbon impact. The cumulative effect of ‘brown’ maintenance increases the total carbon expended far more quickly than ‘green’.

In principle, the more frequent the maintenance intervention the higher the embodied CO₂, but various mechanisms may exist to reduce the total CO₂ expended, such as locally sourced materials, using regional companies to undertake the work and selecting alternative repair solutions. A cradle to site approach is required to fully account for CO₂ associated with all aspects of the repair to fully appreciate its environmental impact. On the face of it an intervention with low carbon emissions has less environmental impact. However, the complexity of lifespan and combinations of repair types suggests a whole life cycle approach
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Grant scheme extended

The UK government has announced extensions to the Listed Places of Worship Grant Scheme, which took effect from 1 October 2013. The latest Spending Review already confirmed that the £42m per annum for the scheme will be continued to 2015-16.

Under the extended format, works to pipe organs, turret clocks, bells and bell ropes will be eligible for claims under the scheme, and – welcome news for practitioners – so will professional services directly related to eligible building work, such as surveyors and architects fees.

Further details www.lpwscheme.org.uk

Planning guidance goes online

The Department for Communities and Local Government has published its ‘beta’ version of the National Planning Policy Guidance (NPPG), which is a consultation in all but name. The consultation has now closed.

The NPPG has been published in web format only, which has attracted some criticism because it makes it less easy to use. The reason for publication online is to enable hot links to other relevant guidance, and to make it easy to update the guidance.

The NPPG is much more detailed than expected, and in many areas of planning policy it will contain all the supplementary guidance. The Historic Environment Forum, which is working with English Heritage (EH) on drafting the historic environment guidance, is minded to adopt existing EH documents and develop new sections as necessary, rather than produce an overall third level document that might only serve to confuse users.


London schemes called in

Proposals to redevelop the Shell Centre on London’s South Bank and the Smithfield meat market face public inquiries. Communities Secretary Eric Pickles has called in the schemes, both of which have been highly controversial.

Previous plans for redevelopment of Smithfield were called in and rejected by then communities secretary Hazel Blears in 2008. English Heritage has also objected to proposed alterations to the Shell Centre, with concerns that its visual impact might cause Parliament Square to be stripped of its World Heritage Site status.

In a letter to the City of London Corporation, Pickles said he had decided to call in the application because it, “concerns matters of substantial regional and national controversy”. The letter said Pickles would be looking at how the scheme conformed with policies in the National Planning Policy Framework on design, and conserving and enhancing the historic environment.

Further details http://bit.ly/1cglz4l

Simpler consent regimes outlined

The Enterprise and Regulatory Reform Act 2013 introduces local and national class consents, heritage partnerships agreements and certificates of lawful use into the planning system by way of changes to the Planning (Listed Buildings and Conservation Areas) Act 1990. The Act put into law Adrian Penfold’s proposals for simplifying the consents regimes.

The class consents system will give listed building consent for changes to the groups or classes defined in the individual consent. Local authorities will have the power to approve local consent, and the Secretary of State will have the power over national consents. Heritage partnership agreements will have statutory force. The process has already been used where there are large historic assets, either singly or in groups, but without the statutory power to grant listed building consent. Certificates of lawful use can be applied for before any changes are made to a designated heritage asset.

The Department for Culture Media and Sport and the Department for Communities and Local Government (DCLG) have set up practitioner ‘sounding board’ group, to comment on the proposed rules and orders that will put these provisions into effect. The DCLG aims to consult on the detail of this secondary legislation in December and bring them into effect April 2014.

Further details www.lpwscheme.org.uk

Further +info

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