

Building Surveying Journal



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Site simulator

Industrial simulation is a valuable way for students to develop the practical skills employers expect of them, as **Simon McLean** details in the second of a series on issues relevant to building surveying degrees

Educational wisdom has it that knowledge gained through practical activity and personal research is often better retained. All stakeholders in building surveying education therefore like degree courses that provide academic and vocational knowledge plus vocational skills training.

In simple terms, graduates want to enter practice already able to undertake basic surveying tasks. RICS prefers this, while such skills are often prized by employers and are therefore advocated by universities.

Placement employers, too, are often looking for students arriving with practical skills and vocational knowledge. Students who embraced practical activities during the first two years of their studies tend to find placements first, often receiving multiple offers.

Academic courses set academic standards and learning outcomes at all levels of teaching. Although learning outside the classroom encourages development of practical skills, students need to be as well supported as they are in the classroom.

Industrial simulation

One way of achieving this is by using industrial simulation, where an activity is designed to run under industrial conditions, often with the support of an industrial partner. It requires the students to undertake tasks that simulate those undertaken in practice.

Industrial simulation that uses an enquiry-based pedagogy is practised on the Building Surveying BSc at the University of Salford. My experience of running these activities over a couple of decades shows that the more realistic the simulation, the better the levels of student engagement. The tutor needs to exercise control over the material studied in such simulations, and they can do this by creative brief writing.

In building surveying terms, this would mean writing an instruction that requires

the student to research material on which they would otherwise only have been lectured, or develop practical skills based on knowledge previously taught to them.

Building surveys

One example of a simple building surveying simulation would be to source an unoccupied house and then ask students to undertake a survey of it using an RICS template.

This would develop their practical site-surveying skills as well as basic pathology and report-writing abilities. The tutor could then add a profile for the client raising the instruction: now, the activity no longer requires the student simply to observe and photograph the property and report in professional language, but to evaluate and record every observation in a way that focuses on the needs of that client.

The tutor could add that the client is a supporter of energy efficiency, requiring students to research energy-saving measures and renewable energy sources, and assess their practicality in the property with that client's resources.

Building pathology

The tutor could also incorporate targeted building pathology by choosing a property with identified defects instead of using a generic house. By adding a proposal for a loft conversion or extension, for example, they could also engage students in issues related to planning, building control, structural performance and construction, design, and management.

Other concerns could be addressed by using, for instance, a listed Victorian building located near water and trees, which would bring in the issues of conservation, biodiversity and the possible need for environmental protection, while converting a ground-floor room into a commercial therapy area would require students to consider accessibility under the Equality Act 2010 and possibly the Enterprise and Regulatory Reform Act 2013.

By skilful manipulation of the brief, a simple building survey can become the vehicle for teaching any number of vocational skills and academic outcomes.

Contract administration

Some vital building surveying skills such as contract administration are quite difficult to simulate without a tutor having control over a live construction project. Certain tasks in the contract administrator's role – such as site meetings and inspections, and the application of contract terms to a given scenario – may be simulated, however, if industry can offer access to suitable sites.

In the context of teaching practical building surveying modules, using



Students on a conservation planning simulation, Brookfield Unitarian Church, Gorton, Manchester



Students on a standing building order simulation Ordsall Hall, Salford

assessment methods such as a written essay misses a trick. While this is a perfectly good way of demonstrating students' achievement of academic outcomes, it offers little by way of added value to the whole education experience.

If the same evidence can be presented in the form of a commonly used report or document, then its completion in an industry-approved language does add value to the submission because students doing so then have evidence of their skills in surveying to show to a prospective employer.

Some such outputs at the University of Salford have been noted as being of better quality than those that are commercially available – not because the students are more skilled or knowledgeable than practising surveyors, but because they can spend more time completing the report.

Engaged students can access examples of practice reports that are already good and make them better: it is then much easier subsequently to pare back excellent work to fit a commercial time frame than it is to bring work up to a commercially acceptable level.

Scope of works

A commonly used tool for commercial simulations run at the University of Salford is preparation of a scope of works to procure remedial works for elements of disrepair noted during the surveying simulation. This requires descriptions of disrepair, and understanding of the causes of the deterioration and complementary defects. For instance, if a student were required to procure works

to repair timber decay then they could also procure works to repair the roof that is allowing the timbers to become damp in the first place, which would evidence their understanding of cause and consequence. A scope of works will also need to demonstrate the student's ability to select and describe suitable repair methods.

A scope of works is an industry-used document written in an accepted form of language, and requires a degree of knowledge of contract and statutory obligation. Being written for a client, that client's profile affects the replacement, repair or consolidation proposed – and for some, whether a disrepair needs work at all, given that different clients' attitudes to non-critical property defects will vary.

Submission is an essential part of the simulation. It maintains the realism of the process, and the manipulation of the brief provides evidence of students meeting the required outcomes, both academic and vocational.

Scaffolding

Taking learning outside the classroom requires control of the learning material and support for students. The method of controlling material has already been established, but if students are not supported adequately then, despite advantages in terms of vocational experience, the possibility of individual disadvantage might mean industrial simulation is an unacceptable risk.

This support is known in education as scaffolding – a term for a purpose that surveyors in particular should understand. Anyone thinking of running industrial

simulation or any form of site-based activity needs to have such supporting methodology well established first.

This needs to be in place for those students who find themselves confused, alienated or just too far outside their comfort zone. Industrial simulation therefore requires the following considerations to be made.

Tutor role

In a classroom the tutor is in visible control; in enquiry-based learning, though, their role becomes one of facilitator, because if they remain visibly in control it can dilute the realism of the simulation.

The tutor must therefore have a discreet role in the simulation but be available to support students who are clearly struggling, help resolve any queries, steer learning, and answer technical questions. They must also be present to step in if a student is operating equipment incorrectly, and be available to monitor health and safety issues. My experience is that support requirements diminish as the simulation progresses, and the role adopted must allow for this.

Successful support requires students to arrive on site with all the knowledge required to perform the tasks. Identification of that knowledge by tutors, whether imparted by lectures or self-preparation, is essential. A student told as part of the simulation that they are a newly graduated surveyor will not engage unless they feel ready to simulate that role. Preparation is central to successful industrial simulation.

In site-based activity, health and safety is paramount. Before going on site, all building surveying students at the University of Salford receive a copy of the same method statement template that large practices must complete before any of their surveyors enters a site. This reinforces both the importance of health and safety issues and realism, as it is a genuine document used by the industry.

To conclude, industrial simulation can offer significant benefits to students, but needs to be creatively designed, meticulously planned and rigorously supported if it is to be successful. ●



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James Burgoyne cautions that you should always check the terms of professional indemnity insurance to be aware of possible pitfalls

In a word

When looking for gaps in professional indemnity insurance (PII) cover, it is perhaps natural to turn immediately to the exclusions section.

However, there are more subtle restrictions that are inherent in the terms of the cover itself. If a problem or loss does not fall under the insuring clauses of the policy, then the cover is not triggered. As such the terms of the cover itself form boundaries, and matters outside of these are not covered, regardless of whether the exclusion section is otherwise silent on the issue.

This is an area that is fertile with misunderstandings and assumptions, so it is worth spending a little time considering the ambit of and triggers for a PII policy.

Definition of cover

PII might be defined as a policy to cover liability for a claim against the professional for negligent provision of professional services in the course of their business. This is a simplified version of a typical PII clause, and much turns on individual words in such definitions.

The first to consider is “claim”: in straightforward terms, if there is no claim then the cover is not triggered.

If a potential problem is discovered by a practitioner and mitigation is possible, it is natural for them to want to take such steps to avoid a legal claim. Often, the concern in such a situation is not only the increased costs of a legal claim but also a further deterioration in commercial relations between the parties due to the escalation of the matter.

But indemnity under a PII policy for mitigation is conceptually awkward because it precedes any claim that

the insurance would cover. While the policy allows notification of potential claims – “circumstances” – it does not automatically provide indemnity for any further steps taken immediately. By definition, a circumstance is something that hasn’t yet become a claim.

In practice, the common sense of dealing with issues early in order to reduce costs and maintain commercial relations often prevails, and insurers reimburse the policyholder for the cost of mitigation. But what is often not understood is that they are not obliged to do so.

This becomes most apparent when a policyholder proceeds with a mitigation measure in a short timescale but does not discuss the action they are taking with the insurer and obtain its agreement to these arrangements. Policyholders sometimes become caught up in the logic of the situation, and are so convinced they have

the obvious, most cost-effective solution for all concerned that they press on and deal with the matter independently.

This is a breach of a basic claim condition – costs cannot be incurred without an insurer’s consent – but the problem is actually more fundamental because the insurer is not obliged to pay for the steps taken in the first place. If the policyholder’s logic was flawed and their enthusiastic solution does not prove to be the optimal or the only one, then the problem becomes compounded.

Drafting of rights

The drafting of rights in a contract can sometimes prevent a claim becoming necessary. For example, if the contract recasts a liability issue as a debt owed to the other party then it removes their need to bring a claim – but potentially thereby has unforeseen consequences for PII. Similarly, indemnities under a contract are separate obligations, and therefore are not the same as damages claims.

The reality is that insurers are often very good about such issues, but fundamentally these are settled at their discretion because the ambit of typical cover does not include them.

Regulatory problems are a further example of such issues. Many practitioners think immediately of their PII cover for any professional issue, but investigations by regulators or tribunals that are unrelated to a damages claim from a client would not fall under the core PII cover.

Better PII policies sometimes contain extensions that deal with such issues, but if a practitioner is not alive to the differences then they may not be checking their insurance to ensure they have such an extension.

Professional business

The term “professional business” gives rise to another set of issues: this will be defined in the PII policy, and anything outside of that definition will not be covered. The narrowest PII policies refer to the professional business described in the schedule, so with these it is very important that the description is sufficiently broad and has not left anything out.

The RICS-approved minimum wording provides a broad definition of professional business: “those services ... which are undertaken by members of the RICS”. Problems arise, however, for any multidisciplinary firm that also provides other services, and whose PII policy does not sufficiently address the broader

nature of the business. Consequently, in the wrong circumstances, the definition “professional business” can operate as one of the most general exclusions in the policy, which is often not appreciated.

The way that the term is used in the insuring clause is also important. Cover for claims “arising out of” professional business carried on by the professional is not as broad as cover “for claims arising out of or in connection with” that business. The former is concerned with the provision of professional services to clients; the latter is also concerned with activities around this provision.



The wordings of PII policies vary, and even those that are all RICS-compliant may differ significantly in the breadth of cover offered

As a practical example of the distinction, a professional received a solicitor’s letter out of the blue alleging infringement of copyright in connection with the use of an image on the professional’s website advertising their services. Under the former definition there may be no cover as the breach is not related to a job performed for a client. However, under the latter definition, the issue can be considered as arising “in connection with” the provision of professional services.

The RICS-approved wording uses the form of words “which arises in consequence of the conduct of professional business by the insured”, which may provide some reassurance.

Difference in condition

These are not the only examples of favourable terms in the RICS-approved wording, but to what extent will this apply? It is usually the case that a particular insurer will draft its own policy wording as it cannot simply use RICS’ own text.

Many insurers therefore include a “difference in condition” (DIC) clause in favour of the RICS policy, which states that in the event of a contradiction between their wording and this policy the RICS terms will take precedence.

On the one hand, this is a belt and braces measure to make sure that any inadvertent discrepancies are appropriately resolved, and on the other it is an immediate and easily verifiable element in the policy wording providing reassurance that the required RICS cover is in fact in place.

Certain DIC clauses, though, do not apply to the entirety of the cover under the policy: some are stated as applying only to the minimum required by RICS. Hence while the policyholder may buy cover for a substantial limit – £2m for example – the terms of the insurer’s policy will apply to the majority of that cover, and the extended RICS cover only applies to a much smaller amount based on the limit of indemnity it requires. For a consultant on their own, this is not a large financial amount at all. As such, it is not just a case of checking that the policy has a DIC clause but checking what this clause actually says.

Watch word

To conclude, as this handful of examples has demonstrated, the wordings of PII policies vary, and even those that are all RICS-compliant may differ significantly in the breadth of cover offered.

Insurance is usually a fundamental component of a firm’s risk management strategy, and therefore it is important that the appropriate policy is chosen. Better policies contain additional elements that address issues discussed above, such as explicit mitigation costs extensions, or more comprehensive forms of words in insuring clauses and definitions.

Insurance should be not be seen as the only component of a risk management strategy, however, and a proper understanding of the issues outside PII allows further risk management steps to be taken, such as in the agreement of client or lender contracts to avoid insurance issues arising later. ●



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Related competencies include
Insurance

Natural benefits

Ed Suttie explains how biophilic design can nurture us in the workplace

We all know the benefits of exercise and a good diet. But what about the buildings in which we spend most of our lives? We isolate ourselves from nature at home, at work and in daily life, and evidence abounds that this is to our detriment.

The relationship of health and well-being with buildings is complex, and depends on how we perceive and experience them. You might ask: what materials are around me? Why do I get a headache working here? Why am I calm in this space? Why am I hot when my colleague feels cold?

The WELL Building Standard, Fitwel and other certification schemes have directed attention towards the health and well-being of building occupants, and in offices this has also helped improve productivity (see www.wellcertified.com and www.fitwel.org).

These schemes also raise questions never before asked of construction and refurbishment projects. According to the World Green Building Council, staff and their benefits make up 90% of the costs of an office-based company, so it would seem wise to pay attention to people and their needs (<http://bit.ly/2jRYM8X>).

Inspiring design

Harvard professor Edward O. Wilson concluded in his book *Biophilia* that we have an inherent connection to nature, and a biological need for physical, mental and social connections with it.

The natural world therefore has a part to play in everything from our health and well-being to our livelihoods and the economy. The construction industry is no exception to this, so to integrate it with nature more effectively we can follow the principles of biophilic design, a concept that takes account of many features in workplace environments that can support health and well-being.



Biophilic design in Norway: an indoor green wall provides direct contact with nature

Research has shown that being in natural environments or even viewing depictions of nature has a positive impact on our well-being. Natural environments can alleviate negative emotions such as anger, anxiety, depression and stress, while helping us feel calm and be inspired. Biophilic design brings us into contact with nature in the built environment.

Leading offices in London and elsewhere are already designing environments around their occupants' health needs – maximising natural light, clean air and so on – as well as considering the business case.

These projects are prompting conversations and grabbing headlines, but building owners and facilities managers also want to know what they can do within limited budgets and the need to ensure a return on investment. As hard evidence has been lacking, the Building Research Establishment (BRE) has begun a biophilic office project (<http://bit.ly/2soP3ej>).

Live office

BRE and Oliver Heath Design, supported by a number of partners that produce green walls, lighting and flooring or deal with furniture and acoustics, started the research project to strengthen the evidence base for biophilic design and its positive effects on office occupants. The aim is to help realise the exciting potential of our existing buildings.

A live office refurbishment on the BRE Watford campus is providing robust indoor environment and occupant data.

Baseline information is being collected this year in the existing building to quantify how it functions now, covering such characteristics as acoustics, light, air quality, thermal comfort and materials, including floor tiles, paint, doors, walls, lighting and services as well as occupants' health and well-being. The next stage is

the biophilic refurbishment, after which office and occupants will be monitored for another year. A control environment has also been established, which will remain unchanged throughout the study.

The long-term findings are intended to improve understanding of the influence of biophilic design and product choices on occupants. The project will result in open guidance for facility managers, developers and building owners and occupiers, while professional institutions including RICS and the Chartered Institution of Building Services Engineers will use the findings the better to equip their members. It could ultimately inform the Health and Wellbeing category in BREEAM as well.

Biophilic refurbishment doesn't have to be extensive or expensive – the choice of floor covering, wall paint and lighting all have significant biophilic qualities – and choices informed by research evidence can help create positive, healthier and more energising workplaces for the future from the offices of the past. ●



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+info

Assessing Health and Wellbeing in Buildings
<http://bit.ly/2n2Z92W>



Related competencies include
Sustainability

As the latest edition of the Wiring Regulations broadens their scope in terms of safety and other factors, **Gary Parker** highlights the significant changes that have been made

Responsibly rewired

The Wiring Regulations have seen a new round of changes in the 18th edition, which is designed to keep up with the ever-evolving ways we design and install electrical works.

Jointly published by the Institution of Engineering and Technology and BSI in July, the 560-page document is due to come in effect in January 2019. Also known as BS 7671, it includes some subtle changes in wording, such as replacing “in use without a fault” with “under normal conditions”, in addition to some regulations being introduced, rewritten or removed entirely (<https://bit.ly/2NXJON>).

Safety paramount

When carrying out or commissioning electrical or other engineering services work, the most basic yet most important responsibility is the preservation of life. Failure to fulfil that responsibility can have devastating consequences.

When it comes to fire safety, the 18th edition expands on previous regulations and amendments, broadening the scope of installers’ and designers’ responsibility for ensuring safe installation to include consideration of fire engineering.

In chapter 42, “Protection against thermal effects”, a new regulation 421.1.7 has been introduced, which recommends the installation of arc-fault detection

devices and suggests numerous possible locations for these.

Regulation 422.2.1 has also been redrafted. Reference to conditions BD2, BD3 and BD4 on escape routes has been deleted, and a note added stating that cables need to satisfy the requirements of the Construction Products Regulation in respect of their reaction to fire.

In chapter 52, “Selection and erection of wiring systems”, regulation 521.11.201 on the support of wiring systems in escape routes has been replaced by a new regulation 521.10.202, which requires cables to be adequately supported against their premature collapse in the event of a fire. This applies throughout the installation, not just in escape routes, and is relevant to all cable types rather than power cables alone.

Broader coverage

Since 2014, the Building Regulations have required all circuits in new or rewired homes to comply with the requirements of BS 7671, which requires an increased use of residual current devices and, more recently, metallic consumer units in dwellings. This requirement was implemented as part of BS 7671: 2008 + A3: 2015; however, the implementation of the regulation relating to metallic consumer units was delayed until 1 January 2016 (<https://bit.ly/2nenkwd>).

The 17th edition of the Wiring Regulations in 2015 had itself been amended from the previous version to ensure that all cable installations along escape routes were supported, so as to prevent premature collapse in the event of fire and improve fire safety for occupants and firefighters alike.

Before this change was introduced in the 17th edition, and the term “escape route” subsequently removed in the 18th so this approach covered all locations, many types of wiring system were liable to fall from walls and ceilings in the early stages of a fire, leaving cables hanging.

These would become entangled with firefighters’ breathing apparatus or uniforms, leaving them trapped and running out of air, and this led directly to the deaths of eight such emergency workers in the UK between 2005 and

“

The 18th edition has broadened installers’ and designers’ responsibility for providing a safe installation to consideration of fire engineering

2010 (<https://bit.ly/2mSONox>). These helped prompt the changes in legislation.

Clarity and compliance

Existing wiring installed in accordance with earlier editions of the regulations may not comply with the current edition in every respect, but this does not necessarily mean that it is unsafe for continued use or require upgrading. BS 7671 is not retrospective, so the changes are aimed at new installations. However, the 18th edition has highlighted some areas in which clarity was perhaps lacking in the past.

The Electrical Contractors’ Association recommends that building surveyors continue to ensure their buildings are kept compliant by having suitably skilled and competent contractors carry out regular inspections of electrical systems, highlighting any potential failings and areas for improvement. ●



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Related competencies include
Construction technology and
environmental services



An open approach

Given the variations in open-plan flat layout and fire safety requirements, **Andy Ballantyne** details research comparing several different models

Fire safety guidance is a significant factor in the internal arrangement of apartments in the UK. In general, either the distance from the furthest point in the apartment to the entrance door is kept very short, or a protected entrance hall connects all rooms to the apartment entrance.

In recent years an open-plan approach has become desirable, with bedrooms being accessed directly from a combined living and kitchen space. To support this, BS 9991: 2011 *Fire safety in the design, management and use of residential buildings – Code of practice*, included guidance for open-plan apartments.

This was revised with the publication of BS 9991: 2015 to align better with earlier research published in the NHBC Foundation report NF19, *Open flat layouts: assessing life safety in the event of fire* (<https://bit.ly/2K1vqG7>).

NF19 details research carried out by the Building Research Establishment (BRE) on behalf of the NHBC Foundation, which compares the risk to life in open-plan apartments to that in designs of a similar scale complying with Approved Document B.

CRISP cases

This assessment was undertaken using BRE's cross-industry standard process (CRISP) modelling software, which applies probability distributions to factors including the location of the fire, such as bedroom, kitchen or living area; the number of doors and windows and whether they are open or closed; and the type and location of people in the model, according to age, gender and degree of dependence on others, for instance.

The effect on items such as detectors, sprinklers and the escaping occupants is then determined based on the geometry. As the occupants travel in the simulation, the accumulated fractional effective dose (FED) – a measure of the harmful gases they have inhaled – is recorded, and then scenarios are compared to assess the risk to life.

NF19 found that the introduction of sprinkler protection to BS 9251: 2014, *Fire sprinkler systems for domestic and residential occupancies – Code of practice*, together with category LD1 enhanced detection, in accordance with BS 5839-6: 2013 *Fire detection and fire alarm systems for buildings – Part 6: Code of practice for the design, installation, commissioning and maintenance of fire detection and fire alarm systems in domestic premises*, improved levels of safety in open-plan apartments, compared to designs complying with Approved Document B that featured a protected entrance hall and category LD3 detection but where the entrance hall arrangements do not have suppression, for the scenarios modelled.

The open-plan variations of these differed according to case.

- **Case 1** comprised a one-bedroom apartment, measuring 8m x 4m, with an unenclosed kitchen. The single bedroom was accessed directly from the kitchen and living area.
- **Case 2** involved a two-bedroom apartment, measuring 10m x 8m, with an enclosed kitchen. The two bedrooms were accessed via the living area.
- **Case 3** consisted of a three-bedroom apartment, measuring 16m x 12m, with an enclosed kitchen. All three bedrooms were also accessed from the living area.

When the NF19 research was incorporated into the BS 9991: 2011 guidance, the decision was originally taken not to require the enclosure of kitchens in apartments measuring up to 10m x 8m on plan, although this decision was reversed in the 2015 version.

In addition, both the 2015 and 2011 versions of BS 9991 allow variations to the sprinkler system under BS 9251, subject to the agreement of the authority

“

In two models, FED per fire is less than in an enclosed kitchen

having jurisdiction. As such, it is common for concealed heads to be provided – a significant variation from the original study, which used quick-response heads.

The guidance in BS 9991: 2015 is restricted to the scope of the original NF19 research. This article therefore provides a summary of an extended study that examined the importance of enclosing kitchens in larger apartments or using concealed heads, in the context of risk to life in sprinkler-protected open-plan apartments. The purpose of this was to widen the design variations permitted for open-plan apartments beyond those given in BS 9991: 2015.

In 2014, Trenton Fire worked with BRE to undertake a numerical study of the effect of adopting unenclosed kitchens and concealed heads in larger open-plan apartments. The extended study was based on case 3 of the NHBC's work, measuring 16m x 12m on plan and having three bedrooms. Unlike the original study, however, the wall separating the kitchen area from the living room was removed, meaning that the bedrooms were accessed directly from a living area with an unenclosed kitchen.

Concealed sprinkler heads

A further variation was also considered, with concealed sprinkler heads introduced and modelled using an increased response time index (RTI) to reflect delayed activation due to the presence of a cover plate.

RTI values for concealed heads were not available, though previous studies by BRE, including its report *Effectiveness of sprinklers in residential premises – an evaluation of concealed and recessed pattern sprinkler products*, have investigated the performance of such sprinkler heads in domestic contexts. In these tests, the increase in activation time of the concealed head was found to be less than 10%, relative to a standard pendant sprinkler head.

The RTI values of the standard pendant test used in the BRE experiments were not documented, so a conservative estimate for the base RTI value was used to calculate that of a concealed head. The activation time for the latter was benchmarked to a special response sprinkler head with an RTI of 80(ms)^{1/2}.

The response time of this head was calculated using a method described in the *SFPE Handbook of Fire Protection Engineering*, adding 10% and then back-calculating a concealed head's RTI.

An RTI value of 115(ms)^{1/2} was derived from this assessment. The value was then used in the extended CRISP study,

Figure 1

Comparison of average FED per fire and waking time in three-bed flat layouts

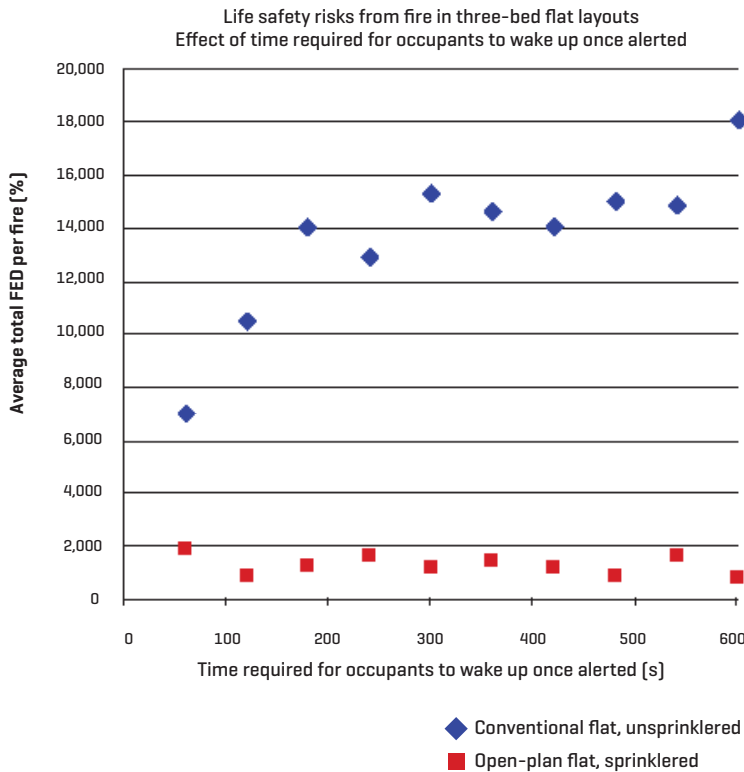
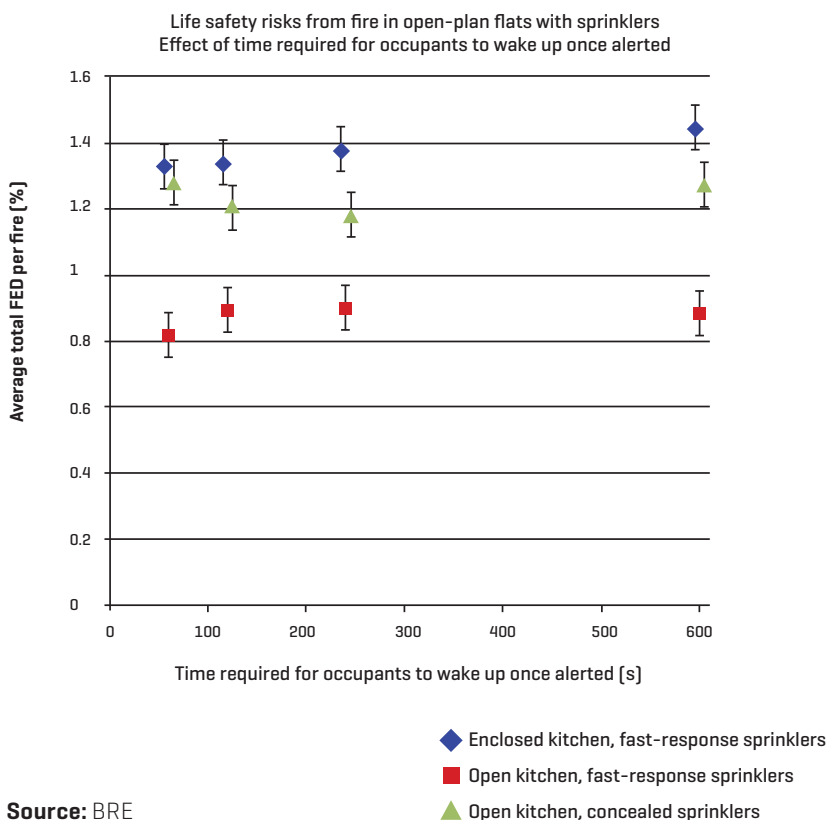


Figure 2

Comparison of average FED per fire and waking time in open-plan flats in the extended study



Source: BRE

following the principles and processes used in the original NF19 study, with the only significant variations being the geometry and RTI of the sprinkler heads.

Findings

The purpose of the study was to measure how the risk to life, in terms of average FED for each fire, differed between an Approved Document B-compliant design and that of the large open-plan apartments, which include sprinkler protection and improved automatic fire detection. Figure 1, from the original NF19 data, compares the average total FED per fire with the time required for occupants to wake up once alerted. The data shows the average total FED is at least three times lower for the open-plan design than the design based on Approved Document B.

Figure 2 shows the results of the extended study. The average FED per fire from the case 3c layout of NF19, where the kitchen is enclosed and fast-response sprinklers are modelled, is compared with that of two other scenarios where the kitchen is open to the living space, with fast-response and concealed-head sprinklers used, respectively.

In both variations, the average total FED per fire is less than where the kitchen is enclosed, including where the slower-responding concealed sprinklers are modelled. This is probably because the sprinklered fires, which are of a fixed size, occur in a larger overall volume; this results in the heat and products of combustion, through which occupants have to escape, being of a lower intensity and toxicity due to dilution with air.

The findings demonstrate that two of the limitations of NF19 are not significant for case 3c, allowing us to conclude that the access room may include a kitchen area and that sprinkler heads with a higher RTI may be used, for a value of up to 115(ms)^{1/2}.

The updated findings are summarised in Table 1 (overleaf). These results also offer supporting data for buildings designed in accordance with the superseded BS 9991: 2011 and those for which sprinkler systems with concealed heads have been previously approved by the authorities having jurisdiction.

Limitations

Certain limitations remain, however, as per the original NHBC study. The study, like NF19, did not investigate apartments greater than 16m x 12m, multi-level apartments, smoke control systems or alternative types of automatic suppression. Neither does it directly

• address the proximity of kitchen cookers to apartment entrance doors.

For the design of apartments outside the scope of these studies, further research with suitable fire modelling tools would be necessary to assess whether a particular design is appropriate.

Interpreting the study results, the delay in sprinkler activation is clearly a major factor. Providing appropriate information to the occupier and good management and maintenance are recommended to promote effective operation of sprinklers. Poor maintenance, painted-over heads and so on could result in a sharp reduction in sprinkler performance and a lower standard of life safety compared to traditional apartment arrangements. ●

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Related competencies include
Fire safety

Table 1

Successfully modelled open-plan flat layout design elements

Design aspect	BS 9991: 2015/NF19 recommendation	Extended study finding
Maximum apartment size [with enclosed kitchen]	16m x 12m with up to three bedrooms	
Maximum apartment size [with unenclosed kitchen]	8m x 4m with a single bedroom	16m x 12m with up to three bedrooms
Minimum ceiling height	2.25m	
Apartment arrangement	Single level only. Multi-level apartments, houses or galleries have not been considered	
Smoke detection	Category LD1 to BS 5839-6	
Suppression	BS 9251 system with fast-response sprinkler heads	BS 9251 system with sprinkler heads performing no worse than concealed heads
Location of cooking appliances	Not permitted to be adjacent to apartment entrance doors	
Access	Not permitted directly from the common stair in small single-stair buildings	



STANDARDS

Forthcoming
 Surveying safely guidance note
 • www.rics.org/standards

All RICS and international standards are subject to a consultation, open to RICS members. To see the latest consultations, please visit
 • www.rics.org/iconult



EVENTS

Subsidence Forum training day
 17 October,
 Tewin Bury Farm, Welwyn
 • www.subsidenceforum.org

RICS Scotland Building Surveying Conference
 15 November,
 Hampden Park, Glasgow
 • www.rics.org/bsconfscot

RICS Water Conference
 27 November,
 Crowne Plaza, Solihull
 • www.rics.org/waterconf

UPDATE

New journal builds on success

From the new year you will see significant changes to *Building Surveying Journal*.

As well as giving our suite of journals a new look, we are launching a larger publication that will not only cover building surveying and conservation but also include building control, as well as

topics relevant to all building surveying disciplines. Naturally, it will maintain the high technical and editorial standards of its predecessors.

You will automatically receive the new journal starting with the February/March 2019 edition.

Fire safety coalition launched

In July, the International Fire Safety Standards (IFSS) Coalition was launched at the UN in Geneva, Switzerland.

RICS gathered bodies from more than 60 countries with the aim of addressing fire safety in buildings in the public interest. The coalition consists of more than 30 local and international professional and standard-setting organisations that are committed to developing and supporting a shared set of global standards for fire safety in buildings (see *Building Surveying Journal* May/June, p.5).

Once these high-level standards are developed, the coalition will work with professionals, governments and supporters around the world to implement them locally. It will form a standard-setting committee that draws on international technical fire experts to develop and write the standards, to ensure they are fit for global markets. ●

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RICS regulation fosters public confidence in the profession, writes **Ian Hulme**

Be assured

Nearly 80% of RICS' regulatory resources go into assurance, and this activity is by far our most useful tool for making certain that professionals and regulated firms meet the public's expectations on service standards, client protection, conduct and competence.

Defining assurance

Assurance means engaging with professionals and regulated firms to help them implement the profession's standards and embed best practice in daily business. We do so in three stages:

- by identifying where there is a risk that RICS standards are not being upheld
- by reviewing the activities, documents, systems and processes of a professional or a firm
- by providing guidance and advice on how to implement professional standards, or, if we find the professional or firm is already doing as required, giving general advice on how to make improvements.

Identifying risk

The first step in supporting our professionals is identifying those who are at risk of falling out of compliance with our standards. We do this by collecting and analysing data on the profession's activities and risk-scoring it, based on material factors such as a firm's size, revenue, number of valuations, disciplinary record and staff experience.

We collect such data in a number of ways. All professionals and firms are required to submit annual information on their activities. We also receive any complaints from the public, and exchange information with other regulators such as the Financial Conduct Authority. This is supplemented by gathering intelligence from the marketplace, for example, by monitoring news coverage.

In our monitoring activity, we focus on issues that the profession must get right so as to instil public confidence, including:

- ensuring the security of client money
- guarding against money laundering
- working to a globally consistent valuation standard

- valuer registration
- managing conflicts of interest.

The way we direct our assurance activities and carry out our work are informed by assessment of risks, leading to more proportionate and targeted regulation. As part of our risk-based approach to regulation, we will target our resources at issues that pose the greatest harm or detriment to the public interest and the profession's reputation.

Conducting reviews

Where we have identified a high risk that certain professionals and firms might not be handling issues correctly, in line with the profession's standards, they may be selected for a regulatory review. This review is based on key documents such as terms of engagement, reports and other standard documentation.

If we have identified a particularly high risk that a firm or professional is failing to comply with the profession's standards, they can expect a regulatory review visit.

These reviews are carried out by RICS specialists, and can take the form of a visit to the firm's office or offices, or a request to examine files and key documents remotely through a secure digital connection. Between August 2016 and July 2017, we conducted 586 regulatory review visits (see [Figure 1](#)).

We realise that we handle sensitive business data during these reviews. RICS fully adheres to EU legislation on data protection, and has in place policies and processes to meet its requirements. All RICS staff must also undergo mandatory annual data protection training, and we have robust data protection and information security clauses in place for all contracts with third-party data processors. We want to ensure that firms and professionals can keep guaranteeing their clients' confidentiality.

Giving guidance and advice

Professionals and firms that undergo a review are rated (see [Figure 2](#)). The firms and individuals who fall short of an outstanding rating receive tailored guidance and advice on how to improve their work to meet the profession's standards. Of the professionals and firms

Figure 1

Types of RICS regulatory review visit, 2016-17

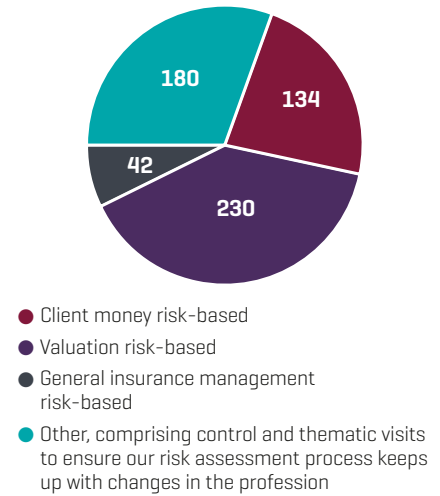
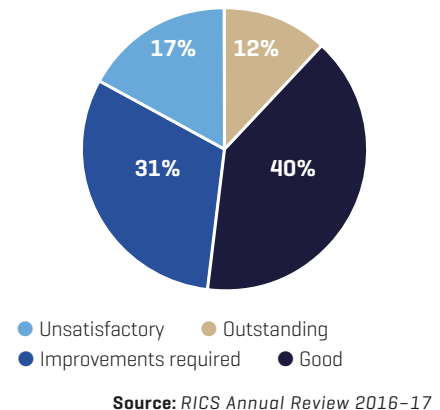


Figure 2

RICS regulatory review visit, ratings 2016-17



that receive a regulatory visit, 95% agree that it was a benefit to their business.

We can only effectively provide assurance if the vast majority of the profession is committed to working to our standards: it is a collaborative effort. RICS considers its assurance regime a success and, as [Figures 1](#) and [2](#) show, we have the numbers to demonstrate this.

We believe that clients can take confidence from the fact our profession submits to independent reviews and values the outcomes of these. Accountability and transparency are the cornerstones of a trusted profession. ●

Ian Hulme is Head of Registration and Compliance at RICS
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Show trial

A mock hearing offered a valuable illustration of the need to prevent health and safety risks on site, **Tom Walker** reports

On 30 January, a company director who had ignored site health and safety responsibilities was sentenced in Newport by a group of lawyers from Blake Morgan. Fortunately for the “director”, he was participating in a mock hearing at the Riverfront Arts Centre as part of the South Wales Working Well Together project. Jointly run by the Health and Safety Executive and the construction industry, the Working Well Together initiative was set up in 1998 to promote a positive health and safety culture by providing information and advice, often in the form of events.

The hearing was staged in full Crown court attire, using photographs of a fictitious site where the breach of regulations had supposedly taken place. The Blake Morgan team consisted of partner Robin Havard in the role of judge, and paralegal Steve Parish as clerk. Partner Claire Rawle was the prosecution advocate, while I acted for the fictional defendant company and director.

It tends to be forgotten that health and safety enforcement forms part of the criminal law. Civil claims for compensation may be brought by injured parties, but when companies, directors or employees are found guilty of health and safety offences, they stand convicted as criminals. In addition, a health and safety offence can be committed by creation of a risk alone, and there is no need for anyone to have been injured.

Penalties

The Sentencing Council’s 2016 health and safety Sentencing Guidelines crystallise this by focusing on the risk of harm as opposed to any actual harm caused, and the 30 January event was designed to illustrate this emphasis. However, we also wanted to show how the guidelines have led to sharp increases in penalties by linking fines to company turnover rather than profitability, and fixing the amounts

by reference to categories of culpability and harm risked.

The guidelines refer to “very high”, “high”, “medium” and “low” culpability. “Very high” signifies flagrant disregard for the law, for example being aware of failures but proceeding anyway; “medium” would be having some health and safety measures in place, but ones that are inadequate; “low” would mean that good measures are in place but not followed.

The fictional scenario related to a deficient construction site that had been visited by the Health and Safety Executive, and was then subject to enforcement action that the defendants had ignored. While no injuries had resulted, the enforcement had focused on the risk of harm from poor site organisation and planning of logistics and deliveries, poor traffic management, and poor fire risk controls. The case was novel in so far as previous mock hearings had used scenarios where harm had occurred.

“
The guidelines have led to sharp increases in penalties by linking fines to company turnover rather than profitability

As a result of the failures, the defendants were prosecuted under the Construction (Design and Management) Regulations, or CDM Regulations, 2015. Indeed, one of the purposes of the updated regulations is to bring an holistic approach to health and safety management – so they were ideally suited to deal with the failures in question, as the prosecution advocate made clear in her opening address.

I made representations as best I could, but my mitigation rang hollow as pictures

of the shambolic site were shown. With the help of a panto audience-style “jury”, our judge imposed a fine of more than £50,000 on the company and a suspended jail sentence on the director.

Holistic enforcement

A key message for surveyors is to appreciate that enforcement, particularly under the CDM Regulations, is increasingly holistic, taking into account the way health and safety risks can be created at the inception of a project as well as during construction itself.

A prosecution can be brought for design and organisational failures at this early stage if they lead to a material risk of harm; for example, inaccurate calculations at the design stage could result in risks created during construction. Similarly, over-ordering of stock and not making suitable storage arrangements on site could also create a risk.

Another factor to appreciate is how the guidelines have radically increased the levels of fines. For example, a business with a £5m turnover convicted of an offence that creates a high risk of serious harm, and found to be in the medium range of culpability, could face a fine of up to £600,000.

Since the event, we have been asked to repeat the exercise for a number of organisations. By all means get in touch if you would like us to provide a similar session for you. ●



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Related competencies include
Health and safety,
Legal/regulatory compliance



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Property technology, more commonly referred to as proptech, is defined by RICS as a “term that refers to all aspects of innovation and how this impacts the built environment. This includes software, hardware, materials or manufacturing” (www.rics.org/proptech).

Proptech is nothing new, and surveyors have been using it for many years to help them provide professional services. Today, however, the term has an increased visibility, and on an almost daily basis there is some new reference to proptech, innovation and disruption in professional publications or online, and concern is expressed about how these will affect the role of the surveyor (see for instance *Building Surveying Journal* May/June, p.4).

Some of this coverage is worded in a threatening way, to shock or scare you into thinking that it won't be long before the surveyor is completely replaced by robots and artificial intelligence. But I don't subscribe to this view: proptech enables surveyors to augment their outputs, building on their professional judgement and reflective thought.

RICS celebrates its 150th anniversary this year. Throughout the past century and a half, surveyors have been both proactive and reactive in solving problems. Even though surveyors today still face the same challenges as their predecessors, they now operate in an industry where advances in technology, specifically proptech, have had a significant impact on the roles they carry out.

Some find it difficult to embrace the change, but it presents an opportunity for others who have the mindset and motivation to respond positively.

Pace of change

The industry is changing at an unprecedented pace, and proptech is today more a mainstream requirement than an optional extra. Surveyors now face an increasing number of opportunities that are only open to those who can demonstrate ability and experience in using proptech.

Surveyors who have not used proptech before but who say that if they were to win the opportunity then they would do



Positivity or pessimism?

Invest in proptech before you need to use it advises **Anthony Walker**, as he looks at surveyors' attitudes to adoption

so are unlikely to secure work. If they did, the chances of them completing that project successfully on time are likely to be slim. Yet this is the stance some companies have taken, and still take, on adopting proptech: they will only use it when they have won an opportunity to justify doing so. But at this point there may be insufficient time for adequate training. Attempting to adopt new

technology at the same time as mobilising a new project is risky to say the least.

In my role as proptech lead on the RICS Building Surveying Professional Group Board, I meet surveyors who say their employers will not invest in proptech until they have secured a fee first. The analogy I use in response to this is that it's a little like not learning to drive until someone asks you to make a journey that

they want completing by a specific date, a date that does not take into account the time needed for driving lessons. The only option you then have is to learn to drive at the same time as you make your first journey – what could possibly go wrong?. Probably quite a lot, and it is doubtful that you would be approached to make a second trip.

Upfront investment

What is in no doubt is that proptech does require some upfront investment, although in most cases this will be a relatively small amount. This would cover not only hardware and software, but also provide adequate time for training before winning your first instruction.

I believe this is critical. Without it you are likely to find that staff will struggle and outputs are unlikely to be acceptable to you or the client. The argument some make for taking this approach is that they simply don't have the time at the start to dedicate to training, but they will probably then spend extra time resolving problems at the end of the surveying work that could have been avoided.

In this elongated process, the instruction may miss the completion deadline, fail to satisfy the client and generate no profit. It does not have to be this way.

You do not need to invest in cutting-edge technology, which would not be realistic for most surveyors. Starting small will reduce risk but also enable you to begin the learning process.

Surveying the surveyors

Earlier this year, I initiated a proptech questionnaire, with input from RICS, GoReport, Teesside University and Trident Building Consultancy (www.rics.org/proptechsurvey), to better understand the challenges and opportunities. The results will allow RICS to target future support for members to help them take proptech opportunities.

The questionnaire received 303 responses, 88% of which were UK-based, and 81% of them came from RICS members. Small and medium-sized enterprises employed 59%, and the other 41% worked for large organisations.

The headline figures paint a favourable picture for the profession – 92% feel that proptech is having a positive effect on surveying and 95% are of the view that it is an opportunity rather than a threat.

In terms of adoption, more use it – 59% – than understand it – 43%. An even smaller number – 40% – do not feel they have the skills or expertise to do so, and there could be a range of reasons for this.

They may be competent with what is required but want to be more skilled, or they could have been asked to start to use proptech with little training. This latter view is reinforced by the fact that just 27% say their company had invested heavily in proptech.

There is still some way to go before we see wider adoption across the profession. Asked to score their company's progress on proptech use on a scale of one to 10, 23% opted for one, indicating it had not been adopted at all. In total, 65% gave a score of one to five, compared to 35% who answered six to 10.



Proptech enables surveyors to augment their outputs, building on their professional judgement and reflective thought

In terms of the barriers to take-up, 56% cited a lack of knowledge and training, 43% doubts about cost, 43% a lack of clarity on the benefits, and 41% the time required to implement proptech.

So it is clear that many still do not feel that they have a full understanding of proptech, or of the advantages and benefits it can offer their organisation and clients. This will hold back the speed of adoption; however, with most organisations now using proptech, the direction of travel is encouraging.

Future talent

A number of those who responded to the proptech questionnaire gave detailed qualitative comments, which provided greater intelligence on issues. A specific remark – “Tough to get the old boys using smartphones let alone new software” – was one of several comments that highlighted the apparent frustration

of surveyors who were working for an organisation or individual who would not support proptech adoption, and who was finding that this was personally holding them back.

The risk this presents is that these surveyors – the ones that organisations need the most in order to help them embrace proptech – may leave to seek a role elsewhere that would give them greater exposure to the technology.

Recruiting and retaining talented staff is one of the biggest challenges the profession is facing. Add to this the need to train the existing workforce to meet the current and future demands of proptech and other digital technologies, and it highlights that as a profession we need to be able to respond positively and more swiftly to proptech than we have in the past.

Proptech can help redefine and increase the profile of the profession by catching the attention of young people who are looking for a technology-related career, rather than one still associated with hard hats, high-vis jackets and muddy boots.

Positive next steps

As the saying goes: “A pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty.”

As the responses to the questionnaire evidenced, surveyors are optimistic, and almost all – 95% – view proptech as an opportunity. We now have solutions to long-standing difficulties, solutions that only a few years ago were unimaginable. With the proptech available, I believe there has never been a better time to be a surveyor. ●



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Related competencies include
Business planning, Data management

We're all conscious of the ways in which, as a sector, building surveying is becoming increasingly digitised. But this isn't only happening at a project level with software such as building information modelling – individual professionals can also benefit from a range of apps that speed up day-to-day work.

So this article rounds up some of the most useful apps by function, based on my own experience and other members' suggestions. These aren't ranked in any way, or endorsed by RICS. However, they are all apps that are either free of charge or offer free versions, and surveyors can use them right away from app stores or through web browsers.

Activity planning

There are few things that vary as much from person to person as the way they

go about getting their work done. What is good for one person doesn't work for another, even though they both achieve the same goal.

An activity planning app or to-do list might be your thing, or maybe you stick to completing your Outlook tasks.

In app terms, then, Wunderlist is one you can use that synchronises well with calendars in Google and Outlook, thus integrating schedules and to-do lists. You may also share your list with other users such as your team members, and even chat with them using the app.

Trello, meanwhile, takes its cue from the "epic and story" school of thought. This one is for the surveyors who wear a project manager's hat, or manage tasks – stories – in a team of people working on a single project – the epic.

We've used Trello at Beyond Condition since we began development, and continue to use it to this day. It enables us to manage ideas that turn into new features and identify issues we want to address. Its strength is in assigning tasks to people, allowing them to take ownership and be accountable for them.

Note-taking

Someone at Microsoft once told me that they don't believe in the idea of a paperless world; instead, they prefer the term "paper-lite".

With that in mind, these apps will help you reduce your paper use. While the notepad and pen have long been critical tools for the surveyor to pack in their travel bag, they can now be added to the list of things you don't need to carry around with you.

Evernote

Evernote does to a greater or lesser extent many of the tasks done by some of the apps discussed below, such as CamCard, OneNote, Genius Scan and Office Lens.

However, it does these all in a single app that seamlessly syncs between mobile, web and desktop clients. It also works through your smart watch, so you can begin dictation right away in a hands-free scenario.

OneNote

A former boss once contacted me on the off chance I could shed some light on an old project that was haunting him. With a quick search of my OneNote file from the job, I was able to solve that problem for him instantly.

Appy shopper

Given the wide range of apps on the market, **Craig MacDonald** rounds up some of the most useful for surveyors



The move from Evernote to OneNote made sense to me: Microsoft Office being standard in today's workplace, OneNote does everything Evernote does but it is also integrated into native Office apps, enabling you to send an Outlook email to OneNote, or go straight from OneNote into a calendar invite.

Notebooks in OneNote partition every part of my life, not only professional from personal but also separating my different work roles, all the while saving to OneDrive online and syncing across my devices. Since dumping my daybook, I've never looked back.

“ Individual professionals can benefit from a range of apps that speed up day-to-day work

Todoist

This is an aide-memoire I have been using for the past 18 months, and I find it invaluable as it makes note-taking very easy. It allows brief notes to be taken during inspections or meetings and it uploads these to the inbox on a mobile, as well as auto-syncing with my iPad and PC so I can flesh these out when I'm back at my desk. It's a great paperless solution that also integrates with Amazon's Alexa.

Document scanning

The camera on your smartphone is a pretty good scanner, so you needn't worry about looking for a photocopier on site, and you can feel free to recycle your Rolodex as well.

Genius Scan, Office Lens and TinyScan are all different apps, but they do basically the same thing – using your phone's camera like a scanner to create PDFs. Office Lens is Microsoft's offering, and this also syncs your scans to OneDrive whether they've been saved as an image or a PDF.

Office Lens

I've been using this ever since someone suggested it in one of my LinkedIn threads, and now I find it indispensable. I undertake a lot of due diligence work and use it to convert any important

documents we are permitted to view on site into PDFs. I can then immediately email them to my team for reference in our report.

CamCard

I find myself raving about CamCard to anyone who asks: I have the app on my personal and work phones, and it syncs scanned business cards and the contacts between them.

As a bonus, because my work phone syncs with my work Outlook, any cards converted into contacts also end up on my laptop. One of my bosses asked me to update a spreadsheet with details from around 100 cards, so I CamCarded each one, synced them with my Outlook and exported them to Excel.

Room Scan

As building surveyors, our note-taking extends to recording measurements and room dimensions so we can draw them up when we return to the office. Measurement apps that make clever use of your phone's camera can collect all this data and even draw the rooms for you.

If you are aware of accuracy and battery consumption then this may meet your needs and then some. To export your notes in the form of PDFs comes at a cost; however, recording the measurements into the app for later reference is free.

Report productivity

Of each of the app categories in the article, this must be the most relevant to surveyors. Our deliverables so often include schedules of some form, repetitive but necessary tables, and fiddly photographic appendices that take up far too much of our time. Generally speaking, data entry and report formatting is not our favourite part of the job. There has to be a better way.

Beyond Condition

Our app saves a large amount of time by using a tabled and captioned photo appendix for what would otherwise be a routine or a monotonous task. After using the interface to caption each image or batch-edit captions for hundreds at a go, you can export them into a Word document then copy and paste the table into a report template.

The app also streamlines bigger tasks such as Excel data entry, and exports georeferences from images to a Google Maps format.

iAuditor

This app is great for creating health and safety audit templates and also provides a range of public ones, as well as exporting a ready-made report. As of May 2018, developer SafetyCulture secured \$60m in its series C funding, with plans to progress iAuditor further.

Site Audit Pro

From a construction perspective, this app can be used to take photographs as part of a site survey and it allows you to create a professional-looking report quickly.

Photography

The camera on your mobile device is amazing. All current models on the market are as good as any point-and-shoot digital camera you might have owned five years ago. What's more, there are some clever apps that work with it to peel away layers of your workflow.

Marking up images is generally native to iOS, Android and various specific smartphone models with a stylus such as a Samsung. Using iOS, I access the functionality from any image in the camera roll; while this is limited, it's still the mark-up tool I use most often. But you can at least annotate an image with your finger and email it straight away.

Another powerful way to provide further locational context for a third party is by using 360-degree images, whether this means showing someone a site using your own device or emailing them a link to open and have a look around. Google offers its own dedicated photo app called Street View, which allows you to stitch together 360-degree images quickly, while Android's OS offers a native facility for doing so. ●



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Related competencies include
Data management

Rectifying unbonded screeds in industrial premises is a fraught process and due care needs to be taken, cautions

Trevor Rushton

Screed flaws

Early in my career, I was involved with the rectification of a failed concrete topping that had been applied to an existing slab in a small, light-industrial unit. Having recently let the refurbished building the landlord was less than happy with the performance of the floor topping, which rapidly developed cracks and became uneven, particularly at bay joints.

The floor had to be replaced at a cost much greater than the original installation – a problem that could easily have been avoided had the designer followed the published guidance available.

Earlier this year, I was involved with the diagnosis of similar problems in a much larger warehouse, where cracking and delamination of a floor had defied all attempts at rectification work. Again, the designer had ignored common sense and relied heavily on a proprietary screed material, an approach that was doomed to failure and which will inevitably lead to a significant loss.

Perhaps it is uncharitable to say so, but the first case I mention was the product of ignorance combined with the effects of poor-quality work and a failure to apply a curing membrane once the topping had been laid.

The second was one of misplaced optimism in the claims of the screed manufacturer, coupled with a fundamental failure to appreciate that the selected product was not being used for its intended purpose.

Both examples illustrate the difficulty of restoring heavily used industrial floors to meet the punishing demands



A cracked screed following attempts at repair

of material-handling equipment (MHE), particularly of the type that uses hard composition wheels and requires flatness.

If one decides to deal with the problem by applying a hard-wearing, cementitious topping then great caution is needed; the process is fraught with pitfalls, and unless scrupulous attention is paid to design and the quality of work then subsequent failure is a significant risk.

Concrete topping

My first example involved the application of a concrete topping of around 75mm thickness to level the floor and deal with surface damage following a fire at the unit. In this case, the topping was intended to be bonded to the sub-floor using a proprietary bonding agent.

To limit shrinkage cracking, the topping was divided into bays by cutting with a saw before the concrete was fully cured. However, it subsequently shrank nonetheless, causing it to curl, with the result that it delaminated from the base and created lips at bay joints.

The raised edge then broke down under the action of the MHE and cracked. Subsequent investigation showed that the bonding agent had been allowed to go off before the topping was laid, while the mix proportions and aggregate size were poorly selected for the particular use in this case.

The floor topping was thus broken up and removed to be replaced with an improved mix, and great attention was

paid to bonding and subsequent curing; it has performed well since.

Unbonded screed

The second example involved a different type of finish, namely an unbonded screed. The warehouse in question had previously formed part of an automotive workshop and was finished with quarry tiles that were deemed unsuitable for the new use.

The designer decided to provide an unbonded screed over the tiling and specified a proprietary hydraulic binder to try to reduce cracking. The manufacturer's data sheets claimed that the binder was suitable for screeds down to 35mm thickness, so at first sight it seemed a perfect solution.

The product could be used in combination with polymer fibres to control cracking further, and it was claimed that its rapid setting would enable the laying of floor finishes between one and four days later.

A specialist screeding company laid the product and achieved a high standard of surface finish. However, one can see a clue to the later failure in the wording of the product literature – “enable the laying of floor finishes”. This was a warehouse floor, and one does not normally expect to apply finishes to surfaces that would be exposed to punishing wheel loads.

Further clues are provided by the manufacturer – “the product is as defined within BS 8204-1 section 5.1.3 part f”. This



The results of compression damage to the screed; the specified proprietary screed was of insufficient strength to accommodate the point loads in practice

is the relevant code for in-situ screeds that are designed to receive a wearing course; that is, they are normally covered with other forms of flooring such as tiling, timber and carpet.

As part of the laying process a warehouse floor is normally traversed with a power floating machine used to produce a smooth, dense and level surface finish to in-situ concrete. A dry shake powder may then be applied to improve wearing, but it is very unlikely that there will be further finishes unless of course epoxy or polyurethane coatings are used.

Essentially, a product that is designed for use as a screed, and which will normally have mechanical protection, is not likely to perform well in circumstances where it is used as a wearing finish in its own right.

In relation to unbonded screeds, BS 8204-1 recommends that a screed should be no less than 50mm thick at any point except when laid on a bonding layer such as an epoxy resin. Since it is rare to find a perfectly flat or uniform surface it is safer to assume a design thickness of 70mm or greater. In my example, the screed had been laid on a polythene separating layer so there was no question of it being bonded.

The code goes on to emphasise the high risk of the screed curling with unbonded and floating levelling screeds, which can lead to steps at joints. Where curling cannot be tolerated, a concrete

overslab designed as a new floor at least 100mm thick will need to be specified.

One can appreciate the difficulty faced by the designer: the warehouse was linked to an adjoining building via openings in the party wall, and a ramp that could accommodate the 100mm change in level would have intruded significantly into the useable floor space.

Fundamental error

However, in selecting a product intended as a screed, the designer made a fundamental error.

The correct code would have been BS 8204-2, the single digit making all the difference. This part of the code gives recommendations for in-situ direct finished base slabs with concrete as a wearing surface as well as wearing screeds (concrete toppings).

Of these recommendations, there are two basic forms:

- 1. monolithic construction:** the wearing screed is applied while the base is still plastic, probably no more than three hours after laying
- 2. separate bonded construction:** the wearing screed is laid onto a set concrete floor, which has been prepared in such a way as to obtain the maximum bond that is practically possible.

Option 1 was clearly impossible in this case, while option 2 would probably have necessitated the removal of the old tile finish. The code suggests that in

instances where laying a bonded screed is not possible then a new overslab needs to be provided.

It will be apparent that a new overslab is something entirely different from the 35mm screed that had originally been selected as a quick fix. The minimum thickness of slab would be 100mm, but to reduce the risk of curling this would need to be increased to 150mm.

Failure of the 35mm screed was probably inevitable, not only in terms of mechanical performance but also in terms of wear. Cracks formed in the screed parallel with the bay joints and about 600mm from them. These cracked areas were very hollow and had clearly curled.

To try to deal with the problem, the contractor cut out and re-laid some of the affected areas and treated the whole slab with an additional coating. Although this may have served to reduce dusting it offered no mechanical strength, and shortly afterwards the repaired areas began to fail.

Curling

Curling of slabs usually occurs as a result of differential drying shrinkage and can be exacerbated by poor curing practice. Allowing the surface to dry quickly – particularly in warm weather – can affect the degree of curling, with the top surface contracting at a faster rate than the bottom surface.

As the curled screed was trafficked it effectively broke its back, leading to cracks. Over time and repeated use, such cracks will gradually interlink, creating myriad small areas of broken screed that can then be dislodged by the MHE.

In conclusion, while the provision of a replacement screed may seemingly be a simple solution, such work is fraught with difficulty. Solutions involving a thin, unbonded cementitious screed are likely to prove unsatisfactory, so if you compromise on the design you can expect to pay more in the long term. ●



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Related competencies include
Building pathology

The Condition Data Collection is assessing the state of the English educational estate, and **Vince Jubb** reports on its progress

School work

If you have any contact with the education sector, you will no doubt have heard of the Condition Data Collection (CDC) programme. The CDC, led by the Department for Education, is gathering data on the condition of buildings for all state-funded schools in England, excluding independent specialist providers, special post-16 institutions and further education colleges.

It is one of the biggest condition data collection exercises undertaken in the UK public sector and at peak times, between 800 and 1,100 schools are being visited each month. By the end of the programme, we will have seen around 22,000 schools and collected data on the condition of around 70,000 buildings, covering more than 60 million m² of floor space.

The CDC programme started in spring 2017 and will conclude in autumn 2019. In carrying it out, we are working with four surveying organisations – Aecom, Capita, Faithful+Gould, and Rider Levett Bucknall – as well as design consultancy Arcadis, and IT supplier KyKloud.

Rolling review

In 2011, Sebastian James' *Review of Education Capital* recommended independent condition surveys on a rolling 20% sample of the school estate, repeating this to develop a full picture of its condition over five years and thereafter.

The Property Data Survey (PDS) assessed the building condition of much of the school estate in England between 2012 and 2014, and was then succeeded by the CDC programme.

The programme is providing a high-level, non-invasive assessment of schools so that we can identify how building condition is changing over time, and it is also helping us evaluate the impact of policy interventions.

We are investing more than £23bn in school buildings between 2016 and 2021. The data collected is providing information on the condition of school buildings, which will inform the way we target future capital investment.

Programme improvements

Based on feedback from the PDS and from early CDC pilot visits, we have sought to improve the methodology and delivery of the programme. The pilot study involved engaging with key stakeholders, including schools, responsible bodies and industry representatives from RICS.

“
CDC is one of the biggest such exercises undertaken in the UK public sector

In particular we have:

- improved the robustness and consistency of grade allocations and data recording for roofs and other critical elements
- improved the approach to collecting data on parts of buildings that are difficult to access, such as drainage elements and mechanical and electrical services
- given greater consideration to local knowledge about buildings and condition to help provide context for surveyors as they collect data
- expanded the school data collected to include some on context and compliance, covering, for instance, flood risk and statutory designations that may constrain future uses of the site
- made data available to schools and responsible bodies on a rolling basis once it has been quality-assured, rather than

waiting until the end of the programme

- improved the IT platform supporting the collation of data on site
- increased key stakeholders' general awareness of the CDC programme.

Responsible reporting

We are now more than halfway into the CDC programme, and surveying organisations have visited more than 12,000 schools in England to collect the required data. We are working closely with these organisations and Arcadis to ensure the quality of the school data sets.

We have provided 2,800 condition reports to schools and responsible bodies, and will be releasing more in the coming months for schools that have already had a CDC visit and for which data has been quality-assured.

We are also collecting feedback from schools, responsible bodies and other key stakeholders on their experience of the CDC programme and the content of the condition reports, which we are using to improve our work.

If you have been involved in the programme and would like to share your views or want to know more about it, please do get in touch or visit

<https://bit.ly/2jfanIO>. ●



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Related competencies include
Data management



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Pretty vacant

Although “vacant possession” of a property is a term discussed in a range of case law it still proves problematic, as **Nick Dowding** and **Vivien King** find

The phrase “vacant possession” arises in several different contexts: it’s a requirement in a sale and purchase agreement, in a lease covenant to yield up, or even in a court order.

Yielding up with vacant possession is often a pre-condition in a tenant’s break clause as well. Even if not mentioned, an obligation to return the premises with vacant possession will usually be implied when a tenant vacates.

Thanks to Lord Justice Rimer’s judgment in **NYK Logistics (UK) Ltd v Ibrend Estates BV** [2011] EWCA Civ 683, we also know that the phrase “means that at the moment that ‘vacant possession’ is required to be given, the property is empty of people and that the purchaser is able to assume and enjoy immediate and exclusive possession, occupation and control of it. It must also be empty of chattels, although the obligation in this respect is likely only to be breached if any chattels left in the property substantially prevent or interfere with the enjoyment of the right of possession or a substantial part of the property.”

Despite this, questions persist. What constitute chattels is an obvious one, and whether their presence would substantially prevent or interfere with the landlord’s right of possession is another.

Note that chattels include not only unfixed items but may, depending on

the facts, include some fixed ones such as demountable partitions, as held in **Riverside Park Ltd v NHS Property Services Limited** [2016] EWHC 1313 in relation to partitions that were fixed to the raised floor and suspended ceiling grid with screws.

Fixtures and alterations

Do fixtures installed or alterations made by a tenant during the term also need to be removed to give vacant possession?

One consideration is whether such items are part of the property of which vacant possession must be given. Often, the tenant must give vacant possession of “the demised premises” or similar, so it is necessary to look carefully at that expression’s definition in the lease.

It may explicitly include fixtures and alterations, but even where it doesn’t these will usually be included by virtue of the principle that the demise includes everything that is in law part of the land – that is, fixed to it – at the time.

In such cases, fixtures, alterations and similar need not be removed to give vacant possession, because they are part of the premises.

But there may be cases where the definition of what must be yielded up does not include them. For example, the demised premises may be defined as including “all subsequent alterations and additions but excluding tenant’s fixtures”.

It might be argued in such a case that the tenant’s fixtures must be removed to comply with the vacant possession

condition. While this argument was assumed correct in **Riverside**, the judgment is not clear as to why, and given that the judge’s conclusion was not essential to his decision it is not binding on other courts.

Contractual obligation

Another point to be considered is whether the tenant is under a contractual obligation to remove fixtures or alterations and reinstate. If so it might be argued – as it was in **Goldman Sachs International v Procession House Trustee Ltd and anor** [2018] EWHC 1523 (Ch.) – that the obligation to give vacant possession requires the relevant items to be removed.

That argument again appears to have been assumed correct in **Riverside**; likewise, the judgment contains no substantial discussion of it and it was not essential to the judge’s decision. The point was not decided in **Goldman Sachs**, although Mr Justice Nugee did say “the ordinary meaning” of vacant possession is to return the premises free of people, chattels and legal interests.

The better view would seem to be that failure to remove the items will not prevent the premises from being yielded up with vacant possession, but that removal will simply form part of the claim for dilapidations. However, it is important to be aware – particularly when advising a tenant – that there is a possible argument the other way.

In the end, as always, the most important feature will be the words used. In **Goldman Sachs**, Mr Justice Nugee determined, on the particular wording of the break clause in that case, that the break was conditional on vacant possession being given, but not on compliance with the yielding-up clause; this required the tenant to remove alterations and additions, reinstate the premises to their original condition and yield them up in the condition set out in a works specification.

At the time of writing, leave has been given to the landlord to appeal. So watch this space. ●

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Related competencies include
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Making the most of MMC

As the use of modern methods of construction gathers momentum, **Andrew Little** reviews progress, potential and barriers to entry

Precision-manufactured; pre-manufacture; modular; prefabricated; volumetric; hybrid: these are all terms with which you may be familiar to describe off-site construction.

Signals from the UK government, though, thankfully indicate that it is now settling on the single term “modern methods of construction” or MMC.

It is fair to say that, in the past two years, adoption of MMC has been gaining traction in response to modernisation of construction techniques across the industry, a trend being driven by existing and predicted labour shortages, building information modelling (BIM) and wider advances in manufacturing technology, materials and automation.

In 2016, Mark Farmer set down various challenges to what he branded a “fragmented” industry in his review *Modernise or Die* (<https://bit.ly/2eqhNNv>). This identified pre-manufacture as one of the potential solutions to threats faced across the industry, and the subject of MMC is therefore rising up the agenda.

Then and now

Such systems have certainly advanced since first rolled out to address the housing crisis after the Second World War, which saw a need for 750,000 new homes. Between 1945 and 1951, 156,000 homes were provided across the UK, typically two- or three-bed houses with integrated plumbing and heating that were each constructed within 40 hours.

Despite a 10-year lifespan, many of these houses lasted much longer, and some 330 of them still remain occupied today. A second wave of prefabricated construction followed, commonly referred to as “PRC” (precast reinforced concrete), and this took the form of houses built using reinforced concrete panels in a variety of combinations. Types included Airey, Cornish, Wates and Unity, and 1.5m such homes were built in the decade after 1945.

Some 70 years later, we again find ourselves in a housing crisis. The industry’s current 160,470 new-build completions, as per Office for National Statistics figures for the 12 months to March 2018, fall short of the annual 300,000-home target; so as demand continues to outstrip supply, there is a major opportunity for MMC and digital technology to help redress this shortfall and overcome barriers to growth.

Current systems

I think it is fair to say that MMC has suffered from a chequered reputation in the past and is largely regarded as

untested in the present. However, development of systems has certainly been refined in recent years, with benefits in terms of cost, time and particularly quality being well publicised.

The industry has recently focused on stimulating the development of MMC capacity so as to increase housing supply, and the UK government has sought to fulfil this aim by specifying that a proportion of dwellings procured using public funds or on government-owned land will have to be constructed using innovative techniques – effectively, MMC. In response, a number of housing providers have established their own MMC product and manufacturing base or partnered with housebuilders and main contractors to meet targets for new homes.

As technology has developed, so have more sophisticated systems. These include fully fitted volumetric units – typically made of light-gauge steel, timber or concrete frames, individual pods for integration into a load-bearing structure, panellised systems, and individual sub-assemblies and components such as prefabricated foundations, floor cassettes, roof cassettes and pre-assembled roof structures.

Potential

“So why would I consider MMC as an option for one of my schemes?” Well, the truth is that cost and performance data is limited, compared to that for more traditional construction techniques, and lifecycle and maintenance information is still unavailable as systems are in their formative years and have not yet been subject to robust monitoring.

However, there have been suggestions that a well-designed and programmed fully fitted volumetric solution made with MMC

MMC has been gaining traction in response to the modernisation of construction techniques



has the potential to reduce a programme duration by 20%, with costs 40% lower than those for traditional techniques.

Perhaps the greatest benefit of using MMC, where most value can be realised, is the potential it offers for significantly improved quality. Ensuring quality is one of the biggest challenges for the industry, brought into closer focus after the Grenfell Tower fire, and indeed this is a central theme in the Hackitt Review.

With this perception that build quality is declining, we should not forget that more conventional construction continues to provide a good-quality product; but quality still needs to improve, if only to meet higher performance standards. The industry is collectively calling for improved quality, and this is advocated, for instance, in the Farmer and Hackitt Reviews.

MMC certainly goes some way to addressing these challenges by having a dedicated workforce manufacture systems in controlled conditions, and this has the potential to provide more consistent quality across the industry.

Product-led approach

Where MMC is considered an option, it is important that off-site suppliers are engaged early and integrated into the design team, and that a product- rather than project-led approach is adopted to ensure optimum value.

Constraints will be unique to each project, and could concern manufacture, handling, transportation and installation, as well as site-specific criteria such as geotechnical conditions. These design considerations are highly important and should not be overlooked, as doing so may entail expensive bespoke solutions later in the project. Off-site manufacture therefore provides a great opportunity to make full use of BIM by allowing all disciplines involved to collaborate fully in a data-rich environment.

Procurement also needs to be carefully considered. There is currently a view that design and build contracts are not suitable for MMC and that bespoke alliancing models may be more appropriate, bringing together contracting expertise, logistical knowledge and a supply chain with an integrated project insurance model that would enable common product platforms and mass customisation. As building surveyors, we have a key role to play in due diligence on any procurement model to ensure it is not only fit for purpose through the initial design and construction stages, but also throughout the lifecycle of the asset itself.

Instilling confidence

As lifecycle performance data for MMC is limited, there are thus understandable concerns about quality and durability. This creates a challenge for warranty providers and stakeholders, including mortgage lenders, valuers and building insurers.

Through increased output, standardisation of systems and analysis of performance, insurers' concerns about failure and potential claims can be reduced by instilling confidence in product quality, particularly where independently certified with a 60-year design life and a clear structure for future maintenance set out.

The sector has also developed dedicated insurance measures in the form of the Build Offsite Property Assurance Scheme (BOPAS), and bodies including NHBC and LABC are now able to

offer independent cover for off-site manufactured products as well, subject to third-party verification.

Barriers

MMC offers an opportunity to tackle many of the challenges the industry faces with regard to quality, skills shortages and the increasing gap between housing supply and demand. There are, though, a number of barriers to adoption and risks that need to be understood if MMC is to become as common as more traditional techniques such as bricks and mortar.

The most talked-about of these barriers is that funders find it difficult to invest in this kind of production model without visibility of future demand. The public sector has a key role to play in overcoming this by establishing procurement and joint venture models that will help to stimulate demand. These would share risk in a collaborative working environment and programmes would cover the longer term rather than being one-off pilots or small-scale developments.

Transparency of capital and operational costs is key, including greater cost information and performance data – especially when a client will ask how the cost compares with more traditional techniques. Currently, there is a degree of confusion around this subject, and without doubt there is a need for sensible, credible benchmark data.

There are also significant concerns around bespoke products and risks associated with insolvency, both during construction or in the future. This risk has focused attention on standardisation and development of a potential MMC design guide, but this is likely to prove another challenge as most companies have invested heavily in their intellectual property and products. While they may be reluctant to share knowledge, progress towards a common product platform and mass customisation is considered a necessity, and a design guide would enable such standardisation of interchangeable component parts.

Bespoke insurance measures such as BOPAS are also complemented by existing warranty providers, including NHBC; however we still need to move towards a position where warranties, insurance and general mortgageability become as common and accessible for MMC as they are for traditional building methods.

Finally, as many MMC companies are small or medium-sized enterprises, there are issues around cash flow, security and insolvency, while the production model often requires significant upfront payment. Clients are understandably nervous about these, fostering a risk-averse attitude to MMC; however, this only emphasises how important it is that local authorities, developers, registered providers and MMC specialists collaborate in joint ventures or alliance arrangements that, if robustly established, will go some way to addressing the challenges faced across the industry and improve housebuilding growth across the UK. ●



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Related competencies include
Construction technology and environmental services

“
MMC has the potential to
provide more consistent quality
across the industry

High performance

With its high property values and land prices, Hong Kong has a significant demand for surveyors. **Franky Wong** looks at the range of the profession's work in the territory

The Nobel laureate Milton Friedman once praised Hong Kong as one of the freest markets on earth. In such a market, the legislative and public administration system is set up to encourage individualism and competition, and participants have the greatest freedom to pursue their best interests.

Given this background, Hong Kong has produced the most Asian billionaires of any region on the continent, with the top few, significantly, having amassed their wealth from the property market.

Hong Kong is also one of the most expensive cities in which to live. This is partly a result of the high land price, which typically accounts for 60–70% of total development costs. To minimise the time taken to pay back any financing for the land, property developers are driven to complete their projects speedily, while maintaining a high standard of services and ensuring the quality of built products.

This fosters a culture of high performance among all project team members, including building surveyors.

Professional training

In the 1960s and 1970s, graduates of building-related diplomas, higher diplomas and advanced diplomas in Hong Kong – courses mainly offered by the Hong Kong Technical College, later the Hong Kong Polytechnic – who wished to become chartered surveyors could take examinations to join RICS. These exams were the forerunners of the present APC; there were also certain exemptions for candidates who had already taken the higher and advanced diplomas.

To earn bachelor's degree qualifications, however, Hong Kong residents had to study abroad, usually in the UK, or take distance learning programmes by correspondence, such as those offered by the College of Estate Management.

With growing demand for building surveyors in subsequent years, more programmes at degree and sub-degree levels were set up at different universities and educational institutions in Hong Kong. In recent years, overseas universities have also set up campuses in the city to grasp the opportunities for education services arising from the upsurge in the Chinese and South-East Asian markets.

Building surveyors receive training in diverse areas of expertise, including economics and finance, land law, building contract law, building regulations, town planning, property valuation, building technologies, building services engineering, structural engineering, environmental science, material science and management, so can take up various positions throughout the project lifecycle.

Professional bodies

In 1997, Hong Kong's sovereignty passed from the UK to mainland China, which is generally seen as the watershed for the development of the two professional surveying bodies there, the Hong Kong Institute of Surveyors (HKIS) and RICS.

In the past 20 years, HKIS has been gaining wider recognition across the city, and a growing number of local practitioners opt to take their first surveyor qualifications with it rather than with RICS, perhaps as many government positions only specify HKIS membership as a recognised professional qualification.

As elsewhere, building surveyors play a broad range of roles in property development in Hong Kong, including project management services from the feasibility stage onwards. They also prepare development proposals that meet the criteria of different government departments for property development.

When it comes to detailed design, surveyors ensure that the documentation, including building and other plans, meets statutory requirements, and that works commence on time. During construction, they monitor progress and liaise with

other professionals to fulfil project goals. After completion, building surveyors carry out regular maintenance and are involved in property and facilities management.

In performing these tasks, all surveyors must abide by the professional rules of conduct and meet the relevant professional and personal standards.

Specialisms

Building surveyors have two core competences: project management and building maintenance. They are all-round building professionals, which makes them ideal managers for projects of any kind from new developments to alterations, extensions and refurbishments. They can oversee projects by coordinating a multidisciplinary team of stakeholders and professionals to work out the most feasible development proposals and have them completed to clients' satisfaction.

To become project leaders with statutory powers and obligations, some also undergo assessments to be qualified as Authorised Persons, the designation for legal agents who assume almost all leadership, supervisory and coordination responsibilities in private developments.

Building surveyors also specialise in diagnosing defects and regulatory deficiencies. They advise clients on building management, maintenance and rehabilitation to boost built assets' value. In addition to their core specialisms, they can – given their broad knowledge and skills – develop their careers into other professions, such as arbitration or town planning consultancy.

Private sector

Building surveyors are employed in both the private and public sectors. In the former, they provide consultancy services to various types of client, for example property developers, contractors, private firms and the government, as well as quasi-governmental organisations. These services include project planning, design and management for different kinds of property, building surveying, property management and building maintenance.

Usual duties include different project stages: meeting clients; coordinating with different stakeholders; carrying out site visits to collect data; and preparing and advising on building designs, working drawings, bills of quantities and specifications for new developments, as well as for alterations and additions.

Other duties include maintenance and fitting-out works; project planning and scheduling; tendering, appraising tenders and selecting suitable contractors; conducting on-site supervision and

monitoring progress; dispute resolutions; preparing statutory submissions; participating in payment evaluation; and writing up technical reports.

Private practice surveyors offer their expertise for professional fees. It is important that clients' requirements are satisfied, ultimately maximising profits and achieving business growth.

Public sector

In the public sector, some building surveyors work in the Hong Kong government's Buildings Department to prepare and enforce development controls for private properties.

They are responsible for checking the submitted plans of proposed developments, and also carry out other professional tasks to ensure buildings comply with regulations and the associated legislative requirements, by, for example, conducting condition and structural surveys for ageing buildings.

There are also maintenance surveyors in other government organisations such as the Housing Department and the Architectural Services Department, who carry out property and facilities management for public housing and government premises respectively.

Building surveyors working in public organisations have a very different mentality to their private-sector counterparts. Their main concern is not the financial feasibility of a project. Instead they focus on the accountability of their roles in performing professional tasks, and adopt a prudent approach in discharging these functions. They must understand their respective duties and responsibilities, and stick to relevant departmental guidelines and manuals.

For instance, if government officials require building owners to take specific remedial actions such as demolition of unauthorised building works, they must state clearly what the supporting regulatory provisions are. Likewise, the authorities never use the word "approved" to grant permission for building plans, but only implicitly suggest that they have "no objection", possibly in order to avoid potential legal disputes.

Active players

To conclude, building surveyors are active players in development in Hong Kong. They are particularly knowledgeable about the legal aspects of property development and specialise in building management and maintenance. Their

comprehensive understanding of other areas of expertise in a multidisciplinary project team also enables them to serve the industry and the community at large in a variety of capacities. Some have even moved beyond their professional arena to be nominated or elected as lawmakers, or become independent non-executive directors in listed companies.

In the future, building surveyors can be expected to continue to contribute to the local economy in different ways. As part of Hong Kong's response to China's One Belt One Road initiative, which aims to improve connectivity and cooperation across Eurasia, their consulting and professional services will be exported to other countries in South-East Asia, Northern Asia and the Middle East to earn them wider international recognition. ●



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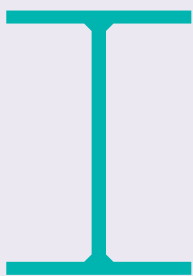


Lift refurbishments, service and repair

Building Conservation Journal

OPINION

A shared tradition



International relations is a question of perspective: we need to see ourselves as others see us. As a country, the UK tends to have an offshore perspective of its neighbours. Then comes the 2018 European Year of Cultural Heritage: is it a mirror, reflecting the way we see ourselves, or a window, showing how others do?

Though given formal status by the European Commission, the Year of Cultural Heritage is what we choose to make of it. The UK may be close to leaving the EU, but we should not underestimate how keen the other 31 countries are to maintain working relationships with us.

Long before Maastricht, and long after Brexit, the UK and Europe will have a common way of getting things done. Call it tradition, or values, or propensity. The Year of Cultural Heritage isn't a self-indulgent immersion in nostalgia but a recognition that while political and economic trends fluctuate, the cultural pulse is reassuringly steady,

as the 2018 Eurobarometer for the 28 EU member states shows. Identity is a resilient and enduring characteristic to which people default when other circumstances are uncertain. The programme for the year reveals that much UK cultural heritage and identity are inextricably connected with Europe, which influences our standards, offers us inspiration, and shapes the market forces that affect us.

A year in the UK

Part of the Year of Cultural Heritage is a call to action, with a projected outcome of 10,000 activities and 1m participants across the 32 countries involved.

The UK programme is performing well, most likely because tradition and cultural expression count for so much here, and perhaps also as an antidote to Brexit. The spectrum of participation is wide, including traditional country estates, historic areas of urban regeneration and new towns.

The 51-year-old Milton Keynes is for instance using 2018 to link with European networks of garden cities, new towns and emerging settlement models.

Meanwhile, Glasgow City Heritage Trust has considered whether its distinctive tenements

have followed more of a European model than a British one, and is looking at how to conserve their character and market value.

The bicentenary of English landscape designer Humphry Repton's death also affords an opportunity to explore his influence across Europe. Elsewhere, the Institute of Historic Building Conservation in Belfast considered an Irish perspective on influences from Europe in conservation practice there.

At first glance, the 2018 European Year of Cultural Heritage may not seem to resonate with the day job of surveyors. But seeing surveying as a distinctive UK cultural tradition as well as a profession could change perspectives and open up new markets here. As the year promotes expertise based on common cultural values as well as professional ones, UK practitioners may gain a competitive edge across the continent as well. ●



Graham Bell is UK National Coordinator of the 2018 European Year of Cultural Heritage and Director of the North of England Civic Trust
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+info

Year of Cultural Heritage
<https://bit.ly/2j20IOX>
www.2018-eych-uk.eu

2018 Eurobarometer
<https://bit.ly/2n7KBzT>

Berlin Call to Action
<https://bit.ly/2mPG1WG>

Historic Environment Scotland has drawn on a range of natural hazard data to assess the risk to its properties in care from the changing climate, writes **David Harkin**

Conservation in a changing climate

The very existence of our historic environment as we know it today is testament to its innate resilience and ability to adapt to change. Historic Environment Scotland (HES) cares for 336 monuments of national and international significance, covering more than 5,000 years of the nation's history. Many of these monuments have had to adapt to change in the past and they are all now having to respond somehow to our changing climate. The unprecedented scale of climate change means that to futureproof our properties in care (PICs) effectively, as well as the wider historic environment, we need to think about novel ways of building on their inherent resilience.

To guide our next steps, we have recently undertaken an initial assessment of natural hazard risk to inform a climate change risk assessment of these PICs. The principle behind this project was to help us identify the sites we believe to be most at risk from climate change, which in turn allows us to prioritise actions to help safeguard these sites for future generations. We see this project as a continuing piece of work, with the results recorded and published so far a snapshot of this ongoing process.

Discharging duties

Our risk assessment project has its roots in a series of legislative drivers issued by the Scottish Government including the Climate Change (Scotland) Act 2009, which places duties on public bodies to undertake adaptation programmes. HES is identified as a major player under the act, owing to its size and influence.

Guidance clarifying these duties, *Public Bodies Climate Change Duties: Putting Them into Practice* was published in 2011 (<https://bit.ly/2LXHW9J>). The Scottish Climate Change Adaptation Programme, established in 2014 after being constituted in the 2009 act, specifically makes HES responsible for quantifying heritage assets affected by climate change using geographical information systems (GIS), and creating a climate change risk register for the PICs. The programme also sets out Scottish ministers' objectives as well as policies and proposals to tackle the impacts of climate change in Scotland.

Aside from these legislative drivers, in undertaking this assessment we also recognise the importance of proactively

addressing changing climatic conditions and their present impact on our PICs. As Scotland's lead public body for the historic environment, we have a duty to set an example and disseminate guidance and information that can help others to play their part in safeguarding our national heritage.

The greatest driving force for this project, however, is that Scotland's climate is changing (see [Figure 1](#)). The past century has been characterised by overall warming and altered precipitation patterns, leading to wetter and warmer winters and drier and warmer summers. We are also experiencing increased frequency of extreme and unpredictable weather events. Together with rising sea level, these mean the outlook for

Figure 1

A summary of the key average changes in Scotland's climate, measured since the 1960s. Source: *Scotland's Climate Trends Handbook, 2014*

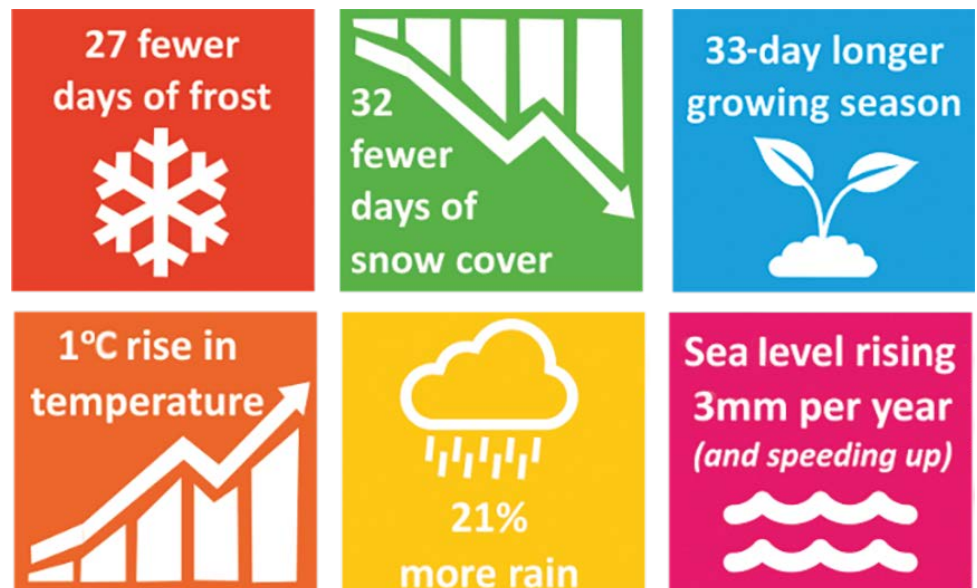


Figure 2A

The inherent risk score, which does not take into account any mitigating factors or controls already in place at PICs

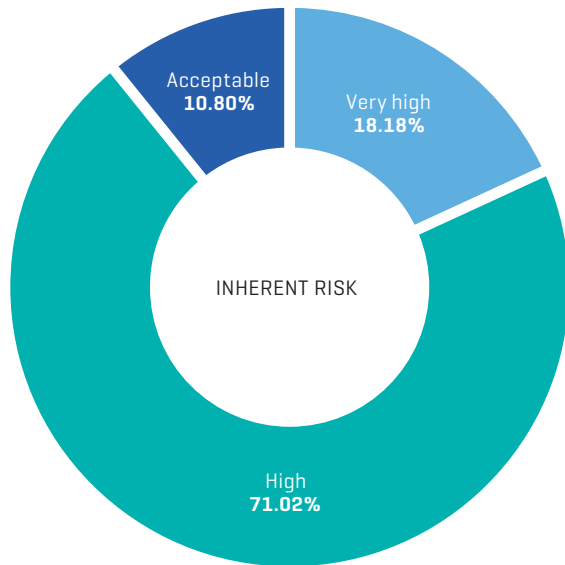
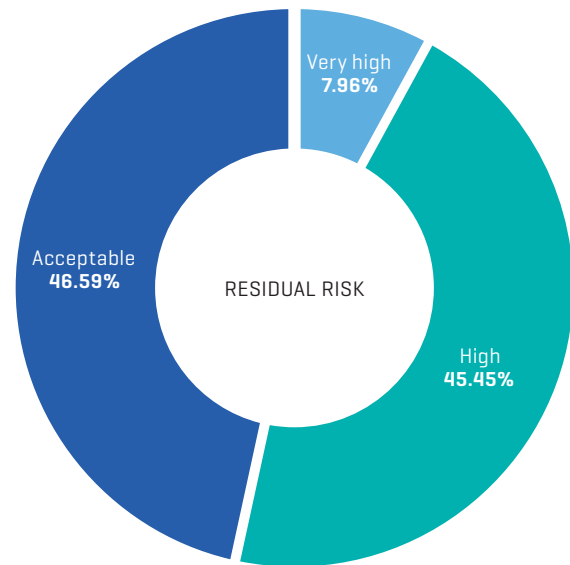


Figure 2B

An assessment of staff and visitor presence at PICs alters the inherent risk score to produce the residual risk score



Scotland's historic environment is uncertain unless we act now.

Working in partnership

To carry out a project of this scale successfully, we joined forces with the Scottish Environment Protection Agency (SEPA) and the British Geological Survey (BGS), which both supplied various nationwide data sets on natural hazards. Work with the BGS fell within the terms of an existing memorandum of agreement between the two organisations, while SEPA was able to assist us under *Action on Climate Change*, a joint statement on our shared responsibilities.

Ordnance Survey base mapping was provided under the One Scotland Mapping Agreement, and Adaptation Scotland offered guidance and support through its Adaptation Learning Exchange Task Group. The latter gave us opportunities to sense-check our approach and learn from other member organisations, including the NHS Scotland and Scottish Water, which were carrying out similar assessments at the same time.

The data assessed

We collated six natural hazard data sets in total from SEPA and the BGS, those being fluvial, pluvial, groundwater and coastal flooding, landslides, and coastal erosion. These were integrated into an ArcGIS database, then, using GIS, we ran spatial queries that involved overlaying

the hazard maps with the boundary information for each PIC.

The results of this analysis then allowed us to assign likelihood scores for each of the six hazards at each of the 336 properties. Depending on the data set in question, these scores were either quantitative return periods – such as the estimated extent of a one-in-10-year flood event at a specific site – or a qualitative account based on the presence or absence of various causative factors – to say whether, for example, the hazard is likely to occur at this site.

We focused on current risk from natural hazards because this acts as an indicator of susceptibility to climate change; hazards such as flooding and coastal erosion will only increase in severity as climate change intensifies.

In order to develop a consistent scoring method for this initial baseline assessment, we then assigned an impact score to each of the PICs, according to both the type of hazard and the type of property. Broadly speaking, our estate can be broken down into three groups based on property type:

1. roofed monuments
2. unroofed monuments with high masonry
3. unroofed monuments with low masonry, standing and carved stones and field monuments.

We then made some general assumptions based on the impact of any given hazard at these sites. For example, a roofed

monument that is likely to have decorative interiors and furnishings is less able to recover from any type of flood than an unroofed ruin; therefore, the impact is higher for the former.

This approach was appropriate for the early phase of the project as it allowed us to record a broad overview of risk across our estate through a desk-based assessment. The results were initially alarming: we recorded an unacceptable level of risk at almost 90% of our PICs, which was the inherent risk score (see Figure 2A).

We then considered staff and visitor presence at each of our PICs. Some sites are staffed and open year-round, some are only open at certain times of the year with a seasonal staff presence, and others have no regular staff presence. If a site was open all year round with a consistent staff presence then we lowered the risk score there as we recognised there would be a proactive



Hazards such as flooding and coastal erosion will only increase in severity as climate change intensifies

Blackness Castle

Blackness Castle is located in the Scottish central belt, standing on the banks of the Firth of Forth at the port that served the Royal Burgh of Linlithgow in medieval times. Built in the 15th century as a lordly residence for the Crichtons, one of Scotland's more politically powerful families at the time, it soon took on other roles. It became a royal castle in 1453, then a garrison fortress, a state prison and, by the late 19th century, an ammunitions depot. The castle was decommissioned after the First World War and has subsequently become a popular visitor attraction.

Risk assessment and hazards

This HES study shows that Blackness Castle is at high risk from fluvial, groundwater, pluvial and coastal flooding as well as coastal erosion (see Figures A and B), while the site is at medium risk from ground instability. These risk scores were calculated on the basis that the property is an occupied, roofed monument; is staffed; allows visitors year-round, albeit with limited access during the winter months; and houses a range of collections documenting the castle's varied uses over the centuries.

Blackness Castle occupies a relatively small proportion of the area managed at this site by HES, and the building itself enjoys some protection from its own impressive curtain wall. The south-east corner of the area managed by HES, however, is particularly susceptible to fluvial flooding due to the presence of a small stream entering the Firth of Forth, as well as being at high risk from coastal flooding and coastal erosion. To mitigate against these hazards, a small retaining wall was constructed to protect this vulnerable area of the site. This makes it a good example of a site where interventions have already been carried out to mitigate the risk of particular hazards.

Climate trends

Historic weather station data from the Met Office was obtained for more detailed analysis of changing weather patterns at HES sites. Data from a range of weather stations across the central belt of Scotland shows that annual rainfall totals have been increasing steadily since the early 1960s, with approximately 200mm more rain now falling annually in the area around Blackness Castle.

In keeping with the general trend across Scotland, climate change will result in



Note: In each figure below, the green line indicates the extent of the land for which HES is responsible

Figure A Blackness coastal flooding

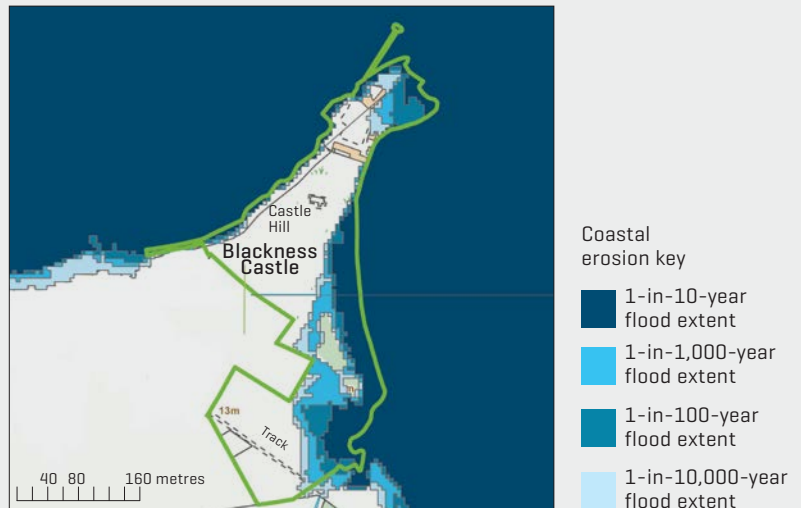
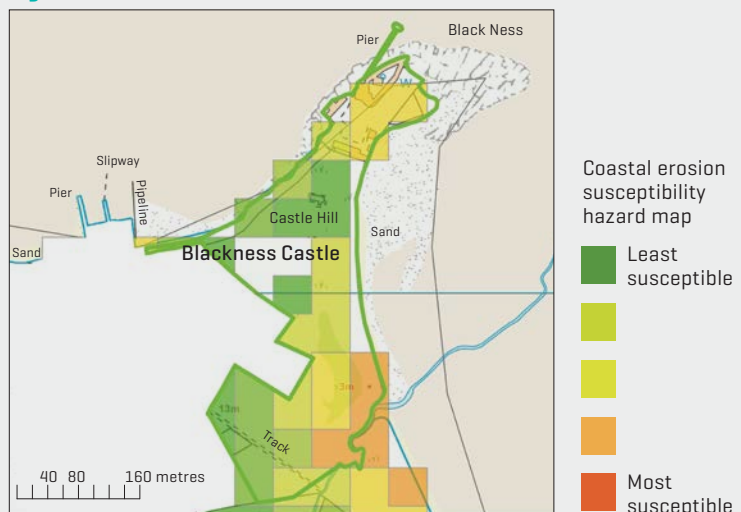



Figure B Blackness coastal erosion



Source: Crown copyright/SEPA. All rights reserved. Full acknowledgement of data providers and participating parties is available at <https://bit.ly/2nAjfCH>



“
Climate change will result in warmer and wetter winters and hotter and drier summers for the site

warmer and wetter winters and hotter and drier summers for the site. The UKCP09 climate change projection tool was used to investigate what the likely range of change may be. Under a high-emissions, “business as usual” scenario, winters at Blackness Castle could be up to 10% wetter than they are currently, while the average maximum and minimum temperatures may rise by up to 2.6°C and 2.2°C respectively. In the same scenario, summers could be 13% drier, with the average maximum and minimum temperatures rising by 3.6°C and 2.9°C respectively.

Future outlook

A full appraisal of risk at Blackness Castle is due to be carried out in the next phase of our project, and will include a more detailed desk-based assessment of historical changes in environmental conditions at the site. This will include using resources such as Dynamic Coast, an interactive tool created as part of the National Coastal Change Assessment for Scotland (www.dynamiccoast.com).

This assessment has established historical coastal change in order to estimate past erosion and accretion rates around Scotland’s soft coastline, and the results have provided a basis for a 50-year projection of coastal change. Another key component of assessing risk at sites such as Blackness Castle is to speak to the people who work at these properties, as their insight and experience of working on the front line will be an invaluable source of information.

▶ response to a hazard, lowering its overall impact. By doing so we calculated a residual risk score, and these results showed that 53% of our sites were actually at an unacceptable level of risk (see [Figure 2B](#)).

The case study (left) illustrates one such assessment we made.

Integrating the results

This evaluation of climate change risk on our estate is helping to improve our conservation decision-making processes. The results of our assessment inform an important strand of consideration in the prioritisation of funds for maintenance and conservation works, thus allowing more efficient use of limited resources.

The results also allow us to adopt a more proactive rather than reactive approach to dealing with the impacts of climate change. This strategic approach will benefit us, as well as the wider historic environment, by enabling the development of methodologies to assess risks and plan for future impacts, strengthening climate change resilience throughout the sector.

What next?

This baseline assessment is a solid starting point for more detailed investigations of risk across our estate. This will involve conducting site visits and speaking to staff and others who manage and use these sites to enhance our understanding of risk. We will initially focus on those sites identified as being most at risk in this baseline assessment.

Incorporating the results of the UK Climate Projections (UKCP) for 2009 and 2018 (<https://bit.ly/1r6u7Up>) will be crucial in making this project a Climate Change Risk Assessment. UKCP09, soon to be superseded by UKCP18, is an online tool that allows users to generate detailed climate change projections for variables such as temperature and rainfall over different future timescales. We will be able to use this tool to establish which regions of the country are most likely to experience the greatest impacts of changing weather patterns, and therefore begin to work out how our sites in these regions can be best prepared to withstand these changes.

The scale of impacts

To date, we have focused on investigating the macro-scale hazards associated with climate change such as flooding and coastal erosion. However, there are a host of micro-scale impacts

that can be just as damaging, such as the decay of stonework.

Scotland has a rich geological history that has resulted in stone being used in the construction of large swathes of the historic environment. Stone decays naturally over time at varying rates depending on the type used, and these decay rates are enhanced by external factors such as poor detailing or misguided interventions and repairs. Climate change is now another important external factor that acts to exacerbate existing problems.

Water is the major factor in the chemical, biological and physical decay processes that are particularly prolific in the deterioration of stonework, and with changing precipitation patterns set to intensify, these issues will become increasingly difficult to rectify. Factoring in an assessment of the vulnerability of different stone types across our estate is just one measure that would enhance the results of our risk assessment.

Sharing the knowledge

Our risk assessment is one of a range of HES research projects on topics such as climate change adaptation of traditional buildings, maintaining such buildings, and making them more energy-efficient. The results of these workstreams have all been published in free guidance aimed at professionals and homeowners who have a duty of care for traditionally constructed buildings.

These principles are also central to the remit of the recently opened Engine Shed, Scotland’s national building conservation centre in Stirling (see *Building Conservation Journal* December 2017/January 2018, pp.28–29). ●

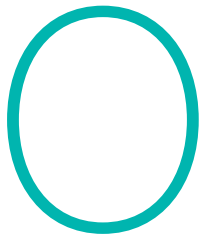


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A Climate Change Risk Assessment
<https://bit.ly/2v17YhM>

Short Guide: Climate Change Adaptation for Traditional Buildings
<https://bit.ly/2uZFUvh>



ver the past year, we have secured recognition of the RICS Historic Building Professional Certification (rics.org/bcas)

from UK heritage agencies, with each of them having now formally adopted it as a requirement for lead professional advisors on repair grants. The result has been growth in demand for certification, and as we continue to engage with like-minded built environment professional bodies and other heritage stakeholders – the Church of England, the Historic Environment Forum, the Society for the Protection of Ancient Buildings (SPAB) and other amenity societies – new opportunities are presenting themselves.

Most recently, we have been working with the building surveyors at the National Trust. One of the strategic aims of the trust is to look after the places we love, and its building surveyors are vital to achieving this objective. With an annual intake of assistant building surveyors, the trust recognises the importance of conservation credentials in addition to the chartered surveying qualification.

Trust in us

John Klahn relates how RICS is working with the National Trust's building surveyors

The assistant building surveyors are supported and encouraged to attend the RICS–SPAB Conservation Summer School, pursuing their chartered qualification and then the RICS certification. Likewise, at RICS we recognise the opportunity the National Trust provides to its building surveyors to gain the necessary experience.

Nicholas Dutton FRICS, Lead Building Surveyor for the London and South East Region at the trust, is driving engagement between RICS and regional building surveyors with the aim of developing a nationwide programme towards

certification. He said: "The National Trust's collection of buildings is both unique and diverse, requiring special skills, care and attention – and most of all a love for buildings.

"I work in close collaboration with the other regional lead building surveyors to ensure we're working in a consistent fashion. We share ideas, knowledge and techniques across the regions, so that best practice is achieved across the National Trust. It's very collegiate and requires new collaborations both inside and outside of the organisation. Being able to promote not just the vital work the trust does for the nation, but the building surveying profession as a whole, makes the job incredibly inspiring."

In coming months, we will be continuing to develop a learning programme, connecting the Conservation School, new training provision and a second edition of the *Historic building conservation* guidance note (rics.org/hbcgn) to create a comprehensive path to RICS-Certified Historic Building Professional status. ●

John Klahn is RICS Certifications Development Manager
jklahn@rics.org

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BUILDING MATERIALS INFORMATION SHEET 6

Slate

This Materials Information Sheet was compiled by **Vanesa Gonzalez** of Historic Environment Scotland, Content Manager for the Engine Shed – Scotland’s building conservation centre
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Summary

Slate is a strong, impermeable and durable roofing material that has been widely used in the UK for centuries. It was the most popular roofing material in the country until the decline of the slate industry in the middle of the 20th century and the introduction of material from overseas, as well as cheaper artificial products such as interlocking concrete tiles. UK slate-bearing regions include Cumbria, Wales and Scotland.

Geology

Slate is a suitable roof covering material because it can be easily split into thin layers of impermeable slabs.

Slate is a metamorphic rock, which, like sedimentary rocks, begins to develop with the accumulation of fine sediments on the seabed or riverbed to create a mudstone. In the case of slate, these sediments tend to be a variety of clay minerals or argillaceous stone. The vertical pressure from the top layers on the lower ones creates bedding planes that run parallel to the original layer, also known as shale.

When shale is exposed to high temperatures and horizontal pressures from movements on the earth’s crust, it becomes slate. The bedding planes then twist and fold, realigning the mineral composition and thus creating cleavage planes or “slaty cleavage”, which allows the material to be split into thin sheets.

Extracted slate can vary widely in terms of appearance and quality, not only from quarry to quarry but also within working pits in the same quarry. Physical characteristics such as colour, texture and thickness can be indicative of the origin of the slate. The application of slate as a roof covering also varies from region to region, as shown in [Table 1](#).

Testing slate

In 2014, the British Standard for slate BS EN 12326, was updated. The document (<https://bit.ly/2M5U3lj>) has two parts, the second of which looks at testing attributes for slates. There are three areas that are critical.

- **Presence of pyrites:** oxidation of pyrites can alter the stability of slate. To assess whether this is an issue, slates undergo a thermal cycling test, in which they are soaked and dried several times and the level of corrosion of the pyrites is assessed. If the material does not show structural or colour changes it is coded T1; T2 if it might showcase some colour changes due to oxidation, but not structural change; or T3 if it might develop structural changes and therefore become permeable.
- **Acid exposure:** this test evaluates the ability of slate to resist atmospheric pollutants. Slates with a carbonate content of more than 20% are not deemed suitable as a roof covering.
- **Water absorption:** in this test, slates are submerged in water for a period of time and the amount they absorb is measured. A good-quality slate won’t absorb any more than 0.6%.

Durability and decay

Slate is generally a tough material, which has been proven to have a lifespan of hundreds of years. However, a number of factors can lead to general failure of a roof, including:

- mechanical damage after adverse weather, collisions from falling objects or foot traffic on the roof surface
- delamination of slate, which is the way that the material naturally decays through time. ●

Table 1

Physical characteristics of slate according to origin

Ballachulish (Scotland)	
Colour	Dark grey
Surface	Presence of lineation [well-marked grain] and even surface
Texture	Medium
Pyrites	Plenty of pyrite presence, medium size
Easdale (Scotland)	
Colour	Dark blue/grey; superficial weathering can tint it brown
Surface	Even and smooth surface, sometimes rough; well-marked lineation
Texture	Varies from smooth to strong crenulation
Pyrites	Abundance of pyrites that are consistent in size
Highland Boundary Fault (Scotland)	
Colour	Wide range of colours, including blue, grey, green and purple
Surface	Even and smooth with no grain; presence of bedding is common
Texture	Fine/medium texture; Highland border presents the finest texture found in indigenous Scottish slate
Pyrites	Very rare
Banff–Aberdeenshire (Scotland)	
Colour	Sombre, dark blue/grey
Surface	Rough surface without lineation; thickest of the Highland slate
Texture	Coarse texture
Pyrites	Very rare
Welsh Grey/Purple	
Colour	Grey/purple
Surface	Smooth and matt
Texture	Fine
Pyrites	None
English Cumbrian	
Colour	Blue-grey to green-grey
Surface	Rough matt
Texture	Distinctive colour and texture due to its volcanic origins
Pyrites	None

UPDATE

Heritage Agenda is compiled by **Henry Russell** OBE FRICS, Department of Real Estate and Planning, University of Reading and Co-chair of the Heritage Alliance's Spatial Planning Advocacy Group. He is also Chair of Gloucester Diocesan Advisory Committee for the Care of Churches and a member of the Church Buildings Council.
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Historic England revises guidance

Streets for All, which provides guidance on the design of the public realm in sensitive historic locations, has been revised by Historic England alongside its regional counterparts.

The guidance looks at improving public spaces without harming their valued character, including specific

recommendations for works to surfaces, street furniture, new equipment, traffic management infrastructure and environmental improvements. The regional documents provide local advice and case studies, and cover traditional local paving materials.

The body has also revised *3D Laser Scanning for Heritage*, which advises on the use of the technology in archaeology and architecture. It now looks at advances made since 2011 such as the speed, resolution, mobility and portability of modern laser scanning systems and their integration with other sensor solutions.

The updated guidance should assist archaeologists, conservators and other cultural heritage professionals who are unfamiliar with 3D laser scanning in making the best possible use of this now highly developed technique.

- <https://bit.ly/2zxk9Zw>
- <https://bit.ly/2uEAnxd>



English planning policy changes due

The government has been consulting on revisions to the National Planning Policy Framework for England, and as this issue went to press its publication was due in the autumn.

The heritage lobby has had meetings with civil servants at the Ministry of Housing, Communities & Local Government and has been reassured that, despite changes to the wording of the introductory sections, no reduction to heritage protection is intended.

- <https://bit.ly/2Fr9Vvu>

Better Buildings Partnership publishes energy advice

Historic buildings pose particular challenges for retrofitting to improve energy performance, presenting both legal and technical issues if listed or otherwise protected.

The Better Buildings Partnership's *Minimum Energy Efficiency Standards and Heritage Properties*, published in May, is

a useful guide to interpreting the law on this matter. It also explains that energy performance certificates are principally designed to cover modern buildings, so need to be used carefully by appropriate experts when it comes to buildings of traditional construction.

- <https://bit.ly/2KXkc5f>

Church backs volunteer skills pilot

We rely on an army of untrained local volunteers to maintain the UK's ecclesiastical heritage, much of it grade I listed. Following the review by Bernard Taylor, *Sustainability of English Churches and Cathedrals*, the government has introduced a pilot programme of fabric and community advisors to help give volunteers some expertise in assessing maintenance needs and carrying out required work.

The pilot schemes are taking place in Manchester and Suffolk, the former in an urban area and the latter in a rural one.

Even if the project is deemed a success, however, the government will not provide full funding to roll the scheme out across England, so strategic planning will be required to determine the best areas to target.

- <https://bit.ly/2IUtGAX>

Cadw issues fresh guidance

Cadw has published a wide range of new best practice advice on subjects such as managing world heritage sites, the setting of heritage assets and heritage impact assessments. The guidance covers technical matters including local roofing materials and window glass.

These are short documents that should be treated as introductions to the relevant topic as they do not provide sources of further advice.

- <https://bit.ly/2NERmVN>



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Incredible, but true, Liquasil's Flexlap is the only BBA Approved cut edge corrosion treatment on the market.

It uses an epoxy based marine coating to actively treat and prevent rust, along with a unique, hardened, coloured silicone top coat to provide long lasting protection against corrosion.

Metal Roof Coating

The first metal roof coating to achieve BBA Approval.

Based on the same hardened silicone technology as Flexlap, moss, lichen and graffiti are permanently banished, since nothing sticks to the coated surface. It can be used on vertical cladding.

Single coat application significantly reduces installation time and costs.

Asbestos Roof Coating

Asbestoseal is now firmly established as the only BBA Approved asbestos roof coating, having gained BBA approval in 2015.

Made for asbestos cement, Asbestoseal first treats the corroded fixings, seals all cracks and small holes and permanently encapsulates and seals the surface, significantly extending the life of the roof.

Understanding Guarantees

PRODUCT-ONLY GUARANTEES

These offer no protection for the professional specifier, the installer or the client.

If a product fails, a manufacturing defect has to be proven and even then, only the cost of replacement material is provided.

Who pays for labour and access?

INSURANCE BACKED GUARANTEES

These are low-cost policies that offer very little protection. They effectively insure against contractor insolvency and only pay out in very limited circumstances.

UNIQUE LIQUASIL LATENT DEFECTS INSURANCE GUARANTEE

Designed to protect the specifier, the client and the contractor, this unique guarantee is provided

as standard on most Liquasil installations.

Underwritten by an A-Rated, Lloyds of London insurer, it provides single-point cover for replacement materials, safe access, labour and professional design.

CPDs and More Information

Liquasil offers free, Accredited CPD sessions nationwide and at our own premises in Solihull.

For more information, please visit liquasil.com or call one of our building surveyors on 0121 709 535



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