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Looking at how to achieve the core competency Legal/regulatory compliance
Visualisations of our future built environment regularly grace the covers of many design magazines. This future looks tantalising, with technology and innovation paving the way for beautifully liveable cities where everyone can enjoy design excellence. It is a picture that is almost unrecognisably different from our current landscape.

But I’d like to pull back from this to remind us of a basic fact: 80 per cent of the buildings that will be in use by 2050 have already been built. While the innovations we anticipate will make tomorrow’s buildings more sustainable when built from scratch, the biggest near-term impact we can have is to improve what’s already here.

As this new journal marks the intersection of surveying, conservation and building control, I’d like to use this platform to open up discussions about how we can work together better and ensure our work creates a more sustainable future. Knocking down and starting again isn’t an option.

The circular economy is a common touchstone for this, though its relationship to the built environment is still being defined. One model for doing so is the Ellen MacArthur Foundation’s ReSOLVE framework: regenerate, share, optimise, loop, virtualise and exchange (bit.ly/Cirbe). Some of its principles can be observed through the combined efforts of RICS members, in particular optimising and looping processes to make buildings more efficient and adaptable, respectively.

A shift in mindset is needed, though. Maybe we should adopt preservation and conservation as the driving force in building projects, and take a lead from organisations such as Heritage England. If we accept that today’s buildings are going to be with us for decades to come, the priority must be to get the most from the materials and carbon that went into them in the first place.

If the cost benefits of renovation aren’t obvious, consider the commercial benefits. By keeping legacy buildings useful and relevant to the needs of occupiers, we contribute to making more distinct and desirable places with character beyond function. I’m not only talking about traditional townhouses or Victorian theatres — brutalism has recently enjoyed renewed appreciation (bloom.bg/2Ny tgj).

Keeping the character and visual diversity of legacy buildings will entail preparing them for an increasingly changeable climate. As seasons shift and weather patterns become more extreme, the materials and regulations of the past must now stand up to unanticipated degradation or damage.

Of course, simply keeping today’s buildings standing won’t represent a great triumph for sustainability. We must be challenged to reduce operational energy consumption and carbon emissions, given that 52 per cent of total carbon emissions in the built environment come from existing buildings (bit.ly/UKGBCclim); of that, 80 to 90 per cent comes from the operational phase of its lifecycle (bit.ly/UNEPbuildclim).

Specifically, we should look at reducing heat loss and condensation risks from thermal bridging, developing appropriate ventilation strategies for a building’s construction, and extending responsibilities for commissioning or fine-tuning into early operation to optimise the performance of a building through use.

Building control and regulations have a role to play in this, but need to set targets that will make a difference without disengaging stakeholders by proposing impossible goals. Finding the right targets therefore requires discussion between multiple stakeholders. These discussions need to continue as technology progresses, to be sure that we’re refining and innovating with the available tools or practices.

Broadening the discussion further even than a cross-section of RICS members, we must think as a community about bringing in diverse skill sets from society at large. The skills gap in surveying will become more acute as the field progresses and we need more technical expertise and broader understanding for cutting-edge work.

With a new and more diverse forum in these pages, I’m hopeful that the advances still to come will see greater collaboration across our professions and beyond.

Mat Lown is a partner and head of sustainability at Tuffin Ferraby Taylor mlown@tftconsultants.com

Related competencies include:
Sustainability
Briefing

Thinking outside the bricks

RICS has released a paper urging government and the construction industry to ‘think outside the bricks’ and boost diversity in construction skills by embracing modern methods of construction (MMC).

*Modern Methods of Construction A forward-thinking solution to the housing crisis?* examines the benefits of off-site modular housing and using proptech to help housing provision. The paper puts forward various recommendations and calls to action, including MMC-specific training, training the existing workforce, investment such as support through public procurement, and regulation, standards and professionalism.

[rics.org/mmcpaper](http://rics.org/mmcpaper)

RICS offers funding for professional research

The RICS Research Trust is now encouraging applications from around the world for up to £20,000 of research funding per project in five specific subject areas as part of a defined call, and is also accepting open-call research applications in the disciplines of land, real estate, construction and infrastructure. To have your proposal considered at the next biannual meeting, please submit it by 5pm on Friday 8 March 2019.

[rics.org/researchtrust](http://rics.org/researchtrust)

BBA launches Product Excellence Programme

The British Board of Agrément (BBA) has introduced a Product Excellence Programme (PEP). Currently BBA's auditors visit client manufacturing facilities every six months. PEP will mean that fire safety products will be tested annually, while all other products will be tested every three years.

BBA will also randomly select products for testing during audits of manufacturing facilities and send them to its Product Excellence Test Centre in Watford. If a tested product does not meet the agreed specifications, it will be subject to immediate further investigation. Companies unable to address the source of failure will have their BBA certificate withdrawn.

Existing certificate holders will be automatically enrolled on to PEP, and those that opt out of the programme will have to provide the BBA with product tests from another UKAS-approved laboratory. All new BBA clients will automatically be assessed against the PEP criteria.

[bbacerts.co.uk](http://bbacerts.co.uk)

Conservation guidance note due for update

The current edition of RICS' *Historic building conservation* guidance note was published some ten years ago and is now in need of an update.

The new edition is going to be global in scope and will be published later this year. It will retain the general order of the original, although there will be some new sections on building pathology, alterations and additions to historic buildings, and valuation.

All other sections will be updated, with those for maintenance and management of heritage buildings and project management sections being completely revised. User experience will also be improved, with graphics and photographs used throughout the revised guidance.

*Alan Cripps is a former associate director of the built environment at RICS*
Register finds local heritage sites increasingly visible

Charity Civic Voice has published the first national register of local heritage lists. This follows research it conducted that was funded by Historic England’s Heritage Protection Commissions programme, and found that at least 168 local authorities across England now have such a list in place. These authorities are therefore active in listening to communities about what buildings, structures, sites and landscapes make the local area special.

The register details local authority names, the year each list was adopted and the number of non-designated heritage assets, and also gives a link to the lists. It will be updated regularly and aims to inspire other communities to create a list, with a guide on doing so also published.

bit.ly/CVloclistreg

EC works on heritage legacy

The European Commission is working with a number of organisations to run long-term projects around the ten European Initiatives, themes that were devised to build a lasting legacy for the European Year of Cultural Heritage (EYCH) 2018. The themes correspond to four principles defining EYCH 2018, namely engagement, sustainability, protection and innovation. The initiatives deal with tangible, intangible and digital aspects of cultural heritage and benefit numerous different target groups.

bit.ly/EYCHLegacy

Standards

Forthcoming
Asbestos guidance note
Party walls guidance note
Technical due diligence professional statement

Recently published
Countering bribery and corruption, money laundering and terrorist financing professional statement
Surveying safely guidance note

All RICS and international standards are subject to a consultation, open to RICS members.

rics.org/iconsult

Events

RICS Fire Safety Conference
Due to significant demand, RICS will run its fire safety conference for a third time. Register your interest now for the event, taking place in Manchester this spring.
RICS.org/fireconference

Building Surveying Conference 2019
2 May, Royal Lancaster Hotel, London
The conference will focus on the latest developments, including sessions on:
• biophilic design and well-being
• building contracts
• the Building Regulations
• dilapidations
• data disruption
• due diligence
• fire safety
• off-site modular construction.

rics.org/bsconf

World Built Environment Forum
13–14 May, Conrad New York
This year’s forum will look at the themes of:
• changes in work and the workplace
• the impact of algorithms and tokenisation
• the outcomes of investing in the built environment for cities and citizens
• energy and transport finance models
• investment risk allocation.

rics.org/wbef

RICS Digital Built Environment Conference
June 2019, London
rics.org/dbeconf
RICS has had extensive behind-the-scenes involvement in Dame Judith Hackitt’s Independent Review of Building Regulations and Fire Safety, and is helping ensure the recommendations are implemented.

Gary Strong

As many of you know, Dame Judith Hackitt, former Chair of the Health and Safety Executive (HSE), was appointed to lead the Independent Review of the Building Regulations and Fire Safety in 2017, and published her interim report on 18 December last year.

RICS was heavily involved in the lead-up to this, engaging with Dame Judith’s team directly and collaborating with the Construction Industry Council to ensure that the report was based on sound factual evidence and that sector interests did not dominate. We wanted to be certain that an industry often described as fragmented came together.

In the early part of 2018, work groups were established by Dame Judith’s team to give their input into the final report, which was published on 17 May (bit.ly/HackittRev). RICS again deployed experts to these six working groups and was the only professional body to have representatives on most of them. Round-table meetings with the Secretary of State for Housing, Communities & Local Government, the Home Secretary and many professional bodies ushered in a new spirit for all involved in construction and fire safety to collaborate in the public interest.

Lost public confidence
The interim report had already been pretty damning of the industry — referring to ‘a race to the bottom’, a culture of doing things ‘as cheaply as possible’ and a ‘systemic regulatory failure’, as well as describing competence as ‘patchy’.

It was also clear to us in RICS that the public had lost confidence in the construction industry to provide fire-safe buildings, a fact that was picked up internationally. We began to hear anecdotes of investors being cautious about UK standards and, with Brexit looming, a reluctance to finance projects.

We have had a dedicated group working with Dame Judith’s team and the Ministry for Housing, Communities & Local Government (MHCLG) Building Safety Programme following the Grenfell fire on 14 June 2017. We are the only professional body to have sufficient resources to interface extensively and directly with these parties and enable many of the meetings of industry experts, and to ensure we work together in the public interest by showing leadership on this important topic.

Dame Judith’s final report made 53 principal recommendations, and more sub-recommendations, including:
- a stronger and tougher regulatory framework for higher-risk residential buildings (HRRBs), which are ten storeys or more in height
- a proposed new Joint Competent Authority (JCA) comprising fire and rescue authorities, LABC and the HSE to oversee better management of risks in these buildings through safety case reviews across their entire lifecycle
- introduction of a safety case approach and permitting regime that will only allow demonstrably safe buildings to be constructed and occupied
- clear responsibilities for ongoing, active life safety management during occupation
- mandatory incident reporting for HRRBs, with confidential reporting on structural safety to be used for all other buildings to cover every safety concern
It was clear to us in RICS that the public had lost confidence in the construction industry to provide fire-safe buildings

Next steps
Almost immediately after publication of the final report, the most important question was ‘What next?’ Many of the recommendations are being worked on behind the scenes, with RICS giving expert advice on these workstreams.

The change for approved inspectors was expected in some quarters, since Dame Judith says no organisation should be able to choose its own regulator. In future, the combination of the HSE, fire and rescue services and LABC in the form of the proposed JCA will oversee any plans for design and construction of HRRBs, as well as managing existing buildings (see the executive summary and Appendix E on competence in Dame Judith’s final report).

Golden thread
The golden thread of fire safety that Dame Judith recommends – deploying digital safety case files, with gateway approval points from inception to handover to management in use – is an important step in enabling transparency and accountability.

Under the recommendations, there will be new sanctions for non-compliance, bringing criminal courts into the process, and the concept of residents’ voice will be introduced, reflecting concerns that residents of Grenfell Tower knew what was happening with the management of their own building but were being ignored.

The role of building safety manager is being created for HRRBs, the description and competencies of which are being scoped out as we go to press.

An example of the many workstreams now under way is the MHCLG Industry Response Group (IRG), which has in turn set up a competence steering group, and I represent RICS on this steering group. It has been charged with reporting to the Secretary of State for Housing, Communities & Local Government quarterly since its inception in May on the competencies that all actors in the planning, design, construction, refurbishment and management of HRRBs will have to demonstrate, making its final recommendations by early 2019.

There is some controversy over the definition of HRRB – a new term that emerged in the Hackitt Review – as a higher-risk residential building more than ten storeys high. However, the rationale for the narrow scope is simply that the new regulatory system will apply to an estimated 2,000–3,000 residential buildings, which will in itself be a significant undertaking.

While we do need to broaden this definition to include hospitals, care homes and student accommodation of any height as well, to do so now would bring the construction industry to a standstill. So the proposed new model will be put in place, tested and refined, before – we hope – being broadened out to other higher-risk complex buildings in time.

The competence of all actors including planners, architects, designers, building control surveyors, building surveyors, project managers, firefighters, installers, site supervisors and building managers will be scrutinised in future as the common framework develops and the defined competencies are checked by an overarching body that will come into being.

RICS has an established pathway and competency framework for fire safety, and we are ensuring in the IRG competency workshops that what emerges is workable and achievable for our members. We have already taken steps this year to enhance the importance of ‘Fire safety’ as a competency. What we have been most concerned about, however, is whether anyone who is not a member of any professional body can demonstrate education, training and competence in life safety in the future.

As we all know and recognise, the fragmented, subcontracted nature of the construction industry does not lend itself easily to recognising and checking competencies by formal accreditation; but for all higher-risk buildings in future, such competency will have to be demonstrated by all in order to earn the right to work on these buildings, with a quest for construction quality and building management quality driving culture change.

Gary Strong FRICS is RICS global building standards director gstrong@RICS.org

Related competencies include:
Fire safety

• clearly established key roles and responsibilities, including tackling poor procurement practices
• a fundamental overhaul of guidance, making it simpler, clearer and easier to use, to support a systems approach to building safety with more rigorous requirements where needed
• digital records to be kept for new HRRBs from initial design intent through to construction, including any changes that occur throughout occupation
• a stronger enforcement and sanctioning package, with criminal sanctions for non-compliance and large fines
• more effective leadership and assessment of competence among key roles to ensure building safety
• stronger testing, labelling and traceability of construction products that are critical to building safety
• empowering residents and giving them a voice in the system

It was clear to us in RICS that the public had lost confidence in the construction industry to provide fire-safe buildings

Gary Strong FRICS is RICS global building standards director gstrong@rics.org

Related competencies include:
Fire safety
When you approach retirement as a surveyor, one of the first issues to consider is whether you will simply wind up your practice or whether you may be able to sell it. Many of the issues you need to address will apply in either case, but there are also differences between the two situations.

As several of these are quite complex, this series aims to give you a general indication of some of the more important ones you need to consider rather than giving detailed guidance on what to do. In this article, we look at some of those you should take into account if you decide to sell.

Of course, before agreeing to sell you will need to decide whether this is worth doing by balancing the benefits — usually the amount you receive for the sale — against any burdens — such as the impact any ongoing obligations may have on your ability to retire completely. Assuming you have done so, decided to sell and found a buyer, what issues will you then need to address?

As with any major transaction, the process will run much more smoothly if you spend time planning. We suggest that you start doing so at least six months before you intend to retire, irrespective of which route you take; there is a lot that you need to do to ensure you cover all the issues.

If you have decided to sell, you will then need to agree the terms. To protect your interests fully, you should retain solicitors to act for you in drafting the sale and purchase agreement, which should cover both what you are selling and any ongoing obligations and liabilities you have.

What exactly you sell will depend on how you are carrying on your practice and, in particular, whether you are doing so as a sole
Don’t commit yourself to expenditure elsewhere without being sure you know what you will be paid and when

trader, through a partnership, or through a company. If it’s either of the first two, then you will be selling the business and assets of the practice. However, if you are practising through a company then you may be selling either its business and assets or the company itself. Each route has advantages and disadvantages, and you may want to take advice on this to work out which is better for you.

For example, if you sell the shares in the company then all the assets and liabilities pass to the buyer with the sale, whereas if you are selling the business and assets but not the shares in the company the buyer can choose which parts of the business it acquires and leave behind any unwanted assets or liabilities. The tax treatment of the proceeds from the sale will be different in either case.

An asset sale may include a transfer to the buyer of various rights the business owns. Where you have agreed to transfer your rights to the buyer under your existing contracts, you will need to check what those contracts say about transfer and comply with any relevant requirements, for example giving notice to or obtaining consent from clients.

Where you have agreed to transfer any intellectual property rights belonging to the business, you will need to take all the steps necessary to do so effectively, including giving any notices and signing the required documents. On the other hand, if you are selling the company and the practice will continue, you will not need to transfer or assign the rights under existing contracts as these will automatically be part of the sale. However, you will need to check whether those contracts impose any restrictions or requirements where there is a change of ownership.

Finally, if the business has any staff, you will need to think about the steps needed to transfer their employment, and what ongoing rights — if any — they will have. In a sale of the business’s assets, employees may transfer automatically to the new owner under legislation, but both the seller and the buyer will need to consider whether the legislation applies and what they need to do to comply well in advance of the sale.

Obviously, how much the business is being sold for will be one of the main considerations. You may want to think about whether it is worth having the business valued before you agree a sale price. Once this is settled, bear in mind that this upfront price may not be what you end up being paid; the sale and purchase agreement may provide for the purchase price to be adjusted to reflect the amount actually payable for liabilities, which were uncertain or estimated at the time the price was agreed but were an important factor in agreeing the price.

Furthermore, even if there is no adjustment to the purchase price, the sale and purchase agreement may provide for part of the amount to be held back for a specified period following completion. Don’t commit yourself to expenditure elsewhere without being sure you know what you will be paid and when.

The effective date of sale will probably be that on which you receive the amount agreed as the sale price, or at least most of it. However, this may not mean that your involvement is at an end because the sale and purchase agreement is likely to impose ongoing obligations, including requiring you to provide assistance or information to the buyer as they continue to run the business.

You may have a number of such obligations and liabilities, including the following.

- You will usually have to give the buyer various warranties, that is, statements of fact about the business, statements on which they will rely. These are often wide-ranging, covering matters such as the financial position of the business and whether it is facing any actual or potential litigation. The buyer will usually have the right to claim compensation if the statements prove to be untrue.
- You may have to agree to indemnify the buyer against amounts it must pay if specified events occur, for example, any claims for unpaid tax relating to the period in which you owned the business.
- You will often remain liable for claims arising out of work carried out before the effective date of sale. The sale and purchase agreement will usually specify how such liabilities are to be covered and in particular who will insure against them, and this could mean you need to arrange run-off professional indemnity insurance.
- The buyer may require you to help deal with ongoing work, liaise with clients to ensure so far as possible that they remain clients, or sign documents necessary to effect the transfer of the business rights to them.

Although you hope everything will run smoothly once you have sold the business and that you will not need to think about it any further, there are a number of respects in which you may want assistance from the buyer after the sale has completed. These could include provision of documents and information that you or your insurers need in order to defend claims for which you remain liable under the sale and purchase agreement, or which you need for other purposes such as dealing with the tax authorities.

In the next article, we look at the procedures for winding up your practice, and the matters that need to be dealt with before the practice can be wound up.

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Related competencies include: Ethics, Rules of conduct and professionalism
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People-centred design

A pioneering project is collecting evidence on how biophilic office layouts can improve the health and well-being of workers

Ed Suttie

An ordinary suite of offices, occupying one floor of an equally ordinary office building just off the M25, is currently the subject of an extraordinary investigation — and plans for a unique refurbishment project.

These working offices at the Watford campus of Building Research Establishment (BRE) and their 40 occupants are the focus of a two-and-a-half-year study called the biophilic office (see Building Surveying Journal October/November 2018, p.8). The project will generate evidence about the impact of biophilic design on office workers’ needs and inherent connection to nature.

Building designers can often forget that buildings are for people. Many designs focus on factors such as energy use — an important issue, but one that accounts for just one per cent of typical office running costs, while staff costs total 90 per cent.

Layouts often pay little attention to the well-being of occupants, with the design ignoring potential impacts on mental, social and physical health, and therefore missing the chance to improve business outcomes.

Built in the 1980s, the study building in Watford is neither new nor beautiful, but it is typical of offices around the world, representing the reality of working conditions for many. This year, these offices will be refurbished using biophilic design principles. This is not just about including plants: it also involves consideration of materials and textures, colour variations, views, personalised workspaces, enhanced lighting and refuge spaces.

Throughout last year, office conditions were extensively monitored, and the occupants’ well-being investigated. This process will continue during refurbishment and for a year after it is completed, giving comparable before and after data.

Initial investigations of the quality of the indoor environment — examining factors such as temperature, carbon dioxide and levels of volatile organic compounds, relative humidity and acoustics — found none of these to be presenting problems, all being within prescribed levels, although lighting was thought poor in some areas.

But when asked about office conditions, most occupants rated the look and feel of their office as ‘poor’, and 67 per cent said they did not want to show anyone around. This feedback came from a questionnaire run quarterly during the project on how occupants feel about issues such as noise, glare, lighting and other comfort factors.

Aspects of staff well-being also being monitored include their fitness, ability to concentrate and stress levels. Wearable technology monitors their heart rate, activity levels and sleep patterns, while the project will additionally gather business and human resources data such as the number of days’ sick leave. Stress levels will be monitored by testing saliva samples.

The refurbishment

The current, cellular offices are occupied by teams who perform varying tasks and who have different requirements. The new layout will comprise three zones, each following a different biophilic design strategy. Oliver Heath Design, BRE’s partner, has consulted occupants and based on their responses

BRE’s biophilic office project is examining how nature-inspired design can foster well-being

has designed areas in such a way as to investigate a wide range of design features. The office design is now in its final stages, and Oliver Heath will work with partners to supply products, technologies and expertise to complete the refurbishment.

Evidence from monitoring the offices and occupants will be widely publicised with the help of project partners, including RICS. The aim is to ensure that health and well-being, through biophilic design, become part of every office refurbishment brief. This will encourage the design of future workplaces that enhance the mental, social and physical health and well-being of the occupants, and enable better business.

Ed Suttie is a director of research at BRE ed.suttie@bre.co.uk

Related competencies include:
Design and specification, Sustainability

Further information:
brgroup.com/biophilic

rics.org/journals 13
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Fairweather Insurance Services Limited

Contact John Upton jupton@fis.insure 01753 881560
Consistency for confidence

The International Fire Safety Standards will help put in place high-level principles to protect lives and buildings

Gary Strong

Despite rapid globalisation and increasing urbanisation, the industry lacks globally consistent, high-level principles for designing, constructing and managing buildings for fire safety. Differences in materials testing and certification, national building regulations or codes and guidance on managing buildings mean confusion, uncertainty and risk to the public.

International Fire Safety Standards (IFSS) will therefore bring greater consistency by setting improved levels of fire safety and professionalism globally, and ensure high demand for qualified professionals.

In the context of the IFSS Coalition’s work, an international standard is set and agreed at a global level and implemented locally. The coalition has established a committee of global experts to set standards that it rather any single organisation will own, and which will be published for free. Member bodies subscribe to the IFSS and commit to their use and implementation, to ensure they are employed in all countries where professionals in the coalition operate.

The coalition will classify and define standards at project, state, national, regional and international level, and professional institutions will incorporate these into their guidance or local standards. We also expect governments to support or adopt the principles, or both. All organisations in the coalition will participate in implementing the standards through their memberships.

Research has shown that inconsistent approaches to fire safety can lead to a loss of confidence in buildings and, in extreme cases, result in loss of life. IFSS will be used throughout the world to redress this. Our aim is that all higher-risk buildings to which occupiers and the public have access will eventually be compliant.

IFSS Coalition

The coalition comprises professional and not-for-profit organisations responsible for researching, developing, publicising and implementing IFSS globally in construction and real-estate, and was established after the Grenfell Tower fire tragedy to act in the public interest. It was launched at the UN in Geneva on 9 July last year. RICS was then invited to the UN’s Economic Commission for Europe meeting in October to present to all 58 countries in the region, which agreed to consider adopting the IFSS once they are published as UN standards.

Coalition members include:
- Association of Building Compliance, New Zealand
- Association of Consultant Approved Inspectors
- Association of European Experts in Building and Construction
- Association for Project Safety
- Australian Property Institute
- British Approvals for Fire Equipment
- Building Control Alliance
- Building Surveyors Special Interest Group, South Africa
- Chartered Association of Building Engineers
- Chartered Institute of Architectural Technologists
- Chartered Institute of Building Services Engineers
- Commonwealth Association of Surveying and Land Economy
- Confederation of Fire Protection Associations Asia
- Consortium of European Building Control bodies
- Construction Industry Research and Information Association
- Council on Tall Buildings and Urban Habitat
- Engineers Australia
- Fédération International de Géomètres, the International Federation of Surveyors
- Fire Industry Association
- Fire Protection Association
- Fire Protection Association Australia
- Hong Kong Institute of Surveyors
- Institute of Philippines Real Estate Appraisers
- Institute of Workplace and Facilities Management
- Institution of Fire Engineers
- International Association of Fire and Rescue Services
- International Code Council
- Local Authority Building Control
- National Fire Industry Association, Australia
- National Fire Protection Association
- National House Building Council
- New Zealand Institute of Building Surveyors
- Northern Ireland Federation of Housing Associations
- RICS
- Royal Institute of British Architects
- Singapore Institute of Building Ltd
- Sports Ground Safety Authority
- Underwriters Laboratories Inc
- the UN
- the World Bank.

More members are expected to join soon. Potential partners and supporters are asked to contact a coalition member, or email me.

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Related competencies include:
Fire safety
The discipline of building surveying is well established in the UK and in some world regions, but the ways in which it has evolved internationally have displayed some marked differences. Nevertheless, the direction of travel for the profession, globally speaking, shows some coherence, as is exemplified by a comparison between practice in the UK and in Malaysia.

Building surveying in the UK emerged from the wider discipline of general practice, or what we would now call real estate. It was formally recognised by RICS when it established the Building Surveying Division in 1973.

At that time the differentiating factor was that building surveyors were shifting towards the technical aspects of buildings, such as maintenance, pathology, alteration and refurbishment, rather than the economic and managerial aspects of generalist surveyors, such as valuation, appraisal and property development.

Shifting from desk to drawing board, the building surveying profession sometimes brushed against the role of the architect, and through the 1980s there was some uncertainty about the future direction of the profession relating to the lack of distinct demarcation between the two roles. Many were clear, however, that they viewed the expertise of the building surveyor to be in the domain of existing buildings. This encapsulated elements of building design, specification, procurement and capital projects, as well as focusing on maintenance, refurbishment and generic property advice to clients and some of the services that we would normally consider general practice. This sometimes resulted in the profession being considered a jack of all trades — probably with some justification.

Turn the clock forward and the current landscape of the profession is rather different. To an extent the role of building surveyor has become even more broadly based, with their skill set allowing them to participate in a variety of professional areas.

Development monitoring, strategic property advice, energy management and sustainability have all been established as key spaces in which the building surveyor can define and perform an important role.

Perhaps the biggest areas of development since those early days of the profession are the establishment of the building surveyor as the primary practitioner in the field of dilapidations and the move towards what might traditionally be called facilities management. These are reflected in current university curricula by the different focus of various BSc programmes in the overall building skills landscape.
The regulatory process will be essential to the recognition of building surveying as a practice in Malaysia

The main distinction between the jack of all trades of the 1980s and the current building surveying practitioner is that, rather than having individuals or firms attempt to provide all services and skills across the building surveying spectrum, we are seeing the development of defined specialisms in the profession.

Modern practitioners are moving towards being specialists in dilapidations, refurbishment or maintenance, and so on. But perhaps the biggest shift is the level at which the role of the building surveyor has been recognised.

The strategic nature of the role is now well accepted, and their advice can have considerable impact in the boardroom.

As we now face growing skills shortages, increasing technological development and the digitisation of industry and practice, the next phase of the development must be the establishment of ‘building surveyor 4.0’, in response to the Fourth Industrial Revolution that these trends represent.

Malaysia

The profession was established in Malaysia in the 1950s in the local government of Kuala Lumpur and Petaling Jaya. Since then, the role has been included in the building control division of the two local authorities, and building surveyors manage, monitor and approve plans for new buildings, renovations and modifications. The number of building surveying teams has also grown, with more than ten local authorities now involved in tasks such as development control and maintenance management.

Building surveying was also established at the national government’s Public Works Department in 2007. To date, more than 40 posts have been created throughout Malaysia, with their scope of work ranging from management and inspection of buildings to controlling the inventory of government assets.

Yet, due to the limited number of jobs in the public sector, only a few building surveying graduates can be recruited, so there are also those who work in different fields such as property management, building estimation, education and construction management.

In the private sector, several building surveying consultancies have been established and registered with the Royal Institution of Surveyors Malaysia (RISM) since 2010. Some RISM members also have RICS membership, and the number who have joined both organisations is growing.

As with some UK practices, private surveying firms in Malaysia focus mostly on building inspection and dilapidations. The Finance Ministry approved registration for building surveying services through RISM in 2012, which, in the Malaysian context, gives them equivalence to other professionals in the built environment.

Although building surveying is growing steadily, it has not yet received the same level of recognition as professions such as engineers, architects and quantity surveyors because there is no specific legislation to protect either the general public or the profession itself.

This regulatory process will be key to the recognition of the practice in Malaysia. The building surveying division of RISM has been canvassing the Ministry of Works, the Ministry of Local Government and the Ministry of Finance for such legislation for more than 30 years, but an act has not yet been finalised.

However, in order to ensure the sustainability of the profession in Malaysia, the government has introduced building surveying programmes at bachelor’s degree level through several public universities.

The first was at Universiti Teknologi MARA in 1993, followed by the University of Malaya in 1996. With growing demand for graduates of these programmes, Universiti Sains Malaysia also introduced a programme in 2009. To date, the number of graduates produced by these universities exceeds 2,500.

In 2012, the Ministry of Education and the Malaysian Qualifications Agency also issued a standard for building surveying programmes, to ensure a consistent curriculum at these universities.

In Malaysia as in the UK, formal qualification involves successful completion of an appropriate academic course, supplemented by work experience and assessment after graduation. Building surveying practitioners must be full members of the building surveying division of RISM and pass the professional competency assessment before they can offer services to the public.

However, due to the lack of legislative control, practitioners such as engineers, architects, quantity surveyors and non-certified building surveying graduates are also practising, although this is without RISM certification.

This is likely to be detrimental to the integrity of the profession by diluting the unique identity of the building surveyor. One of the ways to secure the future of the profession in Malaysia is to finalise the legislation that will formally validate building surveying at the national level and through this create a binding regulatory framework to govern the profession.

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Enacting the Hackitt Review

How should the profession respond to Dame Judith’s proposals on fire safety?

David McCullogh
Chair, RICS Fire Safety in Tall Buildings Working Group
After the tragic events at Grenfell Tower, there has been much discussion about how fire safety in buildings should be ensured. It became obvious very quickly that, although the property sector had for a long time performed well in reducing the number of deaths and injuries due to fire, something had gone seriously wrong in recent years.

Dame Judith Hackitt was asked to review the mechanisms and activities involved in the provision and management of fire safety in buildings. She found many shortcomings in the systems used — so many in fact that she declared those systems ‘not fit for purpose’ (bit.ly/HackittRev).

Her final report, *Building a Safer Future*, is an uncomfortable read for those involved in these systems. But as the title indicates, she wants the industry to look to what it can do to effect change. She cites the way it rose to a similar challenge by increasing safety levels on building sites, and stresses that once again a culture change is required.

RICS has played a major part in the early work on the Hackitt Review (see pp.8–9 of this issue). As chair of the RICS Fire Safety in Tall Buildings Working Group, I would like to thank the staff and members who are making valuable contributions to that work.

Some of the changes necessary to implement the review’s proposals will require statute and official guidance, but Dame Judith’s belief is that much can and should be done by property professions right now, without waiting for legislation. Are RICS members ready for this challenge?

I think we are. I met many at our first fire safety conference in September, and they all confirmed that they are willing to do everything they can to help make our systems better. Places at the conference sold out very shortly after bookings opened, and such a waiting list built up that a repeat event had to be arranged for November: this proves members’ willingness to meet the challenge, and Dame Judith, who delivered the keynote at the first conference, welcomed their show of commitment.

It is worth noting that although her report focusses on higher-risk residential buildings (HRRBs) in the first instance, all the recommendations can be applied to other building types, and indeed Dame Judith acknowledges that such applications should be considered, as many in the industry are urging.

The main challenge in responding to the review will be ensuring those who actually design, develop, build and manage buildings accept responsibility for compliance with the Building Regulations rather than assume that it lies with the enforcing authorities.

There is currently too much reliance on building control completion certificates as evidence of compliance during construction, and, once the building is occupied, on the fact the fire authority has not intervened. Developers and building management teams will thus have to take on the role of assuring and confirming compliance. Enforcement authorities will focus on examining these claims rather than advising and giving guidance on how to achieve compliance.

While such responsibilities are contained in the current Building Regulations, the perception that others are taking care of them has meant they have not been properly discharged, which is one of the shortcomings to which Dame Judith refers.

The Construction, Design and Management Regulations (CDM) approach is cited by Dame Judith as a possible model to be adopted for the Building Regulations as a means of contracting and procurement, with the defined roles of client, principal designer and principal contractor suggested as good ways to pinpoint responsibility.

This is the arena in which chartered surveyors need to play their part. We are often at the forefront of managing and advising on both construction projects and occupied premises, so our expertise will be important in assisting those duty-holders in fulfilling these responsibilities.

Dame Judith suggests a new regime, for which the Secretary of State for Housing, Communities and Local Government has expressed support, where a new Joint Competent Authority (JCA) will integrate enforcement throughout the construction and occupancy phases.

It is clear that enforcement and advice need to be separated in this new model to avoid clouding responsibility or impairing the JCA’s ability to take enforcement action. The authority is also likely to have powers of inspection, and will be charged with checking proposals for completeness before work starts; however, the level of the detail in this process is still to be determined.

Communication of information between those constructing buildings and those responsible for the occupation phase is also highlighted as being weak at present. Although Building Regulation 38 already requires communication of fire safety information this is widely regarded as a failure, in that even where information is communicated it is highly technical and unwieldy, jeopardising the understanding of what is required to maintain safety. Ensuring proper compliance in this area is thus a shining example of where we could make an immediate, telling improvement.

The issue of competence is another that features extensively in Dame Judith’s report. Although professional bodies generally have strong competency regimes for particular disciplines, they may well have to examine whether these can withstand public scrutiny insofar as they apply to working on HRRBs or any other building use groups.

Meanwhile, areas such as fire risk assessment have no nationally or universally understood competency regimes, leading to confusion for those responsible for commissioning in those marketplaces. Considerable work is thus being undertaken by an industry response group in respect of 11 areas of fire safety to create common competencies that can be communicated to the marketplace, and even mandated if necessary (bit.ly/IRGfiresafety). RICS is heavily involved in this work and will of course inform members of any requirements for updating our competencies.

In conclusion, we have been challenged to play our part in effecting change for the better. Chartered surveyors are ideally placed to take a lead in both construction and occupation of buildings, and have signalled our willingness to do so. Now is the time to live up to our charter commitment to society in ensuring that we do build a safer future.

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Related competencies include:
Fire safety, Legal/regulatory compliance
Special cases
for fire safety

It isn’t always possible to follow the guidelines on fire safety, and when it comes to unusual buildings bespoke fire engineering can be necessary

Andrew Nicholson

It is not realistic to expect standard fire safety guidance to give adequate coverage to all aspects of fire safety in every building type. Even very specific guidance such as the Technical Standards for Places of Entertainment 2015 (revised 2018; see bit.ly/ABTTstandards) is not wholly applicable to the fire strategy developed by the Fire Surgery for the untreated timber, candle-lit Sam Wanamaker Playhouse at Shakespeare’s Globe.

In such circumstances, fire engineering is used to demonstrate compliance with the Building Regulations for fire safety, without being restricted to generic guidance documents. It represents the application of knowledge in fire science, human behaviour, technology and the performance of materials and systems to develop alternative solutions. BS 7974 offers a recognised, structured approach to use fire safety principles as the basis for a unique strategy. Regular qualitative design reviews are then undertaken with key stakeholders on all aspects of this, providing a clear audit trail.

What makes a building unusual could be its special contents, such as Sir Isaac Newton’s manuscripts at Clare College, Cambridge; it can be the age, such as the scheduled ancient monuments at Winchester Cathedral; or it can relate to structures other than buildings, such as the restored Cutty Sark.

Typically, it is where there is potential for higher fire growth — such as more combustible materials or the presence of ignition sources — and the occupants are unfamiliar with the layout, for example in museums, galleries, castles, ships, domes, piers, stadia, theatres or nightclubs.

The first stage of an unusual building fire strategy is to determine clear project objectives. Compliance with legislation is a given, for the purposes of life safety. Most unusual buildings will have far wider requirements, though, extending to the implications of contents and property protection, brand or image, business continuity and even competitor advantages, as if a fire takes out a building or business, it may allow a local competitor to benefit.

Clearly identifying the objective in a fire engineering brief is important. For example, the Sam Wanamaker playhouse was designed as though it had been built in 1666, so balancing modern fire safety requirements with Restoration architecture became part of the objective.

The second stage of the strategy is to identify all key stakeholders. Obvious among these are approvers, insurers and designers, who are usually consulted at an early point. All stakeholders should be identified, however, including licensing, users, facilities managers and possible tenants. Understanding their requirements and getting early input can ensure a more robust fire strategy and a smoother route through approvals.

The third stage is to establish how the building is to be used. Event scenarios should consider all possible uses of the building, as clients always want flexibility. Thus, considering what creative functions the events team may lease the spaces for will inform a sustainable fire strategy.

At one popular public assembly building, for instance, almost any space is useable in some way, so keeping routes fire-sterile — that is, allowing no combustible materials — may not be possible. Knowing this early allows decisions to be made on the design of escape routes and on the choice of active and passive systems; respectively, automatic fire suppression and detection, and fire-resisting walls and floors, for instance.

The fourth stage is to undertake a fire hazard assessment. The risk of fire should be established in all relevant locations, and these scenarios should be agreed with the stakeholders so mitigating measures can be considered. The possibility of a single accidental fire in areas where there is fire loading and ignition sources should be considered, with suitable sensitivity studies to test the robustness of design principles.

For example, fire size is not usually a key factor in smoke modelling, and growth rate and soot yield are much more important than smoke layer height and visibility. This will then determine what active and passive measures are needed, such as higher extraction rates over a stage area or even the addition of a fire curtain. Different scenarios will have different effects on means of escape, firefighting and the structure, which should also be considered.

The fifth stage is to understand the operational fire safety management resource. The success of any fire strategy lies with the operational fire safety management, because fire safety is a balance between the technical systems in a building and the way it is used and managed. It is
not possible to rely solely on the former, so the management must play an active part. It is important that the number, roles, training and responsibilities of all staff in the building, including employees, contractors and tenants, are established. How much reliance, if any, may be placed on the management to undertake more bespoke measures can then be determined.

The key to the fire strategy’s success at the playhouse is managing the safe use of the candles, and a strategy was developed covering how these are stored, moved, installed, ignited, trimmed, extinguished, removed and discarded. The Globe employs a permanent technician to supervise this.

In the past, a fire engineer would only be appointed to develop a fire strategy that would achieve approvals, going just part of the way through the Royal Institute of British Architects’ design stages. We have always encouraged our clients to use our services through to stage 5, construction, to monitor the building fire strategy and ensure our intentions are realised. We always encourage contractors to update our fire strategies to as-built conditions, using trackers through the construction stage. We even perform the first fire risk assessment. This is called complete fire engineering.

One good example of an unusual project is the Victorian pleasure pier at Worthing, which projects about 300m into the English Channel and has several architecturally important buildings on it, including the grade II listed Southern Pavilion.

Piers have a long history of destructive fires, and Worthing’s is no exception: in 1933 it survived a significant blaze, which was recently brought sharply back into focus following a near-miss incident with smoking materials in 2015.

After this, pier owners Adur & Worthing Councils commissioned a full review of fire safety arrangements to improve both life safety and property protection. Adopting a qualitative design review approach akin to that in BS 7974 and fully engaging those who own, manage and work on the pier, this assessed passive and active fire protection measures along with operational procedures.

Unsurprisingly, very little UK fire safety guidance exists for pleasure piers specifically, and therefore references were drawn from international guidance, for example NFPA 307 (bit.ly/NFPA307), and from known work completed on other piers around the country.

By methodically and holistically considering each of the buildings on the pier and its substructure, a full fire strategy was developed, with this then forming the foundation for completing fire risk assessments. Key features included:

- an Available Safe Egress Time/Required Safe Egress Time (ASET/RSET) assessment, considering the evacuation of up to 1,000 people from the pier, with the worst case involving a fire where people would have to travel up to 350m back to the land to an ultimate place of safety
- a review of the pier-wide automatic fire detection and alarm systems, with opportunities identified to enhance coverage and use a voice alarm, including external sounders on the deck
- a review of an historic sprinkler system installed in the pavilion theatre, with opportunities to identified to modernise this and extend protection to other buildings, providing significant life safety and property protection benefits
- consideration of the cast-iron supporting structure of the pier, timber decking, and overall unique environment and usage of the pier
- review of firefighting access and the existing horizontal fire main infrastructure with the local fire and rescue service
- identifying opportunities to improve passive fire protection measures in the buildings on the pier, cognisant of sensitivities about their historic and heritage value
- examining the cause of the most recent fire and introducing additional control measures to reduce the risk of a repeat incident, such as designated smoking areas and an imperforate zone on top of the timber decking around the main buildings to prevent accumulation of debris
- improving cooperation and coordination between all relevant stakeholders in relation to fire safety.

Ultimately, the fire risk on this iconic seafront attraction will be significantly reduced as a result of the review.

Andrew Nicholson is founder and director of the Fire Surgery
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Related competencies include:
Fire safety
The persistence and performance of plastic insulation

Despite the difficulties of testing combustible building materials, their performance must be evaluated

Trevor Rushton

A few years ago, I inspected a 50,000m² food storage warehouse constructed of polystyrene composite panels more than 1m thick. My reservations about the purchase were dismissed by the investor with a curt ‘You worry about defects and let us worry about the investment.’

Suitably chastened I pondered the facts – a fire developing in such a building could soon become a fire of the building, a worry that was vexing underwriters in the late 1990s following a number of significant losses at the time. However, in those pre-recession, pre-Grenfell fire days, investors were happy to part with their cash. Would they do so with the same happy abandon now?

Polystyrene is one of a number of common rigid foam products in either expanded (EPS) or extruded form (XPS). It is a thermoplastic material, meaning that it can change shape when heated, and will melt readily in fire.

EPS and XPS are often modified with fire-retardant substances, but can still melt at temperatures as low as 100°C, decomposing at 300°C and igniting at 360°C. However, the foam can shrink rapidly from a flame due to melting, and for that reason may not ignite immediately. When it does, styrene and carbon dioxide are the main products of combustion, in a characteristic dense black smoke.

Not being suitable for composite panels other than in cold stores or internal divisions, EPS is often used as external wall insulation, protected by silicone or polymer-modified thin render systems. Unsurprisingly, many surveyors question the wisdom of using a combustible product in such a vulnerable application.

Other insulation types include polyurethane (PUR), polyisocyanurate (PIR) and phenol formaldehyde resin (PF). All of these are thermosetting materials, which means that they can be formed only once and not remoulded.

PUR and PIR are chemically similar, both being based on polyol and isocyanurate. But whereas pure PUR degrades at about 250°C, PIR is able to sustain temperatures up to 350°C before it starts to decompose; it also forms a more stable char that improves its fire resistance.

While early formulations of PF foam, which is also thermosetting, proved unreliable, this particular material has become almost universal in floor and wall insulation systems.
There has been a tendency to exploit vagaries in terminology as a way of demonstrating compliance

Prior to Grenfell, it was considered to perform very well in the event of a fire, and is certainly superior to PUR in that regard. PF foam exhibits favourable char-forming properties, but usually ignites at temperatures of 530–580°C.

There is now confusion as to the appropriate use of thermosetting and thermoplastic insulation; whether these will satisfy the Building Regulations’ fire requirements, or continue to satisfy them after the Hackitt Review’s revisions are implemented, has yet to be established, as has whether or not they can continue to be used in buildings below the current 18m storey height threshold.

While the performance of stonewool insulation products as an alternative is well understood, these materials are not always as thermally efficient as thermosets, particularly PF, and so construction has to make provision for thicker insulation if it is to accommodate it. This may not be a problem when it comes to new construction, but could well bring challenges for retrofit applications.

In the face of conflicting advice, it often helps to go back to basics. The former European Construction Products Directive – Safety in Case of Fire listed five key principles to bear in mind:

• the construction can be expected to carry its loads for a specific time period
• the generation and spread of fire and smoke in the construction works are limited
• the spread of fire to neighbouring construction works is limited
• occupants can escape or be rescued from the construction by other means
• the safety of any rescue teams is taken into consideration.

These criteria have found their way into the Building Regulations and publications such as BS 9991: 2015; but many of those documents lack clarity, with inconsistent terminology and much that is still left open to interpretation.

Evaluating the performance of various materials is fraught with difficulty, as it relies on the results of small-scale tests that do not necessarily reflect what happens in an actual fire.

The tests undertaken by the Building Research Establishment in the immediate aftermath of the Grenfell fire demonstrated that the combination of materials and the way they were used are the proper subjects of examination. Latterly, organisations such as the Association of British Insurers have also argued that standard test methods fall short because they do not replicate the amount of plastic in modern construction.

Phases by phase

There are three recognised phases to a fire: the growth, pre-ignition or smouldering phase; the fully developed phase; and finally the decay phase. Matters such as combustibility, flame spread smoke and toxic gas generation are relevant to the first of these.

The second phase starts at flashover, the point where all fuel sources in the vicinity suddenly become involved in the fire. This is associated with rapid heat generation and a big increase in heat radiation, and temperatures can exceed 1,000°C. During the final phase, the combustion temperature and release of gas gradually reduce as the available fuel source is exhausted.

Risks to life will be prevalent during the first phase, particularly given that many fatalities are a result of smoke inhalation. While alternative stonewool products are non-combustible and contribute low levels of smoke and toxic product, the same cannot be said of plastic materials.

PUR foams yield toxic smoke, particularly before the fire is fully developed. Isocyanates and carbon monoxide are common at this stage, and hydrogen cyanide can be released by both PUR and PIR. Once open flaming has occurred, the emissions are mainly carbon monoxide. Even small concentrations of these can be lethal, although the inhalation of hot gas can cause severe burns within seconds.

One might be sceptical about the use of plastic foams in any building, but of course the situation is seldom simple; as noted earlier, it is often the case that the overall performance of a system needs to be considered. However, there has been a tendency to exploit vagaries in terminology as a way of demonstrating compliance. For example what does ‘limited combustibility’ actually mean?

The essential point is that all plastic foams are combustible; by varying the constituent raw materials, it is possible to improve char rates or flammability, but standardised tests may not replicate what will happen in an actual fire.

To conclude, an investor today might not be quite so keen to purchase a warehouse built from 12,000m³ of combustible insulation. In my example, the fire load of the polystyrene equalled more or less the total fire load of the building’s contents.

However, that was a warehouse with a low level of human occupancy. Our obsession with plastics means that many thousands of homes have been built – and continue to be built – with products that seem to comply with current standards, but can and do cause harm to their occupants.

Trevor Rushton is a technical director at Watts

Related competencies include:

Fire safety, Risk management
In February 2018, the six-millionth guarantee for the installation of cavity wall insulation (CWI) was granted, as homeowners throughout England took advantage of the chance to reduce their energy bills (bit.ly/CIGAannualreps). CWI’s popularity has been driven by government energy-saving schemes offering free or low-cost insulation that will help reduce the cost of heating the home.

However, unintended side effects in the form of dampness have been widely reported, leading to allegations of poor-quality work and installation in inappropriate buildings. Given the prevalence of CWI in the UK’s housing stock, it is vital that residential surveyors understand the potential issues.

A new industry has emerged including CWI claim companies and CWI extraction contractors. Consumer rights groups have been set up to advise homeowners and raise awareness, with CWI being debated in the House of Commons and Welsh Assembly.

Regardless of varying opinions, CWI continues to play an important role as the government attempts to help low-income, vulnerable and fuel-poor households. All eyes are now on the Office of Gas and Electricity Markets (Ofgem) and the energy suppliers given that the next phase of energy-efficiency policies, the Energy Company Obligation (ECO 3), runs from October 2018 to March 2022.

**What is going wrong?**

There are several types of CWI, such as urea formaldehyde foam insulation, mineral wool insulation — comprising glass fibres and rock wool — polyurethane foam, and bonded polystyrene beads. Penetrating dampness, condensation, mould growth, rising damp and other issues are a risk in all cases.

All houses are built imperfectly and from my experience, all retrospective CWI has at least some deficiency in its installation. Many houses can function without any significant adverse effects, but issues can easily occur where CWI has failed. This is not necessarily a failure of the product itself but of the system, through a combination of factors. These can be separated into the two general categories of property suitability and substandard work, as follows.

Essential with any retrofit project, property suitability for CWI is decided via a pre-installation survey, but until recently was left to the companies doing the work, with little effective third-party monitoring. Unsuitability can be a result of:
- property located in a ‘severe’ or ‘very severe’ wind-driven rain exposure zone, as defined in Approved Document C (bit.ly/AppDocC)
- cavity width too narrow or uneven
- deterioration of external fabric
- external ground levels bridging the damp-proof course (DPC)
- lack of effective DPC
- rubble or debris in the cavity
- mortar ‘snots’ — that is, excessive mortar protruding into the cavity
- high-ground water levels
- existing, partial-fill insulation that is incompatible with the retrofit.

In turn, work is usually substandard where pre-installation surveys have been ignored or the following are evident:
- lack of pre-installation remedial works
- incorrect drill pattern
- incorrect density of insulation
inadequate cavity brush.

Other situations where the CWI can be affected by external conditions after installation include: flooding; escape of water; fire damage, installation of windows, doors, gas flues or air vents; and new external paving at a high level. Condensation or mould may occur where occupants do not allow for sufficient ventilation in their property after CWI installation; while living habits may not change significantly, the way moisture transfers through external walls does.

Careful consideration must be given to whether CWI has been affected by external events following its installation or has not been properly maintained. The presence of defects and how they may have been affected or caused by the CWI are fundamental questions.

It is a fact that CWI can cause dampness. The risk of water ingress is highlighted both by Approved Document C and BRE Good Building Guide 44, part 2 (bit.ly/BREGBC44), which states: ‘There can be an increased risk of rain penetration if a cavity is fully filled with insulation, i.e. moisture [can] transfer from the outer to the inner leaves resulting in areas of dampness on internal finishes.’

The BBA and NHBC looked at increasing the size of cavity walls to see whether this might affect resistance to rain penetration. Their report, Full Fill Cavity Wall Insulation in Areas of Very Severe Exposure to Wind-driven Rain (bit.ly/FullfillCWI) described issues with penetrating damp ingress where blown-in mineral wool insulation was used in a 100mm-wide cavity constructed to 1990s standards. The report stresses that non-standard test conditions were used, and the results ‘have no bearing on the continuing certification or suitability of existing CWI systems’.

**Approach to surveying**

RICS Home Surveys are generally based on non-intrusive inspections, during which the following should be checked where possible:

- energy performance certificate
- CWI guarantee certificate
- filled holes
- air bricks or vents
- mechanical ventilation
- exposure to wind-driven rain, using BS 8104: 1992 (bit.ly/BS81041992)
- insulation type
- condition of brickwork or stonework, including pointing
- condition of external render, including any cladding
- external fabric decoration, such as painted brickwork or waterproof coatings
- efficacy of rainwater goods
- seals around openings
- height of ground levels, including provision of surface water drainage
- condition of DPC
- weep-holes, as built or retrofitted.

Establishing the type of insulation installed can be difficult, but checks in roof voids, meter cupboards and vents can often reveal traces of the material used. Where specific defect surveys are commissioned, an intrusive investigation of cavity walls can be carried out. The key tool is a borescope or similar device: used in a targeted manner, this will allow a detailed analysis of the cavity wall and insulation. Potential weak spots in the cavity include wall junctions – internal and external corners – window and door openings, low-level wall areas – above and below the DPC – and other wall penetrations such as gas flues. Where assistance from a contractor is available, bricks can be carefully removed for a more detailed inspection. This is particularly helpful where there is suspected wall-tie corrosion or where CWI has been incorrectly installed in a non-traditional construction type.

For RICS Building Surveys, an argument can sometimes be made that a few minutes’ drilling and inspecting a cavity wall using a borescope – with the owner’s permission – is justifiable. Compared to time spent struggling with inspection chamber covers or even fixed loft hatches, the performance of an external wall surely deserves the same attention as the below-ground drainage system and roof structure.

**Extraction as a last resort**

Where CWI has been removed, especially where new insulation has not been installed to replace it, residential surveyors should be wary. Without relevant paperwork or a cooperative vendor, an extracted property may not be readily identifiable. Some signs may be present, such as evidence of replaced brickwork and filled drill holes, although a property will often have been repointed at the same time. Depending on the contractor’s skill, damaged brickwork, DPCs, mortar-stained brickwork and even insulation and debris left in the cavity are quite common.

Some cavity clearance certification schemes are gaining popularity, such as those by Stroma Certification and the BBA. Cavity Extraction operates under the Stroma scheme, and managing director Damian Mercer explains: ‘CWI extraction is a highly labour-intensive process relying on a methodical approach to ensure a property is completely cleared of insulation and debris. It is up to extraction companies to work with accreditation bodies to increase standards. Both off-the-shelf and bespoke clearance equipment are vital to achieve a successful extraction.’

There is currently no mandatory regulation in the cavity clearance sector and it is not covered by the Building Regulations. However, RICS surveyors are already working in this area carrying out independent checks and audits and supervising extractions.

Ultimately, satisfactorily performing CWI can only be established with targeted intrusive investigations and a full survey of the property. Whether CWI is a contributing factor or the overriding cause of dampness, RICS surveyors are arguably best placed to ensure that an independent comprehensive inspection is carried out. For all residential surveys, CWI performance should be at the forefront of a surveyor’s mind.

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**Related competencies include:**

Building pathology, Construction technology and environmental services

**Further information:**
The Cumbria Flood Resilience Showcase Project aimed to make two properties into showcases for innovative resilience measures, and demonstrate to householders and business owners what can be done to reduce the devastation that flooding can cause.

The project was funded by private business together with the Environment Agency, and jointly managed by the agency, environmental services firm Adler and Allan, Business in the Community, the Building Research Establishment (BRE), Carlisle City Council and the Prince’s Trust. I spearheaded the work. The project was also task group 1 of the Department for Environment, Food & Rural Affairs (DEFRA)’s Roundtable Property Resilience Action Plan, and more showcases are in the pipeline.

The issue of flooding is one that’s close to the hearts of many in the Cumbrian region, and indeed to mine; I have had the appalling experience of being flooded on several occasions. Our focus was to show how people could get back into their homes or businesses more quickly after a flood. We tried to keep the water out of the properties but also acknowledged that, after a major flood, it could still get in, so we used materials that would recover more quickly.

When I began the project in July 2017, I first had to find some properties that had still not been repaired, some 19 months after the most recent flood event, and though it took me a while I got there. The first thing I did was to ask specialist surveyors to view these properties, conduct surveys and advise me on the way forward. They kindly gave their time and expertise for free, and I would like to express my gratitude to RAB Consultants, Trident, Cunningham Lindsey and BRE for supporting the project. Using their reports, I was able to identify what materials and products were needed to make the properties flood-resilient, and then set about my big ask: my remit for the project was to get all the required materials and services for free.

Our first property, Botcherby Community Centre in Carlisle, was badly flooded during Storm Desmond in December 2015. When I first visited it in July 2017, it had been more or less put back to normal except for...
the kitchen, which was still a shell. We decided to use property flood resilience products on all the doors, airbricks and some low windows to the front. We carried out some maintenance to the kitchen’s external brickwork as well.

I was extremely grateful to Steelplan Kitchens for agreeing to donate a complete kitchen to the project. A team of specialist builders, RTC from Blackpool, came to make the kitchen structure resilient before installation of the kitchen, and the company owner Andrew Bradshaw allowed me to video the process for our bespoke YouTube channel, telling me what he was doing and why. I had decided that, instead of producing a lengthy written report we would record the whole process, enabling homeowners and professionals alike to access how-to videos (bit.ly/CFRSPrvids). I also produced an e-magazine, which detailed the journey we took on both properties (bit.ly/CFRSPmag).

RTC used materials supplied free of charge by Safeguard Europe, which also allowed me to interview one of its scientists. During that week, the community centre was buzzing with activity, as all the companies kindly donating products arrived together — Flood Technologies, Lakeside Flood Solutions, the Flood Company, Flood Smart Systems and JT Atkins. Again, we recorded the process and I interviewed all of them.

The community centre now has two sets of barriers to the back and boiler-room doors; flood-resistant windows to the front; and a normal-looking flood door and side panel to the side of the property.

The original airbricks have been replaced with a self-closing variety as well. RTC also applied Stormdry Masonry Protection Cream to the external brickwork of the kitchen area to waterproof it, helping provide some additional resistance to future flooding and protect the brickwork itself. The barrier to the front entrance will be fitted once an extension has been completed. We will also be helping the centre write an emergency plan to put into action if it receives a flood warning.

Residential resilience

Before any installations began at the second property, the residential premises Edenside Barn, we worked with Aquobex and Oxford Brookes University to test the materials that I’d sourced for free in a small testing tank in Harwell. After a couple of tests, we decided to use polyurea donated by Adler and Allan, spraying it on internal walls to prevent water ingress.

Before application, we were visited by some DEFRA officials. As a demonstration some polyurea was sprayed on a purpose-built wall, and we then asked one of our visitors to take a lump hammer to the structure. Surprisingly, this caused no damage to the treated side, but the other side cracked – impressive stuff.

We used epoxy resin on the floor, kindly donated by Delta Membranes, and this went up to overlap the polyurea. A gypliner donated by British Gypsum was subsequently glued to the walls to support the closed-cell insulation from Kingspan, followed finally by Dragonboard.

All these materials tested well in the tank. We replaced the wooden room dividers with gypframe, again supplied by British Gypsum, and the same materials were applied to that. We had a flood-resilient kitchen shipped from Finland by a company called Puustelli – and once it was installed, I suffered from significant kitchen envy.

We finished the floors with porcelain tiles sold at cost by CTD Tiles, which also provided the waterproof adhesive free of charge. The property already had some flood barriers and, as these offered a higher level of protection — up to 0.9m — than the newer flood doors — 0.6m — Aquobex has refurbished them. The company also supplied a barrier to cover the heating matrix under the stairs.

Outside, quite a lot of the mortar had degraded, so this was made good using Delta Costa repair mortar supplied by Delta Membranes, and the walls were sprayed with nanoShell, which is a water-resistant, transparent breathable spray, also donated by Aquobex.

A more detailed description of the work can be found in the electronic magazine.

The showcase was a huge learning curve for all involved. It was only made possible by donations from our major funders, with sponsorship from Axa, Flood Re and Barclays. It was my hope that once finished, Edenside Barn wouldn’t appear dissimilar to a non-resilient home, showing that flood-resilient repair needn’t look different or ugly. I wasn’t disappointed.

Mary Dhonau HonRICS is the founder of MDA Flood Resilience Consultants marydhonau.co.uk @FloodMary

Related competencies include: Risk management
A report by the Adaptation Sub-Committee of the UK Committee on Climate Change in 2017 committed the government to reducing flooding risk for 300,000 homes by 2021 (bit.ly/UKCCCrep17). With increasing risk of flooding and increased pressure to build on high-risk land, improved decision-making can help to reduce the potential time and cost of designing, altering and reinstating buildings after a flood.

The UK government’s policy on flood risk management attempts to address all scales by minimising the hazard level and reducing the potential for damage. This involves an holistic approach, including management of hazards on the scale of river catchments, as well as promotion and subsidising of property-level flood resilience measures such as resistance — keeping water out of a building — and recoverability — specification of materials that are less likely to be damaged or less costly to replace or repair if they are damaged.

This latter, property-level approach is, however, based on a dearth of research and empirical evidence on the benefits of resilience measures, leading insurance companies to maintain their policy of returning properties to their pre-flood condition.

**Flood damage risk assessment**

Flood damage risk assessment (FDRA) is an important aspect of the risk management process because it enables the potential impact of floods to be identified and informs the selection of optimal risk reduction measures.

Current FDRA methodologies are not effective in accurately predicting the likely damage caused by a flood at an individual building level due to the complexity and variety of building systems, and they are often unsuitable for use by stakeholders such as surveyors, architects and homeowners. So when it comes to individual properties, a risk assessment methodology that takes account of both the hazard — the flood — and the vulnerabilities of the specific buildings at risk is a highly valuable one.

By adopting existing methodologies in related building performance assessment, research has focused on developing an approach that would benefit the wider flood protection sector and improve the remediation process for insurance companies, architects and homeowners.

To consider the building as a whole and the performance of individual elements, and even individual materials, we need to understand the complex nature of the junctions between floors and walls, corners, door openings, different layers and materials, and how each of these function under different external and internal conditions. Testing this way enables assessment of construction details under flood conditions, to give an holistic view of how individual materials and components behave, as well as an understanding of the complex ways that multiple elements behave in conjunction.

Computers can simulate and model details, components and systems by using material-level data from lab tests to assess their flood performance, and any potential damage that may result. Simulations offer the ability to assess a range of scenarios and details that would not be possible to test in a lab.

Lab tests of details are used to understand, in a controlled but practical way, the performance of the detail as a whole, and how the individual elements and materials in it perform under flooding conditions. The data collected during such tests is then compared
with results from computer simulations to test the validity of the findings and calibrate the simulations process.

**Simulations**

Computer modelling and simulation software can help overcome the restrictive nature of lab tests. Extensive literature review and expert consultation, carried out as part of an Innovate UK Knowledge Transfer Partnership project with Oxford Brookes University, identified software that calculates moisture transport based on the driving potentials of water pressure or moisture. The former method can account for the hydrostatic pressure from a head of floodwater — for example, the pressure that will force water into the pores of the building material — while the ability to model moisture transport can tell us how the building and materials dry following a flood.

To verify and refine the outputs of computer simulations and produce useable and insightful data and findings, tests were developed that replicated the details tested in the simulations. Walls were constructed in a tank in the laboratory, and a flood with the same parameters as the simulations was recreated, while critical factors such as moisture levels and drying times were monitored.

Simulation results were markedly similar to the lab tests in terms of the walls’ rate of wetting and drying. Due to the complexities in the modelling and simulations of a cavity wall, which used a variety of materials, complex interfaces between layers and variances in climate, these similarities are notable, and provide confidence that they reflect those that would have been achieved in full-scale tests.

Simulations were used to examine the impact of depth on the moisture absorption and drying processes of wall type A, a brick and block cavity wall with wool-fibre insulation. After 18 days of simulated drying, the wall showed 10kg/m³ of moisture mass density for the 900mm flood, while only 6kg/m³ for the 600mm flood, as illustrated in Figure 1. Clearly the depth of the water affects both the wetting and drying processes.

Similar comparisons were carried out for a one-day and a three-day flood. As can be seen in Figure 2 a one-day flood, as indicated by the lower line, resulted in an overhygroscopic water mass density of 11kg/m³, while the three-day flood resulted in 32.5kg/m³, roughly three times as much, again indicating a significant impact on the absorption rates.

Simulations offer a realistic evidence base to specify measures for improving flood resilience. Similar lab tests would take many weeks if not months and would reach similar results, while simulations can be run over a very short period with varying flood parameters and scenarios. This reduces the time and cost of testing, and offers an exciting development in flood risk damage assessment methodologies. It is hoped that further development will see this simulation process used as means of establishing testing standards in flood protection and remediation.

*Martin Dolan is a research and innovation manager at Aquobex*  
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**Related competencies include:** Risk management
Stack it up

Chimneys in older buildings need careful attention and upkeep to maintain building fabric and avoid the risk of fire, as the first of two articles on the subject details.

Roger Curtis
Chimneys were rare in the early Middle Ages, but by 1400 most homes in Europe had a hearth and chimney as we would recognise them today

Chimneys and their component parts – hearths, flues and finishing details – are an important part of traditional buildings. Ending as the highest, most exposed part of buildings, they require regular maintenance, and occasionally more extensive repair.

Chimneys’ exposure to the stresses of wind, rain and temperature variation brought by the changing climate along with poor maintenance can often cause traditional building fabric to become damp. Many inspections incorrectly blame roofing material and the masonry of walls for dampness when it is in fact caused by water ingress to gable ends and wall heads as a result of chimneys kept in poor condition.

The word ‘chimney’ means the building elements making up a system for combustion of fuel for heat and cooking in a home, forge or other place, while ensuring the smoke is taken out of the building. The use of fire in homes for cooking and heating dates from prehistoric times and is innately associated with warmth and comfort. Such fires, or hearths, were originally set in the middle of a room, with smoke rising and escaping via an opening or vent in the roof.

It was not until the early medieval period that developments in masonry construction allowed hearths to be positioned against a wall, with a hood extending out to catch the smoke and route it upwards through the wall, forming a flue. This was a significant development in building technology and allowed for cleaner interiors and a reduction in medical conditions resulting from smoky air exchange in the room, and thus helps manage internal moisture and air quality.

Chimneys were rare in the early Middle Ages, but by 1400 most homes in Europe had a hearth and chimney as we would recognise them today. It is likely that vernacular building techniques copied the early masonry hoods, and successfully used lower-cost materials to form hearths and flues. In some parts of Britain and Europe these traditions continued; in Scotland the ‘hanging lum’, formed of timber yet redolent of its medieval ancestor, was in use until the early 20th century. A good example is the timber hood and chimney in the parlour of a croft house near Braemar in the north of Scotland (see photo 1, overleaf).

Gradually, the burning area was set further back into the wall, giving rise to the familiar combination of hearth, flue and chimney stack. In Scotland, where the stone walls are often thicker at around 600mm, the flue could be located within the wall; in other parts of Britain, where walls are thinner, a wider area, either internally or externally, is required to accommodate it.

The chimney stack took the smoke clear of roof coverings, especially flammable thatch. Early flues were thin and rectangular, being designed for larger wood-burning hearths, but by the 18th century they had become mainly square as the gable ends of buildings had to fit multiple flues, which were divided by thin slabs of stone called feathers. These are vulnerable to decay and are a common defect and weakness in older properties, often eroded by the products of combustion and the heat of the flue gases.

Most flues were given a layer of plaster externally, is required to accommodate it. Not only do hearths and flues catch the rising smoke, increasing personal comfort, but the upwards motion of hot air due to the draw of the flue results in more efficient combustion in the hearth, increasing the fire’s temperature. This draw also enables air exchange in the room, and thus helps manage internal moisture and air quality.

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Building conservation  Chimneys

Over many years, fires will lead to the formation of chemical deposits called salts, which accelerate the decay of stone or brick externally as an inverted plume of staining on the masonry, and internally the plaster can discolour, often showing around cracks.

In serious cases, the tar and combustion deposits in the chimney are mobilised by water and seep through the plaster lower down, discolouring it and blistering the paint (see photo 4, opposite). Such deposits, usually termed sulphates, can lead to the formation of sulphuric acid, which damages cement-based mortars due to expansion of the binder and aluminates in the ordinary Portland cement. Some forms of early engineering brick are also damaged this way, although lime mortars are less affected given their lower aluminium content.

Over many years, fires will lead to the formation of chemical deposits called salts, which accelerate the decay of stone or brick. Such deposits will always be present, but the effects are minimised if the chimney is dry and well ventilated. Some materials are also affected by sulphates in the flue deposits; many types of brick can as a result progressively break up. The parging layer is often the first to break down, and is revealed by pieces of plaster landing in the hearth. While this is not serious, it shows the internal lining of the flue may need attention. The feathers, which were used before ceramic liners, gradually break down and smoke can then pass between flues.

Depending on the local stone, the rubble of the lining can also break down; this is common on gable ends where the masonry is thin and there is damage from both inside and outside. The mortar holding the chimney cans breaks up and they become loose, known as flaunching, leaving them vulnerable to movement in high winds. The masonry pointing of the stack may also become eroded and decayed, letting in water and allowing plant growth. Wet or damp masonry is also vulnerable to frost damage.

Photo 5, opposite, shows a chimney in poor condition, with all the above defects in evidence. It is likely that internal masonry such as bridges and linings is also damaged and clear that impermeable masonry paint has been used in an attempt to keep water out. As the masonry defects have not been addressed, this inappropriate remedial treatment is simply retaining water, accelerating damage, and paint peels away. A well-maintained chimney, inspected and

1. A ‘hanging lum’ dating from the early 19th century at a croft house in the north of Scotland

2. A Victorian cast-iron grate for burning coal

3. A traditional stack in Edinburgh showing chimney cans and the ashlar masonry work

IMAGES © HISTORIC ENVIRONMENT SCOTLAND
repaired at regular intervals, will not need such a damaging measure.

Plant growth, encouraged by such water ingress will gradually force masonry joints apart, leading to the movement of masonry and eventually reducing structural stability. Wet masonry is also prone to frost damage, as the expansion of liquid as it freezes will break mortar and stone and open up joints.

Weathering details
Even a well-maintained chimney will be subject to accelerated deterioration if it is not designed to suit its immediate environment. In the often-damp climate of the UK, this means the chimney cope should be designed and detailed to shed water clear of the masonry below. If this is not done, then water continually runs down the chimney face, eventually leading to the failure of pointing, stone or other materials. Some architectural styles give a good cope or cornice, others less so. The illustration above shows a traditional chimney that is well designed and detailed, but with damage to the cornice, missing pointing and plant growth that will all lead to dampness and stone decay.

Sweeping
Maintenance of chimneys in use should also include regular sweeping. The frequency of this will depend on how much the hearth is used, what fuel is burnt and how hot the fire is; a fire with damp wood, for instance, will result in incomplete combustion and deposits of soot and sometimes tar on the inside of the chimney.

Flues should be cleaned by a registered sweep, and a certificate is normally issued to the occupant recording the work. Partial or incomplete combustion, for example by continuing to burn damp wood, and failing to sweep the chimney, are likely to result in a chimney fire, where the tar and soot burns in the flue. Despite being contained there, the fire temperature can reach dangerous levels, cracking ceramic liners and adjacent masonry. In this instance, it is essential for fire services to attend the scene promptly.

The second article in this series will focus on repairing and rebuilding chimneys.

Roger Curtis is technical research manager at Historic Environment Scotland
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Even a well-maintained chimney will be subject to accelerated deterioration if it is not designed to suit its immediate environment.
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Floor joists are sized to suit the spans in a building, so as to ensure they are sufficient to cover the relevant distance and support the required loads. It is therefore paramount that the integrity of the joist is maintained. This may seem obvious, but often the installation of a joist or service penetrations compromise its strength.

Typical examples include excessive notching or drilling of the joist, which reduces its integrity and may even require its replacement. It is therefore an important skill for a building control surveyor to be able to identify when a joist has been disproportionally modified.

A standard timber joist section is typically considered to be in flexion through the top chord and in tension through the bottom chord, and it therefore has a neutral axis running through its centre. Thus, drilling small holes through the joist to accommodate water pipes, for example, is typically acceptable, on the proviso that these holes are made through the neutral axis and will not compromise the strength of the joist.

Modifications to timber floor joists must be made carefully to ensure they maintain their load-bearing strength. This, the second in our series on common site issues, looks at how to identify problematic drilling and notching, and how to remedy poor-quality work.
Another form of modification is notching, a standard term used for effectively cutting a section from the top or bottom of the joist; sometimes for ease of fitting into a joist hanger, sometimes for passing services through it.

Again, this can be detrimental to the joist’s strength, for example if it is done too close to the bearing or too deep. Where a joist is notched excessively and too close to the point of bearing, this weakens it and can cause it to fail at that junction.

There are accepted tolerances for notching and drilling floor joists; where these are exceeded, either the joist should be replaced, or it may be possible for a structural engineer to prove its continuing functionality with calculations.

Generally, notching should not exceed 0.125 of the joist depth and a maximum width of 35mm. The notch should only be made within a permitted horizontal zone – between 0.07 and 0.25 of the joist span from either side – so as not to be too close to the bearing point or the centre. Notches should only be permitted along the top or bottom of the joist, and not both.

Holes should only be drilled through the central, neutral axis of the joist, the maximum diameter being 0.25 of joist depth. Again, the hole should only be drilled within an acceptable horizontal zone, between 0.25 and 0.4 of the joist span, so as not to compromise its bearing or centre points. If multiple holes are drilled, they should be spaced apart by at least three times the diameter of the largest hole.
Joist strength can typically be compromised where services haven’t been coordinated with the structural engineer’s plans.

- Building pathology: having an understanding of defects analysis and being able to explain building fabric failure.
- Construction technology and environmental services: understanding the design and construction process and knowledge of construction solutions to solve problems.
- Works progress and quality management: knowledge of construction technology techniques and their relevance on site, good-quality work being vital in ensuring long-term functionality.

While carrying out the inspection, the surveyor should be able to identify the types of defect discussed above, and provide appropriate measurements and photographs in site reports. The detail should be reviewed appropriately using relevant guidance such as BS 8103–3: 2009 to calculate whether the notch, drilling or relevant detail is acceptable.

From there, the building control surveyor would be able to take appropriate action, such as advising on remedial measures or the need for further review to be carried out by a structural engineer. Where a candidate is identifying and resolving such site defects it should be possible to record their experience under at least Level 2 generally, and potentially Level 3, for the Building control inspections competency.

Amy Allen is a director at Assent Building Control amy@assentbc.co.uk

Related competencies include: Building pathology, Construction technology and environmental services, Inspection.
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Satellite monitoring can identify subsidence and structural defects that are otherwise undetectable, as AS Datel’s recently launched Sille service demonstrates

Andreas Kiik

Geographical information systems developer AS Datel launched Sille, an early warning and structural health monitoring system in April last year. The e-service is able to detect ground and infrastructure shifts and subsidence of up to 1mm per week, thanks to data collected from European Space Agency (ESA) satellites.

The software allows each user to constantly monitor the physical condition of major public and private infrastructure such as bridges, buildings, railways, highways, pipelines, harbours, mines and, potentially, private homes.

This is the first service that allows non-expert homebuyers to access radar remote sensing technology on an affordable subscription. It can be used, for example to detect deformation hazards and carry out structural subsidence analysis and surveys for buildings on unstable ground, such as above clay or underground mines.

All of this is carried out by automatic algorithms, and the results are regularly verified by experts and by comparison with on-site measurements. The system was launched globally after more than 22,000 working hours of research and development and support from the Estonian Road Administration, which offers engineering knowledge and data.

Data is collected from two ESA Sentinel satellites, which use interferometric synthetic aperture radar (InSAR) to detect surface movements with an accuracy of a few millimetres per year. They can thus provide an accurate tool for monitoring land subsidence, structural damage and underground construction, to improve safety and reduce economic loss.

InSAR is an active remote-sensing technology that emits microwave impulses towards the ground, with the satellite sensor registering all those that are backscattered or return. This sensor saves two main data components — amplitude and phase. The former is correlated with the energy of the backscattered impulse and used to find targets that are strong reflectors, that is, those that return most of the impulse to the sensor.

Rocks, artificial objects, metal and other hard surfaces reflect well, for example, but soft surfaces such as vegetation or water reflect poorly. The other component, phase, is vital for estimating deformation from space. The wavelength emitted from the radar is known and can therefore be compared with the wavelength reflected back by the targets on Earth. When we measure the difference in distance through time, we can detect the movement of a target on Earth owing to deformation, for instance. The change between satellite and target is expressed as line of sight distance.

The two Sentinel satellites work in tandem to collect new data for each ground location globally at an interval of six to 12 days, and results are constantly correlated with artificial reflectors on a test polygon to make sure that all calculations are correct.

To collect and calculate deformation data, the satellite emits radar wave at time 1. This is targeted at a structure on Earth, and the phase is measured. During the next satellite pass, the process is repeated and a new phase is measured. Then the difference between the two phases is calculated and the difference is found, to enable identification of any deformation.

Sille can be used to monitor objects that reflect most of the emitted impulse to the sensor, and requires the emitted radar waves to have good backscattering properties. Suitable objects include buildings, railways, bridges, bare land, rocks, docks, piers, dams and other artificial structures.
There are several benefits in using the technology, because it enables both historical analysis and automatic large area analysis. Data is gathered continuously so we can detect any deformation since 2014. With all other technologies, the measuring timeline starts when the problem is discovered; however, InSAR shows when and why the problem started to evolve. The satellite data also allows large areas, such as an entire city or country, to be monitored with only one scan.

The technology can detect deformation for most buildings in any city on a weekly basis. Other benefits include:

- systematic monitoring and global coverage (see Figure 1)
- locating safety hazards
- monitoring and evaluating safety risks that emerge slowly and cannot be seen with visual inspection
- indicating places where additional inspection should be carried out
- seeing major changes in long-term trends
- after a failure or structural problem, data can show the reasons it occurred and prove that prevention was impossible
- improving efficiency
- positive public relations
- the fact it works in all weather conditions
- no need to use other devices or sensors, such as tripods

- no need to stop traffic or visit the location as all monitoring is done remotely
- applicable to all construction stages; that is, planning, construction and operation.

Research conducted in 2018 found that using regular satellite deformation monitoring preventatively, to identify problems in bridge structures at an early stage, cost a similar amount to the common approach of making repairs once the problem has become extensive.

However, it also found clear benefits from other aspects of remote sensing, such as its reliability, availability and safety. Thus the investment for constant monitoring and repairs can be paid off quickly.

The Guidelines for Load and Resistance Assessment of Existing European Railway Bridges (bit.ly/sustbridges) describes a standard procedure for evaluating railway bridges for repairs. Figure 2 combines the standard procedure and Sille’s to enable better evaluation and monitoring of structures. The service monitors regularly all bridges that are in constant use, and indicates whether there is a risk or any other issue on which the engineers can focus. This saves time and money and also ensures safer structures for public users.

There are still some challenges in using persistent scatterer InSAR technology such as this — challenges from both technical and business perspectives. Where target objects are very close together or there are several very reflective objects within one data pixel these cannot be isolated from each other, meaning it is not possible to derive deformation measurements for them. However, Sille calculates the deformation from the strongest reflector in the pixel so we can measure the overall deformation of objects, which is in most cases sufficient for correct estimation.

We also cannot assure deformation measurements for all objects on X, Y and Z axes because not all locations on Earth are covered with the dual satellite orbits that would be necessary for this (see Figure 1). For all objects that meet basic visibility and stability criteria, though, the service offers deformation detection and monitoring in at least one line of sight. Objects that are completely blocked by higher features such as mountains, tall buildings or forests cannot be monitored because there is no straight line of visibility from the satellite.

Buildings that are smaller than 100m² are difficult to monitor, and if an object such as a camping trailer, suspension bridge or floating pier is constantly moving it cannot be measured correctly either. It is not possible to monitor objects under active construction as well.

Monitoring cannot begin until three months after construction or repairs have been finished, not only because there is a natural period of building settlement, but the system needs to compute a steady situation from which to calculate future deformation, and this cannot be done when there is constant building activity.

From the business side, the biggest challenge is to explain how this system can be used in specific domains. This technology is still fairly new, so engineers and technical experts are not yet familiar with its potential and limitations. However, the possible uses of this data to solve specific problems are wide. In each situation where deformation or subsidence data is needed for infrastructure, this system can help minimise the cost of data collection.

Although the monitoring process can be divided into three main stages — planning, construction and operation — the main applications of the system would be in
Figure 2. The process of deformation data collection and calculation

the planning and operation stages. In the former, monitoring can focus on:
- areas or structures that are located above metro railway tunnels, closed mines and other underground objects or features
- the surface of the building area before construction, ensuring that it is not subsiding or rising and giving evidence on the geological situation.

Meanwhile, during operation, the following can be monitored:
- structures on slopes that can be affected by landslides, collapses and flowing water
- structures close to construction activities where large amounts of soil are dug
- structures with burst or leaking water pipes, where soils are being eroded under the foundation
- structures located near active mining and blasting work areas
- old structures that can become dangerous as a result of material degradation
- structures located on or near earthquake zones that are most likely to collapse in the event of seismic activity
- structures damaged after an earthquake that may not be visible to the naked eye
- structures located near sinkholes
- new structures that need regular monitoring to guarantee proper repairs and identify dangerous building errors
- high structures that must be stable, such as masts and tall buildings
- structures with foundation repairs, to make sure that these are correct and they are now stable, or if not, where additional work is needed
- structures insured for full risk, where it is possible to prevent costly repairs caused by deformation damage
- structures on soft soil, landfills, temporarily wet or flooded soils and anything else that can lead to a structure becoming unstable
- structures that are insured, to make certain the deformation damage was evident before making the insurance contract or before buying
- structures at risk of subsidence or other damage where a better overview of risks can help owners avoid costly repairs
- previous constructions by bidders for public tenders, to assess the quality of their work and whether it is structurally damaged
- historical structures such as old castles, manors or churches
- structures where dangerous activities take place, such as nuclear or chemical plants
- structures newly built without permission
- structures illegally repaired or demolished.

Despite the challenges, Sille has proved to be an effective means of ensuring structural integrity and preventing disaster. It can greatly enhance surveyors’ abilities to monitor large areas and a wide range of individual objects on a constant basis.

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Dilapidations

‘The process of dilapidations is very confrontational, and this could destroy the trust that a company has built up with customers’

Paul Spaven
RICS Dilapidations Forum Steering Group

‘A proper pain’: that was a client’s view on dilapidations, claimed a speaker at the RICS Dilapidations Forum 2018 conference. We must do better, he says — more on that later.

The September conference was billed as a one-stop shop for essential legal, technical and valuation guidance. It was very well attended, with around 400 delegates and speakers sharing their knowledge and views.

In a year when there have been more new books on dilapidations than directly related legal cases, it was a time for reflection, and an opportunity to consider how we might all improve outcomes for our clients.

A panel of three barristers from Falcon Chambers started the day with a legal speakeasy, discussing reinstatement obligations, lease clauses for recovery of costs and practical issues such as what to do if the lease plan is inaccurate. The legal theme continued with Zia Bhaloo QC of Landmark Chambers and Edward Shaw of Savills reminding us of legal and practical principles in regard to fixtures and chattels.

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Break-out sessions then covered diverse topics, with loss of rent claims addressed by Nic Taggart of Landmark and Richard Kay of Beckett and Kay Chartered Surveyors, while Dr David Arnold from engineers Troup Bywaters + Anders took us through the increasingly important area of mechanical and engineering services in dilapidations, a major growth area.

After lunch, Adam Nash of GVA covered schedules of condition, and the implications of getting this basic service wrong. The Minimum Energy Efficiency Standards were examined from a practical perspective by Stephen Lemmon of Malcolm Hollis, and in terms of the legal framework and outcomes by Peter Williams of Shoosmiths and Nick Dowding QC of Malcolm Hollis.

Solicitors William Glassey and James Morris took us through worked examples of conflicts of interest and RICS’ professional statement on the issue. The formal part of the day concluded with a hard-hitting panel of clients airing their views on dilapidations and on the service that we surveyors, valuers, engineers and lawyers provide.

The head of UK Asset and Property Management for Prologis Stuart Davies told us that, in his experience, the process of dilapidations is excessively confrontational, with far too much ego involved, and this could destroy the trust his company has built up with customers. He believes that, with globalisation, the feudal landlord and tenant relationship must move towards a supplier and customer one.

The other panel member, Sally Duggleby, Savills’ National Head of Industrial and Logistics Occupier Services, echoed Stuart’s views and observed that achieving settlement takes too long. ‘If we spent as much time agreeing leases at the beginning as dealing with dilapidations at the end,’ she said, ‘the deals wouldn’t happen.’

As an imperative for those involved in dilapidations to improve their service, both Sally and Stuart pointed to the changing global real-estate environment. American, Asian and even European investors see dilapidations as an archaic UK concept.

Sally and Stuart believe that there will be a move to shorter, internal-repairing European-style leases, perhaps with inclusive rents and maybe a ‘broom-swept condition’ obligation at lease-end. The panel also criticised the negotiating ability and skills of some dilapidations surveyors.

This was something that the conference sought to improve on, with a witty and thought-provoking presentation by Nick Davies, a barrister at the Really Great Training Company. We heard how to avoid the big four mistakes: going in tough; thinking negotiation is a one-off event, when it is actually a process; information overload; and trying to satisfy wants rather than needs. He also talked about the importance of building credibility, something that the conference content always tries to address.

The idea was floated to delegates of staging the 2019 event in two locations, London and a northern venue. In the meantime, if some of our clients are feeling the pain of dilapidations and the global market is changing the structure of leases, we all need to be creative in our response.

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Related competencies include: Landlord and tenant, Legal/regulatory compliance
‘It is two decades since case law confirmed courts can order specific performance of a tenant’s repairing obligations’

Emma Humphreys
Partner, Charles Russell Speechlys LLP

Rather unusually, two recent dilapidations cases have invited the court to give force to lease-repairing obligations during the term of the tenancy. Despite their unusual circumstances, they give a good indication of how the courts are likely to approach such disputes.

It is two decades since the decision in Rainbow Estates Ltd v Tokenhold Ltd [1999] Ch 64 confirmed that the court can order specific performance of a tenant’s repairing obligations. However, the circumstances need to be appropriate to justify such an order; the situation in Rainbow Estates was rather unusual since the lease in that case contained no Jervis v Harris clause – which would enable the landlord to serve a repairs notice, carry out the works if the tenant does not and recover the cost as a debt — neither did it contain any right of forfeiture.

Zinc Cobham 1 Ltd & Ors v Adda Hotels & Ors [2018] EWHC 1025 (Ch) gave the High Court a chance to look again at the extent to which it is prepared to enforce this type of positive covenant. Zinc had acquired the freehold of a number of hotels occupied by tenants under the Hilton Hotels brand. The leases were designed to maintain the brand and included a series of covenants to clean, decorate or otherwise maintain the hotels in accordance with the ‘operating standards’, that is, the brand standards issued by the Hilton Group.

Zinc identified certain breaches of these covenants and served schedules requiring the tenants to undertake work to remedy them. After serving the schedules, the company issued proceedings for specific performance of the obligations, damages for breach, or both.

It claimed that the condition of the hotels had reduced the value of its interest but said it would be very difficult to quantify the loss arising from the breaches. It therefore sought an injunction for specific performance on the basis that damages would be inadequate compensation. The cost of carrying out the works was estimated to be more than £100m.

The High Court decided that Zinc’s claim for specific performance should be struck out, and that its remedy should be limited to damages. The court felt it would be inequitable to require a tenant to carry out works at a cost that was substantially higher than any loss suffered by the landlord. It pointed out that an order for specific performance would also require constant supervision to monitor compliance with the operating standards.

In the court’s view, Zinc did not have a legitimate interest in enforcing the obligations and was only concerned with financial compensation. However, damages seem likely to be limited given that the breaches are not expected to affect rental levels as a consequence of the terms of the rent review provisions.

In Office Depot International (UK) Limited v UBC Asset Management (UK) Limited & Ors [2018] EWHC 1494 (TCC), meanwhile, the tenant had covenanted to keep the premises in ‘good and substantial repair’. Given that there was a leaking roof, the tenant sought a court declaration as to the extent of works it was required to undertake in order to address the issue, having the benefit of certain contractors’ warranties that it wanted to enforce.

Although there is a wide jurisdiction to grant declaratory relief, the court rejected the tenant’s application in this case. It pointed out that there was no proper dispute between the landlord and tenant here, and the case therefore lacked the benefit of the adversarial trial process.

The court also disliked the lack of a positive proposal from the tenant with regard to the necessary works, and was not prepared to carry out the inquisitorial process it had sought.

Furthermore, the court pointed out that it is not open to the tenant to require the landlord to identify or agree any particular scheme of works in order to satisfy the tenant’s repairing covenant; it is for the tenant to decide on the works that are required in order to meet its repairing obligations. Again, the court was not prepared to supervise the tenant in performing its contract.

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Related competencies include: Landlord and tenant, Legal/regulatory compliance
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A question of due diligence

Vendor surveys can be a valuable resource – provided they are properly conducted

Chris Gibbons

Technical due diligence surveys commissioned by commercial property vendors have become increasingly popular in recent years for. In 2017 at Tuffin Ferraby Taylor, for example, such surveys accounted for 14 per cent of all our technical due diligence instructions, up from eight per cent five years ago. Most of our institutional and property company clients choose to commission a vendor or divestment survey before putting a property on the market, and this can offer significant benefits.

A commercial agent recently remarked to me that the vendor technical due diligence process was ‘useful for getting any ugliness out in the open before potential purchasers start to bid’. A purchaser’s team with any wisdom may well identify such issues later – which will only delay the transaction, threaten the sale price, or even kill the deal.

Once a purchaser has been chosen from a range of bidders, any leverage will be theirs if issues are discovered. Also, revisiting the second bidder does not put the vendor in the best position if a previously unforeseen technical issue has prevented a sale.

For the vendor survey process to succeed, it is important to ensure that the scope and extent of survey aligns with the asset in question. Getting this right comes with experience, but as a rule of thumb you should put yourself in the purchaser’s shoes and ask what you would expect to see.

Before inspection, it is worth knowing what existing documentation is available; for example, and if relevant, are there asbestos, concrete or drainage reports? Many large, modern commercial offices have complex glazed curtain walls, so a specialist report from a facade engineer will usually be required to supplement the surveyor’s advice and give a fuller technical appraisal of the building.

Getting the scope right is also important. One benefit of the vendor survey is that it saves time, but this can be squandered without a proper scope: there is no sense in commissioning a vendor survey if an important technical component is missing.

Another benefit of commissioning vendor technical due diligence is that a vendor can select a technical team of their choice, so should know that the consultant has the necessary skill and competence to report without significant limitations.

Potential pitfalls

We are often asked to review vendor reports prepared by other firms. It is important to be aware of the potential pitfalls of a vendor survey so you can advise clients of any shortcomings. In my experience, much of the problem can be down to an inadequate scope or client brief, or a surveying firm not fully understanding the risk profile of the asset under consideration.

We were recently asked to review a vendor report that was little more than a schedule of photographs with captions for a building with a value of more than £1bn. In this instance, a completely new technical due diligence survey was required, which delayed the transaction for all parties.

Another frequent omission from reports is repair costs. This approach again cancels any time-saving benefits offered by the vendor survey because the purchaser’s team will need to inspect the property to assess such costs. Invariably, such a process takes nearly as much time as the original vendor survey itself.

Be aware that some firms seem to offer contractual reliance on the report to the vendor only. This approach is illogical and confirmation that full reliance will be provided to the purchaser should be the first thing on the checklist when you are presented with a vendor survey for review. The level of professional indemnity insurance offered must also be checked for adequacy against the market norm.

Another common area of difference when reviewing someone else’s work relates to costs for repairs. It is important to keep records of how these have been calculated so they can be compared with the reviewer’s assessment. Very often, such differences can be attributed to each surveyor’s varying point of view, and a sensible conversation is required to reach agreement.

It’s easy to throw stones when reviewing work completed by others, but one should avoid doing so as this simply erodes everyone’s perception of vendor surveying. The peer review process is also a good way to see how and what others are doing and learn from them. Regardless of your view, vendor surveys are advantageous when done properly. Building surveyors should embrace the process for the benefit of the profession and for the promotion of our expertise.

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Related competencies include: Inspection, Landlord and tenant
Legal

‘Japanese knotweed is one of many factors taken into account in valuing property; it can reduce both financial and amenity value’

Vivien King
Consultant

If left uncontrolled, Japanese knotweed can cause extensive damage to the built and natural environments (see Building Control Journal November/December 2018, p.25).

The plant is listed in Part II of Schedule 9 of the Wildlife and Countryside Act 1981, and a person is guilty of an offence if they plant or cause to grow wild any species so listed. So although it is not a crime to have the plant in your grounds, it is if it grows uncontrolled or enters neighbouring land.

The plant is classified as ‘controlled waste’ under the Environmental Protection Act 1990 as well, and can only be transported and disposed of at a licensed site by a licensed contractor.

There have been problems caused by some mortgagees’ reluctance to lend on affected properties, and reports have been published on some lenders’ inability to obtain insurance cover. The presence of Japanese knotweed is one of the many factors taken into consideration when valuing property, and can cause loss in both financial and amenity value.

If a landowner is, or ought to be, aware of the presence of Japanese knotweed on their land, and of the risk of damage and loss of amenity to adjoining properties, it can give rise to a civil claim of nuisance.

The recent Court of Appeal case Network Rail Infrastructure v Williams and Anor [2018] EWCA Civ 1514 dealt with how damages are assessed.

The plant had grown on Network Rail’s land for some 50 years or more. It had not caused actual physical damage to neighbouring land but was in danger of spreading onto it. When it came within 7m of the borders of the land owned by the company, the neighbours sought an injunction against Network Rail requiring it to abate the nuisance.

These neighbours claimed mortgagees refused to lend on properties within 7m of the plant or raised insurmountable requirements in terms of insurance-backed guarantees for remedial works, and thus the value of their properties was reduced.

The recorder at the first instance refused a mandatory injunction, but considered damages in lieu. He awarded treatment and insurance costs plus £10,000 to one claimant and £10,500 to the other in respect of residual diminution in the market value of their respective properties.

However, the Court of Appeal said: ‘The purpose of the tort of nuisance is not to protect the value of property as an investment or a financial asset. Its purpose is to protect the owner of land (or a person entitled to exclusive possession) in their use and enjoyment of the land as such[,] as a facet of the right of ownership or right to exclusive possession.’ Damages for nuisance do not therefore extend to loss in the value of property, but do extend to a claimant’s loss of amenity value relating to the use and enjoyment of their own land.

The court held the plant and its rhizomes ‘can fairly be described, in the sense of the decided cases, as a “natural hazard”. They affect the owner’s ability fully to use and enjoy the land. They are a classic example of an interference with the amenity value of the land.’

The recorder had awarded damages in respect of loss in value of the neighbouring properties, rather than the loss of amenity value, but the appeal court did not resubmit the question of damages to the lower court, feeling that ‘the cost of that exercise would be out of all proportion to the amount of damages in issue’. The decision of the recorder was therefore upheld, but for differing reasons.

So remember: letting Japanese knotweed grow wild is a crime, and if it reaches or is in danger of reaching neighbouring land and affecting its amenity value, it could give rise to a civil claim for damages.

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Related competencies include:
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The best of intentions

Low- and zero-carbon building technologies must operate correctly to achieve the best assessment ratings

Helena Bradford and Marc Hill
The design and selection of the building services installations as well as the building fabric are key in ensuring energy performance

The sustainability and energy performance of buildings are calculated, assessed, rated and certified using the Building Research Establishment Environmental Assessment Method (BREEAM) and energy performance certificates (EPCs), among other approaches.

The 2010 Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive are the EU’s main legislative instruments in this regard. The overarching requirements are for member states to implement a methodology for calculating buildings’ energy performance, setting out minimum requirements and implementing EPCs. In the UK, an EPC is required when a building is constructed, sold or rented.

The use of EPCs should allow those involved in the acquisition of commercial property to assess how energy-efficient it is, and enable them to make informed decisions with respect to saving energy and reducing costs. The EPC’s rating should also assure them how well the building has been designed and the levels of comfort and well-being that its occupants can anticipate, as well as helping fight fuel poverty by reducing energy demand.

Although EPC ratings are based on compliance being proved by design, there is no direct relationship with actual building performance. Nevertheless, the certificates have helped improve understanding of current UK building stock and encouraged developers and portfolio owners to improve the energy efficiency of their buildings. Investors and occupiers are now setting their own sustainability targets by establishing minimum EPC ratings for new-build properties, new acquisitions and refurbishment works.

Current planning requirements encourage good EPC ratings by setting BREEAM and carbon-reduction targets as well as minimum requirements for low- to zero-carbon technologies (LZCTs). Depending on the size and the nature of a development, councils can require a specified BREEAM rating, and impose a percentage reduction in carbon emissions through the use of LZCTs.

BREEAM is designed to help measure and reduce environmental impacts and create more marketable assets. To provide a flexible approach to the assessment and rating of building performance, most BREEAM credits can be traded and non-compliance in one area can be offset by compliance in another. Minimum standards are, however, set in key areas such as energy, water and waste, to ensure performance against fundamental criteria is not overlooked.

As these minimum standards largely relate to energy use, the design and selection of the building services installations as well as the building fabric are critical in ensuring that a building meets the required performance targets. The heating, cooling and domestic hot water plant and building fabric will have minimum requirements, for which evidence will be gathered to model the building’s energy performance using accredited software. The aim is to ensure that the building is compliant on completion, and this will need to be witnessed by the assessor to lodge an as-built EPC.

If post-construction considerations such as handover, commissioning, training and routine servicing are not effectively implemented, this can result in the operational status and efficiency of the building services and LZCTs not being maintained and the calculated building performance not being achieved. It can also lead to increased operational, maintenance and energy costs and a reduction in occupant satisfaction, comfort and well-being.

There are a number of frameworks, rating systems and documents that identify and encourage appropriate handover, commissioning, building aftercare and maintenance principles, along with guidance on assessing the performance of occupied buildings and improving efficiency. These include the Aftercare guide: Developing efficient buildings for any occupier, a report produced by the British Property Foundation and researched by Tuffin Ferraby Taylor (bit.ly/BPFaftguide).

Although the assessment methods are well established and there is a wealth of guidance for the occupancy stage, there are numerous case studies demonstrating that best practice is not consistently implemented by those who own and operate buildings.

Over many years of providing technical due diligence, dilapidations, building condition, maintenance and sustainability advice for clients involved in the acquisition, occupation and disposal of commercial property, Tuffin Ferraby Taylor’s building services engineers and sustainability consultants have identified a number of instances of such failings.

One example is a ten-year-old landmark regional headquarters building of around 16,250m² that has a BREEAM rating of ‘excellent’ and an EPC rating of C. The building services installations include a solar domestic water heating system, comprising heat collectors and associated storage vessels, pumps and controls. The design intent is for this system to provide pre-heated water to storage calorifiers.

However, site investigations determined that the solar hot water system was not operational. A review of the documentation and discussions with the site-based incumbent maintenance contractor’s engineers identified that there were no records in the operation and maintenance manual to confirm design or operating strategy, or that commissioning had been undertaken.

The feedback from the engineering team was that the system had not been operational since installation, and this had not been addressed as part of the de-snagging process during the rectification period. In addition, the engineers did not fully understand how the solar hot water system operated in conjunction with the domestic hot water calorifiers, and since the equipment had not been included in the planned preventative maintenance contract it had never been subject to routine servicing.
A second case study relates to a 20-storey landmark office building of around 20,900m² in size, completed in 2014 to a high-quality specification. The building has a BREEAM rating of ‘excellent’ and an EPC rating of B.

During the site inspection it was identified that there were a number of defects and outstanding repairs associated with the services installations. Some of these defects concerned the base build construction, which had not been dealt with when it came to de-snagging in the rectification period. Furthermore, while the building services incorporated a system of solar photovoltaic modules and associated inverter, generation meter and isolator, this system was isolated and not operational.

In each of these two case studies, the freehold interest was being purchased for investment purposes, and the BREEAM and EPC ratings were likely to be reflected in the property valuation. The non-operational LZCT systems did not satisfy BREEAM assessment criteria. The poor condition, legacy maintenance and repair issues and decrease in system efficiency thanks to the faulty services installations were not reflected in the respective EPC ratings.

These installations would therefore require substantial rectification works to fulfil the EPC and BREEAM ratings. Each property also had a large number of defects and items of disrepair, such as poor-quality closed-water systems, while the heating, comfort cooling and building and energy management systems were not functioning correctly.

The correct design and operation of building services and LZCTs has many advantages. These include achieving desired assessment ratings; reducing energy bills, carbon footprints and greenhouse gas emissions; improving energy system sustainability; and decreasing reliance on external suppliers of fossil fuels.

In buildings where LZCTs are not operating as per their design intent, the EPC rating would most likely worsen if the property were reassessed. In addition, the number of BREEAM credits required to achieve the certified performance rating would not be achieved, and there will also be a likely drop-off in the predicted carbon reduction and associated benefits. Calculated payback periods will not be realised either.

Assessment methods are well established. Although only BREEAM’s ‘outstanding’ rating requires consideration of a building’s occupational performance, guidance on best practice for operational buildings is extensive.

Sustainability is an ongoing obligation that requires long-term consideration and investment; experience of operational buildings has identified that, in many instances, the design intent and performance of LZCTs and services installations are not being achieved. This must be addressed by designers, installers, owners and occupiers, and there must be a shift from achieving compliance by design to fulfilling performance in occupation.

Once ratings have been calculated, servicing and operating conditions must be considered to ensure the basis of an assessment is maintained. Major improvement is required in many buildings if actual performance is to reflect current BREEAM and EPC ratings.

Buildings must be operated and managed with a focus on what is needed to achieve the design intent. In addition, if building owners and occupiers are paying a premium based on assessment ratings, robust technical advice should be sought as operational status may not reflect assessment ratings and the building may not be providing the expected energy and sustainability benefits.

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Related competencies include: Landlord and tenant, Legal/regulatory compliance
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Building conservation practice has ostensibly stayed grounded in the well-founded, slowly evolving core competencies that are reflected in the requirements of an array of professional bodies including RICS (rics.org/bcas) and the Institute of Historic Building Conservation (ihbc.org.uk). While much practice will remain relatively static, the conservation sector is today confronted by significant change that will force us to reconsider what services we provide, how we create value through them, and how we present them to our clients. Two areas of conservation practice subject to disruptive technologies, or that will rely on disruptive technological innovation for solutions, are digital construction asset management and building resilience to climate change.

Digital construction asset management

Great advances have been noted in new-build applications, with increasing levels of building information modelling (BIM) implementation. It is fair to say that the same has not been the case in the heritage sector, which largely uses digital technologies such as laser scanning and photogrammetry for documentation, recording and interpretation. An example is Historic Environment Scotland’s RAE Project, a 3D survey to digitally document 336 of Scotland’s most important monuments which will take place over the next ten years.

In the future we must use scan data more effectively, extracting value and allowing it to take centre stage in surveying, pathology, repair and maintenance, measurement and cost activities (see Building Conservation Journal, May/June 2017, pp.31–33). Scan-to-BIM applications, in which structures are scanned and automatically segmented into individual building elements to create a heritage building information model (HBIM), are considered the holy grail of data processing, and much cutting-edge research is currently being undertaken in this area. The power of extracting value from data cannot be overstated, and efficiencies in this area will enable money to be redirected from relatively mundane survey operations towards fabric repair and the upkeep of buildings. These digital technologies are already changing the way we evaluate, diagnose, repair and maintain our buildings.

Recently, advances in machine learning and artificial intelligence algorithms applied to scanned data have been used to enable automatic defect identification and classification on a scale, rapidity and level of accuracy that is uncommon in traditional practice. The interconnectivity of digital data from numerous sources is therefore paramount to integrated, efficient decision-making and intervention. For example, the extraction of measurement information from laser scanning cannot readily be imported into common digital documents that form the basis of bills of quantities and other common survey report formats. Innovation will link scan data to defects identification, costing, specification and augmented reality using a tablet or iPad, and will help on-site, real-time interaction with point clouds and digital data.

The nature of bespoke manufacture for repair is at a critical juncture thanks to increased use of digital printing technologies and associated novel materials, such as printed artificial stone. Combining dense point clouds with digital printing allows faithful reproduction of eroded and defective building components and assemblages. However, while this is a technological marvel, it poses significant philosophical problems relating to the authenticity and distinguishability of fabric intervention and, importantly, respect for the intangible cultural heritage (ICH) of craft skills in an increasingly automated world. The National Heritage Training Group (the-nhtg.org.uk) has raised concerns over this issue and we must work hard to retain traditional craft skills.

Importantly, the rise of automation and robotics is driving increased use of modern methods of construction. This will radically affect the nature of education and training for construction professionals and the skills required of the workforce, both professional and craft, to carry out what will become more of an assembly line rather than a traditional construction process. However,
although it will face changes, the area that may be least affected by automation and robotics is repair and maintenance and, by extension, the repair of historic buildings that are characterised by complex, bespoke design, reflecting their diversity in architectural form and fabric.

Resilient buildings
Traditional buildings, whether historic or not, constitute the vast majority of our built environment. These buildings were designed to perform in climatic conditions that did not often fluctuate significantly, and many have performed well in these stable environments for centuries. Climate change is placing these structures under increasing strain and they are now often expected to perform under more hostile conditions. Most notably, fabric is often subject to higher and longer lasting levels of moisture, and buildings are at increased flood risk as well as facing accelerated coastal erosion in certain cases.

We must be vigilant, but more importantly informed about the risks that will likely confront individual structures, either in our care or in the wider environment. This can be practically and objectively achieved by evaluating data sets, such as those at ukcip.org.uk, that are geographically contextualised by predicted climate change, for example increased rainfall, flood risk and coastal erosion. The determination and development of evidence-based risk mitigation strategies that support preparation for change will be a growing area of practice. Strategic planning and bespoke technical solutions will be required to help buildings perform under conditions in which they regrettably now find themselves, but the practicalities may be what matters most. Clearly, remedies must be achieved in a context of limited financial resources, forcing difficult decisions to be made in attempts to retain culturally significant fabric and sustain building utility. Organisations such as HES are proactively deploying bespoke strategies, and show us possible future services that we may offer clients in this emerging area (bit.ly/HESccra).

In the context of building resilience to climate change, digital technologies are helping us diagnose failure, and better inform our strategies for upkeep and in-service performance of buildings. For example, multispectral overlays aligned onto laser-scan point clouds are extremely useful for hygrothermal analysis, and can also help us evaluate the performance of complex building detailing that has in the past been more intuitively determined by surveyors assessing building defects. On a macro scale, geographical information systems (GIS) mapping and aerial photogrammetry using unmanned aerial vehicles, or drones, facilitate analysis of coastal erosion or flood risk for wider urban environments.

While building surveyors are not the only construction professionals benefiting from advancing technologies, by virtue of their in-depth and interconnected technical understanding of in-use building performance, repair and maintenance operations, they are arguably better positioned than other construction professionals to navigate this changing world. Importantly, they will themselves be more resilient professionally if digital technologies are meaningfully adopted and used in conservation. After all, it is the passing down of our common inheritance that is important, and if technologies can help us do so more effectively then they should be seen as a force for good rather than something to be feared.

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Avoiding external insulation failures

It is essential to assess external wall insulation systems for their ability to resist wind load and prevent installation failure

Oriola Davies and Fernando Ferrarin

External wall insulation systems (EWISs) comprise insulation material that is mechanically or adhesively fixed to the substrate of a building’s external wall. Various types of render, such as silicone, acrylic, mineral renders and decorated finishes including brick slips or dash finishes, are then bonded to the outer face of the insulation boards or slabs.

Installation improves the thermal performance of new and existing buildings and the aesthetics of facades, in addition to reducing condensation risks. Although thermal performance is the most important feature so far as users are concerned, the structural stability of the system is often overlooked by the non-technical community. This article therefore examines the potential issues and unintended consequences of EWIS design in relation to wind-load resistance.

To address the growing market for EWISs, the UK construction industry has been challenged to improve its design, detailing and installation, including the specification of ancillary components, pre-installation procedures, the quality of work on site, and site surveys.

Furthermore, the construction industry needs to work alongside suppliers, installers and consumers to offer guidance and support on EWIS behaviours that might lead to unintended consequences thanks to poor fittings.

Recent reports of EWIS structural failures worldwide have raised technical bodies’ awareness regarding systems’ resistance to wind load. The collapse of EWISs — which are often rendered with heavy clay bricks or cladding — from the external walls of high-rise buildings can cause property damage, serious injury and fatalities. There have even been circumstances, albeit few and far between, where entire sections have detached from a building’s facade after exposure to severe rain and wind loads.

Design and installation defects such as deficient structural calculations, specification of substandard ancillary components and failure to allow either for components such as insulation materials or for weather exposure during installation also reduce the service life of the system. It is important when designing and specifying EWISs to consider every mechanism by which they resist the applied static and dynamic loads.

Negative wind load — that is, wind suction on the external face of the system — is the most unfavourable condition. The design wind loads on the different zones of the building’s elevation for the specific geographical location must be calculated,
Although thermal performance is the most important feature for users, the structural stability of the system is often overlooked by the non-technical community

taking into account all relevant factors such as location and topography, in accordance with BS EN 1991-1–84: 2005 and its UK National Annex Eurocode; the proposed fixing method must give a design resistance equal to or greater than the design wind load resistance of the system.

Due to the complexity of building materials, tools, fixing and installation techniques, a comprehensive recommendation depends on a detailed understanding of the specific site conditions. Weather exposure and water ingress are major concerns during installation, for instance; water penetration results in saturation and increases the weight of the insulation, meaning both its thermal performance and the strength of the fixings degrade due to corrosion.

Freeze–thaw action and high wind forces on the weakened system during winter can together result in excessive movement, cracking and finally delamination of the render or pull-through of the fixings. Failure to administer water exclusion details correctly also leads to hydraulic pressure on the render surface, which causes bursting and tensile stresses that contribute to the failure of the bond between the adhesive or basecoat and the insulation.

Design resistance of EWISs to negative wind loads is determined either by a full-scale wind–suction test — such as the dynamic wind uplift (DWU) test — or by structural calculation defining the resistance of the contributing components. This is based on limit–state design principles, adopting design that is assisted by testing in accordance with the Eurocode.

The resistance to wind load depends on the system and fixing method. An excessive number of mechanical fixings can produce cold bridges as well, leading to reduced thermal performance. In turn, inadequate fixings placed in symmetrical patterns can induce structural failure where load distribution on them does not match the assumptions made in the calculations.

To emphasise the importance of structural integrity and safety during the system lifespan, the British Board of Agrément (BBA) has revised every current EWIS certificate regarding its strength and stability, and promoted a training course on wind–load resistance available to certificate holders, suppliers and architects.

This training provides technical guidance on understanding and applying the design data in the certificate, thus helping to address the risks associated with the system’s structural design. While there are no obligations to adopt the solutions proposed by the guidance on BBA certificates, following the principles does provide a mechanism for satisfying the Building Regulations.

When assessing the stability of the system under negative wind pressures, the DWU test can be employed in accordance with European and BBA in-house guidelines. This procedure must prove that the system can adequately resist and safely transfer the calculated loads, accounting for all possible failure modes.

The supporting structure — that is, the external wall — should be able to resist any extra load that may be imposed as a result of installing the system. The substrate and supporting structure must be able to transfer all resultant additional loading to the ground in a satisfactory manner.

The adequacy of the substrate and supporting structure must be verified by the person or party who is responsible for the overall stability of the building to which the systems are fitted. Only trained, competent professionals are allowed to carry out the design, specification and installation of EWISs in accordance with the particular requirements.

The DWU test determines the characteristic wind resistance of the EWIS through repeated changes in air pressure in a large sample area, representing actual installations. This attained resistance cannot be extrapolated, and is only valid for the configuration of the system tested, resulting in the maximum pressure load (Q) in the cycle preceding test specimen failure.

This force is considered in characteristic resistance formula $R_c = Q \times C_x \times C_y$, where $R_c$ is the characteristic design resistance, $C_x$ is the geometrical factor to allow deformation in a test wall and real deformation on a complete wall, and $C_y$ is a statistical correction factor.

A successful EWIS design must demonstrate an accurate understanding of material properties including thermal conductance, vapour resistivity, sorptivity — that is, its capacity to absorb and transmit liquid by capillarity — mechanical strength and fire performance.

It must also take account of the installed environment, such as its existing structure and fabric, internal heat and moisture conditions, external solar gains, ventilation and wind environment, as well as considering the modelling capabilities in the design process.

If these elements are correctly certified, considered and assessed during the design phase and the system is properly installed, BBA-certified EWISs present solid, reliable and safe solutions to improve the thermal performance of buildings.

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In May last year, the Supreme Court overturned the Court of Appeal’s decision in Rock Advertising v MWB [2018] UKSC24, upholding the effectiveness of a ‘no oral modification’ clause that required modifications to a contract to be effected in writing and by the signatures of the parties.

This is an important decision as, by confirming that ‘no oral modification’ clauses will be upheld, it means contracting parties will be prevented from being bound by a variation unless the formalities of the contract are fulfilled.

In summary, if a contract contains rules restricting the parties’ ability to amend it informally, those rules should be followed.

Rock Advertising and MWB had entered into a licence so the former could occupy an office space in one of the latter’s properties in Central London. The licence contained a ‘no oral modification’ clause, providing that ‘all variations to this licence must be agreed, set out in writing and signed on behalf of both parties before they take effect’.

Several months later, Rock accumulated arrears of licence fees of more than £12,000, and the parties disputed whether an oral agreement had been reached between them to revise the payment schedule in order to defer part of the overdue amount and spread the accumulated arrears over the remainder of the licence term. The central point in dispute was whether the oral agreement to the payment terms was effective despite breaching the requirements of the ‘no oral modification’ clause.

The Court of Appeal had found in favour of Rock that the oral variation was binding based on the importance of party autonomy, which demanded that parties should be permitted to amend their contracts even in situations where they had previously agreed only to do so by specific means.

The Supreme Court decision
The Supreme Court overturned the Court of Appeal’s decision, ruling that the oral variation was invalid because the parties had not complied with the requirements of the ‘no oral modification’ clause.

Lord Sumption gave the leading judgment. He considered that the Court of Appeal’s emphasis on party autonomy was a ‘fallacy’, deciding that ‘party autonomy operates up to the point when the contract is made, but thereafter only to the extent that the contract allows’. In his view, once parties reach an agreement as to their future conduct, that agreement should set the boundaries of party autonomy.

He also stressed the commercial rationale for including ‘no oral modification’ clauses:
- preventing attempts to undermine written agreements by informal means
- avoiding uncertainty about the exact terms of any oral variation
- making it easier for corporations to police internal restrictions on agreeing variations.

In the view of the Supreme Court, there was no conceptual inconsistency between the general rule allowing contracts to be made informally — say, orally — and a specific rule providing that effect will only be given to contractual variations in writing.

What parties agree in a ‘no oral modification’ clause is not that they are subsequently forbidden to agree to vary the contract informally, but that any informal agreement that does not comply with the formal requirements stipulated by the parties will be ineffective.

In reaching its decision, the Supreme Court has favoured certainty over flexibility. In the context of construction contracts, clients often include ‘no oral modification’ clauses to prevent informal instructions being given and agreements being reached without adequate records being created.

For example, clause 12.3 of NEC4 provides that no change to the contract is effective unless made in writing. Similarly, clause 1.2 (c) of the FIDIC 2017 and clause 3.12 of the JCT 2016 Standard Form Building Contract provide that agreements and instructions under the contract must be written rather than informal.

The Supreme Court decision is a useful reminder that care should be exercised in administering contracts after signature to follow the procedural requirements and contractual mechanisms and ensure legal effect is given to the variation in question.

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Related competencies include: Contract practice, Legal/regulatory compliance
The scenic route into the profession

A trainee surveyor explains how he was inspired to enter the world of building control

Uzoma Jemade

Journalism, then recruitment, then retail — it is fair to say my entry into building control was not by the most conventional route. If I were asked 18 months ago what a cavity wall was, for instance, I would have said it is something you talk about in a dentist’s surgery.

My journey into building control started when I was taking an undergraduate journalism class at the University of Kent. I was watching Homes under the Hammer on BBC iPlayer between lessons and a building surveyor was mentioned. This was an enlightening moment: I had thought only estate agents and property developers were involved in the construction process. I furiously searched online to find a job description, and managed to get a vague understanding of the role.

In summer 2015 I was due to graduate, but had no idea what my next career move would be. I had browsed what felt like every job site in the universe. My eyes didn’t gravitate towards any particular role, but I couldn’t help noticing the huge volume of sales jobs. I applied for several headhunter positions as I liked the job title, which felt as though it were something from a spy thriller. After a handful of interviews, I was offered a position in the construction and built environment sector, recruiting executive-level individuals for some of the UK’s top contractors.

It was in this role I once again became acquainted with building surveying. In my conversations with job candidates and through my own independent research, I was surprised by the large scope of duties in surveying — party wall matters, contract administration, condition surveys, schedule of dilapidations and many more. During the course of my job, I also had to ask candidates if they were RICS-qualified, which led me to the RICS website and in turn to my next career move.

I scoured the site and found postgraduate courses in building surveying in London, and the next day I got a prospectus from Kingston University. I decided to study there; the most important factor in my choice was that its MSc is RICS-accredited, which meant I would be able to take the 24-month APC process on completion. Now I only had to wait seven months until the start of my master’s, in which time I worked in a supermarket.

The early days of the degree were a complete shock to the system. I was learning about a variety of topics, and it felt as though the lectures were going a mile a minute.

Building control module

Then in June 2017, we undertook a module on building control. We were charged with advising on fire safety in a four-storey mixed-use building, using the guidance found in Approved Document B volumes 1 and 2. I became completely immersed in the topic, and the fact that this was shortly after the Grenfell Tower fire spiked my curiosity even more. I began looking into other disasters, such as the collapse of the Ronan Point tower in East London in 1968 and the Summerland leisure centre fire on the Isle of Man in 1973. In this moment I knew I wanted to go into building control, as I believed it would provide a challenging and varied workload as well as offering good career progression.

On graduating, I made a few applications and ultimately decided to work for an approved inspector based in Richmond. I felt there was a greater freedom of choice over clients than there would be in local authority building control.

I quickly progressed to start my APC and began to update my diary every day, recording details of what I had learned from inspections as well as writing up my summary of experience. The APC is proving to be a challenging but rewarding process, which I hope to complete by June 2020.

Uzoma Jemade is a trainee building control surveyor at Jhai Ltd uzoma.jemade@jhai.co.uk
Compliance in compliance

Looking at what you need to do to achieve the core competency of Legal/regulatory compliance

Ewan Craig

Legal/regulatory compliance is one of the core competencies for the Building Surveying pathway of the APC. It is also a significant one, given that it can influence a range of others, for example:

- **Contract practice**: in terms of contractual amendments’ effects
- **Design and specification**: in terms of understanding and applying the Building Regulations.

Specific issues will also arise in your practice, such as dilapidations, rights of light, party wall matters or consents.

**The levels**

- **At Level 1**, you should show knowledge and understanding of any legal or regulatory compliance requirements in your chosen field.
- **At Level 2**, you should apply your knowledge to comply with legal or regulatory requirements in specific situations in your field.
- **At Level 3**, you should be able to provide reasoned advice and recommendations to organisations so they can comply with legal or regulatory requirements in specific situations in your field, and be able to represent clients to statutory bodies or other parties.

You should be familiar with the legal and regulatory issues in your submission documents, and be ready to address questions on them or related issues.

**Questions**

Actual questions for final assessment will be based on the candidate’s experience. Two examples are given below, at Levels 2 and 3 respectively; the answers in each case should explain pertinent issues to support your application of knowledge.

**Q** Please explain the notice under the Party Wall etc. Act 1996 you prepared for building P.

**A** I followed the 1996 Act procedure for notices; it is important to prepare and serve the notices correctly to reduce the chance of any subsequent challenge. I reviewed the planned work and prepared a notice under section 6 of the Act, as the proposed foundations were within 3m of those of the adjoining building. The notice included details of these proposed foundations.

**Q** You provided advice on permissions and consents to alter a grade II listed building A. Would you please explain the reasoning supporting your advice?

**A** The tenants wished to infill one of two external rear doors to their office and remove an internal partition. They believed they did not need permission as these were small changes to the rear of the building and they only had to inform the landlord as a formality. They appointed my firm to prepare the design and specification.

The client was unaware that consents and a licence were required so I advised them to obtain these. Given that the property was a listed building, they would need planning permission and listed building consent for their proposals, which amounted to a material alteration to the fabric and a potential change to the external appearance. I also advised that their lease would require a licence from their landlord to alter the premises. The client extended my firm’s appointment to include advice on these. I proposed revising the external change to closing the external door from the inside.

I gained pre-application advice from the local authority’s conservation officer, prepared detailed plans, a design and access statement, planning statement and a heritage statement to support the planning application under the guidance of my senior partner. I also prepared the documents for review by the landlord’s surveyor to gain the licence to alter. Other items potentially affected were also considered, for example the fire risk assessment.

**Care**

Given the time constraints of the APC, your answer should be a brief but comprehensive response; the answers given above are not exhaustive. Care should be taken to demonstrate your own skills, abilities and knowledge to the assessors.

Ewan Craig is an APC assessor, APC coach and local director with Right Surveyors  ecraig@rightsurveyors.co.uk

**Related competencies include:** Legal/regulatory compliance

**Further information:** rics.org/pathways
Since I wrote my last article my training has got well under way. I am now back at university, settling into my second year, attending weekly CPD sessions and undertaking solo inspections.

The experience I have gained these past few months has seen me leap forward in my development. I attribute this mainly to the solo inspections: there is no substitute for working in real-life situations. No matter how many times I ran through scenarios behind a desk or in a lecture theatre, I can honestly say I learnt the most about our profession when I was out in the field with builders and construction workers, advising them on the regulations and how to meet their requirements.

As a trainee, I found the first few solo inspections I undertook were the hardest, but once I got past the initial trepidation it became the part of the job that I enjoyed the most. I am very excited to progress, and be given the opportunity to work on more complex jobs in the near future.

One aspect of my training that I am putting a lot of effort into is attending as many CPD sessions as possible. The beauty of these is that they vary depending on the nature of the presenter: I could be given in-depth information by a company salesperson about a product that I may encounter on site, or I could be taken through a specific Approved Document by a senior building surveyor.

Each session provides its own unique experience and perks. At Assent, all trainees have sessions with the firm’s training director Martin Conlon on a monthly basis. He takes us through the regulations and Approved Documents, engaging with us and asking us to draw on our field experiences to share with the class.

This system works superbly because as trainees we are able to talk with people of similar experience and learn from each other, while a senior figure is guiding us in the right direction. This monthly session is, without doubt, one of the highlights of my training calendar.

With the university year now well under way, the issue of finding enough time for all aspects of my training is again brought to the fore. Splitting time between work, university, my APC diary and my social life is proving to be a difficult balancing act.

But I feel as though I am managing this as well as possible, with structure being the key. Every Friday morning I start work early, freeing time in the afternoon to complete my APC diary for the week, and I ensure that Sundays are strictly dedicated to study. This is proving to work well, and means I am not spreading myself too thinly.

So far, my university studies have been interesting and particularly helpful for the building control students. The main topic has been fire safety and fire behaviour; following the tragic events at Grenfell Tower, and given the impending changes to our profession, this is clearly an important time to study this essential issue.

My day-to-day work as a surveyor has given me a great head start in class. When discussing the fire safety of buildings, my knowledge is well ahead of other students. I have now even found myself analysing any building as soon as I enter it whether I’m working or not, as I’m sure is the case with most building surveyors.
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Many of us work in the heritage sector, whether we are surveyors, architects, conservators, planners, archaeologists, builders or experts in other disciplines. What unites us is our interest in conserving and investigating the historic environment in all its diversity: built, buried or submerged; fixed or moveable; from the mega scale of the landscape to the nano scale of DNA fragments.

We also have in common the option of becoming professionals, by which I mean expert practitioners who have demonstrated technical competence, are committed to developing their skills through CPD, have signed up to a code of ethical practice to which they are accountable, and work in the public interest. Professionalism promotes value, recognition and trust.

This should mean that we recognise and respect colleagues working in parallel historic environment disciplines, and encourage clients commissioning work to use the services of those with accredited skills in the heritage sector.

One complication, however, is that clients have no idea what the ‘heritage sector’ is, for all that the professions in it are well recognised, according to a report supported by Historic England and prepared by Loud Marketing for the Client Demand task group of England’s Heritage 2020 (bit.ly/CIfAMCreport). We also learn that, much as we might believe professional accreditation is the starting point when deciding whose services to procure, the principal determining factors for clients are previous experience of working with that expert, or a personal recommendation.

With this understanding, the Client Demand group now wishes to develop generic guidance on the advantages of using accredited professionals, and the risks of not doing so. Publishing such guidance on the heritage sector is unlikely to achieve much, but by working together to marshal the arguments partners will be able to undertake coordinated, client-focused campaigns in their professional disciplines.

Those partners currently include the Conservation Accreditation Register for Engineers, the Chartered Institute for Archaeologists, the Institute of Conservation, the Institute of Historic Building Conservation, the Register of Architects Accredited in Building Conservation, the Royal Institute of British Architects, RICS, the Royal Town Planning Institute, and the Council on Training in Architectural Conservation, working with client groups the Country Land and Business Association and Historic Houses. This is an impressive assemblage.

Other groups are working hard on the supply of heritage skills: this initiative supports them by recognising that the best way of ensuring the supply of heritage skills is to ensure demand for them. It is our duty as professionals to promote — and assure — the value of professionalism to our peers, our clients and the public we serve.

The group will explore further opportunities to build on existing registers of accredited professionals. Working with key individuals across client sectors, we hope to understand why previous portals guiding clients to heritage specialists have not gained the profile or purchase intended.

Perhaps the most valuable aspect of this collaboration to date is the collaboration itself. As with so many projects in our sector, success relies on multidisciplinary teams of professionals who recognise the limitations of their own expertise and the huge talents of others, and can work together in the interests of the team and for the public good. We can then move together to the next project.

Peter Hinton is chief executive of the Chartered Institute for Archaeologists and convenor of Heritage 2020’s Client Demand task group peter.hinton@archaeologists.net @InstituteArch

Further information: archaeologists.net
BUILDING MATERIALS INFORMATION SHEET 7: Stained glass

Summary
For centuries, stained glass has been a decorative feature of many high-value buildings, most noticeably churches, cathedrals and abbeys. Stained glass was out of favour for many years after the Reformation, but it has seen a resurgence since the Victorian era.

History
Stained glass was prevalent in ecclesiastical buildings in medieval times. During the Reformation of the 16th century, many of these iconic windows were destroyed and replaced with austere, plain glass. Remaining stained-glass windows were left to decay, and became almost non-existent, although some major ecclesiastical buildings such as York Minster and Lincoln Cathedral retained their stained window glass and can still be seen in situ today.

In the early 19th-century, a revival in stained glass windows began in Britain and Ireland. Many buildings were reglazed with painted or stained glass, bringing back a long-lost craft tradition.

Composition
Stained glass was historically made in a manner very similar to uncoloured, so-called white glass. Sand and an alkaline flux are melted together and this, when cooled, becomes glass. To stain the glass, metallic salts are added while it is still in its molten state to confer a tint, giving the glass the coloured appearance that has become common. At York Minster, manganese was identified as the main colourant in pink glass and cobalt in blue glass. Other metallic salts used to colour glass include copper for red or blue, iron for a green–blue, chromium for green, and gold for a ruby colour.

A further technique known as flashing was developed in the 14th or early 15th century. Flashed glass consists of a thick layer of colourless white glass with a thin layer of coloured glass over it, making for greater transparency. This technique was used to dilute the colour of glass that may have been too dense to use on its own.

Installation and identification
Individual pieces of coloured glass are assembled to make windows, which can be small and simple or large and grandioso. For religious buildings, the image in the glass may be that of a favoured saint or a biblical image. In this regard, surviving stained-glass windows offer an insight into the history of medieval worship. The sponsor of a stained-glass project would often be figured in the window as well, perhaps kneeling at the feet of a saint.

Decay and degradation
The most visible cause of window glass decay is accidental breakage or vandalism. On a much subtler level, atmospheric pollutants, light and changes in temperature and humidity accelerate the decay of stained-glass windows. Micro-organisms and atmospheric particle deposition can also exacerbate weathering.

Weathering occurs when the glass surface becomes wet in the presence of atmospheric pollutants such as sulphur dioxide, nitrogen dioxide and ozone. The glass surface comes into contact with the environment and is covered by a thin film of water, the corrosiveness of which depends on the micro-climate, the concentration of acidic gas and its solubility, as well as the presence of weathering products already formed on the surface. Together, these can cause a loss of structure in the silica that makes up the glass, and a change in its colour.

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Additional data sources
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