Built Environment

Editor's choice

DECEMBER 2021 – FEBRUARY 2022

RICS JOURNALS

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Contents

Understanding asbestos management and removal

BUILT ENVIRONMENT JOURNAL
First published 2 December 2021

By Jeffrey Tribich

Failure to identify, manage and remove asbestos safely can put lives at risk, so it is vital to understand the roles of all those involved in carrying out the hazardous work

Using the wrong or imprecise terms at work can be harmful, even dangerous. Accuracy is particularly critical in dealing with asbestos, when there is often confusion about who does what and why.

Asbestos-related practice can easily be misunderstood. However, the new edition of **Asbestos: legal requirements and best practice for property professionals and clients** RICS guidance note, covered in my **previous article**, should help clarify matters.

Reasons to appoint an asbestos consultant

There are various reasons why it can be helpful to appoint an asbestos consultant. They can provide general advice on asbestos issues, as well as devising strategies to deal with particular projects.

This might extend to specifying and procuring an asbestos survey, interpreting and evaluating a survey report, and scoping and specifying required remediation or removal.

The role may also include activity on site, such as overseeing removal, inspections and advice on additional works. It may encompass advising on asbestos removal in particular circumstances – or, in some cases, recommending that the material be left in situ.

The appointment of an appropriately qualified and experienced asbestos consultant can ensure a safer, more cost-effective outcome. It also demonstrates best practice and good governance as far as regulators such as the Health and Safety Executive (HSE) are concerned. It could therefore form part of a defence in law in the event of an untoward event and alleged culpability.

Many clients, however, do not employ an independent asbestos consultant. Instead, they rely on their lead consultant to instruct asbestos surveys and other work in identifying, managing and removing the material.

In simple, straightforward situations this may be fine. However, the issue is how to discern whether a particular situation is, in fact, simple and straightforward. It may seem that way to a professional with relatively little training yet not actually be the case. There is thus some margin for erroneous judgements and, consequently, problems.

Issues with indemnity insurance

The insurance profession classifies asbestos as a contaminant or pollutant, and often excludes or limits professional indemnity insurance (PII) cover for it. Therefore, construction and property professionals – such as project managers, architects, building surveyors, building control surveyors, quantity surveyors, contract administrators and property managers – may have limited PII cover for asbestos-related services, if they have any at all.

As a result, the nature and extent of the services that they can safely offer could be restricted. However, many professionals may not realise this and could, unwittingly, provide services that are deemed to be asbestos-related and not covered by insurance.

The insurance profession classifies asbestos as a contaminant or pollutant, and often excludes or limits professional indemnity insurance for it

It may therefore be prudent to employ an asbestos consultant, if only for minimal initial assessment and advice. A direct client appointment would be sensible, in order to clarify responsibilities and lines of accountability and simplify any insurance implications.

Commissioning asbestos surveyors

An asbestos survey company identifies the presence and extent of asbestos in a building or on a site. It also categorises the types of asbestos-containing materials involved, and any that is in a dangerous state of repair.

Firms that carry out asbestos surveys are not legally required to be accredited to do so by the United Kingdom Accreditation Service (UKAS). However, the HSE strongly recommends that they are. I will cover UKAS accreditation in a future article.

Those commissioning asbestos surveys must ensure that the scope reflects the full extent of the proposed works, including all necessary opening up. This ensures a survey is fit for purpose.

They also need to make certain that the resulting report is not inappropriately drafted – some are so hedged about with caveats that they are in effect worthless. Surprisingly, such reports are sometimes even produced by UKAS-accredited survey firms. This, again, is something about which an asbestos consultant can advise, ideally at the survey commissioning stage.

Laboratory testing

The survey firm will need to have samples analysed to establish whether they contain asbestos. Legally, the laboratory used must be UKAS-accredited for testing.

Best practice is to appoint a survey firm that has an in-house laboratory, because this ensures the highest degree of control by simplifying and limiting each sample's chain of custody: the responsibility for both inspection and testing lies with a single organisation.

An asbestos survey company identifies the presence and extent of asbestos in a building or on a site.

This avoids, for example, argument between separate survey and laboratory firms as to whether particular samples have been transferred, and contention over responsibility for possible contamination. It also helps in the event that results are required quickly, so that decisions on how to proceed can be made expeditiously.

However, this approach is not obligatory. Most survey firms do not have in-house testing facilities but work with separate laboratories, and would argue that this does not adversely affect the service that they provide. Surveying and testing each require a separate, discrete UKAS accreditation.

Some clients, or firms appointing on behalf of clients, opt to prepare an approved list of surveyors, setting criteria for eligibility; this will also be discussed in a future article.

Asbestos removals

After removing asbestos from a building or land, an asbestos removals contractor arranges for its disposal to a licensed landfill site. The firm may need to be licensed by the HSE, depending on the type of material and the risks inherent in removing it.

Higher-risk removals must be carried out by **licensed contractors**. Such work includes, for example, dealing with sprayed coatings and removals that may disturb pipe lagging. It can also involve loose-fill insulation and work on asbestos millboard, among other types. All such work is done within a separate, tented and sealed area under negative pressure to prevent airborne asbestos fibres escaping.

The HSE maintains a list of licensed contractors. The fact that a contractor is licensed does not mean, however, that its work is approved or guaranteed by HSE, or that it should be automatically trusted to proceed with removals without being closely observed and monitored. This will include scrutiny of its risk assessment and plan of work, or independent monitoring by a laboratory analyst as works progress.

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By Adrian Tagg MRICS

Appointing an asbestos analyst

The client should directly appoint an independent UKAS-accredited laboratory to monitor the removal of licensable asbestos. Again, there is a statutory requirement for this laboratory to be UKAS-accredited for testing.

Testing includes measurement of airborne asbestos fibre levels; for example, sampling outside the tented or enclosed work area to check for possible dust escape while the removal work is in progress.

There is a legal requirement to clean the areas where asbestos has been removed. For licensable work, this is then checked and certified by the analyst. That involves carrying out the four-stage clearance process set out in the second edition of HSE's **Approved Code of Practice L143, Managing and working with asbestos**.

Completion and certification

It is also mandatory for the analyst to issue the certificate for reoccupation. These procedures confirm that all asbestos has been removed, and that the tented or enclosed area inside which the removal has been carried out is safe for reoccupation.

Direct client appointment is important so as to avoid the contractor employing the analyst itself and influencing test and inspection results. While inspecting the removals area, the client-employed analyst can also assess any alleged additional work for which the asbestos removals contractor claims, although this represents an extra service.

This is a significant task, because most construction professionals administering such a contract are not adequately trained to enter an asbestos removal enclosure. Furthermore, their employers are not usually appropriately insured or sufficiently knowledgeable, prepared or organised to manage staff who have such direct exposure. An asbestos consultant could also give advice on this, following site inspection.

Although such monitoring and analysis is a separate operation from asbestos surveying, it is a service often provided by asbestos survey companies that have their own laboratories.

Understanding all these asbestos-related roles and the process of identifying, managing and removing the material can make for more efficient and safer practice that complies with the relevant regulations.

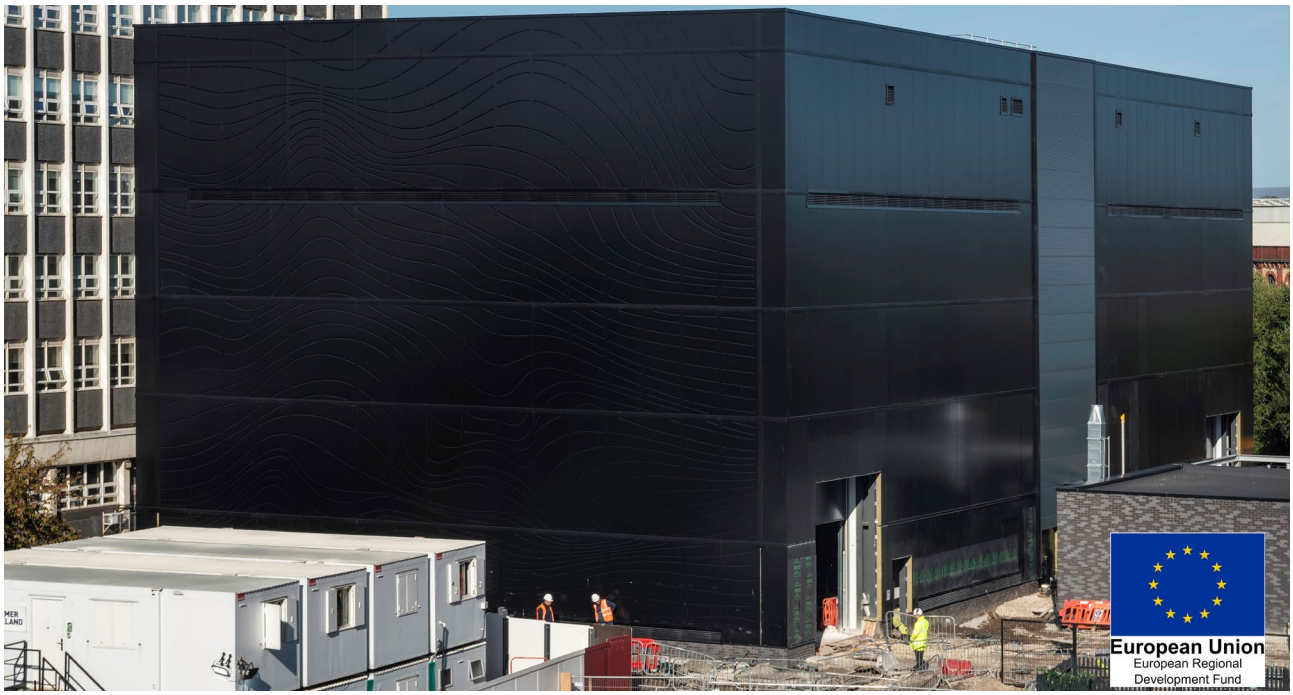
Jeffrey Tribich would like to thank other members of the group for their comments and suggestions in writing this article

Jeffrey Tribich
is the founder of Jeffrey Tribich Consulting and a member of the RICS Asbestos Working Group
Contact Jeffrey:
jeffrey.tribich@gmail.com

Related competencies include:
Client care
Communication and negotiation
Health and safety

How Energy House 2.0 supports net-zero agenda

BUILT ENVIRONMENT JOURNAL
First published 13 January 2022



Energy House 2.0 in November 2021 © McCoy Wynne for University of Salford Art Collection

The soon-to-be-completed Energy House 2.0 broadens the scope for testing net-zero homes in practical scenarios

By Prof . Will Swan
Dr. Richard Fitton

Energy House 2.0 at the University of Salford is due for completion in February. Part-financed by the European Regional Development Fund, the £16m project represents a major investment in the transition to net-zero homes.

The launch of the facility will be timely. As host of the recent COP26, the **UK government** committed in its October **net-zero and heat and buildings strategies** to change the way we power and warm our homes.

The proposed **Future Homes Standard** also makes far greater performance demands, targeting emissions reductions of 75–80% for 2025. But traditional building methods may not be up to the task.

The government's commitment to low-carbon technologies such as air-source heat pumps, district heating and potentially hydrogen means we need to improve the performance of new and existing homes. This will require new technical approaches.

Off-site manufacture, low-carbon heating technologies and smart domestic energy systems, which incorporate renewables and energy storage, will all help. But we will need to innovate rapidly and understand how these technologies perform in practice as whole systems.

A new way of testing

In 2011, Energy House Laboratories at the University of Salford changed the way low-carbon innovations could be assessed. The first facility it developed was the **Salford Energy House**, a Victorian end-terrace in an environmental chamber.

This enabled sustainable retrofits to be tested at a whole-house scale in repeatable conditions, establishing performance in a matter of weeks. By comparison, demonstrators can only provide limited data while large-scale field trials are costly, and both take many months.

However, the design of the original Energy House was limited in terms of archetype, which represents only 20% of UK homes. Furthermore, only limited weather conditions could be simulated. **Energy House 2.0** will instead allow different types of home to be tested under much wider environmental conditions.

Constructing Energy House 2.0

Energy House 2.0 is 48m long, 22m wide and 19m tall. It consists of two 380m2 environmental chambers, which generate identical environmental conditions. They can create temperatures between –20C and +40C, while rigs will provide wind, rain and snow. The rigs also include lamps that replicate solar gain as closely as possible. The two chambers are serviced by a central core, which houses workshop and laboratory spaces, control systems and water tanks.

Work on the project started in August 2020 with the relocation of the existing car park. The first phase of construction on groundwork elements then began. This involved the creation of two large pits and the concrete foundations for the building.

The pits were designed to provide realistic ground conditions. Siting these pits in the base of the chambers minimises the impact of the external environment on test homes. It means we can provide a realistic assessment of heat loss through the ground.

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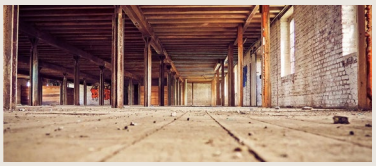


Can dilapidations achieve net-zero carbon?

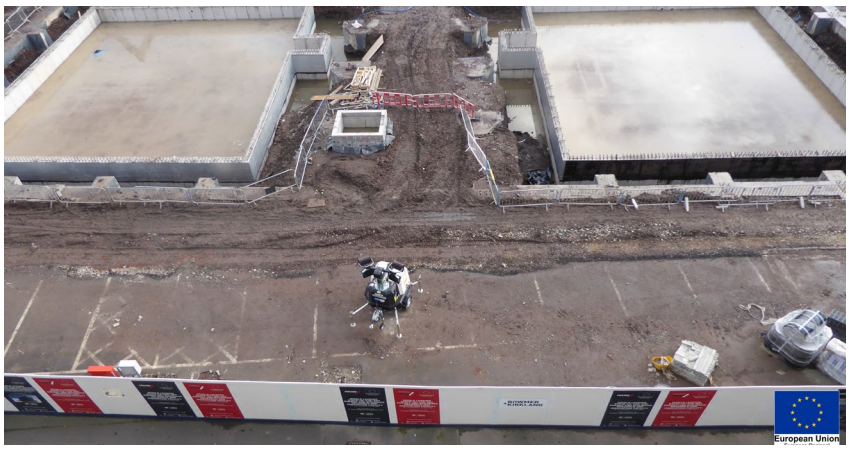
By Jon Rowling

How Scotland's social housing sector can achieve net zero

By Cassandra Dove

Unlike the original Energy House on its concrete plinth, this purpose-built facility was able to include a heat-flux sensor array. This allowed ground conditions to be fully evaluated in the context of building performance.

Next, the steel frame was put up and the insulation added. This is more than 320mm thick to condition the chambers effectively and ensure high performance.



Redevelopment of the former car park site © Richard Fitton

Steel frame ready for cladding, while insulation is added to the chamber pits © Richard Fitton

The chamber interior in October 2021 © McCoy Wynne for University of Salford Art Collection

Once the building shell was completed and the pits were filled with soil, the chambers and environmental control systems were constructed.

Costing around £6m, the heating, ventilation and air conditioning represents one of the largest packages in the project. After this will come the commissioning phase, which is due to be completed in early February.

See drone footage of the project on Youtube.

Partners to help in demonstration phase

Once construction is finished there will be a demonstration phase. We will work with three partner consortia to build different properties that improve our understanding of net-zero homes.

Bellway
The property developer is building a house to test how low-carbon heating technologies will work in combination with building fabric, efficient services, and renewable energy in practical scenarios.

Muse
This developer will build apartments to explore commercially viable net-zero innovation for construction. The findings will inform the sustainability of the Crescent Masterplan, a £2.5bn regeneration scheme in Salford.

Saint-Gobain
The low-impact building developer will be researching modern, light and sustainable construction, to see how it can help meet and exceed standards for homes in the future. It will use the facility for practical testing of building performance and new products.

Alongside the Energy House Laboratories team, the partners' work represents a detailed study into the future of new-build housing that will be central in the transition to net zero.

In the short to medium term, the team anticipates that the greatest demand will be for researching integrated energy systems. These use smart technology to combine renewables, storage, heating, and electric vehicle charging into single systems. There is also demand to better understand energy consumption and fabric performance in homes manufactured off site.

In the longer term, we see opportunities beyond the built environment. Energy House 2.0 is one of the largest environmental chambers in Europe, so the team can engage with vehicle manufacturers, assess emergency shelters, and look at how machines or even people perform under different conditions.

Prof. Will Swan
is the director of Energy House Laboratories in the School of Science, Engineering and Environment at the University of Salford
Contact Will:
w.c.swan@salford.ac.uk

Dr Richard Fitton
is a reader in energy efficiency in the School of Science, Engineering and Environment at the University of Salford
Contact Richard:
r.fitton@salford.ac.uk

Related competencies include:
Construction technology and environmental services
Sustainability

Improving building safety through qualification

BUILT ENVIRONMENT JOURNAL
First published 10 February 2022

By Martin Cawley

A dedicated degree and other initiatives aim to ensure that building control professionals are properly qualified to carry out vital building safety work

The UK building control profession has been through a turbulent few years. Appropriately qualified staff are few and far between, but they have had to contend with new regulations and ensure tragedies such as the Grenfell Tower fire never happen again. At the same time, we have all been dealing with a global pandemic. It certainly hasn't been straightforward.

Emphasis on qualified personnel

A key message from the **Hackitt report** was that professionals working in building safety need appropriate qualifications. These people need not only to understand new regulations, such as those to be introduced by the **Building Safety Bill**, but how to put them into practice. This does not just happen by osmosis. Professionals need proper investment and training if we are going to see change.

At the University College of Estate Management (UCEM), our academic team has been working closely to develop new degrees with our employer base and the Association of Consultant Approved Inspectors (ACAI), who are soon to become building control approvers under the changes proposed in section 42 of the Building Safety Bill.

One of these is our RICS-accredited **BSc (Hons) Building Control** which was launched in **May 2019** with the first intake starting their studies that September. It is the most important programme that we've created in recent years. Discussions for the development of this programme started in July 2016 with a meeting involving Andy Crooks, chief executive of JHAI. The discussion centred around the need for an online programme that delivered more building control specific content than, for example, quantity surveying. This then led to a collaboration with the education committee of the ACAI where the outcome was to determine what the modules would be.

The degree is ideal for those interested in building technology, standards, fire safety, inclusive environments and energy conservation. It can be taken by those working for local authorities or the private sector, as well as approved inspectors.

Teaching is conducted online, and it takes four-and-a-half years to complete the 17 modules part-time. Modules cover topics such as property law, design and environmental science, fire safety and construction technology, and there is also a project module in the final year.

The degree can be started in either autumn or spring. It enhances career prospects, and covers all the skills necessary to become a successful chartered building control surveyor.

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Affordable and accessible apprenticeships

The degree is also available as an apprenticeship programme. UCEM has recently had its degree apprenticeship provision inspected by Ofsted and been given the overall rating of 'Good' with the area behaviour and attitudes being given an 'Outstanding'.

The Apprenticeship Levy means that educating staff is affordable. Smaller businesses only need to pay 5% of the training costs for an apprenticeship programme, while larger businesses can use their levy pot for 100%. If a business has fewer than 50 employees, the government will even cover 100% of training costs.

Apprenticeships can be used to train any employee, not just college leavers. UCEM currently has more than 70 apprentices aged 40 or above, with more to join in our spring intake. This proves that it's never too late to start learning.

Forum fosters collaboration and engagement

UCEM has also developed a building control forum. This brings together key bodies and employers of all sizes to share best practice, support and coordinate apprentice recruitment, identify placement opportunities, and support more relevant CPD. Our first meeting was on 3 February, and focused on attracting a new generation into building control. Initially the forum will be for employers supporting the UCEM apprenticeship programme, and as it grows the aim is to open it wider.

Helping to ensure that our buildings are safe has never been more important. Our priority should be to ensure that those responsible for safety have the necessary training and qualifications to provide the highest-quality buildings.

A helpful way for us to prioritise building control is to stop thinking about it as control and start thinking of it instead as building safety. When we start referring to it this way, we can see that there is nothing more important in the built environment.

Gary Strong, RICS' global building standards director, comments: 'Collaboration is key to ensure that everyone in the sector prioritises building control and invests in it, producing skilled, competent professionals. This is a subject that I'm passionate about, and I'm pleased to see UCEM paving the way.'

"Collaboration is key to ensure that everyone in the sector prioritises building control and invests in it, producing skilled, competent professionals"

Gary Strong

Martin Cawley is associate director at UCEM
Contact Martin: m.cawley@ucem.ac.uk

Related competencies include:
Building control inspections
Fire safety
Legal/regulatory compliance

How digital platform enhances remote inspection

BUILT ENVIRONMENT JOURNAL
First published 20 January 2022

With the pandemic making it less safe for building control surveyors to work on site, the University of Strathclyde has been developing a way to support more effective remote inspections

By Andrew Agapiou

The COVID-19 pandemic is transforming working practices, especially in construction. With these changes comes the opportunity to embrace digital approaches and remote working.

In 2020, researchers from the University of Strathclyde received funding to develop an online platform for remote building inspections from the Construction Scotland Innovation Centre i-Con Challenge. This nine-month project aimed to enable the safe monitoring and inspection of construction sites during the pandemic.

To achieve this, the researchers created immersive, 3D environments by combining mobile technologies and artificial intelligence (AI). This enabled construction sites to operate safely by limiting the need for building standards verifiers to be physically present on site.

Remote inspections recommended

Whether the construction industry should revert to pre-pandemic practice – especially considering the continued need for social distancing where workers are still on site – is currently the subject of industry debate.

If adherence to the government's one-metre-plus social distancing guidelines is not practicable on site, employers should implement the measures set out in the **latest COVID-19 guidance**.

However, there are clear benefits to using digital technology in remote or difficult-to-access sites, improving time management and productivity. The UK and Scottish governments are encouraging surveyors to conduct inspections and assessments remotely as far as possible.

Aims of the platform project

The Strathclyde project not only minimises operators' need to be on site, it enhances remote inspections by giving greater insight into data collected. It will also help the Scottish government's Building Standards Division work with stakeholders to develop digital verification of construction standards.

The aims of the project were twofold. The first was to analyse how mobile and wearable technology can enable digital cameras to take images to analyse offline. The second was to understand how such methods can be combined with AI to make identification and sizing of any building defects faster and more repeatable using virtual reality (VR).

The focus was on prototyping a 3D immersive environment to inspect wall facade coatings. Such coatings play a significant role in the durability of buildings as they protect the wall against the external environment. This is particularly important in refurbishment and maintenance projects where, for example, building control surveyors need to inspect the adequacy of remedial damp-proofing.

Project partners included the Building Standards Division, Ecosystems Technologies Ltd, Crawford Building Consultants, Robert Gordon University, Balfour Beatty Construction, BDP and the Highland Council, as well as the Construction Scotland Innovation Centre.

There are clear benefits to using digital technology in remote or difficult-to-access sites, improving time management and productivity.

Balfour Beatty and the University of Strathclyde's estates office provided the team with access to the learning and teaching building to help develop and test the prototype inspection process.

How technology supports visual inspection

Visual inspection has until now been the primary technique for assessing compliance with the Scottish Building Standards. This approach is time-consuming, however.

It requires particular tools to access elements of a building that are unsafe or difficult for inspection in person. In certain cases, it may not even be feasible to use these tools, especially if the building is in a remote location or has a complicated structure. Other drawbacks with visual inspection include how to interpret the results correctly, and the fact that the surveyor remains in one position throughout.

Remote inspection systems can make building facade inspection safer, more efficient and more accurate. Digital platforms can also enable stakeholders to collaborate simultaneously and review specific elements of a building on a remote basis. This gives occupants and the wider community meaningful ways to engage with a building programme.

To exploit this potential, the project established a framework for integrating methodologies and tools, including VR and digital photogrammetry. This allows collection of real-time data and supports automated decision-making.

Central to the new platform is an interactive VR environment. This enables 3D modelling, BIM and machine learning-based image processing and segmentation to work together.

Accordingly, the system architecture includes visual image collection and processing, accurate acquisition of building geometry, and identification and localisation of defects and anomalies in the fabric. It also includes VR and game-like applications for collaboration.

The research established that creating a digital twin of a building can improve the effectiveness of surveying, allow for remote investigation, automate and enhance communications, save on costs and increase productivity.

The intention was to prototype a virtual environment that combines a 3D model with a machine learning-enabled defect database

Applying AI to a university building

The research demonstrated how AI could be used to inspect the University of Strathclyde's School of Architecture.

The three-storey building was designed by architect Frank Fielden, a professor of architecture at the university in the mid 1960s, as part of a post-war campus in an otherwise residential area. It was listed as a grade B building by Historic Scotland in 2012.

The school was designed in the modernist style. It has a recessed ground floor with 12 prominent, two-storey projected bay windows above, and a roughly square lecture theatre. An exposed, in-situ concrete frame supports a base course, band courses and 20 parapets. There are also blue and black bricks in stretcher-bond external cavity walls.

The building has copperised felt cladding on lightweight concrete Siporex panels on all elevations. This was installed alongside replacement of external window units, a limited services upgrade, fabric repairs, internal reconfiguration and decoration. Following these works, the building was physically incorporated into the university's learning and teaching hub.

The research project used image processing to detect and localise defects arising from dampness and deterioration of facade cladding elements.

3D model of the University of Strathclyde's architecture building, generated from the laser scan and analysis of aerial photogrammetry data
Andrew Agapiou © University of Strathclyde

The AI inspection tool also incorporates 3D laser scanners, drone technology, BIM, VR and gaming software to carry out visual exploration.

We created a database to support this system that includes bibliographic research on the facade materials used, their potential anomalies and common corrective maintenance measures.

Building data into a virtual environment

The intention was to prototype a virtual environment that combines a 3D model with a machine learning-enabled defect database. This would allow collaboration by parties interested in generating, transforming and analysing data; so, for example, different partners on a project can define and consult inspection reports. The platform links the characteristics of the exterior facade elements to building condition monitoring and maintenance activities.

The first stage of the project is now complete, with the successful development of a desktop prototype. The team has also created a 3D immersive environment for a sample building, minimising the need for quantity surveyors and health and safety inspectors to be physically present on site.

The platform gives building control inspectors and the wider professional community meaningful ways to monitor and interrogate building repair and maintenance activities. The prototype can be accessed online to navigate the 3D environment using mouse and keyboard, as well as view, filter and assign defects on the facade. A mobile app is also in development to complement the desktop version.

One of the initial outputs of the project is a large, public set of images of defects to brick and concrete facades. These can be used by professionals to develop algorithms, carry out tests and compare any defects they encounter with reference images.

Future functionality and new facilities

The research team is currently working on the second phase of development with the Building Standards Division. This aims to develop new plug-in features to improve the accessibility and functionality of remote building inspection.

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By Flora Roumpani

These features include:

- offline functionality
- a document search and retrieval facility
- a plug-in application that will extract compatible 2D and 3D approval drawings from a document management system and transfer them to an inspector's mobile device
- a defect extraction format that can be integrated with inspection records to allow for ongoing reporting.

The team will then test the functionality of the upgraded platform with building control inspectors in Scotland. The initial results of these tests will be analysed to develop an accessible, low-cost platform to detect building standards violations from image data. This will combine image-processing technologies, VR interfaces and AI.

These techniques were initially developed to detect and quantify violations of thermal insulation, acoustic insulation and fire-stopping codes from images alone. The same techniques could be readily applied to monitor a range of other conditions and carry out Building Standards inspection activities where image data is routinely collected. This will include among other things the inspection of historic and inaccessible buildings and bridge structures.

The project team hopes to develop a tool that could be rapidly taken to market, providing a timely and efficient means of comparing buildings with their designs. The use of innovative environmental data collection techniques, from low-cost mobile to rapid 3D scanning technologies, will have future applications in asset management.

The team also envisages an overarching, top-level platform that can be used to frame the various information sources and generate an extended digital twin for the building. This will act as a common information model for plug-in modules that focus on specific areas of enquiry.

Andrew Agapiou is a senior lecturer in architecture at the University of Strathclyde
Contact Andrew: agapiou@strath.ac.uk

Related competencies include:
Building control inspections
Building pathology
Work progress and quality management
Legal/regulatory compliance

What the industry can do to hit net zero

BUILT ENVIRONMENT JOURNAL
First published 5 January 2022

English Cities Fund's New Bailey, Salford Central scheme is targeting net zero carbon in operation © Make

By Simon Wyatt

Following COP26, the eyes of the world are on the UK's progress towards net-zero carbon. The built environment sector can lead the way by sustaining and strengthening its commitments

COP26 was always going to be a significant milestone in the global fight against climate change. The Glasgow conference aimed to review the Paris Agreement of 2015, which committed to keep global warming well below 2C, with an ambition of 1.5C.

Since the UK is already committed to net zero by 2050, the pressure on industries – particularly high emitters such as construction – has been increasing exponentially. With the government's interim target of 78% reductions by 2030 aligning with the 1.5C Paris trajectory, it is now clearer than ever that we must act.

However, while the commitment is there, the UK does not yet have the legislation or policy to support it. At times this makes progress toward net zero painfully slow. But even without legislation guiding the way, the built environment can do much more than it is currently doing to achieve net zero.

Industry takes the initiative

The UK's Committee on Climate Change has recommended reductions for new and existing assets alike. Yet we are already seeing the industry prepared to go much further.

Many local authorities have set dates earlier than 2050 for achieving net zero. Developers are therefore signing up to initiatives such as the Better Buildings Partnership (BBP) Climate Commitment and the World Green Building Council's (WGBC) Net Zero Carbon Buildings Commitment. Together, these set the minimum standard for developers that are serious about achieving net zero carbon.

The BBP commitment is one of the most ambitious that developers can adopt. Signatories must publish their net-zero carbon pathways and implementation plans and disclose the energy performance of their assets. They also have to develop comprehensive climate resilience strategies.

Meanwhile, signatories to the WGBC commitment declare that the buildings they control will be net zero by 2030. This encourages an aggressive global push towards energy efficiency, and a shift from fossil fuel to renewables. It also includes requirements to reduce embodied carbon emissions.

This leaves little space for developers to hide. Most recognise that it is not sufficient to be carbon-neutral by offsetting their footprint. Instead, they want to set targets that require absolute reductions in carbon in line with the latest climate science. Only then will they look to offset.

Most [developers] recognise that it is not sufficient to be carbon-neutral by offsetting their footprint. Instead, they want to set targets that require absolute reductions in carbon

Financial frameworks help reduce carbon

Finance is also having an influence, and major investors are increasingly vocal about what they expect. There is now increasing pressure on pension and hedge funds to meet more stringent environmental, social and governance (ESG) criteria, including net-zero carbon and climate resilience.

Several frameworks and reporting processes have also sprung up over the past few years to help businesses. One is **Science-Based Targets (SBT)** a global initiative including environmental charities CDP and WWF as well as the World Resources Institute (WRI). It encourages businesses to set carbon reduction targets in line with the latest climate science.

SBT has recently published a **net-zero carbon blueprint** for businesses. This makes clear that organisations will be required to take responsibility not for just the impacts of their own operations but also their supply chain's emissions.

The investment community may not realise it yet, but pushing such targets will effectively force developers and contractors to measure and lower embodied carbon, in line with climate science. That means a reduction of at least 50% for all buildings by 2030.

Meanwhile, the **Task Force on Climate-related Financial Disclosures (TCFD)**, which was created in 2015 by the international Financial Stability Board (FSB), aims to improve climate-related financial reporting. It has encouraged a considerable rise in reporting over the past year. This increases pressure on developers to prioritise net-zero carbon for new and existing buildings.

Assets and portfolios that do not act run the risk of losing value. As decarbonisation requirements increase over time to align with Paris and net-zero-carbon trajectories, assets that overshoot are vulnerable to financial penalties, devaluation and funding problems.

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Expectations for legislation

This still leaves legislation. In October, the government published its Heat and Buildings Strategy, setting out how the UK will decarbonise its building stock. Although it is a good start, however, the document lacks detail.

The parliamentary Environmental Audit Committee is meanwhile conducting an inquiry on the sustainability of the built environment. This is reviewing the role of the built environment in meeting net-zero carbon commitments. But it needs to act decisively to put all necessary requirements in place in the next year.

The RIBA 2021 ethics and sustainable survey found that these should include:

- mandatory upfront and whole-life embodied carbon assessments for all new and major refurbishment work
- mandatory public disclosure of operational energy performance of all buildings, with sliding minimum targets to 2050
- a ban on new gas boilers for all buildings
- subsidised insulation and energy efficiency works for existing homes and public buildings.

There is also a call to level VAT on new and existing buildings, because it's currently cheaper to knock down and rebuild than it is to retrofit. Some even argue that there should be no VAT on retrofit and full VAT for new builds.

But it's also worth acknowledging how far we have come in only a couple of years. We now have clear commitments and engagement at all levels. Industry standards and definitions are also starting to align, and best-practice examples, tools and guidance are available from the likes of **LETI** and **UKGBC**.

Most importantly, the industry has the will to change.

COP26 can be the springboard for the industry to meaningful action to meet our commitments and limit global temperature rises to 1.5C.

Simon Wyatt is a partner at Cundall
Contact Simon: s.wyatt@cundall.com

Related competencies include:
Construction technology and environmental services
Legal/regulatory compliance
Sustainability

Coordinating conservation of the UK Parliament

BUILT ENVIRONMENT JOURNAL
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By Andrei Iulian

Restoration and renewal of the Palace of Westminster is essential to remedy many thousands of issues and defects. Multidisciplinary collaboration and BIM are making that work possible

The Palace of Westminster is one of the most recognised buildings in the world. Yet despite maintenance works, it is falling apart faster than it can be fixed. It is in urgent need of essential restoration.

The 150-year-old building is at risk of a major fire, flood or falling masonry. The cost of both proactive and reactive maintenance projects as well as ongoing works has doubled in just three years. It is now more than £125m annually, or in excess of £2m a week.

Since the start of 2017, more than 40,000 problems have been reported by the maintenance team. There is asbestos throughout the building, and historic Victorian water and sewerage infrastructure runs alongside old heating, mechanical and electrical systems.

Structure for surveying

Parliament has set up two organisations to handle restoration and renewal. A sponsor body will plan and oversee the programme and a delivery authority will carry out the works.

During RIBA Stage 2, the programme is performing around 100 surveys. A significant proportion of these will require a number of people working on site at one of the busiest buildings in the UK. To date, 43 surveys have been completed, involving more than 50 engineers, building surveyors, acoustics and lighting specialists, and ecologists.

Over Parliament's summer recess, 11 site surveys investigated the building. In total, 2,343 rooms and spaces were examined in this period. Experts recorded thousands of issues, including cracks in stonework and widespread water infiltration. They also analysed the complex network of outdated electrical and mechanical systems.

A visual condition assessment helped gather critical information on defects already reported, as well as local and wider structural problems. It also highlighted areas where urgent works are required before restoration and renewal can begin.

Examining the historic light fittings was one of the more distinctive surveys this summer. This determined the provenance, build quality, typology and condition of each lamp. A variety of fittings were recorded, from large Flemish chandeliers that survived the 1834 fire, through fittings installed in the first electrification of 1880, to a range of hexagonal lights added since 1920.

Building model integrates information

All the information gathered through desktop studies or site investigations must be incorporated into the design model. This combines the programme's database and a 3D model of the Palace of Westminster. It also contains hyperlinks to relevant information in the common data environment.

The 3D model of the palace is structured in line with BIM best practice. This entails splitting it into 52 files representing specific areas of the buildings, including the ventilation voids.

There is asbestos throughout the building, and historic Victorian water and sewerage infrastructure runs alongside old heating, mechanical and electrical systems.

For costing and planning purposes, the model has been divided into 15 above-ground strategic zones plus four in the basement. With the need to develop various design options simultaneously, this has become a highly complex design model.

New information is constantly being collected and collated with the vast amount already held on the database. In the scoping phase for the surveys, the structure and the specific requirements for all data collection are established. This ensures quality control and consistency when integrating such diverse data sets. The design model is aligned with all parliamentary and industry standards, including Uniclass 2015.

The programme, and in particular the heritage and architectural team, has pushed the boundaries of what this application can do for an historic building. This has resulted in some heritage-specific additions to existing classifications.

Exciting work in this area has included cataloguing heritage objects using technology. This showed how much detail can be embedded in the 3D model and the database. The programme focused on a small proportion of more than 25,000 objects in the heritage collections. Digital visualisations for instance are enabling easier categorisation of objects and planning for their decant from the palace.

Developing a detailed record

Most of the work being done – and the quality of the outputs – would have been impossible without coordination between disciplines. The heritage collection project, for instance, combined expertise from the heritage and the data and digital teams, with parliamentary colleagues providing architectural insight. All of this was managed by principal design partner BDP.

The outputs are easily accessible all professionals working on the programme. They show the power of collaboration across multiple disciplines, which was enabled by early adoption of BIM.

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This winter and throughout 2022, more detailed work including intrusive surveys of the building structure will be completed to continue building a detailed record of the palace. The programme is developing a detailed plan that will set out accurate costs, timescales and full detail of the essential work needed. This plan will be brought before Parliament to consider before the main building phase can begin.

Restoring Parliament will boost UK industries, using British materials wherever possible. It will create thousands of jobs in areas from engineering and hi-tech design to traditional crafts such as carpentry and stonemasonry. The programme is already recruiting apprentices and interns and will employ thousands more as restoration continues, involving craftspeople and businesses in a national effort.

Andrei Iulian is BIM manager and surveys lead of the Houses of Parliament Restoration and Renewal programme
Contact Simon: andrei.iulian@r-r.org.uk

Related competencies include:
BIM management
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Americas, Europe, Middle East & Africa
aemea@rics.org

Asia Pacific
apac@rics.org

United Kingdom & Ireland
contactrics@rics.org

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