RIBA
Plan for Use Guide

RIBA
Plan of Work

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Architecture.com

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Cover image: David Attenborough Building © Julieta Sarmiento ORP

Foreword

There is no silver bullet. Averting the climate emergency demands radical, multi-dimensional change from all of us, designers, developers and users of the built environment alike. But when I was standing for election as President of RIBA, I was frequently challenged to name the one thing that I would like to see by the end of my two year term of office. In response, my answer was always the same: A consistent approach to Post Occupancy Evaluation that could be offered as part of Architects' normal service offering on any project to any client.

My campaign slogan was '#ChangeIsNecessary', and I argued for the basic behavioural change necessary to create an industry equipped with the feedback loop necessary to build a body of data and knowledge for continuous improvement. If not a silver bullet, this is surely the essential pre-requisite, not only to overcoming the existential threat of climate change, but also to restoring an understanding of the value our profession brings to our clients and wider society in myriad other ways too.

This publication has been in the making for some time, hampered by the unusual events of the Covid-19 pandemic. But I am delighted that it now joins the impressive suite of guidance such as the Sustainable Outcomes Guide to sit alongside the Architects Plan of Work 2020. Collectively, the guides are essential tools in turning an industry focused on capital cost to one that delivers on outcomes of planetary and human wellbeing. I hope these documents will enable a growing number of practices to adopt and deliver the stretching targets set out in the RIBA's Climate Challenge 2030.

There are obstacles of course. Fragmented procurement processes make it difficult to maintain the necessary continuum through the project life-cycle. Insurers may not be keen to encourage scrutiny of a kind that might reveal liabilities they would rather leave undiscovered. But establishing that 'golden thread' through any procurement process is an outcome of the Hackitt Review on which we must deliver.

There are innovations we can pursue as a consequence of the virtuous cycle of post occupancy evaluation. Performance based procurement of both professional services and construction are opportunities for a win-win through empirical measurement of selected outcomes that drive improvements for businesses and customers alike. For the professions, that would be the sure fire way of overcoming the common complaint that their contribution is undervalued.

I am grateful to the team at RIBA, and the members who contributed their time voluntarily to create this guidance. It is now down to all of us to argue persuasively for its adoption in practice, and to show policymakers the way to performance evaluation in the procurement of a built environment that serves the needs of the planet.

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Introduction

Of the challenges our profession and industry face in the coming decade, none are more pressing than those posed by climate crisis and the Grenfell tragedy. Our response will define our profession as a progressive force for change: to be on the 'right side' of history.

The clock is ticking. The financial crisis of 2008 and the decade of austerity that followed has seen a flat-lining of policy responses to carbon emission reduction across the developed world. So now, alongside other sectors, the construction industry must deliver an unprecedented programme of carbon reduction over the next 10 years. Investment in renewable energy, comprehensive adoption of passive design, whole-life costing and reduction in embodied carbon, alongside alignment with green infrastructure and transport must become standard if we are to avoid the worst impacts of climate change.

Dame Judith Hackitt's Report into the Grenfell Tower fire and Building Regulations was rightfully damming in its condemnation of the current state of our industry. In the preface she writes: "Ours is an industry which has not reflected and learned for itself". Grenfell exposed the danger of prioritising cost over quality, opaque regulation with 'just enough' compliance as well as the devolution of quality control and inspection.

With determination and application of the right strategy, we can and must achieve zero carbon buildings which perform to (or ideally better than) the expectations of client, designer and end user. We must place greater emphasis on performance outcomes right from the start of a project, even prior to briefing, and have a strategy that embeds this emphasis throughout the project programme. Plan for Use is an essential part of this strategy which needs to be deployed if the challenges of the climate crisis and the Grenfell tragedy are to be met.

Why is a greater emphasis on performance outcomes needed?

As post occupancy data grows, the gap between design estimates of energy use and the of actual energy consumption is as much in evidence today as it was in the 1990s. This is due in part to the 'design-to-compliance' culture which allows Part L calculations to ignore un-regulated loads (the plugged-in equipment.) This accounts in part to why under estimation of electricity usage is more pronounced than the underestimation of gas. But this is not sole reason behind the performance gap. Over complexity of building services and controls, inadequate or rushed commissioning of building and service installations, lack of design co-ordination and poor-quality control are all contributing factors. These shortcomings not only result in high energy bills and related carbon emissions but may also manifest in lower levels of comfort and satisfaction amongst building users. The table below shows the performance gap factor between design and actual.[1]

Category	Mean Design Total Heat Consumption (kWh/m^2/yr)	Mean Actual Total Heat Consumption (kWh/m^2/yr)	Factor Change Design to Actual - 'Performance Gap'	Mean Design Total Electricity Use (kWh/m^2/yr)	Mean Actual Total Electricity Use (kWh/m^2/yr)	Factor Change Design to Actual - 'Performance Gap'
Office	46	73	1.59	71	121	1.71
Education	57	84	1.48	56	106	1.90

Figure 1. Performance Gap in Office and Education Buildings, source Carbon Buzz.

Author:
Mike Chater, Principal Architect,
Property Services, Hampshire County Council

What is Plan for Use?

Plan for Use is the RIBA's interpretation of the Soft Landings Framework produced by the Usable Buildings Trust and BSRIA.[2] Its aim is to encourage a more outcome-based approach to design, both within the architectural profession and (by extension) to the construction industry as a whole. The RIBA sees the role of the architect as central to this focal shift, with the process defined by Plan for Use translating into a radical change within practice, discipline and profession. The Plan for Use is embedded within the RIBA Plan for Work 2020.

Plan for Use has three basic components:

1. **Set realistic and measurable targets**
   Client, design team and end users should place greater focus on defining performance outcomes or targets as part of the Project Brief. This includes measurable values on energy consumption, embodied and operational carbon, water and waste as well as "softer" measures like user comfort and well-being. Project-specific targets like reduction in patient waiting times may also be stipulated.

2. **Complete Plan for Use Activities**
   The Plan for Use activities described in this Guide will help to ensure that both the design and its construction are capable of meeting the agreed targets, which should be revised as necessary, as the understanding of the design and the client requirements develops in the course of a project. A Record of Performance Risks is used to manage the aspects of design, procurement and construction that might adversely affect the efficient running of the building in use; and to review progress against mitigating these risks.

3. **Measure and feedback**
   A commitment to measuring and evaluating the performance of the building in use to understand the extent to which targets have been met; to allow the building and its services to be fine-tuned; and crucially, to provide valuable learning to inform future projects.

In light of the climate emergency and responding to the United Nations Sustainable Development Goals (SDGs), the RIBA have mapped the most pressingly relevant SDGs to the architectural profession into eight common core outcomes as shown in shown in Figure 2 below.

To help the profession and practitioners achieve these core outcomes, the RIBA has developed a detailed Sustainable Outcomes Guide that provides key metrics, design principles and verification methods for each of the core outcomes. The Sustainable Outcomes Guide presents measurable and realistic targets and is intended to be referenced and used in the first action of the Plan for Use guide.

Thus, the Plan for Use complements the Sustainable Outcomes Guide and the RIBA Plan of Work 2020 in that it provides greater detail on the activities required at each Stage that are to needed to deliver the desired outcomes of high performing, efficient and comfortable buildings. The RIBA recommends using the Plan for Use Guide as part of standard processes on all projects alongside the other new guidance.

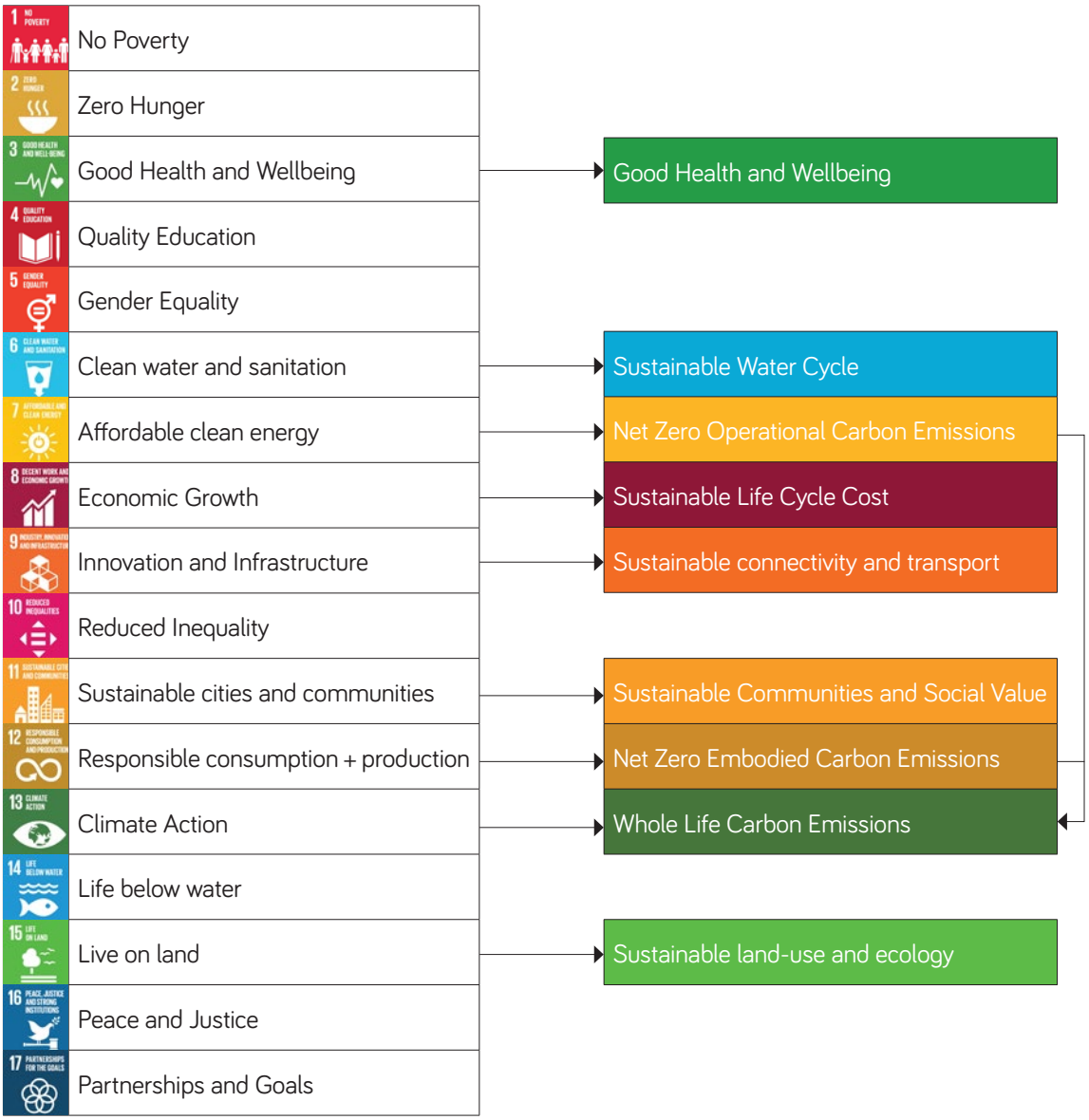


Figure 2. The eight RIBA Sustainable Outcomes Goals mapped against the UN SDGs. Source: RIBA Sustainable Outcomes Guide.

RIBA 2030 Climate Challenge

Whilst working on the Sustainable Outcomes Guide, the RIBA also produced a concisely formatted 2030 Climate Challenge that responds directly to the RIBA's declaration of a climate and ecological emergency. Published not long after the UK declared its ambitious 2050 net-zero target, the Challenge is a voluntary provocation to the architectural profession: to achieve the net zero carbon new buildings by 2030, defining a roadmap with interim energy, water and embodied carbon targets.

The challenge of client adoption, motivation of designers and constructors to realise them in practice should not be under-estimated. The RIBA 2030 Challenge marks a step change both in terms of the ambition of the targets themselves but also a move away from a predictive and theoretical compliance to one which is based upon outcomes.

Whilst there are numerous verification tools for demonstrating compliance with such targets, Plan for Use and Soft Landings are different in that they provide a tactical and strategic framework for explaining how compliance can be practically achieved.

How and When to Use this Guide

At project inception, the architect or project manager is usually best placed to instigate a conversation with the client, explaining how Plan for Use works and its key benefits, including better occupant satisfaction and productivity, lower operating costs and reduced carbon emissions. Plan for Use is not just a tool for improving handover: to obtain maximum benefit, it needs to be applied in all eight RIBA Plan of Work stages. This helps to maintain the "golden thread" from client, design and regulatory intent into operational reality, as identified in the Hackitt report into the Grenfell Tower fire and by Soft Landings Framework.

This Guide identifies activities required at each RIBA work-stage; it outlines how to apply Plan for Use on different forms of contract. The Guide also includes case study examples to illustrate the practical application in range of projects, sectors and scales.

Although directed primarily at architects, the Guide is intended to also assist clients and other building professionals.

Benefits

There are significant benefits of the Plan for Use methodologies on energy performance outcomes. Figure 3 shows two scenarios: a business as usual high energy trajectory, and a lower best-practice trajectory. In the high-energy trajectory, an energy performance gap has emerged contrary to the original design intention. Achieving the flatter trajectory requires energy modelling to be periodically revisited beyond RIBA Stage 2. Fine tuning in RIBA Stage 7 offers opportunities for refinement to building systems and potential to reduce a building's energy demands closer to the original design targets.

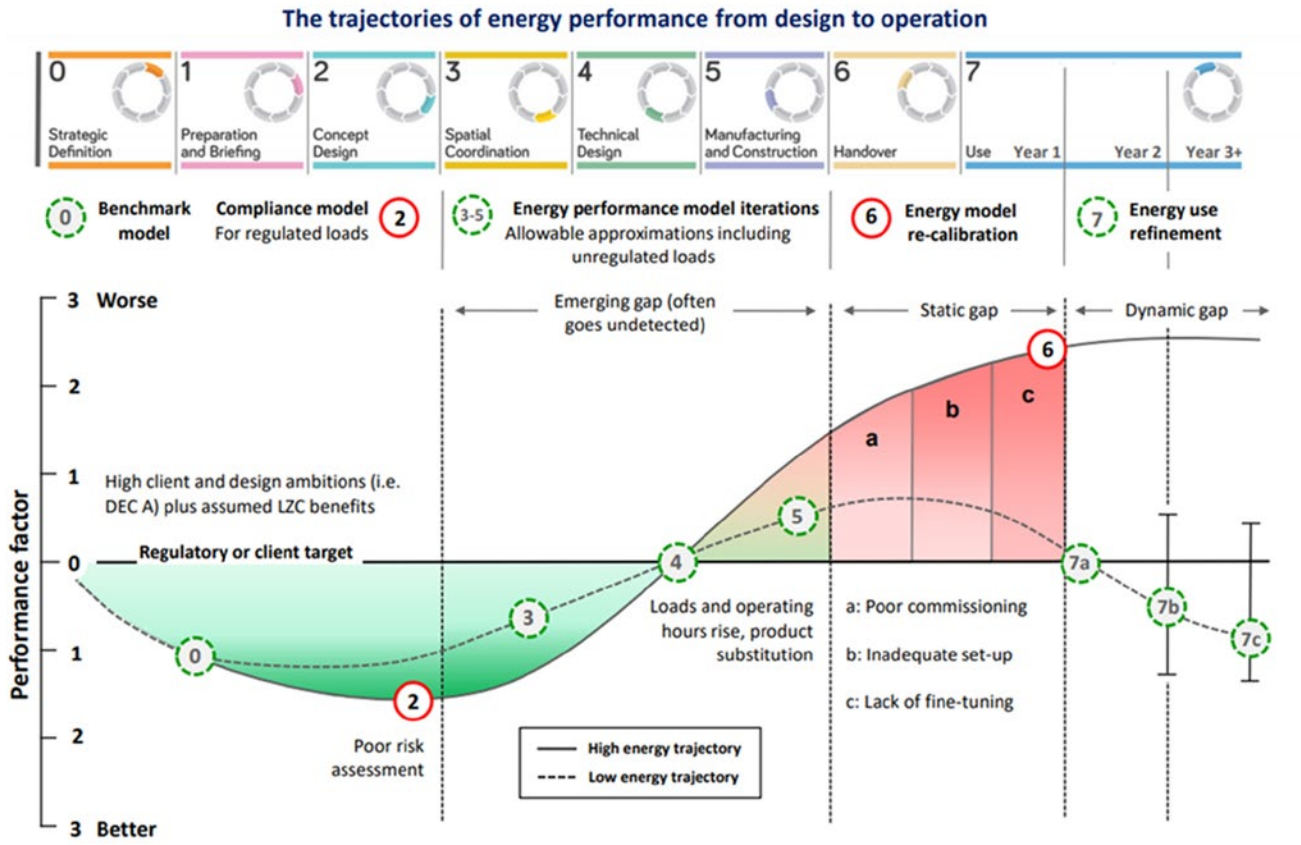


Figure 3: Two trajectories of emerging energy performance during procurement: a 'performance gap' trajectory, and a Soft Landings trajectory with periodic modelling and improvement interventions. (Diagram ©Dr Roderic Bunn. Published in CIBSE TM62: *Operational performance of non-domestic buildings: Occupant satisfaction and GDPR good practice guide.* 2020. Chartered Institution of Building Services Engineers. London.

As clients increasingly demand net zero-carbon buildings, along with contractual penalties for subsequent performance gaps, the call for continual energy modelling in professional appointments will undoubtedly grow.

The performance trajectory principle can also be applied to other performance metrics, such as occupant satisfaction (Figures 4 and 5). Although it is not usually possible to track end-user expectations during procurement, a process of regular reality-checking of critical systems (particularly those with end-user interfaces, like controls) can help to prevent occupant dissatisfaction from emerging in post-occupancy evaluations.

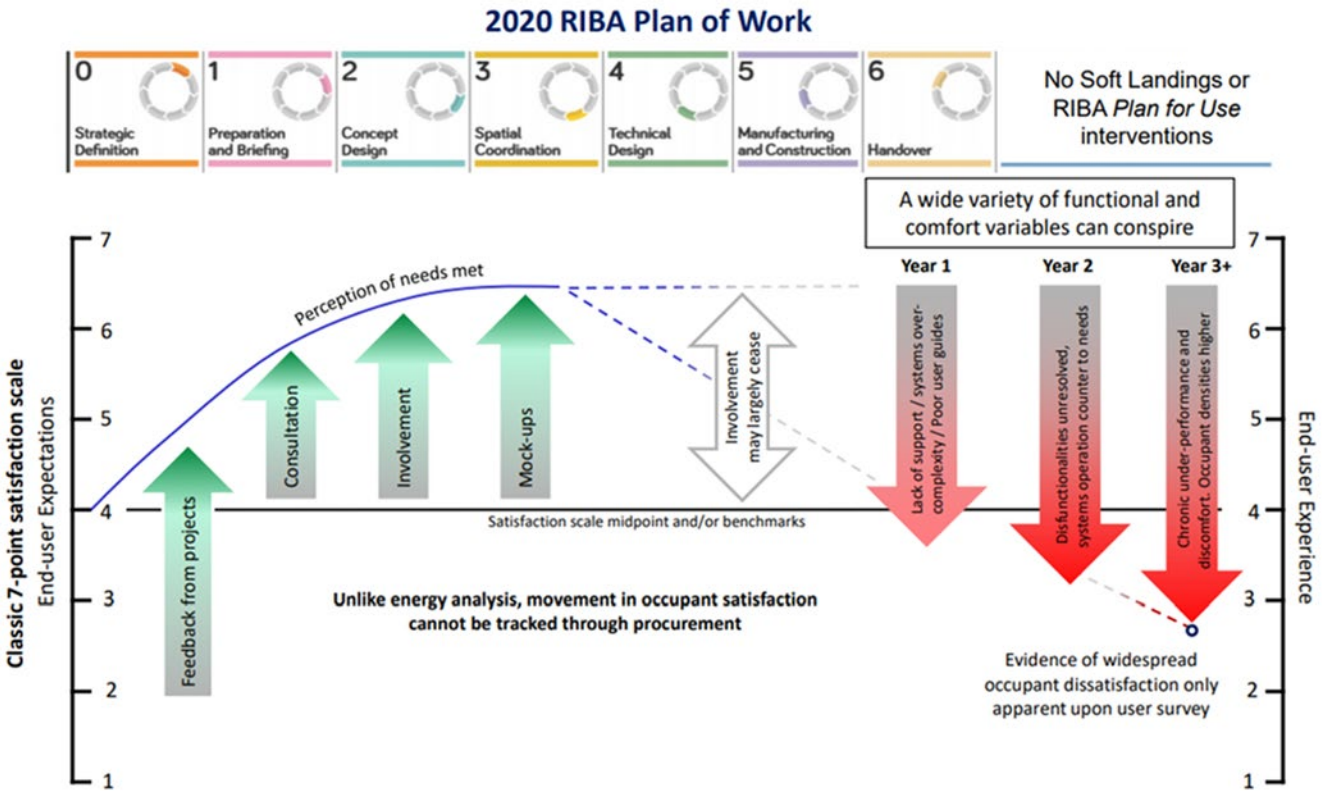


Figure 4: Occupant dissatisfaction can emerge from occupant surveys, despite architects' best efforts during early design consultations. (©Dr Roderic Bunn. Published in CIBSE TM62: *Operational performance of non-domestic buildings: Occupant satisfaction and GDPR good practice guide.* 2020. Chartered Institution of Building Services Engineers. London.

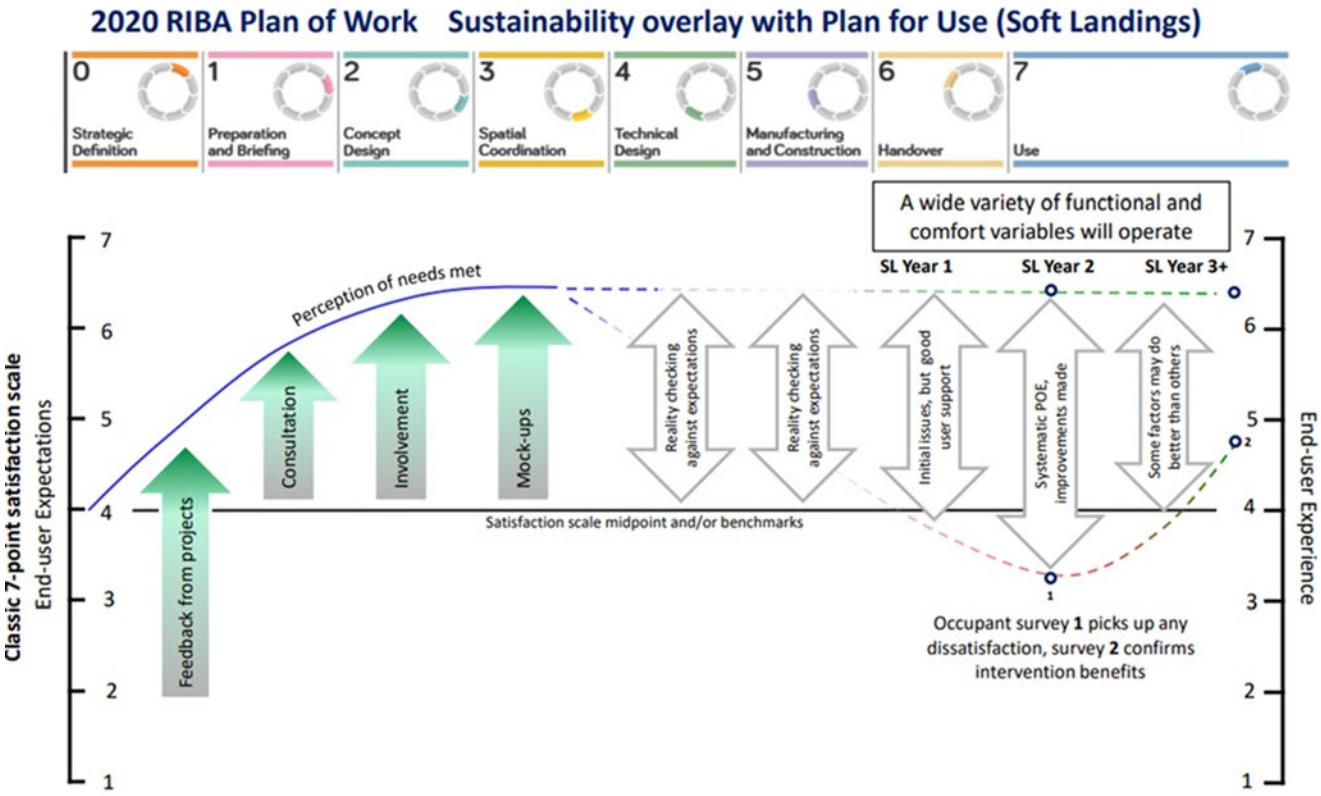


Figure 5: Regular reality-checking of occupant expectations during procurement may increase the likelihood of users' expectations being met. (©Dr Roderic Bunn. Published in CIBSE TM62: *Operational performance of non-domestic buildings: Occupant satisfaction and GDPR good practice guide.* 2020. Chartered Institution of Building Services Engineers. London.

When to use this guide

As can be seen from the above diagrams, the benefits from Plan for Use will be maximised if it adopted at the earliest opportunity i.e. Stage 0 or Stage 1. However, with some types of procurement, the opportunity may not present itself until later, e.g. when an architect has not been novated and joins the project at Stage 4. In spite of this, the adoption of Plan for Use will still be valuable, and the approach will help to procure a better building for everyone.

In due course, the RIBA expects attitudes towards Plan for Use within the profession to become second nature, embedded in everyday practice. The ambition of the tool is to strengthen design and learning within the profession.

Case Study:
The Everyman Theatre,
Liverpool.
Haworth Tompkins Architects.

CHAPTER

1

The Guidance

Stage 0: Strategic Definition

- Explore opportunities for links to other projects or programmes to achieve economies of scale and improve efficiency and review the implications for the scope of the **Client Requirements** and the **Business Case**.

Stage 0 asks the most basic of questions; should the project be a building and if so what kind?

This stage must consider the potential for synergies with other projects or programmes of work as these considerations may lead to new layers of project requirements.

For example, an extension and refurbishment project might be linked to a boiler replacement programme but bringing forward a whole building service upgrade might be more economic in the long-term and worth the earlier capital expenditure. This might in turn prompt a review of whether to increase the scope of the overall refurbishment, altering the client's Project Brief and Business Case.

A larger-scale example is to look at the complementarity of public or private service providers in the geographic area. Could economies of scale create a business case for a multi-client building that would improve efficiency and be less energy intensive?

Case Study:
Havant Public Service Plaza,
Hampshire.
HCC Property Services.

- Review **Feedback** from the existing asset and previous or similar projects.
- Ensure maintenance, whole life cost and **Post Occupancy Evaluation** are considered as an integral part of the **Business Case** and **Client Requirements**.

At the earliest opportunity, clients should be asked how they intend to operate and maintain the facility. Will an existing Facilities Management (FM) contract be retained or extended, or will the project demand a new approach?

Understanding a client's FM arrangements and capabilities is critical to an outcomes-based approach to design. If performance targets are to be met there needs to be a positive relationship between those who commission, design and construct a building and those who will run it. It needs a relationship where all parties provide feedback to each other. It is not just inexperienced clients who can fail to appreciate the value of good FM: large commercial and public sector clients often have very little dialogue between the procurement and operational sides of their organisations.

- Integrate operation, maintenance and whole life cost considerations into both the **Client Requirements** and the **Business Case.**

A Whole Life Cost Plan,[3] can be a good way to tackle this type of question including, for example suitable levels of complexity of electronic controls and Building Management Systems (BMS); an appropriate annual operation and maintenance budget; and what consideration the Project Brief should give to the cost of decommissioning and re-use. More on whole life cost can be found in Stage 2, Stage 0 activities merely identify the extent to which a client is willing to undertake it.

Post Occupancy Evaluation (POE) covers a wide range of building performance review activities. How much will depend on the type and scale of project. Plan for Use embeds a basic level of POE and lesson learning into every project as a standard component of architectural practice: details are given in Stage 6 & 7. The action at this stage is to discuss the benefits of POE with the client and outline the form it may take.

- Review opportunities and **Project Risks** associated with potential future changes of use, operating hours and specific user or tenant requirements that might affect in-use performance.

Identify factors that might have ill-effects on in-use performance and the ability of the building to adapt to needs of future. Addressing such questions early helps to de-risk late changes to the design and consequent potentially costly alterations. Sometimes a building can become a victim of its own success, for example increases in both hours of use and occupation density, which can negatively impact building performance and user satisfaction.[4] Considering such impacts at Stage 0 can ensure that realistic margins are put into both the Project Brief and Business Case.

On smaller projects a client may not have a developed business case, just an expression of need. Similar questions still need to be asked, e.g. will the building have a caretaker, and what might their skill set be? Will this be adequate, or will the Project Brief need changing to suit available caretaking skills? Whole life cost is as valid on a small project as a large one. It may make the difference between electing to invest in renewable technologies, BMS and BIM or not.

Speculative developments are tricky, as capital investors may not be interested in operational performance. However, this is changing as investors begin to see the risks of poor building and environmental performance to future market and rental value; and are increasingly using standards like Well, BREEAM, LEED and NABERS.[5]

Stage 1: Preparation and Briefing

- Incorporate **Feedback** from lessons learned on previous projects or from the existing building's **Facilities Management** team into the **Project Brief**.

Case Study:
NHS Nightingale Hospital, Excel Centre, London, BDP.

- Establish measurable targets for environmental performance, amenity and comfort in the **Project Brief** (e.g. metered energy and water consumption).

UK building regulations currently require post-completion testing across a wide range of measures, including acoustics, airtightness, gas, electrical and fire safety. It is also common practice to undertake CCTV drainage surveys and concrete cube tests. All these serve to demonstrate compliance with a certain level of performance. It is perhaps strange that mandatory testing does not yet exist for in-use energy performance and user comfort. (Part L only requires a theoretical calculation based on regulated energy loads to demonstrate compliance.)

If we are to reduce and ultimately eliminate performance gaps, we must measure our designs under the strain of occupation. Plan for Use requires realistic building-in-use targets to be agreed as part of the Project Brief. These targets should be measurable, and the process and method of measurement should be agreed at the outset. The targets must be kept under regular review, and the design and construction must be monitored against them as the project progresses.

Energy and water consumption can be measured directly from meters or bills, temperature and humidity by simple hand-held meters and data loggers, or even from the BMS. Comfort and Well Being require End User surveys, preferably using established survey methods that are robust and permit benchmarking, e.g. the BUS Methodology.[6]

Some clients may want to add more project-specific targets like adoption rates for flexible working, customer footfall or a reduction in anti-social behaviour. Provided that the targets are realistic and measurable, they should provide the client and project team with a means of structuring desired project outcomes into a set of specific deliverables, to inform the design as it progresses.

Case Study:
Esholt Positive Living,
Yorkshire.
Tate Harmer.

The RIBA has developed a 2030 Climate Challenge to support its members in delivering the UK Governments commitment to zero carbon: www.architecture.com/2030challenge. The 2030 Challenge includes voluntary interim targets that follow the trajectory of the UK's 2050 net zero ambition.

If the 2030 targets are adopted, the easiest way to measure energy is by collating energy and utility bills alongside sub-meter analysis to determine exactly where in the building energy is consumed the most. Making the collation of this data a requirement of the Project Brief allows the project team to establish the extent to which the occupied building is meeting its target. Where the target is missed, it provides an opportunity to investigate further and for resolution.

In the past, there has been a reluctance to set delivery targets for factors outside the direct control of the design and delivery team, e.g. uptake of flexible working in offices, or reduce re-offending rates in prisons: both of which might be down to local management. However, unless measured and assessed, the contribution of building design, construction and commissioning may never be known and the opportunity to make design interventions that could make a difference will be missed.

- Set out the requirements for **Post Occupancy Evaluation**, handover and **Aftercare**, maintenance and **Facilities Management** within the **Project Brief**, taking whole-life costs into consideration.

Having outlined the benefits in the previous stage, the client will need to agree what form these elements will take and to embed them into both the Business Case and Project Brief. Some projects may warrant the inclusion of a contingency budget for additional POE work in Stages 6 and 7, to provide more detailed insights into emerging issues, or into performance attributes of particular interest to the client.

Refurbishment projects can benefit from a pre-occupancy evaluation, using the same POE methods. These can give valuable insights into what works well and what doesn't – priorities can easily be misjudged if based on anecdotal evidence alone. Briefing and design concepts will also benefit from collating data from previous evaluations and from the experiences of team members, extracting lessons learned to inform the subsequent design and equipment selection. Shared site visits can offer valuable team learning experiences between the client and the design & building team.

Stage 1: Preparation and Briefing

- Identify a consultant within the **Responsibility Matrix** to take on the role of Plan for Use champion to maintain the focus on **Project Outcomes** throughout the project.

The development of the Soft Landings Framework and Government Soft Landings showed the importance of having a champion (or champions) to maintain the focus on outcomes throughout a project. The register of RIBA Client Advisers can be used to find consultants that can provide this role, but identifying a champion within the team is likely to yield better results; they will be able to influence critical decisions at all stages of the project and have better access to the other project consultants.

- Agree a schedule of **Project Stakeholder** engagement for Stages 2 and 3, as part of the **Project Execution Plan**.

Planning when stakeholder consultation should take place will vary from project to project depending on size, complexity and client enthusiasm. An experienced client will appreciate the value of these sessions whilst other clients may be reluctant. Too often, design consultation is dominated by a single contact e.g. a headteacher or healthcare manager, but this risks not representing real needs – something which may only become apparent after occupation. To avoid this, the client (and if necessary, end user) should be encouraged to plan a schedule of meaningful stakeholder consultation beyond simple statutory requirements. On smaller projects, such as residential, the client is often the end user, so engagement will commence during this Stage by default.

Reviewing precedents is a normal part of feasibility design, it is less common to consult building users and other stakeholders on their attitudes and lessons learned. Lesson learning is integral to Plan for Use and the earlier it can start the better, ideally in Stages 0 and 1.

No Blame Culture

POE and targets should be set in the context of learning, not blame. While outcomes can be quantified, the process of reaching them is very much a team effort – clients and building managers included. Demands for punitive action in the event of missed targets should be resisted if possible – it will only lead to defensive behaviour, e.g. stifling innovation, and with teams only accepting modest targets. Instead, targets should be stretching but realistic, and if they are not met, there should be collaborative determination to understand the (often complex) reasons why. It will frequently be possible to improve performance by fine-tuning (something that has been far from routine in the past), and the lessons learned can also be fed forward to future projects.

There is no difference between a defect (that should be rectified by the contractor in the defects liability period); and what is an emerging issue – something that may be clear in hindsight but was not anticipated. The contractual context of POE, therefore, needs to be carefully considered to ensure that the culture of learning prevails, and ideally, the client (not the contract) should have a contingency budget to tackle these emerging issues.

On Design and Build contracts the Responsibility Matrix could be used to explain the importance of retaining architectural services beyond Stage 3, e.g. in an independent advisory role for the Plan for Use activities described in Stages 4 – 7. Where an architect is novated for Integrated Design services, the recommendation to provide a Record of Performance Risks is still valid and should therefore be priced as part of that service. The challenge is to encourage clients to set out clear requirements for Plan for Use activities and for architects to develop the necessary skills as rapidly as possible.

Stage 2: Concept Design

- Undertake a **Feedback** exercise to gather lessons learned from key **Project Stakeholders** and produce a Record of Performance Risks.

A Feedback or 'lessons learned' workshop is a good way of collecting insights and experiences from previous projects. If possible, include a wide range of participants including client representatives, end users, facility managers, design consultants, specialist suppliers and main contractor if appointed. The interaction between those delivering buildings and those on the receiving end can be most insightful. These sessions can be independently facilitated if fees allow, but in either case it is essential that the output is recorded in an accessible way.

Case Study:
David Attenborough Building, Cambridge.
Nicholas Hare Architects.

The earlier lessons-learned workshops can take place, the better – perhaps especially for housing, where the issues being raised by residents and potential tenants can be linked to the design approach and the selection of POE techniques to be used.[7] Ideally, this engagement will run through all preconstruction stages. However, clients for smaller projects may not be able to pay for more than one workshop: if so, it may be worth combining the engagement with the Plan for Use Design Review covered in Stage 3.

The output from the engagement workshops and the Design Review should be recorded alongside lessons learned from other projects. The best way to do this is in the form of a building performance risk assessment – a companion to the health and safety, fire, cost, programme and project risk assessments in common use. Performance risks are listed in subject categories, e.g. architectural, mechanical, electrical, landscape and interiors; and should ideally be designed out during the course of design development. For those that remain, mitigation actions or strategies are agreed. The Record of Performance Risks becomes the key document in managing performance risk throughout the project, being reviewed at regular intervals both during design and construction and following on into commissioning, handover and aftercare.

- Finalise requirements for **Post Occupancy Evaluation**, handover and **Aftercare**.
- Review the **Architectural Concept** against end-user, operation and maintenance building performance requirements and whole-life costs.
- Align the **Plan for Use Strategy** with the **Sustainability Strategy**, **Cost Plan**, metering, site waste and other **Project Strategies**.
- Confirm that **Facilities Management** plans are in place, appropriate to the project.

Arrangements for Facilities Management (FM) should have already been discussed in Stages 1 and must be refined during Stage 2. Advice should be obtained from FM specialists now during the design stage: if left too late, opportunities will be lost to plan for a smooth handover and occupation, and some design features may turn out to be difficult to manage or maintain. Prior to commencing Stage 3, the architect should confirm with the Client what FM plans are in place and whether these plans meet the needs of the proposed project. Where a FM team or contract is not in place, the procurement of the FM team or contract should be aligned with the main project programme.

Record of Performance Risks

Tip: Don't just run through the Record of Performance risks as a static checklist; Plan for Use is about the continual evaluation of design and performance risks. As design evolves and specification changes, new risks may well come into play. Plan for Use requires a new professional vigilance in searching out these risks, much as a change control system is used to evaluate and manage cost risk.

Some common operational risks:

- Commissioning conflict between daylight linking and presence detection. Very common in circulation areas: often the sensors are separate and commissioned independently rather they need to be commissioned together to work efficiently. A common fault is that the presence detection is set to switch the lights on after any movement so that lights default to on even in bright daylit spaces.
- Lighting or heating installations in double-height spaces: maintenance access not considered (e.g. for bulb replacement), perhaps requiring a cherry picker which might not fit through the main entrance door.
- Oversized glazing panels in vulnerable areas: liable to get easily broken leaving client or end users with large bills for replacement.
- Breaching of fire stopping compartmentation by services installations either prior to PC or by subsequent adaptation by end users.
- Control interfaces that are either unclear in the function or too complicated to use.

Stage 3: Spatial Coordination

- Undertake **Design Studies** and **Engineering Analysis** to test the building performance requirements and conclude **Design Reviews** with input from end users, facilities managers, specialists, design consultants and the contractor (if appointed), to ratify the design from an end-user perspective.
- Integrate the building performance requirements into a **Spatially Coordinated** design aligned to **Project Stakeholder** consultation **Feedback**.

Design consultation usually runs in parallel with developing the spatially coordinated design. This continues discussions that started during Stage 1. For example, the layout of reception areas; details of building services, security and controls as well as larger scale logistics, e.g. the spatial dynamics of an airport's check-in processes. Good design depends on good two-way dialogue between client, designers, and end user stakeholders. Through open communication a specific client requirement might lead to an inventive design solution; or designers might be able to make perceptive and valuable observations as an external; party on client assumptions on how the building is likely to be used.

Case Study:
National Automotive Innovation Centre,
Warwick.
Cullinan Studio.

Whatever form the consultation takes, it should be concluded with a Plan for Use Design Review, which is a final opportunity for clients, project team and users to scrutinise the now developed design from the perspective of a user. It is not unusual for the resolution of one problem to create new risks elsewhere. The conversation during the review needs to move from the more general observations in a lessons learned workshop to a critical engagement with the specific elements of the proposed design and its interfaces with users. Items covered will include controls, ironmongery, fixtures and fittings, together with more tactile elements such as landscaping (i.e. might certain plants cause allergic reactions, the potential for a timber bench to splinter?)

It is important to acknowledge that design consultation can be a frustrating experience for both parties. They can feel rushed and participants might be preoccupied. The abstract nature of architectural drawings can mean they become misinterpreted by consultees. The Plan for Use Review provides a more structured opportunity to review the developed design from an end-user perspective.

3D visualisation is increasingly becoming a powerful tool for providing end users and stakeholders insight into how their new environment will feel. Use of such technology can help visualise potential issues that drawings and conversation may not reach.

- Update the Record of Performance Risks to inform Stage 4 tasks and deliverables.

The Record of Performance Risks is used to track progress of actions agreed to mitigate performance risk. It will only be effective if regularly reviewed and updated, especially when significant changes in design or specification occur. Sometimes these are only evident to a fresh eye: this is where a Soft Landings Champions can help.

- Embed the requirements for **Post Occupancy Evaluation**, Handover and **Aftercare** in the Procurement Strategy.

Tender documents need to make clear where the responsibility sits for these activities and to make sure there is no conflict of interest. For example, Aftercare is often delivered by the contractor during the defects liability period, but the client needs to define their expectations, especially in terms of the interface with the FM team. POE will require agreed methods of building performance data collection, including reviews of BMS and meter data, occupant surveys, specialised monitoring equipment and reviews of helpdesk records. The details of the equipment needed, the responsibility and regularity of data collection should be included within Project Brief and performance specification / Employers Requirements.

Stage 4: Technical Design

- Regularly review the Record of Performance Risks against the technical design with the design team, design out or control as many performance risks as possible, and identify strategies for managing those that remain.

During Stage 4, the agreed design strategies and ambitions for energy, comfort, wellbeing, and manageability are translated into design proposals and confirmed targets. At a time when attention shifts to the building as a product, defined by details and specification, it can be easy to lose sight of the overall objectives and strategies defined in Stages 0 to 3. Plan for Use urges teams to reflect back to the original objectives to ensure the completed design does not fall short.

A good way to increase the visibility of performance risk is to introduce reviews of the Record of Performance Risks as a standard agenda item at design co-ordination meetings. However, this will not be enough to cover all the angles: people need to be on continuous watch for design developments which may adversely affect in-use performance – this is where Soft Landings Champions can help. In addition, feedback should be obtained from main and specialist contractors (particularly mechanical, electrical and controls specialist) and the facilities management team. In the Record for Performance Risk, be clear how any remaining risks can be mitigated and where possible ascribe a responsible person and a date to each mitigating activity.

Include appropriate instructions for **Plan for Use** activities for the remaining stages in tender information or **Employer's Requirements**, including a handover strategy and **Aftercare** plan, and a requirement for **Facilities Management** information to operate the building effectively and enable it to perform as expected.

- Review tender returns or **Contractors Proposals**, including any alternatives proposed to reduce costs, against the Record of Performance Risks, **Project Outcomes** and **Sustainability Outcomes**.

This sounds obvious but unless requirements for Plan for Use activities are explicitly defined in contract preliminaries and tender documentation, they may well not happen. Responsibility for carrying out the required activities should be unambiguously defined and (if appropriate) priced for.

The more these requirements can be covered by standard specification clauses and prelims, the better. Examples include:

- Handover Strategy and defects protocol
- Aftercare plan
- Training and familiarisation sign off sheet
- Templates / requirements for building user guide and 'quick start' guides
- Template and requirements for asset labelling / BIM
- Maintenance liability schedules
- Performance monitoring requirements and format of data; equipment and responsibilities for data collection.
- As-built Asset Information from contractors and sub-contractors

A major challenge to building performance risk is where cost reductions initiate design changes. A tender that comes in over budget often requires quick decisions on design modifications or changes in specifications to get a project back on track. However, focussing too closely on capital cost without in-use performance and whole life cost considerations can create unintended impacts to both, potentially resulting in any savings in capital outlay cost to be negated by operational cost.

Case Study:
Ygsol Trimsaran,
Carmarthenshire, Wales.
Architype.

POEs often suggest that, with the benefit of hindsight, a different group of savings measures could have saved as much, but with less long-term impact. Such risks can be managed by reference to the Record of Performance Risks; if possible including a list of considered VE items that have already been evaluated with respect to their whole life impacts. Sometimes even small changes e.g. the selection or location of luminaires, can have a large impact on energy use over the lifespan of the product. It is also easy to undermine control strategies, with systems neither being cheap and simple enough to be understandable, nor sophisticated enough to offer true benefits to occupants and FM. If the implications of such savings are known for output performance and longterm costs, the situation can be reviewed with the client, and the project can proceed with revised targets and with much less risk of future recrimination.

Stage 5: Manufacturing and Construction

- Regularly review the Record of Performance Risks on site. Consider the impacts of any design or specification changes upon building performance and whole life cost plan.
- Consider the impacts of any variations to the design or **Specification** on building performance and whole life cost.

Whether the architect is engaged to administer the contract, or act as the client agent for design advice, a schedule of site meetings (proportionate to the size of project), should be arranged to review the Record of Performance Risks. Experience shows that these should not be at the end of site progress meetings as the subject matter will seldom get the time or attention it deserves.

Note: The description of Stage 5 assumes that the majority of design work is completed in Stage 4. However, a tender package may include elements of contractor design, e.g. for steelwork, facades and building services. As a result, the final integration of design and confirmation of controls systems can come very late in the procurement process: this makes it essential that performance risk is reviewed as soon as possible. A services co-ordination workshop should review the Record of Performance Risks, the operation and maintenance strategies, and the timetable to transfer key Asset Information to FM.

- Manufacture, construct and commission the building to deliver effective performance and operation of the building in use.

Case Study:
Contact Theatre and Arts Venue, Manchester.
Sheppard Robson.

As the project moves into construction, the Record of Performance Risks becomes critical to delivering Plan for Use. For this to work well, those managing the construction need to be properly engaged. The main contractor or developer needs to appoint their Plan for Use champion, with day to day overview of the project. On many projects, the Site Manager is best placed to adopt this role, but responsibilities can get blurred and another person may be better able to better provide the critical perspective required. Many UK contractors have detailed high-level policies for Aftercare and low or zero defects; site staff need to understand that the process used to manage performance risk overlaps strongly with these strategies that avoid building defects.

- Encourage a graduated approach to the collation of **Asset Information** and digital data.

Requirements for contractors to issue Asset Information to client and end users should be set out clearly in the tender and specification documents in Stage 4. Increasingly this will include digitisation, as electronic asset tagging or in an integrated BIM model. though there will still be a need for a site inspection to be undertaken to check meters and sensors have been properly installed.

Whilst the contractor has the primary responsibility for assembling the as-built information, CDM puts an onus on the client and designers to ensure it is in place and fit for purpose. Where a make or type of a building component has been named, information required for the Building Manual should be compiled at the beginning of Stage 5 or even earlier and issued in draft. Indeed, some material – for example, the Log Book required by Building Regulations AD L2, could and should be developed from Stage 1 onwards, as a running summary of design intent for the building services and energy-consuming systems and how they will need to be operated and their performance reviewed.

Much time is often wasted extracting as-built information from subcontractors, even where its provision is an unambiguous contractual duty. Frequently the information submitted falls short of the specified requirements. Often it may be generic, in the wrong format, poorly organised and poorly indexed, or missing key elements. It is therefore important to plan for success and request the information at the earliest opportunity and keep up the pressure: things get much more difficult once the subcontractors have left site.

Where a performance specification is used, the main contractor should be encouraged to set milestones for collating this data. Otherwise the chasing for information after Handover will be inevitable. Putting together this data early also allows the FM team to review its relevance, clarity and veracity before final issue. It also ensures that the correct information is in place for the ensuing POE work.

- Review and update the Record of Performance Risks on site and use it to identify and avoid potential defects.

The run up to Handover is a critical period for Plan for Use. The inevitable pressure to deliver on time puts a narrow focus on project completion, in a period which sees the most subcontract activity, with teams working on top of each other. When a programme is running late, the potential for mistakes increases exponentially with critical elements like commissioning and user training being rushed. To counter this, Plan for Use recommends a Handover Planning Workshop – essentially providing a countdown to Handover day.[8] The outcome is for the client team, contractor and facility manager to have a clear understanding of responsibilities; who does what and when, and to co-ordinate around grey areas e.g. client supply, contractor fit.

Stage 5: Manufacturing and Construction

- Commission the energy, water and building comfort and other **Project Outcomes**, monitoring equipment required and check that data being received in the correct format as defined during Stage 3.

Another key requirement in the run up to Handover is to ensure that all the equipment required for monitoring energy, water consumption and building comfort is in place, commissioned correctly and data being received in the correct format as defined during Stage 3. This is critical for the Building Performance Review in Stage 6 and full Post Occupancy Evaluation during Stage 7. If sub-meters are not recording properly or the BMS is not working, a wealth of valuable data will be lost and crucially with it the opportunity to analyse the data to gain insights into usage patterns is missed. Irrespective of who has the contractual responsibility for making sure this is in place, the Plan for Use or Soft Landings Champion should ask to see evidence that this has been completed.

- Compile the **Asset Information** and data required for the effective performance and management of the building for the **Building Manual.**

Case Study:
Engine Shed,
Stirling.
Reiach and Hall Architects.

Building Manual and User Guides

It is important to avoid dauting those responsible for managing a new building with a heavy Building Manual tome. To make it accessible it will always be necessary to prioritise information into three elements:

1) A simple User Guide for all occupant interface elements of the building.
2) A quick start guide designed for the building managers that can double up as an emergency services 'grab pack'. It should contain basic information on meter locations, emergency shut offs, providing an essential overview of the whole building.
3) The Operation and Maintenance Guide, which provides detailed and comprehensive information. This O &M Guide sits below the surface (to use the iceberg analogy) to be referred to when required. It should therefore be easy to navigate and well indexed.

These three elements of the Building Manual are relevant, whatever the progress towards Building Information Management (BIM) is.

In the initial weeks after Handover and occupation, the architect should check that the necessary operation, maintenance and user information is correct, clearly presented and made available to and (importantly) understood by those that need it.

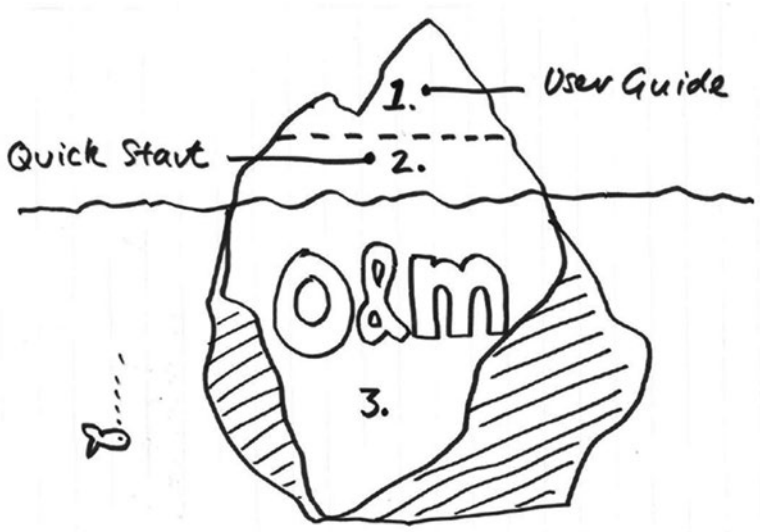


Figure 6: Sketch diagram, Mike Chater 2019

Stage 6: Handover

- Complete an effective transfer to **Facilities Management**, including user training, a user-friendly **Building Manual** and any outstanding **Asset Information**.
- Provide induction and training for building users and **Facilities Management** Team on the effective use, performance and operation of the building.

After the stress and exhilaration of achieving Practical Completion, a time of reflection is needed to check that the handover process itself has been effective.

Even the best staff training programmes can suffer from several factors including absenteeism and information overload. Filming training (even on a mobile phone) is an increasingly popular and effective way of making sure that the information gets passed on. It is also good practice to have training sessions before and after Handover, with the latter being used as a refresher and to provide the opportunity for staff to ask questions and troublesheet once they have operated the building themselves for a period of time.

- Hold a **Project Performance** session with the project team that covers the Plan for Use process.

Feedback on how the Plan for Use process unfolded will help the design and construction teams to continually improve the services they offer and can help the client build more effective teams in the future. These sessions should enable open feedback on what each member of the team learned from carrying out their services.

- Review the progress of defect rectification, maintenance and energy monitoring at periodic **Aftercare** meetings with the design team, contractor and **Facilities Management**.

The frequency of Aftercare meetings and level of Aftercare service should have been established during Stage 3 and incorporated within the contract. An important action on Handover day is to schedule dates for Aftercare or defects monitoring as appropriate. These occasions provide opportunities to walk the building from an occupant's perspective; conduct informal interviews with both users and FM team to gain insight into how well the building is functioning and how the occupants are using it. This is also a good time to collect sample data on temperature and humidity. If the visit takes place on a particularly cold day, it can also include thermal imaging (see light touch Post Occupancy Evaluation Review in box below).

These site visits also present an opportunity to check that the agreed building performance data is being collected in accordance with the project requirements; that routine maintenance is also being carried out, and these are all being recorded.

It is important to check that a proper handover of responsibilities has taken place. At Handover and completion, the contractor should provide an asset schedule, naming all the building and building services elements that need maintenance and their frequency. The asset schedule should be reviewed before the end of the Defects Liability Period: the client needs to be confident that all the systems identified are in good order and have established service contracts. Routine maintenance of building systems must be carried out during the liability period to ensure occupant safety and to avoid the invalidation of supplier warranties. Many clients fail to differentiate clearly between responsibilities for operation (owner and/or occupier), defects (the main contractor), routine maintenance (maintenance contractors[9]), and Aftercare activities (in which unexpected issues can easily arise which do not fall easily into any of the first three categories).

- Undertake light touch **Post Occupancy Evaluation** to review actual in use performance against the design targets set in the **Project Strategies**.

POE is the final but crucial element of Plan for Use. The reason RIBA is seeking to mandate this as an integral part of architectural practice is threefold: to identify and understand performance gaps; identify fine tuning needs and to close learning loop.

1. Identifies and understands performance gaps: POE confirms the extent to which the agreed design targets and outcomes have been achieved and identifies whether any gaps between design intent and in-use performance remain.
2. Identifies fine-tuning needs: POE can highlight items that need attention or fine-tuning during the Defects Liability Period. The normal process of defect rectification does not necessarily pick up such issues because it is often focused on what is visible. POE equips the project team with the focus needed to maximise building performance prior to the conclusion of the building contract.
3. Closing the learning loop: POE provides invaluable feedback and lesson-learning that all involved can take forward into their organisations and to their next projects. This 'closes the loop' that feeds back to the beginning of a project. Using POE outputs to inform new projects, new processes, new systems and components, new designs will drive better buildings that perform effectively for people, planet and business.

Plan for Use splits Post Occupancy Evaluation activities into two parts:

1) The first is a light-touch Post Occupancy Evaluation undertaken towards the end of Stage 6. RIBA's ambition is for this first part to become a standard part of an architect's standard schedule of services.
2) The second part covers more in-depth investigations during Stage 7and is encouraged to be offered as an additional service (with commensurate fee where appropriate). The second part of these POE activities include an appraisal of how performance has changed after the Stage 6 Review. It focusses on changes in performance as a result of Aftercare, as a result of fine tuning as well as a result of defect correction, taking into account any changes in use of the building. If necessary, it may also include scrutiny of emerging issues that demand a deeper understanding, e.g. investigating the cause of a cause of occupant dissatisfaction, or the reasons behind why a particularly system or item works (or does not) work particularly well.

Light touch Post Occupancy Evaluation

Light touch POE should be undertaken ideally within a year of Practical Completion (before the end of the Defects Liability Period). Some clients may wish to appoint a consultant (who has the appropriate experience and training[10]) to undertake the light touch POE, who has not been closely involved in the project. However, close contact with project participants is essential to promote in-depth understanding and spread the learning.[11] Light touch Post Occupancy Evaluation activities should start as soon as practicable and be completed not less than two months before the end of the Defects Liability Period, giving time to discuss and act upon the findings.

The RIBA sees the following six elements as the core of a light-touch POE review.
(Clients, occupiers and teams are free to add more if they wish).

1. Design review – familiarisation with the design and the as-built drawings, specifications and critical details. This might include published data and logbooks if available.
2. Building visit walkabout – undertaken independently or with facilities manager – *see overleaf.*
3. Seek User Feedback. Whilst the responses may be anecdotal and subjective, collation of the subjective responses helps pinpoint areas of concern. Both individual and grouped responses can be insightful into how occupants are interacting with their new environment.[12]
4. Collation and analysis of energy and water meter readings against agreed design targets.
5. Thermographic survey. Depending upon the timing of Practical Completion, a thermographic survey should be undertaken during the heating season. This will highlight hidden discontinuity of insulation and cold bridging. Handheld thermal imaging cameras and smoke pencils to check air movement and infiltration are relatively inexpensive allowing the architect to undertake this during routine inspections.
6. Short report summarising findings of the building performance against its agreed design targets; the results of the User Survey and reflection and recommendations based on the collated findings[13].

Meetings with the design team, client and (if appropriate) contractor are useful to feedback findings and results, especially in relation to occupant surveys and can give a broader and better understanding of the context behind a particular score or comment.

Building Visit

A building visit or walkabout is an opportunity to understand how users or occupants are interacting with the building and to observe any emergent issues that might affect performance. The frequency of such visits and how they are conducted will be very much dependent upon the project and sector: for housing it is dependent upon the goodwill of residents.[14]

For non-domestic it is beneficial to have the facilities manager in attendance as they will often be able to point out areas of concern already reported to them.

Planning a visit around 8 weeks after occupation provides sufficient time for occupants to feel 'moved in' but also for patterns of use to become established and for frustrations to become apparent. Such visits can be planned to coincide with aftercare and defect review meetings to keep salary costs low.

If the client has committed to a full, formal and independent Post Occupancy Evaluation, the consultant delivering the service will probably want to undertake the visit(s) themselves. They should report back and liaise with the architect for mutual benefit and learning.

Case Study:
Quebec Park,
East Hampshire.
Architecture PLB.

Stage 7: Use

In Stage 7 the building takes on its purpose. The Plan for Use is designed to help achieve effective facilities management and deliver the optimum in-use performance, so the building fulfils its intent.

Maintaining accurate Asset Information is a key part of facilities management and whilst not the role of the architect during Stage 7 it is influenced by and based on specifications and information produced by the design team at the end of the project. A new trend in **Facilities Management** is predictive analytics, in which the live asset data from key items of plant is used to determine when plant is underperforming and likely to need attention ahead of schedule. Predictive analytics can help pinpoint areas that might merit fine-tuning activities.

- Implement the findings of the light touch **Post Occupancy Evaluation**, to fine-tune **Building Systems** and **Facilities Management** to optimise comfort and performance.

Many fine-tuning activities will have been undertaken in Stage 6, however, buildings take time to achieve their optimal performance or to 'bed in', not least because people arrive and learn to use, manage and maintain them, sometimes in ways not anticipated in the Project Brief. In addition, engineering systems often require "seasonal commissioning" with changes in use and weather.

Two or three years of Aftercare are becoming more common on larger projects. In Year 2, the building tends to settle-down, as operational procedures stabilise and fine-tuning takes effect.

Clients must put time and money aside for this: the benefits will often be rapid, in terms of lower running costs and greater occupant satisfaction and productivity. Funding for extended Aftercare is best provided outside the building contract.

Contracts with the traditional 12-month Defects Liability Period are more challenging due to the premature termination of contractual Aftercare. In such cases, it is not fair or reasonable to expect all outstanding issues pertaining to building performance to be resolved under the contractor's defects liability. The culture of 'No Blame' needs to protect all design and building team members, so client expectations need to be managed carefully.

Issues raised in the Building Performance Review should be reviewed equitably and plans put in place to undertake the necessary changes. Changes may be managerial (e.g. a revised cleaning regime to reduce disturbance to occupants; or need systems fine-tuning (e.g. re-balancing a ventilation system to avoid localised draughts) or changes may mean replacement (e.g. replacing a failed door lock as a latent defect). Whilst the costs of resolving fine-tuning issues should be modest, the architect should ensure that the client appreciates the potential need for a reserve fund to deal with them once the main contract has completed.

Case Study:
The Enterprise Centre,
Norwich.
Architype.

- Undertake a more detailed **Post Occupancy Evaluation** which covers more in-depth investigations as required, after putting in place separate professional services contracts. Compare predicted performance with actual performance to optimise the operation and maintenance of the building.

At this stage, as part of the more detailed Post Occupancy Evaluation, it is recommended that user perspectives are gathered using a recognised process such as ARUPS' BUS Methodology.

From time to time, a Building Performance Review will flag a serious issue, for example, a big gap between predicted and actual building performance, which is not easily explained or resolved. It may be necessary to dig deeper, ideally using specialist advice from a consultant or university. These are known as Diagnostic or Forensic Post Occupancy Evaluations. Such investigations cover similar ground to that covered by the Building Performance Review, but at a more granular level.[15]

- Disseminate findings of **Post Occupancy Evaluation** activities in electronic format to the client, users, design and construction team members and (where possible) the wider construction industry.

Arguably the most important aspect of the Plan for Use, Soft Landings and similar initiatives, is the capacity for learning. As stated in the introduction, Plan for Use is about setting measurable targets, carrying out Plan for Use activities and then checking the extent to which those targets have been met under the strain of a building in use.

The Record of Performance Risks, if used properly, should act as a historical record of all the performance risks identified; how they evolved; how they were dealt with; and the solutions the design, building and FM teams came up with to obtain the best performance. POE findings provide another rich stream of learning, not just as an indicator of emerging problems which need to be resolved before they reach endemic levels, pointing the way to simpler and more elegant future solutions.

Stage 7: Use

To date, the construction industry has been very reluctant to share such data, unlike aviation or health, presumably because it might be perceived as embarrassing, or leave organisations open to litigation. These perceptions need to be changed because this learning is critical to the success and progress of the construction industry.

1. The final Record of Performance Risks should be issued to all those involved in the project alongside summary reports from the Building Performance Review and any deeper investigations undertaken in Stage 7.
2. The key findings and the final Record of Performance Risks should be made known to others in the practices involved, e.g. as CPD or through design and technical review. Ideally, risk records should be stored and indexed as a centralised resource. New projects should make full use of this learning within the internal design and technical project reviews.

Consideration should be given to how the architectural profession and the wider industry can benefit from a wider dissemination of lessons learned between practices. There can be a stigma attached to this because of the fear of negative publicity. However, User Group experience, for example by Soft Landings and the Usable Buildings Trust, shows that once people get to know each other these barriers disappear. By contrast, learning from failure is something that comes second nature to the aviation industry and motor-racing[16]; the architectural profession and the wider construction industry must follow their lead if we are to drive the change needed to meet the challenges of the coming decade, not least the climate and environment emergency. The RIBA is taking a lead on this through its national CPD programme, but we need to encourage this new kind of dialogue at local and regional levels too, project to project, practice to practice, discipline to discipline.

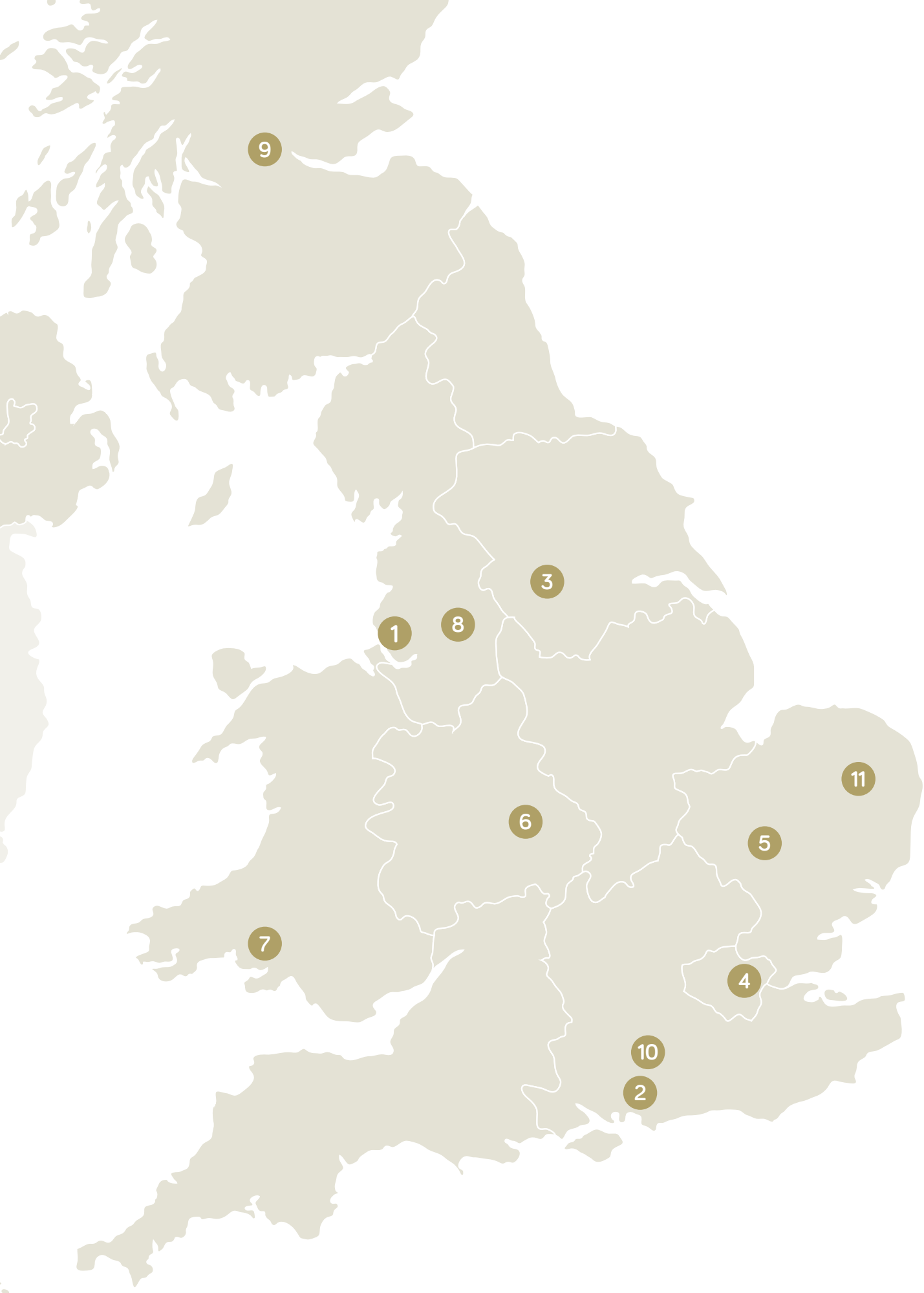
Much better links also need to be developed between professional institutions, practice and academe around education, practice, research, industry, policy and public awareness in relation to building performance in use. There is so much to be learnt and so much to be gained.

CHAPTER

2

Case Studies

The following case studies seek to highlight particular sections of the Plan for Use Guide and demonstrate how embedding the actions set out in the guidance are intrinsic to the processes of delivering better building outcomes.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Case Study 1: Route to Light-touch POE as standard

Photo credit: © Philip Vile

The **Everyman Theatre** project demonstrates how lessons learnt on the process of POE can be implemented across a Practice.

The Everyman Theatre
Location: 1
Client: Liverpool and Merseyside Theatres Trust
Architecture: Haworth Tompkins
Building Service Engineers: Waterman Building Services
Quantity Surveying: Gardiner
Contractor: Gilbert Ash
Date of completion: 2013
Project Value: N/A

Haworth Tompkins have long been discussing carrying out light-touch POE studies to provide feedback into their design process, however there were perceived barriers: namely the cost and know-how of the analysis required.

The Everyman Theatre in Liverpool was used as a test case to see how the Practice could embed light-touch POE reporting across their office portfolio. The Everyman was chosen because it uses an innovative assisted natural ventilation system and Haworth Tompkins were keen to understand how well it was working. In addition, the project team had access to the building's energy performance data and had maintained a good relationship with the theatre's FM team, who had been involved in the design process from the beginning and knew the building inside-out.

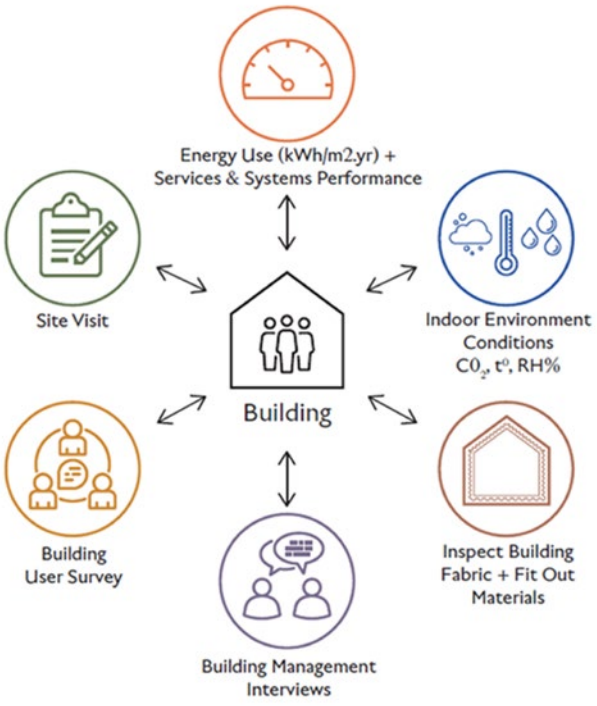
A site visit took place in January 2020 which involved a building walk about to: assess the use of the space, materials durability, as well as to carry out interviews with building users and set-up monitoring equipment in key areas. However, after March 2020 the theatre closed due to the Covid crisis – so the data from the environmental sensors was restricted to the first few months of the year. Key findings included the Building User Surveys analysis processed by Arup.

Disseminating the knowledge gathered by the light-touch POE and acting on the lessons learned is the most important goal of the entire process, and the technical, theatre related, discoveries are already being discussed and fed back into the design process of other current projects. The POE process itself is also being discussed and presented internally throughout the Practice.

The final Everyman light-touch POE report is to be shared throughout the office and will form the basis of a reporting template for other projects. The template will be used across the sectors Haworth Tompkins work in such as residential and higher education.

The Everyman's report was based on the RIBA POE primer as guidance, and Haworth Tompkins put together a list of actions that would provide meaningful feedback for future projects. Time and cost for undertaking these actions were budgeted for and approved by the Practice Directors. These light-touch POE actions comprise: a review of design & construction information; a day site visit for two people (to provide feedback on any changes in internal layout, use of space, durability of materials); carry out interviews with members of the client team (to assess the performance of building services, any controls & maintenance issues); carry out Building User Surveys (distributed to the staff, and then to the audience attending the evening performance); set up monitoring of indoor environmental conditions in key spaces); and a quick analysis of energy and water use with data supplied by the FM.

Further reading: https://www.haworthtompkins.com/climate



Schematic: Haworth Tompkins

Case Study 2: Early identification of economies of increased scale

Photo credit: © Hampshire County Council

The **Havant Public Service Plaza** project demonstrates early interrogation of the Project Brief.

Please refer to **Plan for Use Stage 0: Strategic Definition**

Havant Public Service Plaza
Location: 2
Client: Havant Borough Council & Hampshire County Council
Architecture and Interior Design: HCC Property Services
Building Service Engineers: Gary Jones Associates
Quantity Surveying: Cyril Sweet Ltd
Contractor: Morgan Sindall
Date of completion: August 2011
Project Value: £9.7m

The initial project brief was for the refurbishment of the Borough Council's main offices; a 1970's building full of asbestos in urgent need of modernisation. By interrogating the scope in Stage 0, the project brief was widened to include the co-location of nearby County Council Offices, securing a Central Government Co-location grant in the process. This then pulled in further public service partners such as the Citizen's Advice Bureau enabling visitors to access all their public services under one roof.

The building was stripped back the existing to its structure and external envelope and then refurbishing with energy efficient lighting and ventilation with the completed project achieving a BREEAM 2011 'Very good' rating. Alignment with a County Council driven strategy of flexible office working during RIBA stages 0 and 1 allowed rationalisation of the floorplate, increasing eventual capacity from 440 to 700. The project also included the Public Service Plaza, a new build pavilion that provides a double height public reception space with a cafeteria, confidential meeting areas, 'drop-in' staff facilities and a central information point for the public.

This project would not have become a reality had it not been for the determination to look wider than the original project scope during Stage 0. Identifying other public stakeholders led to the joint application for Government funding. The masterplan that secured the funding still provides a catalyst for potential future regeneration with plans currently being considered to develop offices for the police amongst others. The environmental legacy of the project was realised not only by the breathing of new life into a poorly performing building but also by co-locating other offices by the introduction of flexible working. Now one better building replaces four low performing buildings

"Havant is setting an example to other authorities in Hampshire and is showing just how successful partnership working can be for delivering efficient services to our community"

Tony Briggs, leader of Havant Borough Council.

Further reading: https://www.hants.gov.uk/business/propertyservices/selectedprojects?filter=.Architecture

Photo credit: © Hampshire County Council

Case Study 3: Setting targets from the outset and creating a framework to monitor these

Photo credit: © AVR London

The **Esholt Positive Living** project demonstrates the early use of a framework of sustainability targets that underpin the Project Brief and design proposals.

Please refer to Plan for Use Stage 1: Preparation and Briefing for more detail on actions that help embed desired project outcomes at project outset.

Esholt: Positive Living
Location: 3
Client: Yorkshire Water and Keyland Developments
Architect: Tate Harmer
Sustainability Consultancy: 3Adapt
Date: Outline Planning 2019

Esholt Positive Living will create a ground-breaking, beacon of sustainable development in West Yorkshire on land that includes disused water treatment works. Keyland Developments, sister company to the site's former owner Yorkshire Water believe that they have a responsibility to put this redundant land to positive use and have proposed a bold new vision for the site; to provide an exemplar model for responsible and sustainable development.

To deliver this vision, a framework was developed using the 'six-capitals' model of sustainability. The intent is to grow natural, social, human, intellectual, manufactured and financial capital in perpetuity. The framework sets out high sustainability targets for the project and includes key performance indicators that enable progress to be monitored.

- Sustainable Water Cycle – The scheme uses a hierarchical approach to reduce per capita water consumption and has a residential target of 80 litres/person/day. The landscape strategy has been designed to mimic natural drainage through the use of SUDS.
- Towards Net Zero Operational Carbon – The project minimises energy demand by using passive measures and efficient systems prior to the deployment of LZC technologies. The project is targeting ≥ 70% reduction of regulated carbon emissions with aspirations to become a zero-carbon development as the proposed adjacent commercial site is delivered.
- Towards Net Zero Embodied Carbon – Life cycle assessments will be undertaken during the detailed design stages to inform the selection of materials, reducing lifetime embodied carbon emissions. The project is targeting a residential embodied carbon footprint of less than 450 $kgCO_2/m^2$ and a target of 550 $kgCO_2/m^2$ for the commercial elements on the site.
- Good Health and Well-being – The project integrates into its landscape setting and provides fantastic access to nature and community spaces. The dwellings are expected to achieve excellent daylight levels and occupant comfort. They have been modelled to TM59 requirements to consider the impacts of future climate to 2080 to inform future mitigation strategies.
- Sustainable Land Use and Biodiversity – The scheme embraces its location and seeks to enhance permeability for wildlife, revitalising the surrounding woodland environment. Together, all the measures deployed will provide a net gain to the ecological value of the site.

Further reading: https://tateharmer.com/projects/esholt-keyland-developments/

Case Study 4: Incorporating feedback from lessons learnt from the outset and in real-time

Photo credit: © BDP

The **NHS Nightingale Hospital** project demonstrates the use of lessons learned and briefing that was conducted in real-time to inform the design and construction of the nation-wide programme of emergency hospitals.

Please refer to Plan for Use Stage 1: Preparation and Briefing for more detail and guidance around precedents and lesson learning at project outset.

NHS Nightingale Hospital
Location: 4
Client: Royal Free London NHS Foundation Trust
Lead Designer: BDP
Lead Contractor: CFES
Engineering advisors: Her Majesty's *Armed Forces* – 170 (Infrastructure Support) Engineer Group
Other Contractors: Mott Macdonald, BOC, The Richard Stephens Partnership, ETA Projects, Hoare Lea, Mace, Alpine Works, KPMG
Suppliers: D & L Medical Limited, GES EMEA, Mitie, Wilson James, RFL Property Services, Arcus

To help the UK national effort to combat the pandemic and respond to the shortfall of ICU beds, BDP undertook a study proposing the conversion of large-scale event venues into temporary ICU facilities. This led to the conversion of the 115,000m² ExCeL conference centre at London Docklands into the Nation's first 4,000 bed NHS Nightingale emergency hospital for COVID-19 patients. The key to the project's rapid progress was its clear concept and rigorous approach to decision-making that would **allow construction to progress in parallel with design.** The first 500 beds were **ready in just nine days** due to the collaborative teamwork between clinicians, consultants, contractors, the ExCeL FM team and the British Army.

The London Nightingale Hospital infrastructure delivery team (which included KPMG, MACE, BDP, Mott MacDonald, Hoare Lee, Wilson James, ISS & FES to name a few) were trailblazers as they delivered the first of the nation-wide Nightingale Hospitals. The Excel team therefore fully appreciated the importance of sharing lessons with the other builds. They shared lessons, Revit families, technical documents and advice peer-to-peer with other sites, which proved highly effective. A great example of this was BDP's IKEA-style instruction manual clearly setting out the different fit-out strategies and processes used. With British Army personnel supporting each build, the Military provided a unique, ready-made and effective lesson sharing network that became one of the primary conduits for lesson sharing across the country.

The supporting military engineers were all from the same specialised unit and therefore peers and colleagues. This meant that within hours, dedicated lesson sharing WhatsApp groups were established and within days, the unit had set up a dedicated 'Lessons Team'. The creation of a centralised lessons team enabled the rapid recording and exploitation of lessons across other Nightingale sites with minimal disruption to the deployed military teams.

Two important lessons on the use of lesson sharing in such fast-paced, critical programmes stand out:

1. Design derogations cannot be carbon copied
2. Lesson sharing should be visual, verbal, virtual and in real-time

In order to deliver the London Nightingale Hospital within the project's ambitious timelines, innovative design relaxations or derogations to Health Technical Memoranda (HTMs) had to be employed while still ensuring a high level of care for future patients. However, these derogations were site specific. It would be difficult to ask decision makers to accept and own the associated risks without having access to the underlying context and decisions. However, derogations were still shared to highlight areas that other sites could explore to further reduce construction times.

Due to the fast pace of construction, there was limited time to formally record and distribute lessons. Plus, in the Nightingale Programme, with other sites only days behind London, the utility and effectiveness of lessons reduced by the hour. This is where the use of WhatsApp Groups proved pivotal. Within minutes of an issue arising on site in London, it was shared with military and civilian engineers across other sites, often accompanied with photos. Also, issues could be posted on the WhatsApp Group as they arose, leveraging the collective minds of 30+ engineering professionals to consider and analyse potential solutions. Video conferencing tools enabled virtual site tours to be hosted for engineers on other builds. This allowed them to see how similar challenges were overcome and enabled them to ask questions of the designers, project managers and builders involved. This was invaluable and as effective as any formal record without the associated substantial time drain of more polished lessons learned documents.

Further reading: https://www.bdp.com/en/projects/m-o/nhs-nightingale-hospital/

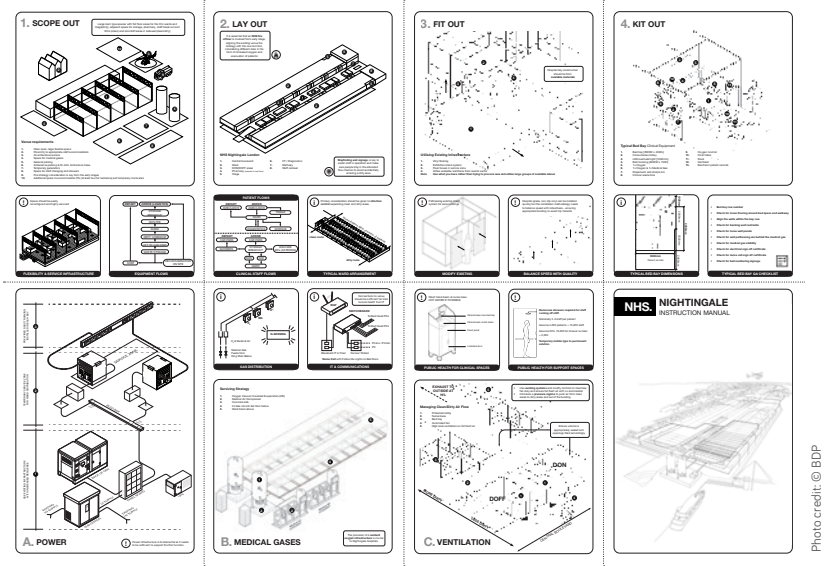


Photo credit: © BDP

Case Study 5: Building trust with early engagement and bespoke targets

Photo credit: © Julieta Sarmiento ORP

The **David Attenborough Building** show cases how early engagement with the project partners enabled barriers to be overcome. Developing bespoke sustainability and wellbeing targets helped to further build up the ownership in the project as the future occupiers had a stake in the project performance outcomes.

Please see Plan for Use Stage 2: Concept Design for more detail on early Plan for Use engagement actions.

David Attenborough Building
Location: 5
Client: University of Cambridge
Architect and Interior Design: Nicholas Hare Architects
Building Services and Sustainability: Buro Happold
Structural and Civil Engineering: Aecom
Project Management and Cost Control: Aecom
Contractor: Kier
Date of Completion: May 2016
Construction cost: £38m

The David Attenborough Building is an iconic brutalist building designed by Arup Associates in the 1960s to house large scale laboratories, workshops and a Museum of Zoology. Both the building fabric and services were at the end of their life and the original design intent lost behind a multitude of inappropriate modifications and

additions. The University wanted to use the project to establish a benchmark of environmentally sustainable refurbishment. The client also wished to explore whether it was possible to transform the seemingly unpromising structure into a flexible workplace that would facilitate collaborative working. Their project partners were the Cambridge Conservation Initiative (CCI), a collaboration of ten leading internationally focused biodiversity conservation organisations who would be coming together for the first time in the re-invented building.

The design adapts the building to its new and enhanced uses through a series of simple but bold architectural interventions. These include a dramatic new entrance to the Museum and a soaring atrium featuring a four-storey living green wall – providing a shared, collaborative hub for CCI partners. A new, experimental green roof with courtyard rain gardens is used as a living laboratory for monitoring biodiversity.

A passive design approach made best use of the building's existing assets and together with the new building systems has resulted in a 25% reduction in regulated CO_2 emissions over 2013 Building Regulations. POE shows that the building is on track to achieve the 40% target reduction in energy use and it is estimated that over 82% of the building's embodied carbon has been saved by retaining the building structure.

Starting engagement early was critical to enable CCI partners to buy into the project; the un-refurbished building seemed a daunting and inhospitable future home. Using a mixture of individual partner meetings and shared workshops focused on key design aspects a level of trust was developed that encouraged users to be more ambitious and consider more open and collaborative work environments. Adopting bespoke sustainability targets like biodiversity and wellbeing that were valued by the users inspired ownership of the project as a whole. The in-depth collaborative explorations of how the building should be inhabited to maximise its sustainability potential have created a body of informed users that have in turn, narrowed the performance gap – delivering the target energy reductions. The process of engagement also usefully kick-started pragmatic collaborative cooperation between partner members and a post occupancy survey has revealed the building has had a strong impact on measures of collaboration.

Further reading: https://www.nicholashare.co.uk/projects/view/the-david-attenborough-building

Photo credit: © Nicholas Hare Architects

Case Study 6: Complex collaborative design consultation

Photo credit: © Hufton + Crow

The **National Automotive Innovation Centre**'s collaborative design consultation process with project partners, automotive engineering specialists, academic researchers and Estate and FM teams resulted in delivering a building in which the client partners report and appreciate the added value that the design brings to the use, function as well as productivity of the building.

More detail on the Plan for Use actions associated with spatial coordination, design reviews and project stakeholder feedback are set out in the **Plan for Use Stage 3: Spatial Coordination**

National Automotive Innovation Centre
Location: 6
Client partners: University of Warwick**;** Jaguar Land Rover**;** Tata Motors European Technical Centre**;** Warwick Manufacturing Group
Architect and Interior Design: Cullinan Studio
Structural, Façade and Building Services Engineers: Arup
Fire and Acoustic Engineers: Buro Happold
Date of Occupation: December 2018, ongoing fit out of the Advanced Propulsion Research Laboratory
Construction cost: £80m

Cullinan Studio has worked with WMG on a series of buildings at Warwick University over the past 20 years. Foresight reviews (using the DQI tool) and hindsight reviews have informed each successive project. Cullinan's latest building is the Lord Bhattacharya Building, which accommodates the National Automotive Innovation Centre (NAIC). The new institution is unique and has been founded to co-locate industry, research, and academia in close proximity to each other, a move that challenges traditional models for research office environments.

This bold project started with good communication and an open, collaborative attitude. In the beginning Jaguar Land Rover, Tata Motors and WMG believed three distinct facilities were needed, but through an exemplary briefing process, Cullinan's were able to bring them together – creating one building. This deep consultation process at feasibility stage led to around a £30 million saving by avoiding duplication of expensive under-utilised spaces.

Whilst each client partner required confidentiality and security in their own areas, everything that could be shared is (tea points, meeting spaces, social spaces and some common workshops) and a visually open aesthetic dominates. Only areas with extreme confidentiality (such as prototype design departments are hidden away.

The architects and engineers consulted hundreds of experts from academics to automotive designers to develop the design. Engaging the University's estates and FM departments and following best practices guides, contributed to delivering a building in which the client partners report the added value in use:

(1) Common collaborative space and circulation enhance the opportunities for chance encounters and relationship building within and between partner organisations.

(2) Shared facilities between partners as well as an opportunity to keep Intellectual Property safe when necessary are embedded in the design philosophy.

(3) *"The co-location of all functions under one roof has realized significant operational benefits in terms of lost travel time and costs."* (TMETC) (650 annual return flights to India reduced to 180).

Designing to 60-year design life with each individual element (envelope, roof, windows etc.) means having defined expectations of life to first maintenance built into the specification. Cullinan's therefore consciously opted for, for example, a thicker roofing membrane than the 'standard' product to increase its life expectancy. The whole life costing exercise allowed the client to understand not just the capital cost but also the long-term cost-in-use. This was in turn factored into sustainable lease agreements.

Cullinan's created an anonymous POE survey based predominantly on the BUS methodology but included other aspects from the Leesman Index as well as questions that dealt directly with the desired outcomes for NAIC (collaboration, cohesion, and cross fertilisation of ideas). It revealed that most building users were not just 'satisfied' but 'impressed' by the building and the showcase-effects it is having on their corporate visitors and suppliers. The survey also revealed that working in a collaborative space brings emphasis to the research being undertaken. The overwhelming appreciation for the excellent natural daylight and connections to nature, with its positive effects on well-being, alongside the direct positive feedback from the client partners demonstrates that the complex consultation process has delivered the desired outcomes.

Further reading: https://www.cullinanstudio.com/project-naic

Photo credit: © Hufton + Crow

Case Study 7: Mitigating performance and cost risks through iterative design

Photo credit: © Phil Borman

The **Trimsaran School project** demonstrates how lessons learnt from preceding projects has led to design solutions that resulted in significant capital and maintenance cost savings to the client while still delivering the same high comfort standards.

The guidance on the iterative process and design and engineering analysis reviews that help deliver the planned for comfort standards are set out in Plan for Use Stage 4: Technical Design

Ysgol Trimsaran and Passivhaus school
Location: 7
Client: Carmarthenshire County Council
Architect: Architype
Building Services and Structures: WSP
Date of completion: August 2017
Construction Cost: £6.3m

The winner of a Welsh architecture award – RSAW Sustainability Award 2019 – Trimsaran school is a bright, healthy one-form-entry Passivhaus primary school with an adjacent nursery. Taking inspiration from the Welsh hillside location, the multi-level scheme nestles comfortably into the steep site with materials that reflect the area's heritage and landscape. The prominent hilltop site required a sympathetic design approach for planning. A natural palette of materials creates a subtle and elegant aesthetic. Elevations have been finished in a mix of hanging clay tiles, paired with Welsh larch and a sedum roof in support of the local supply chain and low carbon credentials. The timber structure is domestically grown Welsh timber frame.

Ysgol Trimsaran is an exemplar learning environment. “It is spacious, light and airy and has improved pupil’s pride and self-esteem. The temperature is constant thus improving concentration levels.” *Sharon Owen, former Headteacher at Ysgol Trimsaran*

The new school is a place where pupils want to learn. The scale and flexibility of spaces has allowed teachers to execute different teaching methods that were previously not possible.

Design for Trimsaran school was heavily influenced by both stakeholder involvement and valuable lessons learnt from Architype’s first and second generation Passivhaus schools, where extensive post occupancy evaluation was undertaken.

Simplifying of elements resulted in significant savings and ease of use for the school and local authority, Carmarthenshire County Council. For example:

- On Oak Meadow primary school – the UK’s first Passivhaus school, a full height curtain walling system was used but for Trimsaran the same effect was achieved through using large windows which were more cost-effective.
- On Oak Meadow school, 120 actuators for window opening and closing were specified, but on Trimsaran primary school we were able to reduce this to just 16, which saved money and reduced maintenance.
- For Trimsaran, much smaller radiators needed to be specified and no back-up boiler was installed. Post Occupancy Evaluation on Oak Meadow school had identified that when the main boiler broke down it had taken five days for the warm temperature to be affected, as the building was so well insulated. The boiler could easily be repaired or replaced within five days, avoiding additional cost and maintenance of a second boiler.

Full performance, design and engineering analysis – including daylight analysis, PHPP (Passivhaus Planning Package) and overheating analysis – was undertaken on the project at the key RIBA stages of 2, 3 and 4. The design for Trimsaran was created to suit end user requirements, with careful consideration given to the links to the early years teaching spaces, as well as the interplay between mobility and performance. For example, on Trimsaran’s first floor – a balcony was added to the design, allowing older students to reach the multi-use games area and playing fields directly from the classrooms. The balcony added the additional performance benefit of providing shading to the floor below, ensuring that these do not overheat. Such design aspects were co-ordinated to check their performance impact within the PHPP analysis and agreed with the client stakeholder team.

Architype advocate that design is an iterative process, with building performance impact being tested at Stages 2, 3 and 4, this avoids design changes which may impact on cost and programme at a later stage.

Further reading: https://www.architype.co.uk/project/ysgol-trimsaran/

Photo credit: © Leigh Simpson Photographer

Case Study 8: Reviewing BMS controls and setting up monitoring to enable fine tuning process

Photo credit: © Sheppard Robson

The **Contact Theatre extension project** embedded a number of workshops with the end users and FM team during the course of the design programme. During the construction phase both the look and functionality of the BMS controls and manual were agreed collaboratively with the facilities team, satisfying the requirements of the building managers and the project aims of minimising energy consumption as much as possible.

The Plan for Use guidance and actions associated with commissioning and building performance data collection and are set out in the Plan for Use Stage 5: Manufacturing and Construction

Contact Theatre and Arts Venue
Location: 8
Client: Contact
Architect: Sheppard Robson
Building Services: Max Fordham LLP
Structural Engineers: Civic Engineers
Date of completion: July 2020
Construction Cost: £6.8m

In 2020, Sheppard Robson together with Max Fordham completed an extension and overhaul of the engineering systems of Alan Short's original 1990's design of the youth-led Contact Theatre in Manchester. Max Fordham was part of Alan Short's original design team, so this project represented the opportunity to re-visit a familiar and iconic project. The extension project was the third iteration for the building since Short's design was in-fact in itself was a refurbishment of a 1960's University Theatre building.

For the 2020 extension, a significant amount of early user engagement took place. The Contact Theatre created its own consultant group – Con:Struct, a team of young people associated with the Theatre that played a pivotal role in ensuring that the developing design reflected not just the needs, but also the 'attitude' of its members, staff and audience. The theatre focuses on young people and their futures; sustainability and limiting carbon emissions were seen as a key driver for the project. This, along with a tight budget, meant that as much as possible building elements were retained and only replaced if the upgrade had significant benefit.

Instead of pursuing BREEAM certification, the client team opted for a Soft Landings approach, focused on the buildings Display Energy Certificate (DEC), which even pre-refurb came in at an A rating, putting it in the top 5% in its benchmark category. The refurbishment aims to retain its DEC A whilst improving comfort and the number of visitors. The aftercare team are engaged in a 2-year process to ensure the building is optimised as much as possible to deliver highly comfortable and healthy spaces, whilst using the least amount of energy possible.

The natural ventilation strategy for Short's design included the addition of the distinctive large natural ventilation H-pots. Back in the '90's the Contact Theatre was the first fully naturally ventilated theatre of the modern age. The refurbishment has kept the same natural ventilation strategy, with the inclusion of additional chimneys for the extension. The control of the chimneys has been upgraded to deliver a demand lead ventilation system with the BMS controlling ventilation rates and limiting draughts to improve comfort and limit energy wastage. However, the building managers can take full manual control if they wish.

During the construction phase a number of mechanical controls workshops were held with the client facilities team to ensure that the building would have the required level of control and monitoring capabilities, and the look and functionality of both the manual and BMS controls were agreed. The controls specialists were fully engaged in the process, and their involvement is ongoing with fine tuning as the theatre becomes fully occupied.

The aftercare process was placed on hold due to the COVID pandemic. However, some of the office spaces have been sporadically occupied and the Contact Theatre team have been receiving user training. The BMS has been set up to remotely monitor the environmental conditions, which will be key to the eventual fine tuning the control of the natural ventilation chimneys during performances once they recommence.

Further reading: https://www.sheppardrobson.com/news/article/aj-retrofirst-stories-manchesters-contact-theatre

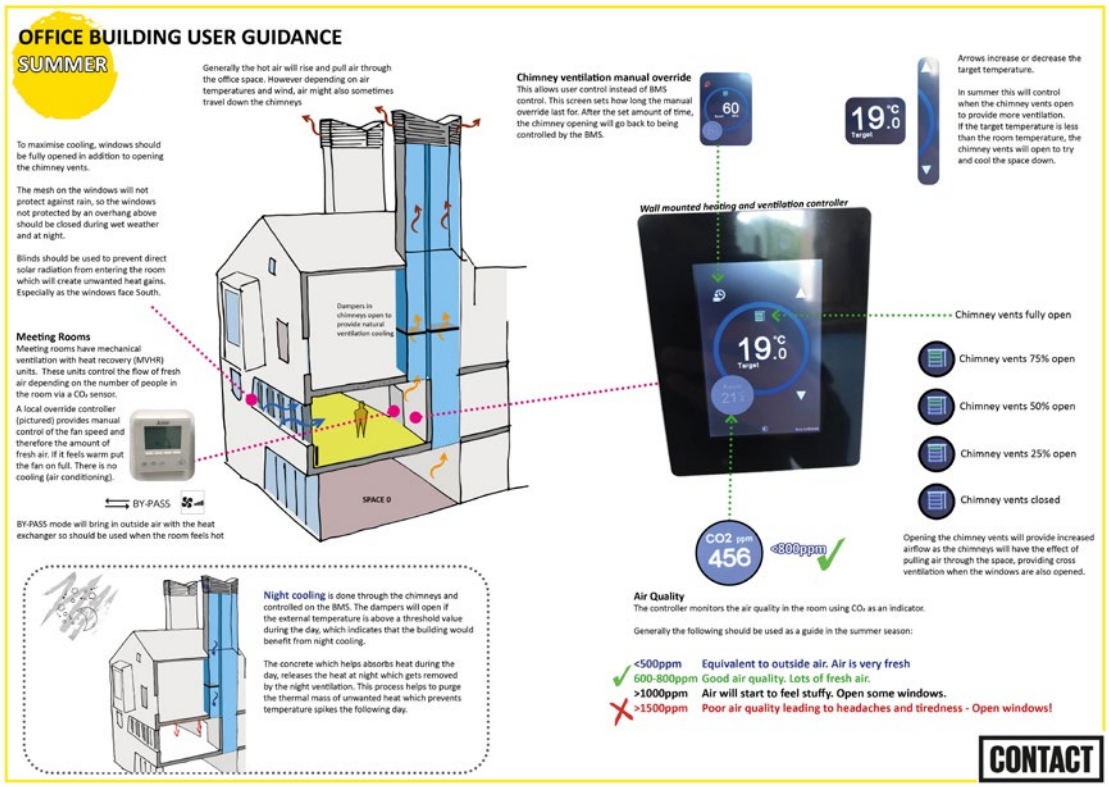


Image credit: © Max Fordham LLP

Case Study 9: Engaging building user guide to support staff in how to operate their building

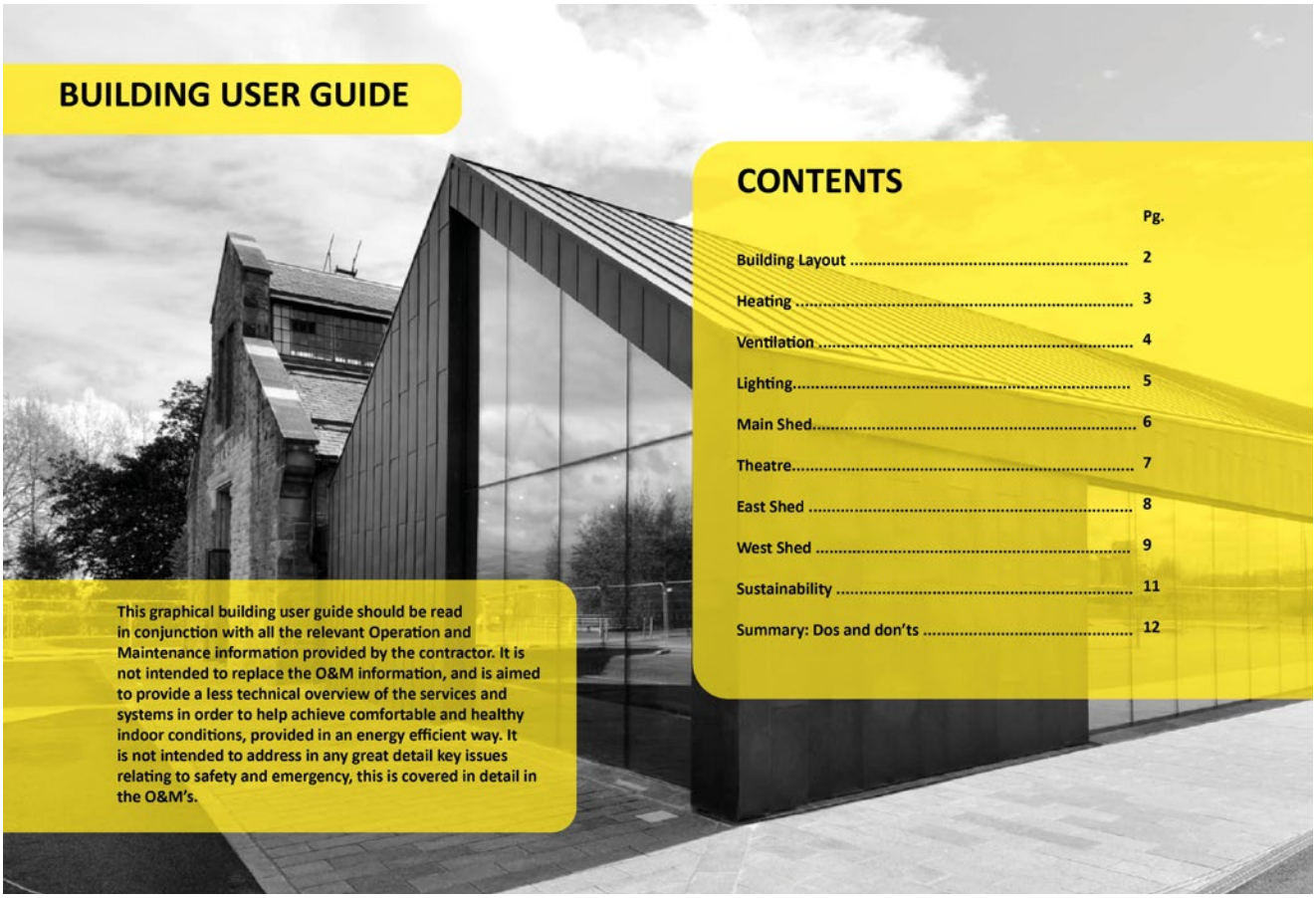


Image credit: © Max Fordham LLP

The **Engine Shed project's** building user guide provides a graphical summary of how to obtain comfortable and healthy internal conditions in the most energy-efficient way possible – giving staff a quick overview of how the building works. The image rich user guide has proved to be very popular with staff and was supplemented by face to face training and training videos.

Further details of actions and guidance around creating building user and operation and maintenance guides are set out in Plan for Use Stage 5: Manufacturing and Construction

Project Name: Engine Shed
Location: 9
Client: Historic Environment Scotland
Architect: Reiach and Hall Architects
Building Services: Max Fordham LLP
Structural Engineers: David Narro Associates
Date of completion: April 2015
Construction Cost: £5.3m

Engine Shed is Scotland's new building conservation centre and offices. The objective was to create a new and dynamic centre, combining both a visitor attraction and a space for learning and engagement with traditional buildings and the skills and materials required to build, conserve and maintain them.

Max Fordham LLP delivered M&E engineering, sustainability consultancy, and Soft Landings services including handover support, building user guidance, building performance monitoring and occupant surveys.

The building users were involved in the initial briefing workshop which was used to form the sustainable design targets for the project. Throughout the design and construction, the users attended meetings to review the progress of these targets, their feedback gathered at each stage.

The Soft Landings aftercare team engaged in several ways to assist in ensuring the building stood the best chance of achieving its operational performance. Extensive training on how to run the building included the production of a graphical building user guide, face-to-face training sessions and training films, as well as detailed commissioning and then ongoing fine tuning.

The building user guide provided a practical, engaging and easy to understand summary of how the building works. It provides an overview of how to obtain comfortable and healthy internal conditions in the most energy-efficient way possible. This guide does not replace the operation and maintenance (O&M) manuals, but rather provides a summary of the most necessary information which impact the users when running and operating the building on a day-to-day basis. From the various illustrations and images, the building users can get a broad understanding of how the building works without needing to read lots of the text. Feedback from the centre staff has been positive: "Visitors ask us a lot of questions and so it's really good that we are able to use this to help us to explain how the heating works. [It] Definitely helps us understand how the building works"

A two-year aftercare process has been followed, facilitated by Max Fordham. The main contractor, sub-contractors and controls specialist have all been engaged throughout the aftercare period and have attended regular meetings and fine-tuning sessions. Max Fordham have reviewed energy consumption, building systems performance monitoring through BMS and building reviews, overseen fine tuning, and gathered occupant opinions. The results of the occupants have informed further fine tuning of how the building controls and management.

Collectively, these activities have seen a marked improvement in the energy performance of the building. The second-year aftercare report shows a 20% reduction in energy use over the first year, resulting in the energy and carbon performance starting to align closer with the design estimates.

Further reading: https://www.cibsejournal.com/case-studies/historic-success/

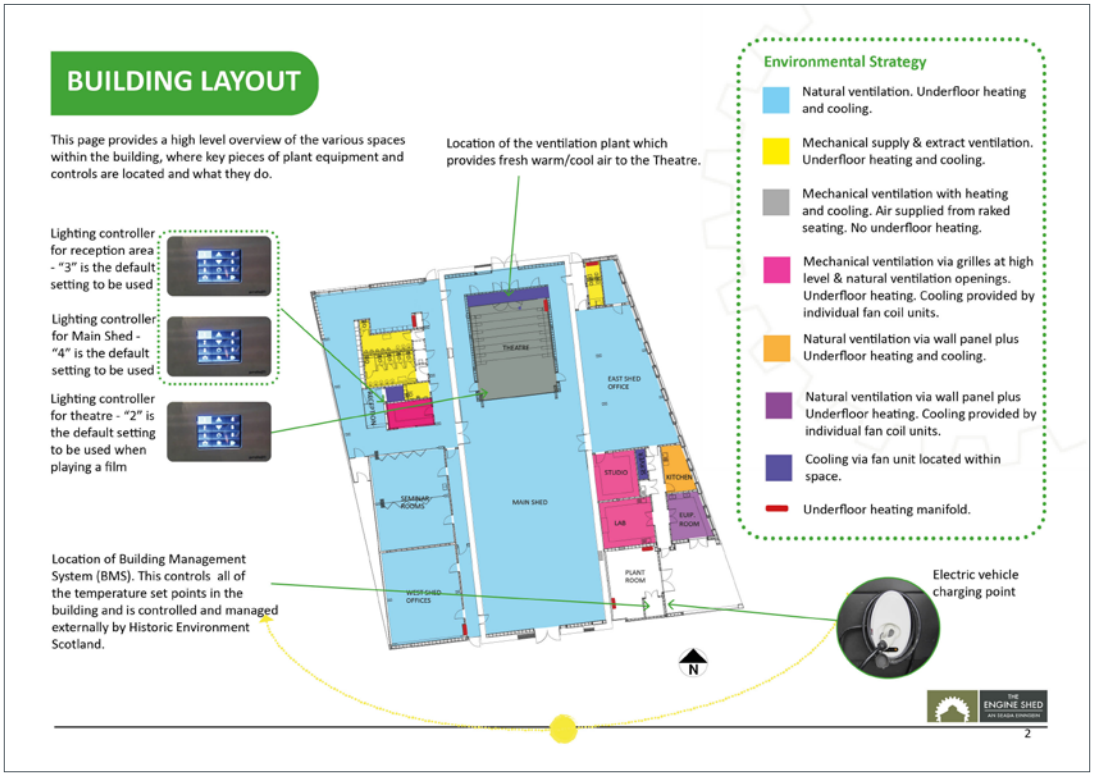


Image credit: © Max Fordham LLP

Case Study 10: Learning from Post Occupancy

Photo credit: Greenbox Associates. © Julia Conway Photography

The **Quebec Park** project demonstrates how to obtain feedback on residential projects and how post occupancy response data can be interrogated to obtain valuable lessons for future projects.

The actions for light-touch POE are set out in the
Plan for Use Stage 6: Handover

Quebec Park, Bordon & Whitehill
Location: 10
Client: Abri
Architect: Architecture PLB
Contractor: Drew Smith Ltd
Post Occupancy Evaluation: Greenbox Associates
Date: June 2018
Construction Cost: £18.5m

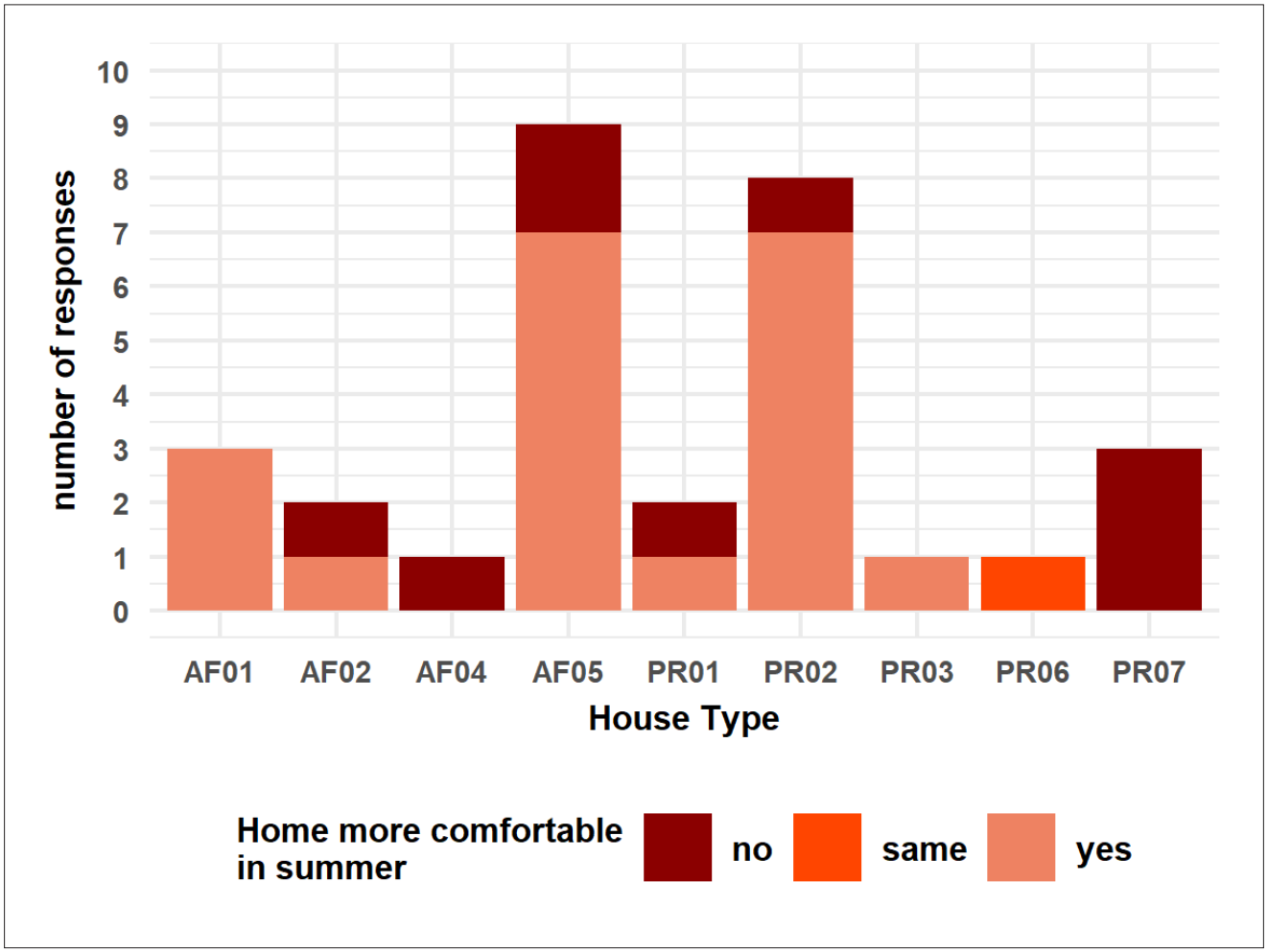
Quebec Park was the first development of a wider regeneration project in Bordon, Hampshire. The development consists of 100 houses and flats built to very high-performance standards. The client wanted the project to be an exemplar and worked with the National Energy Foundation to monitor design and construction quality to close the performance gap. The project was designed to achieve a 45% improvement on Part L 2013 (at the time equating to between Code 4 and 5 from the Code for Sustainable Homes) and was a pilot project for Zero Carbon Hub, working out how the Hub's carbon compliance and fabric energy efficiency standards (FEES) could be achieved

on site. The client was not only keen to avoid the performance gap but wanted to use the learning from the project to inform their future developments. 3 years aftercare and POE were therefore written into the contract which included 'no blame' clauses to ensure the process remained both transparent and collaborative.

The first challenge was to convince residents to take part in a building users survey. 35 homes were contacted for home visits (all of which were being monitored) of which 14 agreed to take part, allowing follow up house visits. The remaining 60+ homes had a postal survey, of which 18 replied. Overall feedback was very positive with 90% of respondents stating that they felt their new home was more energy-efficient than their previous homes and 94% stating their new home was more comfortable in winter. These results were corroborated by energy monitoring results from 35 of the dwellings which showed instead of a performance gap, an impressive 19% average improvement on space heating demand compared with the SAP (design) estimates.

The POE survey period included the heatwave of summer 2018 so the design team were particularly interested to see how the dwellings prevented overheating. 65% of respondents stated their new home was more comfortable in summer and 100% responded that they made use of the moveable shutters which were a feature of the design. The response data was further categorised into house type as shown in the table below and this demonstrates how rich this type of data can be. It allows designers to analyse aspects of those particular dwellings that didn't perform quite as well as the others, maybe due to orientation, detailing or specification (even though all of these had been thoroughly evaluated for overheating risk at the design stage.) The learning drawn from Post Occupancy Evaluations like this project, enable the refinement of design that will be essential in a warming climate and a zero-carbon future.

Further reading: https://architectureplb.com/sectors/quebec-park-bordon



Case Study 11: Securing better performance through a 'no-blame' culture and ring fencing a fine-tuning contingency budget

Photo credit: © BDP/Architype

The **Enterprise Centre** project illustrates how to overcome the culture of blame and how a contingency budget was used to deliver high performance in use outcomes.

More information on fine tuning and aftercare is set out in
Plan for Use Stage 7: Use

The Enterprise Centre
Location: 11
Client: University of East Anglia
Architect: Architype
Building Services, Structures Engineering and Acoustics: BDP
Contractor: Morgan Sindall
Date: June 2015
Construction cost: £11.6m

Designed and delivered to achieve both Passivhaus and BREEAM Outstanding ratings, the Enterprise Centre is a landmark building at the entrance to the UEA campus. Containing 3400m^2 of offices, workshops, lecture theatre, research and development spaces, it supports sustainable business start-ups for graduates and the local economy. The building completed in the summer of 2015 and is architecturally ambitious. A timber frame with lime render has a defining feature of locally sourced thatch cladding. It has since won numerous awards and acclaim and has received A-rated display energy certificates every year since completion.

The project incorporated a full Soft Landings process through the project, which included the requirement for a three-year post occupancy evaluation and aftercare service. Experience with applying Soft Landings elsewhere has exposed major cultural difficulties when building contracts are extended beyond the traditional 12-month defects liability period; particularly in the grey area between establishing what is a latent defect and what is a maintenance liability. This project took a bold step in establishing a contingency fund, (ring-fenced from the main design and project contingency), specifically to address this issue. Establishing a separate budget during Stage 3 with a clear protocol on who authorises its use is a good way of combatting the prevailing blame culture.

The project team were retained, and quarterly meetings were held throughout the 3-year period, including the architect, engineer, contractor, M&E subcontractor, controls specialist, user client and FM team. Additional specialists, e.g. the lighting manufacturer were brought in as required.

The client team collated performance issues reported by users on a live list – mainly minor issues in relation to heating, lighting, ventilation or controls – and this was used as the agenda for each meeting. Over the course of the 3 years, solutions were identified, often straight away with the team on site, but on occasion, if it was clear a component needed to be changed, then the contingency could be used. It didn't matter if it was a design, construction or commissioning issue, it got resolved with 'no blame',

The building's BMS, and, in particular CO_2 and temperature, were monitored remotely through the period, by the architect and engineer, enabling assistance to the FM team. During the period, two BUS surveys were also conducted at the end of years one and three, which identified a number of issues, which were then acted on – usually by making minor modifications to the BMS, or with control gear within the lights.

Further reading: https://www.architype.co.uk/project/the-enterprise-centre-uea/

Author's End Note

'After innumerable demands, you have finally accepted that this house you built in 1929 is uninhabitable.... Please render it inhabitable immediately. I sincerely hope that I will not have to take recourse to legal action.'
Letter to Le Corbusier from Madame Savoye dated 1930.

Villa Savoye has become one of the most iconic buildings of the Modern Movement. The almost religious reverence which is held for this work allows us to overlook an inconvenient truth; that it was viewed by its only occupants as being uninhabitable for many months of the year.

Should such shortcomings be forgiven? Afterall, there is nothing here that could not be fixed today by improvements in flat roof and glazing technology and perhaps some (very large) aircurtains. Pioneers would not be pioneers if they did not take risks, so can Villa Savoye's performance gap be viewed as justifiable collateral damage against its overall contribution to the architectural canon?

So are we as good at bridging the performance gap now? When I was first introduced to Soft Landings 10 years ago, I realised that technology and green design would not be sufficient on their own to deliver the sustainable buildings of future in an increasingly fragmented industry. Success will require the widescale adoption of a process like Soft Landings within both our profession and the wider construction industry. I have been a passionate advocate of Soft Landings ever since, not least because it seeks to re-balance focus on functionality and longevity.

I have been fortunate to be able to work in Local Authority architectural practice for most of my career where the wellbeing of occupants is at the forefront of what we do. As we also hold responsibility for managing the properties we design, it is in our interests to strengthen the bonds between the capital and operational sides of our business. Plan for Use augments this model very well, but it can also help bridge the gap where the disciplines of building design, construction and asset management remain steadfastly separate. Arguably, the more dislocated these functions are, the more vital Plan for Use becomes.

I am very grateful to both the Sustainable Futures Group for inviting me to help develop RIBA's version of this process, and to Hampshire County Council Property Services which has gradually been increasing its adoption on projects allowing refinement and testing of its application.

Mike Chater

Endnotes

1 Carbon Buzz web site has cross sector benchmarked data from over 600 projects; https://www.carbonbuzz.org/evidencetab.jsp

2 The Soft Landings Framework UBT & BSRIA, ref BG54/2014 https://www.usablebuildings.co.uk/UsableBuildings/Unprotected/SoftLandingsFramework.pdf

3 For guidance on whole life cost reporting, see ICMS: Global Consistency in Presenting Construction and Other Life Cycle Costs, International Construction Measurement Standards Coalition (2019). Available at: https://icms-coalition.org/

4 PROBE reports; case study and archive sections of usablebuildings.co.uk

5 NABERS UK (https://www.nabers.gov.au/about/nabers-international/uk) NABERS is an energy efficiency and in-use building energy efficiency scheme that originated in Australia. It provides a rating from one to six stars, helping building owners to understand their building's performance versus other similar buildings and provides a benchmark for progress.

6 https://busmethodology.org.uk

7 F Stevenson, *Housing Fit for Purpose*, RIBA Publishing (2019), Chapter 7.

8 On residential projects, house builders often schedule pre-meetings with house buyers / renters which would cover similar issues. Refer to F Stevenson, *Housing Fit for Purpose*, RIBA Publishing (2019).

9 Some clients and design teams require the main or management contractor to take responsibility for all routine maintenance during the Defects Liability Period. This nominally provides single-point responsibility – thought most contractors will outsource maintenance, if only to another division of their own organisation. Single-point contact also has drawbacks: in particular, 1). clients and occupiers may not take full ownership of their building and rely too much on the building team; 2). At the end of Year 1, clients will have to set up their own routine maintenance contracts: this can be more of a nuisance for everybody than at handover; 3). Main contractors can hide strategic problems that come to light during maintenance, while an independent maintenance contractor would have made its concerns clear.

10 Perhaps the best training for POE is apprenticeship, working together with an experienced evaluator: first as an assistant and then as a partner. The Plan for Use Performance Reviews create opportunities to use external expertise to familiarise and train in-house staff. Some universities also run Masters courses on BPE and POE.

11 There are three main reasons for using independent reviewers: 1).They come with fresh eyes: those intimately involved in a project know too much about it to be able to stand back 2) It brings in people with a wider experience of building projects and their performance, e.g. those for other clients and occupiers and by other practices 3) They are often able to the heat out of contentious issues: for example, an occupant survey may show that complaints do not represent overall occupant satisfaction; or that outcomes that clients or designers find disappointing are in fact reasonably good in relation to comparable buildings.

12 A more formal process is used like ARUPS' BUS Methodology, which may be used in more in-depth POE in Stage 7.

13 It should be noted that if defects are still being resolved, survey and utilities data may be impacted. Results from light touch POE should therefore be interpreted within this context. Once the building has settled down and snags are completed, formal analysis of data and occupant satisfaction surveys will be much more robust (as discussed in the benefits of Aftercare in Stage 7).

14 F Stevenson, *Housing Fit for Purpose*, RIBA Publishing (20190, Primer: How to do housing BPE.

15 See Sustainable Outcomes Guide, RIBA (2019) and F Stevenson, *Housing Fit for Purpose*, RIBA Publishing (2019) for domestic buildings. ASHRAE *Performance Measurement Protocols,* American Society of Heating, Refrigerating and Air-Conditioning Engineers, U.S. Green Building Council (USGBC) and CIBSE (2011), largely for non-domestic buildings.

Glossary

Capitalised terms: The RIBA Plan of Work contains a number of capitalised terms. These are the core procedures, processes and tools, and are used the Plan for Use Guide. As crucial aspects of the RIBA Plan of Work, their intentions and purposes need to be clear – the Glossary in Part 4 of the RIBA Plan for Work publication defines in greater detail the meaning of each term.

2020RIBAPlanofWorkoverviewpdf.pdf –see p. 120 Glossary.

Specific to the Plan for Use is the term Record of Performance Risk, for which a definition is provided below.

Term/task	**Definition** (guidance is included in grey boxes)
Record of Performance Risk	A performance risk is an unforeseen event that can affect a project's performance objectives and/or performance outcomes. Establishing a record of these potential risks is one of the tools with which performance risks can be managed and mitigated. The record of performance risk logs all potential risks that could negatively impact on the project's performance outcomes and assigns a probability of occurrence. This clarity can help to formulate risk resolution strategies and pave the way for limiting under performance or non-compliance. In producing the record, performance risks must first be identified, then subsequently analysed for their probability. This process allows performance risks to be prioritised and mitigating actions put in place to limit those with greatest potential impact first. The last but crucial element of the record of performance risk is allocating an owner to each of the identified risks. The owner is also responsible for the associated risk mitigation and resolution plan. It is essential that the record of performance risk is treated as a live document, and regularly reviewed and updated.

Further Reading

For further reading and guidance, the following are suggested. They do not represent an exhaustive list on the subject, and the majority of these are available for free download. As POE becomes more common place, it is anticipated that more material will be published and shared across industry.

The RIBA Building Knowledge: Pathways to Post Occupancy Evaluation (2017) report stresses the importance POE and shows that it can be a simple and straightforward process. It outlines POE's role in supporting the development of a research culture within architecture to encourage continuous learning and improvement in building design and performance, and also to enable architects to evidence the value of their work. The report contains a number of case studies that demonstrate how POE has been successfully used by individual practices, clients and researchers to understand and communicate the value of investment in high quality architecture.

The RIBA POE Primer (2016) provides a structure for undertaking an evaluation and a schedule of POE/BPE services.

The RIBA Plan of Work 2020 Sustainability Strategy (2020) outlines key actions that the architectural profession must adopt to deliver buildings that both meet clients' requirements and address the climate and biodiversity emergencies. The Sustainability Strategy is agnostic to methodologies, assessment tools and certification routes. Instead, it provides a framework with actions, and stage outcomes to be checked and monitored against. The onus is on individual project teams to develop targets through the Sustainability Outcomes Guide and deliver verified building performance through the Plan for Use Strategy.

The RIBA Sustainable Outcomes Guide (2019) is part of the suite of documents supporting the delivery of sustainable buildings. The Sustainable Outcomes Guide defines the key performance metrics and design principles that architects and project teams should follow. These concise and measurable outcomes and associated metrics correspond to the key UN SDGs that are relevant to the built environment. The RIBA Sustainable Outcomes Guide crystallises targets that need to be achieved, with an aggressive timeline to delivery by 2030 for new and refurbished buildings, and an absolute backstop of 2050 for most existing buildings. The RIBA requires these performance metrics to be independently measured and verified in use by recognised Post Occupancy Evaluation (POE) tools. The guide complements the RIBA Plan of Work 2020 Sustainability Strategy and this Plan for Use Guide.

Another tool that has been used extensively in the UK is the RIBA Higher Education Design Quality Forum Method (2000).

The UKGBC's 'how-to' guidance How to execute high impact post occupancy evaluation.

Woodknowledge Wales has produced a Building Performance Evaluation (BPE) Guide for housing clients. Its purpose is to introduce BPE and to provide an overview of the main BPE techniques available. The guide provides information relevant for client and project managers (such as how to procure BPE) but also clearly sets out the main BPE activities to plan for throughout a project's lifecycle through to occupation.

The guidance is accompanied by a BPE Toolkit for use on projects, which is complemented with more detailed examples and further references.

Fionn Stevenson, Head of the University of Sheffield School of Architecture, uses her original research on housing performance evaluation in her book: Housing Fit For Purpose: Performance, Feedback and Learning to argue that learning from feedback should be taking place at every stage of the housing project lifecycle, improving

outcomes for end users. The book shows why and how the design, construction and management of housing can be linked to feedback and actual evidence of how people choose, and learn, to use their homes.

The Building Performance Network's State of the Nation report provides an accessible review of new-build housing performance in the UK, and covers the methods and tools that have been used in research for assessing the as-built and in-use performance of the sector in detail. The study has also created for the first time, an online and interactive spatial map of housing performance studies undertaken in the UK.

Better Buildings Partnership, Design for Performance, A New Approach to Delivering Energy Efficient Offices in the UK.

The Useable Buildings Trust's website presents material mainly concerned with building performance evaluation, with an emphasis on merit-worthy building case studies. The website aims for independence and strives to offer thoroughly researched, accessible and useful content.

Leesman Index

Arups' BUS methodology

In addition to the above, readers may wight find the below helpful:

Assessing building performance in use 1: The Probe process, R Cohen, M Standeven, W Bordass and A Leaman, Building Research and Information 29 (2), 85-102, 2001.

Building Performance Evaluation Programme: Findings from non-domestic projects – Getting the best from buildings, Innovate UK, 2016.

Building Performance Evaluation Programme: Findings from domestic projects – Making reality match design, Innovate UK, 2016.

Guide to Post Occupancy Evaluation, HEFCE, AUDE, University of Westminster (2006).

Post-occupancy evaluation in architecture: experiences and perspectives from the UK, Rowena Hay, Flora Samuel, Kelly J. Watson, Simon Bradbury, Building Research and Information, 46, 6, May 2017, pp. 698-710.

Soft Landings Framework, BSRIA, (BG 54/2018)

Soft Landings and Design for Performance, BSRIA and Better Buildings Partnership, BG 76/2019.

Soft Landings and Government Soft Landings, BSRIA, BG 61/2015.

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