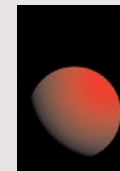


UK Architects Declare Practice Guide → 10 → Designing for Performance



UK Architects Declare
Climate & Biodiversity
Emergency

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Architects Declare was launched as a not-for-profit organisation in the UK on 30 May 2019. Since April 2024 UK Architects Declare is a registered charity. At the time of publication, it has over 1,300 signatories in the UK. It is part of Built Environment Declares, which is now represented in 27 countries around the world.

www.builtenvironmentdeclares.com

Design by Lands
lands.ie

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11 Designing for Performance

This document has been created by an Architects Declare working group to help signatories convert their declaration into meaningful action and build momentum within their practice. The guide is intended to be a live, working document that helps fulfil the fourth point in our 12-point declaration by encouraging the sharing of knowledge and research on an open source basis. We expect this guide to evolve and be refined in future iterations as our understanding of the climate and biodiversity crises develops, and as our industry innovates to find new solutions to these challenges. We encourage our signatories—and other architectural practices or built environment practitioners—to contact us with feedback on this version and examples for the next version.

Throughout the guide we have named suppliers, methods and frameworks which our authors have experience of. We included these specifics to help clarify our intention but encourage practices to do their own

due diligence on specific services. We have contacted the practices and initiatives featured in the guide to request permission to reproduce their work. If we have missed any, please do get in touch so that we can resolve this in future versions of this Guide.

This is section 10 of the guide focusing on Regenerative Design, please read in conjunction with all other sections of the guide.

The Architects Declare Practice guide would not have come to light without the contribution, kind help, and guidance of an enthusiastic group of volunteers, and excellent feedback from expert reviewers. We would like to acknowledge and thank all:

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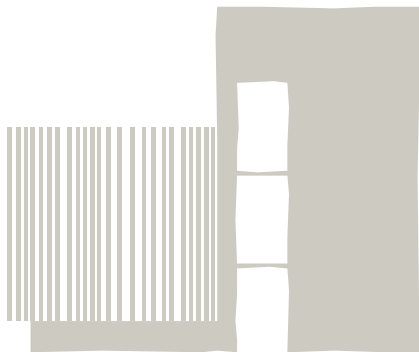
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1 Introduction

What do we mean by building performance?

Building performance describes how well a building actually functions in-use compared to its intended design outcomes. It reflects the building's real-world ability to provide a comfortable, healthy, low-energy, low-carbon, safe and resilient environment for occupants.



It can have a broad scope but typically includes:

- energy and water performance: how much energy and water the building uses in operation,
- indoor environmental quality: thermal comfort, air quality, acoustics, lighting,
- carbon performance: operational and embodied carbon impacts,
- functional performance: how effectively the building supports its intended activities, and
- systems performance: how well building services are designed, commissioned, controlled and maintained.

The focus of this guide is the relationship between building performance and the climate and biodiversity crises, which are exacerbated by energy and water consumption. However, all of these dimensions should be considered holistically to deliver buildings that work for both people and the planet.

What is the performance gap?

The 'performance gap' refers to the difference between predicted and actual energy use in buildings. Many buildings consume 30–70% more energy¹ than design-stage models suggest, with some cases performing far worse. Research by the Carbon Trust² found that 75% of case study designs did not perform as well as expected. There is no single cause of the performance gap. Instead, it arises from a range of factors, including optimistic modelling assumptions, construction quality issues, unregulated loads, and mismatches between how architects and engineers expect buildings to be used and real-world occupant behaviour.

Why is it important?

Poor building performance and the performance gap undermine efforts to mitigate the climate and biodiversity emergencies. They also reduce the resilience of our built environment and its ability to adapt to our changing climate, increasing vulnerability to overheating.

In the UK, construction accounts for 25% of greenhouse gas emissions and embodied emissions alone contribute 40–50 million tonnes of CO₂ annually³. As an industry, we cannot afford to construct buildings that consistently underperform by emitting more carbon than is absolutely necessary.

It has long been understood that closing the performance gap requires rigorous evaluation of building performance, feedback loops between building users and design teams, and whole-life design approaches. However, despite being added to the RIBA Plan of Work in 2006, very few architects routinely conduct building performance evaluation (BPE) or post-occupancy evaluation (POE) studies on their projects.

How our designs perform, and the way the occupants use the buildings and adjust them to meet their needs over time, should be an essential source of design inspiration and the basis of continuous improvement. Like any other design industry, feedback on achieved performance in-use improves accountability and gives designers greater control over design quality. Gathering information on how buildings actually perform in-use also helps clients to improve their briefing process and contractors to improve the construction process.

Incentivising building performance evaluation

Whilst progress has been slow, professional bodies are rising to the challenge. The RIBA National Awards, the Stirling Prize and the CIBSE Building Performance Awards all require the reporting of in-use performance.

In London, all major projects are required to report to the GLA's new 'Be Seen' database. Many non-government organisations, such as LETI, Good Homes Alliance and Wood Knowledge Wales, are already incorporating building performance evaluation and in-use studies into their guidance.

The WELL Building Standard⁴, NABERS⁵ (National Australian Built Environment Rating System) and the UKNZCBS (UK Net Zero Carbon Building Standard) are voluntary building performance standards that require evidence of actual performance in-use data before projects can be certified.

The Soft Landings⁶ process, developed by BSRIA, is a building delivery framework designed to ensure that buildings meet their operational performance goals and client expectations. It spans the entire project lifecycle, from inception to completion and beyond, focusing on improving the building's functionality and user satisfaction.

It is now time for all practices to step up to the challenge of improving building performance. The next section outlines practical steps you can take to achieve this.

1 <https://www.frontiersin.org/journals/mechanical-engineering/articles/10.3389/fmech.2015.00017/full>

2 <https://www.usablebuildings.co.uk/UsableBuildings/Unprotected/LowCarbonBPP/PerformanceGap.pdf>

3 <https://publications.parliament.uk/pa/cm5803/cmselect/cmenvaud/103/report.html>

4 <https://www.wellcertified.com/>

5 <https://www.nabers.gov.au/about/nabers-international/nabers-uk>

6 <https://www.bsria.com/uk/consultancy/project-improvement/soft-landings/guides/>

2 Improving building performance in-use

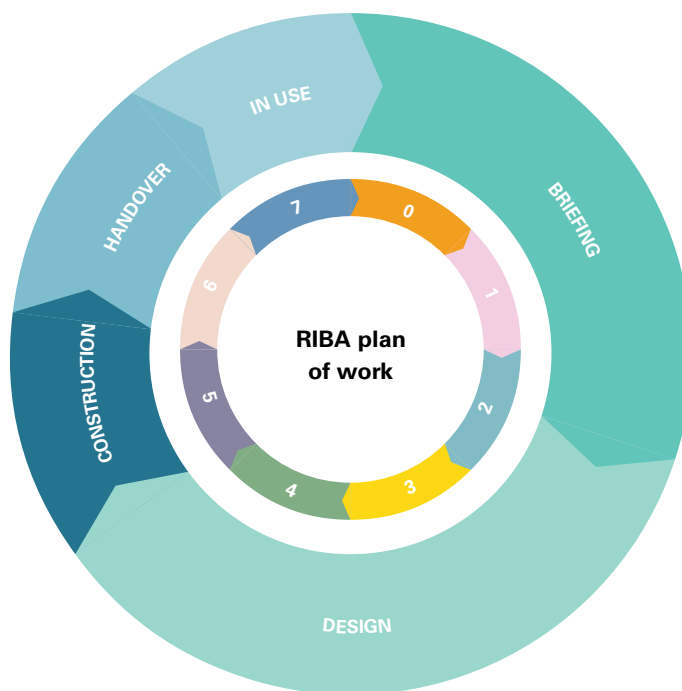
The projects that come closest to meeting net zero carbon performance typically incorporate specific and measurable targets and a mechanism to provide feedback on performance-in-use to all stakeholders.

This approach supports a design culture where design goes hand-in-hand with research at a time when the sector must innovate at an unprecedented pace. While net zero carbon targets do not necessarily deliver architectural quality, good architectural design is essential to achieve mainstream net zero. Feedback is key for both.

This section sets out clear and actionable advice on how to go about designing for good building performance, whatever the scale of your project. The content is organised around the following steps in the design process, aligned with RIBA stages and the BSRIA Soft Landings framework. When designing for performance is embedded in a project from the outset, the outcome of the POE is likely to be mostly good news!

RIBA plan of work

- 0 Strategic definition
- 1 Preparation & brief
- 2 Concept design
- 3 Spatial coordination
- 4 Technical design
- 5 Manufacturing & construction
- 6 Handover
- 7 In use



Building performance steps

Briefing	Review relevant Post Occupancy Evaluation Feedback and feedback from previous projects Develop the performance strategy and evaluation plan, including clear responsibilities, key performance criteria, and metrics/indicators for evaluation
Design	Embed performance requirements throughout the design process, reviewing proposals against performance objectives and finalising the commissioning and monitoring strategy.
Construction	Monitor construction quality and ensure performance-critical elements are delivered as designed.
Handover	Deliver commissioning, graduated handover and user training, ensuring building systems operate as intended and occupants are equipped to use them effectively.
In use	Monitor building performance and undertake post-occupancy evaluation, using a feedback loop to support continuous improvement and inform future projects.

Briefing (RIBA 0-1)

Establish the performance strategy, evaluation approach and project responsibilities from the outset to ensure building performance is embedded throughout the project lifecycle.

Key Actions

- Define clear success criteria in the client brief, including targets for operational energy, water use, indoor environmental quality, embodied carbon and occupant satisfaction, as appropriate to the project.
- Establish key performance criteria and metrics/indicators against which outcomes will be measured and reported.
- Review feedback from previous projects, including any relevant POE studies.
- Develop the performance strategy and evaluation plan, including roles, responsibilities, project milestones and reporting requirements.
- Agree key project stages at which performance outcomes will be reviewed and reported.
- Discuss and agree an appropriate contingency sum and scope for Building Performance Evaluation (BPE), including in-use performance monitoring where possible.
- Define the scope of BPE activities and stakeholder responsibilities at an early stage to minimise post-completion costs and avoid misunderstandings.
- Consider adopting recognised performance-based approaches such as Passivhaus or NABERS (for non-residential projects), which have demonstrated success in reducing the performance gap between predicted and actual outcomes.
- Appoint a Building Performance Champion to oversee the collection and management of performance data throughout design, construction and occupation. This may include operational energy, water use, indoor environmental quality, embodied carbon and occupant feedback. Frameworks such as [Minoro](https://minoro.org/)⁷ can assist in defining responsibilities.
- For retrofit projects, consider undertaking pre-design occupant engagement and basic building performance assessments to establish existing conditions, identify user needs and create a baseline against which future performance can be measured

⁷ <https://minoro.org/>

Design (RIBA 2-4)

Embed performance objectives throughout the design process and establish a robust framework for measuring outcomes once the building is occupied.

Key Actions

- Ensure performance requirements are clearly embedded within the design brief and tested at each design stage.
- Review design proposals against agreed performance objectives and refine solutions where necessary.
- Carry out realistic predictions of operational energy and water consumption using recognised methodologies such as CIBSETM54, accounting for likely occupancy patterns and all significant end uses.
- Finalise performance targets, commissioning requirements and the building monitoring strategy. Ensure seasonal commissioning is included.
- Identify the appropriate level of post-occupancy evaluation and building performance monitoring for the project, considering the client's objectives, project scale and available expertise.
- Specify any monitoring equipment, sub-metering and data collection systems required to support future evaluation.
- Ensure monitoring requirements are integrated into the design and coordinated with the wider building services strategy.
- Consider engaging specialist consultants or research partners where additional expertise would enhance the value of the evaluation process.
- As a minimum, plan a 'light-touch' post-occupancy evaluation to provide feedback on whether design objectives have been achieved and to identify lessons for future projects.

Construction (RIBA 5)

Embed performance objectives throughout the design process and establish a robust framework for measuring outcomes once the building is occupied.

Key Actions

- Monitor construction quality and ensure performance-critical elements are installed as designed.
- Verify that building fabric, airtightness measures, services installations and controls are delivered in accordance with design intent.
- Review construction changes for their potential impact on building performance and ensure any deviations are properly assessed and documented.
- Complete an accurate as-built record of materials and products, supported by Environmental Product Declarations where available.
- Ensure performance monitoring systems, metering equipment and sensors are installed, tested and commissioned as specified.
- Where appropriate, establish contractual requirements for reporting on operational energy, water use and embodied carbon performance.
- Ensure Employer's Requirements clearly define all BPE and POE activities, data collection requirements and reporting responsibilities.

Handover (RIBA 6)

Deliver a structured handover process that supports both technical performance and effective building operation by users and facilities managers.

Key Actions

- Carry out thorough commissioning and testing of all building systems to confirm they operate as intended.
- Plan a graduated handover period that allows users and facilities teams to become familiar with building operation and controls.
- Provide a clear and usable Building User Guide tailored to the needs of occupants and facilities managers.
- Explain how building systems should be operated efficiently and effectively, including controls, maintenance requirements and troubleshooting guidance.
- Develop a plan for seasonal commissioning and fine-tuning to account for variations in weather, occupancy and operating conditions.
- Confirm procedures for collecting and reviewing performance data during the first year of occupation.

In use (RIBA 7)

Monitor actual building performance, evaluate outcomes against original objectives and use a structured feedback loop to drive continuous improvement.

Key Actions

- Monitor operational performance and compare outcomes against the project's original performance targets.
- Undertake post-occupancy evaluation after one full year of occupation to assess both measurable building performance outcomes (such as energy use, water consumption, indoor environmental quality and carbon emissions) and whether the design has successfully met the architectural, functional and social brief.
- Undertake seasonal commissioning and periodic performance reviews to identify performance gaps, optimise building systems and ensure the building continues to operate in line with design intent.
- Share findings with clients, occupants, contractors, facilities managers and design teams so that lessons learned can be embedded within future projects.
- Establish a feedback loop that enables operational improvements, informed decision-making and continual refinement of future designs.
- Adopt a graduated approach to evaluation: begin with high-level review methods and undertake more detailed investigations where issues are identified.
- Conduct occupant satisfaction surveys, ideally after approximately one year of occupation to capture seasonal variations.
- Explore topics such as comfort, usability, health and wellbeing, operational issues, and opportunities for improvement.
- For larger projects, consider using established frameworks such as the BUS Methodology to provide benchmarking and comparison.
- Consider undertaking energy and water use audits and compare actual consumption after one full year of occupancy against initial assumptions and relevant performance benchmarks.
- Break down the annual figures (kWh and litres) in relation to the relevant net floor area to compare with chosen Energy Use Intensity (EUI) benchmarks (kWh/m²/year) (litres/person/day) and compare with initial design assumptions. [Use TM22 methodology where suitable⁸](https://www.cibse.org/knowledge-research/knowledge-portal/tm22-energy-assessment-and-reporting-methodology/) (see Resources).
- Where appropriate, undertake more detailed investigations using environmental monitoring, including temperature, carbon dioxide (as a proxy for ventilation performance and indoor air quality) and relative humidity measurements, alongside service recommissioning or fabric performance testing.
- Share lessons learned through case studies, publications, events and industry knowledge-sharing activities to support wider learning across the sector.

⁸ <https://www.cibse.org/knowledge-research/knowledge-portal/tm22-energy-assessment-and-reporting-methodology/>

NOTE

Understanding energy use first, before carbon emissions, is important as this is closer to the actual building performance, due to the various carbon factors that need to be applied. See Chapter 7: Energy, Whole Life Carbon. Use of the Passivhaus Planning Package (PHPP) can be a useful tool for estimating and reducing actual energy consumption, even where full Passivhaus certification is not specified.

Choosing the right methodology for performance evaluations

Post-occupancy evaluation can range from simple feedback exercises to comprehensive building performance investigations. The most appropriate approach will depend on the client's objectives, project type, available resources and the level of insight required. A combination of qualitative and quantitative methods is often most effective, allowing building performance to be assessed from the perspectives of occupants, operators, designers and measured building data.

There are many methods and activities that can be useful for undertaking building evaluations. The adjacent table summarises these.

Category	Purpose	Example tools and activities
Occupant Feedback & User Experience	Understand whether the building meets occupant needs and supports health, wellbeing and productivity.	Occupant surveys, interviews, focus groups, building walkthroughs, user diaries, stakeholder workshops, community feedback.
Operational Energy & Resource Performance	Compare actual resource use against design-stage targets and benchmarks.	Energy audits, TM22 energy assessments⁹ , TM54 design-versus-operation reviews¹⁰ , Energy Use Intensity (EUI) benchmarking, water use audits, sub-meter analysis, Be Seen reporting.
Indoor Environmental Quality (IEQ)	Assess the quality of the indoor environment and occupant comfort.	Temperature monitoring, CO ₂ monitoring, humidity monitoring, air quality assessments, daylight assessments, acoustic surveys, overheating studies.
Building Systems & Controls Performance	Evaluate whether building services and controls are operating effectively.	BMS reviews, controls usability assessments, commissioning reviews, seasonal commissioning, facilities management reviews, re-commissioning exercises.
Building Fabric Performance	Verify that the building envelope performs as intended.	Airtightness testing, thermographic surveys, fabric performance testing, TM71 heat transfer coefficient measurements¹¹ , moisture and condensation assessments.
Carbon, Circularity & Environmental Outcomes	Assess environmental performance beyond operational energy.	As-built embodied carbon verification, material passport reviews, circular economy assessments, biodiversity monitoring and environmental impact review.
Social, Functional & Regenerative Outcomes	Evaluate whether wider project objectives have been achieved.	Social value assessments, accessibility reviews, community impact studies, placemaking assessments, regenerative outcomes evaluation, review of whether the original brief was fulfilled.
Learning, Aftercare & Continuous Improvement	Close the feedback loop and support future projects.	Soft Landings reviews, lessons-learned workshops, design intent reviews, knowledge capture sessions, performance reporting and longitudinal monitoring over multiple years.

⁹ <https://www.cibse.org/knowledge-research/knowledge-portal/tm22-energy-assessment-and-reporting-methodology/>

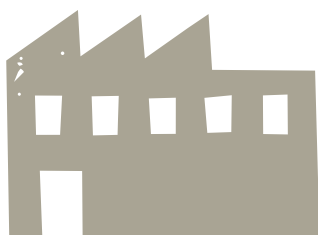
¹⁰ <https://www.cibse.org/knowledge-research/knowledge-portal/tm54-evaluating-operational-energy-use-at-the-design-stage-2022>

¹¹ <https://www.cibse.org/knowledge-research/knowledge-portal/tm71-measuring-heat-transfer-coefficients-in-buildings-2026>

Not every project requires every evaluation activity. A proportionate approach should be adopted based on project scale, building type, risk profile and client objectives. As a minimum, projects should aim to undertake a light-touch POE combining occupant feedback, a review of energy and water performance, and a lessons-learned workshop. Larger or more complex projects may benefit from enhanced or comprehensive Building Performance Evaluation (BPE) activities, including environmental monitoring, detailed energy analysis, commissioning review and fabric performance testing.

The following table sets out the applicability and indicative timing of the most frequently used methods in terms of building type and POE scope.

Table continued on the following page →



Method / activity	Residential	Commercial	Public / civic	Indicative timing
Light touch (minimum recommended)				
Occupant satisfaction survey	✓	✓	✓	6–12 months
Stakeholder feedback survey	✓	✓	✓	6–12 months
Building walkthroughs with users	✓	✓	✓	3–12 months
Lessons learned workshop	✓	✓	✓	3–12 months
Design intent review	✓	✓	✓	6–12 months
Knowledge capture and dissemination	✓	✓	✓	12 months +
Energy consumption review	✓	✓	✓	12 months
Water consumption review	✓	✓	✓	12 months
Accessibility and inclusivity review	✓	✓	✓	6–12 months
Enhanced				
Occupant interviews	✓	✓	✓	6–12 months
Focus groups	✓	✓	✓	6–12 months
Building user diaries	✓	✓	✓	Seasonal / targeted
Occupant behaviour study	✓	✓	✓	6–12 months
Community impact feedback			✓	12 months +
Social brief review	✓	✓	✓	6–12 months
Energy Use Intensity benchmarking	✓	✓	✓	12 months
TM22 energy assessment		✓	✓	12 months
TM54 predicted vs actual review	✓	✓	✓	12 months
TM71 heat transfer coefficient assessment	✓			6–12 months / winter
Sub-meter analysis		✓	✓	Ongoing / 12 months
Be Seen-style operational energy reporting		✓	✓	Annual / 1–5 years
Renewable energy performance review	✓	✓	✓	12 months

NOTE

The new British Standard 40101 on BPE is using definitions from RIBA:

Building Performance Evaluation (BPE)—the setting of targets and monitoring of performance at any point in the life of a building project. (Ref Building Knowledge: Pathways to Post Occupancy Evaluation, p50 footnote 25, RIBA ISBN 9780704915718)

Post Occupancy Evaluation (POE)—the evaluation of a building in-use. (Ref Building Knowledge: Pathways to Post Occupancy Evaluation, p50 footnote 25, RIBA ISBN 9780704915718). **Please note that RIBA as well as the new BS 40101 is adopting the term 'Building Performance in-use' rather than 'POE'.**

In-Use BPE—BPE study as specified in BS40101, carried out over a twelve month period, at any time during the life of the building, provided the building is occupied.

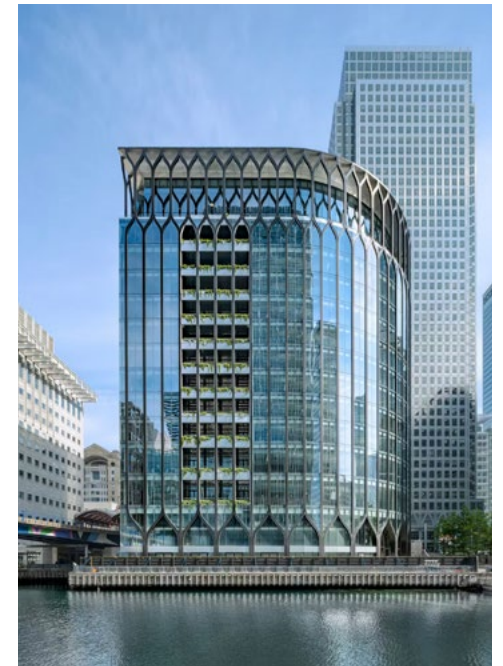
Method / activity	Residential	Commercial	Public / civic	Indicative timing
Temperature monitoring	✓	✓	✓	Seasonal
CO ₂ monitoring		✓	✓	Seasonal / targeted
Relative humidity monitoring	✓	✓	✓	Seasonal
Daylight assessment	✓	✓	✓	6–12 months
Acoustic assessment	✓	✓	✓	6–12 months
Overheating assessment	✓	✓	✓	Summer / heatwave
Facilities management interviews		✓	✓	3–12 months
Building Management System review		✓	✓	3–12 months
Controls usability assessment	✓	✓	✓	3–12 months
Commissioning review	✓	✓	✓	Handover / 3 months
Seasonal commissioning review		✓	✓	Seasonal / first year
Moisture and condensation monitoring	✓	✓	✓	Seasonal / targeted
As-built embodied carbon verification	✓	✓	✓	Handover / completion
Material passport review	✓	✓	✓	Completion
Circular economy assessment	✓	✓	✓	Completion / in use
Biodiversity performance review			✓	Seasonal / 1–5 years
Social value assessment	✓	✓	✓	12 months +
Adaptability and future-readiness review	✓	✓	✓	12 months +
Soft Landings aftercare review	✓	✓	✓	3–36 months
Comprehensive				
Longitudinal performance monitoring	✓	✓	✓	1–5 years
Indoor air quality monitoring	✓	✓	✓	Seasonal / targeted
Re-commissioning of services		✓	✓	As needed
Airtightness testing	✓	✓	✓	Completion / targeted
Thermographic survey	✓	✓	✓	Winter / targeted
Fabric performance testing	✓	✓	✓	Targeted

3 Exemplars

Around the UK, powerful examples of high-performing buildings are already demonstrating what's possible. These projects don't just achieve strong environmental outcomes, they show how thoughtful design, delivery and operation can translate into measurable performance in use. They serve as inspiration to go further, helping us reimagine not just what we build, but how buildings perform over time.

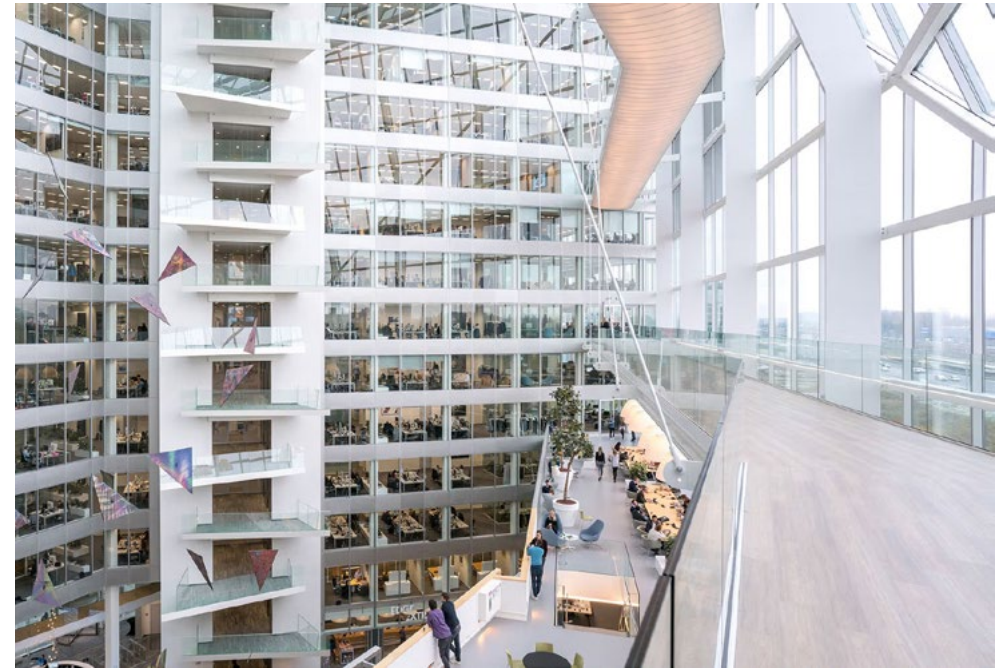
They offer a powerful prompt to think differently. They illustrate that existing policies, regulations, procurement approaches and industry norms are not fixed limits, but starting points that can be challenged and refined to enable better real-world outcomes.

Not every example achieves excellence across every performance metric, and that is part of their value. They invite critical reflection, encouraging us to consider what can be learned, what could be improved, and how future projects might perform even better in use.



The Edge

PLP Architecture
Amsterdam, Netherlands
2015



The Edge is a new-build office in Amsterdam designed to combine high environmental performance with an occupant-centred workplace. Its performance strategy integrates energy-efficient systems, smart controls and extensive building monitoring; the building achieved a record-breaking BREEAM score and is reported to operate as energy-positive. More than 28,000 input/output points collect data on environmental conditions, building use and occupancy. This digital infrastructure enables building systems to respond to occupancy and provides the potential for facilities teams to identify performance issues and adjust operation. Occupants can also control local temperature and lighting and report issues through an app. The Edge therefore demonstrates how continuous sensing can support operational management and occupant interaction.

.....
The Edge,
PLP Architecture



Design intent

The design brief combined an ambition to achieve the highest BREEAM performance with an energy-neutral, digitally enabled workplace. The energy strategy included aquifer thermal energy storage through two 129m wells, a heat pump, photovoltaic generation and LED lighting designed to provide 300 lux at 3.9 W/m², compared with a typical 8 W/m². The BREEAM Energy subscore was 88.89% at design stage, and the ENE1 target was increased from 12 to 14 credits, with the final credit linked to energy-neutral operation. Comfort measures included a north-facing atrium informed by solar-path studies, enhanced north glazing to address motorway noise and a ventilation cascade from offices through the atrium to a rooftop heat exchanger. The workplace strategy responded to Deloitte research indicating less than 50% desk occupancy, using a desk-sharing ratio of 3.85 and reducing desk provision by 36%. Philips, Mapiq and Schneider were engaged early to develop an integrated smart-building system.

Construction & handover

Delivery was managed through a detailed BREEAM credit log, with each credit assigned to a named party, deadline and

open or closed status. A third-party risk review of the 97.66% target was completed in July 2014. Commissioning was overseen by Deerns using formal test procedures and a seasonal commissioning schedule. The photovoltaic strategy combined 1,920 m² on the building with 2,280 m² rented on neighbouring University of Amsterdam roofs. Air-permeability testing met both BREEAM and specification methods, although thermographic testing was deferred until after handover. Testing also identified office partitions achieving 37 dB against a 38 dB requirement; incorrectly specified walls were removed and replaced. Daylight assessment found compliance in 83% of office space but only 36% of general occupied space, with one area restricted to 30-minute occupancy through the user manual. Construction-stage CO₂ emissions, gas, water, energy and waste were recorded fortnightly.

In-use performance

At handover, the BREEAM Energy subscore increased to 100%, although this was a certification outcome rather than a meter reading. The building connects approximately 28,000 sensor input/output points to a data lake, with the Schneider building-management system linked to

Power BI. Occupancy, movement, lighting, humidity and temperature are monitored continuously, while occupants can adjust local temperature and lighting through an app. Building services respond to occupancy in zones of approximately 200 sq ft, with near-zero use when spaces are empty. Reported outcomes include a 40% reduction in building-management costs, a 45% reduction in absenteeism and a 2.5-fold increase in job applications.

Feedback loop

The building's sensor network, app and facilities-management systems provide the infrastructure for continuous monitoring and operational adjustment. Data can inform heating, cooling, ventilation, lighting, cleaning, food provision and maintenance, while occupants can report issues through the app. The replacement of underperforming partitions demonstrates a documented design-to-construction feedback loop, and the BREEAM credit log provided a structured mechanism for resolving delivery issues. Operationally, Deloitte combined its real-estate, facilities-management and IT teams, and learning also informed suppliers, including the addition of the Philips power-over-Ethernet panel to its standard catalogue.

Methodology

<https://www.riba.org/media/wrelsxu3/ribapoebpeprimerpdf.pdf>

<https://www.riba.org/media/edul2w5z/buildingknowledgepathwaystopoe.pdf.pdf>

Sources

<https://edge.tech/portfolio/the-edge>

<https://www.plparchitecture.com/projects/the-edge>

https://www.cdabb.cam.ac.uk/system/files/documents/TheEdge_Paper_LOW1.pdf

<https://bregroup.com/case-studies/the-edge-amsterdam>

Collaborators

CBRE Netherlands [cbre.nl](https://www.cbre.nl)
 Deloitte Netherlands [deloitte.com/nl](https://www.deloitte.com/nl)
 EDGE [edge.tech](https://www.edge.tech)
 Deka Immobilien [deka-immobilien.de](https://www.deka-immobilien.de)
 Philips Lighting [lighting.philips.com](https://www.lighting.philips.com)
 C2N [c2n.nl](https://www.c2n.nl)

Philips Lighting is now Signify, which also has a case study on The Edge.

The Enterprise Centre

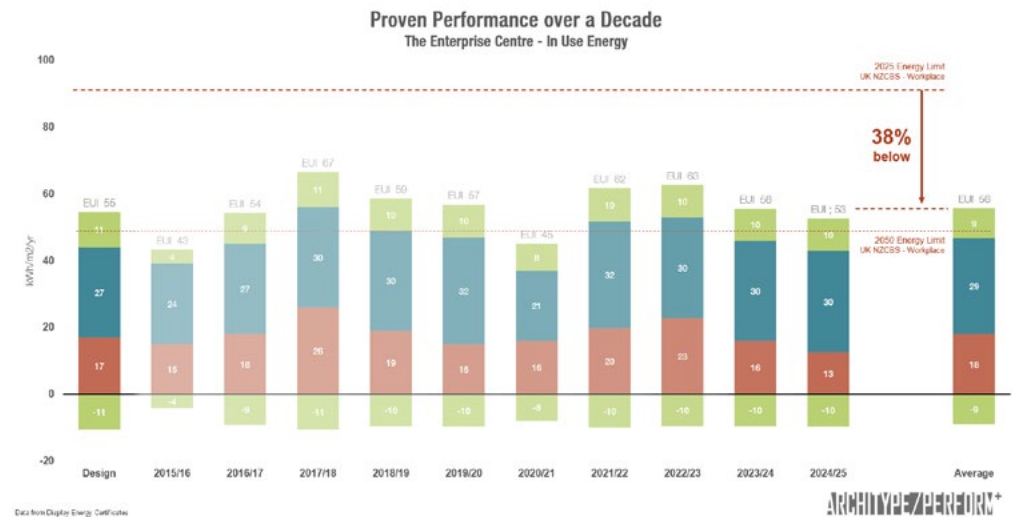
Archtype
Norwich, UK
2015

The Enterprise Centre is a new-build education, research and business-support facility at the University of East Anglia in Norwich. The Passivhaus certified building accommodates business-support workshops, open-plan offices and research and development activities for graduate start-ups and other businesses. It also supports the University's Low Carbon MBA and related graduate development and entrepreneurship programmes delivered by Norwich Business School.

Extensive workshops with University stakeholders informed the brief and design development. Alongside this engagement, the energy implications of design decisions were assessed throughout the process to maintain alignment with the Passivhaus standard. Early engagement established the client's priorities and aspirations for the building and its surrounding landscape. It also defined the areas requiring further design development, the contributions expected from different stakeholders and the programme for continued engagement. Together, these outputs provided a framework for reviewing the developing design.

At RIBA Stage 3, a mid-design review tested the developing design against the priorities established through early engagement. The review produced a recorded set of comments, suggestions, preferences and concerns for the design team to address during subsequent design development.

The Enterprise Centre,
Archtype



Design intent

The Enterprise Centre was designed to combine Passivhaus certification with BREEAM Outstanding and extensive use of renewable materials. Future climate data from the University's Climate Team were incorporated into PHPP modelling to test warming and cooling scenarios over an 87-year period. The energy strategy included a 50 kW roof-mounted photovoltaic array, exceeding the local requirement for 10% renewable-energy provision, together with triple glazing, mechanical ventilation with heat recovery and a fabric-first envelope. Shading studies examined solar gain, daylight and the interaction between south-facing glazing and internal heat gains, leading to a variable shade-height strategy and a compromise between thermal mass and embodied carbon. Embodied carbon was targeted below 500 kgCO₂/m² over a 100-year design life, using natural, bio-renewable and locally sourced materials. User consultation was structured through the Design Quality Indicator process, covering functionality, build quality and impact, with maintenance, cleaning and IT staff involved from the outset. The project formally adopted BSRIA's Soft Landings Framework and a collaborative NEC3 Single Point Delivery contract.

Construction & handover

The building envelope used a continuous airtightness layer and thick insulation arranged as an uninterrupted 'duvet'. Fresh air is provided by mechanical ventilation with heat recovery, supplemented by opening windows, louvres, stack ventilation and high-level exhausts for summer cooling, without active mechanical cooling. The concrete contained 70% ground-granulated blast-furnace slag, giving a reported 62% embodied-carbon saving; reinforcement steel was 98% recycled and the sub-base aggregate was entirely recycled and sourced from a local hospital. Site-waste management and recycling points were incorporated into the BREEAM strategy. A mid-design review at RIBA Stage 3 tested progress against the original aspirations and recorded comments and preferences for action. Compared with similar university projects, the procurement approach was reported to reduce the overall programme by 13% and delivery time by 30%, at a mid-range cost.

In-use performance

Measured performance includes a Display Energy Certificate rating of A (22), annual electricity use of 30 kWh/m²/year and heat use of 19 kWh/m²/year. Renewables provide 31.9% of the building's electricity. Achieved embodied carbon was reported as 443 kgCO₂/m², below the

pre-construction target and 65% lower than a conventional higher-education comparator at the time. Night cooling is operated manually by reception staff, with another staff member managing the remaining controls; no automation or override logging was reported. In the third year, energy use increased because building users did not consistently understand Passivhaus principles, building physics or energy limits, with microwave use identified as a specific contributor.

Feedback loop

Passivhaus certification required energy monitoring during the first year, while the Soft Landings process included post-occupancy evaluation over three years. Predicted and measured embodied carbon were compared against a named baseline, providing a clear design-to-outcome feedback loop. The comfort strategy was also revised during design in response to the shading study. In use, rising energy consumption highlighted the importance of behaviour change and user understanding. Lessons identified for future projects included allowing more time to explain core performance principles, supplementing equipment manuals with clearer building-user guidance and involving future users more fully through Soft Landings. BSRIA contributed independent lifecycle-cost analysis.

Methodology

Passivhaus

https://www.passivhaustrust.org.uk/what_is_passivhaus.php

PHPP

<https://passivehouse.com/en/home/planning-tools/>

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Thirty High

Buckley Gray Yeoman
London, UK
2025

Thirty High, formerly Portland House, is a deep retrofit of an existing commercial office building at 115 Bressenden Place in Victoria, London. Designed by Buckley Gray Yeoman for Landsec, the project retains substantial elements of the existing structure and façade while creating a contemporary Grade A workplace with upgraded façades, high-performance glazing, new building services, flexible workspace, amenity areas and rooftop facilities. A retention-first approach and embodied-carbon targets informed the design, alongside electrification, air-source heat pumps and renewable energy. The project also adopted BREEAM, WELL and the Design for Performance methodology, with a NABERS UK target. Together, these frameworks place measured operational energy performance and occupant wellbeing alongside design-stage modelling as indicators of the building's success in use.

Design for Performance and NABERS UK create a formal feedback loop between design and operation at Thirty High. After occupation, operational energy use is intended to be measured and compared with the target established during design through a structured process of commissioning, measurement, assessment and optimisation. Facilities teams can use this evidence to identify performance gaps and adjust building systems and controls, while the WELL strategy provides a complementary framework for evaluating occupant wellbeing and indoor environmental quality. As the building was completed relatively recently, a comprehensive public post-occupancy dataset is not yet available. Its contribution at this stage is therefore the establishment of a clear mechanism for future verification, optimisation and learning.

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Thirty High,
Buckley Gray Yeoman



Design intent

Thirty High's performance objectives were established through Design for Performance, with a target NABERS UK rating of 5 stars and an aspiration for 5.5 stars. Published project descriptions identify a target operational energy intensity below 65 kWh/m²/year. A retention-first strategy informed the whole-life-carbon approach, retaining the primary structure, core and substantial elements of the façade, with a Stage 4 embodied-carbon target below 400 kgCO₂e/m². The project also targeted high-quality Grade A workplace conditions and WELL Core Platinum, using the façade, glazing and environmental systems to support thermal comfort, daylight and indoor environmental quality. Flexible floorplates, bookable meeting rooms, short-term project space, event and amenity areas, and an improved arrival experience were intended to meet contemporary occupier needs. BREEAM, WELL, NABERS and embodied-carbon objectives were embedded at project level rather than treated solely as end-stage certification exercises.

Construction & handover

The retrofit retained and upgraded the existing structure and concrete façade, avoiding the carbon associated with

demolition and replacement. Approximately 1,800 windows were replaced with high-performance double glazing. The project reported upfront embodied carbon of 360 kgCO₂e/m², representing a reduction of around 60% against the relevant GLA benchmark and remaining below the Stage 4 target of 400 kgCO₂e/m².

The building was converted to an all-electric services strategy using air-source heat pumps and renewable energy. The upgraded façade and building services were designed to provide the environmental conditions required for the workplace and WELL ambitions. Design for Performance created an expectation that systems and controls would be commissioned for actual operational performance rather than simply installed. Early supply-chain engagement supported delivery, while retaining the existing building and façade fundamentally shaped procurement and construction.

In-use performance

NABERS provides the principal mechanism for testing actual operational energy use after occupation against the target established during design. Operational metering is intended to enable facilities teams to identify plant and

control problems and opportunities for optimisation, while actual energy use will inform operational-carbon performance. WELL Core provides a complementary route for assessing occupant wellbeing and indoor environmental quality. The building's flexible workplace arrangements and amenity provision are intended to support occupier experience.

Feedback loop

The intended feedback loop links the design target, commissioning, actual energy use, NABERS assessment and operational optimisation. This creates a structured process in which performance can be measured, benchmarked, diagnosed, adjusted and remeasured, helping to close the gap between design intent and operation. The whole-life-carbon process similarly connects assessment, retention decisions, construction verification and operational energy measurement. For occupant wellbeing, the intended sequence is environmental design, commissioning, occupied conditions, WELL or occupant feedback and operational adjustment. At project level, Design for Performance and NABERS extend attention beyond practical completion, creating a route for operational lessons to inform future Landsec assets.

Methodology

NABERS UK

<https://www.nabers.gov.au/about/nabers-international/nabers-uk>

WELL Building Standard

<https://www.wellcertified.com>

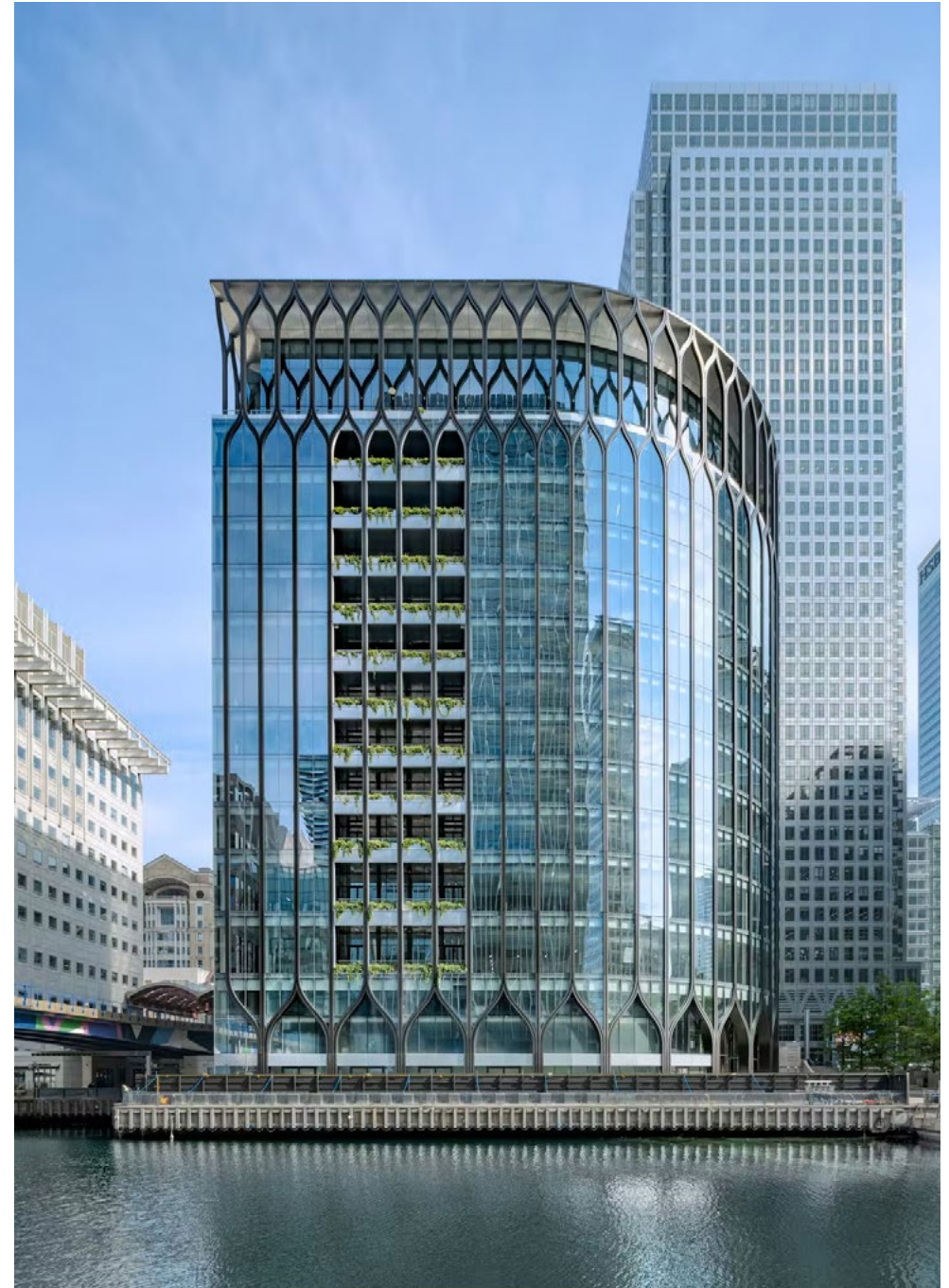
YY London

Buckley Gray Yeoman
London, UK
2023

YY London is a deep retrofit of an existing commercial office and retail building at 30 South Colonnade in Canary Wharf, completed in 2023. Designed by Buckley Gray Yeoman, the project retained and upgraded the existing structure, added three floors and improved environmental and workplace performance. Its environmental strategy combines a high-performance façade, all-electric building services, air-source heat pumps, photovoltaic generation, CO₂-controlled ventilation and extensive energy monitoring. Terraces, natural light, wellbeing and amenity spaces, and smart-building technology support the occupant experience. The project achieved BREEAM Outstanding, alongside WELL Platinum and SmartScore Platinum certifications.

YY London's smart-building and facilities-management systems support continuous operational feedback. Energy monitoring and cloud-based analytics enable facilities teams to identify abnormal consumption, optimise plant and adjust controls. CO₂-responsive ventilation links occupancy and indoor air quality with building operation, while the smart-building platform and occupier app support interaction with the workplace and its amenities. Together, these systems provide the infrastructure for ongoing sensing, analysis and optimisation.

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YY London,
Buckley Gray Yeoman



Design intent

YY London's deep-retrofit strategy sought to transform a first-generation Canary Wharf commercial building while retaining and reusing its 1991 structure. The project reported a 62% reduction in overall energy demand and an estimated saving of 10,260 tCO₂e by avoiding demolition. Its performance strategy combined a high-performance façade, passive design, efficient all-electric services and renewable energy. The façade was redesigned to maximise natural light, with terraces on almost every floor and CO₂-controlled ventilation supporting comfort and indoor air quality. The project secured BREEAM Outstanding, WELL Platinum, NABERS 5-star Design for Performance and London's first SmartScore Platinum rating. Its post-Covid workplace brief also emphasised public-facing amenities, wellness facilities and stronger connections with the public realm, repositioning the previously inward-looking building around contemporary occupier needs.

Construction & handover

The retrofit retained and adapted the existing structure, added three floors and introduced a new façade and building-services strategy within existing structural constraints. Delivered measures included

all-electric services, rooftop photovoltaic generation, air-source heat pumps, mechanical ventilation with heat recovery, CO₂-controlled ventilation, solar-control coatings and building-management controls. New steel and concrete structures contained 25% recycled content by value. Outdoor space on almost every floor, a triple-height reception, restaurants, a rooftop garden, cycle facilities and communal spaces strengthened the relationship between the workplace and public realm. Delivery required close coordination of performance, adaptability and digital systems within the retained structure.

In-use performance

The fully electric building has a reported energy-use intensity of 57.47 kWh/m²/year. Rooftop photovoltaic generation, air-source heat pumps and mechanical ventilation with heat recovery support operational efficiency, while procurement of 100% renewable REGO-certified energy supports the net-zero operational-carbon strategy. Energy monitoring and cloud-based analytics provide the infrastructure for assessing and optimising performance. CO₂-responsive ventilation adjusts operation in response to occupancy and air-quality conditions, and the building-management system supports ongoing

monitoring and control. The occupier app provides travel and weather information, meeting-room booking, access to amenities and selected building functions.

Feedback loop

The feedback loop connects metering, cloud-based analytics, facilities-management intervention, system optimisation and new operational data. Energy and indoor-air-quality information can help facilities teams identify abnormal consumption, adjust systems and respond to occupancy, while occupier interaction with the app and amenities can inform workplace operation. This continuous digital process retains performance information after handover and extends beyond a one-off post-occupancy survey. Whole-life-carbon assessment similarly informed the decision to retain the structure and avoid 10,260 tCO₂e. The smart platform and performance certifications provide a framework for continued operational review.

Methodology

NABERS UK

<https://www.nabers.gov.au/about/nabers-international/nabers-uk>

WELL Building Standard

<https://www.wellcertified.com>

Smart Score

<https://wiredscore.com/certify-a-building/smartscore/>

Tin Barn

Arbor Architects
Bath, UK
2022

The Tin Barn is a residential retrofit near Marshfield, on the outskirts of Bath, which transformed two agricultural barns into a single-family home while retaining the character and fabric of the original structures. Completed in 2022 and certified to the EnerPHit standard in 2023, the project prioritised energy efficiency, low-carbon construction, occupant comfort and indoor environmental quality. Its fabric-first strategy combines a highly insulated and airtight envelope with timber construction, cellulose insulation, mechanical ventilation with heat recovery, an air-source heat pump and measures to manage solar gain and overheating. Embodied carbon and material health were also considered, demonstrating how the reuse of an existing building can be combined with high operational performance.

The Tin Barn demonstrates a performance-verification and occupant-experience approach to building performance. Performance targets established during design were tested through construction quality assurance, airtightness testing, PHPP modelling and EnerPHit certification, while the completed building has provided the occupants with a real-world test of the design assumptions around thermal comfort, ventilation and usability. Post-occupancy evidence for the Tin Barn is currently based principally on the occupants' qualitative feedback about thermal comfort, ventilation and usability. The project has also been shared through case studies and Passivhaus knowledge-sharing to inform wider practice.

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Tin Barn,
Arbor Architects



Design intent

Energy performance was embedded from the outset through PHPP and designPH modelling and the decision to pursue EnerPHit certification. Early modelling tested whether the retained form, orientation and planning constraints could meet the required standard. The carbon strategy combined adaptive reuse of the two barns with timber and bio-based materials, supported by embodied-carbon modelling. Comfort and indoor air quality were central objectives, using high insulation and airtightness, reduced thermal bridging, mechanical ventilation with heat recovery, external blinds, timber shutters and low-VOC, low-off-gassing materials. The occupant-led brief sought a smaller, manageable home with low running costs, workspace and a strong relationship with the landscape. Building services were deliberately straightforward, combining an air-source heat pump and MVHR with summer shading and natural night-purge ventilation. A dedicated Passivhaus consultant and certifier were appointed so that performance requirements informed the brief and design rather than being added later.

Construction & handover

Performance was verified through the EnerPHit certification process. The certified PHPP results included a space-heating demand of 23 kWh/m²/year and a primary energy renewable demand of 51 kWh/m²/year, while airtightness testing achieved 0.35 air changes per hour at 50 Pa. Embodied carbon was calculated at approximately 347 kgCO₂e/m² GIA. Construction quality assurance focused on airtightness, insulation and reduced thermal bridging. The final modelled overheating frequency was approximately 2%. The design was also adapted during construction to accommodate the retained historic fabric, requiring collaboration between the architect, Passivhaus consultant, contractor and clients.

In-use performance

Post-occupancy evidence is principally qualitative: the owners have described thermal comfort, ventilation, usability and the building's behaviour during severe weather through case studies and open-house events.

Feedback loop

The feedback loop connects performance modelling, construction quality assurance, certification, occupant experience and professional dissemination. Design-stage life-cycle assessment informed material choices, which were then checked through the completed embodied-carbon calculation. The certified PHPP energy-demand and overheating results, together with the measured airtightness result, provide a basis for future comparison with operational monitoring. Occupant feedback has been captured through client experience, case-study interviews and open-house events rather than a conventional questionnaire-based post-occupancy evaluation. Lessons have been shared with the wider Passivhaus community, and Arbor has subsequently used real-world case studies and embodied-carbon benchmarks to improve future design decisions. Contractor training and knowledge transfer also carried lessons into delivery practice.

Methodology

EnerPHit

https://www.passivhaustrust.org.uk/passivhaus_awards/passivhaus-retrofit

PHPP

<https://passivehouse.com/en/home/planning-tools>

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Collaborators

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Build Collective buildc.co.uk

Mead Consulting meadconsulting.co.uk

Delta Q delta-q.co.uk/

Hydrock (now Stantec) stantec.com/uk

The Garden Room at Cwm Barn

Arbor Architects
Herefordshire, UK
2022

The Garden Room at Cwm Barn is a conversion and retrofit of an existing agricultural building in Herefordshire, creating a low-energy private residential retreat where the clients and their teenage children can work, exercise and relax. The design responds to its agricultural context through the layout and materiality of historic farmsteads. Flexible, multi-use interiors incorporate biophilic principles and the Japanese philosophy of Wabi Sabi, finding beauty in the natural patina of bio-based materials as they age.

The project also sought to improve energy resilience across the site by replacing fossil fuels with a fabric-first design, air-source heat pumps and a rooftop photovoltaic array, reducing carbon impact and increasing resilience to a changing climate. The high-performance envelope uses a twin-stud wall system prefabricated off site by local contractor Firth Construction. Its airtight, vapour-permeable panels are filled with recycled newspaper insulation. The project surpasses the RIBA 2030 Climate Challenge target for operational energy and achieved an excellent airtightness score. Material selection balanced aesthetics, durability and environmental impact. The Garden Room has a total embodied carbon of 614 kgCO₂/m² GIA, below the RIBA 2030 target.

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The Garden Room at Cwm
Barn, Arbor Architects



Design intent

The Garden Room followed a fabric-first approach informed by passive design principles. An insulated raft slab connects with insulation around the walls and roof to form a continuous envelope, reducing thermal bridging and energy demand. The site-wide brief sought to replace oil-based heating, reduce energy costs and improve resilience to frequent winter power cuts. A plant room serving both the new building and the existing house was therefore planned around battery storage, photovoltaic generation and two air-source heat pumps. Carbon reduction informed the structural and material strategy: timber grades were reduced from C24 to C16 where feasible to enable home-grown timber, and laminated veneer lumber was used above the full width bifold doors instead of steel. The building partially reuses the footprint of an end-of-life storage shed. Comfort and occupant experience were also central, with mechanical ventilation with heat recovery (MVHR), moisture-regulating insulation, framed views, natural materials and flexible space for guests, home working, exercise and family use.

Construction & handover

Twin-stud wall panels were prefabricated off site by the main contractor, improving tolerances and keeping the timber dry, before Posi-Joists were installed on site. The frame was fully filled with breathable, moisture-regulating Warmcel recycled-paper insulation, with vapour-permeable airtight panels and a ventilated zone beneath the standing-seam roof. The roof pitch responded to both rainwater run-off and photovoltaic loading. Locally sourced materials included chestnut decking, larch cladding, oak flooring, cills and joinery, and Douglas fir beams; Valchromat formaldehyde-free board was also used. Zinc cladding and a concrete raft slab moderated the carbon benefits of the timber strategy, although their impact was not quantified. The plant room houses battery storage, water tanks for the two air-source heat pumps and the MVHR unit. Modest upgrades to the existing house, including improved glazing, enabled the site-wide heat-pump and photovoltaic strategy. Delivery relied on a close relationship between client, architect, contractor and specialist joiner rather than a formal staged-handover process.

In-use performance

The building performance betters the RIBA 2030 Climate Challenge target for operational energy and achieved impressive airtightness. The residents report that the building has transformed their approach to living.

Feedback loop

A year-long design phase supported close development of the brief, context, low-energy strategy and client-led details, including the rainwater chute and rill. Off-site fabrication and the close architect–client–contractor relationship provided opportunities to refine construction quality and material choices. The project demonstrates a consistent low-energy design methodology and qualitative client satisfaction.

Methodology

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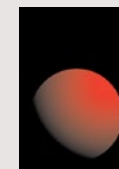
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Architects Declare was launched as a not-for-profit organisation in the UK on 30 May 2019. Since April 2024 UK Architects Declare is a registered charity. At the time of publication, it has over 1,424 signatories in the UK. It is part of Built Environment Declares, which is now represented in 27 countries around the world.

This document has been created by an Architects Declare working group to help signatories convert their declaration into meaningful action and build momentum within their practice. The guide is intended to be a live, working document that helps fulfil the fourth point in our 12-point declaration by encouraging the sharing of knowledge and research on an open source basis. We expect this guide to evolve and be refined in future iterations as our understanding of the climate and biodiversity crises develops, and as our industry innovates to find new solutions to these challenges. We encourage our signatories—and other architectural practices or built environment practitioners—to contact us with feedback on this version and examples for the next version.

www.architectsdeclare.com



UK Architects Declare
Climate & Biodiversity
Emergency