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THE
HOME-GROWN
HOMES
PROJECT



Improving the
Performance of
New Homes

Improving the Performance of New Homes

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EXECUTIVE SUMMARY

New homes in Wales and the UK are frequently designed and approved to meet strict energy efficiency, comfort, and building standards on paper. Yet once built and occupied, many fall short. Newly built (and retrofitted) homes use more energy once occupied than was predicted at design stage. Residents report cold rooms, overheating during warmer periods, stuffy air, condensation and mould. Heating and ventilation systems are sometimes not optimally commissioned. Controls can be technically compliant yet difficult to understand in practice. This difference between predicted and in-use performance is widely known as the performance gap.

It is rarely caused by a single dramatic failure. More often, it results from small but cumulative issues: insulation gaps, thermal bridges at junctions, ventilation systems not properly balanced, commissioning left incomplete, or modelling assumptions that do not reflect real patterns of occupation.

The consequences are significant: higher-than-expected energy bills; increased fuel poverty risk; reduced comfort and wellbeing; greater long-term maintenance costs; damp and mould risk; lower than expected carbon savings. Most importantly, most of these issues are preventable.

The Home-Grown Homes Project (the Project) has explored how to close the performance gap. The Project's first phase focused on developing guidance and tools through an extensive literature review, collaboration with experts and applied research. It culminated in publication of the BPE Guidance and Toolkit ([available here](#)). The second phase tested simplified Building Performance Evaluation (BPE) approaches on live projects, seeking methods to integrate BPE at a wider scale while making it more affordable. It then consolidated the evidence and experience gathered across earlier phases, continuing collaboration with stakeholders and practitioners to develop a practical, scalable quality assurance pathway.

The Project has highlighted the value of a supporting platform to help housing providers implement BPE in a meaningful and consistent way. As a result, the project proposes "future directions", including the development of a dedicated BPE platform that embeds the learning from the Project into a practical implementation tool, subject to funding availability.

This work on closing the performance gap has shown that performance must be defined clearly and checked at the right time - the main challenges are around finding the most efficient methods to do this. This report proposes a structured six-stage Quality Assurance (QA) pathway that embeds measurable benchmarks at design stage, verifies them during construction, and reviews outcomes in occupation. The pathway embeds measurable benchmarks at the design stage, verifies them during construction, and reviews outcomes in occupation. The report also incorporates outputs from a workshop where housing developers shared practical experience and identified priority areas for future development that would support the implementation of Building Performance Evaluation.

The timing of this work is significant. While Awaab's Law (England) does not extend to social housing landlords in Wales, the Welsh Housing Quality Standard (WHQS) is being updated to introduce mandatory timescales for social landlords to investigate and remedy hazards, including damp and mould, with the new requirements taking effect from 1 April 2026. Alongside increasing regulatory focus on overheating (Part O of the Building Regulations) and ventilation (Part F), expectations are rising. These policy drivers reinforce the need for wider adoption of BPE and for systematic action to reduce the performance gap. The [Tai ar y Cyd](#) Project will lead to more standardisation in the development of social housing which will provide an opportunity to embed BPE in the design, construction and occupation of new social homes.

The QA pathway set out here strengthens clarity, timing and ownership. It enables housing providers to move from compliance to confidence. Better homes are not delivered by specification alone. They are delivered when intention, delivery and verification work together.

WHY THIS MATTERS

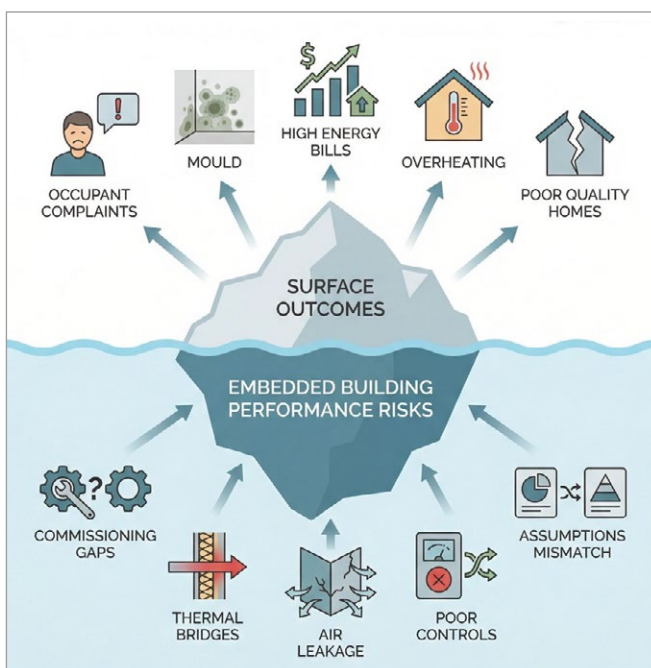
Housing policy in Wales is ambitious. New-build programmes are expected to reduce carbon emissions, improve comfort and lower bills. Retrofit programmes aim to upgrade existing homes to similar standards. These goals sit at the heart of climate commitments and social justice priorities.

Design tools and modelling methods have become more sophisticated. Standards have tightened, but they remain focused largely on design-stage compliance rather than the quality of delivery in practice. As a result, predicted performance does not always align with performance in use, a discrepancy widely known as the performance gap. This can mean buildings using more energy than expected, homes feeling colder or hotter than intended, poor air quality, or the development of condensation and mould.

In practical terms, this often leads to:

- A home modelled to cost £800 per year to heat costing £1,400 or more in reality.
- A ventilation strategy designed to maintain healthy air failing to deliver required flow rates.
- Overheating mitigation measures that appear robust in modelling struggling during warm weather.

Figure 1: Poor building performance risks and outcomes.
 Source: Image generated using DeeAvid AI based on project concepts.



Evidence from Project case studies and wider UK research suggest that gaps of 20–100% between predicted and measured energy use are common. The causes are rarely dramatic failures. More often, they arise from small but cumulative issues: insulation gaps, thermal bridging at junctions, gaps in airtightness detailing, ventilation systems that are not properly balanced, heating systems left on default settings, or controls that residents find difficult to understand. Individually, these issues may seem minor. Collectively, however, they have a disproportionate impact on comfort, energy use, and long-term building integrity. As a result, these outcomes often translate into:

- Increased risk of fuel poverty
- Greater likelihood of damp homes and mould growth, with associated respiratory health impacts
- Elevated risk of overheating-related illness and mortality
- Reduced overall quality of life and wellbeing
- Significant long-term financial burdens for households and housing providers

Without checks, small deviations become embedded in the building fabric, often only becoming visible once residents move in, when remediation is more complex and costly.

HOW CAN BUILDING PERFORMANCE EVALUATION HELP?

Building Performance Evaluation (BPE) is the process of checking whether a building performs in real life as it was designed to perform. When implemented early in the design, construction and delivery stages of a building’s lifecycle, BPE helps prevent performance issues before they become embedded, reducing the risk of costly failures. In this way, BPE provides a practical framework for developing a quality assurance (QA) process that supports the consistent delivery of building quality in practice.

At its heart, BPE addresses a straightforward question: will the building perform as intended once it is occupied? BPE looks at practical matters such as:

- Actual energy use compared with design targets
- Internal temperature and thermal comfort
- Ventilation performance and delivery of suitable fresh air
- Indoor humidity within healthy ranges
- How residents experience and operate their home

BPE does not mean turning homes into laboratories. It does not require complex monitoring in every dwelling. In its most practical form, it means agreeing clear performance expectations at the start of a project and checking, at sensible points, that those expectations have been met. This is important because without checking, we rely on assumptions. As the well-known management principle states: ‘You can’t manage what you don’t measure.’

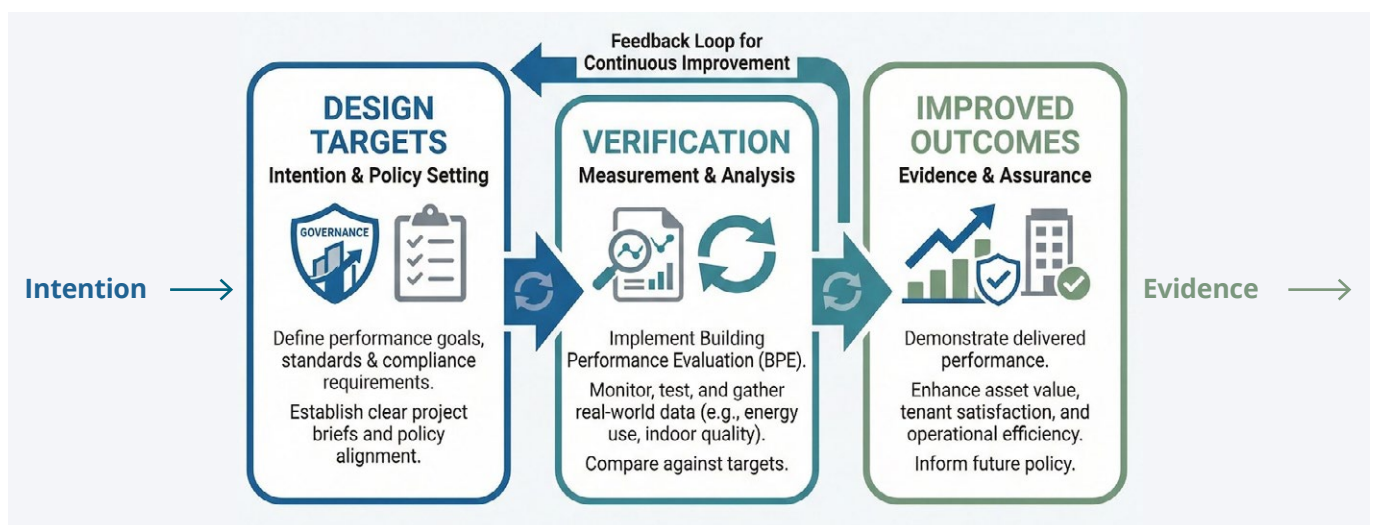
Design models are valuable. Compliance certificates are necessary. But neither tells us with certainty how a home performs once occupied. Small variations in construction, commissioning or use can shift outcomes significantly. BPE contributes to bridging that gap.

When used proportionately, it allows housing providers to:

- Identify issues early, when they are more likely to be cheaper to correct
- Strengthen governance and oversight
- Demonstrate due diligence
- Demonstrate commitment to truly achieving the intended targets
- Improve future projects through structured learning
- Build confidence that public investment is delivering real outcomes

In short, BPE turns intention into evidence.

Figure 2: Building Performance Evaluation provides a structured pathway from intention to evidence, strengthening governance, accountability, and learning across housing delivery. *Source: Image generated using DeeAvid AI based on project concepts.*



How BPE strengthen housing delivery - from intention to evidence

THE CHANGING REGULATORY AND POLICY LANDSCAPE

The case for closing the performance gap is no longer purely technical. It is increasingly regulatory, social and reputational. The importance of performance verification is reinforced by an evolving policy context.

From April 2026, the updated Welsh Housing Quality Standards (WHQS) will introduce mandatory timescales requiring social landlords in Wales to investigate and address hazards such as damp and mould (following wider UK regulatory reforms prompted by Awaab's Law). This marks a clear shift in expectations. This development links housing quality directly to health outcomes and statutory accountability.

At the same time, regulatory focus is intensifying around:

- Part O of the Building Regulations (Overheating) – addressing overheating risk under current and future climate conditions.
- Part F of the Building Regulations (Ventilation and Indoor Air Quality) – strengthening expectations around airflow and humidity control.

These standards are essential. However, they are primarily grounded in design-stage compliance. Routine verification of in-use performance remains limited. Experience from simplified BPE testing suggests that compliance does not always guarantee operational outcomes. Ventilation flow rates are not always achieved in practice; internal humidity levels may exceed recommended thresholds; and overheating mitigation may not perform as predicted. This does not imply widespread failure but highlights the value of proportionate verification.

In this context, BPE equips housing providers with a way to move from compliance to confidence. It enables early identification of risk, timely corrective action and demonstrable due diligence. Rather than waiting for a complaint to trigger investigation under updated WHQS requirements (and/or other regulatory frameworks), performance verification allows providers to prevent issues from arising in the first place.



LEARNING FROM THE HOME-GROWN HOMES PROJECT

The Project approached BPE in stages to ensure recommendations were grounded in practice. The first phase focused on building sector understanding and shared capability and produced the Building Performance Evaluation Guide through literature review, applied research and collaboration with practitioners and stakeholders (on active housing development projects). Its purpose was to establish a common language around performance, demonstrate why the performance gap matters and provide practical entry points for organisations beginning to adopt BPE.

The second phase moved from guidance into application. Simplified BPE approaches were tested across live housing schemes, generating real-world evidence about how evaluation works in practice. This phase identified recurring performance risks, practical delivery constraints and the importance of timing, ownership and usable evidence. It confirmed that even proportionate BPE methods can reveal issues that remain invisible under “business-as-usual” verification, while also highlighting barriers to scaling evaluation across programmes.

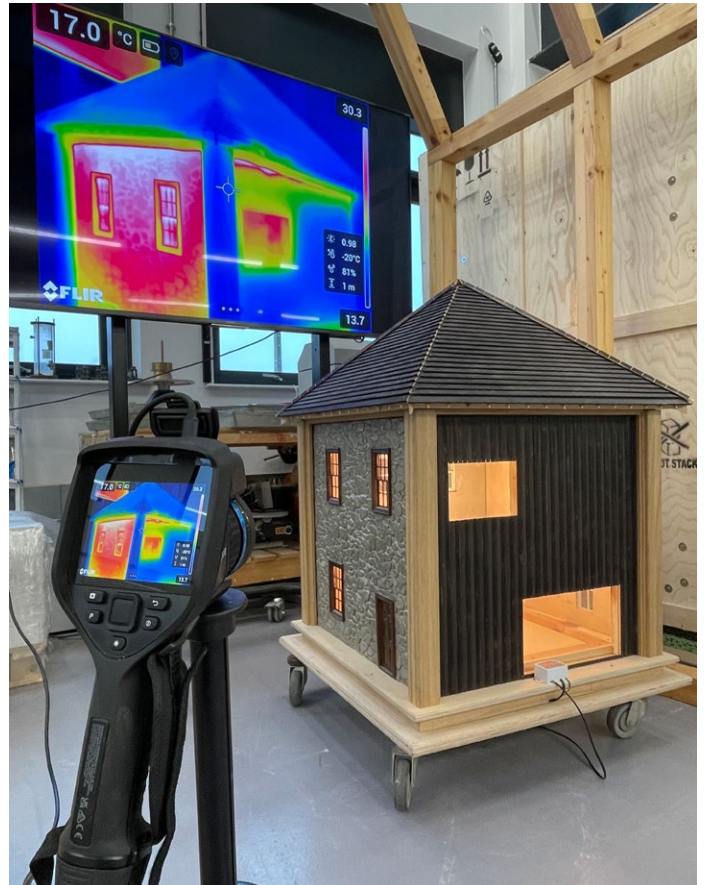
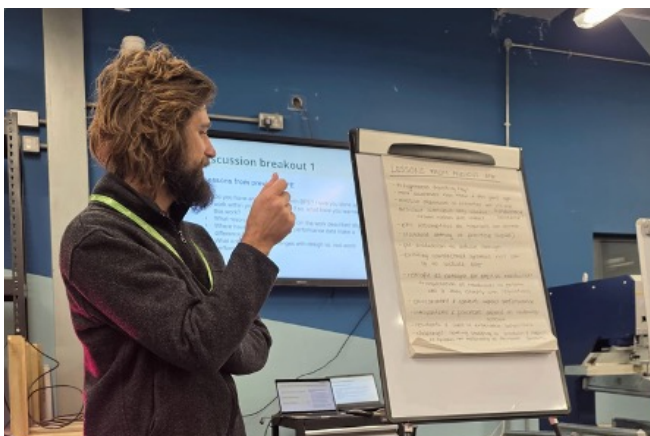
This phase also consolidated technical findings and combined them with structured stakeholder engagement. Feedback meetings, key workshop and sector discussions explored what currently works, what limits adoption, and what would enable BPE to become a normalised part of housing delivery. This phase translated learning into a scalable Quality Assurance pathway, aligning technical evidence with governance, procurement, and operational realities.

Taken together, this progression ensures that the pathway proposed in this report reflects applied experience, stakeholder priorities and tested delivery insights. It is not a theoretical framework imposed from outside practice, but a model shaped by live projects, sector feedback, and iterative refinement. The Project approached BPE as a staged learning journey, designed to ensure recommendations were grounded in real practice rather than abstract theory.



INSIGHTS FROM THE BPE STAKEHOLDER WORKSHOP

Figure 3: Images from the Stakeholder workshop. Source: WkW image database.



A key component of the Project's second phase was a structured stakeholder workshop bringing together housing providers, designers, contractors and sector specialists. The workshop was designed not only to review current BPE practice, but to test how evaluation could realistically scale within everyday housing delivery. Discussions focused on lived delivery experience, governance constraints, and what would make BPE usable rather than aspirational.

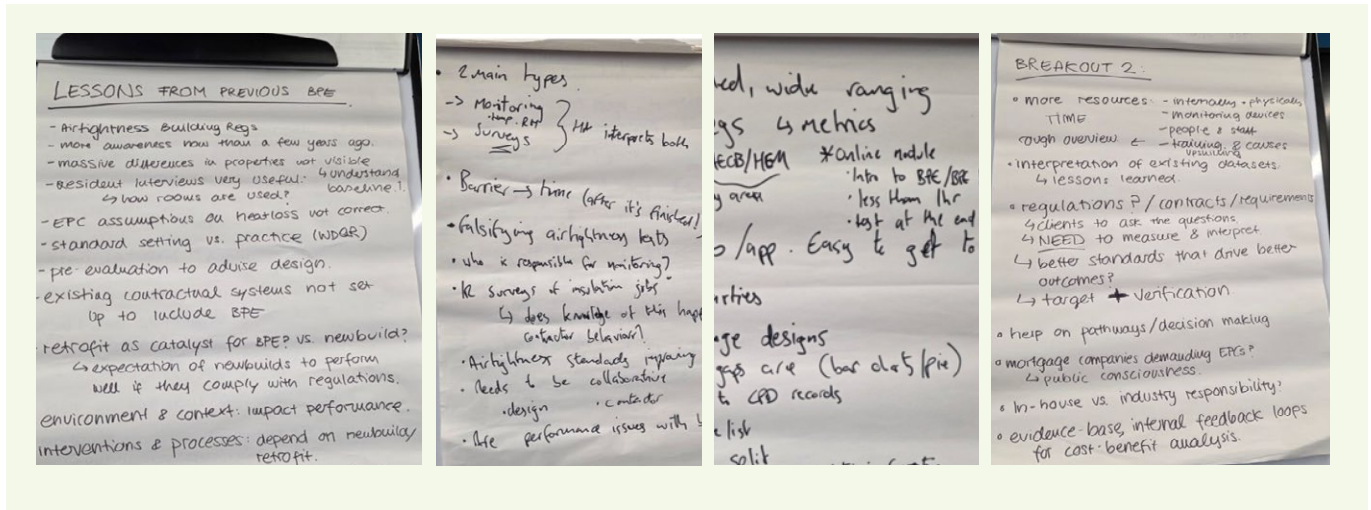
Participants reflected on both current practice and future needs. Several consistent themes emerged. First, BPE is often introduced too late. When verification occurs only after completion, opportunities for inexpensive correction have already passed. Stakeholders emphasised that evaluation is most valuable when embedded earlier, while design intent can still influence construction decisions and commissioning outcomes.

Second, responsibility is not always clearly defined and might be "difficult" to allocate under current processes. Without explicit ownership, performance-related tasks can fall between client, contractor and consultant. Participants highlighted uncertainty around who commissions BPE, who interprets results, and who is accountable for acting on findings. This ambiguity weakens follow-through and reduces the practical impact of evaluation.

Third, simplicity encourages adoption. Overly complex frameworks risk limited uptake, particularly where delivery teams face time and budget pressures. Participants stressed that successful models must be proportionate, repeatable, and aligned with existing project workflows rather than adding parallel systems.

INSIGHTS FROM THE BPE STAKEHOLDER WORKSHOP

Figure 4: BPE Workshop group notes capturing stakeholders' discussions on current BPE practice, barriers and future priorities. Source: Wkw image database.



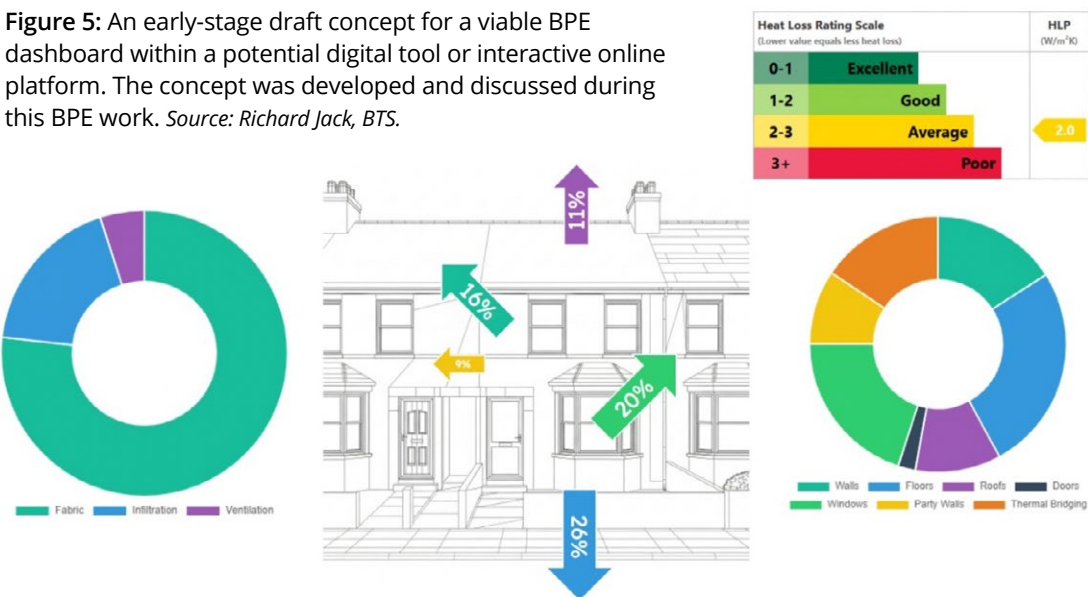
Fourth, structured learning loops are rare. Post-occupancy insights are not consistently embedded into future procurement and design decisions. Stakeholders noted that valuable lessons are often captured informally but not translated into organisational standards, specifications, or governance processes.

Finally, there was strong support for a future model in which performance benchmarks are agreed at project inception, verification is embedded at defined stage-gates,

and evidence actively supports continuous improvement. Participants described a desire for clearer tools, shared templates, and digital guidance to make implementation more accessible across multiple projects.

As a response to the insights discussed during the workshop, translating stakeholder priorities and other Project outcomes a structured, scalable framework for BPE-enabled Quality Assurance is proposed.

Figure 5: An early-stage draft concept for a viable BPE dashboard within a potential digital tool or interactive online platform. The concept was developed and discussed during this BPE work. Source: Richard Jack, BTS.



A SIX-STAGE QUALITY ASSURANCE PATHWAY

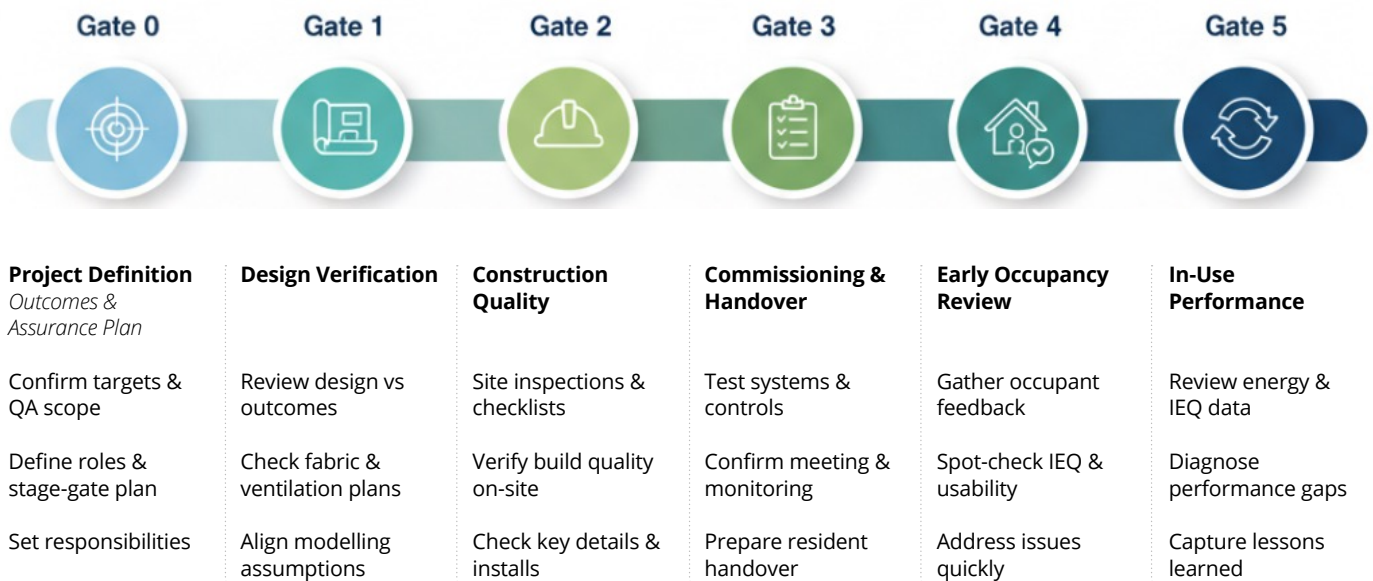
This proposed pathway integrates performance verification into natural project milestones. We recommend a structured ‘stage-gate’ quality assurance pathway supported by BPE. Think of it like airport security gates or safety checkpoints in manufacturing: nothing proceeds to the next stage until key checks are passed and signed off.

This approach fits into standard project timelines (no major delays) and uses simple, affordable methods – photos, checklists, basic tests, short surveys – rather than complex monitoring. It ensures performance risks are spotted and addressed early, responsibilities are clear, and evidence builds up progressively.

The pathway works at two levels:

- Basic (baseline) – achievable for most projects; focuses on essentials like good fabric quality, proper installation and functional systems (inspired by AECB principles for robust, low-risk building).
- Advanced (enhanced) – for schemes with very ambitious targets (i.e. near-Passivhaus levels); adds deeper verification, more monitoring, and detailed analysis.

Figure 6: The Six Stage Quality Assurance (QA) Pathway. Source: Image generated using Davinci AI based on project concepts.



A SIX-STAGE QUALITY ASSURANCE PATHWAY

	Why it matters	Key actions:	Evidence:
<p>1. Project start (Gate 0: Setting targets and plans) Objective: Define success criteria and checking responsibilities before design or procurement locks in.</p>	Unclear targets or ownership can lead to later confusion and unaddressed risks.	Agree energy/comfort/IEQ goals; write a short performance brief; include BPE requirements in contracts; name a QA lead.	Targets document, roles matrix, early risk register. In practice: A short steering group meeting ensures everyone starts aligned.
<p>2. Design check (Gate 1: Verifying plans) Objective: Confirm designs can realistically deliver targets and are buildable.</p>	Many gaps originate in optimistic assumptions or poor detailing.	Review modelling assumptions, ventilation strategy, insulation continuity, thermal bridge risks; check for resident-friendly controls.	Assumptions log, key detail drawings, buildability sign-off.
<p>3. During building (Gate 2: Construction/ on-site quality checks) Objective: Verify installation matches design before elements are hidden.</p>	Construction flaws (e.g., gaps in insulation, poor sealing) cause large performance shortfalls if missed.	Spot inspections at critical stages; photo evidence of junctions; interim airtightness or fabric checks where practical.	Photo logs, signed checklists, material compliance records.
<p>4. Handover / commissioning (Gate 3: Testing systems/ commissioning) Objective: Ensure all systems work correctly and residents can operate them.</p>	Faulty commissioning or confusing controls lead to underperformance and complaints.	Full system tests (heating, ventilation, hot water); handover training; user guides; meter confirmation.	Commissioning certificates, resident packs, settings records.
<p>5. First few months after moving in (Gate 4: Early fixes/occupancy review) Objective: Identify and resolve early issues while still easy to correct.</p>	Problems like condensation or high bills appear quickly; early action prevents escalation.	Resident surveys; spot checks (temperature, humidity, CO ₂); rapid defect fixes.	Feedback summary, issues log + remediation plan.
<p>6. Longer-term review (Gate 5: In-use performance & Learning for next time) Objective: Assess real performance and feed improvements into future projects.</p>	Creates continuous improvement loops across programmes.	Compare energy/IEQ data to targets; team debrief; document lessons.	Summary report, root-cause analysis, action plan for next schemes.

After 6–12 months, compare predicted and actual performance to capture lessons and apply them to future schemes. This structured approach spreads verification across delivery rather than concentrating it at the end.



A SIX-STAGE QUALITY ASSURANCE PATHWAY

Figure 7 – the Six Stage QA Pathway

Source: Diagram generated using ChatGPT AI based on project concepts



DEFINING WHAT GOOD LOOKS LIKE

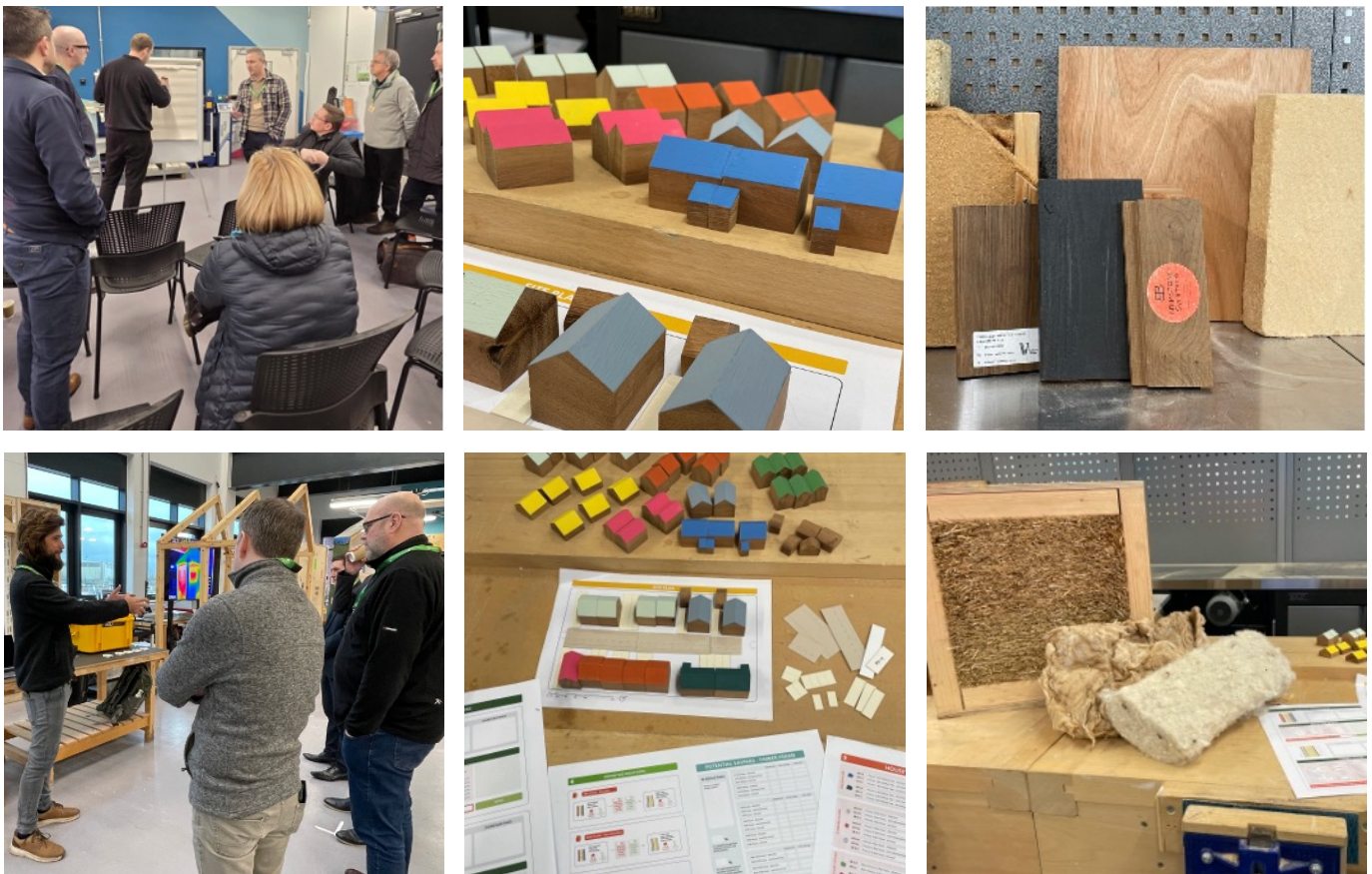
Clarity about what 'good' means is essential. Clear benchmarks provide confidence. At design stage, measurable benchmarks should be agreed and revisited throughout delivery. For every building, performance verification should include:

- Airtightness testing
- Ventilation flow rate verification (Part F of the Building Regulations)
- Heating and hot water commissioning
- Overheating validation aligned with Part O of the Building Regulations
- Monitoring of relative humidity
- Resident satisfaction surveying (aligned with BS 40101)

Where appropriate, additional diagnostic checks may include Heat Transfer Coefficient (HTC) measurement or main wall U-value testing on a sample basis. These measures create evidence that the promise defined at Gate 0 has been realised. However, the purpose is not perfection, it's assurance. When discrepancies are identified, corrective measures can be implemented while issues remain manageable. When performance aligns with predictions, confidence is strengthened.

Experience from the Project suggests that core verification typically represents less than one per cent of total build cost – modest compared to potential remediation or reputational exposure.

Figure 8: Images from the Stakeholder workshop. Source: WkW image database.



FROM COMPLIANCE TO CONFIDENCE IN HOUSING DELIVERY

Strengthening Governance and Public Value

Compliance confirms that minimum regulatory standards have been met. Confidence grows when performance is evidenced in practice. This strengthens board-level assurance, supports engagement with regulators and builds public trust. While current frameworks such as Building Regulations focus primarily on design-stage compliance, housing providers increasingly operate in an environment where boards, regulators, and residents expect demonstrable in-use performance, not only paper certification.

Performance verification reduces uncertainty and strengthens governance structures. Defined checkpoints provide visibility for boards and steering groups, supporting informed oversight and proactive risk management. In the context of evolving regulation (including upcoming policy WHQS updates related to Awaab's Law, increased scrutiny of overheating, and strengthened ventilation expectations), structured verification enables housing providers to demonstrate organisational resilience and due diligence.

This approach extends beyond regulatory compliance by reinforcing public confidence that housing investment delivers intended social, environmental and financial outcomes. It strengthens accountability for how public resources are translated into real-world performance.

In parallel, policy discussions are expanding beyond operational performance toward embodied carbon and whole-life building impact. Emerging proposals such as the potential introduction of Part Z in the UK signal a shift toward regulating carbon across the full lifecycle of buildings, not only their energy use in operation. Similarly, tightening EPC expectations and evolving performance standards point toward a future where evidence-based verification becomes more central to housing delivery. Organisations that embed structured performance evaluation today are better positioned to adapt to these evolving requirements and demonstrate readiness for a more performance-led regulatory environment.



FROM COMPLIANCE TO CONFIDENCE IN HOUSING DELIVERY

Application to Tai ar y Cyd and Wider Delivery

The Tai ar y Cyd Project is an ideal reference case: it aims to deliver exemplar low-carbon, timber-framed social homes using Welsh-grown materials, with strong emphasis on energy efficiency, affordability, comfort, and sustainability. These ambitions make performance verification especially important – small gaps could undermine goals like very low running costs or healthy indoor environments.

The proposed Quality assurance pathway provides defined checkpoints and evidence at key milestones. It reduces the likelihood of late-stage remediation and supports consistent learning across schemes.

Applying the stage-gate model to Tai ar y Cyd projects would provide the steering group and partners with:

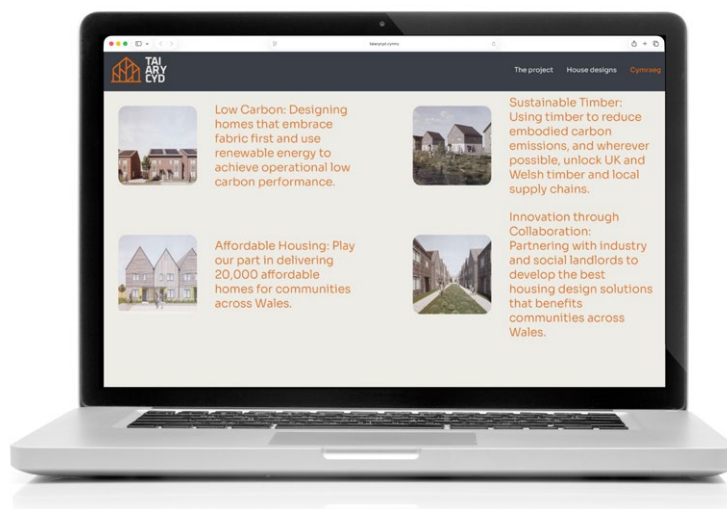
- Clear evidence at each major milestone (e.g., “Gate 2 passed: fabric quality verified via photos and checks”).
- Early warning of risks, allowing fixes during construction rather than costly post-handover work.
- Stronger governance confidence, reduced uncertainty for funders/assurers, and better resident outcomes (lower bills, fewer health/comfort issues).
- A model for scaling across Tai ar y Cyd’s development phases or similar programmes.

Although developed with Tai ar y Cyd in mind, the approach is transferable across housing associations and local authorities and their development projects.

The approach:

- Creates consistency across multiple schemes.
- Supports scalable adoption – start basic, add advanced elements as capability grows.
- Improves procurement by making BPE a standard requirement.
- Builds organisational learning: lessons from one project inform the next, reducing repeat issues.

Figure 9: Tai ar y Cyd website page.



From a policy view, this offers a practical, non-regulatory way to strengthen housing outcomes, align with evolving standards (e.g., Future Homes Standard, BS 40101), and demonstrate due diligence in public-funded projects. Performance should be evidenced progressively, not assumed.

FROM COMPLIANCE TO CONFIDENCE IN HOUSING DELIVERY

Implementation and Cultural Change

“This report is an important contribution to helping the landlords understand the challenge and present ideas about how to move forward.

At present, approaches to understand and address the performance gap are very fragmented. They are especially poor at rigorously unlocking and acting on feedback from residents. There is a real risk that attempts to make progress will meet resistance from landlords as ‘another add on thing to do’.

Tai ar y Cyd is a collaboration of 25 landlords - 11 local authorities and 14 housing associations. Each is grappling with the performance gap challenge.

The advantage of introducing this approach to the Tai ar y Cyd community of landlords is that it offers the opportunity to collaborate, share learning and move

towards agreeing an approach that embeds good practice across a network of landlords. This shared approach has the potential to accelerate learning and enable landlords to intelligently make progress together. The Six Stage Quality Assurance Pathway will help to support Tai ar y Cyd landlords on this journey.

Practically this will be helpful to informing discussions with landlords who are actively bringing forward schemes as part of the Tai ar y Cyd Prototyping Phase – this stage currently involves up to 12 landlords and potentially 400 new homes. These landlords and design teams are convening in a Prototyping/Design/Community of Practice. We look forward to sharing the The Six Stage QA Pathway in this creatives space.” -

Steve Cranston, TAYC Programme Director.

Embedding this QA pathway requires clarity rather than complexity. Immediate priorities include assigning responsibility for BPE, aligning contracts with measurable benchmarks and integrating stage-gates into project programmes. Over time, digital tools, training and case study dissemination can strengthen sector capability.

The most important shift is cultural: recognising that performance verification is integral to delivering quality housing and safeguarding public investment.



CONCLUSIONS AND RECOMMENDATIONS

Wales has the capability and ambition to deliver homes that reduce carbon, lower bills and improve wellbeing. Ensuring that those homes perform as intended in practice is the next essential step. We already know how to design good homes on paper. The missing piece is making sure they are built well and work well in real life – and this QA approach does that without big costs or delays. By defining what good looks like, verifying it at the right moments and embedding learning across programmes, housing providers can reduce risk, strengthen governance and deliver better outcomes for residents.

A clear, staged quality checking approach – using simple, affordable methods – is a practical way to close that gap. Doing this consistently would give better homes for residents, better value for public investment, fewer future problems, and real progress toward warmer, healthier, lower-carbon housing in Wales. It could become 'business as usual' with the right support from policymakers. Performance verification is not an optional extra.

This approach can be adopted and successfully implemented with action in the short, medium and long term:

Short term (0–3 months):

- Nominate someone clearly responsible for quality checking on each project (e.g., a QA lead).
- Put basic checkpoints into project plans and contracts, starting with Gates 0-3 for quick wins.
- Agree a simple list of what evidence to collect at each stage, using templates from the BPE toolkit.

Medium term (3–12 months):

- Build a simple online tool / app to guide teams through the checkpoints (like a digital checklist with templates and reminders).
- Run short training sessions (e.g., 2-hour workshops) so everyone understands why this matters and what to do – focus on non-experts.
- Write standard wording for contracts so checking becomes normal, not extra, and tie it to payments.

Longer term (1+ years):

- Create routine "lessons learned" sessions after each scheme, updating organisation-wide standards.
- Share more real examples showing money saved (e.g., £10,000 avoided in repairs), fewer complaints, better resident satisfaction.
- Keep the approach up to date with new rules and standards, like BS 40101 for performance evaluation.
- Explore digital platforms for sharing evidence across Wales, building a national knowledge base.



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