The voice of our sustainable built environment

TACKLING THE PERFORMANCE GAP

PRACTICAL GUIDE

This Practical Guide covers key principles of staking a Design for Performance approach in the built environment.

IN A SNAPSHOT

We often find that a building's energy performance in use is different to what we anticipate at the design stage. This discrepancy between design intent and actual energy use is the so-called 'performance gap'. Most often, it is used to refer the operational energy performance, but building projects can see a performance gap across a variety of metrics.

NABERS UK Design for Performance framework provides a process for office buildings to achieve a target energy rating in use committed to pre-construction. Through a robust client commitment to achieving a target energy rating, early and continuous design team collaboration, more detailed energy modelling and third party design review, better outcomes are achieved and predicted performance more accurately reflects the performance in use. By ensuring that the responsibility to achieve the target rating passes to those parties delivering and then operating the building, with continuous review against the original design, the performance gap can be minimised. While only office buildings are currently eligible for NABERS certification, these principles can be applied to all building projects.

Why is it important?

If we are to mitigate the built environment's contribution to the climate emergency we must reduce carbon emissions to net zero by 2050. In order to do this, we must both transition away from high carbon fossil fuels and substantially reduce energy demand.

However, the typical process for designing, constructing, and operating a building rarely results in an outcome that aligns with our climate goals. Designs can be unoptimised and inefficient. Energy modelling is often conducted solely for the purposes of Building Regulations compliance and siloed workforces mean that at construction stages, buildings may not be built in line with designs. Often, once complete, those operating the building lack the information to know if systems are performing as they should. This leads the actual energy consumption of the building to be multiple times greater than anticipated form the design stage modelling.

By designing for performance, clients and each subsequent stakeholder are equally responsible for delivering a building that meets the agreed target. Accountability through the design and construction process is essential to be able to construct and operate buildings that are compatible with our net zero future.

Principles of Design for Performance

1 | Accountability and consistency throughout the project

Collaboration and communication between all stakeholders during the design and construction stages is critical to ensure that the modelling accurately reflects the building's design, and that the design intent is then translated into the delivered product. The client should be the driving force behind this, ensuring all parties are aware of and committed to their respective responsibilities. Two key risk points are the transition from the detailed design to construction stage and the handover of the building post-construction.

2 | Design review to identify risks and opportunities

Appointing a suitably experienced party - ideally someone independent of the design team- throughout the design stages to identify potential opportunities for improvements to the design or key risks to delivering the target performance is key to designing for performance. In addition, the design reviewer can also help to ensure the modelling accurately reflects the building as designed.

3 | Detailed and comprehensive modelling to accurately predict energy consumption and understand sensitivities

The typical 'design for compliance' approach uses simplified modelling, which uses standardised / generic profiles based on data from similar buildings in operation to calculate the energy covered by building regulations and compares this performance against a variable baseline (i.e., a relative assessment). In contrast to this, when designing for performance, the approach to modelling is much more detailed, uses profiles and information specific to the building, captures all energy used in the building, and seeks to provide an accurate assessment of the absolute energy consumption (rather than relative to a baseline). As well as this, in addition to the baseline model, designing for performance should include the modelling of a number of 'off axis' scenarios which should reflect potential situations where a building is operating sub optimally or under different circumstances to those assumed for the baseline.

4 | Set absolute, not relative, targets

Designing for compliance means making a relative assessment of building performance against a notional baseline. We need to move to absolute metrics like Energy Use Intensity (EUI) and set targets which reflect actual energy consumption, in order to understand when a building is decarbonising in line with a 1.5°C trajectory and is compatible with a net zero future.

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How can it be done?

1 | Set targets for energy efficiency at the start of a project

If a project is pursuing certification through a recognised scheme such as NABERS UK for offices, this will be based on the target rating. If not, then setting ambitious targets based on available best practice industry targets ensures teams are working towards a collective goal from the earliest stages.

2 | Maximise the energy efficiency of the design

Teams should work collaboratively to deliver the most efficient and effective design possible. This should include consideration of building form, fabric, services and systems, and operating strategy.

3 | Model at every stage to track the performance of the design against the target rating

Use detailed modelling techniques in line with recognised industry methodologies (e.g., CIBSE TM54, NABERS UK Design for Performance, Passivhaus PHPP) to understand the likely performance of the design against the target energy consumption. Appoint a third-party design reviewer to review both the design and modelling. Ensure scenarios that reflect off-axis scenarios alongside the baseline scenario are modelled.

4 | Ensure effective accountability and transfer of information from design, through construction, into operation

It is easy for critical information to be lost or confused when responsibility changes hands. By requiring all parties to collectively commit to delivering the target energy performance and appointing a design team member into a client monitoring role through construction, commissioning, and operation, can minimise the risk of departure from the intended design.

5 | Inform building users about the systems work and how to maintain them

This includes training to ensure facilities managers understand the systems they are using as well as extensive sub-metering so that any discrepancies between anticipated and actual use of individual system can be identified and addressed.

6 | Measure operational energy data over 12 months to compare with targets set at design stage

Design for Performance only matters if the outcome in use is a building that is as efficient as possible. To understand this, and compare against the design stage target, 12 months of representative energy consumption data are needed. The performance of the building should be reviewed every year to optimise performance and ensure systems are maintained and operating effectively.

Case Study: Tempo Building, Maidenhead

Previously the office of a telephone operator, the Tempo building was retrofitted into multi-led offices. The client became a signatory to the Better Buildings Partnership Climate Change Commitment and therefore pledged to achieve net zero carbon for their real state portfolio. Air Source Heat Pumps were installed for heating, cooling and hot water, with the addition of PVs and electric vehicle charging points for part of the existing car park. The design also made allowance for mixed- mode ventilation. This building followed the NABERS UK Design for Performance (DfP) framework and achieved its design stage 5* target rating, with a commitment to achieve this in use.

Source: Tempo - Maidenhead

IN SUMMARY

To avoid the performance gap and ensure that our future building stock is energy efficient and operates as intended, it is essential that we begin to design with energy performance in mind, carrying out accurate modelling and ensuring accountability so that the original design principles are preserved through construction stages into operation. This way, we can reduce our energy consumption and design more sustainable buildings as we decarbonise our built environment.

FURTHER RESOURCES

- UKGBC: Whole Life Carbon Roadmap
- CIBSE: Guide to Design for Performance
- Passivhaus: Planning package