

BUROHAPPOLD
ENGINEERING



BUROHAPPOLD ON
CLOSING THE PERFORMANCE GAP



BuroHappold create elegant, integrated and inspired designs that deliver real value for our clients. To close the gap between design intent and long term operation, we encourage all of our clients to embrace performance modelling, soft landings and post occupancy evaluation. This helps to maximise the operational benefits including low running costs, environmental performance, health, wellbeing and productivity.

B U R O H A P P O L D

CLOSING THE PERFORMANCE GAP

E N G I N E E R I N G

THE CHALLENGE

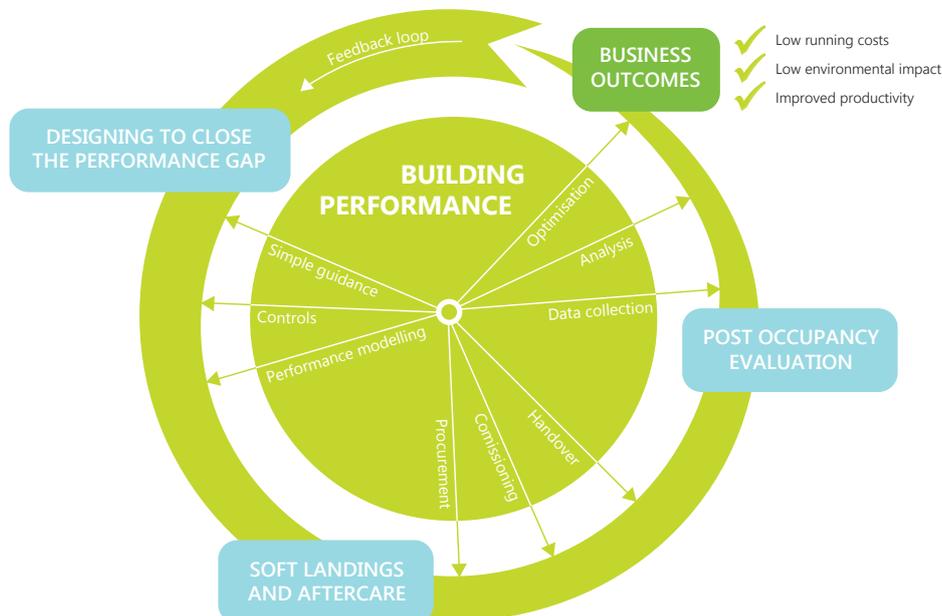
We have been investigating the performance gap since 2003 through Engineering Doctorate and post-occupancy evaluation studies. We still find that 'compliance' models are being referred to as a means to predict operational performance, controls are often not properly commissioned and a lack of soft landings and aftercare means actual performance often slips. A step change is needed and we are the game changers.

THE OPPORTUNITY

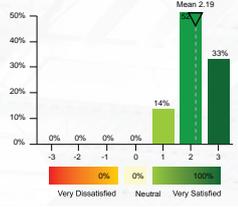
Closing the performance gap delivers triple bottom line benefits of people, planet and profit. We provide more accurate predictions of how assets will perform, highlight opportunities to fine tune the energy use and running costs and measure the impact of the internal environment on health, wellbeing and productivity. Together this increases confidence levels, credibility and marketability of sustainable buildings.

A WORLD CLASS SERVICE

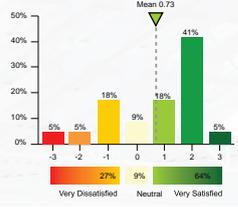
We care about our clients and strive to deliver a value added service with long lasting relationships. Our team of building performance experts and building services engineers allows us to be at the forefront of tackling complex issues. Our Engineering Doctorate researchers have enhanced our a suite of tailored analysis tools, streamlined auditing apps and smart visualisation tools enabling us to efficiently diagnose issues and implement solutions.



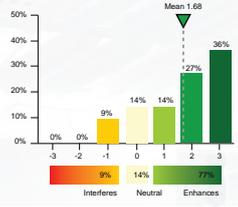
OCCUPANT SATISFACTION



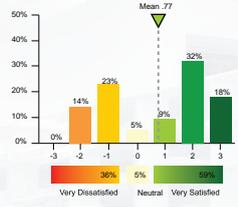
THERMAL COMFORT



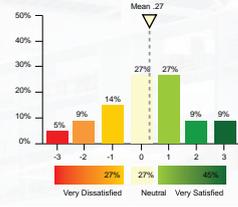
LIGHT LEVELS



AIR QUALITY



ACOUSTICS



MORPHOSIS
POE study
Los Angeles

85% of occupants very satisfied with the building's overall performance. 80% believe the building is improving productivity. Winner of the 'Livable Building Award'.



DESIGNING TO CLOSE THE PERFORMANCE GAP

In order to truly understand how our designs will perform in practice we encourage our clients to invest studies beyond compliance to close the performance gap. From operational energy predictions to detailed simulations of indoor environmental conditions, financial appraisals and controls guidance we make buildings more efficient at every stage of development, embedding feedback and ensuring genuine sustainable growth.

SERVICES PROVIDED:

- Performance modelling
- In-use target setting
- TM54 modelling
- TM22 assessments
- Design enhancements to indoor air quality
- Financial appraisals
- Simple guidance
- Complex controls systems
- BMS specification
- Existing portfolio audits
- DEC 'A' rating strategies
- Tailored benchmarks

THE TOWER, PNC PLAZA

Pittsburgh, Pennsylvania, USA

BuroHappold were appointed to provide MEP, daylight consulting, energy modelling and CFD analysis to this 33 storey office tower.

Through intelligent simulation we have optimised the energy performance of 'breathable' double-skin façade allowing the building to operate in passive ventilation mode for 42% of working hours, whilst being naturally lit for 92% of the day.

These combined initiatives will cut energy use by 50% when compared to similar sized office blocks.

In order to drive these savings forward in use, the energy model has been used to commission all building and control systems to meet design energy performance goals with measurement and verification.

Image BuroHappold Engineering





ONE ANGEL SQUARE

Co-operative Headquarters, Manchester, UK

This project involved consolidating a number of different Co-op businesses into a single new building that could meet all their requirements. High sustainable standards were set and achieved, including BREEAM Outstanding and an EPC A rating. Operational energy and carbon efficiency were high on the agenda and a route to achieving a DEC A rating was set utilising energy prediction methods reflecting CIBSE TM54 method. We are currently researching the building operation interface between BIM and the BMS leading to POE to verify where operational energy targets have been achieved.

Image Palin Images



DAVID ATTENBOROUGH BUILDING

Cambridge, UK

Major refurbishment of a large pre-cast concrete 1960s University of Cambridge building. Baseline performance was established through an energy audit, user survey and thermal imaging. A top down operational energy prediction using the CIBSE TM22-Stage 3 methodology was compared to a bottom-up CIBSE TM54 simulation. Operational energy savings of up to 40% are forecast, equivalent to £150,000/year. Stakeholder engagement has been held throughout the design and handover stages to minimise the performance gap in-use. A POE will verify savings one year after occupation.

Image Nicholas Hare Architects

SOFT LANDINGS & AFTERCARE

Soft Landings provides a framework for a clearer dialogue between the client, design team, contractor and building users, improving the operational readiness of buildings and performance in-use. We link the setting and maintaining of design aspirations to the procurement process with ongoing support and fine tuning during initial occupation and longer term aftercare to unlock the potential of our buildings.

SERVICES PROVIDED:

- Target setting
- Handover
- Procurement
- Commissioning
- Tender requirements
- Seasonal optimisation
- O&M review
- Aftercare review
- Usability workshops
- Stakeholder engagement
- Bespoke occupant survey
- Quality assurance
- Education and training

WESSEX WATER

Bath, UK

Wessex Water was designed by BuroHappold to be one of the greenest offices in the UK, consuming just a third of the energy required to power a similar building. To support this aim an aftercare service was provided to monitor and report on energy use over a 3 year period and identify measures to improve

performance. As a result of the monitoring, improvements were implemented to systems and the fabric resulting in a 50% reduction in energy consumption in core office areas, alongside environmental targets set at the start of the project to reduce absenteeism and improve staff retention being achieved.

Image Burohappold Engineering





UWE SOFT LANDINGS

Bristol, UK

BuroHappold was appointed as Soft Landings Champion and to provide 18 months of aftercare on the major refurbishment of the UWE Bower Ashton campus. We engaged the design team, estate, FM teams and end-users through workshop sessions to help de-risk the

handover of the building. A customised occupant survey was completed by over 220 staff/students exploring usage patterns, energy and environmental conditions. UWE are now able to take this behavioural information and utilise it in future developments.

POE has demonstrated a 46% energy saving compared with the pre-refurbished building.

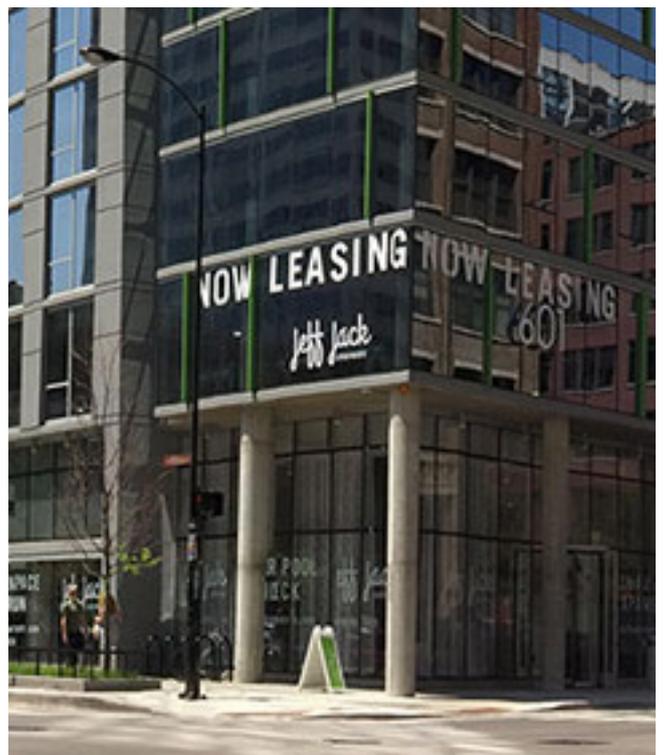
Image UWE Bristol

JEFFJACK APARTMENTS

Chicago, USA

JeffJack Apartments is a new 171 unit facility in Chicago. We undertook regulated energy modelling and operational performance modelling for LEED Certification, enhanced with operational energy cost forecasting. Upon handover we provided "owner's agent" services, reviewing the MEP construction documents. Site visits were undertaken each month to review installations and witness commissioning to help resolve MEP system performance issues. Metrics obtained from the dynamic analytical energy model were used as a feedback loop to educate building occupants and maximise value for the building owner.

Image BuroHappold Engineering



POST OCCUPANCY EVALUATION

Monitoring of performance provides us with the intelligence to continuously innovate and build upon the successes of the past. Our honed broad range of skills, deep knowledge, efficiently design tools and strong links to our building services teams keeps us at the forefront of design identifying key lessons and optimisation areas.

Our depth of knowledge into the latest health and well-being research ensures we align to client and user values.

SERVICES PROVIDED:

- Data collection
- Analysis
- Optimisation
- Diagnostics
- Utility analysis
- User surveys
- Energy assessments
- Energy saving calculations
- Internal environment studies
- Whole life cost analysis
- Half hourly visualisations
- Thermal imaging
- ESOS, DEC's, CRC

MARKS AND SPENCER

M&S Ecclesall Road, Sheffield

The 'Sustainable Learning Store' at Ecclesall Road was built to help M&S in their goal of becoming the world's most sustainable major retailer. To capture learning, a POE covering BMS energy data, lighting, thermal comfort, staff and customer satisfaction was undertaken. 80% of staff found the building a 'good' or 'very good' place to work with 40% saying it improved their productivity. 84% of people were satisfied with the temperature throughout the day and 87% of customers indicated lighting was satisfactory. Feedback has helped to inform design criteria and technologies for future roll-out across M&S stores.

Image BuroHappold Engineering





EMIRATES STADIUM

London, UK

At BuroHappold we aim to provide a complete service from conception and detailed design, through to operation. A high profile example is our work at the Arsenal Emirates Stadium, subjected to a POE two years after opening. Annual operating costs for the 60,000 seat stadium are approximately £1 million/year, so there is a significant incentive to identify savings. Monitoring of electrical energy on the main LV switch panel was carried out on match and non-match days. Opportunities to refine chiller and lighting control were identified and the operational benefits were presented to the site team.

Image BuroHappold Engineering



DERWENT LONDON

London, UK

Derwent are a commercial landlord with over 100 office buildings in London. We undertook detailed energy audits of 8 sites, identifying no, low and medium cost energy interventions. Savings were extrapolated across a portfolio of 41 buildings where Derwent have direct operational control, amounting to £190,000/year savings. As an added value service we undertook a workplace design review to identify how the HVAC, lighting design and office layout contribute towards occupant as privacy, physiological comfort and sensory stimulation. Key learning points were drawn upon that could be used on future projects.

Image Derwent London

BUSINESS OUTCOMES

By engaging with the performance gap, soft landings, aftercare process and post occupancy evaluation we aim to deliver the triple bottom line of people, planet and profit. Alongside these core values, we aim to empower clients and building users inspiring confidence, fun and innovation.

VALUE ADDED:

- Low running costs
- Improved productivity
- Enhanced well-being
- Reduction in staff sick days
- Increased satisfaction
- Greater design confidence
- Low environmental impact
- Upskilled building manager
- Engaged staff & users
- Greater staff retention

QUINTAIN
ESOS Assessment
London, UK

"I'd like to thank you for all your work on this project – it's been a very useful exercise and I'm glad we've avoided the box-tick approach!" R. Beeson, Quintain Sustainability Manager



Quintain office at Brent Civic Centre
£4,500/year saving
1.3 year payback

W05 Energy Centre
£110,000/year saving
0.6 year payback

York House
£19,500/year saving
8.5 year payback

LDO
£26,500/year saving
4.2 year payback

Red Car Park
£13,500/year saving
0.2 year payback

Kingsbourne House
£5,500/year saving
8.4 year payback

BuroHappold Engineering is an independent, international engineering firm with a reputation, built up over the last 40 years, for delivering creative, value led building and city solutions for an ever changing world.

ABOUT

Described by our clients as 'passionate', 'innovative', 'collaborative', 'magic', our global community of driven, world leading engineering professionals based in offices across Europe, America, China, India and the Middle East deliver elegant solutions for buildings and cities that address the major problems facing societies today: resource shortage, climate change, increasing urbanisation and its associated effects.

Using integrated approaches that aim to create innovative, holistic and flexible solutions we work closely with a diverse range of celebrated experts: architects, economists, academics, visionaries, to define, develop and deliver strategic, people focused outcomes. These strong relationships provide us with additional insight and perspectives that ensure the solutions we find can more effectively bridge science with society. Our work culture drives the can-do attitude our clients have come to expect of us, and ever since its inception, the World Architecture 100 poll has consistently voted BuroHappold as one of the very best engineering organisations to work with.

BuroHappold works alongside some of the world's most respected and influential international organisations. We have advised and acted for the United

Nations, the World Bank and UNESCO in their endeavours to alleviate poverty and provide new thinking to solve old problems and have worked in support of a wide range of significant public and private sector clients across the full portfolio of our services.

Our people have skills that cover a wide diversity of expertise and specialities: technical experts who can turn their hand to all the traditional engineering disciplines, as well as integrators who can bring people together to lead and communicate holistic solutions such as frameworks for revitalising failing cities and pioneering master plans for emerging cities: people-flow specialists who can move a million people across the desert with ease: innovators who engineer facades that absorb pollution or create acoustic venues overnight from rope, wood and sheer hard work. We employ economists and planners who can help to create flexible strategies, specialists whose skills range from water management through to materials science, and serial innovators who help us to find our unique solutions to our clients' unique problems. Our team is deliberately broad based.

We have a reputation for embracing the difficult and our teams tackle complex issues head on. But we don't just look for

straightforward answers; we question, investigate and challenge our clients to look wider than the immediate space of their projects, helping them to understand and address social, financial and environmental impacts as well as the obvious technical ones. Our innovative thinking has delivered a plethora of benefits for our clients that can in turn deliver higher than expected returns on their investments including happier more productive occupants, increased energy savings and reduced material usage to name but a few. Our thinking has also delivered advantages with a far wider influence; award winning buildings catalysing broader sustainable regeneration, increased people flow resulting in new retail and residential opportunities and smart strategies attracting new sustainable investment.

At BuroHappold we believe in harnessing the special magic of our people's engineering minds; it is this combination of ingenuity and bravery that is helping us create a future that is solution-led, not problem driven and is in turn helping us to reclaim Engineering and to showcase what the very best that we can offer can really achieve.

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Front cover image
One Angel Square, Manchester, UK © Palin Images