CARBON BITES

From the CIBSE YOUNG ENERGY PERFORMANCE GROUP

Post Occupancy Evaluation

What is Post Occupancy Evaluation (POE)

Post-Occupancy Evaluation (POE) is a structured process of evaluating the performance of a building after it has been built and occupied. POE can take several approaches, varying from highly technological methodologies involving hard data, to socio-psychological interests where more subjective parameters are used to evaluate the performance of a building. As a result, the method to be undertaken in a POE is usually defined by the objectives being pursued and the areas of interest to the stakeholder. As a consequence, a vast number of POE methods and techniques are available worldwide, allowing for an array of different evaluations to be performed in numerous types of buildings. A well designed and conducted POE can provide a solid basis for improving the perfromance of the building under investigation. Therefore, POE can inform further improvements to building design, providing a value feedback loop to designers.

Top 9 POE Methodologies

1. Annual Energy Assessments and Benchmarking – The general starting point for any POE of non-domestic buildings is benchmarking the energy performance. CIBSE TM22 provides a useful framework for this.
2. Data Cross Referencing - To construct an energy assessment, it is always good to cross-reference several sets of data, including main meter readings, BMS readings, spot-checks of the sub-meters, and physical measurements of specific devices. Half-hourly data can be especially helpful.
3. Occupant Surveys – Critical feedback from occupants on comfort, functionality, operability to help understand the relationship between the technical performance of the building and its ability to meet occupants needs.
4. Thermographic Imaging – A means of visually identifying thermal variations in the building fabric or services, such as thermal bridges, infiltration and incorrectly installed/commissioned services.
5. Photographic Walkthroughs – A way of 'sense checking' design details for operability, ergonomics, actual vs intended use and any hack-solutions the users have implemented to compensate for shortfalls in design.
6. Hindsight Review Meetings – A facilitated project review seeking to extract 'lessons learned' from the design and delivery team, which can be used on future projects or phases of work to simplify process and improve quality.
7. Average Internal Temperature Logging – A means of understanding daily temperature ranges and daily and seasonal averages, understanding the thermal lag of the spaces and identifying potential areas of improvement for comfort.
8. IAQ and CO_2 Logging – A way of establishing if the level of air quality is being achieved in practice and ensuring that buildings are delivering the right level of ventilation.
9. Specialist Performance Testing – There are a range of specialist technical performance tests that can be carried out on a building, ranging from empirical U-value testing of various construction elements to whole-house co-heating tests to establish the full envelope heat loss. These are not appropriate for all POEs but can be useful for certain projects.

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Further Information

- https://buildingdataexchange.org.uk/
- http://www.carbonbuzz.org/
- http://www.usablebuildings.co.uk/
- https://www.bsria.co.uk/services/design/soft-landings/free-guidance/

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Ten interesting POE Findings

1. Fabric performance is all about the details: Thermal imaging suggests that the main areas for improvement are around architectural details, junctions and M&E penetrations. Appropriate sealing is necessary to reduce infiltration and careful insulation detailing that can be practically delivered is essential to reducing thermal bridges.
2. There are lots of problems with domestic MVHR: Lack of commissioning, absence of comprehensive design, complex controls, significant usage of flexible ductwork, fans in inaccessible locations and insufficient handover were all evident in many of the BPE case studies. This has a detrimental effect on energy use, occupant satisfaction and air quality and can lead to internal mould and damp issues.
3. People live life in different ways: Energy use in identical 1 bedroom flats can vary significantly (some by over 250%). The reason for this isn't clear but occupancy rates, tenure, employment status and age may all impact likely use. Designers should consider what they can influence and aim to make energy saving intuitive and simple.
4. It's getting hot in new homes: In just under half of the BPE properties monitored temperatures above 28°C were recorded for short periods. Although better insulation and airtightness are partly to blame, evidence suggests that window-opening routines are more important.
5. We're not that good at communal heating yet: Some communal heating system in operation had measured carbon intensity factors for heat that were comparable to direct electric systems and were significantly worse than individual gas boilers. Measured distribution losses were as much as 59% when compared to that assumed in SAP (5%).
6. We need to design for maintainability & robustness: When carrying out site walkthroughs it is common to find instances where systems can't be commissioned, maintained, replaced simply or aren't robust. Foresight and acting on feedback are vital characteristics for designers.
7. Controls are often too complex: If an A4 page with an 8 step instruction list is required to open a roof light then we have failed as designers. If we are to expect occupants to use a building in a prescribed way then this must be the most intuitive option for them to take. Otherwise, it is unlikely to be used, often at the detriment of the building, occupant and energy bill.
8. BMS's are not fit and forget: BMSs are complex, particularly in bigger buildings, which contain more innovative systems that try to keep users comfortable. Without active use of the BMS on a regular basis the system is unlikely to be useful for system optimisation or effective monitoring. The situation gets significantly worse if the BMS hasn't been commissioned in the first place or if the person with BMS skills leaves the building without an appropriate handover.
9. Clients need help during defects periods: Sub meters reading zero, switches for blinds controlling the wrong room, fire dampers blocking ventilation, missing insulation, heating bypasses being left open. These are all examples of latent defects which often were only discovered during a POE study carried out after the defects period has ended.
10. Sub-metering is often useless: There is limited value in having sub metering if there is no way of logging, monitoring and then analysing the data. Too often, metering systems are left with no client interface for accessing valuable data that could be used to optimise a building. As designers we must ensure that a useful metering system is specified and not value engineered out.