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Appendix

To complement the framework, a detailed description of each BPE method included in the I-BPE framework is shown in the following table.

Table A1. Descriptions of study elements and methods included in the I-BPE framework

Review of design intent	Collection and review of all available design and construction documents not only provides general understanding of the design intent but helps to establish a reference point against which the real building performance can be measured.
Design team interview	Helps to develop a deeper understanding of design intent and possible changes that have occurred during the design and construction of the building, and any related successes or failures.
Building walkthrough with stakeholders	A guided building tour with owner, building manager, or designers helps to develop a deeper understanding of the building and its systems, occupancy, control and management.
Inspection of build quality and services	Walkthrough photographic documentation of the building surveying surface level issues which could help explain problems arising in other areas of the study.
Control interface survey	Onsite review of control interfaces of lighting, heating, ventilation and cooling systems available to the building occupants. The review asks such questions as: is the purpose of the user-interface clear? Is it easy to use? etc. (How to conduct: Bordass, B., Leaman, A. & Bunn, R. 2007. Controls for End Users: A guide for good design and implementations.)
Review of installation and commissioning of services	For mechanical and electrical services, lighting, heating, cooling, ventilation and renewable systems, the installation and commissioning review can provide assurance of correct installation and commissioning or reasons for imbalance, inefficiency or failure of systems.
Thermal imaging of the building fabric (envelope)	Thermal imaging or infra-red thermography is often used as a diagnostic tool to provide a thermal image which gives an indication of the surface temperatures and can enable thermal anomalies in construction to be identified. Such anomalies may be the result of gaps in insulation layers, different insulation characteristics, air movement within the structure or, more usually, a combination of all three.
Air tightness testing	Achieving a good level of air tightness is important for the building fabric to reduce the demand for space heating or cooling. The air tightness of a building envelope can be measured using either a fan pressurization (blower door) or a tracer gas.
U-value verification	The measured U-values of constructed building elements, such as a wall, ground floor, window centre-pane, or even a suspected thermal bridge, can be measured using heat flux sensors. The findings can be compared to design predictions to identify material issues.
Energy monitoring	Assessment of building energy use using energy bills, meter readings, continuous monitoring, sub-metering of energy end uses or appliance plug loads.
Environmental monitoring	Spot readings or logging of temperature, relative humidity, CO_2, lighting, noise etc. (includes parameters used for predicted mean vote analyses)
Occupant survey	Questionnaire survey that gather feedback from building occupants on their satisfaction with the building design, perception of control, perception of comfort, thermal sensation, times of use, etc.