

CIBSE Technical Memorandum (TM) 61 to 64 Operational Performance of Buildings

What are CIBSE TM 61, TM 62, TM 63 and TM 64?

Four new CIBSE Technical Memoranda have been published, which focus on the operational performance of buildings from an energy, user, and indoor environmental quality perspective. A brief summary of these important documents is set out below – which will you read first?

TM 61 Operational Performance of Buildings

The longest of the four documents, TM 61 is split into three main parts:

1. Guidance on operational performance of buildings from an **'energy'** perspective. An introduction to the topic is presented. Definitions are given for the performance gap, including: (i) Regulatory performance gap (actual versus compliance); (ii) Static performance gap (actual versus non-calibrated prediction); and (iii) Dynamic performance gap (actual versus a calibrated longitudinal model). The guide provides a systematic review of causes for the performance gap, which cover design, construction, commissioning, handover, and operation. Literature review findings are also given for performance gap evidence across different sectors.
2. Guidance on operational performance of buildings from an **'indoor environmental quality'** perspective. Focusing on acoustics, lighting, indoor air quality and thermal comfort, the guide discusses key metrics and measurement methods, followed by a systematic review of causes for the performance gap and management hierarchies for mitigation approaches. The acoustic guidance discusses several areas, including objective dB-based acoustic metrics versus subjective psychoacoustic metrics. Similarly, the lighting section considers areas, including human responses, visual performance, circadian timing, daylight versus electric lighting, and other aspects. The indoor air quality section discusses perceived Indoor Air Quality (IAQ), substance limits, proxy indicators (for example, CO₂, Volatile Organic Compounds (VOCs)), indoor versus outdoor pollutants, and other aspects. Lastly, the thermal comfort section discusses static and adaptive comfort, making reference to CIBSE TM 52 and 59.
3. The final part of the TM summarises four post occupancy evaluation **case studies**, including an office, school, hospital, and apartment block. For each case study, data on predicted versus actual energy consumption is presented, alongside user satisfaction and design intent versus measured data for indoor environmental quality.

TM 62 Surveying Occupant Satisfaction

The second TM provides guidance supporting the use of **occupancy surveys** as part of post occupancy evaluation (POE). The document begins with an overview of the value of occupancy surveys (for example, "human perceptions drive behaviours in ways that instrumented measurements can neither explain nor predict"). It then provides examples of good practice questionnaires (for example, design, question scales, context setting, and other aspects). Common errors in questionnaires are also discussed (for example, phrasing of questions, loaded questions, subjective versus objective wording, and other aspects). Guidance on conducting surveys is given (for example, awareness setting, data protection, incentives, sampling, and response rates). Lastly, the document includes high level guidance on focus groups and structured interviews.

TM 63 Building Performance Modelling and Calibration for Evaluation of Energy In-Use

The third TM provides a framework for developing **calibrated energy models** for buildings that are now operational. The guidance makes reference to CIBSE TM 54 and the International Performance Measurement and Verification Protocol (IPMVP) with a focus on non-domestic buildings. It demonstrates

how a calibrated simulation model can support a Measurement and Verification (M&V) process to help quantify performance issues. This document should help designers, contractors, building managers and other stakeholders to undertake an effective M&V exercise. The guide includes a detailed case study of an office building, which had a +22% performance gap, uncovering that the majority of the issues were technical issues (for example, building operation, maintenance, parasitic loads, and other aspects).

TM 64 Indoor Air Quality – Emission Sources and Mitigation Measures

The final TM provides further guidance on indoor air quality, which is split into two parts. The first part covers key **pollutants in urban areas**, such as: (i) Pollutants; (ii) Sources; (iii) Impacts; (iv) Perceived IAQ; and (v) Control Measures. For example, for NO_x, the ‘Source’ includes cars, boilers, and other aspects, the ‘Impacts’ include Asthma, ‘Perceived IAQ’ by occupants is minimal as NO_x is odourless, and ‘Control Measures’ include good ventilation and carbon activated filters. The second part contains a detailed overview of air pollution sources, pollutants and mitigation measures for **different building and space types**, including offices, schools, hospitals, houses and flats. For example, for open plan offices, key emission sources include carpets, furniture, people, and heating, ventilation, and air conditioning (HVAC) with key pollutants, including VOCs, formaldehyde, particulates, allergens and bioeffluents.

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Key Issues

- The performance gap between design intent and operation is a major concern.
- Buildings are often occupied and operated differently to their design intent.
- As the construction industry is fragmented, this results in a lack of performance accountability.
- Holistic post occupancy studies looking at energy, user satisfaction and indoor environmental quality are not common in the industry. Therefore, these TMs begin to bridge this gap.

Links

- CIBSE TM 61: <https://cibse.org/knowledge/knowledge-items/detail?id=a0q3Y00000I0NKeQAN>
- CIBSE TM 62: <https://cibse.org/knowledge/knowledge-items/detail?id=a0q3Y00000I0hxfQAB>
- CIBSE TM 63: <https://cibse.org/knowledge/knowledge-items/detail?id=a0q3Y00000I0imxQAB>
- CIBSE TM 64: <https://www.cibse.org/Knowledge/knowledge-items/detail?id=a0q2000000817evAAC>

