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Energy Performance Gaps in Residences: An Analysis of the Variables That Cause Energy Gaps and Their Impact

Authors : Amrutha Kishor

Abstract : Today, with the rising global warming and depletion of resources every industry is moving toward sustainability and energy efficiency. As part of this movement, it is nowadays obligatory for architects to play their part by creating energy predictions for their designs. But in a lot of cases, these predictions do not reflect the real quantities of energy in newly built buildings when operating. These can be described as 'Energy Performance Gaps'. This study aims to determine the underlying reasons for these gaps. Seven houses designed by Allan Joyce Architects, UK from 1998 until 2019 were considered for this study. The data from the residents' energy bills were cross-referenced with the predictions made with the software SefairaPro and from energy reports. Results indicated that the predictions did not match the actual energy usage. An account of how energy was used in these seven houses was made by means of personal interviews. The main factors considered in the study were occupancy patterns, heating systems and usage, lighting profile and usage, and appliances' profile and usage. The study found that the main reasons for the creation of energy gaps were the discrepancies in occupant usage and patterns of energy consumption that are predicted as opposed to the actual ones. This study is particularly useful for energy-conscious architectural firms to fine-tune the approach to designing houses and analysing their energy performance. As the findings reveal that energy usage in homes varies based on the way residents use the space, it helps deduce the most efficient technological combinations. This information can be used to set guidelines for future policies and regulations related to energy consumption in homes. This study can also be used by the developers of simulation software to understand how architects use their product and drive improvements in its future versions.

Keywords : architectural simulation, energy efficient design, energy performance gaps, environmental design
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