



Transforming Energy Auditing: The Role of Building Information Models

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DESCRIPTION

Energy audits are an integral component of the construction industry's overall energy conservation plan. Energy audits are relevant, as evidenced by the European Energy Savings Directive's approval of them, as well as the development and publication of numerous European standards for energy auditing buildings and building systems. However, because present methods for conducting energy audits in buildings do not take into account the most recent improvements in Industry 4.0 practices, building physics engineers concur that energy auditing needs to be updated and enhanced. This study presents a novel technique to advance existing building energy audit technologies by modifying building information.

The viability of a constituent energy audit technique that employs building information models to evaluate building energy consumption in relation to the building envelope. It is investigated whether there is a potential for increased use of digitization techniques in energy audits, as well as the development of new tools in this area. The key findings of this study include an overview and analysis of the industry foundation classes schema building information model data structure and its relationships, which will be used to digitise energy audit procedures.

The method entails a computerized assessment of building energy consumption in connection to building envelope parameters, as well as an examination of economic and energy implications for prospective building shell optimisation scenarios. Furthermore, the evaluation findings for various environmental and financial issues are displayed utilising the developed tool's building envelope modification feature. The design and logic behind the created tool's backing are also discussed. This tool is used to retrieve the data required to conduct the building energy audit.

Buildings consume a significant amount of energy in all industrialised countries; therefore, cutting-edge energy sciences study focuses on strategies to make buildings more energy efficient. Given the ageing of the European Union's building stock, energy efficiency is a key concern. The European

commission's renovation wave operation aims to significantly reduce energy usage and emissions. When it comes to renovations, energy audits are essential in the early stages of building retrofitting. The goal is to identify inefficient energy usage and advise building changes to reduce primary energy consumption.

It is vital to stress the significance of complicated solutions after building exterior improvement in the context of various refurbishment procedures. To enhance the performance of restored buildings, heating, ventilation, and air conditioning systems must be improved or modified. The first step in the energy audit process is to determine the building's envelope, and this study provides a quick assessment of how energy sources affect the payback period for building optimisation. The following phase of this attempt will entail a comprehensive of building systems utilising Building Information Modelling (BIM) documentation.

Data from BIM models, which provide reliable and sufficient information on the building materials currently in use and their attributes, can be used to calculate energy use in detail. Using BIM-based design methodologies, a digital asset model is created by merging various architectural components with specific criteria. The building model's components, which include the envelope geometry and the thermal resistance or thermal conductivity qualities of each material layer, provide sufficient data for the energy assessment of the building envelope.

Depending on the objective of the evaluation, the qualities assigned to an object are machine-readable data that may be evaluated by various algorithms and utilised to develop assessment procedures. BIM technology is projected to become more widely used in the near future as knowledge of its benefits rises and the construction industry is legally obligated to adopt BIM for new project-related investments. In this context, the BIM model is intended to serve as a database for building-related information during energy audits. Furthermore, dynamic input can improve asset data collection and link it to both virtual and actual assets *via* an Application Programming Interface (API). BIM is mentioned in relation to conducting energy audits.

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