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Literature on Energy Analysis Using Green Building Studio and Insight 360

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ABSTRACT:

A large number of people in today's globe are primarily concerned about the issues and consequences of global warming. As it uses roughly 40% of all energy, housing is one of the biggest energy users. This study attempts to increase the strength and energy efficiency of Indian homes relative to other building materials. When applying sustainable energy-efficient design and construction techniques under BIM and technologies like Revit, Insight360, and Green Building Studio, the measure of the total yearly energy and total electricity and fuel life cycle costs for the building wall in the Indian scenario is shown. This is a representation of an energy analysis model that incorporates BIM to produce accurate home performance estimates with better optimization options. The dependability and adaptability of energy analysis utilizing BIM-based simulations with Revit® software, Green Building Studio, and Insight 360 are shown in this study, along with the advantages and drawbacks of employing these BIM tools.

Keywords: BIM, Energy Analysis, Green Building Studio, Insight 360.

Introduction:

The rising concern over climate change and the stringent building design rules today have a significant influence on how efficiently buildings use energy. Therefore, particular consideration should be established and provided for architecture, construction, constructive components, and installations. This necessitates an open line of communication between all the experts and decision-makers concerned, and the Building Information Modelling (BIM) methodology is mentioned as a solid means to accomplish those objectives. BIM is a technique for creating and managing all the information related to a building over its entire life cycle, from planning to implementation.

With this technology, 3D models are used to represent all the data related to geometry, spatial relationships, construction processes, quantities, and material qualities. BIM technologies make it simple to simulate several envelope and thermal mass solutions and choose the best one while taking into consideration the building's lifetime. The primary goal of this study is to examine the capabilities of thermal simulation using software tools found in "BIM software" to determine how the thermal insulation and thermal mass of an envelope affect a test cell's comfort level in the heat. It will emphasize Energy Analysis.

The nation's social and economic growth is considerably aided by the building sector. The majority of the natural resources and energy are used by it. Buildings use 30–40% of the world's principal energy sources, which are responsible for 40–50% of the greenhouse gas emissions that contribute to global warming. As a result, the building sector must realize sustainable social progress. Sustainable development is thought to provide great economic and social advantages while having little negative environmental effect. Professional engineers and architects are more focused on the building's sustainability and energy efficiency.

It would be highly helpful for designers to choose alternative designs that would result in more energy-efficient installations if they first considered the life cycle of a building. Building energy simulation aids in the development of models that examine the flow of energy within and across spaces as well as outside. The energy analysis or simulation of a whole building calculates the anticipated energy consumption (in terms of fuel and electricity) based on the structure's shape, type, climatic conditions, cladding qualities, and active systems like lighting, heating, and ventilation. This knowledge aids architects and designers in making decisions that enhance a building's functionality and lessen its environmental effect. By statistically analyzing the thermal effect of the outer skin, the researchers are studying a strategy to increase thermal comfort. Revit with Insight 360 may help improve building environmental and energy efficiency. With Insight 360, current operations such as Revit energy analysis are integrated into the Revit model. Based on simulation findings and yearly energy usage, this study detailed building and wall design optimization.

Literature Review:

Ahmed M. Maglad et al.(2023), explore the energy performance of an academic building in Pakistan as a case study. This optimization is achieved through the utilization of Building Information Modeling (BIM) and the installation of energy-efficient construction materials. A 3D model of the building is created using BIM, and energy analysis is conducted to assess its energy performance. Areas for energy optimization are identified, and recommendations are developed to improve energy efficiency. Energy analysis utilizing Autodesk Revit and Autodesk Insight is found to be the most effective technique for assessing building energy performance during different design choices [1].

Kamar Aljundi et al.(2016), This paper focuses on the use of Building Information Modelling (BIM) tools The study involved studying the thermal and energy performance of a well-insulated test cell and investigating the effects of changing thermal mass and insulation thickness. For energy analysis in building design. Revit overpredicted the heating demand by an average of times and the cooling demand by 2.5 times compared to Energy Plus. Simulating the effect of thermal inertia by changing the position of the insulation layer and air cavity showed that all simulation models predicted higher heating demands for low thermal mass models compared to high thermal mass. The cooling load was independent of thermal mass [2].

Marko Jaric et al.(2013), introduction emphasizes the importance of BIM adoption and the need for efficient thermal modeling and simulation tools to enhance productivity and sustainability in the construction industry. BIM CAD software allows architects and engineers to handle aesthetics and engineering aspects throughout the design process. The Revit application enables analysis of annual carbon emissions, monthly heating and cooling loads, and annual energy use. The choice of energy simulation software depends on factors such as the user's expertise, specific requirements, and compatibility with BIM applications. It is essential to assess the capabilities and limitations of each tool to select the most suitable one for a particular project or purpose [3].

Deepal et al.(2019), Studied the energy consumption of buildings from the construction phase to the demolition phase. To explore the use of Building Information Modelling (BIM) tools, specifically Autodesk Insight, for energy analysis of buildings.To apply Autodesk Revit Software and Autodesk Insight, a cloud-based energy analysis program, for predicting the energy consumption of a Library building. The energy analysis method using Autodesk Revit and Autodesk Insight is considered a suitable and modern approach for assessing different design options and improving building performance. BIM-based design and documentation systems, such as Autodesk Revit, are well-suited for providing valuable information to improve building design and performance. This implies that BIM technology offers comprehensive data and tools that assist professionals in making informed decisions. BIM-based design and documentation systems, such as Autodesk Revit, are well-suited for providing valuable information to improve building design and performance. This implies that BIM technology offers comprehensive data and tools that assist professionals in making informed decisions [4].

Methodology:

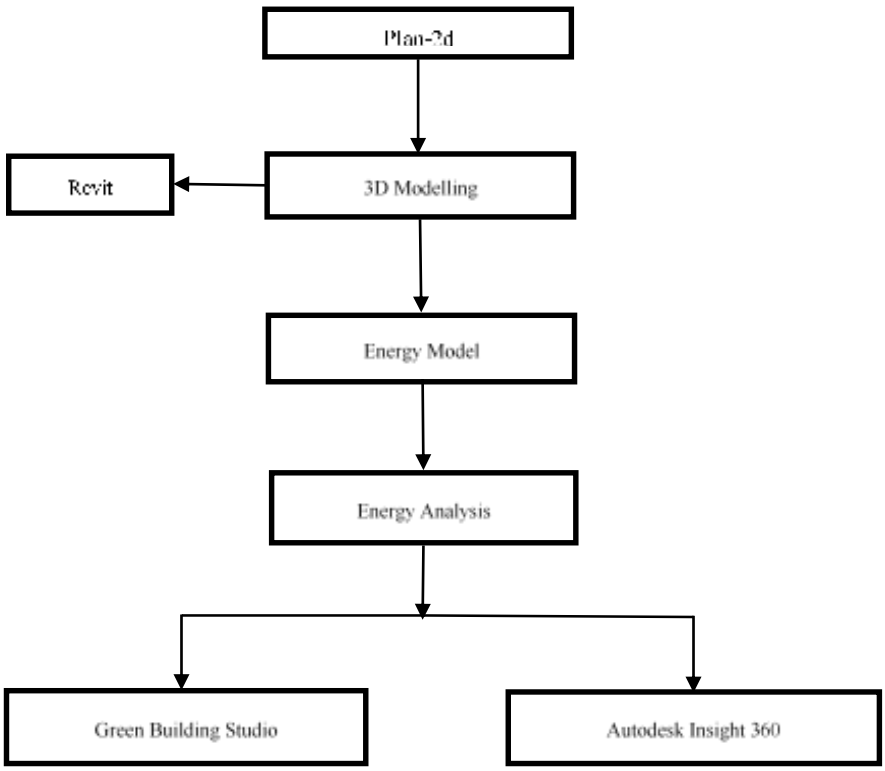

Fig: Work Flow for Energy Analysis

The first step in the Energy simulation process is to determine the energy target. The planned goal was to collect drawings and information on the structure under consideration. Examine the designs and use the Autodesk Revit program to make a 3D model. Export it to the gbXML format for use in GBS applications. Analyse and run findings with the cloud-based Green Building Studio program. Estimating the building's energy consumption. Using the floor plan of the building, a 3D model is built with the Autodesk Revit program. Then, Room tags are assigned to the rooms that are built with Revit. It is critical to build Rooms since they will aid in exporting the file to gbXML format. Select the building type, the project's location, and the Building Element option for Rooms or Spaces, and if the thermal characteristics are to be taken into account, select that option before exporting the file to gbXML. Then Log in to the cloud-based Autodesk Green Building Studio program. Establish a project. In the Schedule section, update the Project information to reflect the project's location, building type, and intended use, as well as whether it is an ongoing project or merely academic research.

The project's location will help in locating the closest weather station and meteorological information for the project region, aiding in the analysis. Refresh the utility tariffs for fuel and electricity use. Additionally, you may edit information about the participating Project Members. Update the gbXML file in the project that was made for the basic run and get results right away. Upon upload, the file will show the outcomes of the input. The outcome displays how much gasoline, power, and other resources are used up. The Charts also include detailed information on yearly energy use, CO2 emissions, lifetime costs, etc. As much accurate information was provided when building the model, the values derived were as near to the real values as possible. In the program, several settings have default values set. To know the possibilities for developing a more energy-efficient building, there is also an option for Design Alternative to the present model, where we may adjust the HVAC specifications, the Roof construction details, the Glazing of Walls, and the kind of Lighting utilized.

Results and Conclusions:

There are several energy modeling software packages available right now, each with a varied level of sophistication and reaction to various factors. The Green Building Studio, Insight 360, and Energy Plus (an energy simulation software tool) are three of the most often utilized simulation software products. These software tools are the most comprehensive but also the most difficult, necessitating a higher level of skill. GBS is the most comprehensive software tool for energy modeling of those that have been studied, although other tools may be better suitable based on the user's viewpoint and the intended usage. GBS has a minor edge over Insight when compared. Software like the one listed above was created before BIM technology and needs special input formats. Software products like EcoDesigner, Green Building Studio (GBS), and Insight are made to interface with BIM applications and offer smooth data sharing. The Insight is the program that offers the most construction simulations to the user, but it necessitates expert expertise. The Insight and Green Building Studio are programs designed to provide users with no prior expertise in energy efficiency modeling with rapid and simple simulation results.

As a result, testing the building during the design phase and softly exporting the model from one tool to another inside the BIM platform of the same software company (with 100% compatibility) has been made possible by BIM tools. The model may be automatically examined, allowing for a quick analysis of potential solutions to be immediately debated in this BIM collaborative environment. Because we were unable to analyze the test cell's passive behavior and were forced to use the HVAC system to calculate the heating and cooling load, the use of BIM to investigate this straightforward test cell has significant restrictions. When compared to the more accurate and proven software used in this calculation, Revit shows significant variances. It is also shown to be a tool with greater mistakes than the seasonal yearly technique, which is typically used in building code compliance. The origins of these mistakes in the Revit/GBS tool will continue to be determined through this research.

Future Scope of Research:

The process of producing and maintaining digital representations of a place's structural and functional elements is known as building information modeling (BIM). Building energy performance and consumption may be analyzed using BIM technologies, which can save energy costs and increase environmental sustainability. Future research on energy analysis using BIM technologies has a broad and expanding reach. The following are some of the main topics of research:

• Creating more precise and complex energy simulation models. Building information modeling (BIM) may be used to produce incredibly accurate models of structures, which can subsequently be used to run energy simulations to forecast energy use and performance. However, there is still potential for development in terms of precision and sophistication, and the present energy simulation models are far from flawless.

• Creating new approaches to include energy analysis into the BIM workflow. Currently, energy analysis is frequently carried out as a distinct stage following the creation of the BIM model. To be more productive and efficient, there is a rising trend towards including energy analysis into the BIM workflow.

• Creating fresh techniques for using BIM data to assist in energy decision-making. BIM data may be used to assist a variety of energy decisions, including controlling energy use, selecting the best energy efficiency solutions, and designing new buildings with energy efficiency in mind. In terms of how BIM data may best be utilized to help energy decision-making, there is still potential for improvement.

Overall, there is great potential for further study into energy analysis utilizing BIM technologies. Energy analysis is a crucial component of BIM, which has the potential to revolutionize the way we design, construct, and manage buildings.

References:

1. Maglad, A. M., Houda, M., Alrowais, R., Khan, A. M., Jameel, M., Rehman, S. K. U., ... & Rehman, M. F. (2023). Bim-based energy analysis and optimization using Insight 360 (case study). *Case Studies in Construction Materials*, *18*, e01755.

2. Aljundi, Kamar, Armando Pinto, and Fernanda Rodrigues. "Energy analysis using cooperation between bim tools (Revit and Green Building Studio) and Energy Plus." *Proceedings of the 1º Congresso Português de Building Information Modelling, Guimaraes, Portugal*. 2016.

3. Jarić, Marko, et al. "A review of energy analysis simulation tools." *International Working Conference ' Total Quality Management–Advanced and Intelligent Approaches'', 4th–7th June 2013, Belgrade, Serbia*. 2013.

4. T. Ramesh, Ravi Prakash, K.K. Shukla, Life cycle approach in evaluating the energy performance of residential buildings in the Indian context, Energy and Buildings 54(2019) 259-265.