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CONCEPT OF GREEN BUILDING: BIM

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Abstract

The Paper green construction, sometimes known as "sustainable building," is the technique of designing, erecting, and maintaining buildings in a manner that is both socially and environmentally responsible. The goal of green building is to improve the health and wellness of a building's occupants while reducing a building's negative environmental impact. Green building involves the use of sustainable materials, energy-efficient systems, and environmentally responsible construction methods. This includes using renewable energy sources such as solar and wind power, maximizing natural light and ventilation, reducing water usage through the use of efficient fixtures and systems, and using recycled materials in construction. Green building also considers the impact of the building on the surrounding environment, including reducing the amount of carbon emissions produced during construction and operation, minimizing waste and pollution, and protecting natural resources such as water and land.

In addition to its environmental benefits, green building can also provide economic benefits through reduced operating costs, increased property value, and improved health and productivity of occupants. Overall, green building is an important aspect of sustainable development, and its adoption is essential in mitigating the negative impacts of human activities on the environment.

Keyword- BIM.

Introduction

Building Information Modelling (BIM) is a digital modelling technology that is more frequently utilised in the planning, development, and maintenance of buildings. BIM is a powerful tool for designing green buildings because it allows architects and engineers to integrate sustainable features into the design from the earliest stages, and to simulate the performance of the building in terms of energy efficiency, carbon emissions, and indoor environmental quality.

In the context of green building design, BIM can be used to model and analyse the building's systems and components, such as the building envelope, HVAC systems, lighting, and water systems. BIM can help

identify areas where energy and water can be saved, and can help optimize the design for efficiency and sustainability.
BIM can also help identify potential conflicts and issues during the design phase, which can be addressed before construction begins, thereby reducing the risk of costly and time-consuming changes later in the process. BIM can be used to generate detailed plans and specifications that are accurate, up-to-date, and accessible to all stakeholders throughout the project lifecycle.
In addition to its design and analysis capabilities, BIM can be used to facilitate collaboration and communication among the various stakeholders in a green building project, including architects, engineers, contractors, and owners. BIM allows for the sharing of data and information across different platforms and software, improving communication and reducing errors and misunderstandings.
Overall, BIM is a powerful tool for designing green buildings that are energy-efficient, sustainable, and cost-effective. Its use in green building design is becoming increasingly widespread, and it is expected to continue to play a critical role in the construction industry as more and more buildings are designed and built to meet sustainability goals.

The objectives of green building design using BIM include:
Incentive in FSI for Green Building Green buildings shall be entitled for incentive FSI as below. GRIHA Three star/ IGBC Silver / LEED silver or equivalent rating - 3% incentive FSI on basic FSI.GRIHA Four star/IGBC Gold/LEED Gold or equivalent rating - 5% incentive FSI on basics.GRIHA Five star/ IGBC Platinum/ LEED Platinum or equivalent rating - 7% incentive FSI on basic FSI. Provided, achieving minimum GRIHA Three star/ IGBC Silver / LEED silver or equivalent rating for construction projects shall be mandatory for all buildings belonging to Government, Semi- Government, local bodies and public sector undertakings.

Energy Efficiency: One of the primary objectives of green building design is to reduce the energy consumption of the building. By using BIM, designers can model the building's systems and components, and simulate the performance of the building to identify areas where energy can be saved. BIM can be used to optimize the design for energy efficiency by testing different scenarios and configurations.

Sustainable Materials: Another objective of green building design is to use sustainable and non-toxic materials in the construction of the building. BIM can be used to model and analyse the environmental impact of materials and products used in the construction, and to identify opportunities to use recycled content, rapidly renewable, and locally sourced materials.

Indoor Environmental Quality: Green building design also aims to create a healthy and comfortable indoor environment for occupants. BIM can be used to model and analyse the building's HVAC and lighting systems to optimize the design for indoor environmental quality, including natural light and ventilation, air quality, and thermal comfort.

Water Efficiency: Green building design seeks to reduce water consumption through the use of low-flow fixtures and systems, rainwater harvesting, and greywater recycling. BIM can be used to

model and analyse the building's water systems to identify opportunities for water savings and to optimize the design for water efficiency.
Waste Reduction: Green building design aims to reduce waste during construction and operation of the building. BIM can be used to model and analyse waste reduction strategies, such as recycling facilities and waste reduction plans, to optimize the design for waste reduction.
Overall, the objective of green building design using BIM is to create buildings that are energy-efficient, sustainable, healthy, and cost-effective. BIM is a powerful tool for achieving these objectives by allowing designers to model, analyse, and optimize the building's systems and components to create a high-performing and sustainable building.

Research methodology

Research methodology for studying green building design using BIM (specifically Revit) would involve the following steps:
Literature Review: Conduct a review of existing literature on green building design and BIM. This step will involve gathering information from books, journal articles, conference papers, and online resources related to green building design and BIM, and understanding the current state of the art in this field.

Case Studies: Conduct case studies of green building projects that have used BIM (specifically Revit) in their design and construction. This step will involve identifying relevant case studies and analysing the design and construction process, performance metrics, and lessons learned(Ganorkar, R. A., et al., 2013).

Surveys: Conduct surveys of architects, engineers, and construction professionals who have experience in green building design using BIM (specifically Revit). The survey will aim to gather information on the benefits, challenges, and best practices in using BIM for green building design.

Interviews: Conduct interviews with industry experts and stakeholders, including architects, engineers, construction professionals, and building owners, to gain insights into the use of BIM in green building design. The interviews will aim to gather information on the challenges, benefits, and best practices in using BIM for green building design (Bhambulkar, 2011).

Data Analysis: Analyse the data gathered from the literature review, case studies, surveys, and interviews to identify trends, challenges, and best practices in green building design using BIM (specifically Revit). The analysis will aim to identify gaps in knowledge and areas for future research.

Recommendations: Based on the findings of the research, provide recommendations for improving the use of BIM for green building design. These recommendations may include guidelines for design and construction professionals, suggestions for software developers, and recommendations for future research(Patil, R. N., & Bhambulkar, A. V.,2020).

Overall, the research methodology for studying green building design using BIM (specifically Revit) will involve a combination of literature review, case studies, surveys, and interviews to gather data and insights into the use of BIM for sustainable building design. The analysis of the data will aim to provide recommendations for improving the use of BIM for green building design.

ENERGY ANALYSIS

Energy Analysis Energy analysis is a key component of green building design and is an important aspect of the green building certification process. The purpose of energy analysis is to evaluate the energy performance of a building and identify opportunities for energy efficiency improvements. The analysis involves modelling the building's energy systems and simulating the performance of the building under different operating conditions (Bhambulkar, A., & Khedikar, I. P. ,2011).

In the context of green building certification, energy analysis is a requirement for many certification programs, including LEED, Green Globes, and others. The analysis typically involves the use of energy modelling software, such as Energy Plus, or Design Builder, which allows designers to model the building's energy systems and simulate its performance.

The energy analysis process involves the following steps:

Data Collection: Collecting data on the building's design, orientation, and location, as well as its mechanical and electrical systems, insulation, windows, and other components.

Modelling: Creating a digital model of the building in the energy modelling software, including its geometry, materials, and energy systems.

Simulation: Running simulations of the building's performance under different operating conditions, including weather patterns, occupancy levels, and internal loads.

Analysis: Analysing the simulation results to identify areas of energy inefficiency and opportunities for improvement.

Optimization: Using the simulation results to optimize the building's energy performance through the selection of more efficient equipment, systems, and materials.

Verification: Verifying the energy performance of the building through on-site testing and monitoring.

Overall, energy analysis is an important component of green building design and certification, and is essential for creating buildings that are energy-efficient and sustainable. Through energy analysis, designers can identify areas of inefficiency and opportunities for improvement, and optimize the building's energy performance to reduce its environmental impact and operating costs.

DESIGN ALTERNATIVES

Design alternatives for green building using BIM (specifically Revit) can include a range of sustainable design strategies and technologies, which can be incorporated into the building's design and construction to reduce its environmental impact and improve its energy efficiency.

Some examples of design alternatives for green building using BIM (Revit) include:

Passive Design Strategies: Incorporating passive design strategies such as optimizing building orientation, using natural ventilation, daylighting, and shading to reduce the building's energy consumption and increase its indoor comfort.

Efficient Building Envelope: Designing and constructing a building envelope that is well-insulated, air-tight, and optimized

for thermal performance to reduce the building's energy consumption and operating costs.

Energy-Efficient Systems: Using energy-efficient heating, cooling, and ventilation systems, including renewable energy systems such as solar panels, geothermal systems, or wind turbines, to reduce the building's energy consumption and carbon footprint.

Water Efficiency Strategies: Incorporating water efficiency strategies such as using low-flow plumbing fixtures, harvesting rainwater, and using greywater systems to reduce the building's water consumption and improve its sustainability(Khobragade, Bhambulkar, & Chawda, 2022) .

Sustainable Materials: Selecting sustainable materials such as low-impact building materials, recycled materials, or materials with a low carbon footprint to reduce the building's environmental impact(Dr. Ashtashil Vrushketu Bhambulkar, et al.,2023).

Smart Building Technology: Incorporating smart building technology such as building automation systems, energy management systems, and sensor networks to optimize the building's energy performance and reduce its operating costs.

Overall, the design alternatives for green building using BIM (Revit) are numerous and can be tailored to meet the specific needs of the building and its occupants. By incorporating sustainable design strategies and technologies into the building's design and construction, designers can create buildings that are environmentally sustainable, energy-efficient, and comfortable for their occupants

RESULTS AND CONCLUSIONS

The results of the design of green building using BIM (Revit) are likely to be a sustainable, energy-efficient building that meets the requirements of green building certification programs such as LEED, Green Globes, and others. The use of BIM technology allows for the integration of sustainable design strategies and technologies into the building's design and construction, resulting in a building that is optimized for energy efficiency, environmental sustainability, and occupant comfort.

The energy analysis component of the design process allows designers to simulate the building's performance under different operating conditions and identify areas of inefficiency and opportunities for improvement. Through the use of energy modelling software and simulation tools, designers can optimize the building's energy performance and reduce its environmental impact.

The use of sustainable materials, passive design strategies, energy-efficient systems, and smart building technology can also contribute to the overall sustainability and energy efficiency of the building, reducing its operating costs and carbon footprint while enhancing the comfort and well-being of its occupants.

In conclusion, the design of green building using BIM (Revit) is an effective and efficient approach to creating sustainable, energy-efficient buildings. By incorporating sustainable design strategies and technologies into the building's design and construction, designers can create buildings that meet the requirements of green building certification programs and contribute to a more sustainable and resilient built environment.

LIMITATIIONS & FUTURE SCOPE

Limitations of the design of green building using BIM (Revit) include the following:

Lack of Knowledge and Expertise: One of the main limitations of the design of green building using BIM (Revit) is the lack of knowledge and expertise among architects, engineers, and construction professionals. The implementation of sustainable design strategies and technologies requires specialized knowledge and expertise that is not always readily available.

Cost and Budget Constraints: Another limitation of the design of green building using BIM (Revit) is the cost and budget constraints associated with sustainable design strategies and technologies. The implementation of these strategies and technologies can be more expensive than conventional design and construction methods, making it difficult for some projects to incorporate them.

Availability of Sustainable Materials: The availability of sustainable materials can also be a limitation of the design of green building using BIM (Revit). Some sustainable materials may not be readily available in certain regions or may be more expensive than conventional materials, making it challenging to incorporate them into the building's design.

Future scope of the design of green building using BIM (Revit) includes the following:

Advancements in BIM Technology: Advancements in BIM technology are expected to improve the efficiency and effectiveness of the design of green building using BIM (Revit), allowing for more accurate and detailed modelling of sustainable design strategies and technologies.

Increased Knowledge and Expertise: The development of specialized knowledge and expertise in sustainable design strategies and technologies is expected to increase, making it easier for architects, engineers, and construction professionals to incorporate these strategies and technologies into the building's design.

Cost Reductions: The cost of sustainable design strategies and technologies is expected to reduce over time as they become more widely adopted and the availability of sustainable materials improves, making it more feasible to incorporate them into the building's design.

Regulatory Requirements: The increasing focus on sustainability and energy efficiency in building codes and regulations is expected to drive the adoption of green building design and construction practices, further expanding the scope and impact of the design of green building using BIM (Revit).

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