
COMPARATIVE ANALYSIS OF CONVENTIONAL BUILDING AND GREEN BUILDING BY USING BUILDING INFORMATION MODELING (BIM) TOOLS

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Pune- 411038 India**ABSTRACT**

The scope of sustainability in every industry is rapidly increasing nowadays. Similarly, the construction industry is also demanding changes in planning and construction of projects in order to bring in sustainability. 40% of energy consumed worldwide is used for the usage and operation of buildings. Global concern for the environment has necessitated reduction in energy demand and consumption for buildings. BIM tools such as Autodesk Revit, Green Building Studio (GBS) and Insight 360 can be utilized to analyze the building performance in terms of various parameters such as energy use intensity, life cycle energy use/cost, annual carbon emissions, monthly heating and cooling loads, monthly peak demand and monthly electricity and fuel consumption. By employing green materials in the conventional building model, the conventional building model is modified into a green building model. Using BIM, the use of artificial resources can be greatly reduced by replacing them with the use of renewable energy resources thereby saving energy. To show how efficient BIM is, the results of the performance of the conventional and green building models are compared. The present work attempts to compare the changes in operational and life cycle cost of a building through modification of various parameters including the use of green materials, green roof, energy efficient structures and alternative energy sources like solar panels. It is also discussed how to employ building information modeling (BIM) to effectively comprehend various cost management. The findings of this study indicate that the life cycle cost of energy efficient buildings can be significantly lower compared to conventional buildings. The study emphasizes the usefulness of BIM in estimating the main factors that affect building cost.

Keywords: BIM, Energy Efficient, Green Building Studio (GBS), Insight 360, Sustainability.

1. INTRODUCTION

The Energy Crises are increasing day by day in the world. The Construction industry require much more energy such as Fuel, Electricity etc. in life cycle and in operation some efforts are taken by some agencies i.e. Green Building Councils such as UGBC IGBC.

The Sustainability should be in front of eye while work in construction industry Green Buildings playing important role to reduce energy consumption, CO₂ emission, life cycle cost and corresponding cost. BIM (Building Information Modelling) industry in collaboration with construction industry will help to achieve such sustainable goal like reduction in energy consumption and CO₂ emission making building green with BIM calculation and analysis can be done with accuracy and faster. In the project by using BIM the analysis is done on buildings with various materials to concluding the energy consumptions and life cycle cost.

2. BACKGROUND

In the project energy simulation and building analysis done on the basis of material in the model. The Building analysis and energy simulations require calculation and Automation it can be done with BIM tools with accuracy in lesser time. The types of models prepared in Autodesk Revit Architecture and it analyze with the help of Autodesk GBS and Insight 360. The various materials are used in same model with no of trials and results is concluded

3. METHODOLOGY

The building model prepared by using Autodesk Revit which can create analytical model for energy analysis in GBS the models can compare in Insight 360 on the basis of life cycle cost , annual energy cost by using analyze tab peak heating and cooling load can be obtained. The materials are to be place in these model and trial to be taken with the help of Green building studio.

4. Building Modelling an Energy Analysis

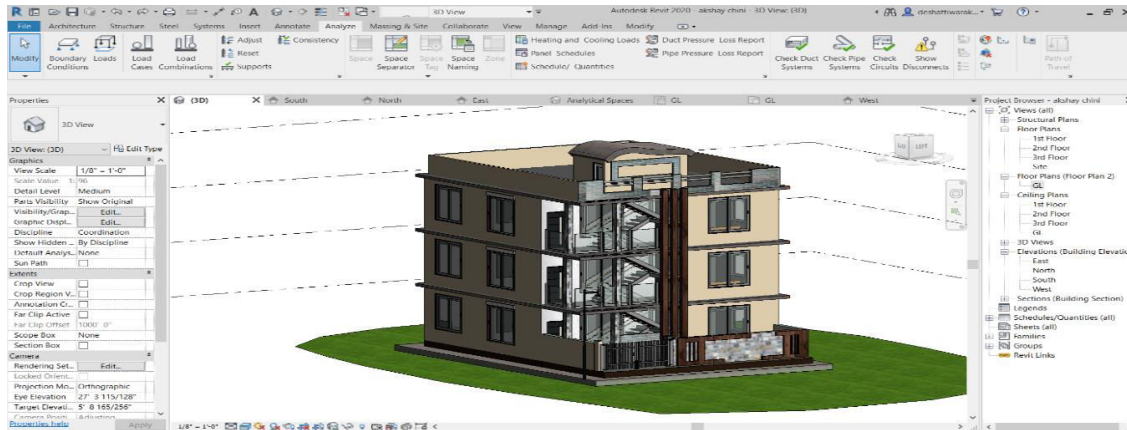
Name of the project: Multi Family Residential buildings

G+2 Building

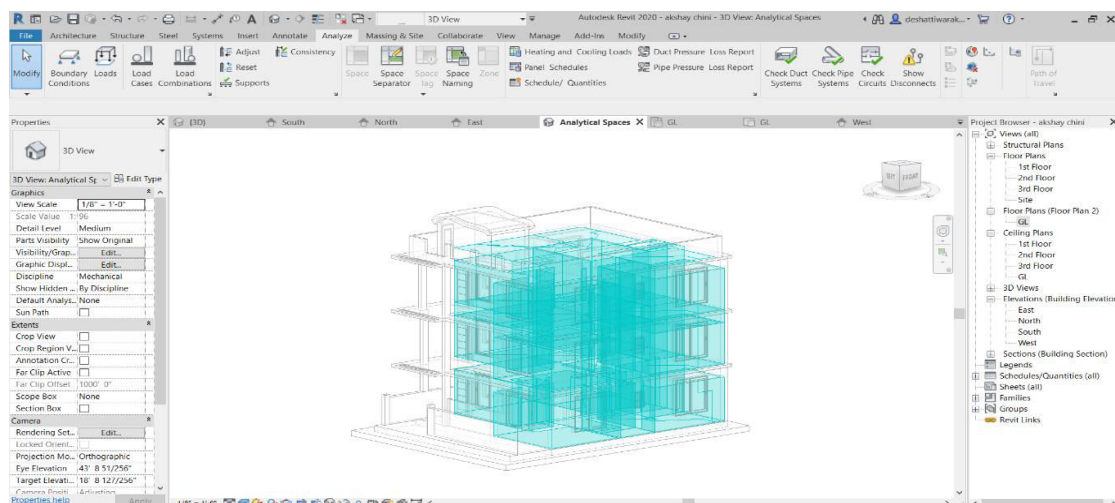
Project location: Pune

3D Modelling Using Autodesk Revit Architect

A 3D building model is created by using BIM Tools Autodesk Revit architecture. It started with ground plan of building then above story. The various details like door windows, panels etc. are put on the model and materials are selected. Finishing is done on the surfaces of building. To analyse the models the materials are replaced by green materials such as wood wool, AAC block, Green roof etc. which can be easily possible in Revit.



Energy analysis of the building model which is obtained from Autodesk Revit Architecture requires energy setting which has to be done. From this energy setting the energy model of existing building can be obtained and this model can be used for energy analysis and also to conclude peak heating and cooling load. Before analyzing the model in GBS, some settings have to be done, i.e., location of building type of building etc. By using GBS, the building energy performance is calculated.



5. Ecofriendly Materials Used

Table No. 1. Materials used and their green benefits

Elements of Buildings	Materials used in the Green building	Green building
Wall	Autoclaved aerated concrete block	Thermal protection and reducing heating and cooling load
Flooring	Cork	Reducing heat losses
Ceiling	Gypsum	Thermal Isolation
Roofing	Green roofing & roofing w	Improve Air Quality
Roof top	Solar panels	Electricity consumption and Co2 emission

Table No. 2. Parameters are used in Project

Annual energy cost	Fuel consumption
Life cycle energy cost	Annual peak demand
Electric use intensity	Peak heating load
Electricity consumption	Peak cooling load

6. RESULT

The energy use intensity and life cycle cost is the energy require per unit area and its corresponding cost. Peak cooling and heating loads is the energy required to maintained temperature inside the building with green materials. Energy/fuel consumption and its cost reduced.

Table No 3. Comparisons between Convention Building and Green Building

Parameters	Conventional building	Green building
Annual energy cost	167454Rs.	148630Rs.
Life cycle cost	2280719Rs.	2024337Rs.
Electricity consumption	25342kwh	22487kwh
Fuel	29297MJ	26486MJ
Annual peak demand	6.9kw	6.3kw
Energy use intensity	1413MJ/m3/year	1341MJ/m3/year

7. CONCLUSION

The building performance compare between the building models based on result obtained. The life cycle cost and annual energy cost reduced by 11.2% and 11.24% respectively from conventional to green building. The Electricity consumption also reduce by 11.26%. The fuel Consumption also reduce by 9.59%. Annual peak demand is 8.7% reduce. The use of green building materials improves the energy efficiency of building while also providing environmental benefits. In overall analysis is done on the basis of various parameters results the building performance has improved by making it green building. From the project it can be concluded that BIM has in significance importance to make building green and that are

- By using BIM tools calculation process makes faster and with accuracy
- Building performance can analyse easily with practical condition without any errors.
- The compression and detailed results can obtain with using BIM tools.

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