



Comparative Cost Analysis of a Green Building and Conventional Building

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ABSTRACT

Nowadays recycling waste and industrial products gaining popularity to make concrete environment-friendly material and the concrete can be called Green Concrete. As well as "Green building" is defined as "a building constructed with design and construction processes which significantly reduce or eliminate negative impact of buildings on the environment and occupants." The green building is the building which uses less energy, less water and by using renewable resources energy is to be produced and it is utilize for the house. In this paper the comparison of green building with conventional building with respect to economy is studied with the help of suitable case study. It also includes study of existing green building, by carrying out survey with respect to energy saving, operating cost, saving in electricity water, to study of IEQ etc. This study also helpful to reduce the wastage, to maintain healthy and safe to the environment. This paper proposed the guidelines for the design of fly ash-based green concrete and presented a comparative analysis of a high-rise green structure and a conventional structure in terms of cost analysis. Green building cost is less as compare to conventional concrete.

Keywords: Green building; Sustainable development; Modern building techniques; Cost efficiency;

Introduction:

Unfortunately concrete is not an environmental friendly material, either to make, or to use, or even to dispose of. To gain the raw materials to make this material, much energy and water must be used, and quarrying for sand and other aggregates causes environmental destruction and pollution. It is claimed to be a huge source of carbon emissions into the atmosphere. Some claim that concrete is responsible for up to 5% of the world's total amount of carbon emissions, which contribute to greenhouse gases. The reason for the huge popularity of concrete is the result of a number of well-known advantages, such as low cost, general availability, and wide applicability. But this popularity of concrete also carries with it a great environmental cost. Cement-based materials are the most abundant manufactured materials in the world. Today's exciting trend is the Green building is in our country. The potential environmental benefit to society of being able to build with green concrete is huge. Green Concrete as the name suggests is eco friendly and saves the environment by using waste products generated by industries in various forms like rice husk ash, micro silica, etc to make resource-saving concrete structures. Use of green concrete helps in saving energy with emissions, waste water. Green concrete is very often also cheap to produce as it uses waste products directly as a partial substitute for cement, thus saving energy consumption in production of per unit of cement. Over and above all green concrete has greater strength and durability than the normal concrete. It is realistic to assume that the technology can be developed, which can reduce the CO₂ emission related to concrete production.

Green Building

Green building (also known as green construction or sustainable building) refers to both a structure and the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from planning to design, construction, operation, maintenance, renovation, and demolition. This requires close cooperation of the contractor, the architects, the engineers, and the client at all project stages. Therefore, **green building concept** refers to the conceptualization of making the entire life-cycle of a building sustainable. This can be achieved by adopting sustainable practices right from design and construction phase to the operation, maintenance, and demolition phase. Even the renovation phase is considered to be a crucial part of green building concept.

providing people with healthy, comfortable and efficient use of space, and being in harmony with nature Buildings that live in harmony. Green building technology focuses on low consumption, high efficiency, economy, environmental protection, integration and optimization.

LITERATURE RERVIEW:

Emad S. Bakhom and Yasser M. Mater (2022) research paper aimed to develop an approach using a multicriteria decision-making algorithm based on Analytical Hierarchy Process (AHP), to select the most suitable industrial waste to achieve the desired green concrete properties. The research starts by determining the alternatives including 18 industrial wastes, and the criteria including 14 properties of concrete. An algorithm was developed using a python script to analyze the influence of incorporating each of the industrial waste alternatives on both the mechanical and sustainable properties of concrete. Subsequently, the efficiency of the proposed algorithm is validated using three case studies that present different circumstances of concrete specifications.

Priyanka Nangare et al (2020) was study Now a days, due to effects of global warming, green building concept will be used to compensate or used to reduce the problems created from the increased temperature. The Green building is a system which deals with the various factors such as study of water conservation, study of energy conservation, reduction in the wastage, study of saving of materials etc. As well as “Green building” is defined as “a building constructed with design and construction processes which significantly reduce or eliminate negative impact of buildings on the environment and occupants.” The green building is the building which uses less energy, less water and by using renewable resources energy is to be produced and it is utilize for the house. In this paper the comparison of green building with conventional building with respect to economy is studied with the help of suitable case study.

OBJECTIVES:

To examine the cost benefit perspectives of sustainable buildings and conventional building.

METHODOLOGY:

Step 1: Research paper from different authors was summarized in this section who have focused towards analysing multi storey high rise structures considering seismic loads with different zones and soil condition.

Table 1 Geometrical Specifications of the Structure

Geometrical Specification	
Particulars of Item	Properties
Number of Storey	G+8
Typical Storey height	3.2m
Bottom Storey Height	3.2m
Floor Diaphragm	Rigid
Number of Grid Lines in X-direction	6
Number of Grid Lines in Y-direction	6
Beam Size	400x300mm
Beam Shape	Rectangular
Column Size	400x400mm
Column Shape	Rectangular
Slab Depth	125mm
Slab Type	Thin Shell

ANALYSIS RESULT:

The two cases were evaluated for G+8 structure considering green building and RCC building. The structure was modelled and analysed using analytical application STAAD PRO. The case study was compared on parameters of

Cost Analysis

Table 2 Cost Analysis of Rebar in INR

Frame Type	Reinforcement in kg	Rate of Rebar kg as per SOR	Cost of Rebar in INR
RCC Building	11231.29	89.89	10,09,580.65
Green Building	10723.65	89.89	9,63,948.89

Table 3 Cost Analysis of concrete in INR

Frame Type	Concrete cu.m	Rate of concrete (m3) as per SOR	Cost of concrete in INR
RCC Building	94.5	6120	5,78,340
Green Building	92.6	6120	5,66,712

Inference- Cost analysis, also known as cost-benefit analysis, is the process of calculating the potential earnings from a situation or project and subtracting the total cost associated with completing it. It predicts the profit gained from a project and compares the project's cost to its estimated financial benefits. Green Building has proved to be a sustainable and cost-effective option which reduces the quantity of rebar and concrete reduced in the project. The current rates were considered as per SOR, INR. Green sustainable structure is comparatively more economical than bare frame by 8.4%.

Conclusion

The design process of a green building requires several stages such as the architectural design and structural design stages. In addition, a cost analysis is important to compare the cost of a conventional building to the cost of a LEED certified green to show how a green alternative is beneficial in the long run. In the structural design, several green features are added to the building such as solar panels, rain barrels, and vegetation on the roof. The green features are added to minimize the waste of vital resources such as water and electricity. Although the LEED-certified building is a costly alternative, the building's cost will be paid off in eight years and about three thousand dollars will be saved annually after the cost is paid off. Therefore, the green building design is an excellent choice for future projects because the design not only saves vital resources and helps in saving the environment, but also gets paid off in the long run.

REFERENCES

1. Ammar Qassem Ahdal, Mokhtar Ali Amrani, Abdulraheeb A.A. Ghaleb, Aref A. Abadel, Hussam Alghamdi, Mohammed Alamri, Muhammad Wasi and Mutahar Shameeri, [Mechanical performance and feasibility analysis of green concrete prepared with local natural zeolite and waste PET plastic fibers as cement replacements], *Case Studies in Construction Materials* 17 (2022) e01256.
2. Arundeeep Saini, Jocelyn Quintanilla, David Paiva, Thai Nguyen, Alina Phung, Tadeh Zirakian and David Boyajian, [Undergraduate Structural Design and Analysis of a LEED Certified Residential Build], *International Journal of Research Studies in Science, Engineering and Technology* Volume 8, Issue 2, 2021, PP 19-25 ISSN 2349-476X.
3. Nihar Khalatkar, [Study on Green Concrete], *International Journal of Advances in Mechanical and Civil Engineering*, ISSN: 2394-2827 Volume-4, Issue-2, April-2017.
4. Pavithra Rathnasiri, Suranga Jayasena and Mohan Siriwardena, [Assessing the Applicability of Green Building Information Modelling for Existing Green Buildings], *International Journal of Design & Nature and Ecodynamics* Vol. 15, No. 6, December, 2020, pp. 763-776.
5. Xiaoqiu Ma, [Research on Green Building Materials Management System Based on BIM], *CHEMICAL ENGINEERING TRANSACTIONS* VOL. 66, 2018.
6. Lakshmi R, [conversion of existing conventional building to green building using simple versatile affordable green rating for integrated habitat assessment and cost analysis], *EPRA International Journal of Research and Development (IJRD)* Volume: 6 | Issue: 12 | December 2021.
7. Guddeti Janardhan Reddy and Shaik Akhil Mastan, [experimental study on green concrete], *International Journal For Technological Research In Engineering* Volume 5, Issue 3, November-2017.
8. Chandra Shekhar Singh, [Green Construction: Analysis on Green and Sustainable Building Techniques], *Civil Engineering Research Journal*, ISSN: 2575-8970, Conceptual Volume 4 Issue 3 - April 2018.
9. Priyanka Nangare1, Prof. Abhijit Warudkar "Cost Analysis of Green Building" *international Journal of Scientific Engineering and Research (IJSER)* www.ijser.in ISSN (Online): 2347-3878, Impact Factor (2014).