

Design of Zero Energy Residential Building

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Abstract - The prior motive of this research paper is to design a Net Zero Energy Residential Building. It is much typical to understand the entire concept of a net zero energy building. As we know that the building play important role on the energy usability and the environment which adversely affect the development of the present years. Zero energy building design has become prior for architect and researchers related to architectural engineering and building. A zero energy building refers to a building with a net energy consumption of zero over a year. In present the lack of conformist energy sources boosts in evolving the NZEBs. According to the study a major effect of building on the total worldwide energy feasting level i.e. around 40% of the total energy is expended by only buildings and becoming a major main energy consumptive part of the global structure.

Key Words: 1.Zero energy building, 2.Design, 3.Plan, 4.Vastu Shastra, 5.Solar integrated design, 6.P V solar Module, 7.Energy consumption, 8.Cost factor, 9.Innovative Techniques.

1. INTRODUCTION

Mahatma Gandhi planned a society where the man would live in accord with nature. He Offered having self-reliant village societies to accomplish this goal, having a development built on renewable resources. He insisted for the growth of human beings from every stratum of the society and to avoid wasteful use of resources. The term Net Zero Energy Building is defined as the building with zero net energy consumption i.e., the total amount of energy used by the building on annual basis is roughly equal to the total amount of renewable energy created on the site. Buildings have a important influence on energy use and the environment. Profitable and housing buildings account for about 33% of the total electricity in India. With speedy urbanization, there has been a steady migration from rural parts of the country to urban areas, leading to increased energy consumption particularly in the commercial sector. The concept of a Net Zero Energy Building (NZEB), one which produces as much energy as it uses over the course of a year, recently has been evolving from research to reality. Currently, there are only a small number of highly efficient buildings that meet the principles to be called "Net Zero". As a result of advances in creation knowledge's, renewable energy systems, and academic research, creating Net Zero Energy buildings is fetching more and more possible. The

aim of this Study is to be focusing on the building to create it a Net Zero by using a Renewable Energy.

Resources as an alternative of Non Renewable Resources. It implies that the energy demand for heat and electrical power is condensed, and this reduced demand is met on an annual basis from renewable energy supply. The renewable energy supply can either be combined into the building design or it can be definitely provided for the building. Currently, there are only a small number of highly effective buildings that meet the principles to be called "Net Zero". As a result of advances in construction skills, renewable energy systems, and academic research, creating Net Zero Energy buildings is becoming more and more possible.

2. Planning of building

2.1 Vastu shastra

Simply means the knowledge of construction. It was a principle written during the Vedic era and based on the four basic directions and five fundamentals of nature (Earth, Wind, Water, Air, and Soul/space). These elements are allotted to a different direction with the Soul/space in the center. Each element has a methodical role to play. It is founded on the consequence of instructions and each element represents a direction.

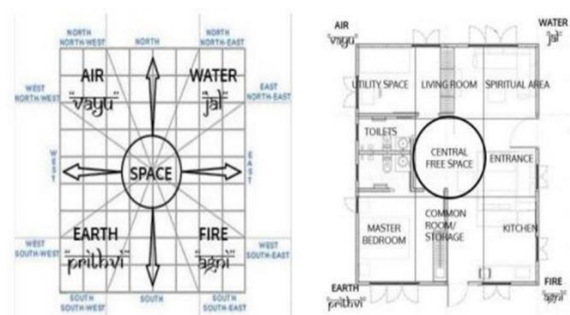


Fig-1 : Vastu shastra

3. Functional designing

The ground floor of the building including one hall, two bedrooms, one dinning, one kitchen. The distributions of the rooms in the plan has been done with due attention of sun diagram as per the requirement of zero energy building. The first floor of the building consists of one hall, two bedrooms,

one dining, one kitchen. The divisions of the rooms in the plan has been done with due consideration of sun diagram as per the condition of zero energy building. The plan has been prepared using Auto CAD software.



Fig-2 : Ground floor plan

In view of all the limitations in building by laws and Vastu Shastra we have proposed a plan having floor area 1038 square feet.

4. Structural designing

The suitable design and planning of the building can make the building low-priced than that of the conventional type of buildings. Usage of hollow bricks and avoidance of columns and beams will result in depressing of temperature inside the building. Design experience in the following areas has been gained during the course of the project.

- i. Design of slabs
- ii. Design of footings
- iii. Design of wall using Hollow bricks
- iv. Design of solar panels

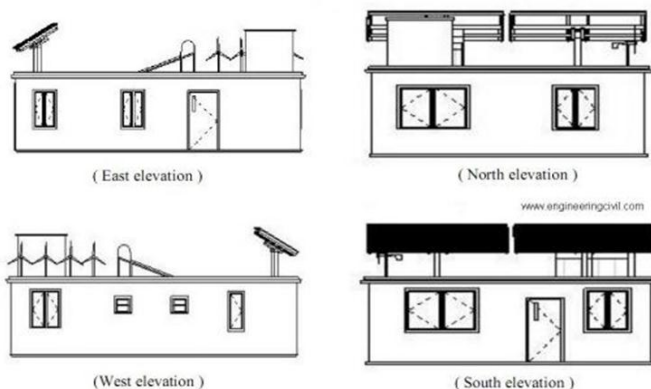


Fig-3 : Solar paneling and fittings

5. Material and methodology

In this work, we want to study and analyze the zero energy building available in India. The study will be carried out based on the need of zero energy building and method of tumbling the building energy consumption and energy protection. We have identified zero energy building placed in BIEC, Bangalore for our study. This structure is energy sufficient and uses renewable energy sources for heating and power generation to operate the electrical and electronic appliances.

5.1 Lighting of the building of HVAC System

This unit is provided with solar PV panels of 3 kW capacity and these panels are mounted on the roofs tilted south direction to get maximum solar energy. However addition of extra number of solar panels will make the building more supportable. Each room in the building has LED lights which condenses the energy consumption. The glass blocks in the roof allows the sun light enter the building. The bamboo frameworks provided in the building make an efficient, cost effective and environmental friendly shading device. The used door and windows are stabbed through the clay brick walls and the preterm brick's provides the thermal insulation. The steel frame was used in the structure creation as it helps to complete the structure in short period. The PV solar system used in the structure which supplies electrical power to the structure.

5.2 Interior and furniture

In Zero energy building, low volatile organic complexes (VOC) paints are used to reduce the VOC emission. The furniture provided in the structure is made of bamboo and other renewable materials. This decreases the carbon foot print.

5.3 Rain Water Harvesting System

The building has rain water harvesting system which collects the rain water that runs off from the roof of the building and is collected in a recharge tank. Hence it recharges the water table beneath. The roof pipes are embedded with radiant cooling pipes with chilled water flowing through them giving the place a natural air cooling effect.

5.4 Sewage treatment

The sewage water from the building is treated in BIEC STP Facility and treated water is recycled for landscaping, flushing in toilets and make up water for the Cooling Tower.

6. Estimations

The quantities of the various materials in conventional building and NZEB are calculated. The rate analysis for various description of work is calculated based on the PWD. The total cost of the NZEB is higher than that of

conventional building. As per analysis the cost of ideal conventional building seems about **20,16,308.44** /-whereas the cost of Net zero energy Building is seems about **26,00,217.15** /-



Chart-1 : Cost comparioson bar chart

7. Conclusions

In this project we have completed the design of the Conventional building by using modular bricks and Net Zero Energy Residential Building by using Hollow Brick The Comparison of the Conventional Building and NZERB was completed by using the parameters such as the temperature by using instrument infrared thermometer which was found to be 4°C less in NZERB compared to conventional building under same condition. Hence by using the renewable resources the impact on the active energy loads can be reduced, thus we can conserve electricity locally and globally.

8. Future scope of the project

The building designed as a NET ZERO ENERGY BUILDING produces its own electricity, thus it can save huge amount in electricity bill. These kinds of buildings are environmental friendly reducing the environmental hazards (e.g. It would release zero carbon content that would help in controlling global warming).The design for the building should be such that the requirement of temperature regulation does not fluctuate throughout the year.

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