

Review of Green Building Technologies, Model Creation and It's Case Study

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ABSTRACT

Green technology is the term where we use scientifically proven technologies to reduce human impact on environment through construction of green building. In this paper we have presented the various technologies used in construction of green building by preparing a detailed demonstrative model. For better understanding of the green building concept practically, we have visited an Architect office at Sangli. This case study is mentioned in this paper.

RELEVANCE

Keeping an eye on the pace at which our country India is progressing and developing there is a necessity which comes along with it 'The necessity of sustainable development'. In this paper, we have highlighted about the Green Building concept along with its practical application. Since our country, India is now considered to be in one of the most progressively developing countries, we need to make sustainable development to counter with the problems which might hinder us in our near future. The problems of global warming, global ecological disbalance and ecosystem disbalance is a great threat to not only our country but to the whole world. We must carve our ways into sustainable development. One such way is Green Building. Green Building designing is a concept where one must design a building in such a manner that it is accustomed with nature friendly plans. An ideal Green Building may consist of rainwater harvesting plant, Solar power generating plant, walls made from waste material, correctly oriented building planning for appropriate air ventilation and air movement, surrounding full of trees to provide oxygen to the people living by sewage water treatment plant and many more ideas which contribute to better and natural living standards. Everyone must understand the importance of Green Building designing and implement in their niche habitat to prolong longevity and quality of living. This paper will help people to understand the necessity of this sustainable development through Green Building via a case study.

METHODS USED FOR GREEN BUILDING

Green Building has variety of methods which can be used for its implementation. Some of them are:

1. Vacuum Walls: this is the age-old concept which is like the concept is used in a thermos. Here the walls of the building have three layers. The inner and the outer layer being solid and the layer between them being vacuum. The heat waves which generally strike the outer wall and enter the room will not enter in this scenario. The vacuum doesn't allow heat transfer, and no heat energy is passed into the room, controlling the overall temperature inside the room. It may help us to reduce electricity bills.
2. Solar Powered Building: The entire building is powered by the solar panels which are fit on the terrace of the building. These solar panels have solar cells which absorb heat energy coming from the sun. The captured energy is stored in batteries and then utilized periodically according to its usage.
3. Wind energy utilization: In this method, windmills are set up to generate energy through the wind. The wind generally has high velocity at higher altitudes. A windmill can generate electricity by using the wind to turn its blades and store the energy in batteries. This electrical energy can be utilized wherever necessary.
4. Orientation of landscaping: One must consider to orientation of land with respect to sunlight, wind directions before construction. Such type of orientation gives a lot of natural light and the direction of wind help us to keep the temperature of the room moderate by using some elements. This will particularly help us in our summer season where the usage of air conditioner is higher. The overall cost consumption can be reduced by bringing in natural solutions.
5. Plantation: Filling up the place with a lot of plants and trees will increase the oxygen content of the place. It is said that a place which has greenery around it is much likely to have more productivity. Naturally, a person working in such a surrounding

would work with more enthusiasm and energy. Such oxygen emitting plants are available in nature.

6. Use of LEDs: Maximum utilization of LEDs must be made as they have high energy efficiency. The LEDs consume less electricity and provide more productive outcome along with long lifespan. They also help in reducing greenhouse gas emission. They are versatile and durable as well.

7. Water Treatment plant: The water which is collected from the kitchen or the water from our basin can be collected in the centralised system where it is purified. This purified water will later be used in your flush system, gardening and cash wash stations. This system makes sure that the water which is used once can be utilized multiple times which will contribute towards saving water.

8. Rainwater harvesting: The water which is collected on the terrace of the building can be rooted into a tank. This water can be used for plants or can be treated and be used for toiletries.

9. Wooden flooring: Wood is a poor conductor of heat so it can be utilized for flooring.

10. Airduct: By adding airducts in Green Building, one can circulate fresh air at his home and can maintain uniform temperature all over the house.

11. Biogas plant: Biogas can be generated by using the kitchen waste obtained from the building and can later be to produce organic fertilisers. This biogas can also be transferred to every home for cooking and heating of food on stove. This technique helps us introducing the carbon emission managing waste in a proper way and reduce our dependence on natural gases and LPG.

12. Green roof top: The building must have plant trees and vegetation on the terrace so that it can absorb most of the heat and lowers the temperature inside the building.

MODEL

To showcase an ideal Green Building, we have constructed a model demonstrating the concept. Plans implemented in our model are:



FIG 1- MODEL MAKING



FIG 2- COMPLETED MODEL

1. Solar power building: All the lights inside the buildings are powered from the energy derived from the solar panels which are set up on the rooftop of the building. This reduces the overall electricity cost which need to be made by the flat holders.

2. Wind power generation: Windmills are set up which provide electricity to the streetlamps and also light up the parking spaces and garden.

3. Biogas plant: The energy derived from the biogas plant is supplied to all the flats where cooking and heating processes can take place. The biogas can also be used to produce organic fertilisers. these organic fertilisers can be used in the garden in the building.

4. Rainwater harvesting: All the water that is collected from the terrace is collected in a mean tank at ground level. This water can later be used for multiple purposes like providing water to the plants, allowing people to wash car through this water, used in toilets or any other viable usage.

5. Waste water treatment plant: The water that is used in the kitchen and basin can be treated again to be used in toilets. This will ensure that the water is used at its maximum potential to derive sustainable water conservation.

6. Usage of waste material: Waste materials can be used for making the exterior compound walls or for making small benches where young generation or the old generation can sit and have quality time.

7. Vacuum walls: The walls of our building are three layers where the outer and inner layer are solid. The layer between them is a vacuum which resist most of the heat which comes from the sun striking the exterior wall.

8. Smart streetlights: Street light in the building, only Light, when they particularly sense a human being or a car which passes nearby. This helps in producing maximum efficiency from the same amount of electricity which would have once gone to waste.

9. Usage of LEDs: all the flats have LEDs fit in them so that high electrical efficiency can be derived, and cost conservation can be done.

CASE STUDY

We have visited studio 888 which is owned by architect Pramod Chaugule. This green office is situated in Sangli. Mr Pramod is a nature enthusiast and loves to incorporate his projects with nature and sustainable development.

During our visit, we observed how Studio 888 integrates multiple green technologies into a single, practical workspace combining passive cooling, on-site energy generation, and natural ventilation strategies within a compact urban plot."

The ideas which he has implemented in his green office are as follow

1) Solar panels and windmill: They have installed two solar panels of capacity 3KW each and one wind mill. These non-conventional energy sources reduce their electricity consumption bill to zero.



FIG 3- SOLAR PANEL AT STUDIO 888 IN SANGLI

- 2) Orientation: His conference room is situated at northeast side of the land where natural air easily flows. The conference room is covered with bamboos on one side which are capable of eliminating 80 percent of toxins as a result we observe the room temperature of the conference room to be around 25-26 degree Celsius without AC and fan .
- 3) Plantation of Oxyrich Plants: He has planted trees, which naturally produce more oxygen as compared to the other plants. They include Pongamia Pinata (Karanj), Neem tree, Bamboo and Ficus Religiosa (Pimpal). The Pongamia pinata plant has dust absorption property. This particularly helps in keeping the quality of the air cleaner and purified.



FIG 4- BAMBOO PLANTS AT STUDIO 888 AT SANGLI

- 4) Vacuum walls: The walls constructed in the building are vacuum walls which increases the heat resistance and lowers temperature in the rooms.



FIG 5- VACUUM WALLS AT STUDIO 888 IN SANGLI

- 5) Construction of window with Natural Air Circulation: The curtains were placed strategically parallel to each other. The water flows through the curtain by the arrangement of drip irrigation. This arrangement take away the heat from the air coming inside the office. It results in lowering the temperature of office



FIG 6- NATURAL CURTAIN PLACEMENT AT STUDIO 888 IN SANGLI

- 6) Usage of Wooden Flooring: The office space is equipped with wooden flooring, which restrict heat from transferring from floor to wall.



FIG 7- WOODEN FLOORING AT STUDIO 888 IN SANGLI

- 7) Green roof top: The building had plants, trees and vegetation on the terrace which absorbed most of the heat and lowered the temperature of the building



FIG 8- ROOF TOP PLANTATION AT STUDIO 888 IN SANGLI

- 8) Airduct: Airducts were added in Green office, which circulated fresh air in the office and maintained uniform temperature all over the office



FIG 9- AIR DUCTS AT STUDIO 888 IN SANGLI

CONCLUSION

Impact of construction on environment must be understood by the everyone in the world. If such green technologies are available while constructing a building it will help us in sustainable development. Through various methods like solar power, rainwater harvesting, vacuum walls and plantation, green buildings promote eco-friendly living. Our case study at Studio 888 demonstrates the real world benefits of these techniques, proving that sustainable architecture can be both practical and effective. By integrating green technologies, we can conserve resources and lower energy consumption.

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