

Construction Methodology of Ideal Building

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Abstract - The buildings are one of the biggest energy consumers. In India the construction methodology practiced is a conventional one. In the current construction methodology, the natural resources are being used at faster rate than estimated. Hence, it has become essential to think about a construction methodology of an ideal building to reduce the demand and consumption of natural resources. This concept will allow reducing the use of natural resources in the construction practices and pushing towards using renewable resources. This study is aimed at the use of construction methodology with ideal building as compared to conventional method. The main purpose of present study is about the various construction materials, technologies and techniques to minimize the use of natural resources and maximize the use of renewable resources such as solar panel, biogas plants etc. The use of eco-friendly construction materials such as green concrete, pervious concrete may prove very effective for greater energy efficiency and when green concrete used for road surfaces etc., helping to increase in infiltration causing the recharge of groundwater and thereby rise in water table.

Key Words: Construction Methodology, Ideal Building, Natural Resources, Renewable Resources, Green Concrete

1. INTRODUCTION

1.1 Concept of Ideal Building

The ideal building is a high performance building which consists of energy efficient design and performance, cost effective which make the building sustainable and eco-friendly for the present and future. The construction sector has a significant impact on the energy demands and the greenhouse gas emissions in buildings. This concept of construction methodology of ideal building will help increase efficiency of building and minimize the energy consumption.

1.2 Applications of Ideal Building

The concept of construction methodology of ideal building can be applied to various construction materials, technologies and techniques such as pervious concrete for internal roads, green concrete, rainwater harvesting, roof cooling techniques, motion sensors, solar panels, biogas plants, etc.

2. ISSUES CAUSED DUE TO CONVENTIONAL METHODOLOGY OF CONSTRUCTION:

2.1 Scarcity of water

The scarcity of water is the most important problem we are facing currently. The condition such as no rain or untimely rain causes the shortage of water as the storage of water is not sufficient. The careless use of water causes unnecessary wastage of water. The shortage of water is a major problem currently in India.

2.2 Shortage of electricity

The shortage of electricity is also an issue that exists for so many years. Most of the electricity is generated from hydro-power generation plants and from thermal power plants which use fossil fuels. The distribution losses and wastage of electricity is also another major factor in the shortage of electricity.

2.3 Lack of proper storm water conveyance

Storm water is the free flowing water which is obtained from the rainfall which does not infiltrate into the ground. The lack of proper storm water conveyance is also a long standing issue which leads to stagnation of water during rainy season around the premises and create health and infrastructure issues. If the runoff is more than the capacity of

conveyance of storm water system provided then the flooding and logging of water will take place causing various issues.

2.4 Effect of radiation on buildings

The effect of radiation due to sun on the surfaces of buildings causes to increase the temperature inside the building which compels to make use of fans, air coolers, A.Cs., etc. by the occupants of the building and thus energy consumption rises to multiple folds. This could be avoided by adopting some eco-friendly measures such as covering of external surface by heat repellant eco-friendly surface treatments, including use of micro climbers, etc.

3. PROPOSED METHODOLOGY OF SOLVING IDENTIFIED PROBLEM:

3.1 Use of pervious concrete for internal roads

Pervious concrete is a form of lightweight porous concrete. The pervious concrete [Figure 1] can be used for the construction of internal road of the building which provides support to the storm water system during rainfall to avoid flooding of water which leads to damages to the structural components of the building.

3.1.1 Layers of the pervious concrete

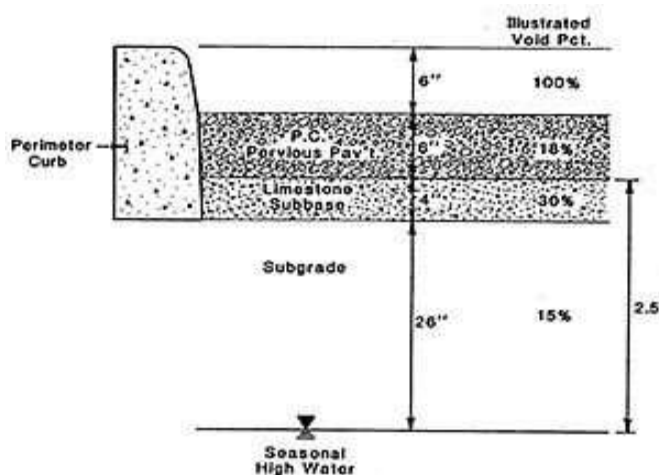


Fig. 1: Schematic diagram of pervious concrete

3.1.2 Benefits of pervious concrete

- Helps in reduction of storm water runoff.
- Increases the groundwater table.
- Prevents partial entry of water into streams and does not allow it to get polluted.

- Installation cost of pervious concrete is less, as compared to traditional solid concrete.

3.2 Use of rainwater harvesting system

The rainwater harvesting [Figure 2] is the simple procedure of collecting and storing of rainwater for domestic use. The purpose of making a provision of rainwater harvesting is that, it allows capturing the runoff from the rainwater which is generally not collected and acts as obstruction in the optimum use of pure and natural rainfall water available for utilisation.

3.2.1 Components of rain water harvesting

- Roof Catchment
- Gutters
- Drain Pipes
- Filter Unit
- Storage Tank



Fig. 2: Rainwater Harvesting System

3.3 Roof cooling techniques

3.3.1 Types of roof cooling techniques

a) Heat Reflective Paint

Heat reflective paint helps to reduce the roof temperature. This is generally of a light shade and can reflect about 80 % of solar radiation which results in cooler buildings and also minimises the use of air conditioners leading to lower carbon emissions. The temperature inside the building may be brought down to 20° C by using heat reflective paint.

b) Rooftop gardens

The rooftop garden [Figure 3] helps in keeping the buildings cooler as compared to traditional roofs. The traditional roofs release the heat back into the atmosphere leading to increase in the temperature of surrounding environment. This is called the urban island effect. The installation of the green rooftop garden helps in saving energy. The installation of rooftop garden as a part of the original plan of the building considering the climatic characteristics, and the capacity of cooling and heating requirements will prove to be very effective and efficient.



Fig. 3: Rooftop garden

c) Roof ponds

The roof pond [Figure 4] is a shallow pond constructed on the roof of the building. The roof pond shall be kept closed during the day to avoid heating and kept open during the night for effective cooling. The pond absorbs the heat of the building and the solar radiation. This technique can only be practiced where water is cheap and available abundantly.

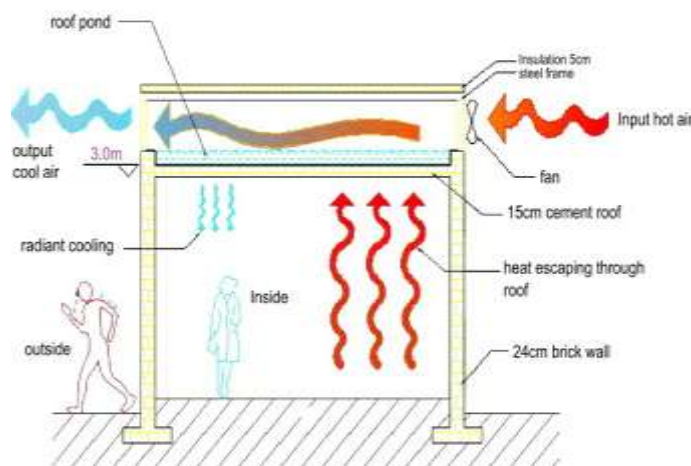


Fig. 4: Working of a Roof pond

3.4 Electric motion sensors

The electric motion sensors may be used to detect the motion of moving objects, particularly people. These sensors help to reduce the energy consumption in the building as the lights turn on and off; if they detect any motion near the sensor.

3.4.1 Benefits of electric motion sensors

- Reduces the electrical energy demand
- No need to touch to turn on which makes them elder and child friendly.
- Reduce the chances of accident or injury.

3.5 Solar panels

The solar panel may be used to convert the sunlight into electricity and to be stored in storage batteries; which may be used when there is load shedding or shortage of electricity. The construction of buildings with sustainable energy systems necessarily plays an important role. Energy saving is also a high-priority worldwide. This captive electricity afterwards may be used for the use of necessary electrical appliances, water heating equipments, etc. The use of solar panels helps in reducing the use of electricity generated from non renewable resources such as fossil fuels and hydropower.

3.6 Biogas plant

The main problem is the continuously increasing production of municipal and organic waste. This will also prove to be an effective treatment of organic waste generated daily. The installation of biogas plant in the vicinity of the building will help to reduce the use of electricity produced by non renewable resources such as fossil fuels and hydroelectricity. The biogas is a renewable source of energy.

3.6.1 Applications of Biogas

- Use as a combustible fuel
- Generation of electricity
- Heating of water

3.7 Green Concrete

Green concrete is prepared from concrete wastes which makes it an eco-friendly as no new natural resources are consumed in the manufacturing

process. Recycling of waste and industrial by products gaining popularity to make concrete environment friendly material and the concrete can be called as Green Concrete. (Baikerikar A. 2014) This concrete needs some extra steps during the preparing the mix design and its placing as compared to conventional concrete. It helps in getting a sustainable structure having a long life span. This concrete has greater durability and strength. The emissions of CO₂ from green concrete are less as compared to conventional concrete.

3.7.1 Advantages of Green Concrete

- Longer life span
- Good thermal and fire resistance properties.
- High rate of workability than conventional concrete

4. CONCLUSIONS

The inclusion of various materials, techniques, and technologies, such as pervious concrete, rainwater harvesting, roof cooling, electric motion sensors, solar panels, biogas plant and green concrete, etc. will lead to bring the concept of ideal building into reality and will also reduce energy consumption to make building more efficient. Also, the recurring cost on power consumption and ancillary operations will get reduced considerably. This will also reduce the harmful emissions from the building, which is more important from environmental perspective.

From the above study, it can be concluded that the concept of ideal building will prove very effective in present construction practices and will also help to reduce deterioration or damage to environment by adopting eco-friendly practices.

FUTURE SCOPE OF STUDY

At present there is limited use of new materials, techniques and technologies of ideal building in India, due to various factors such as economic constraints, non-availability of eco-friendly materials, techniques, highly skilled manpower, etc.

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