

Green Building

Hrithik Chavhan¹, Shriya Jawalkar², Prajwal Lokhande³

BE 2nd Year, Department of Civil Engineering, JDIET, Yavatmal, Maharashtra, India^{1 2 3}

hrithik123chavhan@gmail.com¹, hrithik007gate@gmail.com², prajwallokhande2@gmail.com³

Abstract— Green building refers to both the structure and the process that are environmentally accountable and amenity efficient throughout the lifestyle of a building. The green building can be named as economical building which deals with the ecological issues within or outside the building premises. The study consummates 40% to 50% energy saving is possible in green building. Refurbishing conventional building into a green building can increase sustainability, in order to reduce negative environmental impact, it is need of an hour to use more sustainable materials which are ecofriendly and can lead a better tomorrow. This paper provides an overview of the methods which can be undertaken very easily on the household level by conserving the rainwater. It also gives information about the techniques that can be applied for the conversion of solar energy into an electrical energy on household basis.

Keywords: - Green building, rainwater harvesting, solar energy, photovoltaic cells.

I INTRODUCTION

Urbanization is growing on a faster pace throughout the world resulting into environmental problems of serious nature. To address a portion of the ecological issues, presentation of green building idea in major urban area is a stage towards environmental protection.

Conventional buildings contributes one third of total greenhouse gas emissions the building sector contributes 30% of global annual greenhouse gas emission and consume only 40% of energy. Carbon dioxide emissions are 47% of total global emissions in the world. 1.4 metric ton carbon emission rating has been contributed by India.

Energy consumption is the main reason for greenhouse gas emission from buildings, if necessary steps are not taken to reduce the consumption then there is a possibility that the emission will get double in the coming decades. So here is the flowchart showing the root cause of environmental pollution due to conventional buildings.

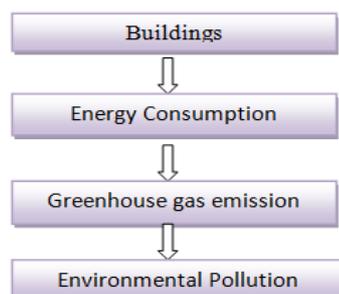


Figure 1 Root cause of pollution

In order to overcome this problem related to conventional buildings we will adopt convenient eco-friendly resource in an efficient way i.e. by shifting towards green building.

II WHAT IS GREEN BUILDING?

The building which reduces impacts on human health and environment and the one which increases efficiency of resources in the form of energy, water and material and which governs waste reduction has less compaction in energy and cost. The green building is one which shifts from harm to harmless technologies and materials.

There are 27 definitions to define the green building, but in the short terms to define green building as, “the building which makes the use of renewable resources preserves biodiversity and integrity of the environment which enhance and foster a comfortable and fulfilling lifestyle for the human habitants and also enhancing the well being of human population with the maintenance of technological and economical development.

The building which utilizes environment friendly construction practices by which we can save energy , water and raw material, by which we can make minimum use of water as far as possible. Reducing greenhouse gas emissions and shifting to the 3R rule (Recycle, Reuse and Remake) in order to create healthy environment in the houses.

III OBJECTIVES

A green building should be design so as to have maximum environmental benefits and economical benefits. This building can minimize harmful impact on environment rather than conventional buildings. By making the use of green materials and sustainable technologies, economy is achieved. So here are some principles which can conserve our environment and help us to achieve economy.

A. Design Efficiency

The structure design of building varies from one building to another, is never repeating itself and is not a streamline process as that like of industrial process. Building are complex products consists of multitude of materials having various design variables aided at a design stage itself and the variations of this design can affect the environment through the buildings relevant lifecycle stages. The objective is to minimize the environmental impacts which are associated with the lifecycle

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stages of the building.

B. Energy Efficiency

The principle of energy efficiency is to make maximum use of passive energy and reduce the use of active energy. The orientation of a building also plays a major role in the utilization of energy in such a way that the building should have an adequate ventilation to have maximum natural light and air. It should have a proper position of door and window in a structure. It should have thermal insulating wall, ceiling and floor to have maximum energy efficiency.

C. Water Efficiency

As we very well know that the demand for water consumption is increasing than its ability to replenish itself. By using water harvesting and natural refineries such technique can conserve and restore water. The green building has its two objectives for water efficiency i.e. to reduce water consumption and water quality. This conservation and protect can be achieved by designing dual plumbing in buildings that recycles water in water closet flushing. By making use of ultra low flush toilets and low flow shower head, we can minimize waste water. Sewer traffic can be reduced by eliminating the use of toilet paper and making the use of bidets and thus increasing water on site. Demand for the local aquifer will be minimize by making the use of no sewage and grey water on site like as in site irrigation.

D. Materials Efficiency

Materials are composed of renewable resources rather than making use of nonrenewable resources. Buildings should have properly design or mechanically powered ventilation system so as to have filtered and cleaner air from outdoor for the occupants. The industrial waste and agricultural waste generated can be recycled so as to reduce its increasing impact on the environment. By shifting towards renewable sources of energy such as solar panels which not only provides light but is also a valuable energy source.

E. Indoor Air Quality

Indoor air quality can be achieved by reducing the volatile organic compounds and providing adequate ventilation by proper selection of construction material. Constructing green building emphases more on the designing of ventilation system so that the people get the filtered, clean air and proper lighting most of the time. Indoor lighting also helps in controlling the dampness which is one of the cause of bacteria and generation of deadly diseases. So good ventilation system enhances the air quality of the building and also protects the people from the diseases.

F. Waste Reduction

The main objective of green architecture is to reduce waste of energy, water and material. As we know

that maximum waste are generated by commercial buildings. The disposal of waste to the landfills is one of the ways for the reduction of the waste but is not only the solution. By adopting well designed buildings the amount of waste can be reduce by the onsite solutions such as compost bins, etc.

The waste water which is generated from dishwashing, washing machines which are the sources of greywater can be treated and used for subsurface irrigation and no portable purpose, such as toilet and wash car. We refuse to make use of centralized waste water treatment system due to its cost and more energy consumption and an alternative to this is to convert waste and waste water into fertilizer which lowers the cost.



IV RAIN WATER HARVESTING

Rainwater is the only source of fresh water. Rainwater flowing through streets joins various mains and sub main streams and then flows through river. River joining the sea water and then joins to the ocean makes the fresh water as salty water. The various treatment units which are adopted (i.e. to create fresh water from salty water) are under increased load because of increase in pollution and water drainage. Rainwater harvesting is to make use of store water which we have previously collected from rainwater. It is key measure or a solution to drought conditions of desert area facing low rainfall conditions. Rainwater harvesting system has basically two types;

- A] Surface runoff rainwater harvesting system.
- B] Rooftop rainwater harvesting system.

A] SURFACE RUNOFF RAINWATER HARVESTING:

Artificial recharge methods of rainwater harvesting are to be utilized. Since the rooftop and paved surface rainwater harvesting is not enough for the whole year. There is no direction gain, but this is the best method by which the water is available in the ground for a long period, so it is an indirect

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method of rainwater harvesting as water has to get accumulated under a small constructed area like pits, wells, trenches, shafts which are unfiltered due to the presence of soil with them.

This method is also known as recharging ground water aquifer. Few of the methods of surface runoff rainwater harvesting are listed below;

- 1] Recharging of bore holes.
- 2] Recharging through wells.
- 3] Pits
- 4] Trenches
- 5] Shafts
- 6] Recharging making percolation tanks.

➤ **RECHARGING THROUGH WELLS:**

The location of well is decided on the basis that maximum rainwater will accumulate in that area. Among abandon number of wells, some of them are chosen for recharging and their purpose of construction is to recharge the drainage (storm) water i.e. connecting pipe to the wells. It is necessary to have clean water recharge in the well, so for this purpose filter media is constructed near the well which allows only filtered water into the well, so that sediment will not settle into the well. In the similar manner methods for pit, trenches can be carried out.

Recharging rate affecting the surface runoff is as follows;

- 1) **Permeability of soil** - If soil is permeable then it allows maximum water to recharge i.e. capacity of soil to allow water inside it.
- 2) **Maximum catchment area** – The place which allows maximum rainwater to get collected.
- 3) **Groundwater table** – It should be low so that it allows maximum water to get recharge instead of rising upward in water table condition.

B] ROOFTOP RAIN WATER HARVESTING:

This is one of the methods that help in augmenting the ground level. The method in which the rainwater is collected on the rooftop where the roof become the catchment and then that stored water can be diverted to artificial recharge system or tank.

As per the water requirement, rainfall and catchment area of that particular building, the storage tank has to be design. The water collected on the roof of the building is diverted into the storage tank. We are adopting this method just not to use this stored water in the rainy season, but also to save the energy incurred on transportation and distribution of water. Indirectly the groundwater is also conserved if it is being extracted to meet the demand in rainy. The storage tank should be arranged in such a way that it should have excess water overflow system and the drain pipes which are connected to storage tank should have

mesh filtered at mouth and first flush device followed by filtration system. It is one of the cost effective way of rainwater harvesting in which the stored water can be used for secondary purposes such as gardening and washing.

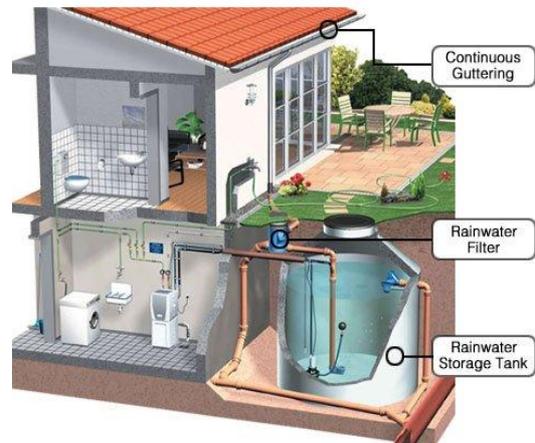


Figure 2 Rooftop rain water harvesting

V SOLAR ENERGY IN GREEN BUILDING

As we know that fossil fuels are on the way of extinction in future, thus creating problems for energy resources. So in order to prevent their extinction and making them available for the future we will shift towards renewable energy sources. The renewable energy sources include wind, biomass and solar which are tremendously available.

We get radiant light and heat from the sun in the form of solar energy, this solar energy can be converted into electrical energy due to development in technology to make us available for daily purpose. Some of the solar technologies are;

- 1] Solar heating.
- 2] Solar photovoltaic
- 3] Solar architecture
- 4] Solar thermal electricity

Depending on the way to capture, convert and distribute solar energy can be classified into active solar energy and passive solar energy.

The use of photovoltaic panel and thermal collectors to harness the energy comes under active solar energy. While the passive solar energy is the technique in which energy is harness passively. For example, by adjusting the orientation of building the natural sunlight and heat is captured.

A] PHOTOVOLTAIC PANELS:

Our environmental challenges have been combat by the use of important fool i.e. a key diver having the ability to produce green energy from sun power i.e. the solar panels. The environment behavior of building is improved by in cooperating voltaic technology in the architectural designs of building without influencing the comfort aesthetics or cost of the building.

Photovoltaic panels use ranges from substituting various building elements and materials such as glass wall and glass window. From the recent past year, a huge development is

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observed in solar photovoltaic panels and so today they are ideal solution that can be mounted into any type of building ranging from traditional to contemporary modern designing.

WORKING THEORY :

The transformation of incoming sunlight into electricity rather than heat is called as photovoltaic cells, which are made from silicon. Solar panels are also called as modulus which contains photovoltaic cells. In solar photovoltaic cells consist of a thin slice of a glass, under this glass positive or negative silicon film is placed.

The photons of the sunlight falling on the cells separate the electrons from the silicon. These negatively charged electrons are attracted to one side of the silicon cell, because of which electric voltage is created that can be collected and channeled. Solar photovoltaic array is formed by gathering this current in the form of series by wiring the individual solar panels. The multiple strings of the array cables are terminated in an electrical box called as fused array combiner. Content within the combiner box are fuses. Designed to protect the individual module cable as well as the connections, which deliver power to the inverter. But the electricity produced is in the form of DC which has to be converted into AC for our regular home appliances use.

B] THE ROOF SYSTEM:

By using the photons of light from the sun panels excite electrons in silicon cells thus converting sun ray into electricity. The south facing installation of solar panels will provide the optimum potential for our system, rather than the other orientation. The panel should receive sunlight during the prime sunlight hours from 9 am to 3 pm, so that it will provide sufficient production and make sure that panels doesn't come under the shade. If one cell out of the 36 cells is under shade then it can reduce the power production may more than half. There are some devices such as solar pathfinder which carefully identifies the area under shade before the installation of panels.



Figure 3 Solar electricity can be generated directly using photovoltaic (PV) panels .

Every time the perfect orientation cannot be provided to the panel due to some reasons. There are some of the systems designs which track the sun's journey across the sky. So we can take advantage of such system to gain maximum solar energy. In case of nontracking photovoltaic systems they should be inclining in such a way so that its angle of inclination should be equal to sides' latitude, so that all year round we will have maximum energy.

VI CONCLUSION

Sustainable building will ultimately serve to improve not only the energy performance of building but will also assist the country to conserve energy and natural resources by increased recovery and recycling the materials. Green building movement is to stay for the benefits for the individuals, society and the country at large.

Rainwater harvesting achieves one key of green building goal by reducing the water requirement and recharging groundwater. Application of solar photovoltaic system is the one time investment which provides its benefit at very low maintenance cost without using artificial resource. Reuse and recycle of grey water is advisable.

The goal of green building is to use resources more efficiently and reduce negative impact of building while construction and during lifecycle. The major intent of the learning is to generate the earth more sustainable and there is a need for conserving natural resources and adopting green buildings.

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