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Green Building: "A Global Approach for Sustainable Development"

Rakhi M. Shelke*, Nitesh B. Thikare* and Kamlesh V. Madurwar**
**Assistant Professor, Department of Civil Engineering, PCE, Nagpur, (MS), INDIA*
***Assistant Professor, Department of Civil Engineering, PBCOE, Nagpur, (MS), INDIA*

(Corresponding author: Rakhi M. Shelke)
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ABSTRACT: Technology is made for good and easy life for human being. Everyone is talking about new technology of different sector. Information technology, third and fourth generation data transfer and communication, power sector, real estate and infrastructure development are basic technological sector of today's generation. Here we are mainly discussing about environmental sector. Availability of natural resources is major concern of whole world. Energy demand of whole world including India is increasing day by day. For meeting that energy demands every country is expanding their power plant capacity and optimizing the various options to increase the energy generation capacities. The growth of energy sector is higher than population growth in country like India and China, which can be emphasize from the increasing trend of per capita energy conservation. We know that energy generation from the fossil fuel is directly affected to the environment and increasing trend of energy generation from fossil fuels also challenge the environmental impact for the generation to come. The best option to meet the energy demand and supply requirement is to "GO GREEN". Here it's a small concept presented in this paper to save environment and energy conversation "GREEN BUILDING CONCEPT". This concept will be a major step for the building sector for eco-friendly design on energy and environmental concern.

Keywords: Green construction, Sustainable development, Natural Resources, & Energy consumption.

I. INTRODUCTION

Global warming and climate changes have become a major concern for mankind today. Inorder to ensure that, development and environment conservation go hand in hand, majorcorporations around the world are empowering projects to slow down depletion of naturalresources.We spend 90% of our lives in buildings that protect us from the extremes of the nature like heat, cold, rain, wind, snow etc. However, our buildings use enormous amount of energy, water, andmaterial throughout their life cycle. They also create a large amount of waste and have a profoundeffect on ecosystem.The economic, health and environmental impact of our homes is apparent in our society. Tomeet the challenges of our built environment, a new way of designing & construction has evolved.It's a Green Building, this system follows design and construction practices that significantly reduce or eliminate the negative impact of the building on the environment and the occupants.Before emphasizing more on this topic we would like to define word "SUSTAINIBILITY". "Meeting the need of people today without destroying the resources that will be needed by person in future, based on the long range planning and recognition of the finite nature of natural resources "In this paper we discuss about some of the important Green building aspects like Light or visibility Analysis, Evaporative Cooling System, Land Scape, Waste Water Treatment, Rain water Harvesting and Green roofs.

II. WHAT IS GREEN BUILDING?

Green building is the practice of promoting optimum utilization of resources like water , energy & material by the way of which , reducing building impacts on human health and the environment during the building's lifecycle, through better design, construction, operation, and maintenance which includes:

- Efficient use of energy, water, and other resources.
- Protecting occupant health and employee productivity.
- Reducing waste, pollution and environmental degradation.

Modern construction causes unwanted environmental impacts and limiting these impacts is within the scope of green building. Perhaps the easiest way to understand green building is to first consider the various environmental impacts that buildings generate and then consider how negative impacts can be reduced or eliminated through more effective planning, design and construction.

Modern Buildings impact the environment in the following areas:

- Site Selection.
- Materials and Resources.
- Energy Use and Air Pollution.
- Indoor Air Quality.
- Water Use and Quality

A. What is a Green Material?

A green material is one that simultaneously does the most with the least, fits most harmoniously within ecosystem processes, helps eliminate the use of other materials and energy, and contributes to the attainment of a service-based economy.

Understanding what a green material is depends on understanding relationships—in nature, in the economy, between nature and the economy. It is a very complex matter and always changing. What is considered a green material is also constantly changing. It is certainly important to look closely at every individual product and material, but it is often more efficient to look first at the building system. This is particularly clear when we see systems now being designed to allow buildings to be easily dismantled rather than demolished. The context in which a material is used is crucial. A conventional petrochemical-based building material might be used in buildings and developments that are quite ecological in overall impact. Similarly, a "green" material might be deployed or installed in destructive ways that completely negate their positive characteristics. By being salvaged and reused, a very conventional material might become a green material. It's a question of relationships that are multi-dimensional and constantly shifting.

Following are the Different Green Materials that are Commonly Used in Green Buildings for Different Purposes

1) FOR ROOFING:-
- Steel
- Slate/stone
- Living or green roof
- White roof
- Composites

2) FOR EXTERIOR SIDING:-
- Wood
- Fibre cement
- Natural cement
- Composites

3) FOR INTERIOR FINISHES:-
- Natural clay plaster
- Low/no-VOC (volatile organic compound) paints, stains, and coatings
- Natural fiber flooring
- Bamboo flooring
- Reclaimed wood
- Paperless drywall
- Clay brick
- Earth
- Non-fired bricks
- Recycled / re-used bricks
- Mud brick
- Hollow clay bricks
- Recycled cork
- Natural stone
- Natural linoleum
- Recycled tile
- Recycled or wool carpeting
- Paper stone and Richlite manufacture countertops
- Terrazzo countertops
- Natural linoleum countertops

4) FOR INSULATION:-
- Fibreglass
- Cellulose
- Natural fibre (cotton, wool)
- Cotton
- Mineral wool
- Structural insulated panels (SIPS)
- Insulated concrete forms (ICF)
- Straw
- Cob

B. Building Simulation Analysis

Building simulation solutions allow you to address the thermodynamic complexities involvedin construction of a building and undertake integrated performance appraisals of various options at a reasonable cost. For the first time, the construction industry has the computer aided tools to make assessments that are very close to the physically validated results. Simulation provides a way to assess the benefits of particular schemes, improve life cycle performance, enhance design quality, appraise climate change mitigation measures, undertake scenario based energy planning, link energy and health and enable inter-organization partnerships. The biggest advantage for simulation at the design stage is to integrate the different technical domains and identify the trade-offs to arrive at an optimum solution.

Building simulation analysis follows a systematic approach to ensure the most accurate output.

It includes a detailed study of the following factors:
- Energy Analysis
- Fenestration Analysis
- Solar Insolation Analysis
- Daylight Analysis
- Location Analysis
- Light Pollution Analysis
- Reflection And Glare Analysis
- Shadow Analysis
- Visibility Analysis
- Acoustic Analysis

Here we will discuss about some of the important parameters that we are studying in our final year project on green building and will implement in a model that we will prepare for our civil department of our college.

C. Fenestration: Light and ventilation

Good design for building requires sufficient daylight for tasks performedwithin a space. This is achieved by providing enough means to let in diffused light from the sky, butkeep out direct light from the sun to prevent heat gain and glare.

Daylight analysis is the process bywhich the amount of diffused sunlight that enters into the interior of a building is estimated. Thisanalysis does not take into account the direct sunlight entering into the building, but it uses theluminance of the standard overcast sky from weather files as the measure of the exterior diffusedsunlight. It helps us assess the impact of the exterior surfaces on the entry of this light into theinterior floor space of the building.

In our design of our Civil Building we kept in mind of the following points:

- Building Layout ensures that 90% of the building spaces ensures day light.
- Low Heat transmitting glass used.
- Double Glass to further reduce heat gain.
- Natural lighting: No light will be used until late evening.
- Light captured from as many sides possible.
- Natural Light used in dark corner by use of full length slits for maximum light.
- All work station and class rooms will have ample light facility.
- Light may be filtered in offices and faculty member rooms by using shutter curtain.
- Fully glazed window will be used in Class rooms, Labs to pass enough light.
- Jail walls will be provided to allow controlled passage of air and light in the interior space. This also throw pattern of light in the interior space enhancing the aesthetic view.
- Where natural light will be unavailable like washrooms there sensor light will be used to save power.

This benefits us in the following ways:

- Provides 30-50% saving in lighting and heating services.
- Benefit continues throughout the life of the structure.
- No major maintenance work is required.

D. Green Roofs

Green roofs are lightweight, engineered roofing systems that protect the integrity of the roof and provide many benefits for stormwater management and energy efficiency. The "Stormwater ManagementSystems" section describes green roofs and the benefits for stormwater management.

Benefits of Green Roofs

- Reduced heating due to fewer fluctuations in roof temperature and insulating properties of vegetation
- Reduced cooling costs due to fewer fluctuations in roof temperature and heat loss due to evaporation in the summer
- Increased property value.
- Extension of the life of the roof membrane because of protection from intense ultraviolet radiation and continued expansion and contraction due to fluctuating temperatures
- Noise insulation

Fig. 1.

E. Mechanics of Courtyard

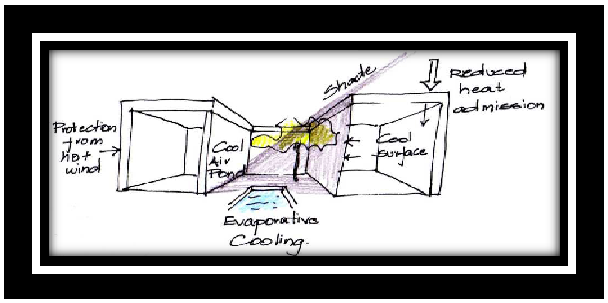

Fig. 2. Evaporative Cooling System.

An evaporating cooling pond is designed at the courtyard in which water will be there and there will be evaporation by use of the sunlight and which will cool the surrounding atmosphere. Especially in climate of Nagpur where humidity is very less and there is extreme temperature during the summer season this is a best process of keeping the surrounding cool.

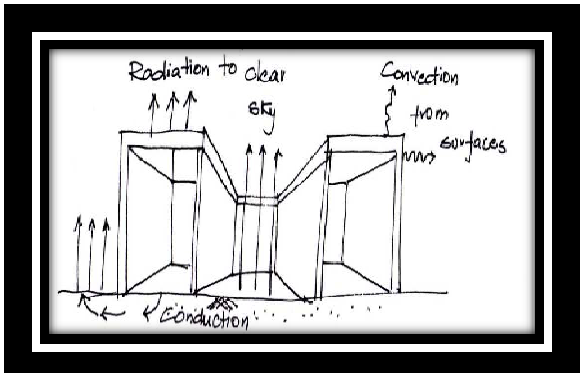

Fig. 3. Night Activities of the courtyard.

Courtyard functions as a convective thermostat and gives protection from extreme of whether. It acts as the energy center and also the communication center.

F. Waste water Treatment System and Rain Water Harvesting

Screening- Screening is the very first method involved in the treatment of grey water. It helps to remove large debris such as sticks, leaves, rubbish and other large particles which may interfere with subsequent treatment steps.

Equalization- After screening, grey water is equalized by mixing it thoroughly in the tank so that foul smell, odor, etc can be minimized and the water get mixed properly so that the strength of water is same everywhere.

Settling- When grey water get equalized, it is allowed to settle for 4-6 hours. The solids and heavy particles get settle down at the bottom of tank by gravity and light particles floats on water.

Filtration- In this unit, grey water passes through different media of filter i.e. aggregate, sand, coal and charcoal. Sand and gravel are usually used for filter bed but charcoal and coal have also properties to purify water. There are several kinds of depth filter, some employing fibrous material and others employing granular materials. Sand bed filters are an example of a granular loose media depth filter. They are usually used to separate small amounts (<10 parts per million or <10 g per cubic meters) of fine solids (<100 micrometers) from aqueous solutions. Water passes quickly through the sand and small particles are removed. The internal pore characteristics are very important properties of aggregates. Absorption relates to the particles ability to take in liquid and purify. Ill-smelling chlorine and other unpleasant odors is eliminated by the absorption power of the charcoal. Also microorganisms living in the many pores of the charcoal break down unhealthy organic matters. Coal is an adsorbent used to take tiny sediment out of water making it cleaner. In addition, they are usually used to purify the fluid rather than capture the solids as a valuable material. Therefore they find most of their uses in liquid effluent (wastewater) treatment. Sand filters are shallow layers of stone, medium gravel, and pea gravel beneath a deep layer of sand. A slow sand filter will have grey-water load of 0.1to0.2 m3/m2/hr. These gravity filters may be constructed in a 200 liter drum or similar container that is of suitable size. The bottom of the filter should be filled with stones that are too large to enter the drain pipe. Sand filters require regular cleaning and replacement of the top layer of media. Multi-media filters require less frequent cleaning, but all layers must be cleaned or replaced when maintenance is required.

Rainwater harvesting: is the accumulation and deposition of rainwater for reuse before it reaches the aquifer. Uses include water for garden, water for livestock, water for irrigation, and indoor heating for houses etc..

In many places the water collected is just redirected to a deep pit with percolation. The harvested water can be used as drinking water as well as for storage and other purpose like irrigation.

Rainwater harvesting provides an independent water supply during regional water restrictions and in developed countries is often used to supplement the main supply. It provides water when there is a drought, prevents flooding of low-lying areas, replenishes the ground water level, and enables dug wells and bore wells to yield in a sustained manner. It also helps in the availability of clean water by reducing the salinity and the presence of iron salts.

• Makes use of a natural resource and reduces flooding, storm water, erosion, and contamination of surface water with pesticides, sediment, metals, and fertilizers.

• Excellent source of water for landscape irrigation, with no chemicals such as fluoride and chlorine, and any dissolved salts and minerals from the soil.

• Home systems can be relatively simple to install and operate and it may reduce your water bill.

• Promotes both water and energy conservation

III. GREEN CONSTRUCTION IN INDIA

India is in the infant stage in the making of Green Buildings. Whatever buildings are registered major share is of private sector, while the public sector share is negligible. Mainly offices, corporate offices, institutions and parks are green buildings in India. No indication of private small level planning e.g. private houses, small offices etc.

Keeping in mind the above constraints, the researcher is hopeful that present study would be a stepping stone in this direction

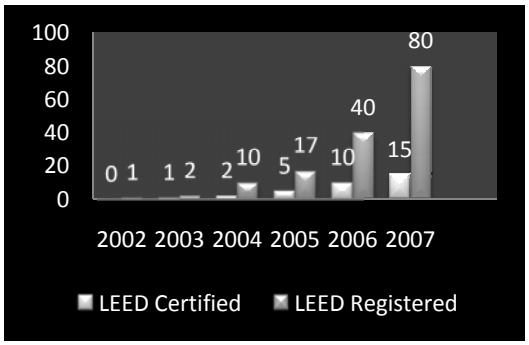

Fig. 4.

IV. CONCLUSION

In an environmentally stressed world, green buildings are moving from an exotic curiosity to a necessity. Buildings are perhaps the single greatest stress on the environment, accounting for the world's fresh water withdrawals, one-quarter of its wood harvest, and two fifths of its material and energy flows.

In such a scenario of shortages of clean water and other materials, and the possibility of devastating climate change, the greening of buildings constitutes a collective vital. In India some world class Green Buildings have constructed in past few years, but still the concept of green buildings for general masses is in infancy stage. Present work is an attempt in the direction to make people, communities and general public aware about the advantages of green buildings for sustainable environmental development and management. For that four sustainability steps offer a way to achieve successful energy efficiency.

(i) Measure energy use to identify potential savings and malfunctions

(ii) Install low consumption equipment and systems

(iii) Improve long term use by deploying automation management, consulting, training and tracking resources while maintaining high performance.

(iv) Continuously analyse energy savings through maintenance, supervision and monitoring Given the political difficulties of obtaining energy, and likely future shortages of conventional energy sources, we cannot ignore the enormous conservation that green buildings make possible. And buildings with natural materials and lighting also create a happier, healthier, more productive atmosphere. Yet evaluating, what makes a building green? Is a critical task. Green buildings may be considered as a checklist of environmentally friendly elements, and such checklists are needed to authenticate that a given building is as environmentally friendly as it claims.

Then the barrier between natural and artificial will break, as buildings move towards a harmony with natural processes. And, instead of being a great drain on energy and a destructor of ecosystems, buildings are evolving toward being part of a healthy, managed environment. A strong awareness of the advantages of green buildings, a conscious effort to change, will speed this process along. In the future years and decades the green building techniques will become commonplace for political, environmental, and economic reasons.

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