

# Green Buildings- A Case Study of Green Buildings, Dehra Dun

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**Abstract:** --- Technology has increased tremendously in the past decades but on the negative side problems like global warming, ozone layer depletion, pollution, deforestation and climate change are ultimately causing a massive destruction and is leading the world towards a catastrophe. Our aim should now be to safeguard our environment which has been gravely affected. The only solution for this problem is the concept to green technology which is applicable to buildings, cars, fuel etc. Development of infrastructure leads to about 30% pollution thus in order to counteract green buildings are the only solution. Green buildings is the practice of building structures using processes which help in expanding and increasing efficiency in terms of energy, water and materials and also these structures do not have any harmful impact on human wellbeing and the surrounding environment. Also there is a need to reduce the carbon footprints which is the amount of greenhouse gas emissions caused by a product. In this paper an attempt has been made to discuss about the concept of green buildings after visiting of one of the most prestigious green buildings constructed in India which is Oil and natural Gas Corporation (ONGC) Green Building which has been 735 certified emissions including Indian Green Building Council (IGBC), Green Rating For Integrated Habitat Assessment (GRIHA) certifications and is also given Leadership In Energy And Environmental Design (LEED) platinum certification. Thereby giving insights on how energy conservation can be done at various levels and under different geographic locations.

**Keywords:-** global warming, ozone layer depletion, carbon footprints, IGBC, GRIHA, LEED, greenhouse gas, energy, pollution

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## I. INTRODUCTION

Green buildings is the process of construction of buildings through employing principles which help in improving and enhancing efficiency in terms of energy, water and materials. These kind of buildings do not have any hazardous effect on the nature, atmosphere and human health. Green buildings are having more advantages than normal buildings. They help in enhancing air and water conditions and protect biodiversity. On the economic side they have low operating cost and occupants' productivity is also increased. Socially they intensify the aesthetic qualities and reduce the burden on local infrastructure. First of all for construction of a green building a site is chosen which has to be retained again in terms of the soil which is accomplished by planting trees having less amount of water and pesticide requirement. The building is designed in such a way that the sunlight and natural light is received should be maximum for illumination of the building. In addition to this, the building has installations which comprises of high technology lightening control systems. The heating and cooling systems are proficient in terms of energy. Materials used in the interior and the exterior are those which can be reused and reprocessed. To improve water efficiency techniques like rain water harvesting, sewage treatment etc. are also been installed. Also low flush toilets, showers are used and micro irrigation is used to provide water in the

grassland areas.

## II. OBJECTIVE

The aim of this study is to generate awareness about green buildings and encourage the building firms to utilize green technology to its maximum potential. It is important that we should wake up and address the issues posing a threat to the world. Our purpose is to imbibe more and more knowledge about green technology so that, it can be applied in structures and new innovations keep happening.

## III. METHDOLOGY

The study conducted in this paper deals with the visit to one of the most impressive green building been constructed in India which is "Oil and natural Gas Green Building" in Dehra Dun also known as the 'Green Hills' and to analyze the processes and techniques employed in it through which it is able to achieve successfully the maximum amount of reduced emissions. The building has an area of 14600 square meters and has five floors in it. The building has a space for 620 people. Registered with United Nations Framework Convention on Climate Change (UNFCCC) under Clean Development Mechanism it generates 735 Certified Emission Reduction(CERs) every year. The total cost of the building amounts is around 130 crores with reimbursement phase of seven and a half years.



**Fig 1. Green Building ONGC, Dehra Dun**



**Fig 2. ONGC Green Roof**

#### **IV. TECHNIQUES INVOLVED TO REDUCE EMISSIONS IN THE ONGC GREEN BUILDING DEHRA DUN**

Many methods and techniques have been utilized to make the Green Hills one of the most magnificent piece of construction in civil engineering. Some of them are-

##### ***Landscaped green roof or the living roof***

A green roof or living roof is a roof of the building that is partially or completely covered with vegetation and plants, planted over a waterproofing membrane. Green roof helps in reducing heat. They are also able to diminish cooling loads on a building up to fifty to ninety percent. They cut down storm water runoff. Landscaped green roofs also lead to natural habitat generation. Some disadvantages are there, the cost of installing a green roof is double than that of a green roof. The extra mass of the retained water and soil substrate causes a large strain and stress on the structural design of a building. Some green roofs have high demanding structural standards especially in seismic activity regions of the world. In the ONGC Green Building, Dehra Dun the first layer is of reinforced concrete. The second layer is the waterproofing layer and then the soil is placed upon it. Many small blocks have been constructed to reduce soil erosion. Next step was to plant the grass. Then the grass was to be maintained throughout the year. Based on this orientation and the sun's direction the type and the density of grass was selected. The green roof acts as a type of insulation for the whole building and helps in reducing the heat.

##### ***Bamboo plantations***

Bamboo plantations are essential as they bring ruined land back into production and diminish soil erosion. It is eco-friendly and helps in conserving water. Plantations of bamboo increase the chemical and physical composition of soil. Its helps in increasing the land productivity per unit area by reducing the stress on land due to huge population density. Bamboo trees also form more oxygen in comparison with many trees.

##### ***Sewage treatment plant***

Sewage treatment is the process of removing contaminants from wastewater, primarily from household sewage. Sewage treatment normally involves three steps –

***Primary treatment:*** It involves holding the sewage where heavy solid and particulate matter settles to the bottom whereas oil, grease and lighter solids float on the surface. The residual liquid is subjected to secondary treatment.

***Secondary treatment:*** removes suspended and dissolved biological matter. Secondary treatment is performed by micro-organisms in a special habitat.

***Tertiary treatment:*** Treated water is disinfected physically or chemically previously to discharge in a stream, river, etc and it is used for the irrigation purposes, watering plants etc.

##### ***Rainwater Harvesting System***

Rainwater harvesting is the collection, accumulation and deposition of rainwater for reuse on-site rather than allowing it to be run off. The components of rain water harvesting system are as follows-

***Catchments:*** The catchment area is the surface which receives the rainfall collects and provides water to the

system.

**Coarse mesh:** It is installed on the roof to avoid the passage of debris and garbage.

**Gutters:** Channels around the border of a sloping roof which is used to accumulate and use to carry rainwater to the storage tank.

**Conduits:** are the pipelines or drains which carry rainwater from the catchment area to the harvesting system.

A rainwater harvesting system is easy to maintain. It helps in reducing water bills as the water collected can be used for various purposes. It also reduces the burden of soil erosion in many areas. It decreases Demand on ground water unpredictable rainfall which means little or no rainfall can limit the supply of water. The cost of setting up a rainwater harvesting system is very high. Rainwater harvesting system requires regular maintenance from time to time.

#### **Water Efficiency**

Low pour rate fixture and low sanitary fittings help in controlling the usage of water. The green roof is situated where the catchment area is connected to the harvesting area. Also there is a presence of sewage treatment plant (STP) through which waste water is treated and used for water to the plants. This feature also helps in saving about 20% amount of the water utilized in the building.

#### **Intelligent lightning system**

##### **Compact Fluorescent Lamp (CFL):**

Compact fluorescent lamp or compact fluorescent tube is a fluorescent lamp designed to replace an incandescent lamp. CFLs use one-third to one-fifth of the electric power, and last up to eight to fifteen times longer. CFLs are four times more proficient than the incandescent bulbs. While the initial costing is more, CFLs are cheap in the long run. CFL's help in reducing carbon emissions

##### **Light Emitting Diode:**

An LED is a forward biased P-N junction which emits light spontaneously. LEDs produce more light per watt than incandescent bulbs. LED are very small and can be easily populated onto printed circuit boards. LED has a relatively long useful life. LED contains no heavy or toxic element which can harm anyone.

##### **Natural Lightning:**

Skylight covering are the lungs of the green roof. They make daylight reachable into various floors of the

office. These coverings also protects the building from sunlight and help the daylight come inside the building.



**Fig 3. Skylight Covering of the Green Building**

#### **Energy Efficiency:**

Solar Panels installed in the parking space helps in generating about 7.5% of the total building electricity. Solar water heating system and LED intelligent lights and sensors help in saving energy to its maximum capacity. The HVAC on Under Floor Ventilation System (UFAD) is combined with an integrated building management system (IBMS) to manage the HVAC lightening, power control in the building. CO and CO<sub>2</sub> detectors have been installed in a particular room to know their levels. Solar energy does not lead to or cause any kind of pollution. Solar energy can be used in isolated and remote areas. Solar energy is infinite and unending. It can be harnessed only during the day time and is very expensive to use.



**Fig 4. Solar panels on the parking lots**

#### **Air conditioning system and use of efficient motors:**

In the Green Building ONGC there has been the use of air and water cooled chillers. The chiller has the function of pulling the air inside the building and then the water is cooled at a particular temperature. This helps in cooling the air and then it is passed into another duct from which it is passed into the air conditioning system. There has been an effort of making use of the water pumping system for variable flow.

## V. CONCLUSION

On the basis of this paper the conclusion that can be drawn is that green buildings are very efficient and a future of the world. Though they may seem to be very expensive but in the long run they are better than regular and ordinary buildings. They have lot more advantages than compared to the disadvantages. Mankind needs to develop more and more green buildings in the near future in order to defend planet Earth from the destruction and devastation. Therefore green buildings are helping in increasing the efficiency and also on the other hand they are helping in reducing the stress on environment and also helps in minimizing the problems of global warming, climate change etc. There continuous research going in the field of green technology as it is a new emerging and upcoming field. Cost of a green building is same to that of an ordinary building. Green buildings have greater water efficiency than regular buildings. The material efficiency of green buildings is more due to usage of renewable, reusable, recyclable and non-toxic materials. In a green building there is no presence of indoor temperature cooling. Green buildings require correct structural positioning and orientation for appropriate quantity of light. Green materials are not easily and readily available and also have high shipping or transportation costs. That why time for constructing a green building is more as compared to a regular building. The construction of a green roof causes much problem. Some machines and product may lead to increase in carbon footprints. Site, materials and space in which building should be optimized to their fullest which is not possible under many circumstances. Some improvements and modifications can be done like enhanced sealing to minimize losses through cooling and heating. Expanding the efficiency of skylights and windows. Increased insulation in walls, foundations and ceilings. Improvement in the hot-water distribution systems to decrease wastage in energy

## REFERENCES

- [1] LEED | U.S. Green Building Council/ LEED Reference Guide for Green Building Design and Construction  
[www.usgbc.org/leed](http://www.usgbc.org/leed)
- [2] Green Building Standards and Certification Systems  
<http://www.wbdg.org/resources/gbs.php>
- [3] Sustainability at work: ONGC unveils its first Green Building at Dehra Dun [www.ongcindia.com](http://www.ongcindia.com)