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Green Building Design A Sustainable future

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Abstract

In today's age of urbanization the environment is being ignored by human beings. Environmental imbalance is produced due to different activities made by us. Construction industry is doing a massive role in this. While construction processes and after construction due to faulty planning, pollution is created as well as lots of natural resources are wasted. Water scarcity is a major problem in front of society even though while using water for construction, gardening and other domestic purposes proper care is not taken and water is wasted. In normal constructions proper care is not taken to save energy and energy is not efficiently used. As demand of energy is increasing rapidly therefore there is excessive load on big thermal power projects, which adds into the pollution. The water falling on the roof top is not utilized in normal buildings. The waste produced in homes is also contributing to pollution and in making un sanitary and unaesthetic atmosphere. A green building design provides solutions to all above-mentioned problems and contributes in keeping the environment clean and green. The study shows that Green Buildings are only way to a sustainable future.

1. Introduction

Green building is generally defined as a building, which utilizes less external energy and is capable of producing ample amount of energy for its intended use itself without causing harm to the environment. Green building is called energy efficient building or eco-friendly building.

These buildings are called green due to their similarity with trees…as trees generate their food only by the use of sun light and air, these buildings are also capable of producing energy and utilizing it properly without damaging the environment.

A green building depletes the natural resources to the minimum during its construction and operation. The aim of a green building design is to minimum during its construction and operation. The aim of a green building design is to minimize the demand on non-renewable resources, maximize the utilization efficiency of these resources, when in use, and maximize the reuse, recycling, and the utilization of renewable resources. It maximizes the use of efficient building materials and construction practices; optimizes the use of on –site sources and sinks by bio-climatic architectural practices; uses minimum energy to power itself; uses efficient equipment to meet its lighting, air-conditioning, and other needs; maximizes the use of renewable sources of energy; uses minimum energy to power itself; uses efficient waste and water management practices; and provides comfortable and hygienic indoor working conditions. It is evolved through a design process that requires all concerned- the architect and landscape designer and the air conditioning, electrical, plumbing, energy consultants –to work as a team to address all aspects of building and system planning, design, construction and operation. They critically evaluate the impacts of each design decision on the environment and arrive at viable design solutions to minimize the negative impacts and enhance the positive impacts on the environment. In sum, the following aspects of the building design are looked into in an integrated way in a green building

Following are the points that possess prime importance in design, construction and operations of a green building.

- **Proper site planning**
- **Efficient use of water**
- **Passive design of building**
- **Rainwater harvesting**
- **Use of Non-conventional energy.**
- **Saving energy**
- **Solid waste management**
- **Waste water management**

2. Site planning

Site planning is the most important from design point of view of green building. The site planning should be done by adopting the following techniques i.e. by preserving and protecting landscape during construction, soil conservation and reduce air pollution during construction.[1]
As per adopting the above techniques of proper site planning in green building design it will prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling reuse. Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter. Hence fertility of the soil can maintained at site even after construction.

3. Saving water

Water is one of the essential requirement of human being. Saving water is important principle of green building design. As per TERI- GRIHA following techniques should be adopted to save the water i.e. a) Reduction landscape water requirement by xeriscaping, drip irrigation and sprinkler irrigation. b) Reduce the water use by the building with water efficient fixtures. [1]

c) Efficient water use during construction.

As per saving water techniques will help in maximizing water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems .Hence it will avoid wastage of water contributing towards one of the principle of green building design.

4. Passive design

Passive design is design that does not require mechanical heating or cooling. Homes that are passively designed take advantage of natural energy flows to maintain thermal comfort. Passive design consist of two types passive cooling and passive heating. [2]

4.1 Passive cooling:

Passive cooling maximizes the efficiency of the building envelope by minimizing heat gain from the external environment and facilitating heat loss to the following natural sources of cooling:

- **Evaporative cooling**
- **Radiative cooling**
- **Ground cooling**
- **Ventilation**

4.2 Passive solar heating

Passive solar heating is the direct use of sunlight for space heating. The concept is simple, but creating a successful installation may be complex. Passive solar heating is not a concept for casual experimentation, because failure is almost certain to leave a big mess. In general, the larger the fraction of the building's heating that is provided by passive solar, the more complex the design must be to avoid adverse effects. Passive heating should include day lighting wherever possible, since both involve the controlled intake of solar energy through glazing.

Passive heating can be done by following ways:-

- Orientation for passive solar heating
- Passive solar shading
- Locating heaters
- Locating thermal mass
- Air movement and comfort

5. Rain water harvesting

Rainwater harvesting is the collection and storage of rain from roofs or from a surface catchments for future use. The water is generally stored in rainwater tanks or directed into mechanisms, which recharge groundwater. This is appropriate in many parts of the world, such as western Britain, China, Brazil, Thailand, Sri Lanka, Germany, Australia and India, where there is enough rain for collection and conventional water resources either do not exist or are at risk of being over-used to supply a large population. [1]

Rainwater harvesting can provide lifeline water for human consumption, reduce water bills and the need to build reservoirs, which may require the use of valuable land.

6. Use of non-conventional energy

6.1 Solar energy

Solar power is the technology of obtaining usable energy from the light of the sun. Solar energy has been used in many traditional technologies for centuries and has come into widespread use where other power supplies are absent, such as in remote locations and in space. Switching to solar helps protect florida's beautiful and delicate environment, and reduceour dependence on fossil fuels. [1]

- Solar energy can be currently used in a number of applications:

1) Heat (hot water, building heat, cooking)
2) Electricitygeneration (photovoltaic, heat engines)

The solar photovoltaic (PV) systems are at work converting the suns radiation directly to electricity. They provide electricity to homeowners, ranchers, and farmers for TV, VCR, stereo, lighting, pumps, electric fences, and livestock feeders, without connection to the power company. Hence it will prove free Inexhaustible Power, simplicity, low maintenance, energy efficient, economical and environmentally sound.

6.2 Wind energy

Wind power is the conversion of wind energy into more useful forms, usually electricity using wind turbines. Most modern wind power is generated in the form of electricity by converting the rotation of turbine blades into electrical current by means of an electrical generator. In windmills (a much older technology) wind energy is used to turn mechanical machinery to do physical work, like crushing grain or pumping water. Wind energy is ample, renewable, widely distributed, clean, and mitigates the greenhouse effect if used to replace fossil-fuel-derived electricity.

- Use of small-scale wind turbines

This rooftop-mounted urban wind turbine charges a 12 volt battery and runs various 12 volt appliances within the building on which it is installed. Wind turbines can be used for household electricity generation in conjunction with battery storage over many decades in remote areas. Household generator units of more than 1 kW are now functioning in several countries.

Wind turbines can be used for household electricity generation in conjunction with battery storage contributing towards green building design. As it has low noise levels, reliable operation, value for money, minimized visual intrusion compliance with all safety requirements both structural and electrical.

7. Saving energy

The use of energy in a building can be reduced by adopting some new techniques and equipments instead of using old conventional equipments for household works such as[2]

- **Solar water heater**
- **Solar lantern**
- **Solar cooker**
- **Use of biogas**

As utilization of the above advanced equipment will definitely save the energy and reduce the consumption of renewable resources such a gas, electricity, etc It proves to be economical and environment friendly.

8. Solid waste management

Solid waste management includes all activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes. Solid waste can be defined as material that no longer has any value to the person who is responsible for it, and is not intended to be discharged through a pipe. It does not normally include human excreta. It is generated by domestic, commercial, industrial, healthcare, agricultural and mineral extraction activities and accumulates in streets and public places. The words "garbage", "trash", "refuse" and "rubbish" is used to refer to some forms of solid waste. Compost is created by the decomposition of organic matter such as yard waste. Compost systems confine compost so that it can receive air and create suitable temperatures for proper decomposition into fertilizer.[1]

By adopting the above method of composting at domestic level will result in appropriate solid waste management due which problem of collection and disposal of waste by Municipal corporation will be solved. Hence it will contribute towards healthy and secure environment.

9. Grey water management

Greywater is defined as the wastewater produced from baths and showers, clothes washers, and lavatories. The wastewater generated by toilets, kitchen sinks, and dishwashers are called black water. The primary method of greywater irrigation that will be discussed is through sub-surface distribution.[4]

Types of Sub-surface distribution systems are

- Evapotranspiration(ET) systems
- Shallow Trench
- Shallow mound

As adopting the above method reuse of water produced from bath, clothes washers except toilet for gardening purposes,etc.As using grey water for gardening will reduce the burden on Municipal water supply and wastewater systems .

10. Green buildings Vs Conventional Buildings

Externally, a green building and a conventional building look alike. In terms of functionality too, a green building is as much functional as a normal building. However the difference is the benefits that a green building can provide.

TANGIBLE BENEFITS:

- A green building consumes 30-40% less water than a conventional building.
- Energy consumption lesser by 40-50%.
  - Enhanced productivity of occupants, 10-15% more than a conventional building.
- Reduction in initial investments on equipment and systems.

INTANGIBLE BENEFITS:

- Green corporate image.
- Health and safety of occupants.
- Enhanced occupant comfort.

Imbibe best operational practices from day-one.

Incremental cost of constructing a Green building gets paid back in 3-5 years

Conclusion

In today's age where 'Energy crisis' is major problem. Green building gives brilliant solution for this. These are designed to use minimum energy. All the systems for cooling and heating are designed such that they require very less energy.

Green buildings are also capable of producing electricity on domestic level with non-conventional energy sources.

In today's era green buildings are essential as environmental balance is very important for survival and further development of human beings. Green buildings are only way to a sustainable future.

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