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Sustainable Green Building Concept

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Abstract - *Green building (also known as green construction or sustainable building) expands and complements the building design concerns of economy, utility, durability, and comfort. A Green Building is one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier space for occupants as compared to conventional buildings. Green Buildings are designed to reduce the overall impact on human health and the natural environment by the following ways Using energy, water and other resources efficiently. By reducing waste, pollution, and environmental degradation*

Key Words: Sustainable Building, Sustainable Materials, Green Building, Solid waste management

1. INTRODUCTION

Sustainability lies at the heart of construction and design. A sustainable approach of construction brings lasting environmental, social and economic benefits to a construction project. From that perspective, concrete achieves high valuable properties as a construction material limiting the impacts of a building or infrastructure on its surroundings.

"Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

It contains within it two key concepts: 1. The concept of needs, in particular the essential needs of the words poor, to which prevailing priority should be given. 2. The idea of limitations imposed by the state of technology and social organisations on environments ability to meet present and future needs.

To ensure sustainable development of any activity that is expected to bring about economic growth, it is must to consider its environmental impacts so that it is more consistent with long term growth and development.

Many 'development projects', such as dam's mines, roads, industries and tourism development, have severe environmental consequences that must be studied before they are even begin. The pressure that man exerts upon nature for fulfilment of his needs is greater than ever and is escalating at an alarming rate.

Buildings account for more than 40% of all global carbon dioxide emission, one of the main culprits implicated in the phenomenon of global warming in which India comes on 144th position (1.4 metric ton) in carbon emission rating in the world. Green building is the practice of constructing or modifying structures to be environmentally responsible, sustainable and resource-efficient throughout their life cycle. This includes efficiently using energy, water and other natural resources, protecting occupant health, improving employee productivity and reducing waste, pollution and environmental degradation [1]. Green buildings accounts for improving environmental footprint by reducing energy use by 30-5-%, CO2 emissions by35%, waste output by 70% and water usage by 40%.

1.1 OBJECTIVES

Green building are designed to reduce the overall impact of the built environment on human health and the natural environment by : Efficiently using energy, water and other resources. Protecting occupant health and improving employee productivity. Reducing waste, pollution and environment degradation

1.2 CONCEPT OF SUSTAINBILITY

Sustainability is based on a simple principle: everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony that permit fulfilling the social, economic and other requirements of present and future generations.

While India is preparing to achieve these growth plans with enthusiasm, it is essential that the country should analyse and take into account the price that the future populations of the world and India will have to pay in return if this growth takes place without adequate thought to sustainability.

Some of us may question why India must slow down its pace of development and pay for the sins of already developed and industrialized Western nations. Clearly, the OECD or the industrialized countries must take the lead in mitigating climate change, reducing greenhouse gas emissions, but also large developing countries such as India and China will also have to start to reduce their emissions over the next 20 to 30 years if we truly want to give our children a chance at a future. Developing countries with large emissions should

have some responsibility, although differentiated and different from the industrialized world. While sustainable practices and products are perceived as counter Productive with the growth of GDP. Growth that is not sustainable is not true growth.

1. Design Aspects Of Sustainable Development

Sustainable design is the thoughtful integration of architecture with electrical, mechanical, and structural engineering. In addition to concern for the tradition; aesthetics of massing, proportion, scale, texture. Shadow and light, the facility design team needs to be concerned with long term costs: environmental, economic and human. All in all sustainable design is more of a philosophy of a building than perspective building style

- Harvest all their own water and energy needs on site.
- Be adapted specifically to site climate and evolve as conditions change.
- Operate pollution free and generate no waste that aren't useful for some other process in the building or immediate environment.
- Promote the health and well-being of all inhabitants, as a healthy ecosystem does.
- It should comprise energy efficient integrated systems that maximize efficiency and comfort.
- Improve the health and diversity of the local ecosystem rather than degrade it.
- Be beautiful and inspire us to dream.

2. Sustainable Development By Design

- The design process plays a significant role in creating built environment respecting all principles of sustainable development.
- The various climatic zones like hot-dry, warm-humid, composite, temperate and cold climates as wellas sun path movements and annual wind directions along with rainfall are the vital statistics data which need to be considered while designing a project.
- The building envelope creates harmonious development when neighbourhood poses one of the biggest challenges in selection of building materials, technologies and practices. It may be a combination of natural and man-made materials with least embodied energy and also leading to use of renewable resources. The trade-off between choice of the materials and technologies and their effect on environment has to be balanced. As a holistic approach, all efforts should be made towards:

  Encouraging and harnessing building materials out of agricultural, industrial and Bio-wastes.

  Environment-friendly and cost-effective.

  Making building construction more indigenous, more adaptable to climatic zones of India.

  Encouraging the use of traditional technologies and local vernacular architecture and construction practices which may be blended with the modern technology applications.

3. Site Design and Development

- A well-planned and optimally oriented building relates well to its site and the climate. This maximizes opportunities for:

  1. Passive solar heating when heating is needed.
  2. Solar heat gain during winters.
  3. Natural ventilation as needed.
  4. High-quality day lighting throughout the year.

Carefully planned building placement shall also minimize storm water runoff, habitat disturbance, protect open space, and reduce the risk of soil - erosion.

4. Building Orientation and Shading

The building shall be oriented with the long sides facing north and south whenever the site and location permit such orientation.

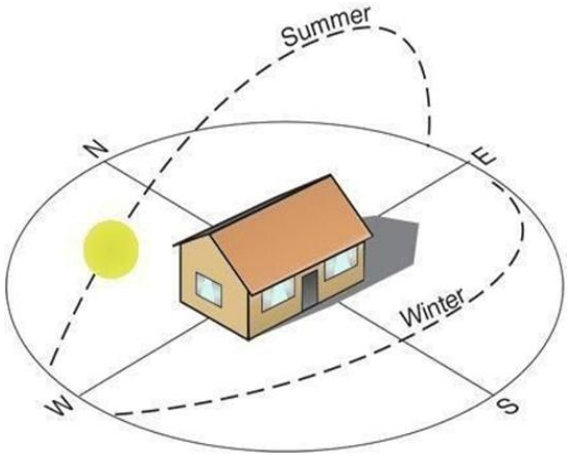

Fig -1: Building orientation and shading

Balconies and open terraces should be built on the south side of the house, where direct sunlight will permit their use for more hours during the day and more days during the year. Likewise, the garage, store rooms and other areas that are less frequently used should be situated at the northern part of the house, where they will act as buffers against cold winter winds.

Another environmental factor that should be considered in the planning of building orientation and positioning is prevailing winds, which are the winds that blow predominantly from a single, general direction over a particular point. Data for these winds can be used to design a building that can take advantage of summer breezes for passive cooling, as well as shield against adverse winds that can further chill the interior on an already cold winter day.

For maximum solar gain, a building should be located near the site's southern boundary to reduce the shading from neighboring properties, and also provide sunny outdoor space. However, the best where daylight access is limited, to assist daylight penetration into living areas and private open spaces. Shading of window can drastically reduce the heat gain through sun. The shades along the glass of window define the net reduction in the direct heat gain through solar radiation. Therefore after appropriate orientation of the building and shading device, select a glass with low SHGC value, to reduce the heat transfer. Location for solar access will vary from site to site depending on site shape, orientation and topography, and shading from trees and neighbouring buildings.

There is a provision for external shading of the south façade during the peak summer season, and provisions are required for providing vertical shading to prevent direct solar radiation and glare due to low altitude sun angles, especially on the eastern and western facades.

There is a protection for the building envelope against thermal losses, drafts and degradation by natural elements such as wind and materials such as dust, sand, snow, rainwater, hail, etc. Orient buildings and design shading devices to optimize 1use of solar energy.

5. Design strategies for Day lighting

This is the most important aspect as it while designing openings the natural daylight, will promote some amount of heat gain as well, hence the challenge is to reduce the heat gain while ensuring the adequate natural day lighting.

Daylight comprises both skylight (diffuse light from the sky), and sunlight (direct beam radiation from the sun). It is constantly changing according to the time of day, time of year and the weather and it is this variability that provides interest to interiors and helps to create satisfying places to work and live.

East & west directions have highest insolation values, while south & north have the least. Therefore more windows can be provided on these two directions to reduce the insolation values.

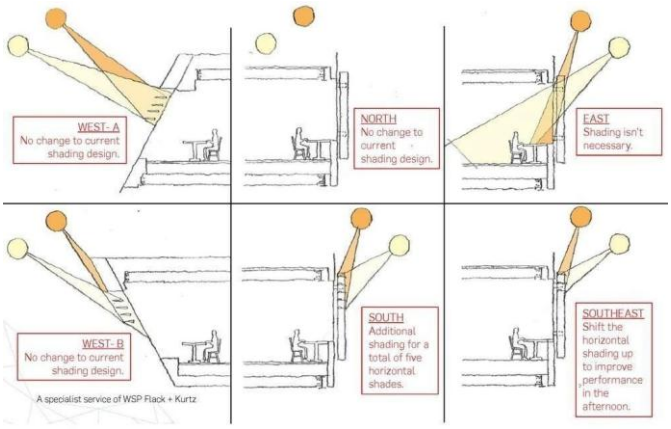

Fig -2: Design strategies for day lightning

The size of the window determines the amount of day light and solar radiation coming inside. Therefore it is advisable to optimize the design of the window as per the climatic zones and as per the wall window ratio.

6. Design strategies in a Cold climate

Design according to the site slopes, and Orientation should preferably be in north -south direction i.e. longer walls should face north & south to receive more solar heat during winter months.

Glazing windows up to 25% floor area may be provided. Double glazing is preferable to avoid heat losses during winter nights. Adopt Trobe walls as they are a very useful passive heating system. They require little or no effort to operate, and are ideal for cold climates.

Sunspaces are equally simple and silent, and can allow views. Rooms heated by a Trobe wall or sunspace often feel more comfortable than those heated by forced air systems, even at lower air temperatures, because of the radiantly warm surface of the wall. Allow maximum solar heat gain inside the building which will allow natural daylight during the day but intelligently cut the cold waves during the night time, if possible provide air lock to prevent heat loss.

2. SELF CLEANING WALL

Nanomatik has a water based formula and can be applied on different sorts of surfaces such as ceramics, granite, concrete and glass. It destroys all kinds of organic contamination on the external surfaces that stems from air pollution, algae&mold formation. It also contributes to the Greener World mission by eliminating the VOCs that are present in the air. Nanomatik is a Nano technological top coating system

that creates self-cleaning surfaces. This novel technology depends on the photo catalytic feature of TiO2nanocoating. When photo-catalyst (TiO2) is exposed to light in the presence of water vapour, two highly reactive substances are formed: hydroxyl radicals [•OH] and a superoxide anion [O2-1]. It allows the oxidation of airborne VOCs and toxic organic matter into CO2and water at RT with UV or near-UV light source. It does not need a special energy and use only clean energy in ordinary life. Specific titanium dioxide has strong photo catalyst reaction.

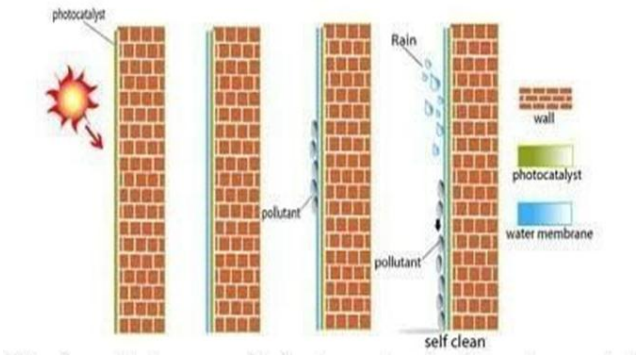

Fig -3: Concept of Self-cleaning wall

Photo catalyst has the following advantages over the alternative technologies:

1. Real destruction of pollutant rather than a simple transfer on a substrate.
2. Degradation of pollutant at ambient temperature and pressure.
3. Applied by well-known, user-friendly techniques (HVLP, dip coating, etc.).
4. Economical, cheap and low energy consumption.
5. Adapted for a large range of pollutant (VOC, bacteria, mould).
6. Manufacture integration on a large range of final products is also possible.

3. CONCLUSION

Sustainable building materials by definition are materials which are domestically created and sourced which decreases transportation costs and CO2 emissions, they could consist of reused materials, they possess a lower environmental effect, they are thermally effective, they need less energy than conventional materials, they make use of renewable resources, they are lower in harmful emissions and they are economically sustainable.

Economic development achieved so far has adopted various techniques which have proved harmful for the environment in which we reside in.

The growing population and our rete of consumption of natural resources has placed a big stress on the environment.

The crying need is for sustainable development which aims at development which does not have a negative impact on the environment.

Careful use of the resources and maximum use of non-conventional energy sources will enable us to attain sustainable development.

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