

## Opportunities of Energy Efficient Building and Energy Conservation in India

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**ABSTRACT:** Building consumes important amount of energy to keep the built environment comfortable. Energy consumption for production a building material and construction of building is also significant. The very objective of constructing a building is to provide a shelter and artificial environment that is more conducive for human Occupancy then the natural environment as a result the building sector is now perturbing factor to the environment the energy related perturbation like sulphur dioxide and nitrogen oxide. In this scenario introduction of Energy Efficiency in buildings has become critical for achieving a collective objective of energy securities and environmental protection. The available option of architectural intervention, building material, available technology and design methodology are required to be carefully evaluated to minimize energy uses and provide cost effective solution. The purpose is to achieve fought with the least amount of conventional energy input. The paper depicts the various technique and advantage of constructing Energy Efficient Building to meet the energy requirement in build environment.

**KEY WORDS:** Conventional, Shelter, Perturbation, Human Occupancy, Artificial Environment.

**BROAD AREA:** Energy and Environmental Engineering. Sub-Area- Energy Efficient Building

### I. INTRODUCTION

Energy Efficient Building is the design and construction of building giving carefully consideration to three main elements: Healthy indoor condition, maximum Energy Efficiency and insightful utilization of regular assets. Show a Energy Efficient Building, also known as a sustainable building, structure that is designed, built, renovated, operated, or reused in an ecological and resource efficient manner. Energy Efficient Building are designed to meet certain targets such as protecting occupant health; improving worker productivity; using energy, water and other resources more efficiently; and reducing the impact to the surrounding. There are several way to denote a building's "greenness." in the US, and now worldwide, Energy Efficient Building are certified through an independent third party, US Energy Efficient Building council's program, leadership in energy and environmental design(LEED).Energy Efficient Building increase the efficient use of energy, environmental, and human resource increase in efficiency directly translate into economic benefit and Energy Efficient Building incorporate practice that significantly reduce or eliminate adverse environmental impact. Making improvements renovating or building new is most cost effective. A one-time investment premium of less than 1% of first cost can increase Energy Efficiency over standard Building Code hones by 20-30%.

### II. DIFFERENT FACTS OF ENERGY EFFICIENT BUILDING

- The US department of energy stated that today is building consume more energy than any other segment of the US economy, including transportation and industry.
- The EPA estimate that building related illnesses represent \$60 billion of yearly profitability lost across the nation
- Green or high-performance building typically nice or sell faster, and retain and attract tenants better because they combine superior amenity and comfort with lower occupancy cost and more competitive terms.
- Energy and water efficient building reduce operating cost to less than half those of a traditional building by employing Green design concept.
- Improved indoor environment can increase employee productivity by up to 16 percent.

- Well integrated and comprehensive Energy Efficient Building projects can result in lower or neutral incremental project development cost.

### **III. ECONOMIC BENEFITS OF ENERGY EFFICIENT BUILDING**

An Energy Efficient Building may cost more up front, but saves through lower operating cost over the life of the building. Energy Efficient Building approach applies a project life cycle cost analysis for determining the appropriate up-front expenditure. This analytical method calculates costs over the useful life of the asset. The cost saving can only be fully realized when they are incorporated at the project's conceptual design phase with the assistance of an integrated team of professionals. It system approach ensure that the building is designed as one system rather than a collection of stand-alone system. Some benefits, such as improving occupant health, comfort, and productivity, reducing pollution and landfill waste are not easily quantified. Consequently, they are not adequately considered in cost analysis. For this reason, consider setting aside a small portion of the building budget to covered differential cost associated with the less tangible Energy Efficient Building benefits or the cost of researching and analyzing Energy Efficient Building option. Even with a tight budget, mini Energy Efficient Building measure can be incorporated with minimal zero increased upfront cost.

**Element of Energy Efficient Building** – Element of Energy Efficient Building practices is:

#### **Sitting -**

- Start by selecting a site well suited to take advantage of mass transit.
- Protect and retain existing landscaping and natural feature. Select plants that have low water and pesticide needs, and generate minimum plant trimmings. Use compost and mulches. This will save water and time.
- Recycled content paving materials furnishings, and mulches help close the recycling loop.

**Energy Efficiency-** Most building can reach Energy Efficiency levels by adopting following strategy:

- Passive design strategies can dramatically affect building energy performance. This measure includes building shape and orientation, passive solar design, and the use of natural lighting.
- Develop strategies to provide natural lighting. Studies have shown that it is a positive impact on productivity and wellbeing.
- Install high efficiency lighting system with advanced lighting controls. Include motion sensor tied to dimmable lighting control. Task lighting reduces general overhead light level.
- Used properly sized and energy efficient heat/cooling system in conjunction with a thermally efficient building shell. Maximize light colors for roofing and wall finish materials; install high R-value wall ceiling insulation; and use minimal class on East and West exposures.
- Minimize the electric load from lighting, equipment, and appliances.
- Consider alternative energy sources such as photovoltaic full cells that are now available in new product and applications. Renewable energy sources provide a great symbol of emerging Technologies for the future.

#### **Material Efficiency-**

- selective sustainable construction material and product by evaluating several characteristics such as reused and recycled content, zero or low off gassing of harmful air emission, or are low toxicity, sustainably, harvested materials, high recyclability, durability, longevity, and local production. Such products promote resource conservation and efficiency. Using recycled content products also helps develop market for recycled material.
- Use dimensional planning and other material efficiency strategies. These strategies reduce the amount of building material needed and cut construction cost. For example, design room on 4 foot multiples to conform to standard sized wall board and Plywood sheets.
- Reuse and recycle construction and demolition materials. For example, using inert demolition material as a base course for a parking lot keeps material out of landfills and costs less.
- Require plan for managing material through deconstruction, demolition, and construction.
- Design with adequate space to facilitate recycling collection and to incorporate a solid waste management program that prevents waste generation.

#### **Water Efficiency-**

- Design for dual plumbing to use recycled water for toilet flushing or a grey water system that recovers water or other non-potable water for site irrigation.
- Minimize water by using lo flush toilets, low flow shower head, and other water conserving fixtures.
- Used recalculating system for centralized hot water distribution.

- Install point of use hot water heating system for more distant locations.
- Meter the landscape from buildings. Use micro irrigation (which excludes sprinklers and high pressure sprayers) to supply water in no turf areas.
- Use State of the art irrigation controllers and self-closing nozzles.

**Occupants Health and Safety** - Recent study conducted by USA reveal that building with good overall environmental quality can reduce the rate of respiratory disease, allergy, asthma, sick building symptoms, and enhance worker performance. The potential financial benefits of improving indoor environments exceed cost by a factor of 8 to 14. Choose construction material and interior finished products with zero or low emission to improve indoor air quality. Many building material and cleaning/maintenance product emit toxic gases such as volatile organic compounds (VOC) and formaldehyde. This gas says can have a detrimental impact on occupant's health and productivity. Provide adequate ventilation and high efficiency, induct filtration system. Heating and cooling system that ensures adequate ventilation proper filtration can have a dramatic and positive impact on indoor air quality. Prevent indoor microbial contamination through selection of materials resistance to microbial growth.

**Building Operation and Maintenance** - Energy Efficient Building measures cannot achieve their goal unless they work as intended. Building commissioning include testing and adjusting the mechanical, Electrical and plumbing system all equal equipment meets design criteria and maintenance of equipment. Overtime, building performance can be assured through measurement, adjustment, and upgrading. Proper maintenance insures that a building continues to perform as design and commissioned.

#### **Step to Ensure Success for Energy Conservation-**

- Establish a vision that embraces sustainable principles and an integrated design approach.
- Develop a clear statement for the projects vision, goal, design criteria, and priorities.
- Developer project budget that covers Energy Efficient Building measures. Allocate contingencies for additional Research and Analysis of specific option. Seek sponsorship or grant opportunities.
- Seek advice of a design professional with Energy Efficient Building experience.
- Select a design and construction team that is committed to the project vision. Modify the selection process to insured the contractor have appropriate qualification to identify, select and implement and integrated system of Energy Efficient Building measure.
- Develop a project schedule that allows for system testing and commissioning.
- Develop contract plans and specification to ensure that the building design is at a suitable level of building performance.
- Create effective incentives and oversight.

**Emerging Trends in Energy Conservation in India** - Careful consideration to building operation helps in maximizing the energy saving potential in design by reduction in both summer cooling and winter heating requirements. The Engineer India Limited (EIL) building oriented N-S and New Delhi Municipal Corporation (NDMC) building oriented along the N-SW Axis benefit from this principle. The position of the service-core is a key consideration in office planning. In the LIC building, positioned peripherally on the east and West sides, the core provides internal user spaces buffered from the effect of low East and West Sun. The external core acts as a giant micro-barrier that helps in modifying the microclimate. The shading of open space becomes crucial in summer months. This finds expression in the overhead sunscreens over courtyard spaces at the India habitat Centre, and the large space frame connecting them to office blocks at LIC, which alas the NDMC refused permission to cover due to increased ground coverage. Use of courtyard in configuring the build form has been widely realized as an appropriate response to the hot climate providing shade and also acting as a heat vent. For the high-rise office, it seems that maximum scope for architectural innovation lies in treating the external wall section as much of the floor planning is standardized. The wall is painted block to increase its absorptive capacity and is placed directly behind glazing with an air gap in between vents are provided for circulation. Solar radiation is absorbed by Blackened surface and is stored as sensible heat in the wall. Cool room air its place through the lower vents, thus establishing a natural circulation pattern. A part of absorbed heat is conducted through the wall and is transferred to the living space by convection and radiation. Thus, the living space gets heated up. During summer months, when Sun's altitude is high, the overhang on the wall cut of direct sunshine.

#### **IV. CONCLUSION**

In the developed countries the energy consumption growth rate is only marginally higher compared to the population growth rate, in USA energy consumption is projected to grow at 1.3% while the population growth

rate is projected to grow at 0.8%. In contrast, the developing countries like India, population growth rate is expected to grow at 1.3%, while the energy consumption rate is expected to grow at 4.3 %. These Trends would strain the energy sector to a large extent. Building Sector being a major energy consumer can contribute to a large extent to address this issue. Energy Efficient Building has the potential to save 30-40% Energy. The general awareness on Energy Efficient Building in India is scarce and scattered. Through architects have been sporadically adopting concepts like passive architecture and natural air-conditioning, an integrated and holistic approach towards construction of Energy Efficient Building is yet to emerge.

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