

Concepts of Energy Saving in Building Construction

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Abstract- Saving of Energy is the highest priority in the world. Residential buildings consume about 40% of energy generated. This energy is requiring in lighting, heating, cooling, ventilation, cooking and in so many small activities. In Green buildings concept uses maximum natural energy and save our non-renewable energy. Orientation is important aspect of building, building-materials should be fetch form nearby sites, appropriate construction technology, and automation technology in home appliance can save huge amount of energy used in buildings. sustainability theory of green buildings is a key point. In this review paper green buildings concept, methodology, materials and problems are discussed with respect to the energy savings. *Key words*-Green buildings, HVAC, Green-roof, rat trap wall.

I. INTRODUCTION

Definition of Sustainability: - “The term sustainability refers to the ability of the people of the present to maintain a high quality of living while ensuring that future generations will have access to the resources that they need to also maintain a high quality of life.” Sustainability is important for all concerns in construction industry, for technical personal, and architects, because they plan and design the buildings. In today’s World, all literate persons accept the importance of the sustainability.

Due to mass cement concrete construction and increase in urbanization and industrial area heat island and global warming becoming new burning issue. To protect our environment green building plays very important role. Green buildings are getting popular because in long run these are saving energy and natural resources. We know that near about 40% of total energy is consumed in construction fields.

The aim of Green buildings is to save our environment, enhance the efficiency of natural resources. But it is not easy task to satisfy the green building criteria. So many parameters to be satisfied, economic, environmental, level of society etc.

II. NEED OF GREEN BUILDINGS TODAY

Expenditures on energy is increasing day by day, from 2010 to 2018 it is increased from 10% to 15 % and it is next to health care cost. In green buildings reduction in energy consumption is focused, it can reduce energy consumption globally. In green buildings design the aim is maximize the recycling and minimize the non-renewable resources. People should opt green building concept for sustainable development and to construct a dialectic relation between environment and architect. The foremost reason with the increase in carbon di-oxide also causes the

increase the surrounding temperature. The warmer envelope outside is having an immense effect on the indoor temperature of building. Mentioning the buildings and human comfort level, because higher temperature causes discomfort inside and to maintain proper level we need some mechanical solution for which more energy consumption will be there Urban heat island is the phenomenon due to commercial, industrial activities and concrete surfacing causes more heat in urban area. , which is the upshot of the rapidly increasing population causing the reduction of green surfaces thus resulting in an increasing heat islands.

3. STRATEGIES USED IN GREEN BUILDINGS

Two strategies are adopted in green building (a) passive (b) active

In Passive strategy of building construction factors considered are (a) orientation of building (b) appropriate shading devices (c) thermal property of materials used (d) appropriate use of natural resources sun and wind. In active method mechanical/ electrical appliances are used to control heating, cooling, humidity control, air control for occupant's comfort.

Passive strategy of energy efficient buildings: following are some common passive strategies for green buildings. (1), (2), (3)

A. Green roof

Normally 10-20 cm thick RCC slabs are used for roofing of residential, commercial buildings. The roof may it be flat or inclined, short or long span. If roof is covered with green plants called green roof. Generally green layer is developed over thin waterproofing membrane. A green roof can create 5-7-degree temperature difference between outer and inner of a room.

B. Cavity wall

Double wall with air-gap is known as cavity wall. In the insulated cavity wall construction, the cavity is filled by foam, fibre-glass, cellulose, etc. Tiles also provided protection to the walls from coming in direct contact of atmospheric heat ensuring the reduction of the temperature as well as increasing the cooling effects as well.

C. Rat-Trap Bond walls

In this masonry air pockets are left between the arrangement of the bricks which is beneficial in two ways, (a) thermal and sound insulation (b) almost 25 % saving in bricks. This is especially helpful in south Asian hot countries. The strength is equal to the strength of traditional 230 mm wall.

D. Wooden doors and windows

For achieving good thermal insulation, Wooden door and windows are always beneficial. Because wooden doors and windows have less effect of temperature variations or sun light as compared to the steel or other material doors.

E. Rain water harvesting system

These days rainwater harvesting system is compulsory requirement because water level is going down every year, scarcity of water becoming big problem. (11)

Active strategies- The factors which are independent of each other, but their combination affect worker's thermal comfort. ⁽¹⁰⁾ . There are so many factors affect the comfort level of occupant, like air temperature and velocity, humidity, and temperature. similarly, it also dependent on your personal factors like cloth and body metabolism

Technologies in Green buildings: Energy-efficient building technologies are increasingly dependent on building automation through intelligent sensing and

control, often via wireless sensors and controllers. (9), (10),

III. SMART MONITORING OF BUILDING ENERGY

Smart meters or current sensors can be attached to main power lines. Sensors can be placed on every appliance to monitor their on /off state and automatically controlled. This can save 15-20 % energy. Motion controlled lighting ventilation can save 5-80 % lighting/ ventilation energy. (12) (14)

IV. THE GRADUAL POLICY ADAPTATION APPROACH

Green Building concept contains so many factors in it, hence it is not possible to adopt by society at once, therefore step by step implementation of policies are required. Because greening process is big systematic process which should be adopted gradually. (4), (5), (6)

V. SOFTWARE TOOLS USES IN GREEN BUILDING

Some of the software are very helpful in analysing the different parameters of energy saving and green buildings. These are ATHENA, eQUEST, BEES etc. ATHENA is used for Life cycle cost, with different materials. BEES give environmental performance and economic aspect. With initial cost, maintenance cost, repair, replacement cost etc. While eQUEST is building energy simulation tool. (13), (16)

VI. HOW BUILDING ARE ASSESSED GREEN

There are so many rating tools adopted by different countries, In Singapore BCA green mark, In Malaysia GBI green building Index. But for different countries Tropical and temperate same rating tools are not applicable. Every nation having its

own rules, by-laws according to its climatic, social and cultural need. Rating tools may not be same for all. (15)

VII. GREEN BUILDINGS PROBLEMS IN INDIA

Problems in green buildings: - Initial investment in green buildings may be slightly more but in long run it is not costly. Our people are not aware about its usefulness; hence motivation is required for its implementation. The utmost hurdle in implementation is the lack of awareness of persons involved in construction, owner, contractor architect. They are not trained in sustainable construction practices.

In India we have Indian Green Building Council (IGBC) to implement the principals of Green Buildings. It also makes awareness program and spread the green building principals. It also prepares the necessary data base required for green buildings. (8)

VIII. GREEN BUILDINGS IN INDIA

In India the green building concept is spearheaded by Confederation of Indian Industry (CII), is gaining popularity with upcoming construction projects being certified under the Leadership in Energy and Environmental Design (LEED) rating system. It is the most widely accepted benchmark for green buildings over the world. (7)

The two new entrants to the already existing 13 green certified buildings in India are Hiranandani – B G House, Powai at Mumbai and ABN Amro Bank at Chennai. CII has played the role of a LEED facilitator in these projects by hand holding the respective project teams comprising of the Client, Architect and all other consultants right from registration to Green certification of the buildings.

Hiranandani - B G House is the first LEED certified Platinum rated Green Building in Mumbai and 4th in the country. Hiranandani – B G House, Powai

has been awarded the prestigious Platinum rating under LEED for New Construction. The prominent green features of this Building are highlighted below:

(i) Orientation of the building plays important role it should be preferably east-west., (ii) roof and walls should be High efficient thermal insulation. (iii)small gardens over roof and along wall helps in the saving energy (iv)High albedo coating on the terrace, (v) in green buildings provision of full grey water treatment is there (vi) in various plumbing system Ultra low flow & flush water fixtures are used. , (vii) to enhance natural light entry skylight and glass partitions are used. for increased natural light and enhanced views, (viii)building management should be Intelligent other system which requires are (ix) CO₂ and fresh air monitoring system(x) ventilation system and thermal system should be in comfort zone. (xi) construction materials should form the source within 600 km range and also have some recycled content.(xii) glazing with high performance (xiii) monitoring system should be sufficient.(xiii) wooden products with rapidly renewable materials.

ABN Amro Bank, Chennai goes green. ABN Amro Bank office at Olympia Tech Park, Chennai has earned the Gold rating under LEED for Commercial Interiors (LEED – CI) v 2.0. By doing so it is the first project to be rated green under LEED for Commercial Interiors in the country. LEED for Commercial Interiors differs from LEED for New construction in terms of its scope. Interior projects in leased or rented commercial space would qualify for green rating under LEED-CI whereas LEED-NC encompasses the entire building right from the site to its interiors.

Following are the important green features incorporated in this Building

(a) First LEED –Golden certified in India is Olympia-Tech-Park, Chennai for its green commercial interior. (b) The flush fixers low and ultra-low water flow (c)better self-lighting controls , (d)Better controls on HVAC equipment's and systems to achieve optimum power along with better thermal comfort, (e)CO₂ monitoring systems, (f) Enhanced fresh air ventilation, (g)paints sealant carpet adhesive should be prepared with Low emitting materials,(h) materials used in construction should be from near to construction place (within 600 km range) (i) highly renewable materials should be used in finished wooden products With Green certifications awarded, Hiranandani – B G House and ABN Amro Bank have become landmark projects in the fast-growing green building movement within the country.

X. CONCLUSION

In India public is not much aware about green buildings However, green buildings knowledge will be very helpful in tropical countries like India. It needs awareness programs to be conducted among the people it should be included in the course curriculum. first of all, builders, contractors, owners should be taught about green buildings. Government rules and regulations should be there for awareness and proper control. To save the natural resources and to reduce the energy load, green buildings awareness programs are very necessary. In any building for saving energy both passive and active methodology should be adopted. This paper reviews presents scenario in India regarding green buildings. illiteracy, poorness and lack of future estimation is major hurdle in this movement. Various strategies developed for green buildings are not always applicable everywhere. Our objective should be such that green building in our country can be a cost-effective solution. Because economy of developed country and developing country is different.

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