International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 03 | Mar-2018 www.irjet.net p-ISSN: 2395-0072

ENERGY EFFICIENT AND SUSTAINABLE BUILDINGS

Mohd Aasim Ahmed[1], K.M. Girija[2]

[1]UG Scholar, Civil Department, Poojya Doddappa Appa College of Engineering, Kalaburagi, Karnataka, INDIA
[2]Asso. Professor, Civil Department, Poojya Doddappa Appa College of Engineering, Kalaburagi, Karnataka, INDIA

Abstract – *Now a day's Energy Crisis has reached its peak level throughout the Globe, Increase in Population has Results in Corresponding Increase in use of Conventional Resources. Efficient use of Energy has to be Enhanced in order to have a Sustainable Future, Report says about 40% of Total world's Energy is Consumed by the Buildings thought Non-Renewable (or) Conventional Source of energy.*

In this Paper a Brief Discussion have been made in a lucid language to have a energy efficient and Sustainable Buildings (Green Buildings) which is not only Energy Efficient but also an Environmentally Responsible (Eco friendly). Energy Efficient is significantly termed as (here in this paper) use of Non Conventional Energy Parameter where ever possible.

Key Words: - **Green Buildings, Practices in Green Building, Energy efficient (Solar Energy), Indoor Environmental Quality, GRIHA (LEED), IGBC, BEE…….**etc

1. INTRODUCTION

Sustainable buildings also know as Green buildings is refer to an infrastructure situated in a perfect geographical location, use of eco friendly & low embodied energy materials, low maintenance, energy efficient, less environmental impact on demolition & environmentally responsible for healthy occupant with indoor quality.

A green building enhances the conservation of dwindling conventional energy source. Their construction also promotes a healthier life to an occupant & the nature by maintaining sustainable environmental condition, which can cause the significant change in the global climate.

Also they consumes less natural resources, generates less wastes which creates space for a hygienic environment.

1.1 Need of Green Buildings

Ordinary buildings consumes about 30-40% of total energy during their construction period & the Major energy is consumed during its lifetime i.e. by house lighting, building heating (in cold zones), building cooling (in hot zone)….. Etc

This above energy is extracted only by means of conventional energy sources which not only creates environmental pollution but also affects on occupant life.

In order to minimize the use of such energy for the above purpose green buildings are preferred, which are future responsible.

1.2 Objectives of green buildings

- ✓ Energy efficient environment.
- ✓ Eco friendly materials & construction methods.
- ✓ To conserve (or) reduce the rate of usage of conventional sources of energy.
- ✓ Indoor environmental quality.
- ✓ To improve occupant health & their productivity, comfort.
- ✓ Reducing pollution & less landfill waste.

2. PRACTISES IN GREEN BUILDINGS

The following are some major practices that are carried out in a green building

- ➢ Geographical location(i.e. Sustainable site)
- ➢ Water resources.
- ➢ Energy efficiency.
- ➢ Eco friendly materials.
- ➢ Indoor environment quality & Hygienic occupant health.

2.1 Geographic Location

Transmission of sunlight though glazing is much important which reduces the building heating cost for the building situated in low-altitude winter sun. This is achieved by passive solar heating at perfect geographical location.

The maximum solar radiation is found at the equator; therefore it is advisable that building should be elongated in east-west direction. Building located in northern hemisphere should have a large window opening though glazing in which the walls should face towards south (vice-versa). High coated glazing will prevent UV radiation to enter in the house. The heat is transferred by means of radiation and convention. But during summer sun the covering is made (as shown in figure 1).

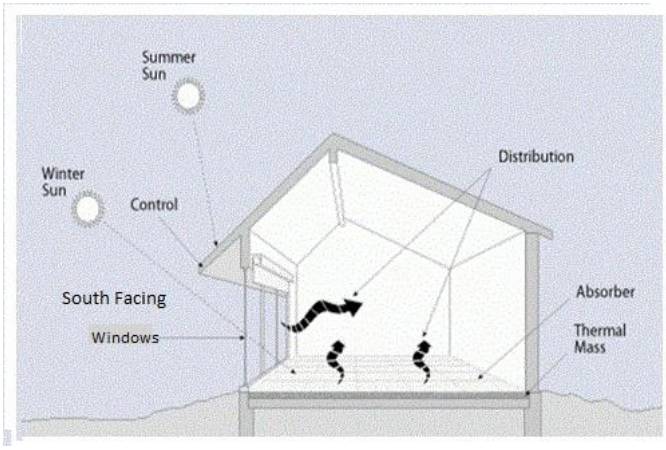


Figure 1

Also at night the thermal storage walls helps in maintaining the temperature. These walls store the heat in the day time and at night due to temperature difference in outside the heat is released inside the building. During which the windows are covered by curtains. Intensive building cooling requires active solar components.

2.2 Water resources

By reducing the use of water, one saves the life of their future i.e. the establishment of rain water catchment (as shown in figure 2). The stored water can be effective use for the sanitary & washing clothes ….etc

Use of water efficient appliances such as low flow showerheads, self closing taps, dual flush toilets…etc can save water.

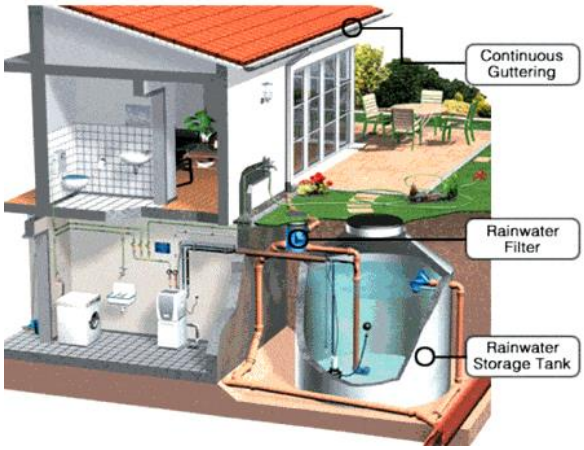


Figure 2

Also by installing grey water system one can reuse the water for the same.

It is advisable to recharge their own ground water table periodically. Hence effective porous flooring has to done in front yard so that water gets infiltrate at high rate.

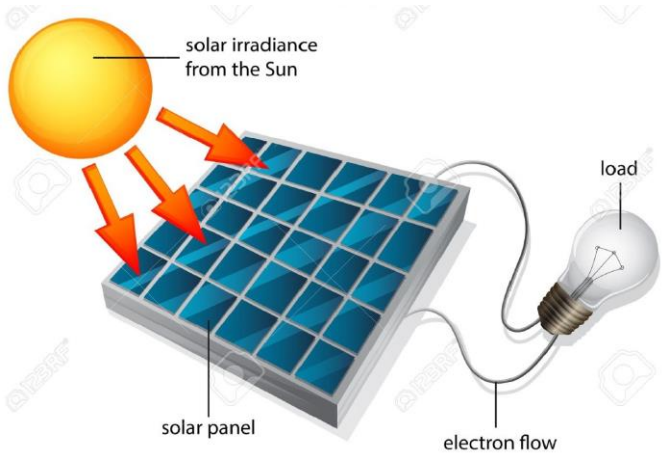
2.3 Energy Efficiency

Use of non conventional sources has to be enhanced in the building in view of depletion of conventional sources. Following are some sources for a common use:

2.3.1 Solar cell (or) Photovoltaic cell

The direct conversion of solar energy into electrical energy is by means of photovoltaic effect in a solar cell. Photovoltaic effect is define as the generation of EMF by absorbing the photon from the solar irradiance (plural of radiation) which releases the electron from the higher orbital of the material, this free electron will flow in crystal lattice system which will generate electricity. In order to have high voltage these cells are grouped in the required No. known as solar module.

The solar power generated in excess in the owner's house is counteracted by means of Bi-directional electric meter. This meter will rotate in one direction while consuming the electricity from government source and it will rotate in opposite direction when excess solar power is generated by solar modules during daytime.



Wind mills are also used as energy efficient component, but it is suitable only for industrials buildings.

2.3.2 Solar cookers

An another energy efficient component which works on solar energy is the solar cooker

Figure 3 shows the schematic representation of working of solar cooker. The solar rays (especially a beam radiation) falls on a parabolic mirror (highly reflective), this converges the radiations at a point.

Now at this point a Black coated cooking platform (simply a black coated cookers) are placed, since the black color is good radiation absorbent.

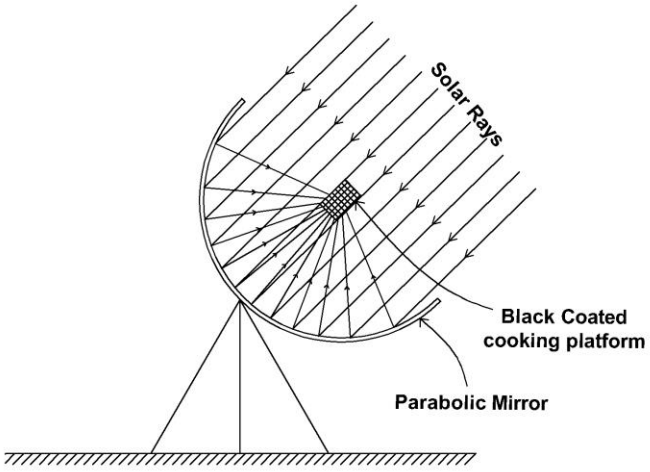


Figure 3

Similarly there are many other active & passive solar components which works on solar energy, such as SOLAR DISTILLATION, SOLAR FURNANCE, SOLAR WATER HEATER, SOLAR PUMPS…… etc

The main drawback of these solar components is their efficiency is quite less.

2.4 Eco friendly Materials

Materials obtain naturally (or) from renewable source in a sustainable way, which can cause less environmental impact. These materials can be used for construction of green building, also it should be noted that the site of these materials should be within the region so the cost of transportation is less & hence it will increase the country's economy

These materials are subjected to life cycle analysis (LCA) for their durability, less waste generation, reusable, non toxic recycle

E.g.: 1) Natural fiber carpet made up of jute felt
2) Ceramic tiles
3) Linoleum is a alternative to vinyl with no VOC

2.5 Indoor Quality Environment

Indoor quality environment is a mixture of air we breathe, the lighting from sun, the noise level produced, even the electromagnetic field produce by electric power consuming devices

The basic building materials used should be non toxic, also Solar refrigerator should be used as active component which reduces the use of CFC (chloro-fluoro carbon) which in turn reduces the green house gases, reduces the Ozone layer depletion & also reduces the rate of asthma.

The above provisions will leads to a healthier Occupant life. The provision of lighting by sun will increase in consumption of vitamin D, which will increase their productivity and comfort

3. GREEN BUILDING RATING SYSTEM

There are three primary system of rating in INDIA

1. GRIHA
2. IGBC
3. BEE

3.1 Green Rating for Integrated Habitat Assessment (GRIHA)

Green Rating for Integrated Habitat Assessment (GRIHA) is India's own rating system for a green building jointly developed by the Ministry of New and Renewable Energy, Government of India and TERI (The Energy and Resources Institute). It is a design evaluation system where ratings are given in a three-tier process. The process initiates with the online submission of documents as per the prescribed format and fees and then by the site visit and evaluation of the building by a team of professionals and experts from GRIHA Secretariat. GRIHA rating system consists of 34 criteria categorized in four different sections. They are

(1) Site selection and site planning.

(2) Conservation and efficient utilization of resources.

(3) Building operation and maintenance.

(4) Innovation.

Commonwealth Games Village, New Delhi, Fortis Hospital, New Delhi, CESE (Centre for Environmental Sciences & Engineering) Bldg, IIT Kanpur, Suzlon One Earth, Pune and many other buildings has received GRIHA rating

3.2 Indian Green Building Council (IGBC)

The Leadership in Energy & Environmental Design (LEED) is the rating system given to Green Buildings. LEED is developed by the U.S. Green Building Council (USGBC), the organization initiating sustainability in an environment through Green Buildings. LEED has a framework for assessing building performance against their design criteria (as shown in figure 4).

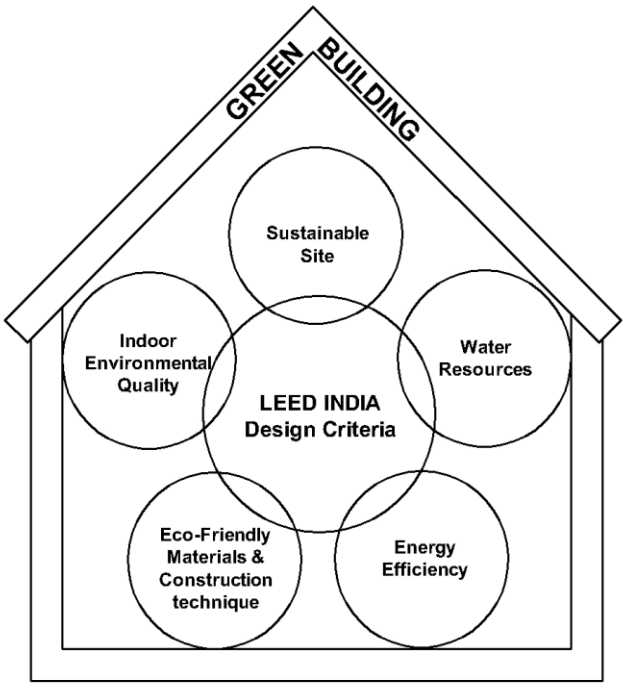


Figure-4

The benchmarks for the LEED Green Building Rating System were developed in year 2000 and are currently available for new and existing constructions.

3.3 Bureau of Energy Efficiency (BEE)

As the electrical goods are rated with the energy efficiency stars on scale from 1 to 5. Similarly green buildings are rated on the basis of their energy efficiency by the BEE. Higher the no. of stars higher is the efficiency of the building and less environmental impact. BEE has special energy performance index (EPI) which consider the rating of building in the units of kilo watt hour per square meter per year.

4. ANCIENT INDIAN SCENARIO ON GREEN BUILDING

Indian history has constructed many green buildings. Each civilization has their own unique techniques in the construction of monuments like mosque, temple, churches, forts, palaces…etc

Some of them are double stone walls, red mud blocks to keep building cooler inside; higher storey height will lift the warmer air up and cooler air down; also the some of the monuments are surrounded by water bodies (or) constructed at the bank of river so as to incorporate cool breeze in them

The above mention techniques are just common, in reality Each historical monument has got its own unique special techniques which are quite brilliant in their own

5. CONCLUSIONS

According to my knowledge this article has brought me to the conclusion that green building will maximize the energy saving & minimize the environmental impact in all aspects and hence I conclude that a strict bylaws has to be enforced especially in urban areas which promotes the construction of these buildings incorporated with green features.

REFERENCES

[1] G.D Rai "NON-CONVENTIONAL ENERGY SOURCES" Khanna publishers-2015

[2] Vinutha Bai N "ENERGY EFFICIENT AND GREEN TECHNOLOGY CONCEPTS" Vol:03, special issue:06 may-2016 (IRJET)

[3] Mohd Yasir Laeeq " GREEN BUILDING: CONCEPTS AND AWARENESS" Vol:04, Issue:07, July-2017 (IRJET)

[4] Prof. Ghalimath.A.G "GREEN BUILDING" Vol:02, Issue:08, Nov-2015 (IRJET)

[5] Some other INTERNET SOURES.

BIOGRAPHIES

Mohd Aasim Ahmed is a final year student (2017-18), pursing his undergraduate degree from Civil Engg Dept, Poojya Doddappa Appa College of Engineering, Kalaburagi.

Smt. K. M. Girija, M.Tech (Geotechnical Engg) is a Associate Professor from Civil Engg Dept, Poojya Doddappa Appa College of Engineering, Kalaburagi.