

Low Carbon Building

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Abstract – India is developing country with amazing rate of economic development. In the last decade the most of the development in real estate is focused in an around the major cities. The rate of development in major cities is alarming and in many cases it is of haphazard nature and now developed as hubs for various service industries. No doubt this development is important and is contributing to economic growth of our country. However this has led to rapid urbanization around some chosen nuclei, which is creating pressure on urban infrastructure and deteriorating quality of services in urban areas. The industrialization due to globalization caused the real estate development in metros, which is really at its peak. Increasing urbanization and industrialization has given boost to construction industry in general and number of bungalows, apartments, commercials complexes, skyscrapers and many other structures including industrial building, dams, and roads are coming up at rapid rate. Most of structures are designed by architects and engineers with innovative concepts and enhanced features. However, it is observed that in many cases, environmental aspects are ignored leading to uncomfortable habitat and increased maintenance requirements causing threat to environment. Low carbon content building is one of key solution to overcome such environmental problem caused by amazing real estate development Low carbon home is nothing but a technique Sustainable Building in which attempt is made for reducing emission of carbon by using low carbon emission materials and low carbon emission techniques for construction. In other words low carbon buildings are the buildings which release very low or little or no carbon during their lifetime.

Which may ultimately prove to be dangerous to human life as well as environment, hence it is needed to find solution to overcome this environmental problem due to rapid construction. Low carbon content building technique is come in flash to minimize the hazards of rapid constructions.

2 Sustainable Development-

Sustainability can be defined as the continued ability of a society, an ecosystem, or any such interactive system to function without exhausting key resources and without adversely affecting the environment. Sustainable development also defined in technical terms as a development path along which the maximization of human well-being for today's generations does not lead to declines in future well-being. Fig No1 show aspects of sustainable design. In short a sustainable building/habitat is one that is economically viable, environmentally benign, and socially acceptable

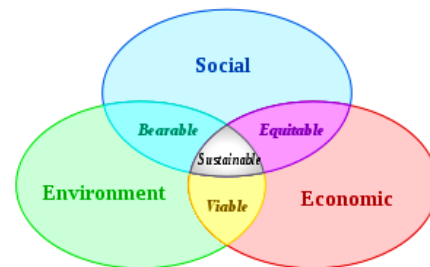


Fig. 1 Sustainable Development

Key Words: Carbon Emissions, Sustainable Development, Emission Factor, Low Carbon Building

1. INTRODUCTION

India is developing country with amazing rate of economic development. Increasing urbanization and industrialization has given boost to construction industry in general and number of bungalows, apartments, commercials complexes, skyscrapers and many other structures including industrial building, dams, and roads are coming up at rapid rate. Most of structures are designed by architects and engineers with innovative concepts and enhanced features. However, it is observed that in many cases, environmental aspects are ignored leading to uncomfortable habitat and increased maintenance requirements causing threat to environment.

2.1 Principles of Sustainable Development In Building Design:-

- ✓ Optimize site/ exiting structures potential.
- ✓ Optimize energy use.
- ✓ Protect and conserve water.
- ✓ Use environmentally preferable materials/products.
- ✓ Enhance indoor environmentally quality.
- ✓ Optimize operational and maintenance practices.

2. Carbon Footprints

Carbon footprint' has become a widely used term and concept in the public debate on responsibility and abatement action against the threat of global climate

change. It had a tremendous increase in public appearance over the last few months and years and is now a buzzword widely used across the media, the government and in the business World. A carbon footprint is a measure of the impact our activities have on the environment, and in particular climate change. The carbon footprint is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product. This includes activities like burning fossil fuels for electricity, heating, manufacturing building materials, transportation of this material to the site, building renovation and deconstruction etc.

2.1 Building and Climate Change

Energy consumption in Indian buildings is expected to increase substantially due to economic growth, construction growth and human development. The demand for energy to run appliances such as TVs, air conditioning and heating units, refrigerators and mobile phone chargers will increase substantially as living standards rise in India. Also the growth in commercial sector and the shift from rural to urban living will continue to take place. This will result in a substantial increase in resultant emissions from the buildings sector alone and need concrete efforts to bring down the energy consumption by buildings through various measures. The carbon is released in the atmosphere during following stages of building life.

- ✓ Building Construction / renovation.
- ✓ Building Operation.
- ✓ Building Deconstruction.

Hence the lifetime carbon emission of building E_{Lt} is the some of its emission from construction, operation, and deconstruction.

$$E_{Lt} = E_c + E_o + E_d$$

Where;

E_c = Construction emission (Including renovation)

E_o = Operation emission

E_d = Deconstruction emission.

3 Low Carbon Building

Low carbon building is nothing but it is one of technique of Sustainable Building in which attempt is

made for reducing emission of carbon by using low carbon emission materials and low carbon emission techniques for construction or low carbon content building. Fig 2 gives idea about low carbon content building or low carbon building.

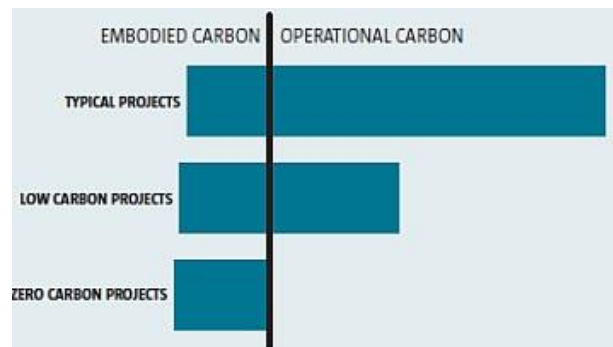


Fig. 2 Low Carbon Building.

The concept of low carbon building is still relatively new to world. In low carbon building main aim is to reduce GHG emission from building construction to building operation to building deconstruction. Based upon the % of reduction of GHG emission through building compared to baseline building low carbon content building is classified as below. Fig 3 show classification of Low Carbon Building

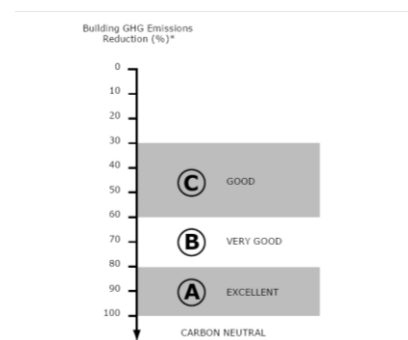


Fig- 3 Classification of Low Carbon Building

The total amount of carbon emission associated with the building construction are calculated as follows

$$E_c = \sum E_{mat} + \sum E_{trans} + \sum E_{site} + \sum E_{waste}$$

Where;

E_{mat} = Emission from material / product manufacturing.

E_{trans} = Emission from material / product transport.

E_{site} = Emission from site works.

E_{waste} = Emission from construction waste treatment.

Further, with for each building construction material / product

$$E_{mat} = Q_{mat} \times EF_{mat}$$

Where;

Q_{mat} = Quantity of building construction material / product.

EF_{mat} = Emission Factor associated with material / product manufacturing.

Total amount of carbon emission associated with the building operation are calculated as below

$$E_{o-a} = E_{ele-a}$$

Where;

E_{o-a} = Emission related to annual electricity consumption.

With for electricity,

$$E_{ele-a} = C_{ele-a} \times EF_{grid}$$

Where;

C_{ele-a} = Annual electricity consumption.

EF_{grid} = Carbon emission factor associated with electricity production and distribution.

The total lifetime cycle carbon emission E_o associated with the building operation can be quickly calculated as follows

$$E_o = E_{o-a} \times Lt.$$

Destruction carbon is nothing but the amount of carbon created at the end of the building lifespan looking at removing each material and product. This could be demolition, disposal and preparation of the land for the next construction OR deconstruction and dismantling for salvage, recycling, reuse and reclaim incineration of demolition wastes, decomposition in landfills.

3. Techniques of Low Carbon Building.

- ✓ Choose recycled materials for the building construction.
- ✓ Sources Local Material.
- ✓ Proper Site Selection.
- ✓ Construction of cool roof Cool Roof.
- ✓ Day-lighting.

- ✓ Wind Towers.
- ✓ Building integrated PV system.
- ✓ Wind Mills.
- ✓ Carbon Offset

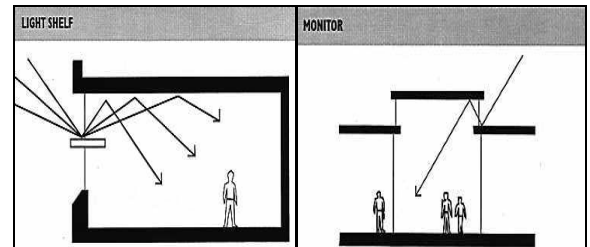


Fig4- Day Light Systems

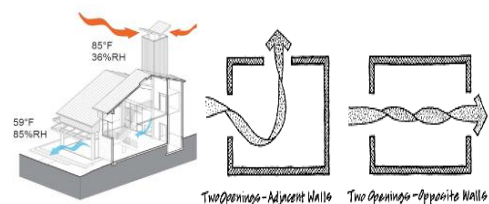


Fig- 5 Wind Towers and cross ventilation



Fig- 6 Wind Mills

4. CONCLUSIONS

“Low Carbon Building” not only helps in increasing efficiency of building but also helps in reducing carbon emission which is main cause for climate change and related environmental problem. Hence to protect future of next generation we should pro-active in this global issue. It can be finally concluded that “Low Carbon Building is Building Today for Tomorrow

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