

A Study On Eco Friendly Structure

M. Parthasarathi, PG Scholar

Abstract

Global warming is a serious problem facing the world today as well the world in the future. In order to stop or reverse this problem, society must change, learning to alter what they use in order to be less harmful to the environment. Making buildings “Green” would greatly impact this problem. There are many ways for this to be done and more ways are being developed rapidly. As these new developments arise, the cost reward for green building becomes more logical for the consumer. The Global warming is the effects of climate change are felled across the world both government and individuals are beginning to take task of building greenhouses much more seriously. Green building is an opportunity to use the resources efficiently while creating healthier building that improve human health, build better environmental problems.

Key Words: Green building, low carbon building, greenhouse effect, Eco-friendly construction.

Introduction

Green building concept deals with the optimum use of natural resources for the development beneficial or non-harmful to the environment. In other words, green building is a building which utilizes very less amount of manmade energy and is capable of producing ample amount of energy without causing any harm to the environment. The term ‘Green’ environmentally friendly from building to the landscaping choices it also. It also encompasses energy use, water use, and storm water and wastewater reuse. Similarly use of recycled plastic, recycled aggregates and wastes for the construction. And another method of construction of low

carbon building which uses sustainable materials like blended cement, fly ash bricks, low energy intensity floor and roofing system, mud blocks etc.

Scope of Green Building

The Green building concept is catching up fast globally, and in India too. A Green Building is one, which in the process of constructing a building, uses renewable materials, saves money on light bills, gas bills and water bills. This method can include using all natural materials but for the most part, it pertains to saving environment and costs. It is a reflection of the growing concern for environment and energy, and the awareness that huge consumption also leads to huge depletion of resources.

More and more people are becoming aware of this fact and the concept of Green Building is here to stay and it should be encouraged and promoted for the betterment of the society. Our experiences of the recently constructed green buildings have been very encouraging. It reduces the energy consumption of a building, thus reducing CO₂ and global warming to help the climate change. It is also cost effective and is being implemented worldwide. The markets have transformed in the last 10 years. Building-owners, developers, architects and consultants see a value proposition in designing green. Green design is turning out to be a niche area for developers. During the next few years' green buildings are well poised to grow at 50-60 per cent annually. Owners and occupants are now demanding green buildings from architects, designers and consultants. There is an increased need for green building materials and products in the industry.

Emerging Trends in the Sector

Green buildings have always been part of the Indian ethos. The large-scale adoption today comes naturally for Indian designers and architects. The only change, perhaps, that we are seeing today is the need to blend our traditional wisdom with contemporary technologies and practices. This can largely be attributed to the changes in lifestyle and general increase in economic affordability of the people.

Engineering & Technology in India www.engineeringandtechnologyinindia.com

ISSN 2472-8640 1:5 December 2016

Dr. C. Swarnalatha, Ph.D. (Ed.) Entrepreneurship and Management:

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Building Awareness

Awareness on the green building concept was sporadic during initial stages. With the educational and training programmes conducted by IGBC, now we have excellent professionals deeply involved in this.

Availability of Materials

The green building movement has enabled a wonderful market transformation in the country. Most of the materials are today available within the country. However, we need more manufacturers involved in green building materials. The market potential for green building materials & equipment by the year 2012 is expected to be US\$ 40 billion.

Cost of Green Buildings

At initial stages the incremental cost has been experienced between 12-18 percent and now we can observe that the incremental cost has been reduced to 5-8 per cent. Further, we are aiming at green buildings becoming less costly than conventional buildings thus making them affordable for the common man.

Benefits of Green Buildings

With new technologies constantly being developed to complement current practices in creating greener structures, the benefits of green building can range from environmental to economic to social. By adopting greener practices, we can take maximum advantage of environmental and economic performance. Green construction methods when integrated while design and construction provide most significant benefits. Benefits of green building include:

Environmental Benefits

- Reduce wastage of water
- Conserve natural resources
- Improve air and water quality

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- Protect biodiversity and ecosystems

Economic Benefits

- Reduce operating costs
- Improve occupant productivity
- Create market for green product and services

Social Benefits

- Improve quality of life
- Minimize strain on local infrastructure
- Improve occupant health and comfort

1 Design

- The single most important green design decision is size. Smaller houses automatically consume fewer resources both during construction and after occupation. "Houses should be sized to work for you every day," says Sarah Susanka, architect and author of *The Not So Big House*. Susanka further suggests that we stick to basic shapes. "Simpler forms lose less energy because the ratio of exterior surface area to volume is smaller. Every projection from a house is like a cooling fin."
- Solar orientation is the most important design element. Heating and cooling loads in a home could be cut significantly by orienting the long walls of houses east-west, exposing south facing windows in winter, and shading them in summer, and avoiding expanses of glass on west-facing walls that get the full brunt of the flat afternoon sun.
- Even in lots where the street dictates layout of the home, there are still steps you can take. You can reverse plans to place the garage on the west side of a house. Porches and broad roof overhangs can shade south and west facing windows. Plant, or don't cut down in the first place, trees that shade the west side of a house."

2 Durability

- What's the key to durability? Water is probably public enemy one, two, three, and four. Uncontrolled water rots homes, peels paint, and causes mold.
- Moisture control is a huge focus of building science–inspired components like generous overhangs, proper window and door flashings, and rain-screen walls that allow siding to dry, improve paint durability, and avoid water wicking. Normal construction details assume greater importance.
- Controlling air and moisture leakage from inside to out not only saves energy, but also can prevent damaging condensation from forming in framing cavities. The use of vapor barriers in cold climates is an important moisture control element.
- Attention to detail is another key. We must follow a careful step-by-step flashing, sealing, and installation sequence to ensure proper performance over the life of the building.
- Other details can be as basic as properly installing house wrap or builder's felt as a secondary weather barrier, so that water that gets in behind the siding was directed out again.

3 Energy Efficiency

- Insulation is a job that needs careful detailing. From a green perspective, this is very important. And air sealing—filling the holes where inside air can leak out or outside air can leak in—is at least as important as insulation, because no insulation can achieve its potential if air can leak through it. Air infiltration must be kept as low as possible.
- It's vital to eliminate areas that allow inside air access to the thermal envelope, including areas behind bathtubs, showers, and kitchen soffits. These areas should be closed off from

the wall behind them with an air and moisture barrier. Recessed ceiling lights are another source of leakage. New models are available that are air sealed to help control infiltration.

- While you're thinking about HVAC equipment, don't neglect the ducts. Don't run any ducts in unconditioned spaces. Normal air conditioning duct leakage can be 20 percent. If those ducts are in unconditioned spaces, \$20 of every \$100 paid for air conditioning is wasted. The importance of properly sealing ducts is easy to see in that light. If you do an outstanding job of air sealing and insulation, you might qualify for rebates through your state's Energy Star program.
- Fluorescent lighting gives you more light for your energy dollar, (compared to incandescent or halogen), and they also produce less heat than incandescent and halogens and can save significantly on cooling loads. Fluorescent lights don't necessarily give off a sickly green light anymore, either. Commonly available lamps with a color temperature of 2,600 to 2,800 kelvin give off light that's nearly indistinguishable from a cool white incandescent bulb.
- Supplying Energy Star-rated appliances is another simple way to cut down energy use. Similar Energy Star-rated appliances can vary in actual consumption, so go one step further and compare annual energy use printed on each appliance's label.

4 Waste Reduction

- If ever there was a green building strategy that's a no-brainer, waste reduction is it. A simple expedient is to design in 2-foot modules to use materials most efficiently. Optimum Value Engineering is an approach to framing that questions the use of every stick of lumber to optimize materials use. For example, most openings don't require double 2x12 headers for structural purposes. If a double 2x12 can be replaced with a single member, it will save lumber and create space to add insulation.

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- Recycling is another simple approach. Cardboard and metal are easy to recycle. Not only does this keep material out of the landfill, but recycling saves some of the cost of buying new, and saves the cost of a Dumpster.

5 Indoor Air Quality

- If there's a downside to air sealing, it's the potential to trap pollutants inside. Typical indoor pollutants include formaldehyde (off-gassing from OSB, most forms of particle board, and some carpet and their glues), volatile organic compounds (VOCs) (solvents from paints, finishes, automotive products, etc.), combustion by-products such as carbon monoxide (from gas stoves and any improperly vented fuel-burning appliance), and excessive moisture.
- There are two approaches to improving indoor air quality (IAQ). The first is reducing the use of products that off-gas. Use plywood floor sheathing, which off-gasses less formaldehyde than OSB. Detached garages separate exhausts, fuel, and pesticide storage from living spaces. Providing dedicated combustion air for furnaces, boilers, and water heaters can prevent back-drafting stack gasses into the house.
- Proper ventilation, the second approach, is as important as reducing sources. Using heat recovery ventilators (HRVs) in northern climates, brings fresh outside air in, while exhausting stale inside air. The two air streams pass each other in the ventilator's heat exchanger, with the outgoing indoor air tempering the incoming outdoor air. An added benefit is that in the winter an HRV ventilates the house and retains some indoor humidity. It exhausts air from bathrooms, and laundry and kitchen areas, and directs the tempered incoming fresh air into the living areas and bedrooms.

6 Water Conservation

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- Many of us remember the inadequate flushing and frequent clogs from the federally mandated change to 1.6-gallons-per-flush toilets in the 1980s. But that has changed, and low-consumption toilets perform very well today.
- Water issues also include managing storm water runoff to maintain natural ground percolation that recharges aquifers, as well as preventing siltation of waterways. It's often possible to reduce the storm sewer infrastructure by increasing the ability of individual home sites to absorb storm flows. Techniques include draining roof runoff to absorption fields and the use of pervious concrete pavers on driveways. This approach may even ease the path through local land-use boards by showing that you're doing the right thing.

7 Green Products

- Simply choosing one product over another is the easiest, yet the least important path to going green. Look for swaps that take something not as green and replace it with something greener that requires no changes in worker skills. Examples include specifying concrete that incorporates fly ash (a waste product from coal-burning power plants) as a partial substitute for Portland cement. Another example is using bamboo flooring, which regenerates quickly, instead of wood species that are not as sustainable.
- Look for Forest Stewardship Council certified lumber and low-VOC paints. Although low-VOC paints cost a little more, the major brands all include a mildewcide, which makes them an easy sell.
- Prefab foundation panels are one possible swap. Not only does a Superior Wall foundation go up in a day, it's waterproof, it requires no concrete footer, and it's insulated. Elk's reflective roof shingles are another, which use a 3M mineral coating that reflects about 25 percent of unwanted solar radiation versus other shingles.
- **Fundamental Green Building Materials**

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Resource Efficiency can be accomplished by utilizing materials that meet the following criteria:

- **Recycled Content:** Products with identifiable recycled content, including postindustrial content with a preference for postconsumer content.
- **Natural, plentiful or renewable:** Materials harvested from sustainably managed sources and preferably have an independent certification (e.g., certified wood) and are certified by an independent third party.
- **Resource efficient manufacturing process:** Products manufactured with resource-efficient processes including reducing energy consumption, minimizing waste (recycled, recyclable and or source reduced product packaging), and reducing greenhouse gases.
- **Locally available:** Building materials, components, and systems found locally or regionally saving energy and resources in transportation to the project site.
- **Salvaged, refurbished, or remanufactured:** Includes saving a material from disposal and renovating, repairing, restoring, or generally improving the appearance, performance, quality, functionality, or value of a product.
- **Reusable or recyclable:** Select materials that can be easily dismantled and reused or recycled at the end of their useful life.
- **Recycled or recyclable product packaging:** Products enclosed in recycled content or recyclable packaging.
- **Durable:** Materials that are longer lasting or are comparable to conventional products with long life expectancies.

Indoor Air Quality (IAQ) is enhanced by utilizing materials that meet the following criteria:

- **Low or non-toxic:** Materials that emit few or no carcinogens, reproductive toxicants, or irritants as demonstrated by the manufacturer through appropriate testing.
- **Minimal chemical emissions:** Products that have minimal emissions of Volatile Organic Compounds (VOCs). Products that also maximize resource and energy efficiency while reducing chemical emissions.
- **Low-VOC assembly:** Materials installed with minimal VOC-producing compounds, or no-VOC mechanical attachment methods and minimal hazards.

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- **Moisture resistant:** Products and systems that resist moisture or inhibit the growth of biological contaminants in buildings.
- **Healthfully maintained:** Materials, components, and systems that require only simple, non-toxic, or low-VOC methods of cleaning.
- **Systems or equipment:** Products that promote healthy IAQ by identifying indoor air pollutants or enhancing the air quality.

Energy Efficiency can be maximized by utilizing materials and systems that meet the following criteria:

- Materials, components, and systems that help reduce energy consumption in buildings and facilities. (See [Green Building Basics](#) for more information.)

Water Conservation can be obtained by utilizing materials and systems that meet the following criteria:

- Products and systems that help reduce water consumption in buildings and conserve water in landscaped areas. (See [Green Building Basics](#) for more information.)

Affordability can be considered when building product life-cycle costs are comparable to conventional materials or as a whole, are within a project-defined percentage of the overall budget. (See [Environmental and Economic Assessment Tools](#) for links to resources.)



Three Basic Steps of Product Selection

Product selection can begin after the establishment of project-specific environmental goals. The environmental assessment process for building products involves three basic steps (Froeschle, 1999).

- Research
- Evaluation
- Selection

1. Research

This step involves gathering all technical information to be evaluated, including manufacturers' information such as Material Safety Data Sheets (MSDS), Indoor Air Quality (IAQ) test data, product warranties, source material characteristics, recycled content data,

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environmental statements, and durability information. In addition, this step may involve researching other environmental issues, building codes, government regulations, building industry articles, model green building product specifications, and other sources of product data. Research helps identify the full range of the project's building material options.

2. Evaluation

This step involves confirmation of the technical information, as well as filling in information gaps. For example, the evaluator may request product certifications from manufacturers to help sort out possible exaggerated environmental product claims. Evaluation and assessment is relatively simple when comparing similar types of building materials using the environmental criteria. For example, a recycled content assessment between various manufacturers of medium density fibre board is a relatively straightforward "apples to apples" comparison. However, the evaluation process is more complex when comparing different products with the same function. Then it may become necessary to process both descriptive and quantitative forms of data.

A life cycle assessment (LCA) is an evaluation of the relative "greenness" of building materials and products. LCA addresses the impacts of a product through all of its life stages. Although rather simple in principle, this approach has been difficult and expensive in actual practice (although that appears to be changing).

One tool that uses the LCA methodology is BEES (**B**uilding for **E**nvironmental and **E**conomic Sustainability) software. It allows users to balance the environmental and economic performance of building products. The software was developed by the National Institute of Standards and Technology's Building and Fire Research Laboratory and can be downloaded free on their Web site.

3. Selection

This step often involves the use of an evaluation matrix for scoring the project-specific environmental criteria. The total score of each product evaluation will indicate the product with

the highest environmental attributes. Individual criteria included in the rating system can be weighted to accommodate project-specific goals and objectives.

Green Global

- Environmental impacts assessed on a 1,000-point scale in multiple categories:
 - Energy
 - Indoor Environment
 - Site
 - Water
 - Resources
 - Emissions
 - Project/Environmental Management
- After achieving a threshold of at least 35% of the total number of 1,000 points, new and existing commercial buildings can be certified for their environmental achievements and sustainability by pursuing Green Globes certification that assigns a rating of one to four globes
- Two Categories
- New Construction
- Continual Improvement of Existing Buildings
- New Construction – 2 Stages
- Stage I -- review of construction documents, working drawings, landscape designs, energy analysis, LCA documentation, commissioning reports, etc.
- Stage II -- onsite walk through, review of additional documentation, and interview of key team members
- Continual Improvement of Existing Buildings
- extensive documentation review and an on-site visit with a walk through and interview of facility manager and chief engineer

Conclusion

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We are living at a time when the earth is constantly being subjected to UV rays, global warming, and high level of pollution. The disaster is the unhealthy condition in our living. The environment of Raipur city is also very hot in summer as compared to other cities due to the major problem of global warming, greenhouse effect and uncertainty in climatic behavior which is affecting the human beings vastly. So this green building approach as discussed will prove to be very beneficial giving effective result to reduce the extreme heat during the summer thus reducing energy consumption making the building sustainable providing the comfort level for the residents

A green building with water harvesting system utilize the natural energy to reduce temperature and increase ground water level hence it saves the additional cost required for mechanical means to reduce temperature. Its advantage can be summarized as stated below: It will absorb CO₂ from atmosphere and reduces the greenhouse effect. The plantation will also give pleasant look to the building and surrounding areas. The collective effective of several buildings with green roof can reduce the —Heat island effect in urban areas, improve the air quality and reduce the dust and other airborne particles.

By providing green roofs, insulated cavity walls and tiles on the outer face of the wall, we will reduce the indoor temperature about 50C to 70C. The rain water harvesting system will increase the ground water level which will be utilized in the period of demand. A green building with water harvesting system utilize the natural energy to reduce temperature and increase ground water level hence it will save the additional cost required for mechanical means to reduce temperature. Tiles on the outer face of the wall will reflect sun rays therefore reduce indoor temperature of building. By the provision of tiles on the wall, we will reduce yearly painting or distempering charges of the wall. Tiles protect the wall from the seepage during heavy rainfall. Though the concept of Green Homes in India is new, yet it will help us to put the first step forward in preservation of the earth's natural resources and cutting down on energy consumption and its cost.

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ISSN 2472-8640 1:5 December 2016

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