

## **The Green Building Design Principle and Practice Model for Bangladesh**

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### **Abstract**

The green is the sense about a multilateral approach to save earth and ourselves and also finding a balance between sustenance and architecture. The building thermal comfort can be realized through building envelope design related to green building design concepts. The design concept aim is to reduce the heat gain and minimize the cooling load for the mechanical air-conditioning, it is one of the primary focuses in the building energy policy now a days. The objective is to develop green building design principle and sustainable design model for bangladesh. Imperial analytical studies have been done for green building design concept develop for warm humid climate in Bangladesh. The result of this study give a guide line for green building design for bangladesh. This study conclude that proper design of green building can minimize the cooling load for residential building in Bangladesh.

**Keywords:** *green building, design principle, model, environment, Bangladesh*

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### **1. Introduction**

Mother Nature is unity and it has a deep significance within our present realm of reality in life. The green is the sense about a multilateral approach to save earth and ourselves and also finding a balance between sustenance and architecture. Architecture presents a significant challenge for the natural environment. Roodman and lenssen (1995) claim, for instance, that buildings account for 16 per cent of the world's water use, 20 per cent of its wood harvest and 40 per cent of its material and energy flows. The phrase is 'architecture as pedagogy' to describe the concept that we learn from buildings, not just in them. Similarly, W.J. Rohwedder (2003) extends this idea to describe 'pedagogy of place' (Kathryn, 2005).

Buildings have a major impact upon the world's resources and upon the health of people who occupy them. Green buildings are designed specifically to reduce the level of resources consumed, whether energy, raw materials or water. In the process of using less finite resources and more renewable ones, development becomes healthier and more user-friendly (Brian, 1998). 'Green architecture' has come to represent the holistic concern for a broad array of environmental topics in architecture, from energy efficiency and indoor air quality to resource conservation and land use planning, and from an accounting for the environmental impacts of raw materials acquisition through to the life of a

building and beyond. Broadly stated, 'green architecture' seeks to design for the health of both the individual and the planet. This rubric suggests the close identification of 'safe' and 'green' agendas (Jim, 2005). Green building in Dhaka with regards to all aspect of physical and social solution as well as ideological practice is very rare. A principle concern of this research is exploring the model green building as case study documented. Designer will develop the challenge of sustainability is more a matter local interpretation than of the setting of objective or universal goals. The project aim is not to provide particular technique that might convince people to think differently about natural ecosystem or adopt some climate responsive feature and form of best practice. The green building concept contributions begin a few cultural attitudes which have been more or less successful in creating new form of architecture with in dense Dhaka city towards more sustainable future. This paper will give a guideline about the construction of multiple natures and eco-architecture in warm humid climate of Bangladesh.

### **2. Green Building Design Guiding Principle**

The role of the brief is crucial if sustainable design is to become commonplace. One reason why so many buildings perform badly from an environmental point of view is over specification. Air-conditioning is specified in the brief yet users do not want it. High-technology air-sealed facades are

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employed where natural cross ventilation is the better option. Open planning buildings are designed to provide greater flexibility and user comfort. To combat this problem the Energy Efficiency building at dense Dhaka city where only 5% green area is exists now a day has issued the following guiding principles for the energy-efficient sustainable green building. For the green building design needs to reduce energy loads wherever possible, creating a comfortable, healthy indoor environment. The building should be designed with climate responsive feature, energy input as efficiently as possible and protecting the residents against traffic noise. During designing period the orientation of the building need to be perfect. The building should have proper natural lighting system and proper cross ventilation for control of indoor air pollution. The building must have the green roof as environmental friendly and also heat protection of the top floor. The main focus will be on health and safety during construction and dampness and flood. A system should be making for rain water conservation for watering in garden, flashing etc. the building design will be the simplest solutions that will satisfy the client's requirements and can be managed by the end user of the building. Proper traditional green landscape design on building and surrounding areas and avoidance of over-sized plant with upgradeability provide at design stage (Bill, 1995).

The principles need to address key areas of performance from the design of lighting (especially the effective use of daylight and controls on artificial lighting), visual comfort, psychological wellbeing, health and passive control of the living indoor environment (Rumana, 2009). These guiding principles translate into briefing points, which help in achieving energy and environmentally friendly building of the future (EEBPP, 1995). Points to consider are describe below,

- environmental, social, ecological impact of building with future flexibility for next generation and detail study of user needs or demands according to culture;
- use of innovative design ideas and energy efficiency considered at all stages and optimization of comfort and health standards build ability and replace ability;
- selection of appropriate technologies and local materials and use of easily understood building controls;
- maximum passive environmental control and minimum use of complex AC services and exploitation of natural ventilation as the prime means of cooling;
- exploitation of thermal capacity of structure and use of simple, local techniques rather than unnecessary complexity;
- commissioning appropriate level of specification, on-site/modular/pre-fabricated construction opportunities and use of land with consumption and conservation;
- Training of building occupiers in operation of environmental systems.

The case studies illustrate these and other principles of green building design. The main benefits perceived by developers and owners of green buildings are low cost in use and maintenance terms with higher environmental quality of workplace leading to happier, healthier, more productive of workforce for user. It enhanced company and building image (green building, 1996).

Clearly not all building designs need to address each point, but the briefing checklist allows the right mix of parameters to be established. It is also evident that buildings in contaminated or polluted urban areas will have different sustainable

characteristics from those on the dense city. The parameters also point towards the open-planning concept, natural ventilated and daylight building of the future. Although the checklist of energy, environmental and ecology issues, it is generally true that a building of low-energy consumption is also likely to have reduced impacts elsewhere. The goal was to reduce energy consumption by green building design.

### 2.1. Sustainability Indicators for Green Buildings

Sustainable green building capital cost yet will save lots of money per year in energy bills. Green roof saving the capital costs of air-conditioning leads to a significant reduction in the volume of CO<sub>2</sub> emitted and maintain indoor thermal comfort (Rumana, 2010). The question posed earlier about whether green building pay has both financial and moral dimensions. There is growing evidence from built projects than in monetary terms along green buildings do present a sounder long-term invest than more conventionally designed buildings (Brian, 1998). While financing arguments are important, there is also the need to consider the health, comfort and wellbeing of the building occupants (Rumana, 2009). As sustainability gains greater moral urgency so too, building development is increasingly responding to many pressing environmental issues rather than just a single one (Brian, 1998). The green building design by architect embraces many environmental issues in a holistic fashion. Such significant and measurable advantages are auger well for a new generation of green buildings. Such as move from fossil fuel to renewable energy sources and efficient use of other resources waste minimization for closing cycles and Life-cycle assessment of the project. Air Pollution control through non car accesses, environmental capacity and local sourcing to contrall biodiversity and land-use diversity is essential for healthy, comfortable, safety and security access for all the users. Durability, flexibility social equity and local distinctiveness or richness is driven by environmental factors.

## 3. Result of Case Study

### 3.1 Sustainable Model Building in Dhaka

The case study building differs with respect to environmental, social, cultural and sustainability features. The buildings embody quite contrasting and particular building design responses to the different environmental goals and requirements faced in the case study. Not only do they represent different technical and physical solutions or pathways to the problem of sustainable design, they also have very different approaches to how one should produce sustainable designs, in terms of the design process. This may be partly linked to the way the energy and environmental goals in these different projects have been formulated and the degree to which the building owner played the role of initiator of the environmental aspects in the projects.



Figure 1: Sustainable green building at Dhaka in Bangladesh

The building is often perceived the latest technology. Its environmental goals cover everything from demanding a 'green building' process to quite particular considerations with regard to transportation, handling the building site, data on materials and environmental etc. The energy saving and energy conservation strategies were applied in this project through different point of view. Climate responsive design concept is applied through design of easy airflow, heat recovery and low-emitting building materials etc to achieve sustainability. Proper north-south cross ventilation provide from all spaces to minimize energy used for indoor cooling. Natural forces such as air flow pressers and enough opening for ventilation also influence to reduce cooling load. Enough penetration of daylight is helpful to reduce the consumption of electricity for artificial lighting during day time. Maximum 334 lux luminance is recorded in middle space of the project. Geothermal heat control is successfully done by vertical green landscapes. Green roof works as a thermal insulation of the roof. Hanging vertical green landscape enhances building image and thermal comfort of indoor environment where Green plants are working for indoor air purification from carbon. Alternative building materials, e.g. transparent, environmentally friendly local materials is use in all facades.



Figure 2: Natural lighting condition in model building at Dhaka in Bangladesh

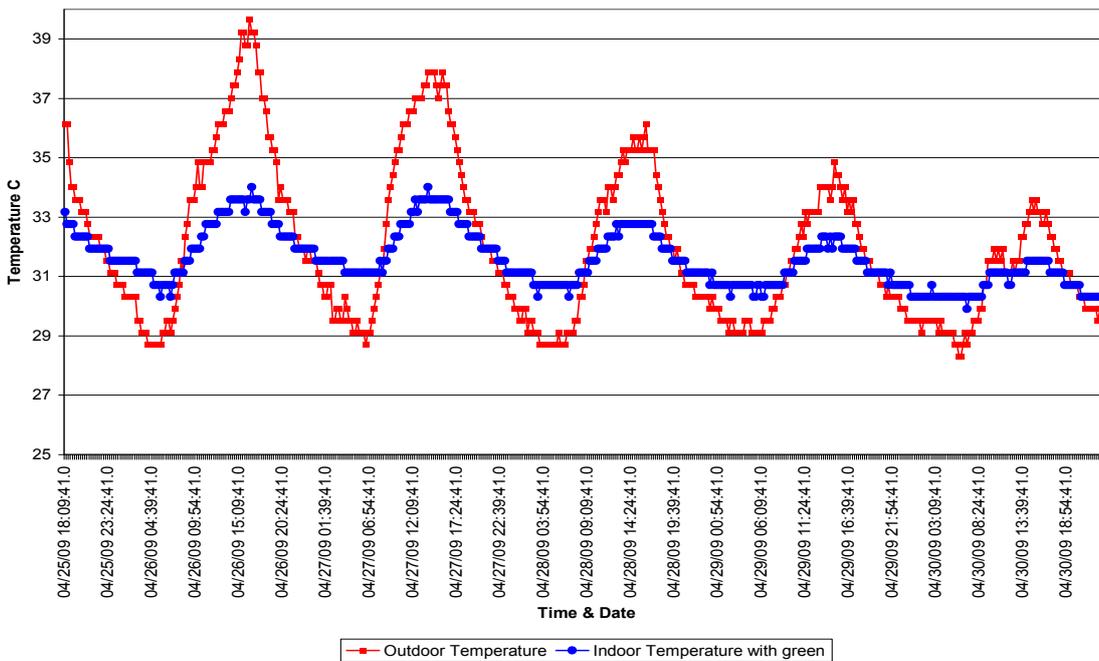


Figure 3: Graph Profile of outdoor and indoor temperature of the selected building.

### 3.2 Environmental analysis of the case study

The thermal performance result of the environmental research on this project concludes that design contributes thermal benefit to both micro climates of indoor environment and surrounding outdoor ambient environment of the building. It contributes to reducing energy consumption for cooling load, mitigating the UHI effect in urban environment and also reduces the effect of global warming by controlling the CO<sub>2</sub> level.

Green application can reduce maximum the indoor air temperature 6.8°C from outdoor during the hottest summer period when outdoor is recorded 39.72°C. comfort zone

analysis for Bangladesh according to Sharma, Ali and Mallick (1995) during the summer season, the comfort temperature range is between 24 °C to 32 °C while relative humidity range is fixed in 50% (lower limit) to 90% (upper limit). According to the graph profile the indoor temperature of the residence shows that maximum hour of the day is stay within comfort temperature range. It is a desirable condition for the resident. Proper night ventilation can reduce more indoor air temperature. So the combination of green landscape and proper ventilation can reduce the indoor temperature almost same to the outdoor temperature. It provides a cooling potential of the thermal comfort in indoor environment of the house which is found to be adequate. Green application and landscape within

the building is as a passive cooling means for architectural design strategy in Bangladesh. Design of the green structure is easy to construction, economical maintenance and replaceable plants for thermal protection. It's provided a very effective solution for the contemporary building in tropical Bangladesh. Peoples are in habituation for present state of affairs being very energy saving, cost efficient for urban resident and an applicable nature responsive eco-systemic well being. This green building design includes economic and social concerns as well as environmental aspects of sustainability.

#### 4. Conclusion

Sustainable green building is not a fixed concept. In this project the combination of human well being issue and technology of ecological solution develop a green building. Ecology is no longer contrast but also a part of comfort and well being of human life. Green building is environmental challenges recourse consumption better than others concept. Therefore it is important that design method have a role in defining the future development of the green building through passive cooling strategy. Green buildings are not necessarily more costly to construct but it will save a lots of money in life cycle. It also leads to enhanced satisfaction by occupants. The natural beauty of the green network in urban environment looking from far away is aesthetically pleasing for residents to immerse. Environmental friendly or sustainable policies were now essential to implement in the high-rise residential building at Dhaka city. Green building design effort for landscape ecological considerations in micro climate of Dhaka city to develop a concept of green Dhaka.

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