Energy Saving in Buildings-case Study: Sos Children's Village, Dehradun

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Abstract: Energy saving or energy efficiency in buildings is a method to design buildings by taking the advantage of natural resources and innovative use of passive solar techniques. Mainly these buildings have high performing controlled ventilation, high efficient heating, lighting and cooling system, high performing building envelop, than a traditional or average contemporary building. Energy efficient buildings are designed to provide a significantly higher standard of energy efficiency than the minimum required by the national building standards.

The prime objective of writing this paper is to increasing the energy efficient building designs which can make a small contribution to reducing energy demand and carbon emissions. Aims also to help to determine the effective low-cost, low maintenance energy efficient designed strategies for the better sustainable architecture. These strategies can be used as guidelines by the Architects to improve design practice because our quality of life and society is linked to the environment.

To understand the energy efficient buildings the case taken into consideration is a SOS Tibetan Children’s Village, Rajpur, Dehradun. The SOS is best example of implementation of energy efficiency building systems, it is built by taking advantages of climatic conditions of a region, simple construction techniques , innovative use of passive solar techniques , appropriate material selection and intelligent landscape planning .

These kinds of studies helps to minimize energy consumption and can be used effectively to produce good architecture which is traditional, low cost as well as eco friendly by taking the advantage of climatic conditions of a Particular region. The SOS Tibetan Children’s Village is an appropriate example to explain energy efficiency in building designs. The analysis will help in catering the demand of energy efficient building, which can be a measure to overcome the dependency on mechanical systems.

Keywords: Passive solar techniques, building envelop, eco friendly, national building standards, innovative.

1. INTRODUCTION

Now- a -day’s energy saving buildings, zero energy buildings, green or sustainable architecture is in demand. The reason for this demand is shelter. Shelter is one of the basic needs of human beings. On one hand shelter provides facilities for human activities and social development on other hand its impact on the environment is very serious. If the buildings are not designed keeping energy efficiency in mind by Architects lot of natural resources can go in vain because demand of buildings increasing day by day and Architect plays major role in design of buildings. Modern buildings which are designed today has serious environment effect. These buildings are built using many industry made common building materials such as bricks, cement, and concrete, steel, plastic and glass etc creates dangerous environmental problems increase carbon monoxide in atmosphere, greenhouse gas emission, global warming, acid rain, ozone layer depletion, shortage of clean water, toxic waste and increasing pollution is directly or indirectly creates health problems.

Therefore the building which is less dependent on energy for their successful operation to overcome dependence on mechanical system; the answer comes directly in mind is energy saving buildings. The energy efficient building manages heating, lighting and cooling effect without compromising comfort or quality of life.

2. STRATEGIES TO REDUCE ENERGY

An architect can achieve energy efficiency in the building by applying architecture related to nature or bioclimatic architecture and taking advantage of the local climatic conditions. Some common design strategies or elements directly or indirectly reduce energy use in buildings. Following are the common ways by which energy can be reduced in building design:

- Landscaping
- Ratio of built and open spaces
- Orientation
- Location of water bodies
- Building envelop
- Controlled ventilation
- Energy efficient doors and windows
- High efficiency heating and cooling system
- Pitched roofs
3. CASE STUDY: SOS CHILDREN'S VILLAGE, DEHRADUN

Figure 1: View of SOS Children’s Village: Source: Author

4. INTRODUCTION ABOUT SOS CHILDREN'S VILLAGE, DEHRADUN

The SOS Tibetan Children's Village, Dehradun is located in the small town of Rajpur in Mussoorie foothills; Dehradun Uttarakhand is one of the best examples of energy saving building in India. The site of SOS measures 14,300 sq.m. And comprising of 15 family cottages, small nursery school, dispensary, community house, residences for the director and co-workers, recreation room and place of worship was inaugurated on 4th of October, 1999. The Central Tibetan Administration aims to build it to protect and promote Tibetan culture. The SOS Tibetan Children's Village Dehradun dedicated to the Tibetan children that provide home and education to 225 children.

The site has a slope towards south, which allows orientation of the cottages. The site comprises of horticulture zone, animal husbandry, and floriculture and crop cultivation with the natural endowment of slopes and the watercourse.

The site has the entrances from the north - west direction from Mussoorie – Dehradun 30’ wide steep road.

Figure 2: Site Plan

5. ARCHITECTURAL ENERGY EFFICIENT DESIGN FEATURES

- The Architecture of the SOS Village is respond to composite climate of DehraDun and its traditional building material.

- The concept of design is based on simple low-cost, low – maintenance construction, environment friendly techniques, design taking the advantage of climatic condition, recycling of water (use of rain water), use of natural forests, air and carefully designed out building envelop.

- The primary strategy is to provide protection from harsh winds from the north-east and to provide solar access.
• The outdoor, used commonly by all the residents, is also designed as a habitable space.
• The planning of the village is based on independent clusters are open from all sides.
• Orientation of building is such that maximize solar access in the winters and ventilation in the summer.
• The planning is based on clusters are open from all sides.
• Homes and their clusters around outdoor living courts are specially designed for the children and their mother’s needs.
• The parking is at the front from the north side DehraDun-Rajpur Road.
• A large number of straight flight of stairs go down, the water drainage are built on both side of steps so that the rain water will runs directly into the plants.
• The winter sun and turn away from the northern wind and face the beautiful valley.
• Combination of steps and ramp.
• A little nursery school at the bottom of the cascad ing steps and amphitheatre for school functions.
• Cleaning, washing, cooking becomes the front of daily living.

6. GENERAL VIEWS FROM ENTERENCE

![Figure 3: Entrance with rain water channels](image)

![Figure 4: Site steep slope towards south & way to school](image)

7. VIEWS OF SCHOOL

Amphitheatre floor finished with low cost building material- pebbles which are non- slippery in rains too. Cascading Steps are facing south so that in winter allows maximum solar access & trees buffers in summers.

Rain Water channels

steps

Rain water channel

POCKETS

Wide steps

Figure 3: Entrance with rain water channels

On both sides:

Figure 4: Site steep slope towards south & way to school

- The toilet block in north-east corner family homes acts as a buffer against cold winter winds.
- Terracotta tiles are used at roofs for insulation.
- Light grey color stone aggregate plaster is used on external faces of walls.
- Windows with double rebate double shutters in houses are provided to reduce infiltrations.
- Bedrooms with solid timber board shutters on inner side for insulation.
- It adopts a careful landscape planning. Landscape planning has been carefully done to provide shelter from cold winter winds and access to winter sun. The planning and plantation schemes are combined.
- The large playground is in a wind-sheltered zone with clear winter sun access, while the existing fruit orchard in the campus doubles as a shaded playground.
- Smaller pockets between buildings, benches under the shelter of trees and low walls to sit or slide on are also planned as places for informal recreation.
8. VIEWS OF OUTDOORSPACES

The outdoor spaces used commonly by all the residents. The large playground is on the clear winter sun side i.e. Southern side, the existing orchards shaded it.
9. VIEWS OF CONNECTED SPACES

Figure 11-13: landscaping in connected areas

10. BUILDINGPLANNING

Figure 14: Buildings are adjusted to terrain and facing south

Figure 15: Front verandah of house facing south function as adjacent outdoor space

Figure 16: Levels are adjusted to receive winter sun from south side
11. BUILDING FABRIC

Building fabric the simple Low-cost construction techniques to improve the thermal performance in building. The Bed Rooms has Double rebate windows. Yellow color timber shutters on the inner side instead of curtains. These are shut during the summer afternoon and winter nights. The terracotta tile cladding improves the thermal dampening of the roof. The external walls are finished with light grey colored stone aggregate plaster. They reduce the temperature of the wall.
12. CONCLUSION

In the end, while design, type, cost, uses and style of building differs but the energy efficient buildings have some common ways which can be used in any type of building. Increasing windows or openings area as per the climate and the solar path (Preferably openings towards the south) of the region. Properly designed overhangs over the openings will help to prevent overheating in summer. Energy efficient buildings provide comfort, lowers operating costs last but not the least most important save our valuable environment.

REFERENCES

[2] Figure 3 -21 Source- Author