

Solar Efficient Building

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Abstract—To design a solar efficient building, as it is challenging to design a building by only using solar passive energy, therefore active solar energy is equally important to design a building. A combination of both passive and active solar energy is necessary to design “SOLAR EFFICIENT BUILDING”. As solar energy is more efficient and environment friendly over the fossil fuels. Therefore, to design “solar efficient building” by achieving thermal and visual comfort with the minimum use of artificial energy. Therefore, by integrating virtual planning, elements, materials and technologies. “Solar efficient building” can be designed economically.

Index Terms— Active solar energy, passive solar energy, solar energy.

I. INTRODUCTION

In today's world, it is difficult to design a building with relating to solar efficient and economical as well, especially in developing countries like India. A need to save energy is becoming more critical for the world in future, as there will be a shortage of energy. Therefore, with the increasing demand of energy and gradual depletion of fossil fuels, solar conversion has regained the spotlight of global activities. But the conversion for solar energy is radially usable form is too expensive to be commercially successful at present. Also, in many areas, a large amount of energy consumption of region is still prepared by fossil fuels. Therefore, use of renewable sources is only alternative over the use of fossil fuels.

Passive solar energy: - The use of sun's energy is stored, collect, distribute and to control thermal energy flow by natural principles of heat transfer.

Passive solar energy can be achieved naturally as- orientation of building, proper shading should be provided, colors, vegetation.

There are many advantages of solar passive:

1. Energy can be saved on a large scale.
2. It can easily integrate in the building.
3. It is economic.
4. Easy to maintain.
5. Common materials are used to construct.

More open spaces should be designed in different pattern so there will be proper flow of air around the building. It also affects the building in process of heat gain and heat loss. If there is direct gain of solar heat then, it will result in winter losses and summer overheating. To avoid such, overhangs, Shutters, reflectors can be used. Exhaust and ventilation should be provided to cool down the interior spaces of the building.

Active solar systems which are generally in used are:

Solar water heater, space conditioning, producing electricity, process heat, solar mechanical energy.

Thermal insulation: To reduce unwanted heat loss and gain-thermal insulation reduce the heat transfer through a material. So, insulation reduce thermal conduction.

Thermal mass-heat absorption ability of a building material should have the capacity of storing heat to achieve thermal comfort.

Thermal mass and thermal insulation in Ahmedabad context-according to Ahmedabad climate-the used of high thermal mass material in building without insulation, will radiate heat all night during summer and will absorb all the heat produced in the night. Use of insulation with the low thermal mass material will not be effective in indoor temperature comfortable. Heat will be within the building only.

High mass construction with high insulation levels is most use full to reduce heat gain. The External side of a building should have high mass material insulation so that, it protects a building from the summer heat.

II. HOW IT CAN BE ACHIEVED TO DESIGN A SOLAR BUILDING ECONOMICALLY

The lower the consumption, the lower the effects on the global environment.

The primary function of a solar energy efficient building is to regulate the temperature, air movement, humidity, proper light and ventilation, less use of electricity.

Therefore, by integrating solar energy as,

1. virtual planning
2. materials
3. elements
4. technology

Therefore, to integrate solar energy in a building or to design a solar efficient building economically, these methods can be used.

A. Virtual planning

1) Orientation of building

The orientation of a building should depend on north and south direction in context with Ahmedabad climate. Glazing windows should be designed to the north direction, but, proper shading should be provided to obstruct the sun glare to enter the building. So, the building will have the impact of solar energy. As it will keep the building warm in winters also.

2) Planning

Planning should be done accordingly, so that each room should get proper light and ventilation so, there will be less consumption of electricity. The size of the window should be designed so that, the lights should reach at corners of the room also. As by increasing the size of window vertically, the sun rays will direct reach to the end of the rooms of a building from that one window and if the window size is less than the provided standard size one more window should be provided on the other wall.

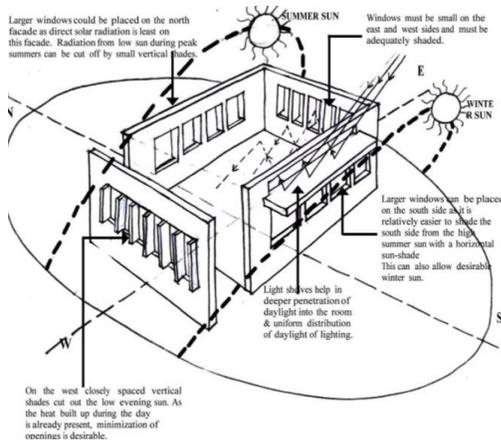


Fig.1. Orientation of building

B. Materials

There are many materials which are used to construct a building like brick, concrete, lime, wood, bamboo etc. But here, main use of materials considered as:

1) Concrete

As concrete is the efficient material which has the capability to retain heat and absorb heat as well. As concrete is generally used to construct a building. As it is easily available and economic.

2) Tivek

It is a moisture barrier as a protective layer around the house which reduces the risk of moisture which leads to mold sometimes.

C. Elements

1) Shading

By providing proper shading devices it will reduce the harsh sunlight to enter the building. By designing cantilever over the windows, doors, ventilation. Also, by using vertical or horizontal bars in front of a window as a frame. As it provides a good aesthetic look and also helps to reduce the direct sunlight to enter in building.

2) External wall

The thickness of a wall should be more as it will be moisture resistant and thermal resistant by doing exterior cladding.

D. Technology

1) Solar water heater

As to design an economical solar efficient building. A Solar water heater can be used in buildings. As it is economical as compared to other solar devices. As it is generally in use for daily life activities. So, the consumption of electricity will be less. Therefore, it helps to design solar efficient building economically.

III. CONCLUSION

In this paper it concludes, how to design a solar efficient building economically in context with Ahmedabad (hot and dry climate). After integrating, solar energy as virtual planning, elements, materials, and technology. One can design an economical solar efficient building. Renewable source will help to keep environment clean. The Building will be economic as well. The Building should be designed with concern to human comfort. It has low heat gains and direct heat gains are absorbed by thermal mass. Solar water heater is reasonable and it is easy to install.

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