

# Passive Solar Building Design with U-Boot Technology

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**Abstract**— In this paper we have tried to design a building of windows, walls and floors are made to collect store and distribute solar energy in the form of heat in the winter and reject solar heat in summer. This is called passive solar building design because unlike active solar heating system. It does not involve use of mechanical and electrical devices. We can say that for passive solar building design in terms of scientific has been developed from a combination of climatology, thermodynamics like as heat transfer and human thermal comfort for building to be inhabited by human. This type of building are constructed from lightweight materials but some internal thermal mass is normally incorporated to reduce the summer peak temperatures and maintain stable winter temperature and prevent over heating in spring before normal solar shading becomes effective. And roof of the building are built by the U-boot technology because it is very light weight and recycle material hence prevent by earth quick and fire resistance, more double efficient.

**Key words:** Solar Panel, Building Material, Heating System Material, Cooling System Material, Equator-Facing Glass, Roof-Angle Glass/Skylights & Operable Shading & Insulation Devices, U-Boot Beton (Single or Double Which Is Required)

## I. INTRODUCTION

In passive solar buildings and U-boot technology, windows, walls, and floors are built to store, collect and distribute solar energy in form of heat in winter and reject solar heat in the summer. And u-boot beton are provided in the roof hence building weight is reduce compare to other reinforcement concrete roof. There are following terms-

- Is based upon climate considerations
- Attempts to control comfort (heating and cooling) without consuming fuels Uses the orientation of the building to control heat gain and heat loss
- Uses the shape of the building (Plan, Section) to control air flow
- Uses materials to control heat
- Maximizes use of free solar energy for heating and lighting
- Maximizes use of free ventilation for cooling
- Uses shade (natural or architectural) to control heat gain

Solar Energy is a radiant heat source causes natural processes upon which all life depends. Basic natural processes that are used in passive solar energy are thermal energy flows associated with radiation, conduction and natural convection.

Sunlight striking on building, building materials reflect, transmit or absorb solar radiation, heat produced by sun causes air movement that can be predictable in designed spaces. Passive solar energy means that mechanical means are not employed to utilize solar energy.

## II. METHODOLOGY

Building should be elongated on an east-west axis. Building south face receive sunlight between hours of 9:00 a.m. and 3:00 p.m. (sun times) during heating season, interior spaces requiring most light and heating and cooling should be along the south face of building.

Less use spaces should be located on the north. An open floor plan optimizes passive system operation. Use shading to prevent summer sun entering the interior.

## III. STUDIES SUN PATH IN SKY

In sky path of sun is change at time to time i.e. shown in figure

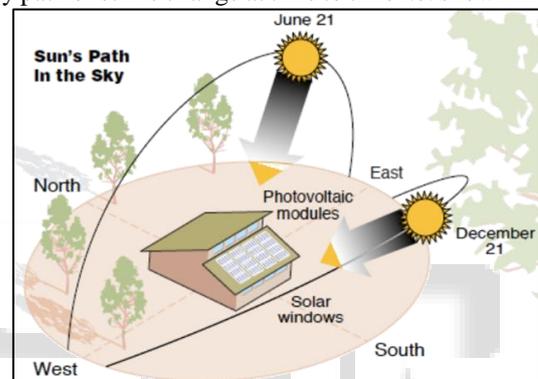


Fig. 1:

A sensor is provided on top of the building like as 'Sunflower'. Nature of this sensor totally depends upon the sunflower for more absorption of the solar energy.

In my opinion path of sun is in elliptical type. In India June month distance between sun and earth are less compare to December month hence we can say that in high quantity solar energy absorb in June and stored it as requirement and some energy are rejected because this is summer season and in this season we want to cool our building.

December month distance between sun and earth are more compare to June hence demand of the solar energy are more because this is cool season and we want heat of the building environment.

## IV. PASSIVE SOLAR HEATING

Building are heated in cold season basically three terms

- Direct gain
- Indirect gain and
- Isolated gain

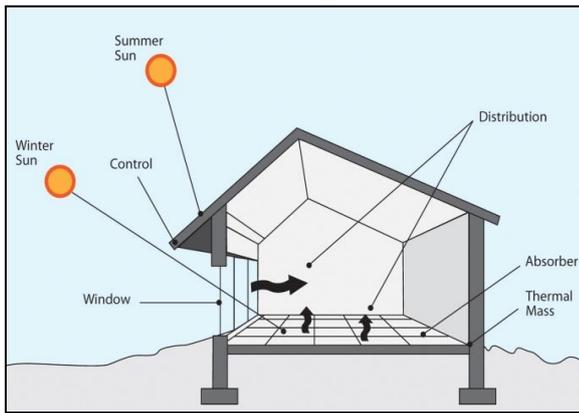


Fig. 2: Direct Energy Gain System

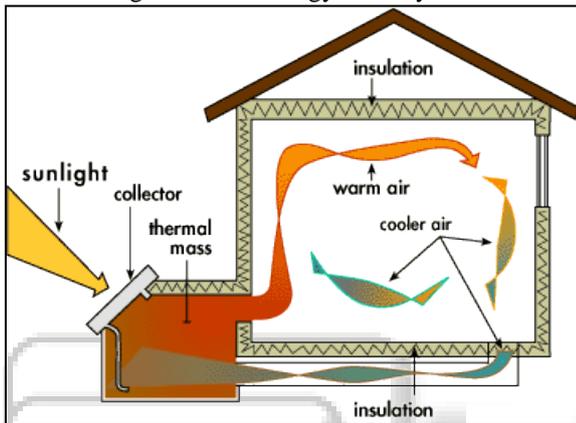


Fig. 3: Indirect Gain System

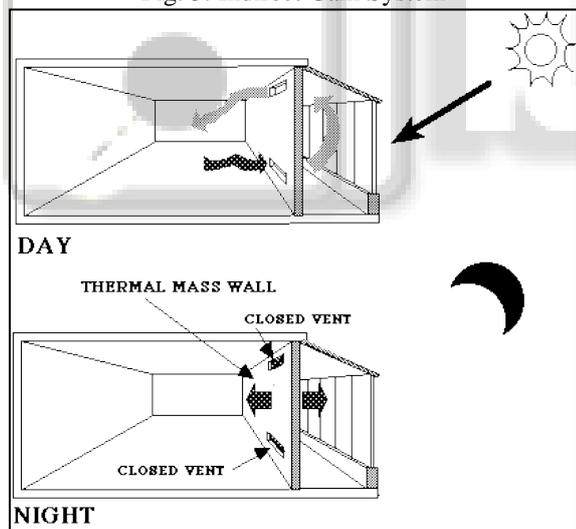


Fig. 4: Isolated Gain System

### V. PASSIVE SOLAR COLLING

In this type of building cooling system are provided main three terms

- Proper ventilation & air movement
- Supply of fresh air
- Physiological cooling

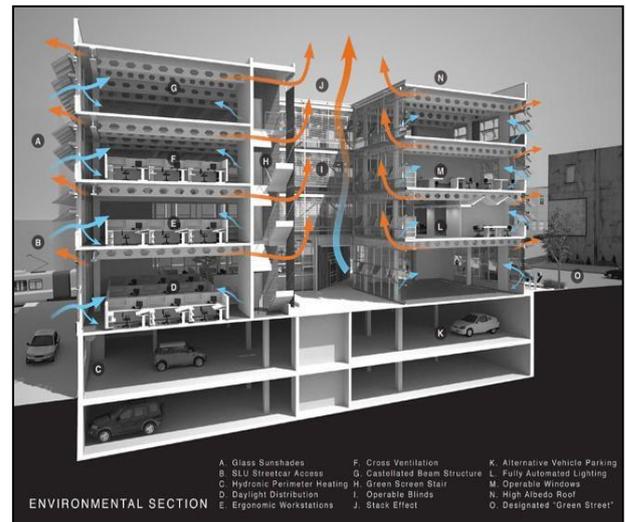


Fig. 5: Ventilation and Air Movement System

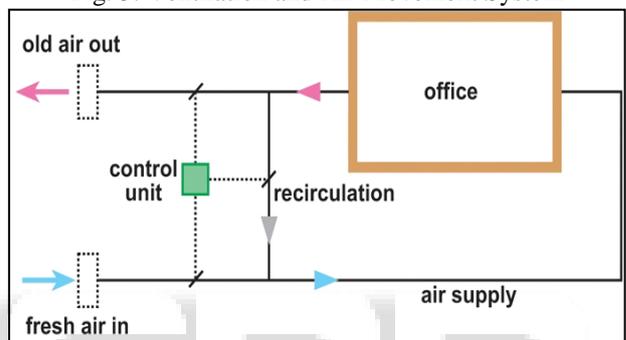


Fig. 6: Supply of Fresh



Fig. 7: Physiological Cooling

### VI. DE-HUMIDIFICATION

Its main functions are humidity control for human comfort. In hot-dry climates humidification of air may be necessary, associated with evaporative cooling. It is only possible through mechanical means without this, in warm humid climates, some relief is provided by air movement. And also improve the quality of the air supply means remove sand and dust carries by winds.

### VII. PASSIVE SOLAR STRATEGIES

The main strategy of passive solar are

#### A. Lighting

- It is obtained by artificial terms (lamp and light fixtures) and natural lighting (day-light, windows, and sky-shelves)
- Window

### VIII. U-BOOT TECHNOLOGY

U-Boot beton is a recycled polypropylene formwork that was designed to create lighting slabs and rafts and prevent the seismic ways or earth quack.

#### A. How to Install It

In u-boot technology firstly we completed formwork and then provide the reinforcement. U-Boot elements are laid on top of the decking according to design specification and ready to receive the concrete and casting. Playing does not require personally.

Correct distance between too elements are provided according to designing. And U-boot elements are jointed to each other according to design specification and the concrete are provided on the roof and then do to completed technical timing formwork are removed and then we get a very clean and smooth surface of the roof which is very efficient and light weight.



Fig. 8:



Fig. 9:

#### B. Advantage

There are following advantages of the passive solar building design with u-boot technology i.e.

- Saving concrete.
- Energy saving building and low casting.
- Very effective and efficient in designing because a sensor is provide which is work according to sun's path.
- Building are light in weight hence prevent the seismic wave and earth quack.
- Increase no of floors.
- Reduce no of beams and increase the span length.
- Reduce overall load of the structure, weight of the pillar and foundation.
- Increase the durability of the building etc.

#### C. Application

There are following applications i.e.

- Commercial building

- Simple housing
- Hotel
- Car parking building
- Hospital etc.



Fig. 10:



Fig. 11:

### IX. FUTURE WORK

To show of the increasing population and this type of buildings are very necessary and importance. It is reduce the global warming and eco-friendly for environment.

In my opinion all building are made by this project of concepts.

### X. CONCLUSION

In our country some places are high temperature hence AC are necessary for all buildings, it is very dangerous to global warming, living things, plants & trees etc. Therefore building is designed to use of passive solar because in our country sunlight is available in all season. Hence it is very effective for this major problem. And roof of the building are built by u-boot technique.

### REFERENCE

- [1] [www.passivesolarbuildingdesign.co.in](http://www.passivesolarbuildingdesign.co.in)
- [2] Design technology integrated curriculum
- [3] American River College