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STUDY OF SOLAR PASSIVE TECHNIQUE SUITABLE FOR BILDING IN NAGPUR REGION

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ABSTRACT:

Renewable energy sources provide an endless amount of energy. Solar power can be used to help ful fill a building's energy requirements in either a passive or active manner. Reducing energy consumption for heating, cooling, and lighting in a building is possible through a climate-responsive design approach, which includes features like static sunshades, walls, and roofs. Four rooms were created with varying combinations of static sunshades, walls, and roofs to investigate the impact of passive building components in a composite climate zone. The ongoing expansion of the construction sector and the increasing need for energy give rise to several ongoing issues and challenges that require resolution. Passive design is tailored to local weather and site conditions to enhance the well-being of occupants and reduce energy consumption. Designing a passive building effectively entails making the most of the surrounding climate conditions. Passive cooling is a building design strategy that aims to regulate heat gain and heat dissipation to enhance indoor thermal comfort without using much energy. Passive cooling techniques utilize non-mechanical approaches to regulate indoor temperature, playing a crucial role in reducing buildings' environmental impact. The energy usage in buildings is anticipated to rise further due to higher living standards and the growing global population. The market has seen a growing adoption of air conditioning in recent years, leading to a significant increase in total energy consumption.

INTRODUCTION:

Renewable energy sources can help us lower our carbon footprint while also saving money on electricity bills. We will look at how solar passive energy can be incorporated into residential building design in this presentation .when sunlight reaches a structure, the materials can either reflect, transmit, or absorb the solar radiation. Furthermore, the heat created by the sun generates air movement, which can be predicted in well- designed areas. These fundamental reactions to solar heat inspire architectural components, material selections, and placements that can give heating and cooling effects in a home. The utilization of solar passive techniques in building design has gained significant attention worldwide due to its potential to reduce energy consumption, minimize environmental impact, and enhance occupant comfort. In regions like Nagpur, characterized by hot and dry climatic conditions, the adoption of solar passive techniques becomes particularly pertinent to mitigate the challenges of high temperatures and limited water resources. Nagpur, located in the central part of India, experiences a subtropical climate with scorching summers and mild winters. During the summer months, temperatures can soar above 45°C (113°F), necessitating extensive cooling measures in buildings to maintain comfortable indoor conditions. Additionally, the region faces water scarcity issues, emphasizing the need for sustainable building solutions that minimize reliance on conventional energy sources and water-intensive cooling systems.

OBJECTIVES:

1. Climate analysis: Conduct an in-depth analysis of the local climate in Nagpur, including solar radiation patterns, temperature variations, humidity levels, and prevailing wind directions.
2. Building materials and construction techniques: Examine suitable building materials and construction methods that enhance thermal performance and enable effective utilization of solar energy.

LITRTURE REVIEW:

1. **Serkanet.al (2003):** concluded that the energy-efficiency design strategies by passive solar components having the additional cost of about 9% of the total building cost, it is possible to save the total annual energy used in this specific residential building by 18%. **2. Andreas Athienitiset. al (2008):** stated that Based on the design of the houses, it is expected that homes with low and near net-zero energy use can be designed in a cost effective manner within PV system and efficiently utilized in the house.
2. **Singh et.al (2016):** the ratio of height to width of buildings, along with other physical features such as trees and streets, can improve indoor thermal conditions and also save valuable land for other purposes..

3. **AbdolvahidKahoorzadeh et.al** (2014): displays passive solar features such as shading tools. The inclusion of extra components would help maintain a stable and comfortable temperature within the interior space. Likewise, indoor humidity levels can be regulated. Allow the building to be opened at night in order to ventilate and cool down the thermal mass inside. Shut the buildings during the day to prevent heat from coming in. Hence, residents experience greater comfort with a traditional passive solar system, regardless of whether the temperature is cold or hot. It offers economic advantages as well. Actually, buildings need rather small cooling or heating systems.
4. **NajmehNajafiet.al (2013):** By exploring Shiraz's traditional architecture, one can develop an eco-friendly and long-lasting architectural style.

METHEDOLOGY:

1) Passive Solar Design Integration
2) Orientation

1) Passive Solar Design Integration: A. Create with the Sun in Consideration: Sunlight can offer sufficient warmth, illumination, and shading while promoting summer airflow in a properly planned residence. Passive solar design can lower costs for heating and cooling energy, enhance spatial liveliness, and enhance comfort. Passive solar design principles that are inherently flexible usually provide energy benefits with minimal maintenance risks throughout the building's lifespan. Design Techniques: Passive solar design combines various building elements to minimize or eliminate the use of mechanical heating and cooling as well as artificial lighting during the day. Designers and builders focus on the sun in order to reduce the amount of heating and cooling required. The design doesn't have to be intricate, but it does require understanding of solar geometry, window technology, and local climate.

2) Orientation: Utilizing passive solar design and creating a favorable site microclimate both improve a building's energy and environmental efficiency. Ideally, the building should have easy access to sunlight and natural light, situated in a location that is warm and sunny, and offers protection from the wind.

CONCLUSION:

1) The solar panels installed in Nagpur have been very successful. The introduction of solar panels has led to lower energy expenses for numerous residents in the region, along with a boost in energy self-sufficiency. Utilizing solar panels has led to increased energy production efficiency, while also reducing pollution and environmental harm from conventional energy sources. The implementation of solar panels in Nagpur is a prime illustration of how sustainable energy can enhance the well-being of locals, and this pattern is expected to persist in the coming years.

2) Passive solar building design is a part of green building design by the providing this of design; we are able to use solar energy, which offers no cost & our non-renewable resources can be saved to a large extent

3) Passive solar building design provides thermal comfort during various seasons, like summer, winter & it is very useful design to provide natural ventilation in the building, passive solar provides natural light by insulation in the building, passive solar provides natural light by installation of photovoltaic, which didn't require any other source of energy, proper orientation of building can be done by this type of design

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