An Investigation of Energy Efficient using Phase Changing Material (PCM)

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***Abstract* :- Climate change, caused by the release of greenhouse gases (mainly carbon dioxide) into the atmosphere, has been recognized as one of the greatest threats of the 21st century. Share of energy consumption in India and China has also been on the raise due to sharp urbanization, population explosion, and intensive growth of IT and related business. Buildings are the dominant energy consumers in modern cities account upto 40% energy consumption. Their consumption can be largely cut back through improving efficiency, which is an effective means to lessen greenhouse gas emissions and slow down depletion of non-renewable energy resources. There is over 50% saving potential in the building sector and thus it is considered as a potential sector to meet the challenges of global energy and climate change. Along with introduction of energy efficiency measures, more effective means are needed to induce or compel greater efforts, especially to the signatories . This technical paper discusses the role of energy efficiency in green buildings in Indian scenario to reduce the energy consumption and environmental degradation through Green House Gas emission (GHG). The possibility and benefits of harmonizing governmental and private-sector schemes are also discussed.**

Our project paper presents a study has been undertaken for the newly constructed and existing buildings in order to assess its potential and capacity to save energy.The paper thus deals with the various energy saving concepts which can be incorporated at the time of planning, designing, construction and execution stage to have energy efficiency in buildings keeping in mind the cost perspective.

INTRODUCTION

1.1 General

The primary objective of this project is to gain sufficient knowledge in planning, analysis, and design of building and Quantity surveying. Our project deals with the plan and design of a Bank building. It is a reinforced concrete framed structure consisting of G +2 with adequate facilities.IS 456:2000 codes is the basic code for general construction in concrete structures, hence all the structural members are designed using limit state method in accordance with the IS 456:2000 code and design aids. The planning of any building in India will be recognized by National Building Code (NBC) , hence the building is planned in accordance with the National Building Code of India.The residential building has proper ventilation, it is provided with sufficient doors, windows. Water supply and electrification are also provided.

1.2 Practical considerations

Besides all the fundamentals of planning discussed, following practical points should be additionally considered:

1) The elements of the building should be strong and capable to withstand the likely adverse effects of natural agencies.

2) Strength, stability, convenience and comfort of the occupants should be the first consideration in planning.

3) Elevation should be simple but attractive. The number of doors and windows provided should be less for a bank building.

4) The provisions of built in furniture at proper places are useful from the point of view of utility.

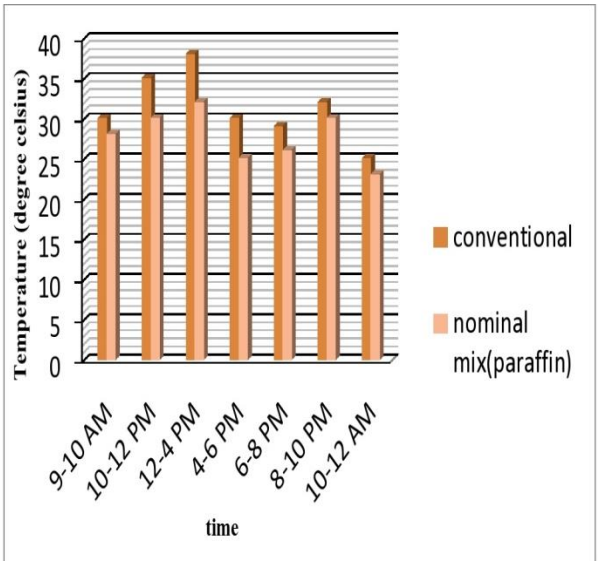
5) Since the plan is for a bank building, the locker rooms must be secured with thicker walls than usual.

Proper nomenclature of floors and storey's and also unified and improved methods of designating the structural members eliminate the possible confusion and led to less efforts and saving in time in the preparation of design calculation and drawings.There are two main methods to design the structural members, they are working stress method and limit state method. Here, we adopt the limit state method for designing all the structural members involved, in our project. The structures are designed to its elastic limit in the working stress method, whereas in the limit state method of design, the structural members are designed up to its plastic limits.

Both the methods are having the safety value. But, the most economical method is the limits state method, which is adopted in every constructional design nowadays. Hence we planned to go for the limit state method of design. For our project work we took only for important structural members to design they are slab, beam, column and footing. The slab is designed by assuming it as simply supported with four edges discontinuous, for easier design calculation.

TESTING

RESULT:



1.3 Scope of the Project Work

On this fast world, as the technologies grows faster, we must comes up with the challenges around us. To meet out these needs, one has to make the computer as a user friendly to do all the jobs not only in time but with accuracy. Since we have got familiarity in analysis and design, it will helpful for our higher studies and to work as design engineer in forth coming environment.

1.4 Objectives

- New innovation idea and luxury houses
- Multi level car parking
- Club house with modern amenties
- Landscapes and gardens

Key benefits of intelligent buildings

An intelligent building is one that uses both technology and processes to create a facility that is safer and more productive for its occupants and more operationally efficient for its owners. It exhibits key attributes of environmental sustainability to benefit present and future generations. Each building is unique in its mission and operational objectives, and therefore, must balance short and long term needs. A building is typically termed intelligent when the building‘s subsystems provide the occupants with productive and comfortable conditions by responding to their requirements and enhancing the workplace environment. Table1. Shows the key benefits of intelligent buildings

India’s Sustainable Development

India‘s economic growth can only be sustained with corresponding to growth in infrastructure. Presently the growing demand is being met by crumbling infrastructure, such as road networks, city transport, water & sanitation etc. A solution to the contradiction requires a massive enlargement of urban infrastructure which will further require newer green and sustainable techniques for building this infrastructure. These newer techniques encapsulate the foundation of green buildings. Energy consumption and associated greenhouse gas emissions will continue to rise unless actions to direct the construction industry towards sustainable consumption and production are urgently taken About 70% of the infrastructure in 2030, such as buildings, will be added in next two decades—between 2012 and 2032. The projections for energy demand in 2032 imply a fourfold increase in requirements. Such a dramatic increase of energy supply will be difficult to manage because of resource constraints.. In 2001, the Government of India (GoI) passed the Energy Conservation Act (ECAct, 2001) and the following year established the Bureau of Energy Efficiency (BEE) under its provisions. One of the first initiatives of BEE was to prepare an Energy Conservation Action Plan, which was released in August 2002. In June 2008, India

released the first National Action Plan on Climate Change (NAPCC) outlining existing and future policies and programs addressing climate change mitigation and adaptation. The plan identified eight core _national missions' including a National Mission for Enhanced Energy Efficiency (NMEEE).

Energy efficiency in building is an accumulation of energy efficiencies of appliances used like ACs, lighting, chillers, AHUs, Fans and various other systems. BEE as an national agency has been introducing and monitoring efficiencies of buildings and appliances in India. Figure 5 shows the annual energy-saving potential for about 25 products estimated in a recent study . One can see that if finite amount of resources are available, a good strategy would be to focus on the top 7–10 appliances and capture most of the energy savings.

Bright Green Building

Another concept in the area of energy efficient and environment friendly building is the emergence of Bright Green Building (BGB). Bright green building is one that is both intelligent and green. It is a building that uses both technology and process to create a facility that is safe, healthy and comfortable, and enables productivity and well being for its occupants. It provides timely, integrated system information for its owners so that they may make intelligent decisions regarding its operation and maintenance, and has an implicit logic that effectively evolves with changing user requirements and technology, ensuring continued and improved intelligent operation, maintenance and optimization. A bright green building is designed, constructed, and operated with minimum impact on the environment, with emphasis on conserving resources, using energy efficiently and creating healthy occupied environments. Sustainability is measured in three interdependent dimensions: environmental stewardship, economic prosperity and social responsibility. Bright green buildings exhibit key attributes of environmental sustainability to benefit present and future generations.In bright green buildings, fully networked systems transcend the simple integration of independent systems to achieve interaction across all systems, allowing them to work collectively,optimizing abuilding's performance, and constantly creating an environment that is conducive to the occupants. Bright green buildings provide a dynamic environment that responds to occupants _changing needs and lifestyles

CONCLUSION

Under hot arid conditions, the energy efficient concrete gives better performance then normal convential mix

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REFERENCES

[1] Nahar NM, Sharma P, Puurohit MM. Studies on solar passive cooling techniques for arid areas. Energy Conversion and Management 1999;40:89– 95.
[2] Cook J. Passive cooling. Cambridge, MA, London, England: MIT Press, 1985.
[3] Givoni B. Experimental studies on radiant and evaporative cooling of roofs. In: Proceedings of the International Passive and Hybrid Cooling Conference, Miami Beach, FL. 1981. p. 279– 83.
[4] Kondepudi SN. A simplifi ed analytical method to evaluate the effects of roof spray evaporative cooling. Energy Conversion and Management 1993;34(1):7– 16.
[5] Sodha MS, Khatry AK, Malik MAA. Reduction of heat fl ux through a roof by water fi lm. Solar Energy 1978;20:189– 91.
[6] Chandra S. Temperature control in a building with evaporative cooling and variable ventilation. Solar Energy 1983;30:381– 7.
[7] Tiwari GN, Lugani N, Singh AK. Design parameters of a non-air-conditioned cinema hall for thermal comfort under arid-zone climate conditions. Energy and Buildings 1993;19:349– 61.
[8] Singh AK, Tiwari GN. Energy conservation in a cinema hall under hot and dry conditions. Energy conversion and Management 1996;37(5):531– 9.
[9] Tiwari GN, Kumar A, Sodha MS. A review — Cooling by water evaporation over roof. Energy conversion and Management 1982;22:143– 53.
[10] Gandhidasan P. Simplifi ed model for the behavior of a roof-spray cooling system. Applied Energy 1989;34:69– 77.
[11] Sodha MS, Kumar A, Singh U, Tiwari GN. Periodic theory of an open pond. Applied Energy 1980;7:305– 19.