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Original Research Article

DESIGN AND ECONOMIC ASPECTS OF GREEN BUILDING

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ABSTRACT: Green building (also known as green construction or sustainable building) refers to a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from sitting to design, construction, operation, maintenance, renovation, and demolition. This requires close cooperation of the design team, the architects, the engineers, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.

Introduction:-

New technologies are constantly being developed to complement current practices in creating greener structures; the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

A similar concept is natural building, which is usually on a smaller scale and tends to focus on the use of natural materials that are available locally. Other related topics include sustainable design and green architecture. Sustainability may be defined as meeting the needs of present generations without compromising the ability of future generations to meet their needs. Although some green building programs don't address the issue of the retrofitting existing homes, others do. Green construction principles can easily be applied to retrofit work as well as new construction.

Economics Aspects

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A. Energy prices have historically been higher in Europe, since governments have taxed fuels more than in the U.S. As an example, in April 2008 diesel prices in Germany were about $9.00 per gallon (€ 1.49 per liter). Because economics is a primary driver of behavior, one could ascribe a lot of European emphasis on low-energy solutions to economics rather than culture, but people we interviewed saw this approach as much a moral issue as an economic one.

B. The psychology of saving energy is more deeply ingrained in Europe than in the U.S. because of a long history of higher fuel prices. Of course, all countries are in shock with the three- and fourfold increase in crude oil prices that began in 2004, and energy conservation has become even more of a practical economic imperative.

C. Electricity prices in Düsseldorf, Germany in 2008 appeared to average about the equivalent of 17cents per kWh, certainly higher than most locations in the U.S. Higher electricity prices make investments in energy-efficient technologies more attractive.

D. Economics drives most change in the advanced economies. Higher energy prices in the U.S. are going to drive us more toward European approaches to comfort engineering that place greater emphasis on radically improved energy efficiency without adding initial cost.

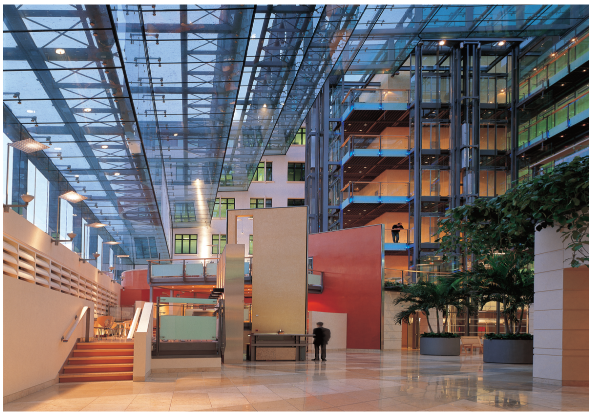

Fig:1 Green Building Design

Overview of technologies

Our research examined in detail three European building system technologies and their status of or potential for adoption in North America. In this report, we describe each building system technology conceptually, with considerations for design and application. We include challenges and impediments presented by the North American and in particular, the United States' markets. Finally, we reference and picture examples of both European and North American buildings employing the technologies to illustrate the technologies in use.18 here, we address three important building system technologies:

• Radiant heating and cooling
• Active façades
• Building system user interface and system integration

Radiant heating and cooling

Radiant heating and cooling systems rely on the distribution of hot or chilled water throughout a building structure as opposed to more conventional North American systems that rely on the distribution of cool or hot air using ductwork. As the name suggests, radiant systems directly heat or cool the occupants through radiative heat transfer as opposed to convection or other means. Depending on the type of radiant system applied in a given building, it may also take advantage of the thermal mass of the building structure. Radiant heating and cooling systems found application in ancient times in Roman and Middle Eastern structures.

When applied in the U.S. radiant systems are used almost exclusively for heating, and are becoming increasingly common in residential and are even selected commercial projects. In Europe radiant heating systems are used broadly for both residential and commercial applications; in certain areas they are also being used for cooling as well.

Concept

Radiation presents the most significant heat transfer mechanism between the human body and its Surroundings. Other means in order of magnitude include convection, conduction, and perspiration. Therefore, radiant systems are generally thought to provide the best environment for human comfort. In both radiant heating and cooling systems, the preferred installation location is overhead in or on the ceiling where it "mimics the overhead sun and clear night sky effect that we have been subject to for millions of years of evolution. The most important caveat on radiant cooling and heating systems is that they do not provide for ventilation, and a complementary outdoor air system is typically required for ventilation purposes. Furthermore, radiant cooling systems provide only sensible temperature control, and do not account for latent, or humidity, control. In the case of radiant cooling systems, the potential for surface condensation presents a significant concern, and depending on climate, humidity management may require a separate, complementary system to control moisture levels, as well as a commitment to a sealed building.

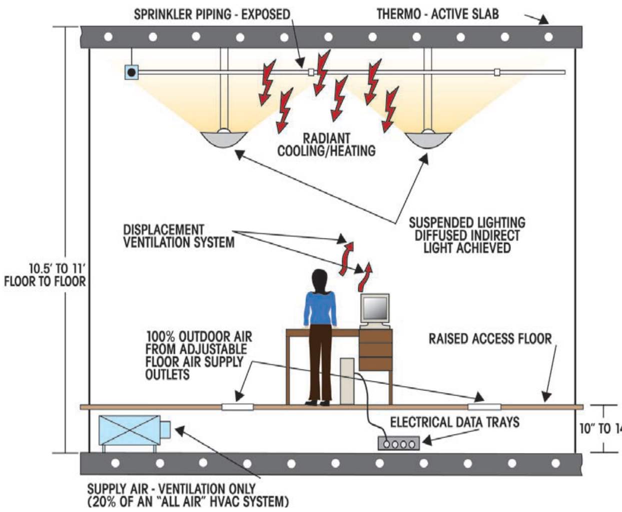

Fig:2 Design Aspects of Green Building

Here are three common physical means of facilitating heat transfer between the water and the building occupants Panels and Beams Metal panels or beams containing tubing are surface mounted, embedded on floors, walls, or ceilings, or suspended from ceilings.

Slabs (Embedded Tubes) Plastic tubes are embedded in the structure to provide the conduit for water, while the structure acts as thermal storage and radiant surface. !is is typically done with a high thermal density concrete slab (sometimes called an active slab) in either the floor or ceiling.

Tubes can also be run below other flooring materials including wood floors and carpet using special sub-floor or insulating panels. !is option is less effective since there is more insulation and less mass then the use of a concrete slab.

Capillary Tubes Mats containing small closely spaced tubes are embedded in plastic, gypsum, or plaster on walls and/or ceilings. !e end result is similar to a slab. !is type of installation is more common in smaller installations, including residential installations.

In all three methods, a mechanical system is responsible for cooling or heating the water. Such systems include:

• Chiller or chiller plant
• Heat pumps, including ground source heat pumps
• Boiler or boiler plant
• Cooling tower
• Well water or other ground water

Benefits

Radiant heating and cooling systems excel in energy efficiency and human comfort.

- Because nearly half of the heat transfer between human beings and their surroundings occurs via radiation, radiant heating and cooling systems are known for superior human comfort.
- Radiant systems are virtually silent.
- Decoupling sensible temperature control from ventilation allows for potential improvement in indoor air quality, with elimination of air recirculation.
- Radiant systems generally use less energy than forced air systems (with one reference estimating a 30% average savings, and a range of 17% to 42% potential energy savings in North American climates).20
- A building constructed using thermo-active slabs may consume up to 60% to 70% less energy than an equivalent conventional building with an "all-air" HVAC system

Challenges and impediments

Radiant heating and cooling systems present a variety of challenges and impediments when it comes to use in commercial buildings in the United States:

- The design community of architects and engineers in the United States is not generally familiar with radiant systems, especially radiant cooling systems.
- Likewise, the construction community is also not generally familiar with radiant systems, and current methods of building construction are deeply embedded.
- Humidity management and surface condensation potential present unfamiliar territory.

Conclusion

The above paper has given the overall idea about the design aspects of green building in this era due to the scarcity of electricity and this presents a good economical aspects which should be good in natural ventilating as well as lightning purpose with lees consumption of the conventional cost which implies that the eco-environmental and eco-friendly life is being trying up to be a great comfort including the less expenditure.

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