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Energy Efficient Convention Center

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Abstract – *In this modern era of industrialization and urbanization, resource consumption is at its peak. Industrialization and urbanization results in increase in infrastructure developments. These consumes resources in great extent .In this paper we have discussed about various techniques and methods that can make a building energy efficient .For this we take a convention center building .A convention center is a multipurpose building which serves the purposes of conducting meetings, concerts games etc .Resources and fuels are been used in a large amount for the construction and running of the building .This is reduced to make the building energy efficient and ecofriendly.*

1. INTRODUCTION

The demand on energy resources is continually increasing over the years. There is a huge gap between the energy supply and demand chain. Energy efficiency along with renewable and non-conventional energy sources is required to ensure sustainable energy consumption in this world. Energy demand can be meet by cutting down the wastage of energy and saving the carbon emission. Different policies and methods are implemented for efficient energy consumption. Energy efficiency is the use of improved technology that need low energy to perform than the existing technology. It is defined as any process, technique or equipment that helps to achieve reduction in energy consumption while performing an operation while achieving the same or better level of output.

Another term comes under this energy conservation. Both terms involved in utilization of energy in efficient ways and resources for sustainable energy development. The conservation aimed at using less energy while the efficiency denotes the wise use of energy with minimum wastage. Energy conservation is a behavioural change in reducing energy consumption.

Building engineers are looking to optimize building efficiency and then incorporate renewable energy technologies, leading to the creation of energy efficient buildings. Changes can be made in existing buildings to reduce energy usage and costs. These may include small methods, such as choosing LED light bulbs and energy efficient appliances, or larger efforts such as upgrading insulation and weatherization. Total amount of energy used by the building on an annual basis is roughly equal to the amount of energy generated on the site through renewable sources. These buildings consequently contribute less overall greenhouse gas to the atmosphere. It also reduces the dependence on fossil fuels and protects the environment for future generations.

In this paper we are discussing the various measures that we used in convention center building plan and design in order to make it energy efficient and eco-friendly.

1.1 Lighting

Lighting is necessary for visibility of objects in dark areas. Lighting is the use of light to achieve aesthetic effects. It also refers as equipment which produces light. Lighting includes artificial sources of light like lamps and bulbs, and naturally by capturing daylight.

Energy efficient lighting systems are required to reduce the building's energy demand. Day lighting is a method by direct light from sun can enter the building through windows, skylights, or light shelves. It is used as the main source of light during daytime in buildings. This can save energy by avoiding the use of artificial lighting. But a building cannot always depend on day lighting. It is because some time it is too bright and some time it is darker. And also light should be well distributed.

In order to overcome these issues we have to provide artificial lighting. It includes lamps, bulbs, light fixtures etc. However we require energy efficient lighting. It reduces the electricity demand and is a cost effective method of lighting system. In conventional lamps like incandescent and gas discharge lamps, most of the electricity is wasted in terms of heat and these consume more power. Thus energy efficient lighting includes the use of less power lights by replacing high power consumption lights like incandescent, high discharge lamps, etc. This can be achieved by using lamps which consumes less electricity they are

1. Compact fluorescent lamps (CFL)
2. Light Emitting Diode (LED) lamps

In convention center we are providing day lighting. For these windows and shutters are provided. Window glass is provided as Tinted Heat-Absorbing Glass. It is a glass which absorbs energy from solar radiation. It cuts down the sun's heat, enabling greater convenience and comfort inside the building. It also increases the aesthetic appearance of building. It also protects from glare and allow less visible light transmittance.

But it is not enough for uniform lighting, so artificial lighting should be provided. So we are providing LED lights which are the most energy efficient and most durable type of bulbs. They differ from ordinary lamps because they don't get burn-out. They produce equal amount of light as incandescent lamps, which consumes 80 percent less electricity compared to incandescent bulbs and fluorescent lamps. And also these lamps reduces CO2 emission and mercury pollution while going through fossil fuel burning process.

1.2 Plants

Plants are documented as being especially good at improving air quality. There are different plants that are beneficial to the building and the environment. Plants like Areca Palm, Aloe Vera, Elephant Ear Philodendron, Lady Palm, Bamboo or Reed Palm, English Ivy etc have many benefits to the health of the users of the building and to the environment.

1. Aloe Vera- This plant fight against the toxic substances generated by environmental pollution. It contains antioxidant vitamins and minerals. Vitamins include A, B, E and minerals such as selenium, manganese, zinc, chromium etc.
2. Areca Palm- This plants can survive in areas of low light. They are efficient at capturing light. They absorb other gases that are harmful and also process the gasses. It also absorbs indoor air pollutants. They include Acetone, Xylene, Toluene and Formaldehyde. They are mainly emitted from petroleum products, paints and wooden furnitures.
3. Elephant Ear Philodendron- It is a plant that function as air fresheners. This plant consumes harmful gases and other toxic substances in the air and increases the general air quality. Elephant ear philodendrons are beautiful and decorative plant can be placed indoors or outdoors.
4. Lady Palm-It is an air purifying plant. It helps in removing formaldehyde and ammonia from the atmosphere. It helps in improving the indoor air quality and provides a healthy fresh environment. Formaldehyde get emitted from paints, furniture, automobile engines etc. This gas exposure may cause cancer.
5. Bamboo or Reed Palm-Plants removes many harmful chemicals and pollutants from the air. This plant is used as an indoor plant because of aesthetic effect and also removes certain harmful gases from the indoor environment.

In our convention center we use these plants because it increases the air quality and is benefited to human health and environment. These plants only uses minimal amount of water. Thus they are efficient plants for environment and also absorbs toxic materials.

Vertical gardening is also done in the convention center. It is a method of providing vegetation cover vertically in frames or walls. Vertical landscapes are pleasing aesthetically and sustainable, and they contribute to the greening of urban areas. These helps in filtering pollutants and carbon dioxide out of the air. The quality of the air is also improved. It also helps to reduce the heat absorption, which can result in significant energy savings in areas. It regulates the temperature through transpiration and provide cooling to the building. Major advantage is that it only required limited space for vegetation.

1.3 Solar

Solar energy created by capturing the sun's energy and turns it into electricity. Sun is a natural nuclear reactor, where nuclear fusion reactions produce massive amounts of energy, this process always takes place. Solar energy comes can be captured with various technologies, commonly solar panels. Solar panels are made up of many solar cells. Solar cells made of semiconductors like silicon. First, sunlight reaches the solar panel. The solar panels convert the solar energy to DC current, which moves to the inverter,then it is converted from DC to AC by the inverter, then it can be used for lighting. Solar is an energy efficient source, it can reduce the consumption of fossil fuel.

In the convention center we used solar panels, which will fulfill the energy requirements of the buiding. Lights, fans and other electic equipments uses the electricity from solar panel. Thus it forms an energy efficient way of resource consumption.

1.4 Rainwater harvesting

Rainwater harvesting is a technique of collection and storage of rainwater from surfaces, rooftops which is collected, filtered and used. Water from rainwater tank can be used for gardening and irrigation of plants, laundry, and flushing toilets. Rainwater harvesting systems are designed after examining site conditions that include rainfall pattern, intensity rainfall, subsurface soil and their storage characteristics.

Rain water harvesting is an easy, simple. Its main advantages include it act as backup source of water. Thus it prevents the depletion of ground water. Thus average ground water level donot get lowered. This helps the ground water to refill. This system is easy to maintain. The collection of rain water reduces erosion and flooding around buildings. When water is stored such a way, water connection is not required. There for reduces water bill. The storage water thus helps to avoid water scarcity in dry weather seasons.

In our convention center we are providing water harvesting system. It is connected to toilets and for watering the plants. Thus, it is an eco-friendly method, as it helps to refill the ground water level and avoiding its extra use.

1.5 Acoustics

Controlling the quality and amount of sound inside a building comes under acoustics. Acoustics allows pleasant sound in halls and reduces echoes and noise. It minimizes the noise transmission from one space to another. It affects the design, operation and construction of buildings. These have great significance auditoriums and theaters where sound has great relevance. Some terms come under acoustics includes reverberation time, it is the time taken by sound to decay by 60 dB after an abrupt termination. If reverberation time is high, it makes a room sound muffled, loud and noisy. Sound absorption is another issue comes under acoustics, it is the loss of sound energy when sound waves come into contact with an absorbent material such as ceilings, walls, floors and it results in such a way that the sound is not reflected back into the space. It can also use to reduce reverberation times. Acoustics can help to reduce the effects of noise disturbances, which can have negative effects on health, well-being and general quality of life.

Some measures to improve the acoustical effects include acoustic panels. These panels are sound absorbing panels placed on the walls and ceilings. It provides the perfect sound absorption materials for deadening and dampening sound in buildings. It controls and reduce noise, eliminate echo in a building. There are different types of acoustical panels, including standard fabric-wrapped panels, perforated wood and water resistant acoustic panels. In auditoriums with soundproofing panels, it can improve sound clarity by reducing background noise due to echoes thus improving the audience's experience. Sound absorbing acoustic panels absorb sound waves it helps in reducing noise, clarify speech and limit reverberation in walls. If thicker is the sound absorbing wall panels, it reflects, absorbs and dissipate more sound waves.

In our convention center we are using this acoustics panels thus improving the effects inside it.

2. CONCLUSION

Energy efficient buildings are the buildings that are designed to provide a significant reduction of the energy. It includes energy needed for heating and cooling, which includes the equipments that will be chosen to heat or cool the building. Energy efficient building is becoming more and more vital as energy emerges as a critical issue due to high demand for energy and unsustainable supplies of energy. Energy efficient buildings can lower greenhouse gas (GHG) emissions and other pollutants, as well as decrease water use. Improving energy efficiency can decrease individual utility bills and help stabilize electricity prices and volatility unities to save money as well as reduce greenhouse gas emissions.

In our convention center we use solar which reduces the electricity demand.The lighting provided are LEDs which consumes only less amount of electricity. Rainwater systems are also provided hence water bills are reduced.Different types of plants are provided which help in increase the indoor and outdoor air quality. Acoustics can help to reduce the effects of noise disturbances, which can have negative effects on health, well-being and general quality of life. Thus making energy efficient and eco-friendly building.

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