Performance of Green Energy Town House Over Conventional Building at Hyderabad City-India

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***Abstract*: Green Environment and Sustainable Development is considered to be the essential part for our upcoming era. Determination of the sustainable material for the building construction for the economical aspect is difficult challenge to identify and to apply for the successful implementation. As we are aware the increasing in the living cost, construction of dream house is not easy with the material what is available in the market with specified cost. In the view of green energy and economical aspects, to use the sustainable materials we are analysing a building model with affordable materials which are taken care in design with light weight, high strength, also resistance to the corrosion, chemical attack and fatigue cracks. The use of GFRP bars shows the positive aspects in the cost estimate when compared to the existing reinforcement types. The clear idea and implantation of natural resources of sunlight, wind source have been studied for the residential building is discussed to compare with the existing HVAC components. Location and Geometry pattern of the building with respect to the climatic factor, and natural energy utilization is studied and analyzed in the current research paper. Our study focused on the green energy design aspects and energy auditing for the town house construction in the Hyderabad is proposed with the positive benefits and reduce the cost burden in the construction.**

***Keywords*: Green Energy, Sustainability, Energy Auditing, GFRP Bars, Natural resources**

1. Introduction

The pillar of economy for any country is infrastructure. India Expected to grow by 2030 it is like to have GDP of 4 Trillion USD & Population of 1.5 Billion. As per DPCC (Delhi pollution control committee) 30% of air pollution caused by dust which produce from construction sites. Almost 10-12 Million tons of Waste debris produced by demolishing, construction of civil structures. Green building[1-3] expects a 14 percent savings in operational costs over five-year saving. Buildings account for up to 40% of the overall energy consumption in Asian country, and industrial and residential property
combined can account for over 2000 TWH of energy consumption by 2030. India has associate degree energy deficit of around 12% that is probably going to extend with the government's electrification drive in rural areas[4][5][6].
In this paper, a Conventional building is Compared with green town house building and the results are listed.

2. GFRPS

GFRP compounds have been used sparingly in building engineering for nearly 50 years in both new construction and renovation and renovation of existing buildings. The use of GFRP bars and grids for concrete is a growing segment of the application of GFRP composites in structural engineering for new construction[7][8]. The development of the fiber-reinforced plastic for commercial use was being extensively researched in the 1930s. In the UK, significant research was started by pioneers such as Norman de Bruyne. From the 1950s to the 1970s, a small number of studies were conducted on the feasibility of investigating the use of GFRP-wide glass rods. These barriers were used to create magnetic resonance imaging centres, due to their electrical appearance, also these GFRP bars were cost competitive with stainless steel bars, which were the only other alternative for this application.
In 1980s, glass helical -strand deformed reinforcing bars were produced for structural engineering applications. In the late 1980's, interest in the use of GFRP barriers gained momentum as attention-grabbing objects, especially highway bridges. nternational Grating, Inc., based in the United States, established a fiber-glass glass -reinforced bar that was used experimentally in many bridge projects[9]. This was followed by the 1990s with the construction of the disabled GFRP bars by Marshall Composites, Inc. Extensive research was conducted in the 2990s on the behaviour of concrete beams and slabs reinforced with various types of GFRP bars.
GFRP was unknowingly acquired in 1967 in an attempt to destroy Disneyland's "House of the Future". Built between 1956 and 1957, the future house is built entirely of fiberglass. 1994, almost 600 million pounds of composite materials had been used by the building business.

2.1 GFRP Bars and development

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PROPERTIES	STEEL	GFRP
Specific gravity	7.2	1.80
Young modulus	20000Mpa	30000Mpa
Tensile strength	483-690Mpa	483-1600Mpa
Poisson ratio	0.3	0.34
Coefficient of thermal expansion	6.5	3.5—5.6

2.2 Material and Parameters

We discuss about materials in GFRP. The elements that contribute to the mechanical properties of GFRP compounds include fiber type, matrix, approximate number of elements and the shape of the fibres. The quality of the interface between the matrix and the fiber also has a significant impact on GFRP mechanical properties. In addition, a back healing and treatment program may be available impact on the final properties of composite materials.
Ultimate tensile strength, and creep, uniaxial compressive strength, and compressive strength are some of the mechanical properties of GFRP construction materials. The mechanical and physical properties of the fiber-reinforced materials are studied with an emphasis on the potential applications of these materials as durable concrete reinforcement. The degradation of concrete is vital to consider because the extensive degradation leads to reduced load-bearing load. The durability of a fiber reinforced concrete structure depends largely on the fiber, resin, fiber / matrix characteristics, production process, loading type and environmental condition. GFRP reinforcement always works in comparison to many environmental factors: especially moisture, chemical substances, temperature, UV and ozone, penetration, fatigue and water.

2.3 Experimental studies

GFRP materials physical and mechanical properties were determined by some experimental methods. We know by taking results GFRP more efficient compared as steel[11]. When comparing the costs of the fiberglass rebar vs steel rebar it can be easily stated the difference in the initial cost. Steel rebar has vulnerability to corrosion or oxidation when exposed to salts, aggressive chemicals, and moisture. As it corrodes, steel rebar swells and rises the tensile load on the concrete, which starts to crack and spall, creating openings that lead to further and faster deterioration of the
steel and concrete. This causes costly repair and maintenance and, if allowed to progress far enough, it can compromise the structure's integrity fiberglass rebar is effective in saving costs by removing the need for the future repairs.

Table-1:Properties of Steel and GFRP

3. Air Conditioning

The reason for installing the HVAC system in any building is that to bring good air quality to business homes, it improves productivity. This machine is useful in reducing the formation of harmful pollutants and pathogens. This machine enables energy to maintain temperature[12-13]. In addition. It helps to reduce moisture by retaining that moisture in the structure. The operation of an AC machine in a highly efficient operation is a major challenge. In a built building there are many set points, flooring and additives that can clarify price inefficiencies. In addition, the effects of climate change on the area, which may place a significant burden on the system. To reduce this inefficiency, the analytical statistics will provide visibility to our machine with the appropriate final result and in a practical way to take corrective action[. As a consequence of this, it will reduce energy costs. In addition, the masses will actually shrink. One study state that AC renewable energy is responsible for saving about a percent of energy. As a stock of fact is very important to use statistical analysis statistics using a machine to find the power and the power of cost. Statistics can be helpful in improving air quality, and can include- placing, testing and cleaning.
Generally, an AC system can mean any time that changes the atmosphere, usually the interior of a building or a location[14]. This change or "condition" should be related to local temperature, cooling, humidity handling, cleaning, air circulation, or air circulation. However, most people when they take "AC" usually refer to a mechanical or man-made device to help with the cold, or to cool and manage the internal air humidity. In the context of building donations, a complete construction machine that provides local heating, air flow through the machine and AC system is commonly referred to as HVAC (Heating, Ventilation & Air Conditioning).

3.1The Basic need for a guided spirit in Building

The use of air conditioners, better known as AC, has already proved to be an obligation in various homes and apartments. In fact, there are a variety of people who can live without AC, they can seek AC for their room, office, car, theatre and almost everywhere. Overall, it is very smooth to see that we want AC because the ambient temperature can be very high. Of course, that is one of the main reasons why we feel warm and our frame craves cooling. In addition to the surrounding heat, various other recommendations introduce warmth inside the room, leading to a rise in room temperature causing unpleasant conditions[15]. Maintaining proper

humidity in all building materials. At the right times, it releases air from unbalanced humidity. Ability to provide solid and accurate delivery of airflow. Removing air, any micro-organisms, ashes, pollutants and distinct 'foreign bodies. In hot weather, gently hold the indoor air to cool. Be able to have at least a minimum of room temperature during the winter. The weather should know that we are no longer at a very high price to buy or maintain[16]. In addition to allowing for proper air circulation construction, dry air has the potential to lead to comfort and greater stability problems. It is generally accepted that your construction has enough air flow to trade the interior of the air for at least 4 hours at a time. One of the positive effects of older renovated homes may not be that they do not want to help with air flow, while modern homes will want to help meet lower air flow standards.

3.2 Items and Signs

Maximum thermal conductivity

The load for general warming includes the external load of warmth and the internal load of warmth. The external heat load includes the transfer of heat and direct sunlight throughout the construction envelope from the outside to indoor conditions. The normal heat build-up with a constant internal load load is calculated by the maximum thermal strength of 0 ~ 12 cm and the effects. We see the pure effect of thermal conductivity on the heat build-up load as a fashion for extending beyond the temperature of the dry bulb. The transfer of heat by building the partition is reduced by increasing the size of the input. Saving percentages in building a warm load is the difference between building a warm load without the outside installation and separating the cost without the installation[17-18]. Energy-saving fashion within the side of residential houses as a feature of thermal insulation. Energy saving will increase with the size of the installation to 6 cm. Slow growth in energy saving up to eight inches. Therefore, the most complete size of the thermal insulation is found between 6 ~ eight cm and my saving power of 50.46%. Also, similar results are shown and the maximum filling size of extruded polystyrene (XPS) is between 0.053 and 0.069m and the maximum filling of fast polystyrene (EPS) is between 0.081 and 0.105m. The experimental study describes the HVAC rebel machine the use of a built-in greenhouse for heating and cooling. -conditioning machine The overall performance of this machine is 44.5% better than a traditional smoke detector with a remaining 30% load and this improvement can be achieved by 73. eight% Latent load 42%. Containing a desiccant cycle and a vapour pressure cycle, it is very popular due to its energy saving and its antiseptic feature to make the air smooth on the green roof and manage the sites to check the cooling effect of building thermal heating (BTI). The use of air-conditioning power under an unobstructed roof is considered by the power accuracy of the logger. A simple roof with no BTI knowledge is expected to place very little cooling load outside the BTI. The intricate roof and complex BTI places a greater cooling burden than the BTI. The green roof and the heat sinking of the resulting joints combine to violate the thermal insulation.

4.Lighting

Artificial lighting will reason for up to fifteen of a building's yearly electricity use. Usage of gift lighting technology and planning to minimalize the necessity for artificial lighting will reduction lighting energy use in structures by 50-70%. Lighting is the procedure of proper use of light to get the everyday desirable and cosmetic effects[19]. Lighting is the combine use of both artificial light sources (like lamps, LEDS, CFLS) and the natural light source that is day lighting. The main sources of day lighting are windows, skylights or light shelves which can save the energy of artificial lighting in day time.

4.1 Natural Lighting

Natural lighting, also known as daylight, is a way to bring natural light into your home using outdoor glazing (windows, sky lights, etc.), thus reducing the need for non-invasive lighting and energy saving. Natural lighting has been proven to enhance the health and comfort levels of passenger building[20].

4.2 Design towards Natural Lightening

Many components of sunlight are integrated into a real building system, however, technologies such as tubular daylighting devices, sky lights, lighting controls, and well-designed interior design can be considered for retrofit projects.

The science of daylight is more complex than simply bringing light to the home. When adding a lighting fixture, you should consider measuring heat gain and loss, light control, and daytime variability[21-22]. In addition, the size of the window and spaces, the choice of glass, the appearance of the interior finish, and the location of the interior partition should all be considered. In addition, there are many types of daytime games and each has its own unique collection of design considerations.

4.3 Passive Daylighting Strategies

Every single building is different, which is why architects alter passive daylighting ways supported the building's location and its supposed use. The goal of daylighting is to gather enough daylight within the summer to show off electrical lights and collect the maximum amount as potential within the winter to assist heat the building. Here area unit some style fundamentals that architects use to take in as much natural daylight as possible:

4.3.1 Building orientation: Light direction is important. Light from the south is usually better for daylight as the sunlight is constant throughout the day and year. This suspension can be used to gain solar heat. The light from the north is the next best, as the sunlight is as constant as the south, with just a small amount. Light from the east and west must be evaded if by all possible. Sunlight in these areas is difficult, it occurs only during the middle of the day, and the sun's rays change year-round, making sunlight difficult to control. The architects designed the buildings so that the rooms that needed the lightest (like the front doors) faced north or south, while the rooms that needed the least amount of sunlight (such as the front rooms) faced west or east

4.3.2 Windows: To take as much light into the building as conceivable, the designers used windows with high ceilings. They can also use the same windows (ribbon horizontal windows) throughout the façade to illuminate the space evenly. HMC developers

used this approach when building a border project. We also used the placement of both windows - windows facing each other from opposite or near sides - to illuminate entry on all sides.

4.3.3 Space lights: Skylights enable light to penetrate the building from above, which is beneficial in areas where light from the windows does not approach.. Like windows, the separation of light from the sky is the same as the same lighting. Builders can also place lights at the top, allowing light to circulate before reaching the floor.

4.3.4 Clerestories: Windows above the level of the eye, or clerestories, can illuminate the entire room. Architects often combine clerestories with materials for roofing or paint. The light penetrates the clean areas and shines on the ceiling, scattering the light that diffuses most in the basement.

4.3.5 Light shelves: The vertical shelf placed above the windows reduces the light and directs the light deeper into the space.

4.3.6 Solar tubes. This sunlight from the ceiling with a small opening. They look like ordinary roof lights during the day, but they are powered by the sun rather than by electricity. This works best when installed directly on desks, where people need more light. Light wall colours. Light, reflective paint helps light to bound round the room and makes the space feel sunnier.

4.3.7 External Shading Systems: At convinced times of the daytime, the light will be much brighter and can produce stronger light inside the building. To prevent this, the designers designed external dimming systems to protect the windows and other open openings. These systems usually include a combination of vertical and vertical objects, but vary depending on location, climate, and construction conditions.

4.4 Compelling Benefits:

1. **Reduced energy usage**. The reduceed dependence on artificial lighting will facilitate lessen the utilization of electricity by the maximum amount as 100%.
2. **Strong dose of vitamin D**. Sufficient quantity of daylight will stop calciferol and B1 deficiency which will reason diseases like hypovitaminosis and avitaminosis.
3. **Increased performance because of modification in working atmosphere**. Many studies have been showed showing the most improved performance for employees when natural lighting is promoted in their work.
4. **Bigger visual appeal in interiors**. Natural light is still the finest type of lighting used in interior design and can be a interesting task, yet rewarding to successfully install in a building. Overall, natural light offers many long-term assistances that affect the entire life of our living world.

5.Ventilation

Ventilation is a process of "switching" or ventilating any space to provide high quality indoor air. Green constructions aim to diminish the environmental effect on buildings and reduce electricity consumption. Using natural or mechanical air cooling, or a combination of the two, instead of old-style energy-efficient cooling systems, is one way to achieve these goals.

5.1 Natural Ventilation

Natural Ventilation is an excellent solution to reduce energy consumption. It is a great way to reduce the impact of equipment and HVAC systems on the environment. Natural ventilation is important in building any sustainable buildings. From a commercial point of view, natural respiratory systems offer lower costs and lower operating costs (energy, maintenance) than mechanical systems. Natural breathing works well and is cost-effective and provides an outside atmosphere in building employers[23]. It seems like using separate processes to provide open air inside a building to get less air and cooling without the use of mechanical components. Normal breathing has become a critical part of the green building today and needs to be confirmed by the LEED and the Living Building Challenge (LBC)[24]. Typically, a small amount of natural air in buildings can be summed up in two forms, consisting of air-breathing compounds or known as wind turbines, as well as thermal conductivity.

5.1.1 Types of Natural Ventilation

There are mostly two types of natural ventilation that can be hired in a building:

1.Wind Driven Ventilation
   a. Single sided ventilation
   b. Cross sided ventilation.
2. Stack Ventilation. (pressure generated by buoyancy)

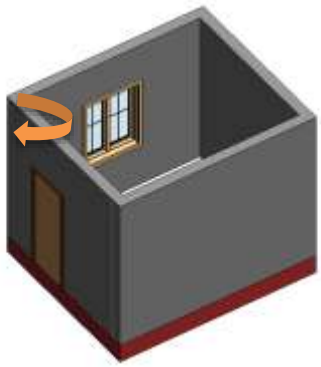

Figure-1: Single Sided Ventilation

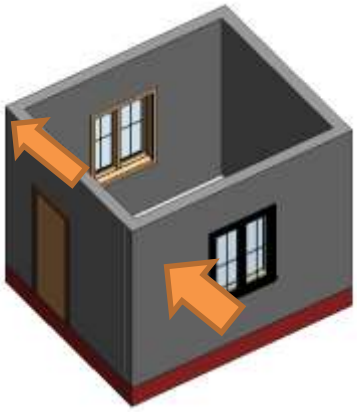

Figure-2: Cross Sided Ventilation

Both of these are caused by natural variations in pressure. However, the difference in pressure caused by air-driven breathing uses the natural force of air and stack ventilation is caused by the pressure exerted by the increase in temperature and humidity[25]. Therefore, there are various mechanisms underlying these two types of ventilation.

Advantages of Natural Ventilation System

- **Energy saving** Buildings are one of the most energy efficient and producers of carbon dioxide. Natural respiratory systems do not emit carbon dioxide or other harmful substances. They do not need electricity or other fuel to make air
- **No pipelines and ducting** Unlike cooler air or air-conditioners, natural methods do not require pipes or pipes that generate more revenue and, in some cases, damage the beauty of the building
- **More natural light** Anything natural is good for health. At least, many times. A great openness not only brings natural air but also a lot of natural light. In case the sun is heavy, you can always cover them with beautiful drapes!
- **Efficient use of space** The air handling units of any other machine require installation space, whereas, a small amount of natural air only needs to be opened. The mechanical space can now be used for a variety of other purposes.
- **Low maintenance** The absence of pipes, hoses and equipment will not need to be repaired without open dusting, which is a herculean operation!
- **Less expensive** Except for expenses on frames, shutters and hangings for openings, there is no expenditure for whatsoever else. No equipment means, no extra costs. nature air is free, isn't it?
- **Less health-issues** Mechanical systems can cause disturbances and unpleasant noises (if the equipment is not maintained correctly). Natural respiration can reduce such symptoms of disease-causing disease

6.Conclusion

The project aimed to understand, plan and design Green Building That has been achieved by studying different green technologies for buildings. By planning and designing building layout, development of plan, elevation, sections etc. Various green technologies and materials proposed with their feasibility study and cost comparison. The structure of the building is designed using STAAD PRO software. Finally, we are also done the considering LEED certification standards. Replacement of Steel around 80% reduce cost by 8-12%, also use of GFRPs makes structure more economical & eco-friendlier. By replacing Conventional bricks with AAC blocks Reduce self-weight and cost of material, saves time. The final estimated cost analysis is shown in table-2.

Table-2: Estimated Cost

Conventional Building	Green Building	Percentage Variation	Saving Cost
□ 40,33,576.00	□ 38,58,604.00	4%	□ 1,74,972.00

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