

Advantages of Green Material Used Construction

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Abstract - Green and sustainable constructions are of a great trend in the present scenario. Such a type of construction aims at reduction in waste, pollution, to share resources like water, energy, natural resources, etc and to achieve sustainable development by improving environmental quality. It is the practice of increasing efficiency with which buildings minimize the use of resources and reducing building impacts on human health and the environment. The 'Green Building' concept is gaining very much importance in various countries, including India. These buildings ensure the wastes are minimized at every stage during the construction and operation of the building, resulting in low costs, according to experts in the technology. The study mainly aims to replace the normal building materials like brick, concrete, stones with recycled and eco-friendly materials. The main aim is to reduce the load on the environment. Bricks, concrete, etc leads to depletion of natural resources. The aim of green construction is to achieve sustainability too. So using recycled materials will be a good solution for the above.

- Utilization of energy, water, and other resources efficiently
- Adopting renewable energy, such as solar energy
- Reduction in Pollution and waste generation, and the enabling of re-use and recycling
- Indoor environmental air quality is maintained
- Prefer materials that are non-toxic, ethical and sustainable in nature
- Consideration of the environment and quality in design, construction, and operation measures
- Adopt a design that enables adaptation to a changing environment.

Any building can be a green building, whether it's a home, an office, a school, a hospital, a community centre, or any other type of structure, provided it includes features listed above. Here we are mainly concentrating on using sustainable building materials to go green. Sustainable materials mean materials that don't cause any impact to the environment. The different methods will be discussed in detail below.

Key Words: Recycled materials, Green building, Sustainable, Future development, Energy efficient

2. CONVENTIONAL BUILDING MATERIALS AND ENVIRONMENT

1. INTRODUCTION

Conventional construction materials have a great impact on the environment. The increase in pollution level and the material shortage is making builders adopt new construction practices. The green building concept is the best one in the new building practices. Such a type of construction aims at reduction in waste, pollution, to share resources like water, energy, natural resources, etc and to achieve sustainable development by improving environmental quality. It is the practice of increasing efficiency with which buildings minimize the use of resources and reducing building impacts on human health and the environment. The 'Green Building' concept is gaining very much importance in various countries, including India. These buildings ensure the wastes are minimized at every stage during the construction and operation of the building, resulting in low costs, according to experts in the technology. As per the 'World Green building council,' there are a number of features that can make a building 'green'. These include:

Conventional construction involves the method of ordinary or standard construction. It uses traditional materials and remains within a specific parameter for construction. Buildings are the major account for more than 41% of energy consumption in developed countries. It includes services like HVAC, lighting, water heating, pumping and fans that amount up to 40%. Buildings and its uses are responsible for causing a large part of the environmental load induced by humanity. It includes 42% of all energy consumption, 40% of all atmospheric emissions, 30% of all raw materials used, 25% of water usage, 25% of solid waste and 20% of liquid waste. From studies, it is found that 3 billion metric tons of raw materials are consumed annually to manufacture building materials and products. After the food industry, the building industry is considered as the second-largest consumer of raw materials. Since buildings are large entities they can have impacts on the environment in various ways. As the present-day designs consume large quantities of physical resources, like energy, money and resources, it could result in the loss of amenities and biodiversity which are more difficult to assess.

The life cycle of a building material includes four steps, 1. extraction, 2. Processing, 3. Use and Maintenance, 4. Disposal. The building material is processed from naturally occurring substances mostly. This includes limestone, clay, silica sand, pumice, etc. Bricks and concrete manufacturing depends on these natural resources. These are the most widely used building material too. Extraction of these materials from the ground leads to Deforestation, Desertification and Soil Erosion. The extraction of materials also leads to Ecological toxicity, degradation, climate change, ozone layer depletion, acidification, habitat alteration, etc. on a secondary basis. To avoid these environmental effects new practices like green building materials which are made from recycled and waste materials should be adopted for construction.

3. GREEN BUILDING MATERIAL

Green building materials are materials that don't create any impact on the environment. The common objectives of green building material are to minimize the impact on the natural environment and reduce energy and water usage. It also must protect the health of occupants and increase productivity. Moreover, the design must be in such a manner that it minimizes waste, pollution and environmental degradation. A green building material incorporates environmental considerations into every phase of its building structure.

A green material or sustainable material is any material that can be put to effective use in the present without compromising its availability for use by coming generations. These are mostly renewable or the materials that are recycled and reused. The materials must be able to reduce energy consumption too. So various green construction materials had passed through our study.

- **Wool Brick** - It is a natural building material obtained by adding wool and natural polymer found in seaweed to the clay of the brick. It minimizes the usage of clay and can increase the strength to about 37% more than ordinary brick. It is temperature resistant and can be used in any climate. Since they are dry hard extra burning is not required thus incineration can be avoided.
- **Solar Tiles** - Roofing occupies the largest part of a building. This space can be made useful by adopting Solar tiles. Solar Tiles spend a large portion of the day absorbing energy from the sun. Compared to normal solar units they are not fixed on the top of the existing roofing; instead, they are fully integrated into the building. The material protects from all-weather conditions and moreover generates electricity.
- **GFRG panels** - GFRG sheets manufactured by FRBL, Kochi Kerala are the best example of recycled building material. The core material of GFRG is phosphogypsum. The raw gypsum is a

byproduct of FACT acid plant and hence it is a green material. The material is reinforced with glass fiber to provide load-bearing capacity. The material is cheap and affordable for construction.

We have done our study on GFRG sheets. It has spectacular properties and it is found as one of the best green building material. The main advantage is that it is cheap compared to bricks and it is made of a waste product. The material is available as large sheets. It can be easily cut and bent as the requirement of the work. It can save Manpower too. Compared to normal construction 20% to 30% less labor usage is required for GFRG panels. It can be easily dismantled or altered compared to a normal brick wall.

The speed of construction is faster which can save time and we know time is money. It offers a dry construction method. The materials fire performance is good, it is fire resistant for up to 4 hours. The acoustic properties are also wonderful as drywalls are estimated to offer up to +63 STC with cavity insulation.

3.1 Manufacturing of GFRG

Raw gypsum is collected from the gypsum deposition at phosphoric acid plants and is crushed. It is fed to the Calciner for calcination and then heated to 180 to 200-degree Celsius. The plaster is mixed with water, white cement and chemicals (D50 and BS94) in a mixer. The first layer of slurry is spread over the table followed by the first layer of glass fiber. Aluminum plugs are inserted for forming hollow cavities inside the panel. The process of spreading slurry and glass fiber is repeated. After some time the plugs are removed and are dried in a dryer at 200 degrees Celsius. After the manufacturing in the plant, it is transported to sites as per client's requirement.

3. COMPARISON BETWEEN A GREEN BUILDING MATERIAL AND CONVENTIONAL BUILDING MATERIAL

So as to compare with conventional building materials, these green materials are more energy-efficient, have lower functioning and maintenance costs, provide improved comfort and well-being of occupants and have a lower risk of harmful impacts on the environment. It uses key assets like energy, water, land and materials more economically than conventional buildings. It is proven that conventional building materials don't integrate these efficient strategies in order to have reduced environmental impacts and it leads to the utilization of natural resources, increased wastage, and increased operational and maintenance cost.

Execution of green materials can lead to an average of 35% reduction in carbon emissions as by the study reports. It also reduces water handling by 40%, solid

waste declines by 70% and diminution in energy consumption by 50%. Green building concept also states that an area with high biodiversity should be avoided from the construction as it harms the environment. The key elements of green material construction are energy efficiency, smart design, eco-materials and water conservation. It is known that a conventional building uses a large amount of land, energy, water and raw materials for its construction and its uses. They are also responsible for large GHS emissions as well as the emission of harmful air pollutants along with a large amount of construction and demolition wastes. Some of the green materials include GFRG panels, greenwood or engineering wood, green paints etc. Rainwater harvesting, permeable pavements, rain gardens etc makes the construction green.

5. CONCLUSION

As discussed in this paper, we figured out that green materials are much more superior than conventional materials in terms of overall energy-saving criteria as well as they are eco-friendly in nature. It is found that green material construction involves the usage of materials and processes that are resource-efficient and environmentally responsible throughout the lifecycle of a building. A green material construction involves low maintenance and operational costs, energy efficiency, enhancing indoor environmental quality, water efficiency, better health, material efficiency, a better environment and thus reduces the strain on local resources. It brings about a wide range of advantages in the environmental, economic and social structure. Thus it can be concluded that green buildings bring multiple benefits worldwide.

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